Diversity and pasture potential of legumes indigenous to southern Africa

by

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DECLARATION

I, Marike Trytsman, declare that the thesis that I hereby submit for the degree Philosophiae Doctor at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

Signature:

Date: 7 October 2013

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Maar God gee 'n gestalte daaraan, soos Hy bepaal het; aan elke saadsoort gee Hy 'n eie gestalte.

1 Korintiërs 15:38 (1983-vertaling)

Then God gives it the new body he wants it to have. A different plant grows from each kind of seed.

1 Corinthians 15:38 (New Living Translation)

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ABREVIATIONS

ABS - Access and Benefit-sharing

AHC - Agglomerative Hierarchical Clustering

ARC - Agricultural Research Council

BNF - Biological Nitrogen Fixation

CIAT - Centro Internacional de Agricultura Tropical

CSIRO - Commonwealth Scientific & Industrial Research Organization

DA - Discriminant Analysis

EMBRAPA - Empresa Brasileira de Pesquisa Agropecuária

FAO - Food and Agricultural Organization

ICARDA - International Center for Africultural Research in the Dry Areas

ILRI - International Livestock Research Institute

IPR - Intellectual Property Rights

ITPGR - International Treaty on Plant Genetic Resources

NEPAD - New Partnership for Africa's Development

PCA - Principle Component Analysis

PGR - Plant Genetic Resources

PGRFA - Plant Genetic Resources for Food and Agriculture

POSA - Plants of southern Africa

PRECIS - National Herbarium (PRE) Computerised Information System

QDGC/QDGCs – Quarter Degree Grid Cell/s

SADC - Southern African Development Community

SANBI - South African National Biodiversity Institute

TK - Traditional Knowledge

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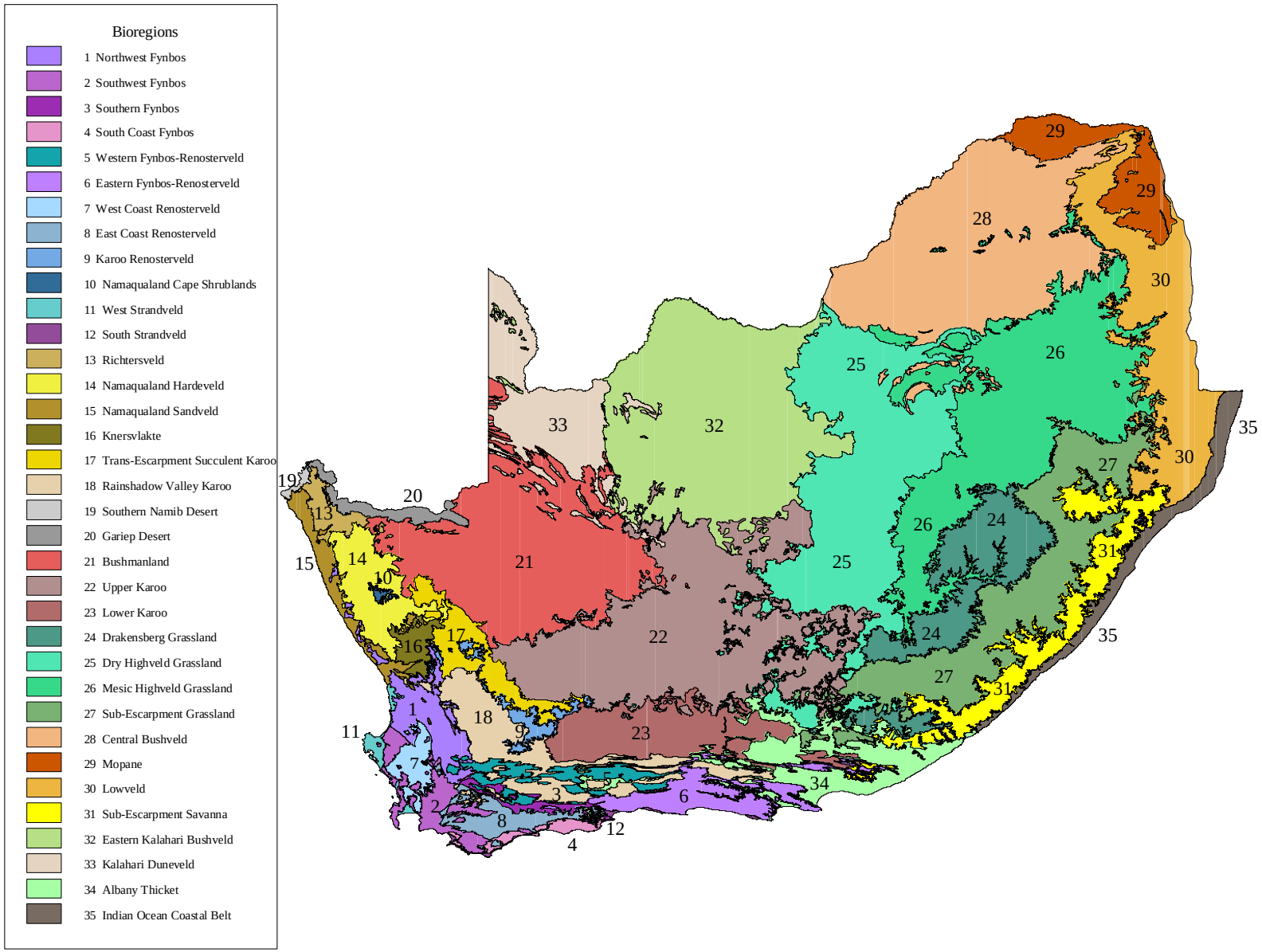

Figure I. Bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al*. 2006).

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ABSTRACT

Diversity and pasture potential of legumes indigenous to southern Africa

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Submitted in partial fulfilment of the requirement for the degree

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This study records all known legume (Leguminosae/Fabaceae) species indigenous to South Africa, Lesotho and Swaziland to establish distribution patterns and optimum climatic and soil conditions for growth. The main purpose was to propose a list of legume species for further evaluation of their pasture potential.

Collection data supplied by the National Herbarium (PRE) Computerised Information System were recorded to establish the distribution patterns of species based on the bioregions vegetation map. A total of 1 654 species are known to be indigenous, representing 24 tribes and 122 genera.

The grouping of legume species into five main clusters and 16 Leguminochoria is ecologically described, with the highest legume species richness found in the Northern Mistbelt Forest. Key and diagnostic species are provided for each Leguminochorion. Soil pH and mean annual minimum temperature were found to be the main drivers for distinguishing between legume assemblages. The optimum climatic and soil conditions for growth are described as well as the available descriptive attributes for species recorded. Information on the range of tolerance of most species to abiotic factors is presented. Mean annual rainfall and soil pH are highly correlated with the distribution pattern of most species, followed by mean

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annual minimum temperature. Legume species adapted to a wide range of soil pH levels and low soil phosphorus levels are recorded.

Existing data on the cultivation and grazing or browsing status of indigenous legumes were used to select 584 species found mainly in the Central Bushveld, Mopane and Lowveld Bioregions to be further evaluated for their pasture potential. Known characteristics were used to categorise species. Species contained in the tribe Phaseoleae are of special interest since it contains most of the genera with present-day agricultural value, i.e. *Eriosema*, *Rhynchosia* and *Vigna* species are listed as having high potential as pasture species.

This study has shown that the descriptive and distribution data accumulated by botanists (notably taxonomists) could be of beneficial use in meeting agricultural objectives. Indigenous legumes are adapted to a wide range of soil and climatic conditions and represent a valuable but largely unexploited natural resource for pasture development and soil conservation practices.

Keywords: adaptation, biomes, bioregions, climate, Fabaceae, fodder, genebank, Leguminosae, plant genetic resources, tribes, soil.

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CHAPTER 1

INTRODUCTION

1.1 Background

The importance of legumes (Leguminosae / Fabaceae *s.l.*) in a pasture or cropping system, its notable soil conservation enhancing qualities and nitrogen-fixing abilities are acknowledged by researchers and valued by farmers worldwide. The purpose of this study is to record all known legume species indigenous to South Africa, Lesotho and Swaziland, to establish distribution patterns and optimum climatic and soil conditions for growth and to propose a list of legume species for further evaluation for pasture potential.

Even though many South African grass species have been evaluated, improved and made commercially available, only a few legumes such as *Lablab purpureus*, *Listia bainesii* and *Vigna unguiculata* are established fodder or pasture crops being used locally and internationally. Currently the National Forage Genebank of the ARC-Animal Production Institute holds only ± 5% of indigenous legume species, as opposed to nearly all the important indigenous forage grass species.

The reason for the little interest in evaluating and developing indigenous legume species could be attributed to large and well-known genera such as *Aspalathus* (335 species), *Crotalaria* (55 species), *Indigofera* (196 species) and *Tephrosia* (62 species) not generally recognised as livestock feed. This is mainly due to low acceptability, palatability or production and many species containing antiquality factors such as cyanogenic glucosides, alkaloids and saponines. Noteworthy, though, are the considerable information available on the livestock feed value of species of *Acacia* (49 species). The easy access to improved pasture legumes from other countries, especially Australia and southern America, could also have contributed to the indifference to investigating local genetic resources. Moreover, the Pasture Legume Research Unit of the Department of Agriculture was merged into what later became known as the ARC-Range and Forage Institute in 1989, currently with a declining emphasis on pasture research projects that focus on screening, characterisation, description, evaluation, selection and breeding of potential and/or promising pasture legumes. The acquisition of primarily alien legume genetic resources since 1982 with the aim of alleviating problems associated with agricultural land use practices was published by Kruger (1999).

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1.2 Key questions

What legume species are indigenous to South Africa, Lesotho and Swaziland and what are their taxonomic relationships?

What descriptive and qualitative data are recorded for indigenous legume species and how do these descriptors relate to distribution patterns and potential pasture value?

Could the available datasets and methods used to record and describe indigenous legumes be used for assessing adaptive abilities and pasture potential of species?

Could the available datasets be used to determine levels of adaptation to varying climate and soil conditions between species?

Could the use of botanical descriptions and occurrence data be useful in prioritising the large number of species when selecting possible species for further evaluation?

To what extent could occurrence data recorded on a regional scale realise agricultural needs?

1.3 Objectives

The principal objectives of this study are:

- To describe the diversity of legumes indigenous to South Africa, Swaziland and Lesotho in terms of their adaptive and botanical characteristics with the aim of predicting possible pasture value.
- To use the outcome of this study as a guideline in the collection and conservation of seed within the National Forage Genebank of the ARC-Animal Production Institute.

1.4 Hypotheses

- The wealth of descriptive and distribution data accumulated by botanists and taxonomists could be used to cluster, describe and select indigenous legume species for further evaluation as animal feed.
- Indigenous legumes are adapted to diverse soil and climatic conditions, creating the opportunity to select species for specific agricultural needs.

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1.5 Research approach

Legumes indigenous to South Africa, Lesotho and Swaziland will be listed using available descriptive (Germishuizen & Meyer 2003) and distribution data (PRECIS 2008). The PRECIS (National Herbarium Pretoria (PRE) Computerised Information System) database documented a total of 33 726 Leguminosae records and will be edited for species present within the borders of the above-mentioned countries, and incomplete and double records within a quarter degree grid cell will be omitted.

The phylogeny of the Leguminosae as proposed by Lewis *et al*. (2005) will be used for establishing taxonomic relationships. The available data from Germishuizen & Meyer (2003) will be used to describe growth form, height and altitude of individual species. PRECIS distribution records will be superimposed on the biome and bioregion vegetation maps published by Mucina & Rutherford (2006). At the quarter degree scale (standard format for PRECIS data capturing), vegetation types will be recorded under the various biomes and bioregions. The same principle of assigning annual rainfall, pH, temperature, and phosphorus values to quarter degree grid cells will be used to determine distribution patterns of legumes across the aforementioned variables. PRECIS data will further be used to generate a map indicating the collection intensity for leguminous species in South Africa, Lesotho and Swaziland.

This study is the initial phase of assessing a total of 1 654 species of the family Leguminosae known to be indigenous to South Africa, Lesotho and Swaziland and representing 24 tribes and 122 genera. Most indigenous genera are contained in the subfamily Faboideae, while most genera with present-day agricultural value fall in the tribe Phaseoleae.

1.6 Layout of thesis

This thesis starts with an overview of legume research in southern Africa and, where applicable, the rest of Africa and globally (Chapter 2). Focus is on the use of legumes in agricultural production systems (cropping and livestock) rather than on taxonomic relationships and biological nitrogen fixation.

Chapter 3 contains a full research paper published in *African Journal of Biotechnology* in 2011. The article gives a brief outline of taxonomic relationships, available descriptive information at tribe level and of collection intensities of indigenous legume species.

The methods and definitions of the terms used in this study are given in Chapter 4.

An inventory of all known indigenous legume species is recorded alphabetically in Chapter 5. A distribution map, based on PRECIS collection data, is presented for each species. Where no data is available, only the taxon is listed. A short description of the growth form, height

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and altitude range is given, as well as the highest and second highest % occurrence in bioregions and biomes, and climate and soil properties are stated. Available literature, focusing primarily on livestock feed value, cultivation, antiqualities and nodulation, is cited where relevant.

Chapter 6 describes the 16 uniquely formed Leguminochoria, the emphasis on the bioregions and biomes where clusters are formed, as well as on the key climate and soil properties. The climate and soil properties are compared along with species richness, species range, key and diagnostic species. The floristic links between Leguminochoria are established by comparing key species common to clusters.

The effect of different abiotic variables on the distribution patterns of legume species is discussed in Chapter 7. The adaptive ability to prevailing climate and soil conditions of all legume species within a tribe or genus is given in table form. A list of species adapted to low soil P at any given pH level, is also presented.

Legume species known to be cultivated, grazed or browsed by livestock were screened for their pasture potential by using available descriptive data, namely distribution patterns, known antiqualities, adaptation to low soil phosphorus, height and perenniality. The number of cultivated or grazed/browsed species was plotted at both latitude and longitude to determine quarter degree grid cells containing the highest percentage. These results are presented in Chapter 8.

Chapter 9 concludes this thesis with a general discussion and final conclusion.

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CHAPTER 2

REVIEW OF AFRICAN LEGUMES USED IN AGRICULTURAL SYSTEMS

2.1 Use of legumes in agricultural cropping systems

Various reports on the use of forage legumes in sub-Saharan Africa have been published (Haque *et al*. 1985; Speedy & Pugliese 1991; FAO 1996; Tarawali *et al*. 1999; Shelton 2001; Maposse *et al*. 2003; Whitbread & Pengelly 2004). Legumes in rotation with other crops were first mentioned in Roman times (Isely 1982), with lucerne probably being the first forage legume to be domesticated.

Graham & Vance (2003) state that legume crop yields have not kept pace with those of cereals, and even more so in developing countries. They ascribe this trend mainly to the unfavourable environmental conditions under which legumes grow, e.g. grown after the main crop such as rice or maize has been harvested and on poor soils. The need to develop legumes that are more tolerant to drought, acid and salinity is essential, taking future predictions of water shortages in consideration. Collection and evaluation of germplasm should be prioritised (Graham & Vance 2003) and, as mentioned by Sprent & Gehlot (2011), the full potential of African indigenous legumes has not been realised and South Africa is seen as a valuable source of legumes for arid and semi-arid regions. The diversification of legume species used as food and forage is acknowledged as vital for a changing world (Sprent *et al*. 2010).

In a review of tropical forage legumes in sub-Saharan Africa, Thomas & Sumberg (1995) state that notwithstanding nine decades of research, cultivation is still marginal with only some success in dairy production systems in highland areas. They state that even though outstanding pasture species adapted to a wide range of environments are available, the problem of poor livestock nutrition is not necessarily the accepted single most important constraint in livestock production, and that a farmer participatory approach is vital in future research programmes. The reasons for the poor adoption of forage legumes by African farmers are discussed by Sumberg (2002), Lenne & Wood (2004) and Shelton *et al*. (2005).

The use of pasture legumes in South Africa is mainly focused in the Western Cape, where they are used in rotation with winter grains and as pastures (Van Heerden 2007; Van Heerden 2012). In KwaZulu-Natal (Eckard 1994) and irrigated areas in the Eastern Cape (Botha 2003) legume pastures are used mainly in dairy farming. However, none of the indigenous species play a major role in pasture production, since alien temperate species such as *Medicago sativa*, *Trifolium repens* and annual species of *Trifolium* and *Medicago* integrate well into

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cropping systems. Some research on lamb production from grass–legume mixtures was done by the Department of Agriculture and Development on the Roodeplaat (Pretoria) and Nooitgedacht (Ermelo) Research Stations in the 1980s, but the adoption rate by farmers were not documented. Subtropical and tropical legumes introduced from Australia, South America and India were mainly used in these regions, with *Desmanthus virgatus*, *Leucaena leucocephala* and *Stylosanthes guianensis* mostly utilised (Kruger 1999). Indigenous species mostly used in evaluation trials were *Lablab purpureus*, *Neonotonia wightii* and *Vigna unguiculata*. The renewed interest in *Chamaecytisus palmensis* (tagasaste or tree lucerne) should be noted (Erasmus 2012) and the effect of harvesting or drying methods to improve intake was reported by Assefa *et al*. (2012).

The importance of legumes in agriculture is summarised by Vance (2001). The high protein food for humans and animals, reduced nitrogen fertiliser requirements, added nitrogen for rotation and intercrops, reclamation of acid soils, cover crops to control weed are only a few. Added to the role of legumes in improved animal production and soil fertility, their significant role in enhancing soil carbon sequestration is envisaged by Abberton (2010).

2.2 Agronomic evaluation and breeding of indigenous legumes

Many reports from Africa where indigenous legume species were compared as animal feed are available, including for:

Acacia spp. (Pellew 1980; Mlambo *et al*. 2001; Smith *et al*. 2005; Mapiye *et al*. 2011)
Alysicarpus rugosus (Nyoka *et al*. 2004; Rootman *et al*. 2004)
Colophospermum mopane (Lukhele & Van Ryssen 2000; Mutakela 2009)
Crotalaria spp. (Sarwatt & Mkiwa 1988; Muir & Maposse 2002)
Dichrostachys cinerea (Smith *et al*. 2005)
Lablab purpureus (Nyoka *et al*. 2004; Odhiambo 2004)
Listia bainesii (Smith 1977; Rootman *et al*. 2004; Mapiye *et al*. 2006)
Listia heterophylla (Kategile 1985)
Macrotyloma axillare (Smith 1977; Kategile 1985; Clatworthy & Madakadze 1988; Lusembo *et al*. 1995; Nyoka *et al*. 2004; Mapiye *et al*. 2006)
Mucuna pruriens (Odhiambo 2004)
Neonotonia wightii (Smith 1977; Clatworthy & Madakadze 1988; Mapiye *et al*. 2006)
Peltophorum africanum (Lukhele & Van Ryssen 2000)
Rhynchosia spp. (Lusembo *et al*. 1995; Muir & Maposse 2002)
Sesbania sesban (Niang *et al*. 1998; Debela *et al*. 2011)
Stylosanthes fruticosa (Kategile 1985; Clatworthy & Madakadze 1988)
Teramnus labialis (Clatworthy & Madakadze 1988)
Vigna luteola (Rootman *et al*. 2004)
Vigna unguiculata (Nyoka *et al*. 2004; Odhiambo 2004; Rootman *et al*. 2004)
Zornia spp. (Hakiza *et al*. 1988a; Muir & Maposse 2002)

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A few legume species extensively used and investigated are discussed below.

The forage potential of several species of *Indigofera* has been investigated by Hassen *et al*. (2006, 2007, 2008) and Tjelele (2006). The variation in production, quality and indospicine levels within accessions and between species provides an opportunity to select and breed a suitable forage crop, using *I. spicata*, *I. arrecta* and *I. cryptantha*, which showed unique potential.

Lablab purpureus is described as one of the most diverse legume species but under threat of genetic erosion (Pengelly & Maass 2001; Maass *et al*. 2010). Research in Africa is limited to soil improvement, using mainly cv. Rongai from Australia, therefore suggesting that existing biodiversity as being more suitable to African climates, is overlooked. An agronomic and nutritive review of *L. purpureus* published in 1999, underlines its importance as a pasture crop worldwide (Murphy & Colucci 1999). Recent evaluation studies in Limpopo, South Africa, yielded promising germplasm introduced from Australia as well as local varieties (Ayisi *et al*. 2004; Whitbread *et al*. 2011).

Lotononis was recently revised, with *Euchlora*, *Leobordea* and *Listia* reinstated and *Ezoloba* introduced as a new genus (Boatwright *et al*. 2011). During the 1970s, *Listia bainesii* was identified as a potential species for improvement owing to its growth form that promotes grazing resistance (Smith 1974). *Lotononis angolensis* (indigenous to southern Africa) and *Listia heterophylla* were also recognised as potential pasture species. As a result of a *Listia bainesii* breeding and improvement programme in Uruguay, cv. INIA Glencoe was released (Real & Altier 2005). The attributes of this cultivar are described as resistance to *Fusarium oxysporum*, high seed and forage production, deep root development, persistence under relatively high temperatures and relative resistance to frost.

Before 1999, a few reports on the forage value of species of *Sesbania* were published (Gillett 1963; Onim & Dzowela 1988; Gutteridge 1998). It is described as an excellent livestock feed with large species diversity in Africa; hence access to germplasm for evaluation purposes is relatively easy. Kisinyo *et al*. (2012) found that accessions of *S. sesban* that are aluminium toxicity-tolerant and phosphorus-efficient are available. Feeding *S. sesban* at low percentages should not affect ruminants negatively (Cook *et al*. 2005).

Stylosanthes fruticosa is not considered a successful pasture crop, notwithstanding many reports on its pasture potential (Hakiza *et al*. 1988b). Other alien species of *Stylosanthes* were widely tested throughout the sub-Saharan region and, probably owing to the extensive selection and breeding efforts, out-yielded and persisted longer than *S. fruticosa*.

The growth potential of the drought-tolerant *Tylosema esculentum* was evaluated (Powell 1987) and its seed qualities were compared to soybeans (Bower *et al*. 1988). Although local and international interest in this species as a drought-resistant pasture crop is known (Dakora *et al*. 1999), little research on its feed value has been done since 2000. In a recent study by researcher from the University of Pretoria, extracts of *Tylosema esculentum* were found to have potential use as microbicides (Chingwaru *et al*. 2011).

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African clovers have been evaluated as pasture crops since 1952, including *Trifolium africanum*, *T. burchellianum* and *T. stipulaceum* (Gillett 1952; Britten 1962; 'T Mannetje & Pritchard 1968; Jones *et al*. 1974; Kahurananga 1988). Jones *et al*. (1974) concluded that future development of indigenous clovers lies where climate and soil conditions exclude the growth of white clover (*T. repens*), a highly developed and productive clover species.

Vigna unguiculata is probably the most widely used and productive species in sub-Saharan Africa. Research papers report on the drought tolerance (Akyeampong 1985; Osonubi 1985), diversity (Panella *et al*. 1993; Fang *et al*. 2007; Badiane *et al*. 2012), dual-purpose varieties (Kristjanson *et al*. 2002; Singh *et al*. 2003; Anele 2011), importance as food (Hallensleben *et al*. 2009) and soil phosphate uptake (Makoi *et al*. 2010).

Dusi white clover (*Trifolium repens*) was the first species included in the legume improvement programme initiated in South Africa at Cedara in 1976, while pasture grass improvement has taken place since 1910 (Smith & Rhind 1984). The authors predict that only priority legume species such as *Medicago sativa*, *Trifolium repens* and *T. pratense* would receive attention from plant breeders in future. Apart from seed selections made by researchers for further evaluations, the aim of breeding indigenous legume pasture species has never been prioritised within the South African Department of Agriculture or the Agricultural Research Council. *Vigna unguiculata* cv. Encore was the only grazing cultivar released by the Roodeplaat Research Station. However, the ARC-Grain Crops Institute (Potchefstroom) has bred three promising *Vigna unguiculata* cultivars to be released soon (Anon 2012).

Cook *et al*. (2005) list cultivars mostly released in Australia, for *Lablab purpureus* cv. Rongai, cv. Highworth, cv. Koala and cv. Endurance; for *Listia bainesii* cv. Beit, cv. INIA cv. Glencoe and cv. Miles; *Macrotyloma axillare* cv. Archer, cv. Guatá and Jcv. ade; for *Neonotonia wightii* cv. Clarence, cv. Cooper, cv. Kenya violet glycine, cv. Kenya white glycine, cv. Malawi, cv. Moshi, cv. Tinaroo and cv. Tropic Verde; for *Sesbania sesban* cv. Mt Cotton; for *Teramnus labialis* cv. Semilla Clara and cv. Semilla Oscura; for *Vigna luteola* cv. Dalrymple; for *Vigna unguiculata* cv. Red Caloona, cv. Ebony PR, cv. Arafura, cv. Banjo, cv. Big Buff, cv. Holstein, cv. Blackeye peas, cv. Browneye peas, cv. Ojo Negro, cv. Minica and more.

In a paper prepared for the FAO (Food and Agricultural Organization), Abberton *et al*. (2008) concluded that as a result of climate change, adaptive challenges in breeding forage grass and legume species include the increase in genetic variation in varieties and cultivars, maintaining sward composition in mixtures where cultivars are adapted to different environmental stresses and enhance the drought tolerance and increase water use efficiency of pasture species. In terms of drought tolerance, future collection and characterisation of genetic resources adapted to drought-prone environments plays an important role.

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2.3 Biological nitrogen fixation (BNF)

Research on the biological nitrogen fixation of legumes indigenous to Africa is well documented, with prominent work by F.D. Dakora (Dakora 2000; 2003; Dakora & Keya 1997) and colleagues (Masutha *et al*. 1997; Boone *et al*. 1999; Muofhe & Dakora 1999; Ayisi *et al*. 2000; Musil *et al*. 2003; Pule-Meuelenberg & Dakora 2007; Spriggs & Dakora 2007; Makoi *et al*. 2009). Valuable earlier work on the nodulating abilities of indigenous species is reported by Grobbelaar & Clarke (1972, 1974, 1975), Grobbelaar *et al*. (1967), Grobbelaar & Van Rooyen (1979), Grobbelaar *et al*. (1983) and in the review by Strijdom (1998). The latest interest in indigenous legumes from Australian researchers resulted in many publications (Yates *et al*. 2007; Ardley *et al*. 2009; Gerding *et al*. 2012). The nodulation of genera found in South Africa, Lesotho and Swaziland is presented in Table 2.1.

Table 2.1 Nodulation of legume genera found in South Africa, Lesotho and Swaziland based on the review of Sprent (2001) following the classification of Lewis *et al*. (2005) and Boatwright *et al*. (2011) for the tribe Crotalarieae. (+) Nodulation noted for some or all species; (–) No nodulation noted for some or most species; (?) No or little information.

Subfamily	Tribe	Genera
Caesalpinioideae		
	Cercideae	*Adenolobus* (–), *Bauhinia* (–), *Tylosema* (–), *Piliostigma* (–),
	Detarieae	*Schotia* (–), *Colophospermum* (–), *Guibourtia* (–), *Afzelia* (–), *Brachystegia* (–)
	Cassieae	*Dialium* (–), *Chamaecrista* (+), *Senna* (–), *Cassia* (–)
	Caesalpinieae	*Umtiza* (?), *Pterolobium* (–), *Caesalpinia* (–), *Pomaria* (–), *Peltophorum* (–), *Parkinsonia* (–), *Erythrophleum* (+), *Burkea* (–)
Mimosoideae		
	Mimoseae	*Xylia* (–), *Entada* (+), *Elephantorrhiza* (+), *Newtonia* (–), *Xerocladia* (+), *Neptunia* (+), *Dichrostachys* (+), *Adenopodia* (–)
	Acacieae	*Acacia* (+)
	Ingeae	*Faidherbia* (+), *Calliandra* (+), *Albizia* (+)
Faboideae		
	Swartzieae	*Cordyla* (–)
	Sophoreae	*Xanthocercis* (–), *Bolusanthus* (+), *Sophora* (+), *Baphia* (+)
	Podalyrieae	*Cyclopia* (+), *Xiphotheca* (+), *Amphithalea* (+), *Stirtonanthus* (–), *Podalyria* (+), *Liparia* (+), *Virgilia* (+), *Calpurnia* (+)
	Crotalarieae	*Aspalathus* (+), *Wiborgia* (+), *Wiborgiella* (+), *Rafnia* (+), *Lebeckia* (+), *Calobota* (+), *Lotononis* (+), *Pearsonia* (+), *Rothia* (+), *Bolusia* (+), *Crotalaria* (+)
	Genisteae	*Melolobium* (+), *Dichilus* (+), *Polhillia* (–), *Argyrolobium* (+)
	Dalbergieae	*Zornia* (+), *Pterocarpus* (+), *Stylosanthes* (+), *Dalbergia* (+), *Aeschynomene* (+), *Smithia* (+), *Kotschya* (+), *Ormocarpum* (+)
	Hypocalypteae	*Hypocalyptus* (+)
	Indigofereae	*Cyamopsis* (+), *Indigastrum* (+), *Microcharis* (+), *Indigofera* (+)
	Millettieae	*Xeroderris* (+), *Craibia* (+), *Philenoptera* (+), *Millettia* (+), *Mundulea* (+), *Tephrosia* (+), *Requienia* (+), *Ptycholobium* (+)
	Abreae	*Abrus* (+)

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Subfamily	Tribe	Genera
	Phaseoleae	*Canavalia* (+), *Galactia* (+), *Ophrestia* (+), *Mucuna* (+), *Bolusafra* (+), *Rhynchosia* (+), *Eriosema* (+), *Flemingia* (+), *Erythrina* (+), *Otoptera* (+), *Decorsea* (+), *Neorautanenia* (+), *Neonotonia* (+), *Dumasia* (+), *Teramnus* (+), *Sphenostylis* (+), *Alistilus* (+), *Dolichos* (+), *Macrotyloma* (+), *Dipogon* (+), *Lablab* (+), *Vigna* (+)
	Desmodieae	*Desmodium* (+), *Pseudarthria* (+), *Alysicarpus* (+)
	Psoraleeae	*Otholobium* (+), *Psoralea* (+), *Cullen* (+)
	Sesbanieae	*Sesbania* (+)
	Loteae	*Lotus* (+)
	Galegeae	*Astragalus* (+), *Lessertia* (+), *Sutherlandia* (+)
	Trifolieae	*Trifolium* (+), *Trigonella* (+)

Herridge *et al*. (2008) state that the symbiotic associations between crop and forage/fodder legumes and rhizobia are the most important nitrogen fixing agents in agricultural systems. Global nitrogen fixation by forage and fodder legume–rhizobia symbiosis is estimated to be 12–25 Tg (1.3–2.7x10^7 tons) annually.

In a review of *Rhizobium* inoculant technologies in sub-Saharan Africa, Chianu *et al*. (2011) recognised the need to advance *Rhizobium* inoculant technology development as well as capacity building around BNF to promote legume production and solve soil fertility problems.

2.4 Soil conservation

The use of legume species in soil conservation practices to restore and improve fertility and to reclaim and conserve degraded soil, is well known. The use of indigenous legumes in soil conservation practices is recorded as follows:

Cover crops, planted after the main crop (e.g. maize) has been harvested, are used to reduce soil erosion and the volume and velocity of runoff over the soil, integrating legumes such as:

Alysicarpus vaginalis (Morris 1997)
Crotalaria spp. and *C. ochroleuca* (Morris 1997; Ekeleme *et al*. 2003)
Desmodium spp. (Morris 1997)
Indigofera hirsuta, (Sampson 1928)
Lablab purpureus (Ekeleme *et al*. 2003; Odhiambo 2011)
Mucuna pruriens (Sampson 1928; Ekeleme *et al*. 2003; Odhiambo 2011)
Vigna unguiculata (Sampson 1928; Odhiambo 2011)

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Green manure crops are used to improve soil fertility where a crop with a low C:N ratio is incorporated in the soil, normally during the flowering stage, integrating legumes such as:

Lablab purpureus (Onyango 2002)
Mucuna pruriens (Waddington *et al*. 2004)
Sesbania sesban (Chikowo *et al*. 2006) and *S. tetraptera* (Morris 1997)
Vigna unguiculata (Onyango 2002)

Crop rotation is practised mainly to control pests and diseases, but also to increase the organic matter content of the soil and improve soil structure and rooting depth for a period longer than a year, integrating legumes such as:

Lablab purpureus (Peoples *et al*. 2009)
Vigna unguiculata (Lupwayi *et al*. 2011)

Soil reclamation and reinforcement of degraded veld is practised by planting a permanent pasture acceptable to grazers to enhance nutrient cycling, using legumes such as:

Crotalaria spp. (Nezomba *et al*. 2007, 2009)
Indigofera astragalina (Nezomba *et al*. 2007, 2009)
Sutherlandia microphylla (Wilcock *et al*. 2004)
Tephrosia purpurea (Nezomba *et al*. 2007, 2009)
Vigna vexillata (Barnes *et al*. 1986)

Soil fertility can be improved by using cover crops, green manure and crop rotation practices, integrating legumes such as:

Crotalaria spp. (Mapfumo *et al*. 2005; Tauro *et al*. 2007)
Indigofera spp. (Mapfumo *et al*. 2005; Tauro *et al*. 2007)
Neonotonia wightii (Macharia *et al*. 2011)
Sesbania sesban (Oberson *et al*. 2006)
Sutherlandia microphylla (Morris 1997)
Tephrosia spp. (Morris 1997; Mapfumo *et al*. 2005; Tauro *et al*. 2007)

Conservation agriculture is practised through no or minimum tillage, crop rotation and residue management, integrating legumes such as:

Lablab purpureus (Trytsman 2008; Bloem *et al*. 2009)
Mucuna pruriens (Naudin & Balarabé 2008)
Vigna unguiculata (Trytsman 2008; Bloem *et al*. 2009)

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2.5 Chemical antiquality factors

Data presented in this thesis refer to chemical antiquality factors present in certain legume species. The antiquality factors are defined below and are aimed as background for data presented in the inventory of legume species (Chapter 5). Ologhobo (1989) suggests that the variation in content of antiquality factors should be considered in breeding studies when selecting for improved forage legumes.

Abrin is a lectin (carbohydrate-binding protein) found in the seed of *Abrus precatorius* and is extremely poisonous (Adedapo *et al*. 2007).

Alkaloids are chemical compounds that contain mostly basic nitrogen atoms, having a bitter taste that limits intake and could have a toxic effect (Rodriquez & Tecson-Mendoza 1998).

Bloat is caused when gas builds up in the rumen and is trapped in the rumen fluid. Bloat-safe legumes are often related to the presence of condensed tannins (Dewhurst *et al*. 2009; Wang *et al*. 2012) and where wild relatives, containing genes that control bloat, are used in breeding programs (Woodfield & Clark 2009).

Bonducin is a homoisoflavone that acts as a phytoestrogen and is found in *Caesalpinia bonduc* (Watt & Breyer-Brandwijk 1962).

Chaksine is an alkaloid found in *Chamaecrista absus* (Watt & Breyer-Brandwijk 1962).

Crotalariosus equorum is a chronic respiratory disease in horses and mules that is associated with the intake of e.g. *Crotalaria dura* and *C. globifera* (Kellerman *et al*. 2005).

Glycosides are molecules in which a sugar group (glycone) is bound to a nonsugar group (aglycone). Cyanogenic glycosides, flavonoid glycosides and saponines are glycosides defined by the aglycone.

- **Cyanogenic glycosides** are toxic when ingested and hydrolysed to free hydrogen cyanide (HCN) or prussic acid (Norton 1998). Ruminants are more susceptible to cyanogen toxicity than non-ruminants since the hydrolytic reaction takes place through microbial activity in the rumen, toxic levels resulting in energy deprivation and death (Kumar 1992). Hydrocyanic acid is an aqueous solution of hydrogen cyanide. **Acacipetalin** is a cyanogenic glycoside found in *Acacia hebeclada* subsp. *hebeclada* (Watt & Breyer-Brandwijk 1962).
- **Flavonoid glycosides** are plant pigment compounds that act as antioxidants (Samanta *et al*. 2011).
- **Saponine glycosides** give a bitter taste to pastures and have foaming properties, resulting in weight loss and gastroenteritis (Aganga & Tshwenyane 2003) and are found in e.g. *Sesbania sesban* (Kumar 1992).

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Glycyrrhizin is a sweet compound containing potassium and calcium salts derived from the liquorice root of *Abrus precatorius* (Karwasara *et al*. 2011).

Indospicine is a free amino acid which causes hepatotoxicity when grazed by cattle (Hassan *et al*. 2008) and is found in e.g. *Indigofera spicata* (Kumar 1992).

Phenol is a poisonous crystalline acidic compound present in wood such that of as *Pterocarpus angolensis* (King *et al*. 1952).

Rotenone and tephrosin are used as a pesticide and piscicide and occur in some species of *Tephrosia* (Morris & Walker 2002).

Tannins, polyphenolic compounds, occur as two groups, namely hydrolysable tannins and condensed tannins where the latter is present in many forage legumes and seeds (Aganga & Tshwenyane 2003). It affects rumen function and depresses intake, wool growth and live weight gain, but at moderate levels a nutritional advantage with increased bypass protein availability and suppression of bloating (Aganga & Tshwenyane 2003).

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CHAPTER 3

SYSTEMATICS, DIVERSITY AND FORAGE VALUE OF INDIGENOUS LEGUMES OF SOUTH AFRICA, LESOTHO AND SWAZILAND

A full length research paper was published in 2011 in the African Journal of Biotechnology, Volume 10 (63) pages 13773 – 13779, available online at: http://www.academicjournals.org/AJB.

The final manuscript is included rather than the printed version. The prescribed journal format is followed and thus differs from the thesis format.

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Systematics, diversity and forage value of indigenous legumes of South Africa, Lesotho and Swaziland

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ABSTRACT

The diversity of legumes, indigenous to South Africa, Lesotho and Swaziland is reported using recorded descriptive and distribution data. A total of 24 tribes, 118 genera and 1662 species were documented with the majority of genera belonging to subfamily Faboideae, tribe Phaseoleae, and the majority of species to tribe Crotalarieae. In terms of distribution patterns, most species were present in the Savanna Biome and Central Bushveld Bioregion. Even though most tribes contain species with secondary metabolites (mainly non-protein amino acids), tribes containing poisonous species are far fewer. Herbs are the key growth form, followed by shrubs, dwarf shrubs and trees. The majority of species are perennials. A map representing the collection intensity for the study area showed that the majority of legumes species were collected in the Fynbos, Savanna and Grassland Biome. It is concluded that indigenous South African legumes are extremely diverse and this denotes the importance of further investigating their forage potential or use in other agricultural practices.

Key words: Biomes, bioregions, Fabaceae, fodder, genebank, Leguminosae, pastures, tribes

INTRODUCTION

Legumes are used extensively in various agricultural practices, for example as high quality pastures, cover and cash crops, for soil improvement and erosion control (Graham and Vance, 2003; Gepts et al., 2005; Lewis et al., 2005). The majority of legumes cultivated in South Africa are introduced species, particularly those used as planted pastures. The most valued commercially produced indigenous legumes are A*spalathus linearis* (rooibos) and C*yclopia intermedia* (honey bush) endemic to the Cape Floristic Region and well-known for their culinary (as tea) and medicinal value. Researchers such as Sprent et al. (2010) argued that by developing indigenous African legumes, especially those well adapted to drought and low soil nutrient levels, agricultural diversity will be retained.

The general belief that indigenous legume species are either poisonous and/or low producers could have attributed to the little attention given to evaluating indigenous legumes for their forage potential (Kruger, pers. comm.) Nevertheless, cultivars have been released from African legume species such as *Lotononis bainesii* 'INIA Glencoe' (Real and Altier, 2005), *Neonotonia wightii* 'Clarence' and *Lablab purpureus* 'Endurance' (Cook et al., 2005). The majority of recently published work on South African legumes relates to phylogenetic and

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biological nitrogen fixation studies. Phylogenetic research focused mainly on the Genistoid tribes (Van Wyk, 2003; Moteetee and Van Wyk, 2006), Podalyrieae (Van der Bank et al., 2002), Crotalarieae (Boatwright et al., 2009; Boatwright et al., 2011) and *Hypocalypthus* (Schutte and Van Wyk, 1998). The latest research on biological nitrogen fixation focused on *Lotononis bainesii* (Jaftha et al., 2002), *Lebeckia* spp. (Phalane, 2008) and *Vigna unguiculata* (Makoi et al. 2009). In terms of pasture evaluation Rootman et al. (2004) and Howieson (2010) are among the more recent papers reporting on the use of indigenous legumes in pasture evaluations trials under South African conditions.

The aim of this paper is to report on the current state of knowledge on the indigenous legume genetic diversity in South Africa, Lesotho and Swaziland. This was seen as the first phase in reviewing the possible forage potential of indigenous legumes. Improving adaptive species from the underutilized indigenous germplasm pool should be a research emphasis in developing new pasture species.

MATERIALS AND METHODS

The Leguminosae (Fabaceae) indigenous to South African, Lesotho and Swaziland (hereafter referred to as South Africa) were listed using available descriptive (Germishuizen and Meyer, 2003) and distribution data (PRECIS, 2008; Mucina and Rutherford, 2006). Approximately 63 species were not recorded in PRECIS (2008) and ± 58 species were not recorded in Germishuizen and Meyer (2003) of which 85 species had insufficient records. PRECIS (National Herbarium, (PRE) Computerised Information System) contains a total number of 33726 Leguminosae records. The data was edited for species present within the borders of the above mentioned countries, as well as omitting double records within a quarter degree grid. The edited data resulted in 27618 records.

The phylogeny of Leguminosae as proposed by Lewis et al. (2005) was used to create a bubble diagram showing the evolutionary relationships of subfamilies and tribes of South-African legumes and the proportion between growth form and growth period within each tribe. The data from Germishuizen and Meyer (2003) was used to quantify herbs, dwarf shrubs, shrubs, trees, climbers, creepers, annuals and perennials within each tribe. Mixed growth forms (e.g. species described as both herb and shrub) were not included in the data as 88% of species were accounted for in the single growth form designation.

PRECIS distribution records were superimposed on biome and bioregion vegetation maps published by Mucina and Rutherford (2006). At the quarter degree scale (standard format for PRECIS data capturing) the biomes and bioregions vegetation types were recorded. Where more than one biome or bioregion was present within a quarter degree it was termed an eco-region. The allocation of vegetation types within the quarter degree was thus only applied to pure types, i.e. mixed vegetation types were coded as eco-regions and are not presented.

PRECIS data was further used to generate a map indicating the collection intensity for legume species in South Africa. Under-collection was found mainly in the Central Karoo

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where low legume species numbers were recorded. The history of the PRECIS database has been published by Steenkamp et al. (2005).

RESULTS AND DISCUSSION

The legumes of South Africa belong to three subfamilies, 24 tribes, 118 genera and a total of 1662 species (Table 1.) The majority of species falls within the subfamily Faboideae with the largest number of species within the tribe Crotalarieae (630 species) followed by Indigofereae (208 species) and Phaseoleae (180 species). Six tribes namely Acacieae, Swartzieae, Hypocalypteae, Abreae, Sesbanieae and Loteae contain only one genus. A total of 27618 PRECIS records were recorded for the Leguminosae in South Africa (Table 1). The number of PRECIS records, relative to the number of species contained within a tribe, compared well. This however, has no reference to individual species. The range in altitude indicated that Swartzieae had the lowest adaptive range, followed by Hypocalypteae and Sophoreae. The remaining 21 tribes' maximum range exceeded the 1500m level.

The wide distribution range of most tribes is noteworthy with 15 of the 24 tribes present in seven or more biomes (Table 1). This includes smaller tribes such as Cercideae and Trifolieae. Hypocalypteae (*Hypocalyptus* spp.) is present in only one biome, namely Fynbos. The Savanna Biome is well represented (16 tribes), followed by the Grassland (4 tribes) and Fynbos Biomes (4 tribes).

Crotalarieae is represented in 29 of the 35 bioregions of South Africa, Galegeae in 27 bioregions, followed by both Genisteae and Indigofereae with 26 bioregions (Table 1). Regardless of the fact that Galegeae contains only 62 species (belonging to *Astragalus*, *Lessertia* and *Sutherlandia*) it is exceptionally widespread. The majority of tribes are present in the Central Bushveld Bioregion (SVC), including the larger tribes such as Crotalarieae and Indigofereae. The Lowveld (SVI), Mesic Highveld Grassland Bioregion (GM) and Eastern Fynbos-Renosterveld Bioregion (F06) follow.

The majority of legume tribes contain species with secondary metabolites that are of agricultural and economic interest. Isoflavonoids (e.g. genistein and rotenone are common in subfamily Faboideae whereas non-protein amino acids (e.g. canavanine and mimosine) are present in most tribes except Cercideae, Podalyrieae and Psoraleeae (Wink and Mohamed, 2003). In the same study isoflavonoids have been reported in most members of the tribes Genisteae, Desmodieae and Phaseoleae and all of the members of the tribes Trifolieae and Sophoreae. Quinolizidine alkaloids occur mainly in tribes from the Genistoid clade (Wink and Mohamed, 2003).

The potential use for forage or soil conservation and presence of poisonous compounds for the different legume tribes is reflected in Table 1 (Lewis et al., 2005). Most tribes contain species with forage and soil conservation potential, e.g. fodder production, ground cover, green manure or soil improvement. In terms of its poisonous traits, nine tribes namely

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Table 1. Statistics of tribes, genera and species of Leguminosae indigenous to South Africa, Lesotho and Swaziland.

Tribe	#Genera (#world)	# Species	#PRECIS records	Altitude (m)	#Biomes (majority)	#Bioregions (majority)	Secondary metabolites	Fodder / soil conservation value	Poisonous trait
Subfamily Caesalpinioideae									
Cercideae	4 (12)	9	269	0 - 1850	8 (Savanna)	14 (SVC)	-	X	-
Detarieae	5 (82)	11	283	0 - 1800	7 (Savanna)	13 (SVI)	np	X	X
Cassieae	4 (21)	18	702	0 - 1750	7 (Savanna)	14 (SVC)	np	-	-
Caesalpinieae	8 (56)	13	288	0 - 2000	8 (Savanna)	14 (SVC)	np	-	-
Subfamily Mimosoideae									
Mimoseae	8 (40)	19	461	0 - 1850	7 (Savanna)	12 (SVC)	alk,np	X	-
Acacieae	1 (1)	49	1727	0 - 2950	8 (Savanna)	21 (SVC)	alk,np	X	X
Ingeae	3 (36)	13	302	0 - 1650	4 (Savanna)	8 (SVI)	np	X	-
Subfamily Faboideae									
Swartzieae	1 (17)	1	8	0 - 200	2 (Savanna)	2 (SVI)	not tested	X	X
Sophoreae	4 (45)	5	95	0 -1400	2 (Savanna)	7 (SVC)	alk,np,iso	X	-
Podalyrieae	8 (8)	139	1119	0 - 2438	7 (Fynbos)	16 (F06)	alk,iso	-	1
Crotalarieae	11 (11)	630	6734	0 - 3447	8 (Fynbos)	29 (SVC)	alk, np, iso	X	X
Genisteae	4 (25)	77	1438	0 - 3019	8 (Grassland)	26 (GM)	alk, np, iso	X	-
Dalbergieae	8 (49)	27	1059	0 - 2100	5 (Savanna)	11 (SVI)	np, iso	X	X
Hypocalypteae	1 (1)	3	70	50 - 1350	1 (Fynbos)	3 (F06)	not tested	-	-
Indigofereae	4 (7)	208	3489	1 - 3500	8 (Savanna)	26 (SVC)	np	X	X
Millettieae	8 (45)	75	1747	0 - 2135	8 (Savanna)	18 (SVC)	np, iso	X	1,2
Abreae	1 (1)	2	108	15 - 1615	2 (Savanna)	4 (SVI)	not tested	X	X
Phaseoleae	22 (89)	180	4404	0 - 2440	7 (Savanna)	22 (SVC)	alk, np, iso	X	1,2
Desmodieae	3 (30)	17	370	3 - 1950	4 (Savanna)	9 (CB,SVI)	alk, np, iso	X	-
Psoraleeae	3 (9)	85	1483	0 - 3200	8 (Fynbos)	25 (F06)	iso	X	-
Sesbanieae	1 (1)	10	114	0 - 1800	3 (Savanna)	8 (SVC)	np	X	X
Loteae	1 (22)	3	68	0 - 2196	5 (Grassland)	9 (GM)	np, iso	X	-
Galegeae	3 (24)	62	1034	0 - 3279	8 (Grassland)	27 (SVK)	alk, np, iso	X	X
Trifolieae	2 (6)	6	246	0 - 3250	7 (Grassland)	12 (GM)	np, iso	X	-
Total	**118 (638)**	**1662**	**27618**						

Biome and bioregion classification from Mucina and Rutherford (2006) where CB=Indian Ocean Coastal Belt, SVC=Central Bushveld, F06=Eastern Fynbos Renosterveld, GM=Mesic Highveld Grassland, SVI=Lowveld, SVK=Eastern Kalahari Bushveld. Secondary metabolites from Wink and Mohamed (2003) where alk=quinolizidine pyrrolozidine, indolizidien, indole and *Erythrina* alkaloids, np=non-protein amino acids, iso=isoflavonoids. Fodder value and poisonous traits from Lewis et al. (2005). [1]Insecticide; [2]Piscicide.

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Detarieae, Acacieae, Swartzieae, Crotalarieae, Dalbergieae, Indigofereae, Abreae, Sesbanieae and Galegeae contain poisonous species.

The suprageneric classification of the legume tribes is shown in the form of a bubble diagram in Figure 1 (based on Lewis et al., 2005). The family Faboideae comprises of three clades, namely the Genistoid clade that includes Crotalarieae with the largest number of species (37.9%) and Swartzieae and Abreae with the lowest number of species (0.1%), the Dalbergioid clade that comprises of the small tribe Dalbergieae (1.6%) and the Old World clade in which the agriculturally important Phaseoleae tribe (10.8%) falls. The highest number of legume species is grouped in the Genistoid clade, containing 51.3% of the species found in South Africa.

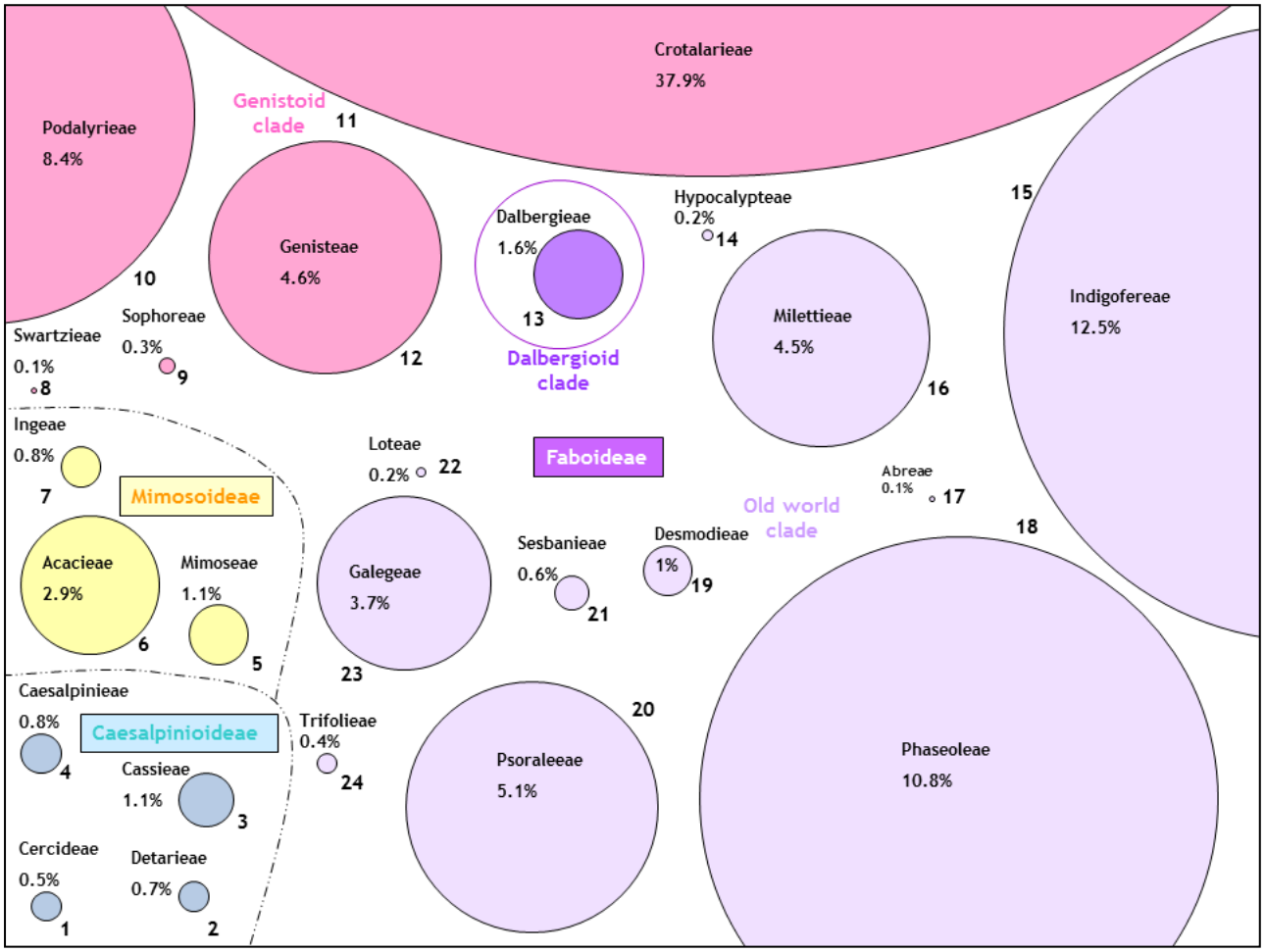

Figure 1. Bubble diagram depicting the subfamilies (3) and tribes (24) of Leguminosae indigenous to South African, Lesotho and Swaziland. The number in a bubble indicates the percentage species of a tribe in relation to the total number of species present. The number outside a bubble displays the order in the suprageneric classification according to Lewis et al. (2005).

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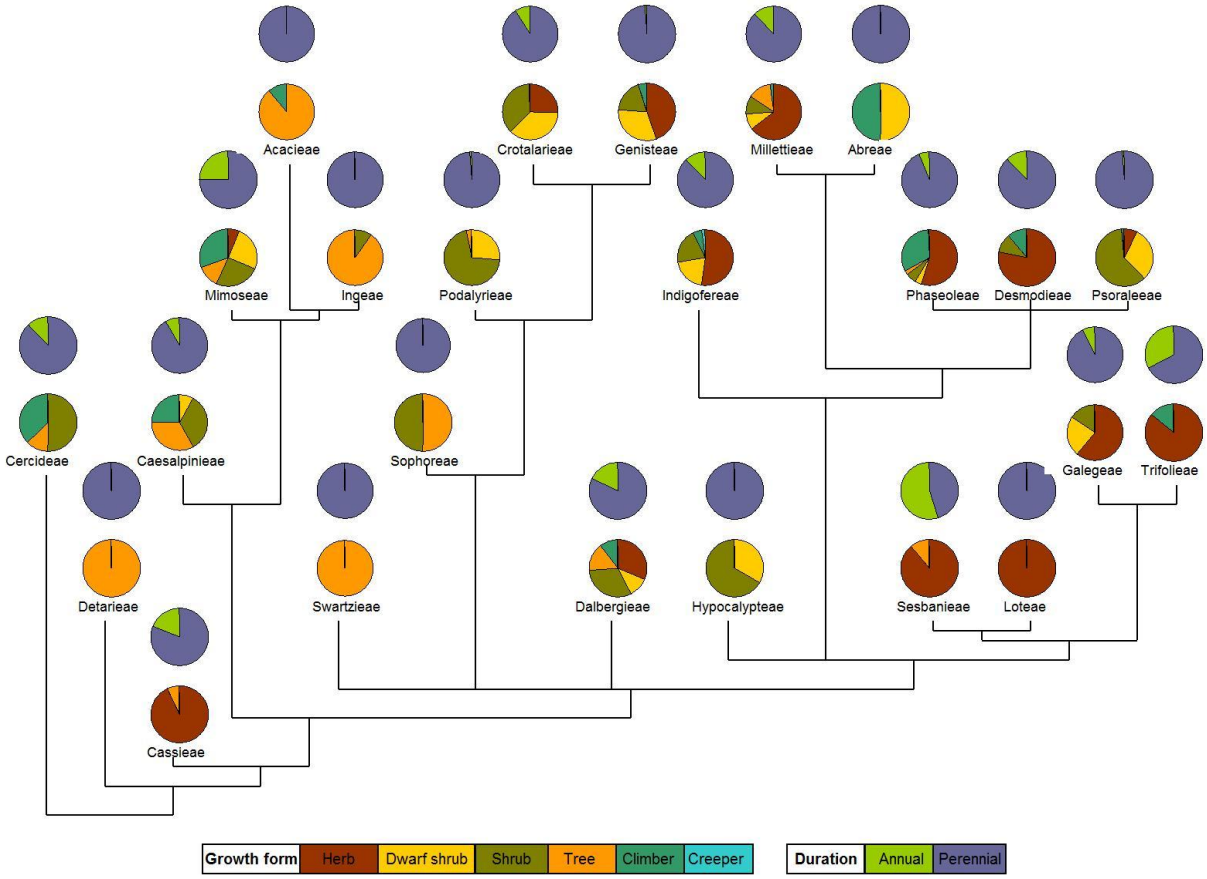

Figure 2. The different growth form and duration ratios plotted on a simplified phylogeny of Leguminosae in South African, Lesotho and Swaziland. Phylogeny based on Lewis et al. (2005) and Boatwright et al. (2011) for the tribe Crotalarieae.

Based on a simplified phylogeny of Leguminosae as proposed by Lewis et al. (2005), the different growth form and growth period ratios are depicted in Figure 2. The majority of legumes are herbs, followed by shrubs, dwarf shrubs and trees. The smaller tribes evidently contain only one type of growth form (e.g. trees within Detarieae and Swartzieae and herbs within Loteae) whereas the larger tribes display most of the growth forms (e.g. Crotalarieae, Psoraleeae and Indigofereae). A remarkable attribute noted for Phaseoleae was the considerable number of climbers present within this tribe. This is a result of two genera, namely *Rhynchosia* and *Vigna*. Whereas members of *Vigna* are well established pasture plants, *Rhynchosia minima* and *Rhynchosia totta* are not, but has been proposed by Maposse et al. (2003) as species with range-reseeding and cultivated pasture potential. A quarter degree frequency count shows that *R. totta* is the most abundant species, present in 238 grids. The majority of legume species are perennials. Sesbanieae, containing only one genus namely *Sesbania*, was the only tribe containing a majority of annuals.

In Table 2 the genera within each tribe is listed. Caesalpinioideae have only one endemic genus namely *Umtiza* whilst the Faboideae contains a large number of endemic genera, mainly grouped in tribes Hypocalypteae, Genisteae, Podalyrieae, Psoraleae, Galegeae and Crotalarieae of which the largest is *Aspalathus* with 335 species. The most important genera containing species that have been selected and bred for forage production worldwide are

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Lotononis (147 spp.), *Stylosanthes* (1 spp.), *Canavalia* (5 spp.), *Mucuna* (4 spp.), *Neonotonia* (1 spp.), *Teramnus* (1 spp.), *Dolichos* (12 spp.), *Macrotyloma* (5 spp.), *Lablab* (1 spp.), *Vigna* (20 spp.), *Desmodium* (11 spp.), and *Trifolium* (5 spp.). The Red Data List (Golding, 2002) recorded none of the Leguminosae to be extinct, threatened or at a low risk in South Africa. Lesotho, however, has three threatened species and Swaziland seven species at a low risk. 'The Plants of southern Africa' website of the South African National Botanical Institute (SANBI, 2011) provides the current status of all species, for example species of *Aspalathus*, *Cyclopia*, *Indigofera* and *Lotononis* are listed to be either critically endangered or extinct.

In Figure 3 the number of PRECIS records per quarter degree is mapped, showing the collection intensity at the specimen level. The Fynbos Biome has been well represented, probably due to extensive collecting by herbaria in the Western Cape. Other distinct collection sites were the Savanna and Grassland Biomes, close to the Great Escarpment and the Indian Ocean Coastal Belt Biome. Plant collections are mainly done by SANBI, the Department of Agriculture and local Universities where accessibility and diversity plays a role in collection intensity. The large number of uncollected sites in southern Africa was also noted by Steenkamp et al. (2005).

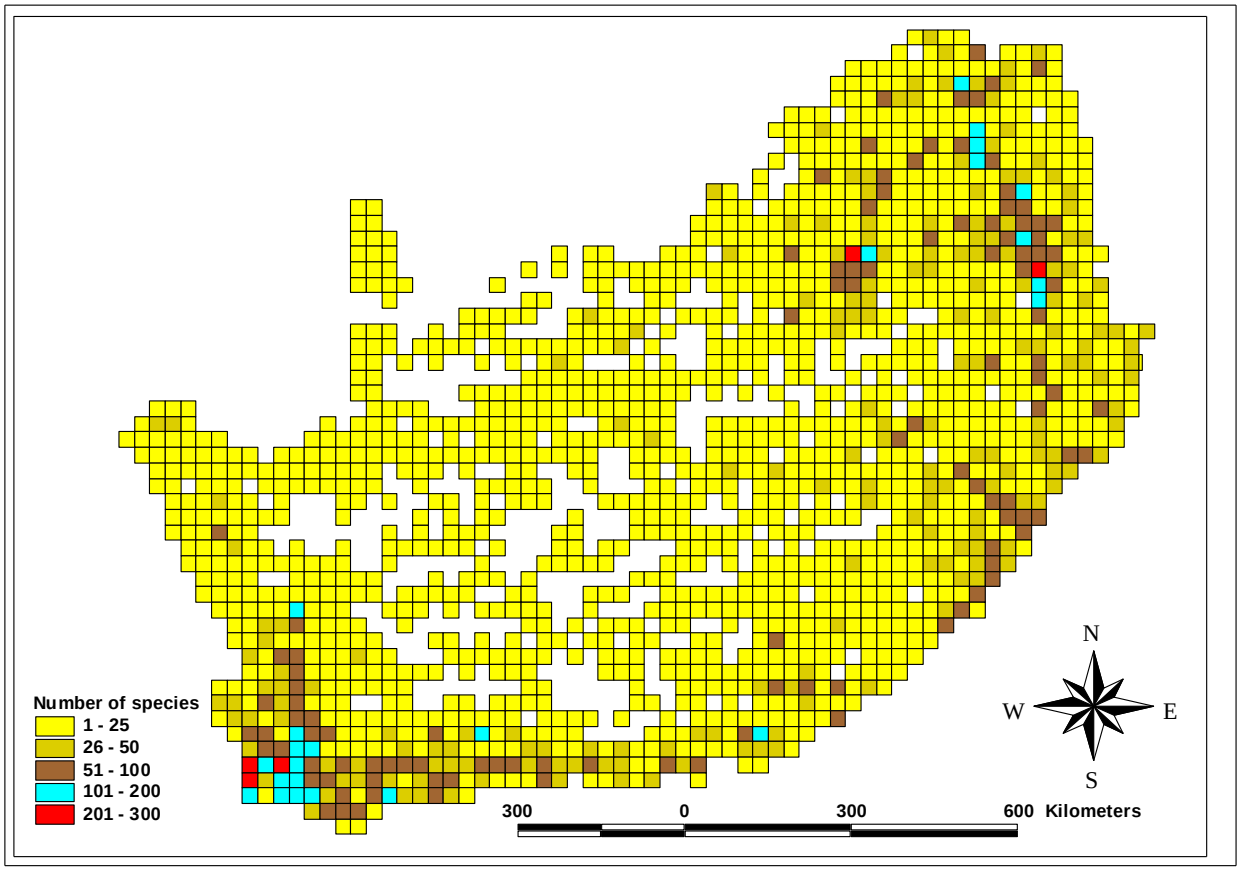

Figure 3. Collection intensity for Leguminosae in South African, Lesotho and Swaziland as recorded in PRECIS (2008).

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Table 2. Subfamilies, tribes and genera of Leguminosae indigenous to South Africa, Lesotho and Swaziland following the suprageneric classification of Lewis et al. (2005) and Boatwright et al. (2011) for the tribe Crotalarieae.

Subfamily	**Tribe**	**Genera**
Caesalpinioideae		
	Cercideae	*Adenolobus* (1), *Bauhinia* (5), *Tylosema* (2), *Piliostigma* (1),
	Detarieae	*Schotia* (7), *Colophospermum* (1), *Guibourtia* (1), *Afzelia* (1), *Brachystegia* (1)
	Cassieae	*Dialium* (1), *Chamaecrista* (12), *Senna* (4), *Cassia* (1)
	Caesalpinieae	*Umtiza* (1), *Pterolobium* (1), *Caesalpinia* (3), *Pomaria* (4), *Peltophorum* (1), *Parkinsonia* (1), *Erythrophleum* (1), *Burkea* (1)
Mimosoideae		
	Mimoseae	*Xylia* (1), *Entada* (2), *Elephantorrhiza* (8), *Newtonia* (1), *Xerocladia* (1), *Neptunia* (1), *Dichrostachys* (4), *Adenopodia* (1)
	Acacieae	*Acacia* (49)
	Ingeae	*Faidherbia* (1), *Calliandra* (1), *Albizia* (11)
Faboideae		
	Swartzieae	*Cordyla* (1)
	Sophoreae	*Xanthocercis* (1), *Bolusanthus* (1), *Sophora* (1), *Baphia* (2)
	Podalyrieae	*Cyclopia* (23), *Xiphotheca* (9), *Amphithalea* (45), *Stirtonanthus* (3), *Podalyria* (25), *Liparia* (21), *Virgilia* (3), *Calpurnia* (10)
	Crotalarieae	*Aspalathus* (335), *Wiborgia* (11), *Wiborgiella* (7), *Rafnia* (31), *Lebeckia* (14), *Calobota* (13), *Lotononis* (147), *Pearsonia* (15), *Rothia* (1), *Bolusia* (1), *Crotalaria* (55)
	Genisteae	*Melolobium* (16), *Dichilus* (5), *Polhillia* (6), *Argyrolobium* (50)
	Dalbergieae	*Zornia* (4), *Pterocarpus* (3), *Stylosanthes* (1), *Dalbergia* (5), *Aeschynomene* (9), *Smithia* (1), *Kotschya* (2), *Ormocarpum* (2)
	Hypocalypteae	*Hypocalyptus* (3)
	Indigofereae	*Cyamopsis* (2), *Indigastrum* (7), *Microcharis* (3), *Indigofera* (196)
	Millettieae	*Xeroderris* (1), *Craibia* (1), *Philenoptera* (3), *Millettia* (2), *Mundulea* (1), *Tephrosia* (62), *Requienia* (2), *Ptycholobium* (3)
	Abreae	*Abrus* (2)
	Phaseoleae	*Canavalia* (5), *Galactia* (1), *Ophrestia* (2), *Mucuna* (4), *Bolusafra* (1), *Rhynchosia* (59), *Eriosema* (46), *Flemingia* (1), *Erythrina* (10), *Otoptera* (1), *Decorsea* (2), *Neorautanenia* (3), *Neonotonia* (1), *Dumasia* (1), *Teramnus* (1), *Sphenostylis* (2), *Alistilus* (1), *Dolichos* (12), *Macrotyloma* (5), *Dipogon* (1), *Lablab* (1), *Vigna* (20)
	Desmodieae	*Desmodium* (11), *Pseudarthria* (1), *Alysicarpus* (5)
	Psoraleeae	*Otholobium* (45), *Psoralea* (37), *Cullen* (3)
	Sesbanieae	*Sesbania* (10)
	Loteae	*Lotus* (3)
	Galegeae	*Astragalus* (1), *Lessertia* (56), *Sutherlandia* (5)
	Trifolieae	*Trifolium* (5), *Trigonella* (1)

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CONCLUSION

The descriptive and distribution data used in this study confirm the considerable diversity of the legumes indigenous to South Africa, Lesotho and Swaziland. The majority of species falls in the tribe Crotalarieae, mainly due to the presence of diverse genera such as *Aspalathus* and *Lotononis*. The agriculturally important Phaseoleae tribe is well represented with 22 genera and 180 species, including 20 species of the well known *Vigna* pasture plant. Species grown in the Savanna Biome and Central Bushveld Bioregion were well presented. The diverse growth forms and distribution patterns of legumes are potentially useful in screening, selecting and breeding pasture legumes or for specific agricultural applications.

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REFERENCES

Boatwright JS, Tilney PM, Van Wyk B-E (2009). The generic concept of *Lebeckia* (Crotalarieae, Fabaceae): Reinstatement of the genus *Calobota* and the new genus *Wiborgiella*. South African Journal of Botany 75: 546–556.

Boatwright JS, Wink M, Van Wyk B-E (2011). The generic concept of *Lotononis* (Crotalarieae, Fabaceae): Reinstatement of the genera *Euchlora*, *Leobordea* and *Listia* and the new genus *Ezoloba*. Taxon 60:161–177.

Cook BG, Pengelly BC, Brown SD, Donnelly JL, Eagles DA, Franco MA, Hanson J, Mullen BF, Partridge IJ, Peters M, Schultze-Kraft R (2005). Tropical Forages: an interactive selection tool. [CD-ROM], CSIRO, DPI&F (Qld), CIAT and ILRI, Brisbane, Australia.

Gepts P, Beavis WD, Brummer EC, Shoemaker RC, Stalker HT, Weeden NF, Young ND (2005). Legumes as a model plant family. Genomics for food and feed report of the cross-legume advances through genomics conference. Pl. Phys. 137: 1228–1235.

Germishuizen G, Meyer NL (2003). Plants of southern Africa: an annotated checklist. *Strelitzia 14*, South African Biodiversity Institute, Pretoria, South Africa.

Golding JS (ed) (2002). Southern African Plants Red Data List. Southern African Botanical Diversity Network Report no. 14, Sabonet, Pretoria, South Africa.

Graham PH, Vance CP (2003). Legumes: Importance and constrains to greater use. Pl. Phys. 131: 872–877.

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Howieson J (2010). Pasture development for community livestock production in the Eastern Cape province of South Africa. http://aciar.gov.au/projects /LPS/2004/022.

Jaftha JB, Strijdom BW, Steyn PL (2002). Characterization of pigmented methylotropic bacteria which nodulate *Lotononis bainesii*. Syst. Appl. Microbiol. 25: 440–449.

Lewis G, Schrire B, Mackinder B, Lock M (eds) (2005). Legumes of the world. Royal Botanical Gardens, Kew, UK.

Makoi JHJR, Chimphango SBM, Dakora FD (2009). Effect of legume plant density and mixed culture on symbiotic N_2 fixation in five cowpea (*Vigna unguiculata* L. Walp) genotypes in South Africa. Appl. Sci. Papers and Reports 31.
http://dk.cput.ac.za/apsc_papers/31.

Maposse IC, Muir JP, Alage AA (2003). Status of range and forage research in Mozambique. Afr. J. Range For. Sci. 20: 63–68.

Moteetee A, Van Wyk B-E (2006). A revision of the genus *Melolobium* (Genisteae, Fabaceae). S. Afr. J. Bot. 71: 51–98.

Mucina L, Rutherford MC (eds) (2006). The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia 19*. South African Biodiversity Institute, Pretoria, South Africa.

Phalane FL (2008). The diversity of root nodule bacteria associated with *Lebeckia* species in South Africa. MSc Thesis, University of Pretoria, South Africa.

PRECIS Database (2008). South African National Biodiversity Institute, Pretoria, South Africa. http://posa.sanbi.org/searchspp.php.

Real D, Altier N (2005). Breeding for disease resistance, forage and seed production in *Lotononis bainesii* Baker. N.Z.J. Agric. Res. 48: 93–100.

Rootman G, Mabistela M, Pengelly B (2004). Selecting potential fodder bank legumes in semi-arid northern South Africa. Tropical legumes for sustainable farming systems in southern Africa and Australia, ACIAR Proc. no 115 (eds AM Whitbread & BC Pengelly).

SANBI (2011). South African National Botanical Institute, Plants of southern Africa. http://posa.sanbi.org

Schutte AL, Van Wyk B-E (1998). The tribal position of *Hypocalyptus* Thunberg (Fabaceae). Novon 8: 178–182.

Sprent JI, Odee DW, Dakora FD (2010). African legumes: a vital but under-utilized resource. J. of Exp. Bot. 61: 1257–1265.

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Steenkamp Y, Van Wyk AE, Smith GF, Steyn H (2005). Floristic endemism in southern Africa: A numerical classification at generic level. Biol. Skr. 55: 253–271.

Van der Bank ML, Chase MW, Van Wyk B-E, Fay MF, Van der Bank FH, Reeves G, Hulme A (2002). Systematics of the tribe Podalyrieae (Fabaceae) based on DNA, morphological and chemical data. Bot. J. Linn. Soc. 139: 159–70.

Van Wyk B-E (2003). The value of chemosystematics in clarifying relationships in the genistoid tribes of papilionoid legumes. Biochem. Syst. Ecol. 31: 875–884.

Wink M, Mohamed GIA (2003). Evolution of chemical defence traits in the Leguminosae: mapping of distribution patterns of secondary metabolites on a molecular phylogeny inferred from nucleotide sequences of the *rbc*L gene. Biochem. Syst. Ecol. 31: 897–917.

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CHAPTER 4

METHODS AND DEFINITIONS

4.1 Methods

4.1.1 Study area

Legume species indigenous to the Republic of South Africa, the Kingdom of Lesotho and the Kingdom of Swaziland were included in the study (Figure 4.1).

4.1.2 Legume species and intraspecific taxa

The indigenous legume species and intraspecific taxa were recorded using the section on the family Fabaceae in the 'Plants of Southern Africa, an online checklist' of the South African National Biodiversity Institute (SANBI), at http://posa.sanbi.org/searchspp.php as published on 21-04-2011. Naturalised and alien legume species were excluded from all datasets. Germishuizen & Meyer (2003) was used to describe each species in terms of its life form, life cycle, height and altitude, e.g. *Abrus laevigatus* E.Mey.: life form: dwarf shrub, climber; life cycle: perennial; height: 1.0–3.0 m; altitude: 50–1615 m. Data on the SANBI website were compared with Germishuizen & Meyer (2003) where anomalies were found.

The reinstatement of *Calobota* and the new genus *Wiborgiella* were implemented for the division of *Lebeckia*, whereas the reinstatement of *Euchlora*, *Leobordea* and *Listia* and the new genus *Ezoloba* were recorded for reclassification of *Lotononis* (Boatwright *et al*. 2009, 2011). The division of *Lotononis* was not recorded in the table presented in the review (Chapter 2: Table 2.1) or in the published article (Chapter 3).

The Fabaceae records in the National Herbarium (PRE) Computerised Information System (PRECIS) were obtained on 21-11-2008 and used to map distribution patterns of all species; the presence/absence of species in quarter degree grid cells (QDGCs) was used for data analysis. The original database contained 33 726 records. Species present outside South Africa, Lesotho and Swaziland were removed, and duplicate records, incompletely described botanical names as well as alien legume species were omitted. The edited data resulted in 27 618 records (Trytsman *et al*. 2011), which were further refined to 27 322 records. The history of PRECIS is summarised by Gibbs Russell & Arnold (1989) and additional

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information is given by Steenkamp *et al.* (2005). Where outliers were noted in the distribution patterns presented in Chapter 5 (Inventory), it was assumed that such species were adapted to the given environmental conditions, and they were therefore not removed from the dataset. An example is *Dalbergia armata* with a wide distribution in the Lowveld and Indian Ocean Coastal Belt Bioregion but with only one occurrence in the East Coast Renosterveld Bioregion.

However, the PRECIS database has some inherent weaknesses, especially errors regarding the allocation of taxa to QDGCs. It is estimated that QDGCs for around 15% of records may be incorrect (Biodiversity Information Officer, pers. comm). The database furthermore does not reflect all herbarium records from southern Africa, but mainly those housed in the National Herbarium (PRE) in Pretoria and some of its satellite herbaria, notably the KZN Herbarium (NH) in Durban and the Compton Herbarium (NBG) in Cape Town. Despite its inherent limitations, results of the present analysis have been considered sufficiently meaningful to justify the use of this database, the only one of its kind for the study area.

The duration (growth period) of a species is not always well defined or uniformly described. Three states are used, namely annual, perennial and occasional perennial. For the purpose of this study, 'occasional perennial' has been treated as a synonym of short-lived perennial. When above-ground material is shed during winter, yet the below-ground parts persist, the species in question has been taken as a perennial.

Author citations of scientific names are supplied in Chapter 5 (Inventory) but in all other chapters only the genus names, species names and names of intraspecific taxa are given.

4.1.3 Maps

The bioregions map of Rutherford *et al*. (2006) was used to create distribution maps with ArcView GIS 3.2, ESRI Inc. 2002. The biomes map of Rutherford *et al*. (2006) was used to generate additional data to describe each QDGC containing indigenous legumes and presented in tables. The maps that were used to generate data on climate (mean annual rainfall, mean annual minimum temperature and mean annual maximum temperature map) and soil (phosphorus, pH and exchangeable sodium percentage (ESP)) within each QDGC were supplied by the Agricultural Research Council - Institute for Soil, Climate and Water (ARC-ISCW, 2009). Nell (2010) assigned sodicity levels in each bioregion and these data were used mainly in Chapter 5 (Inventory). All maps were in GIS format, enabling enlargements of regions where QDGCs contained more than one zone for a specific variable, e.g. where a QDGC contained two mean annual rainfall zones, the dominant rainfall figure was assigned. If three or more rainfall zones converged in a QDGC, a combination of the two most prevailing zones was assigned. The climate and soil classes used in this study are recorded in Table 4.1.

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4.1.4 Scale

The description of each QDGC in terms of bioregions, biomes and abiotic factors was based on the regional maps mentioned in 4.1.3, one QDGC averaging 675 km^2 (± 26 x 26 km). The use of small (megaregional) scale maps as well as assigning rainfall, temperature, soil phosphorus, soil pH and ESP values to an area as large as a QDGC, evidently resulted in a less accurate dataset. This happened especially where two or more bioregions or biomes converged in a QDGC (termed an ecotone), resulting in a considerable loss of descriptive data for many QDGCs. The abiotic data were easier to assign, since QDGCs could be described in transitional terms and classed in a zone closest to those presented in Table 4.1.

4.1.5 Statistical analysis

The XLSTAT 2010.6.01 Software (Addinsoft) was used for clustering analysis (Agglomerative Hierarchical Clustering, AHC) (Chapters 6, 7 and 8), discriminant analysis (Chapter 7) and Pearson's correlation test (Chapter 7). The main reason for using XLSTAT was the easy access to a consulting biometrician assisting with statistical analysis of all datasets generated for this study. The Datametric Department of the Agricultural Research Council (ARC) offers an accessible and professional service to all ARC researchers, at no cost. PC-Ord (McCune & Mefford 2006) was used to compare AHC results (Chapter 6) performed by a statistical program not developed for biodiversity data (XLSTAT) with one that was (PC-Ord). The PHYTOTAB-PC program package of Westfall (1992) was used to classify key species recorded in clusters (Chapter 6) and Table Curve 2D (Version 5.01) to fit the most appropriate functions on the latitudinal and longitudinal dataset presented in Chapter 8.

4.2 Definitions

Legume: a member of the flowering plant family Leguminosae (Fabaceae). With their unique flower structures, podded fruit (legumens) and the ability to fix atmospheric nitrogen, legumes have many applications and are, for example, used as grain food, animal fodder, and in soil conservation and medicinal practices; they are second only to grasses in world economic importance. In the study area the Leguminosae has three subfamilies, namely the Caesalpinioideae, Mimosoideae and Faboideae (Papilionoideae), with 24 tribes, 122 genera and 1 654 species.

Leguminochorion (plural: *Leguminochoria*): a geographic area with relatively similar legume species.

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Biome: a biogeographic area defined primarily on combinations of dominant life or growth forms and secondarily on the basis of major climatic features that mostly affect the biota at a continental or subcontinental scale (Rutherford *et al*. 2006).

Bioregion: defined on the basis of similar biotic and physical features and processes at the regional scale (Rutherford *et al*. 2006).

Ecotone: a transitional zone between two or more biomes or bioregions.

Fodder crop, *pasture* and *forage*: a *fodder crop* and *pasture* are grown on arable land, while a *forage* is grazed or browsed in the natural environment (see Chapter 8).

Plant Genetic Resources: the economic, scientific or societal value of the heritable materials contained within and among species (FAO 1989).

Key species: the first (top) 20 species listed in a Leguminochorion.

Diagnostic species: species with an occurrence of 70% or higher in a given Leguminochorion.

Species richness: the total number of single species divided by the total number of QDGCs contained in a cluster.

Species occurrence: the total count of an individual species in a cluster divided by the number of QDGCs in the same cluster.

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Table 4.1. Classes used in the description of QDGCs with regard to climate and soil variables.

Mean annual rainfall (mm)
<400
200–600
400–800
600–1000
>800
Mean annual minimum temperature (ºC)
<2
0–4
2–8
>6
Mean annual maximum temperature (ºC)
<27
25–29
27–35
>33
Soil phosphorus ($mgkg^{-1}$) or (ppm)
<10
5–35
>20
Soil pH (H_2O)
<6.4 (acidic)
5.5–7.4 (moderately acid to neutral)
6.5–7.4 (neutral)
6.5–8.4 (neutral to moderately alkaline)
>7.5 (alkaline)
Exchangeable Sodium Percentage (ESP)
Non-sodic = 1–6
Medium sodic = 6–15
Highly sodic = >15

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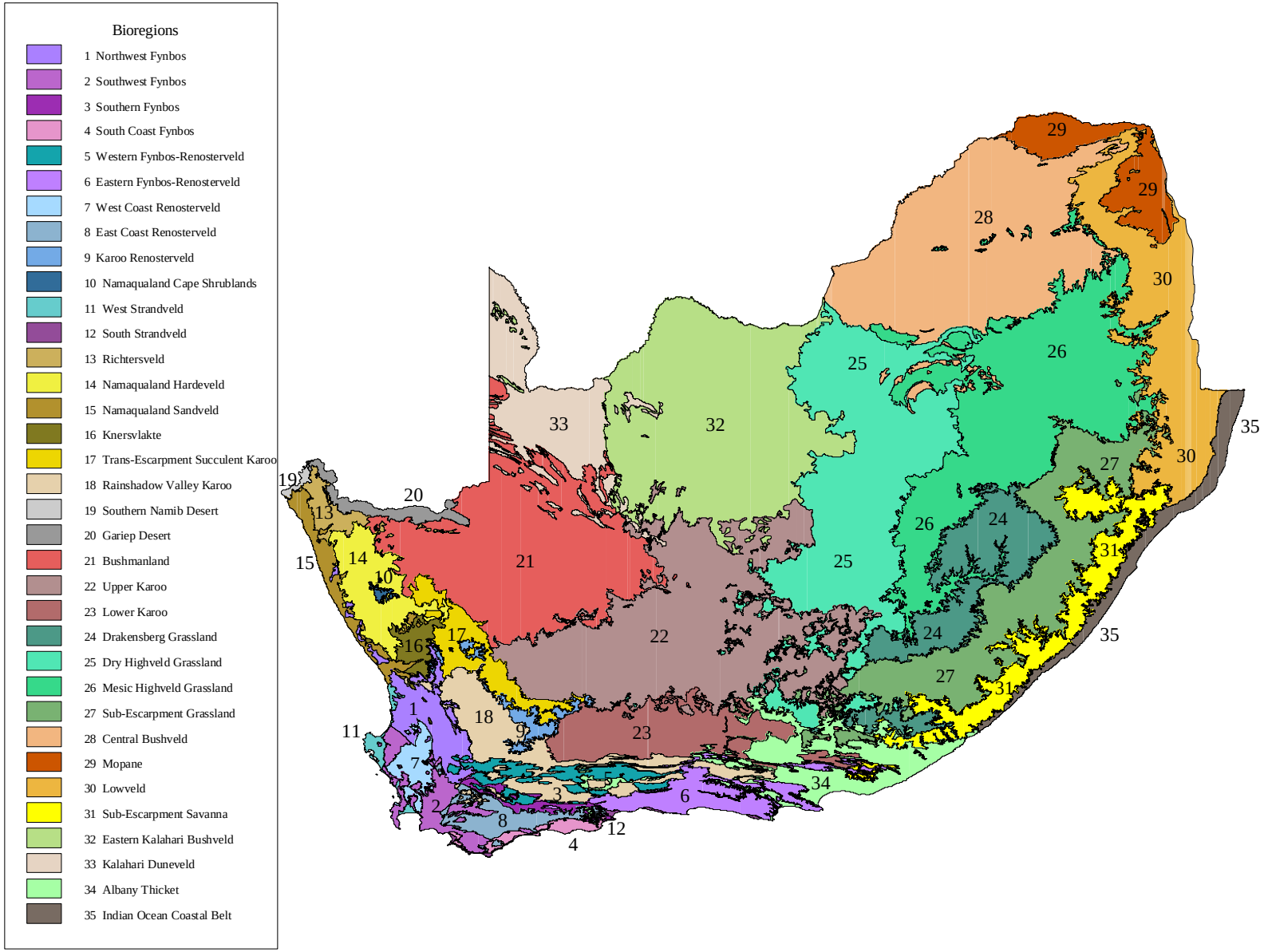

Figure 4.1. Bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al*. 2006).

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CHAPTER 2

REVIEW OF AFRICAN LEGUMES USED IN AGRICULTURAL SYSTEMS

2.1 Use of legumes in agricultural cropping systems

Various reports on the use of forage legumes in sub-Saharan Africa have been published (Haque *et al*. 1985; Speedy & Pugliese 1991; FAO 1996; Tarawali *et al*. 1999; Shelton 2001; Maposse *et al*. 2003; Whitbread & Pengelly 2004). Legumes in rotation with other crops were first mentioned in Roman times (Isely 1982), with lucerne probably being the first forage legume to be domesticated.

Graham & Vance (2003) state that legume crop yields have not kept pace with those of cereals, and even more so in developing countries. They ascribe this trend mainly to the unfavourable environmental conditions under which legumes grow, e.g. grown after the main crop such as rice or maize has been harvested and on poor soils. The need to develop legumes that are more tolerant to drought, acid and salinity is essential, taking future predictions of water shortages in consideration. Collection and evaluation of germplasm should be prioritised (Graham & Vance 2003) and, as mentioned by Sprent & Gehlot (2011), the full potential of African indigenous legumes has not been realised and South Africa is seen as a valuable source of legumes for arid and semi-arid regions. The diversification of legume species used as food and forage is acknowledged as vital for a changing world (Sprent *et al*. 2010).

In a review of tropical forage legumes in sub-Saharan Africa, Thomas & Sumberg (1995) state that notwithstanding nine decades of research, cultivation is still marginal with only some success in dairy production systems in highland areas. They state that even though outstanding pasture species adapted to a wide range of environments are available, the problem of poor livestock nutrition is not necessarily the accepted single most important constraint in livestock production, and that a farmer participatory approach is vital in future research programmes. The reasons for the poor adoption of forage legumes by African farmers are discussed by Sumberg (2002), Lenne & Wood (2004) and Shelton *et al*. (2005).

The use of pasture legumes in South Africa is mainly focused in the Western Cape, where they are used in rotation with winter grains and as pastures (Van Heerden 2007; Van Heerden 2012). In KwaZulu-Natal (Eckard 1994) and irrigated areas in the Eastern Cape (Botha 2003) legume pastures are used mainly in dairy farming. However, none of the indigenous species play a major role in pasture production, since alien temperate species such as *Medicago sativa*, *Trifolium repens* and annual species of *Trifolium* and *Medicago* integrate well into

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cropping systems. Some research on lamb production from grass–legume mixtures was done by the Department of Agriculture and Development on the Roodeplaat (Pretoria) and Nooitgedacht (Ermelo) Research Stations in the 1980s, but the adoption rate by farmers were not documented. Subtropical and tropical legumes introduced from Australia, South America and India were mainly used in these regions, with *Desmanthus virgatus*, *Leucaena leucocephala* and *Stylosanthes guianensis* mostly utilised (Kruger 1999). Indigenous species mostly used in evaluation trials were *Lablab purpureus*, *Neonotonia wightii* and *Vigna unguiculata*. The renewed interest in *Chamaecytisus palmensis* (tagasaste or tree lucerne) should be noted (Erasmus 2012) and the effect of harvesting or drying methods to improve intake was reported by Assefa *et al*. (2012).

The importance of legumes in agriculture is summarised by Vance (2001). The high protein food for humans and animals, reduced nitrogen fertiliser requirements, added nitrogen for rotation and intercrops, reclamation of acid soils, cover crops to control weed are only a few. Added to the role of legumes in improved animal production and soil fertility, their significant role in enhancing soil carbon sequestration is envisaged by Abberton (2010).

2.2 Agronomic evaluation and breeding of indigenous legumes

Many reports from Africa where indigenous legume species were compared as animal feed are available, including for:

Acacia spp. (Pellew 1980; Mlambo *et al*. 2001; Smith *et al*. 2005; Mapiye *et al*. 2011)
Alysicarpus rugosus (Nyoka *et al*. 2004; Rootman *et al*. 2004)
Colophospermum mopane (Lukhele & Van Ryssen 2000; Mutakela 2009)
Crotalaria spp. (Sarwatt & Mkiwa 1988; Muir & Maposse 2002)
Dichrostachys cinerea (Smith *et al*. 2005)
Lablab purpureus (Nyoka *et al*. 2004; Odhiambo 2004)
Listia bainesii (Smith 1977; Rootman *et al*. 2004; Mapiye *et al*. 2006)
Listia heterophylla (Kategile 1985)
Macrotyloma axillare (Smith 1977; Kategile 1985; Clatworthy & Madakadze 1988; Lusembo *et al*. 1995; Nyoka *et al*. 2004; Mapiye *et al*. 2006)
Mucuna pruriens (Odhiambo 2004)
Neonotonia wightii (Smith 1977; Clatworthy & Madakadze 1988; Mapiye *et al*. 2006)
Peltophorum africanum (Lukhele & Van Ryssen 2000)
Rhynchosia spp. (Lusembo *et al*. 1995; Muir & Maposse 2002)
Sesbania sesban (Niang *et al*. 1998; Debela *et al*. 2011)
Stylosanthes fruticosa (Kategile 1985; Clatworthy & Madakadze 1988)
Teramnus labialis (Clatworthy & Madakadze 1988)
Vigna luteola (Rootman *et al*. 2004)
Vigna unguiculata (Nyoka *et al*. 2004; Odhiambo 2004; Rootman *et al*. 2004)
Zornia spp. (Hakiza *et al*. 1988a; Muir & Maposse 2002)

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A few legume species extensively used and investigated are discussed below.

The forage potential of several species of *Indigofera* has been investigated by Hassen *et al*. (2006, 2007, 2008) and Tjelele (2006). The variation in production, quality and indospicine levels within accessions and between species provides an opportunity to select and breed a suitable forage crop, using *I. spicata*, *I. arrecta* and *I. cryptantha*, which showed unique potential.

Lablab purpureus is described as one of the most diverse legume species but under threat of genetic erosion (Pengelly & Maass 2001; Maass *et al*. 2010). Research in Africa is limited to soil improvement, using mainly cv. Rongai from Australia, therefore suggesting that existing biodiversity as being more suitable to African climates, is overlooked. An agronomic and nutritive review of *L. purpureus* published in 1999, underlines its importance as a pasture crop worldwide (Murphy & Colucci 1999). Recent evaluation studies in Limpopo, South Africa, yielded promising germplasm introduced from Australia as well as local varieties (Ayisi *et al*. 2004; Whitbread *et al*. 2011).

Lotononis was recently revised, with *Euchlora*, *Leobordea* and *Listia* reinstated and *Ezoloba* introduced as a new genus (Boatwright *et al*. 2011). During the 1970s, *Listia bainesii* was identified as a potential species for improvement owing to its growth form that promotes grazing resistance (Smith 1974). *Lotononis angolensis* (indigenous to southern Africa) and *Listia heterophylla* were also recognised as potential pasture species. As a result of a *Listia bainesii* breeding and improvement programme in Uruguay, cv. INIA Glencoe was released (Real & Altier 2005). The attributes of this cultivar are described as resistance to *Fusarium oxysporum*, high seed and forage production, deep root development, persistence under relatively high temperatures and relative resistance to frost.

Before 1999, a few reports on the forage value of species of *Sesbania* were published (Gillett 1963; Onim & Dzowela 1988; Gutteridge 1998). It is described as an excellent livestock feed with large species diversity in Africa; hence access to germplasm for evaluation purposes is relatively easy. Kisinyo *et al*. (2012) found that accessions of *S. sesban* that are aluminium toxicity-tolerant and phosphorus-efficient are available. Feeding *S. sesban* at low percentages should not affect ruminants negatively (Cook *et al*. 2005).

Stylosanthes fruticosa is not considered a successful pasture crop, notwithstanding many reports on its pasture potential (Hakiza *et al*. 1988b). Other alien species of *Stylosanthes* were widely tested throughout the sub-Saharan region and, probably owing to the extensive selection and breeding efforts, out-yielded and persisted longer than *S. fruticosa*.

The growth potential of the drought-tolerant *Tylosema esculentum* was evaluated (Powell 1987) and its seed qualities were compared to soybeans (Bower *et al*. 1988). Although local and international interest in this species as a drought-resistant pasture crop is known (Dakora *et al*. 1999), little research on its feed value has been done since 2000. In a recent study by researcher from the University of Pretoria, extracts of *Tylosema esculentum* were found to have potential use as microbicides (Chingwaru *et al*. 2011).

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African clovers have been evaluated as pasture crops since 1952, including *Trifolium africanum*, *T. burchellianum* and *T. stipulaceum* (Gillett 1952; Britten 1962; 'T Mannetje & Pritchard 1968; Jones *et al*. 1974; Kahurananga 1988). Jones *et al*. (1974) concluded that future development of indigenous clovers lies where climate and soil conditions exclude the growth of white clover (*T. repens*), a highly developed and productive clover species.

Vigna unguiculata is probably the most widely used and productive species in sub-Saharan Africa. Research papers report on the drought tolerance (Akyeampong 1985; Osonubi 1985), diversity (Panella *et al*. 1993; Fang *et al*. 2007; Badiane *et al*. 2012), dual-purpose varieties (Kristjanson *et al*. 2002; Singh *et al*. 2003; Anele 2011), importance as food (Hallensleben *et al*. 2009) and soil phosphate uptake (Makoi *et al*. 2010).

Dusi white clover (*Trifolium repens*) was the first species included in the legume improvement programme initiated in South Africa at Cedara in 1976, while pasture grass improvement has taken place since 1910 (Smith & Rhind 1984). The authors predict that only priority legume species such as *Medicago sativa*, *Trifolium repens* and *T. pratense* would receive attention from plant breeders in future. Apart from seed selections made by researchers for further evaluations, the aim of breeding indigenous legume pasture species has never been prioritised within the South African Department of Agriculture or the Agricultural Research Council. *Vigna unguiculata* cv. Encore was the only grazing cultivar released by the Roodeplaat Research Station. However, the ARC-Grain Crops Institute (Potchefstroom) has bred three promising *Vigna unguiculata* cultivars to be released soon (Anon 2012).

Cook *et al*. (2005) list cultivars mostly released in Australia, for *Lablab purpureus* cv. Rongai, cv. Highworth, cv. Koala and cv. Endurance; for *Listia bainesii* cv. Beit, cv. INIA cv. Glencoe and cv. Miles; *Macrotyloma axillare* cv. Archer, cv. Guatá and Jcv. ade; for *Neonotonia wightii* cv. Clarence, cv. Cooper, cv. Kenya violet glycine, cv. Kenya white glycine, cv. Malawi, cv. Moshi, cv. Tinaroo and cv. Tropic Verde; for *Sesbania sesban* cv. Mt Cotton; for *Teramnus labialis* cv. Semilla Clara and cv. Semilla Oscura; for *Vigna luteola* cv. Dalrymple; for *Vigna unguiculata* cv. Red Caloona, cv. Ebony PR, cv. Arafura, cv. Banjo, cv. Big Buff, cv. Holstein, cv. Blackeye peas, cv. Browneye peas, cv. Ojo Negro, cv. Minica and more.

In a paper prepared for the FAO (Food and Agricultural Organization), Abberton *et al*. (2008) concluded that as a result of climate change, adaptive challenges in breeding forage grass and legume species include the increase in genetic variation in varieties and cultivars, maintaining sward composition in mixtures where cultivars are adapted to different environmental stresses and enhance the drought tolerance and increase water use efficiency of pasture species. In terms of drought tolerance, future collection and characterisation of genetic resources adapted to drought-prone environments plays an important role.

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2.3 Biological nitrogen fixation (BNF)

Research on the biological nitrogen fixation of legumes indigenous to Africa is well documented, with prominent work by F.D. Dakora (Dakora 2000; 2003; Dakora & Keya 1997) and colleagues (Masutha *et al*. 1997; Boone *et al*. 1999; Muofhe & Dakora 1999; Ayisi *et al*. 2000; Musil *et al*. 2003; Pule-Meuelenberg & Dakora 2007; Spriggs & Dakora 2007; Makoi *et al*. 2009). Valuable earlier work on the nodulating abilities of indigenous species is reported by Grobbelaar & Clarke (1972, 1974, 1975), Grobbelaar *et al*. (1967), Grobbelaar & Van Rooyen (1979), Grobbelaar *et al*. (1983) and in the review by Strijdom (1998). The latest interest in indigenous legumes from Australian researchers resulted in many publications (Yates *et al*. 2007; Ardley *et al*. 2009; Gerding *et al*. 2012). The nodulation of genera found in South Africa, Lesotho and Swaziland is presented in Table 2.1.

Table 2.1 Nodulation of legume genera found in South Africa, Lesotho and Swaziland based on the review of Sprent (2001) following the classification of Lewis *et al*. (2005) and Boatwright *et al*. (2011) for the tribe Crotalarieae. (+) Nodulation noted for some or all species; (–) No nodulation noted for some or most species; (?) No or little information.

Subfamily	Tribe	Genera
Caesalpinioideae		
	Cercideae	*Adenolobus* (–), *Bauhinia* (–), *Tylosema* (–), *Piliostigma* (–),
	Detarieae	*Schotia* (–), *Colophospermum* (–), *Guibourtia* (–), *Afzelia* (–), *Brachystegia* (–)
	Cassieae	*Dialium* (–), *Chamaecrista* (+), *Senna* (–), *Cassia* (–)
	Caesalpinieae	*Umtiza* (?), *Pterolobium* (–), *Caesalpinia* (–), *Pomaria* (–), *Peltophorum* (–), *Parkinsonia* (–), *Erythrophleum* (+), *Burkea* (–)
Mimosoideae		
	Mimoseae	*Xylia* (–), *Entada* (+), *Elephantorrhiza* (+), *Newtonia* (–), *Xerocladia* (+), *Neptunia* (+), *Dichrostachys* (+), *Adenopodia* (–)
	Acacieae	*Acacia* (+)
	Ingeae	*Faidherbia* (+), *Calliandra* (+), *Albizia* (+)
Faboideae		
	Swartzieae	*Cordyla* (–)
	Sophoreae	*Xanthocercis* (–), *Bolusanthus* (+), *Sophora* (+), *Baphia* (+)
	Podalyrieae	*Cyclopia* (+), *Xiphotheca* (+), *Amphithalea* (+), *Stirtonanthus* (–), *Podalyria* (+), *Liparia* (+), *Virgilia* (+), *Calpurnia* (+)
	Crotalarieae	*Aspalathus* (+), *Wiborgia* (+), *Wiborgiella* (+), *Rafnia* (+), *Lebeckia* (+), *Calobota* (+), *Lotononis* (+), *Pearsonia* (+), *Rothia* (+), *Bolusia* (+), *Crotalaria* (+)
	Genisteae	*Melolobium* (+), *Dichilus* (+), *Polhillia* (–), *Argyrolobium* (+)
	Dalbergieae	*Zornia* (+), *Pterocarpus* (+), *Stylosanthes* (+), *Dalbergia* (+), *Aeschynomene* (+), *Smithia* (+), *Kotschya* (+), *Ormocarpum* (+)
	Hypocalypteae	*Hypocalyptus* (+)
	Indigofereae	*Cyamopsis* (+), *Indigastrum* (+), *Microcharis* (+), *Indigofera* (+)
	Millettieae	*Xeroderris* (+), *Craibia* (+), *Philenoptera* (+), *Millettia* (+), *Mundulea* (+), *Tephrosia* (+), *Requienia* (+), *Ptycholobium* (+)
	Abreae	*Abrus* (+)

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Subfamily	Tribe	Genera
	Phaseoleae	*Canavalia* (+), *Galactia* (+), *Ophrestia* (+), *Mucuna* (+), *Bolusafra* (+), *Rhynchosia* (+), *Eriosema* (+), *Flemingia* (+), *Erythrina* (+), *Otoptera* (+), *Decorsea* (+), *Neorautanenia* (+), *Neonotonia* (+), *Dumasia* (+), *Teramnus* (+), *Sphenostylis* (+), *Alistilus* (+), *Dolichos* (+), *Macrotyloma* (+), *Dipogon* (+), *Lablab* (+), *Vigna* (+)
	Desmodieae	*Desmodium* (+), *Pseudarthria* (+), *Alysicarpus* (+)
	Psoraleeae	*Otholobium* (+), *Psoralea* (+), *Cullen* (+)
	Sesbanieae	*Sesbania* (+)
	Loteae	*Lotus* (+)
	Galegeae	*Astragalus* (+), *Lessertia* (+), *Sutherlandia* (+)
	Trifolieae	*Trifolium* (+), *Trigonella* (+)

Herridge *et al*. (2008) state that the symbiotic associations between crop and forage/fodder legumes and rhizobia are the most important nitrogen fixing agents in agricultural systems. Global nitrogen fixation by forage and fodder legume–rhizobia symbiosis is estimated to be 12–25 Tg (1.3–2.7x10^7 tons) annually.

In a review of *Rhizobium* inoculant technologies in sub-Saharan Africa, Chianu *et al*. (2011) recognised the need to advance *Rhizobium* inoculant technology development as well as capacity building around BNF to promote legume production and solve soil fertility problems.

2.4 Soil conservation

The use of legume species in soil conservation practices to restore and improve fertility and to reclaim and conserve degraded soil, is well known. The use of indigenous legumes in soil conservation practices is recorded as follows:

Cover crops, planted after the main crop (e.g. maize) has been harvested, are used to reduce soil erosion and the volume and velocity of runoff over the soil, integrating legumes such as:

Alysicarpus vaginalis (Morris 1997)
Crotalaria spp. and *C. ochroleuca* (Morris 1997; Ekeleme *et al*. 2003)
Desmodium spp. (Morris 1997)
Indigofera hirsuta, (Sampson 1928)
Lablab purpureus (Ekeleme *et al*. 2003; Odhiambo 2011)
Mucuna pruriens (Sampson 1928; Ekeleme *et al*. 2003; Odhiambo 2011)
Vigna unguiculata (Sampson 1928; Odhiambo 2011)

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Green manure crops are used to improve soil fertility where a crop with a low C:N ratio is incorporated in the soil, normally during the flowering stage, integrating legumes such as:

Lablab purpureus (Onyango 2002)
Mucuna pruriens (Waddington *et al*. 2004)
Sesbania sesban (Chikowo *et al*. 2006) and *S. tetraptera* (Morris 1997)
Vigna unguiculata (Onyango 2002)

Crop rotation is practised mainly to control pests and diseases, but also to increase the organic matter content of the soil and improve soil structure and rooting depth for a period longer than a year, integrating legumes such as:

Lablab purpureus (Peoples *et al*. 2009)
Vigna unguiculata (Lupwayi *et al*. 2011)

Soil reclamation and reinforcement of degraded veld is practised by planting a permanent pasture acceptable to grazers to enhance nutrient cycling, using legumes such as:

Crotalaria spp. (Nezomba *et al*. 2007, 2009)
Indigofera astragalina (Nezomba *et al*. 2007, 2009)
Sutherlandia microphylla (Wilcock *et al*. 2004)
Tephrosia purpurea (Nezomba *et al*. 2007, 2009)
Vigna vexillata (Barnes *et al*. 1986)

Soil fertility can be improved by using cover crops, green manure and crop rotation practices, integrating legumes such as:

Crotalaria spp. (Mapfumo *et al*. 2005; Tauro *et al*. 2007)
Indigofera spp. (Mapfumo *et al*. 2005; Tauro *et al*. 2007)
Neonotonia wightii (Macharia *et al*. 2011)
Sesbania sesban (Oberson *et al*. 2006)
Sutherlandia microphylla (Morris 1997)
Tephrosia spp. (Morris 1997; Mapfumo *et al*. 2005; Tauro *et al*. 2007)

Conservation agriculture is practised through no or minimum tillage, crop rotation and residue management, integrating legumes such as:

Lablab purpureus (Trytsman 2008; Bloem *et al*. 2009)
Mucuna pruriens (Naudin & Balarabé 2008)
Vigna unguiculata (Trytsman 2008; Bloem *et al*. 2009)

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2.5 Chemical antiquality factors

Data presented in this thesis refer to chemical antiquality factors present in certain legume species. The antiquality factors are defined below and are aimed as background for data presented in the inventory of legume species (Chapter 5). Ologhobo (1989) suggests that the variation in content of antiquality factors should be considered in breeding studies when selecting for improved forage legumes.

Abrin is a lectin (carbohydrate-binding protein) found in the seed of *Abrus precatorius* and is extremely poisonous (Adedapo *et al*. 2007).

Alkaloids are chemical compounds that contain mostly basic nitrogen atoms, having a bitter taste that limits intake and could have a toxic effect (Rodriquez & Tecson-Mendoza 1998).

Bloat is caused when gas builds up in the rumen and is trapped in the rumen fluid. Bloat-safe legumes are often related to the presence of condensed tannins (Dewhurst *et al*. 2009; Wang *et al*. 2012) and where wild relatives, containing genes that control bloat, are used in breeding programs (Woodfield & Clark 2009).

Bonducin is a homoisoflavone that acts as a phytoestrogen and is found in *Caesalpinia bonduc* (Watt & Breyer-Brandwijk 1962).

Chaksine is an alkaloid found in *Chamaecrista absus* (Watt & Breyer-Brandwijk 1962).

Crotalariosus equorum is a chronic respiratory disease in horses and mules that is associated with the intake of e.g. *Crotalaria dura* and *C. globifera* (Kellerman *et al*. 2005).

Glycosides are molecules in which a sugar group (glycone) is bound to a nonsugar group (aglycone). Cyanogenic glycosides, flavonoid glycosides and saponines are glycosides defined by the aglycone.

- **Cyanogenic glycosides** are toxic when ingested and hydrolysed to free hydrogen cyanide (HCN) or prussic acid (Norton 1998). Ruminants are more susceptible to cyanogen toxicity than non-ruminants since the hydrolytic reaction takes place through microbial activity in the rumen, toxic levels resulting in energy deprivation and death (Kumar 1992). Hydrocyanic acid is an aqueous solution of hydrogen cyanide. **Acacipetalin** is a cyanogenic glycoside found in *Acacia hebeclada* subsp. *hebeclada* (Watt & Breyer-Brandwijk 1962).
- **Flavonoid glycosides** are plant pigment compounds that act as antioxidants (Samanta *et al*. 2011).
- **Saponine glycosides** give a bitter taste to pastures and have foaming properties, resulting in weight loss and gastroenteritis (Aganga & Tshwenyane 2003) and are found in e.g. *Sesbania sesban* (Kumar 1992).

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Glycyrrhizin is a sweet compound containing potassium and calcium salts derived from the liquorice root of *Abrus precatorius* (Karwasara *et al*. 2011).

Indospicine is a free amino acid which causes hepatotoxicity when grazed by cattle (Hassan *et al*. 2008) and is found in e.g. *Indigofera spicata* (Kumar 1992).

Phenol is a poisonous crystalline acidic compound present in wood such that of as *Pterocarpus angolensis* (King *et al*. 1952).

Rotenone and tephrosin are used as a pesticide and piscicide and occur in some species of *Tephrosia* (Morris & Walker 2002).

Tannins, polyphenolic compounds, occur as two groups, namely hydrolysable tannins and condensed tannins where the latter is present in many forage legumes and seeds (Aganga & Tshwenyane 2003). It affects rumen function and depresses intake, wool growth and live weight gain, but at moderate levels a nutritional advantage with increased bypass protein availability and suppression of bloating (Aganga & Tshwenyane 2003).

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CHAPTER 1

INTRODUCTION

1.1 Background

The importance of legumes (Leguminosae / Fabaceae *s.l.*) in a pasture or cropping system, its notable soil conservation enhancing qualities and nitrogen-fixing abilities are acknowledged by researchers and valued by farmers worldwide. The purpose of this study is to record all known legume species indigenous to South Africa, Lesotho and Swaziland, to establish distribution patterns and optimum climatic and soil conditions for growth and to propose a list of legume species for further evaluation for pasture potential.

Even though many South African grass species have been evaluated, improved and made commercially available, only a few legumes such as *Lablab purpureus*, *Listia bainesii* and *Vigna unguiculata* are established fodder or pasture crops being used locally and internationally. Currently the National Forage Genebank of the ARC-Animal Production Institute holds only ± 5% of indigenous legume species, as opposed to nearly all the important indigenous forage grass species.

The reason for the little interest in evaluating and developing indigenous legume species could be attributed to large and well-known genera such as *Aspalathus* (335 species), *Crotalaria* (55 species), *Indigofera* (196 species) and *Tephrosia* (62 species) not generally recognised as livestock feed. This is mainly due to low acceptability, palatability or production and many species containing antiquality factors such as cyanogenic glucosides, alkaloids and saponines. Noteworthy, though, are the considerable information available on the livestock feed value of species of *Acacia* (49 species). The easy access to improved pasture legumes from other countries, especially Australia and southern America, could also have contributed to the indifference to investigating local genetic resources. Moreover, the Pasture Legume Research Unit of the Department of Agriculture was merged into what later became known as the ARC-Range and Forage Institute in 1989, currently with a declining emphasis on pasture research projects that focus on screening, characterisation, description, evaluation, selection and breeding of potential and/or promising pasture legumes. The acquisition of primarily alien legume genetic resources since 1982 with the aim of alleviating problems associated with agricultural land use practices was published by Kruger (1999).

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1.2 Key questions

What legume species are indigenous to South Africa, Lesotho and Swaziland and what are their taxonomic relationships?

What descriptive and qualitative data are recorded for indigenous legume species and how do these descriptors relate to distribution patterns and potential pasture value?

Could the available datasets and methods used to record and describe indigenous legumes be used for assessing adaptive abilities and pasture potential of species?

Could the available datasets be used to determine levels of adaptation to varying climate and soil conditions between species?

Could the use of botanical descriptions and occurrence data be useful in prioritising the large number of species when selecting possible species for further evaluation?

To what extent could occurrence data recorded on a regional scale realise agricultural needs?

1.3 Objectives

The principal objectives of this study are:

- To describe the diversity of legumes indigenous to South Africa, Swaziland and Lesotho in terms of their adaptive and botanical characteristics with the aim of predicting possible pasture value.
- To use the outcome of this study as a guideline in the collection and conservation of seed within the National Forage Genebank of the ARC-Animal Production Institute.

1.4 Hypotheses

- The wealth of descriptive and distribution data accumulated by botanists and taxonomists could be used to cluster, describe and select indigenous legume species for further evaluation as animal feed.
- Indigenous legumes are adapted to diverse soil and climatic conditions, creating the opportunity to select species for specific agricultural needs.

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1.5 Research approach

Legumes indigenous to South Africa, Lesotho and Swaziland will be listed using available descriptive (Germishuizen & Meyer 2003) and distribution data (PRECIS 2008). The PRECIS (National Herbarium Pretoria (PRE) Computerised Information System) database documented a total of 33 726 Leguminosae records and will be edited for species present within the borders of the above-mentioned countries, and incomplete and double records within a quarter degree grid cell will be omitted.

The phylogeny of the Leguminosae as proposed by Lewis *et al*. (2005) will be used for establishing taxonomic relationships. The available data from Germishuizen & Meyer (2003) will be used to describe growth form, height and altitude of individual species. PRECIS distribution records will be superimposed on the biome and bioregion vegetation maps published by Mucina & Rutherford (2006). At the quarter degree scale (standard format for PRECIS data capturing), vegetation types will be recorded under the various biomes and bioregions. The same principle of assigning annual rainfall, pH, temperature, and phosphorus values to quarter degree grid cells will be used to determine distribution patterns of legumes across the aforementioned variables. PRECIS data will further be used to generate a map indicating the collection intensity for leguminous species in South Africa, Lesotho and Swaziland.

This study is the initial phase of assessing a total of 1 654 species of the family Leguminosae known to be indigenous to South Africa, Lesotho and Swaziland and representing 24 tribes and 122 genera. Most indigenous genera are contained in the subfamily Faboideae, while most genera with present-day agricultural value fall in the tribe Phaseoleae.

1.6 Layout of thesis

This thesis starts with an overview of legume research in southern Africa and, where applicable, the rest of Africa and globally (Chapter 2). Focus is on the use of legumes in agricultural production systems (cropping and livestock) rather than on taxonomic relationships and biological nitrogen fixation.

Chapter 3 contains a full research paper published in *African Journal of Biotechnology* in 2011. The article gives a brief outline of taxonomic relationships, available descriptive information at tribe level and of collection intensities of indigenous legume species.

The methods and definitions of the terms used in this study are given in Chapter 4.

An inventory of all known indigenous legume species is recorded alphabetically in Chapter 5. A distribution map, based on PRECIS collection data, is presented for each species. Where no data is available, only the taxon is listed. A short description of the growth form, height

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and altitude range is given, as well as the highest and second highest % occurrence in bioregions and biomes, and climate and soil properties are stated. Available literature, focusing primarily on livestock feed value, cultivation, antiqualities and nodulation, is cited where relevant.

Chapter 6 describes the 16 uniquely formed Leguminochoria, the emphasis on the bioregions and biomes where clusters are formed, as well as on the key climate and soil properties. The climate and soil properties are compared along with species richness, species range, key and diagnostic species. The floristic links between Leguminochoria are established by comparing key species common to clusters.

The effect of different abiotic variables on the distribution patterns of legume species is discussed in Chapter 7. The adaptive ability to prevailing climate and soil conditions of all legume species within a tribe or genus is given in table form. A list of species adapted to low soil P at any given pH level, is also presented.

Legume species known to be cultivated, grazed or browsed by livestock were screened for their pasture potential by using available descriptive data, namely distribution patterns, known antiqualities, adaptation to low soil phosphorus, height and perenniality. The number of cultivated or grazed/browsed species was plotted at both latitude and longitude to determine quarter degree grid cells containing the highest percentage. These results are presented in Chapter 8.

Chapter 9 concludes this thesis with a general discussion and final conclusion.

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CHAPTER 3

SYSTEMATICS, DIVERSITY AND FORAGE VALUE OF INDIGENOUS LEGUMES OF SOUTH AFRICA, LESOTHO AND SWAZILAND

A full length research paper was published in 2011 in the African Journal of Biotechnology, Volume 10 (63) pages 13773 – 13779, available online at: http://www.academicjournals.org/AJB.

The final manuscript is included rather than the printed version. The prescribed journal format is followed and thus differs from the thesis format.

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Systematics, diversity and forage value of indigenous legumes of South Africa, Lesotho and Swaziland

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ABSTRACT

The diversity of legumes, indigenous to South Africa, Lesotho and Swaziland is reported using recorded descriptive and distribution data. A total of 24 tribes, 118 genera and 1662 species were documented with the majority of genera belonging to subfamily Faboideae, tribe Phaseoleae, and the majority of species to tribe Crotalarieae. In terms of distribution patterns, most species were present in the Savanna Biome and Central Bushveld Bioregion. Even though most tribes contain species with secondary metabolites (mainly non-protein amino acids), tribes containing poisonous species are far fewer. Herbs are the key growth form, followed by shrubs, dwarf shrubs and trees. The majority of species are perennials. A map representing the collection intensity for the study area showed that the majority of legumes species were collected in the Fynbos, Savanna and Grassland Biome. It is concluded that indigenous South African legumes are extremely diverse and this denotes the importance of further investigating their forage potential or use in other agricultural practices.

Key words: Biomes, bioregions, Fabaceae, fodder, genebank, Leguminosae, pastures, tribes

INTRODUCTION

Legumes are used extensively in various agricultural practices, for example as high quality pastures, cover and cash crops, for soil improvement and erosion control (Graham and Vance, 2003; Gepts et al., 2005; Lewis et al., 2005). The majority of legumes cultivated in South Africa are introduced species, particularly those used as planted pastures. The most valued commercially produced indigenous legumes are A*spalathus linearis* (rooibos) and C*yclopia intermedia* (honey bush) endemic to the Cape Floristic Region and well-known for their culinary (as tea) and medicinal value. Researchers such as Sprent et al. (2010) argued that by developing indigenous African legumes, especially those well adapted to drought and low soil nutrient levels, agricultural diversity will be retained.

The general belief that indigenous legume species are either poisonous and/or low producers could have attributed to the little attention given to evaluating indigenous legumes for their forage potential (Kruger, pers. comm.) Nevertheless, cultivars have been released from African legume species such as *Lotononis bainesii* 'INIA Glencoe' (Real and Altier, 2005), *Neonotonia wightii* 'Clarence' and *Lablab purpureus* 'Endurance' (Cook et al., 2005). The majority of recently published work on South African legumes relates to phylogenetic and

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biological nitrogen fixation studies. Phylogenetic research focused mainly on the Genistoid tribes (Van Wyk, 2003; Moteetee and Van Wyk, 2006), Podalyrieae (Van der Bank et al., 2002), Crotalarieae (Boatwright et al., 2009; Boatwright et al., 2011) and *Hypocalypthus* (Schutte and Van Wyk, 1998). The latest research on biological nitrogen fixation focused on *Lotononis bainesii* (Jaftha et al., 2002), *Lebeckia* spp. (Phalane, 2008) and *Vigna unguiculata* (Makoi et al. 2009). In terms of pasture evaluation Rootman et al. (2004) and Howieson (2010) are among the more recent papers reporting on the use of indigenous legumes in pasture evaluations trials under South African conditions.

The aim of this paper is to report on the current state of knowledge on the indigenous legume genetic diversity in South Africa, Lesotho and Swaziland. This was seen as the first phase in reviewing the possible forage potential of indigenous legumes. Improving adaptive species from the underutilized indigenous germplasm pool should be a research emphasis in developing new pasture species.

MATERIALS AND METHODS

The Leguminosae (Fabaceae) indigenous to South African, Lesotho and Swaziland (hereafter referred to as South Africa) were listed using available descriptive (Germishuizen and Meyer, 2003) and distribution data (PRECIS, 2008; Mucina and Rutherford, 2006). Approximately 63 species were not recorded in PRECIS (2008) and ± 58 species were not recorded in Germishuizen and Meyer (2003) of which 85 species had insufficient records. PRECIS (National Herbarium, (PRE) Computerised Information System) contains a total number of 33726 Leguminosae records. The data was edited for species present within the borders of the above mentioned countries, as well as omitting double records within a quarter degree grid. The edited data resulted in 27618 records.

The phylogeny of Leguminosae as proposed by Lewis et al. (2005) was used to create a bubble diagram showing the evolutionary relationships of subfamilies and tribes of South-African legumes and the proportion between growth form and growth period within each tribe. The data from Germishuizen and Meyer (2003) was used to quantify herbs, dwarf shrubs, shrubs, trees, climbers, creepers, annuals and perennials within each tribe. Mixed growth forms (e.g. species described as both herb and shrub) were not included in the data as 88% of species were accounted for in the single growth form designation.

PRECIS distribution records were superimposed on biome and bioregion vegetation maps published by Mucina and Rutherford (2006). At the quarter degree scale (standard format for PRECIS data capturing) the biomes and bioregions vegetation types were recorded. Where more than one biome or bioregion was present within a quarter degree it was termed an eco-region. The allocation of vegetation types within the quarter degree was thus only applied to pure types, i.e. mixed vegetation types were coded as eco-regions and are not presented.

PRECIS data was further used to generate a map indicating the collection intensity for legume species in South Africa. Under-collection was found mainly in the Central Karoo

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where low legume species numbers were recorded. The history of the PRECIS database has been published by Steenkamp et al. (2005).

RESULTS AND DISCUSSION

The legumes of South Africa belong to three subfamilies, 24 tribes, 118 genera and a total of 1662 species (Table 1.) The majority of species falls within the subfamily Faboideae with the largest number of species within the tribe Crotalarieae (630 species) followed by Indigofereae (208 species) and Phaseoleae (180 species). Six tribes namely Acacieae, Swartzieae, Hypocalypteae, Abreae, Sesbanieae and Loteae contain only one genus. A total of 27618 PRECIS records were recorded for the Leguminosae in South Africa (Table 1). The number of PRECIS records, relative to the number of species contained within a tribe, compared well. This however, has no reference to individual species. The range in altitude indicated that Swartzieae had the lowest adaptive range, followed by Hypocalypteae and Sophoreae. The remaining 21 tribes' maximum range exceeded the 1500m level.

The wide distribution range of most tribes is noteworthy with 15 of the 24 tribes present in seven or more biomes (Table 1). This includes smaller tribes such as Cercideae and Trifolieae. Hypocalypteae (*Hypocalyptus* spp.) is present in only one biome, namely Fynbos. The Savanna Biome is well represented (16 tribes), followed by the Grassland (4 tribes) and Fynbos Biomes (4 tribes).

Crotalarieae is represented in 29 of the 35 bioregions of South Africa, Galegeae in 27 bioregions, followed by both Genisteae and Indigofereae with 26 bioregions (Table 1). Regardless of the fact that Galegeae contains only 62 species (belonging to *Astragalus*, *Lessertia* and *Sutherlandia*) it is exceptionally widespread. The majority of tribes are present in the Central Bushveld Bioregion (SVC), including the larger tribes such as Crotalarieae and Indigofereae. The Lowveld (SVI), Mesic Highveld Grassland Bioregion (GM) and Eastern Fynbos-Renosterveld Bioregion (F06) follow.

The majority of legume tribes contain species with secondary metabolites that are of agricultural and economic interest. Isoflavonoids (e.g. genistein and rotenone are common in subfamily Faboideae whereas non-protein amino acids (e.g. canavanine and mimosine) are present in most tribes except Cercideae, Podalyrieae and Psoraleeae (Wink and Mohamed, 2003). In the same study isoflavonoids have been reported in most members of the tribes Genisteae, Desmodieae and Phaseoleae and all of the members of the tribes Trifolieae and Sophoreae. Quinolizidine alkaloids occur mainly in tribes from the Genistoid clade (Wink and Mohamed, 2003).

The potential use for forage or soil conservation and presence of poisonous compounds for the different legume tribes is reflected in Table 1 (Lewis et al., 2005). Most tribes contain species with forage and soil conservation potential, e.g. fodder production, ground cover, green manure or soil improvement. In terms of its poisonous traits, nine tribes namely

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Table 1. Statistics of tribes, genera and species of Leguminosae indigenous to South Africa, Lesotho and Swaziland.

Tribe	#Genera (#world)	# Species	#PRECIS records	Altitude (m)	#Biomes (majority)	#Bioregions (majority)	Secondary metabolites	Fodder / soil conservation value	Poisonous trait
Subfamily Caesalpinioideae									
Cercideae	4 (12)	9	269	0 - 1850	8 (Savanna)	14 (SVC)	-	X	-
Detarieae	5 (82)	11	283	0 - 1800	7 (Savanna)	13 (SVI)	np	X	X
Cassieae	4 (21)	18	702	0 - 1750	7 (Savanna)	14 (SVC)	np	-	-
Caesalpinieae	8 (56)	13	288	0 - 2000	8 (Savanna)	14 (SVC)	np	-	-
Subfamily Mimosoideae									
Mimoseae	8 (40)	19	461	0 - 1850	7 (Savanna)	12 (SVC)	alk,np	X	-
Acacieae	1 (1)	49	1727	0 - 2950	8 (Savanna)	21 (SVC)	alk,np	X	X
Ingeae	3 (36)	13	302	0 - 1650	4 (Savanna)	8 (SVI)	np	X	-
Subfamily Faboideae									
Swartzieae	1 (17)	1	8	0 - 200	2 (Savanna)	2 (SVI)	not tested	X	X
Sophoreae	4 (45)	5	95	0 -1400	2 (Savanna)	7 (SVC)	alk,np,iso	X	-
Podalyrieae	8 (8)	139	1119	0 - 2438	7 (Fynbos)	16 (F06)	alk,iso	-	1
Crotalarieae	11 (11)	630	6734	0 - 3447	8 (Fynbos)	29 (SVC)	alk, np, iso	X	X
Genisteae	4 (25)	77	1438	0 - 3019	8 (Grassland)	26 (GM)	alk, np, iso	X	-
Dalbergieae	8 (49)	27	1059	0 - 2100	5 (Savanna)	11 (SVI)	np, iso	X	X
Hypocalypteae	1 (1)	3	70	50 - 1350	1 (Fynbos)	3 (F06)	not tested	-	-
Indigofereae	4 (7)	208	3489	1 - 3500	8 (Savanna)	26 (SVC)	np	X	X
Millettieae	8 (45)	75	1747	0 - 2135	8 (Savanna)	18 (SVC)	np, iso	X	1,2
Abreae	1 (1)	2	108	15 - 1615	2 (Savanna)	4 (SVI)	not tested	X	X
Phaseoleae	22 (89)	180	4404	0 - 2440	7 (Savanna)	22 (SVC)	alk, np, iso	X	1,2
Desmodieae	3 (30)	17	370	3 - 1950	4 (Savanna)	9 (CB,SVI)	alk, np, iso	X	-
Psoraleeae	3 (9)	85	1483	0 - 3200	8 (Fynbos)	25 (F06)	iso	X	-
Sesbanieae	1 (1)	10	114	0 - 1800	3 (Savanna)	8 (SVC)	np	X	X
Loteae	1 (22)	3	68	0 - 2196	5 (Grassland)	9 (GM)	np, iso	X	-
Galegeae	3 (24)	62	1034	0 - 3279	8 (Grassland)	27 (SVK)	alk, np, iso	X	X
Trifolieae	2 (6)	6	246	0 - 3250	7 (Grassland)	12 (GM)	np, iso	X	-
Total	**118 (638)**	**1662**	**27618**						

Biome and bioregion classification from Mucina and Rutherford (2006) where CB=Indian Ocean Coastal Belt, SVC=Central Bushveld, F06=Eastern Fynbos Renosterveld, GM=Mesic Highveld Grassland, SVI=Lowveld, SVK=Eastern Kalahari Bushveld. Secondary metabolites from Wink and Mohamed (2003) where alk=quinolizidine pyrrolozidine, indolizidien, indole and *Erythrina* alkaloids, np=non-protein amino acids, iso=isoflavonoids. Fodder value and poisonous traits from Lewis et al. (2005). [1]Insecticide; [2]Piscicide.

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Detarieae, Acacieae, Swartzieae, Crotalarieae, Dalbergieae, Indigofereae, Abreae, Sesbanieae and Galegeae contain poisonous species.

The suprageneric classification of the legume tribes is shown in the form of a bubble diagram in Figure 1 (based on Lewis et al., 2005). The family Faboideae comprises of three clades, namely the Genistoid clade that includes Crotalarieae with the largest number of species (37.9%) and Swartzieae and Abreae with the lowest number of species (0.1%), the Dalbergioid clade that comprises of the small tribe Dalbergieae (1.6%) and the Old World clade in which the agriculturally important Phaseoleae tribe (10.8%) falls. The highest number of legume species is grouped in the Genistoid clade, containing 51.3% of the species found in South Africa.

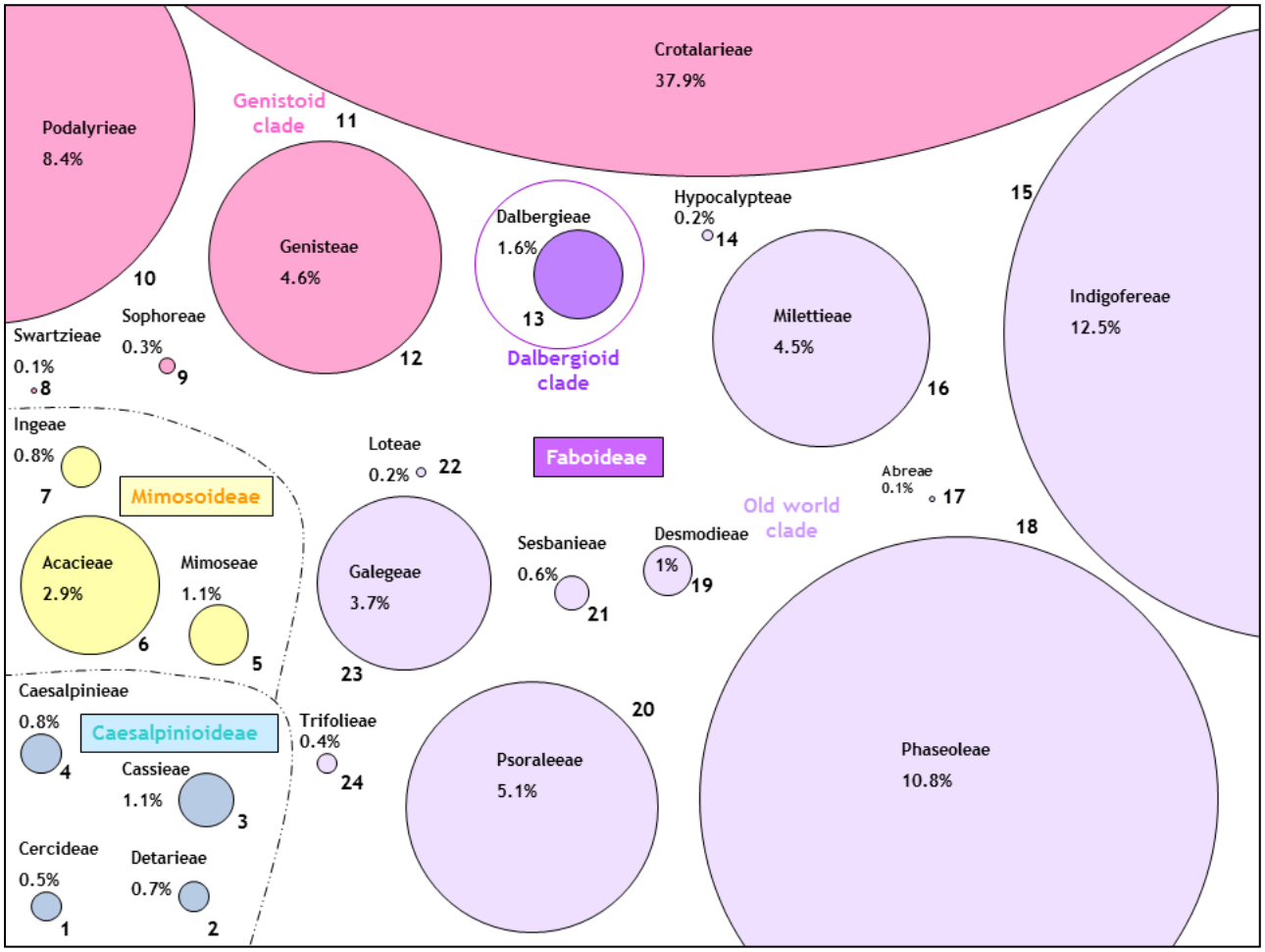

Figure 1. Bubble diagram depicting the subfamilies (3) and tribes (24) of Leguminosae indigenous to South African, Lesotho and Swaziland. The number in a bubble indicates the percentage species of a tribe in relation to the total number of species present. The number outside a bubble displays the order in the suprageneric classification according to Lewis et al. (2005).

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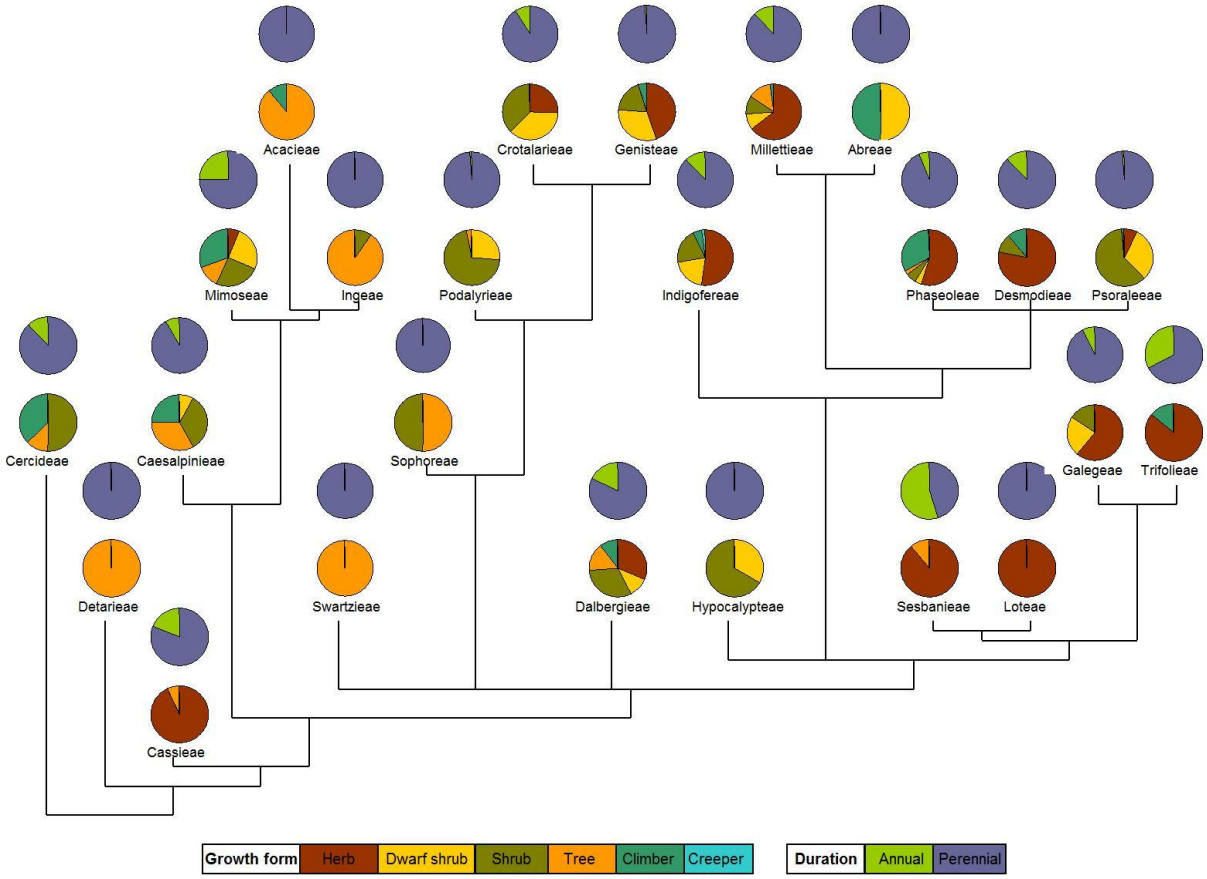

Figure 2. The different growth form and duration ratios plotted on a simplified phylogeny of Leguminosae in South African, Lesotho and Swaziland. Phylogeny based on Lewis et al. (2005) and Boatwright et al. (2011) for the tribe Crotalarieae.

Based on a simplified phylogeny of Leguminosae as proposed by Lewis et al. (2005), the different growth form and growth period ratios are depicted in Figure 2. The majority of legumes are herbs, followed by shrubs, dwarf shrubs and trees. The smaller tribes evidently contain only one type of growth form (e.g. trees within Detarieae and Swartzieae and herbs within Loteae) whereas the larger tribes display most of the growth forms (e.g. Crotalarieae, Psoraleeae and Indigofereae). A remarkable attribute noted for Phaseoleae was the considerable number of climbers present within this tribe. This is a result of two genera, namely *Rhynchosia* and *Vigna*. Whereas members of *Vigna* are well established pasture plants, *Rhynchosia minima* and *Rhynchosia totta* are not, but has been proposed by Maposse et al. (2003) as species with range-reseeding and cultivated pasture potential. A quarter degree frequency count shows that *R. totta* is the most abundant species, present in 238 grids. The majority of legume species are perennials. Sesbanieae, containing only one genus namely *Sesbania*, was the only tribe containing a majority of annuals.

In Table 2 the genera within each tribe is listed. Caesalpinioideae have only one endemic genus namely *Umtiza* whilst the Faboideae contains a large number of endemic genera, mainly grouped in tribes Hypocalypteae, Genisteae, Podalyrieae, Psoraleae, Galegeae and Crotalarieae of which the largest is *Aspalathus* with 335 species. The most important genera containing species that have been selected and bred for forage production worldwide are

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Lotononis (147 spp.), *Stylosanthes* (1 spp.), *Canavalia* (5 spp.), *Mucuna* (4 spp.), *Neonotonia* (1 spp.), *Teramnus* (1 spp.), *Dolichos* (12 spp.), *Macrotyloma* (5 spp.), *Lablab* (1 spp.), *Vigna* (20 spp.), *Desmodium* (11 spp.), and *Trifolium* (5 spp.). The Red Data List (Golding, 2002) recorded none of the Leguminosae to be extinct, threatened or at a low risk in South Africa. Lesotho, however, has three threatened species and Swaziland seven species at a low risk. 'The Plants of southern Africa' website of the South African National Botanical Institute (SANBI, 2011) provides the current status of all species, for example species of *Aspalathus*, *Cyclopia*, *Indigofera* and *Lotononis* are listed to be either critically endangered or extinct.

In Figure 3 the number of PRECIS records per quarter degree is mapped, showing the collection intensity at the specimen level. The Fynbos Biome has been well represented, probably due to extensive collecting by herbaria in the Western Cape. Other distinct collection sites were the Savanna and Grassland Biomes, close to the Great Escarpment and the Indian Ocean Coastal Belt Biome. Plant collections are mainly done by SANBI, the Department of Agriculture and local Universities where accessibility and diversity plays a role in collection intensity. The large number of uncollected sites in southern Africa was also noted by Steenkamp et al. (2005).

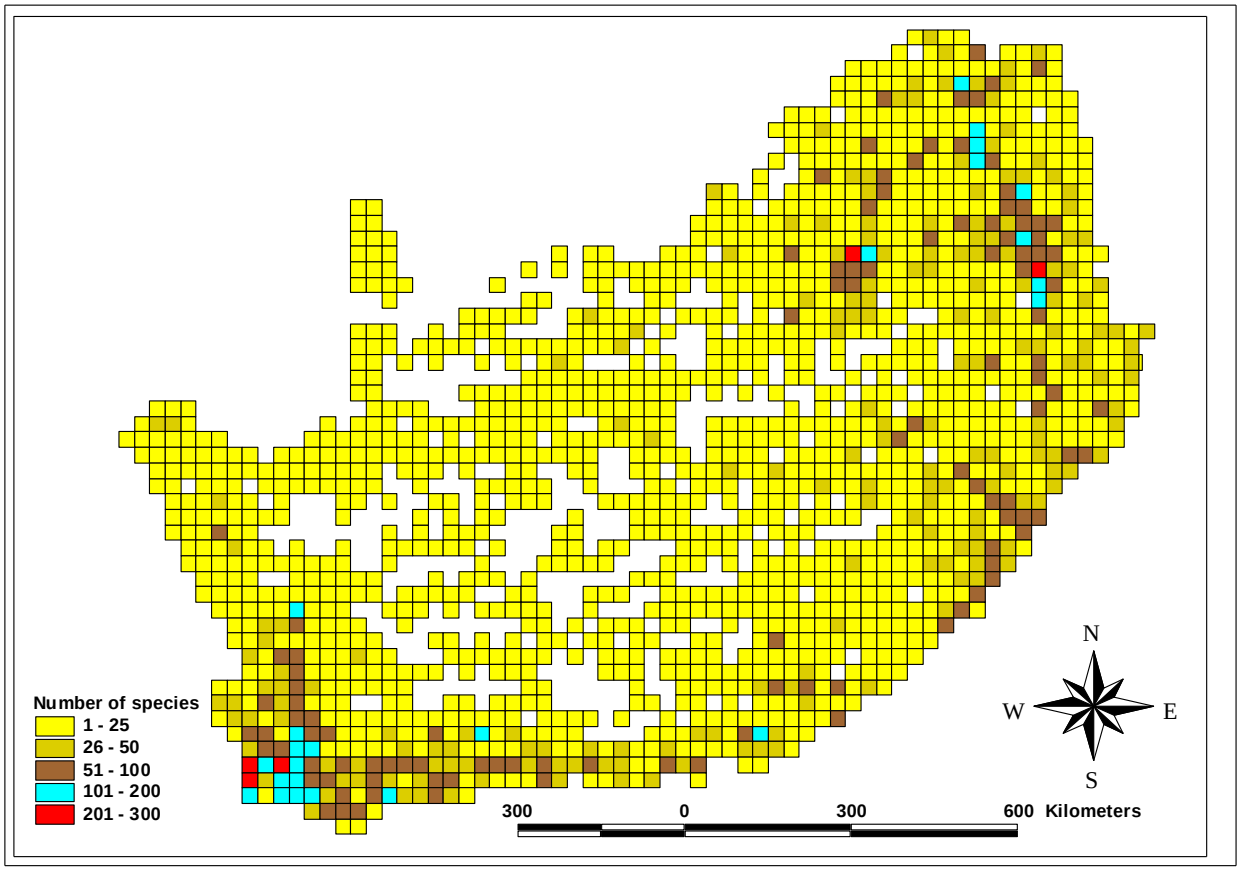

Figure 3. Collection intensity for Leguminosae in South African, Lesotho and Swaziland as recorded in PRECIS (2008).

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Table 2. Subfamilies, tribes and genera of Leguminosae indigenous to South Africa, Lesotho and Swaziland following the suprageneric classification of Lewis et al. (2005) and Boatwright et al. (2011) for the tribe Crotalarieae.

Subfamily	**Tribe**	**Genera**
Caesalpinioideae		
	Cercideae	*Adenolobus* (1), *Bauhinia* (5), *Tylosema* (2), *Piliostigma* (1),
	Detarieae	*Schotia* (7), *Colophospermum* (1), *Guibourtia* (1), *Afzelia* (1), *Brachystegia* (1)
	Cassieae	*Dialium* (1), *Chamaecrista* (12), *Senna* (4), *Cassia* (1)
	Caesalpinieae	*Umtiza* (1), *Pterolobium* (1), *Caesalpinia* (3), *Pomaria* (4), *Peltophorum* (1), *Parkinsonia* (1), *Erythrophleum* (1), *Burkea* (1)
Mimosoideae		
	Mimoseae	*Xylia* (1), *Entada* (2), *Elephantorrhiza* (8), *Newtonia* (1), *Xerocladia* (1), *Neptunia* (1), *Dichrostachys* (4), *Adenopodia* (1)
	Acacieae	*Acacia* (49)
	Ingeae	*Faidherbia* (1), *Calliandra* (1), *Albizia* (11)
Faboideae		
	Swartzieae	*Cordyla* (1)
	Sophoreae	*Xanthocercis* (1), *Bolusanthus* (1), *Sophora* (1), *Baphia* (2)
	Podalyrieae	*Cyclopia* (23), *Xiphotheca* (9), *Amphithalea* (45), *Stirtonanthus* (3), *Podalyria* (25), *Liparia* (21), *Virgilia* (3), *Calpurnia* (10)
	Crotalarieae	*Aspalathus* (335), *Wiborgia* (11), *Wiborgiella* (7), *Rafnia* (31), *Lebeckia* (14), *Calobota* (13), *Lotononis* (147), *Pearsonia* (15), *Rothia* (1), *Bolusia* (1), *Crotalaria* (55)
	Genisteae	*Melolobium* (16), *Dichilus* (5), *Polhillia* (6), *Argyrolobium* (50)
	Dalbergieae	*Zornia* (4), *Pterocarpus* (3), *Stylosanthes* (1), *Dalbergia* (5), *Aeschynomene* (9), *Smithia* (1), *Kotschya* (2), *Ormocarpum* (2)
	Hypocalypteae	*Hypocalyptus* (3)
	Indigofereae	*Cyamopsis* (2), *Indigastrum* (7), *Microcharis* (3), *Indigofera* (196)
	Millettieae	*Xeroderris* (1), *Craibia* (1), *Philenoptera* (3), *Millettia* (2), *Mundulea* (1), *Tephrosia* (62), *Requienia* (2), *Ptycholobium* (3)
	Abreae	*Abrus* (2)
	Phaseoleae	*Canavalia* (5), *Galactia* (1), *Ophrestia* (2), *Mucuna* (4), *Bolusafra* (1), *Rhynchosia* (59), *Eriosema* (46), *Flemingia* (1), *Erythrina* (10), *Otoptera* (1), *Decorsea* (2), *Neorautanenia* (3), *Neonotonia* (1), *Dumasia* (1), *Teramnus* (1), *Sphenostylis* (2), *Alistilus* (1), *Dolichos* (12), *Macrotyloma* (5), *Dipogon* (1), *Lablab* (1), *Vigna* (20)
	Desmodieae	*Desmodium* (11), *Pseudarthria* (1), *Alysicarpus* (5)
	Psoraleeae	*Otholobium* (45), *Psoralea* (37), *Cullen* (3)
	Sesbanieae	*Sesbania* (10)
	Loteae	*Lotus* (3)
	Galegeae	*Astragalus* (1), *Lessertia* (56), *Sutherlandia* (5)
	Trifolieae	*Trifolium* (5), *Trigonella* (1)

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CONCLUSION

The descriptive and distribution data used in this study confirm the considerable diversity of the legumes indigenous to South Africa, Lesotho and Swaziland. The majority of species falls in the tribe Crotalarieae, mainly due to the presence of diverse genera such as *Aspalathus* and *Lotononis*. The agriculturally important Phaseoleae tribe is well represented with 22 genera and 180 species, including 20 species of the well known *Vigna* pasture plant. Species grown in the Savanna Biome and Central Bushveld Bioregion were well presented. The diverse growth forms and distribution patterns of legumes are potentially useful in screening, selecting and breeding pasture legumes or for specific agricultural applications.

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REFERENCES

Boatwright JS, Tilney PM, Van Wyk B-E (2009). The generic concept of *Lebeckia* (Crotalarieae, Fabaceae): Reinstatement of the genus *Calobota* and the new genus *Wiborgiella*. South African Journal of Botany 75: 546–556.

Boatwright JS, Wink M, Van Wyk B-E (2011). The generic concept of *Lotononis* (Crotalarieae, Fabaceae): Reinstatement of the genera *Euchlora*, *Leobordea* and *Listia* and the new genus *Ezoloba*. Taxon 60:161–177.

Cook BG, Pengelly BC, Brown SD, Donnelly JL, Eagles DA, Franco MA, Hanson J, Mullen BF, Partridge IJ, Peters M, Schultze-Kraft R (2005). Tropical Forages: an interactive selection tool. [CD-ROM], CSIRO, DPI&F (Qld), CIAT and ILRI, Brisbane, Australia.

Gepts P, Beavis WD, Brummer EC, Shoemaker RC, Stalker HT, Weeden NF, Young ND (2005). Legumes as a model plant family. Genomics for food and feed report of the cross-legume advances through genomics conference. Pl. Phys. 137: 1228–1235.

Germishuizen G, Meyer NL (2003). Plants of southern Africa: an annotated checklist. *Strelitzia 14*, South African Biodiversity Institute, Pretoria, South Africa.

Golding JS (ed) (2002). Southern African Plants Red Data List. Southern African Botanical Diversity Network Report no. 14, Sabonet, Pretoria, South Africa.

Graham PH, Vance CP (2003). Legumes: Importance and constrains to greater use. Pl. Phys. 131: 872–877.

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Howieson J (2010). Pasture development for community livestock production in the Eastern Cape province of South Africa. http://aciar.gov.au/projects /LPS/2004/022.

Jaftha JB, Strijdom BW, Steyn PL (2002). Characterization of pigmented methylotropic bacteria which nodulate *Lotononis bainesii*. Syst. Appl. Microbiol. 25: 440–449.

Lewis G, Schrire B, Mackinder B, Lock M (eds) (2005). Legumes of the world. Royal Botanical Gardens, Kew, UK.

Makoi JHJR, Chimphango SBM, Dakora FD (2009). Effect of legume plant density and mixed culture on symbiotic N_2 fixation in five cowpea (*Vigna unguiculata* L. Walp) genotypes in South Africa. Appl. Sci. Papers and Reports 31.
http://dk.cput.ac.za/apsc_papers/31.

Maposse IC, Muir JP, Alage AA (2003). Status of range and forage research in Mozambique. Afr. J. Range For. Sci. 20: 63–68.

Moteetee A, Van Wyk B-E (2006). A revision of the genus *Melolobium* (Genisteae, Fabaceae). S. Afr. J. Bot. 71: 51–98.

Mucina L, Rutherford MC (eds) (2006). The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia 19*. South African Biodiversity Institute, Pretoria, South Africa.

Phalane FL (2008). The diversity of root nodule bacteria associated with *Lebeckia* species in South Africa. MSc Thesis, University of Pretoria, South Africa.

PRECIS Database (2008). South African National Biodiversity Institute, Pretoria, South Africa. http://posa.sanbi.org/searchspp.php.

Real D, Altier N (2005). Breeding for disease resistance, forage and seed production in *Lotononis bainesii* Baker. N.Z.J. Agric. Res. 48: 93–100.

Rootman G, Mabistela M, Pengelly B (2004). Selecting potential fodder bank legumes in semi-arid northern South Africa. Tropical legumes for sustainable farming systems in southern Africa and Australia, ACIAR Proc. no 115 (eds AM Whitbread & BC Pengelly).

SANBI (2011). South African National Botanical Institute, Plants of southern Africa. http://posa.sanbi.org

Schutte AL, Van Wyk B-E (1998). The tribal position of *Hypocalyptus* Thunberg (Fabaceae). Novon 8: 178–182.

Sprent JI, Odee DW, Dakora FD (2010). African legumes: a vital but under-utilized resource. J. of Exp. Bot. 61: 1257–1265.

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Steenkamp Y, Van Wyk AE, Smith GF, Steyn H (2005). Floristic endemism in southern Africa: A numerical classification at generic level. Biol. Skr. 55: 253–271.

Van der Bank ML, Chase MW, Van Wyk B-E, Fay MF, Van der Bank FH, Reeves G, Hulme A (2002). Systematics of the tribe Podalyrieae (Fabaceae) based on DNA, morphological and chemical data. Bot. J. Linn. Soc. 139: 159–70.

Van Wyk B-E (2003). The value of chemosystematics in clarifying relationships in the genistoid tribes of papilionoid legumes. Biochem. Syst. Ecol. 31: 875–884.

Wink M, Mohamed GIA (2003). Evolution of chemical defence traits in the Leguminosae: mapping of distribution patterns of secondary metabolites on a molecular phylogeny inferred from nucleotide sequences of the *rbc*L gene. Biochem. Syst. Ecol. 31: 897–917.

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CHAPTER 4

METHODS AND DEFINITIONS

4.1 Methods

4.1.1 Study area

Legume species indigenous to the Republic of South Africa, the Kingdom of Lesotho and the Kingdom of Swaziland were included in the study (Figure 4.1).

4.1.2 Legume species and intraspecific taxa

The indigenous legume species and intraspecific taxa were recorded using the section on the family Fabaceae in the 'Plants of Southern Africa, an online checklist' of the South African National Biodiversity Institute (SANBI), at http://posa.sanbi.org/searchspp.php as published on 21-04-2011. Naturalised and alien legume species were excluded from all datasets. Germishuizen & Meyer (2003) was used to describe each species in terms of its life form, life cycle, height and altitude, e.g. *Abrus laevigatus* E.Mey.: life form: dwarf shrub, climber; life cycle: perennial; height: 1.0–3.0 m; altitude: 50–1615 m. Data on the SANBI website were compared with Germishuizen & Meyer (2003) where anomalies were found.

The reinstatement of *Calobota* and the new genus *Wiborgiella* were implemented for the division of *Lebeckia*, whereas the reinstatement of *Euchlora*, *Leobordea* and *Listia* and the new genus *Ezoloba* were recorded for reclassification of *Lotononis* (Boatwright *et al*. 2009, 2011). The division of *Lotononis* was not recorded in the table presented in the review (Chapter 2: Table 2.1) or in the published article (Chapter 3).

The Fabaceae records in the National Herbarium (PRE) Computerised Information System (PRECIS) were obtained on 21-11-2008 and used to map distribution patterns of all species; the presence/absence of species in quarter degree grid cells (QDGCs) was used for data analysis. The original database contained 33 726 records. Species present outside South Africa, Lesotho and Swaziland were removed, and duplicate records, incompletely described botanical names as well as alien legume species were omitted. The edited data resulted in 27 618 records (Trytsman *et al*. 2011), which were further refined to 27 322 records. The history of PRECIS is summarised by Gibbs Russell & Arnold (1989) and additional

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information is given by Steenkamp *et al.* (2005). Where outliers were noted in the distribution patterns presented in Chapter 5 (Inventory), it was assumed that such species were adapted to the given environmental conditions, and they were therefore not removed from the dataset. An example is *Dalbergia armata* with a wide distribution in the Lowveld and Indian Ocean Coastal Belt Bioregion but with only one occurrence in the East Coast Renosterveld Bioregion.

However, the PRECIS database has some inherent weaknesses, especially errors regarding the allocation of taxa to QDGCs. It is estimated that QDGCs for around 15% of records may be incorrect (Biodiversity Information Officer, pers. comm). The database furthermore does not reflect all herbarium records from southern Africa, but mainly those housed in the National Herbarium (PRE) in Pretoria and some of its satellite herbaria, notably the KZN Herbarium (NH) in Durban and the Compton Herbarium (NBG) in Cape Town. Despite its inherent limitations, results of the present analysis have been considered sufficiently meaningful to justify the use of this database, the only one of its kind for the study area.

The duration (growth period) of a species is not always well defined or uniformly described. Three states are used, namely annual, perennial and occasional perennial. For the purpose of this study, 'occasional perennial' has been treated as a synonym of short-lived perennial. When above-ground material is shed during winter, yet the below-ground parts persist, the species in question has been taken as a perennial.

Author citations of scientific names are supplied in Chapter 5 (Inventory) but in all other chapters only the genus names, species names and names of intraspecific taxa are given.

4.1.3 Maps

The bioregions map of Rutherford *et al*. (2006) was used to create distribution maps with ArcView GIS 3.2, ESRI Inc. 2002. The biomes map of Rutherford *et al*. (2006) was used to generate additional data to describe each QDGC containing indigenous legumes and presented in tables. The maps that were used to generate data on climate (mean annual rainfall, mean annual minimum temperature and mean annual maximum temperature map) and soil (phosphorus, pH and exchangeable sodium percentage (ESP)) within each QDGC were supplied by the Agricultural Research Council - Institute for Soil, Climate and Water (ARC-ISCW, 2009). Nell (2010) assigned sodicity levels in each bioregion and these data were used mainly in Chapter 5 (Inventory). All maps were in GIS format, enabling enlargements of regions where QDGCs contained more than one zone for a specific variable, e.g. where a QDGC contained two mean annual rainfall zones, the dominant rainfall figure was assigned. If three or more rainfall zones converged in a QDGC, a combination of the two most prevailing zones was assigned. The climate and soil classes used in this study are recorded in Table 4.1.

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4.1.4 Scale

The description of each QDGC in terms of bioregions, biomes and abiotic factors was based on the regional maps mentioned in 4.1.3, one QDGC averaging 675 km^2 (± 26 x 26 km). The use of small (megaregional) scale maps as well as assigning rainfall, temperature, soil phosphorus, soil pH and ESP values to an area as large as a QDGC, evidently resulted in a less accurate dataset. This happened especially where two or more bioregions or biomes converged in a QDGC (termed an ecotone), resulting in a considerable loss of descriptive data for many QDGCs. The abiotic data were easier to assign, since QDGCs could be described in transitional terms and classed in a zone closest to those presented in Table 4.1.

4.1.5 Statistical analysis

The XLSTAT 2010.6.01 Software (Addinsoft) was used for clustering analysis (Agglomerative Hierarchical Clustering, AHC) (Chapters 6, 7 and 8), discriminant analysis (Chapter 7) and Pearson's correlation test (Chapter 7). The main reason for using XLSTAT was the easy access to a consulting biometrician assisting with statistical analysis of all datasets generated for this study. The Datametric Department of the Agricultural Research Council (ARC) offers an accessible and professional service to all ARC researchers, at no cost. PC-Ord (McCune & Mefford 2006) was used to compare AHC results (Chapter 6) performed by a statistical program not developed for biodiversity data (XLSTAT) with one that was (PC-Ord). The PHYTOTAB-PC program package of Westfall (1992) was used to classify key species recorded in clusters (Chapter 6) and Table Curve 2D (Version 5.01) to fit the most appropriate functions on the latitudinal and longitudinal dataset presented in Chapter 8.

4.2 Definitions

Legume: a member of the flowering plant family Leguminosae (Fabaceae). With their unique flower structures, podded fruit (legumens) and the ability to fix atmospheric nitrogen, legumes have many applications and are, for example, used as grain food, animal fodder, and in soil conservation and medicinal practices; they are second only to grasses in world economic importance. In the study area the Leguminosae has three subfamilies, namely the Caesalpinioideae, Mimosoideae and Faboideae (Papilionoideae), with 24 tribes, 122 genera and 1 654 species.

Leguminochorion (plural: *Leguminochoria*): a geographic area with relatively similar legume species.

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Biome: a biogeographic area defined primarily on combinations of dominant life or growth forms and secondarily on the basis of major climatic features that mostly affect the biota at a continental or subcontinental scale (Rutherford *et al*. 2006).

Bioregion: defined on the basis of similar biotic and physical features and processes at the regional scale (Rutherford *et al*. 2006).

Ecotone: a transitional zone between two or more biomes or bioregions.

Fodder crop, *pasture* and *forage*: a *fodder crop* and *pasture* are grown on arable land, while a *forage* is grazed or browsed in the natural environment (see Chapter 8).

Plant Genetic Resources: the economic, scientific or societal value of the heritable materials contained within and among species (FAO 1989).

Key species: the first (top) 20 species listed in a Leguminochorion.

Diagnostic species: species with an occurrence of 70% or higher in a given Leguminochorion.

Species richness: the total number of single species divided by the total number of QDGCs contained in a cluster.

Species occurrence: the total count of an individual species in a cluster divided by the number of QDGCs in the same cluster.

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Table 4.1. Classes used in the description of QDGCs with regard to climate and soil variables.

Mean annual rainfall (mm)
<400
200–600
400–800
600–1000
>800
Mean annual minimum temperature (ºC)
<2
0–4
2–8
>6
Mean annual maximum temperature (ºC)
<27
25–29
27–35
>33
Soil phosphorus ($mgkg^{-1}$) or (ppm)
<10
5–35
>20
Soil pH (H_2O)
<6.4 (acidic)
5.5–7.4 (moderately acid to neutral)
6.5–7.4 (neutral)
6.5–8.4 (neutral to moderately alkaline)
>7.5 (alkaline)
Exchangeable Sodium Percentage (ESP)
Non-sodic = 1–6
Medium sodic = 6–15
Highly sodic = >15

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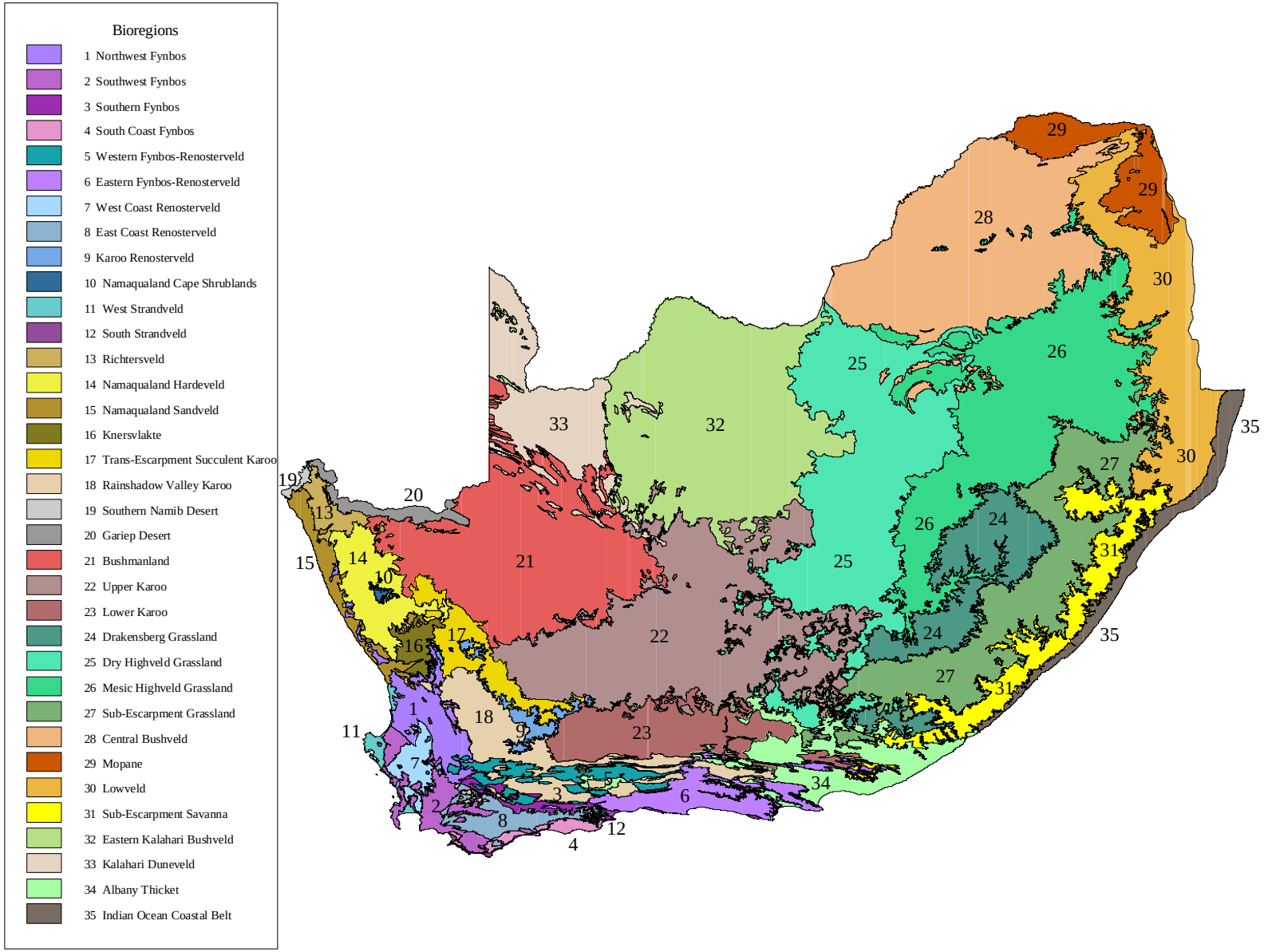

Figure 4.1. Bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al*. 2006).

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CHAPTER 5

INVENTORY OF INDIGENOUS LEGUME SPECIES: DISTRIBUTION, ADAPTATION AND SPECIAL NOTES

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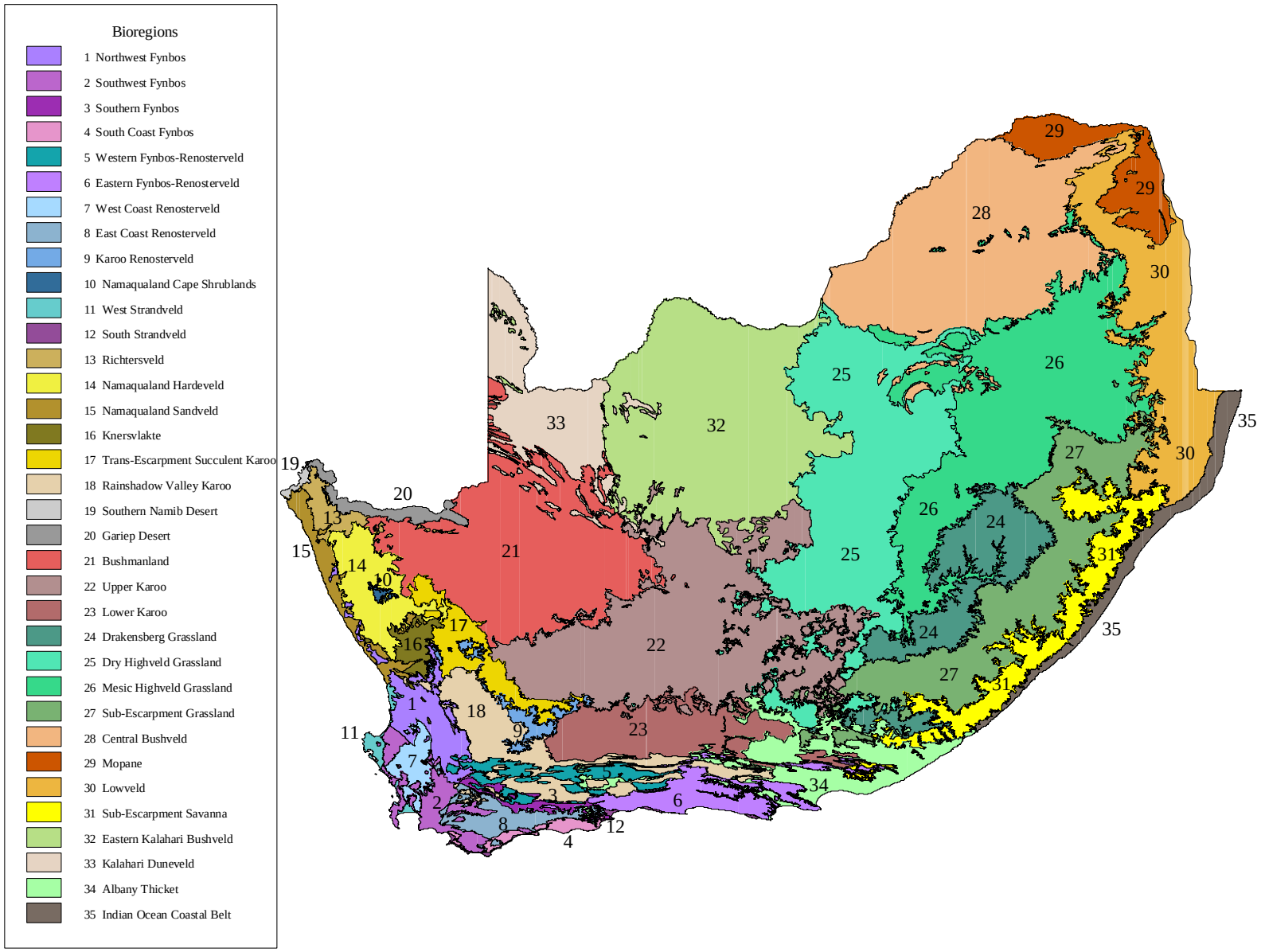

Figure 5.1. Bioregions of South Africa, Lesotho and Swaziland (Rutherford et al. 2006).

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LEGEND

Genus species* including *subspecies* and *varieties **Tribe**

P (Perennial); occ. P (Occasional perennial); A (Annual); Ht (Height in metres); Alt (Altitude in metres); ? (Unknown)

OCCURRENCE	HIGHEST AND SECOND HIGHEST (%)
Bioregion	Rutherford, M.C., Mucina, L. & Powrie, L.W. 2006. Bioregions map. Ecotones removed from dataset.
Biome	Rutherford, M.C., Mucina, L. & Powrie, L.W. 2006. Biome map. Ecotones removed from dataset.
Rainfall (mm)	ARC-ISCW, 2009. Mean annual rainfall map.
Min temp (°C)	ARC-ISCW, 2009. Mean Annual minimum temperature map.
Max temp (°C)	ARC-ISCW, 2009. Mean annual maximum temperature map.
Phosphorus (ppm)	ARC-ISCW, 2009. Phosphorus map.
pH (H_2O)	ARC-ISCW, 2009. pH map.
ESP	Nell, P. 2010. Exchangeable Sodium Percentage (ESP) data.
QDGCs	PRECIS Database 2008.

NOTES:

Where subspecies or varieties are not specified in the literature, information regarding the species is noted for all the subspecies or varieties.

Livestock feed: Negative (-) if not suitable as feed
DM: Dry matter production
CP: Crude Protein Content (%)
Antiquality: Includes toxicity
N_2 fixation: African literature
Flowering date: August–November (Spring); November–March (Summer); March–May (Autumn); May–August (Winter). Most inclusive references were cited – where seasons differed between references, all references were cited.
Pods: Closed pods or fruit

Notation before species name:
[E] Endemic species

Notation above map:
① Unknown potential
② Livestock feed, not cultivated
③ Cultivated
❖ Diagnostic species
☠ Poisonous or Antiquality factors
– Insufficient information

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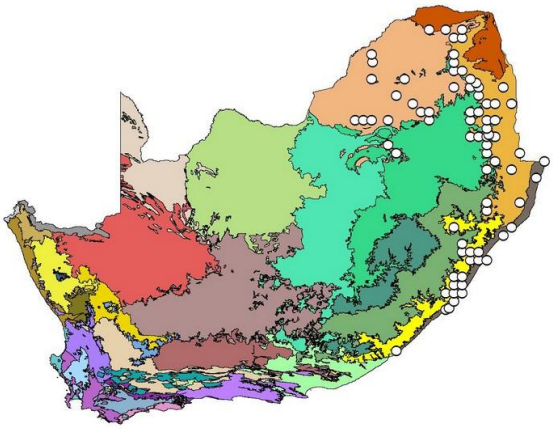
Abrus laevigatus E.Mey.

Abreae ①

Dwarf shrub, climber; P; Ht 1.0–3.0; Alt 50–1615

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (39)	Lowveld (32)
Biome	Savanna (82)	Indian Ocean (18)
Rainfall (mm)	>800 (45)	400–800 (37)
Min temp (°C)	2–8 (57)	>6 (36)
Max temp (°C)	25–29 (66)	27–35 (34)
Phosphorus (ppm)	<10 (76)	5–35 (24)
pH	<6.4 (68)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2430 (10)	2531; 2631; 2930; 3030 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Flowering:** Spring, summer, autumn (Pooley 1998).



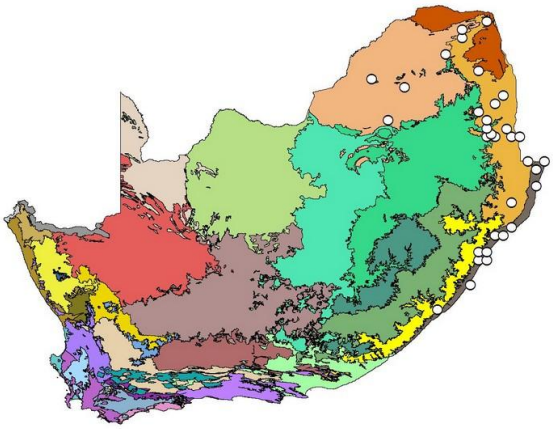
Abrus precatorius L. subsp. *africanus* Verdc.

Abreae ☠①

Dwarf shrub, climber; P; Ht 2.4–4.5; Alt 15–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (47)	Lowveld (41)
Biome	Savanna (70)	Indian Ocean (30)
Rainfall (mm)	>800 (44)	400–800 (38)
Min temp (°C)	>6 (69)	2–8 (31)
Max temp (°C)	27–35 (56)	25–29 (44)
Phosphorus (ppm)	<10 (66)	5–35 (34)
pH	<6.4 (59)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	2531; 2631; 2931 (12)	2632 (9)

NOTES: **Antiquality:** Abrin and abric acid in seed; highly toxic (Steyn 1934; Watt & Breyer-Brandwijk 1962); Glycyrrhizin in root (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Magical; medicine for humans and livestock (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Pooley 1998).



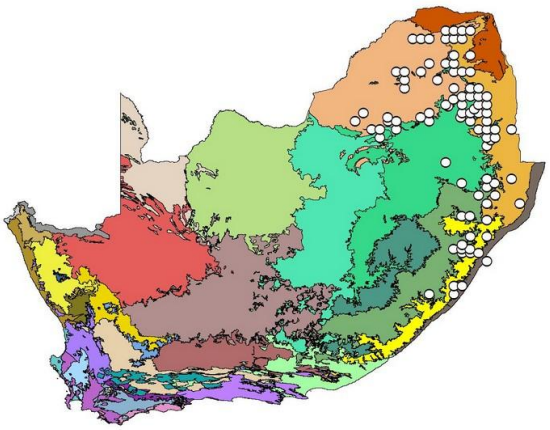
Acacia ataxacantha DC.

Acacieae ②❖

Shrub, tree, climber; P; Ht 3–15; Alt 150–1980

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (52)	Lowveld (23)
Biome	Savanna (86)	Grassland (10)
Rainfall (mm)	400–800 (44)	>800 (34)
Min temp (°C)	2–8 (71)	>6 (19)
Max temp (°C)	25–29 (64)	27–35 (29)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<6.4 (65)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2430 (12)	2530 (9)

NOTES: **Livestock feed** (Le Houérou 1980; Breebaart *et al.* 2002). **N_2 fixation:** No nodulation (Grobbelaar & Clarke 1975; Masutha *et al.* 1997). **Biocultural:** Timber (Van Wyk *et al.* 2000). **Flowering:** Summer (Van Wyk *et al.* 2000).



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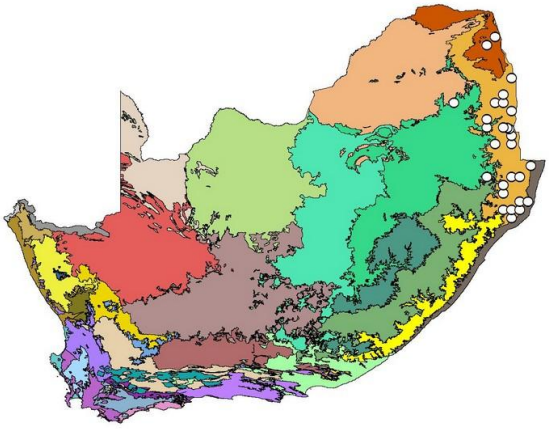
Acacia borleae Burtt Davy

Acacieae ①

Shrub, tree; P; Ht 1–5; Alt 52–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (88)	Mopane (12)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (48)	>800 (26)
Min temp (°C)	>6 (74)	2–8 (22)
Max temp (°C)	27–35 (85)	25–29 (15)
Phosphorus (ppm)	<10 (85)	5–35 (15)
pH	5.5–7.4 (37)	<6.4 (33)
ESP	Non (100)	
QDGCs	2531 (29)	2731 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer (Steyn 1994).



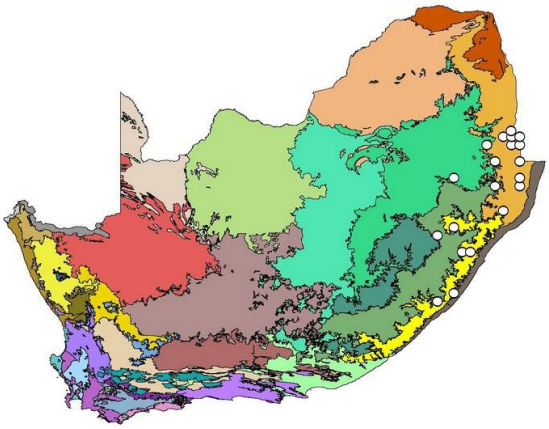
Acacia brevispica Harms subsp. *dregeana* (Benth.) Brenan

Acacieae ☠②

Shrub, tree, climber; P; Ht 1–5; Alt 107–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (83)	Mesic Highveld Grassland; Sub-Escarpment Savanna (8)
Biome	Savanna (85)	Grassland (15)
Rainfall (mm)	600–1000	>800
Min temp (°C)	>6 (60)	2–8 (30)
Max temp (°C)	27–35 (50)	25–29 (45)
Phosphorus (ppm)	<10 (90)	5–35 (10)
pH	<6.4 (65)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	2631 (25)	2632 (15)

NOTES: **Livestock feed** (Dicko & Sikena 1992). **N_2 fixation:** Nodulated (Högberg 1992). **Antiquality:** Tannin in bark; alkaloid in bark (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans and livestock; piscicide (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Steyn 1994).



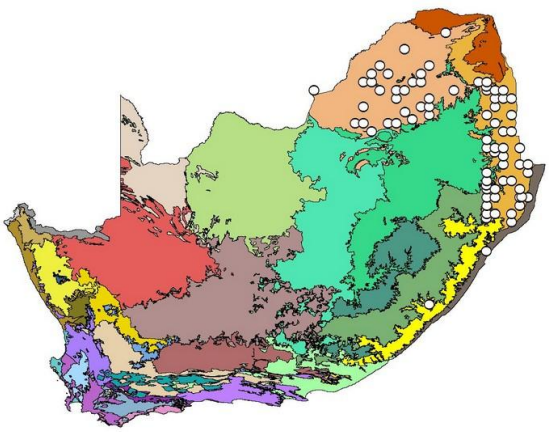
Acacia burkei Benth.

Acacieae ②

Tree; P; Ht 2–27; Alt 20–1310

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (51)	Central Bushveld (49)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (67)	>800 (17)
Min temp (°C)	2–8 (57)	>6 (39)
Max temp (°C)	27–35 (70)	25–29 (30)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (47)	5.5–7.4 (37)
ESP	Non (100)	
QDGCs	2731 (11)	2431 (10)

NOTES: **Livestock feed** (Kunene *et al.* 2003). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Spring, summer (Steyn 1994; Venter & Venter 1996).



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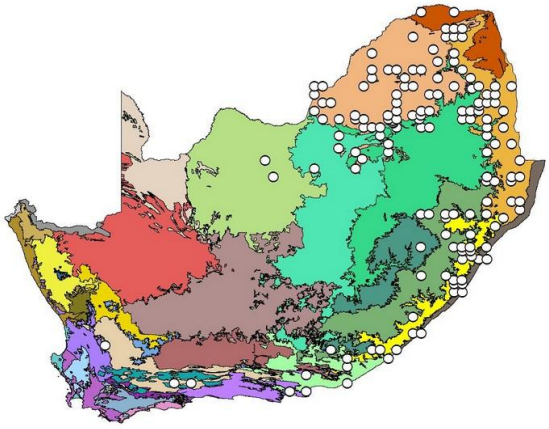
Acacia caffra (Thunb.) Willd.

Acacieae ☠②

Shrub, tree; P; Ht 3–18; Alt 15–1723

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (51)	Lowveld (23)
Biome	Savanna (85)	Grassland (7)
Rainfall (mm)	400–800 (55)	>800 (23)
Min temp (°C)	2–8 (52)	>6 (25)
Max temp (°C)	25–29 (49)	27–35 (48)
Phosphorus (ppm)	<10 (71)	5–35 (28)
pH	<6.4 (54)	5.5–7.4 (32)
ESP	Non (98)	Highly ESP (2)
QDGCs	2528 (6)	2428; 2530 (5)

NOTES: **Livestock feed** (Van Wyk *et al.* 2000). **Antiquality:** Prussic acid in young wilted twigs (Kellerman *et al.* 2005); Tannin in bark (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Fuel (Van Wyk *et al.* 2000); Medicine for humans; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Van Wyk & Malan 1998).



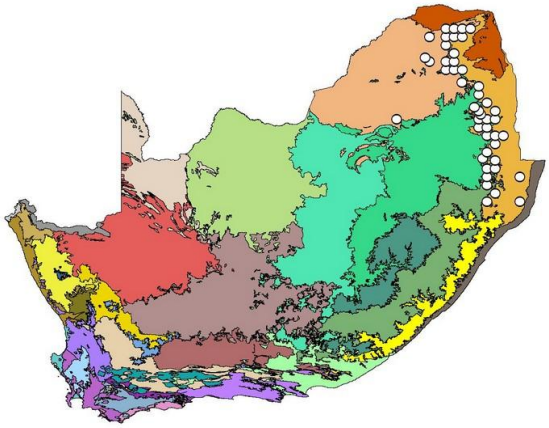
Acacia davyi N.E.Br.

Acacieae ①

Shrub, tree; P; Ht 1–12; Alt 155–2900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Lowveld (45)	Mesic Highveld Grassland (10)
Biome	Savanna (100)	
Rainfall (mm)	>800 (40)	400–800 (31)
Min temp (°C)	2–8 (79)	>6 (19)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	<10 (64)	5–35 (36)
pH	<6.4 (71)	5.5–7.4 (24)
ESP	Non (100)	
QDGCs	2631 (14)	2329; 2531; 2731 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Summer (Steyn 1994).



[E]*Acacia ebutsiniorum* P.J.H. Hurter

Acacieae –

Tree; Undefined; Ht ?–2.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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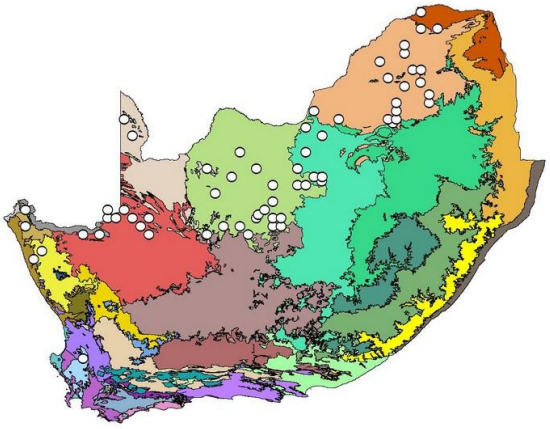
Acacia erioloba E.Mey.

Acacieae

Shrub, tree; P; Ht 5–18; Alt 120–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (36)	Central Bushveld (31)
Biome	Savanna (73)	Nama-Karoo (15)
Rainfall (mm)	<400 (50)	400–800 (42)
Min temp (°C)	2–8 (47)	<2 (33)
Max temp (°C)	27–35 (57)	>33 (30)
Phosphorus (ppm)	<10 (57)	5–35 (25)
pH	>7.5 (30)	5.5–7.4 (22)
ESP	Non (95)	Medium; High (3)
QDGCs	2824 (13)	2528 (8)



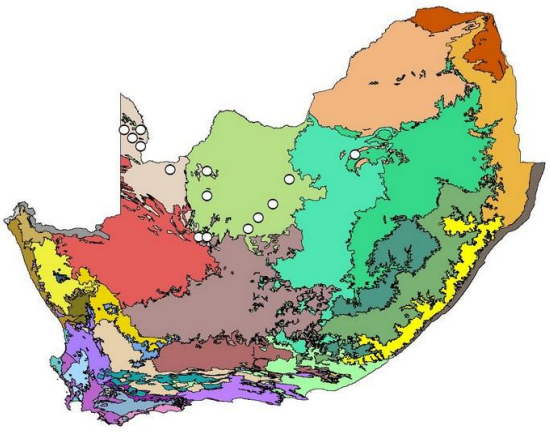
NOTES: **Livestock feed** (Dicko & Sikena 1992; Pule-Meuelenberg & Dakora 2007). **CP:** Pods 22% (Mlambo *et al.* 2001). **Antiquality:** Hydrocyanic acid (Kellerman *et al.* 2005). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Fuel; Gum; medicine for humans; timber (Van Wyk *et al.* 2000). **Flowering:** Winter, spring (Van Wyk *et al.* 2000).

Acacia erioloba E.Mey. × *A. haematoxylon* Willd.

Acacieae

Tree; P; Ht 4–7; Alt 240–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (56)	Kalahari Duneveld (44)
Biome	Savanna (100)	
Rainfall (mm)	<400 (79)	400–800 (21)
Min temp (°C)	0–4 (50)	2–8 (29)
Max temp (°C)	27–35; >33 (50)	
Phosphorus (ppm)	<10 (57)	5–35 (43)
pH	>7.5 (36)	6.5–7.4; 6.5–8.4 (29)
ESP	Non (100)	
QDGCs	2520; 2620; 2722; 2824; 2922 (14)	2627; 2721; 2725; 2823 (7)



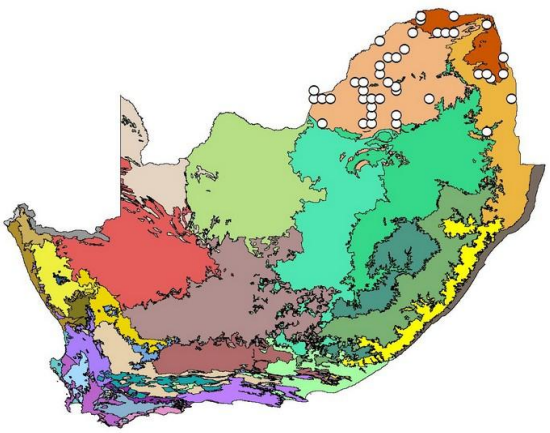
NOTES: **Livestock feed** (Watt & Breyer-Brandwijk 1962; Pule-Meuelenberg & Dakora 2007). **CP:** Pods 11% (Watt & Breyer-Brandwijk 1962). **Antiquality:** Hydrocyanic acid in leaf, pod and seed (Watt & Breyer-Brandwijk 1962). **Biocultural:** Beverage; gum; magical; medicine for humans; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Steyn 1994; Van Rooyen 2001).

Acacia erubescens Welw. ex Oliv.

Acacieae

Shrub, tree; P; Ht 1.5–10; Alt 305–1740

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (90)	Mopane (6)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (69)	200–600 (21)
Min temp (°C)	2–8 (72)	>6 (18)
Max temp (°C)	27–35 (85)	25–29 (15)
Phosphorus (ppm)	<10 (54)	5–35 (46)
pH	<6.4 (36)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	2427 (18)	2527 (10)



NOTES: **Livestock feed** (Pule-Meuelenberg & Dakora 2007). **DM:** 1430 g/tree (Smit 2003). **CP:** Pods 27% (Mlambo *et al.* 2001). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural use:** Gum (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Steyn 1994).

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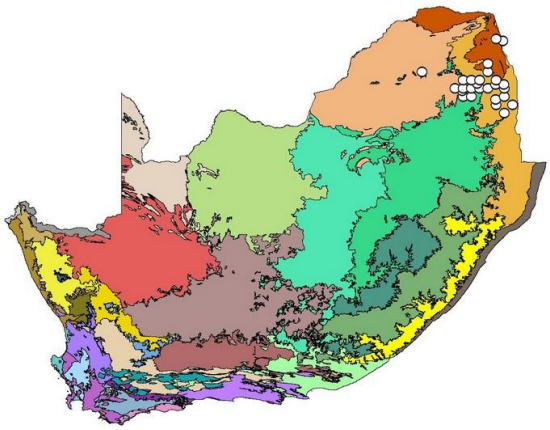
Acacia exuvialis I.Verd.

Acacieae ①

Shrub, tree; P; Ht 1–5; Alt 275–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (73)	Mopane (18)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (77)	200–600; 600–1000 (9)
Min temp (°C)	>6 (59)	2–8 (41)
Max temp (°C)	27–35 (59)	25–29 (41)
Phosphorus (ppm)	<10 (73)	5–35 (27)
pH	5.5–7.4 (41)	6.5–7.4 (27)
ESP	Non (100)	
QDGCs	2430 (46)	2431 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Steyn 1994).



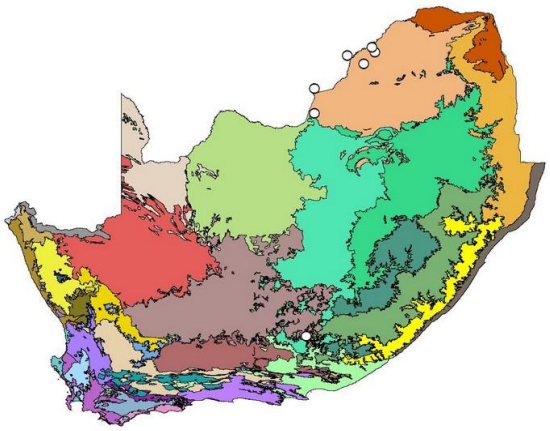
Acacia fleckii Schinz

Acacieae ②

Shrub, tree; P; Ht 1–10; Alt 410–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (83)	200–600 (17)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4; 6.5–7.4 (33)	5.5–7.4; 6.5–8.4 (17)
ESP	Non (100)	
QDGCs	2327 (43)	2326; 2425; 2525; 3225 (14)

NOTES: **Livestock feed** (Pule-Meuelenberg & Dakora 2007). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer (Steyn 1994).



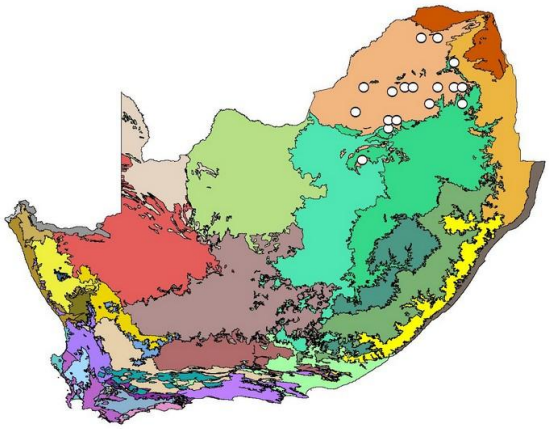
Acacia galpinii Burtt Davy

Acacieae ③

Tree; P; Ht 0.6–36; Alt 640–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (92)	Mesic Highveld Grassland (8)
Biome	Savanna (90)	Grassland (10)
Rainfall (mm)	400–800 (81)	200–600 (13)
Min temp (°C)	2–8 (88)	0–4 (13)
Max temp (°C)	27–35 (63)	25–29 (31)
Phosphorus (ppm)	<10 (63)	5–35 (38)
pH	5.5–7.4 (44)	<6.4 (25)
ESP	Non (100)	
QDGCs	2528 (19)	2329; 2428; 2430 (13)

NOTES: **Livestock feed** (Van Wyk *et al.* 2000; Pule-Meuelenberg & Dakora 2007). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Timber (Van Wyk *et al.* 2000). **Flowering:** Spring, summer (Venter & Venter 1996; Van Wyk *et al.* 2000).



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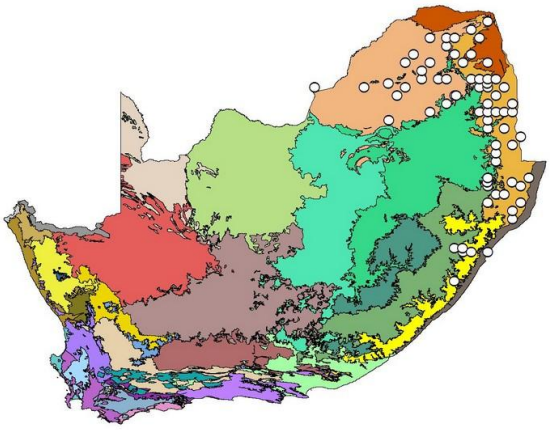
Acacia gerrardii Benth. subsp. *gerrardii* var. *gerrardii*

Acacieae

Shrub, tree; P; Ht 2.5–15; Alt 183–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (51)	Central Bushveld (38)
Biome	Savanna (97)	Indian Ocean (3)
Rainfall (mm)	400–800 (58)	>800 (21)
Min temp (°C)	2–8 (56)	>6 (44)
Max temp (°C)	27–35 (63)	25–29 (37)
Phosphorus (ppm)	<10 (74)	5–35 (26)
pH	<6.4 (40)	5.5–7.4 (39)
ESP	Non (100)	
QDGCs	2531 (14)	2330; 2430; 2431 (8)

NOTES: **Livestock feed** (Pellew 1980). **CP:** Plant 10–27% (Pellew 1980). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Tannin in bark (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Van Wyk *et al.* 2000).



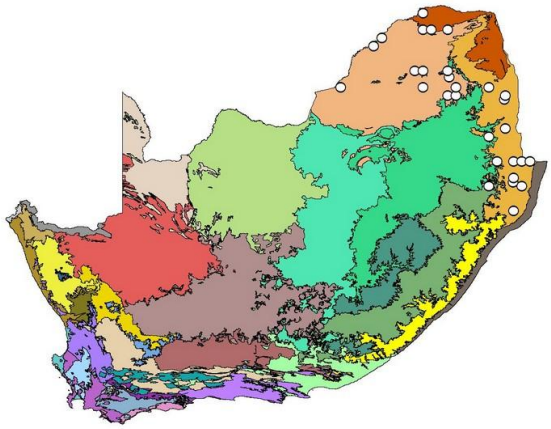
Acacia grandicornuta Gerstner

Acacieae

Tree; P; Ht 1–15; Alt 30–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (56)	Central Bushveld (38)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (59)	200–600 (15)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	27–35 (63)	25–29 (37)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	6.5–8.4 (37)	5.5–7.4 (26)
ESP	Non (100)	
QDGCs	2429 (18)	229 (14)

NOTES: **Livestock feed** (Pule-Meuelenberg & Dakora 2007). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Steyn 1994).



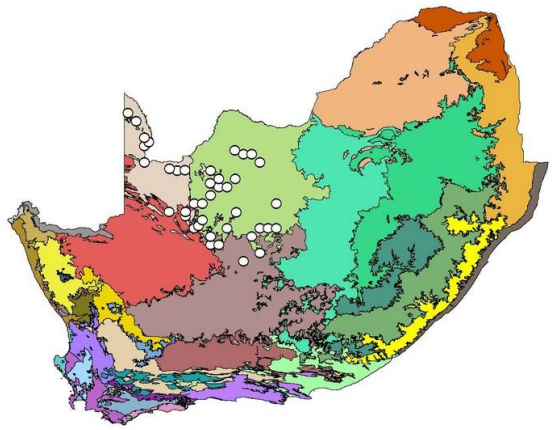
Acacia haematoxylon Willd.

Acacieae

Shrub, tree; P; Ht 1–10; Alt 120–1280

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (72)	Kalahari Duneveld (22)
Biome	Savanna (96)	Nama-Karoo (4)
Rainfall (mm)	<400 (94)	200–600; 400–800 (3)
Min temp (°C)	<2 (56)	0–4 (31)
Max temp (°C)	>33 (61)	27–35 (39)
Phosphorus (ppm)	<10 (64)	5–35 (36)
pH	>7.5 (42)	6.5–7.4 (31)
ESP	Non (100)	
QDGCs	2822 (14)	2722; 2824 (11)

NOTES: **Livestock feed** (Pule-Meuelenberg & Dakora 2007). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Flowering:** Spring, summer (Steyn 1994; Van Rooyen 2001).



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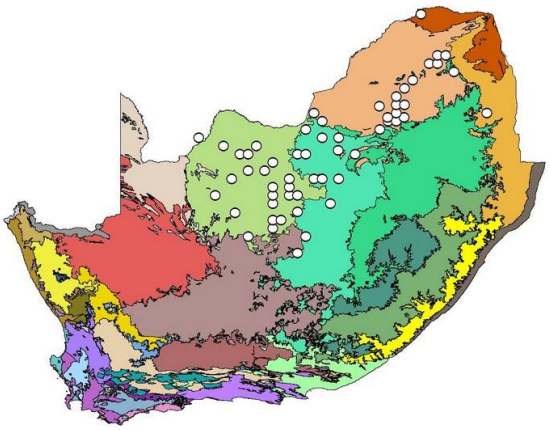
Acacia hebeclada DC. subsp. *hebeclada*

Acacieae ☠②

Shrub, tree; P; Ht 0.5–9; Alt 750–2950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (49)	Central Bushveld (32)
Biome	Savanna (83)	Grassland (18)
Rainfall (mm)	400–800 (69)	<400 (22)
Min temp (°C)	<2 (59)	2–8 (30)
Max temp (°C)	27–35 (76)	>33 (17)
Phosphorus (ppm)	<10 (85)	5–35 (15)
pH	5.5–7.4 (28)	<6.4 (26)
ESP	Non (100)	
QDGCs	2528; 2725 (9)	2329; 2824 (7)

NOTES: **Livestock feed** (Watt & Breyer-Brandwijk 1962; Pule-Meuelenberg & Dakora 2007). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Antiquality:** Hydrocyanic acid in leaves and immature pods; acacipetalin (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Van Rooyen 2001).



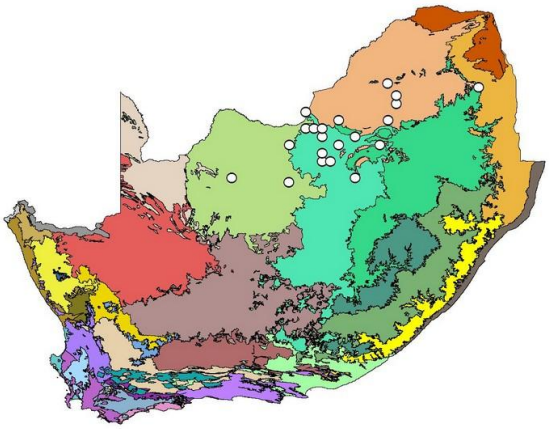
Acacia hereroensis Engl.

Acacieae ①

Shrub, tree; P; Ht 2–10; Alt 410–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (58)	Central Bushveld (33)
Biome	Grassland (70)	Savanna (30)
Rainfall (mm)	400–800 (89)	<400; >800 (5)
Min temp (°C)	<2 (63)	2–8 (21)
Max temp (°C)	27–35 (84)	25–29 (11)
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (47)	<6.4 (42)
ESP	Non (100)	
QDGCs	2626 (26)	2525 (16)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer (Steyn 1994).



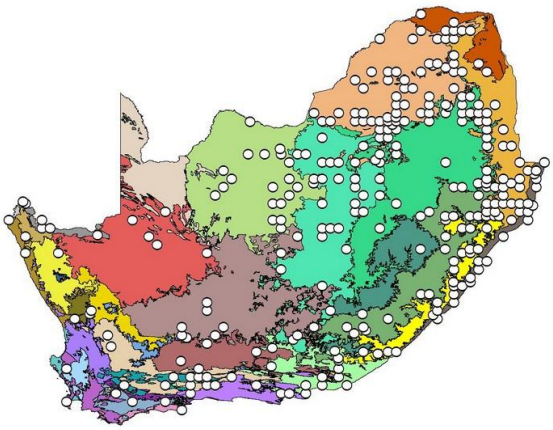
Acacia karroo Hayne

Acacieae ☠③❖

Shrub, tree; P; Ht 1–22; Alt 3–2406

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (29)	Eastern Kalahari Bushveld (14)
Biome	Savanna (51)	Grassland (25)
Rainfall (mm)	400–800 (48)	<400 (20)
Min temp (°C)	2–8 (43)	<2; >6 (22)
Max temp (°C)	27–35 (52)	25–29 (40)
Phosphorus (ppm)	<10 (62)	5–35 (27)
pH	<6.4 (35)	5.5–7.4 (29)
ESP	Non (94)	Medium ESP (3)
QDGCs	2528 (3.3)	2831; 3322 (3)

NOTES: **Livestock feed** (Dicko & Sikena 1992; Van Rooyen 2001; Mapiye *et al.* 2011). **CP:** Leaves 15% (Mapiye *et al.* 2011). **Cultivated** (Glen 2002). **Antiquality:** Tested negatively for hydrocyanic acid; tannin in bark (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Beverage; fuel; gum; magical; medicine for humans and livestock; timber (Watt & Breyer-Brandwijk 1962). **Ecology:** Seed ecology (O'Connor *et al.* 2010). **Flowering:** Spring, summer (Van Wyk *et al.* 2000).



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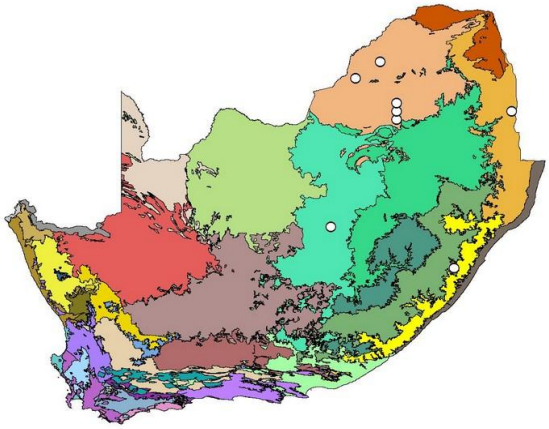
Acacia karroo Hayne × *A. tenuispina* I.Verd.

Acacieae ①

Shrub, tree; P; Ht 0.5–4; Alt ?–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (71)	Dry Highveld Grassland (14)
Biome	Savanna (83)	Grassland (17)
Rainfall (mm)	400–800 (88)	>800 (13)
Min temp (°C)	2–8 (76)	<2; >6 (12)
Max temp (°C)	27–35 (88)	25–29 (12)
Phosphorus (ppm)	<10 (88)	5–35 (12)
pH	<6.4 (50)	6.5–8.4 (25)
ESP	Non (100)	
QDGCs	2528 (38)	2327; 2427; 2531; 2826; 3030 (13)

NOTES: –



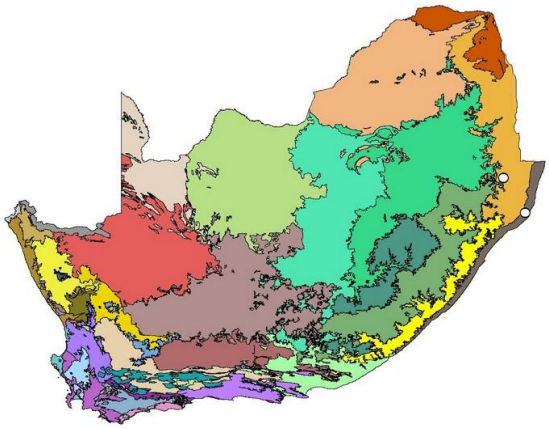
[E]*Acacia kosiensis* P.P.Swartz

Acacieae ①

Tree; P; Ht 10–17; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	2731; 2832 (50)	

NOTES: –



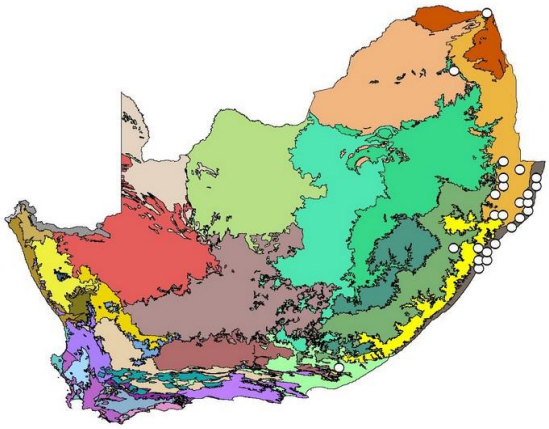
Acacia kraussiana Meisn. ex Benth.

Acacieae ①

Shrub, climber; P; Ht 1–15; Alt 5–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal belt (75)	Lowveld (25)
Biome	Indian Ocean (80)	Savanna (20)
Rainfall (mm)	>800 (45)	400–800 (36)
Min temp (°C)	>6 (77)	2–8 (23)
Max temp (°C)	27–35 (77)	25–29 (18)
Phosphorus (ppm)	<10 (82)	5–35 (18)
pH	5.5–7.4 (50)	<6.4 (41)
ESP	Non (100)	
QDGCs	2732 (23)	2832 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer (Steyn 1994).



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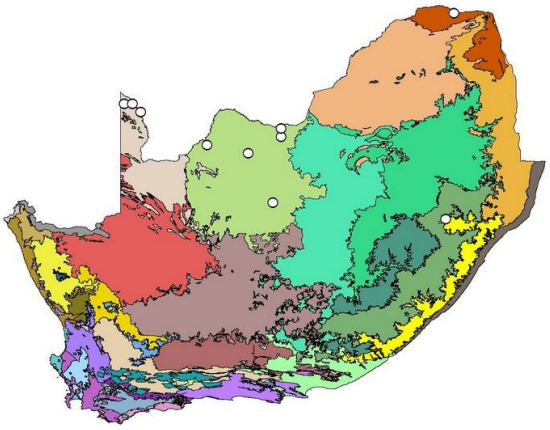
Acacia luederitzii Engl. var. *luederitzii*

Acacieae ☠ ②

Shrub, tree; P; Ht 1.5–15; Alt 765–1650

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (56)	Kalahari Duneveld (33)
Biome	Savanna (100)	
Rainfall (mm)	<400 (60)	400–800 (30)
Min temp (°C)	<2; 0–4; 2–8 (30)	>6 (10)
Max temp (°C)	>33 (70)	27–35 (30)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	>7.5 (50)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	2520 (30)	2230; 2524; 2622; 2623; 2624; 2824; 2829 (10)

NOTES: **Livestock feed** (Watt & Breyer-Brandwijk 1962; Kunene *et al.* 2003). **Antiquality:** Tannin in galls (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer (Van Rooyen 2001).



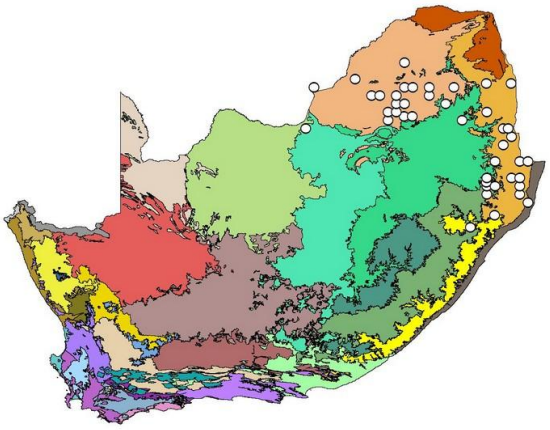
Acacia luederitzii Engl. var. *retinens* (Sim) J.H.Ross & Brenan

Acacieae ☠ ②

Shrub, tree; P; Ht 1–15; Alt 48–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (57)	Lowveld (39)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (73)	600–1000; >800 (14)
Min temp (°C)	2–8 (62)	>6 (30)
Max temp (°C)	27–35 (78)	25–29 (19)
Phosphorus (ppm)	<10 (81)	5–35 (19)
pH	<6.4 (43)	5.5–7.4 (35)
ESP	Non (100)	
QDGCs	2528; 2731 (14)	2427; 2428; 2531; 2631 (8)

NOTES: **Livestock feed** (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Tannin in galls (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Summer (Steyn 1994).



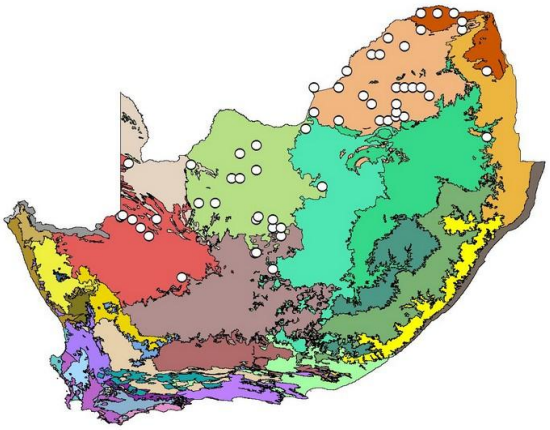
Acacia mellifera (Vahl) Benth. subsp. *detinens* (Burch.) Brenan

Acacieae ③

Shrub, tree; P; Ht 1.5–10; Alt 200–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (48)	Eastern Kalahari Bushveld (25)
Biome	Savanna (86)	Nama-Karoo (14)
Rainfall (mm)	<400 (46)	400–800 (35)
Min temp (°C)	2–8 (57)	<2 (31)
Max temp (°C)	27–35 (65)	>33 (28)
Phosphorus (ppm)	<10 (57)	5–35 (30)
pH	>7.5 (30)	5.5–7.4 (26)
ESP	Non (100)	
QDGCs	2824 (9)	2820 (7)

NOTES: **Livestock feed** (Le Houérou 1980; Dicko & Sikena 1992; Van Rooyen 2001). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Fuel; gum; magical; poison arrows; timber (Watt & Breyer-Brandwijk 1962); Pods as food (Van Wyk *et al.* 2000); Medicine for humans (Morgan 1981). **Flowering:** Spring (Van Rooyen 2001).



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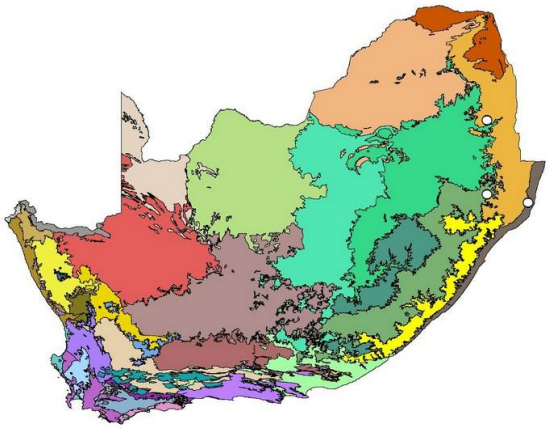
[E]*Acacia natalitia* E.Mey.

Acacieae ①

Tree; P; Ht 3–8; Alt ?–10

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 5.5–7.4; 6.5–7.4 (33)	
ESP	Ecotone	
QDGCs	2531; 2731; 2832 (33)	

NOTES: –



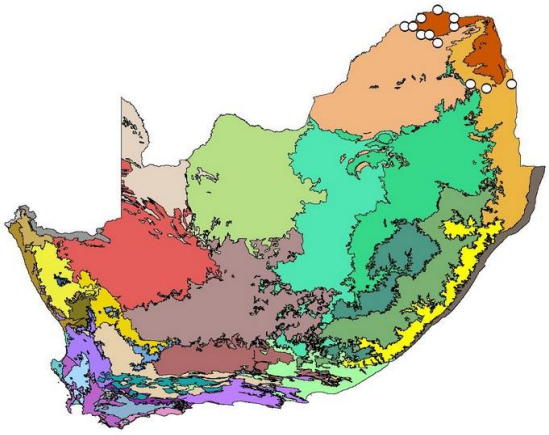
Acacia nebrownii Burtt Davy

Acacieae ①

Shrub, tree; P; Ht 1–7.5; Alt 550–1435

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (60)	Lowveld; Central Bushveld (20)
Biome	Savanna (100)	
Rainfall (mm)	<400 (55)	200–600 (27)
Min temp (°C)	2–8 (73)	>6 (27)
Max temp (°C)	27–35 (82)	25–29 (18)
Phosphorus (ppm)	5–35 (91)	<10 (9)
pH	6.5–8.4 (55)	6.5–7.4 (27)
ESP	Non (100)	
QDGCs	2229 (36)	2228; 2230 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Steyn 1994).



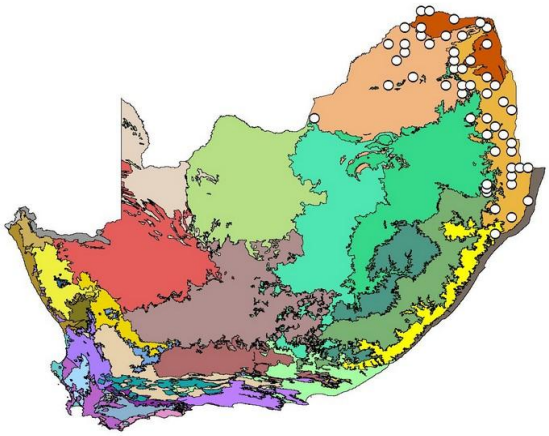
Acacia nigrescens Oliv.

Acacieae ☠③

Tree; P; Ht 2–30; Alt 25–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (52)	Central Bushveld (26)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (46)	600–1000 (15)
Min temp (°C)	2–8 (52)	>6 (46)
Max temp (°C)	27–35 (73)	25–29 (27)
Phosphorus (ppm)	<10 (58)	5–35 (42)
pH	<6.4 (37)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	2229; 2330; 2531 (10)	2328; 2431; 2631; 2731 (8)

NOTES: **Livestock feed** (Van Wyk *et al.* 2000); Browse response (Fornara & Du Toit 2007). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Tannin in bark (Watt & Breyer-Brandwijk 1962). **Biocultural:** Fuel (Van Wyk *et al.* 2000); Timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Winter, spring (Van Wyk *et al.* 2000).



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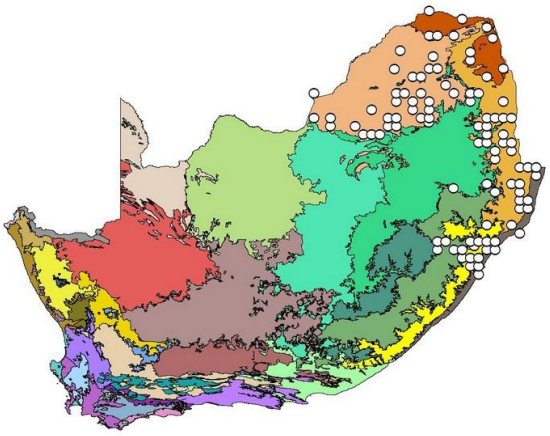
Acacia nilotica (L.) Willd. ex Delile subsp. *kraussiana* (Benth.) Brenan — Acacieae

Tree; P; Ht 3–15; Alt 5–1829

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (49)	Lowveld (31)
Biome	Savanna (88)	Indian Ocean (7)
Rainfall (mm)	400–800 (51)	>800 (29)
Min temp (°C)	2–8 (47)	>6 (39)
Max temp (°C)	27–35 (58)	25–29 (39)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (44)	5.5–7.4 (37)
ESP	Non (100)	
QDGCs	2930 (10)	2531 (8)

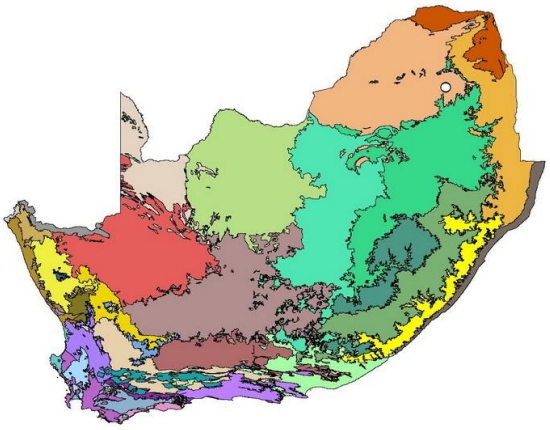


NOTES: **Livestock feed** (Le Houérou 1980; Dicko & Sikena 1992; Ngwa *et al.* 2003). **Cultivated** (Glen 2002). **CP:** Pods 15% (Smith *et al.* 2005). **Antiquality:** Tannin in pods and leaves (Hutchings *et al.* 1996); Pods poisonous in excessive quantities (Kellerman *et al.* 2005); Tested negatively for hydrocyanic acid; tannin in pod; saponin (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Dye (Van Wyk *et al.* 2000); Gum; medicine for humans; timber (Watt & Breyer-Brandwijk 1962). **Soil conservation:** Rehabilitation (Bosch & Borus 2006). **Flowering:** Spring, summer, autumn (Van Wyk *et al.* 2000).

[E]*Acacia ormocarpoides* P.J.H.Hurter — Acacieae

Tree; Not defined; Ht ?–3.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	6.5–8.4 (100)	
ESP	Non (100)	
QDGCs	2429 (100)	

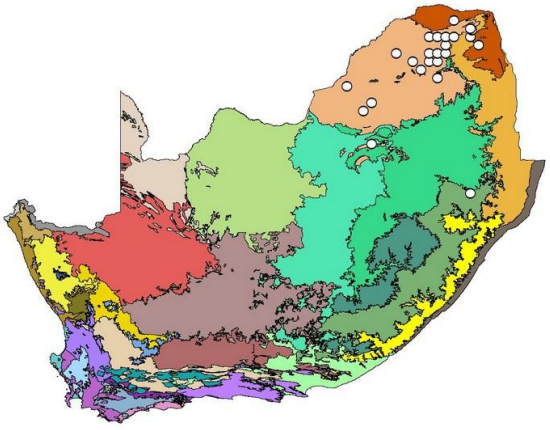


NOTES: –

Acacia permixta Burtt Davy — Acacieae

Shrub, tree; P; Ht 1–5; Alt 490–1405

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (87)	Sub-Escarpment Grassland; Mopane (7)
Biome	Savanna (95)	Grassland (5)
Rainfall (mm)	400–800 (65)	200–600 (26)
Min temp (°C)	2–8 (65)	>6 (22)
Max temp (°C)	27–35 (61)	25–29 (39)
Phosphorus (ppm)	5–35 (70)	<10 (30)
pH	5.5–7.4 (43)	<6.4 (30)
ESP	Non (100)	
QDGCs	2329 (38)	2230 (13)



NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Tested negatively for hydrocyanic acid (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer (Steyn 1994).

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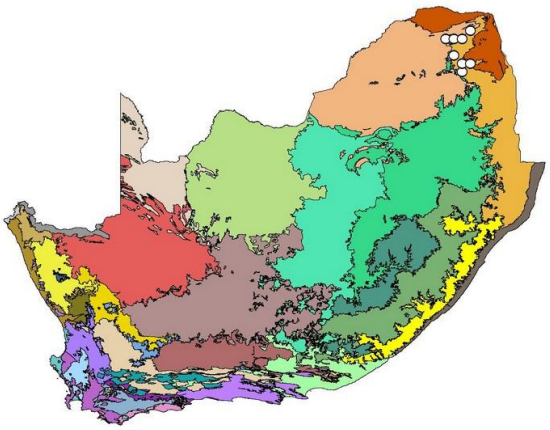
***Acacia polyacantha* Willd. subsp. *campylacantha* (Hochst. ex A.Rich.) Brenan** **Acacieae** ①

Tree; P; Ht 2–15; Alt 460–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Lowveld (50)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (75)	600–1000 (25)
Min temp (°C)	>6 (63)	2–8 (37)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	<6.4; 5.5–7.4 (50)	
ESP	Non (100)	
QDGCs	2330 (67)	2230; 2329; 2430 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Gum; medicine for humans; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer (Steyn 1994).

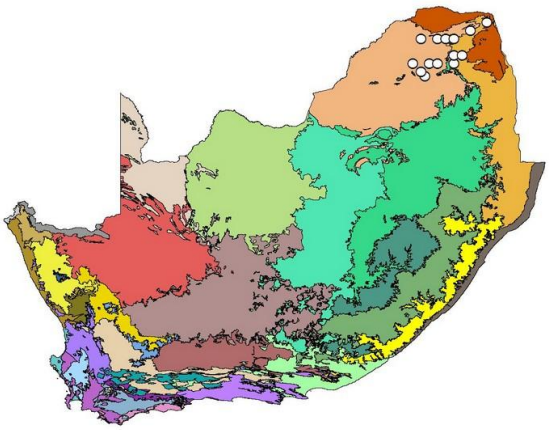


***Acacia rehmanniana* Schinz** **Acacieae** ①

Shrub, tree; P; Ht 2–10; Alt 1100–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (46)	600–1000 (31)
Min temp (°C)	2–8 (69)	>6 (31)
Max temp (°C)	27–35 (54)	25–29 (46)
Phosphorus (ppm)	5–35 (77)	<10 (23)
pH	5.5–7.4 (46)	<6.4 (31)
ESP	Non (100)	
QDGCs	2329; 2330 (36)	2230; 2231; 2328; 2429 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Fuel; timber (Van Wyk *et al.* 2000). **Flowering:** Summer (Van Wyk *et al.* 2000).



[E]*Acacia robbertsii* P.P. Swartz **Acacieae** –

Shrub, tree; P; Ht 2–4; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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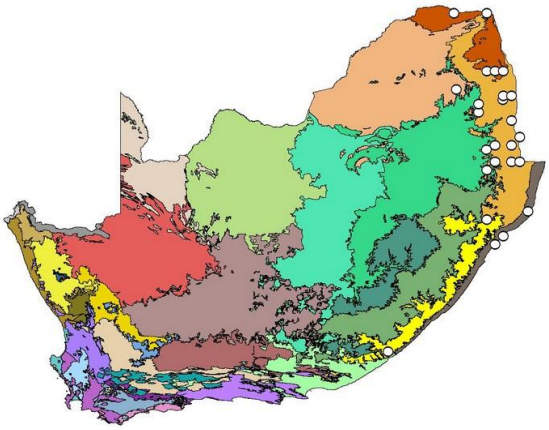
Acacia robusta Burch. subsp. *clavigera* (E.Mey.) Brenan

Acacieae ☠ ③

Tree; P; Ht 4–20; Alt 15–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (58)	Indian Ocean Coastal Belt (25)
Biome	Savanna (80)	Indian Ocean (20)
Rainfall (mm)	400–800; >800 (35)	600–1000 (22)
Min temp (°C)	>6 (70)	2–8 (30)
Max temp (°C)	27–35 (61)	25–29 (35)
Phosphorus (ppm)	<10 (87)	5–35 (13)
pH	<6.4 (52)	5.5–7.4; 6.5–7.4 (17)
ESP	Non (100)	
QDGCs	2431 (25)	2631 (17)



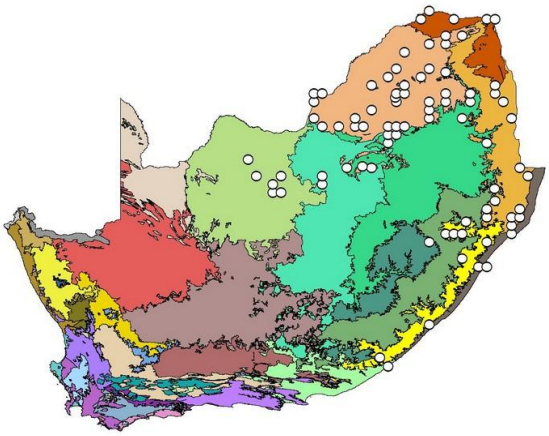
NOTES: **Livestock feed** (Kunene *et al.* 2003). **Cultivated** (Glen 2002). **Antiquality:** Root toxic (Hutchings *et al.* 1996); Cyanogenic glucoside and hydrocyanic acid in leaves and immature pods (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Magical; medicine for humans (Hutchings *et al.* 1996); Timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Winter, spring (Van Wyk *et al.* 2000).

Acacia robusta Burch. subsp. *robusta*

Acacieae ☠ ③

Tree, P; Ht 4.5–21; Alt 30–1980

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (53)	Lowveld (16)
Biome	Savanna (94)	Grassland; Indian Ocean (3)
Rainfall (mm)	400–800 (58)	>800 (15)
Min temp (°C)	2–8 (51)	>6 (23)
Max temp (°C)	27–35 (58)	25–29 (37)
Phosphorus (ppm)	<10 (77)	5–35 (23)
pH	<6.4; 5.5–7.4 (40)	6.5–8.4 (11)
ESP	Non (100)	
QDGCs	2428 (7)	2528; 2724; 2831 (6)



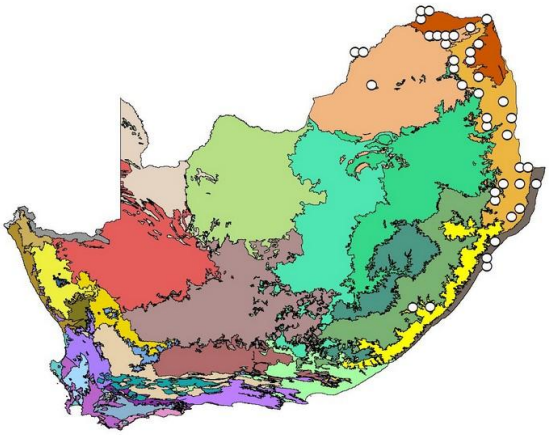
NOTES: **Livestock feed** (Kunene *et al.* 2003). **Cultivated** (Glen 2002). **Antiquality:** Root toxic (Hutchings *et al.* 1996); Cyanogenic glucoside and hydrocyanic acid in leaves and immature pods (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Magical; medicine for humans (Hutchings *et al.* 1996); Timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Van Wyk & Malan 1998).

Acacia schweinfurthii Brenan & Exell var. *schweinfurthii*

Acacieae ③

Shrub, climber; P; Ht 1.5–12; Alt 30–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (43)	Mopane (24)
Biome	Savanna (89)	Indian Ocean (11)
Rainfall (mm)	400–800 (45)	>800 (23)
Min temp (°C)	2–8 (55)	>6 (45)
Max temp (°C)	27–35 (65)	25–29 (33)
Phosphorus (ppm)	<10 (58)	5–.35 (42)
pH	5.5–7.4 (38)	<6.4 (25)
ESP	Non (100)	
QDGCs	2229 (15)	2330 (13)



NOTES: **Livestock feed** (Pule-Meuelenberg & Dakora 2007. **Cultivated** (Glen 2002). **Flowering:** Summer (Steyn 1994).

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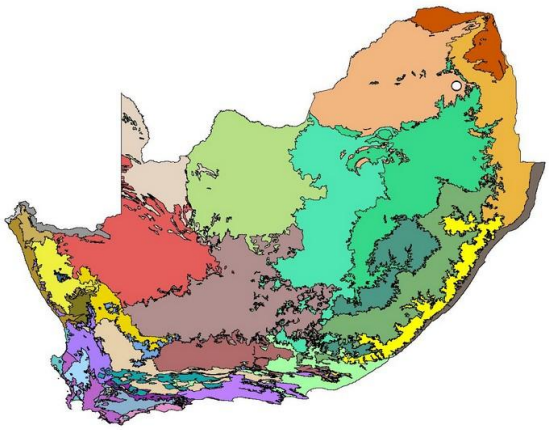
[E]*Acacia sekhukhuniensis* P.J.H.Hurter

Acacieae ①

Tree; P; Ht ?–3.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	>7.5 (100)	
ESP	Non 100)	
QDGCs	2430 (100)	

NOTES: –



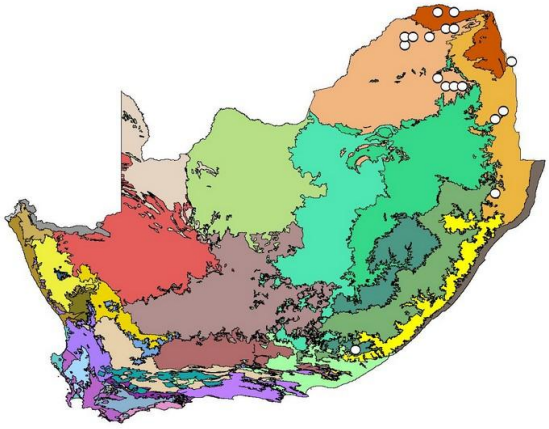
Acacia senegal (L.) Willd. var. *leiorhachis* Brenan

Acacieae ②

Shrub, tree; P; Ht 2–9; Alt 185–1190

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (66)	Lowveld; Mopane (17)
Biome	Savanna (100)	
Rainfall (mm)	200–600 (35)	400–800 (29)
Min temp (°C)	2–8 (71)	>6 (24)
Max temp (°C)	25–29 (59)	27–35 (41)
Phosphorus (ppm)	5–35 (59)	<10 (41)
pH	5.5–7.4; 6.5–8.4 (29)	6.5–7.4 (18)
ESP	Non (100)	
QDGCs	2328 (18)	2229; 2230; 2429; 2430; 2531 (12)

NOTES: **Livestock feed** (Le Houérou 1980; Dicko & Sikena 1992). **CP:** Plant 14–33% (Pellew 1980). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Gum; medicine for humans (Watt & Breyer-Brandwijk 1962); Timber (Van Wyk *et al.* 2000). **Flowering:** Winter, spring (Van Wyk *et al.* 2000).



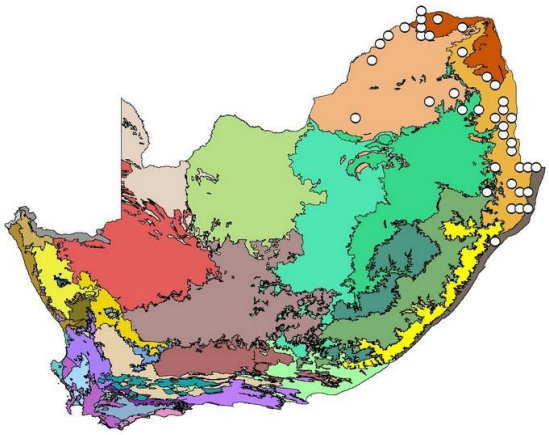
Acacia senegal (L.) Willd. var. *rostrata* Brenan

Acacieae ②

Shrub, tree; P; Ht 1.5–8; Alt 45–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (56)	Central Bushveld (24)
Biome	Savanna (97)	Grassland (3)
Rainfall (mm)	400–800 (46)	500–1000 (21)
Min temp (°C)	>6 (54)	2–8 (44)
Max temp (°C)	27–35 (87)	25–29 (10)
Phosphorus (ppm)	<10 (69)	5–35 (31)
pH	5.5–7.4 (41)	6.5–8.4 (23)
ESP	Non (100)	
QDGCs	2229 (15)	2531 (13)

NOTES: **Livestock feed** (Le Houérou 1980; Dicko & Sikena 1992). **CP:** Plant 14–33% (Pellew 1980). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Gum; medicine for humans (Watt & Breyer-Brandwijk 1962); Timber (Van Wyk *et al.* 2000). **Flowering:** Winter, spring, summer (Steyn 1994; Van Wyk *et al.* 2000).



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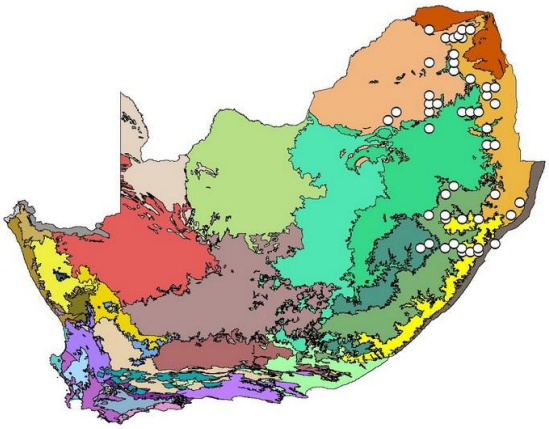
Acacia sieberiana DC. var. *woodii* (Burtt Davy) Keay & Brenan

Acacieae ☠②

Tree; P; Ht 2–18; Alt 30–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (37)	Lowveld (26)
Biome	Savanna (73)	Grassland (23)
Rainfall (mm)	400–800 (37)	>800 (32)
Min temp (°C)	2–8 (59)	>6 (27)
Max temp (°C)	25–29 (54)	27–35 (39)
Phosphorus (ppm)	<10 (73)	5–35 (27)
pH	<6.4 (68)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	2330 (12)	2529; 2930 (10)



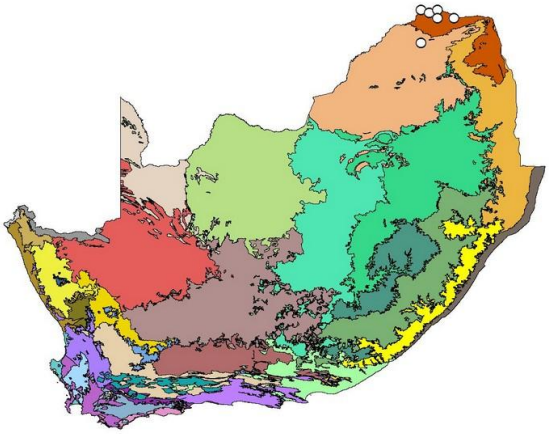
NOTES: **Livestock feed:** High value (Watt & Breyer-Brandwijk 1962; Smith 1992; Hgwa *et al.* 2003). **CP:** Pods 17% (Hgwa *et al.* 2003). **Antiquality:** Wilted leaves toxic; pods taint milk (Hutchings *et al.* 1996); Tannin in bark (Watt & Breyer-Brandwijk 1962); Prussic acid (Zinn *et al.* 2007). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Gum; medicine for humans (Watt & Breyer-Brandwijk 1962); Timber (Van Wyk *et al.* 2000). **Flowering:** Spring, summer (Steyn 1994; Van Wyk *et al.* 2000).

Acacia stuhlmannii Taub.

Acacieae ①

Shrub, climber; P; Ht 1.5–4; Alt 490–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (83)	Central Bushveld (17)
Biome	Savanna (100)	
Rainfall (mm)	<400 (83)	200–600 (17)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	27–35 (83)	25–29 (17)
Phosphorus (ppm)	5–.5 (100)	
pH	6.5–8.4 (83)	>7.5 (17)
ESP	Non (100)	
QDGCs	2229 (71)	2230; 2329 (14)



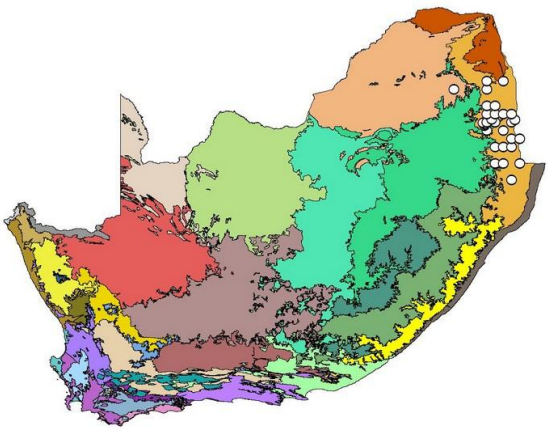
NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Gum (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Steyn 1994).

Acacia swazica Burtt Davy

Acacieae ①

Shrub, tree; P; Ht 1–8; Alt 90–1005

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (94)	Central Bushveld (6)
Biome	Savanna (100)	
Rainfall (mm)	400–800; 600–1000 (38)	>800 (24)
Min temp (°C)	>6 (71)	2–8 (29)
Max temp (°C)	27–35 (79)	25–29 (21)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (50)	5.5–7.4; 6.5–7.4 (21)
ESP	Non (100)	
QDGCs	2531 (53)	2631 (20)



NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer (Steyn 1994).

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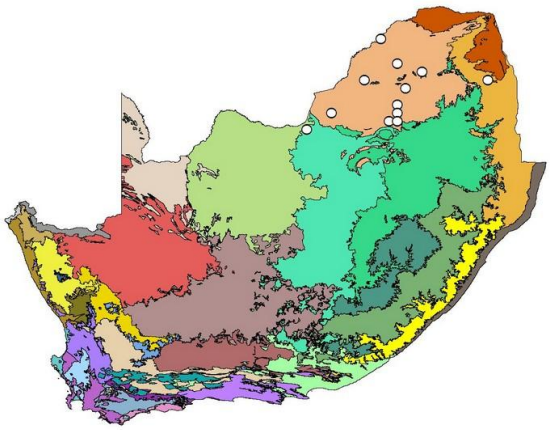
Acacia tenuispina I.Verd.

Acacieae ①

Shrub; P; Ht 0.5–4.5; Alt 695–1650

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (91)	Lowveld (9)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (92)	200–600 (8)
Min temp (°C)	2–8 (76)	<2; 0–4; >6 (8)
Max temp (°C)	27–35 (85)	25–29 (15)
Phosphorus (ppm)	<10 (69)	5–35 (31)
pH	5.5–7.4 (46)	<6.4 (31)
ESP	Non (100)	
QDGCs	2528 (31)	2429 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer (Steyn 1994).



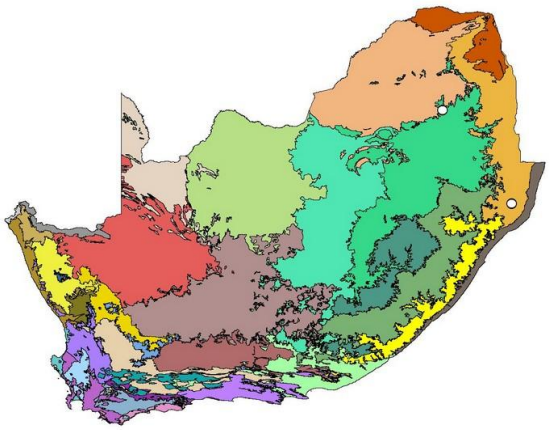
[E]*Acacia theronii* P.P.Swartz

Acacieae ①

Tree; P; Ht 4–6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Lowveld (50)	
Biome	Grassland; Savanna (50)	
Rainfall (mm)	400–800; 600–1000 (50)	
Min temp (°C)	0–4; >6 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Non (100)	
QDGCs	2529; 2831 (50)	

NOTES: –



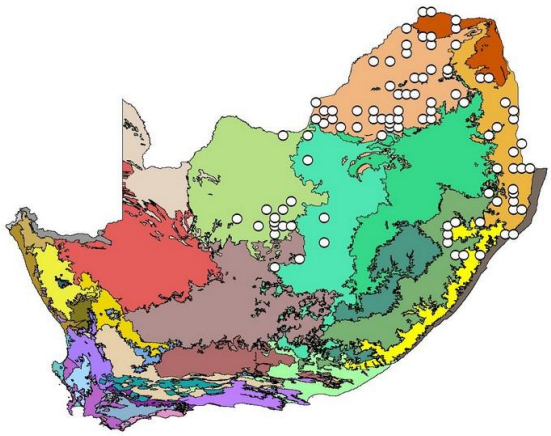
Acacia tortilis (Forssk.) Hayne subsp. *heteracantha* (Burch.) Brenan

Acacieae ☠②

Shrub, tree; P; Ht 1–15; Alt 30–1360

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (50)	Lowveld (20)
Biome	Savanna (95)	Grassland (5)
Rainfall (mm)	400–800 (61)	<400 (13)
Min temp (°C)	2–8 (41)	>6 (24)
Max temp (°C)	27–35 (76)	25–29 (20)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	5.5–7.4 (35)	<6.4 (32)
ESP	Non (100)	
QDGCs	2824 (8)	2527 (7)

NOTES: **Livestock feed** (Le Houérou 1980; Dicko & Sikena 1992). **CP:** Plant 10–21% (Pellew 1980); Pods 13.3% (Araya *et al.* 2003). **Antiquality:** Hydrocyanic acid in fresh leaves and pods (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Ecology:** Seed (Ernst *et al.* 1989). **Biocultural:** Fuel; timber (Watt & Breyer-Brandwijk 1962); Pods as food (Morgan 1981). **Flowering:** Spring, summer (Van Wyk *et al.* 2000).



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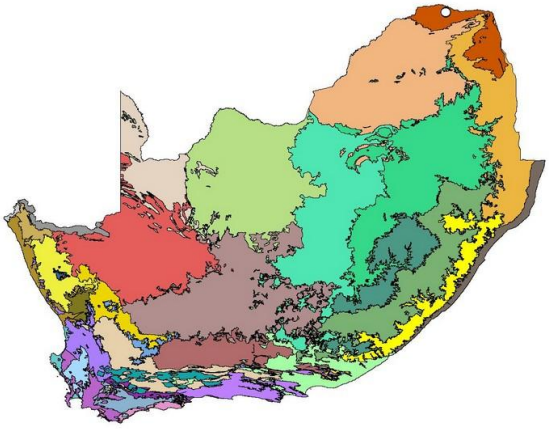
Acacia tortilis (Forssk.) Hayne subsp. *spirocarpa* (Hochst. ex A.Rich.) Brenan var. *spirocarpa*

Acacieae ②

Shrub, tree; P; Ht 3–14; Alt 915–1275

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Non (100)	
QDGCs	2229 (100)	



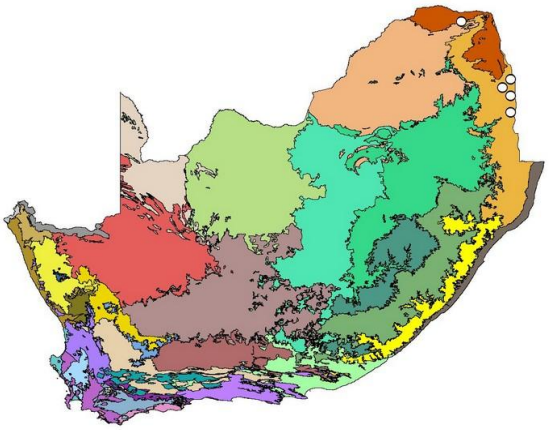
NOTES: **Livestock feed** (Le Houérou 1980; Dicko & Sikena 1992). **CP:** Plant 10–21% (Pellew 1980). **Biocultural:** Gum; timber (Watt & Breyer-Brandwijk 1962); Pods as food (Morgan 1981).

Acacia welwitschii Oliv. subsp. *delagoensis* (Harms) J.H.Ross & Brenan

Acacieae ☠①

Tree; P; Ht 1.5–13; Alt 380–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (80)	200–600 (20)
Min temp (°C)	>6 (80)	2–8 (20)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	6.5–7.4 (80)	6.5–8.4 (20)
ESP	Non (100)	
QDGCs	2431 (60)	2230; 2531 (20)



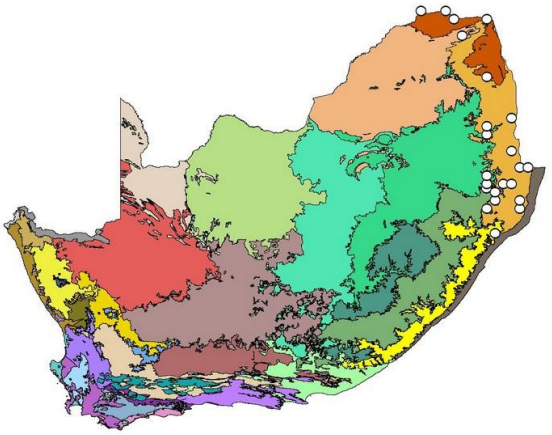
NOTES: **Antiquality:** Tannin in gall (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Summer (Steyn 1994).

Acacia xanthophloea Benth.

Acacieae ③

Tree; P; Ht 1–30; Alt 25–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (70)	Mopane (30)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (41)	>800 (23)
Min temp (°C)	>6 (55)	2–8 (45)
Max temp (°C)	27–35 (59)	25–29 (36)
Phosphorus (ppm)	<10 (73)	5–35 (27)
pH	<6.4 (41)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	2731 (27)	2531 (14)



NOTES: **Livestock feed** (Pellew 1980). **DM:** 5t/ha/yr (Pellew 1980). **CP:** Plant 10–23% (Pellew 1980). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Gum; medicine for humans; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Van Wyk *et al.* 2000).

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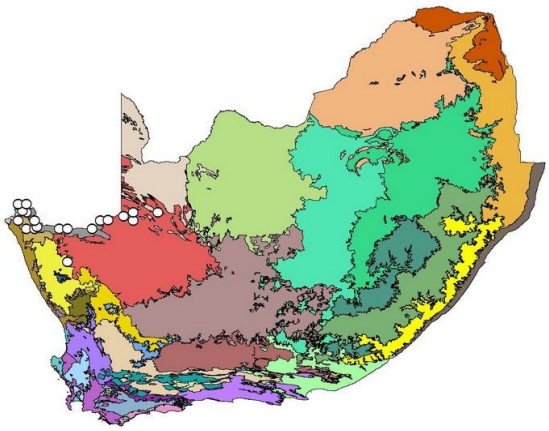
Adenolobus garipensis (E.Mey.) Torre & Hillc.

Cercideae ②

Shrub, tree; P; Ht 1.7–9; Alt 100–1850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southern Namib Desert; Bushmanland (43)	Richtersveld (14)
Biome	Desert (50)	Nama-Karoo (33)
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (47)	>6 (41)
Max temp (°C)	>33 (65)	27–35 (24)
Phosphorus (ppm)	>20 (94)	5–35 (6)
pH	>7.5 (94)	6.5–8.4 (6)
ESP	Non; Medium (43)	High (14)
QDGCs	2817 (35)	2820 (20)

NOTES: **Livestock feed** (Lewis *et al.* 2005).



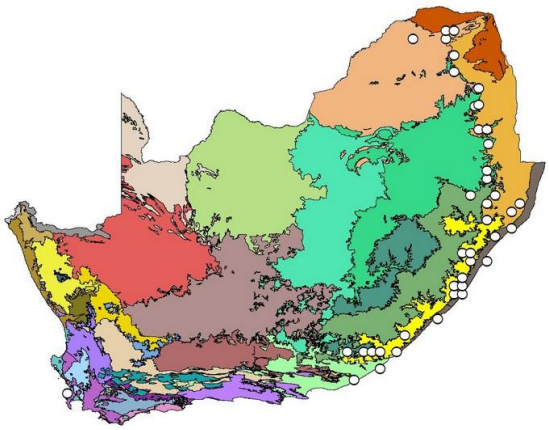
Adenopodia spicata (E.Mey.) C.Presl

Mimoseae ①

Shrub, climber; P; Ht 2–6; Alt 15–1340

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (31)	Central Bushveld (23)
Biome	Savanna (50)	Indian Ocean (21)
Rainfall (mm)	>800 (58)	600–1000 (20)
Min temp (°C)	2–8 (55)	>6 (43)
Max temp (°C)	25–29 (85)	27–35 (15)
Phosphorus (ppm)	<10 (55)	5–35 (45)
pH	<6.4 (68)	5.5–7.4 (28)
ESP	Non (100)	
QDGCs	3030 (12)	2831 (10)

NOTES: **N_2 fixation:** No nodulation (Grobbelaar & Clarke 1975).
Antiquality: Saponin in roots (Watt & Breyer-Brandwijk 1962).
Biocultural: Magical; medicine for humans and livestock (Watt & Breyer-Brandwijk 1962).



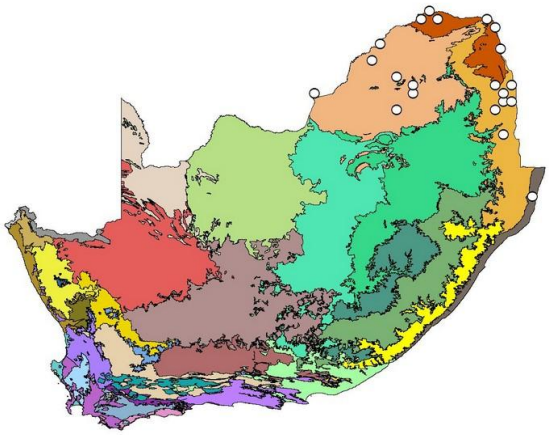
Aeschynomene indica L.

Dalbergieae ②

Herb; P; Ht 0.3–3; Alt 275–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (39)	Lowveld (33)
Biome	Savanna (95)	Indian Ocean (5)
Rainfall (mm)	400–800 (62)	200–600 (19)
Min temp (°C)	>6 (52)	2–8 (48)
Max temp (°C)	27–35 (90)	25–29; >33 (5)
Phosphorus (ppm)	<10 (62)	5–35 (38)
pH	6.5–7.4 (38)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	2431 (24)	2229; 2428 (14)

NOTES: **Livestock feed** (Le Houérou 1980). **N_2 fixation:** *Rhizobium* isolates (Doignon-Bourcier *et al.* 2000). **Antiquality:** Possibly toxic (Cook *et al.* 2005).



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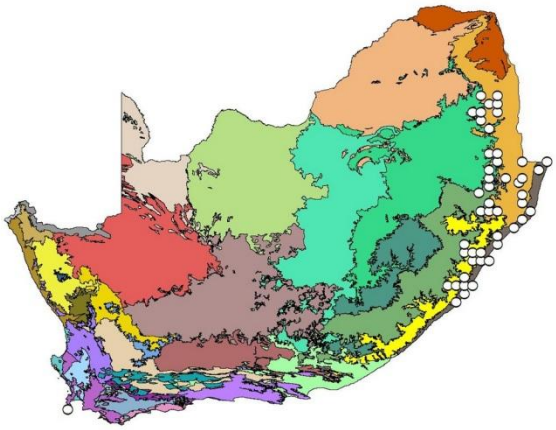
***Aeschynomene micrantha* DC.** **Dalbergieae** ①

Herb; P; Ht 0.2–3; Alt 3–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (48)	Indian Ocean Coastal Belt (38)
Biome	Savanna (60)	Indian Ocean (30)
Rainfall (mm)	>800 (58)	400–800 (25)
Min temp (°C)	>6 (54)	2–8 (46)
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2930 (13)	3030 (10)

NOTES: –

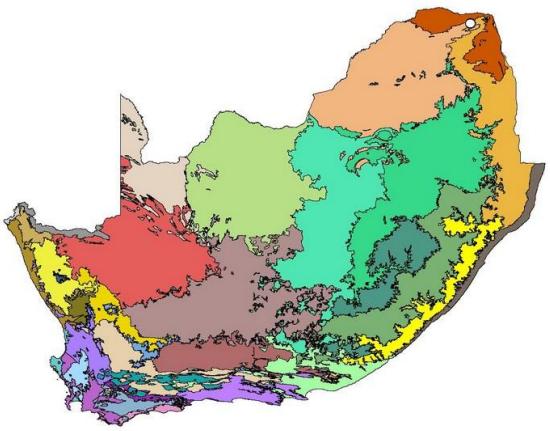


***Aeschynomene nodulosa* (Baker) Baker f. var. *glabrescens* J.B.Gillett** **Dalbergieae** ①

Shrub; P; Ht 0.15–3; Alt 920–1760

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2230 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).

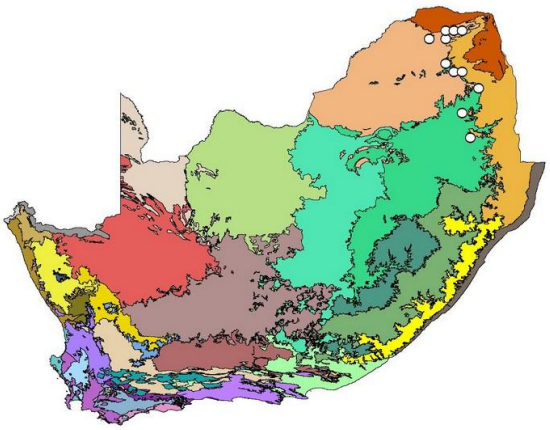


Aeschynomene nodulosa* (Baker) Baker f. var. *nodulosa **Dalbergieae** ①

Shrub; P; Ht 0.45–3; Alt 920–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (75)	Mesic Highveld Grassland (25)
Biome	Savanna (100)	
Rainfall (mm)	400–800; 600–1000 (36)	200–600 (18)
Min temp (°C)	2–8 (91)	0–4 (9)
Max temp (°C)	25–29 (91)	<27 (9)
Phosphorus (ppm)	5–35 (73)	<10 (27)
pH	<6.4 (64)	5.5–7.4; 6.5–8.4 (18)
ESP	Non (100)	
QDGCs	2329; 2430 (27)	2230 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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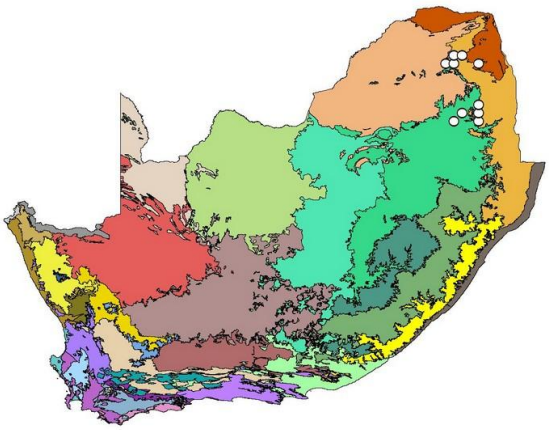
Aeschynomene nyassana Taub. — Dalbergieae ①

Shrub; P; Ht 0.15–3; Alt 725–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Savanna (67)	Grassland (33)
Rainfall (mm)	600–1000 (50)	>800 (30)
Min temp (°C)	2–8 (70)	>6 (20)
Max temp (°C)	25–29; 27–35 (40)	<27 (20)
Phosphorus (ppm)	<10 (70)	5–35 (30)
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	2530 (50)	2330 (40)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).

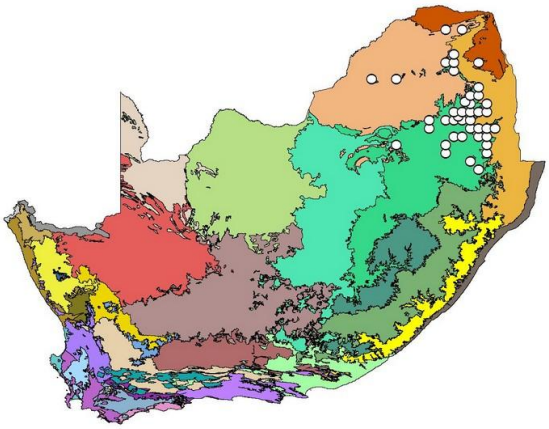


Aeschynomene rehmannii Schinz var. *leptobotrya* (Harms ex Baker f.) J.B.Gillett — Dalbergieae ①

Shrub; P; Ht 0.3–3; Alt 610–2060

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (87)	Lowveld (13)
Biome	Grassland (67)	Savanna (33)
Rainfall (mm)	>800 (39)	400–800; 600–1000 (29)
Min temp (°C)	2–8 (63)	0–4 (24)
Max temp (°C)	25–29 (59)	<27 (24)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (85)	5.5–7.4 (12)
ESP	Non (100)	
QDGCs	2530 (29)	2430; 2531; 2630 (10)

NOTES: –

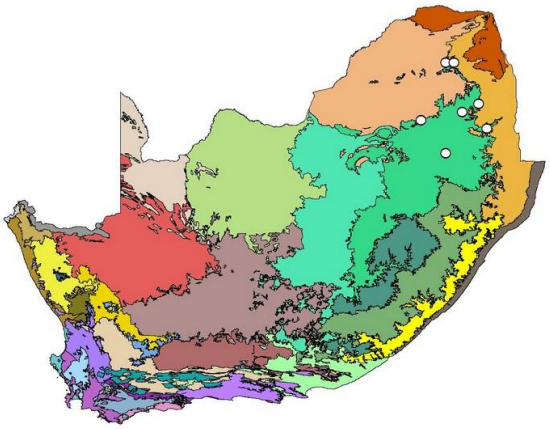


Aeschynomene rehmannii Schinz var. *rehmannii* — Dalbergieae ①

Dwarf shrub, shrub; P; Ht 1–1.4; Alt 915–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (43)	600–1000; >800 (29)
Min temp (°C)	2–8 (86)	<2 (14)
Max temp (°C)	25–29 (57)	<27 (29)
Phosphorus (ppm)	<10 (71)	5–35 (29)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2530 (29)	2329; 2330; 2529; 2531; 2629 (14)

NOTES: –



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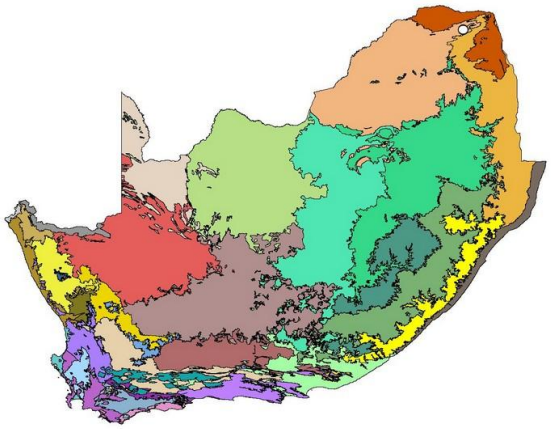
Aeschynomene rhodesiaca Harms

Dalbergieae ①

Herb; A; Ht 0.15–0.6; Alt ?–1310

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2230 (100)	

NOTES: –



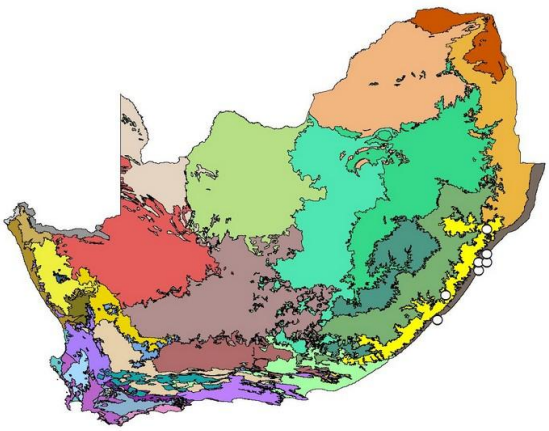
Aeschynomene uniflora E.Mey. var. *uniflora*

Dalbergieae ①

Dwarf shrub; A; Ht 0.5–2.4; Alt 5–

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (86)	2–8 (14)
Max temp (°C)	25–29 (71)	27–35 (29)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4 (86)	5.5–7.4 (14)
ESP	Non (100)	
QDGCs	2931 (29)	2831; 2930; 3029; 3030; 3129 (14)

NOTES: –



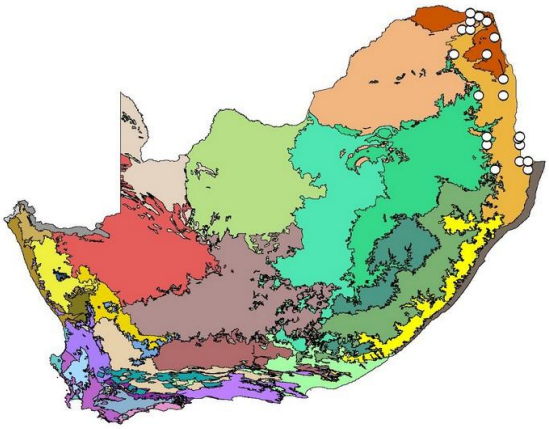
Afzelia quanzensis Welw.

Detarieae ③

Tree; P; Ht 3.5–20; Alt 75–945

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (63)	Mopane (38)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (30)	200–600 (25)
Min temp (°C)	>6 (70)	2–8 (30)
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (40)	6.5–7.4 (35)
ESP	Non (100)	
QDGCs	2230; 2632 (24)	2331; 2431; 2631 (9)

NOTES: **Livestock feed** (Kunene *et al.* 2003); Game (Venter & Venter 1996). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Högberg & Nylund 1981). **Biocultural:** Medicine for livestock (Hutchings *et al.* 1996); Magical; medicine for humans; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Venter & Venter 1996).



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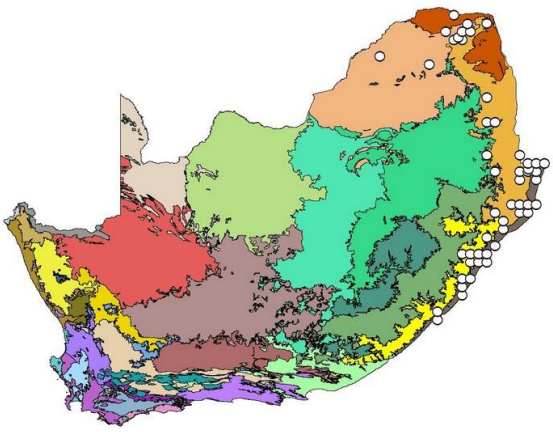
Albizia adianthifolia (Schumach.) W.Wight var. *adianthifolia*

Ingeae

Tree; P; Ht 2.4–20; Alt 0–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (48)	Lowveld (33)
Biome	Savanna (70)	Indian Ocean (30)
Rainfall (mm)	>800 (54)	400–800 (25)
Min temp (°C)	>6 (79)	2–8 (21)
Max temp (°C)	27–35 (56)	25–29 (44)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	<6.4 (40)	5.5–7.4 (10)
ESP	Non (100)	
QDGCs	2732 (12)	2832; 2930 (10)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Poisonous; tannin in pod (Watt & Breyer-Brandwijk 1962). **Biocultural:** Gum; magical; medicine for humans; timber (Watt & Breyer-Brandwijk 1962); Seed as food (Van Wyk *et al.* 2000). **Flowering:** Spring (Van Wyk *et al.* 2000).



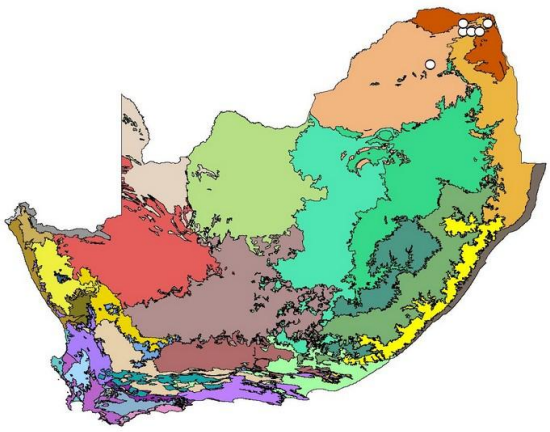
Albizia amara (Roxb.) Boivin subsp. *sericocephala* (Benth.) Brenan

Ingeae

Tree; P; Ht 1.8–12; Alt 200–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (50)	200–600 (33)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (83)	25–29 (17)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 6.5–7.4 (33)	5.5–7.4; 6.5–8.4 (17)
ESP	Non (100)	
QDGCs	2230 (66)	2231; 2329 (17)

NOTES: **Antiquality:** Saponin in bark, pods and root (Watt & Breyer-Brandwijk 1962). **Biocultural:** Gum; medicine for humans (Watt & Breyer-Brandwijk 1962).



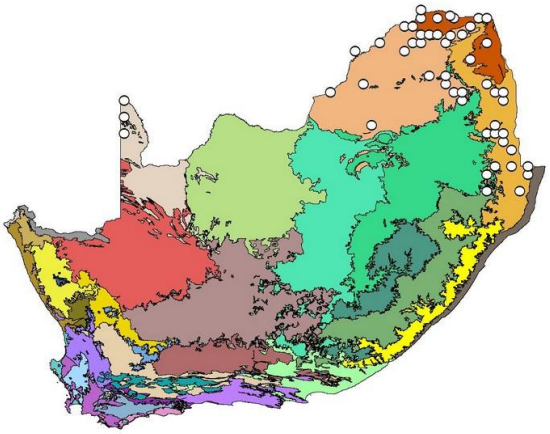
Albizia anthelmintica (A.Rich.) Brongn.

Ingeae

Shrub, tree; P; Ht 0.9–10.7; Alt 25–1650

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (42)	Lowveld (32)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (41)	<400; 200–600 (20)
Min temp (°C)	2–8 (63)	>6 (35)
Max temp (°C)	27–35 (63)	25–29 (29)
Phosphorus (ppm)	5–35 (55)	<110 (45)
pH	5.5–7.4 (31)	6.5–8.4 (22)
ESP	Non (100)	
QDGCs	2229; 2230 (12)	2431; 2531; 2631 (8)

NOTES: **Livestock feed** (Dicko & Sikena 1992; Van Rooyen 2001). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979; Högberg 1992). **Antiquality:** Saponin in bark and seeds (Watt & Breyer-Brandwijk 1962; Hutchings *et al.* 1996). **Biocultural:** Gum; medicine for humans and livestock; piscicide; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Winter, spring (Van Wyk *et al.* 2000).



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Albizia antunesiana Harms

Ingeae

Shrub, tree; P; Ht 0.4–20; Alt 500–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: **Antiquality:** Tannin and saponin in bark (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans; timber (Watt & Breyer-Brandwijk 1962).

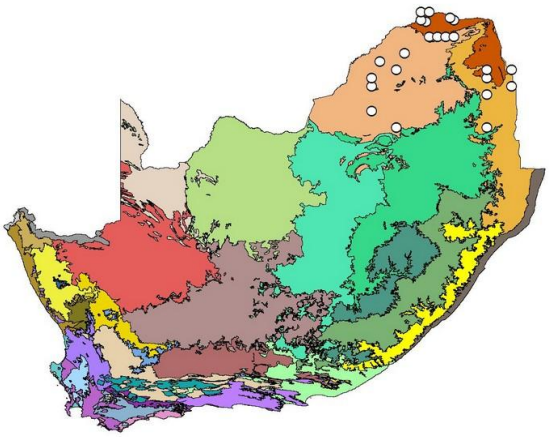
Albizia brevifolia Schinz

Ingeae ③

Shrub, tree; P; Ht 3–15; Alt 150–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (47)	Mopane (33)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (50)	<400; 200–600 (23)
Min temp (°C)	2–8 (73)	>6 (27)
Max temp (°C)	27–35 (77)	25–29 (23)
Phosphorus (ppm)	5–35 (59)	<10 (41)
pH	5.5–7.4 (41)	6.5–8.4 (32)
ESP	Non (100)	
QDGCs	2229 (30)	2230; 2431 (13)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



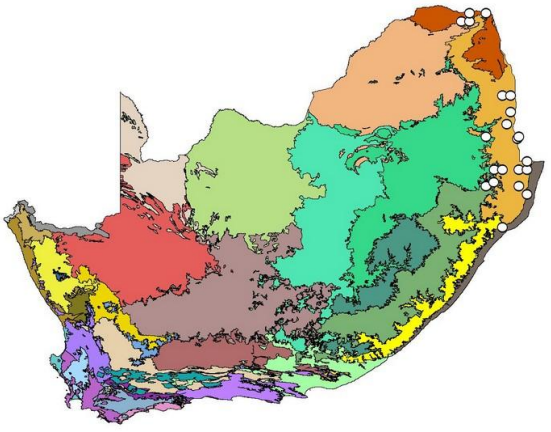
Albizia forbesii Benth.

Ingeae ①

Tree; P; Ht 3–20; Alt 25–550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (89)	Mopane (11)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (53)	200–600; >800 (16)
Min temp (°C)	>6 (74)	2–8 (26)
Max temp (°C)	27–35 (79)	25–29 (16)
Phosphorus (ppm)	<10 (68)	5–35 (32)
pH	<6.4 (32)	5.5–7.4; 6.5–7.4 (26)
ESP	Non (100)	
QDGCs	2732 (20)	2230; 2632; 2731 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Magical (Hutchings *et al.* 1996).



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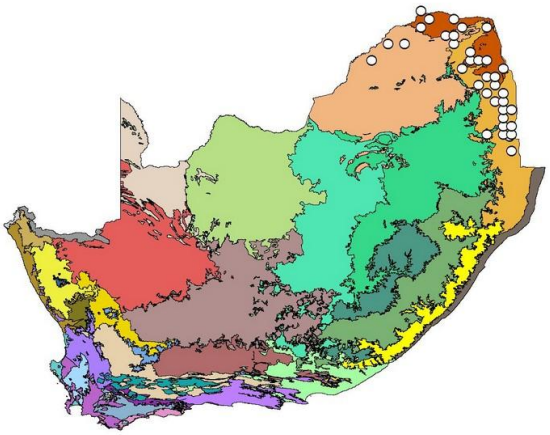
Albizia harveyi E.Fourn.

Ingeae ②

Tree; P; Ht 1.5–20; Alt 250–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (54)	Mopane (29)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (49)	200–800 (20)
Min temp (°C)	>6 (71)	2–8 (29)
Max temp (°C)	27–35 (89)	25–29 (11)
Phosphorus (ppm)	<10 (51)	5–35 (49)
pH	6.5–7.4 (31)	5.5–7.4 (26)
ESP	Non (100)	
QDGCs	2531 (25)	2431 (19)

NOTES: **Livestock feed** (Pule-Meuelenberg & Dakora 2007). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Biocultural:** Gum; medicine for humans (Watt & Breyer-Brandwijk 1962).



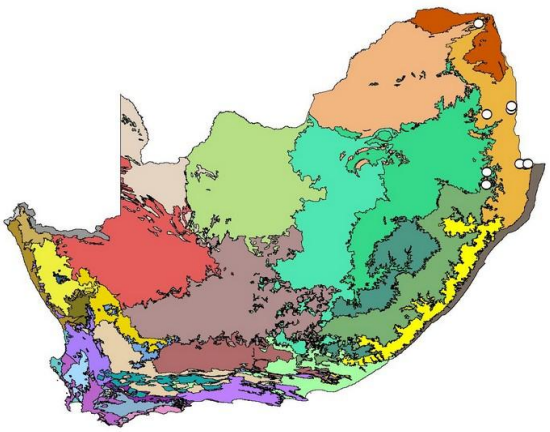
Albizia petersiana (Bolle) Oliv. subsp. *evansii* (Burtt Davy) Brenan

Ingeae ①

Tree; P; Ht 5–10; Alt 25–425

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (50)	>800 (33)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	27–35 (83)	25–29 (17)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	6.5–7.4 (50)	<6.4 (33)
ESP	Non (100)	
QDGCs	2531; 2632 (38)	2230; 2731 (13)

NOTES: **Biocultural:** Medicine for humans (Hutchings *et al.* 1996).



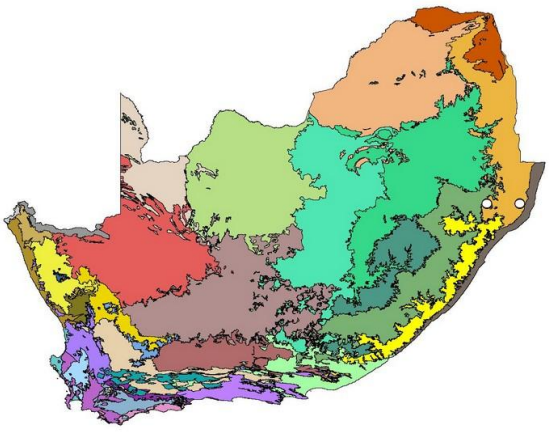
[E]*Albizia suluensis* Gerstner

Ingeae ①

Tree; P; Ht 6–10; Alt 275–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Non (100)	
QDGCs	2831; 2832 (50)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Biocultural:** Medicine for humans; timber (Watt & Breyer-Brandwijk 1962).



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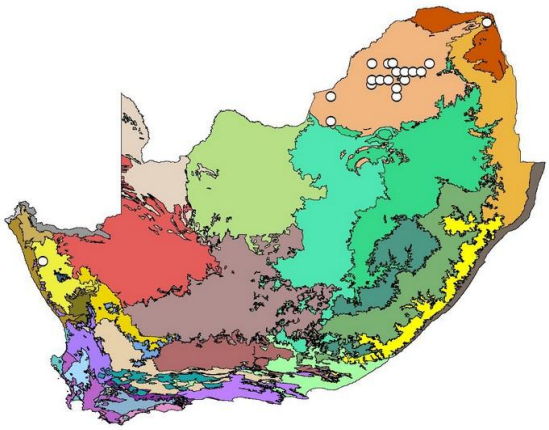
Albizia tanganyicensis Baker f. subsp. *tanganyicensis*

Ingeae ☠②

Tree; P; Ht 1–12; Alt 520–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (92)	Succulent Karoo (8)
Rainfall (mm)	400–800 (83)	200–600 (11)
Min temp (°C)	2–8 (83)	>6 (11)
Max temp (°C)	27–35 (56)	25–29 (44)
Phosphorus (ppm)	<10 (72)	5–35 (28)
pH	<6.4 (50)	5.5–7.4 (44)
ESP	Non (100)	
QDGCs	2428 (39)	2328; 2427 (11)

NOTES: **Livestock feed:** Game (Venter & Venter 1996). **Antiquality:** Pods toxic (Hutchings *et al.* 1996). **Flowering:** Spring (Venter & Venter 1996).



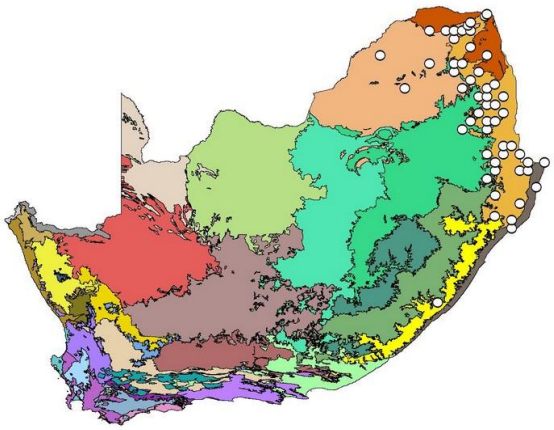
Albizia versicolor Welw. ex Oliv.

Ingeae ☠③

Tree; P; Ht 2.5–20; Alt 0–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (61)	Central Bushveld (17)
Biome	Savanna (94)	Grassland; Indian Ocean (3)
Rainfall (mm)	400–800 (38)	>800 (28)
Min temp (°C)	>6 (52)	2–8 (46)
Max temp (°C)	27–35 (60)	25–29 (36)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	<6.4 (50)	5.5–7.4 (32)
ESP	Non (100)	
QDGCs	2230; 2531 (12)	2430; 2631 (9)

NOTES: **Livestock feed** (Pule-Meuelenberg & Dakora 2007); Game (Venter & Venter 1996). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Antiquality:** Pods toxic (Hutchings *et al.* 1996); Tannin in bark (Watt & Breyer-Brandwijk 1962). **Biocultural:** Gum; medicine for humans; poison arrows; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Venter & Venter 1996; Van Wyk *et al.* 2000).



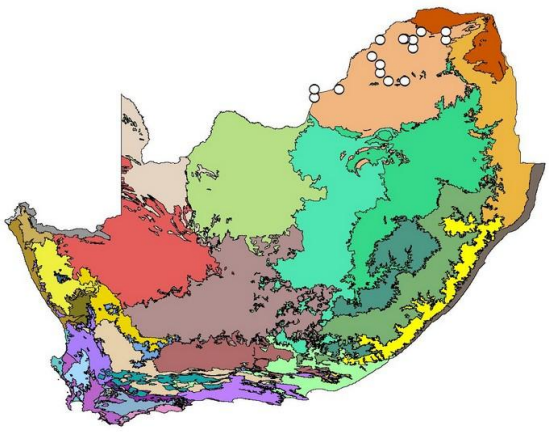
Alistilus bechuanicus N.E.Br.

Phaseoleae ①

Herb; P; Ht 0.01–0.6; Alt 790–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (53)	200–600 (40)
Min temp (°C)	2–8 (93)	0–4 (7)
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (53)	<10 (47)
pH	<6.4 (40)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2328 (25)	2327 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



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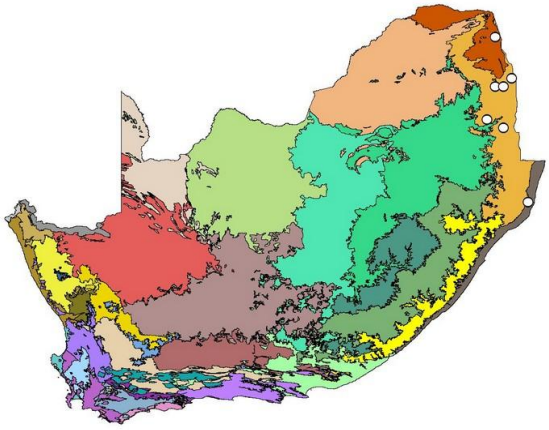
Alysicarpus glumaceus (Vahl) DC. subsp. *glumaceus* var. *glumaceus* — Desmodieae ①

Herb; A; Ht 0.1–1.5; Alt 6–400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (80)	Mopane (20)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (43)	>800 (29)
Min temp (°C)	>6 (86)	2–8 (14)
Max temp (°C)	27–35 (86)	25–29 (14)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	6.5–7.4 (71)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	2431 (43)	2531 (29)

NOTES: **N_2 fixation:** *Rhizobium* isolates (Doignon-Bourcier *et al.*1999, 2000). **Biocultural use:** Medicine for humans (Watt & Breyer-Brandwijk 1962).

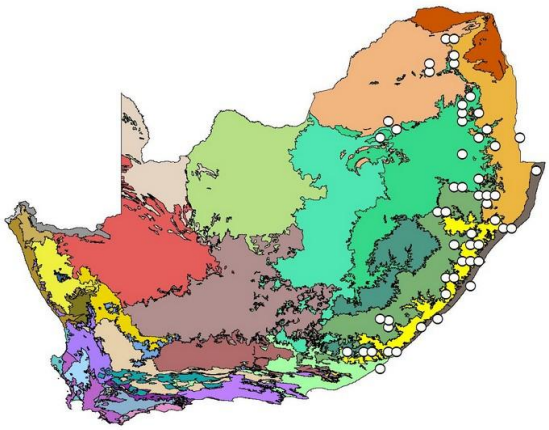


Alysicarpus rugosus (Willd.) DC. subsp. *perennirufus* J.Léonard — Desmodieae ③

Herb; P; Ht 0.2–1; Alt 30–1950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (33)	Indian Ocean Coastal Belt; Mesic Highveld Grassland; Central Bushveld (19)
Biome	Grassland (50)	Savanna (30)
Rainfall (mm)	>800 (41)	600–1000 (39)
Min temp (°C)	2–8 (57)	>6 (24)
Max temp (°C)	25–29 (74)	27–35 (17)
Phosphorus (ppm)	<10 (72)	5–35 (28)
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	2930 (13)	2530; 2730; 2831 (7)

NOTES: **Livestock feed:** High grazing tolerance (Muir & Pitman 1991). **DM:** 0.8–2.2 t/ha (Nyoka *et al.* 2004); 3.8 t/ha (Clatworthy & Madakadze 1988). **CP:** Leaf 15–22% (Cook *et al.* 2005). **Antiquality:** Tannin in plant; not toxic (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1975); *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Biocultural use:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Soil conservation:** Green manure (Cook *et al.* 2005). **Flowering:** Whole year (Pooley1998).

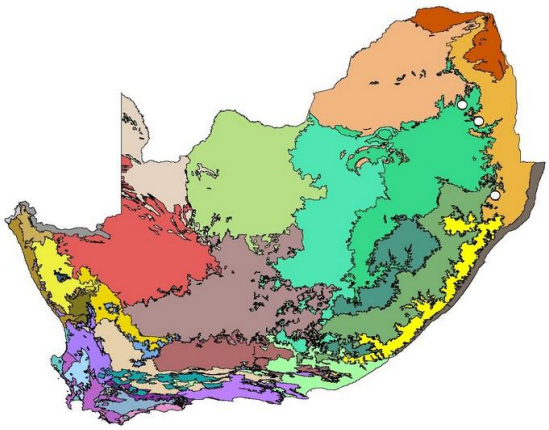


Alysicarpus rugosus (Willd.) DC. subsp. *rugosus* — Desmodieae ③

Herb; A; Ht 0.01–1.5; Alt ?–1550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (67)	400–800 (33)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (67)	<27 (33)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2630 (67)	2731 (33)

NOTES: **Livestock feed:** High grazing tolerance (Muir & Pitman 1991). **DM:** 3.8 t/ha (Clatworthy & Madakadze 1988). **CP:** Leaf 15–22% (Cook *et al.* 2005); Seed 27% (Siddhuraju *et al.* 1992). **Antiquality:** Tannin in plant; not toxic (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967); *Rhizobium* isolates (Doignon-Bourcier 1999, 2000). **Biocultural use:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Soil conservation** (Cook *et al.* 2005). **Flowering:** Whole year (Pooley1998).



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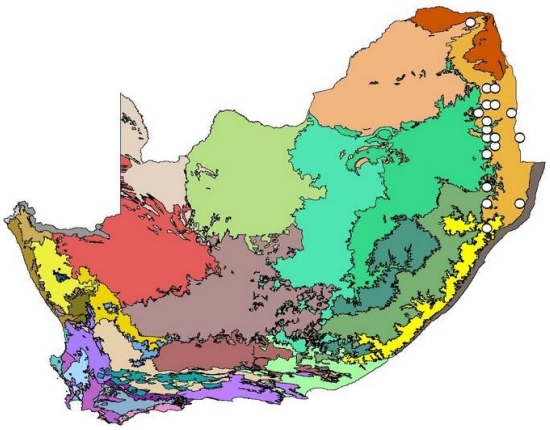
Alysicarpus vaginalis (L.) DC. var. *vaginalis*

Desmodieae ②

Herb; P; Ht 0.1–0.6; Alt 10–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	>800 (50)	400–800 (28)
Min temp (°C)	2–8 (56)	>6 (44)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (94)	5–35 (6)
pH	<6.4 (72)	5.5–7.5 (17)
ESP	Non (100)	
QDGCs	2531 (28)	2631 (22)

NOTES: **Livestock feed** (Cook *et al.* 2005). **Biocultural use:** Criminal poisoning (Watt & Breyer-Brandwijk 1962). **Soil conservation** (Cook *et al.* 2005).



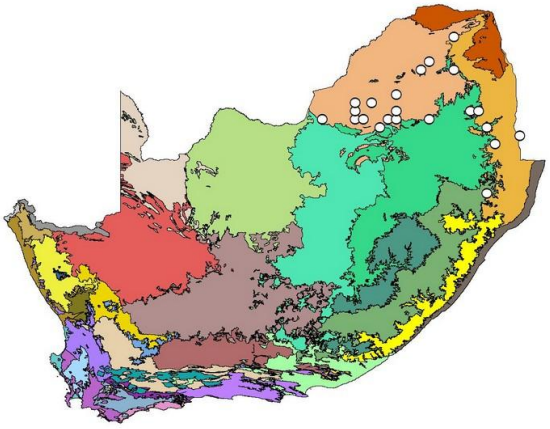
Alysicarpus zeyheri Harv.

Desmodieae ①

Herb; P; Ht 0.1–0.8; Alt 10–1435

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (92)	Lowveld (8)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (64)	>800 (23)
Min temp (°C)	2–8 (73)	0–4 (18)
Max temp (°C)	27–35 (59)	25–29 (41)
Phosphorus (ppm)	<10 (82)	5–35 (18)
pH	<6.4 (77)	5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2527 (27)	2528 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural use:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



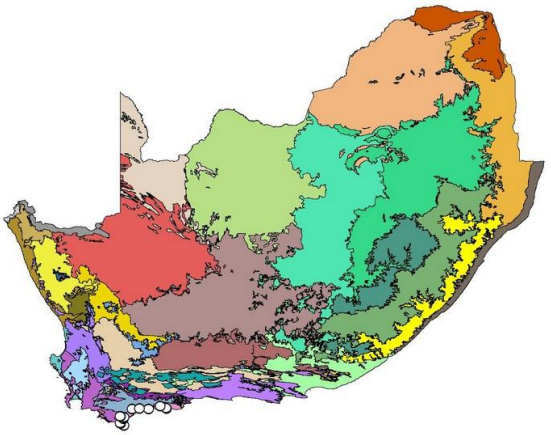
[E]*Amphithalea alba* Granby

Podalyrieae ①

Dwarf shrub, shrub; P; Ht 0.01–0.5; Alt 45–120

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (86)	400–800 (14)
Min temp (°C)	>6 (57)	2–8 (43)
Max temp (°C)	25–29 (86)	<27 (14)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (43)	6.5–7.4 (29)
ESP	Non (100)	
QDGCs	3420 (73)	3421 (27)

NOTES: **Flowering:** Winter (Mustart *et al.* 2003).



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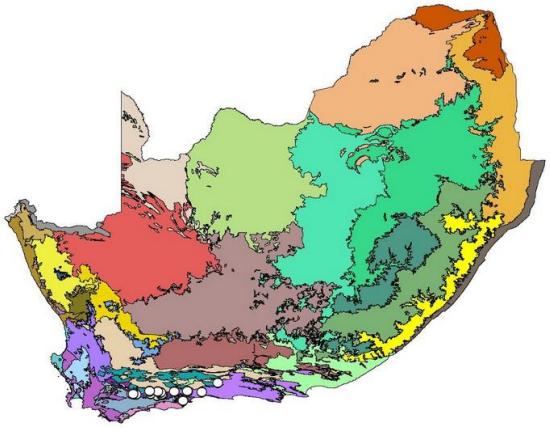
[E]*Amphithalea axillaris* Granby

Podalyrieae ①

Shrub; P; Ht 0.6–0.9; Alt 365–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (60)	<400 (20)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (70)	27–35 (30)
Phosphorus (ppm)	5–35 (90)	<10 (10)
pH	5.5–7.4 (50)	6.5–8.4 (30)
ESP	Ecotone	
QDGCs	3320 (37)	3321 (32)

NOTES: –



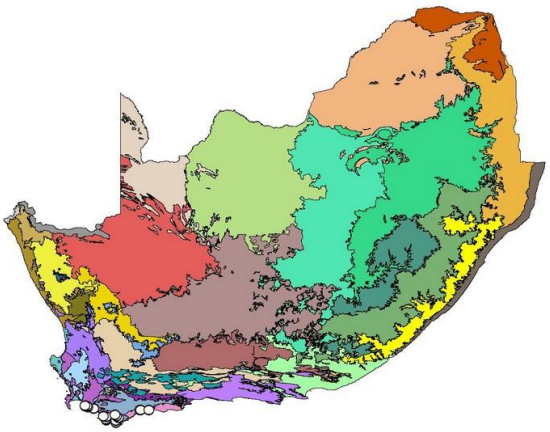
[E]*Amphithalea biovulata* (Bolus) Granby

Podalyrieae ①

Dwarf shrub, herb; P; Ht 0.3–0.4; Alt 70–304

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (63)	200–600 (25)
Min temp (°C)	>6 (63)	2–8 (37)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (88)	<10 (12)
pH	6.5–7.4 (50)	<6.4; 5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3419 (64)	3418; 3420 (18)

NOTES: **Flowering:** Spring (Mustart *et al.* 2003).



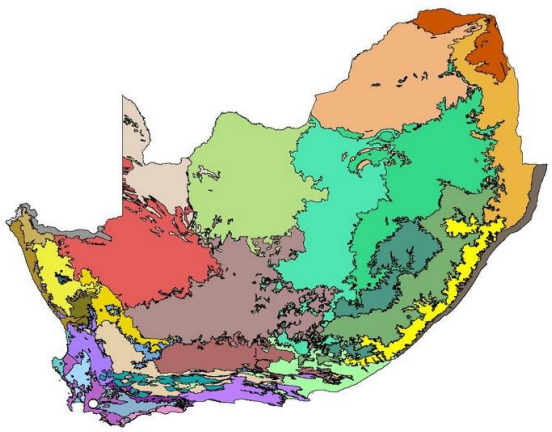
[E]*Amphithalea bodkinii* Dummer

Podalyrieae ①

Dwarf shrub; P; Ht 0.01–0.3; Alt ?–1097

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: –



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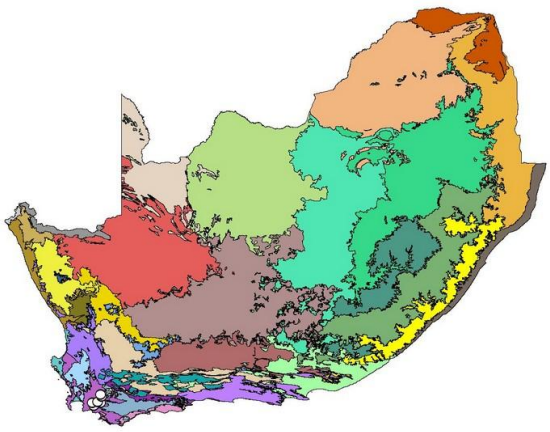
[E]*Amphithalea bowiei* (Benth.) A.L.Schutte

Podalyrieae ①

Dwarf shrub; P; Ht 0.15–0.3; Alt 325–585

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800; >800 (33)	
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Ecotone	
QDGCs	3419 (82)	3319 (18)

NOTES: –



[E]*Amphithalea bullata* (Benth.) A.L.Schutte

Podalyrieae –

Dwarf shrub; P; Ht 0.01–0.15; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

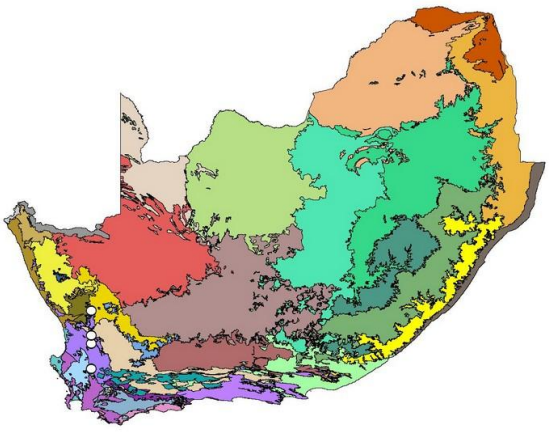
[E]*Amphithalea cedarbergensis* (Granby) A.L.Schutte

Podalyrieae ①

Dwarf shrub; P; Ht 0.2–0.25; Alt 795–1676

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	<400; 200–600 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	<6.4 (50)	5.5–7.4; >7.5 (25)
ESP	Ecotone	
QDGCs	3219 (60)	3119; 3319 (20)

NOTES: –



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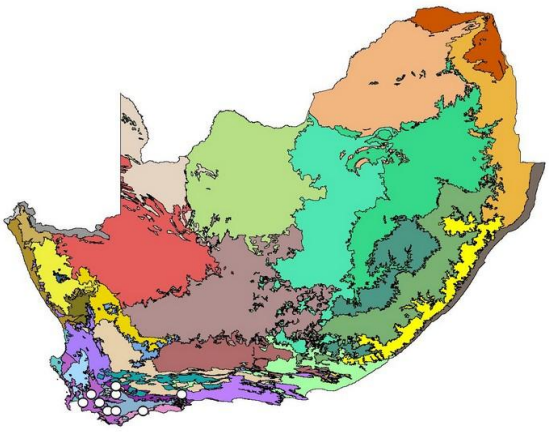
[E]*Amphithalea ciliaris* Eckl. & Zeyh.

Podalyrieae ①

Dwarf shrub; P; Ht 0.2–0.8; Alt 60–685

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	>800 (22)
Min temp (°C)	2–8 (56)	0–4 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	5.5–7.4 (56)	6.5–7.4 (33)
ESP	Non (100)	
QDGCs	3319; 3419 (33)	3321; 3418; 3420 (11)

NOTES: **Flowering:** Spring (Mustart *et al.* 2003).



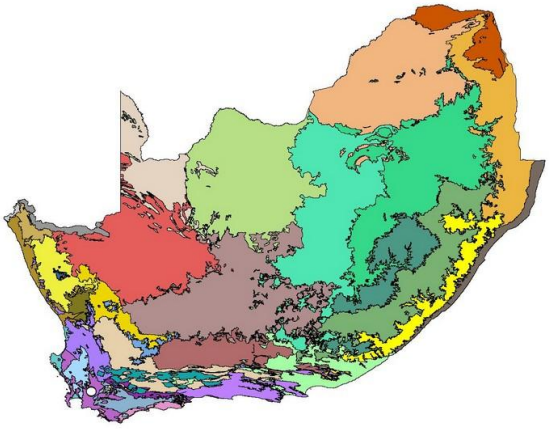
[E]*Amphithalea concava* Granby

Podalyrieae ①

Dwarf shrub; P; Ht ?; Alt 1300–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	3319 (100)	

NOTES: –



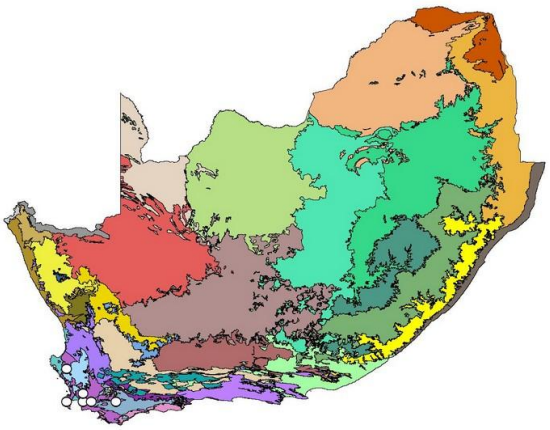
[E]*Amphithalea cuneifolia* Eckl. & Zeyh.

Podalyrieae ①

Shrub; P; Ht 0.9–2.5; Alt 396–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000; >800 (33)	<400; 200–600 (17)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (66)	5.5–7.4; 6.5–7.4 (17)
ESP	Ecotone	
QDGCs	3318; 3418; 3419 (33)	

NOTES: –



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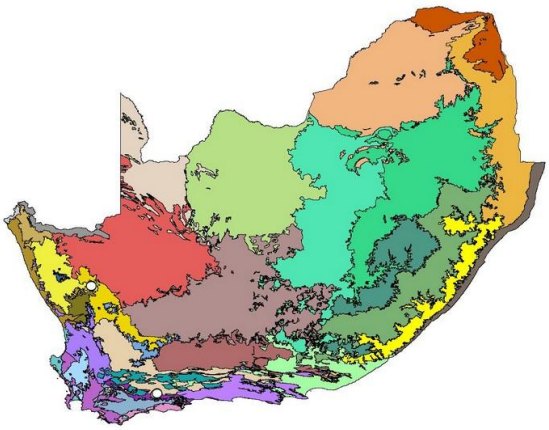
[E]*Amphithalea cymbifolia* (C.A.Sm.) A.L.Schutte

Podalyrieae ①

Dwarf shrub; P; Ht 0.15–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	6.5–8.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3321 (67)	3019 (33)

NOTES: –



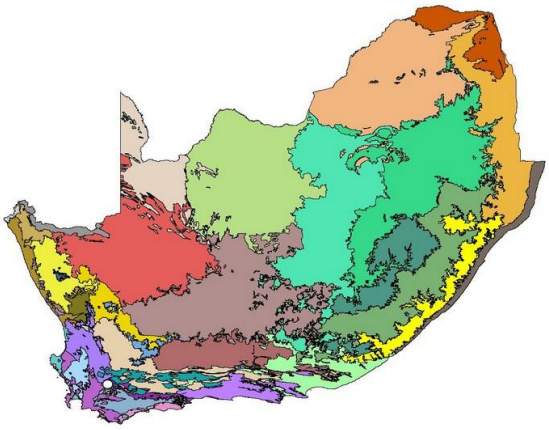
[E]*Amphithalea dahlgrenii* (Granby) A.L.Schutte

Podalyrieae ①

Dwarf shrub; P; Ht 0.01–0.5; Alt 975–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



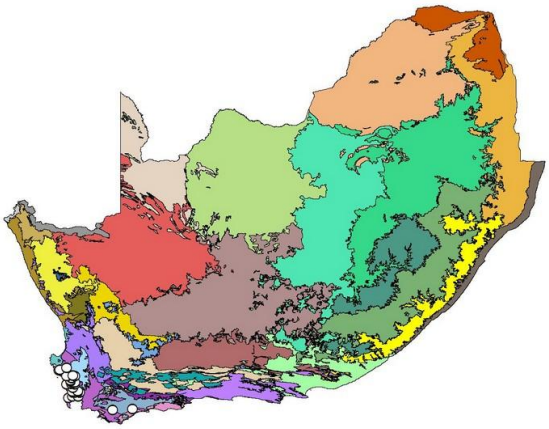
[E]*Amphithalea ericifolia* (L.) Eckl. & Zeyh. subsp. *erecta* Granby

Podalyrieae ①

Shrub; P; Ht 0.5–1; Alt 23–245

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (64)	<400; 600–1000 (18)
Min temp (°C)	>6 (64)	2–8 (36)
Max temp (°C)	25–29 (91)	27–35 (9)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (64)	5.5–7.4 (27)
ESP	Ecotone	
QDGCs	3318 (88)	3418; 3419; 3420 (4)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Autumn, winter, spring (Manning & Goldblatt 2000).



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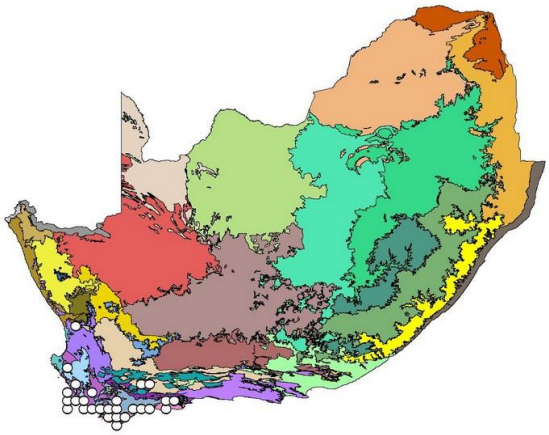
[E]*Amphithalea ericifolia* (L.) Eckl. & Zeyh. subsp. *ericifolia* — Podalyrieae — ①

Shrub; P; Ht 0.35–0.5; Alt 15–732

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (60)	South Coast Fynbos; South Strandveld (20)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (41)	400–800 (26)
Min temp (°C)	2–8 (52)	>6 (44)
Max temp (°C)	25–29 (85)	27–35 (11)
Phosphorus (ppm)	5–35 (81)	<10 (11)
pH	<6.4 (41)	5.5–7.4 (22)
ESP	Non (80)	Medium (20)
QDGCs	3419 (29)	3418 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Autumn, winter, spring (Manning & Goldblatt 2000).



[E]*Amphithalea ericifolia* (L.) Eckl. & Zeyh. subsp. *minuta* Granby — Podalyrieae — –

Dwarf shrub; P; Ht ?; Alt ?–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

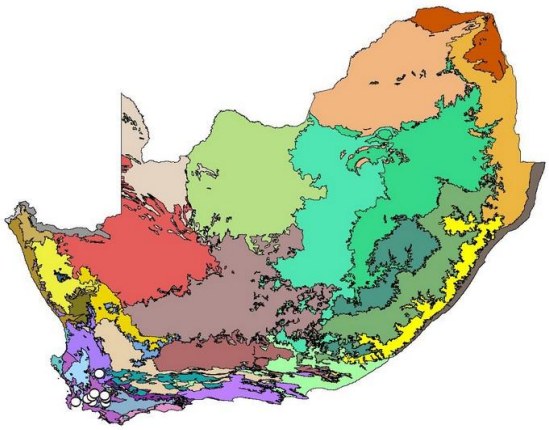
NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Autumn, winter, spring (Manning & Goldblatt 2000).

[E]*Amphithalea ericifolia* (L.) Eckl. & Zeyh. subsp. *scoparia* Granby — Podalyrieae — ①

Dwarf shrub; P; Ht 0.01–0.25; Alt 915–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (42)	200–600; 400–800 (29)
Min temp (°C)	0–4; 2–8 (43)	>6 (14)
Max temp (°C)	25–29 (86)	<27 (14)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (43)	6.5–7.4 (14)
ESP	Non (100)	
QDGCs	3419 (45)	3319 (36)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Autumn, winter, spring (Manning & Goldblatt 2000).



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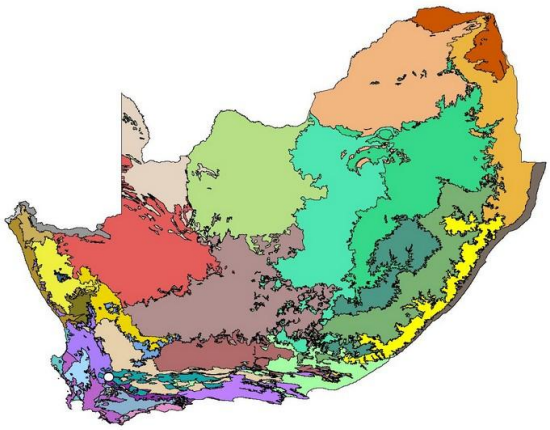
[E]*Amphithalea esterhuyseniae* (Granby) A.L.Schutte

Podalyrieae ①

Dwarf shrub, shrub; P; Ht 0.15–0.35; Alt 1067–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



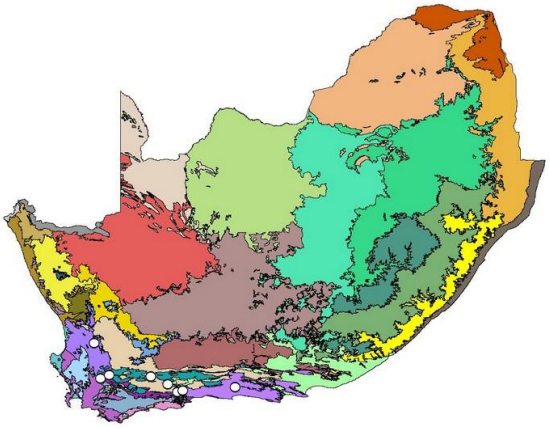
[E]*Amphithalea flava* (Granby) A.L.Schutte

Podalyrieae ①

Shrub; A; Ht 0.5–0.8; Alt 300–470

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (38)	<400; 400–800 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (50)	27–35 (38)
Phosphorus (ppm)	5–35 (88)	>20 (12)
pH	5.5–7.4 (50)	<6.4; >7.5 (25)
ESP	Medium (100)	
QDGCs	3321 (38)	3319 (25)

NOTES: –



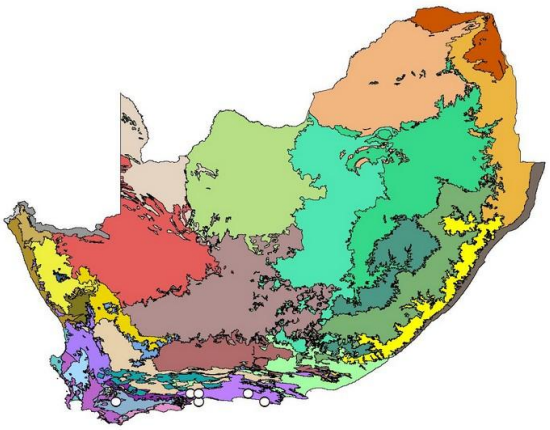
[E]*Amphithalea fourcadei* Compton

Podalyrieae ①

Shrub; P; Ht 0.3–1.5; Alt 762–1650

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	200–600 (33)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (66)	5.5–7.4; 6.5–7.4 (17)
ESP	Medium (100)	
QDGCs	3322 (32)	3323; 3419; 3422; 3424 (17)

NOTES: –



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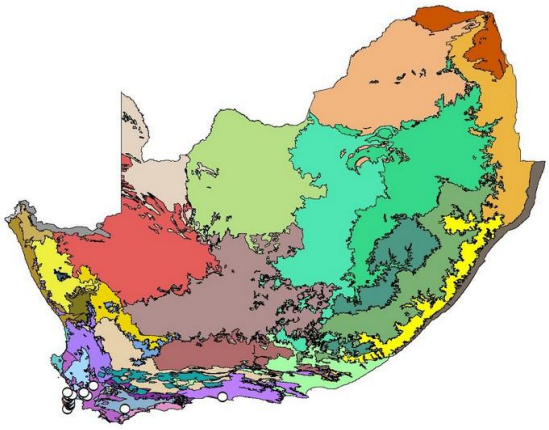
[E]*Amphithalea imbricata* (L.) Druce

Podalyrieae ①

Shrub; P; Ht 0.01–1.8; Alt 500–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (38)	>800 (25)
Min temp (°C)	>6 (50)	2–8 (38)
Max temp (°C)	25–29 (88)	<27 (13)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (75)	5.5–7.4; 6.5–8.4 (13)
ESP	Non; Medium (50)	50
QDGCs	3418 (46)	3318 (42)

NOTES: **Flowering:** Spring, summer (Kidd 2002).



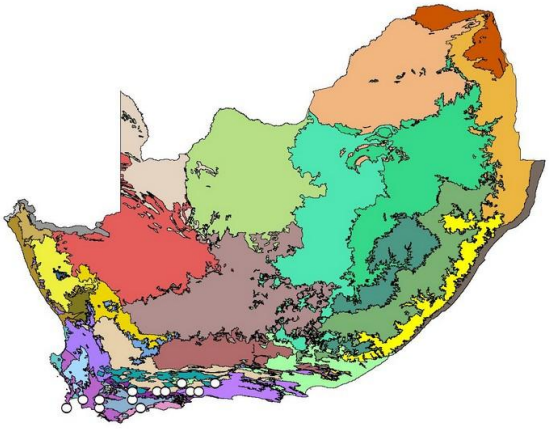
[E]*Amphithalea intermedia* Eckl. & Zeyh.

Podalyrieae ①

Dwarf shrub; P; Ht 0.2–0.8; Alt 58–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (31)	<400 (23)
Min temp (°C)	2–8 (85)	>6 (15)
Max temp (°C)	25–29 (69)	27–35 (31)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (38)	<6.4 (31)
ESP	Non (100)	
QDGCs	3321; 3322 (21)	3418; 3419; 3420 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



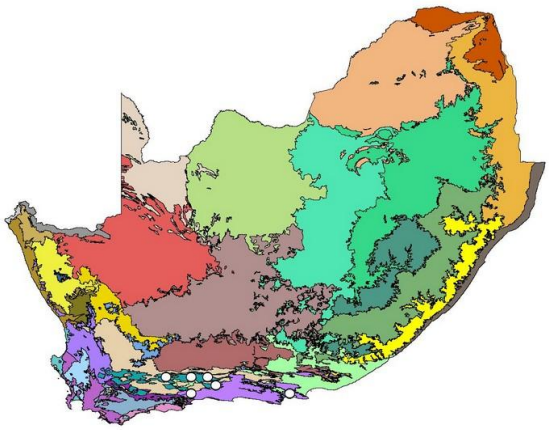
[E]*Amphithalea micrantha* Walp.

Podalyriea ①

Shrub; P; Ht 0.2–0.5; Alt 579–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600; 400–800 (33)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35; >20 (50)	
pH	5.5–7.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3322 (66)	3321; 3325 (17)

NOTES: –



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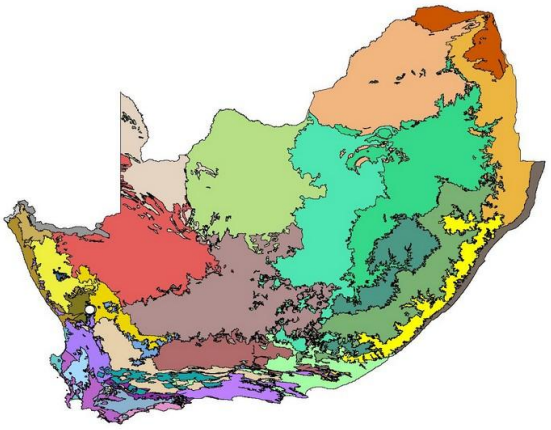
[E]*Amphithalea minima* (Granby) A.L.Schutte

Podalyrieae ①

Dwarf shrub; P; Ht 0.01–0.8; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3119 (100)	

NOTES: –



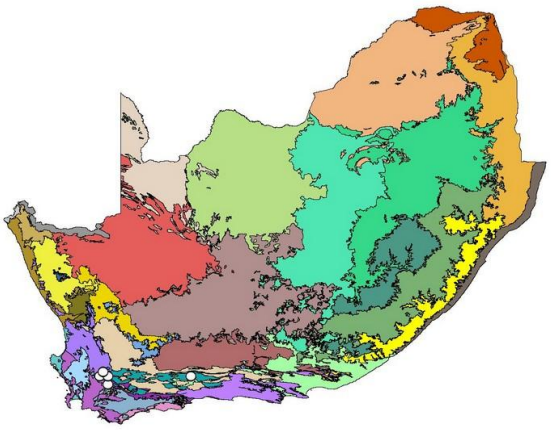
[E]*Amphithalea monticola* A.L.Schutte

Podalyrieae ①

Dwarf shrub; A; Ht 0.1–0.9; Alt 185–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400; 400–800 (25)
Min temp (°C)	0–4 (75)	2–8 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	5.5–7.4 (50)	6.5–7.4; >7.5 (25)
ESP	Ecotone	
QDGCs	3319 (80)	3322 (20)

NOTES: –



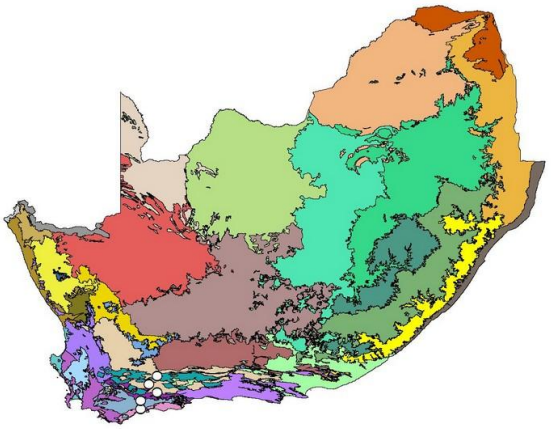
[E]*Amphithalea muirii* (Granby) A.L.Schutte

Podalyrieae ①

Dwarf shrub, shrub; P; Ht 0.2–0.5; Alt 45–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (60)	200–600 (40)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	27–35 (60)	25–29 (40)
Phosphorus (ppm)	5–35 (60)	>20 (40)
pH	>7.5 (40)	5.5–7.4; 6.5–7.4; 6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3321; 3420 (40)	3320 (20)

NOTES: –



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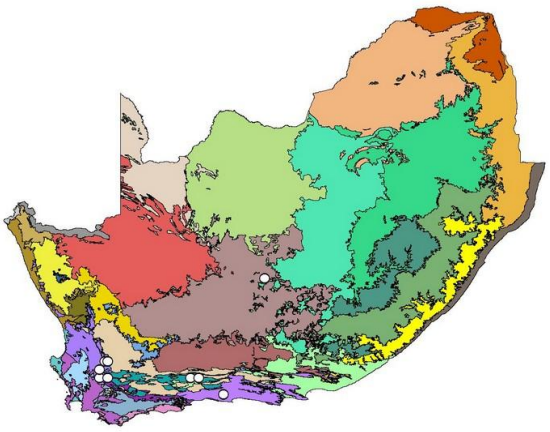
[E]*Amphithalea muraltioides* (Benth.) A.L.Schutte

Podalyrieae ①

Dwarf shrub; P; Ht 0.4–1.5; Alt 450–1463

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400 (25)
Min temp (°C)	2–8 (50)	0–4 (38)
Max temp (°C)	25–29 (50)	27–35 (38)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	5.5–7.4; >7.5 (38)	<6.4 (25)
ESP	Medium (100)	
QDGCs	3319 (30)	3219; 3322 (20)

NOTES: –



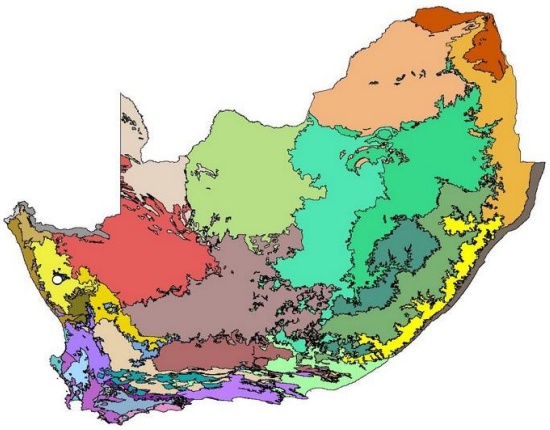
[E]*Amphithalea obtusiloba* (Granby) A.L.Schutte

Podalyrieae ①

Dwarf shrub; P; Ht 0.01–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	>20 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3018 (100)	

NOTES: –



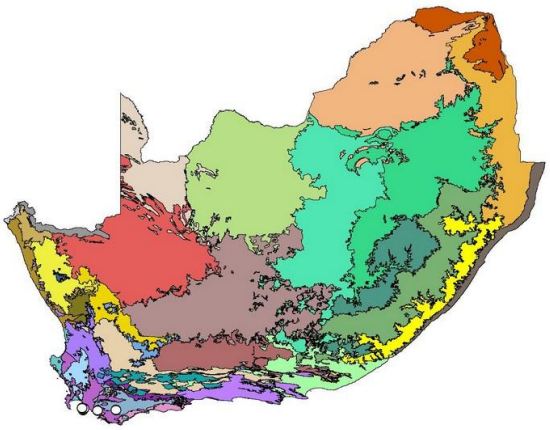
[E]*Amphithalea oppositifolia* L.Bolus

Podalyrieae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt 155–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800; >800 (33)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3418 (71)	3419 (29)

NOTES: –



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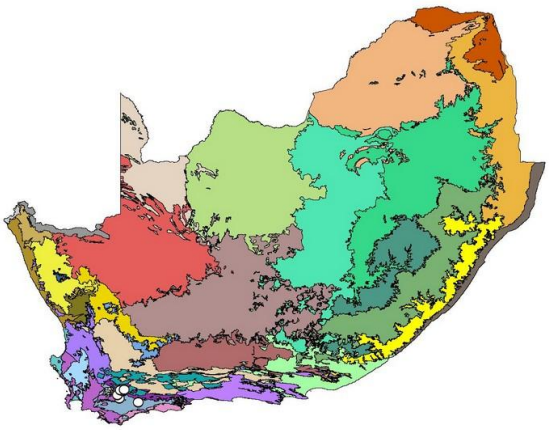
[E]*Amphithalea pageae* (L.Bolus) A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 0.9–2; Alt 300–310

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–20 (100)	
pH	6.5–7.4 (75)	5.5–7.4 (25)
ESP	Ecotone	
QDGCs	3319; 3320 (33)	3419; 3420 (17)

NOTES: –



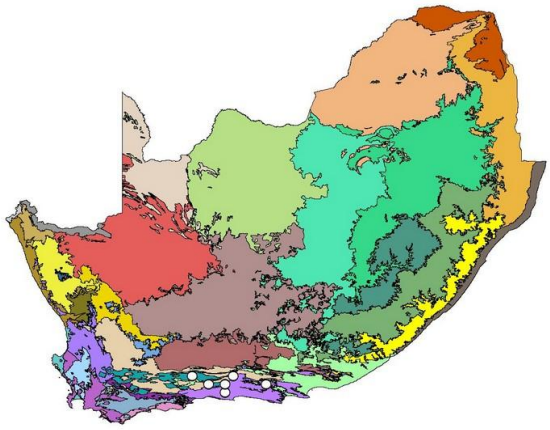
[E]*Amphithalea parvifolia* (Thunb.) A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 0.5–1.2; Alt 610–1463

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	<400 (50)	200–600 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (50)	27–35 (33)
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	5.5–7.4 (50)	<6.4 (33)
ESP	Medium (100)	
QDGCs	3323 (50)	3322 (33)

NOTES: –



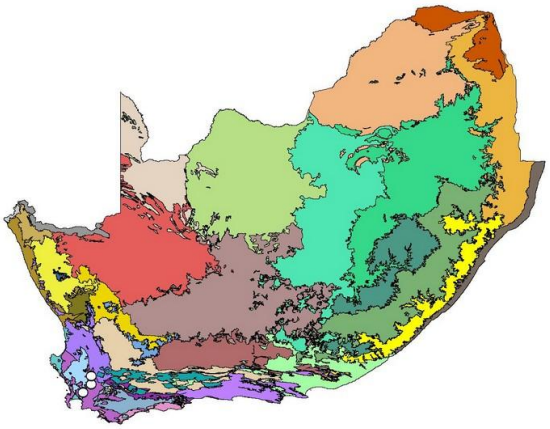
[E]*Amphithalea perplexa* Eckl. & Zeyh.

Podalyrieae ①

Shrub; P; Ht 0.35–1.2; Alt 305–1677

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000; >800 (33)	
Min temp (°C)	0–4 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Ecotone	
QDGCs	3319 (67)	3318 (33)

NOTES: –



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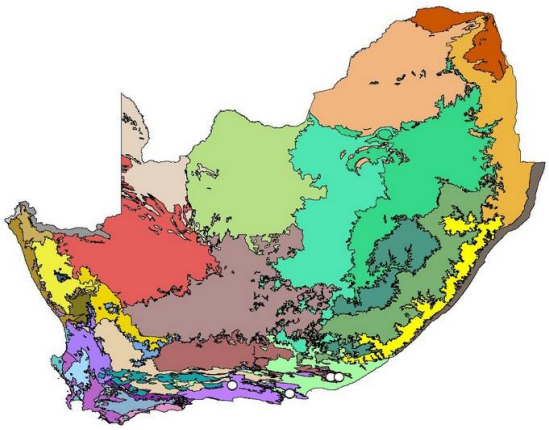
[E]*Amphithalea phylicoides* Eckl. & Zeyh.

Podalyrieae ①

Shrub; P; Ht 0.8–1.5; Alt 610–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	400–800 (75)	200–600 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Medium (100)	
QDGCs	3326 (50)	3323; 3325 (25)

NOTES: –



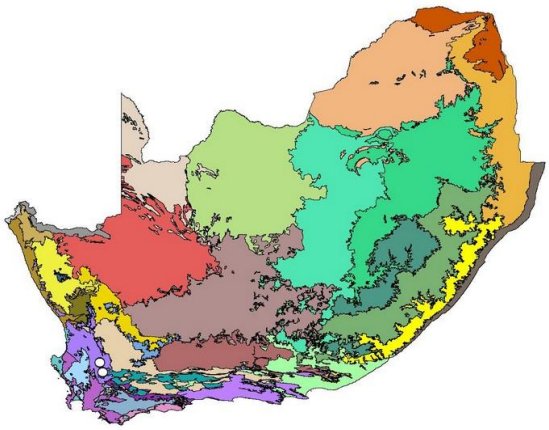
[E]*Amphithalea purpurea* (Granby) A.L.Schutte

Podalyrieae ①

Dwarf shrub, shrub; P; Ht ?; Alt ?–1820

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3219 (75)	3319 (25)

NOTES: –



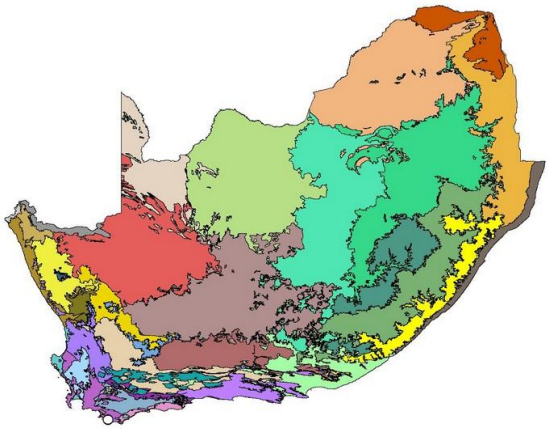
[E]*Amphithalea rostrata* A.L.Schutte & B.-E.van Wyk

Podalyrieae ①

Dwarf shrub; P; Ht 0.01–0.6; Alt ?–120

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: –



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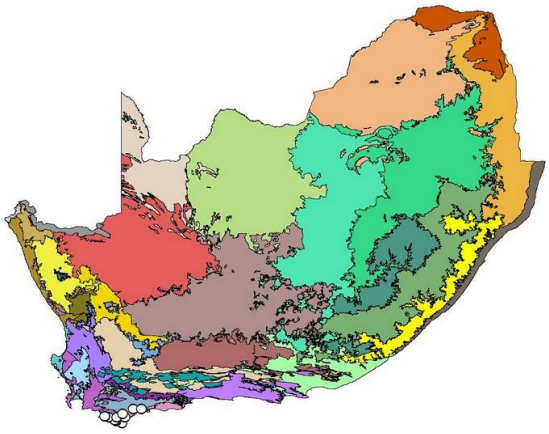
[E]*Amphithalea sericea* Schltr. **Podalyrieae** ①

Shrub; P; Ht 0.6–0.9; Alt 60–183

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (83)	<27 (17)
Phosphorus (ppm)	5–35 (83)	<10 (17)
pH	6.5–8.4 (50)	6.5–7.4 (33)
ESP	Ecotone	
QDGCs	3419 (64)	3420 (36)

NOTES: –

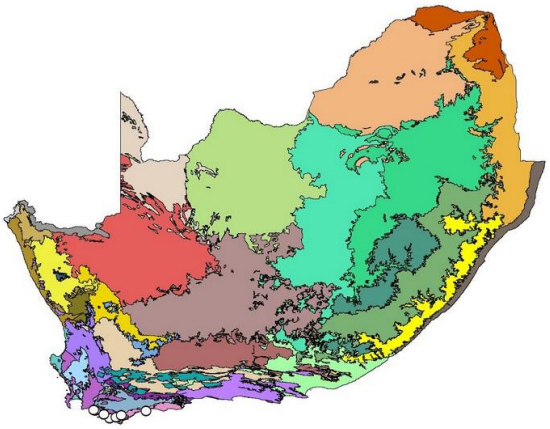


[E]*Amphithalea speciosa* Schltr. **Podalyrieae** ①

Shrub; P; Ht 0.9–1.3; Alt 182–215

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (60)	200–600 (40)
Min temp (°C)	>6 (60)	2–8 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	6.5–7.4 (40)	<6.4; 5.5–7.4; 6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3419 (71)	3420 (29)

NOTES: –

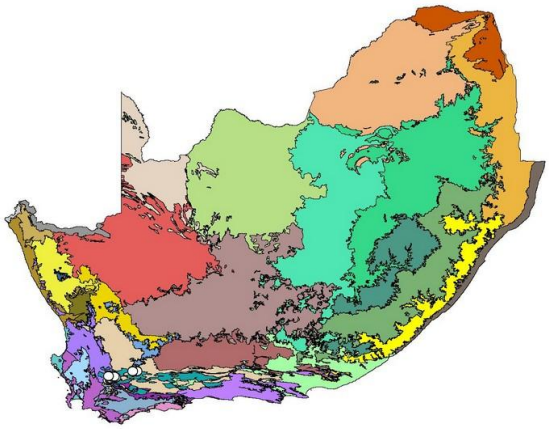


[E]*Amphithalea spinosa* (Harv.) A.L.Schutte **Podalyrieae** ①

Shrub; P; Ht 0.4–1.2; Alt 520–1035

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (67)	200–600 (33)
Min temp (°C)	0–4 (67)	2–8 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	6.5–8.4 (33)
ESP	Ecotone	
QDGCs	3319 (73)	3320 (27)

NOTES: –



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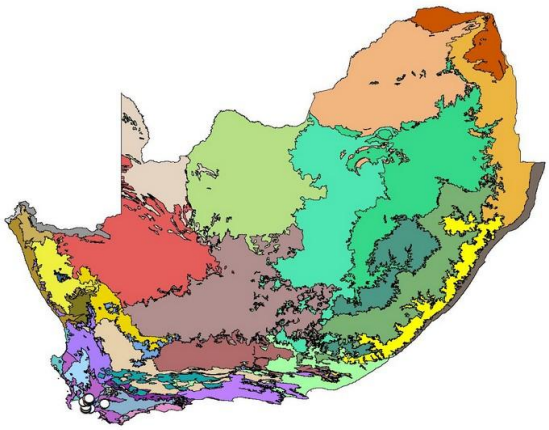
[E]*Amphithalea stokoei* L.Bolus **Podalyrieae** ①

Shrub; P; Ht 0.01–0.3; Alt 325–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (60)	400–800 (40)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	3418 (53)	3419 (47)

NOTES: –

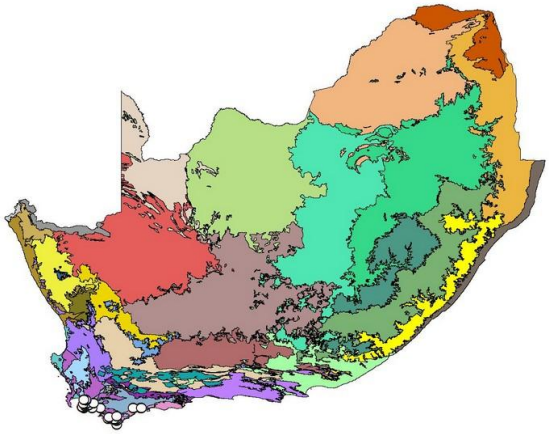


[E]*Amphithalea tomentosa* (Thunb.) Granby **Podalyrieae** ①

Shrub; P; Ht 0.3–0.9; Alt 30–2438

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	>800 (30)
Min temp (°C)	2–8 (70)	>6 (30)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (90)	<10 (10)
pH	<6.4 (50)	6.5–7.4 (30)
ESP	Non (100)	
QDGCs	3418; 3419 (45)	3420 (10)

NOTES: –

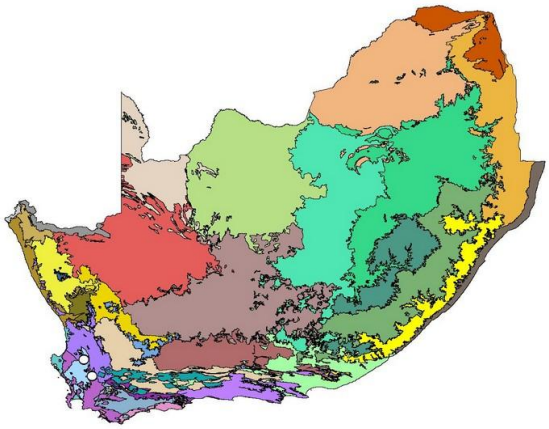


[E]*Amphithalea tortilis* (E.Mey.) Steud. **Podalyrieae** ①

Dwarf shrub; P; Ht 0.15–0.2; Alt 360–975

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4; 208 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3218; 3319 (50)	

NOTES: –



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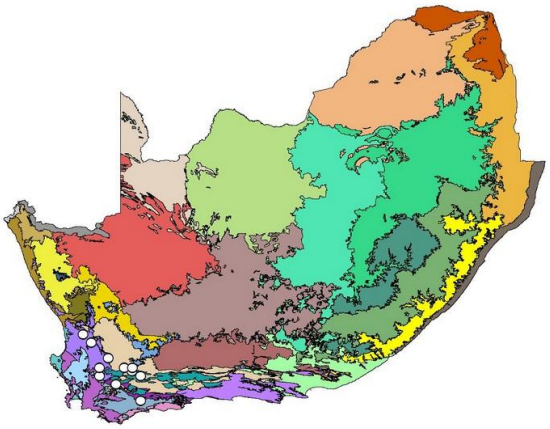
[E]*Amphithalea villosa* Schltr. **Podalyrieae** ①

Dwarf shrub; P; Ht 0.3–0.9; Alt 1005–1524

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400 (30)
Min temp (°C)	2–8 (70)	0–4 (30)
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	5–35 (90)	>20 (10)
pH	5.5–7.4 (40)	<6.4; 6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3320 (36)	3319 (27)

NOTES: –

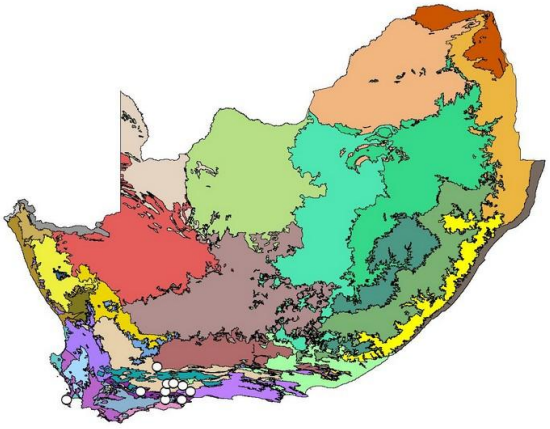


[E]*Amphithalea violacea* (E.Mey.) Benth. **Podalyrieae** ①

Shrub; P; Ht 0.3–1; Alt 245–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (50)	200–600 (30)
Min temp (°C)	2–8 (90)	>6 (10)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (80)	<10; >20 (10)
pH	6.5–8.4 (30)	<6.4; 5.5–7.4; >7.5 (20)
ESP	Ecotone	
QDGCs	3321 (50)	3421 (20)

NOTES: –

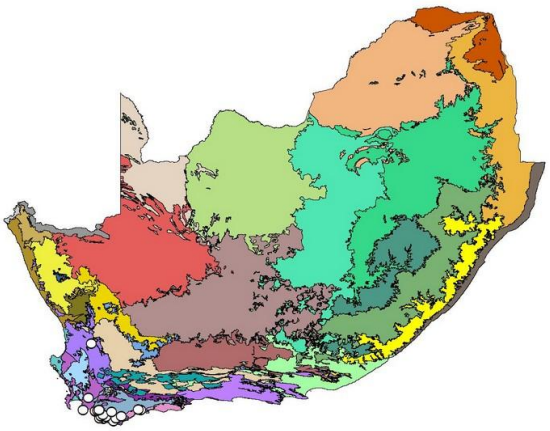


[E]*Amphithalea virgata* Eckl. & Zeyh. **Podalyrieae** ①

Dwarf shrub; P; Ht 0.15–0.3; Alt 58–914

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (55)	200–600 (27)
Min temp (°C)	2–8 (64)	>6 (36)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (82)	<10 (18)
pH	<6.4 (45)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	3419 (75)	3420 (15)

NOTES: –



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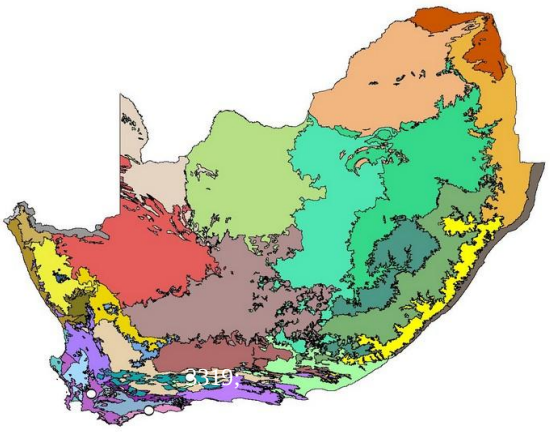
[E]*Amphithalea vlokii* (A.L.Schutte & B.-E.van Wyk) A.L.Schutte **Podalyrieae** ①

Dwarf shrub; P; Ht 0.01–1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; >800 (33)	
Min temp (°C)	0–4; 2–8; >6 (33)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	5.5–7.4; 6.5–7.4; >7.5 (33)	
ESP	Non (100)	
QDGCs	3319; 3322; 3420 (33)	

NOTES: –

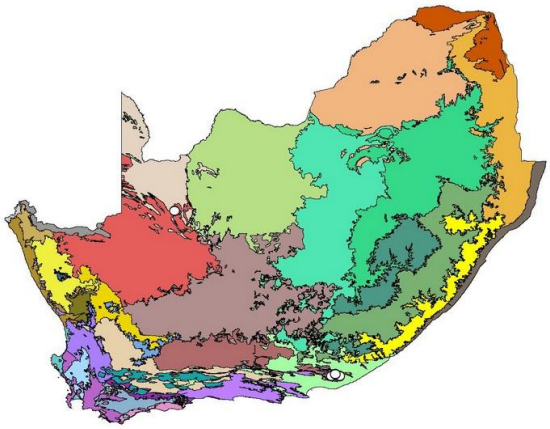


[E]*Amphithalea williamsonii* Harv. **Podalyrieae** ①

Dwarf shrub; P; Ht 0.2–0.5; Alt 460–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (67)	<400 (33)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (67)	>33 (33)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	>7.5 (33)
ESP	Ecotone	
QDGCs	3326 (75)	2821 (25)

NOTES: –

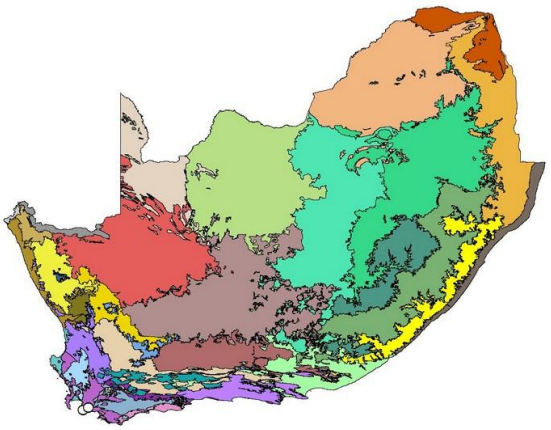


[E]*Argyrolobium aciculare* Dummer **Genisteae** ①

Herb; A; Ht 0.01–0.1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3418; 3419 (50)	

NOTES: –



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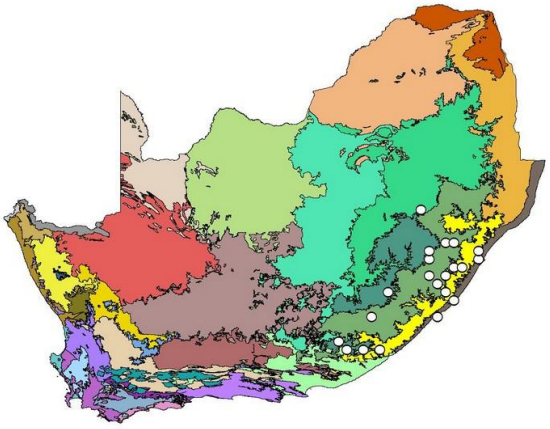
[E]*Argyrolobium amplexicaule* (E.Mey.) Dummer — Genisteae — ①

Dwarf shrub, climber; P; Ht 0.12–1; Alt 763–2073

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (67)	Indian Ocean Coastal Belt; Sub-Escarpment Savanna (17)
Biome	Grassland (89)	Indian Ocean (11)
Rainfall (mm)	>800 (71)	600–1000 (19)
Min temp (°C)	0–4; 2–8 (29)	>6 (24)
Max temp (°C)	25–29 (62)	<27 (38)
Phosphorus (ppm)	<10 (62)	5–35 (38)
pH	<6.4 (86)	5.5–7.4 (10)
ESP	Non (100)	
QDGCs	3029 (19)	2929; 2930 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer (Manning 2001).



[E]*Argyrolobium angustissimum* (E.Mey.) T.J.Edwards — Genisteae — –

Herb; P; Ht 0.2–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

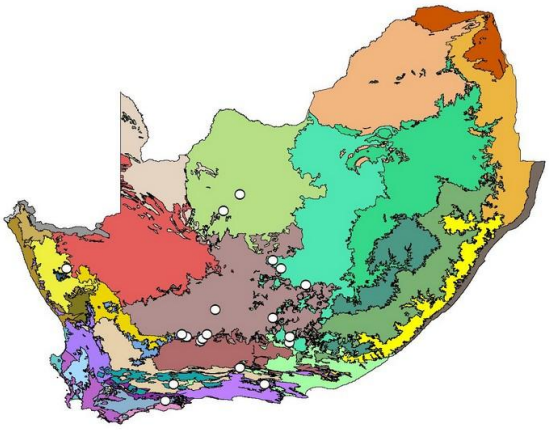
NOTES: –

[E]*Argyrolobium argenteum* Eckl. & Zeyh. — Genisteae — ①

Shrub, herb, climber; P; Ht 0.4–1; Alt 274–1676

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (50)	Upper Karoo; Namaqualand Hardeveld (25)
Biome	Nama-Karoo; Savanna (40)	Fynbos (20)
Rainfall (mm)	<400 (74)	200–600 (26)
Min temp (°C)	<2; 2–8 (37)	0–4 (26)
Max temp (°C)	27–35 (63)	25–29 (37)
Phosphorus (ppm)	5–35 (58)	>20 (32)
pH	6.5–8.4; >7.5 (32)	6.5–7.4 (26)
ESP	Non (75)	Medium (25)
QDGCs	3222 (21)	3225 (11)

NOTES: –



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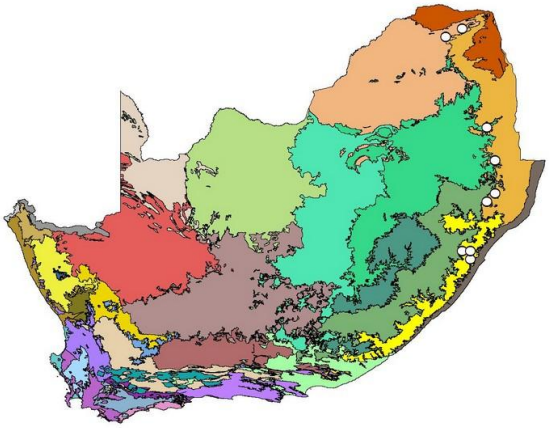
Argyrolobium ascendens Walp.

Genisteae ①

Herb; P; Ht 0.01–0.5; Alt 579–1372

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Sub-Escarpment Savanna (50)	
Biome	Savanna (100)	
Rainfall (mm)	>800 (56)	600–1000 (33)
Min temp (°C)	2–8 (89)	>6 (11)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (56)	5.5–7.4 (44)
ESP	Non (100)	
QDGCs	2930 (34)	2230; 2329; 2531; 2631; 2731; 2831 (11)

NOTES: –



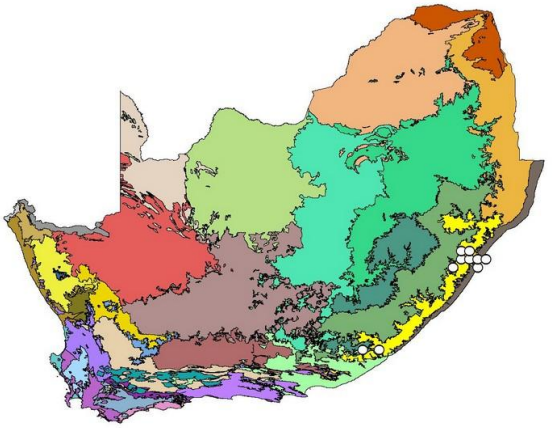
[E]*Argyrolobium baptisioides* (E.Mey.) Walp.

Genisteae ①

Dwarf shrub, shrub; P; Ht 0.01–1; Alt 610–1281

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (67)	Sub-Escarpment Savanna (33)
Biome	Indian Ocean (67)	Savanna (33)
Rainfall (mm)	>800 (80)	600–1000 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (90)	27–35 (10)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (60)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	2930 (50)	3030; 3227 (20)

NOTES: **Flowering:** Spring (Pooley 1998).



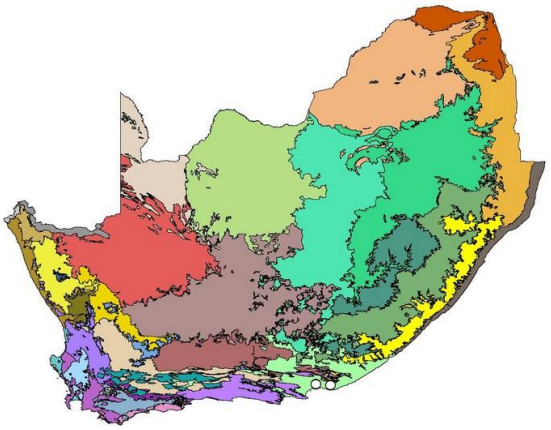
[E]*Argyrolobium barbatum* Walp.

Genisteae ①

Herb; P; Ht 0.15–1.8; Alt 183–245

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (100)	
Biome	Albany Thicket (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–8.4 (50)	
ESP	Non (100)	
QDGCs	3325; 3326 (50)	

NOTES: –



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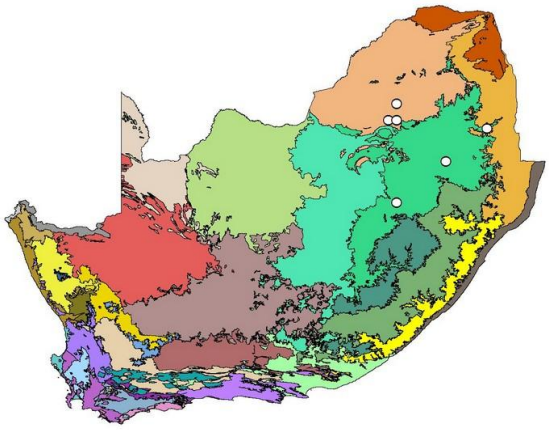
[E]*Argyrolobium campicola* Harms

Genisteae ①

Herb; P; Ht 0.28–0.8; Alt 915–1067

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (60)	Mesic Highveld Grassland (40)
Biome	Grassland (67)	Savanna (33)
Rainfall (mm)	400–800 (83)	>800 (17)
Min temp (°C)	2–8 (67)	<2 (33)
Max temp (°C)	27–35 (50)	<27 (33)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2528 (49)	2531; 2629; 2828 (17)

NOTES: –



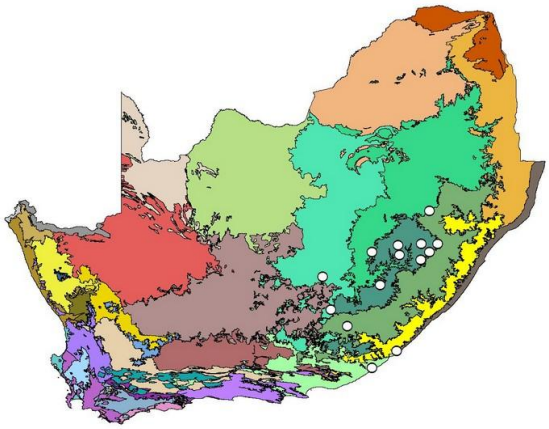
Argyrolobium candicans Eckl. & Zeyh.

Genisteae ③

Shrub; P; Ht 0.1–0.2; Alt 30–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (49)	Albany Thicket; Dry Highveld Grassland; Sub-Escarpment Grassland (17)
Biome	Grassland (92)	Albany Thicket (8)
Rainfall (mm)	400–800 (50)	>800 (29)
Min temp (°C)	<2 (64)	0–4 (21)
Max temp (°C)	<27 (50)	25–29 (43)
Phosphorus (ppm)	<10 (64)	5–35 (36)
pH	<6.4 (71)	6.5–8.4 (14)
ESP	Non (100)	
QDGCs	2929 (38)	2928; 3126

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



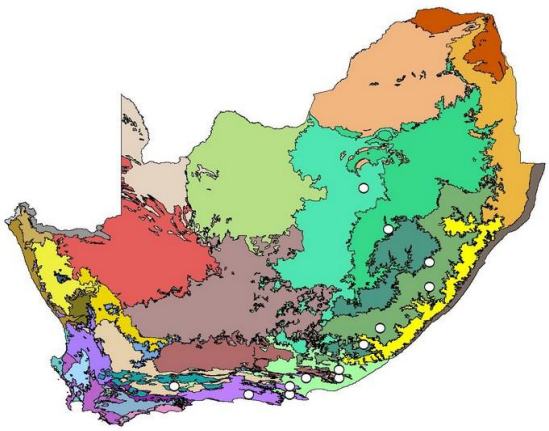
Argyrolobium collinum Eckl. & Zeyh.

Genisteae ②

Dwarf shrub; P; Ht 0.1–0.45; Alt 518–1433

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (40)	Eastern Fynbos-Renosterveld; Dry & Mesic Highveld Grassland; (20)
Biome	Grassland (100)	
Rainfall (mm)	400–800 (46)	>800 (23)
Min temp (°C)	2–8 (69)	<2 (23)
Max temp (°C)	25–29 (46)	<27 (23)
Phosphorus (ppm)	5–35 (62)	<10 (38)
pH	5.5–7.4 (54)	<6.4 (31)
ESP	Non (80)	Medium (20)
QDGCs	3325 (23)	3326 (15)

NOTES: **Livestock feed** (Shearing & Van Heerden 1997). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Autumn (Moriarty 1997).



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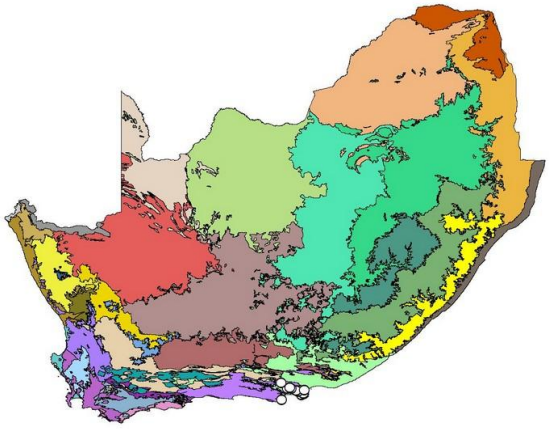
[E]*Argyrolobium crassifolium* Eckl. & Zeyh.

Genisteae ①

Dwarf shrub; P; Ht 0.6–1.5; Alt 122–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (80)	200–600 (20)
Min temp (°C)	>6 (60)	2–8 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–8.4 (40)	<6.4 (20)
ESP	Ecotone	
QDGCs	3325 (82)	3324; 3424 (9)

NOTES: –



[E]*Argyrolobium crinitum* (E.Mey.) Walp.

Genisteae –

Dwarf shrub; P; Ht 0.01–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

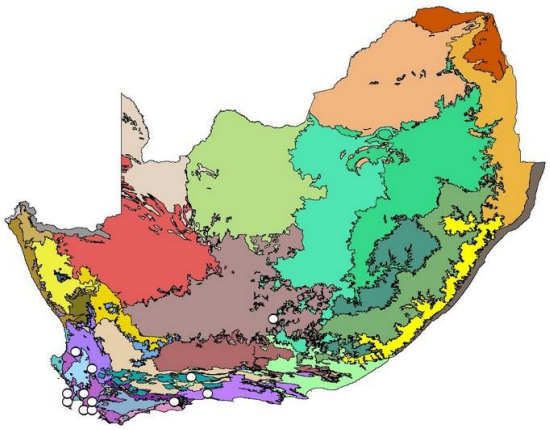
[E]*Argyrolobium filiforme* (Thunb.) Eckl. & Zeyh.

Genisteae ①

Herb; P; Ht 0.1–0.15; Alt 21–945

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (32)	<400; 200–600; 400–800; >800 (17)
Min temp (°C)	2–8 (58)	>6 (25)
Max temp (°C)	25–29 (92)	27–35 (8)
Phosphorus (ppm)	5–35 (83)	<10; >20 (8)
pH	<6.4 (75)	6.5–7.4 (17)
ESP	Non (50)	Medium (50)
QDGCs	3318; 3322; 3418; 3419 (17)	3124; 3218; 3319; 3421 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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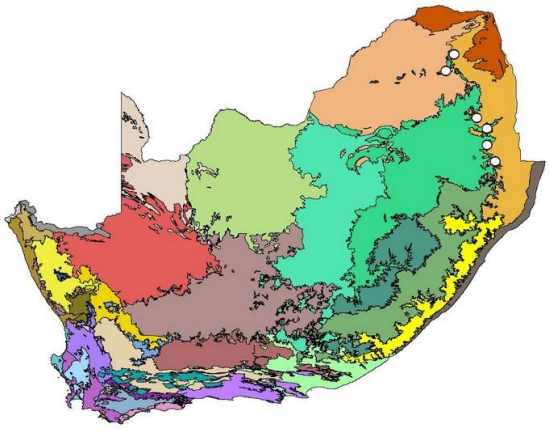
Argyrolobium frutescens Burtt Davy

Genisteae ①

Shrub; P; Ht 0.5–0.6; Alt 762–1464

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (50)	600–1000 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (83)	5.5–7.4 (17)
ESP	Ecotone	
QDGCs	2631 (32)	2330; 2429; 2530; 2531 (17)

NOTES: –



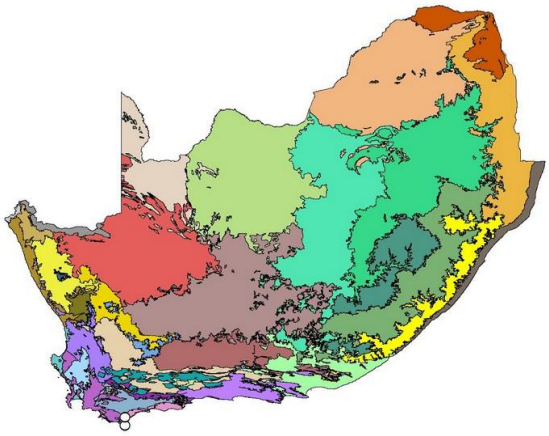
[E]*Argyrolobium harmsianum* Schltr. ex Harms

Genisteae ①

Dwarf shrub; P; Ht ?–2; Alt ?–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	>6 (100)	
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3420 (100)	

NOTES: –



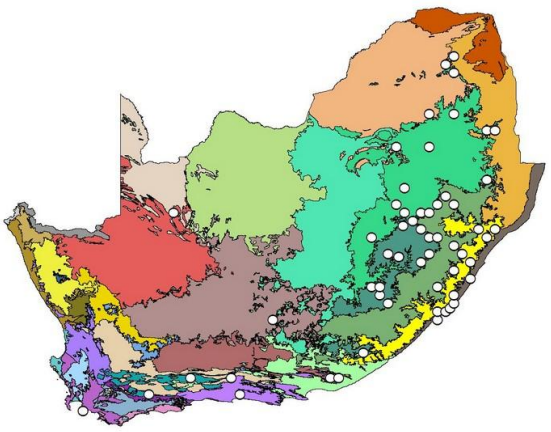
Argyrolobium harveyanum Oliv.

Genisteae ①

Dwarf shrub, herb; P; Ht 0.1–0.5; Alt 0–2450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (33)	Drakensberg Grassland (20)
Biome	Grassland (89)	Indian Ocean (7)
Rainfall (mm)	>800 (44)	600–1000 (26)
Min temp (°C)	2–8 (33)	<2 (28)
Max temp (°C)	25–29 (63)	<27 (26)
Phosphorus (ppm)	<10 (72)	5–35 (26)
pH	<6.4 (74)	5.5–7.4 (19)
ESP	Non (93)	Medium (7)
QDGCs	2828; 2829; 2929; 3130 (7)	2928; 2930; 3027; 3030; 3129 (5)

NOTES: **Flowering:** Whole year (Pooley 1998).



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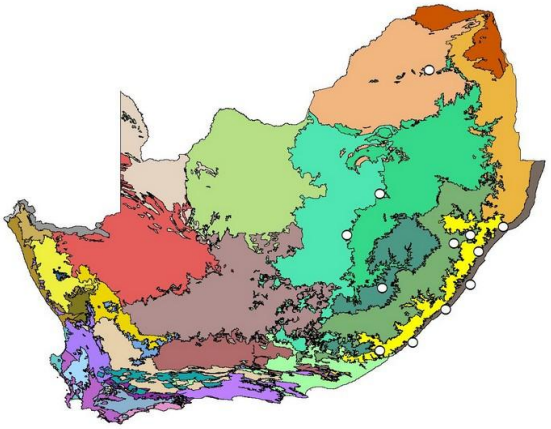
[E]*Argyrolobium humile* E.Phillips

Genisteae ①

Herb; P; Ht 0.02–0.75; Alt 50–2130

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (50)	Sub-Escarpment Grassland; Central Bushveld (25)
Biome	Grassland (50)	Indian Ocean (38)
Rainfall (mm)	>800 (54)	600–1000 (23)
Min temp (°C)	>6 (46)	<2 (23)
Max temp (°C)	25–29 (77)	<27 (15)
Phosphorus (ppm)	<10 (62)	5–35 (38)
pH	<6.4 (77)	5.5–7.4 (15)
ESP	Non (100)	
QDGCs	2930 (20)	2429; 2727; 2831; 2926; 3027; 3030; 3129; 3130; 3227; 3228 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



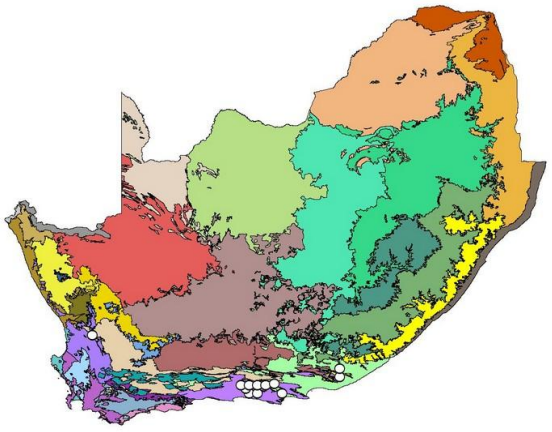
[E]*Argyrolobium incanum* Eckl. & Zeyh.

Genisteae ①

Dwarf shrub; P; Ht 0.07–1.5; Alt 61–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	200–600 (55)	400–800 (36)
Min temp (°C)	2–8 (91)	>6 (9)
Max temp (°C)	25–29 (73)	<27 (18)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (55)	<6.4 (45)
ESP	Medium (100)	
QDGCs	3324 (42)	3323 (33)

NOTES: –



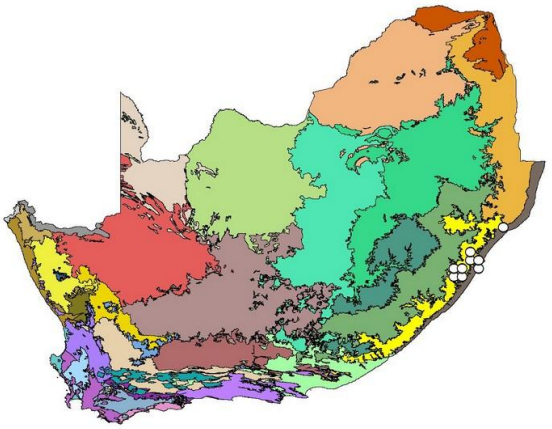
[E]*Argyrolobium longifolium* (Meisn.) Walp.

Genisteae ①

Dwarf shrub; P; Ht 0.3–1.5; Alt 610–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Savanna (67)	Indian Ocean Coastal Belt (33)
Biome	Indian Ocean; Savanna (50)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (89)	5–35 (11)
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3030 (56)	2930 (33)

NOTES: **Biocultural:** Magical (Hutchings *et al.* 1996).



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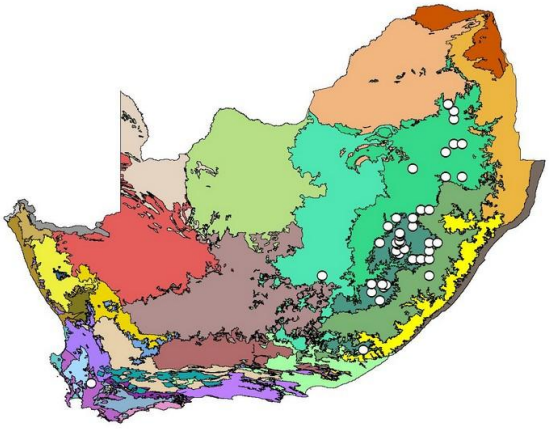
***Argyrolobium lotoides* Harv.** **Genisteae** ①

Herb; P; Ht 0.05–0.2; Alt 335–3000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (47)	Mesic Highveld Grassland (42)
Biome	Grassland (97)	Fynbos (3)
Rainfall (mm)	>800 (41)	600–1000 (35)
Min temp (°C)	<2 (70)	0–4 (24)
Max temp (°C)	<27 (70)	25–29 (27)
Phosphorus (ppm)	<10 (89)	5–35 (11)
pH	<6.4 (78)	5.5–7.4 (19)
ESP	Non (100)	
QDGCs	2928 (36)	2929 (10)

NOTES: –

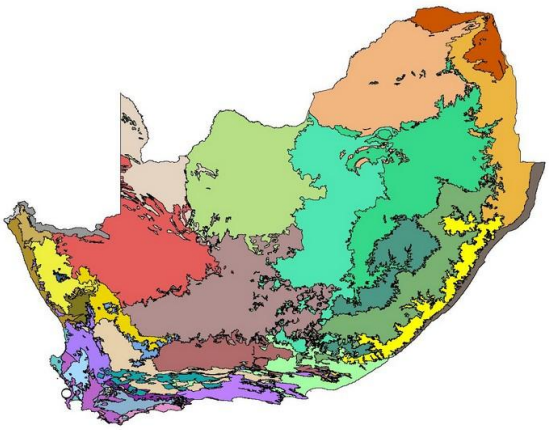


[E]*Argyrolobium lunare* (L.) Druce subsp. *lunare* **Genisteae** ①

Dwarf shrub; P; Ht ? Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: –

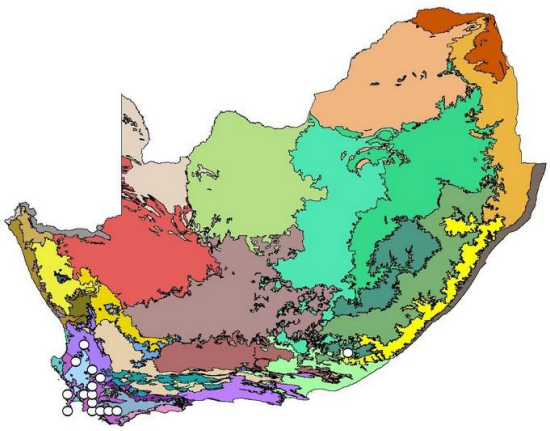


[E]*Argyrolobium lunare* (L.) Druce subsp. *sericeum* (Thunb.) T.J.Edwards **Genisteae** ①

Unknown; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (40)	200–600 (27)
Min temp (°C)	2–8 (53)	0–4 (27)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (93)	<10 (7)
pH	<6.4 (53)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	3419 (33)	3319 (27)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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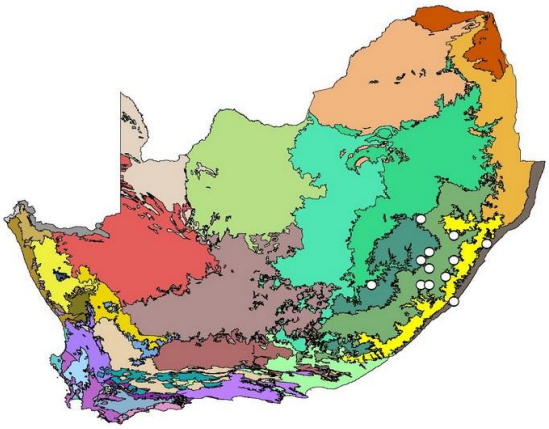
Argyrolobium marginatum Bolus

Genisteae ②

Herb; P; Ht 0.1–1.8; Alt 61–2409

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (75)	600–1000 (25)
Min temp (°C)	<2; 0–4 (33)	2–8; >6 (17)
Max temp (°C)	25–29 (58)	<27 (42)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3029 (33)	2929; 2930 (17)

NOTES: **Livestock feed** (Pooley 2003). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer (Pooley 2003).



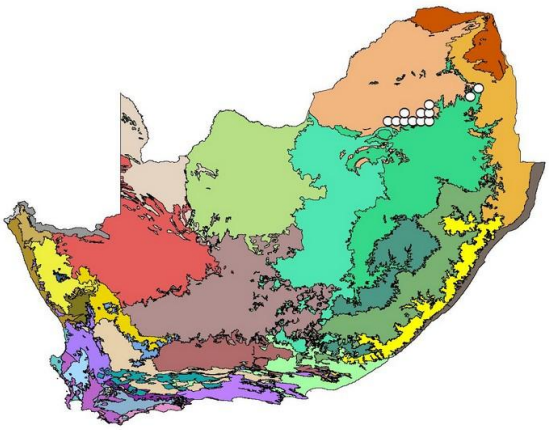
[E]*Argyrolobium megarrhizum* Bolus

Genisteae ①

Dwarf shrub, shrub; P; Ht 0.3–7; Alt 945–1311

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (84)	600–1000; >800 (8)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (58)	27–35 (42)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2528; 2529 (42)	2430 (16)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



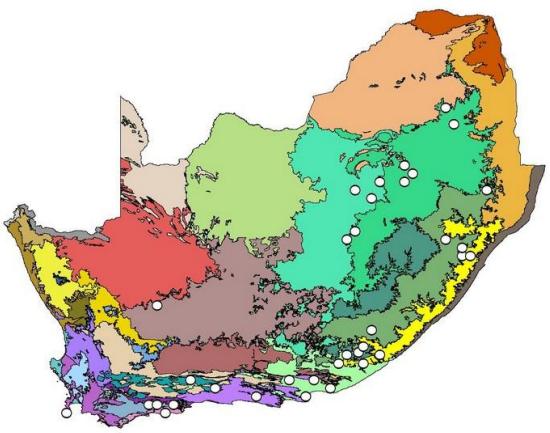
[E]*Argyrolobium molle* Eckl. & Zeyh.

Genisteae ①

Herb; P; Ht 0.05–0.2; Alt 61–2683

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (30)	Dry Highveld Grassland (20)
Biome	Grassland (60)	Fynbos (27)
Rainfall (mm)	400–800 (51)	200–600 (23)
Min temp (°C)	2–8 (54)	<2 (26)
Max temp (°C)	25–29 (69)	27–35 (26)
Phosphorus (ppm)	<10 (51)	5–35 (43)
pH	5.5–7.4 (43)	<6.4 (37)
ESP	Non (90)	Medium (10)
QDGCs	3227 (11)	2727; 2930; 3325; 3421 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1972).



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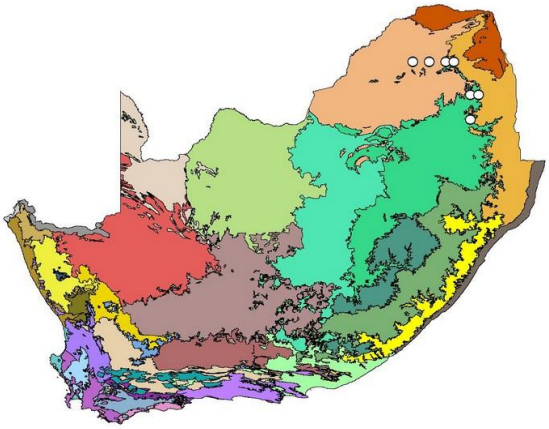
[E]*Argyrolobium muddii* Dummer

Genisteae ①

Dwarf shrub, herb; P; Ht 0.25–0.6; Alt 1200–1677

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (42)	600–1000; >800 (29)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (57)	27–35 (43)
Phosphorus (ppm)	<10 (57)	5–35 (43)
pH	<6.4 (71)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	2329; 2430 (29)	2328; 2330; 2530 (14)

NOTES: –



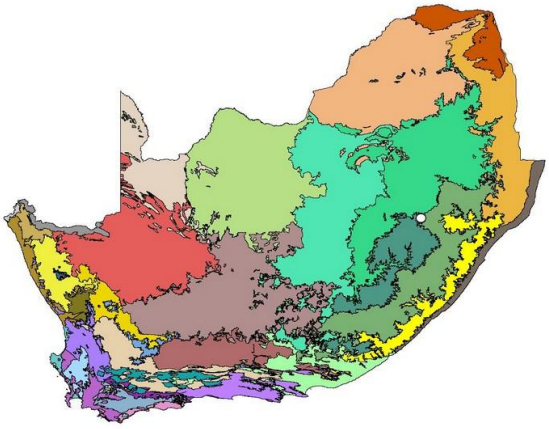
[E]*Argyrolobium nanum* Schltr. ex Harms

Genisteae ①

Herb; P; Ht 0.01–0.1; Alt 1525–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Grassland (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2829 (100)	

NOTES: –



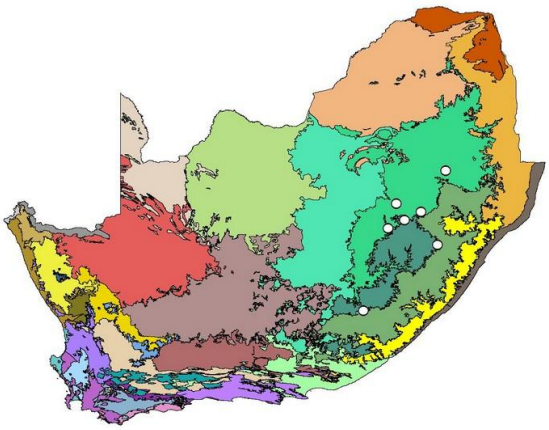
Argyrolobium nigrescens Dummer

Genisteae ①

Herb; P; Ht 0.07–0.2; Alt 1098–2134

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800; >800 (43)	600–1000 (14)
Min temp (°C)	<2 (71)	0–4 (29)
Max temp (°C)	<27 (86)	25–29 (14)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4 (86)	5.5–7.4 (14)
ESP	Non (100)	
QDGCs	2828 (44)	2729; 2829; 2929; 3127 (14)

NOTES: –



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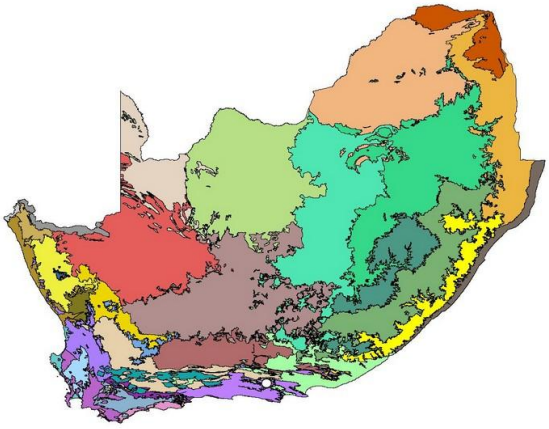
[E]*Argyrolobium parviflorum* T.J.Edwards

Genisteae ①

Shrub; P; Ht 0.01–1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3324 (100)	

NOTES: –



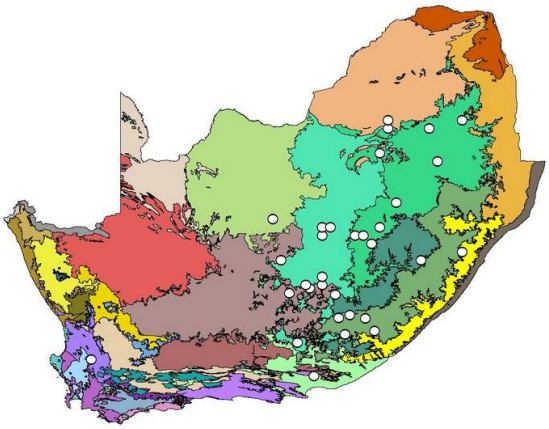
Argyrolobium pauciflorum Eckl. & Zeyh.

Genisteae ①

Herb; P; Ht 0.45–0.55; Alt 250–2043

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (44)	Dry Highveld Grassland (31)
Biome	Grassland (85)	Fynbos; Nama-Karoo; Savanna (5)
Rainfall (mm)	400–800 (59)	200–600 (16)
Min temp (°C)	<2 (59)	0–4 (22)
Max temp (°C)	27–35 (44)	25–29 (38)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	6.5–8.4 (44)	<6.4 (31)
ESP	Non (100)	
QDGCs	2927; 3025; 3026 (9)	2528; 2826; 3126 (6)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer (Pooley 1998).



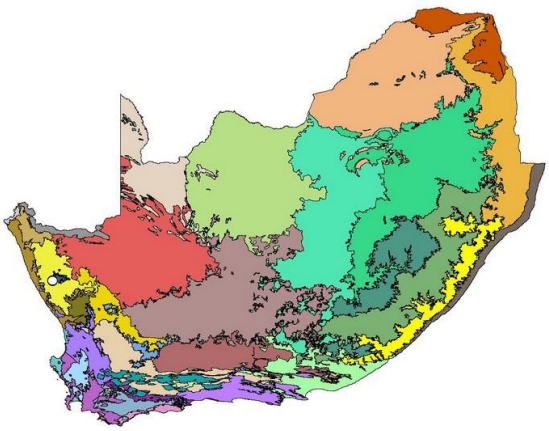
[E]*Argyrolobium petiolare* (E.Mey.) Steud.

Genisteae ①

Dwarf shrub; P; Ht 0.3–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Medium (100)	
QDGCs	3017 (100)	

NOTES: –



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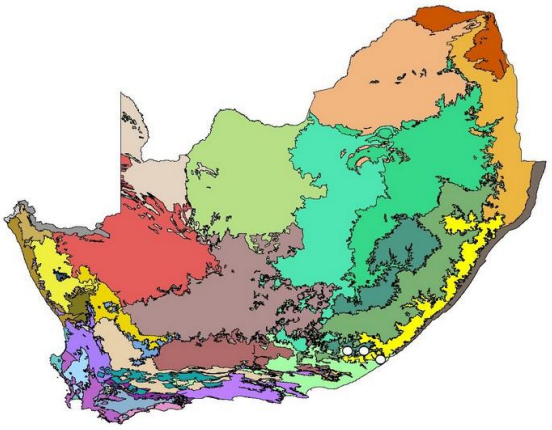
[E]*Argyrolobium polyphyllum* Eckl. & Zeyh.

Genisteae ①

Dwarf shrub, shrub; P; Ht 0.3–1.5; Alt 15–1677

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	600–1000 (67)	400–800 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Ecotone	
QDGCs	3227 (67)	3226 (33)

NOTES: **Flowering:** Summer (Manning 2001).



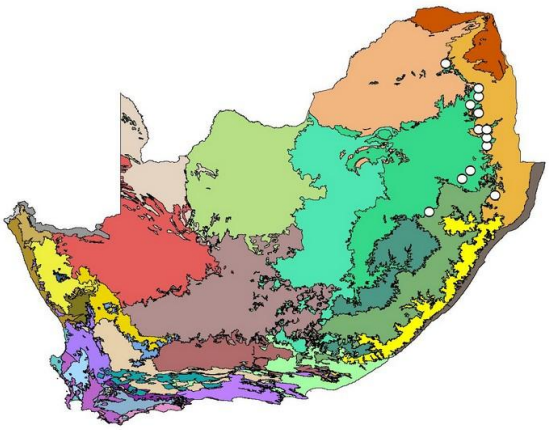
Argyrolobium pseudotuberosum T.J.Edwards

Genisteae ①

Herb; P; Ht 0.12–0.6; Alt 1067–2074

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (77)	600–1000 (15)
Min temp (°C)	2–8 (69)	0–4 (31)
Max temp (°C)	25–29 (92)	<27 (8)
Phosphorus (ppm)	<10 (92)	5–35 (8)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2530 (23)	2430; 2631; 2730 (15)

NOTES: –



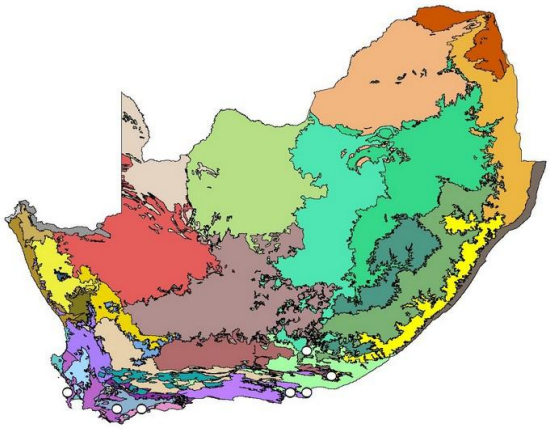
[E]*Argyrolobium pumilum* Eckl. & Zeyh.

Genisteae ①

Dwarf shrub; P; Ht 0.1–0.25; Alt 15–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (43)	600–1000 (14)
Min temp (°C)	2–8 (57)	>6 (43)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (43)	6.5–7.4 (29)
ESP	Ecotone	
QDGCs	3325 (30)	3225; 3318; 3326; 3419; 3420 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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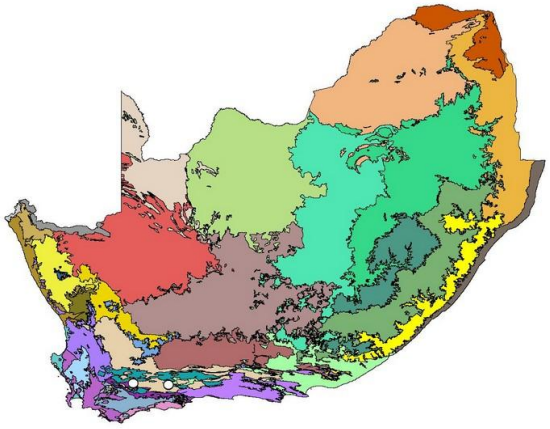
[E]*Argyrolobium rarum* Dummer

Genisteae ①

Dwarf shrub; P; Ht ?; Alt 300–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3320; 3321 (50)	

NOTES: –



Argyrolobium robustum T.J.Edwards

Genisteae –

Dwarf shrub; ?; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: **Flowering:** Spring, summer (Pooley 2003).

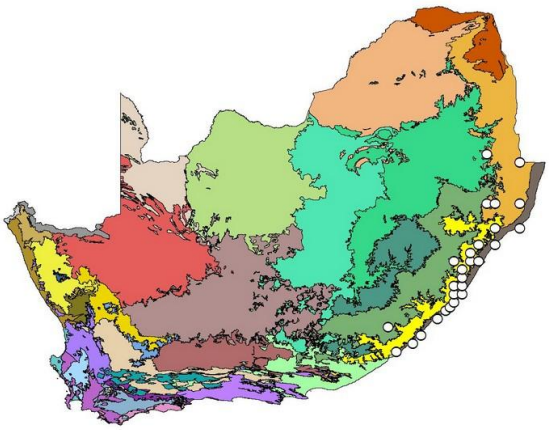
Argyrolobium rotundifolium T.J.Edwards

Genisteae ①

Herb; P; Ht 0.15–1.8; Alt 2–976

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (44)	Lowveld; Sub-Escarpment Savanna (22)
Biome	Indian Ocean (56)	Savanna (33)
Rainfall (mm)	>800 (81)	600–1000 (15)
Min temp (°C)	>6 (81)	2–8 (19)
Max temp (°C)	25–29 (85)	27–35 (15)
Phosphorus (ppm)	<10 (62)	5–35 (38)
pH	<6.4 (77)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	3030 (22)	2930 (19)

NOTES: –



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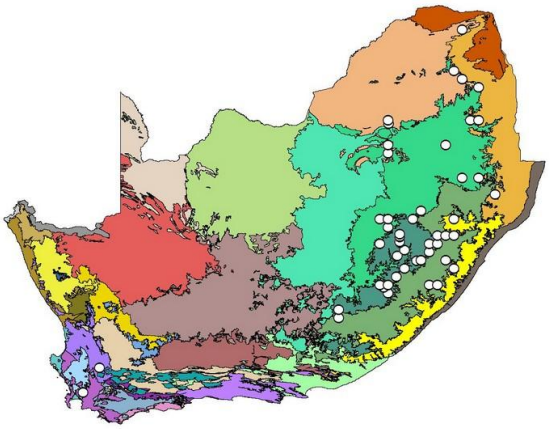
Argyrolobium rupestre (E.Mey.) Walp. subsp. *rupestre*

Genisteae ①

Herb; P; Ht 0.1–0.6; Alt 200–2440

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland; Mesic Highveld Grassland (36)	Sub-Escarpment Grassland (18)
Biome	Grassland (89)	Savanna (7)
Rainfall (mm)	>800 (47)	600–1000 (29)
Min temp (°C)	<2 (44)	2–8 (29)
Max temp (°C)	25–29 (49)	<27 (47)
Phosphorus (ppm)	<10 (82)	5–35 (18)
pH	<6.4 (78)	5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2928 (18)	2929 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



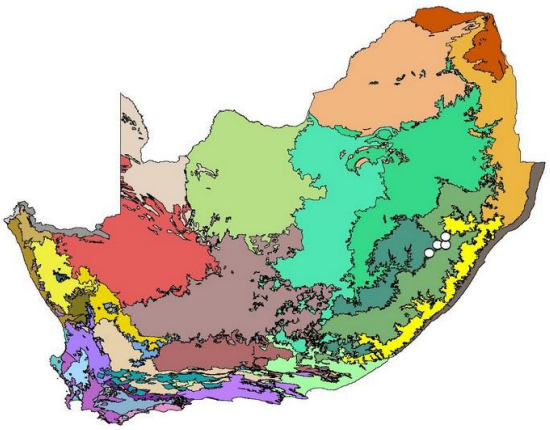
[E]*Argyrolobium sankeyi* Harms

Genisteae ①

Herb; P; Ht ?; Alt ?–1708

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (75)	600–1000 (25)
Min temp (°C)	0–4 (75)	<2 (25)
Max temp (°C)	<27 (75)	25–29 (25)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2929 (100)	

NOTES: **Flowering:** Summer (Pooley 1998).



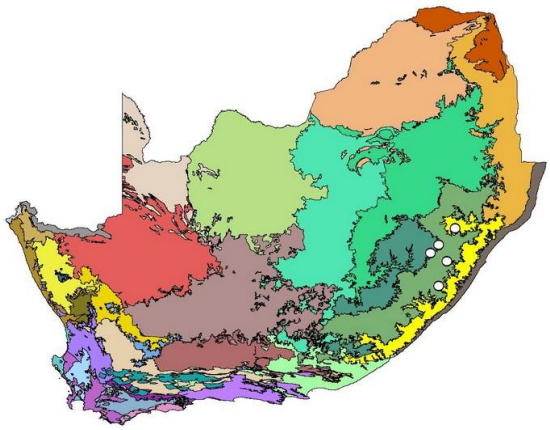
[E]*Argyrolobium sericosemium* Harms

Genisteae ①

Herb; P; Ht 0.1–0.3; Alt 1500–2226

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Grassland (100)	
Rainfall (mm)	>800 (80)	600–1000 (20)
Min temp (°C)	0–4; 2–8 (40)	<2 (20)
Max temp (°C)	<27 (60)	25–29 (40)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Ecotone	
QDGCs	2929 (60)	2830; 3029 (20)

NOTES: **Flowering:** Spring, summer, autumn (Pooley 1998).



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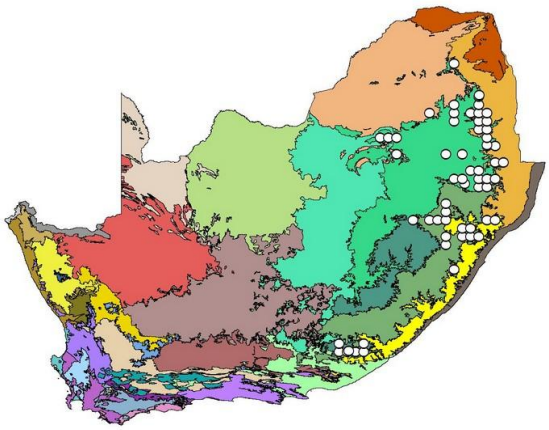
Argyrolobium speciosum Eckl. & Zeyh.

Genisteae ③

Herb; P; Ht 0.2–5; Alt 610–1952

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (50)	Sub-Escarpment Grassland (29)
Biome	Grassland (87)	Savanna (13)
Rainfall (mm)	600–1000 (40)	>800 (35)
Min temp (°C)	2–8 (53)	0–4 (40)
Max temp (°C)	25–29 (68)	27–35 (19)
Phosphorus (ppm)	<10 (84)	5–35 (16)
pH	<6.4 (84)	5.5–7.4 (12)
ESP	Non (100)	
QDGCs	2530 (13)	2730 (12)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996).



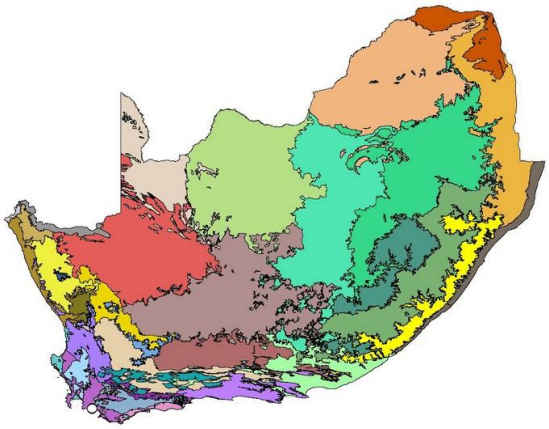
[E]*Argyrolobium splendens* (E.Mey.) Walp.

Genisteae ①

Herb; P; Ht 0.2–0.3; Alt ?–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: –



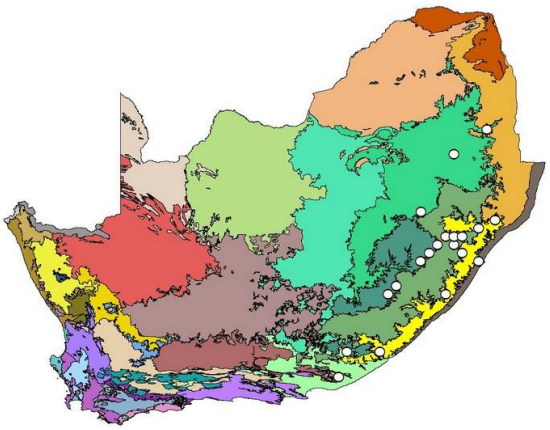
Argyrolobium stipulaceum Eckl. & Zeyh.

Genisteae ①

Herb; P; Ht 0.12–0.3; Alt 6–2440

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Sub-Escarpment Grassland (50)	
Biome	Grassland (89)	Savanna (11)
Rainfall (mm)	>800 (55)	600–1000 (35)
Min temp (°C)	2–8 (40)	0–4 (35)
Max temp (°C)	25–29 (60)	<27 (40)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2929; 2930 (24)	3028 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Spring, summer (Pooley 1998).



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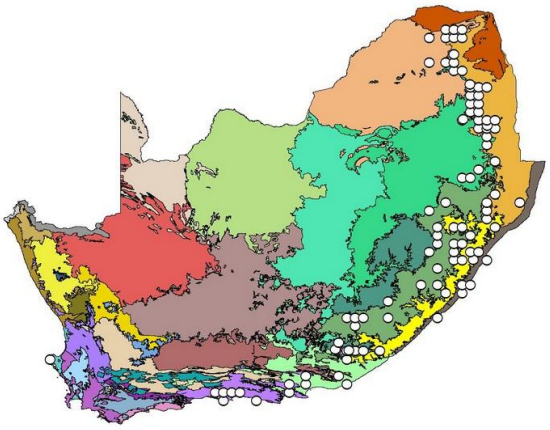
Argyrolobium tomentosum (Andrews) Druce

Genisteae ③❖

Dwarf shrub; P; Ht 0.2–2; Alt 9–3019

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (29)	Eastern Fynbos-Renosterveld (17)
Biome	Grassland (51)	Savanna (29)
Rainfall (mm)	>800 (42)	600–1000 (31)
Min temp (°C)	2–8 (58)	0–4 (23)
Max temp (°C)	25–29 (69)	<27 (18)
Phosphorus (ppm)	<10 (58)	5–35 (42)
pH	<6.4 (69)	5.5–7.4 (22)
ESP	Non (80)	Medium (20)
QDGCs	2930; 3226 (9)	2630 (8)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Magical (Hutchings *et al.* 1996). **Flowering:** Whole year (Pooley 1998).



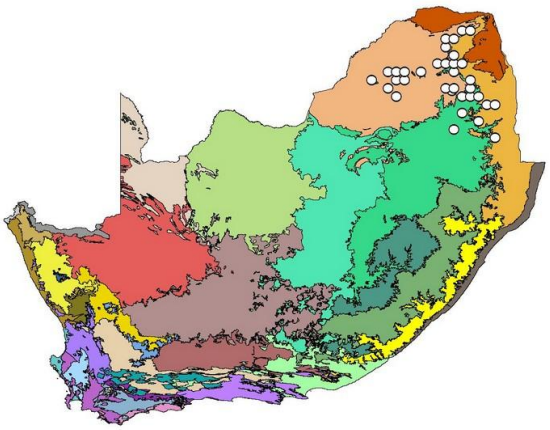
Argyrolobium transvaalense Schinz

Genisteae ③

Dwarf shrub, shrub; P; Ht 0.05–0.3; Alt 610–2040

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (64)	Lowveld (21)
Biome	Savanna (94)	Grassland (6)
Rainfall (mm)	400–800 (64)	600–1000 (24)
Min temp (°C)	2–8 (85)	>6 (12)
Max temp (°C)	25–29 (64)	27–35 (30)
Phosphorus (ppm)	<10 (61)	5–35 (39)
pH	<6.4 (58)	5.5–7.4 (36)
ESP	Non (100)	
QDGCs	2430 (24)	2428 (21)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972, 1975). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



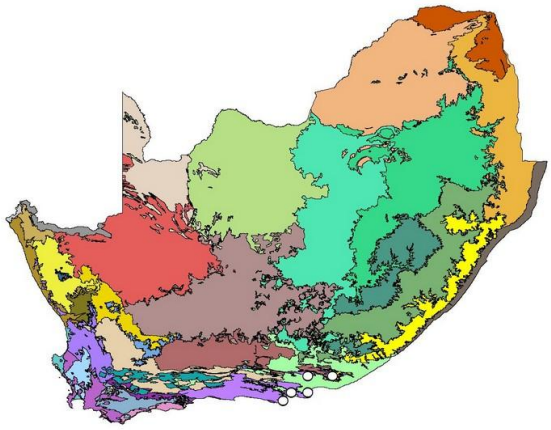
[E]*Argyrolobium trifoliatum* (Thunb.) Druce

Genisteae ①

No records

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (80)	200–600 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (60)	<6.4; 6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3325 (60)	3326; 3424 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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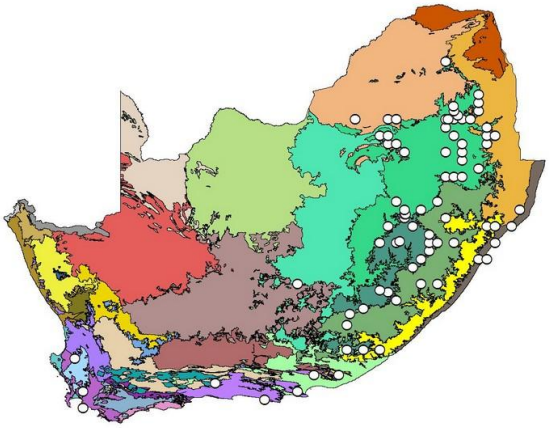
Argyrolobium tuberosum Eckl. & Zeyh.

Genisteae ①

Herb; P; Ht 0.6–0.89; Alt 91–2897

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (48)	Drakensberg Grassland; Sub-Escarpment Grassland (14)
Biome	Grassland (83)	Fynbos (10)
Rainfall (mm)	>800 (41)	400–800 (30)
Min temp (°C)	0–4 (33)	<2 (29)
Max temp (°C)	25–29 (50)	<27 (37)
Phosphorus (ppm)	<10 (79)	5–35 (21)
pH	<6.4 (82)	5.5–7.4 (12)
ESP	Non (100)	
QDGCs	2530 (10)	2828 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer (Pooley 1998).



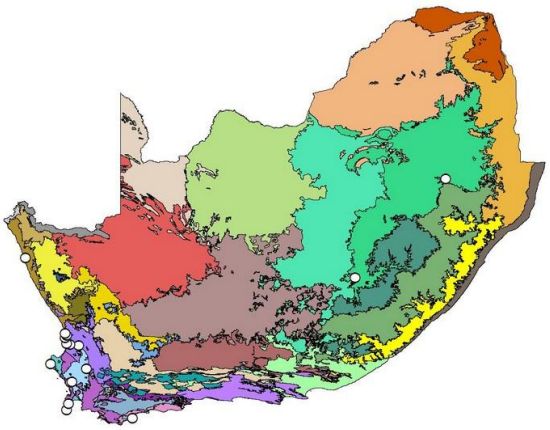
[E]*Argyrolobium velutinum* Eckl. & Zeyh.

Genisteae ①

Dwarf shrub; P; Ht 0.1–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos; West Strandveld; Namaqualand Sandveld (25)	
Biome	Fynbos (77)	Grassland (15)
Rainfall (mm)	<400 (38)	200–600 (31)
Min temp (°C)	>6 (76)	<2; 0–4; 2–8 (8)
Max temp (°C)	25–29; 27–35 (38)	<27 (24)
Phosphorus (ppm)	5–35 (77)	<10 (15)
pH	<6.4 (38)	6.5–7.4 (31)
ESP	Non (50)	Medium; High (25)
QDGCs	3218 (41)	3318 (18)

NOTES: **Flowering:** Spring, summer (Van Wyk & Malan 1998).



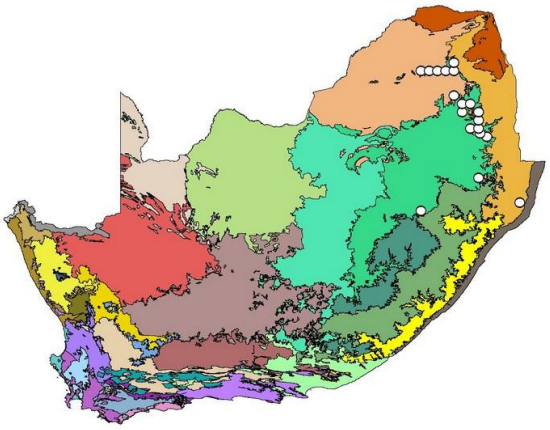
Argyrolobium wilmsii Harms

Genisteae ①

Shrub; P; Ht 0.3–2; Alt 640–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (60)	Central Bushveld; Lowveld (20)
Biome	Grassland; Savanna (50)	
Rainfall (mm)	>800 (36)	400–800; 600–1000 (32)
Min temp (°C)	2–8 (79)	0–4 (11)
Max temp (°C)	25–29 (63)	<27 (21)
Phosphorus (ppm)	<10 (68)	5–35 (32)
pH	<6.4 (63)	5.5–7.4 (32)
ESP	Non (100)	
QDGCs	2530 (37)	2429 (21)

NOTES: –



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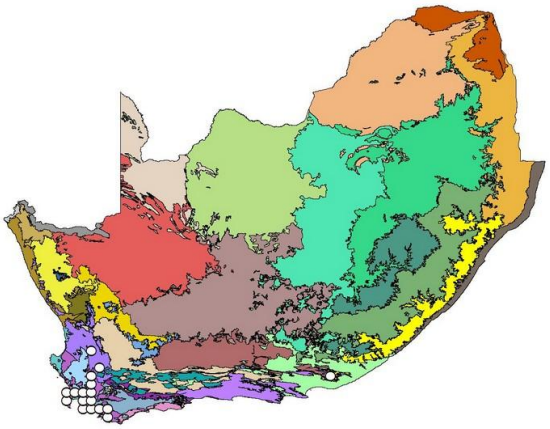
[E]*Aspalathus abietina* Thunb.

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–0.6; Alt 15–1062

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (67)	Northwest Fynbos (33)
Biome	Fynbos (100)	
Rainfall (mm)	200–600; >800 (29)	400–800 (24)
Min temp (°C)	2–8 (53)	0–4; >6 (24)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (88)	<10 (12)
pH	<6.4 (65)	5.5–7.4 (35)
ESP	Non (100)	
QDGCs	3419 (29)	3319 (24)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



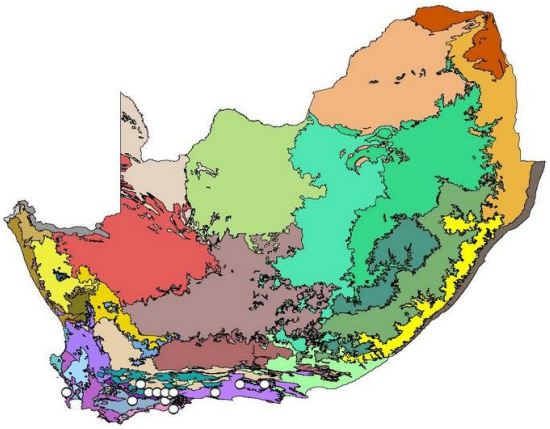
[E]*Aspalathus acanthes* Eckl. & Zeyh.

Crotalarieae ①

Shrub; P; Ht 0.4–3.5; Alt 75–730

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos; Eastern–Fynbos Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (58)	<400 (25)
Min temp (°C)	2–8 (92)	>6 (8)
Max temp (°C)	25–29 (50)	27–35 (42)
Phosphorus (ppm)	5–35 (84)	<10; >20 (8)
pH	5.5–7.4 (42)	6.5–8.4 (33)
ESP	Non; Medium (50)	
QDGCs	3321 (31)	3320; 3421 (15)

NOTES: –



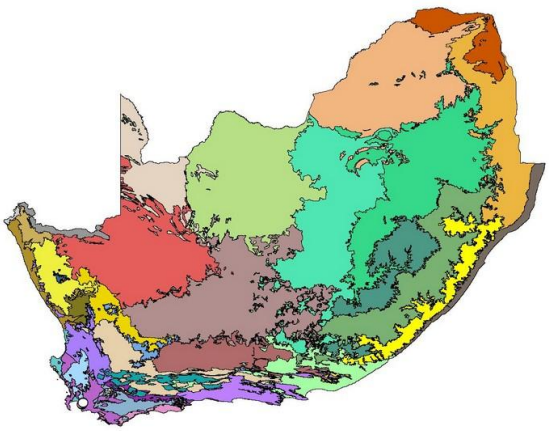
[E]*Aspalathus acanthiloba* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.5–0.8; Alt ?–180

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3418 (100)	

NOTES: –



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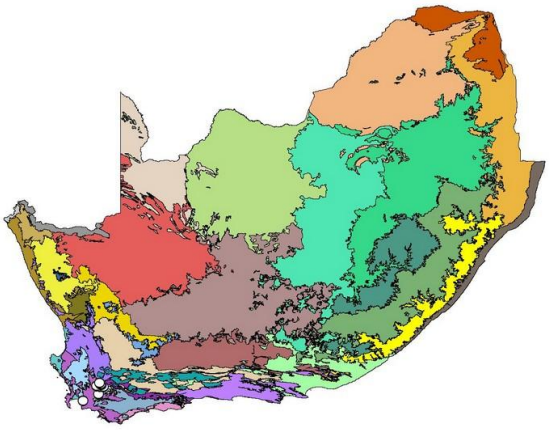
[E]*Aspalathus acanthoclada* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.4–1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	>800 (33)
Min temp (°C)	0–4 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Ecotone	
QDGCs	3319 (94)	3418 (6)

NOTES: –



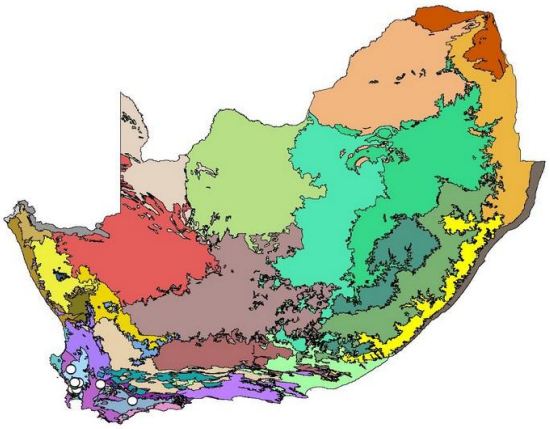
[E]*Aspalathus acanthophylla* Eckl. & Zeyh.

Crotalarieae ①

Shrub; P; Ht 0.3–0.9; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (80)	<400 (20)
Min temp (°C)	>6 (60)	0–4; 2–8 (20)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (60)	<6.4 (40)
ESP	Ecotone	
QDGCs	3318 (86)	3319; 3420 (14)

NOTES: –



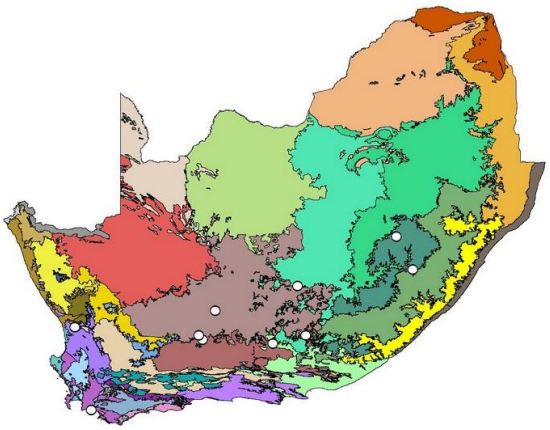
Aspalathus acicularis E.Mey. subsp. *acicularis*

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.25–1.5; Alt 1525–1829

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland; Upper Karoo (50)	
Biome	Grassland (50)	Fynbos; Nama-Karoo (25)
Rainfall (mm)	<400 (60)	>800 (20)
Min temp (°C)	<2 (40)	0–4; 2–8; >6 (20)
Max temp (°C)	27–35 (60)	<27; 25–29 (20)
Phosphorus (ppm)	5–35 (50)	>20 (30)
pH	>7.5 (40)	<6.4 (30)
ESP	Non (100)	
QDGCs	3222 (20)	2928; 3025; 3028; 3118; 3122; 3224; 3225; 3419 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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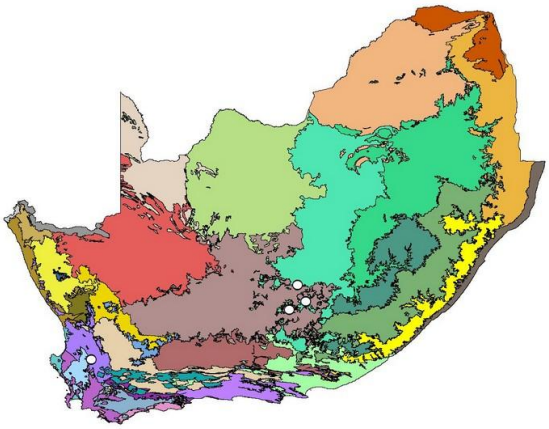
[E]*Aspalathus acicularis* E.Mey. subsp. *planifolia* R.Dahlgren **Crotalarieae** ①

Shrub; P; Ht 0.3–0.8; Alt ?–1550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (50)	200–600; 400–800 (25)
Min temp (°C)	<2 (50)	0–4; 2–8 (25)
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	5.5–7.4; 25
ESP	Ecotone	
QDGCs	3125 (50)	3025; 3219 (25)

NOTES: –

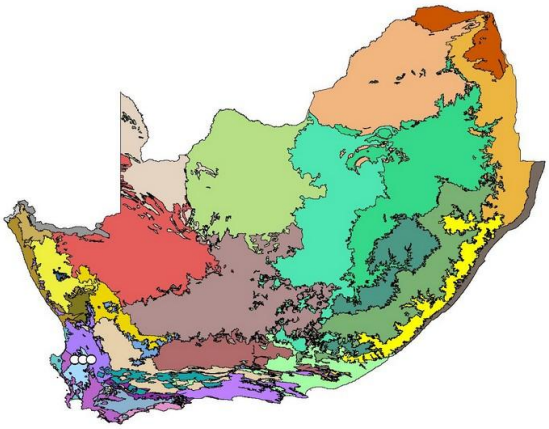


[E]*Aspalathus acidota* Garab. ex R.Dahlgren **Crotalarieae** ①

Shrub; P; Ht 0.9–1.2; Alt 35–90

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	6.5–8.4 (33)
ESP	Ecotone	
QDGCs	3218 (67)	3219 (33)

NOTES: –

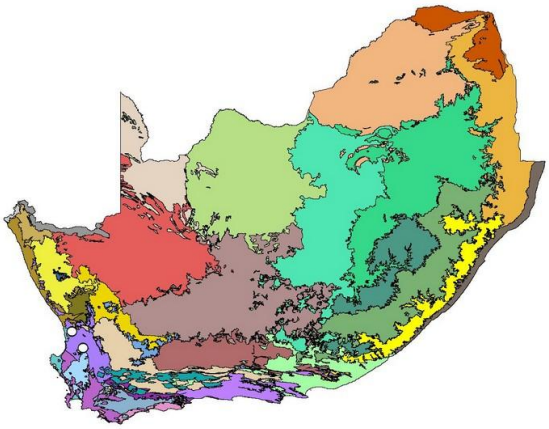


[E]*Aspalathus acifera* R.Dahlgren **Crotalarieae** ①

Dwarf shrub; P; Ht 0.01–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3218 (100)	

NOTES: –



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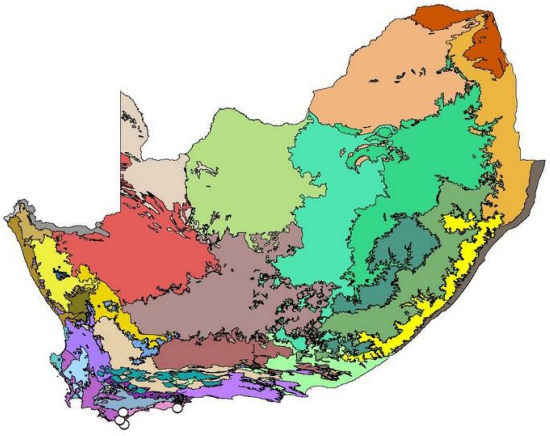
[E]*Aspalathus aciloba* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (75)	<27 (25)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	6.5–8.4 (50)	<6.4; 6.5–7.4 (25)
ESP	Non (100)	
QDGCs	3420 (50)	3419; 3421 (25)

NOTES: –



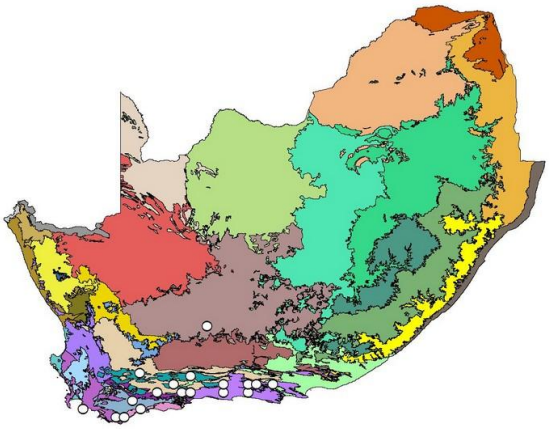
[E]*Aspalathus aciphylla* Harv.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.3–2.5; Alt 80–975

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern-Fynbos Renosterveld (50)	Southwest Fynbos; Upper Karoo (25)
Biome	Fynbos (83)	Nama-Karoo (17)
Rainfall (mm)	200–600 (44)	<400 (28)
Min temp (°C)	2–8 (83)	>6 (11)
Max temp (°C)	25–29 (61)	27–35 (28)
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	<6.4 (33)	5.5–7.4 (22)
ESP	Non; Medium (50)	
QDGCs	3323 (22)	3321; 3420 (17)

NOTES: –



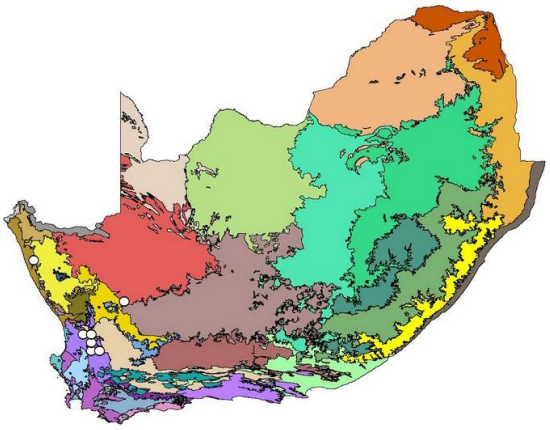
[E]*Aspalathus acocksii* (R.Dahlgren) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.5–1; Alt 400–970

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (57)	<400 (29)
Min temp (°C)	2–8 (72)	0–4; >6 (14)
Max temp (°C)	25–29 (71)	27–35 (29)
Phosphorus (ppm)	5–35 (86)	>20 (14)
pH	5.5–7.4 (58)	<6.4; 6.5–8.4; >7.5 (14)
ESP	Non (100)	
QDGCs	3219 (58)	2917; 3120; 3218 (14)

NOTES: **Flowering:** Spring, summer (Van Rooyen & Steyn 1999).



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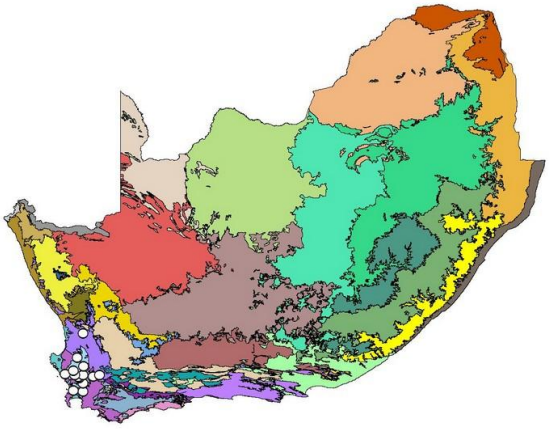
[E]*Aspalathus aculeata* Thunb.

Crotalarieae ①

Shrub; P; Ht 0.6–1; Alt 180–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (73)	400–800 (18)
Min temp (°C)	2–8 (64)	0–4; >6 (18)
Max temp (°C)	25–29 (64)	27–35 (36)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (64)	5.5–7.4 (26)
ESP	Ecotone	
QDGCs	3318 (72)	3218; 3319 (14)

NOTES: –



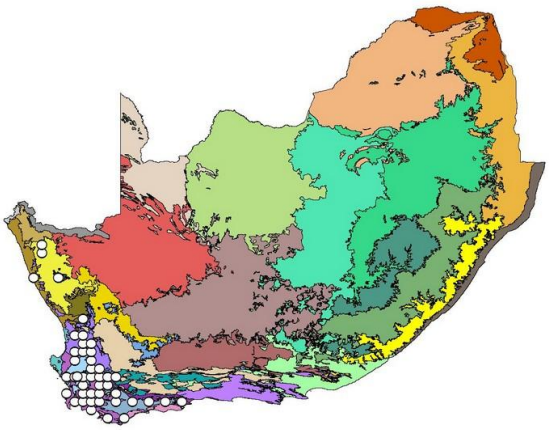
[E]*Aspalathus acuminata* Lam. subsp. *acuminata*

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.15–2.5; Alt 12–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos; Namaqualand Hardeveld (33)	
Biome	Fynbos (91)	Succulent Karoo (9)
Rainfall (mm)	200–600 (51)	400–800 (21)
Min temp (°C)	2–8 (53)	0–4 (26)
Max temp (°C)	25–29 (81)	27–35 (16)
Phosphorus (ppm)	5–35 (91)	<10; >20 (5)
pH	<6.4; 5.5–7.4 (37)	6.5–8.4 (14)
ESP	Non (67)	Medium (33)
QDGCs	3319 (25)	3318 (16)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Van Rooyen & Steyn 1999).



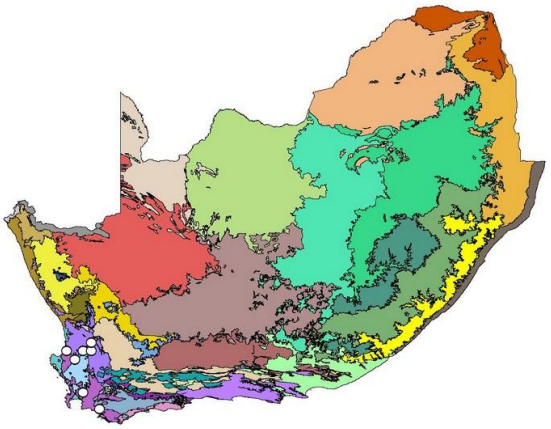
[E]*Aspalathus acuminata* Lam. subsp. *pungens* (Thunb.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.3–2.5; Alt 185–1204

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (43)	400–800 (29)
Min temp (°C)	2–8 (86)	>6 (14)
Max temp (°C)	25–29 (86)	27–35 (14)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (42)	5.5–7.4; 6.5–8.4 (29)
ESP	Non (100)	
QDGCs	3218 (43)	3219 (29)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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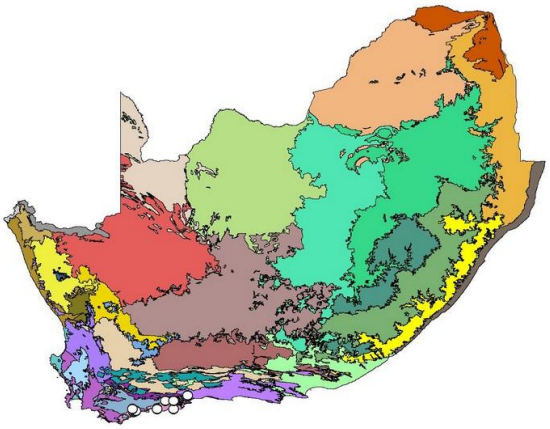
[E]*Aspalathus acutiflora* R.Dahlgren

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.5–0.8; Alt ?–45

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (83)	400–800 (17)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	5.5–7.4 (50)	<6.4 (33)
ESP	Non (100)	
QDGCs	3420; 3421 (44)	3322 (12)

NOTES: –



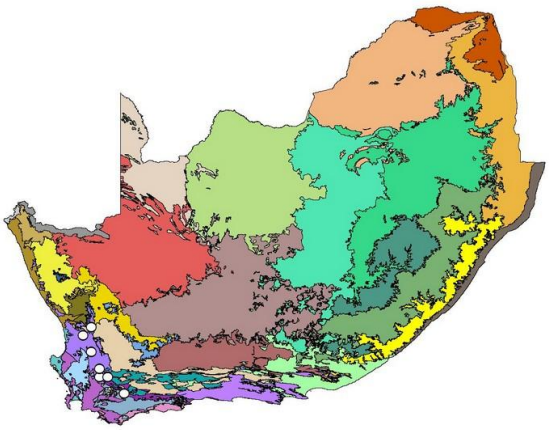
[E]*Aspalathus aemula* E.Mey.

Crotalarieae ①

Shrub; P; Ht 1–2.5; Alt 520–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (71)	<400; 400–800 (14)
Min temp (°C)	2–8 (57)	0–4 (43)
Max temp (°C)	25–29 (71)	27–35 (29)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (57)	<6.4; 6.5–7.4; 6.5–8.4 (14)
ESP	Non (100)	
QDGCs	3319 (44)	3119; 3218; 3219; 3320 (14)

NOTES: –



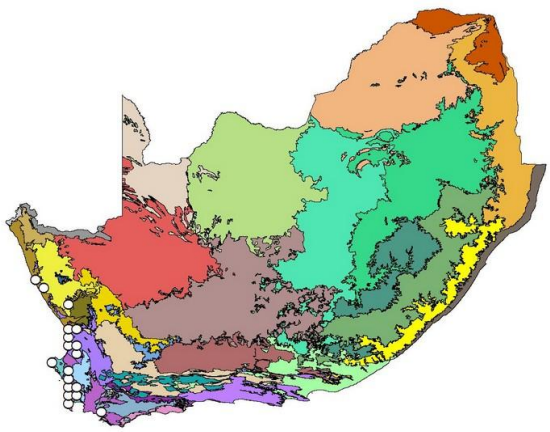
[E]*Aspalathus albens* L.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.2–1; Alt 15–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; West Strandveld (50)	
Biome	Fynbos (87)	Succulent Karoo (13)
Rainfall (mm)	<400 (50)	200–600 (33)
Min temp (°C)	>6 (89)	2–8 (11)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (94)	>20 (6)
pH	<6.4 (39)	6.5–7.4 (28)
ESP	Non; Medium (50)	
QDGCs	3318 (33)	3218 (22)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Manning & Goldblatt 2000).



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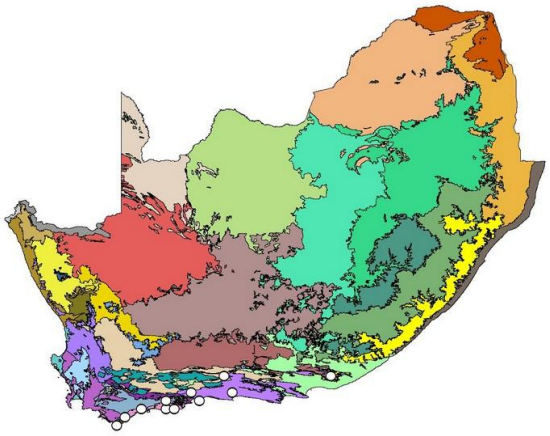
[E]*Aspalathus alopecurus* Benth.

Crotalarieae ①

Shrub; P; Ht 0.2–1; Alt 10–220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (45)	400–800 (36)
Min temp (°C)	2–8 (73)	>6 (27)
Max temp (°C)	25–29 (73)	<27 (18)
Phosphorus (ppm)	5–35 (91)	<10 (9)
pH	<6.4 (36)	5.5–7.4 (27)
ESP	Non; Medium (50)	
QDGCs	3421 (27)	3420; 3323 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



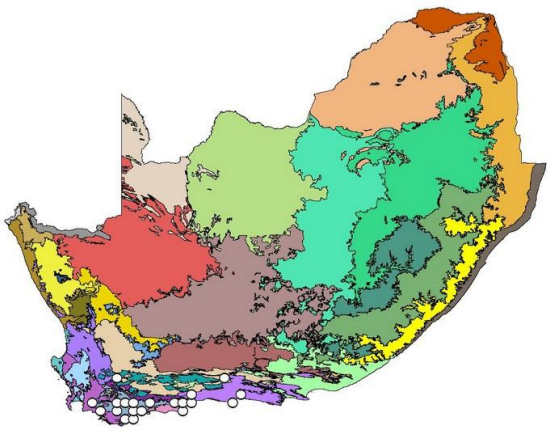
[E]*Aspalathus alpestris* (Benth.) R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–1; Alt 15–975

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (55)	<400; 400–800 (15)
Min temp (°C)	2–8 (80)	>6 (15)
Max temp (°C)	25–29 (65)	<27 (20)
Phosphorus (ppm)	5–35 (85)	<10 (15)
pH	<6.4 (40)	5.5–7.4 (25)
ESP	Medium (100)	
QDGCs	3420 (35)	3419 (20)

NOTES: –



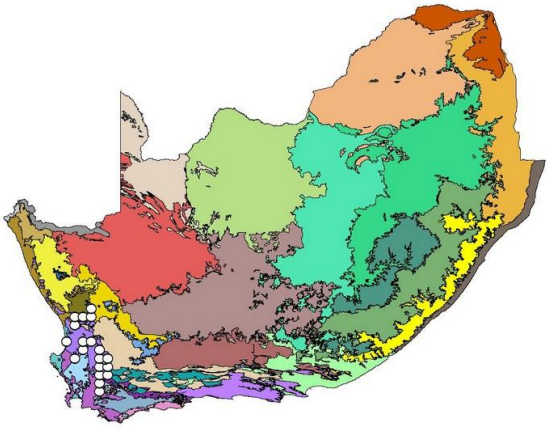
[E]*Aspalathus altissima* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.5–2.5; Alt 300–1435

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (58)	<400 (32)
Min temp (°C)	2–8 (53)	0–4 (32)
Max temp (°C)	25–29 (79)	27–35 (21)
Phosphorus (ppm)	5–35 (84)	>20 (16)
pH	5.5–7.4 (42)	6.5–8.4 (26)
ESP	Non (100)	
QDGCs	3319 (30)	3219 (25)

NOTES: –



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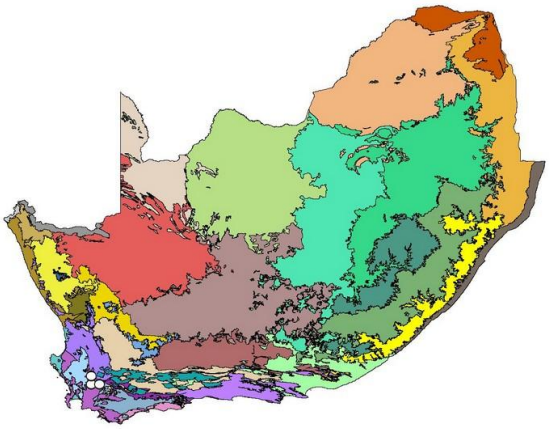
[E]*Aspalathus amoena* (R.Dahlgren) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.3–0.7; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	>800 (33)
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



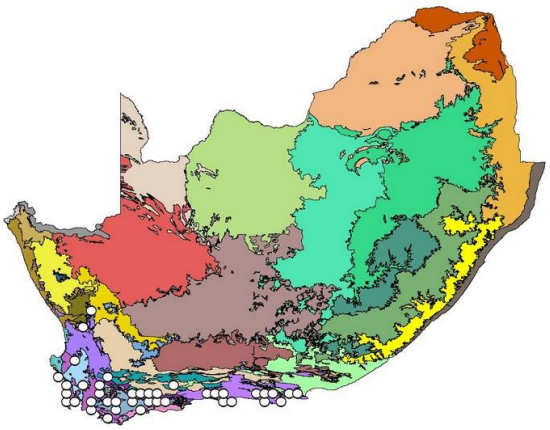
[E]*Aspalathus angustifolia* (Lam.) R.Dahlgren subsp. *angustifolia*

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.15–1; Alt 15–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (40)	400–800 (28)
Min temp (°C)	2–8 (68)	>6 (25)
Max temp (°C)	25–29 (70)	>27 (20)
Phosphorus (ppm)	5–35 (94)	<10; >20 (3)
pH	<6.4 (43)	5.5–7.4 (33)
ESP	Medium (100)	
QDGCs	3419 (15)	3318 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972, 1975).
Flowering: Spring, summer (Kidd 2002).



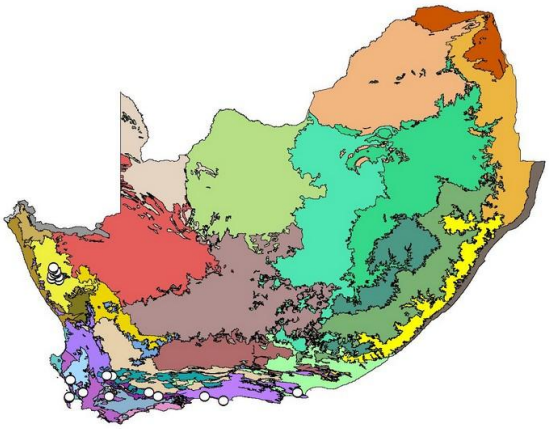
[E]*Aspalathus angustifolia* (Lam.) R.Dahlgren subsp. *robusta* (E.Phillips) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 2–3; Alt 155–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld; Namaqualand Hardeveld (50)	
Biome	Fynbos (75)	Succulent Karoo (25)
Rainfall (mm)	<400 (40)	200–600 (27)
Min temp (°C)	2–8 (60)	>6 (27)
Max temp (°C)	25–29 (73)	<27; 27–35 (13)
Phosphorus (ppm)	5–35 (87)	5–35 (13)
pH	<6.4; 6.5–8.4 (33)	5.5–7.4 (20)
ESP	Medium (100)	
QDGCs	3018 (24)	3017 (19)

NOTES: **Flowering:** Spring, summer (Kidd 2002).



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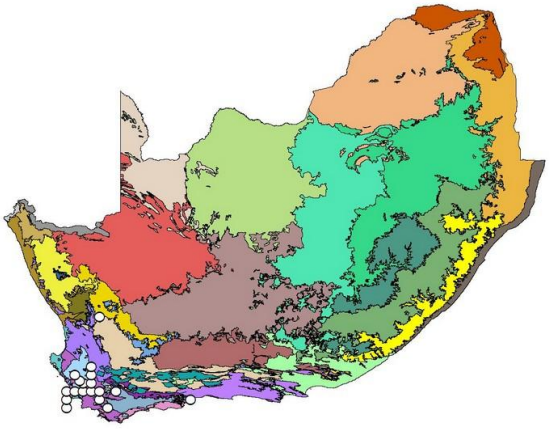
[E]*Aspalathus araneosa* L.

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–1.5; Alt 90–914

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (93)	Succulent Karoo (7)
Rainfall (mm)	200–600 (35)	400–800 (29)
Min temp (°C)	2–8 (41)	0–4 (35)
Max temp (°C)	25–29 (88)	<27; 27–35 (6)
Phosphorus (ppm)	5–35 (88)	<10; >20 (6)
pH	<6.4 (59)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	3318; 3319 (33)	3418; 3419 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



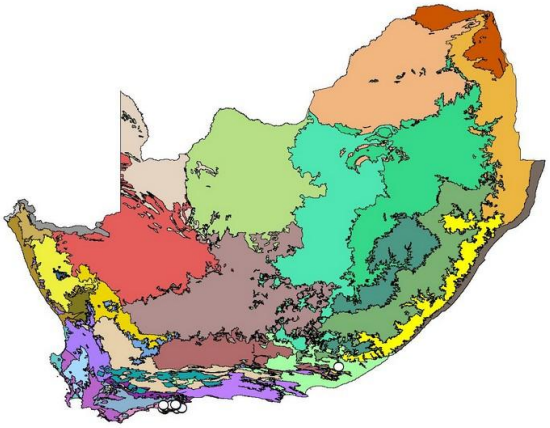
[E]*Aspalathus arenaria* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 1–1.7; Alt 18–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	400–800 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3421 (93)	3326 (7)

NOTES: –



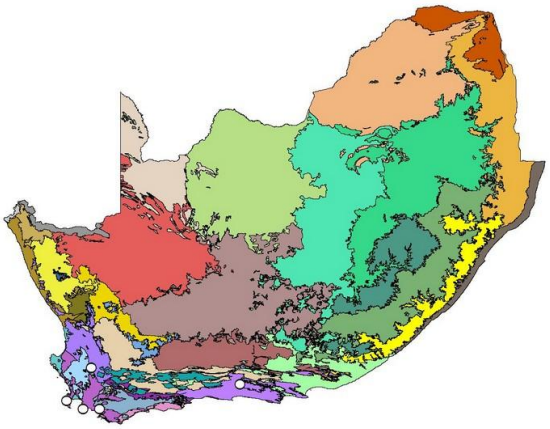
[E]*Aspalathus argyrella* MacOwan

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.3; Alt 50–1005

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (40)	200–600; 600–1000; >800 (20)
Min temp (°C)	2–8 (60)	0–4; >6 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	3418 (40)	3319; 3323; 3419 (20)

NOTES: –



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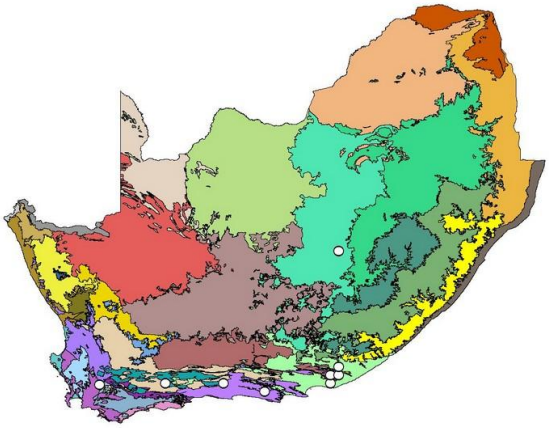
[E]*Aspalathus argyrophanes* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.6–1.5; Alt 460–1575

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (67)	200–600 (22)
Min temp (°C)	2–8 (67)	<2; 0–4; >6 (11)
Max temp (°C)	25–29 (56)	27–35 (33)
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	5.5–7.4 (56)	<6.4 (22)
ESP	Non (100)	
QDGCs	3326 (45)	2926; 3319; 3321; 3323; 3324 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



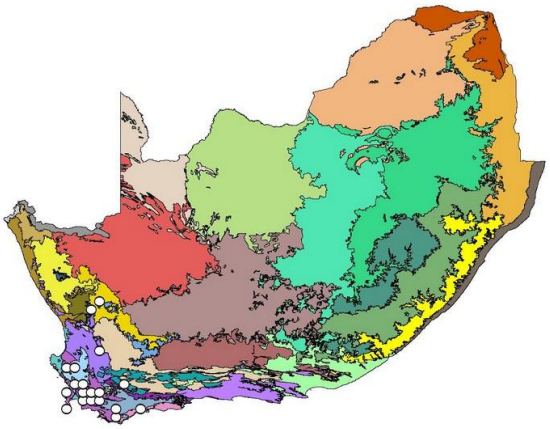
[E]*Aspalathus arida* E.Mey. subsp. *arida*

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–0.8; Alt 30–1320

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (67)	West Coast Renosterveld (33)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (32)	<400; 400–800 (21)
Min temp (°C)	2–8 (63)	>6 (26)
Max temp (°C)	25–29 (89)	27–35 (11)
Phosphorus (ppm)	5–35 (89)	>20 (11)
pH	<6.4; 5.5–7.4 (37)	6.5–7.4 (16)
ESP	Fynbos (100)	
QDGCs	3318 (32)	3419 (21)

NOTES: **Flowering:** Spring, summer (Kidd 2002).



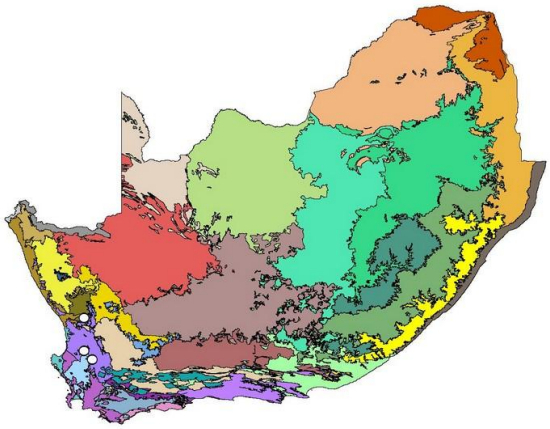
[E]*Aspalathus arida* E.Mey. subsp. *erecta* (E.Mey.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.8–1.5; Alt ?–150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; 400–800 (33)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	6.5–8.4 (33)
ESP	Ecotone	
QDGCs	3118; 3218; 3219 (33)	

NOTES: **Flowering:** Spring, summer (Kidd 2002).



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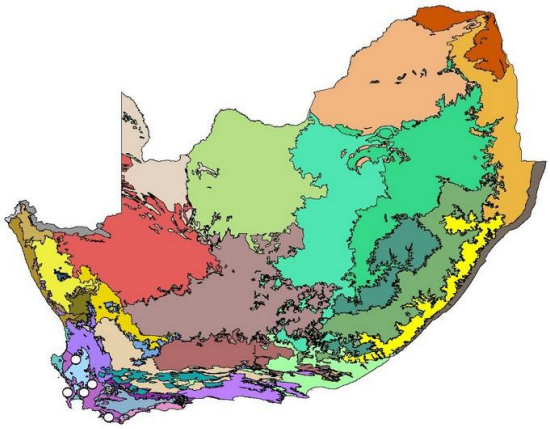
[E]*Aspalathus arida* E.Mey. subsp. *procumbens* (E.Mey.) R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.4; Alt 107–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (40)	200–600; 400–800; >800 (20)
Min temp (°C)	2–8 (60)	0–4; >6 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	<6.4; 5.5–7.4 (40)	6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3318 (40)	3218; 3319; 3419 (20)

NOTES: **Flowering:** Spring, summer (Kidd 2002).



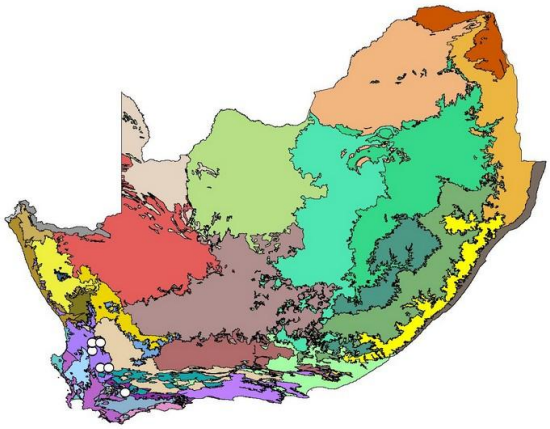
[E]*Aspalathus aristata* Compton

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–1; Alt 1125–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (66)	<400; 400–800 (17)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (50)	<6.4 (33)
ESP	Ecotone	
QDGCs	3219 (50)	3319 (33)

NOTES: –



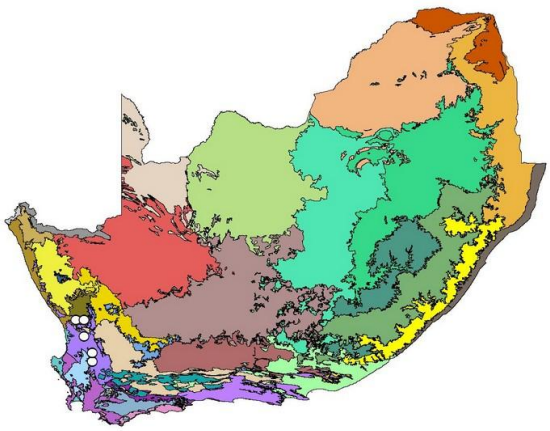
[E]*Aspalathus aristifolia* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–1; Alt 120–546

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600 (40)	400–800 (20)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	5–35 (80)	>20 (20)
pH	5.5–7.4 (60)	6.5–8.4 (0)
ESP	Ecotone	
QDGCs	3118; 3219 (40)	3218 (20)

NOTES: –



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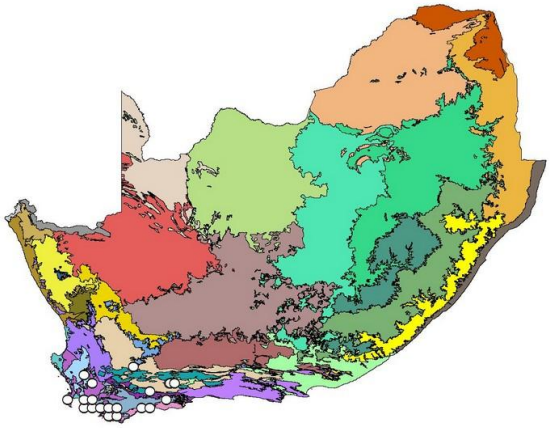
[E]*Aspalathus aspalathoides* (L.) R.Dahlgren

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.1–0.45; Alt 15–1405

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (37)	400–800; >800 (21)
Min temp (°C)	2–8 (74)	>6 (21)
Max temp (°C)	25–29 (79)	27–35 (21)
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	<6.4 (37)	5.5–7.4 (26)
ESP	Non (100)	
QDGCs	3419 (35)	3321; 3418 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Kidd 2002).



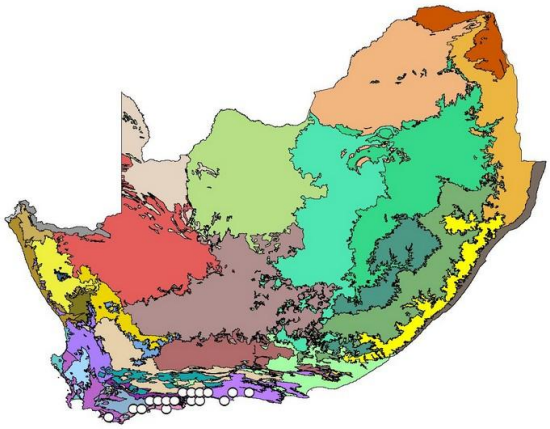
[E]*Aspalathus asparagoides* L.f. subsp. *asparagoides*

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.25–1; Alt 10–270

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (83)	South Coast Fynbos (17)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (47)	400–800; 600–1000 (24)
Min temp (°C)	2–8 (94)	>6 (6)
Max temp (°C)	25–29 (71)	>27 (29)
Phosphorus (ppm)	5–35 (88)	<10 (12)
pH	<6.4 (53)	5.5–7.4 (35)
ESP	Medium (83)	Non (17)
QDGCs	3421 (24)	3322; 3420 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



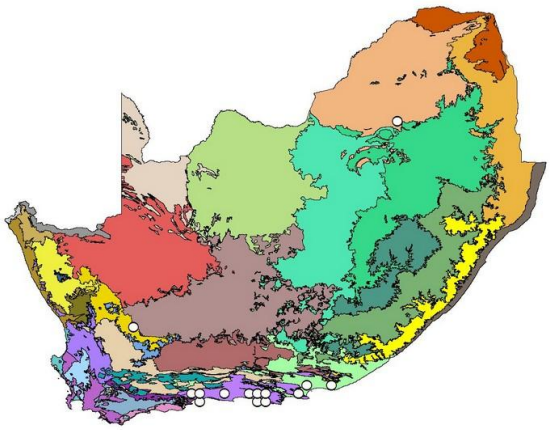
[E]*Aspalathus asparagoides* L.f. subsp. *rubro-fusca* (Eckl. & Zeyh.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.1–1; Alt 305–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (71)	Albany Thicket; Central Bushveld (14)
Biome	Fynbos (67)	Albany Thicket (33)
Rainfall (mm)	400–800 (57)	600–1000 (29)
Min temp (°C)	2–8 (57)	>6 (36)
Max temp (°C)	<27 (50)	25–29 (36)
Phosphorus (ppm)	5–35 (86)	<10; >20 (7)
pH	<6.4 (64)	6.5–8.4 (21)
ESP	Medium (71)	Non (29)
QDGCs	3322; 3323; 3324; 3325; 3424 (14)	2528; 3120; 3326; 3422 (7.5)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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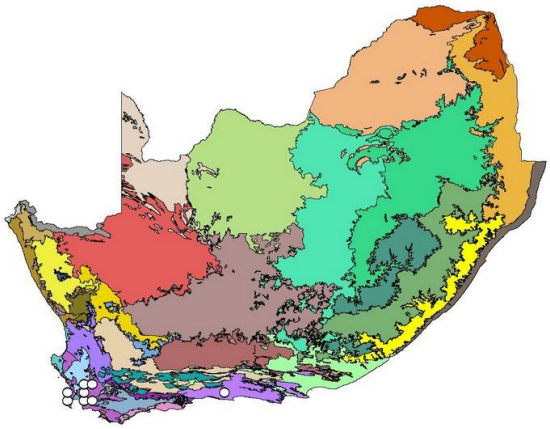
[E]*Aspalathus astroites* L.

Crotalarieae ①

Shrub; P; Ht 0.8–1.3; Alt 550–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (50)	>800 (38)
Min temp (°C)	2–8 (63)	>6 (25)
Max temp (°C)	25–29 (88)	<27 (12)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (88)	5.5–7.4 (12)
ESP	Medium (100)	
QDGCs	3318 (38)	3418 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



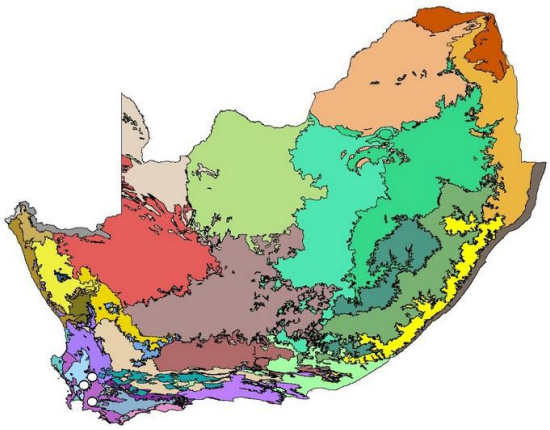
[E]*Aspalathus attenuata* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–1; Alt ?–290

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800; >800 (33)	
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	10<6.4 (0)	
ESP	Ecotone	
QDGCs	3318; 3319; 3419 (33)	

NOTES: –



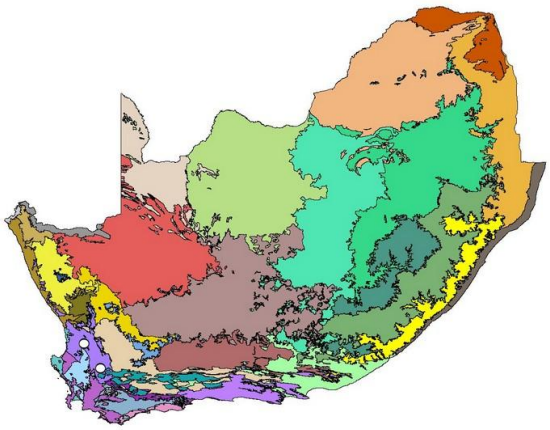
[E]*Aspalathus aurantiaca* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.01–1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3218; 3319 (50)	

NOTES: –



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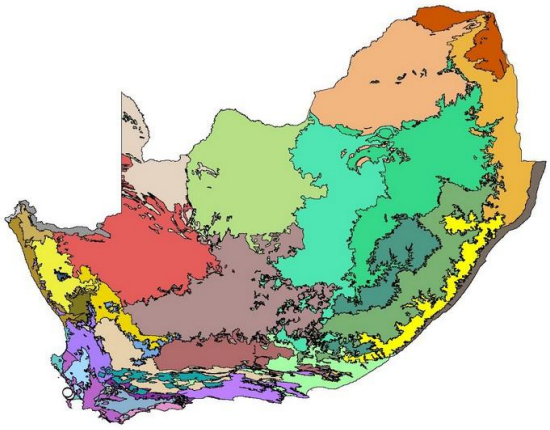
[E]*Aspalathus barbata* (Lam.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.4–1.3; Alt 366–520

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: **Flowering:** Spring, summer (Kidd 2002).



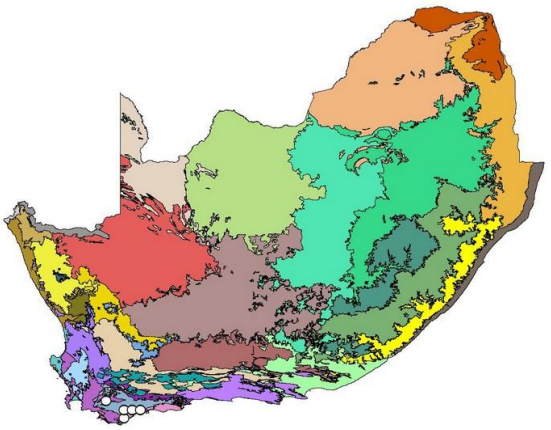
[E]*Aspalathus barbigera* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.4–1; Alt 60–80

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (80)	<400 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (60)	5.5–7.4; 6.5–7.4 (20)
ESP	Ecotone	
QDGCs	3420 (80)	3419 (20)

NOTES: –



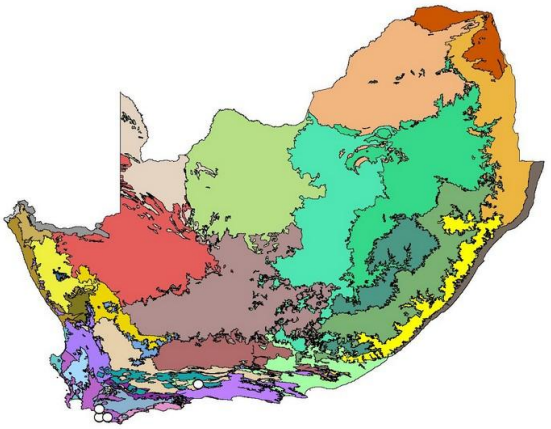
[E]*Aspalathus batodes* Eckl. & Zeyh. subsp. *batodes*

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.35–0.5; Alt 364–520

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (75)	<400 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	5.5–7.4 (50)	<6.4; 6.5–8.4 (25)
ESP	Ecotone	
QDGCs	3419 (75)	3322 (25)

NOTES: –



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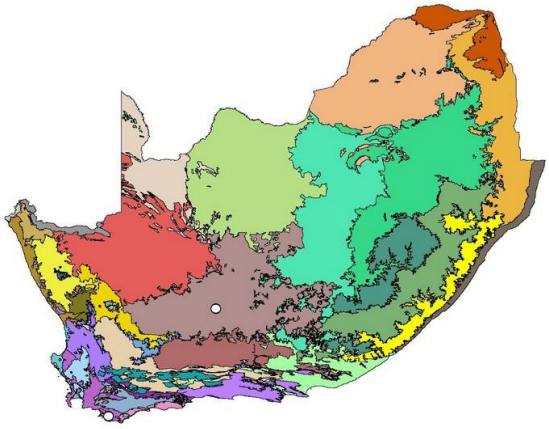
[E]*Aspalathus batodes* Eckl. & Zeyh. subsp. *spinulifolia* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–1; Alt 168–400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Upper Karoo (100)	
Biome	Fynbos; Nama-Karoo (50)	
Rainfall (mm)	<400; 400–800 (50)	
Min temp (°C)	<2; 2–8 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	5.5–7.4; >7.5 (50)	
ESP	Non (100)	
QDGCs	3122; 3419 (50)	

NOTES: –



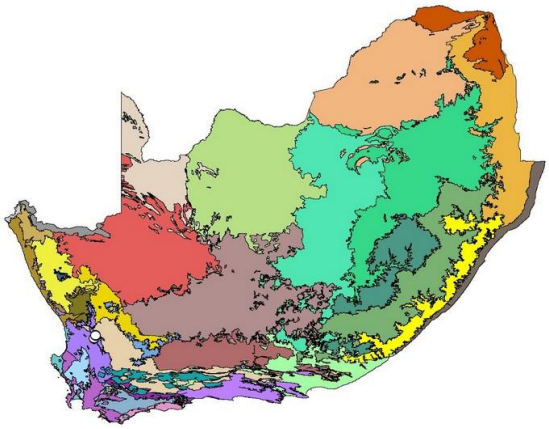
[E]*Aspalathus bidouwensis* Garab. ex R.Dahlgren

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.3–0.6; Alt ?–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3219 (100)	

NOTES: –



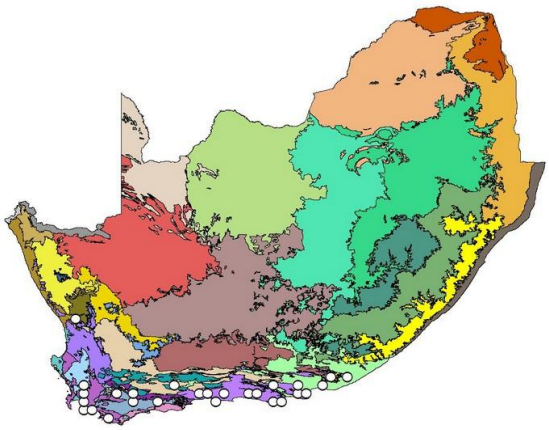
[E]*Aspalathus biflora* E.Mey. subsp. *biflora*

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–1; Alt 6–795

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (66)	Albany Thicket; Southwest Fynbos (17)
Biome	Fynbos (90)	Albany Thicket (10)
Rainfall (mm)	400–800 (41)	200–600; 600–1000 (22)
Min temp (°C)	2–8 (70)	>6 (26)
Max temp (°C)	25–29 (74)	<27 (19)
Phosphorus (ppm)	5–35 (89)	<10 (7)
pH	<6.4 (48)	5.5–7.4; 6.5–8.4 (22)
ESP	Medium (67)	Non (33)
QDGCs	3325; 3326 (11)	3318; 3322; 3323; 3324; 3418; 3419; 3424 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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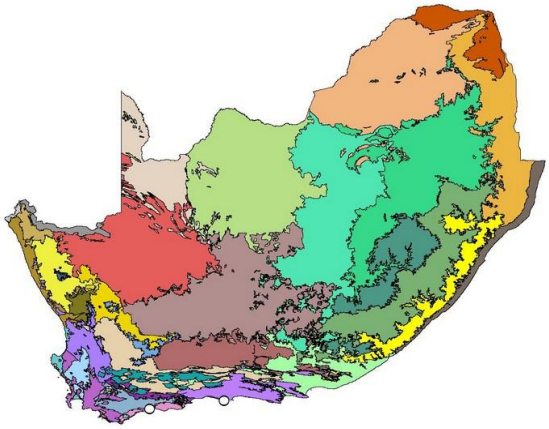
[E]*Aspalathus biflora* E.Mey. subsp. *longicarpa* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–60

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; >800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 6.5–7.4 (50)	
ESP	Medium (100)	
QDGCs	3420; 3423 (50)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



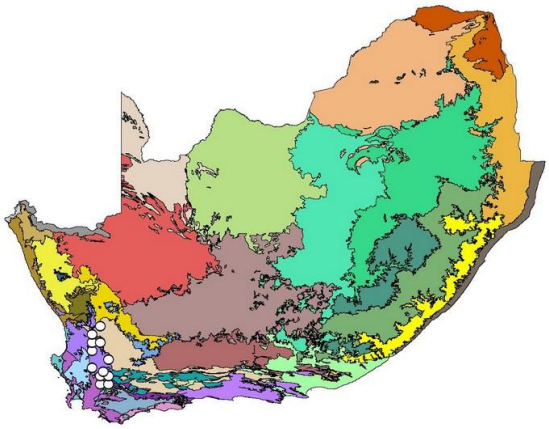
[E]*Aspalathus bodkinii* Bolus

Crotalarieae ①

Dwarf shrub; P; Ht 0.02–0.7; Alt 850–2135

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Rainshadow Valley Karoo (50)	
Biome	Fynbos (83)	Succulent Karoo (17)
Rainfall (mm)	200–600 (55)	400–800 (27)
Min temp (°C)	2–8 (55)	0–4 (45)
Max temp (°C)	25–29 (73)	27–35 (27)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (64)	<6.4 (18)
ESP	Non; High (50)	
QDGCs	3319 (50)	3219 (42)

NOTES: –



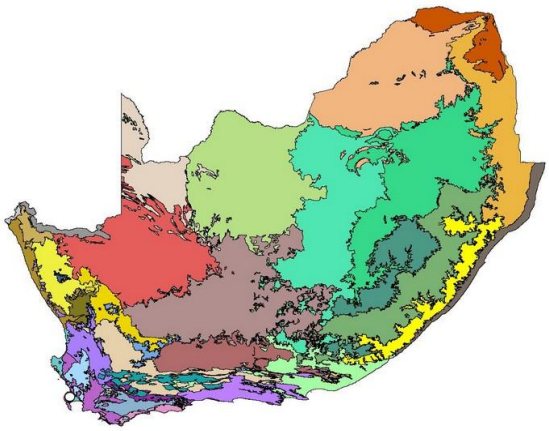
[E]*Aspalathus borboniifolia* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.2–0.6; Alt 610–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: –



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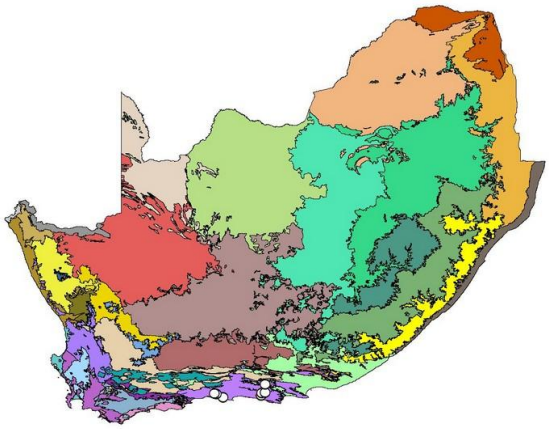
[E]*Aspalathus bowieana* (Benth.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.9–1.5; Alt 244–564

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	200–600; 400–800; 600–1000; >800 (25)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	<27 (75)	25–29 (25)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Medium (100)	
QDGCs	3324 (63)	3322 (25)

NOTES: –



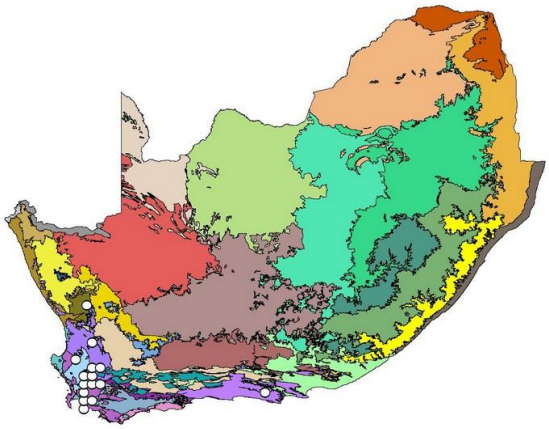
[E]*Aspalathus bracteata* Thunb.

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–1.5; Alt 80–1983

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (33)	400–800; >800 (27)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (80)	27–35 (13)
Phosphorus (ppm)	5–35 (93)	>20 (7)
pH	<6.4 (73)	5.5–7.4 (13)
ESP	Non (100)	
QDGCs	3319 (33)	3318 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



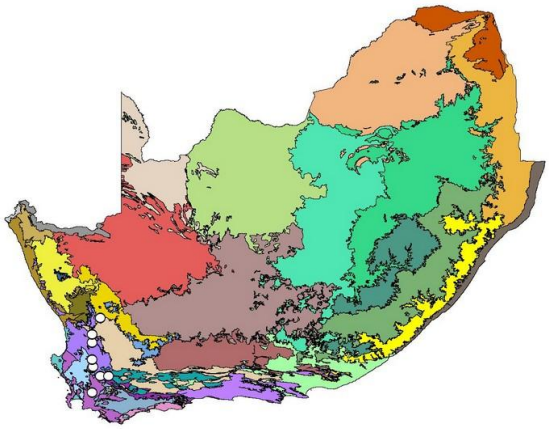
[E]*Aspalathus brevicarpa* (R.Dahlgren) R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.1; Alt 200–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (86)	Succulent Karoo (14)
Rainfall (mm)	400–800 (50)	200–600 (25)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (88)	>20 (13)
pH	5.5–7.4 (63)	<6.4 (25)
ESP	Non (100)	
QDGCs	3319 (56)	3219 (33)

NOTES: –



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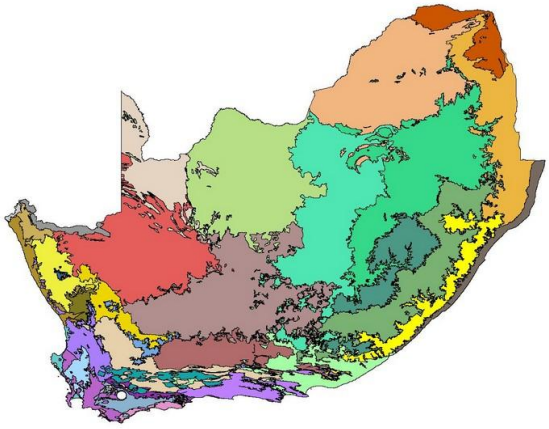
[E]*Aspalathus burchelliana* Benth.

Crotalarieae ①

Shrub; P; Ht 0.01–0.8; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3420 (100)	

NOTES: –



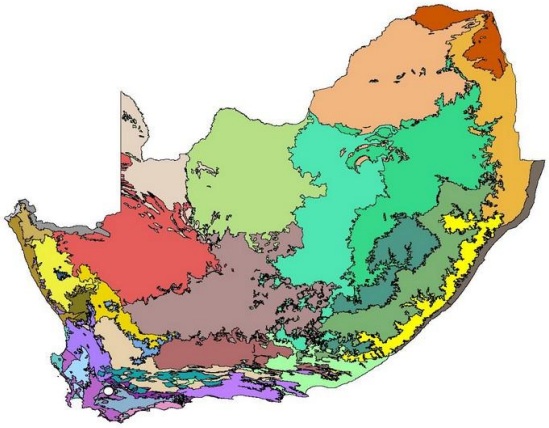
[E]*Aspalathus caespitosa* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



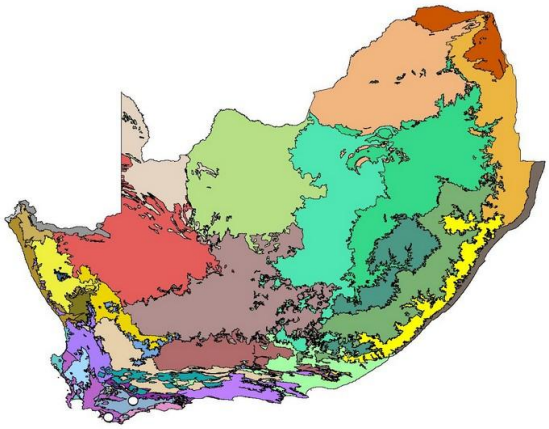
[E]*Aspalathus calcarata* Harv.

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.4; Alt 122–152

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3419; 3420 (50)	

NOTES: –



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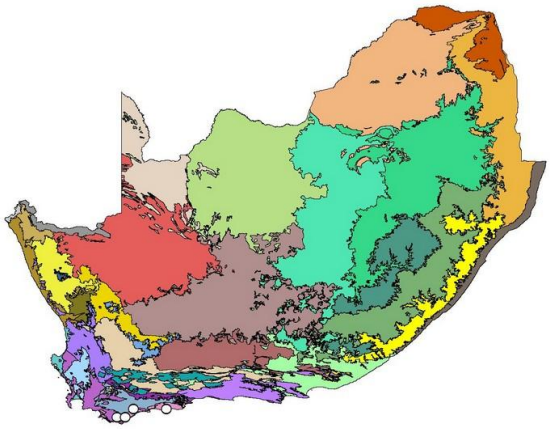
[E]*Aspalathus calcarea* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.9; Alt 20–155

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	400–800 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	<6.4; 6.5–7.4 (25)
ESP	Non (100)	
QDGCs	3420 (50)	3419; 3421 (25)

NOTES: **Flowering:** Autumn, winter, spring (Mustart *et al.* 2003).



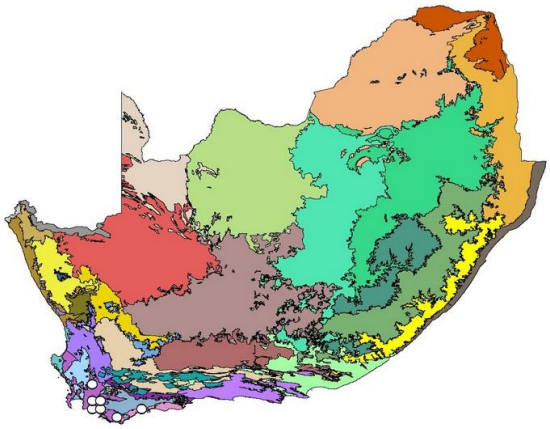
[E]*Aspalathus caledonensis* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.7; Alt 182–580

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (57)	>800 (29)
Min temp (°C)	2–8 (57)	>6 (29)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (42)	5.5–7.4; 6.5–7.4 (29)
ESP	Ecotone	
QDGCs	3419 (72)	3319; 3420 (14)

NOTES: **Flowering:** Spring (Mustart *et al.* 2003).



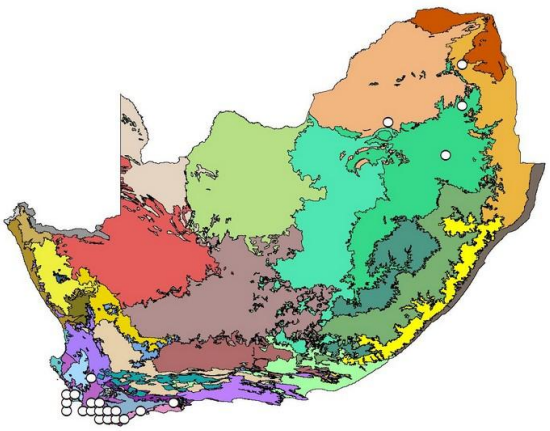
[E]*Aspalathus callosa* L.

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–1; Alt 15–1585

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Mesic Highveld Grassland (33)	Central Bushveld; Lowveld (17)
Biome	Fynbos (85)	Grassland (10)
Rainfall (mm)	400–800 (50)	200–600 (32)
Min temp (°C)	2–8 (45)	>6 (41)
Max temp (°C)	25–29 (82)	<27; 27–35 (9)
Phosphorus (ppm)	5–35 (73)	<10 (27)
pH	<6.4 (55)	5.5–7.4 (32)
ESP	Non (100)	
QDGCs	3419 (41)	3418 (14)

NOTES: **Flowering:** Summer (Kidd 2002).



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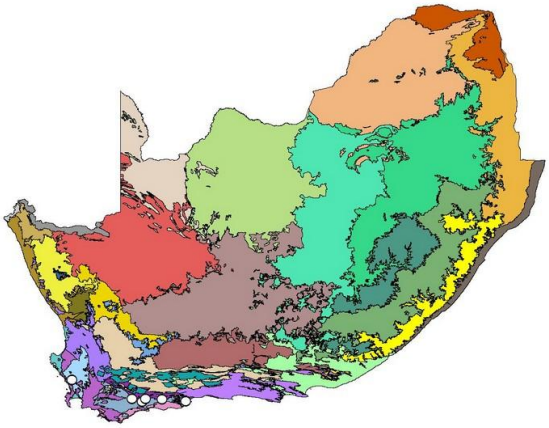
[E]*Aspalathus campestris* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.5; Alt ?–39

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (83)	<10 (17)
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Ecotone	
QDGCs	3420 (50)	3421 (33)

NOTES: –



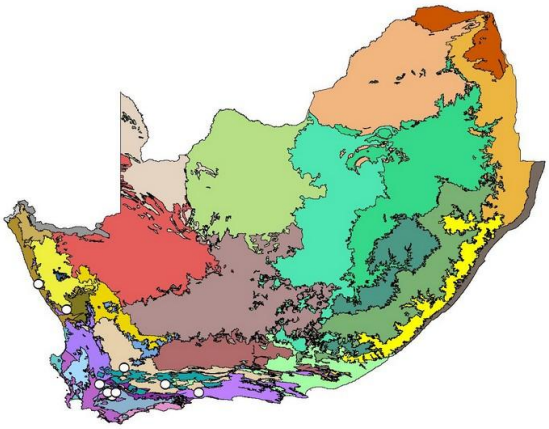
[E]*Aspalathus candicans* Aiton f.

Crotalarieae ①

Shrub; P; Ht 0.6–1.5; Alt 15–533

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (50)	200–600 (38)
Min temp (°C)	0–4; 2–8 (38)	>6 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (38)	6.5–7.4 (25)
ESP	Ecotone	
QDGCs	3319 (45)	3017; 3118; 3320; 3321; 3322 (11)

NOTES: –



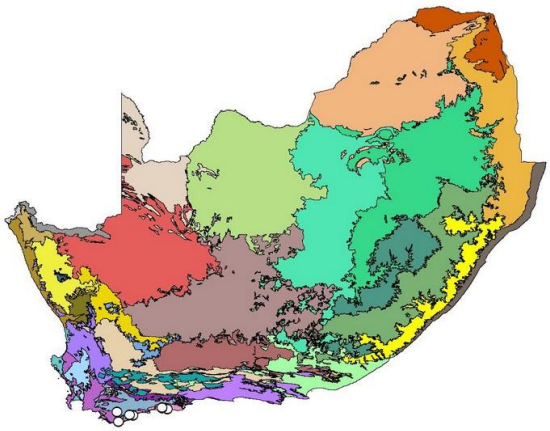
[E]*Aspalathus candidula* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.5; Alt 60–165

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (60)	<400; 400–800 (20)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	25–29 (80)	<27 (20)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (40)	<6.4; 6.5–7.4; >7.5 (20)
ESP	Non (100)	
QDGCs	3421 (42)	3419; 3420 (29)

NOTES: –



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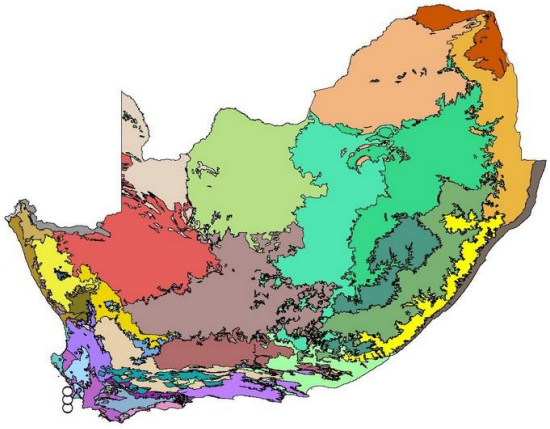
[E]*Aspalathus capensis* (Walp.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 1–2; Alt 2–396

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (67)	400–800 (33)
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3418 (67)	3318 (33)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Winter, spring, summer (Manning 2003).



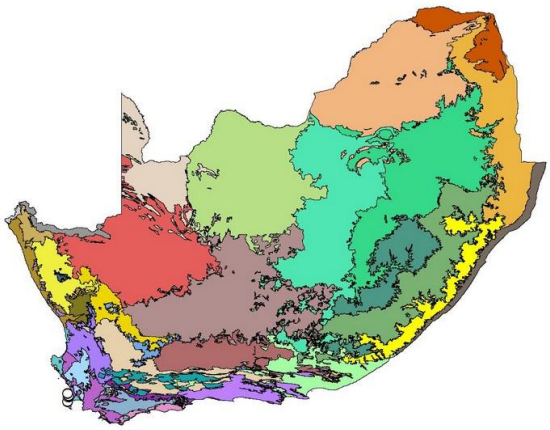
[E]*Aspalathus capitata* L.

Crotalarieae ①

Shrub, tree; P; Ht 0.01–2; Alt 365–950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (80)	3418 (20)

NOTES: **Flowering:** All seasons (Kidd 2002).



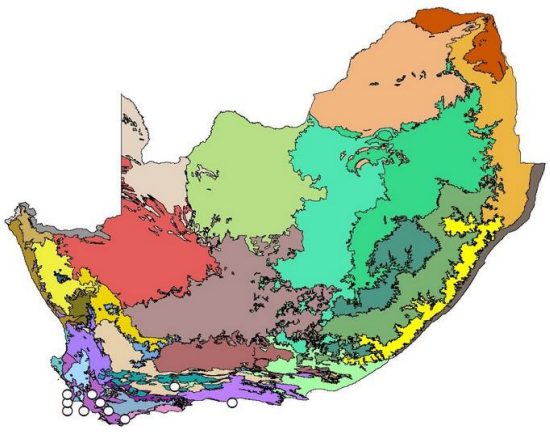
[E]*Aspalathus carnosa* P.J.Bergius

Crotalarieae ①

Shrub; P; Ht 0.2–1.5; Alt 9–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (75)	Eastern Fynbos-Renosterveld (25)
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (30)	200–600; 400–800; >800 (20)
Min temp (°C)	2–8 (50)	>6 (40)
Max temp (°C)	25–29 (80)	<27; 27–35 (10)
Phosphorus (ppm)	5–35 (90)	<10 (10)
pH	<6.4 (50)	5.5–7.4 (30)
ESP	Non (75)	Medium (25)
QDGCs	3418 (30)	3419 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972; Boone *et al.* 1999). **Flowering:** Spring, summer (Kidd 2002).



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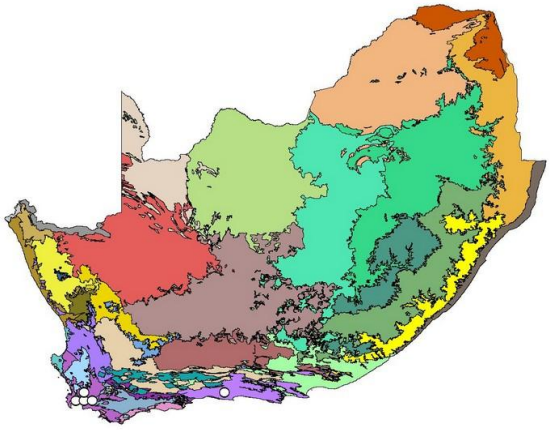
[E]*Aspalathus cephalotes* Thunb. subsp. *cephalotes*

Crotalarieae ①

Shrub; P; Ht 0.6–2; Alt 250–762

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000; >800 (40)	400–800 (20)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	25–29 (60)	<27 (40)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Medium (100)	
QDGCs	3418 (40)	3318; 3323; 3419 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Manning 2003).



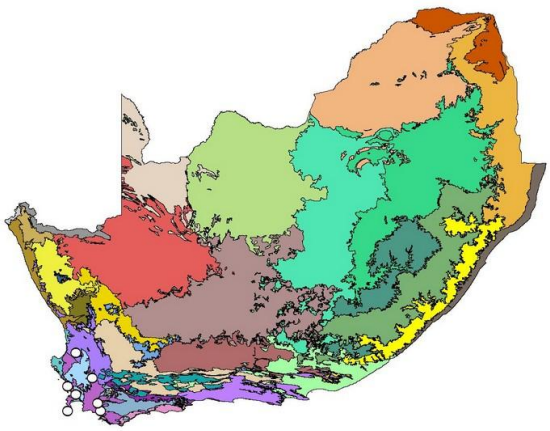
[E]*Aspalathus cephalotes* Thunb. subsp. *obscurifolia* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (57)	400–800 (43)
Min temp (°C)	2–8; >6 (43)	0–4 (14)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	7<6.4 (2)	5.5–7.4; 6.5–7.4 (14)
ESP	Non (100)	
QDGCs	3318; 3419 (29)	3218; 3319; 3418 (14)

NOTES: **Flowering:** Spring (Manning 2003).



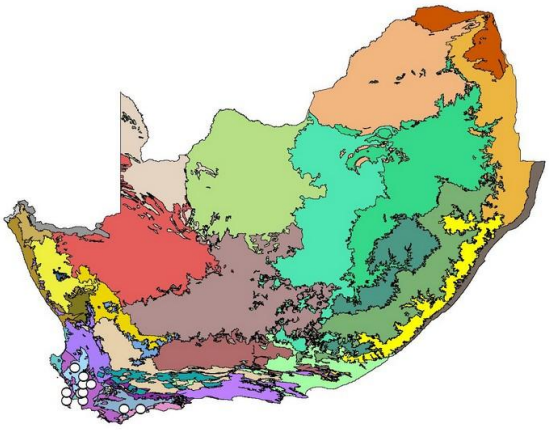
[E]*Aspalathus cephalotes* Thunb. subsp. *violacea* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–1.8; Alt 76–762

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Coast Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (30)	>800 (20)
Min temp (°C)	2–8 (60)	>6 (30)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (60)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	3318 (54)	3418; 3420 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



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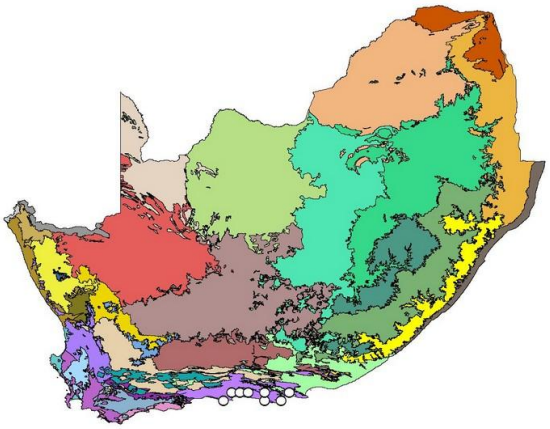
[E]*Aspalathus cerrhantha* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt 120–488

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	600–1000 (38)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	<27 (75)	25–29 (25)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (88)	5.5–7.4 (12)
ESP	Medium (100)	
QDGCs	3323 (38)	3424 (25)

NOTES: –



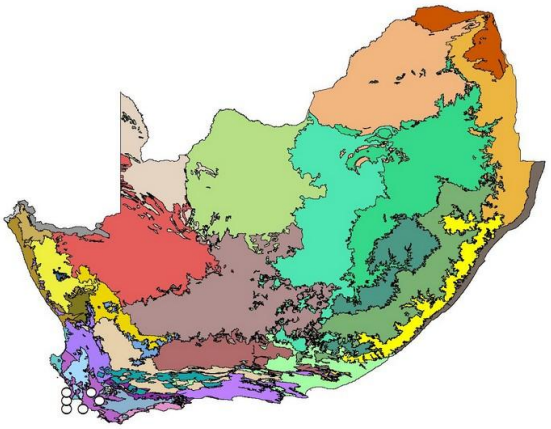
[E]*Aspalathus chenopoda* L. subsp. *chenopoda*

Crotalarieae ①

Shrub; P; Ht 0.6–2; Alt 46–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; 600–1000; >800 (33)	
Min temp (°C)	>6 (50)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3418 (49)	3318; 3319; 3419 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Manning 2003).



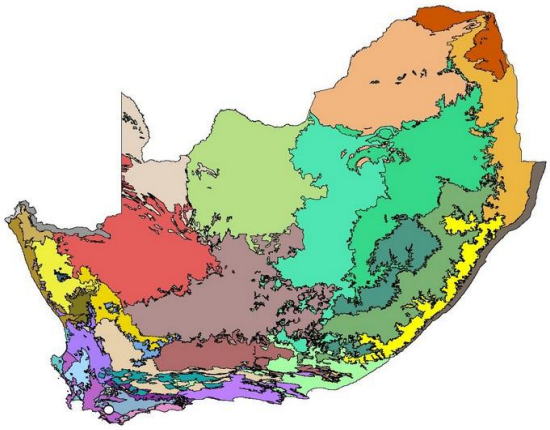
[E]*Aspalathus chenopoda* L. subsp. *gracilis* (Eckl. & Zeyh.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.01–1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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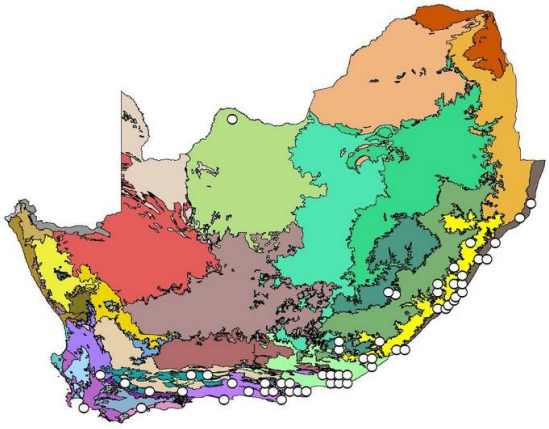
[E]*Aspalathus chortophila* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.1–3; Alt 10–1890

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (33)	Eastern Fynbos-Renosterveld (25)
Biome	Indian Ocean (31)	Fynbos; Grassland (23)
Rainfall (mm)	>800 (37)	400–800 (35)
Min temp (°C)	2–8 (46)	>6 (43)
Max temp (°C)	25–29 (76)	<27 (13)
Phosphorus (ppm)	5–35 (63)	<10 (33)
pH	<6.4 (44)	5.5–7.4 (26)
ESP	Non (75)	Medium (25)
QDGCs	3326 (13)	3324; 3325 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar *et al.* 1983). **Flowering:** Whole year (Pooley 1998).



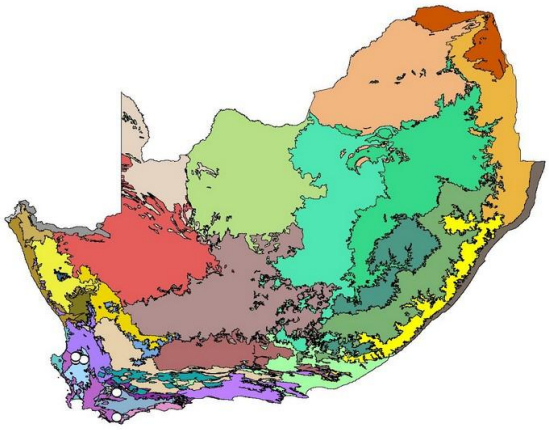
[E]*Aspalathus chrysantha* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.2; Alt 480–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	400–800 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (50)	5.5–7.4; 6.5–8.4 (25)
ESP	Ecotone	
QDGCs	3218 (60)	3319; 3419 (20)

NOTES: –



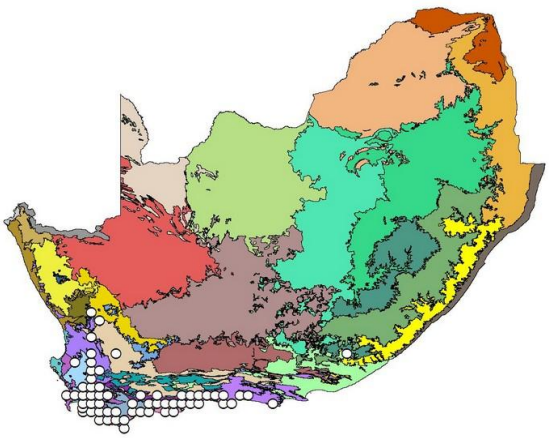
[E]*Aspalathus ciliaris* L.

Crotalarieae ①

Shrub; P; Ht 0.1–1.5; Alt 15–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (57)	Southwest Fynbos; South Coast Fynbos (14)
Biome	Fynbos (95)	Succulent Karoo (5)
Rainfall (mm)	200–600 (42)	400–800 (25)
Min temp (°C)	2–8 (71)	>6 (15)
Max temp (°C)	25–29 (78)	<27 (17)
Phosphorus (ppm)	5–35 (88)	<10 (8)
pH	<6.4 (46)	5.5–7.4 (32)
ESP	Medium (57)	Non (36)
QDGCs	3419 (15)	3319 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



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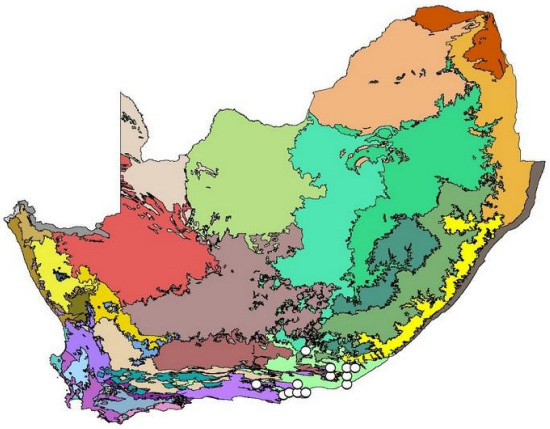
[E]*Aspalathus cinerascens* E.Mey.

Crotalarieae ①

Shrub; P; Ht 0.9–2.5; Alt 45–670

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (100)	
Biome	Albany Thicket (100)	
Rainfall (mm)	400–800 (69)	200–600 (31)
Min temp (°C)	2–8 (69)	>6 (31)
Max temp (°C)	25–29 (92)	27–35 (8)
Phosphorus (ppm)	5–35 (85)	<10 (15)
pH	5.5–7.4; 6.5–8.4 (31)	6.5–7.4 (23)
ESP	Non (100)	
QDGCs	3326 (38)	3325 (31)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



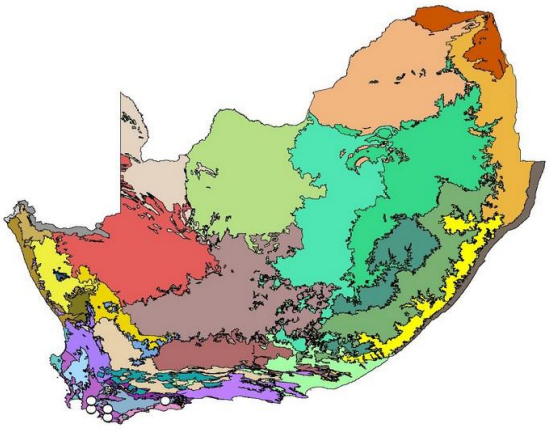
[E]*Aspalathus citrina* R.Dahlgren

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.2–0.7; Alt 60–460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (40)	>800 (20)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (60)	<10 (40)
pH	5.5–7.4 (60)	<6.4 (40)
ESP	Ecotone	
QDGCs	3419 (80)	3421 (20)

NOTES: –



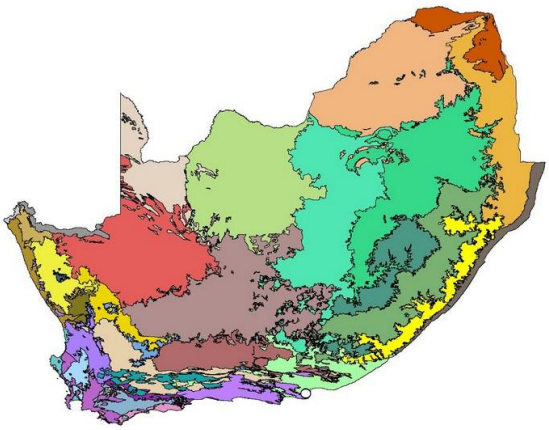
[E]*Aspalathus cliffortiifolia* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	106.5–8.4 (0)	
ESP	Ecotone	
QDGCs	3325 (100)	

NOTES: –



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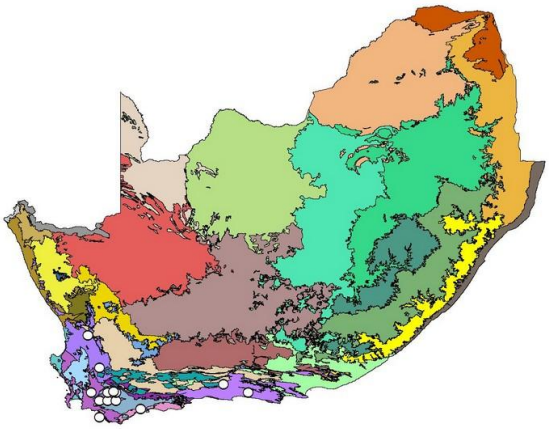
[E]*Aspalathus cliffortioides* Bolus

Crotalarieae ①

Shrub; P; Ht 0.2–1; Alt 150–1465

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (17)
Min temp (°C)	2–8 (50)	0–4 (33)
Max temp (°C)	25–29 (92)	<27 (8)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (42)	6.5–7.4 (33)
ESP	Non; Medium (50)	
QDGCs	3319 (38)	3419 (31)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



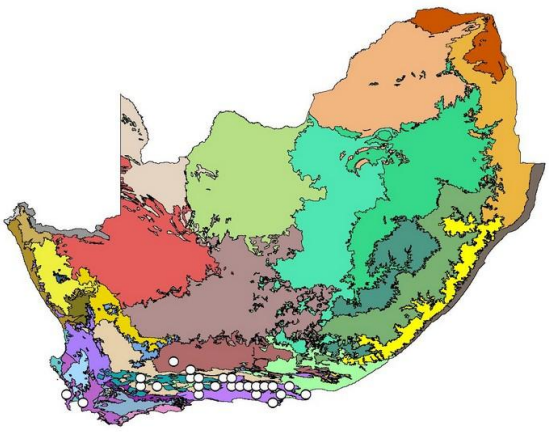
[E]*Aspalathus collina* Eckl. & Zeyh. subsp. *collina*

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.3–2; Alt 155–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (67)	Lower Karoo (33)
Biome	Fynbos (67)	Nama-Karoo (33)
Rainfall (mm)	<400; 200–600 (36)	400–800 (16)
Min temp (°C)	2–8 (84)	>6 (16)
Max temp (°C)	25–29 (60)	27–35 (32)
Phosphorus (ppm)	5–35 (76)	>20 (24)
pH	<6.4 (32)	5.5–7.4; 6.5–8.4 (24)
ESP	Medium (100)	
QDGCs	3322 (24)	3323; 3324 (20)

NOTES: –



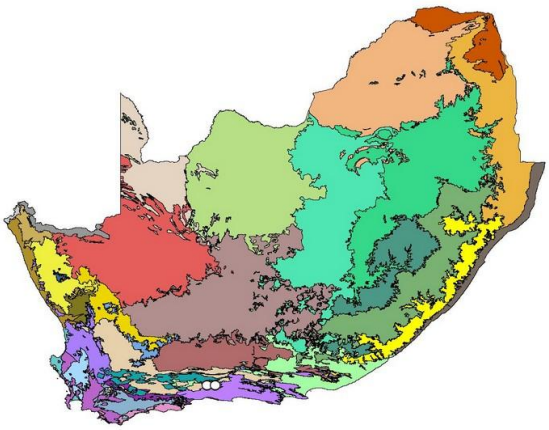
[E]*Aspalathus collina* Eckl. & Zeyh. subsp. *luculenta* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.6–2.8; Alt 372–1420

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	105.5–7.4 (0)	
ESP	Ecotone	
QDGCs	3322 (100)	

NOTES: –



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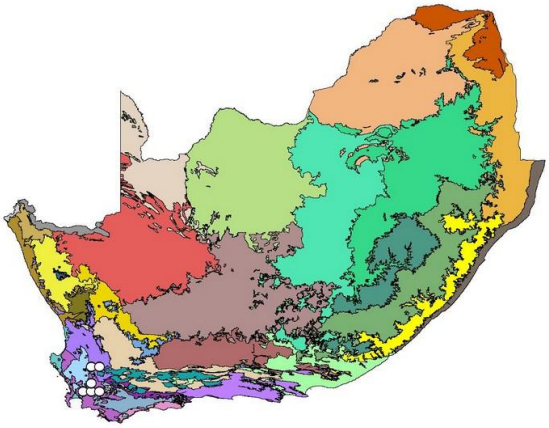
[E]*Aspalathus commutata* (Vogel) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.3–0.5; Alt 460–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; >800 (33)	400–800; 600–1000 (17)
Min temp (°C)	0–4 (83)	2–8 (17)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Non (100)	
QDGCs	3319 (83)	3318 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Beverage (Watt & Breyer-Brandwijk 1962).



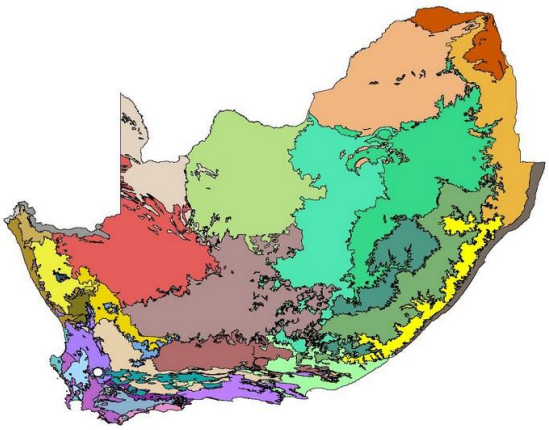
[E]*Aspalathus compacta* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



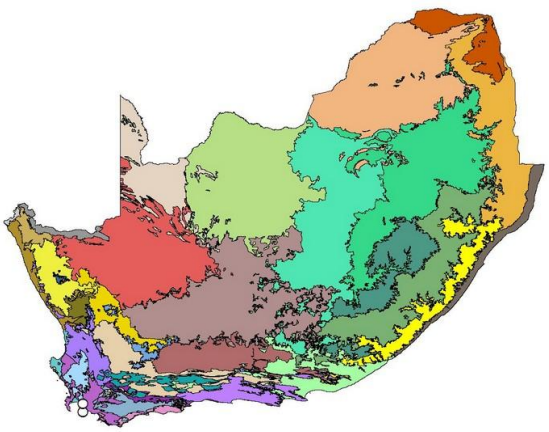
[E]*Aspalathus complicata* (Benth.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.5–1.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3418 (100)	

NOTES: –



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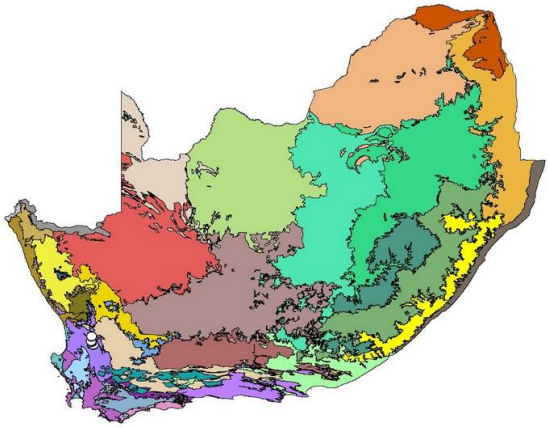
[E]*Aspalathus comptonii* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3219 (100)	

NOTES: –



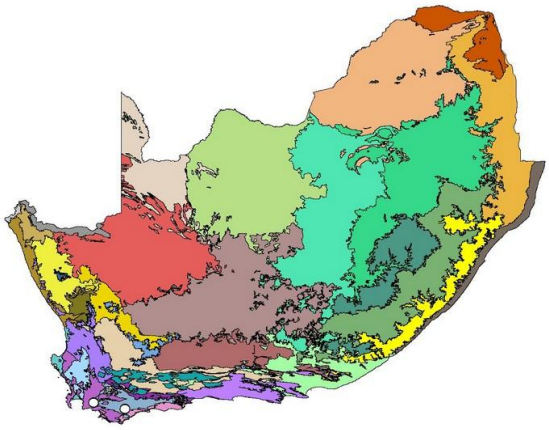
[E]*Aspalathus concava* Bolus

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.4; Alt ?–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; >800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 6.5–8.4 (50)	
ESP	Ecotone	
QDGCs	3419; 3420 (50)	

NOTES: –



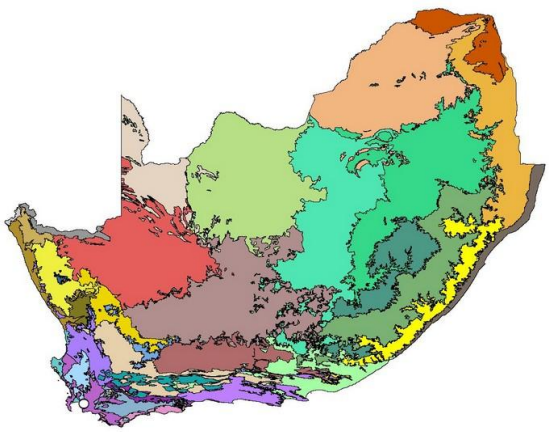
[E]*Aspalathus condensata* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3418 (100)	

NOTES: –



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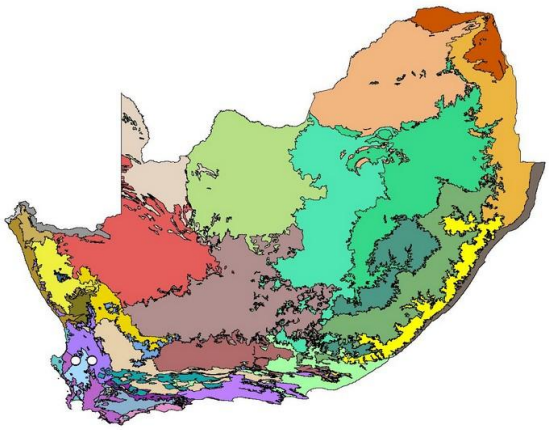
[E]*Aspalathus confusa* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.25–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–8.4 (50)	
ESP	Ecotone	
QDGCs	3218; 3219 (50)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



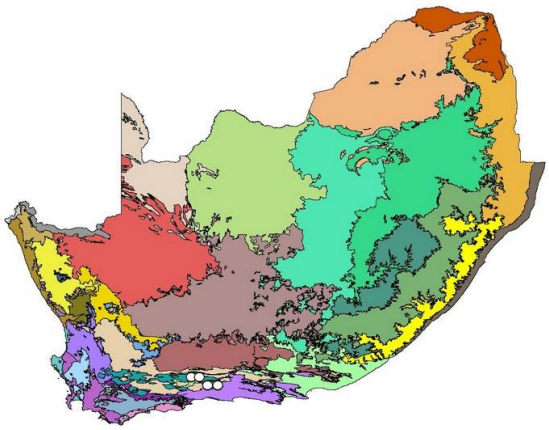
[E]*Aspalathus congesta* (R.Dahlgren) R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–0.3; Alt 1829–1891

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35; >20 (50)	
pH	5.5–7.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3322 (100)	

NOTES: –



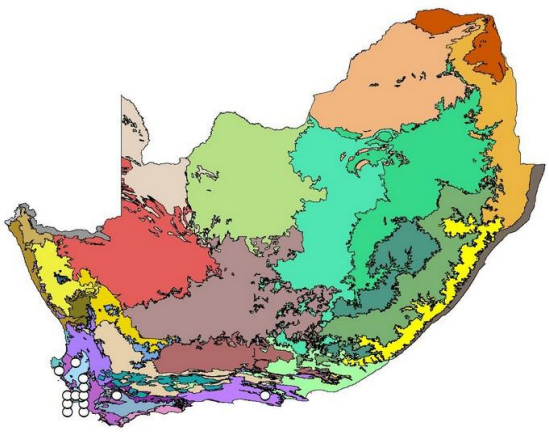
[E]*Aspalathus cordata* (L.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.4–1; Alt 30–368

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (31)	400–800; 600–1000 (23)
Min temp (°C)	2–8 (54)	>6 (38)
Max temp (°C)	25–29 (84)	<27; 27–35 (16)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (77)	5.5–7.4; 6.5–7.4; 6.5–8.4 (8)
ESP	Non (100)	
QDGCs	3318 (50)	3418 (29)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Beverage; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Manning 2003).



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[E]*Aspalathus cordicarpa* R.Dahlgren — Crotalarieae —

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

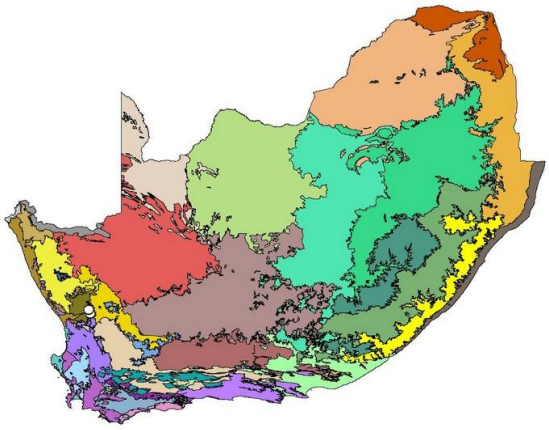
NOTES: –

[E]*Aspalathus corniculata* R.Dahlgren — Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.9; Alt ?–754

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3119 (100)	

NOTES: –

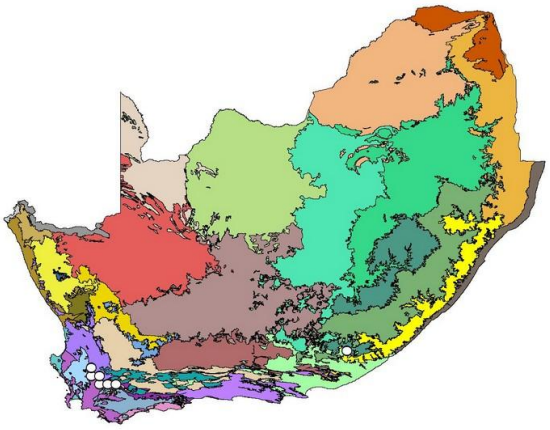


[E]*Aspalathus corrudifolia* P.J.Bergius — Crotalarieae ①

Shrub; P; Ht 1–3; Alt 300–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (57)	400–800 (43)
Min temp (°C)	0–4 (86)	2–8 (14)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (42)	<6.4; 6.5–7.4 (29)
ESP	Ecotone	
QDGCs	3319 (86)	3226 (14)

NOTES: –



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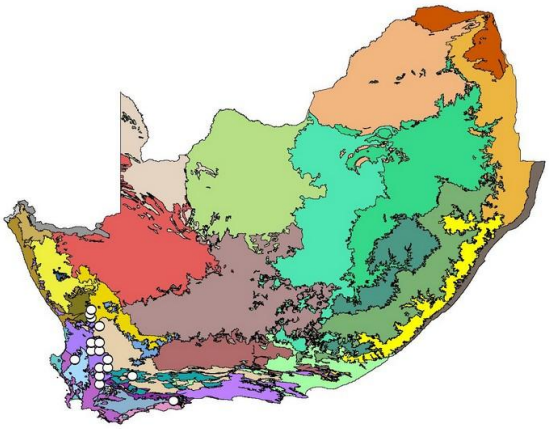
[E]*Aspalathus costulata* Benth.

Crotalarieae ①

Shrub; P; Ht 0.6–2; Alt 180–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Rainshadow Valley Karoo (50)	
Biome	Fynbos (83)	Succulent Karoo (17)
Rainfall (mm)	200–600 (53)	<400 (33)
Min temp (°C)	2–8 (73)	0–4 (27)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (80)	>20 (13)
pH	5.5–7.4 (47)	6.5–8.4 (27)
ESP	Non; High (50)	
QDGCs	3219 (31)	3119; 3319 (25)

NOTES: **Flowering:** Spring (Van Rooyen & Steyn 1999).



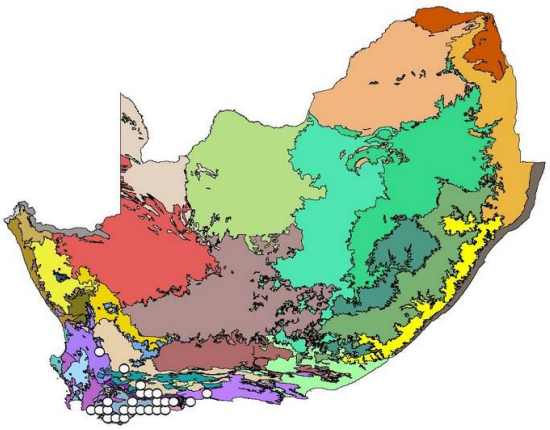
[E]*Aspalathus crassisepala* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–1.5; Alt 15–1372

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (60)	400–800 (20)
Min temp (°C)	2–8 (84)	>6 (16)
Max temp (°C)	25–29 (80)	27–35 (16)
Phosphorus (ppm)	5–35 (84)	<10 (12)
pH	5.5–7.4 (32)	6.5–8.4 (28)
ESP	Non; Medium (50)	
QDGCs	3419; 3420 (24)	3421 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



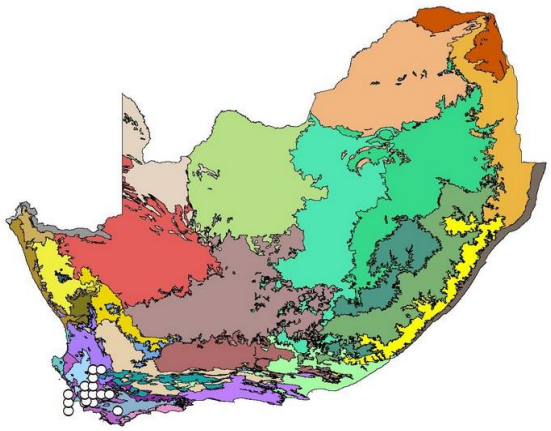
[E]*Aspalathus crenata* (L.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.15–1.8; Alt 75–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (33)	>800 (27)
Min temp (°C)	0–4 (47)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	3319 (44)	3418 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Beverage; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Kidd 2002).



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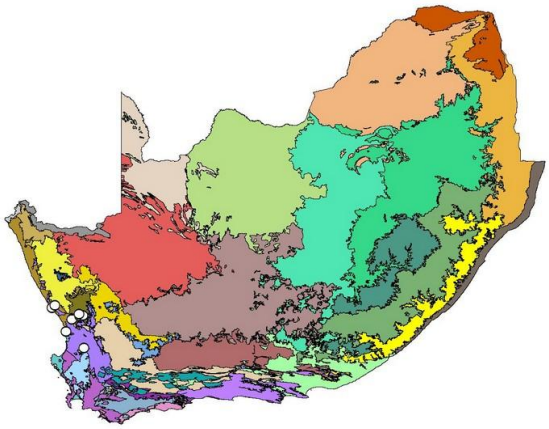
[E]*Aspalathus cuspidata* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.35; Alt 45–880

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (83)	200–600 (17)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (50)	27–35 (33)
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	6.5–8.4 (50)	6.5–7.4 (33)
ESP	Ecotone	
QDGCs	3118 (50)	3117; 3218 (25)

NOTES: –



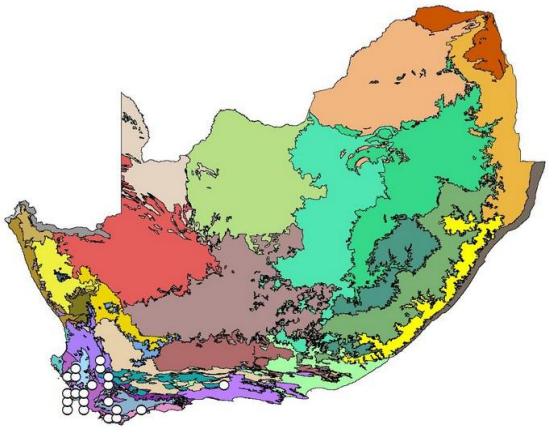
[E]*Aspalathus cymbiformis* DC.

Crotalarieae ①

Shrub; P; Ht 0.15–1; Alt 27–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (50)	Northwest Fynbos; West Coast Renosterveld (25)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (57)	400–800; 600–1000; >800 (14)
Min temp (°C)	2–8 (52)	>6 (29)
Max temp (°C)	25–29 (90)	27–35 (10)
Phosphorus (ppm)	5–35 (95)	<10 (5)
pH	<6.4 (57)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	3318 (29)	3319; 3418; 3419 (19)

NOTES: **Flowering:** Spring, summer (Kidd 2002).



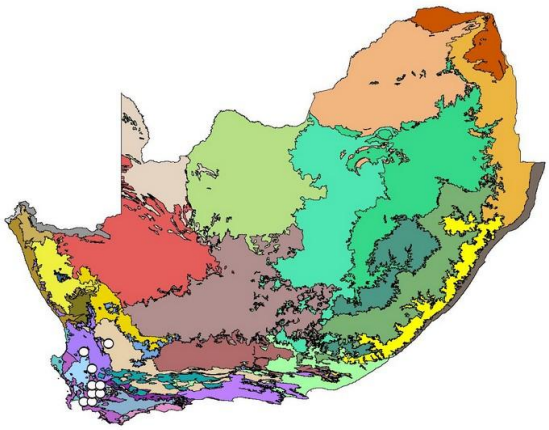
[E]*Aspalathus cytisoides* Lam.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.2–0.9; Alt 609–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Rainshadow Valley Karoo (50)	
Biome	Fynbos (86)	Succulent Karoo (14)
Rainfall (mm)	>800 (44)	200–600 (33)
Min temp (°C)	0–4 (56)	2–8 (44)
Max temp (°C)	25–29 (89)	27–35 (11)
Phosphorus (ppm)	5–35 (89)	>20 (11)
pH	5.5–7.4 (56)	<6.4 (33)
ESP	Non; High (50)	
QDGCs	3319 (56)	3218; 3219; 3418; 3419 (11)

NOTES: –



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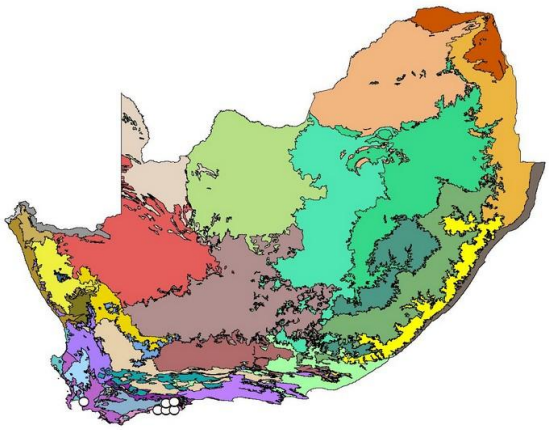
[E]*Aspalathus dasyantha* Eckl. & Zeyh.

Crotalarieae ①

Shrub; P; Ht 0.03–1; Alt 91–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (83)	>800 (17)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3421 (83)	3418 (17)

NOTES: –



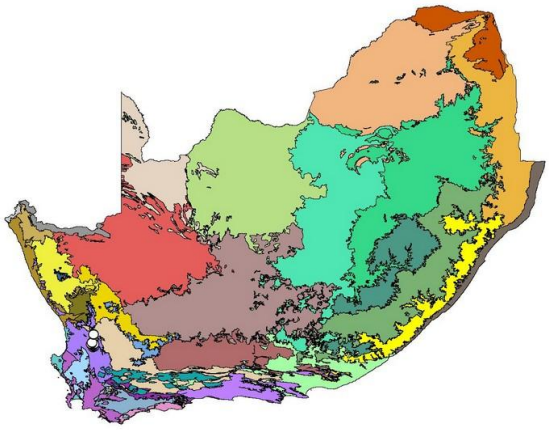
[E]*Aspalathus decora* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 1.5–3; Alt 950–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Non (100)	
QDGCs	3219 (100)	

NOTES: –



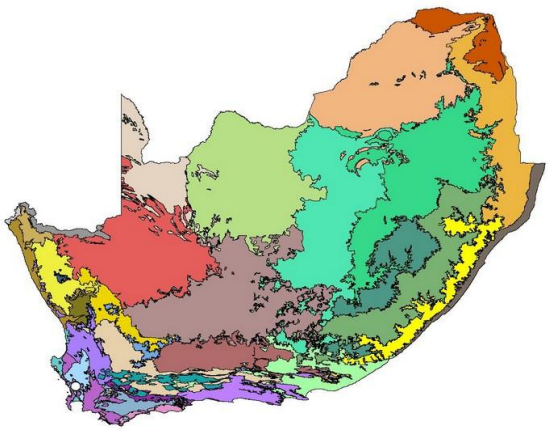
[E]*Aspalathus densifolia* Benth.

Crotalarieae ①

Shrub; P; Ht 1–1.5; Alt ?–200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: –



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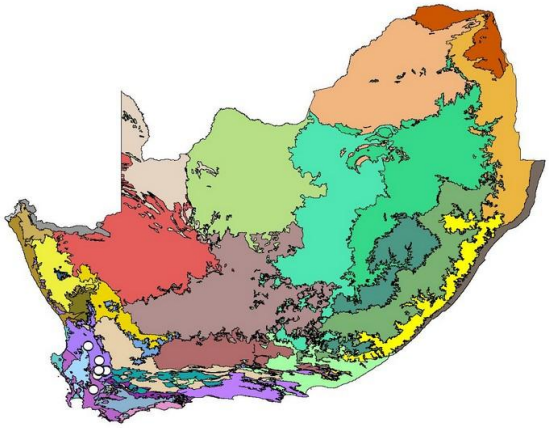
[E]*Aspalathus desertorum* Bolus

Crotalarieae ①

Dwarf shrub; P; Ht 0.7–1; Alt ?–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (67)	Southwest Fynbos (33)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800; >800 (17)
Min temp (°C)	0–4 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Non (100)	
QDGCs	3319 (80)	3219 (20)

NOTES: –



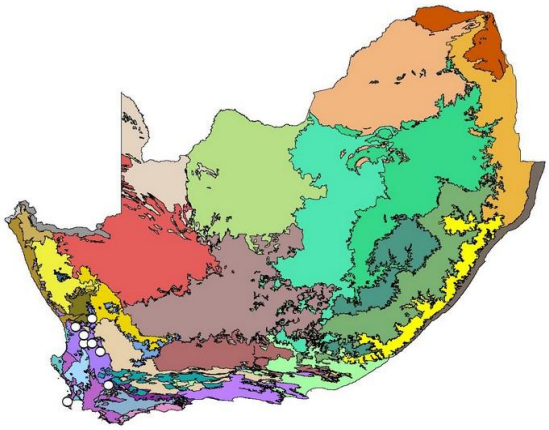
[E]*Aspalathus dianthopora* E.Phillips

Crotalarieae ①

Shrub; P; Ht 0.6–2; Alt 460–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400 (25)
Min temp (°C)	2–8 (63)	>6 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (88)	>20 (12)
pH	<6.4 (38)	5.5–7.4; 6.5–8.4 (25)
ESP	Ecotone	
QDGCs	3118 (30)	3218; 3219 (20)

NOTES: –



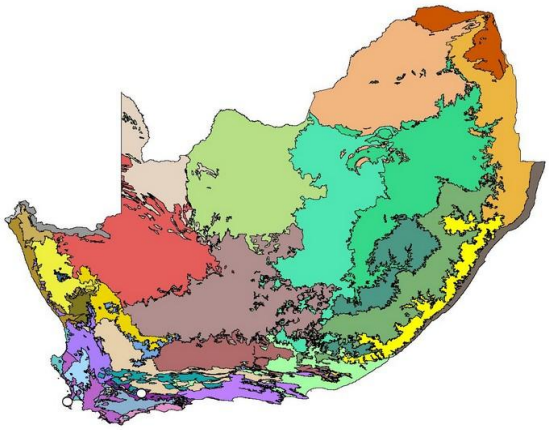
[E]*Aspalathus diffusa* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt 487–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3320; 3418 (50)	

NOTES: –



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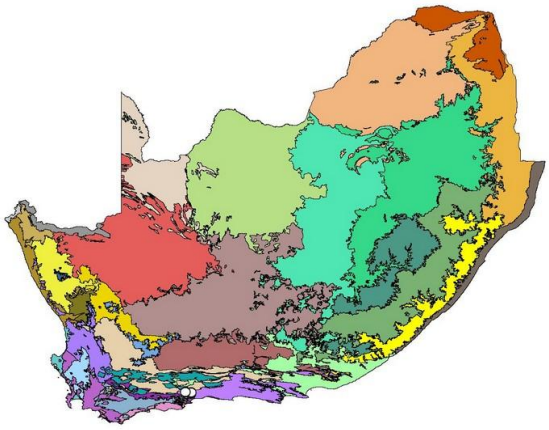
[E]*Aspalathus digitifolia* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–1.2; Alt 488–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3322 (80)	3321 (20)

NOTES: –



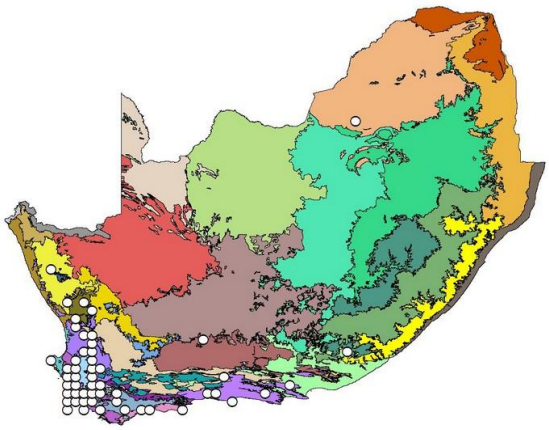
[E]*Aspalathus divaricata* Thunb. subsp. *divaricata*

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.1–1.5; Alt 30–1770

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld (30)	Northwest Fynbos; West Coast Renosterveld; West Strandveld; Central Bushveld (10)
Biome	Fynbos (91)	Succulent Karoo (6)
Rainfall (mm)	200–600 (40)	<400 (21)
Min temp (°C)	2–8 (54)	>6 (29)
Max temp (°C)	25–29 (73)	27–35 (19)
Phosphorus (ppm)	5–35 (87)	>20 (10)
pH	<6.4 (46)	5.5–7.4 (23)
ESP	Non (60)	Medium (40)
QDGCs	3318 (17)	3319 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



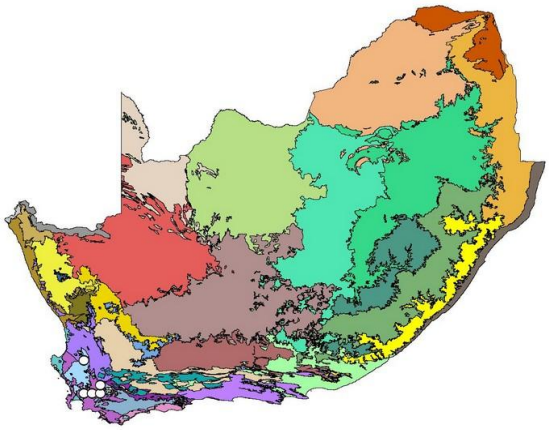
[E]*Aspalathus divaricata* Thunb. subsp. *gracilior* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.4; Alt 518–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (60)	600–1000; >800 (20)
Min temp (°C)	0–4 (60)	2–8 (40)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (80)	<6.4 (20)
ESP	Non (100)	
QDGCs	3319 (60)	3218; 3318 (20)

NOTES: **Flowering:** Spring, summer (Kidd 2002).



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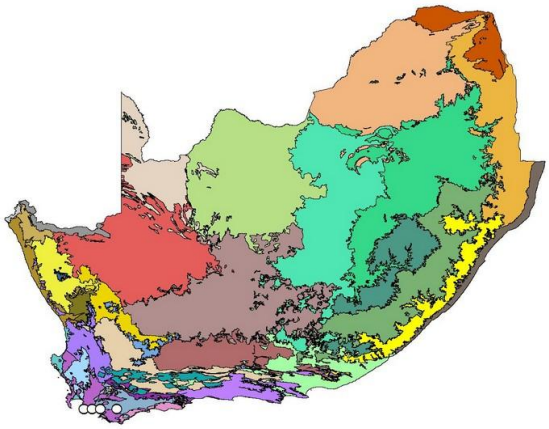
[E]*Aspalathus dunsdoniana* Alston ex R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 1–2; Alt 70–495

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	200–600; >800 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3419 (75)	3418 (25)

NOTES: –



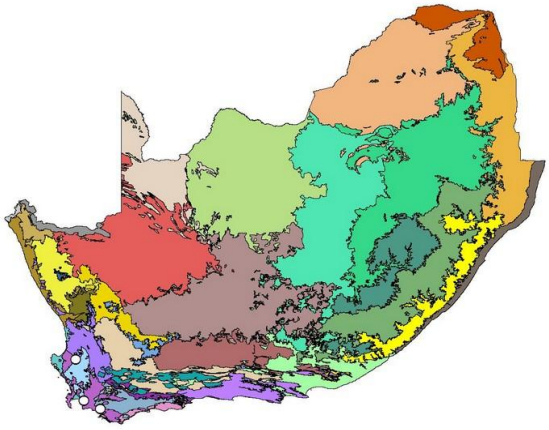
[E]*Aspalathus elliptica* (E.Phillips) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.8–2; Alt 610–1160

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800; >800 (33)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	6.5–8.4 (33)
ESP	Ecotone	
QDGCs	3218; 3418; 3419 (33)	

NOTES: –



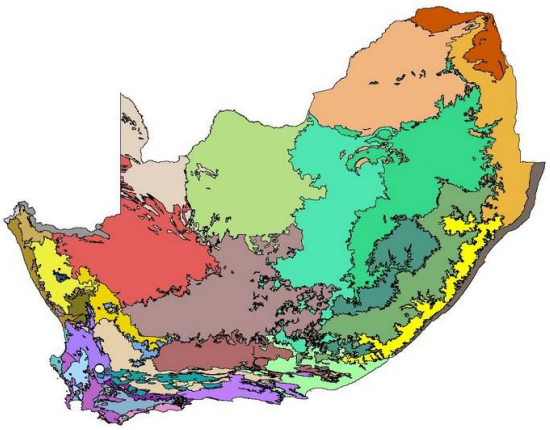
[E]*Aspalathus empetrifolia* (R.Dahlgren) R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



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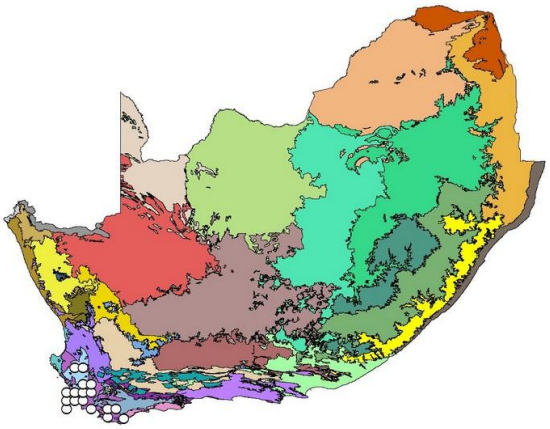
[E]*Aspalathus ericifolia* L. subsp. *ericifolia*

Crotalarieae ①

Shrub; P; Ht 0.2–1; Alt 25–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (67)	West Coast Renosterveld (33)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (35)	400–800 (29)
Min temp (°C)	2–8 (47)	>6 (41)
Max temp (°C)	25–29 (82)	27–35 (12)
Phosphorus (ppm)	5–35 (88)	<10 (12)
pH	<6.4 (53)	5.5–7.4 (41)
ESP	Non (100)	
QDGCs	3318 (35)	3418; 3419 (23)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Manning 2003).



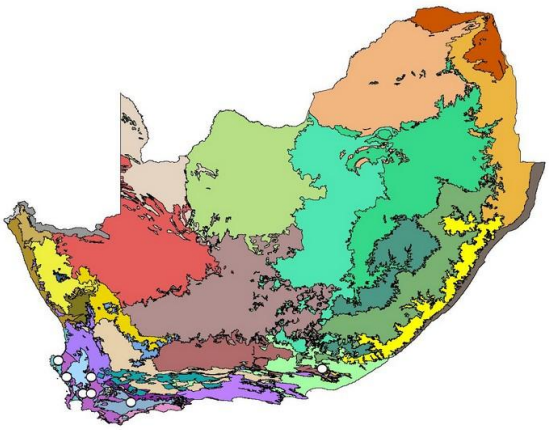
[E]*Aspalathus ericifolia* L. subsp. *minuta* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–1; Alt ?–460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (57)	<400; 600–1000; >800 (14)
Min temp (°C)	2–8 (42)	0–4; >6 (29)
Max temp (°C)	25–29 (71)	27–35 (29)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (43)	6.5–8.4 (14)
ESP	Non (100)	
QDGCs	3318; 3319 (29)	3218; 3326; 3420 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Manning 2003).



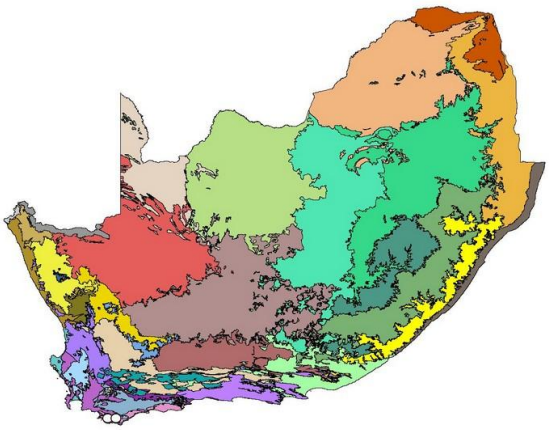
[E]*Aspalathus ericifolia* L. subsp. *pusilla* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.2; Alt ?–150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	5.5–7.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: **Flowering:** Spring (Manning 2003).



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[E]*Aspalathus erythrodes* Eckl. & Zeyh. **Crotalarieae** –

Shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

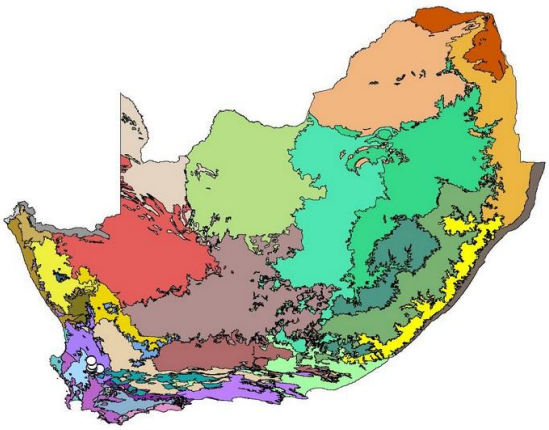
NOTES: –

[E]*Aspalathus esterhuyseniae* R.Dahlgren **Crotalarieae** ①

Dwarf shrub; P; Ht ?; Alt 915–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (67)	200–600 (33)
Min temp (°C)	0–4 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Ecotone	
QDGCs	3319 (86)	3219 (14)

NOTES: –

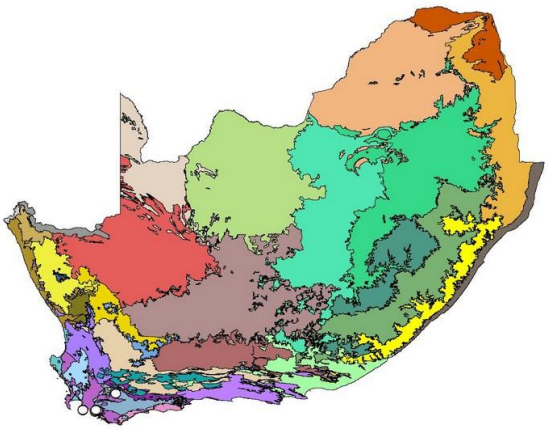


[E]*Aspalathus excelsa* R.Dahlgren **Crotalarieae** ①

Shrub; P; Ht 1.3–3; Alt ?–50

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	200–600; >800 (25)
Min temp (°C)	2–8 (50)	0–4; >6 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (75)	6.5–7.4 (25)
ESP	Non (100)	
QDGCs	3419 (84)	3319; 3418 (8)

NOTES: –



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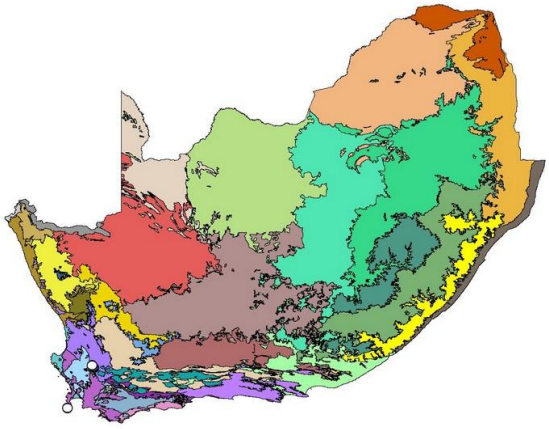
[E]*Aspalathus fasciculata* (Thunb.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.5–1; Alt 610–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	0–4; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3319 (83)	3418 (17)

NOTES: –



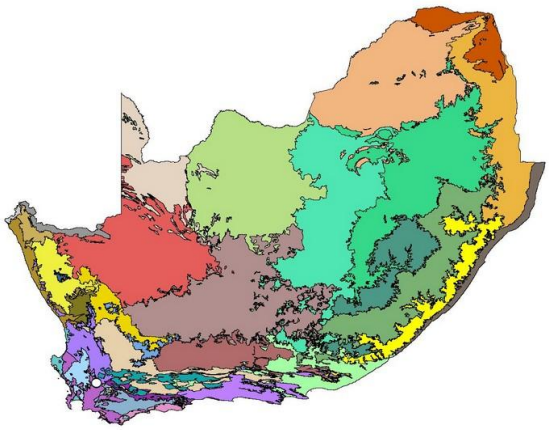
[E]*Aspalathus ferox* Harv.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



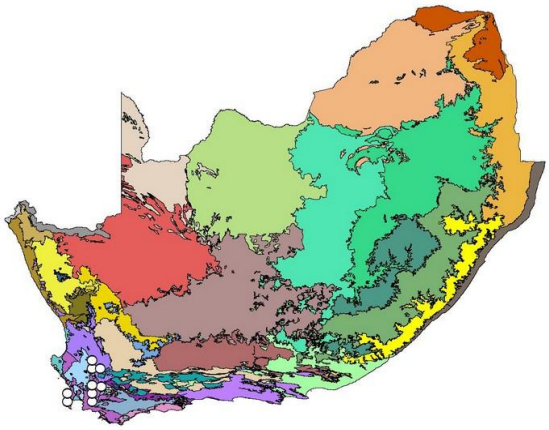
[E]*Aspalathus filicaulis* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.4; Alt 303–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (34)	200–600; 400–800; 600–1000 (22)
Min temp (°C)	0–4 (56)	2–8; >6 (22)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (56)	5.5–7.4 (44)
ESP	Non (100)	
QDGCs	3319 (56)	3219; 3318; 3418; 3419 (11)

NOTES: –



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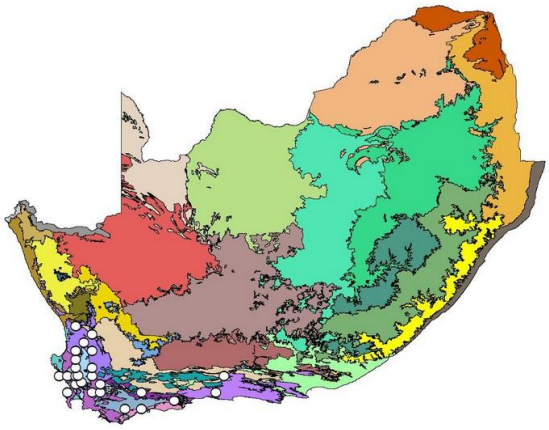
[E]*Aspalathus flexuosa* Thunb.

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–1.5; Alt 76–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos; Eastern Fynbos-Renosterveld; West Coast Renosterveld (25)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (63)	<400 (21)
Min temp (°C)	2–8 (50)	>6 (29)
Max temp (°C)	25–29 (79)	27–35 (17)
Phosphorus (ppm)	5–35 (96)	<10 (4)
pH	<6.4 (38)	5.5–7.4 (33)
ESP	Non (75)	Medium (25)
QDGCs	3318 (32)	3319 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



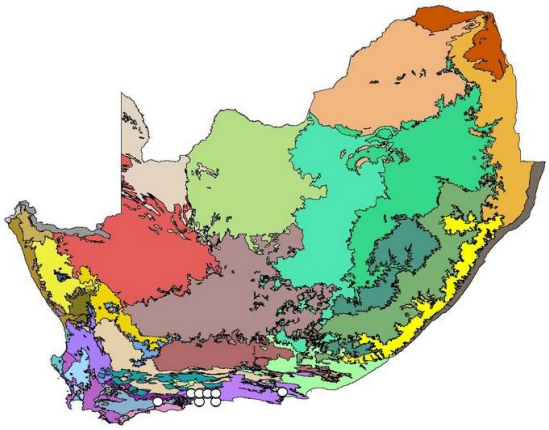
[E]*Aspalathus florifera* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.8–2; Alt 91–457

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (50)	400–800 (38)
Min temp (°C)	2–8 (88)	>6 (13)
Max temp (°C)	25–29 (63)	<27 (38)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Medium (100)	
QDGCs	3322 (50)	3422 (25)

NOTES: **Flowering:** Spring (Moriarty1997).



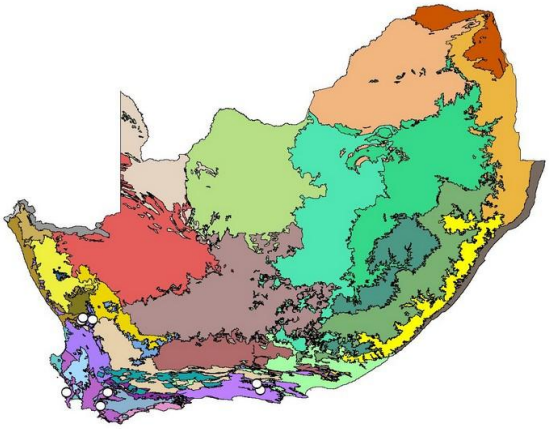
[E]*Aspalathus florulenta* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–0.5; Alt ?–730

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; 400–800 (29)	600–1000 (13)
Min temp (°C)	0–4; >6 (72)	2–8 (14)
Max temp (°C)	25–29 (72)	<27; 27–35 (14)
Phosphorus (ppm)	5–35 (86)	>20 (14)
pH	<6.4 (57)	6.5–8.4 (29)
ESP	Medium (100)	
QDGCs	3118 (33)	3324 (22)

NOTES: –



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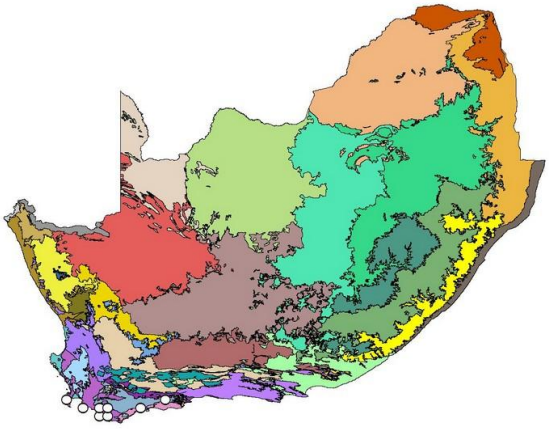
[E]*Aspalathus forbesii* Harv.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.4–1.5; Alt 46–60

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (38)	600–1000; >800 (12)
Min temp (°C)	2–8 (63)	>6 (37)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	5.5–7.4 (50)	<6.4 (38)
ESP	Non (100)	
QDGCs	3419 (50)	3418 (25)

NOTES: –



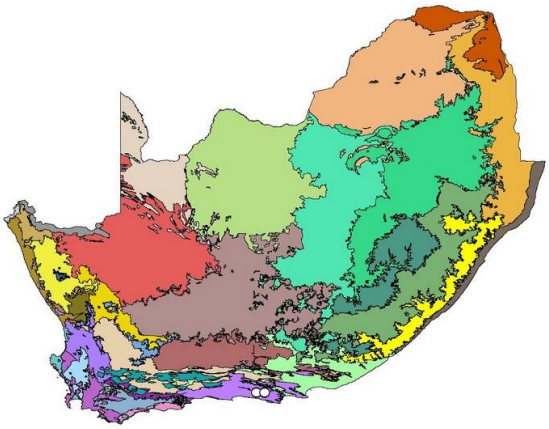
[E]*Aspalathus fourcadei* L.Bolus

Crotalarieae ①

Shrub; P; Ht 1–2; Alt ?–350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Medium (100)	
QDGCs	3324 (100)	

NOTES: –



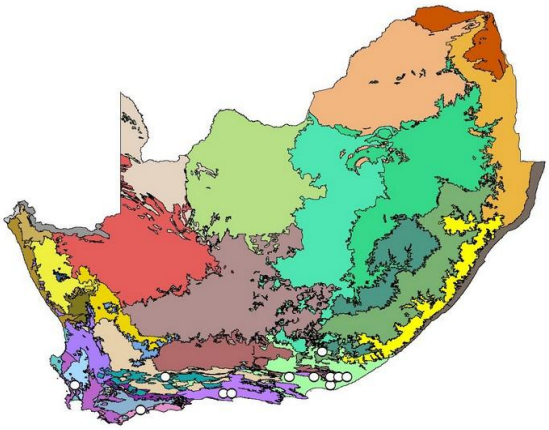
[E]*Aspalathus frankenioides* DC.

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.5; Alt 460–1341

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (42)	200–600 (33)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (66)	<27; 27–35 (17)
Phosphorus (ppm)	5–35 (84)	<10; >20 (8)
pH	<6.4; 5.5–7.4; 6.5–7.4 (25)	6.5–8.4 (17)
ESP	Medium (100)	
QDGCs	3326 (33)	3323; 3325 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Autumn (Manning 2001).



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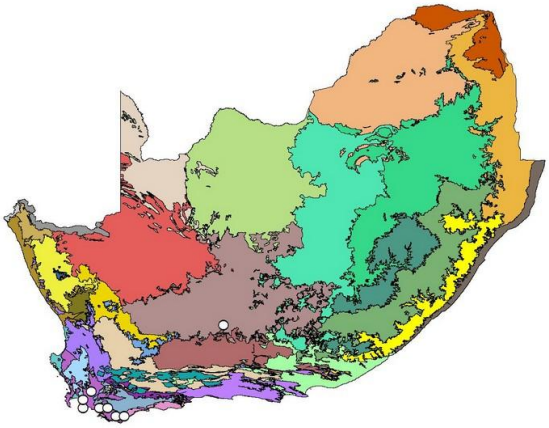
[E]*Aspalathus fusca* Thunb.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.15–1.5; Alt 50–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (88)	Nama-Karoo (12)
Rainfall (mm)	>800 (38)	200–600; 400–800 (25)
Min temp (°C)	2–8 (63)	0–4 (25)
Max temp (°C)	25–29 (88)	27–35 (12)
Phosphorus (ppm)	5–35 (74)	<10; >20 (13)
pH	<6.4 (38)	6.5–7.4 (25)
ESP	Non (100)	
QDGCs	3419 (38)	3418 (25)

NOTES: –



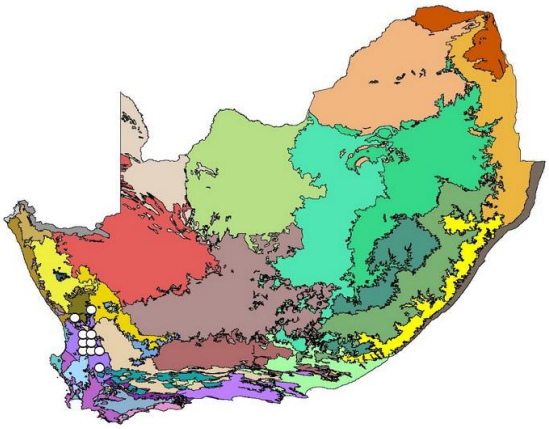
[E]*Aspalathus galeata* E.Mey.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.2–1; Alt 380–1140

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (70)	<400 (20)
Min temp (°C)	2–8 (80)	0–4; >6 (10)
Max temp (°C)	25–29 (90)	27–35 (10)
Phosphorus (ppm)	5–35 (80)	>20 (20)
pH	5.5–7.4 (50)	<6.4 (30)
ESP	Non (100)	
QDGCs	3219 (40)	3218 (30)

NOTES: **Flowering:** Spring, summer (Van Rooyen & Steyn 1999).



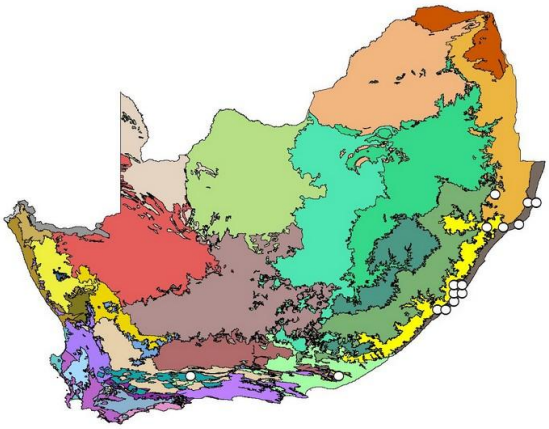
[E]*Aspalathus gerrardii* Bolus

Crotalarieae ①

Shrub; P; Ht 0.4–2; Alt 15–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (86)	<400; 400–800 (7)
Min temp (°C)	>6 (80)	2–8 (20)
Max temp (°C)	25–29 (73)	27–35 (27)
Phosphorus (ppm)	<10 (60)	5–35 (33)
pH	<6.4 (73)	6.5–7.4 (13)
ESP	Non (100)	
QDGCs	3030 (26)	2832 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Whole year (Pooley 1998).



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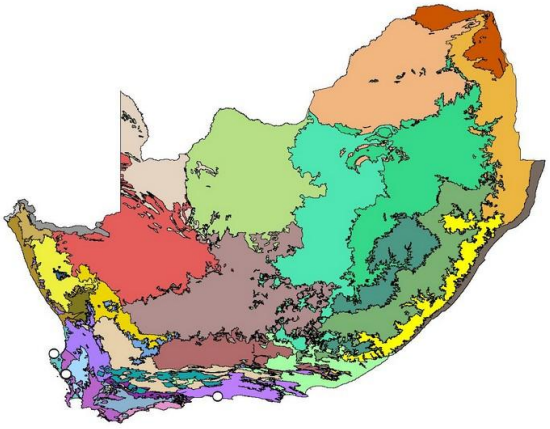
[E]*Aspalathus glabrata* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.3–1; Alt 152–183

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; 600–1000 (33)	
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	<27; 25–29; 27–35 (33)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	>7.5 (33)
ESP	Medium (100)	
QDGCs	3318 (60)	3217; 3422 (20)

NOTES: –



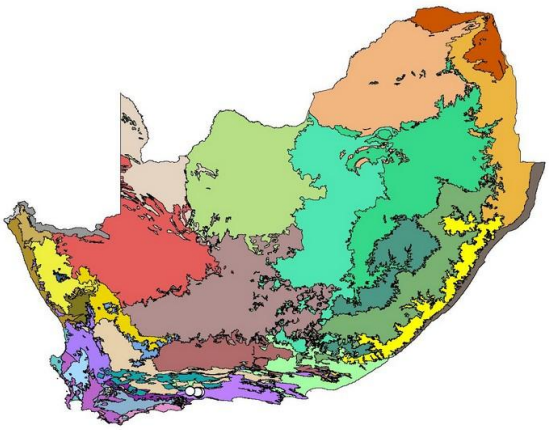
[E]*Aspalathus glabrescens* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.8–1.8; Alt 549–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800; 600–1000 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3322 (100)	

NOTES: –



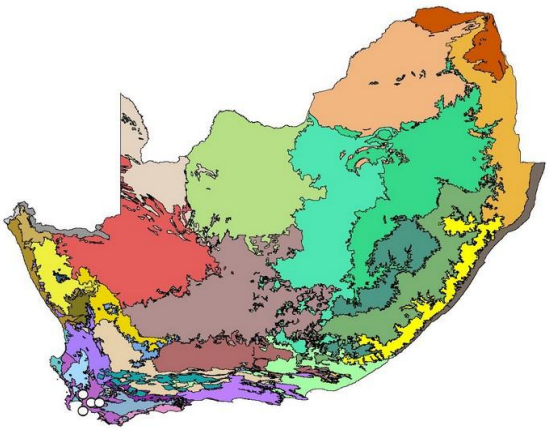
[E]*Aspalathus globosa* Andrews

Crotalarieae ①

Shrub; P; Ht 1.5–2.5; Alt 747–762

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (50)	400–800; 600–1000 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3419 (50)	3318; 3418 (25)

NOTES: –



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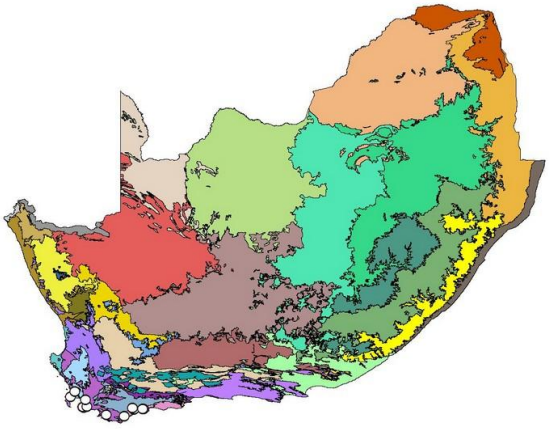
[E]*Aspalathus globulosa* E.Mey.

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–2; Alt 152–350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	>800 (25)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (88)	<10 (12)
pH	<6.4 (50)	6.5–8.4 (25)
ESP	Non (100)	
QDGCs	3418 (59)	3420 (29)

NOTES: –



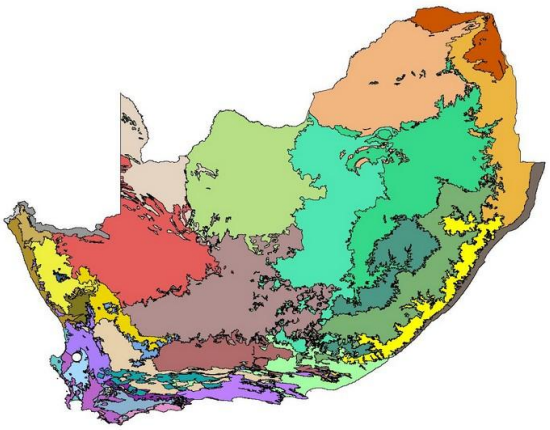
[E]*Aspalathus glossoides* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3218 (100)	

NOTES: –



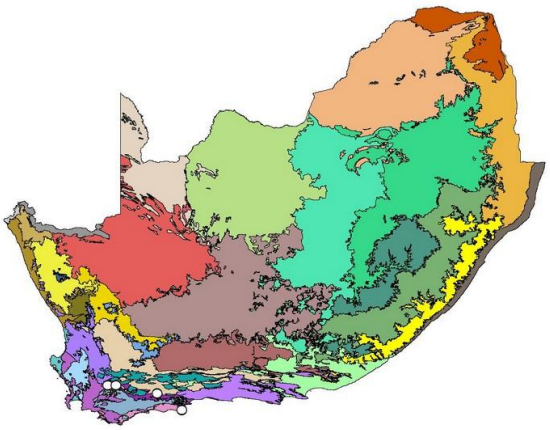
[E]*Aspalathus grandiflora* Benth.

Crotalarieae ①

Shrub; P; Ht 0.4–1.3; Alt 80–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (75)	<400 (25)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	6.5–7.4 (50)	<6.4; 6.5–25
ESP	Ecotone	
QDGCs	3319 (50)	3321; 3421 (25)

NOTES: –



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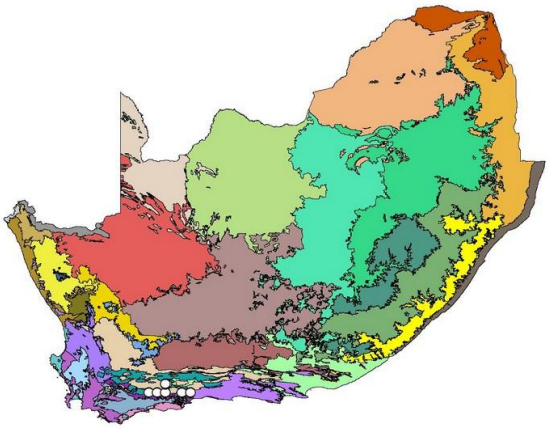
[E]*Aspalathus granulata* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–1; Alt 396–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (50)	200–600 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	5.5–7.4 (33)
ESP	Ecotone	
QDGCs	3321 (74)	3320; 3322 (13)

NOTES: –



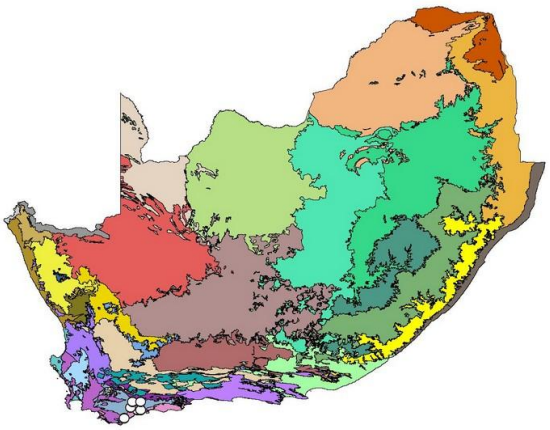
[E]*Aspalathus grobleri* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt 100–120

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–8.4 (40)	6.5–7.4 (20)
ESP	Ecotone	
QDGCs	3420 (100)	

NOTES: –



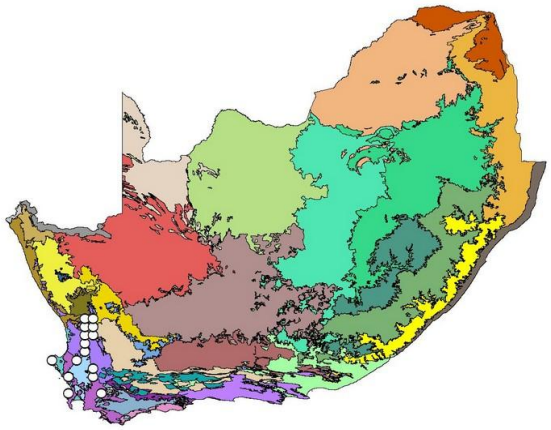
[E]*Aspalathus heterophylla* L.f.

Crotalarieae ①

Dwarf shrub; P; Ht 0.08–0.3; Alt 115–840

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (53)	<400 (33)
Min temp (°C)	2–8 (60)	0–4; >6 (20)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (93)	>20 (7)
pH	<6.4; 6.5–8.4 (33)	5.5–7.4 (27)
ESP	Medium (100)	
QDGCs	3218 (27)	3319 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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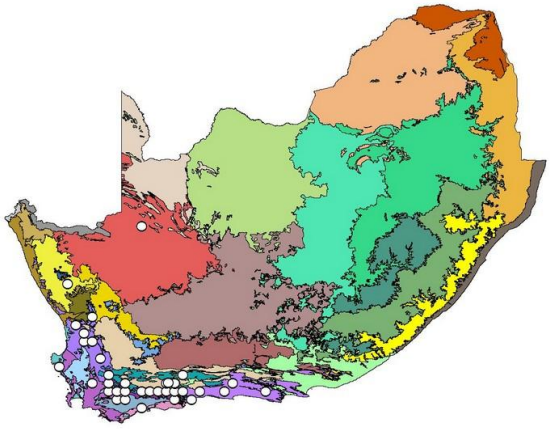
[E]*Aspalathus hirta* E.Mey. subsp. *hirta* — Crotalarieae ①

Shrub; P; Ht 0.6–2.5; Alt 50–1080

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (40)	Northwest Fynbos; Bushmanland; Namaqualand Hardeveld (20)
Biome	Fynbos (86)	Nama-Karoo; Succulent Karoo (7)
Rainfall (mm)	200–600 (49)	<400 (31)
Min temp (°C)	2–8 (77)	0–4 (14)
Max temp (°C)	25–29 (60)	27–35 (29)
Phosphorus (ppm)	5–35 (86)	>20 (11)
pH	<6.4; 6.5–7.4 (26)	5.5–7.4; 6.5–8.4 (20)
ESP	Medium (60)	Non (40)
QDGCs	3321 (26)	3319 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Spring, summer (Mustart *et al.* 2003).

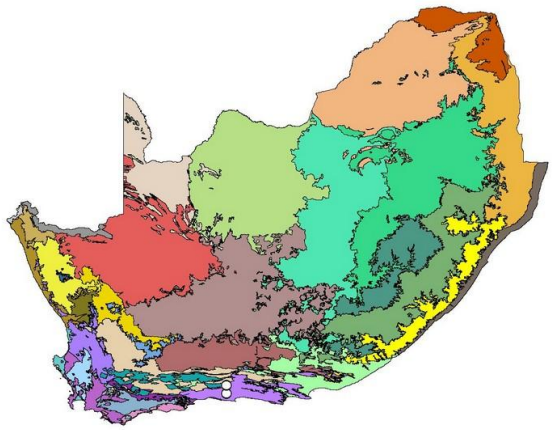


[E]*Aspalathus hirta* E.Mey. subsp. *stellaris* R.Dahlgren — Crotalarieae ①

Shrub; P; Ht 0.9–1.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	200–600; 600–1000 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	<27; 252– (50)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Medium (100)	
QDGCs	3323 (100)	

NOTES: –

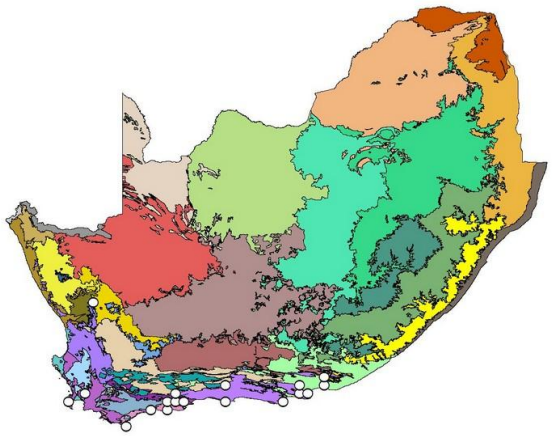


[E]*Aspalathus hispida* Thunb. subsp. *albiflora* (Eckl. & Zeyh.) R.Dahlgren — Crotalarieae ①

Shrub; P; Ht 0.1–1; Alt 60–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; South Coast Fynbos; Eastern Fynbos-Renosterveld (33)	
Biome	Fynbos (86)	Albany Thicket (14)
Rainfall (mm)	200–600 (44)	400–800 (33)
Min temp (°C)	2–8 (61)	>6 (39)
Max temp (°C)	25–29 (78)	<27; 27–35 (11)
Phosphorus (ppm)	5–35 (83)	<10 (11)
pH	<6.4 (44)	6.5–8.4 (28)
ESP	Non (67)	Medium (33)
QDGCs	3421 (22)	3325 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Boone *et al.* 1999). **Flowering:** Winter, spring, summer (Manning & Goldblatt 2000).



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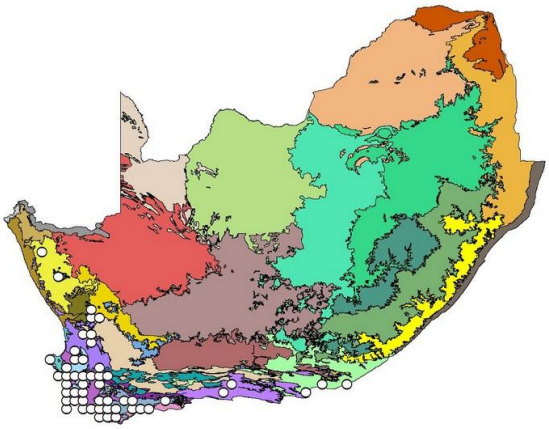
Aspalathus hispida Thunb. subsp. *hispida*

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.15–1.8; Alt 3–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Southwest Fynbos; Eastern Fynbos-Renosterveld (24)	West Strandveld; Namaqualand Hardeveld (14)
Biome	Fynbos (90)	Albany Thicket; Succulent Karoo (5)
Rainfall (mm)	200–600 (46)	400–800 (27)
Min temp (°C)	2–8 (56)	>6 (35)
Max temp (°C)	25–29 (81)	27–35 (15)
Phosphorus (ppm)	5–35 (87)	>20 (8)
pH	<6.4 (37)	5.5–7.4 (33)
ESP	Non; Medium (50)	
QDGCs	3318 (19)	3419 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972; Boone *et al.* 1999). **Flowering:** Winter, spring, summer (Manning & Goldblatt 2000).



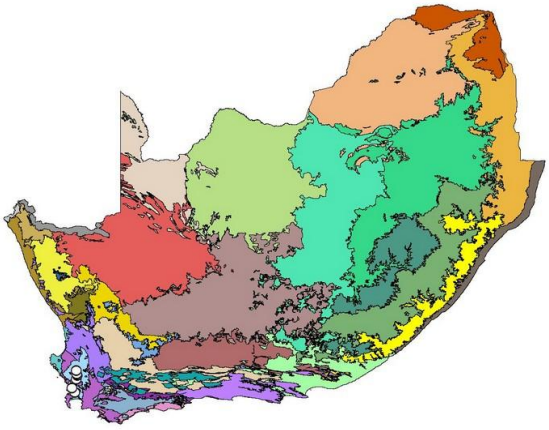
[E]*Aspalathus horizontalis* (R.Dahlgren) R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–517

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Coast Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3318 (100)	

NOTES: –



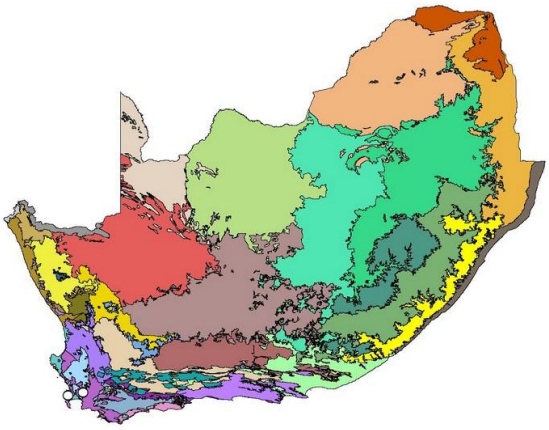
[E]*Aspalathus humilis* Bolus

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt 1000–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: –



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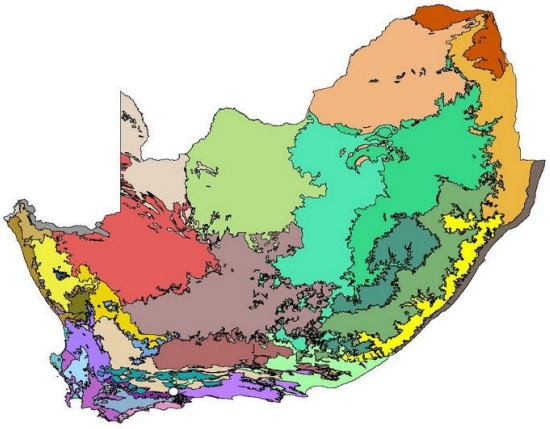
[E]*Aspalathus hypnoides* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.8; Alt ?–420

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3321 (100)	

NOTES: –



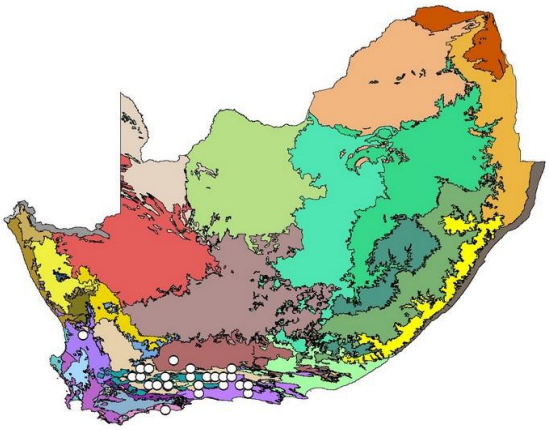
[E]*Aspalathus hystrix* L.f.

Crotalarieae ①

Shrub; P; Ht 0.5–3; Alt 82–1465

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos; Eastern Fynbos-Renosterveld; Lower Karoo; Rainshadow Valley Karoo (25)	
Biome	Fynbos; Nama-Karoo; Succulent Karoo (33)	
Rainfall (mm)	<400 (67)	200–600 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (63)	25–29 (33)
Phosphorus (ppm)	5–35 (58)	>20 (42)
pH	>7.5 (42)	6.5–8.4 (25)
ESP	Medium (50)	Non; High (25)
QDGCs	3323 (27)	3322 (23)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



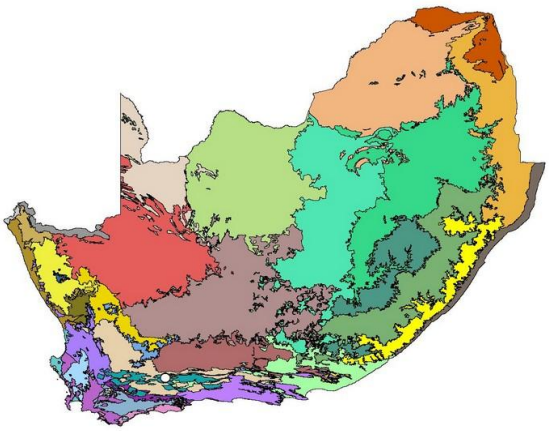
[E]*Aspalathus incana* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3321 (100)	

NOTES: –



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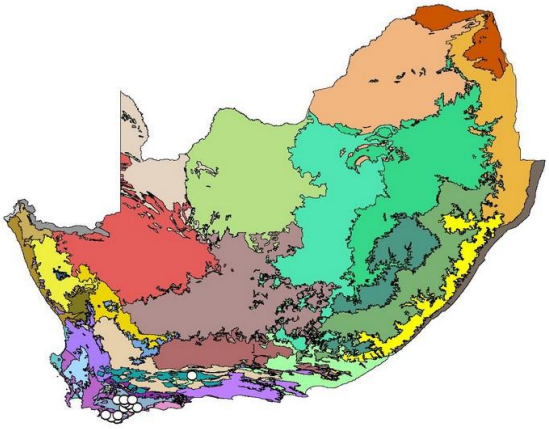
[E]*Aspalathus incompta* Thunb.

Crotalarieae ①

Dwarf shrub; P; Ht 0.91–2.7; Alt 60–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (56)	<400; 400–800 (22)
Min temp (°C)	2–8 (89)	>6 (11)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (78)	<10; >20 (11)
pH	6.5–7.4 (44)	5.5–7.4; 6.5–8.4 (22)
ESP	Ecotone	
QDGCs	3420 (57)	3419 (36)

NOTES: –



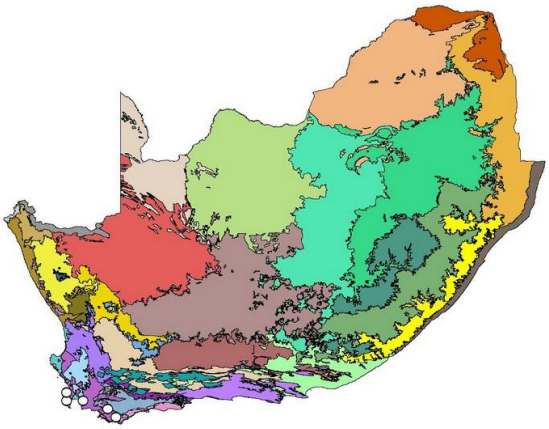
[E]*Aspalathus incurva* Thunb.

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.6; Alt 304–549

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (40)	200–600; 400–800; >800 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	<6.4 (60)	5.5–7.4; 6.5–7.4 (20)
ESP	Ecotone	
QDGCs	3418; 3419 (40)	3318 (20)

NOTES: –



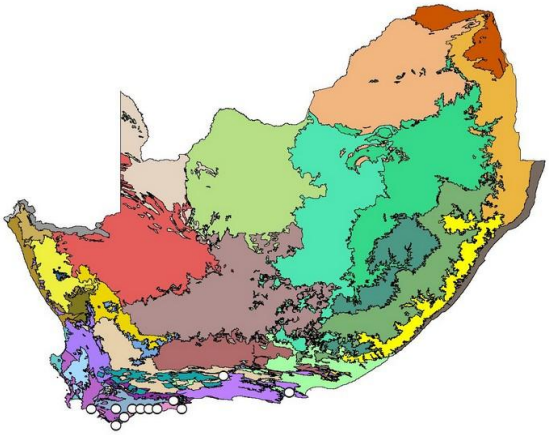
[E]*Aspalathus incurvifolia* Vogel ex Walp.

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–1; Alt 15–1115

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (25)
Min temp (°C)	2–8 (58)	>6 (42)
Max temp (°C)	25–29 (92)	27–35 (8)
Phosphorus (ppm)	5–35 (83)	<10 (17)
pH	<6.4; 5.5–7.4; 6.5–7.4; 6.5–8.4 (25)	
ESP	Ecotone	
QDGCs	3420 (33)	3419; 3421 (25)

NOTES: **Flowering:** Winter, spring (Mustart *et al.* 2003).



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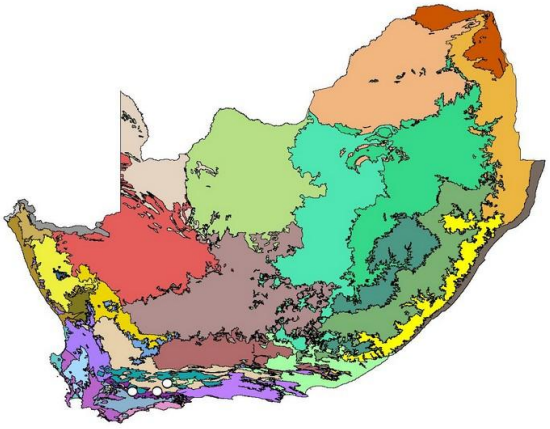
[E]*Aspalathus inops* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.3; Alt 450–1204

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (67)	200–600 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–7.4; >7.5 (33)	
ESP	Ecotone	
QDGCs	3321 (67)	3320 (33)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



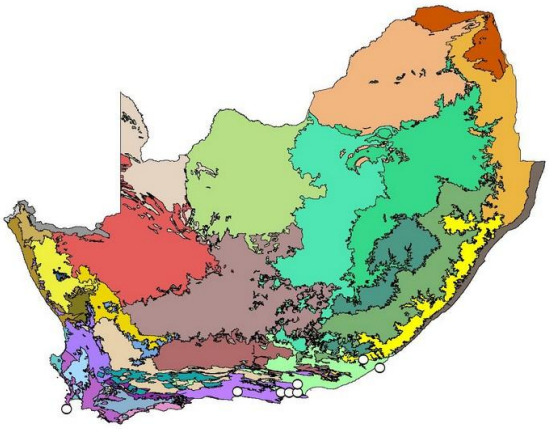
[E]*Aspalathus intermedia* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub; P; Ht 0.35–0.6; Alt 120–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Southwest Fynbos; Eastern Fynbos-Renosterveld (33)	
Biome	Albany Thicket; Fynbos (50)	
Rainfall (mm)	400–800 (75)	200–600; 600–1000 (13)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (88)	<27 (12)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (38)	6.5–8.4 (25)
ESP	Non (67)	Medium (33)
QDGCs	3325 (35)	3227; 3323; 3324; 3327; 3418 (13)

NOTES: –



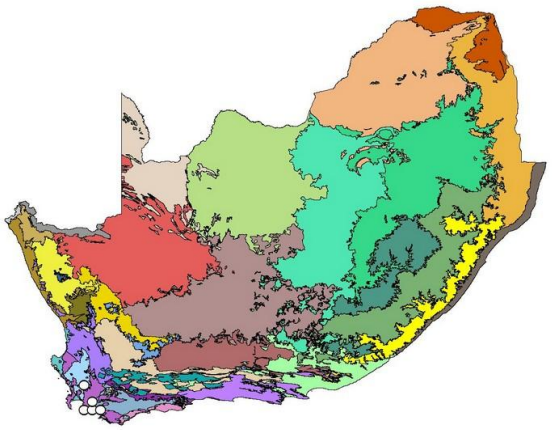
[E]*Aspalathus intervallaris* Bolus

Crotalarieae ①

Dwarf shrub; P; Ht 0.7–1; Alt 61–975

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (60)	>800 (40)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3419 (60)	3318; 3418 (20)

NOTES: –



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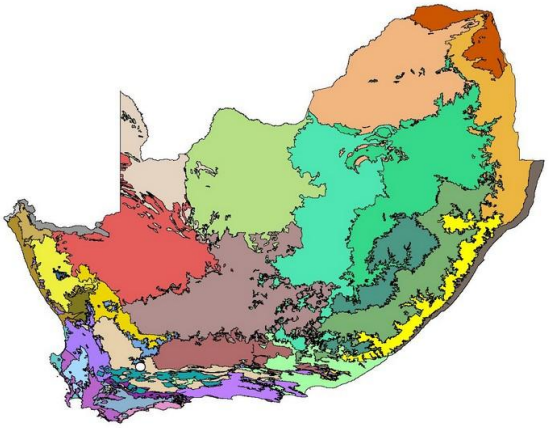
[E]*Aspalathus intricata* Compton subsp. *anthospermoides* (R.Dahlgren) R.Dahlgren — Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.35; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3320 (100)	

NOTES: –

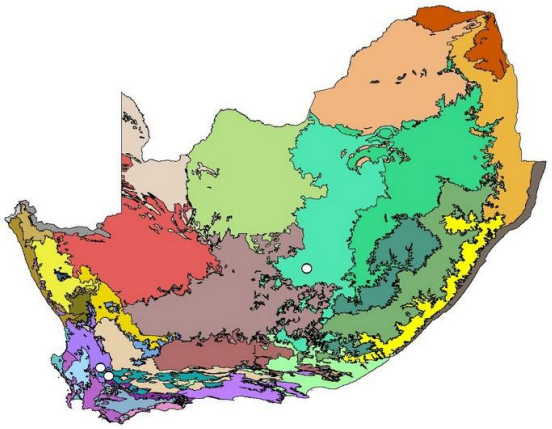


[E]*Aspalathus intricata* Compton subsp. *intricata* — Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.5; Alt 960–1524

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (100)	
Biome	Fynbos (67)	Grassland (33)
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (67)	<2 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4; 6.5–7.4 (33)	
ESP	Non (100)	
QDGCs	3319 (67)	3025 (33)

NOTES: –

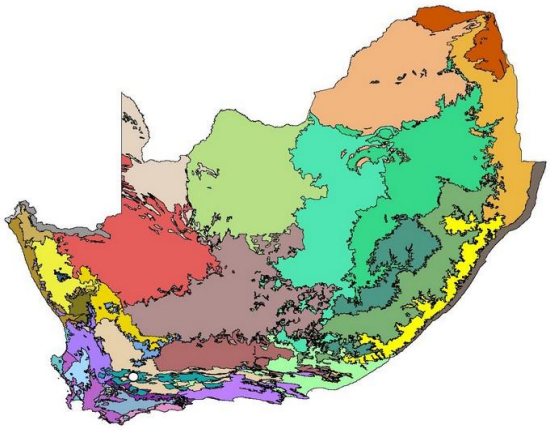


[E]*Aspalathus intricata* Compton subsp. *oxyclada* (Compton) R.Dahlgren — Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–1150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3320 (100)	

NOTES: –



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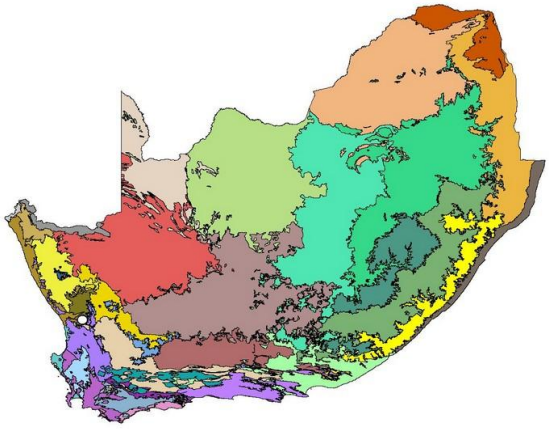
[E]*Aspalathus isolata* (R.Dahlgren) R.Dahlgren — Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.25; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3118 (100)	

NOTES: –

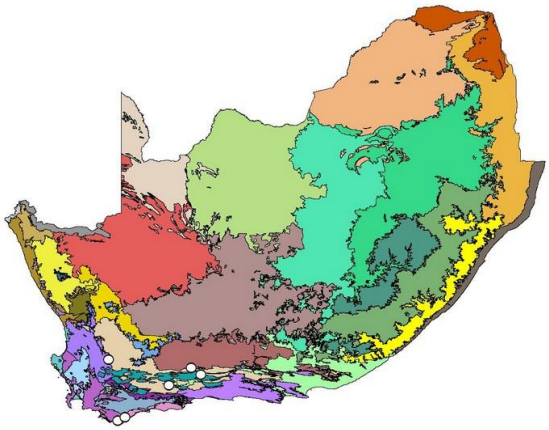


[E]*Aspalathus joubertiana* Eckl. & Zeyh. — Crotalarieae ①

Dwarf shrub; P; Ht 0.4–1.5; Alt 152–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400 (33)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	>7.5 (49)	5.5–7.4; 6.5–7.4; 6.5–8.4 (17)
ESP	Ecotone	
QDGCs	3322 (32)	3219; 3321; 3419; 3420 (17)

NOTES: –

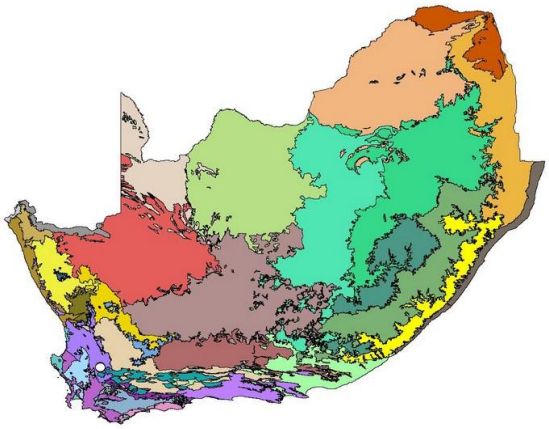


[E]*Aspalathus juniperina* Thunb. subsp. *gracilifolia* (R.Dahlgren) R.Dahlgren — Crotalarieae ①

Dwarf shrub; P; Ht 0.01–1; Alt ?–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



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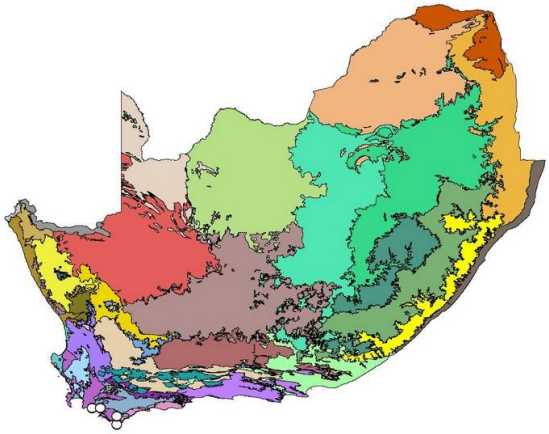
[E]*Aspalathus juniperina* Thunb. subsp. *grandis* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.01–0.8; Alt 50–160

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



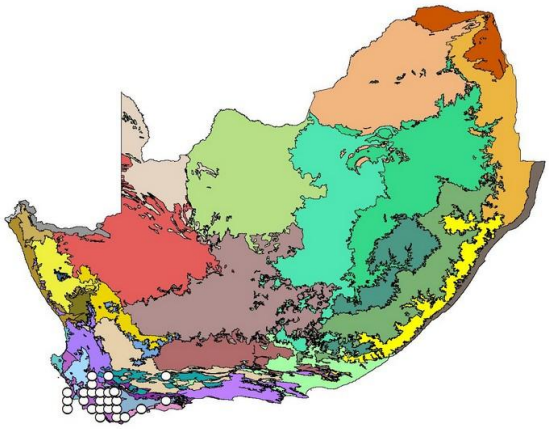
[E]*Aspalathus juniperina* Thunb. subsp. *juniperina*

Crotalarieae ①

Dwarf shrub; P; Ht 0.9–1.5; Alt 30–1371

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (48)	400–800 (24)
Min temp (°C)	2–8 (44)	0–4; >6 (28)
Max temp (°C)	25–29 (96)	27–35 (4)
Phosphorus (ppm)	5–35 (92)	<10; >20 (4)
pH	5.5–7.4 (40)	<6.4 (32)
ESP	Non (100)	
QDGCs	3419 (35)	3319 (31)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



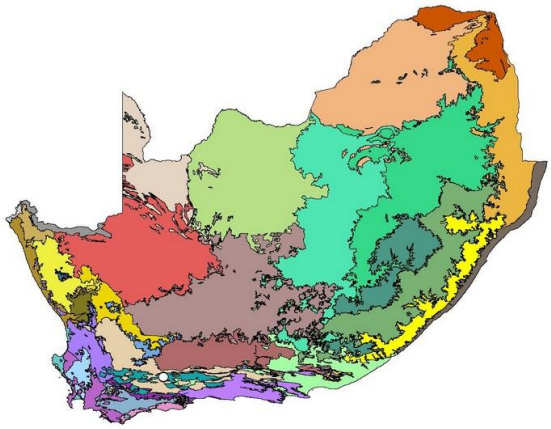
[E]*Aspalathus juniperina* Thunb. subsp. *monticola* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.6; Alt 1000–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3321 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



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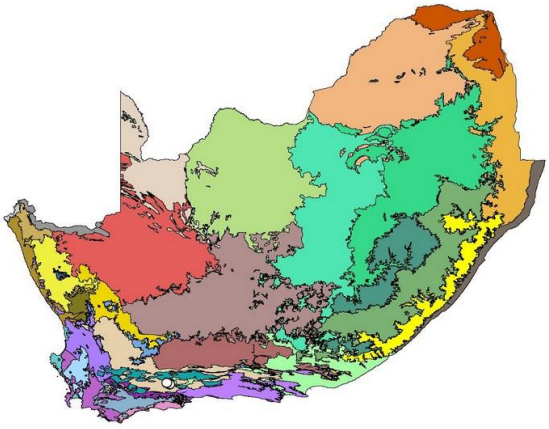
[E]*Aspalathus karrooensis* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.5–1; Alt ?–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3321 (100)	

NOTES: –



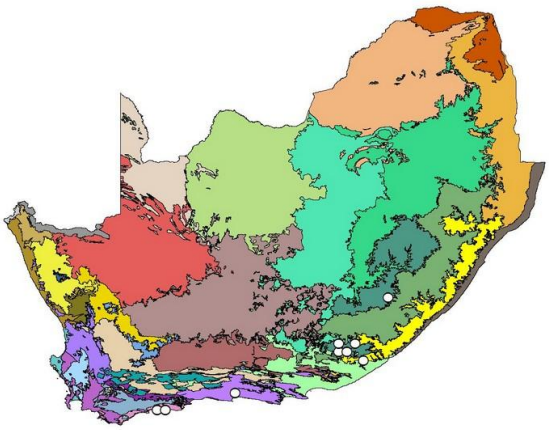
[E]*Aspalathus katbergensis* (R.Dahlgren) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.4–1; Alt 52–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (67)	Grassland (33)
Rainfall (mm)	400–800 (56)	200–600 (22)
Min temp (°C)	2–8 (67)	0–4 (22)
Max temp (°C)	25–29 (78)	<27 (22)
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	<6.4 (44)	5.5–7.4 (33)
ESP	Non; Medium (50)	
QDGCs	3226 (33)	3227; 3421 (22)

NOTES: –



[E]*Aspalathus keeromsbergensis* R.Dahlgren

Crotalarieae –

Dwarf shrub; P; Ht 0.2–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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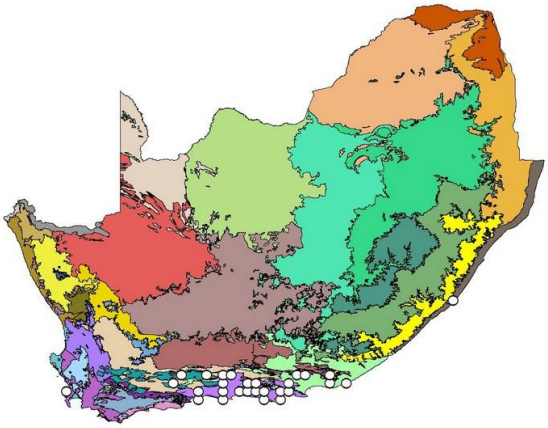
[E]*Aspalathus kougaensis* (Garab. ex R.Dahlgren) R.Dahlgren

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.2–3; Alt 150–1420

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (86)	Albany Thicket (14)
Biome	Fynbos (75)	Albany Thicket (25)
Rainfall (mm)	400–800 (36)	200–600 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (57)	<27 (29)
Phosphorus (ppm)	5–35 (89)	>20 (7)
pH	<6.4 (57)	6.5–8.4 (21)
ESP	Medium (86)	Non (14)
QDGCs	3323 (25)	3324; 3325 (14)

NOTES: –



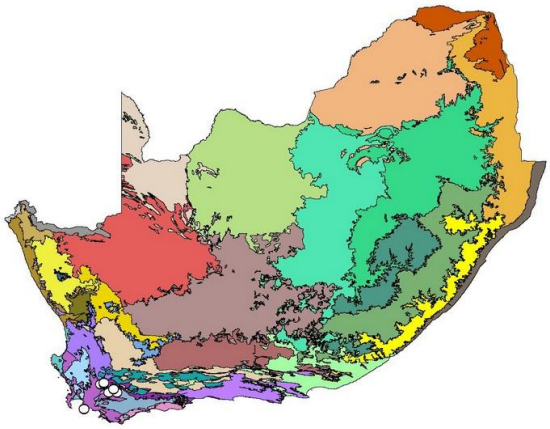
[E]*Aspalathus lactea* Thunb. subsp. *breviloba* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.3–0.6; Alt ?–245

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	>800 (25)
Min temp (°C)	0–4 (75)	2–8 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (50)	<6.4; 5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3319 (86)	3418 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



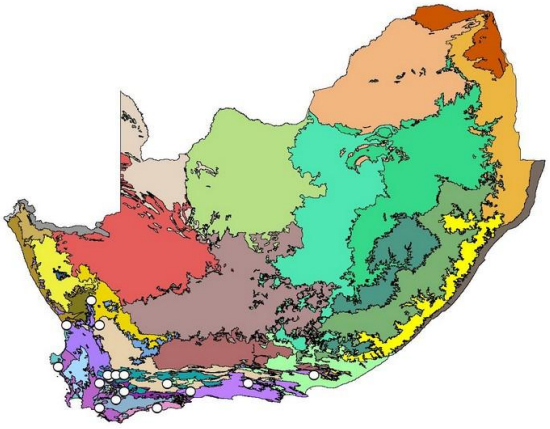
[E]*Aspalathus lactea* Thunb. subsp. *lactea*

Crotalarieae ①

Shrub; P; Ht 0.3–2; Alt 2–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Rainshadow Valley Karoo (100)	
Biome	Fynbos (83)	Succulent Karoo (17)
Rainfall (mm)	<400; 200–600 (44)	400–800 (12)
Min temp (°C)	2–8 (69)	0–4 (19)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (94)	>20 (6)
pH	5.5–7.4 (44)	6.5–7.4 (19)
ESP	High (100)	
QDGCs	3319 (24)	3119; 3320; 3419 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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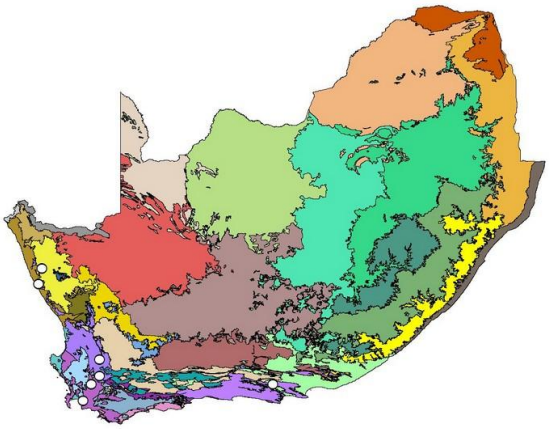
[E]*Aspalathus laeta* Bolus

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–0.9; Alt ?–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (80)	Succulent Karoo (20)
Rainfall (mm)	<400; 200–600; >800 (29)	400–800 (13)
Min temp (°C)	2–8 (42)	0–4; >6 (29)
Max temp (°C)	25–29 (86)	27–35 (14)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (43)	<6.4 (29)
ESP	Non (100)	
QDGCs	3017; 3319 (29)	3219; 3324; 3418 (14)

NOTES: **N2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



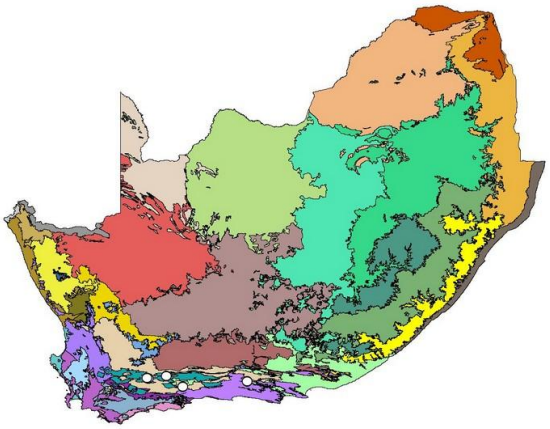
[E]*Aspalathus lamarckiana* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 1.5–2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (75)	200–600 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	5–35; >20 (50)	
pH	>7.5 (50)	<6.4; 6.5–8.4 (25)
ESP	Ecotone	
QDGCs	3320; 3321 (40)	3323 (20)

NOTES: –



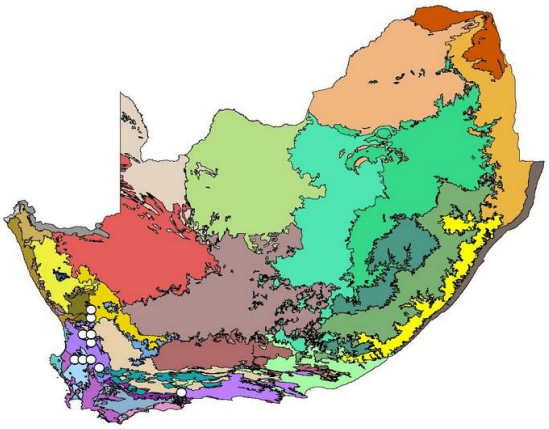
[E]*Aspalathus lanata* E.Mey.

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–5; Alt 426–640

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (60)	<400; 400–800 (20)
Min temp (°C)	2–8 (90)	0–4 (10)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (80)	>20 (20)
pH	5.5–7.4 (50)	<6.4; 6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3218 (36)	3219 (27)

NOTES: –



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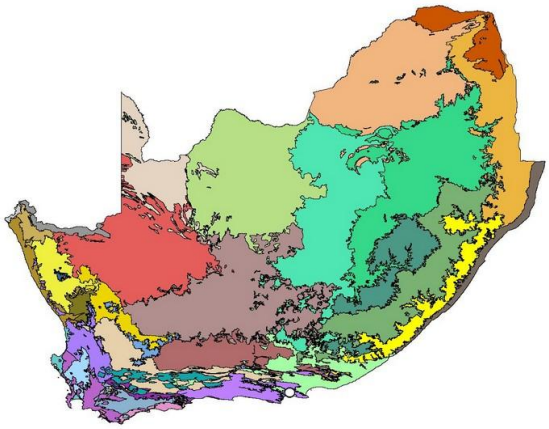
[E]*Aspalathus lanceicarpa* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3325 (100)	

NOTES: –



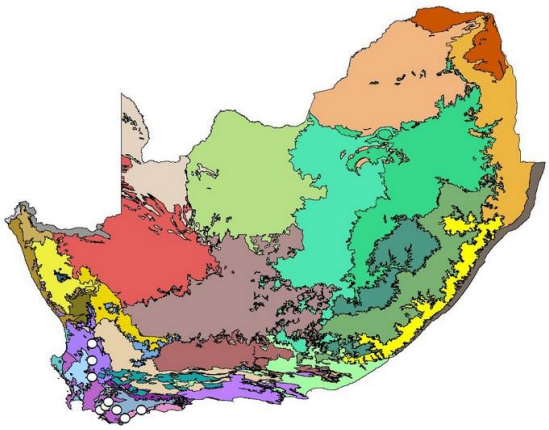
[E]*Aspalathus lanceifolia* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–6.1; Alt 15–460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	2–8 (67)	>22 (22)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (89)	>20 (11)
pH	5.5–7.4 (44)	<6.4 (33)
ESP	Ecotone	
QDGCs	3419 (44)	3219; 3420 (22)

NOTES: –



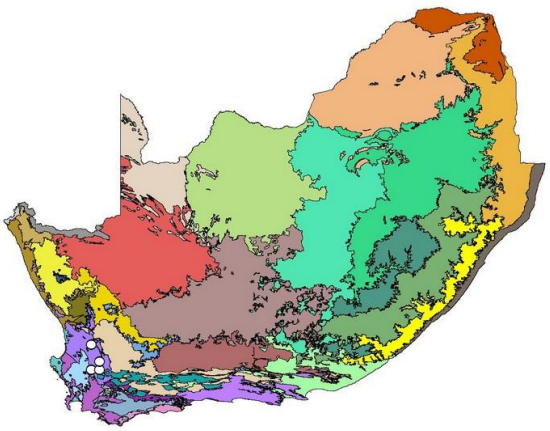
[E]*Aspalathus lanifera* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt 1005–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3219; 3319 (50)	

NOTES: –



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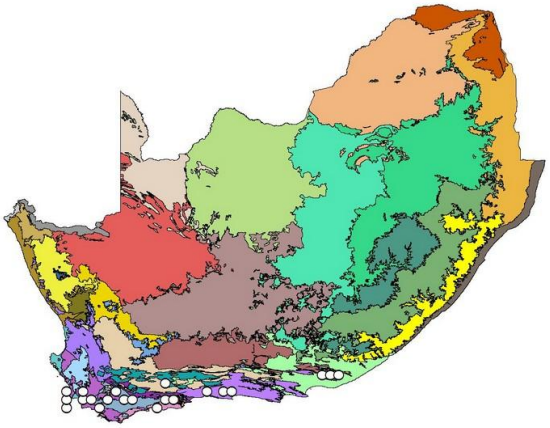
[E]*Aspalathus laricifolia* P.J.Bergius subsp. *canescens* (L.) R.Dahlgren

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.15–1; Alt 100–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (75)	Southwest Fynbos (25)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (33)	600–1000 (29)
Min temp (°C)	2–8 (81)	>6 (14)
Max temp (°C)	25–29 (76)	27–35 (14)
Phosphorus (ppm)	5–35 (95)	<10 (5)
pH	<6.4 (52)	5.5–7.4 (33)
ESP	Medium (75)	Non (25)
QDGCs	3326; 3418; 3419; 3421 (14)	3318; 3323; 3420 (10)

NOTES: **N2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Moriarty1997).



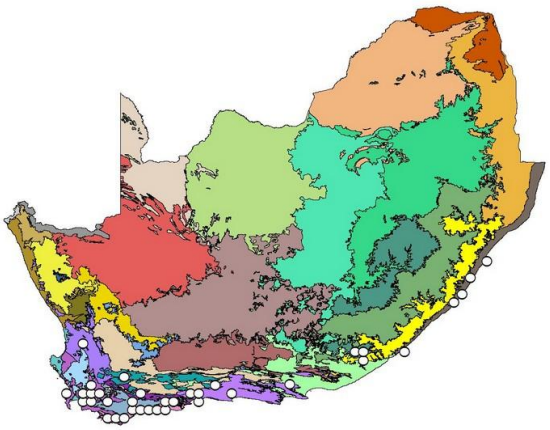
[E]*Aspalathus laricifolia* P.J.Bergius subsp. *laricifolia*

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–1.21; Alt 12–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (43)	Eastern Fynbos-Renosterveld (29)
Biome	Fynbos (87)	Indian Ocean (13)
Rainfall (mm)	200–600 (42)	>800 (25)
Min temp (°C)	2–8 (64)	>6 (25)
Max temp (°C)	25–29 (88)	<27; 27–35 (6)
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	<6.4 (47)	5.5–7.4 (31)
ESP	Non (71)	Medium (29)
QDGCs	3420 (14)	3419; 3421 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Moriarty1997).



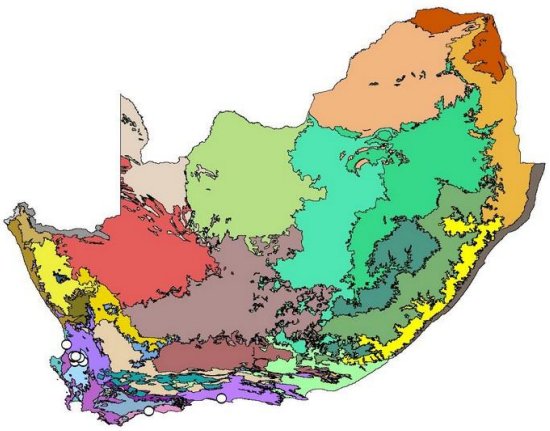
[E]*Aspalathus latifolia* Bolus

Crotalarieae ①

Shrub; P; Ht 0.3–1; Alt 75–1219

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	<400; >800 (17)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (50)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (50)	<6.4; 5.5–7.4; 6.5–8.4 (17)
ESP	Medium (100)	
QDGCs	3218 (80)	3420; 3423

NOTES: –



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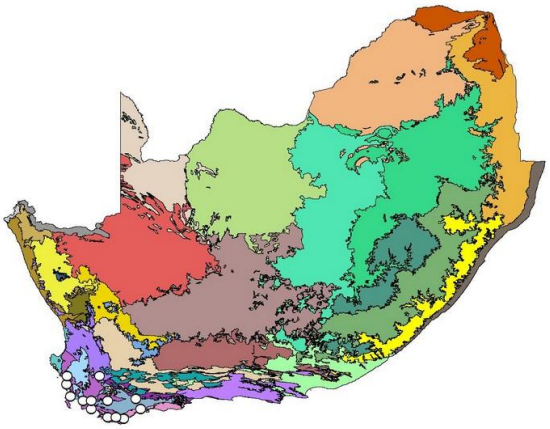
[E]*Aspalathus lebeckioides* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.7–1; Alt 115–680

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (46)	400–800 (31)
Min temp (°C)	2–8; >6 (46)	0–4 (8)
Max temp (°C)	25–29 (92)	27–35 (8)
Phosphorus (ppm)	5–35 (92)	<10 (8)
pH	<6.4 (46)	5.5–7.4 (31)
ESP	Ecotone	
QDGCs	3419 (38)	3318; 3420 (23)

NOTES: –



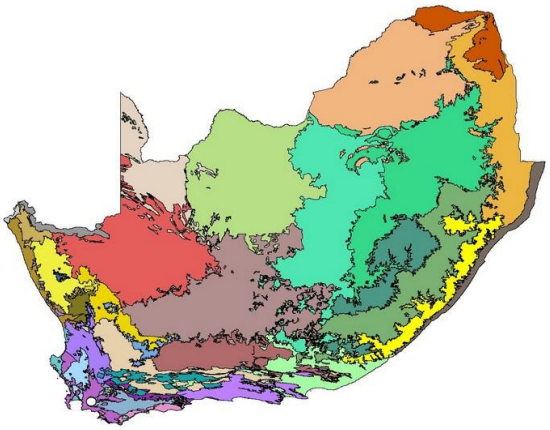
[E]*Aspalathus lenticula* Bolus

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: –



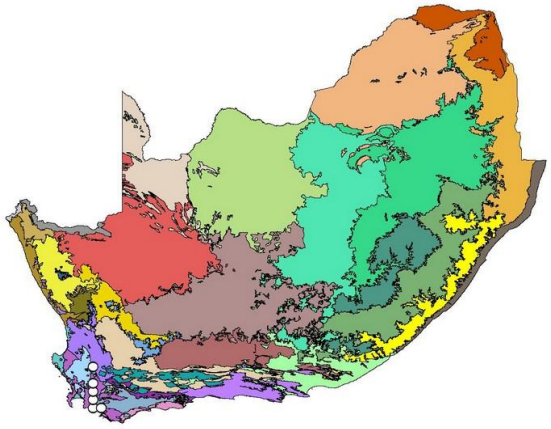
[E]*Aspalathus leptocoma* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub; P; Ht 0.25–0.3; Alt 50–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	0–4 (50)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3319; 3419 (50)	

NOTES: –



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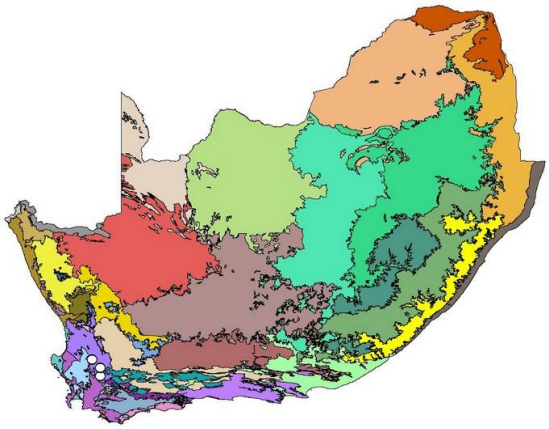
[E]*Aspalathus leptoptera* Bolus

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–1; Alt ?–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (67)	200–600 (33)
Min temp (°C)	0–4 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Ecotone	
QDGCs	3319 (67)	3219 (33)

NOTES: –



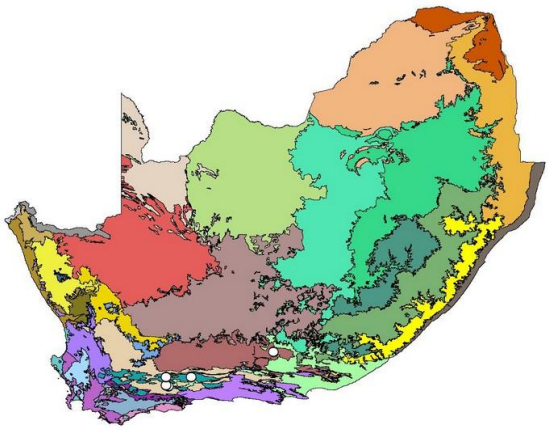
[E]*Aspalathus leucophylla* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.5–1.5; Alt 701–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lower Karoo (100)	
Biome	Nama-Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (75)	5–35 (25)
pH	>7.5 (100)	
ESP	Medium (100)	
QDGCs	3321 (60)	3224; 3322 (20)

NOTES: –



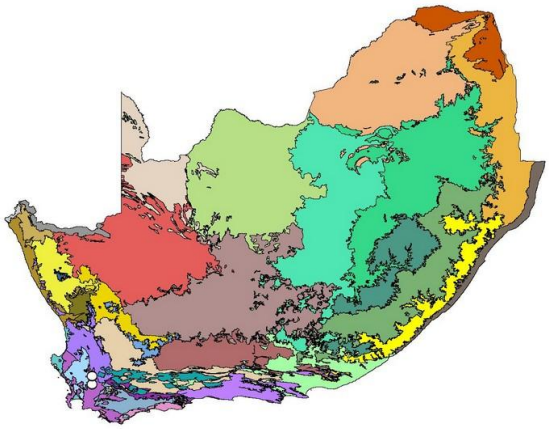
[E]*Aspalathus linearifolia* (Burm.f.) DC.

Crotalarieae ①

Shrub; P; Ht 0.9–2; Alt 155–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; >800 (50)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



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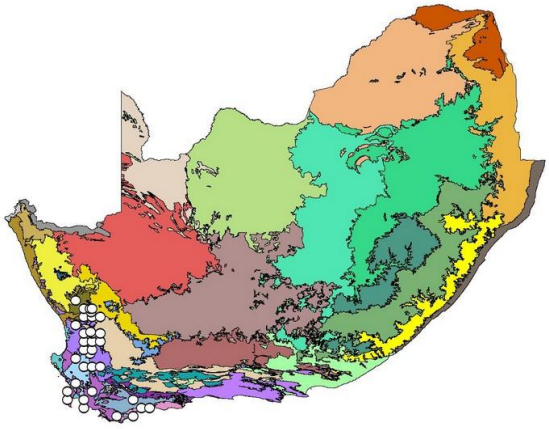
[E]*Aspalathus linearis* (Burm.f.) R.Dahlgren

Crotalarieae ③

Dwarf shrub, shrub; P; Ht 0.15–2.4; Alt 15–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (67)	Northwest Fynbos (33)
Biome	Fynbos (90)	Succulent Karoo (10)
Rainfall (mm)	200–600 (40)	<400 (33)
Min temp (°C)	2–8 (63)	>6 (27)
Max temp (°C)	25–29 (67)	27–35 (30)
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	<6.4; 5.5–7.4 (30)	>7.5 (17)
ESP	Non (100)	
QDGCs	3219 (21)	3119 (15)

NOTES: **Cultivated:** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972; Boone *et al.* 1999); 128 kgN/ha (Muofhe & Dakora 1999). **Biocultural:** Beverage; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Van Rooyen & Steyn 1999).



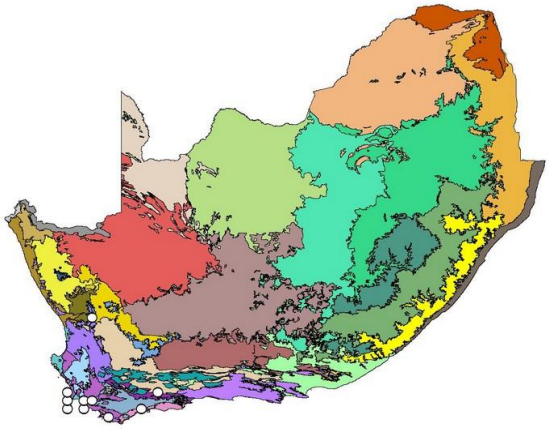
[E]*Aspalathus linguiloba* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.25–0.8; Alt 30–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (30)	<400; 400–800; 600–1000 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C) 60	25–29 (90)	27–35 (10)
Phosphorus (ppm)	5–35 (80)	<10; >20 (10)
pH	<6.4 (60)	6.5–8.4 (20)
ESP	Non (100)	
QDGCs	3418 (40)	3419 (20)

NOTES: **N2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



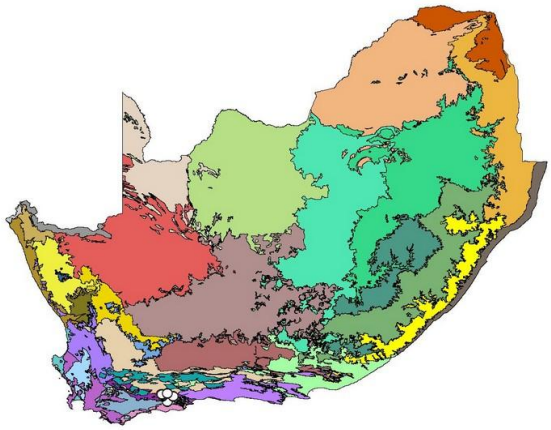
[E]*Aspalathus longifolia* Benth.

Crotalarieae ①

Shrub; P; Ht 0.5–1.5; Alt 150–1464

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–8.4 (50)	
ESP	Ecotone	
QDGCs	3321 (86)	3421 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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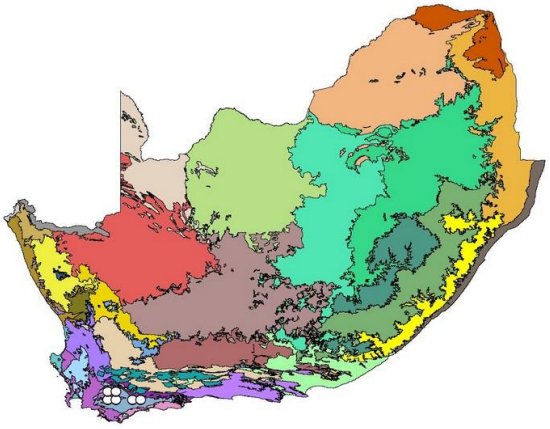
[E]*Aspalathus longipes* Harv.

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–1.5; Alt 60–100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3319; 3419; 3420 (33)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



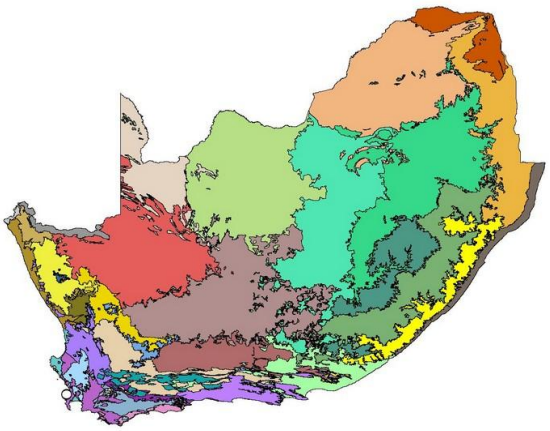
Aspalathus lotiflora R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: –



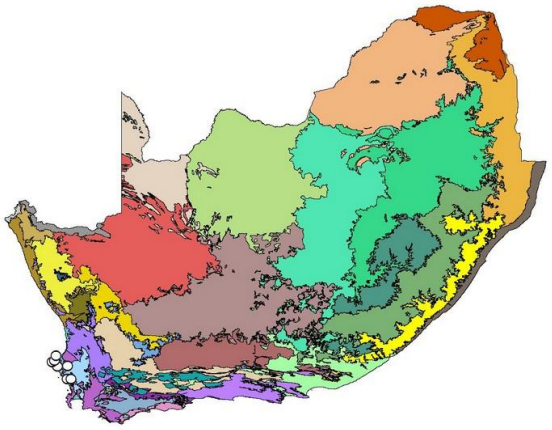
[E]*Aspalathus lotoides* Thunb. subsp. *lagopus* (Thunb.) R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.15; Alt ?–61

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (67)	200–600 (33)
Min temp (°C)	>6 (83)	2–8 (17)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (33)	6.5–7.4; 6.5–8.4 (17)
ESP	Medium (100)	
QDGCs	3318 (63)	3217 (25)

NOTES: –



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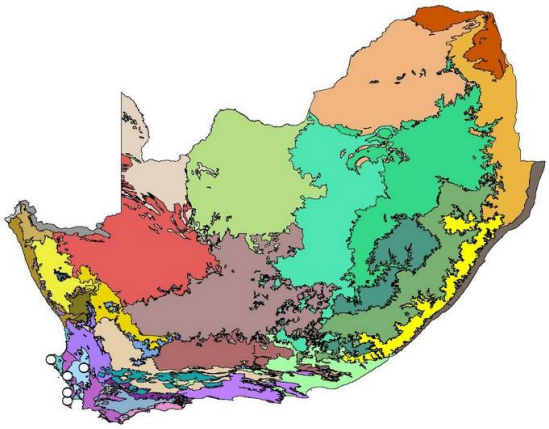
[E]*Aspalathus lotoides* Thunb. subsp. *lotoides* **Crotalarieae** ①

Dwarf shrub; P; Ht 0.01–0.15; Alt 30–60

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (40)	<400 (20)
Min temp (°C)	>6 (80)	2–8 (20)
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (60)	5.5–7.4; 6.5–7.4 (20)
ESP	Medium (100)	
QDGCs	3318 (60)	3217; 3418 (20)

NOTES: –

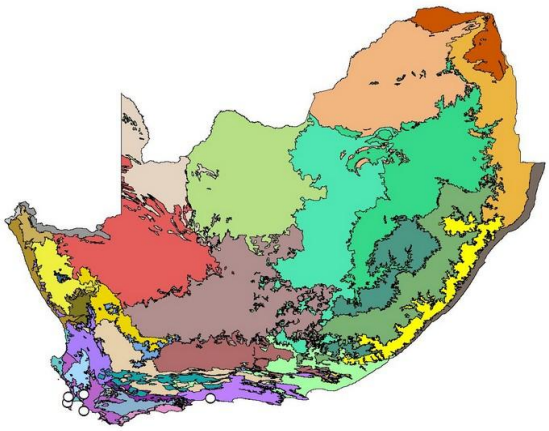


[E]*Aspalathus macrantha* Harv. **Crotalarieae** ①

Shrub, tree; P; Ht 2–4; Alt 183–320

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (80)	>800 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non; Medium (50)	
QDGCs	3318; 3418 (40)	3322 (20

NOTES: **N2 fixation:** Nodulated (Grobbelaar & Clarke 1972).

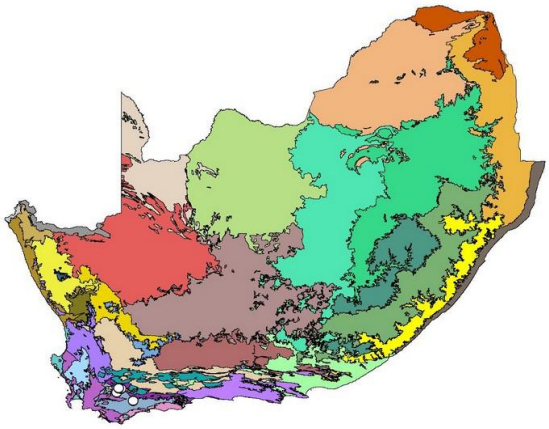


[E]*Aspalathus macrocarpa* Eckl. & Zeyh. **Crotalarieae** ①

Shrub; P; Ht 0.01–2; Alt 400–540

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3319 (75)	3420 25)

NOTES: –



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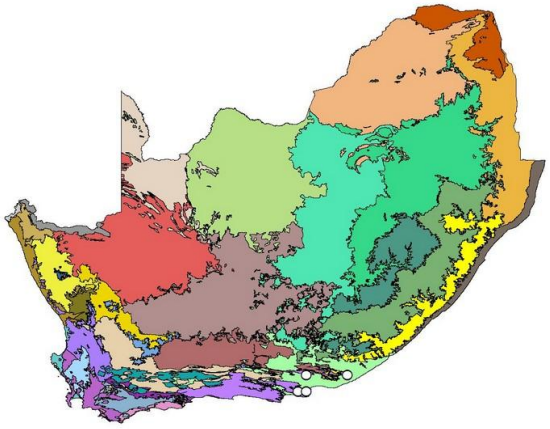
[E]*Aspalathus marginalis* Eckl. & Zeyh.

Crotalarieae ①

Shrub; P; Ht 0.15–0.9; Alt 85–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (75)	200–600 (25)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	6.5–8.4 (50)	5.5–7.4; 6.5–7.4 (25)
ESP	Ecotone	
QDGCs	3325 (75)	3326 (25)

NOTES: –



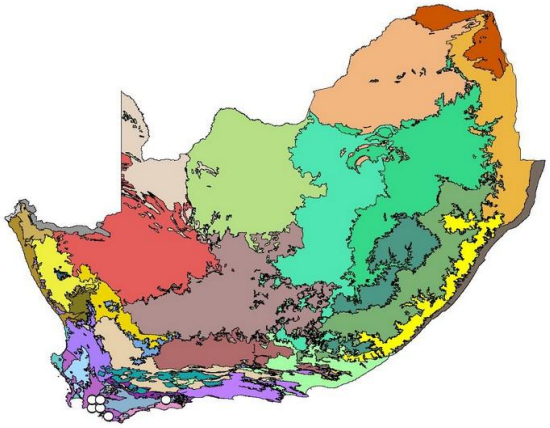
[E]*Aspalathus marginata* Harv.

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–0.3; Alt 55–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (66)	200–600; >800 (17)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (83)	<10 (17)
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3419 (83)	3421 (17)

NOTES: –



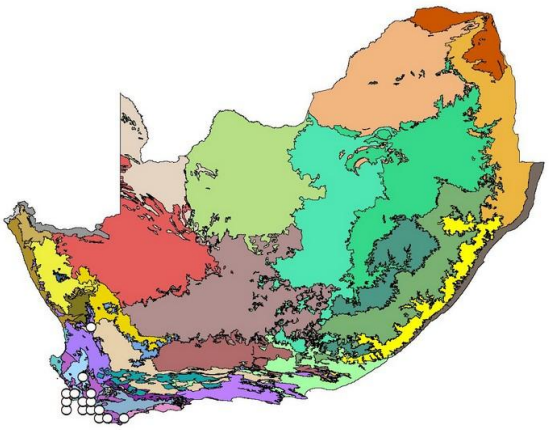
[E]*Aspalathus microphylla* DC.

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–0.7; Alt 30–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (31)	200–600; >800 (25)
Min temp (°C)	2–8 (50)	>6 (44)
Max temp (°C)	25–29 (81)	27–35 (19)
Phosphorus (ppm)	5–35 (94)	<10 (6)
pH	<6.4 (63)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3419 (31)	3418 (25)

NOTES: **N2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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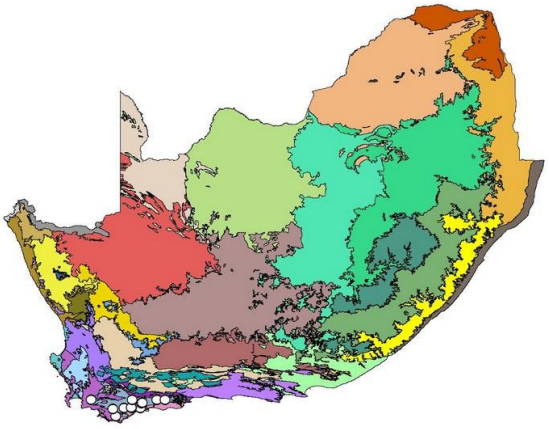
[E]*Aspalathus millefolia* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.4; Alt 75–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (70)	<400; 400–800; >800 (10)
Min temp (°C)	2–8 (90)	>6 (10)
Max temp (°C)	25–29 (90)	27–35 (10)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (50)	6.5–7.4; 6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3420 (62)	3419 (23)

NOTES: –



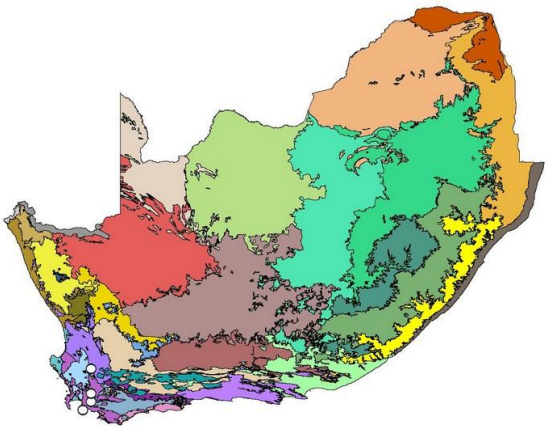
[E]*Aspalathus monosperma* (DC.) R.Dahlgren

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 1.2–1.8; Alt 600–853

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (75)	400–800 (25)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3319 (50)	3418; 3419 (25)

NOTES: –



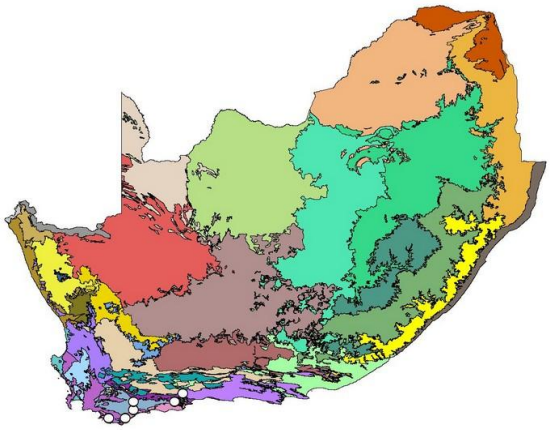
[E]*Aspalathus mundiana* Eckl. & Zeyh.

Crotalarieae ①

Shrub; P; Ht 0.1–1; Alt 106–381

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (83)	400–800 (17)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	5.5–7.4 (50)	6.5–8.4 (33)
ESP	Ecotone	
QDGCs	3420 (49)	3321; 3419; 3421 (17)

NOTES: –



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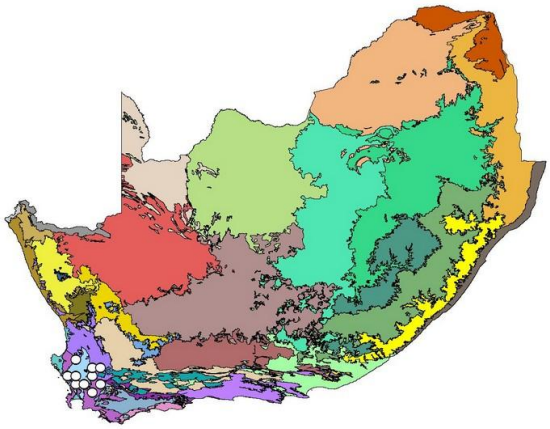
[E]*Aspalathus muraltioides* Eckl. & Zeyh.

Crotalarieae ①

Shrub; P; Ht 0.3–1.5; Alt 91–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (70)	400–800 (20)
Min temp (°C)	0–4 (50)	2–8 (30)
Max temp (°C)	25–29 (90)	27–35 (10)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (70)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	3319 (50)	3318 (40)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



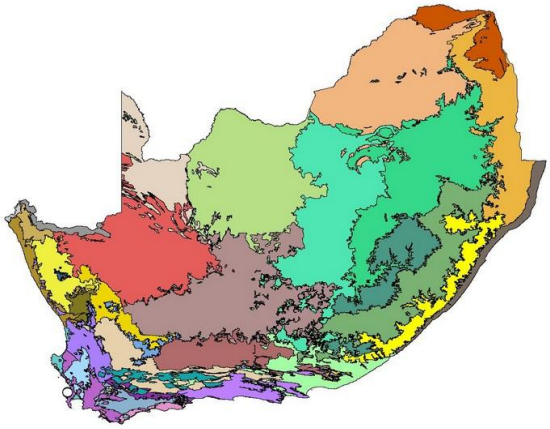
[E]*Aspalathus myrtillifolia* Benth.

Crotalarieae ①

Shrub; P; Ht 0.01–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: –



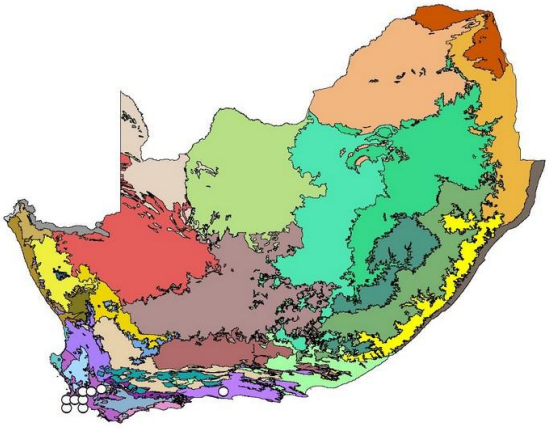
[E]*Aspalathus neglecta* T.M.Salter

Crotalarieae ①

Shrub; P; Ht 0.3–2; Alt 240–762

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (75)	Eastern Fynbos-Renosterveld (25)
Biome	Fynbos (100)	
Rainfall (mm)	600–1000; >800 (33)	400–800 (22)
Min temp (°C)	2–8 (44)	>6 (33)
Max temp (°C)	25–29 (78)	<27 (22)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (78)	5.5–7.4 (22)
ESP	Non (75)	Medium (25)
QDGCs	3418 (56)	3319 (22)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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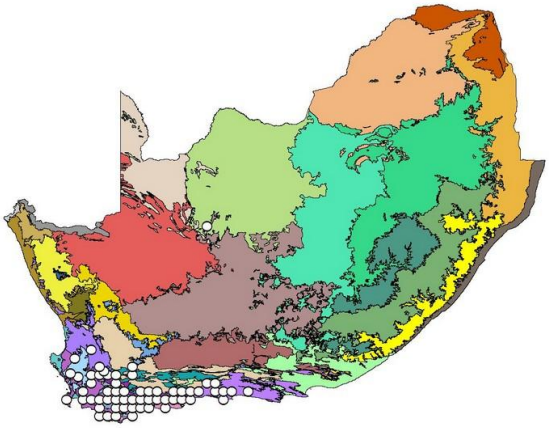
[E]*Aspalathus nigra* L.

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–1.2; Alt 15–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (72)	Northwest Fynbos; South Coast Fynbos (14)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (53)	<400; 400–800 (14)
Min temp (°C)	2–8 (72)	0–4 (17)
Max temp (°C)	25–29 (76)	<27; 27–35 (12)
Phosphorus (ppm)	5–35 (93)	<10 (7)
pH	5.5–7.4 (34)	<6.4 (33)
ESP	Medium (71)	Non (29)
QDGCs	3319 (17)	3419; 3420 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



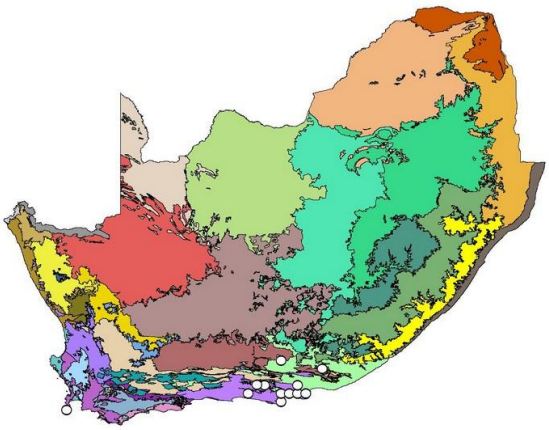
[E]*Aspalathus nivea* Thunb.

Crotalarieae ①

Shrub; P; Ht 0.9–2.5; Alt 15–396

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	200–600 (42)
Min temp (°C)	2–8 (58)	>6 (42)
Max temp (°C)	25–29 (83)	<27; 27–35 (8)
Phosphorus (ppm)	5–35 (82)	>20 (8)
pH	<6.4 (42)	5.5–7.4; 6.5–8.4 (25)
ESP	Non; Medium (50)	
QDGCs	3325 (33)	3324 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



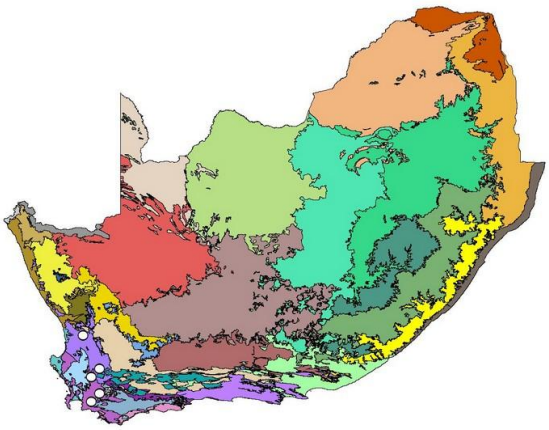
[E]*Aspalathus nudiflora* Harv.

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt 274–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (80)	>800 (20)
Min temp (°C)	0–4 (60)	2–8 (40)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (60)	5.5–7.4 (40)
ESP	Ecotone	
QDGCs	3319 (60)	3218; 3419 (20)

NOTES: –



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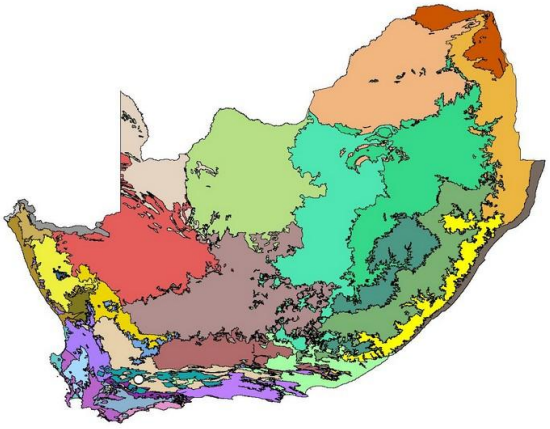
[E]*Aspalathus obliqua* R.Dahlgren

Crotalarieae ①

Dwarf shrub, shrub; P; Ht ?; Alt 762–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3320 (100)	

NOTES: –



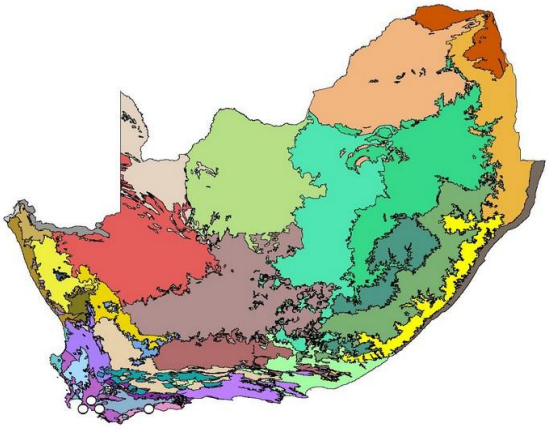
[E]*Aspalathus oblongifolia* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.7–2; Alt 40–122

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (50)	200–600; 400–800 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (75)	6.5–7.4 (25)
ESP	Non (100)	
QDGCs	3419 (50)	3418; 3420 (25)

NOTES: –



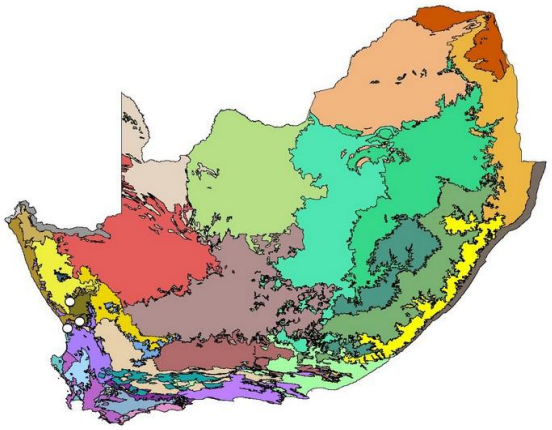
[E]*Aspalathus obtusata* Thunb.

Crotalarieae ①

Shrub; P; Ht 0.3–0.4; Alt 152–215

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	>20 (67)	5–35 (33)
pH	6.5–8.4 (67)	>7.5 (33)
ESP	Ecotone	
QDGCs	3118 (100)	

NOTES: –



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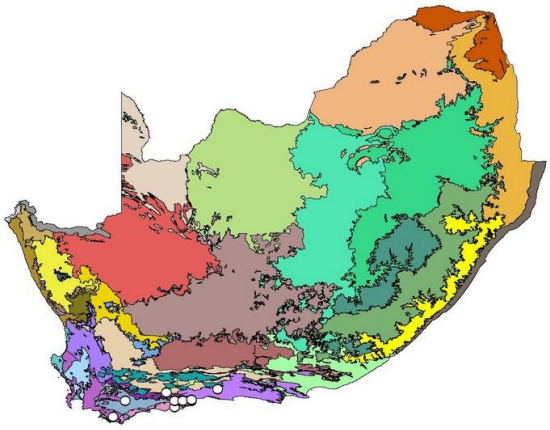
[E]*Aspalathus obtusifolia* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.5–1.2; Alt ?–122

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	400–800 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (50)	<27; 27–35 (25)
Phosphorus (ppm)	5–35 (62)	<10 (38)
pH	<6.4 (63)	6.5–7.4 (25)
ESP	Non; Medium (50)	
QDGCs	3421 (36)	3422 (27)

NOTES: –



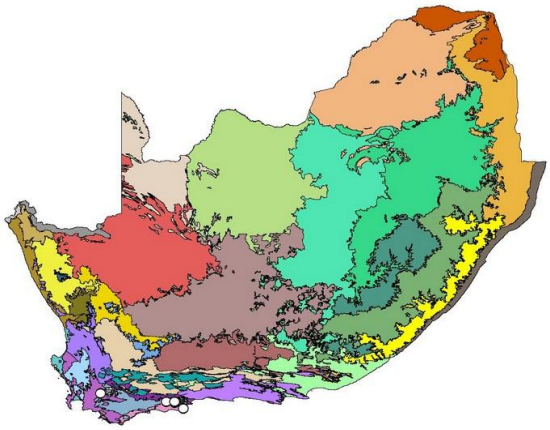
[E]*Aspalathus odontoloba* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.4–0.6; Alt 10–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3421 (80)	3319 (20)

NOTES: –



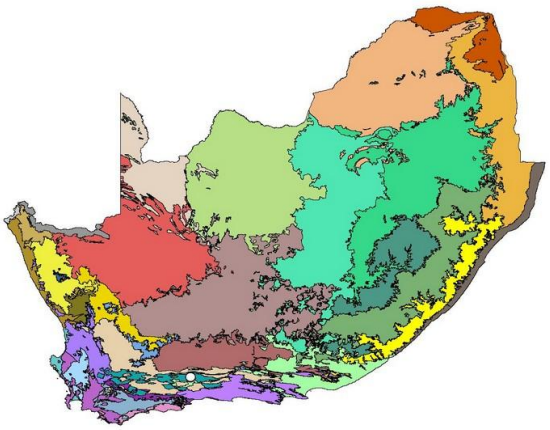
[E]*Aspalathus oliveri* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.01–0.75; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3322 (100)	

NOTES: –



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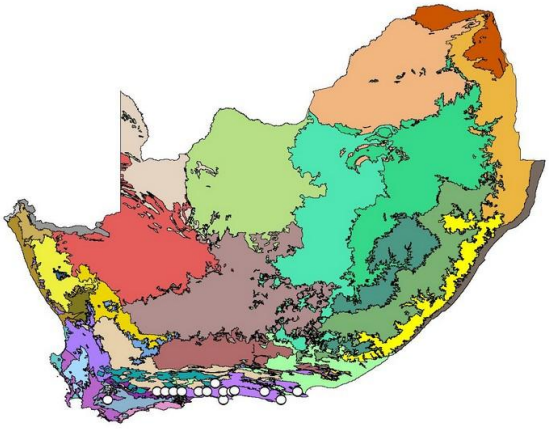
[E]*Aspalathus opaca* Eckl. & Zeyh. subsp. *opaca* — Crotalarieae ①

Dwarf shrub; P; Ht 0.1–1.5; Alt 120–975

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (29)	400–800 (21)
Min temp (°C)	2–8 (86)	>6 (14)
Max temp (°C)	25–29 (50)	<27 (29)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (50)	5.5–7.4 (29)
ESP	Medium (100)	
QDGCs	3321 (27)	3322; 3323 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).

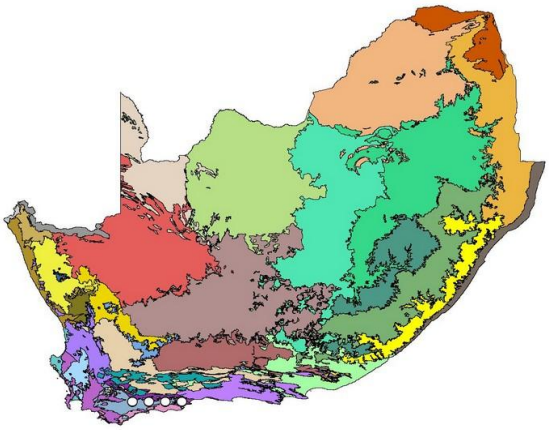


[E]*Aspalathus opaca* Eckl. & Zeyh. subsp. *pappeana* (Harv.) R.Dahlgren — Crotalarieae ①

Dwarf shrub; P; Ht 0.1–0.5; Alt 120–184

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	5.5–7.4 (75)	<6.4 (25)
ESP	Ecotone	
QDGCs	3420; 3421 (50)	

NOTES: –

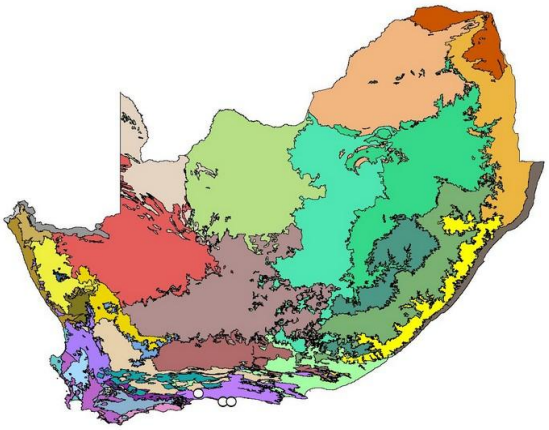


[E]*Aspalathus opaca* Eckl. & Zeyh. subsp. *rostriloba* R.Dahlgren — Crotalarieae ①

Dwarf shrub; P; Ht 0.3–0.8; Alt 120–245

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (67)	>800 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	<27 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Medium (100)	
QDGCs	3423 (66)	3322 (33)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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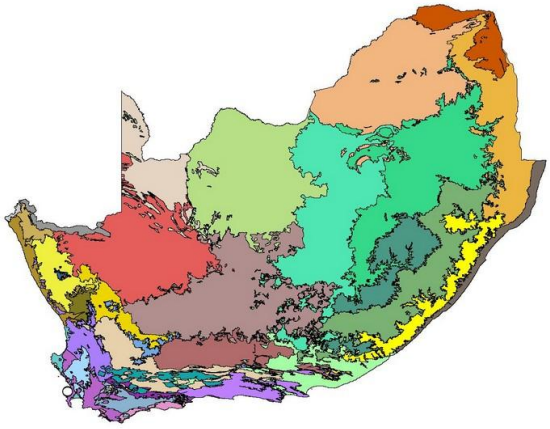
[E]*Aspalathus orbiculata* Benth.

Crotalarieae ①

Shrub; P; Ht 0.5–1; Alt ?–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: –



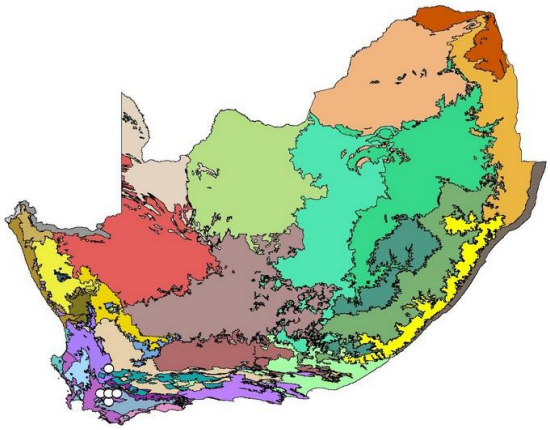
[E]*Aspalathus pachyloba* Benth. subsp. *macroclada* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.6–2; Alt 365–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (80)	2–8 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (60)	6.5–7.4 (40)
ESP	Ecotone	
QDGCs	3319 (80)	3419 (20)

NOTES: –



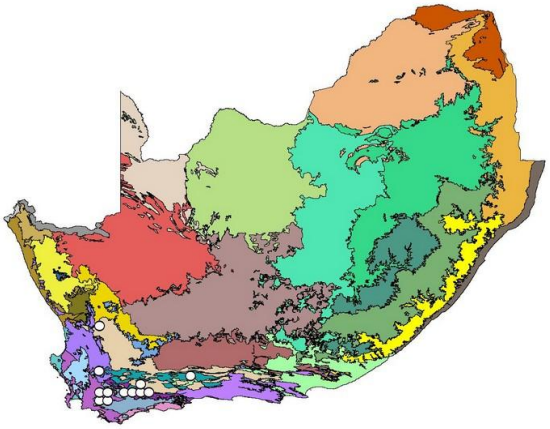
[E]*Aspalathus pachyloba* Benth. subsp. *pachyloba*

Crotalarieae ①

Shrub; P; Ht 0.7–2; Alt 290–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Rainshadow Valley Karoo (100)	
Biome	Fynbos (75)	Succulent Karoo (25)
Rainfall (mm)	200–600 (58)	<400 (33)
Min temp (°C)	2–8 (83)	0–4 (17)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	5.5–7.4; 6.5–8.4 (33)	6.5–7.4 (25)
ESP	High (100)	
QDGCs	3320 (50)	3319; 3419 (17)

NOTES: –



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[E]*Aspalathus pachyloba* Benth. subsp. *rugulicarpa* R.Dahlgren **Crotalarieae** –

Shrub; P; Ht 0.5–0.8; Alt 650–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

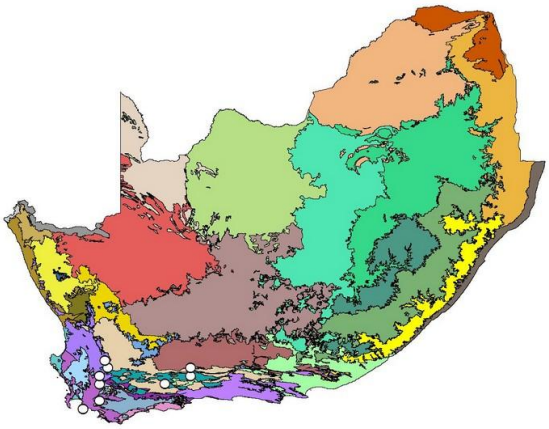
NOTES: –

[E]*Aspalathus pachyloba* Benth. subsp. *villicaulis* R.Dahlgren **Crotalarieae** ①

Shrub; P; Ht 0.4–1.5; Alt 900–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600 (33)	400–800 (22)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (78)	>20 (22)
pH	5.5–7.4 (56)	>7.5 (33)
ESP	Non (100)	
QDGCs	3319 (33)	3322 (22)

NOTES: –

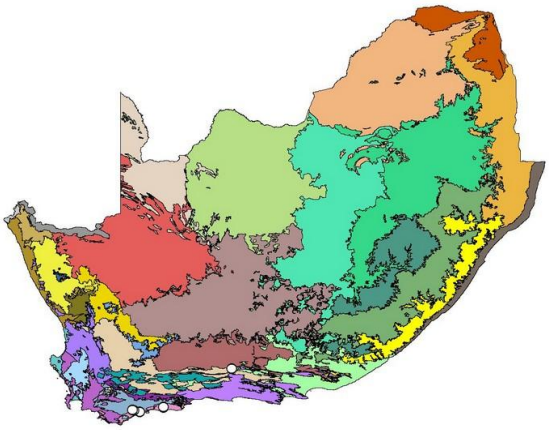


[E]*Aspalathus pallescens* Eckl. & Zeyh. **Crotalarieae** ①

Shrub; P; Ht 0.5–1.2; Alt 45–100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	<400 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	<6.4; 6.5–7.4 (25)
ESP	Non (100)	
QDGCs	3420 (50)	3421 (33)

NOTES: –



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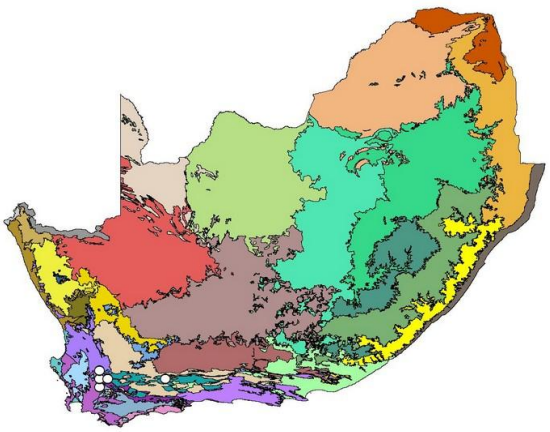
[E]*Aspalathus pallidiflora* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.4–0.6; Alt 1708–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (60)	<400; 400–800 (20)`
Min temp (°C)	0–4 (80)	2–8 (20)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (80)	>20 (20)
pH	5.5–7.4 (60)	<6.4; >7.5 (20)
ESP	Ecotone	
QDGCs	3319 (80)	3321 (20)

NOTES: –



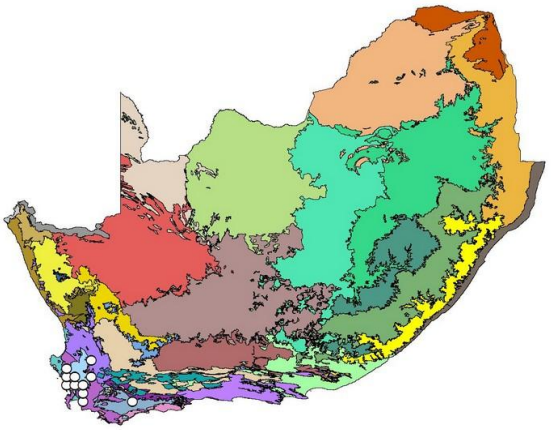
[E]*Aspalathus parviflora* P.J.Bergius

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.3; Alt 61–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (55)	400–800 (18)
Min temp (°C)	2–8 (55)	>6 (36)
Max temp (°C)	25–29 (82)	27–35 (18)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (73)	5.5–7.4 (27)
ESP	Ecotone	
QDGCs	3318 (64)	3219; 3319; 3418; 3420 (9)

NOTES: –



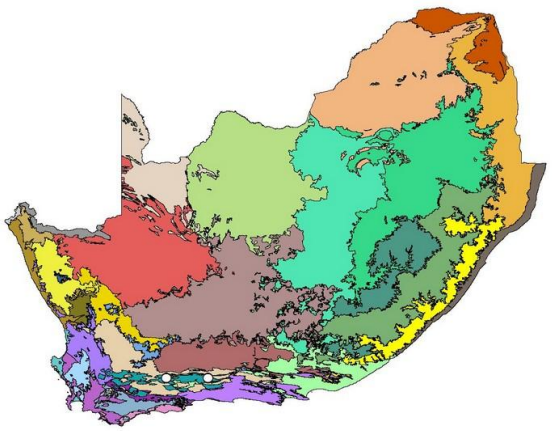
[E]*Aspalathus patens* Garab. ex R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt 1800–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3321; 3322 (50)	

NOTES: –



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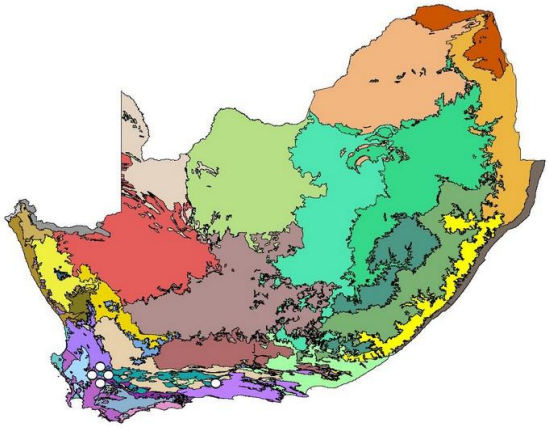
[E]*Aspalathus pedicellata* Harv. **Crotalarieae** ①

Dwarf shrub; P; Ht ?; Alt 1372–2135

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (80)	2–8 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (60)	<6.4 (40)
ESP	Ecotone	
QDGCs	3319 (80)	3322 (20)

NOTES: –

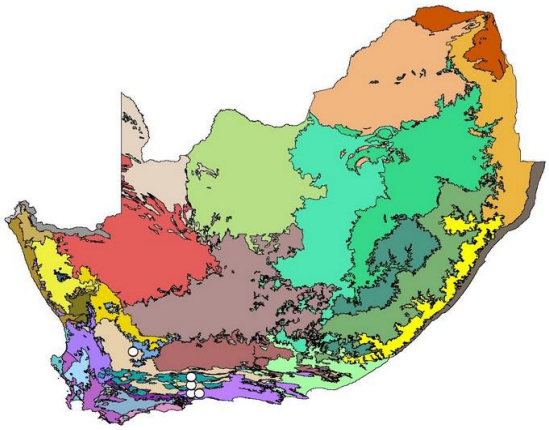


[E]*Aspalathus pedunculata* Houtt. **Crotalarieae** ①

Shrub; P; Ht 1–2; Alt 490–700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (60)	400–800; 600–1000 (20)
Min temp (°C)	2–8 (80)	0–4 (20)
Max temp (°C)	27–35 (60)	25–29 (40)
Phosphorus (ppm)	5–35 (80)	>20 (20)
pH	>7.5 (40)	<6.4; 5.5–7.4; 6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3322 (80)	3220 (20)

NOTES: –

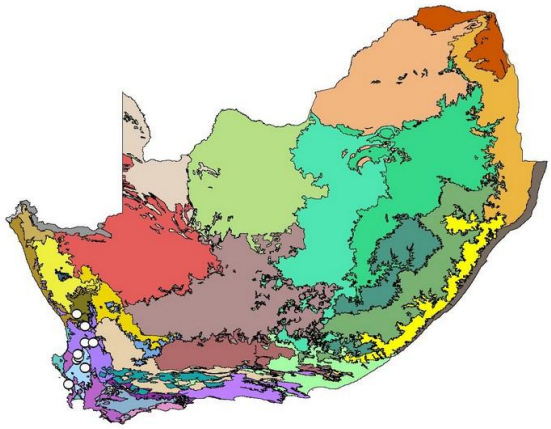


[E]*Aspalathus pendula* R.Dahlgren **Crotalarieae** ①

Shrub, tree; P; Ht 1.5–3.5; Alt 230–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (72)	<400; 400–800 (14)
Min temp (°C)	2–8 (86)	>6 (14)
Max temp (°C)	25–29 (71)	27–35 (29)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (43)	6.5–8.4 (29)
ESP	Ecotone	
QDGCs	3218 (50)	3318 (25)

NOTES: –



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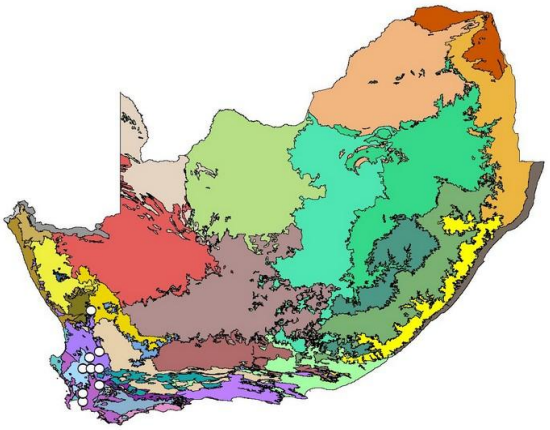
[E]*Aspalathus perfoliata* (Lam.) R.Dahlgren subsp. *perfoliata* — Crotalarieae ①

Shrub; P; Ht 0.2–1.8; Alt 305–1980

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (44)	400–800 (22)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (89)	27–35 (11)
Phosphorus (ppm)	5–35 (89)	>20 (11)
pH	<6.4; 5.5–7.4 (44)	>7.5 (12)
ESP	Ecotone	
QDGCs	3319 (33)	3219; 3318 (22)

NOTES: –

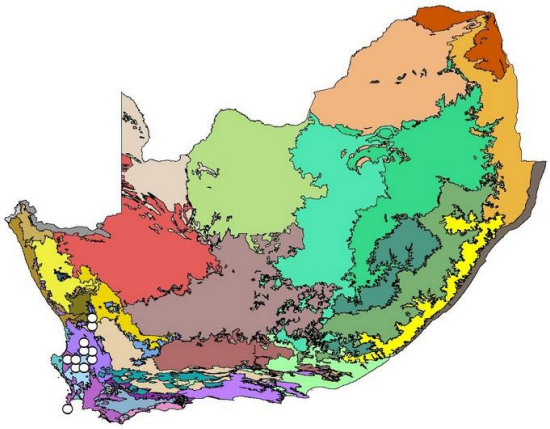


[E]*Aspalathus perfoliata* (Lam.) R.Dahlgren subsp. *phillipsii* R.Dahlgren — Crotalarieae ①

Shrub; P; Ht 0.5–2; Alt 460–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos; West Coast Renosterveld (33)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (55)	<400 (27)
Min temp (°C)	2–8 (82)	>6 (18)
Max temp (°C)	25–29 (64)	27–35 (36)
Phosphorus (ppm)	5–35 (91)	>20 (9)
pH	5.5–7.4 (45)	6.5–8.4 (36)
ESP	Non (100)	
QDGCs	3218 (36)	3119; 3219; 3318 (18)

NOTES: **Flowering:** Spring, summer (Van Rooyen & Steyn 1999).

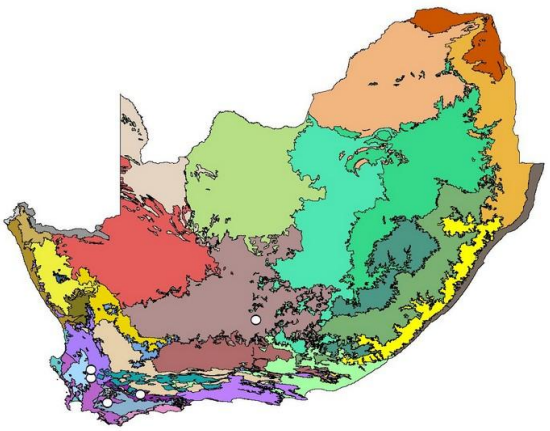


[E]*Aspalathus perforata* (Thunb.) R.Dahlgren — Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt 250–1085

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Upper Karoo (100)	
Biome	Fynbos (80)	Nama-Karoo (20)
Rainfall (mm)	200–600 (60)	<400; 400–800 (20)
Min temp (°C)	0–4; 2–8 (40)	<2 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (40)	5.5–7.4; 6.5–7.4; >7.5 (20)
ESP	Non (100)	
QDGCs	3319 (40)	3124; 3320; 3419 (20)

NOTES: –



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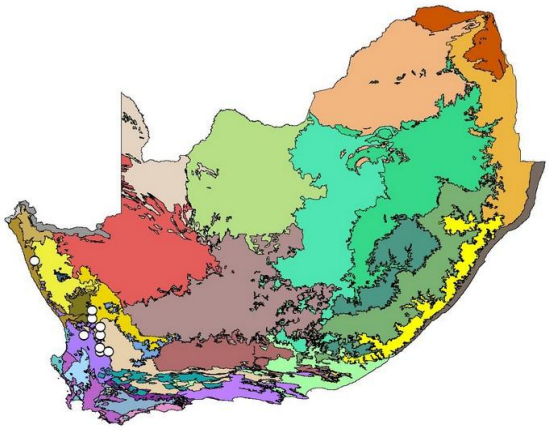
[E]*Aspalathus petersonii* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.4–1.3; Alt 200–1090

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Rainshadow Valley Karoo (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (78)	200–600 (22)
Min temp (°C)	2–8 (89)	>6 (11)
Max temp (°C)	27–35 (56)	25–29 (44)
Phosphorus (ppm)	5–35 (78)	>20 (22)
pH	5.5–7.4 (56)	6.5–8.4 (33)
ESP	High (100)	
QDGCs	3219 (44)	3119 (33)

NOTES: –



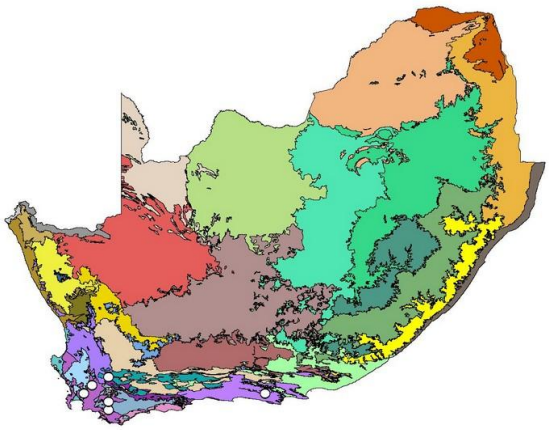
[E]*Aspalathus pigmentosa* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (49)	400–800; 600–1000; >800 (17)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (83)	<27 (17)
Phosphorus (ppm)	5–35 (83)	<10 (17)
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Ecotone	
QDGCs	3319; 3419 (33)	3318; 3324 (17)

NOTES: –



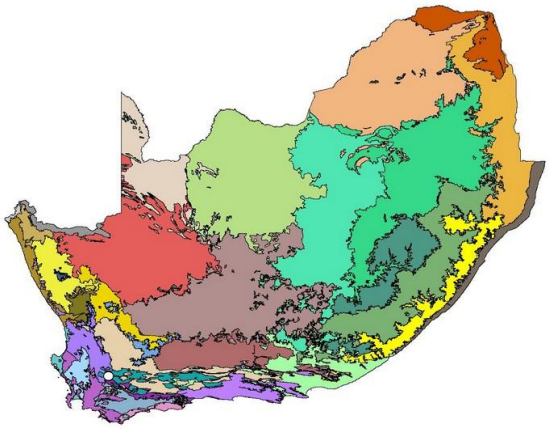
[E]*Aspalathus pilantha* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



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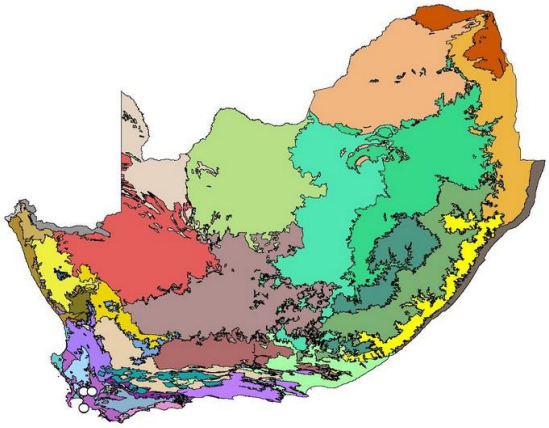
[E]*Aspalathus pinea* Thunb. subsp. *caudata* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.8; Alt 400–914

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (67)	600–1000 (33)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3318; 3319; 3418 (33)	

NOTES: –



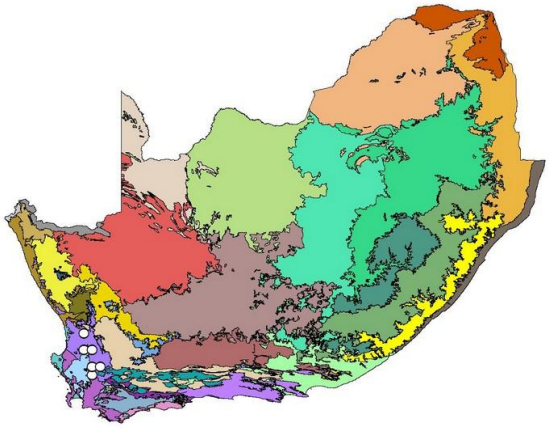
[E]*Aspalathus pinea* Thunb. subsp. *pinea*

Crotalarieae ①

Shrub; P; Ht 0.6–2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (83)	400–800 (17)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Non (100)	
QDGCs	3319 (50)	3218 (33)

NOTES: –



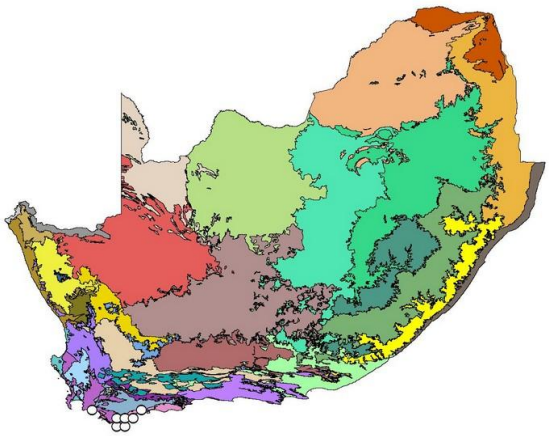
[E]*Aspalathus pinguis* Thunb. subsp. *australis* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.1–1; Alt 12–150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (57)	200–600 (29)
Min temp (°C)	>6 (86)	2–8 (14)
Max temp (°C)	25–29 (71)	<27 (29)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (43)	6.5–8.4 (29)
ESP	Ecotone	
QDGCs	3420 (57)	3419 (43)

NOTES: **Flowering:** Winter, spring, summer (Manning & Goldblatt 2000).



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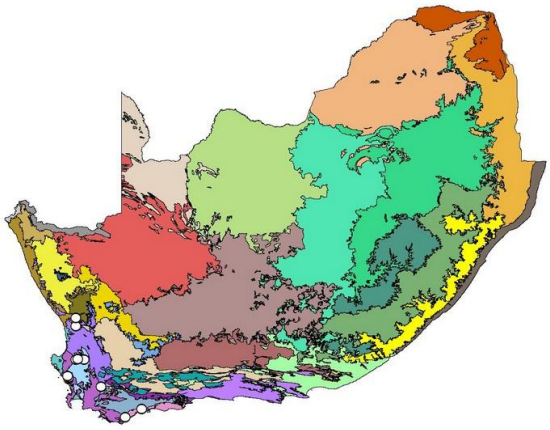
[E]*Aspalathus pinguis* Thunb. subsp. *longissima* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 1.4–1.8; Alt 10–275

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	<400 (25)
Min temp (°C)	>6 (63)	2–8 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (88)	>20 (12)
pH	6.5–8.4 (50)	5.5–7.4 (25)
ESP	Ecotone	
QDGCs	3318 (33)	3218 (25)

NOTES: **Flowering:** Winter, spring, summer (Manning & Goldblatt 2000).



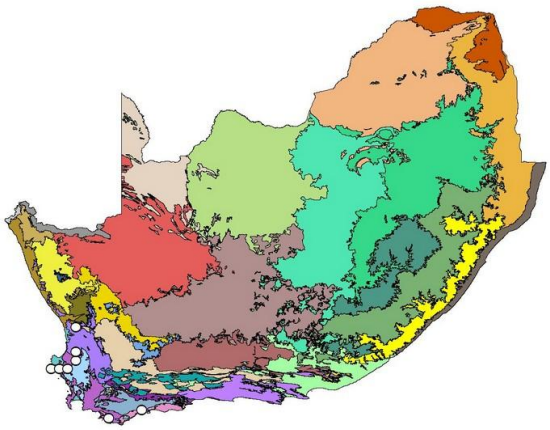
[E]*Aspalathus pinguis* Thunb. subsp. *occidentalis* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.4–1.5; Alt ?–20

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (50)	200–600 (38)
Min temp (°C)	>6 (63)	2–8 (38)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (88)	<10 (12)
pH	5.5–7.4; 6.5–8.4 (38)	6.5–7.4 (24)
ESP	Medium (100)	
QDGCs	3218; 3318 (24)	3118; 3317; 3419; 3420 (13)

NOTES: **Flowering:** Winter, spring, summer (Manning & Goldblatt 2000).



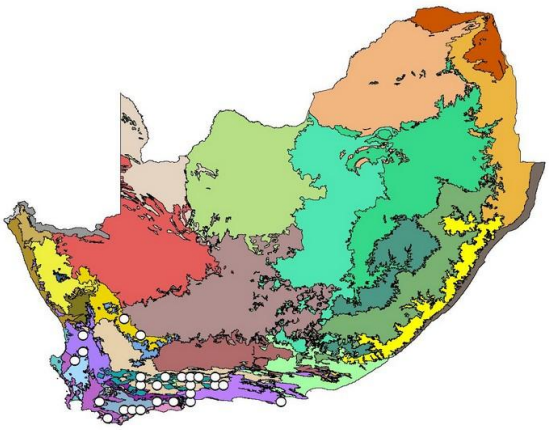
[E]*Aspalathus pinguis* Thunb. subsp. *pinguis*

Crotalarieae ①

Shrub; P; Ht 0.3–1.5; Alt 90–975

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (90)	Succulent Karoo (10)
Rainfall (mm)	<400 (42)	200–600 (38)
Min temp (°C)	2–8 (85)	>6 (8)
Max temp (°C)	25–29 (58)	27–35 (38)
Phosphorus (ppm)	5–35 (58)	>20 (35)
pH	6.5–8.4 (31)	5.5–7.4 (27)
ESP	Medium (100)	
QDGCs	3322 (23)	3218; 3321; 3420 (12)

NOTES: **Flowering:** Winter, spring, summer (Manning & Goldblatt 2000).



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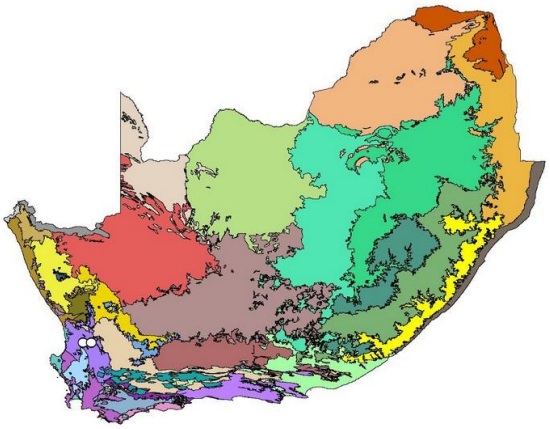
[E]*Aspalathus polycephala* E.Mey. subsp. *lanatifolia* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.6–1.6; Alt 1000–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3218; 3219 (50)	

NOTES: –



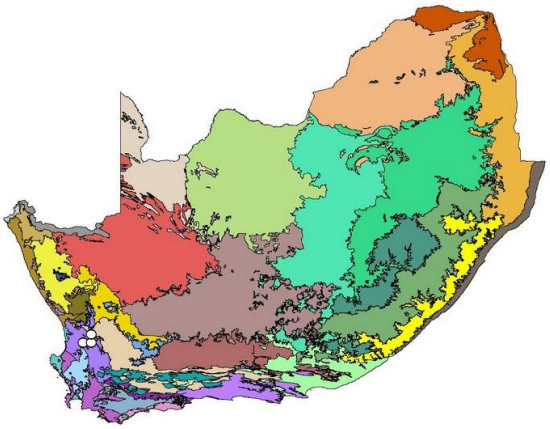
[E]*Aspalathus polycephala* E.Mey. subsp. *polycephala*

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.7–2; Alt 960–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Ecotone	
QDGCs	3219 (67)	3218 (33)

NOTES: –



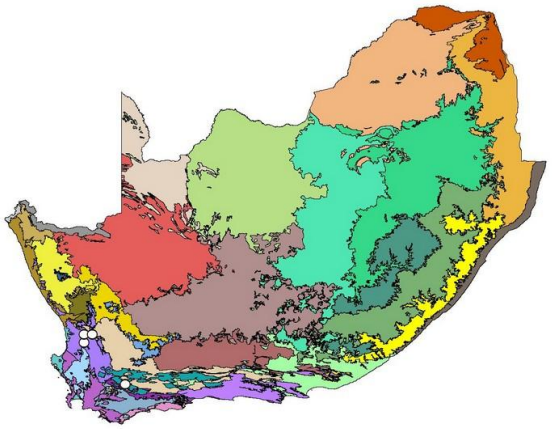
[E]*Aspalathus polycephala* E.Mey. subsp. *rigida* (Schltr.) R.Dahlgren

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.2–1.5; Alt 700–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	<400 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (50)	<6.4; 6.5–7.4 (25)
ESP	Ecotone	
QDGCs	3218 (50)	3219; 3320 (25)

NOTES: –



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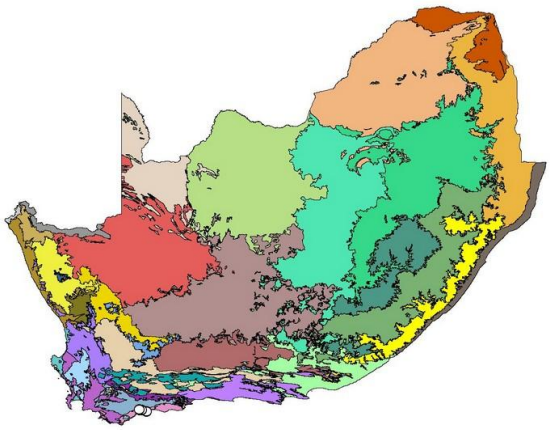
[E]*Aspalathus potbergensis* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt 420–518

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3420 (100)	

NOTES: –



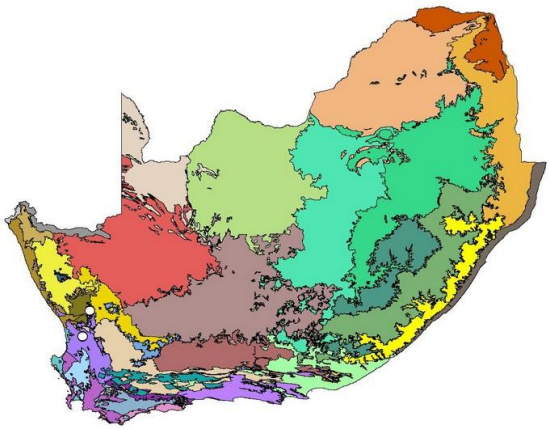
[E]*Aspalathus proboscidea* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (500)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	5.5–7.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3119; 3218 (50)	

NOTES: –



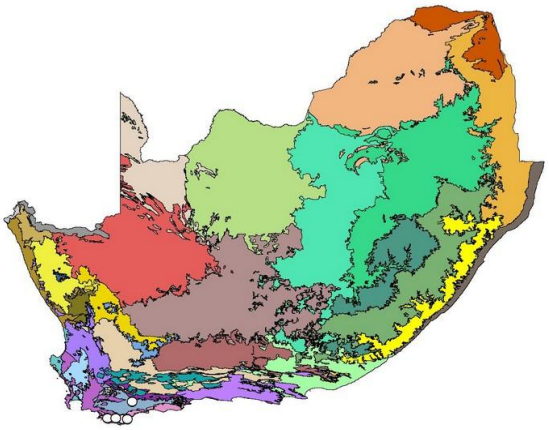
[E]*Aspalathus prostrata* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.8; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	5.5–7.4 (50)	6.5–7.4; 6.5–8.4 (25)
ESP	Ecotone	
QDGCs	3420 (60)	3419 (40)

NOTES: –



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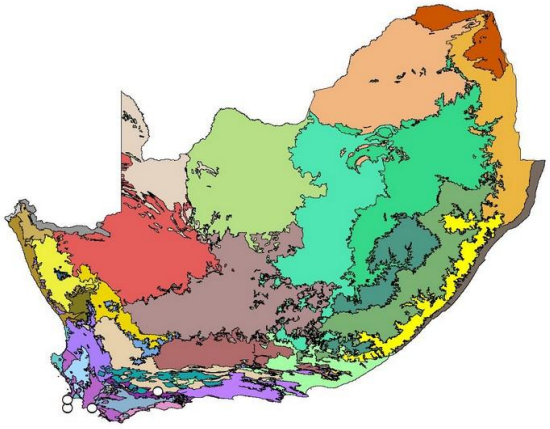
[E]*Aspalathus psoraleoides* (C.Presl) Benth.

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–0.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	<400; 600–1000 (25)
Min temp (°C)	>6 (75)	2–8 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (75)	6.5–8.4 (25)
ESP	Non (100)	
QDGCs	3418 (50)	3321; 3419 (25)

NOTES: –



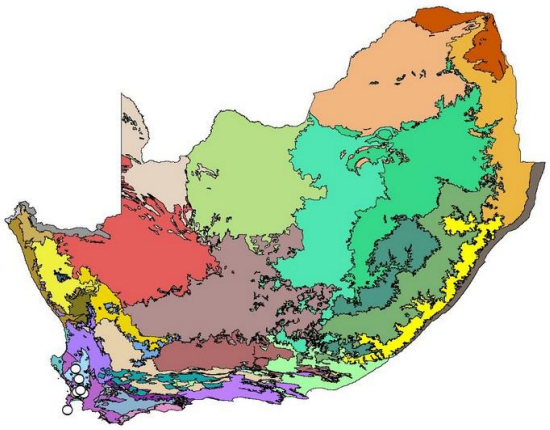
[E]*Aspalathus puberula* (Eckl. & Zeyh.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht ?; Alt ?–122

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; West Coast Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (60)	400–800; 600–1000 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	3318 (88)	3418 (12)

NOTES: –



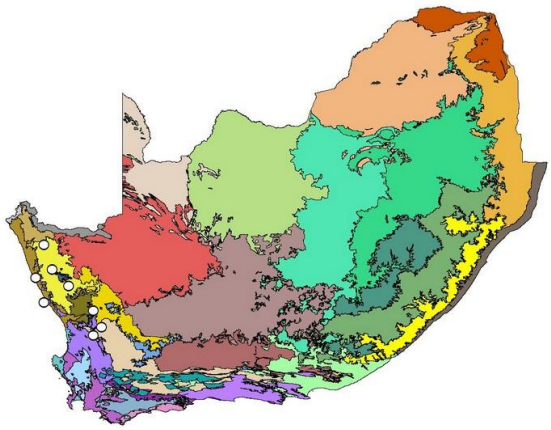
[E]*Aspalathus pulicifolia* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.2–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld; Namaqualand Sandveld; Rainshadow Valley Karoo (33)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (88)	200–600 (12)
Min temp (°C)	2–8 (63)	>6 (37)
Max temp (°C)	25–29 (50)	27–35 (38)
Phosphorus (ppm)	5–.35 (63)	>20 (37)
pH	6.5–7.4 (38)	6.5–8.4; >7.5 (25)
ESP	High (67)	Medium (33)
QDGCs	3017; 3119 (24)	2917; 3018; 3117; 3219 (13)

NOTES: –



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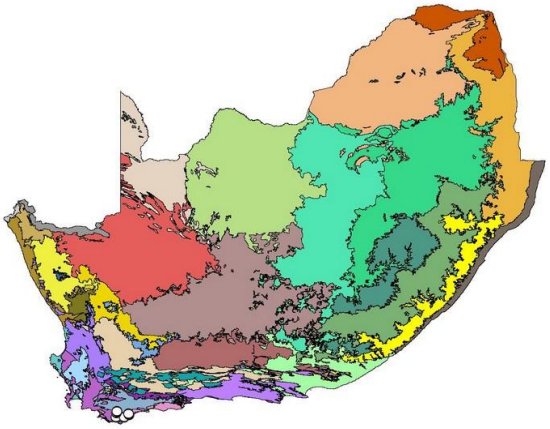
[E]*Aspalathus pycnantha* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.5; Alt 10–20

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400; 400–800 (25)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (75)	<27 (25)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–7.4; 6.5–8.4; >7.5 (25)	
ESP	Ecotone	
QDGCs	3419; 3420 (50)	

NOTES: **Flowering:** Winter, spring (Mustart *et al.* 2003).



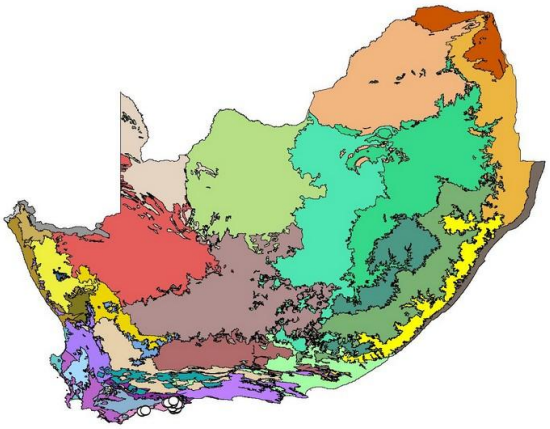
[E]*Aspalathus quadrata* L.Bolus

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–0.4; Alt 24–200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (60)	<10 (40)
pH	<6.4; 6.5–7.4 (40)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	3421 (87)	3420 (13)

NOTES: –



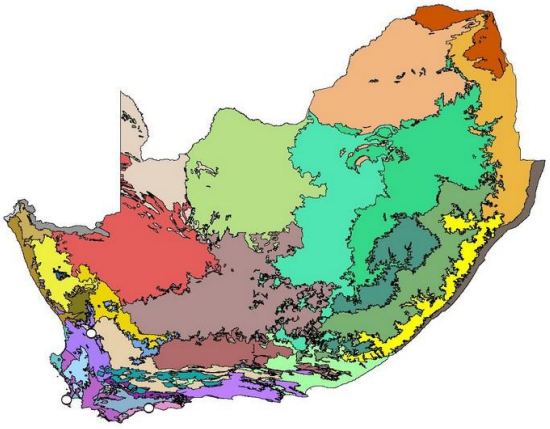
[E]*Aspalathus quinquefolia* L. subsp. *compacta* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.25–1; Alt 244–258

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	600–1000 (33)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4; 6.5–7.4 (33)	
ESP	Ecotone	
QDGCs	3219; 3418; 3420 (33)	

NOTES: **Flowering:** Spring (Manning & Goldblatt 2000).



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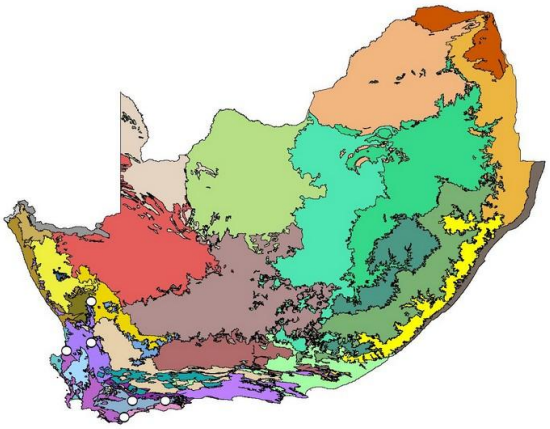
[E]*Aspalathus quinquefolia* L. subsp. *hispida* (Thunb.) R.Dahlgren

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.5–2; Alt 47–488

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	5.5–7.4; 6.5–8.4 (33)	<6.4; >7.5 (17)
ESP	Ecotone	
QDGCs	3420 (32)	3119; 3218; 3219; 3421 (17)

NOTES: **Flowering:** Spring (Manning & Goldblatt 2000).



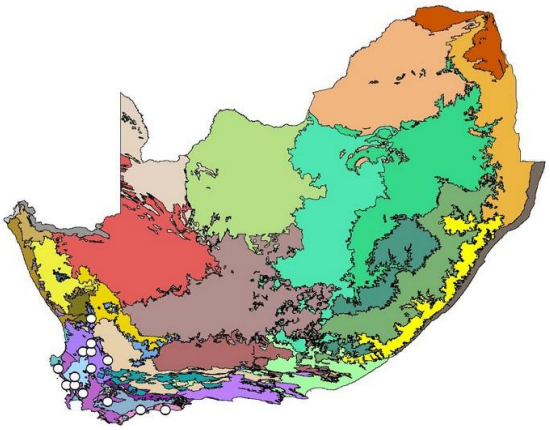
[E]*Aspalathus quinquefolia* L. subsp. *quinquefolia*

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.2; Alt 60–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; South Coast Fynbos (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (64)	<400; 400–800 (14)
Min temp (°C)	2–8 (64)	>6 (29)
Max temp (°C)	25–29 (86)	27–35 (14)
Phosphorus (ppm)	5–35 (93)	>20 (7)
pH	<6.4 (50)	5.5–7.4 (36)
ESP	Non (100)	
QDGCs	3318 (36)	3219 (21)

NOTES: **Flowering:** Spring (Manning & Goldblatt 2000).



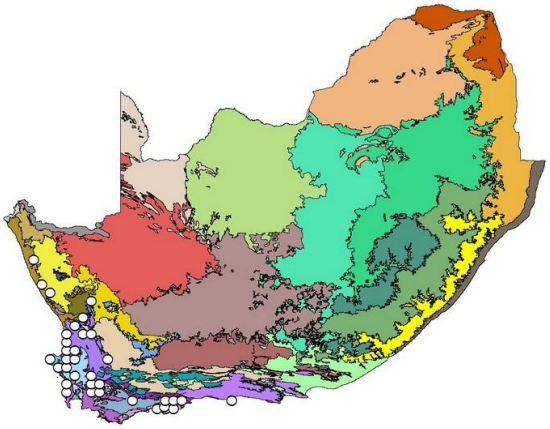
[E]*Aspalathus quinquefolia* L. subsp. *virgata* (Thunb.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.2–1.5; Alt 10–950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (40)	Southwest Fynbos; Eastern Fynbos-Renosterveld; West Strandveld (20)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400 (38)
Min temp (°C)	2–8 (47)	>6 (38)
Max temp (°C)	25–29 (62)	27–35 (35)
Phosphorus (ppm)	5–35 (88)	<10 (9)
pH	5.5–7.4 (35)	<6.4 (26)
ESP	Non (60)	Medium (40)
QDGCs	3218; 3421 (20)	3318; 3319 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Spring (Manning & Goldblatt 2000).



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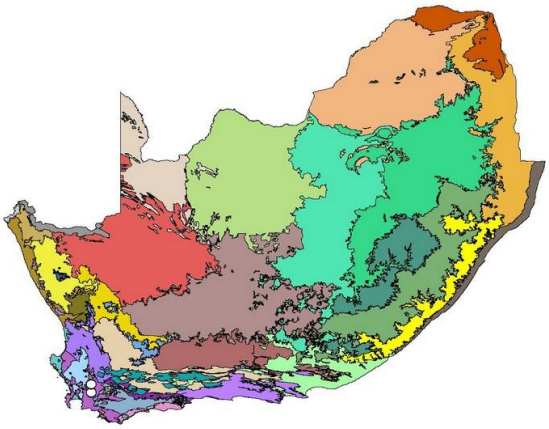
[E]*Aspalathus radiata* Garab. ex R.Dahlgren subsp. *pseudosericea* R.Dahlgren Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.5; Alt 610–1066

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	3319 (100)	

NOTES: –

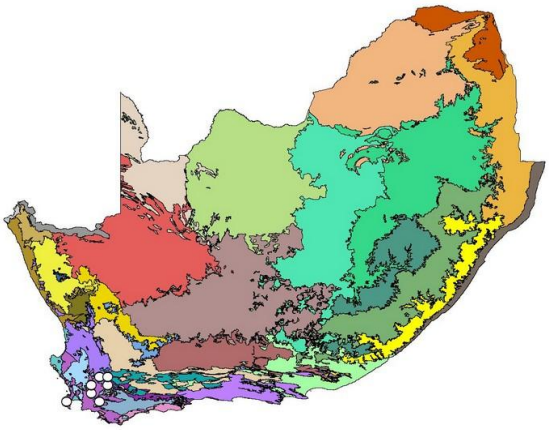


[E]*Aspalathus radiata* Garab. ex R.Dahlgren subsp. *radiata* Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.5; Alt 550–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800; >800 (29)	600–1000 (13)
Min temp (°C)	0–4 (72)	2–8; >6 (14)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (72)	<6.4; 6.5–7.4 (14)
ESP	Non (100)	
QDGCs	3319 (71)	3418; 3419 (14)

NOTES: –

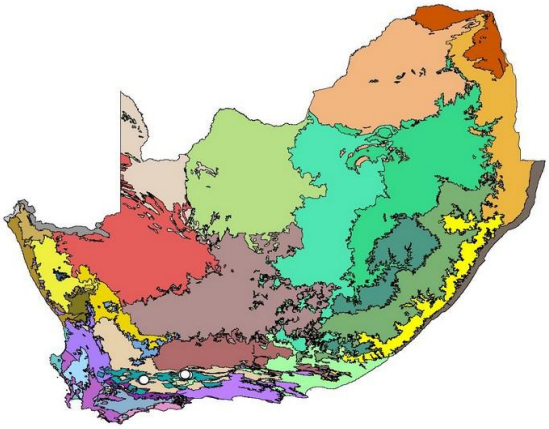


[E]*Aspalathus ramosissima* R.Dahlgren Crotalarieae ①

Shrub; P; Ht 0.3–2; Alt 1300–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	>20 (100)	
pH	6.5–8.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3321 (63)	3320 (25)

NOTES: –



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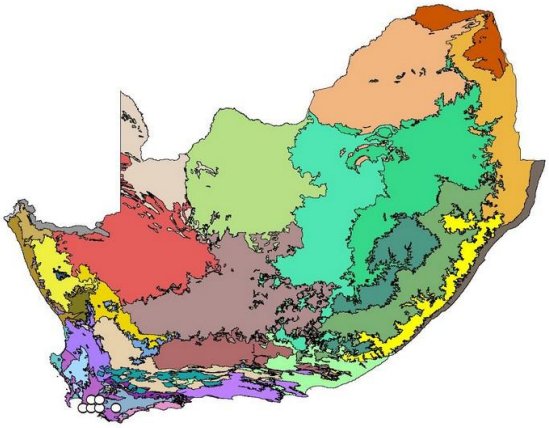
[E]*Aspalathus ramulosa* E.Mey.

Crotalarieae ①

Shrub; P; Ht 0.5–0.7; Alt 60–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	>800 (33)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3419 (83)	3418 (17)

NOTES: –



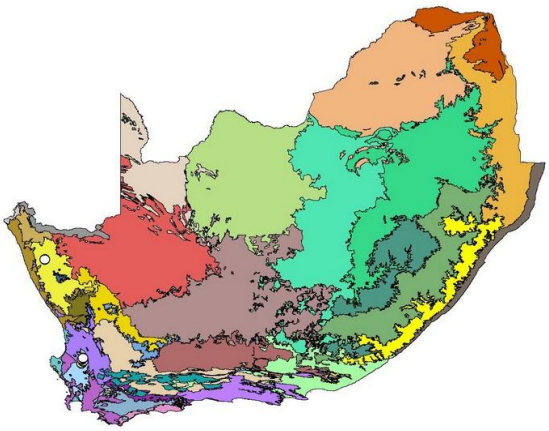
[E]*Aspalathus rectistyla* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.2–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Fynbos; Succulent Karoo (50)	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	3218 (80)	2917 (20)

NOTES: –



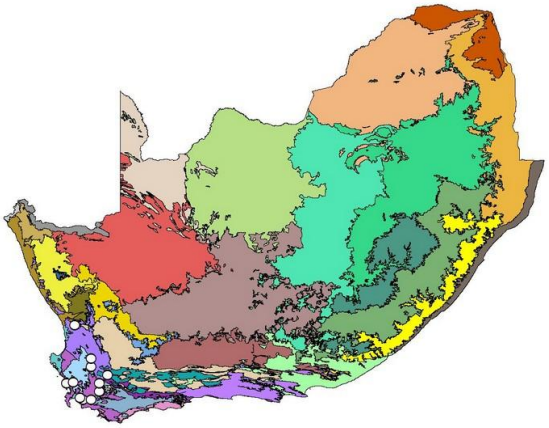
[E]*Aspalathus recurva* Benth.

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.5; Alt 275–520

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	400–800; >800 (20)
Min temp (°C)	0–4 (40)	2–8; >6 (30)
Max temp (°C)	25–29 (90)	27–35 (10)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (50)	5.5–7.4 (40)
ESP	Ecotone	
QDGCs	3319 (42)	3318; 3418 (17)

NOTES: –



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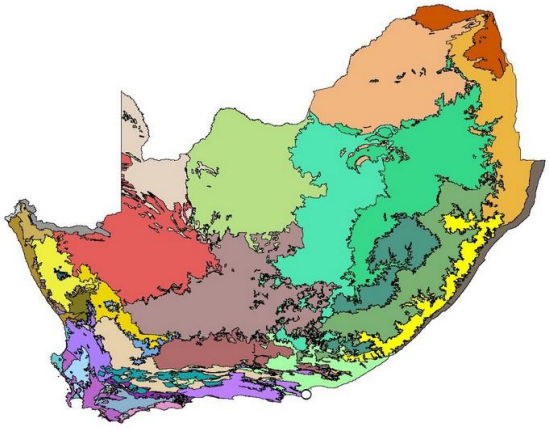
[E]*Aspalathus recurvispina* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3325 (100)	

NOTES: –



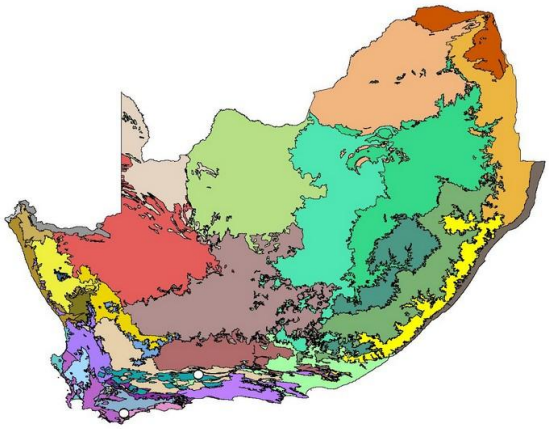
[E]*Aspalathus repens* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–90

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	6.5–8.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3420 (67)	3322 (33)

NOTES: –



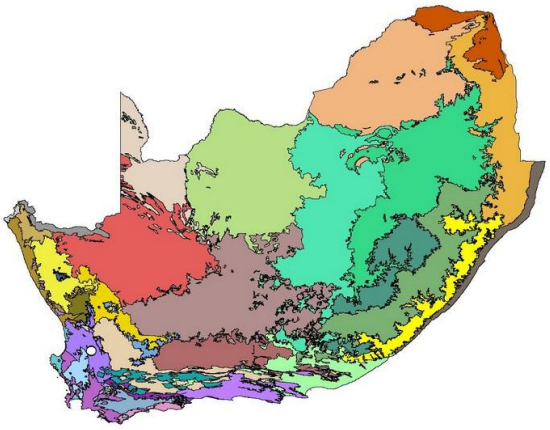
[E]*Aspalathus retroflexa* L. subsp. *angustipetala* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.6–4; Alt ?–830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	3219 (100)	

NOTES: –



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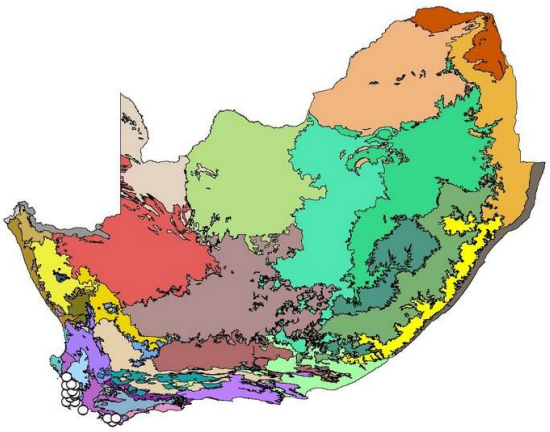
[E]*Aspalathus retroflexa* L. subsp. *bicolor* (Eckl. & Zeyh.) R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.05–1.5; Alt ?–170

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (40)	400–800 (30)
Min temp (°C)	>6 (70)	2–8 (30)
Max temp (°C)	25–29 (90)	<27 (10)
Phosphorus (ppm)	5–35 (90)	<10 (10)
pH	<6.4 (80)	5.5–7.4; 6.5–7.4 (10)
ESP	Non (100)	
QDGCs	3318 (62)	3418; 3419 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



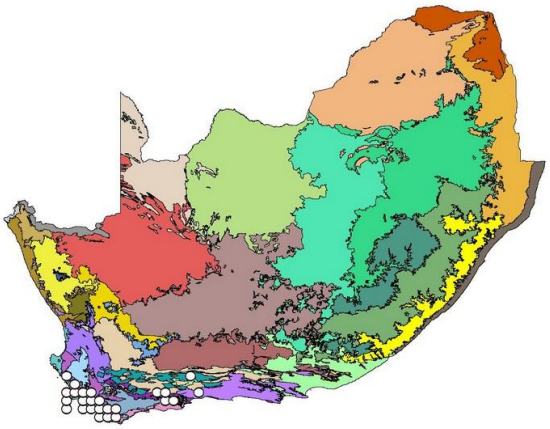
[E]*Aspalathus retroflexa* L. subsp. *retroflexa*

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–1; Alt 30–1158

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (28)	600–1000; >800 (16)
Min temp (°C)	2–8 (64)	>6 (32)
Max temp (°C)	25–29 (88)	27–35 (12)
Phosphorus (ppm)	5–35 (84)	<10 (12)
pH	<6.4 (56)	5.5–7.4 (28)
ESP	Non (100)	
QDGCs	3419 (36)	3318 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



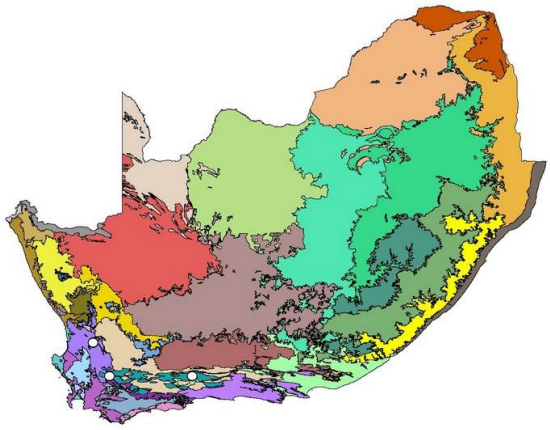
[E]*Aspalathus rigidifolia* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.15–1; Alt ?–1900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; 400–800 (33)	
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	<6.4; 5.5–7.4; >7.5 (33)	
ESP	Ecotone	
QDGCs	3219; 3319; 3322 (33)	

NOTES: –



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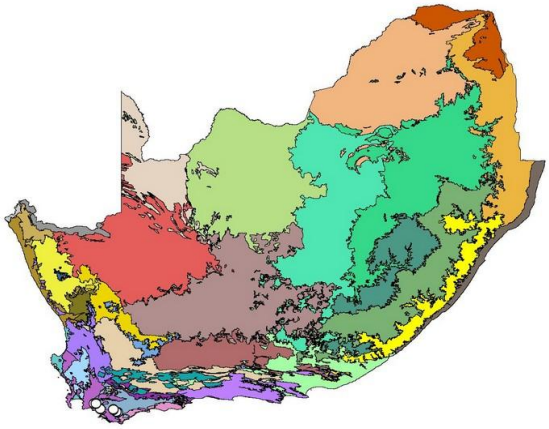
[E]*Aspalathus rosea* Garab. ex R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.4; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800; >800 (33)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: –



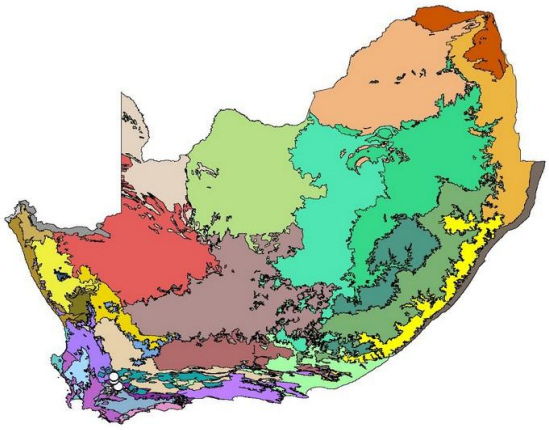
[E]*Aspalathus rostrata* Benth.

Crotalarieae ①

Shrub; P; Ht 1–1.5; Alt ?–830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



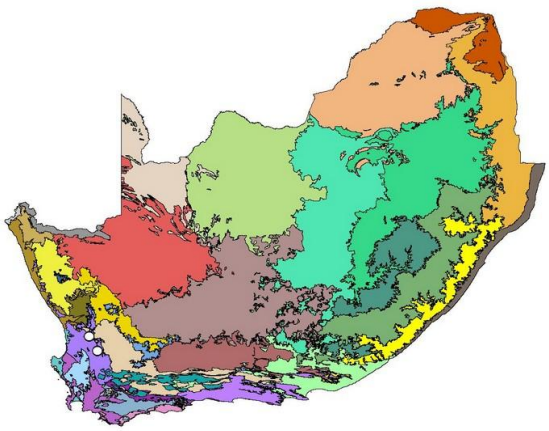
[E]*Aspalathus rostripetala* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3219 (100)	

NOTES: –



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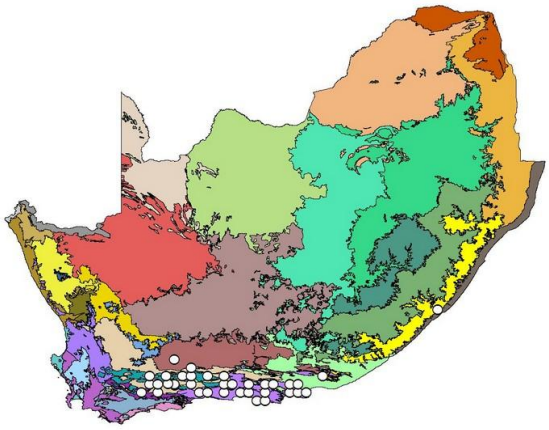
[E]*Aspalathus rubens* Thunb.

Crotalarieae ①

Dwarf shrub; P; Ht 0.25–0.8; Alt 4–1875

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (86)	Lower Karoo (14)
Biome	Fynbos (67)	Nama-Karoo (33)
Rainfall (mm)	<400 (37)	200–600 (26)
Min temp (°C)	2–8 (86)	>6 (14)
Max temp (°C)	25–29 (46)	27–35 (37)
Phosphorus (ppm)	5–35 (74)	>20 (23)
pH	<6.4 (31)	6.5–8.4 (29)
ESP	Medium (100)	
QDGCs	3323 (22)	3321 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



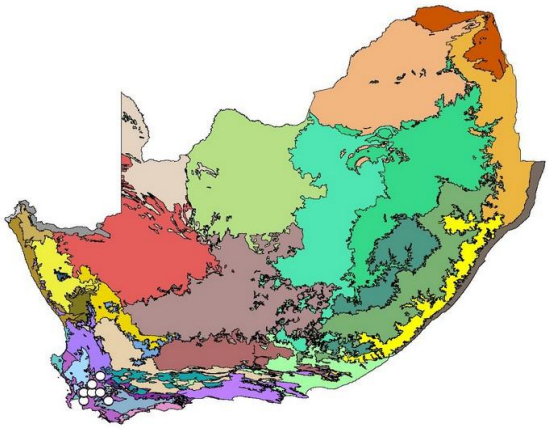
[E]*Aspalathus rubiginosa* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.3–1; Alt 975–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (43)	200–600 (29)
Min temp (°C)	0–4 (57)	2–8 (43)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (71)	<6.4 (29)
ESP	Non (100)	
QDGCs	3319 (58)	3318; 3418; 3419 (14)

NOTES: –



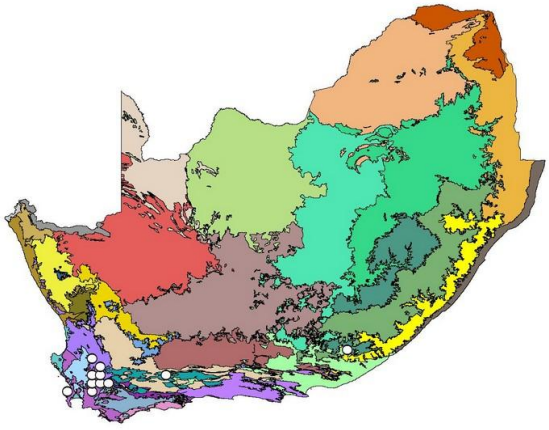
[E]*Aspalathus rugosa* Thunb.

Crotalarieae ①

Shrub; P; Ht 1–3; Alt 440–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (36)	400–800 (27)
Min temp (°C)	0–4 (64)	2–8 (27)
Max temp (°C)	25–29 (91)	27–35 (9)
Phosphorus (ppm)	5–35 (91)	>20 (9)
pH	5.5–7.4 (55)	<6.4 (27)
ESP	Non (100)	
QDGCs	3319 (64)	3219; 3226; 3318; 3321 (9)

NOTES: –



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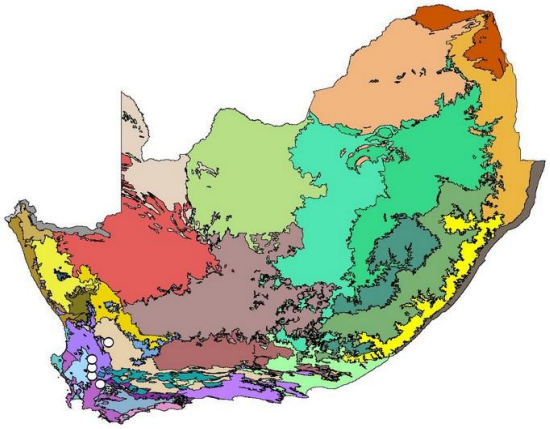
[E]*Aspalathus rupestris* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.9; Alt 990–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Rainshadow Valley Karoo (100)	
Biome	Fynbos (75)	Succulent Karoo (25)
Rainfall (mm)	200–600; 400–800 (40)	<400 (20)
Min temp (°C)	0–4 (60)	2–8 (40)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (80)	>20 (20)
pH	<6.4; 5.5–7.4 (40)	6.5–8.4 (20)
ESP	High (100)	
QDGCs	3319 (60)	3219 (40)

NOTES: –



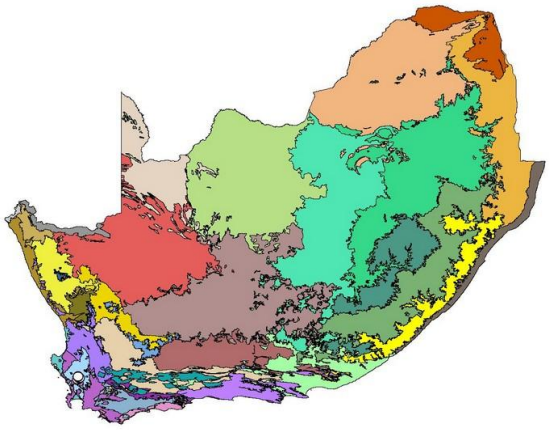
[E]*Aspalathus rycroftii* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.5–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: –



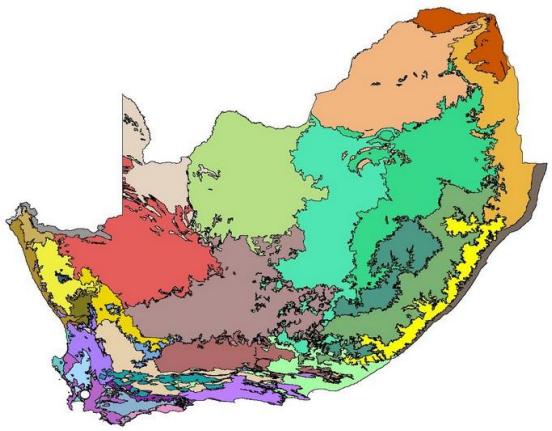
[E]*Aspalathus salicifolia* R.Dahlgren

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.4–1; Alt 1067–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: –



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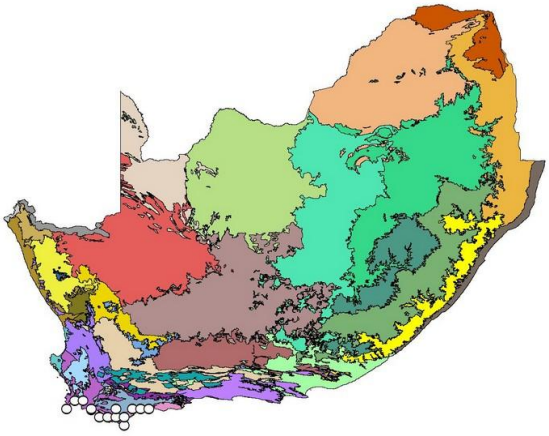
[E]*Aspalathus salteri* L.Bolus

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.8; Alt 15–215

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (54)	200–600 (38)
Min temp (°C)	>6 (62)	2–8 (38)
Max temp (°C)	25–29 (85)	<27 (15)
Phosphorus (ppm)	5–35 (92)	<10 (8)
pH	<6.4 (31)	5.5–7.4; 6.5–7.4; 6.5–8.4 (23)
ESP	Non (100)	
QDGCs	3419 (43)	3420 (36)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



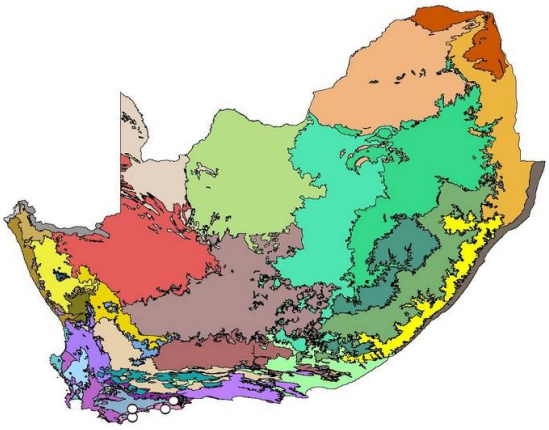
[E]*Aspalathus sanguinea* Thunb. subsp. *foliosa* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.4–1; Alt 25–155

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	<400 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (75)	<27 (25)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	<6.4 (50)	6.5–8.4; >7.5 (25)
ESP	Non (100)	
QDGCs	3420; 3421 (50)	

NOTES: –



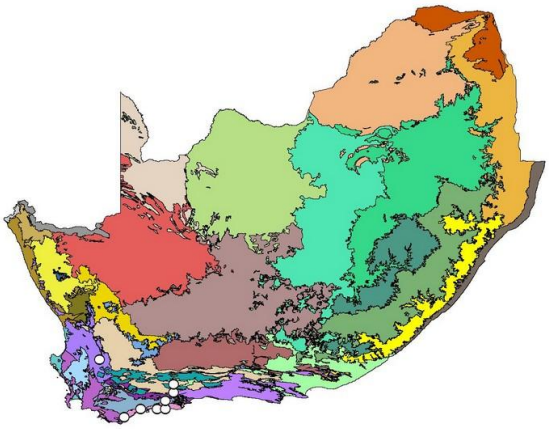
[E]*Aspalathus sanguinea* Thunb. subsp. *sanguinea*

Crotalarieae ①

Shrub; P; Ht 0.2–1; Alt 8–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; South Coast Fynbos (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (88)	<400 (12)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (38)	<6.4; 6.5–8.4 (25)
ESP	Non (100)	
QDGCs	3421 (38)	3321; 3420 (25)

NOTES: –



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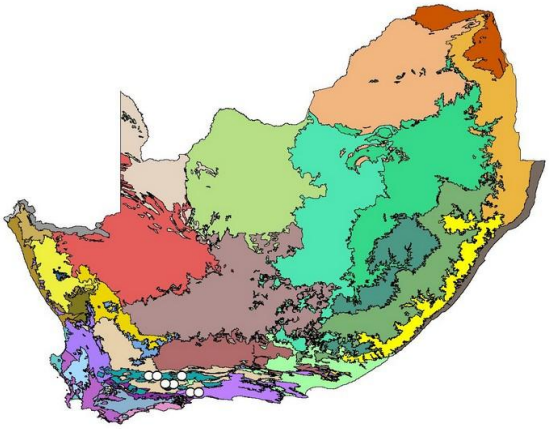
[E]*Aspalathus sceptrum-aureum* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 1.2–2.5; Alt 800–1405

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (71)	400–800; 600–1000 (14)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (71)	25–29 (29)
Phosphorus (ppm)	5–35 (57)	>20 (43)
pH	>7.5 (43)	6.5–8.4 (29)
ESP	Ecotone	
QDGCs	3321 (70)	3322 (20)

NOTES: **Flowering:** Spring (Moriarty 1997).



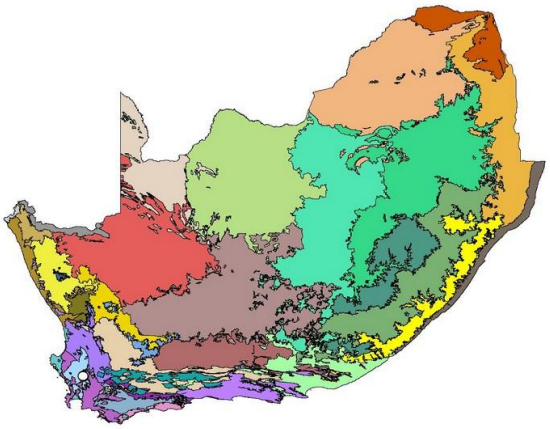
[E]*Aspalathus secunda* E.Mey.

Crotalarieae ①

Shrub; P; Ht ?; Alt ?–250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: –



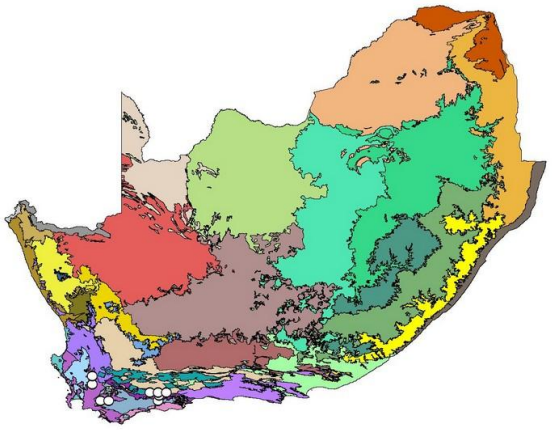
[E]*Aspalathus securifolia* Eckl. & Zeyh.

Crotalarieae ①

Shrub; P; Ht 0.2–1.2; Alt 430–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (50)	6.5–8.4 (38)
ESP	Ecotone	
QDGCs	3321 (33)	3319; 3419 (22)

NOTES: **Flowering:** All seasons (Mustart *et al.* 2003).



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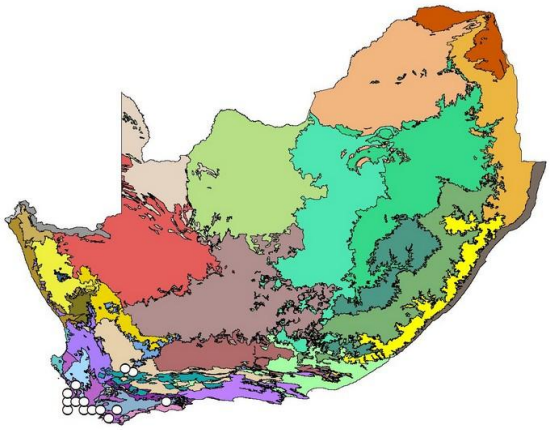
[E]*Aspalathus sericea* P.J.Bergius

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–1; Alt 15–1005

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (36)	200–600 (21)
Min temp (°C)	2–8 (57)	>6 (43)
Max temp (°C)	25–29 (79)	27–35 (14)
Phosphorus (ppm)	5–35 (93)	<10 (7)
pH	<6.4 (64)	5.5–7.4 (21)
ESP	Non (100)	
QDGCs	3418 (36)	3419 (29)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



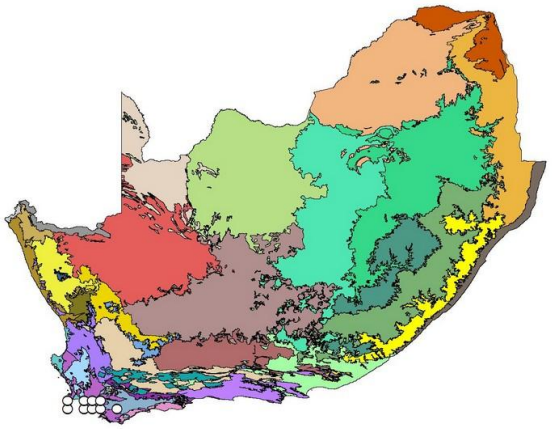
[E]*Aspalathus serpens* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.5–1; Alt 60–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (44)	>800 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (78)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	3419 (56)	3418 (44)

NOTES: –



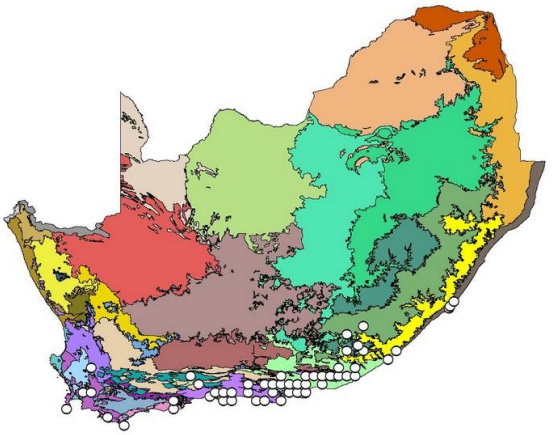
[E]*Aspalathus setacea* Eckl. & Zeyh.

Crotalarieae ①

Shrub; P; Ht 0.25–3.5; Alt 5–1705

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (47)	Albany Thicket (24)
Biome	Fynbos (56)	Albany Thicket (25)
Rainfall (mm)	400–800 (40)	200–600 (23)
Min temp (°C)	2–8 (62)	>6 (29)
Max temp (°C)	25–29 (75)	<27 (17)
Phosphorus (ppm)	5–35 (87)	<10 (10)
pH	<6.4 (46)	5.5–7.4 (29)
ESP	Non (53)	Medium (47)
QDGCs	3325 (15)	3326 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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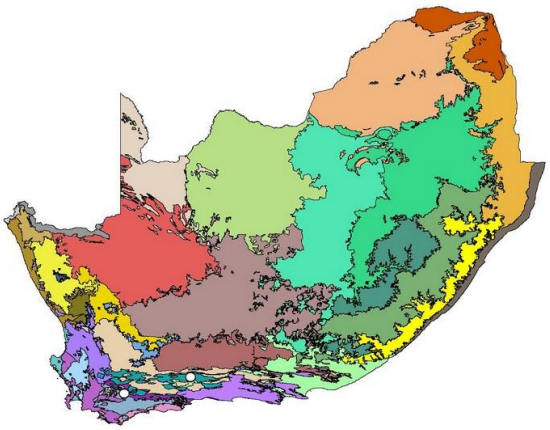
[E]*Aspalathus shawii* L.Bolus subsp. *glabripetala* (R.Dahlgren) R.Dahlgren Crotalarieae ①

Shrub; P; Ht 0.5–0.7; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	6.5–7.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3320; 3322 (50)	

NOTES: –

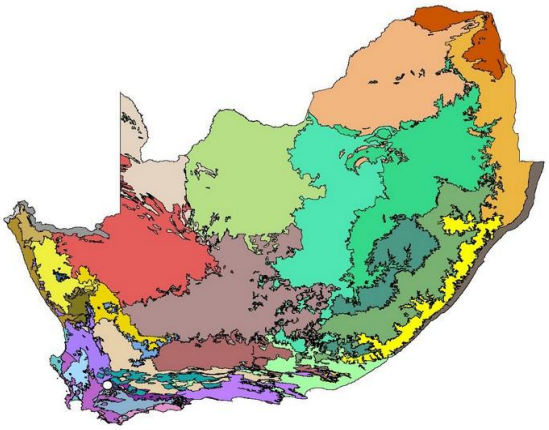


[E]*Aspalathus shawii* L.Bolus subsp. *longispica* (R.Dahlgren) R.Dahlgren Crotalarieae ①

Shrub; P; Ht 0.5–0.8; Alt 762–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –

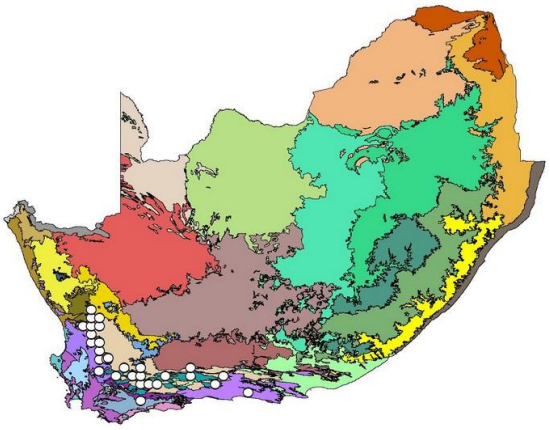


[E]*Aspalathus shawii* L.Bolus subsp. *shawii* Crotalarieae ①

Shrub; P; Ht 0.4–1.5; Alt 73–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Eastern Fynbos-Renosterveld; Rainshadow Valley Karoo (33)	
Biome	Fynbos (60)	Succulent Karoo (40)
Rainfall (mm)	<400 (71)	200–600 (21)
Min temp (°C)	2–8 (96)	0–4 (4)
Max temp (°C)	27–35 (54)	25–29 (43)
Phosphorus (ppm)	5–35 (64)	>20 (36)
pH	6.5–8.4; >7.5 (32)	5.5–7.4 (25)
ESP	Non; Medium; High (33)	
QDGCs	3219 (27)	3320 (23)

NOTES: –



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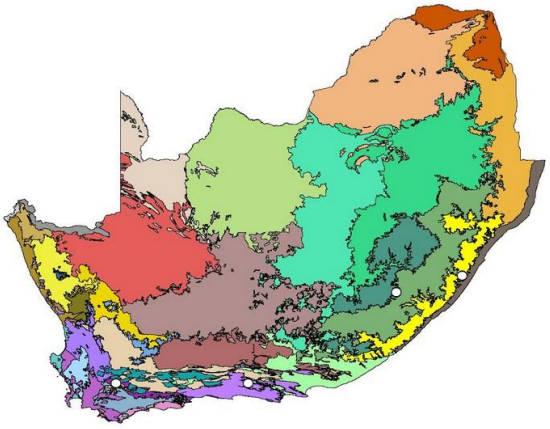
[E]*Aspalathus simii* Bolus

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–1.3; Alt 70–1410

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	600–1000; >800 (25)
Min temp (°C)	0–4 (50)	2–8; >6 (25)
Max temp (°C)	25–29 (75)	<27 (25)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	<6.4 (75)	6.5–7.4 (25)
ESP	Ecotone	
QDGCs	3028; 3030; 3319; 3323 (25)	

NOTES: –



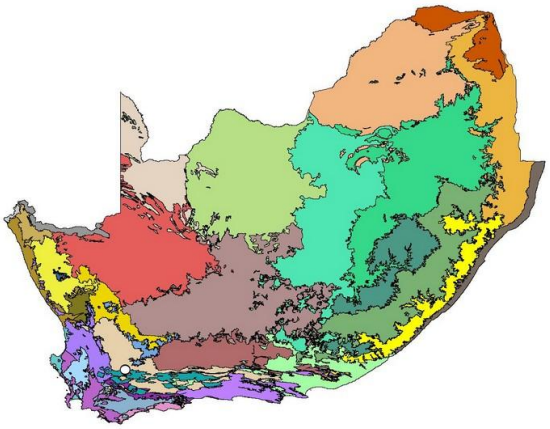
[E]*Aspalathus singuliflora* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3320 (100)	

NOTES: –



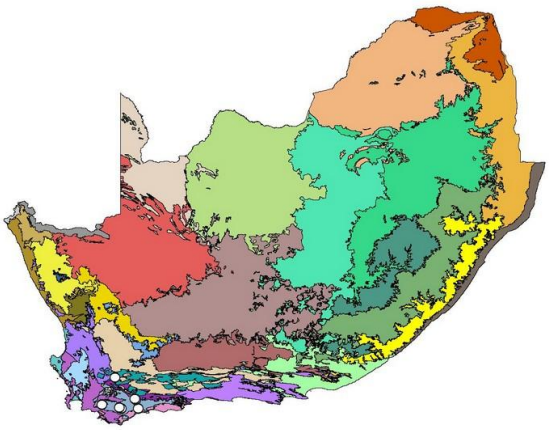
[E]*Aspalathus smithii* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.3; Alt 100–245

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400 (33)
Min temp (°C)	2–8 (67)	0–4; >6 (17)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	6.5–7.4; 6.5–8.4 (17)
ESP	Ecotone	
QDGCs	3420 (57)	3419 (29)

NOTES: –



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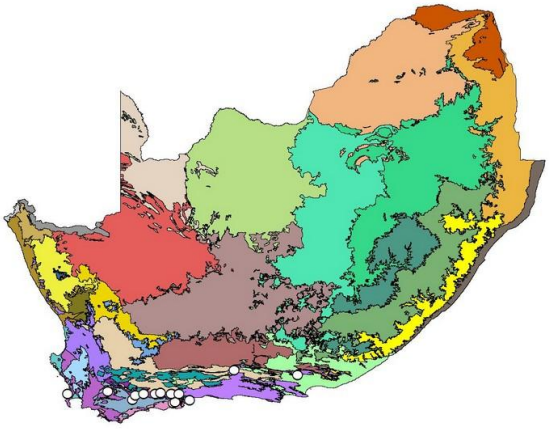
[E]*Aspalathus spectabilis* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.6–2; Alt 244–425

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	<400 (17)
Min temp (°C)	2–8 (84)	0–4; >6 (8)
Max temp (°C)	25–29 (58)	27–35 (33)
Phosphorus (ppm)	5–35 (92)	<10 (8)
pH	5.5–7.4 (33)	<6.4; 6.5–8.4 (25)
ESP	Ecotone	
QDGCs	3321 (33)	3320; 3421 (17)

NOTES: –



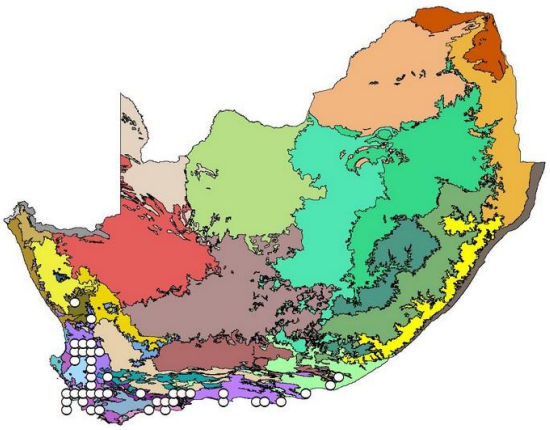
[E]*Aspalathus spicata* Thunb.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.15–2.5; Alt 30–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (38)	Northwest Fynbos; Southwest Fynbos (25)
Biome	Fynbos (96)	Succulent Karoo (4)
Rainfall (mm)	200–600 (47)	400–800 (28)
Min temp (°C)	2–8 (53)	>6 (30)
Max temp (°C)	25–29 (84)	<27 (9)
Phosphorus (ppm)	5–35 (93)	>20 (5)
pH	<6.4 (44)	5.5–7.4 (35)
ESP	Non (63)	Medium (37)
QDGCs	3319 (16)	3218 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



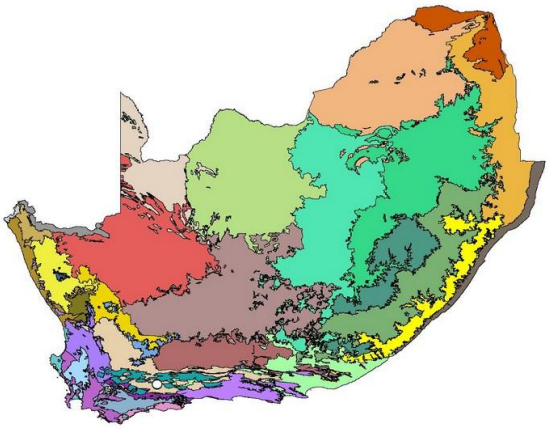
[E]*Aspalathus spiculata* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.4–0.8; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3321 (100)	

NOTES: –



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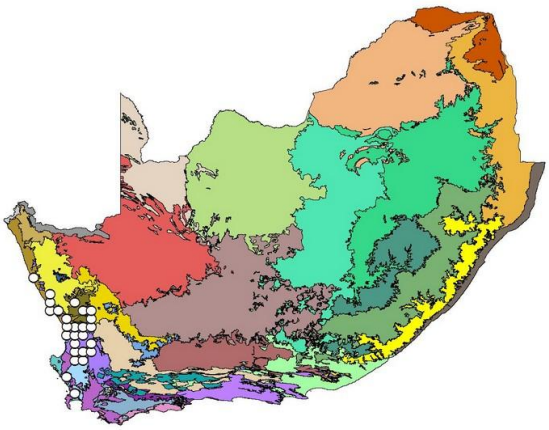
[E]*Aspalathus spinescens* Thunb. subsp. *lepida* (E.Mey.) R.Dahlgren — Crotalarieae ①

Shrub; P; Ht 0.35–2; Alt 30–1130

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (85)	Succulent Karoo (15)
Rainfall (mm)	<400 (62)	200–600 (35)
Min temp (°C)	>6 (54)	2–8 (46)
Max temp (°C)	25–29 (54)	27–35 (42)
Phosphorus (ppm)	5–35 (85)	>20 (15)
pH	6.5–8.4 (38)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	3218 (31)	3118 (27)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Manning & Goldblatt 2000).

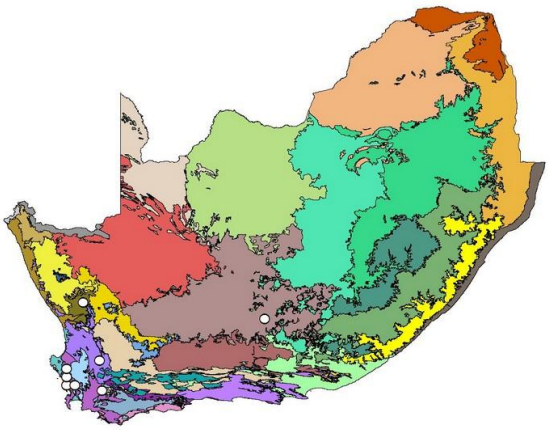


[E]*Aspalathus spinescens* Thunb. subsp. *spinescens* — Crotalarieae ①

Shrub; P; Ht 0.6–1.5; Alt ?–200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Upper Karoo (50)	
Biome	Fynbos (83)	Nama-Karoo (17)
Rainfall (mm)	200–600 (63)	<400 (37)
Min temp (°C)	>6 (50)	2–8 (25)
Max temp (°C)	25–29 (88)	27–35 (12)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	<6.4 (50)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3318 (50)	3118; 3124; 3219; 3319 (12.5)

NOTES: **Flowering:** Spring (Manning & Goldblatt 2000).

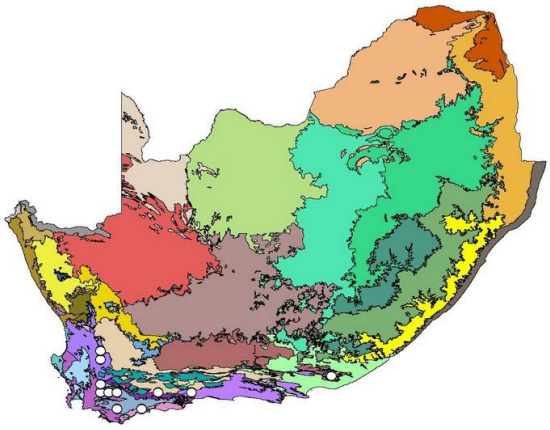


[E]*Aspalathus spinosa* L. subsp. *flavispina* (C.Presl ex Benth.) R.Dahlgren — Crotalarieae ①

Shrub; P; Ht 0.1–2; Alt 45–945

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (73)	400–800 (18)
Min temp (°C)	2–8 (55)	0–4 (36)
Max temp (°C)	25–29 (91)	27–35 (9)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (55)	6.5–7.4 (27)
ESP	Non (100)	
QDGCs	3319 (36)	3219 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Spring, summer, autumn (Pooley 1998).



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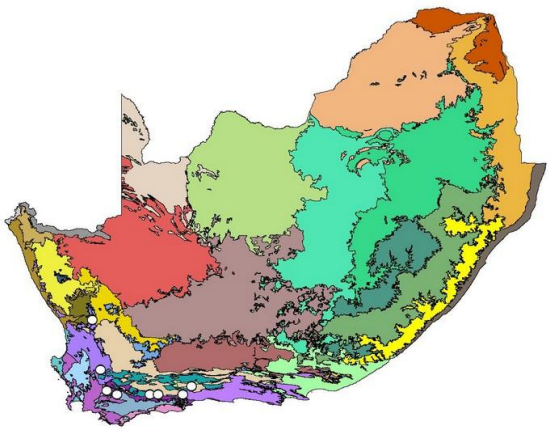
[E]*Aspalathus spinosa* L. subsp. *glauca* (Eckl. & Zeyh.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.3–1.2; Alt 430–671

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (63)	<400 (37)
Min temp (°C)	2–8 (63)	0–4 (37)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (88)	>20 (12)
pH	6.5–8.4 (50)	6.5–7.4 (25)
ESP	Ecotone	
QDGCs	3319 (38)	3321 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Spring, summer, autumn (Pooley 1998).



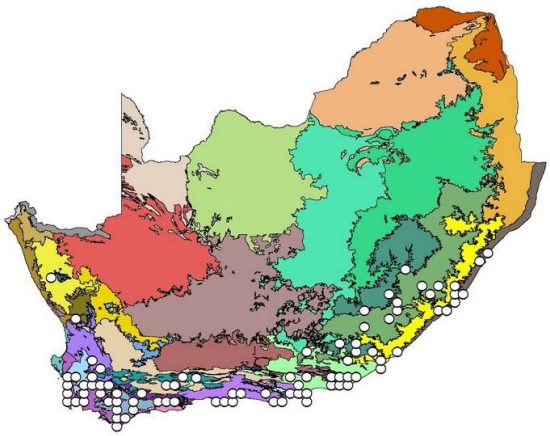
[E]*Aspalathus spinosa* L. subsp. *spinosa*

Crotalarieae ①

Shrub; P; Ht 0.2–1.3; Alt 15–1950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (33)	Sub-Escarpment Grassland (27)
Biome	Fynbos (66)	Grassland (20)
Rainfall (mm)	400–800 (31)	200–600 (29)
Min temp (°C)	2–8 (45)	>6 (33)
Max temp (°C)	25–29 (73)	<27 (18)
Phosphorus (ppm)	5–35 (76)	<10 (20)
pH	<6.4 (46)	5.5–7.4 (23)
ESP	Non (60)	Medium (40)
QDGCs	3319 (8)	3318; 3325; 3326 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer, autumn (Pooley 1998).



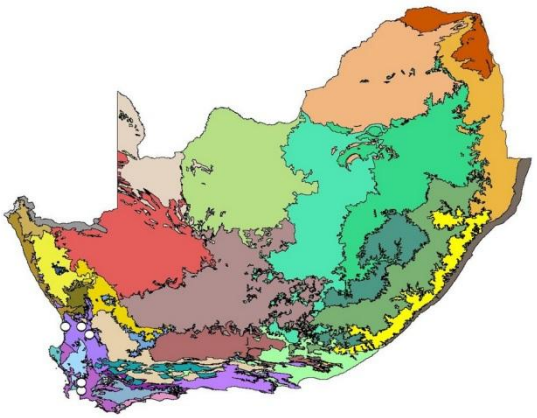
[E]*Aspalathus spinosissima* R.Dahlgren subsp. *spinosissima*

Crotalarieae ①

Shrub; P; Ht 0.3–1.8; Alt 762–1244

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; 400–800; 600–1000; >800 (20)	
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (60)	5.5–7.4; 6.5–7.4 (20)
ESP	Ecotone	
QDGCs	3218 (40)	3219; 3318; 3418 (20)

NOTES: –



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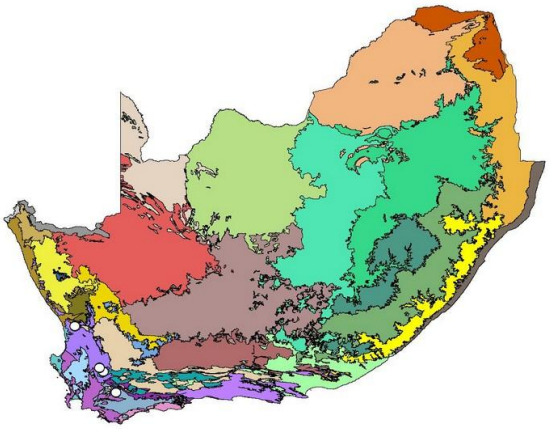
[E]*Aspalathus spinosissima* R.Dahlgren subsp. *tenuiflora* R.Dahlgren — Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt 1250–1677

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400; 400–800 (25)
Min temp (°C)	0–4 (75)	>6 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4; 6.5–7.4; 6.5–8.4 (25)	
ESP	Ecotone	
QDGCs	3319 (75)	3118 (25)

NOTES: –

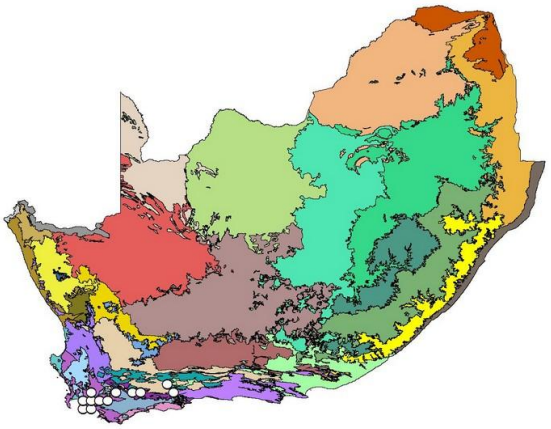


[E]*Aspalathus stenophylla* Eckl. & Zeyh. — Crotalarieae ①

Dwarf shrub; P; Ht 0.25–0.35; Alt 305–1280

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (42)	>800 (33)
Min temp (°C)	2–8 (75)	0–4 (17)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (42)	<6.4 (33)
ESP	Non (100)	
QDGCs	3419 (32)	3319; 3320; 3321; 3418 (17)

NOTES: –

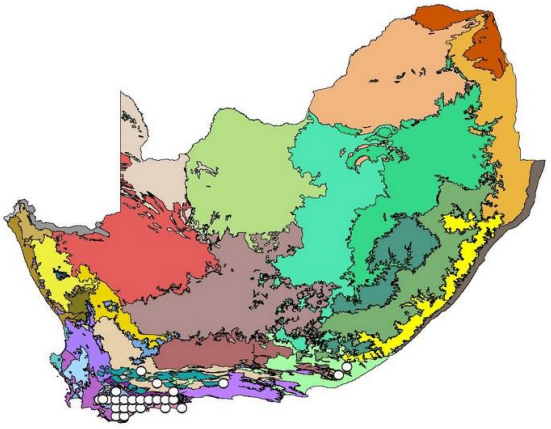


[E]*Aspalathus steudeliana* Brongn. — Crotalarieae ①

Shrub; P; Ht 0.2–1; Alt 10–914

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos; Albany Thicket (50)	
Biome	Fynbos (94)	Albany Thicket (6)
Rainfall (mm)	200–600 (72)	400–800 (16)
Min temp (°C)	2–8 (88)	>6 (8)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (88)	<10 (8)
pH	5.5–7.4 (40)	6.5–7.4 (20)
ESP	Non (100)	
QDGCs	3420 (33)	3419 (22)

NOTES: –



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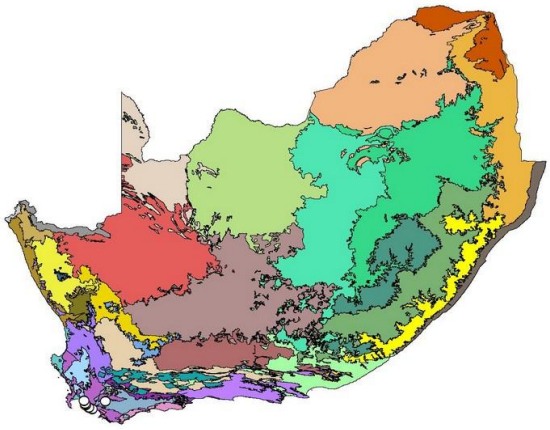
[E]*Aspalathus stokoei* L.Bolus **Crotalarieae** ①

Shrub; P; Ht 0.01–3; Alt 366–450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (50)	200–600; 400–800 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3418 (70)	3419 (30)

NOTES: –

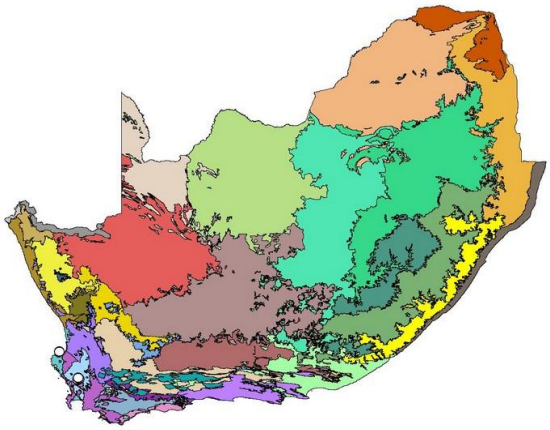


[E]*Aspalathus stricticlada* (R.Dahlgren) R.Dahlgren **Crotalarieae** ①

Shrub; P; Ht 0.2–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; >7.5 (50)	
ESP	Medium (100)	
QDGCs	3318 (75)	3217 (25)

NOTES: –

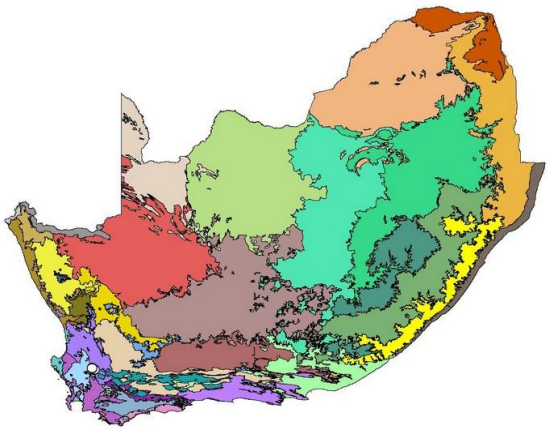


[E]*Aspalathus suaveolens* Eckl. & Zeyh. **Crotalarieae** ①

Dwarf shrub; P; Ht 0.01–0.02; Alt 700–1677

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



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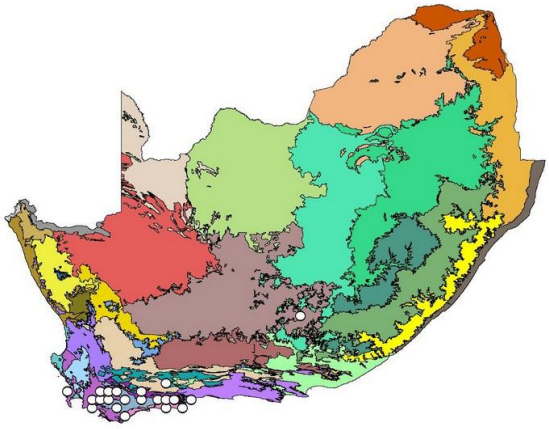
[E]*Aspalathus submissa* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–0.4; Alt 60–1105

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (14)
Min temp (°C)	2–8 (67)	0–4; >6 (14)
Max temp (°C)	25–29 (81)	27–35 (14)
Phosphorus (ppm)	5–35 (90)	<10 (10)
pH	<6.4; 5.5–7.4 (33)	6.5–7.4 (19)
ESP	Non (100)	
QDGCs	3419; 3421 (24)	3319; 3420 (14)

NOTES: –



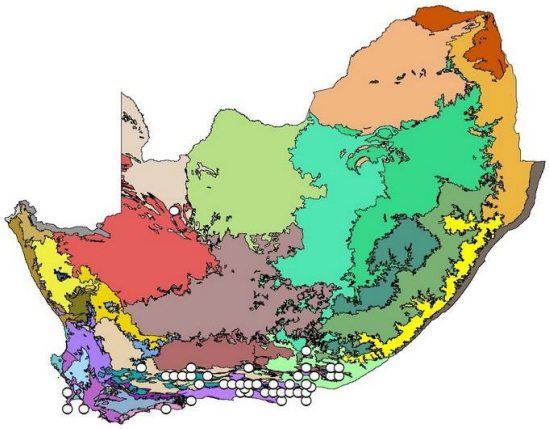
[E]*Aspalathus subtingens* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–2; Alt 5–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (44)	Albany Thicket; Southwest Fynbos (22)
Biome	Fynbos (75)	Albany Thicket (25)
Rainfall (mm)	200–600 (36)	400–800 (33)
Min temp (°C)	2–8 (76)	>6 (21)
Max temp (°C)	25–29 (67)	27–35 (21)
Phosphorus (ppm)	5–35 (81)	>20 (19)
pH	<6.4 (33)	5.5–7.4 (24)
ESP	Non (56)	Medium (44)
QDGCs	3325 (21)	3323 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



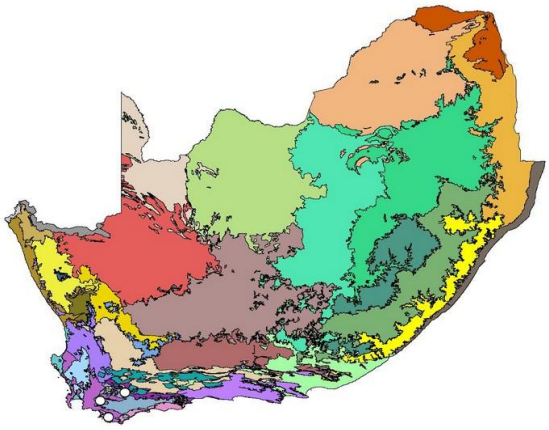
[E]*Aspalathus subulata* Thunb.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.3–1; Alt 275–460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (67)	200–600 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	5.5–7.4 (67)	6.5–7.4 (33)
ESP	Ecotone	
QDGCs	3419 (67)	3320 (33)

NOTES: –



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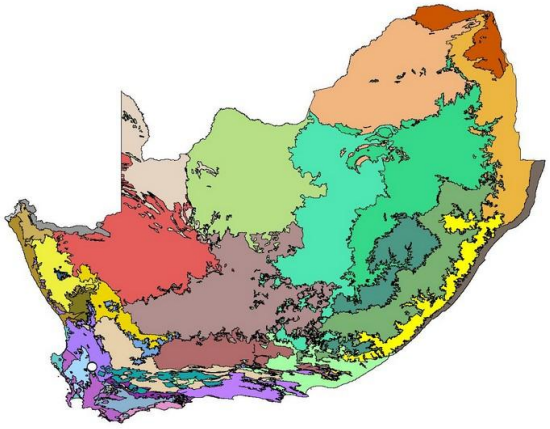
[E]*Aspalathus sulphurea* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



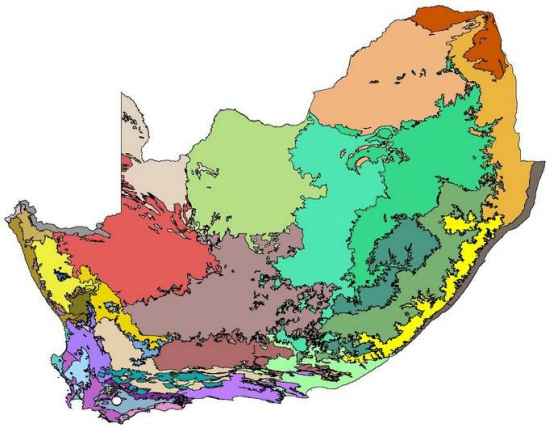
[E]*Aspalathus taylorii* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.25–0.45; Alt 152–244

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: –



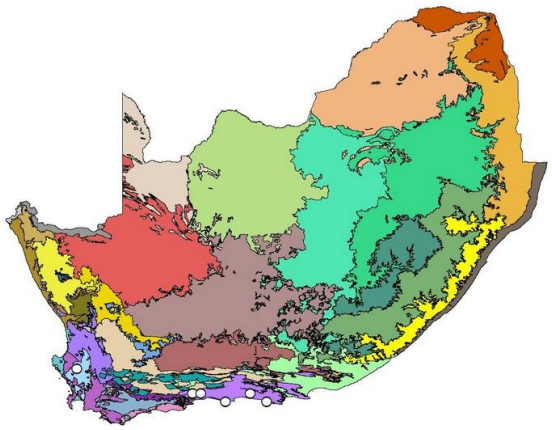
[E]*Aspalathus tenuissima* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–795

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (67)	West Coast Renosterveld (33)
Biome	Fynbos (100)	
Rainfall (mm)	400–800; 600–1000 (33)	200–600; >800 (17)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	<27 (50)	25–29 (33)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Medium (67)	Non (33)
QDGCs	3322 (32)	3318; 3323; 3423; 3424 (17)

NOTES: –



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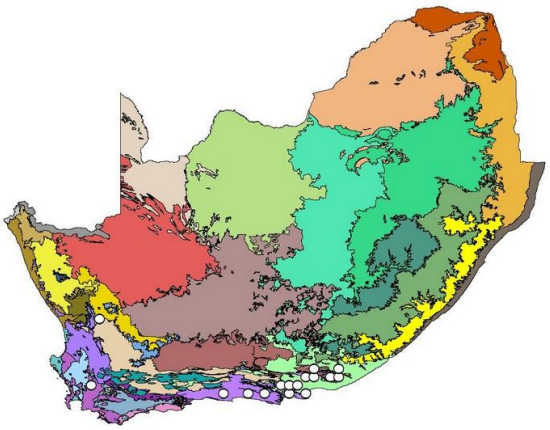
[E]*Aspalathus teres* Eckl. & Zeyh. subsp. *teres*

Crotalarieae ①

Shrub, tree; P; Ht 1–4.5; Alt 200–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos; Succulent Karoo (50)	
Rainfall (mm)	200–600; 400–800 (38)	600–1000 (13)
Min temp (°C)	2–8 (88)	0–4; >6 (6)
Max temp (°C)	25–29 (75)	<27 (19)
Phosphorus (ppm)	5–35 (88)	>20 (13)
pH	5.5–7.4 (50)	<6.4; 6.5–8.4 (19)
ESP	Medium (100)	
QDGCs	3325 (44)	3326 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



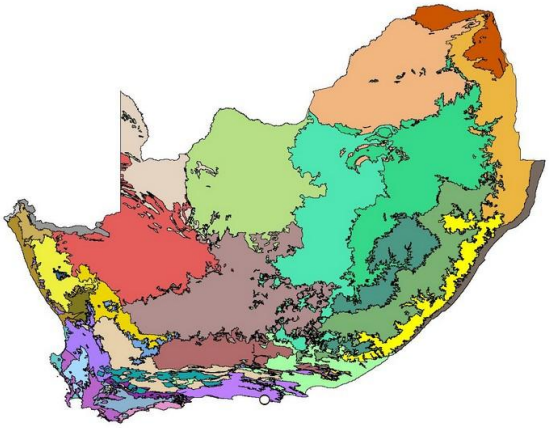
[E]*Aspalathus teres* Eckl. & Zeyh. subsp. *thodei* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.01–1.8; Alt ?–245

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3424 (100)	

NOTES: –



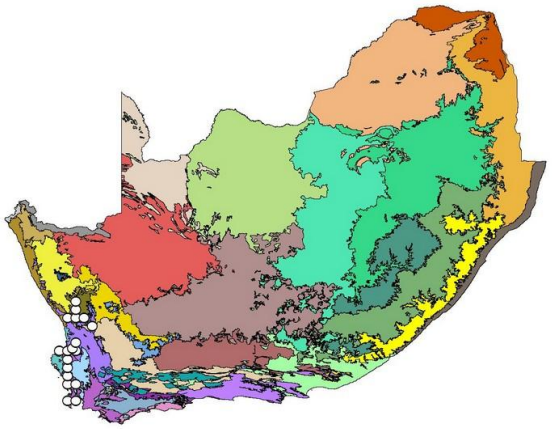
[E]*Aspalathus ternata* (Thunb.) Druce

Crotalarieae ①

Shrub; P; Ht 0.3–1.5; Alt 30–490

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Knersvlakte (50)	
Biome	Fynbos (85)	Succulent Karoo (15)
Rainfall (mm)	<400 (59)	200–600 (29)
Min temp (°C)	>6 (82)	2–8 (18)
Max temp (°C)	25–29; 27–35 (47)	<27 (6)
Phosphorus (ppm)	5–35 (82)	>20 (18)
pH	6.5–8.4 (35)	<6.4 (29)
ESP	Non; High (50)	
QDGCs	3218 (33)	3118 (28)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Spring, summer (Manning & Goldblatt 2000).



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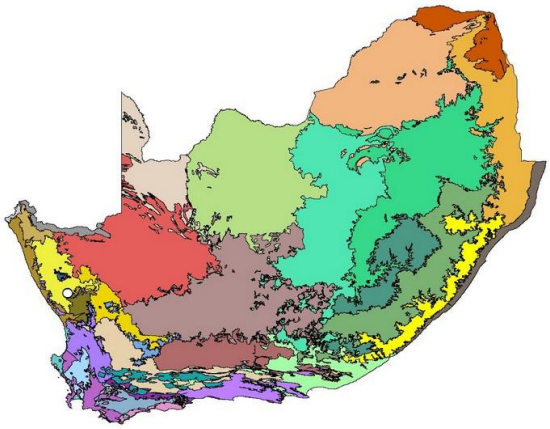
[E]*Aspalathus theresae* C.N.Cupido

Crotalarieae ①

No records

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Albany Thicket (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3018 (100)	

NOTES: –



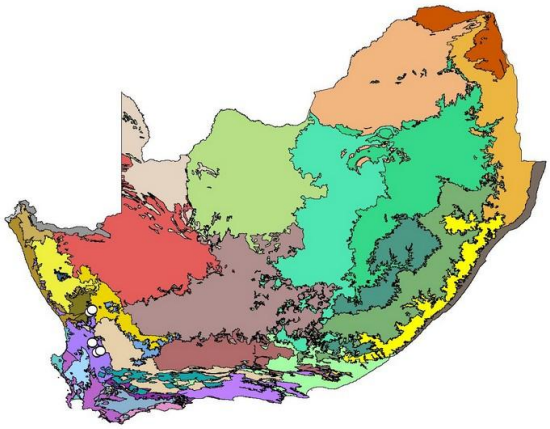
[E]*Aspalathus tridentata* L. subsp. *fragilis* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.01–0.2; Alt ?–780

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; 400–800 (33)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	<6.4; 5.5–7.4; >7.5 (33)	
ESP	Ecotone	
QDGCs	3219 (60)	3119 (40)

NOTES: **Flowering:** Spring, summer (Van Rooyen & Steyn 1999).



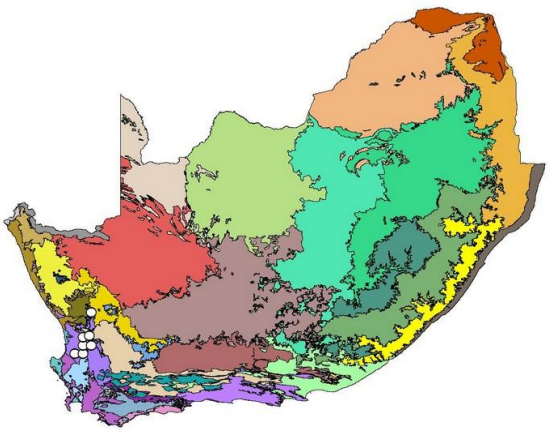
[E]*Aspalathus tridentata* L. subsp. *rotunda* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.5–1.5; Alt 520–685

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (71)	<400; 400–800 (14)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (86)	27–35 (14)
Phosphorus (ppm)	5–35 (86)	>20 (14)
pH	5.5–7.4 (43)	<6.4 (29)
ESP	Ecotone	
QDGCs	3218 (57)	3219 (29)

NOTES: **Flowering:** Spring, summer (Kidd 2002).



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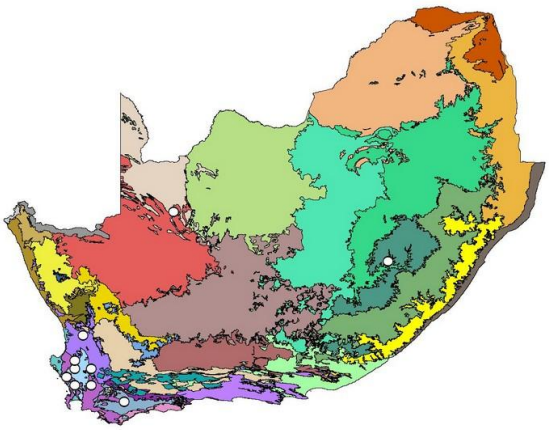
[E]*Aspalathus tridentata* L. subsp. *staurantha* (Eckl. & Zeyh.) R.Dahlgren — Crotalarieae ①

Shrub; P; Ht 0.3–0.9; Alt 30–620

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Coast Renosterveld (100)	
Biome	Fynbos (88)	Grassland (13)
Rainfall (mm)	200–600 (60)	400–800 (20)
Min temp (°C)	2–8 (40)	0–4 (30)
Max temp (°C)	25–29 (50)	27–35 (30)
Phosphorus (ppm)	5–35 (90)	<10 (10)
pH	<6.4 (40)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	3318 (30)	3218; 3319 (20)

NOTES: –

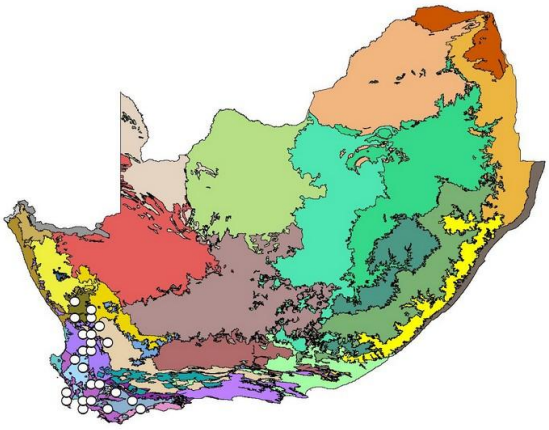


[E]*Aspalathus tridentata* L. subsp. *tridentata* — Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.3–1.5; Alt 30–1130

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Rainshadow Valley Karoo (50)	Northwest Fynbos; Southwest Fynbos (25)
Biome	Fynbos (82)	Succulent Karoo (18)
Rainfall (mm)	200–600 (46)	<400 (25)
Min temp (°C)	2–8 (67)	>6 (21)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	>20 (21)
pH	5.5–7.4 (38)	<6.4 (25)
ESP	Non; High (50)	
QDGCs	3219 (17)	3119; 3218; 3319; 3418 (13)

NOTES: –

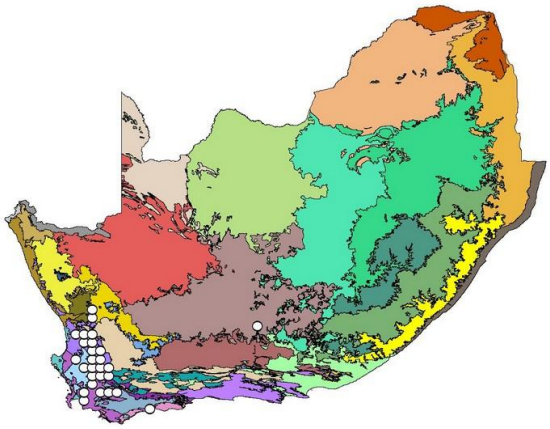


[E]*Aspalathus triquetra* Thunb. — Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.25–2; Alt 90–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (67)	Upper Karoo (33)
Biome	Fynbos (94)	Nama-Karoo (6)
Rainfall (mm)	200–600 (59)	<400; 400–800 (15)
Min temp (°C)	2–8 (52)	0–4 (37)
Max temp (°C)	25–29 (89)	27–35 (11)
Phosphorus (ppm)	5–35 (93)	>20 (7)
pH	5.5–7.4 (44)	<6.4 (30)
ESP	Non (100)	
QDGCs	3319 (37)	3219 (22)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Van Rooyen & Steyn 1999).



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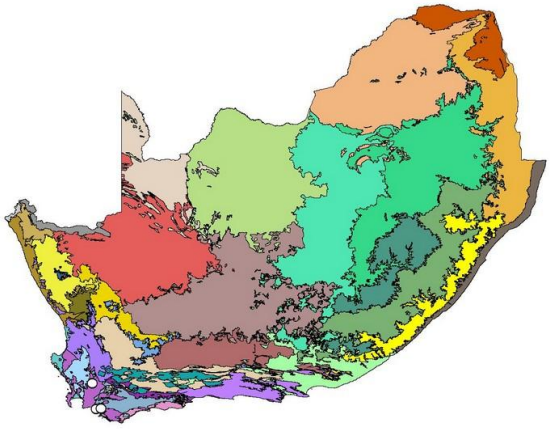
[E]*Aspalathus truncata* Eckl. & Zeyh.

Crotalarieae ①

Shrub; P; Ht 0.5–1.5; Alt ?–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (67)	>800 (33)
Min temp (°C)	0–4; 2–8; >6 (33)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Ecotone	
QDGCs	3419 (67)	3319 (33)

NOTES: –



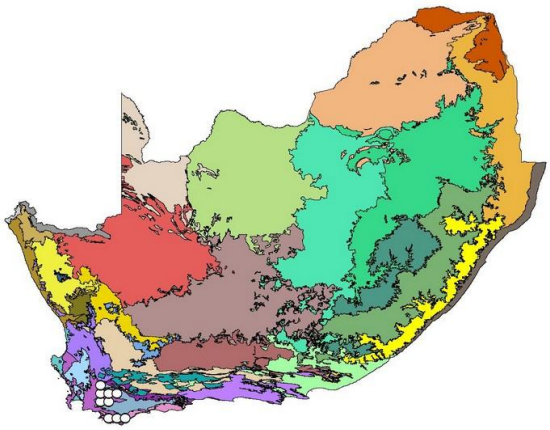
[E]*Aspalathus tuberculata* Walp.

Crotalarieae ①

Shrub; P; Ht 0.3–1.5; Alt 30–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	0–4; 2–8 (44)	>6 (12)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	5.5–7.4 (56)	6.5–7.4 (33)
ESP	Ecotone	
QDGCs	3319; 3419 (44)	3420 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



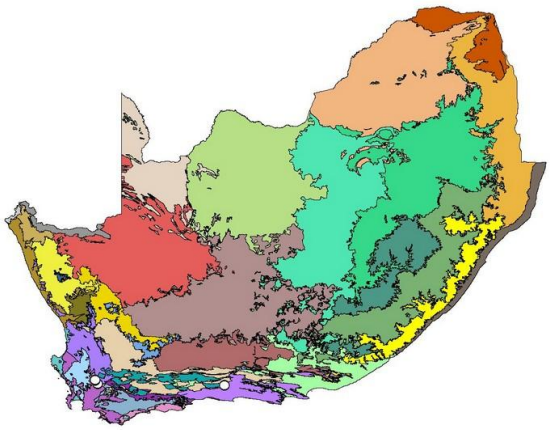
[E]*Aspalathus tulbaghensis* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.6–1.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Ecotone	
QDGCs	3319 (80)	3323 (20)

NOTES: –



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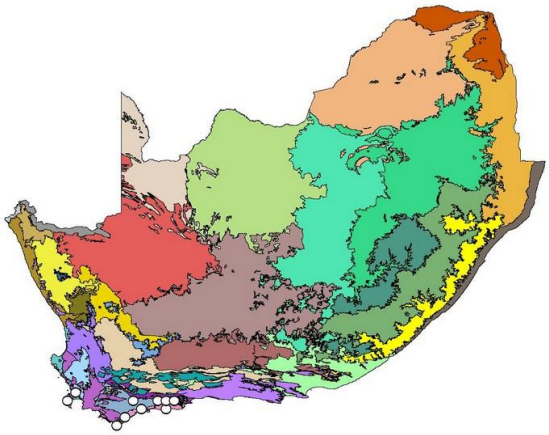
[E]*Aspalathus tylodes* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.4–0.8; Alt 46–245

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (80)	400–800; 600–1000 (10)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (90)	27–35 (10)
Phosphorus (ppm)	5–35 (90)	<10 (10)
pH	<6.4 (40)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	3421 (40)	3420 (30)

NOTES: –



[E]*Aspalathus ulicina* Eckl. & Zeyh. subsp. *kardouwensis* R.Dahlgren

Crotalarieae –

Shrub; P; Ht ?; Alt ?–680

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

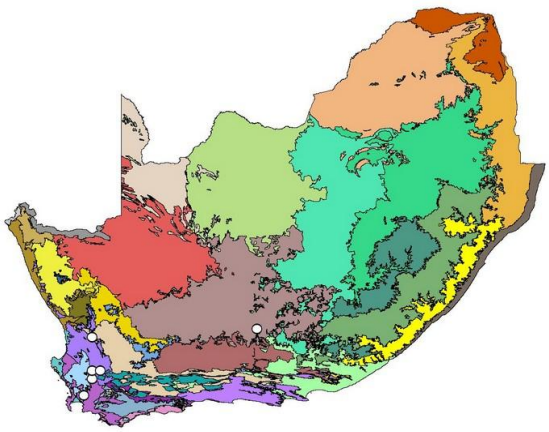
[E]*Aspalathus ulicina* Eckl. & Zeyh. subsp. *ulicina*

Crotalarieae ①

Shrub; P; Ht 0.8–1.5; Alt 152–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Upper Karoo (100)	
Biome	Fynbos (80)	Nama-Karoo (20)
Rainfall (mm)	200–600 (50)	<400; 400–800; 600–1000 (17)
Min temp (°C)	0–4 (50)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (66)	5.5–7.4; >7.5 (17)
ESP	Non (100)	
QDGCs	3319 (49)	3124; 3219; 3318 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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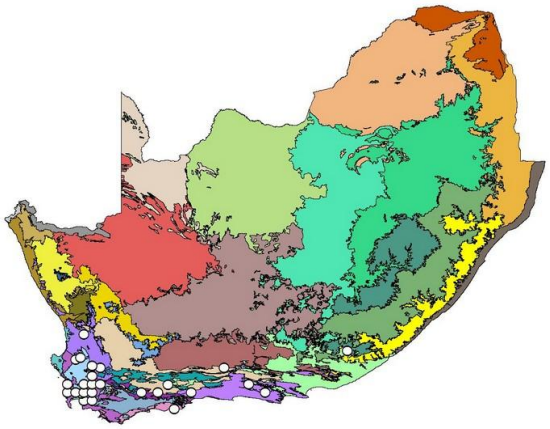
[E]*Aspalathus uniflora* L.

Crotalarieae ①

Shrub; P; Ht 0.2–2.5; Alt 90–1770

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; South Coast Fynbos (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (44)	400–800 (20)
Min temp (°C)	2–8 (60)	0–4 (28)
Max temp (°C)	25–29 (76)	27–35 (20)
Phosphorus (ppm)	5–35 (96)	<10 (4)
pH	<6.4 (52)	5.5–7.4 (28)/
ESP	Non (100)	
QDGCs	3318; 3319 (23)	3218 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



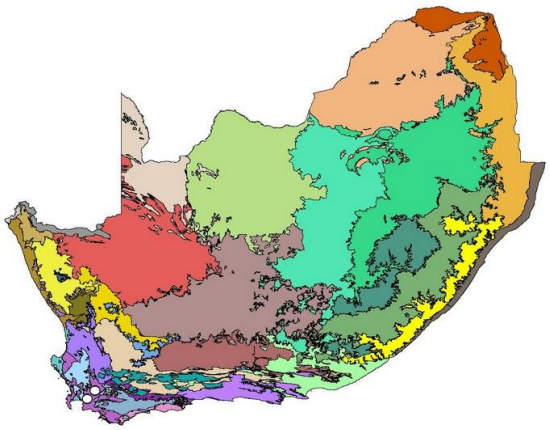
[E]*Aspalathus vacciniifolia* R.Dahlgren

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.3; Alt 915–1677

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Non (100)	
QDGCs	3319; 3418 (50)	

NOTES: –



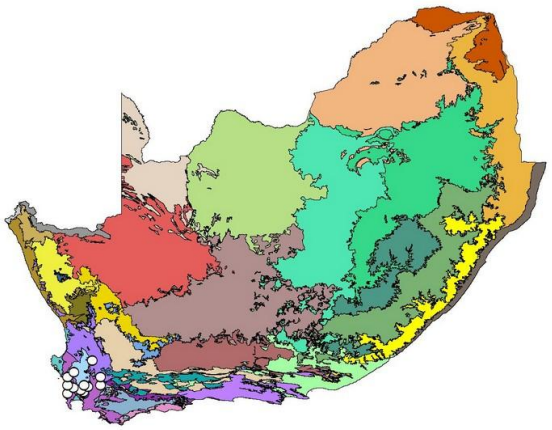
[E]*Aspalathus varians* Eckl. & Zeyh.

Crotalarieae ①

Shrub; P; Ht 0.2–0.6; Alt 50–61

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Coast Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	400–800 (30)
Min temp (°C)	2–8; >6 (40)	0–4 (20)
Max temp (°C)	25–29 (90)	27–35 (10)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (60)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	3318 (77)	3319 (15)

NOTES: –



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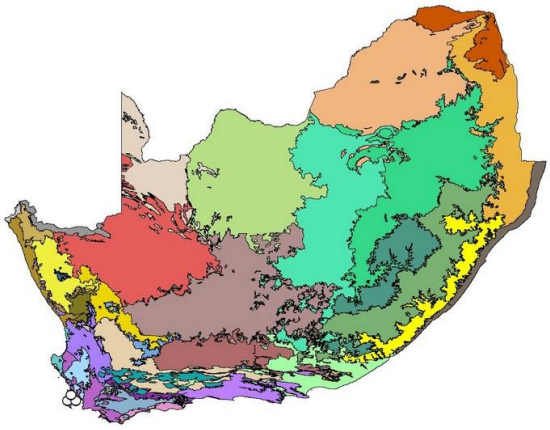
[E]*Aspalathus variegata* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.4; Alt ?–24

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (67)	400–800 (33)
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (67)	<27 (33)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3418 (67)	3318 (33)

NOTES: –



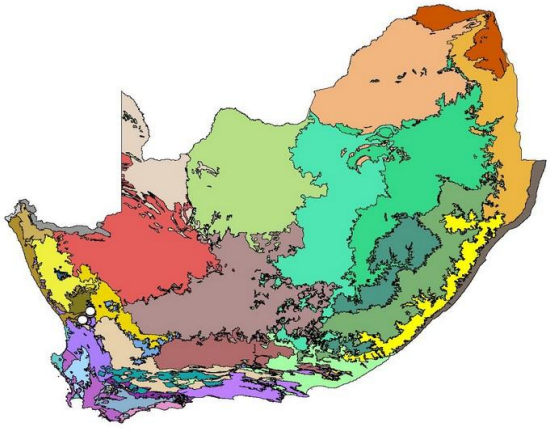
[E]*Aspalathus venosa* E.Mey.

Crotalarieae ①

Shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	>20 (67)	5–35 (33)
pH	6.5–8.4 (67)	>7.5 (33)
ESP	Ecotone	
QDGCs	3119 (67)	3118 (33)

NOTES: –



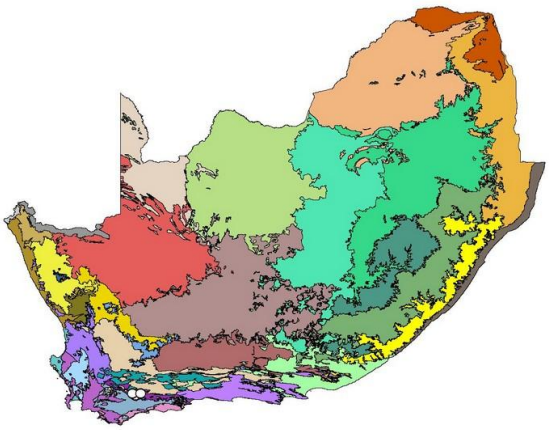
[E]*Aspalathus verbasciformis* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 1.2–2; Alt ?–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3320 (100)	

NOTES: –



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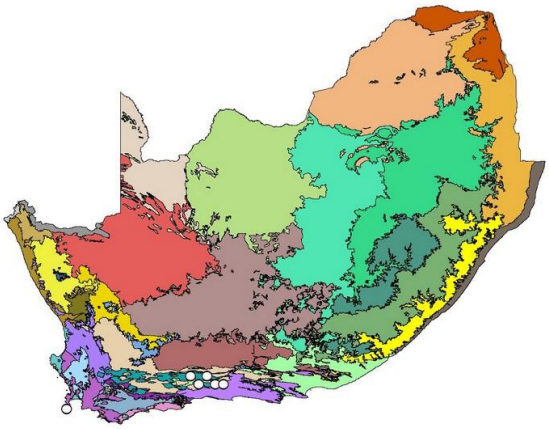
[E]*Aspalathus vermiculata* Lam. **Crotalarieae** ①

Shrub; P; Ht 0.7–2; Alt ?–850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400 (33)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	<6.4; >7.5 (33)	5.5–7.4; 6.5–8.4 (17)
ESP	Non (100)	
QDGCs	3322 (66)	3323; 3418 (17)

NOTES: –

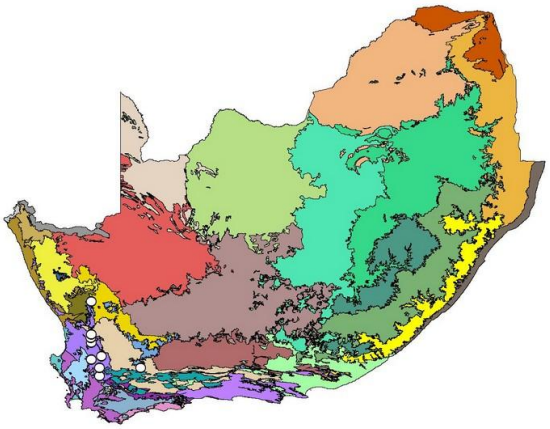


[E]*Aspalathus villosa* Thunb. **Crotalarieae** ①

Dwarf shrub; P; Ht 0.01–0.15; Alt 460–1690

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (38)	<400 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	<6.4; 5.5–7.4 (38)	>7.5 (24)
ESP	Non (100)	
QDGCs	3219 (56)	3319 (22)

NOTES: –

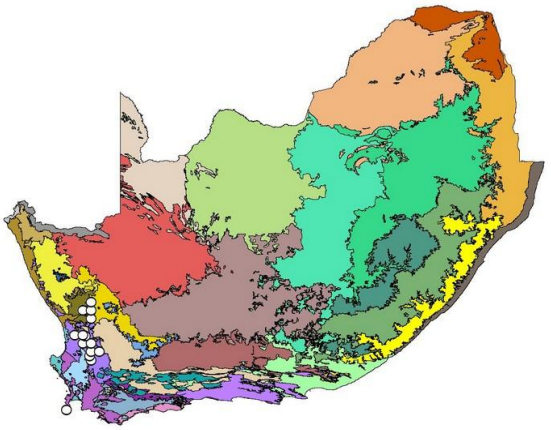


[E]*Aspalathus vulnerans* Thunb. **Crotalarieae** ①

Shrub, tree; P; Ht 1–3; Alt 185–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos (50)	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (42)	200–600 (33)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	5.5–7.4 (42)	<6.4; >7.5 (25)
ESP	Non (100)	
QDGCs	3219 (36)	3218 (29)

NOTES: –



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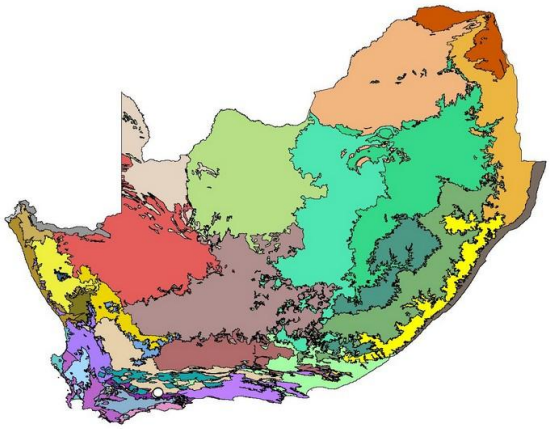
[E]*Aspalathus vulpina* Garab. ex R.Dahlgren

Crotalarieae ①

Shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3321 (100)	

NOTES: –



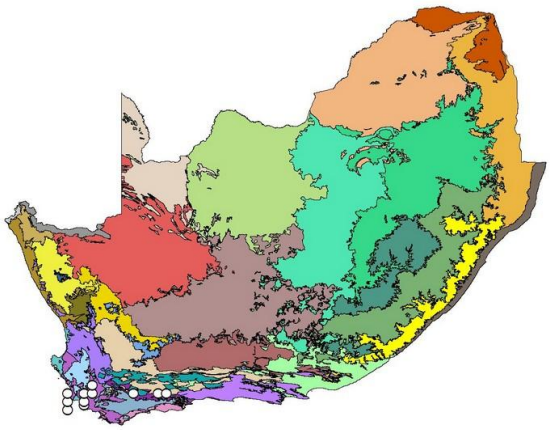
[E]*Aspalathus willdenowiana* Benth.

Crotalarieae ①

Shrub; P; Ht 0.5–4; Alt 91–914

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000; >800 (30)	<400 (20)
Min temp (°C)	2–8 (50)	>6 (30)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (50)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	3418 (36)	3318; 3319; 3321 (18)

NOTES: –



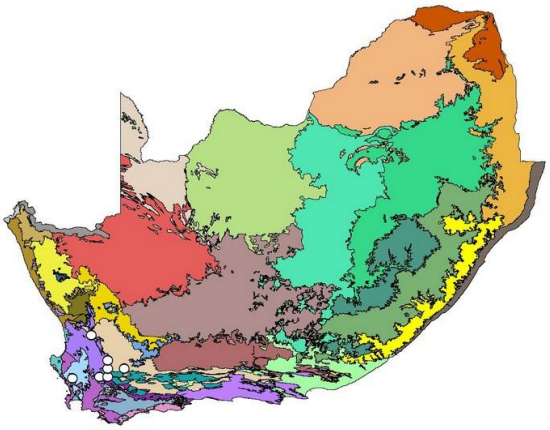
[E]*Aspalathus wittebergensis* Compton & P.E.Barnes

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.5; Alt 870–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos	
Rainfall (mm)	200–600 (71)	<400; 400–800 (14)
Min temp (°C)	2–8 (57)	0–4 (43)
Max temp (°C)	25–29 (57)	27–35 (43)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (71)	<6.4; 6.5–8.4 (14)
ESP	Ecotone	
QDGCs	3319 (43)	3219 (29)

NOTES: –



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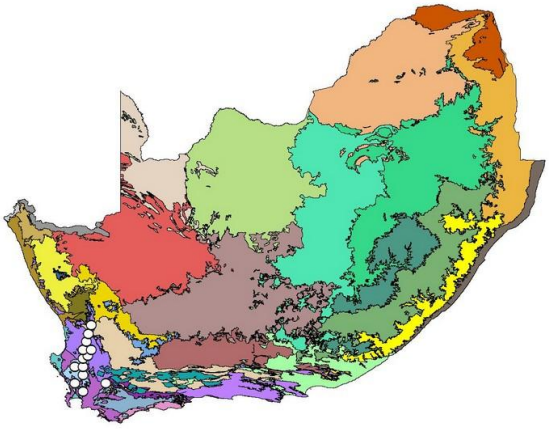
[E]*Aspalathus wurmbeana* E.Mey.

Crotalarieae ①

Shrub; P; Ht 0.2–1.5; Alt 60–335

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; West Coast Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (76)	<400; 400–800; 600–1000 (8)
Min temp (°C)	2–8 (84)	0–4; >6 (8)
Max temp (°C)	25–29 (62)	27–35 (38)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (54)	<6.4 (31)
ESP	Non (100)	
QDGCs	3318 (39)	3218; 3219 (23)

NOTES: –



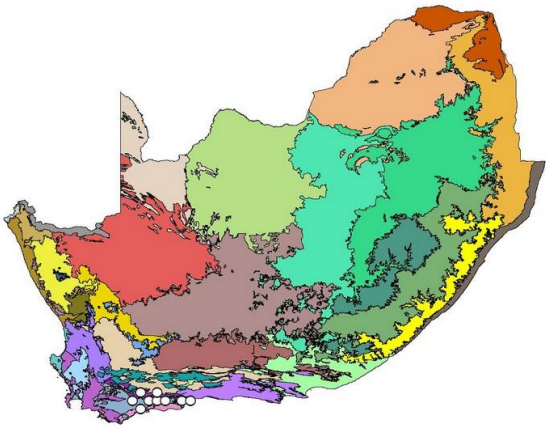
[E]*Aspalathus zeyheri* (Harv.) R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.2–2; Alt 65–370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (78)	<400; 400–800 (11)
Min temp (°C)	2–8 (89)	>6 (11)
Max temp (°C)	25–29 (67)	27–35 (22)
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	5.5–7.4 (44)	<6.4; 6.5–7.4 (22)
ESP	Ecotone	
QDGCs	3420; 3421 (33)	3320; 3321; 3422 (11)

NOTES: –



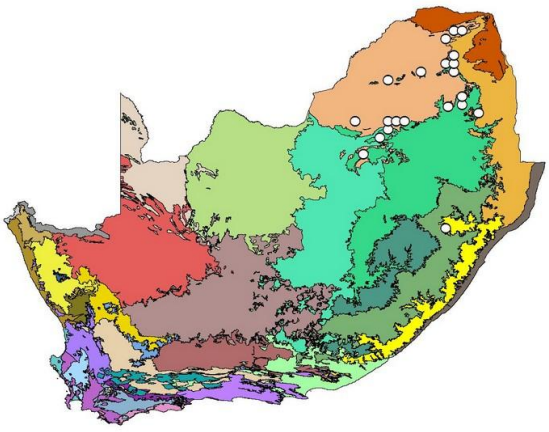
Astragalus atropilosulus (Hochst.) Bunge subsp. *burkeanus* (Harv.) J.B.Gillett var. *burkeanus*

Galegeae ①

Herb; P; Ht 0.5–0.9; Alt 915–1403

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (86)	Mesic Highveld Grassland (14)
Biome	Savanna (83)	Grassland (17)
Rainfall (mm)	400–800 (71)	600–1000 (24)
Min temp (°C)	2–8 (76)	0–4 (24)
Max temp (°C)	25–29 (52)	27–35 (43)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (71)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	2528 (19)	2230; 2329; 2330; 2430; 2530; 2627 (10)

NOTES: –



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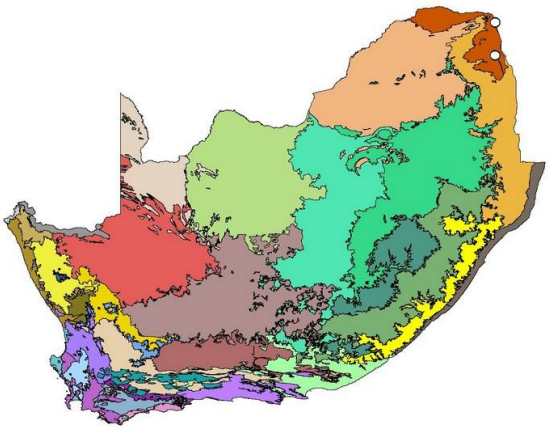
Baphia massaiensis Taub. subsp. *obovata* (Schinz) Brummitt var. *obovata*

Sophoreae ③

Shrub, tree; P; Ht 1–9; Alt 250–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Non (100)	
QDGCs	2231; 2331 (50)	

NOTES: **Livestock feed** (Dicko & Sikena 1992; Pule-Meuelenberg & Dakora 2007. **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans; timber (Watt & Breyer-Brandwijk 1962).



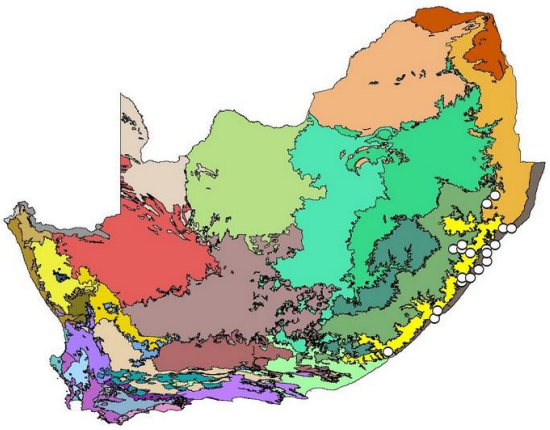
[E]*Baphia racemosa* (Hochst.) Baker

Sophoreae ①

Shrub, tree; P; Ht 1.8–10; Alt 0–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (86)	Sub-Escarpment Savanna (14)
Biome	Indian Ocean (83)	Savanna (17)
Rainfall (mm)	>800 (87)	600–1000 (13)
Min temp (°C)	>6 (80)	2–8 (20)
Max temp (°C)	25–29 (73)	27–35 (27)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (93)	5.5–7.4 (7)
ESP	Non (100)	
QDGCs	2831; 2931; 3030 (20)	2930; 3129 (13)

NOTES: **Flowering:** Spring, summer (Venter & Venter 1996).



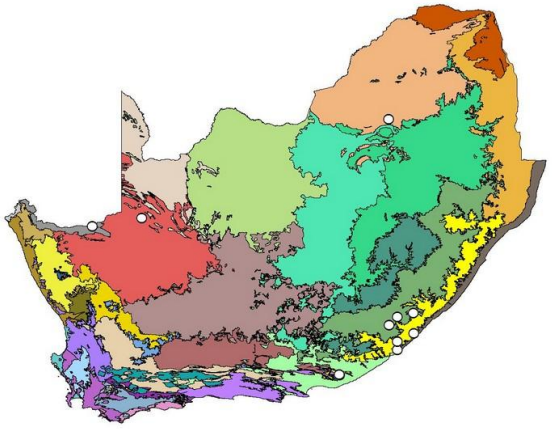
[E]*Bauhinia bowkeri* Harv.

Cercideae ③

Shrub, tree; P; Ht 3–18; Alt 0–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Gariep Desert; Sub-Escarpment Grassland; Central Bushveld; Sub-Escarpment Savanna (25)	
Biome	Grassland (50)	Desert; Savanna (25)
Rainfall (mm)	600–1000 (34)	<400; 400–800; >800 (22)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (67)	>33 (22)
Phosphorus (ppm)	5–35 (56)	<10; >20 (22)
pH	<6.4 (44)	5.5–7.4 (33)
ESP	Non (75)	Medium (25)
QDGCs	3228 (30)	3128; 3326 (20)

NOTES: **Cultivated** (Glen 2002).



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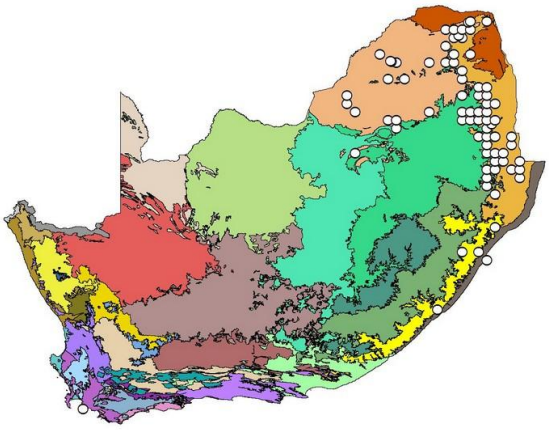
Bauhinia galpinii N.E.Br.

Cercideae ③❖

Shrub, climber; P; Ht 0.5–8; Alt 25–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (43)	Lowveld (40)
Biome	Savanna (94)	Fynbos; Indian Ocean (3)
Rainfall (mm)	400–800 (42)	>800 (36)
Min temp (°C)	2–8 (67)	>6 (31)
Max temp (°C)	25–29 (50)	27–35 (47)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (72)	5.5–7.4 (21)
ESP	Non (100)	
QDGCs	2631 (13)	2531 (9)

NOTES: **Livestock feed** (Joffe 2003). **Cultivated** (Glen 2002). **N_2 fixation:** No nodulation (Grobbelaar *et al.* 1967). **Antiquality:** Not toxic (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Venter & Venter 1996; Manning 2003).



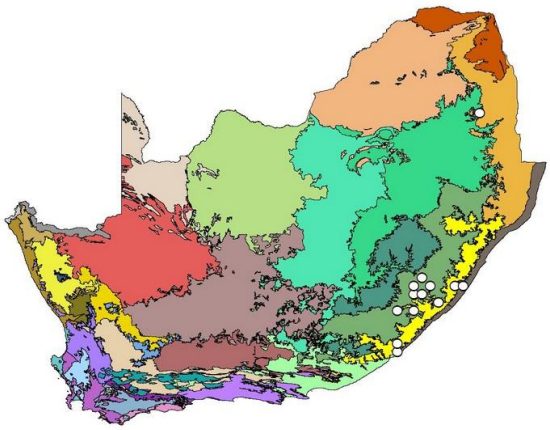
[E]*Bauhinia natalensis* Oliv. ex Hook.

Cercideae ③

Shrub; P; Ht 1–2.5; Alt 300–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (80)	Sub-Escarpment Savanna (20)
Biome	Grassland (75)	Savanna (25)
Rainfall (mm)	>800 (54)	600–1000 (46)
Min temp (°C)	2–8 (38)	>6 (31)
Max temp (°C)	25–29 (62)	<27 (38)
Phosphorus (ppm)	<10 (54)	5–35 (46)
pH	<6.4 (77)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	3029 (23)	3028; 3030; 3128; 3228 (15)

NOTES**: Cultivated** (Glen 2002).



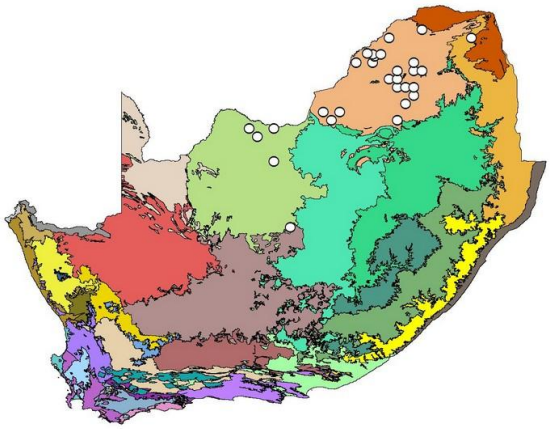
Bauhinia petersiana Bolle subsp. *macrantha* (Oliv.) Brummitt & J.H.Ross

Cercideae ☠③

Shrub, tree, climber; P; Ht 1.5–10; Alt 550–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (82)	Eastern Kalahari Bushveld (18)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (82)	<400 (11)
Min temp (°C)	2–8 (68)	<2 (18)
Max temp (°C)	27–35 (68)	25–29 (21)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	5.5–7.4 (54)	<6.4 (21)
ESP	Non (100)	
QDGCs	2428 (28)	2327 (21)

NOTES: **Livestock feed** (Dicko & Sikena 1992). **Cultivated** (Glen 2002). **Antiquality:** Tannin in root (Watt & Breyer-Brandwijk 1962). **Biocultural:** Food and medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer (Van Rooyen 2001).



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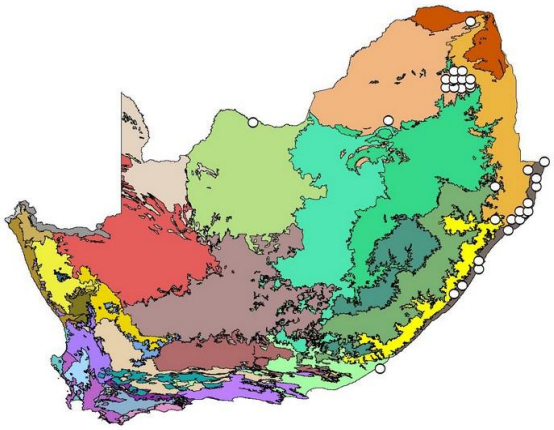
Bauhinia tomentosa L.

Cercideae ☠ ③

Shrub, tree; P; Ht 1–8; Alt 0–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (46)	Central Bushveld (38)
Biome	Savanna (62)	Indian Ocean (31)
Rainfall (mm)	400–800 (53)	>800 (37)
Min temp (°C)	>6 (53)	2–8 (43)
Max temp (°C)	25–29 (57)	27–35 (40)
Phosphorus (ppm)	<10 (70)	5–35 (30)
pH	5.5–7.4 (43)	<6.4 (30)
ESP	Non (100)	
QDGCs	2430 (30)	2832 (15)

NOTES: **Livestock feed** (Agbede 2006). **Cultivated** (Glen 2002). **N_2 fixation:** No nodulation (Grobbelaar & Clarke 1975). **Antiquality:** Hydrocyanic acid in pods (Watt & Breyer-Brandwijk 1962). **Biocultural:** Dye; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer, autumn (Venter & Venter 1996).



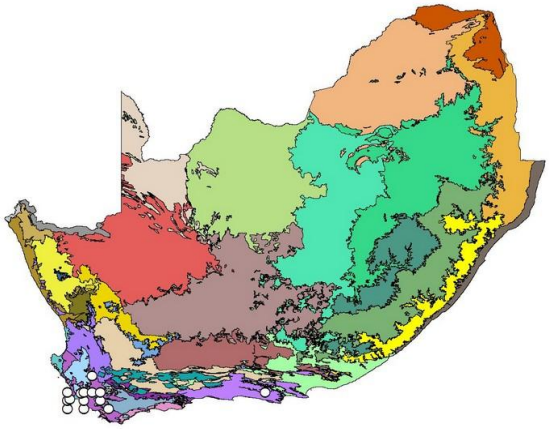
[E]*Bolusafra bituminosa* (L.) Kuntze

Phaseoleae ③

Dwarf shrub; P; Ht 0.75–2.5; Alt 30–732

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800; 600–1000; >800 (25)	
Min temp (°C)	2–8 (50)	0–4; >6 (25)
Max temp (°C)	25–29 (92)	<27 (8)
Phosphorus (ppm)	5–35 (92)	<10 (8)
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3418 (36)	3318; 3319 (21)

NOTES: **Cultivated** (Glen 2002).



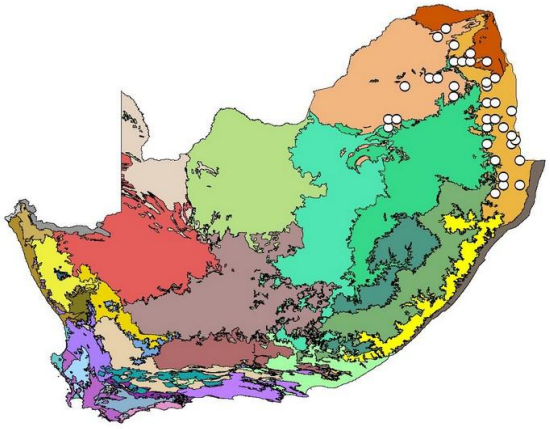
Bolusanthus speciosus (Bolus) Harms

Sophoreae ③

Tree; P; Ht 2–12; Alt 15–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (56)	Central Bushveld (39)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (62)	>800 (18)
Min temp (°C)	2–8 (59)	>6 (41)
Max temp (°C)	27–35 (65)	25–29 (35)
Phosphorus (ppm)	<10 (79)	5–35 (21)
pH	<6.4 (41)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2531 (19)	2330; 2631 (14)

NOTES: **Livestock feed:** Game (Venter & Venter 1996). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans; timber (Van Wyk *et al.* 2000). **Flowering:** Spring, summer (Venter & Venter 1996; Van Wyk *et al.* 2000).



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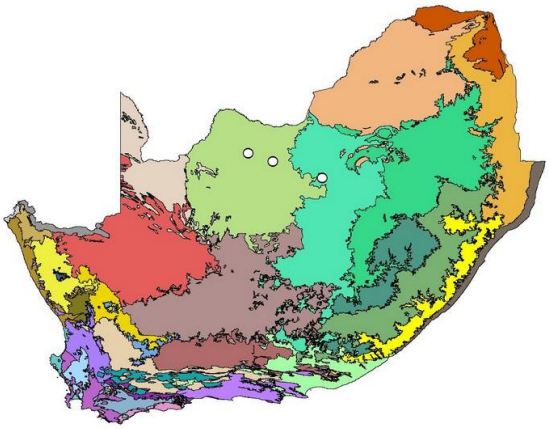
Bolusia acuminata (DC.) Polhill

Crotalarieae ①

Herb; A; Ht ?–0.3; Alt 1220–1281

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (67)	<400 (33)
Min temp (°C)	<2 (100)	
Max temp (°C)	27–35 (67)	>33 (33)
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (67)	6.5–7.4 (33)
ESP	Non (100)	
QDGCs	2623; 2624; 2726 (33)	

NOTES: –



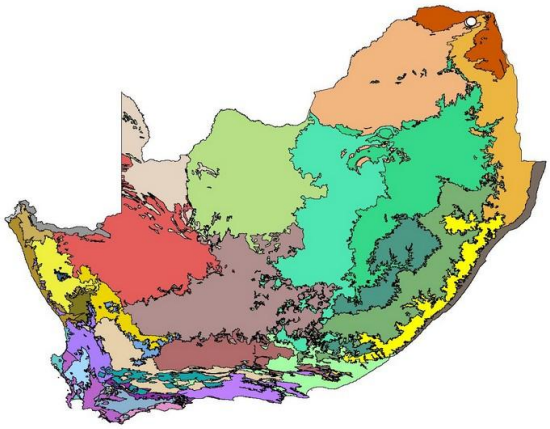
Brachystegia spiciformis Benth.

Detarieae ☠③

Tree; P; Ht 15–20; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2230 (100)	

NOTES: **Livestock feed** (Baloyi *et al.* 2009). **Cultivated** (Chinuwo *et al.* 2010). **Antiquality:** Tannin in bark (Watt & Breyer-Brandwijk 1962). **Biocultural:** Gum; fibre; medicine for humans; timber (Watt & Breyer-Brandwijk 1962).



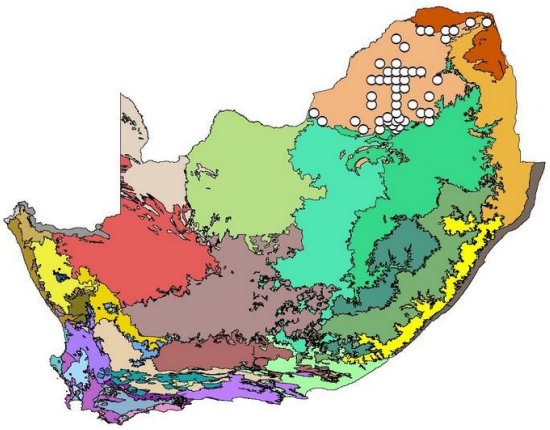
Burkea africana Hook.

Caesalpinieae ☠②❖

Tree; P; Ht 1.5–15; Alt 450–1950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (84)	200–600 (14)
Min temp (°C)	2–8 (84)	0–4 (11)
Max temp (°C)	27–35 (59)	25–29 (41)
Phosphorus (ppm)	<10 (68)	5–35 (32)
pH	<6.4 (48)	5.5–7.4 (36)
ESP	Non (100)	
QDGCs	2428; 2528 (21)	2527 (11)

NOTES: **Livestock feed:** Kudu (Owen-Smith & Cooper 1987). **N_2 fixation:** No nodulation (Grobbelaar & Clarke 1975). **Antiquality:** Foliage toxic (Lewis *et al.* 2005); Tannin in bark and pods (Watt & Breyer-Brandwijk 1962). **Biocultural:** Gum; medicine for humans; piscicide; timber (Watt & Breyer-Brandwijk 1962).



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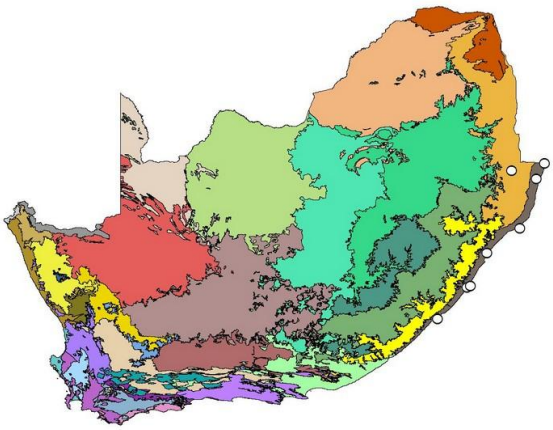
Caesalpinia bonduc (L.) Roxb.

Caesalpinieae ☠③

Shrub, tree, climber; P; Ht 1.5–6; Alt 2–8

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (86)	Lowveld (14)
Biome	Indian Ocean (71)	Savanna (29)
Rainfall (mm)	>800 (57)	400–800 (43)
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (71)	25–29 (29)
Phosphorus (ppm)	5–35 (57)	<10 (43)
pH	5.5–7.4 (71)	<6.4 (29)
ESP	Non (100)	
QDGCs	3030 (25)	2632; 2731; 2732; 2832; 2931; 3129 (12.5)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Bonducin and saponin in seed; alkaloid in leaves (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



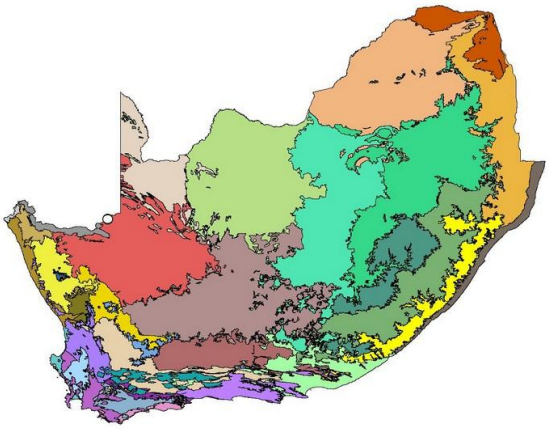
[E]*Caesalpinia bracteata* Germish.

Caesalpinieae ①

Shrub; P; Ht 1–4; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (100)	
Biome	Nama-Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	>33 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Non (100)	
QDGCs	2819 (100)	

NOTES: –



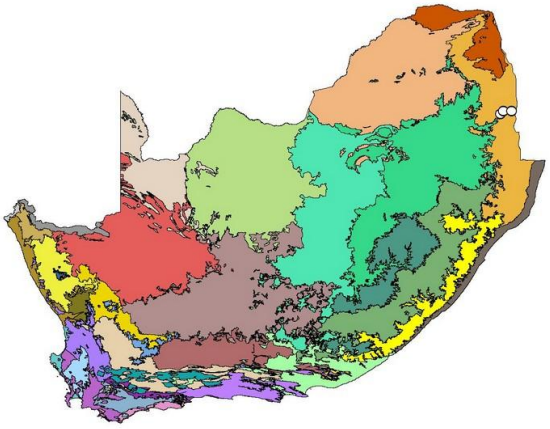
Caesalpinia rostrata N.E.Br.

Caesalpinieae ①

Shrub; P; Ht 2–3.5; Alt ?–15

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800; 600–1000 (50)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	6.5–7.4 (100)	
ESP	Non (100)	
QDGCs	2531 (100)	

NOTES: –



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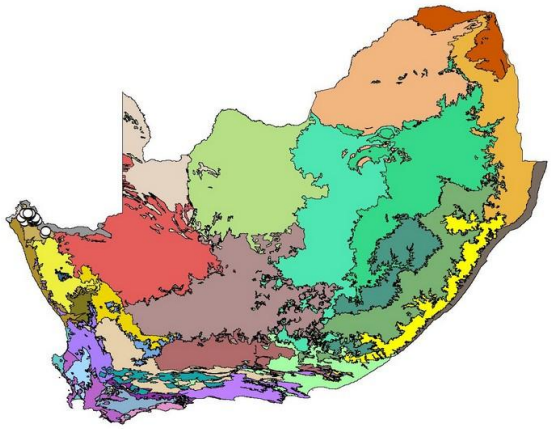
[E]*Calliandra redacta* (J.H.Ross) Thulin & Asfaw

Ingeae ①

Shrub; P; Ht 0.2–0.9; Alt 550–960

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Gariep Desert (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (83)	2–8 (17)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Medium (100)	
QDGCs	2817 (90)	2816; 2917 (5)

NOTES: –



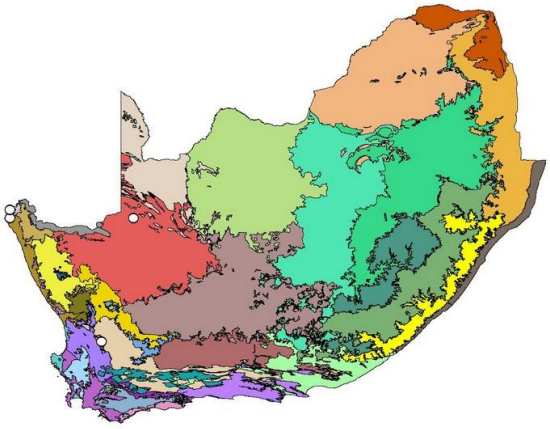
Calobota acanthoclada (Dinter) Boatwr. & B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.6; Alt 80–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southern Namib Desert; Bushmanland (50)	
Biome	Desert; Nama-Karoo (50)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (50)	25–29; >33 (25)
Phosphorus (ppm)	>20 (75)	5–35 (25)
pH	>7.5 (75)	5.5–7.4 (25)
ESP	Non; Medium (50)	
QDGCs	2816 (50)	2820; 3219 (25)

NOTES: –



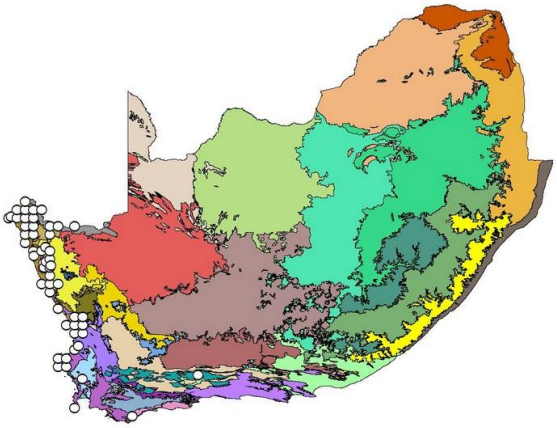
Calobota angustifolia (E.Mey.) Boatwr. & B.-E.van Wyk

Crotalarieae ②

Dwarf shrub, shrub; P; Ht 0.15–2; Alt 4–880

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Sandveld (33)	Gariep Desert; Southern Namib Desert (17)
Biome	Succulent Karoo (58)	Fynbos (29)
Rainfall (mm)	<400 (96)	200–600; 400–800 (2)
Min temp (°C)	>6 (94)	2–8 (6)
Max temp (°C)	25–29 (47)	27–35 (45)
Phosphorus (ppm)	5–35 (51)	>20 (49)
pH	>7.5 (45)	6.5–8.4 (33)
ESP	Medium (56)	High (39)
QDGCs	2917; 3017 (18)	2816 (16)

NOTES: **Livestock feed** (Le Roux & Schelpe 1997). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



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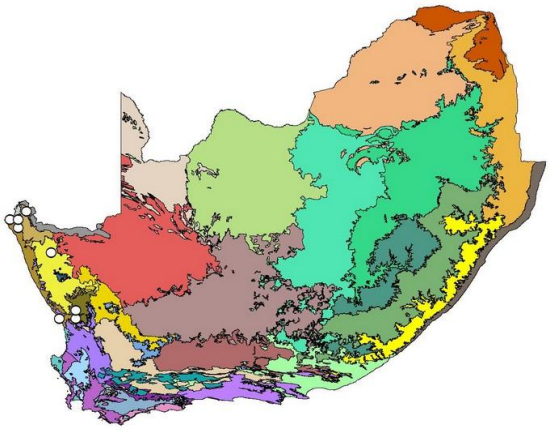
Calobota cinerea (E.Mey.) Boatwr. & B.-E.van Wyk

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.3–1.5; Alt 130–340

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Knersvlakte; Namaqualand Hardeveld (50)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (88)	2–8 (12)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	>20 (75)	5–35 (25)
pH	>7.5 (63)	6.5–8.4 (25)
ESP	Medium; High (50)	
QDGCs	2816; 3118 (38)	2817; 2917 (12)

NOTES: –



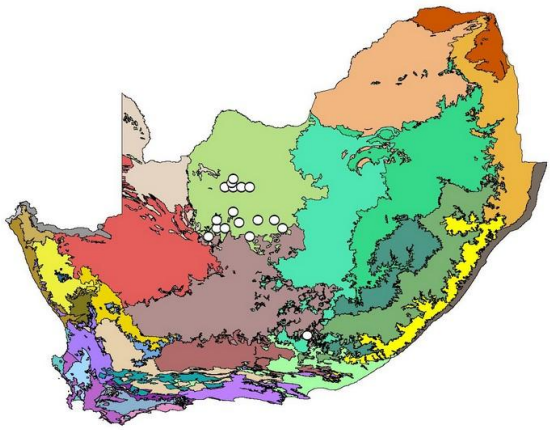
Calobota cuspidosa (Burch.) Boatwr. & B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.5–2.5; Alt 900–2135

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (82)	200–600 (18)
Min temp (°C)	<2 (88)	0–4 (12)
Max temp (°C)	27–35 (71)	>33 (29)
Phosphorus (ppm)	<10 (88)	5–35 (12)
pH	6.5–7.4 (77)	6.5–8.4 (18)
ESP	Non (100)	
QDGCs	2723 (35)	2823; 2824 (18)

NOTES: –



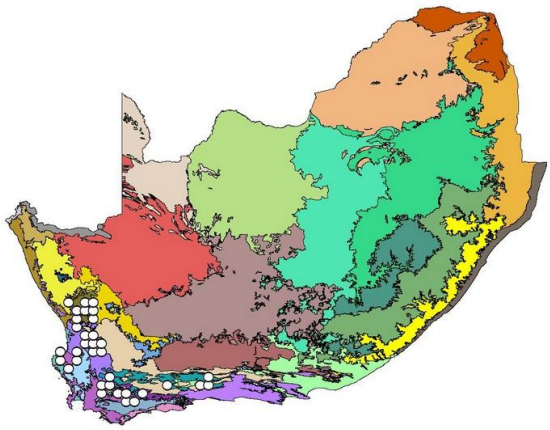
Calobota cytisoides (Berg.) Eckl. & Zeyh.

Crotalarieae ①

Shrub; P; Ht 0.5–3; Alt 45–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northern Fynbos; West Strandveld; Knersvlakte (33)	
Biome	Fynbos (86)	Succulent Karoo (14)
Rainfall (mm)	200–600 (50)	<400 (47)
Min temp (°C)	2–8 (65)	>6 (21)
Max temp (°C)	25–29 (62)	27–35 (38)
Phosphorus (ppm)	5–35 (74)	>20 (26)
pH	5.5–7.4 (32)	>7.5 (26)
ESP	Non; Medium; High (33)	
QDGCs	3118 (18)	3218; 3219; 3319 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Winter, spring, summer (Manning 2003).



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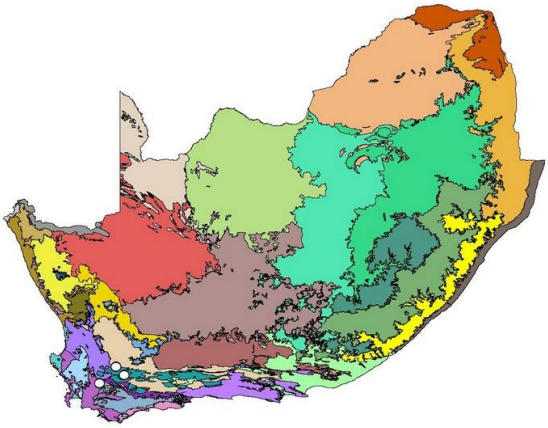
Calobota elongata (Thunb.) Boatwr. & B.-E.van Wyk — Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (67)	200–600 (33)
Min temp (°C)	0–4 (67)	2–8 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (67)	5.5–7.4 (33)
ESP	Ecotone	
QDGCs	3319 (66)	3320 (33)

NOTES: –

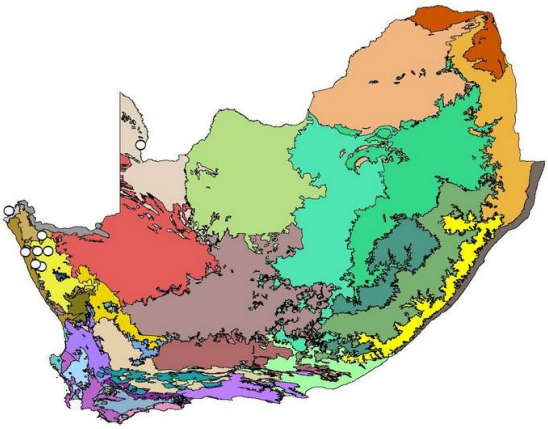


Calobota halenbergensis (Merxm. & Schreib.) Boatwr. & B.-E.van Wyk — Crotalarieae ①

Shrub; P; Ht 0.6–1; Alt 360–760

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Gariep Desert; Namaqualand Hardeveld; Namaqualand Sandveld; Kalahari Duneveld (25)	
Biome	Succulent Karoo (72)	Desert; Savanna (14)
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (63)	2–8 (37)
Max temp (°C)	25–29 (63)	27–35 (25)
Phosphorus (ppm)	5–35; >20 (50)	
pH	>7.5 (63)	6.5–7.4 (25)
ESP	Medium (50)	Non; High (25)
QDGCs	2917 (61)	2620; 2816; 3017 (13)

NOTES: –

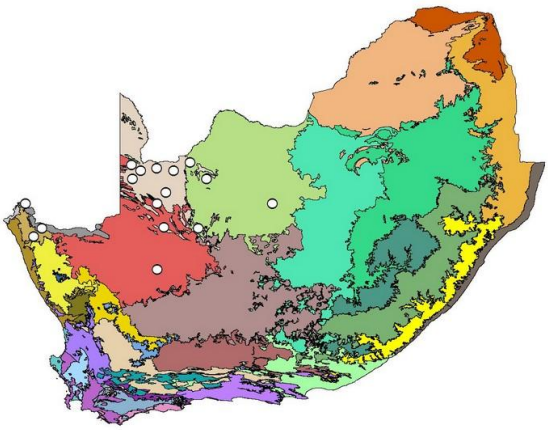


Calobota linearifolia (E.Mey.) Boatwr. & B.-E.van Wyk — Crotalarieae ①

Shrub; P; Ht 0.3–1.29; Alt 400–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Kalahari Duneveld (50)	Eastern Kalahari Bushveld (25)
Biome	Savanna (78)	Nama-Karoo; Succulent Karoo (11)
Rainfall (mm)	<400 (94)	400–800 (6)
Min temp (°C)	0–4 (31)	<2; 2–8 (25)
Max temp (°C)	>33 (75)	27–35 (19)
Phosphorus (ppm)	5–35 (50)	<10; >20 (25)
pH	>7.5 (74)	6.5–7.4; 6.5–8.4 (13)
ESP	Non (88)	Medium (12)
QDGCs	2720 (19)	2721; 2817; 2821 (13)

NOTES: **Flowering:** Spring, summer (Van Rooyen 2001).



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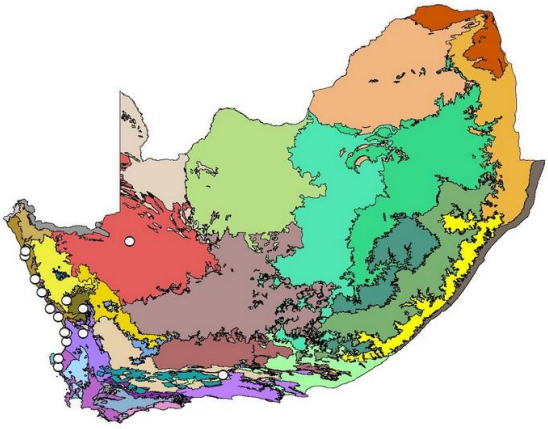
Calobota lotononoides (Schltr.) Boatwr. & B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.3–1.5; Alt 5–460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Sandveld (67)	Bushmanland (33)
Biome	Fynbos; Succulent Karoo (45)	Nama-Karoo (10)
Rainfall (mm)	<400 (94)	200–600 (6)
Min temp (°C)	>6 (75)	2–8 (19)
Max temp (°C)	27–35 (44)	25–29 (38)
Phosphorus (ppm)	5–35 (69)	>20 (31)
pH	>7.5; 6.5–7.4 (31)	6.5–8.4 (25)
ESP	High (67)	Non (33)
QDGCs	3218 (31)	3118 (19)

NOTES: –



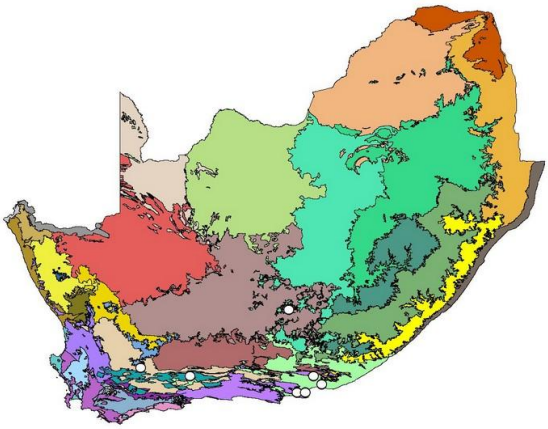
Calobota psiloloba (E.Mey.) Boatwr. & B.-E.van Wyk

Crotalarieae ☠ ①

Dwarf shrub, shrub; P; Ht 0.3–2; Alt 30–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (100)	
Biome	Albany Thicket (100)	
Rainfall (mm)	<400; 400–800 (43)	200–600 (14)
Min temp (°C)	>6; 2–8 (43)	0–4 (14)
Max temp (°C)	25–29 (57)	27–35 (43)
Phosphorus (ppm)	5–35 (71)	>20 (29)
pH	6.5–8.4 (57)	>7.5 (29)
ESP	Non (100)	
QDGCs	3325 (44)	3125; 3320; 3322; 3326 (14)

NOTES: **Antiquality:** Toxic (Watt & Breyer-Brandwijk 1962).



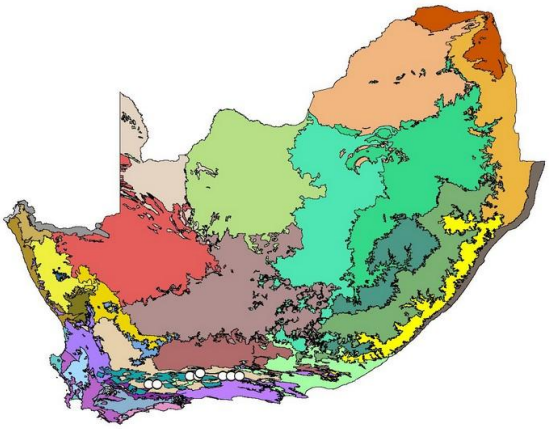
Calobota pungens (Thunb.) Boatwr. & B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 1.2–1.6; Alt 793–884

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (75)	200–600 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	5–35; >20 (50)	
pH	>7.5 (63)	5.5–7.4 (25)
ESP	Ecotone	
QDGCs	3322; 3323 (38)	3320; 3321 (12)

NOTES:



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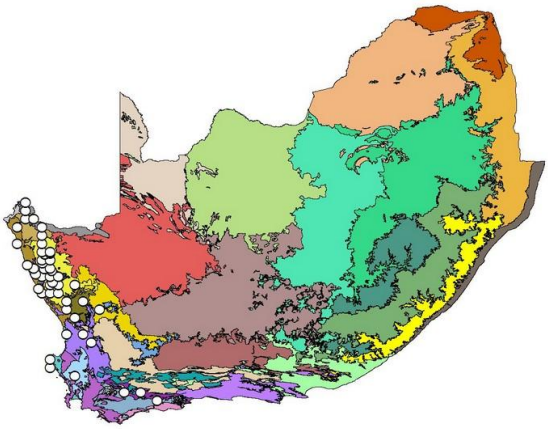
Calobota sericea (Thunb.) Boatwr. & B.-E.van Wyk

Crotalarieae ②

Dwarf shrub, shrub; P; Ht 0.3–1.8; Alt 5–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (67)	West Strandveld; Namaqualand Sandveld (13)
Biome	Succulent Karoo (77)	Fynbos (23)
Rainfall (mm)	<400 (87)	200–600 (11)
Min temp (°C)	>6 (62)	2–8 (38)
Max temp (°C)	25–29 (51)	27–35 (47)
Phosphorus (ppm)	5–35 (68)	>20 (32)
pH	6.5–8.4 (36)	>7.5 (26)
ESP	Medium (87)	High (13)
QDGCs	3017 (28)	2917 (19)

NOTES: **Livestock feed** (Le Roux & Schelpe 1997). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Magical; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Manning 2003).



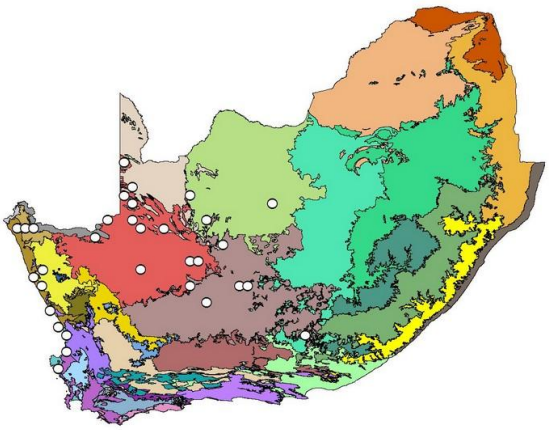
Calobota spinescens (Harv.) Boatwr. & B.-E.van Wyk

Crotalarieae ②

Shrub; P; Ht 0.15–1.5; Alt 5–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (42)	Upper Karoo; Eastern Kalahari Bushveld (21)
Biome	Nama-Karoo (50)	Succulent Karoo (25)
Rainfall (mm)	<400 (94)	200–600; 400–800 (3)
Min temp (°C)	>6 (34)	<2 (28)
Max temp (°C)	27–35 (50)	>33 (31)
Phosphorus (ppm)	5–35 (50)	>20 (41)
pH	>7.5 (66)	6.5–7.4; 6.5–8.4 (16)
ESP	Non (86)	High (14)
QDGCs	2820; 3017 (9)	2720; 2817; 2922; 3023; 3218 (6)

NOTES: **Livestock feed:** Palatable; pods highly nutritional (Le Roux *et al.* 1994; Breebaart 2003). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



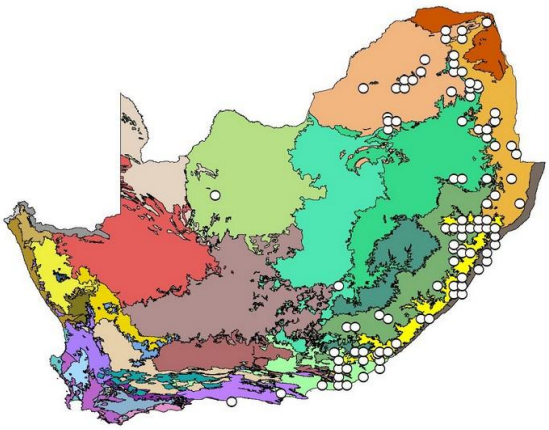
Calpurnia aurea (Aiton) Benth. subsp. *aurea*

Podalyrieae ☠③

Shrub, tree; P; Ht 1–10; Alt 0–1900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (24)	Albany Thicket; Indian Ocean Coastal Belt; Lowveld (15)
Biome	Savanna (51)	Grassland (17)
Rainfall (mm)	400–800; >800 (35)	600–1000 (26)
Min temp (°C)	2–8 (54)	>6 (34)
Max temp (°C)	25–29 (69)	27–35 (24)
Phosphorus (ppm)	<10 (58)	5.5–7.4 (42)
pH	<6.4 (56)	5.5–7.4 (29)
ESP	Non (97)	Medium (3)
QDGCs	2430 (9)	2830; 3030; 3227; 3326 (6)

NOTES: **Livestock feed** (Breebaart *et al.* 2002). **Cultivated** (Glen 2002). **N_2 fixation:** No nodulation (Grobbelaar & Clarke 1975). **Antiquality:** Alkaloids in leaves (Hutchings *et al.* 1996); Tannin in leaves and twigs (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996); Medicine for livestock (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer (Venter & Venter 1996).



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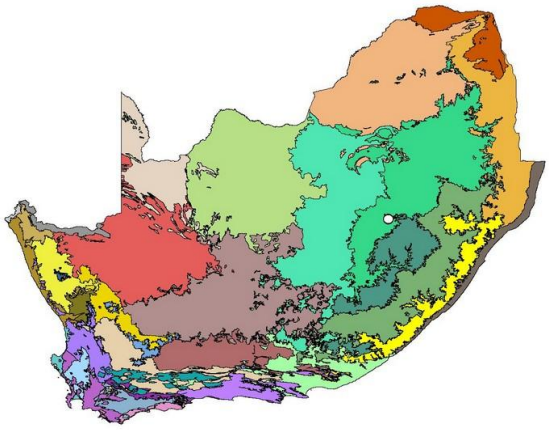
[E]*Calpurnia capensis* (Burm.f.) Druce

Podalyrieae ①

Tree; P; Ht 2–4; Alt 1050–1850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	<2 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2828 (100)	

NOTES: –



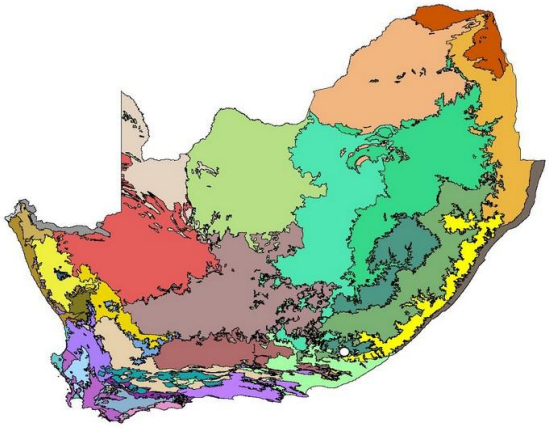
[E]*Calpurnia floribunda* Harv.

Podalyrieae ①

Shrub, tree; P; Ht 0.01–3; Alt 0–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3226 (100)	

NOTES: **Flowering:** Autumn (Manning 2001).



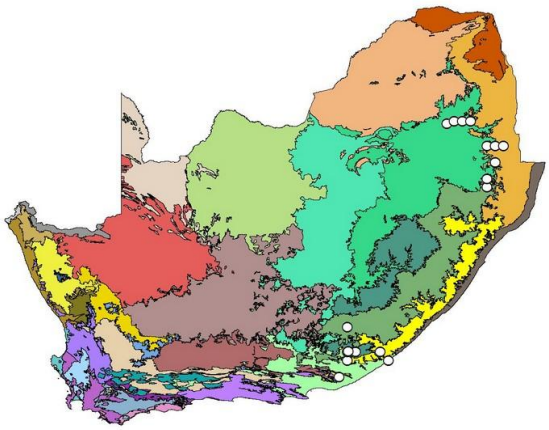
Calpurnia glabrata Brummitt

Podalyrieae ①

Shrub, tree; P; Ht 1–3; Alt 50–1750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (60)	Sub-Escarpment Grassland; Lowveld (20)
Biome	Grassland (75)	Savanna (25)
Rainfall (mm)	400–800 (41)	600–1000 (35)
Min temp (°C)	2–8 (59)	0–4 (29)
Max temp (°C)	25–29 (59)	27–35 (24)
Phosphorus (ppm)	<10 (59)	5–35 (41)
pH	<6.4 (76)	5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2631 (22)	2530; 3226 (17)

NOTES: –



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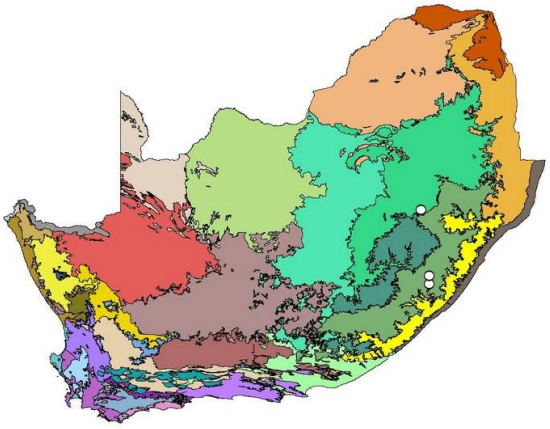
[E]*Calpurnia intrusa* (R.Br. in W.T.Aiton) E.Mey.

Podalyrieae ①

Shrub; P; Ht 0.2–3; Alt 150–1950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (67)	600–1000 (33)
Min temp (°C)	0–4 (67)	<2 (33)
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (1000	
QDGCs	3029 (67)	2829 (33)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for livestock (Watt & Breyer-Brandwijk 1962).



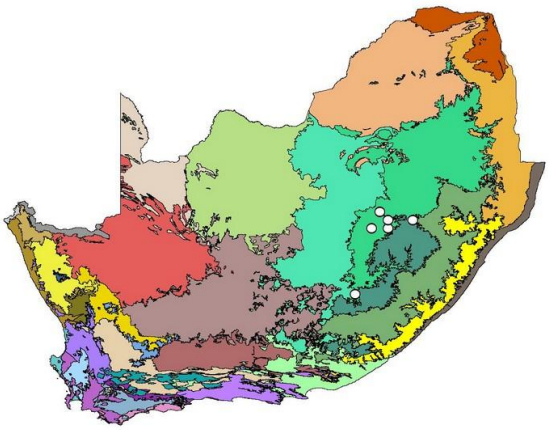
Calpurnia reflexa A.J.Beaumont

Podalyrieae ①

Shrub, tree; P; Ht 1–2; Alt 1400–2200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (50)	>800 (33)
Min temp (°C)	<2 (83)	0–4 (17)
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (50)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2828 (50)	2827 (33)

NOTES: –



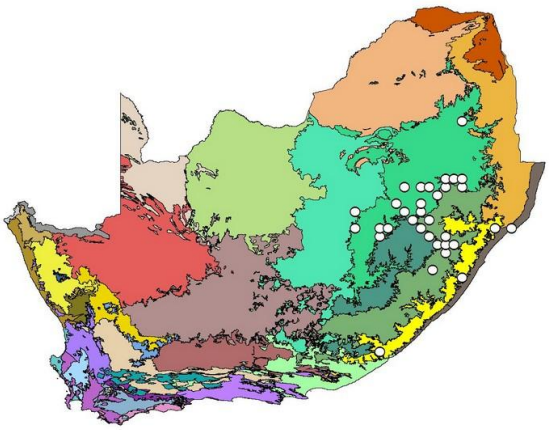
Calpurnia sericea Harv.

Podalyrieae ①

Shrub; P; Ht 1–3.6; Alt 200–2200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (63)	Sub-Escarpment Grassland (31)
Biome	Grassland (100)	
Rainfall (mm)	>800 (45)	600–1000 (33)
Min temp (°C)	0–4 (48)	<2 (39)
Max temp (°C)	<27 (55)	25–29 (39)
Phosphorus (ppm)	<10 (85)	5–35 (15)
pH	<6.4 (88)	5.5–7.4 (9)
ESP	Non (100)	
QDGCs	2729; 2929 (15)	2828; 2829 (12)

NOTES: –



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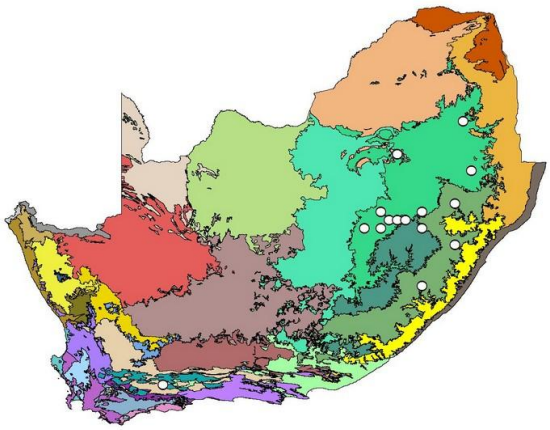
Calpurnia villosa Harv. var. *intrusa* (R.Br. ex Aiton f.) E.Mey.

Podalyrieae ☠ ③

Shrub; P; Ht 0.2–3; Alt 600–1950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (71)	Sub-Escarpment Grassland (29)
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (40)	400–800; >800 (27)
Min temp (°C)	<2; 0–4 (47)	2–8 (6)
Max temp (°C)	<27; 25–29 (47)	27–35 (6)
Phosphorus (ppm)	<10 (87)	5–35 (13)
pH	<6.4 (79)	5.5–7.4; 6.5–7.4; >7.5 (7)
ESP	Non (100)	
QDGCs	2827; 2828 (20)	2829 (13)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Alkaloids in plant (Hutchings *et al.* 1996). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for livestock (Hutchings *et al.* 1996). **Flowering:** Summer (Van Wyk & Malan 1998).



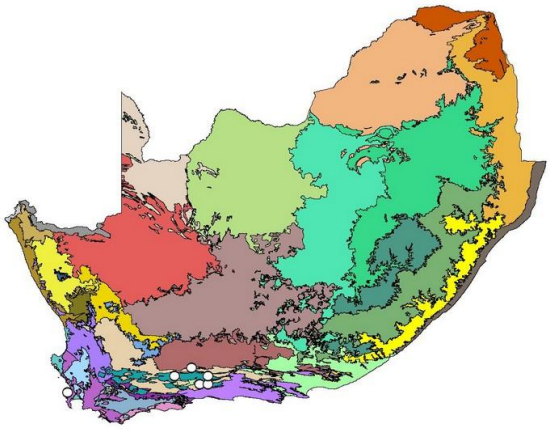
Calpurnia villosa Harv. var. *villosa*

Podalyrieae ③

Shrub; P; Ht 2–3; Alt 150–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (66)	200–600; 600–1000 (17)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	6.5–8.4; >7.5 (33)	<6.4; 5.5–7.4 (17)
ESP	Ecotone	
QDGCs	3322 (66)	3318; 3321 (17)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



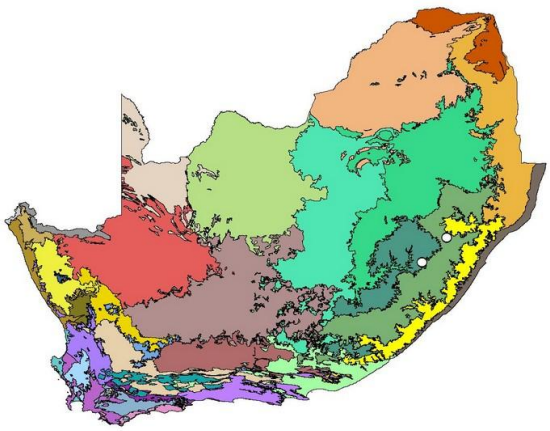
[E]*Calpurnia woodii* Schinz

Podalyrieae ①

Shrub; P; Ht 0.8–1.8; Alt 1350–1550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Grassland (100)	
Rainfall (mm)	600–1000; >800 (50)	
Min temp (°C)	<2; 0–4 (50)	
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2929 (100)	

NOTES: –



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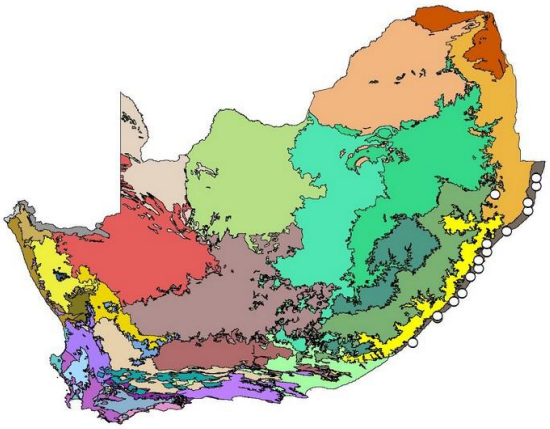
[E]*Canavalia bonariensis* Lindl.

Phaseoleae ①

Climber; P; Ht 1.5–3; Alt 5–60

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (87)	400–800 (13)
Min temp (°C)	>6 (93)	2–8 (7)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	<10 (73)	5–35 (27)
pH	<6.4 (67)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	3030 (19)	2732; 2832; 2931; 3129 (13)

NOTES: **Flowering:** Spring, summer, autumn (Pooley 1998).



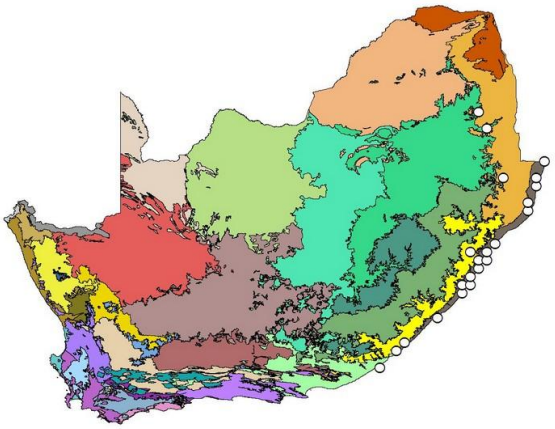
Canavalia rosea (Sw.) DC.

Phaseoleae ☠②

Climber; P; Ht 0.1–0.3; Alt 5–457

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (84)	Albany Thicket; Sub-Escarpment Savanna (8)
Biome	Indian Ocean (77)	Savanna (15)
Rainfall (mm)	>800 (77)	400–800 (23)
Min temp (°C)	>6 (86)	2–8 (14)
Max temp (°C)	25–29 (59)	27–35 (41)
Phosphorus (ppm)	<10 (64)	5–35 (36)
pH	<6.4 (59)	5.5–7.4 (36)
ESP	Non (100)	
QDGCs	3030 (22)	2931 (14)

NOTES: **Livestock feed:** Seed (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975; Grobbelaar *et al.* 1983). **Antiquality:** Plant and seed poisonous; no alkaloids or cyanogenic glycosides isolated from seed (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer, autumn, winter (Pooley 1998).



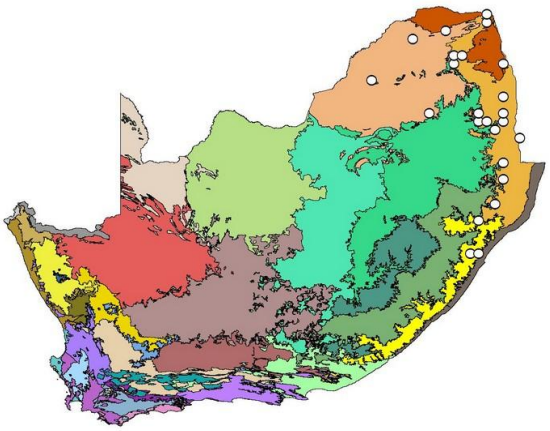
Canavalia virosa (Roxb.) Wight & Arn.

Phaseoleae ☠③

Climber; P; Ht 3–15; Alt 105–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (57)	Central Bushveld (29)
Biome	Savanna (100)	
Rainfall (mm)	600–1000 (38)	>800 (25)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (50)	25–29 (46)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	5.5–7.4 (42)	<6.4 (38)
ESP	Non (100)	
QDGCs	2531 (17)	2330 (13)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1974). **Antiquality:** Seed poisonous (Pooley 1998). **Flowering:** Summer, autumn, winter (Pooley 1998).



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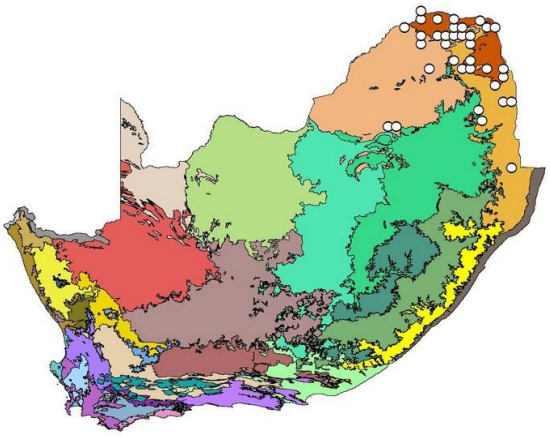
Cassia abbreviata Oliv. subsp. *beareana* (Holmes) Brenan

Cassieae ③

Shrub, tree; P; Ht 0.3–13; Alt 275–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (40)	Indian Ocean Coastal Belt (33)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (43)	200–600 (26)
Min temp (°C)	2–8 (51)	>6 (49)
Max temp (°C)	27–35 (77)	25–29 (23)
Phosphorus (ppm)	5–35 (63)	<10 (37)
pH	5.5–7.4; 6.5–8.4 (26)	<6.4; 6.5–7.4 (23)
ESP	Non (100)	
QDGCs	2230 (20)	2229 (17)

NOTES: **Livestock feed:** Game (Venter & Venter 1996). **Cultivated** (Glen 2002). **N_2 fixation:** No nodulation (Grobbelaar & Van Rooyen 1979). **Antiquality:** Tannin in root and bark (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Van Wyk *et al.* 2000).



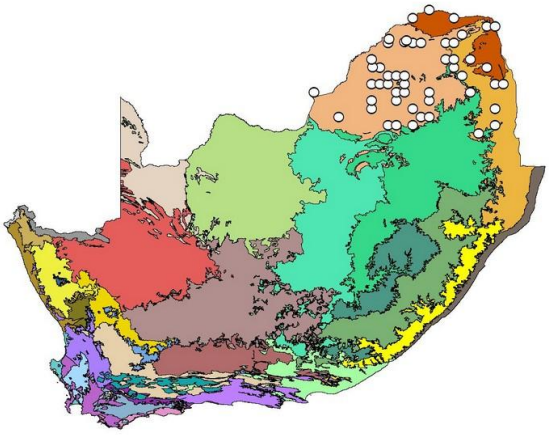
Chamaecrista absus (L.) H.S.Irwin & Barneby

Cassieae ①

Herb; A; Ht 0.1–1; Alt 350–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (81)	Mopane (16)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (68)	200–600 (12)
Min temp (°C)	2–8 (78)	>6 (20)
Max temp (°C)	27–35 (64)	25–29 (36)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	5.5–7.4 (40)	<6.4 (38)
ESP	Non (100)	
QDGCs	2428 (15)	2328 (10)

NOTES: **Antiquality:** Chaksine in seed (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Ecology:** Seed (Tauro *et al.* 2007). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



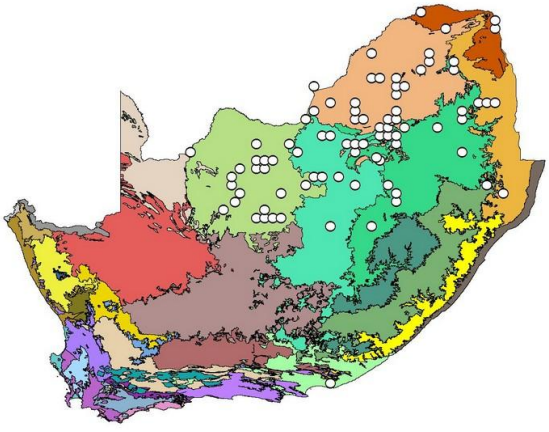
Chamaecrista biensis (Steyaert) Lock

Cassieae ①

Herb; P; Ht 0.05–0.6; Alt 350–1750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (35)	Central Bushveld (28)
Biome	Savanna (74)	Grassland (26)
Rainfall (mm)	400–800 (68)	<400 (15)
Min temp (°C)	<2 (45)	2–8 (32)
Max temp (°C)	27–35 (63)	25–29 (24)
Phosphorus (ppm)	<10 (85)	5.–35 (15)
pH	<6.4 (41)	5.5–7.4 (26)
ESP	Non (100)	
QDGCs	2528; 2627 (7)	2527; 2824 (6)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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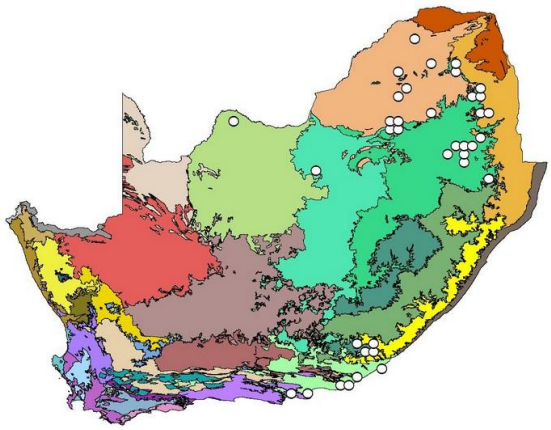
Chamaecrista capensis (Thunb.) E.Mey. var. *capensis* — Cassieae ①

Herb; P; Ht 0.1–0.4; Alt 0–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (40)	Mesic Highveld Grassland (35)
Biome	Grassland; Savanna (41)	Albany Thicket (18)
Rainfall (mm)	400–800 (62)	600–1000 (15)
Min temp (°C)	2–8 (62)	<2 (18)
Max temp (°C)	25–29 (64)	27–35 (26)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (67)	5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2630 (16)	2430; 2528; 3227 (11)

NOTES: **Flowering:** Summer, autumn (Manning 2001).

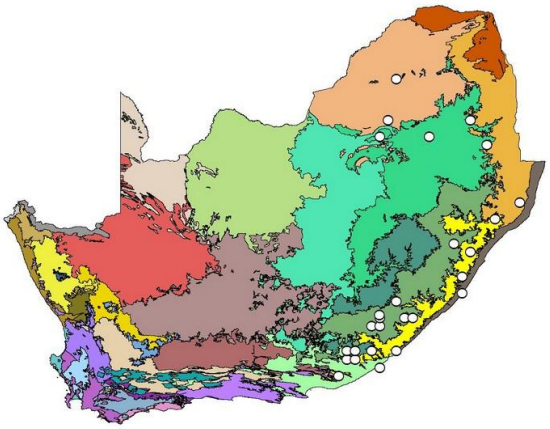


Chamaecrista capensis (Thunb.) E.Mey. var. *flavescens* (Thunb.) E.Mey. — Cassieae ①

Herb; P; Ht 0.1–0.9; Alt 0–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (40)	Albany Thicket; Indian Ocean Coastal Belt; Mesic Highveld Grassland; Central Bushveld; Lowveld; Sub-Escarpment Savanna (10)
Biome	Grassland (55)	Savanna (27)
Rainfall (mm)	400–800 (46)	>800 (23)
Min temp (°C)	2–8 (58)	>6 (23)
Max temp (°C)	25–29 (76)	<27; 27–35 (12)
Phosphorus (ppm)	<10 (58)	5–35 (42)
pH	<6.4 (54)	5.5–7.4 (46)
ESP	Non (100)	
QDGCs	3127 (15)	3128; 3227 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972; Grobbelaar *et al.* 1983). **Flowering:** Summer, autumn (Manning 2001).

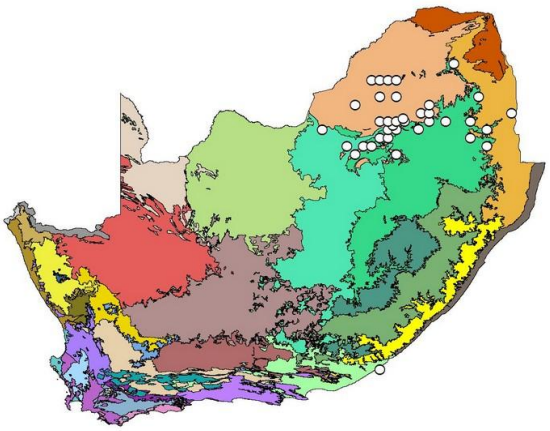


Chamaecrista comosa E.Mey. var. *capricornia* (Steyaert) Lock — Cassieae ①

Herb; P; Ht 0.2–0.9; Alt 900–1750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (67)	Mesic Highveld Grassland (13)
Biome	Savanna (67)	Grassland (25)
Rainfall (mm)	400–800 (83)	>800 (11)
Min temp (°C)	2–8 (63)	0–4 (23)
Max temp (°C)	25–29 (57)	27–35 (40)
Phosphorus (ppm)	<10 (89)	5–35 (11)
pH	<6.4 (74)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	2528 (19)	2529 (16)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Winter, spring, summer (Pooley 1998).



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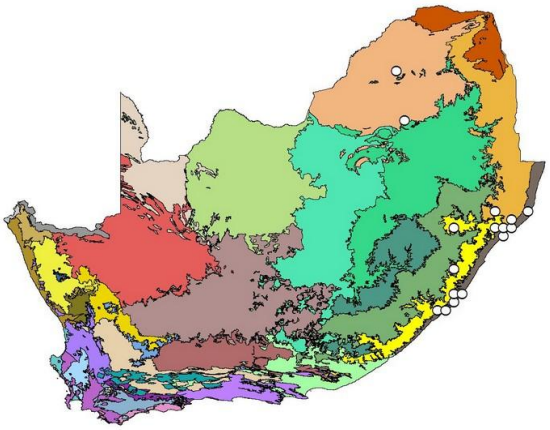
Chamaecrista comosa E.Mey. var. *comosa*

Cassieae ①

Herb; P; Ht 0.2–1.5; Alt 0–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (80)	Central Bushveld (20)
Biome	Indian Ocean (60)	Savanna (40)
Rainfall (mm)	>800 (81)	400–800 (13)
Min temp (°C)	>6 (69)	2–8 (31)
Max temp (°C)	25–29 (63)	27–35 (37)
Phosphorus (ppm)	<10 (88)	5–35 (12)
pH	<6.4 (81)	5.5–7.4 (19)
ESP	Non (100)	
QDGCs	2831 (31)	3030 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



Chamaecrista huillensis (Mendonça & Torre) Lock

Cassieae –

Herb; P; Ht 0.01–0.3; Alt ?–450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

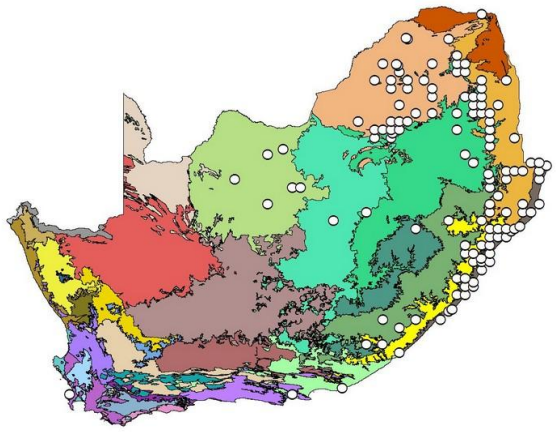
Chamaecrista mimosoides (L.) Greene

Cassieae ☠③❖

Herb; P; Ht 0.1–1.6; Alt 0–1750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (31)	Indian Ocean Coastal Belt (25)
Biome	Savanna (60)	Indian Ocean (24)
Rainfall (mm)	>800 (39)	400–800 (43)
Min temp (°C)	2–8 (46)	>6 (37)
Max temp (°C)	25–29 (51)	27–35 (45)
Phosphorus (ppm)	<10 (74)	5–35 (26)
pH	<6.4 (64)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2528; 2831; 3030 (6)	2439; 2731; 2930 (5)

NOTES: **Livestock feed:** Unpalatable (Steinke & Nel 1990). **Antiquality:** Tannin in leaf (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation** (Maposse *et al.* 2003). **Biocultural:** Magical; medicine for humans (Watt & Breyer-Brandwijk 1962). **Ecology:** Seed (Tauro *et al.* 2007). **Flowering:** Spring, summer, autumn (Pooley 1998).



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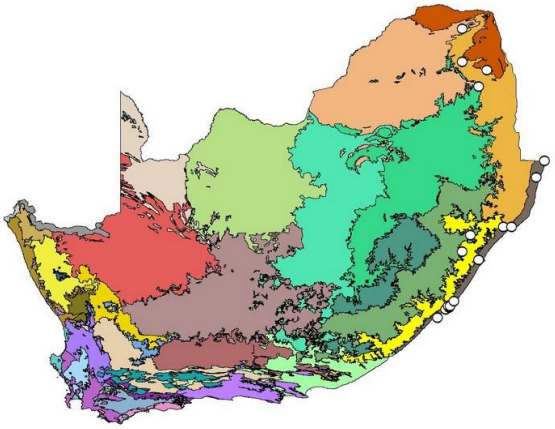
[E]*Chamaecrista plumosa* E.Mey. var. *erecta* (Schorn & Gordon-Gray) Lock — Cassieae ①

Herb; P; Ht 0.4–2.5; Alt 150–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (83)	Lowveld (17)
Biome	Savanna (57)	Indian Ocean (43)
Rainfall (mm)	>800 (60)	400–800 (27)
Min temp (°C)	>6 (73)	2–8 (20)
Max temp (°C)	25–29 (60)	27–35 (33)
Phosphorus (ppm)	<10 (53)	5–35 (47)
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3129 (24)	2930 (18)

NOTES: –

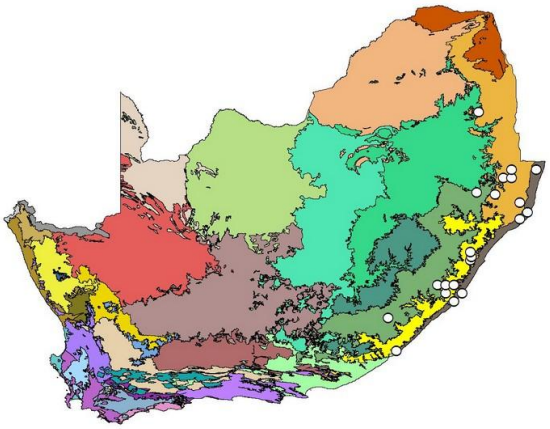


Chamaecrista plumosa E.Mey. var. *plumosa* — Cassieae ①

Herb; P; Ht 0.2–0.4; Alt 0–850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Lowveld (33)	Sub-Escarpment Grassland (22)
Biome	Savanna (44)	Indian Ocean (33)
Rainfall (mm)	>800 (65)	400–800 (20)
Min temp (°C)	>6 (55)	2–8 (40)
Max temp (°C)	25–29 (60)	27–35 (35)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (55)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	2731 (19)	2832; 2930; 3029 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975; Grobbelaar *et al.* 1983).

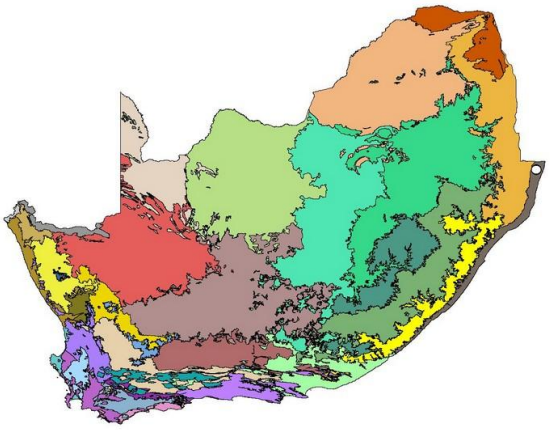


Chamaecrista plumosa E.Mey. × *C. mimosoides* (L.) Greene — Cassieae ①

Herb; P; Ht 0.01–0.3; Alt 0–60

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	2732 (100)	

NOTES: –



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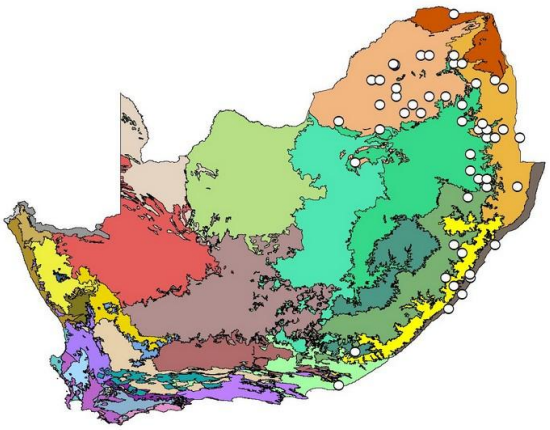
Chamaecrista stricta E.Mey.

Cassieae ③

Herb; A; Ht 0.1–1; Alt 0–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (42)	Lowveld (23)
Biome	Savanna (71)	Grassland (21)
Rainfall (mm)	400–800 (47)	>800 (29)
Min temp (°C)	2–8 (51)	>6 (29)
Max temp (°C)	27–35 (51)	25–29 (43)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (65)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2328; 2530; 3030 (8)	2330; 2730 (6)

NOTES: **Soil conservation:** Organic N (Morris 1997).



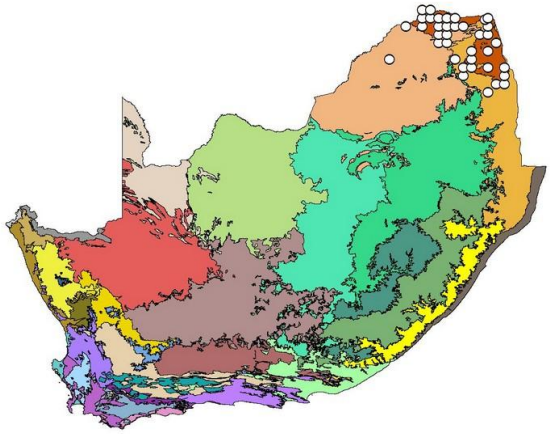
Colophospermum mopane (J.Kirk ex Benth.) J.Kirk ex J.Léonard

Detarieae ☠ ③

Tree; P; Ht 1–20; Alt 200–1150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (72)	Central Bushveld (17)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (42)	<400; 200–600 (28)
Min temp (°C)	>6 (53)	2–8 (47)
Max temp (°C)	27–35 (83)	25–29 (14)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	6.5–8.4 (42)	6.5–7.4 (31)
ESP	Non (100)	
QDGCs	2229 (30)	2330 (14)

NOTES: **Livestock feed** (Dicko & Sikena 1992; Lewis *et al.* 2005). **DM:** 1.5 t/ha/yr (Pellew 1980). **CP:** Leaves 14% (Lukhele & Van Ryssen 2000). **Cultivated** (Glen 2002). **Antiquality:** Tannin in bark and leaves (Watt & Breyer-Brandwijk 1962; Wessels *et al.* 2007). **N_2 fixation:** Primitive root nodules isolated (Jordaan *et al.* 2000). **Biocultural:** Fuel (Van Wyk *et al.* 2000); Fibre; gum; medicine for humans; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Van Wyk *et al.* 2000).



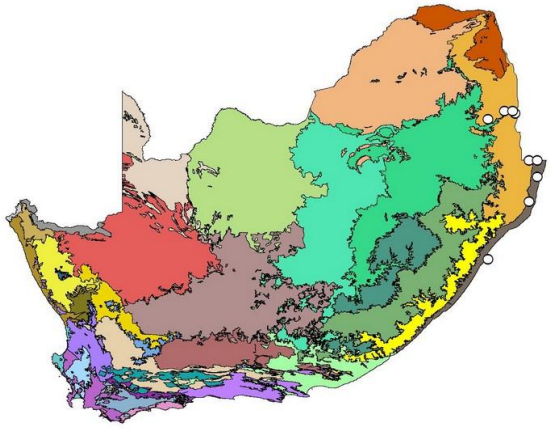
Cordyla africana Lour.

Swartzieae ③

Tree; P; Ht 10–25; Alt 0–200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (60)	Indian Ocean Coastal Belt (40)
Biome	Savanna (60)	Indian Ocean (40)
Rainfall (mm)	400–800 (50)	>800 (38)
Min temp (°C)	>6 (88)	2–8 (12)
Max temp (°C)	27–35 (88)	25–29 (12)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	6.5–7.4 (50)	5.5–7.4 (38)
ESP	Non (100)	
QDGCs	2531 (44)	2632 (22)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** No nodulation (Grobbelaar & Clarke 1975). **Biocultural:** Pods as food; gum; timber (Watt & Breyer-Brandwijk 1962). Flowering: Spring (Van Wyk *et al.* 2000).



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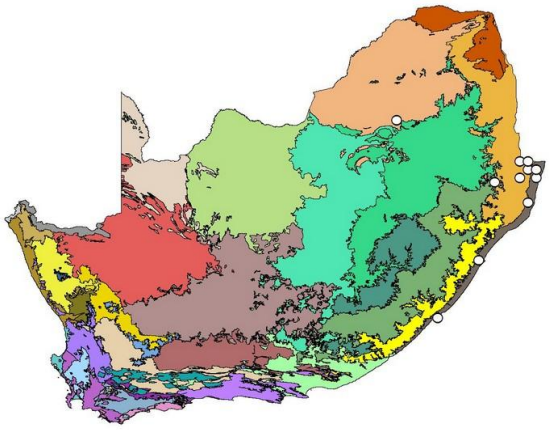
Craibia zimmermannii (Harms) Dunn

Millettieae ③

Tree; P; Ht 1.5–15; Alt 0–350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Lowveld (43)	Central Bushveld (14)
Biome	Indian Ocean; Savanna (50)	
Rainfall (mm)	400–800 (70)	>800 (30)
Min temp (°C)	>6 (90)	2–8 (10)
Max temp (°C)	27–35 (80)	25–29 (20)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	5.5–7.4 (60)	<6.4; 6.5–7.4 (20)
ESP	Non (100)	
QDGCs	2732 (45)	2632 (18)

NOTES: **Cultivated** (Glen 2002). **Flowering:** Spring (Venter & Venter 1996).



Crotalaria anthyllopsis Welw. ex Baker

Crotalarieae –

Herb; A; Ht ?; Alt 640–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

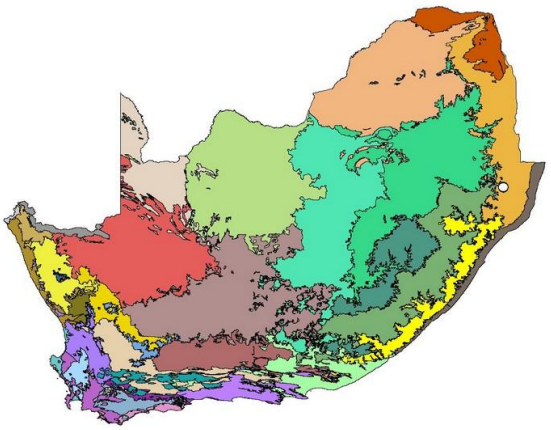
Crotalaria argyraea Welw. ex Baker

Crotalarieae ☠①

Herb; P; Ht 0.5–1.21; Alt 250–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2731 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Antiquality:** Suspected toxicity (Watt & Breyer-Brandwijk 1962).



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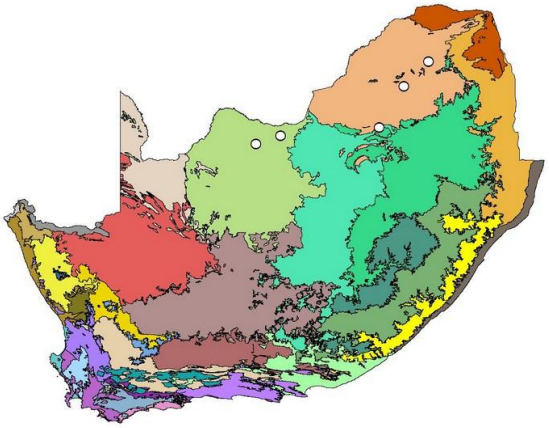
Crotalaria barkae Schweinf. subsp. *barkae*

Crotalarieae ☠②

Herb; occ. P; Ht 0.3–0.5; Alt 950–1405

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Eastern Kalahari Bushveld (50)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (80)	200–600 (20)
Min temp (°C)	0–4; 2–8 (40)	<2 (20)
Max temp (°C)	27–35; >33 (40)	25–29 (20)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	<6.4; 5.5–7.4 (40)	6.5–7.4 (20)
ESP	Non (100)	
QDGCs	2624 (40)	2329; 2428; 2527 (20)

NOTES: **Livestock feed** (Le Houérou 1980). **Antiquality:** Toxic to livestock (Watt & Breyer-Brandwijk 1962).



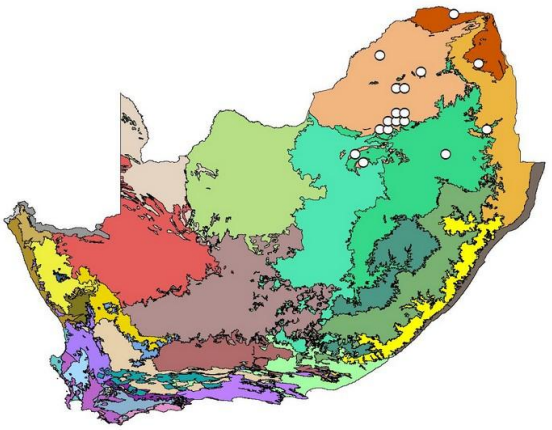
Crotalaria brachycarpa (Benth.) Burtt Davy ex I.Verd.

Crotalarieae ①

Herb; P; Ht 0.15–0.5; Alt 610–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (78)	Mesic Highveld Grassland; Mopane (11)
Biome	Savanna (88)	Grassland (12)
Rainfall (mm)	400–800 (88)	<400; >800 (6)
Min temp (°C)	2–8 (65)	0–4 (18)
Max temp (°C)	27–35 (71)	25–29 (24)
Phosphorus (ppm)	<10 (71)	5–35 (29)
pH	<6.4 (59)	5.5–7.4 (35)
ESP	Non (100)	
QDGCs	2528 (35)	2428; 2627 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Germishuizen & Clarke 2003).



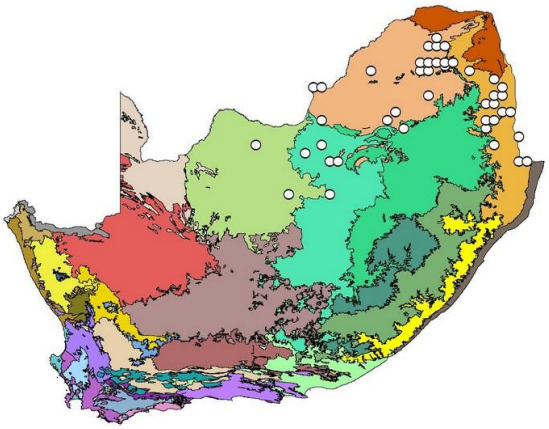
Crotalaria burkeana Benth.

Crotalarieae ☠①

Herb; P; Ht 0.25–0.7; Alt 60–1560

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (45)	Lowveld (35)
Biome	Savanna (84)	Grassland (16)
Rainfall (mm)	400–800 (69)	200–600; >800 (12)
Min temp (°C)	2–8 (50)	>6 (26)
Max temp (°C)	27–35 (76)	25–29 (21)
Phosphorus (ppm)	<10 (69)	5–35 (31)
pH	<6.4; 5.5–7.4 (40)	6.5–7.4 (12)
ESP	Non (100)	
QDGCs	2329 (21)	2531 (16)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Alkaloids (Steyn 1934); Causes crotalariosis (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Steyn 1934; Watt & Breyer-Brandwijk 1962).



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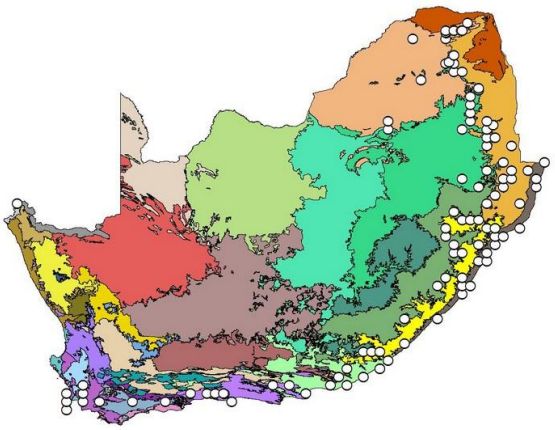
Crotalaria capensis Jacq.

Crotalarieae ③

Shrub, tree; P; Ht 1–6; Alt 10–1980

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (31)	Central Bushveld; Lowveld (14)
Biome	Savanna (28)	Fynbos; Indian Ocean (26)
Rainfall (mm)	>800 (39)	400–800 (28)
Min temp (°C)	2–8 (55)	>6 (38)
Max temp (°C)	25–29 (65)	27–35 (26)
Phosphorus (ppm)	<10 (51)	5–35 (48)
pH	<6.4 (63)	5.5–7.4 (26)
ESP	Non (89)	Medium (11)
QDGCs	2731 (6)	2430; 2631; 2930; 2931 (5)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Winter, spring, summer (Manning 2001).



Crotalaria colorata Schinz subsp. *colorata*

Crotalarieae –

Herb, shrub; P; 0.3–0.6; Alt ?–6

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

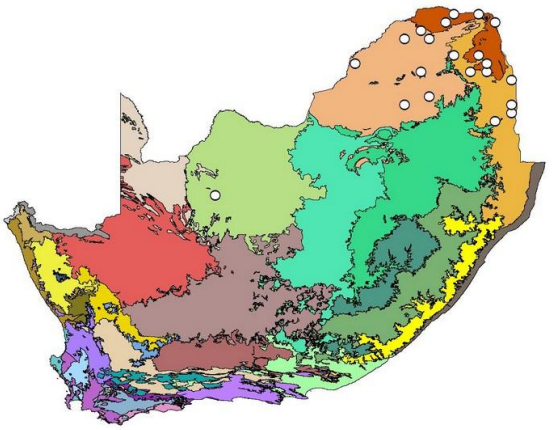
Crotalaria damarensis Engl.

Crotalarieae ☠ ③

Herb; occ. P; Ht 0.15–0.8; Alt 305–1405

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (36)	Lowveld; Mopane (29)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (50)	200–600 (23)
Min temp (°C)	2–8 (50)	>6 (45)
Max temp (°C)	27–35 (86)	25–29 (9)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	5.5–7.4 (36)	6.5–7.4 (32)
ESP	Non (100)	
QDGCs	2229; 2531 (9)	2230; 2330; 2429; 2431 (9)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Alkaloid in plant (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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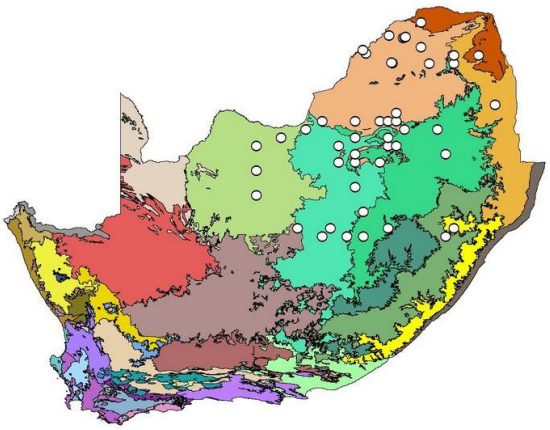
Crotalaria distans Benth. subsp. *distans*

Crotalarieae ①

Herb; A; Ht 0.2–0.8; Alt 765–1950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (47)	Dry Highveld Grassland (17)
Biome	Savanna (62)	Grassland (38)
Rainfall (mm)	400–800 (70)	200–600 (17)
Min temp (°C)	<2 (41)	2–8 (35)
Max temp (°C)	27–35 (76)	25–29 (15)
Phosphorus (ppm)	<10 (85)	5–35 (15)
pH	<6.4 (54)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2328 (14)	2528; 2627 (8)

NOTES: **Antiquality:** None tested (Steyn 1934; Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Magical (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer, autumn (Germishuizen & Clarke 2003).



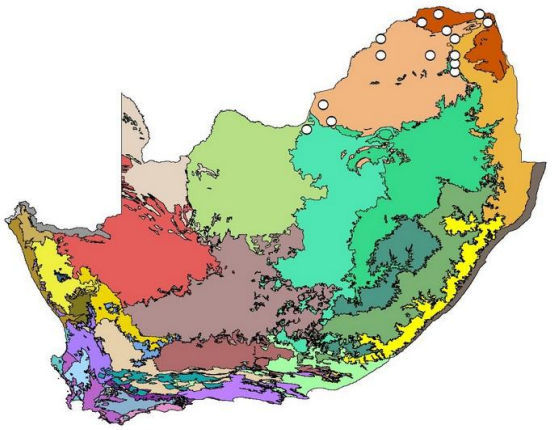
Crotalaria distans Benth. subsp. *mediocris* Polhill

Crotalarieae ①

Herb; A; Ht 0.3–0.8; Alt 765–1310

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (71)	Mopane (29)
Biome	Savanna (100)	
Rainfall (mm)	200–600 (33)	400–800; 600–1000 (27)
Min temp (°C)	2–8 (60)	>6 (20)
Max temp (°C)	27–35 (80)	25–29 (20)
Phosphorus (ppm)	5–35 (73)	<10 (27)
pH	<6.4 (47)	6.5–8.4 (27)
ESP	Non (100)	
QDGCs	2229; 2330 (20)	2327; 2526 (13)

NOTES: **Antiquality:** None tested (Steyn 1934). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Magical (Watt & Breyer-Brandwijk 1962).



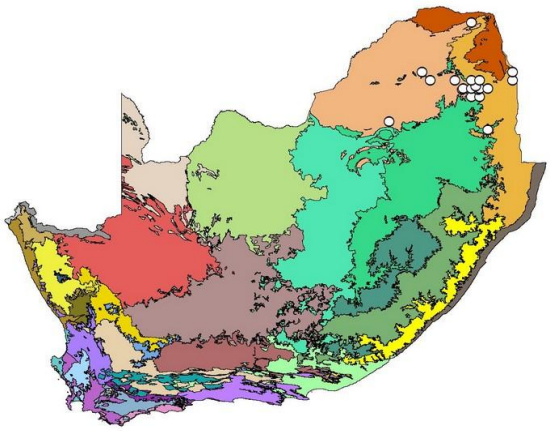
[E]*Crotalaria doidgeae* I.Verd.

Crotalarieae ①

Shrub; P; Ht 0.6–3.5; Alt 600–1460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (57)	Central Bushveld (43)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (69)	>800 (19)
Min temp (°C)	2–8 (69)	>6 (31)
Max temp (°C)	25–29 (63)	27–35 (37)
Phosphorus (ppm)	<10 (69)	5–35 (31)
pH	<6.4 (38)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	2430 (60)	2431 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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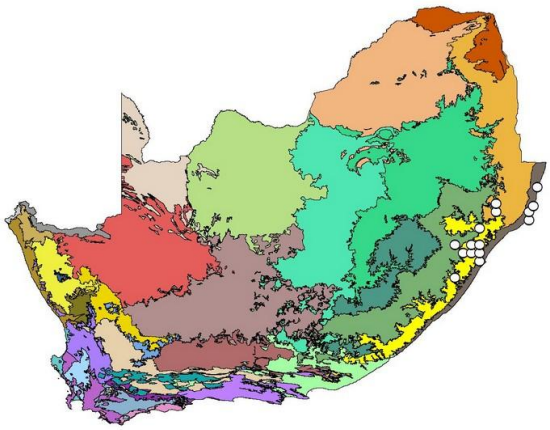
[E]*Crotalaria dura* J.M.Wood & M.S.Evans subsp. *dura*

Crotalarieae ①

Dwarf shrub, herb; P; Ht 0.15–0.6; Alt 1–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (66)	Sub-Escarpment Grassland; Sub-Escarpment Savanna (17)
Biome	Indian Ocean (57)	Savanna (29)
Rainfall (mm)	>800 (80)	600–1000 (13)
Min temp (°C)	>6 (60)	2–8 (33)
Max temp (°C)	25–29 (67)	27–35 (27)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (53)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	2930 (47)	2832 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Poisonous (Kellerman *et al.* 2005); Causes crotalariosis in horses (Steyn 1934; Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Pooley 1998).



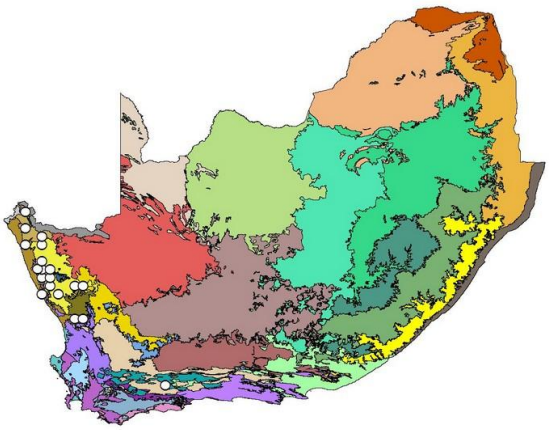
[E]*Crotalaria effusa* E.Mey.

Crotalarieae ①

Herb; A; Ht 0.05–0.7; Alt 134–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (75)	Richtersveld (25)
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (63)	2–8 (37)
Max temp (°C)	27–35 (53)	25–29 (47)
Phosphorus (ppm)	5–35 (58)	>20 (42)
pH	6.5–8.4 (42)	>7.5 (37)
ESP	Medium (75)	High (25)
QDGCs	3017 (37)	2917 (21)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



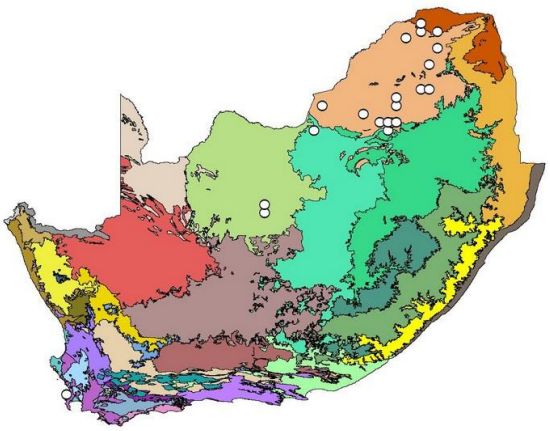
Crotalaria eremicola Baker f. subsp. *eremicola*

Crotalarieae ③

Herb; P; Ht 0.1–0.8; Alt 124–1530

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (75)	Eastern Kalahari Bushveld (13)
Biome	Savanna (88)	Fynbos; Grassland (12)
Rainfall (mm)	400–800 (65)	<400; 200–600 (15)
Min temp (°C)	2–8 (75)	0–4 (15)
Max temp (°C)	27–35 (85)	25–29 (10)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	<6.4 (35)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	2528 (24)	2229 (14)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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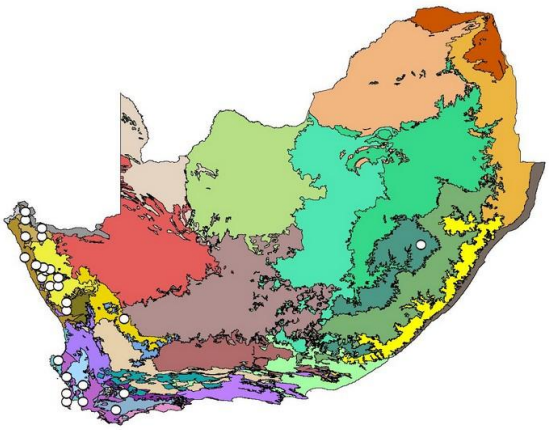
[E]*Crotalaria excisa* (Thunb.) Baker f. subsp. *excisa*

Crotalarieae ①

Herb; P; Ht 0.1–1.2; Alt 5–2440

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (33)	Gariep Desert; Drakensberg Grassland; Namaqualand Sandveld; Trans-Escarpment Succulent Karoo (17)
Biome	Succulent Karoo (53)	Fynbos (41)
Rainfall (mm)	<400 (68)	200–600 (12)
Min temp (°C)	>6 (60)	2–8 (32)
Max temp (°C)	25–29 (56)	27–35 (36)
Phosphorus (ppm)	5–35 (60)	>20 (36)
pH	>7.5 (32)	6.5–8.4 (28)
ESP	Medium (66)	Non; High (17)
QDGCs	3017 (22)	2917 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).
Flowering: Spring (Manning & Goldblatt 2000).



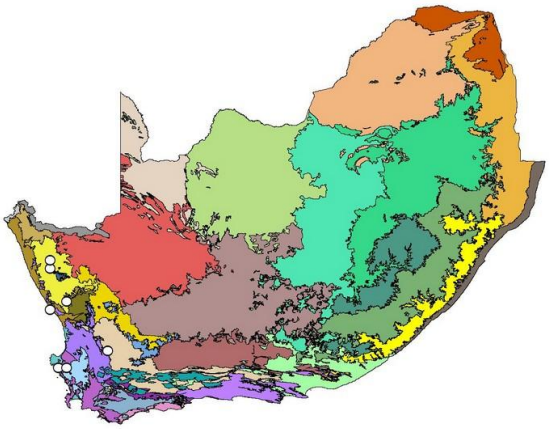
[E]*Crotalaria excisa* (Thunb.) Baker f. subsp. *namaquensis* Polhill

Crotalarieae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (60)	Fynbos (40)
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (57)	2–8 (43)
Max temp (°C)	25–29 (57)	27–35 (29)
Phosphorus (ppm)	5–35 (86)	>20 (14)
pH	5.5–7.4 (57)	6.5–7.4 (29)
ESP	Medium (100)	
QDGCs	3318 (30)	2917; 3017; 3117; 3118; 3219 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).
Flowering: Spring (Manning & Goldblatt 2000).



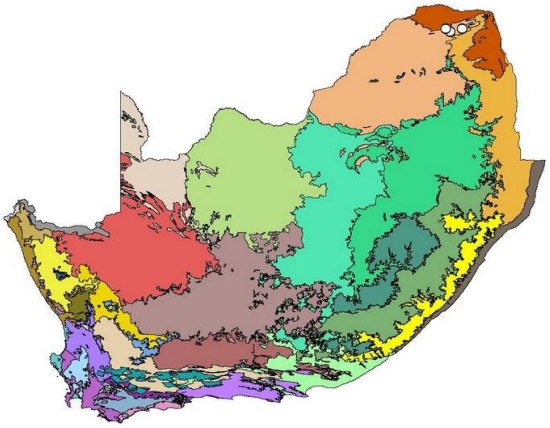
Crotalaria gazensis Baker f. subsp. *herbacea* Polhill

Crotalarieae ①

Dwarf shrub, herb; P; Ht 1–2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	200–600; 400–800; 600–1000 (33)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4; 6.5–8.4 (33)	
ESP	Non (100)	
QDGCs	2230 (67)	2229 (33)

NOTES: –



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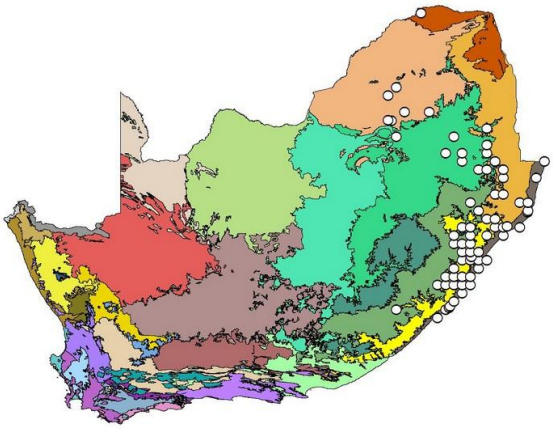
Crotalaria globifera E.Mey.

Crotalarieae ②

Herb, shrub; P; Ht 0.2–1.2; Alt 5–1735

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (45)	Central Bushveld (17)
Biome	Indian Ocean (38)	Grassland; Savanna (31)
Rainfall (mm)	>800 (61)	600–1000 (19)
Min temp (°C)	2–8 (43)	>6 (39)
Max temp (°C)	25–29 (66)	27–35 (25)
Phosphorus (ppm)	<10 (82)	5–35 (18)
pH	<6.4 (78)	5.5–7.4 (19)
ESP	Non (100)	
QDGCs	2930 (17)	3030 (13)

NOTES: **Livestock feed** (Maposse *et al.* 2003). **Antiquality:** Alkaloids in plant (Hutchings *et al.* 1996); Crotalariosis in horses (Steyn 1934; Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Spring, summer, autumn (Pooley 1998).



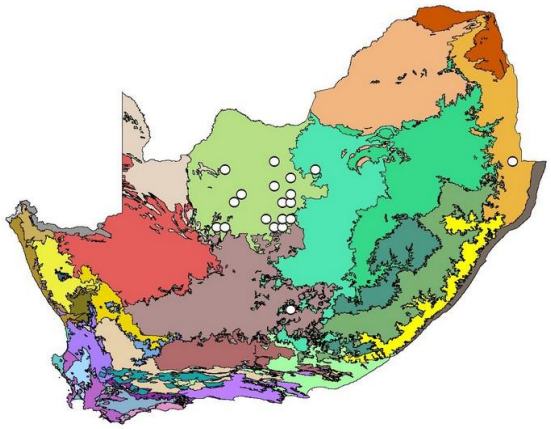
Crotalaria griquensis L.Bolus

Crotalarieae ①

Herb; P; Ht 0.1–0.4; Alt 1200–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (93)	Lowveld (7)
Biome	Savanna (100)	
Rainfall (mm)	<400; 400–800 (42)	200–600 (11)
Min temp (°C)	<2 (84)	0–4 (11)
Max temp (°C)	27–35 (89)	>33 (11)
Phosphorus (ppm)	<10 (95)	5–35 (5)
pH	6.5–7.4 (37)	6.5–8.4; >7.5 (26)
ESP	Non (100)	
QDGCs	2824 (26)	2725 (16)

NOTES: –



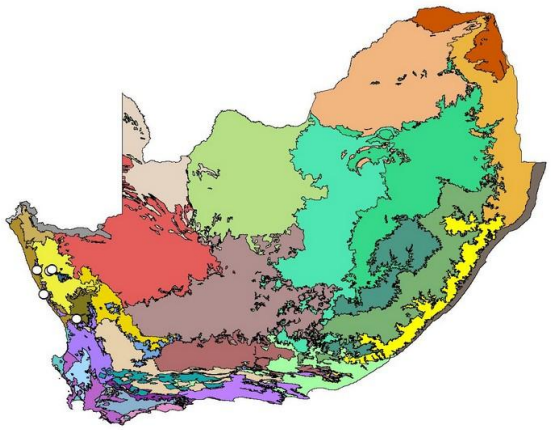
[E]*Crotalaria humilis* Eckl. & Zeyh.

Crotalarieae ①

Herb; A; Ht ?; Alt ?–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (75)	2–8 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	6.5–8.4 (75)	6.5–7.4 (25)
ESP	Ecotone	
QDGCs	3017 (83)	3118 (17)

NOTES: –



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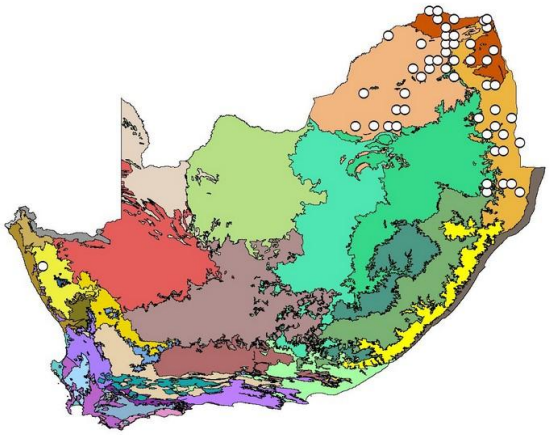
Crotalaria laburnifolia L. subsp. *australis* (Baker f.) Polhill

Crotalarieae ③

Herb, shrub; P; Ht 0.2–2; Alt 150–1435

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (50)	Lowveld; Mopane (25)
Biome	Savanna (97)	Succulent Karoo (3)
Rainfall (mm)	400–800 (53)	200–600 (16)
Min temp (°C)	2–8 (59)	>6 (37)
Max temp (°C)	27–35 (75)	25–29 (24)
Phosphorus (ppm)	5–35 (51)	<10 (49)
pH	<6.4 (37)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	2329 (13)	2229; 2531 (10)

NOTES: **Livestock feed** (Lusigi *et al.* 1984). **CP:** Plant 23% (Nezombo *et al.* 2009). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** No alkaloids (Williams & Molyneux 1987). **Soil conservation:** Organic N (Nezomba *et al.* 2009); Cover crop (Morris 1997). **Ecology:** Seed (Tauro *et al.* 2007). **Flowering:** Summer, autumn (Pooley 1998).



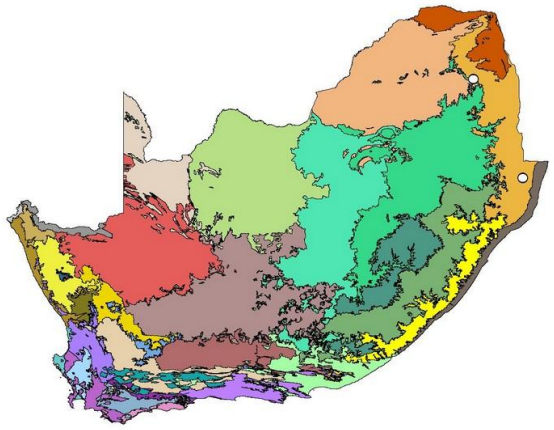
Crotalaria laburnifolia L. subsp. *laburnifolia*

Crotalarieae ③

Shrub; P; Ht 0.01–1.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	2430; 2732 (50)	

NOTES: **Livestock feed** (Lusigi *et al.* 1984). **CP:** Plant 23% (Nezombo *et al.* 2009). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Mapfumo *et al.* 2005). **Soil conservation:** Organic N (Nezombo *et al.* 2009); Cover crop (Morris 1997). **Ecology:** Seed (Tauro *et al.* 2007). **Flowering:** Summer, autumn (Pooley 1998).



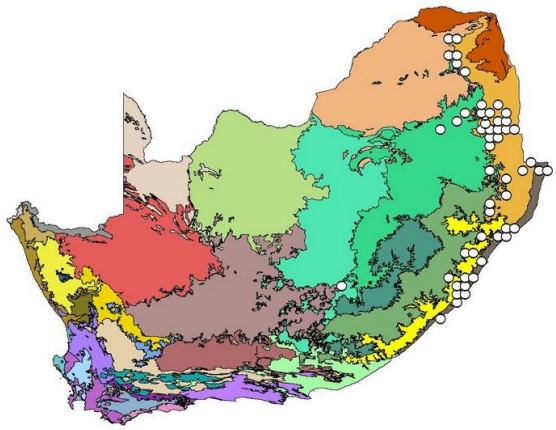
Crotalaria lanceolata E.Mey. subsp. *lanceolata*

Crotalarieae ③

Herb; occ. P; Ht 0.2–1.7; Alt 10–1067

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (45)	Indian Ocean Coastal Belt (30)
Biome	Savanna (61)	Indian Ocean (28)
Rainfall (mm)	>800 (54)	400–800; 600–1000 (23)
Min temp (°C)	>6 (48)	2–8 (46)
Max temp (°C)	25–29 (58)	27–35 (38)
Phosphorus (ppm)	<10 (73)	5–35 (27)
pH	<6.4 (71)	5.5–7.4 (19)
ESP	Normal (100)	
QDGCs	2531 (17)	2530 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Cover crop (Morris 1997). **Biocultural:** Magical (Hutchings *et al.* 1996). **Flowering:** Whole year (Pooley 1998).



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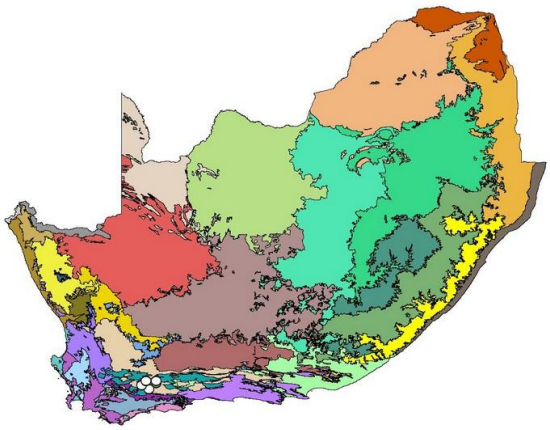
[E]*Crotalaria lebeckioides* Bond

Crotalarieae ①

Shrub; P; Ht 0.6–1; Alt ?–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	>20 (75)	5–35 (25)
pH	>7.5 (75)	6.5–8.4 (25)
ESP	Ecotone	
QDGCs	3320 (60)	3321 (40)

NOTES: –



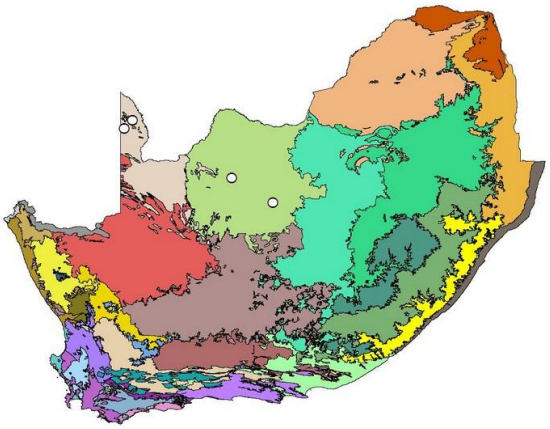
Crotalaria leubnitziana Schinz

Crotalarieae ③

Herb; P; Ht 0.1–0.6; Alt 50–960

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (67)	Kalahari Duneveld (33)
Biome	Savanna (100)	
Rainfall (mm)	<400 (75)	400–800 (25)
Min temp (°C)	<2; 2–8 (50)	
Max temp (°C)	>33 (75)	27–35 (25)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	>7.5 (75)	6.5–7.4 (25)
ESP	Non (100)	
QDGCs	2520 (50)	2723; 2824 (25)

NOTES: **Soil conservation:** Cover crop (Morris 1997).



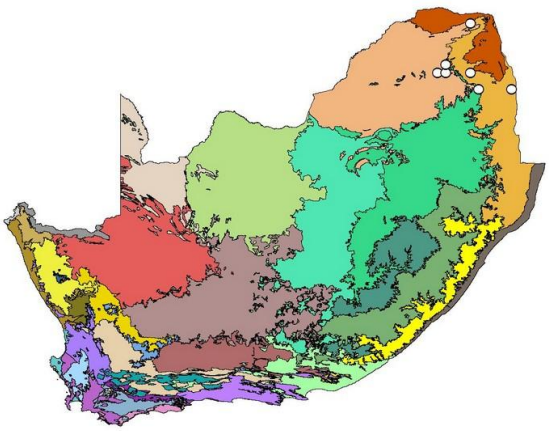
[E]*Crotalaria longidens* Burtt Davy ex I.Verd.

Crotalarieae ①

Herb; P; Ht 0.7–2; Alt 1035–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (72)	200–600; >800 (14)
Min temp (°C)	2–8 (71)	>6 (29)
Max temp (°C)	25–29 (57)	27–35 (43)
Phosphorus (ppm)	5–35 (71)	<10 (29)
pH	5.5–7.4 (43)	<6.4; 6.5–7.4 (29)
ESP	Non (100)	
QDGCs	2429; 2430 (29)	2230; 2329; 2431 (14)

NOTES: –



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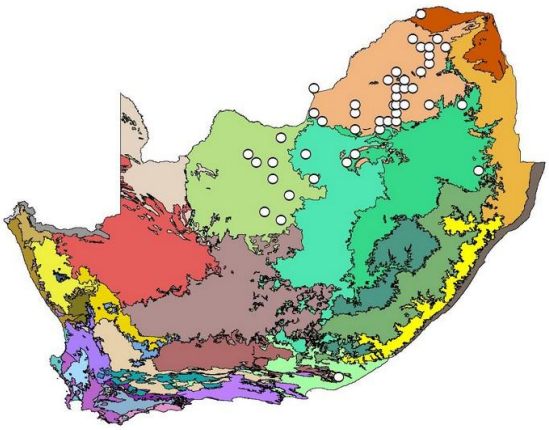
Crotalaria lotoides Benth.

Crotalarieae ③

Herb; P; Ht 0.15–3; Alt 6–2925

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (68)	Eastern Kalahari Bushveld (24)
Biome	Savanna (94)	Grassland (6)
Rainfall (mm)	400–800 (78)	200–600 (13)
Min temp (°C)	2–8 (60)	0–4 (22)
Max temp (°C)	27–35 (73)	25–29 (18)
Phosphorus (ppm)	<10 (73)	5–35 (27)
pH	5.5–7.4 (42)	<6.4 (38)
ESP	Non (100)	
QDGCs	2428 (15)	2329; 2528 (13)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



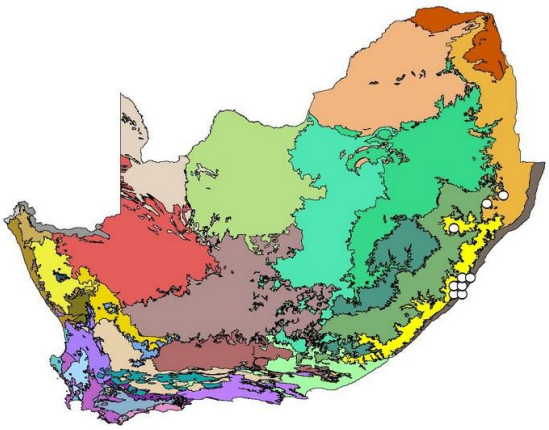
[E]*Crotalaria macrocarpa* E.Mey. subsp. *macrocarpa*

Crotalarieae ①

Shrub; P; Ht 0.3–3; Alt 420–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Lowveld (50)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (67)	600–1000 (22)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (89)	27–35 (11)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (89)	5.5–7.4 (11)
ESP	Non (100)	
QDGCs	3030 (67)	2731; 2830; 2831 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer, autumn (Pooley 1998).



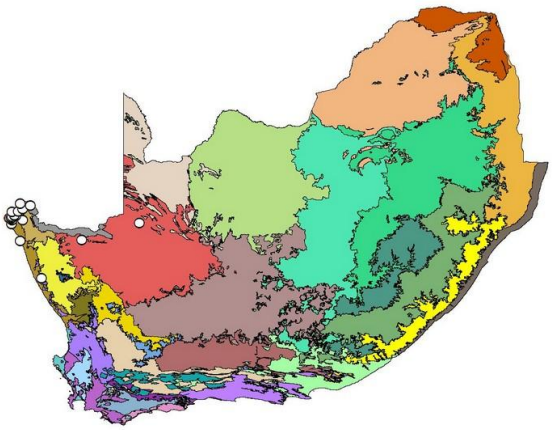
Crotalaria meyeriana Steud.

Crotalarieae ①

Herb; P; Ht 0.05–5; Alt 40–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southern Namib Desert; Bushmanland; Namaqua Sandveld (33)	
Biome	Desert; Nama-Karoo; Succulent Karoo (33)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (80)	2–8 (20)
Max temp (°C)	>33 (40)	25–29; 27–35 (30)
Phosphorus (ppm)	>20 (90)	5–35 (10)
pH	>7.5 (90)	6.5–8.4 (10)
ESP	Non; Medium; High (33)	
QDGCs	2816 (75)	2817; 2820; 2916; 2918; 3017 (5)

NOTES: –



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***Crotalaria mollii* Polhill** **Crotalarieae** –

Herb; P; Ht 0.01–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

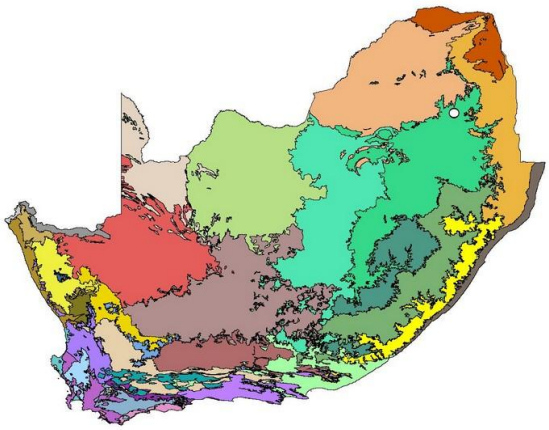
NOTES: –

[E]***Crotalaria monophylla* Germish.** **Crotalarieae** ①

Herb; P; Ht 0.14–0.25; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2530 (100)	

NOTES: –

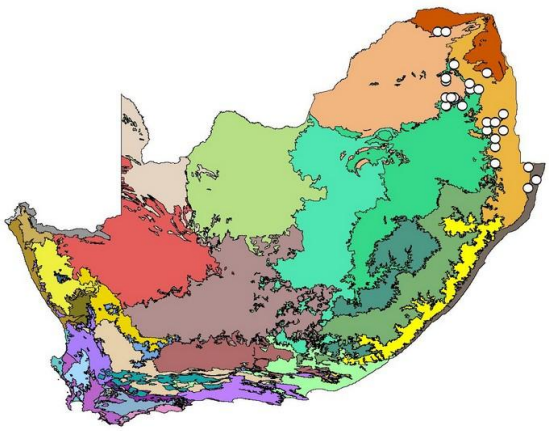


***Crotalaria monteiroi* Taub. ex Baker f. var. *galpinii* Burtt Davy ex I.Verd.** **Crotalarieae** ②

Dwarf shrub, shrub; P; Ht 1–2.5; Alt 60–1240

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (49)	Indian Ocean Coastal Belt; Mesic Highveld Grassland; Central Bushveld (17)
Biome	Savanna (78)	Grassland; Indian Ocean (11)
Rainfall (mm)	400–800 (48)	>800 (26)
Min temp (°C)	2–8 (65)	>6 (30)
Max temp (°C)	25–29 (61)	27–35 (35)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	5.5–7.4 (35)	<6.4 (30)
ESP	Non (100)	
QDGCs	2430 (22)	2531 (19)

NOTES: **Livestock feed** (Maposse *et al.* 2003). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Whole year (Pooley 1998).



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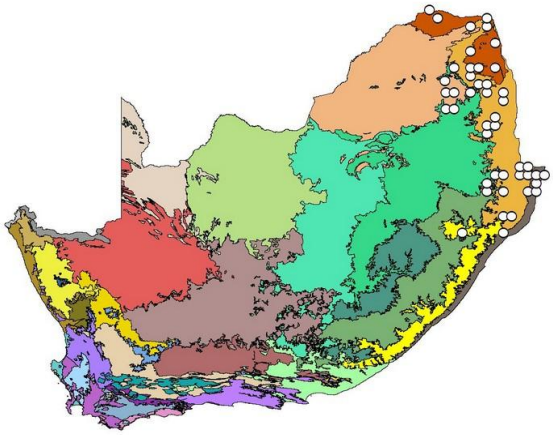
Crotalaria monteiroi Taub. ex Baker f. var. *monteiroi*

Crotalarieae ②

Dwarf shrub, shrub; P; Ht 0.6–3; Alt 30–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (50)	Mopane (21)
Biome	Savanna (86)	Indian Ocean (14)
Rainfall (mm)	400–800 (59)	200–600 (13)
Min temp (°C)	>6 (61)	2–8 (37)
Max temp (°C)	27–35 (74)	25–29 (24)
Phosphorus (ppm)	<10 (65)	5–35 (35)
pH	5.5–7.4 (43)	<6.4 (28)
ESP	Non (100)	
QDGCs	2732 (15)	2731 (11)

NOTES: **Livestock feed** (Maposse *et al.* 2003). **Flowering:** Whole year (Pooley 1998).



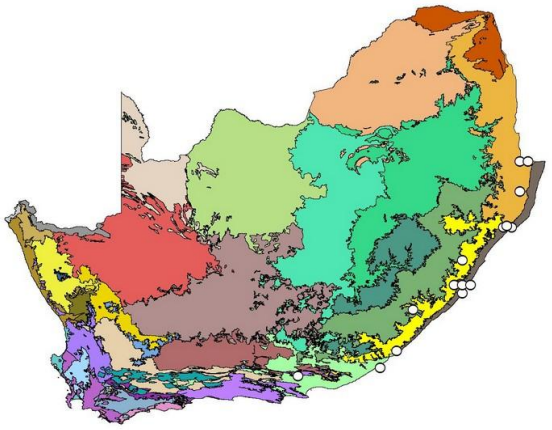
[E]*Crotalaria natalensis* Baker f.

Crotalarieae ①

Shrub; P; Ht 0.45–3; Alt 10–380

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Lowveld (43)	Albany Thicket (14)
Biome	Savanna (50)	Indian Ocean (33)
Rainfall (mm)	>800 (57)	400–800 (29)
Min temp (°C)	>6 (79)	2–8 (21)
Max temp (°C)	25–29 (71)	27–35 (29)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (57)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	3030 (27)	2831 (20)

NOTES: **Flowering:** Spring, summer, autumn (Pooley 1998).



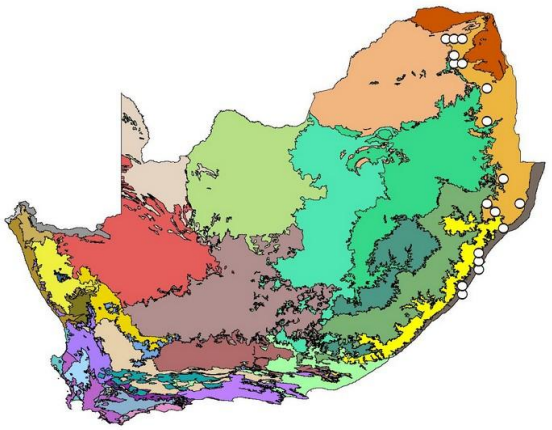
Crotalaria natalitia Meisn. var. *natalitia*

Crotalarieae ③

Herb, shrub; P; Ht 0.45–2; Alt 5–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (50)	Indian Ocean Coastal Belt (33)
Biome	Savanna (78)	Indian Ocean (22)
Rainfall (mm)	>800 (44)	400–800; 600–1000 (28)
Min temp (°C)	>6 (61)	2–8 (39)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	<10 (61)	5–35 (39)
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2330 (28)	2831; 3030 (17)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Pooley 1998).



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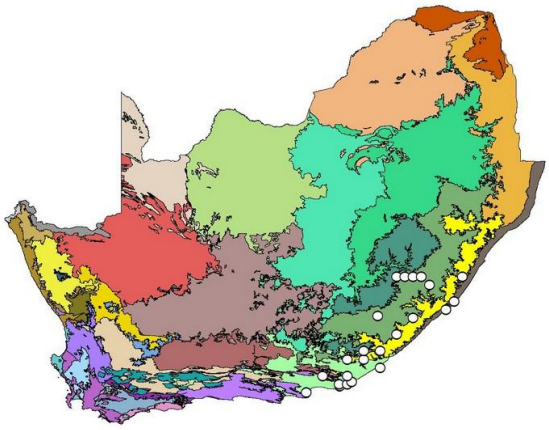
[E]*Crotalaria obscura* DC.

Crotalarieae ③

Herb; P; Ht ?; Alt 5–1676

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (50)	Albany Thicket (38)
Biome	Grassland (56)	Albany Thicket (33)
Rainfall (mm)	400–800 (39)	600–1000 (35)
Min temp (°C)	2–8; >6 (39)	<2 (17)
Max temp (°C)	25–29 (74)	<27 (22)
Phosphorus (ppm)	5–35 (61)	<10 (39)
pH	<6.4; 5.5–7.4 (39)	6.5–7.4 (13)
ESP	Non (100)	
QDGCs	3326 (21)	3028; 3227 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Cover crop (Morris 1997). **Flowering:** Winter, spring, summer (Pooley 1998; Manning 2001).



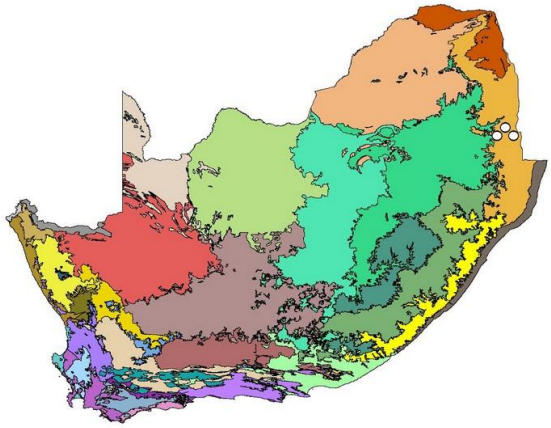
Crotalaria ochroleuca G.Don

Crotalarieae ③

Herb; occ. P; Ht 0.5–2; Alt 183–1067

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	600–1000 (67)	>800 (33)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (67)	6.5–7.4 (33)
ESP	Non (100)	
QDGCs	2631 (67)	2531 (33)

NOTES: **DM:** 5.0 t/ha (Tauro *et al.* 2007). **CP:** Plant 26% (Nezomba *et al.* 2009). **Cultivated** (Sarwatt & Mkiwa 1988; Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975); 83 kgN/ha (Samba *et al.* 2002). **Soil conservation:** Organic N (Nezomba *et al.* 2009); Cover crop (Morris 1997). **Ecology:** Seed (Tauro *et al.* 2007).



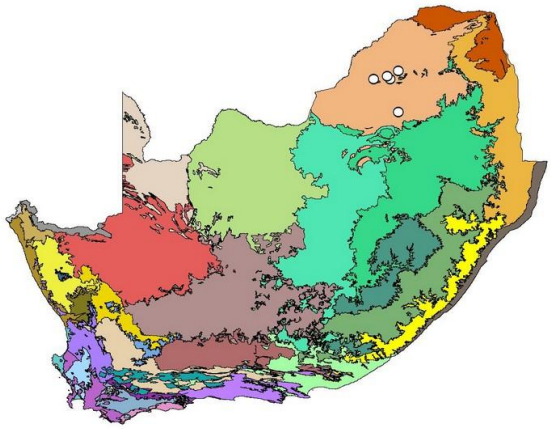
Crotalaria orientalis Burtt Davy ex I.Verd. subsp. *allenii* (I.Verd.) Polhill & A.Schreib.

Crotalarieae ☠①

Dwarf shrub, herb; P; Ht 0.4–1; Alt ?–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2428 (60)	2427; 2528 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** None tested (Steyn 1934); Suspected toxicity (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer (Van Rooyen 2001).



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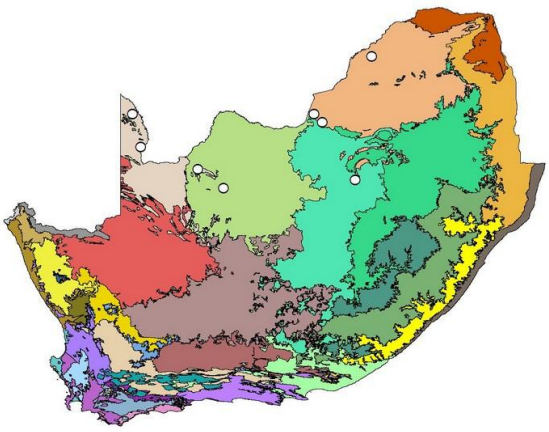
Crotalaria orientalis Burtt Davy ex I.Verd. subsp. *orientalis*

Crotalarieae ①

Dwarf shrub, herb; P; Ht 0.5–0.8; Alt 885–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (29)	Central Bushveld; Kalahari Duneveld; Eastern Kalahari Bushveld (13)
Biome	Savanna (86)	Grassland (14)
Rainfall (mm)	400–800 (56)	<400 (44)
Min temp (°C)	0–4 (44)	2–8 (33)
Max temp (°C)	>33 (56)	27–35 (44)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	6.5–7.4 (44)	<6.4; >7.5 (22)
ESP	Non (100)	
QDGCs	2525 (23)	2327; 2520; 2526; 2620; 2722; 2723; 2727 (11)

NOTES: –



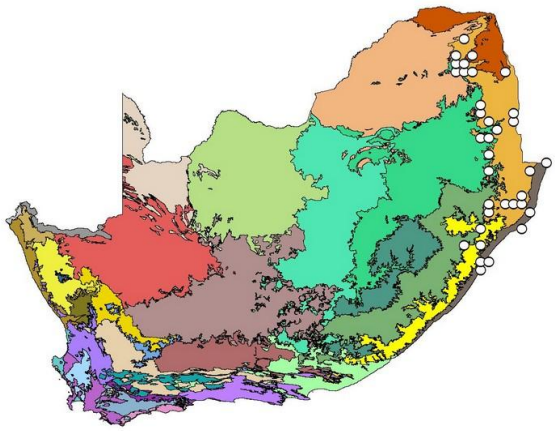
Crotalaria pallida Aiton var. *pallida*

Crotalarieae ☠③

Herb; P; Ht 0.1–2; Alt 5–960

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (60)	Indian Ocean Coastal Belt (33)
Biome	Savanna (75)	Indian Ocean (25)
Rainfall (mm)	>800 (43)	400–800 (31)
Min temp (°C)	>6 (51)	2–8 (49)
Max temp (°C)	24–35 (51)	25–29 (49)
Phosphorus (ppm)	<10 (74)	5–35 (26)
pH	<6.4 (57)	5.5–7.4 (34)
ESP	Non (100)	
QDGCs	2330 (14)	2531; 2831 (11)

NOTES: **DM:** 9.0 t/ha (Tauro *et al.* 2007). **CP:** Plant 18% (Nezomba *et al.* 2009). **Cultivated** (Glen 2002). **Antiquality:** Alkoloid in seed and leaves highly poisonous to livestock (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Organic N (Nezomba *et al.* 2009); Green manure (Watt & Breyer-Brandwijk 1962). **Ecology:** Seed (Tauro *et al.* 2007). **Biocultural:** Beverage; fibre (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Pooley 1998).



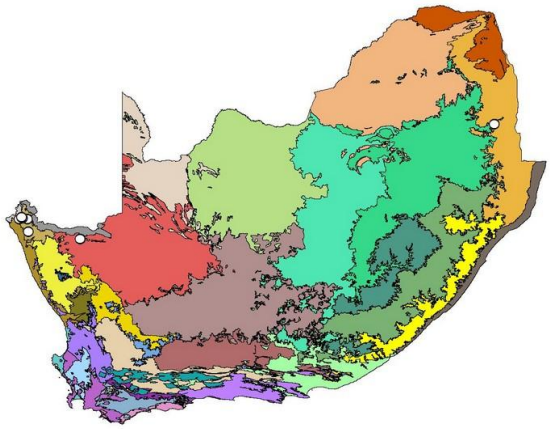
[E]*Crotalaria pearsonii* Baker f.

Crotalarieae ①

Herb; P; Ht 0.3–0.5; Alt 250–460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (80)	>800 (20)
Min temp (°C)	>6 (80)	2–8 (20)
Max temp (°C)	25–29 (60)	27–35; >33 (20)
Phosphorus (ppm)	>20 (80)	<10 (20)
pH	>7.5 (80)	5.5–7.4 (20)
ESP	Ecotone	
QDGCs	2816 (44)	2918 (22)

NOTES: –



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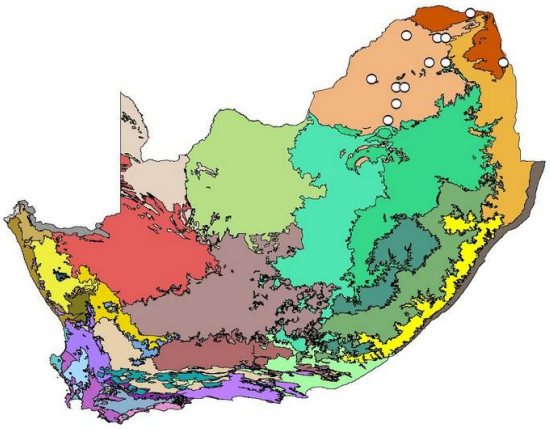
Crotalaria pisicarpa Welw. ex Baker

Crotalarieae ①

Herb; occ. P; Ht 0.01–0.5; Alt 262–1430

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (89)	Mopane (110
Biome	Savanna (100)	
Rainfall (mm)	400–800 (67)	200–600 (25)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	5.5–7.4 (50)	<6.4 (25)
ESP	Non (100)	
QDGCs	2329 (33)	2428; 2528 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



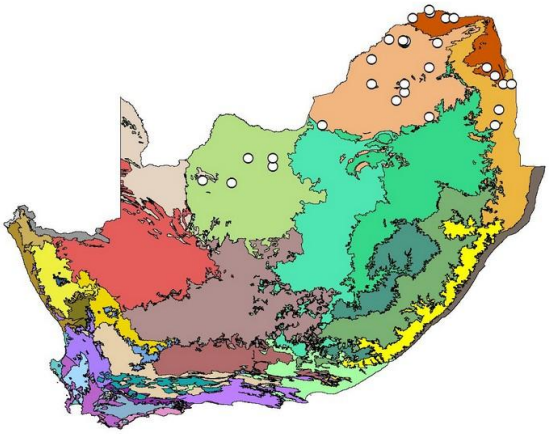
Crotalaria podocarpa DC.

Crotalarieae ②

Herb; A; Ht 0.1–0.7; Alt 262–1560

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (45)	Eastern Kalahari Bushveld (25)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (58)	<400 (27)
Min temp (°C)	2–8 (46)	>6 (31)
Max temp (°C)	27–35 (69)	25–29 (19)
Phosphorus (ppm)	<10 (62)	5–35 (38)
pH	5.5–7.4 (42)	6.5–7.4 (23)
ESP	Non (100)	
QDGCs	2328 (16)	2229; 2428; 2431 (10)

NOTES: **Livestock feed** (Le Houérou 1980). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Autumn (Van Rooyen 2001).



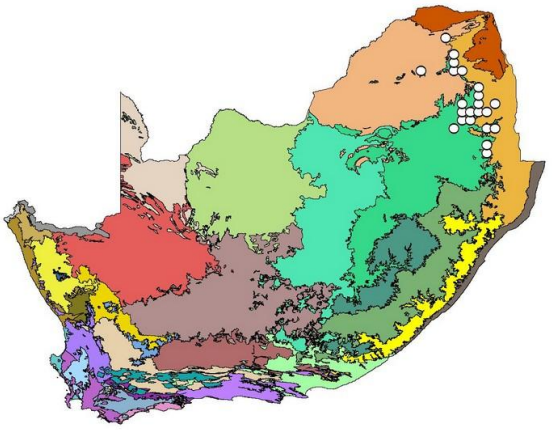
Crotalaria recta Steud. ex A.Rich.

Crotalarieae ③

Herb; P; Ht 1–2.5; Alt 700–1980

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (57)	Lowveld (29)
Biome	Savanna (60)	Grassland (40)
Rainfall (mm)	>800 (50)	600–1000 (27)
Min temp (°C)	2–8 (82)	0–4 (14)
Max temp (°C)	25–29 (59)	27–35 (23)
Phosphorus (ppm)	<10 (77)	5–35 (23)
pH	<6.4 (82)	5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2530 (36)	2531 (18)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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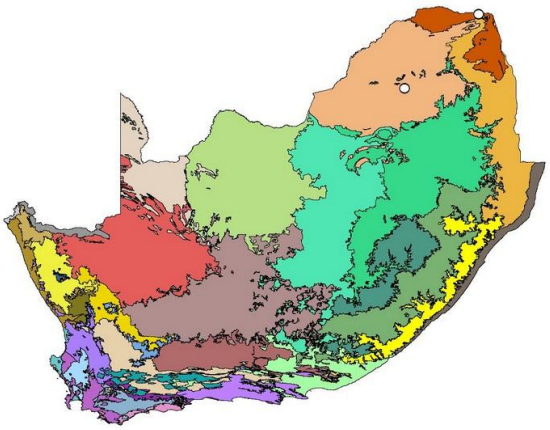
Crotalaria rhodesiae Baker f.

Crotalarieae ☠ ③

Herb; P; Ht 0.4–0.9; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–7.4 (50)	
ESP	Non (100)	
QDGCs	2230; 2428 (50)	

NOTES: **N_2 fixation:** Nodulated (Mapfumo *et al*. 2005).)**Soil conservation:** Cover crop (Morris 1997). **Antiquality:** Toxic to livestock (Watt & Breyer-Brandwijk 1962).



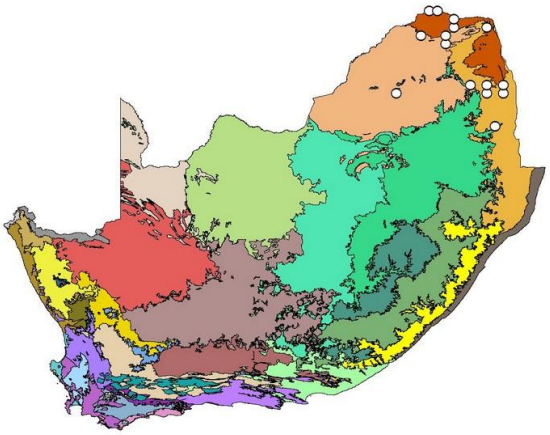
Crotalaria schinzii Baker f.

Crotalarieae ①

Herb; P; Ht 0.03–0.4; Alt 380–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld; Mopane (38)	Central Bushveld (24)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (47)	<400 (27)
Min temp (°C)	>6 (53)	2–8 (47)
Max temp (°C)	27–35 (73)	25–29 (27)
Phosphorus (ppm)	5–35 (60)	<10 (40)
pH	5.5–7.4; 6.5–8.4 (33)	6.5–7.4 (20)
ESP	Non (100)	
QDGCs	2229; 2431 (27)	2230 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



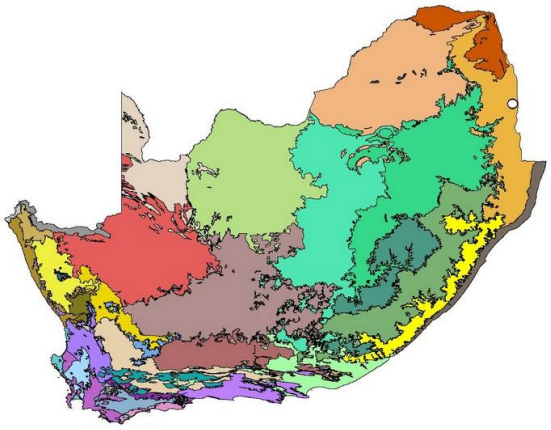
Crotalaria schlechteri Baker f.

Crotalarieae ①

Herb; P; Ht 0.4–0.8; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	6.5–7.4 (100)	
ESP	Non (100)	
QDGCs	2531 (100)	

NOTES: –



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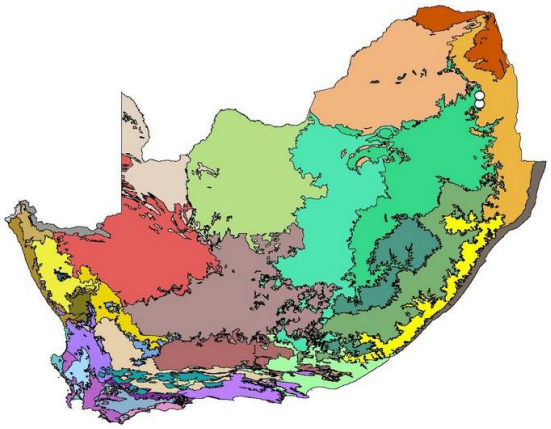
Crotalaria spartea Baker

Crotalarieae ③

Herb; A; Ht 0.2–1.3; Alt 1086–1096

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2430; 2530 (50)	

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



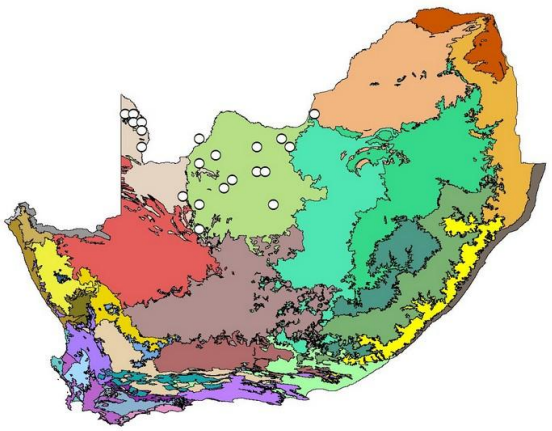
Crotalaria spartioides DC.

Crotalarieae ☠①

Shrub; P; Ht 0.4–2; Alt 910–1585

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (71)	Kalahari Duneveld (29)
Biome	Savanna (100)	
Rainfall (mm)	200–600 (48)	<400 (29)
Min temp (°C)	<2 (57)	2–8 (29)
Max temp (°C)	>33 (76)	27–35 (24)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	>7.5 (38)	6.5–7.4 (29)
ESP	Non (100)	
QDGCs	2520 (23)	2622 (14)

NOTES: **Antiquality:** Poisonous (Kellerman *et al.* 2005). **Flowering:** Spring, summer (Van Rooyen 2001).



Crotalaria spartioides DC. × *C. virgultalis* Burch. ex DC.

Crotalarieae –

Shrub; P; Ht ?; Alt ?–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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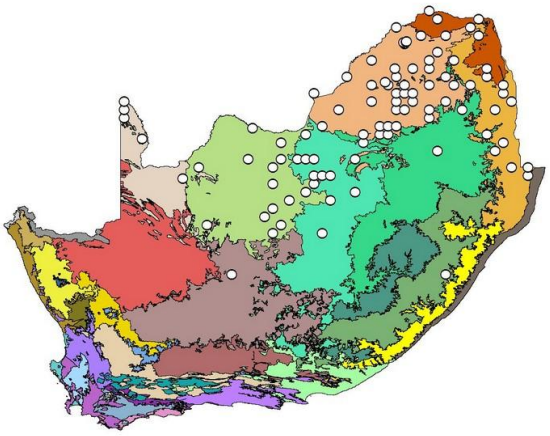
Crotalaria sphaerocarpa Perr. ex DC. subsp. *sphaerocarpa*

Crotalarieae ☠③

Herb; A; Ht 0.2–1.2; Alt 65–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (47)	Eastern Kalahari Bushveld (21)
Biome	Savanna (84)	Grassland (14)
Rainfall (mm)	400–800 (69)	<400 (17)
Min temp (°C)	2–8 (49)	<2 (27)
Max temp (°C)	27–35 (71)	25–29 (16)
Phosphorus (ppm)	<10 (72)	5–35 (28)
pH	5.5–7.4 (35)	<6.4 (25)
ESP	Non (100)	
QDGCs	2428 (9)	2328 (6)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Antiquality:** Poisonous seeds (Bromilow 2001); None tested (Watt & Breyer-Brandwijk 1962); No alkaloids (Williams & Molyneux 1987). **Soil conservation:** Cover crop (Morris 1997). **Ecology:** Weed (Bromilow 2001). **Flowering:** Summer (Van Rooyen 2001).



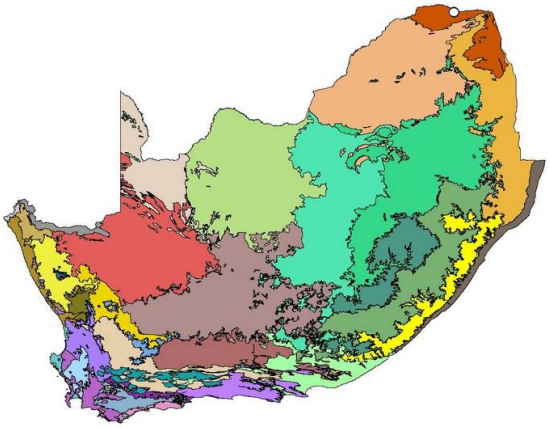
Crotalaria steudneri Schweinf.

Crotalarieae ①

Herb; A; Ht 0.4–0.6; Alt 940–1460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	>7.5 (100)	
ESP	Non (100)	
QDGCs	2230 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



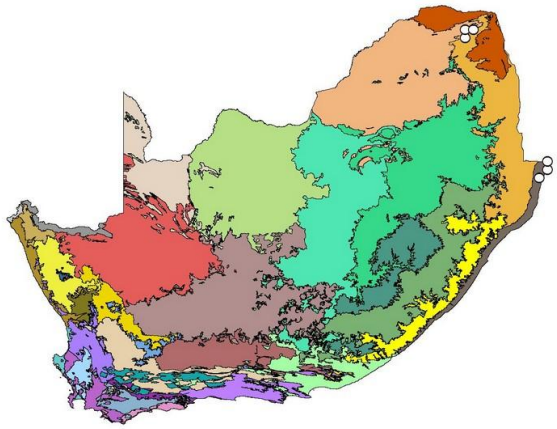
Crotalaria vasculosa Wall. ex Benth.

Crotalarieae ①

Herb; A; Ht 0.15–1; Alt ?–30

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Savanna (67)	Indian Ocean (33)
Rainfall (mm)	400–800 (83)	600–1000 (17)
Min temp (°C)	>6 (83)	2–8 (17)
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (83)	<10 (17)
pH	<6.4; 5.5–7.4 (50)	
ESP	Non (100)	
QDGCs	2230; 2732 (33)	2330; 2632 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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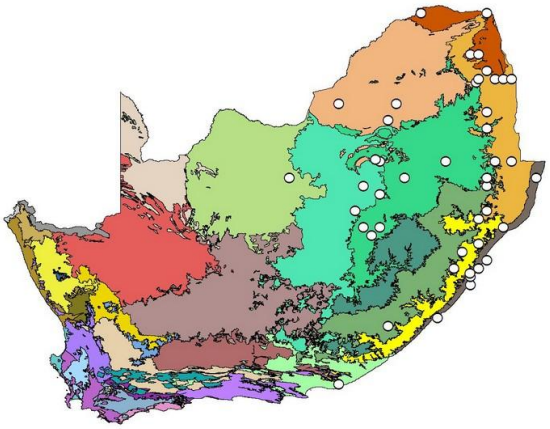
Crotalaria virgulata Klotzsch subsp. *grantiana* (Harv.) Polhill

Crotalarieae ③

Herb; occ. P; Ht 0.1–1; Alt 5–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Mesic Highveld Grassland; Lowveld (21)	Central Bushveld; Mopane (13)
Biome	Savanna (46)	Grassland (35)
Rainfall (mm)	400–800 (59)	>800 (27)
Min temp (°C)	>6 (41)	2–8 (34)
Max temp (°C)	27–35 (50)	25–29 (45)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (52)	5.5–7.4; 6.5–7.4 (20)
ESP	Non (100)	
QDGCs	3030 (11)	2431 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar *et al.* 1983). **Antiquality:** None tested (Watt & Breyer-Brandwijk 1962). **Soil conservation:** Cover crop (Morris 1997).



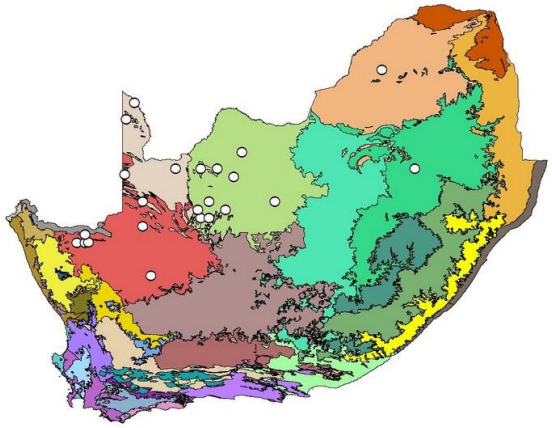
Crotalaria virgultalis Burch. ex DC.

Crotalarieae ①

Shrub; P; Ht 0.4–1.5; Alt 155–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (47)	Bushmanland (27)
Biome	Savanna (76)	Nama Karoo (18)
Rainfall (mm)	<400 (86)	400–800 (14)
Min temp (°C)	<2; 2–8 (41)	0–4 (18)
Max temp (°C)	>33 (68)	27–35 (27)
Phosphorus (ppm)	<10 (59)	5–35 (23)
pH	>7.5 (55)	6.5–7.4 (18)
ESP	Non (100)	
QDGCs	2722; 2918 (17)	2520; 2722 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



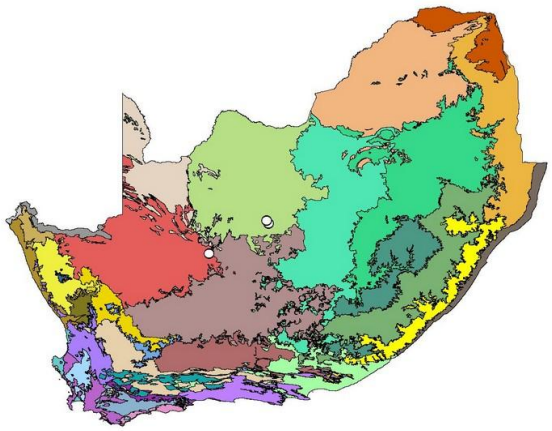
Cullen biflora (Harv.) C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (100)	
Biome	Nama Karoo; Savanna (50)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	<2; 0–4 (50)	
Max temp (°C)	27–35; >33 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	6.5–8.4; >7.5 (50)	
ESP	Non (100)	
QDGCs	2824 (67)	2922 (33)

NOTES: –



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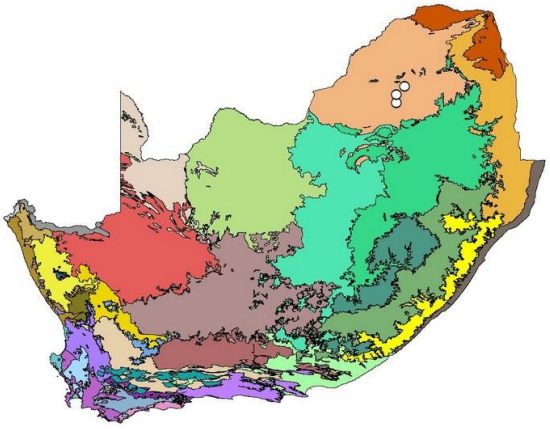
Cullen holubii (Burtt Davy) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.3–0.4; Alt 1065–1372

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	2428 (67)	2528 (33)

NOTES: –



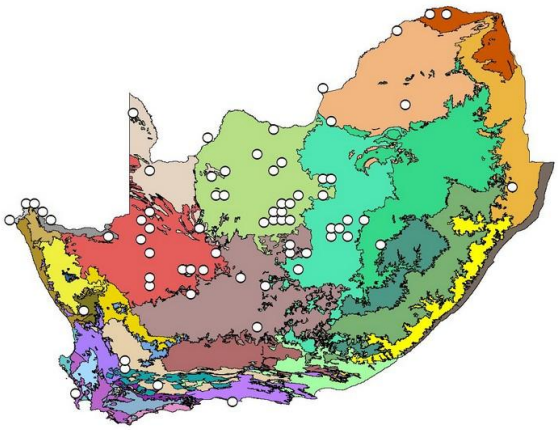
Cullen tomentosum (Thunb.) J.W.Grimes

Psoraleeae ③

Herb; P; Ht 0.1–1.2; Alt 15–1677

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (36)	Bushmanland (19)
Biome	Savanna (49)	Nama Karoo (25)
Rainfall (mm)	<400 (65)	400–800 (29)
Min temp (°C)	<2 (54)	2–8 (22)
Max temp (°C)	27–35 (62)	>33 (32)
Phosphorus (ppm)	<10 (48)	5–35; >20 (26)
pH	>7.5 (45)	6.5–8.4 (22)
ESP	Non (89)	Medium (6)
QDGCs	2824 (11)	3021 (7)

NOTES: **Livestock feed** (Le Roux *et al.* 1994). **Cultivated** (Glen 2002). **Antiquality:** Not toxic (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Summer (Van Rooyen 2001).



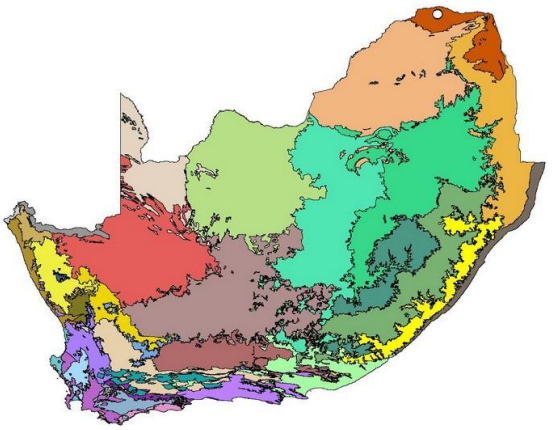
Cyamopsis dentata (N.E.Br.) Torre

Indigofereae ①

No descriptive records

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Non (100)	
QDGCs	2229 (100)	

NOTES: –



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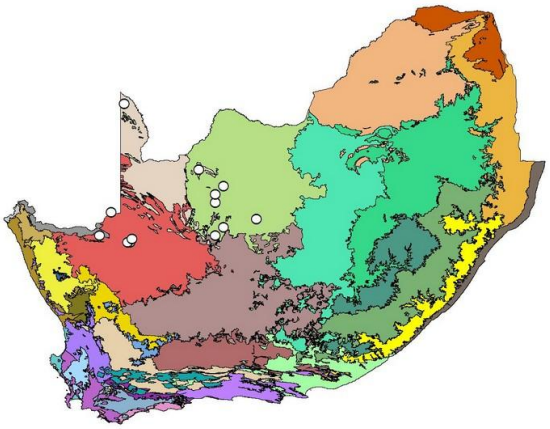
Cyamopsis serrata Schinz

Indigofereae ①

Herb; A; Ht 0.01–0.25; Alt 610–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland; Eastern Kalahari Bushveld (44)	Kalahari Duneveld (12)
Biome	Savanna (60)	Nama Karoo (40)
Rainfall (mm)	<400 (100)	
Min temp (°C)	<2 (54)	0–4; 2–8 (23)
Max temp (°C)	>33 (69)	27–35 (31)
Phosphorus (ppm)	<10 (46)	>20 (38)
pH	>7.5 (46)	6.5–7.4 (38)
ESP	Non (100)	
QDGCs	2920 (23)	2722 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).
Flowering: Summer (Van Rooyen 2001).



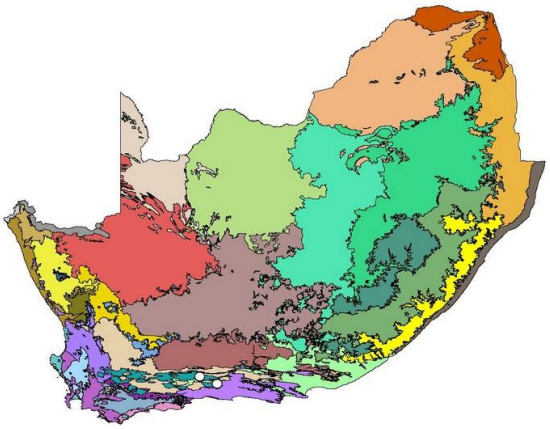
[E]*Cyclopia alopecuroides* A.L.Schutte

Podalyrieae ①

Dwarf shrub; P; Ht 0.01–0.6; Alt 1500–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	5.5–7.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3322 (100)	

NOTES: –



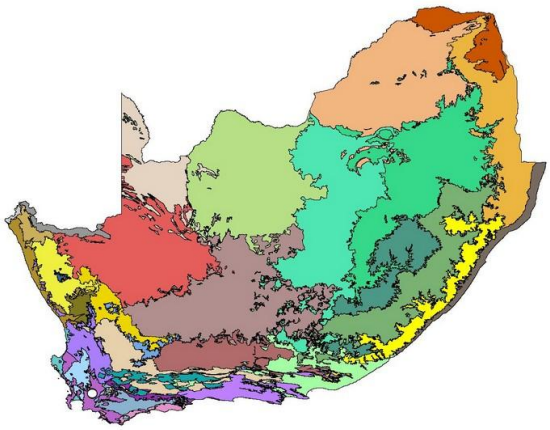
[E]*Cyclopia alpina* A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 0.01–0.3; Alt 1220–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	3319 (100)	

NOTES: –



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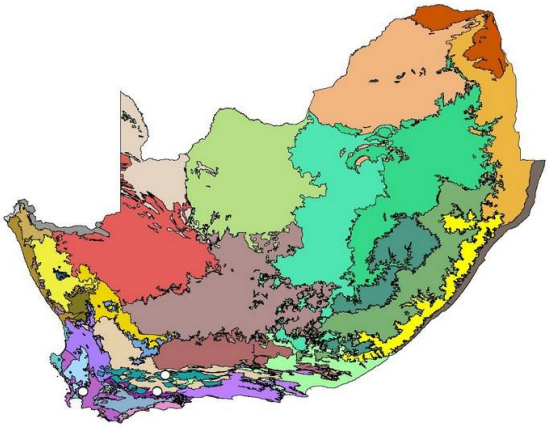
[E]*Cyclopia aurescens* Kies

Podalyrieae ①

Dwarf shrub; P; Ht ?–0.69; Alt ?–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (67)	600–1000 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	<6.4; 6.5–8.4; >7.5 (33)	
ESP	Ecotone	
QDGCs	3321 (67)	3318 (33)

NOTES: **Biocultural:** Beverage (Watt & Breyer-Brandwijk 1962).



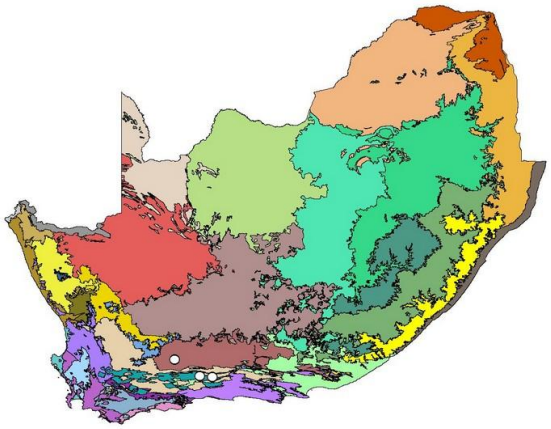
[E]*Cyclopia bolusii* Hofmeyr & E.Phillips

Podalyrieae ①

Shrub; P; Ht 0.01–1.5; Alt ?–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lower Karoo (100)	
Biome	Nama Karoo (100)	
Rainfall (mm)	<400 (67)	200–600 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	>20 (100)	
pH	6.5–8.4 (67)	>7.5 (33)
ESP	Medium (100)	
QDGCs	3322 (67)	3221 (33)

NOTES: –



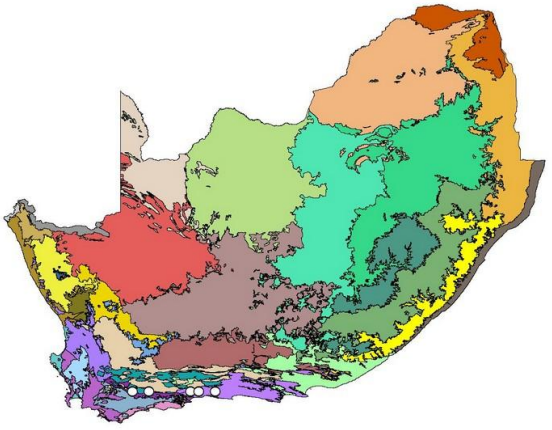
[E]*Cyclopia bowieana* Harv.

Podalyrieae ①

Shrub; P; Ht 1–1.8; Alt 490–1586

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	200–600; 600–1000 (40)	400–800 (20)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (80)	<27 (20)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (40)	6.5–8.4 (20)
ESP	Medium (100)	
QDGCs	3322 (60)	3320 (40)

NOTES: **Biocultural:** Beverage (Watt & Breyer-Brandwijk 1962).



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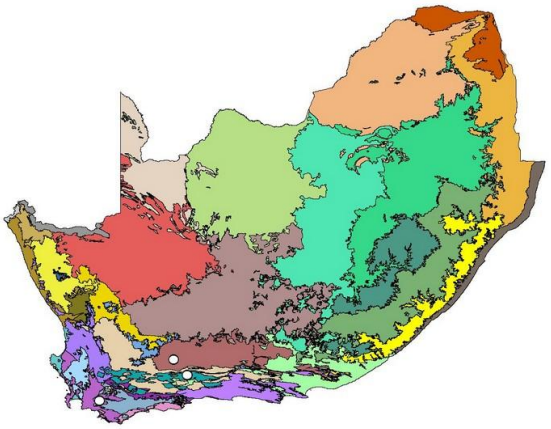
[E]*Cyclopia burtonii* Hofmeyr & E.Phillips

Podalyrieae ①

Shrub; P; Ht 0.3–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lower Karoo (100)	
Biome	Fynbos; Nama Karoo (50)	
Rainfall (mm)	<400 (67)	400–800 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	>20 (67)	5–35 (33)
pH	5.5–7.4; 6.5–8.4; >7.5 (33)	
ESP	Medium (100)	
QDGCs	3322 (50)	3221; 3419 (25)

NOTES: **Biocultural:** Beverage (Watt & Breyer-Brandwijk 1962).



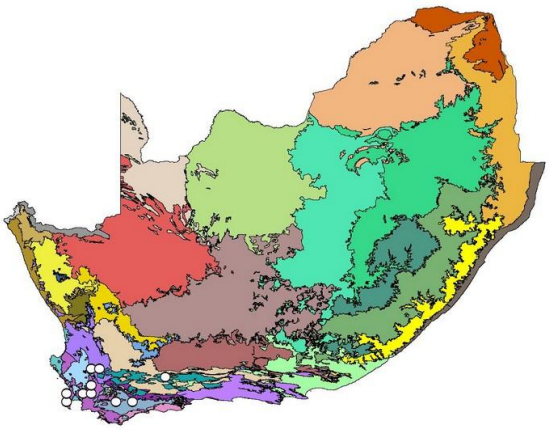
[E]*Cyclopia buxifolia* (Burm.f.) Kies

Podalyrieae ①

Shrub; P; Ht 0.6–1; Alt 305–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (30)	>800 (20)
Min temp (°C)	0–4; 2–8 (40)	>6 (20)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (90)	>20 (10)
pH	<6.4 (50)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	3319 (40)	3318 (20)

NOTES: **Biocultural:** Beverage (Watt & Breyer-Brandwijk 1962).



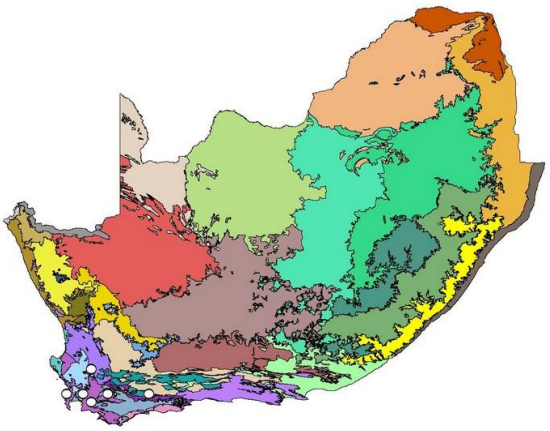
[E]*Cyclopia falcata* (Harv.) Kies

Podalyrieae ①

Shrub, P; Ht 0.4–0.89; Alt 300–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (34)	400–800; >800 (16)
Min temp (°C)	2–8 (50)	0–4 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (68)	6.5– 7.4; 6.5– 8.4 (16)
ESP	Ecotone (100)	
QDGCs	3318; 3319 (34)	3320; 3419 (16)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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[E]*Cyclopia filiformis* Kies

Podalyrieae –

Dwarf shrub; P; Ht 0.01–0.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

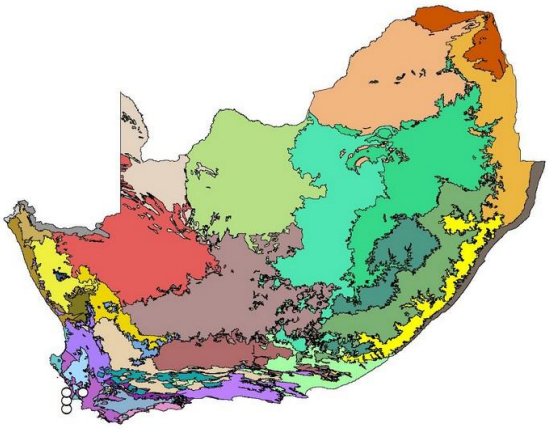
[E]*Cyclopia galioides* (P.J.Bergius) DC.

Podalyrieae ①

Shrub; P; Ht 0.3–1; Alt 275–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (75)	400–800 (25)
Min temp (°C)	>6 (75)	2–8 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3318; 3418 (50)	

NOTES: **Flowering:** Summer, autumn (Kidd 2002).



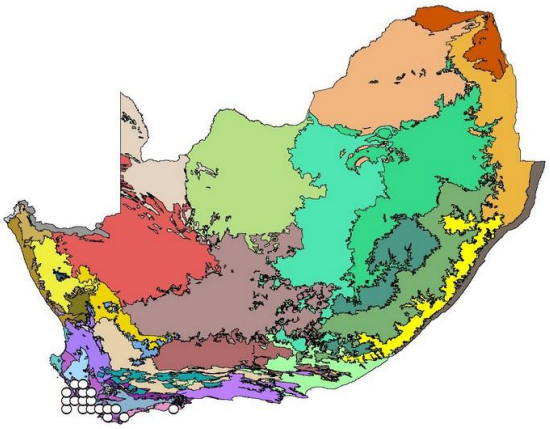
[E]*Cyclopia genistoides* (L.) R.Br.

Podalyrieae ☠③

Shrub; P; Ht ?–1.79; Alt 15–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (75)	South Coast Fynbos (25)
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (33)	200–600 (28)
Min temp (°C)	2–8 (56)	>6 (39)
Max temp (°C)	25–29 (94)	<27 (6)
Phosphorus (ppm)	5–35 (83)	<10 (17)
pH	<6.4 (72)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	3419 (33)	3418 (28)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Tannin in plant (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972, 1975). **Biocultural:** Beverage; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Winter, spring, summer (Kidd 2002).



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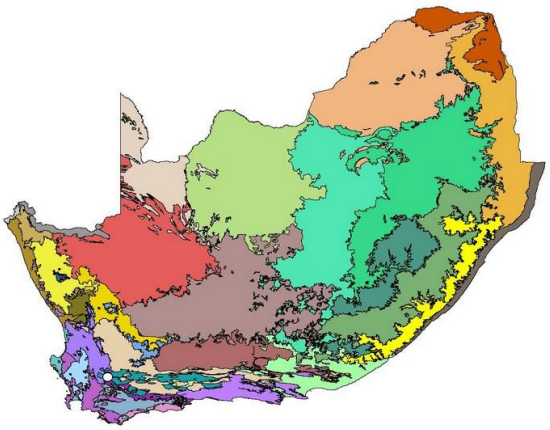
[E]*Cyclopia glabra* (Hofmeyr & E.Phillips) A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 0.01–1.2; Alt 1670–2250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



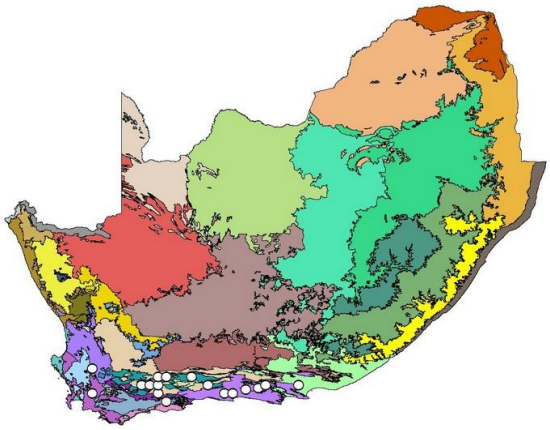
[E]*Cyclopia intermedia* E.Mey.

Podalyrieae ①

Shrub; P; Ht 0.5–0.7; Alt 215–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (75)	Southwest Fynbos (25)
Biome	Fynbos (100)	
Rainfall (mm)	<400 (47)	25–29 (24)
Min temp (°C)	2–8 (88)	0–4 (12)
Max temp (°C)	25–29; 27–35 (41)	<27 (18)
Phosphorus (ppm)	>20 (71)	5–35 (29)
pH	<6.4; >7.5 (29)	5.5–7.4 (24)
ESP	Medium (75)	Non (25)
QDGCs	3321 (24)	3323 (18)

NOTES: **Biocultural:** Beverage (Watt & Breyer-Brandwijk 1962).



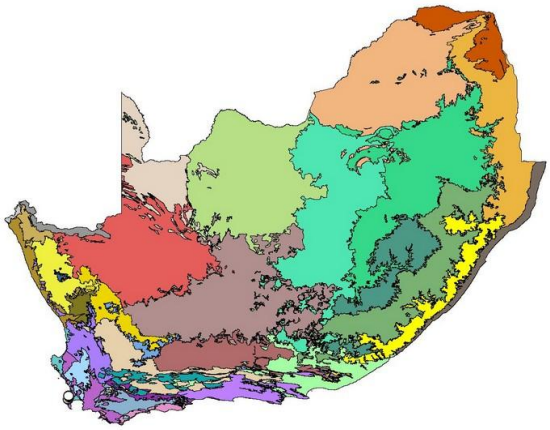
[E]*Cyclopia latifolia* DC.

Podalyrieae ①

Shrub; P; Ht 0.01–1; Alt 900–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (80)	3418 (20)

NOTES: –



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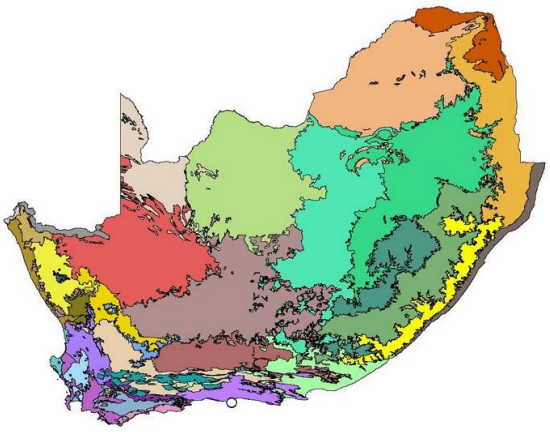
[E]*Cyclopia laxiflora* Benth.

Podalyrieae ①

Shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Medium (100)	
QDGCs	3423 (100)	

NOTES: –



[E]*Cyclopia longifolia* Vogel

Podalyrieae –

Dwarf shrub; P; Ht 0.01–0.15; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: **Biocultural:** Beverage (Watt & Breyer-Brandwijk 1962).

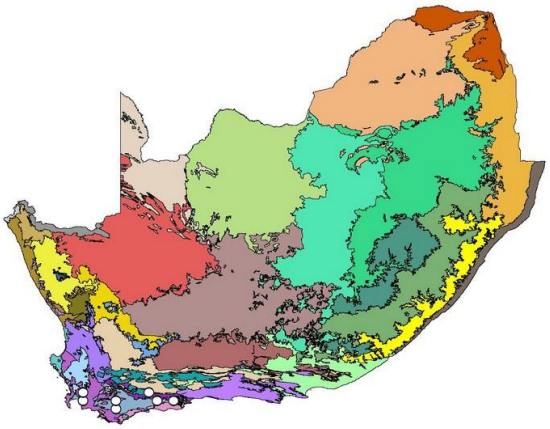
[E]*Cyclopia maculata* (Andrews) Kies

Podalyrieae ③

Shrub; P; Ht 1–2.5; Alt 290–762

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (71)	600–1000; >800 (14)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (86)	<10 (14)
pH	<6.4 (43)	5.5–7.4 (29)
ESP	Ecotone	
QDGCs	3419; 3421 (29)	3318; 3320; 3418 (14)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Beverage (Watt & Breyer-Brandwijk 1962).



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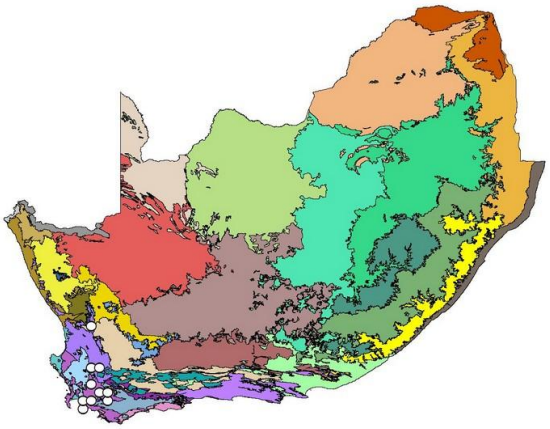
[E]*Cyclopia meyeriana* Walp.

Podalyrieae ①

Shrub; P; Ht 0.6–1.5; Alt 765–1585

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; >800 (40)	<400; 400–800 (10)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (90)	27–35 (10)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (50)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	3319 (50)	3418; 3419 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



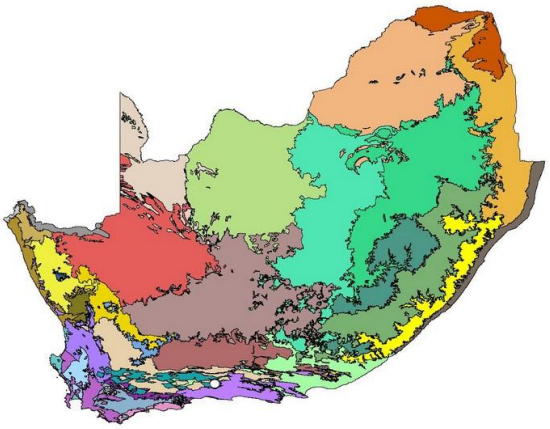
[E]*Cyclopia plicata* Kies

Podalyrieae ①

Dwarf shrub; P; Ht 0.01–1.5; Alt ?–990

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3322 (100)	

NOTES: –



[E]*Cyclopia pubescens* Eckl. & Zeyh.

Podalyrieae –

Shrub; P; Ht 1–2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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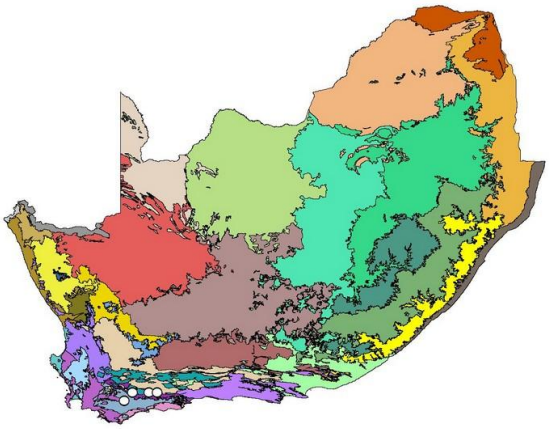
[E]*Cyclopia sessiliflora* Eckl. & Zeyh.

Podalyrieae ①

Shrub; P; Ht 0.15–1; Alt 275–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	<400 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	5.5–7.4; 6.5–7.4 (25)
ESP	Ecotone	
QDGCs	3320 (50)	3321; 3420 (25)

NOTES: **Biocultural:** Beverage (Watt & Breyer-Brandwijk 1962).



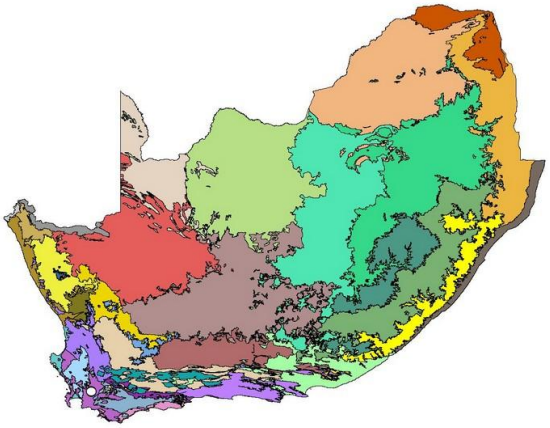
[E]*Cyclopia squamosa* A.L.Schutte

Podalyrieae ①

Shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	3319 (100)	

NOTES: –



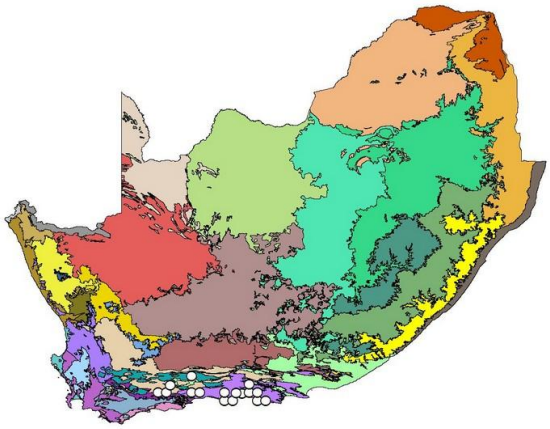
[E]*Cyclopia subternata* Vogel

Podalyrieae ☠ ①

Shrub; P; Ht 0.5–3; Alt 155–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (38)	<400 (25)
Min temp (°C)	2–8 (88)	>6 (12)
Max temp (°C)	<27 (56)	27–35 (25)
Phosphorus (ppm)	5–35 (94)	>20 (6)
pH	<6.4 (69)	6.5–8.4; >7.5 (13)
ESP	Medium (100)	
QDGCs	3323 (31)	3321; 3322; 3423 (19)

NOTES: **Antiquality:** Tannin in plant (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Spriggs & Dakora 2007). **Biocultural:** Beverage (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Moriarty 1997).



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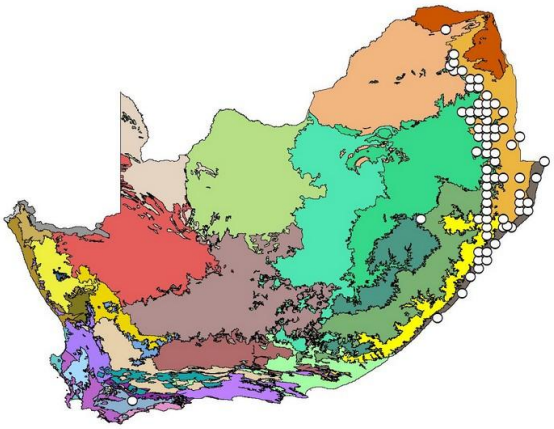
Dalbergia armata E.Mey.

Dalbergieae ①

Shrub, climber; P; Ht 0.7–15; Alt 0–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (54)	Indian Ocean Coastal Belt (42)
Biome	Savanna (58)	Indian Ocean (33)
Rainfall (mm)	>800 (56)	600–1000 (22)
Min temp (°C)	2–8 (54)	>6 (43)
Max temp (°C)	25–29 (54)	27–35 (44)
Phosphorus (ppm)	<10 (84)	5–35 (16)
pH	<6.4 (72)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2531; 2831 (11)	2430; 2530; 2631 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



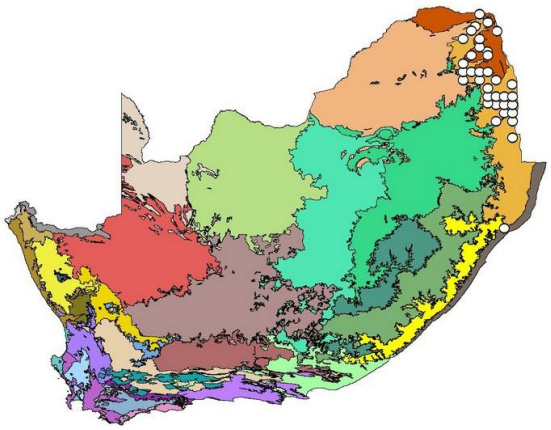
Dalbergia melanoxylon Guill. & Perr.

Dalbergieae ③

Shrub, tree; P; Ht 5–12; Alt 60–1320

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (80)	Mopane (20)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (72)	200–600; 600–1000; >800 (8)
Min temp (°C)	>6 (88)	2–8 (13)
Max temp (°C)	27–35 (88)	25–29 (12)
Phosphorus (ppm)	<10 (56)	5–35 (44)
pH	<6.4; 5.5–7.4; 6.5–7.4 (31)	6.5–8.4 (7)
ESP	Non (100)	
QDGCs	2531 (24)	2431 (21)

NOTES: **Livestock feed** (Le Houérou 1980; Dicko & Sikena 1992). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975); *Rhizobium* isolates (Doignon-Bourcier *et al.* 2000). **Biocultural:** Medicine for humans; timber (Van Wyk *et al.* 2000). **Flowering:** Spring, summer (Van Wyk *et al.* 2000).



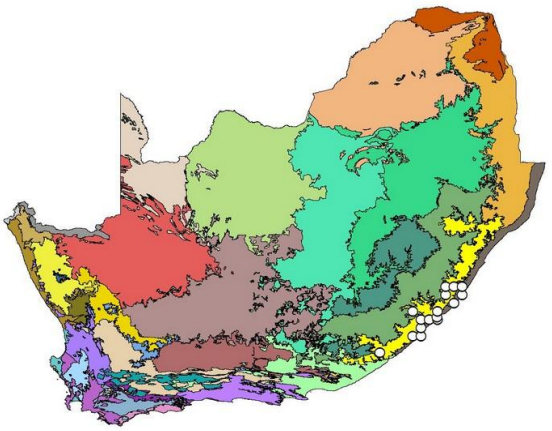
[E]*Dalbergia multijuga* E.Mey.

Dalbergieae ①

Shrub, tree; P; Ht 2–5; Alt 0–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (87)	600–1000 (13)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (53)	<10 (47)
pH	<6.4 (60)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	3129 (38)	3030 (19)

NOTES: –



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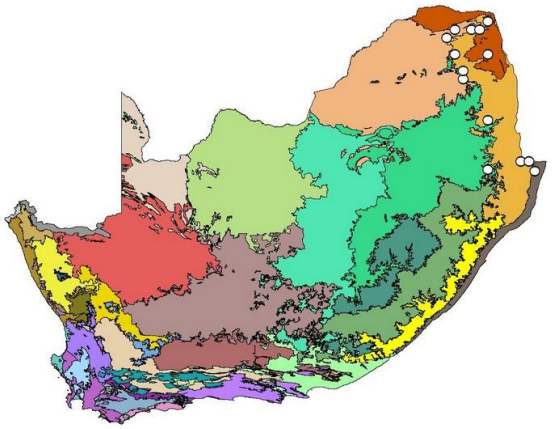
Dalbergia nitidula Baker

Dalbergieae ①

Shrub, tree; P; Ht 0.5–6; Alt 50–1900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Lowveld (33)	Indian Ocean Coastal Belt; Mopane (17)
Biome	Savanna (89)	Indian Ocean (11)
Rainfall (mm)	400–800 (64)	200–600; >800 (14)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (57)	25–29 (43)
Phosphorus (ppm)	5–35 (71)	<10 (29)
pH	5.5–7.4 (50)	6.5–7.4 (29)
ESP	Non (100)	
QDGCs	2230 (21)	2430; 2632 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



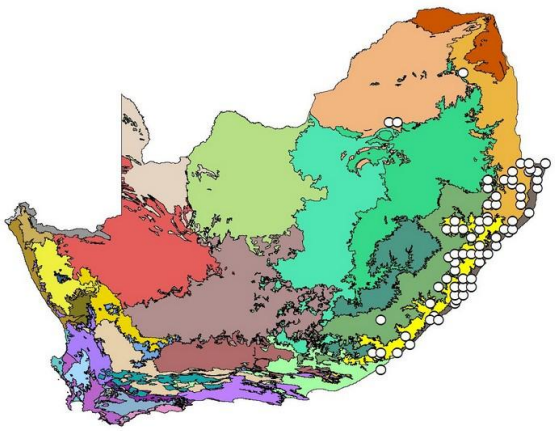
Dalbergia obovata E.Mey.

Dalbergieae ③

Shrub, tree, climber; P; Ht 1.8–8; Alt 0–1750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (44)	Lowveld (28)
Biome	Indian Ocean (43)	Savanna (39)
Rainfall (mm)	>800 (55)	400–800 (29)
Min temp (°C)	>6 (58)	2–8 (35)
Max temp (°C)	25–29 (58)	27–35 (35)
Phosphorus (ppm)	<10 (71)	5–35 (29)
pH	<6.4 (63)	5.5–7.4 (34)
ESP	Non (100)	
QDGCs	2930; 3030 (12)	2732; 2831 (10)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Magical (Hutchings *et al.* 1996); Medicine for humans (Watt & Breyer-Brandwijk 1962).



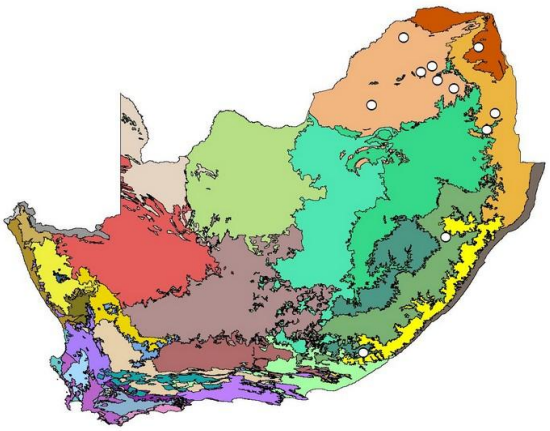
[E]*Decorsea galpinii* (Burtt Davy) Verdc.

Phaseoleae ①

Climber; P; Ht ?; Alt ?–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (72)	Lowveld; Mopane (14)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (55)	600–1000 (27)
Min temp (°C)	2–8 (73)	>6 (18)
Max temp (°C)	25–29 (55)	27–35 (45)
Phosphorus (ppm)	<10 (55)	5–35 (45)
pH	<6.4; 5.5–7.4 (36)	6.5–7.4; 6.5–8.4; >7.5 (9)
ESP	Non (100)	
QDGCs	2429; 2531 (18)	2328; 2329; 2330; 2430; 2527; 2929; 3227 (9)

NOTES: –



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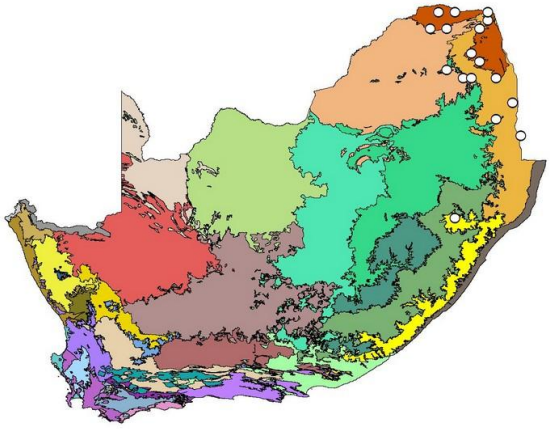
***Decorsea schlechteri* (Harms) Verdc.** **Phaseoleae** ①

Herb, climber; P; Ht 1–3; Alt 167–1524

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (60)	Lowveld (40)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (47)	200–600 (24)
Min temp (°C)	>6 (59)	2–8 (41)
Max temp (°C)	27–35 (65)	25–29 (29)
Phosphorus (ppm)	5–35 (65)	<10 (35)
pH	5.5–7.4 (41)	6.5–7.4 (29)
ESP	Non (100)	
QDGCs	2229 (17)	2230; 2231; 2330; 2430; 2531 (12)

NOTES: –

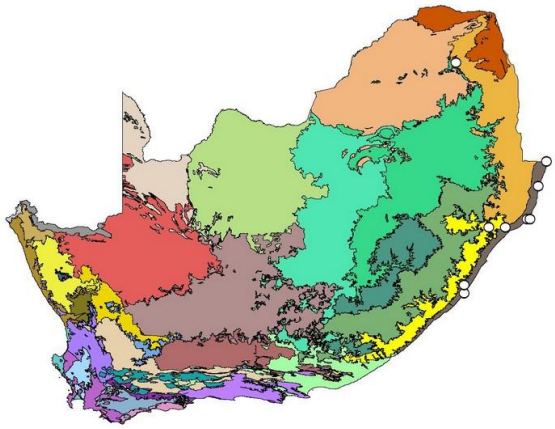


***Desmodium adscendens* (Sw.) DC. var. *robustum* B.G.Schub.** **Desmodieae** ②

Herb; P; Ht 0.01–0.3; Alt 3–30

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (75)	Savanna (25)
Rainfall (mm)	>800 (63)	400–800 (25)
Min temp (°C)	>6 (88)	2–8 (12)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (63)	5.5–7.4 (37)
ESP	Non (100)	
QDGCs	2831; 2832; 3030 (22)	2330; 2632; 2732 (11)

NOTES: **Livestock feed** (Morris 1997).

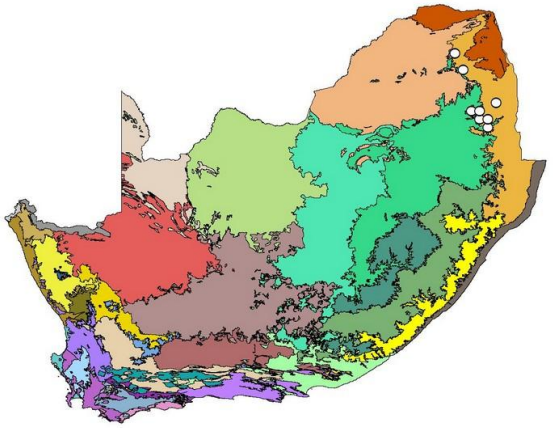


***Desmodium barbatum* (L.) Benth. var. *dimorphum* (Welw. ex Baker) B.G.Schub.** **Desmodieae** ②

Dwarf shrub, shrub; P; Ht 0.45–1; Alt 610–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	>800 (63)	400–800 (25)
Min temp (°C)	2–8 (88)	>6 (12)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	<10 (88)	5–35 (12)
pH	<6.4 (88)	5.5–7.4 (12)
ESP	Non (100)	
QDGCs	2530; 2531 (38)	2330; 2430 (12)

NOTES: **Livestock feed** (Morris 1997). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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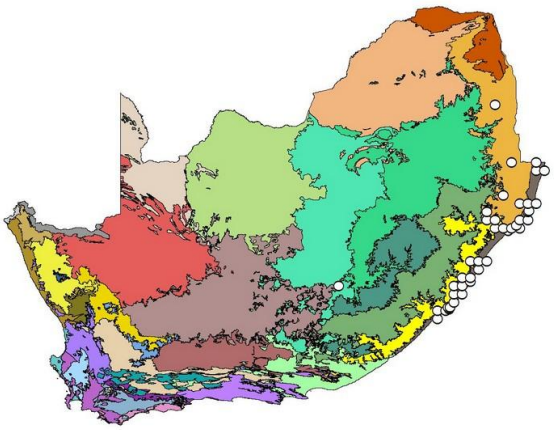
Desmodium dregeanum Benth.

Desmodieae ①

Dwarf shrub, herb; P; Ht 0.25–1.2; Alt 5–1575

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (72)	Lowveld (28)
Biome	Indian Ocean (73)	Savanna (27)
Rainfall (mm)	>800 (75)	400–800 (17)
Min temp (°C)	>6 (83)	2–8 (14)
Max temp (°C)	25–29 (56)	27–35 (44)
Phosphorus (ppm)	<10 (72)	5–35 (28)
pH	<6.4 (69)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2832 (21)	3030 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** All seasons (Pooley 1998).



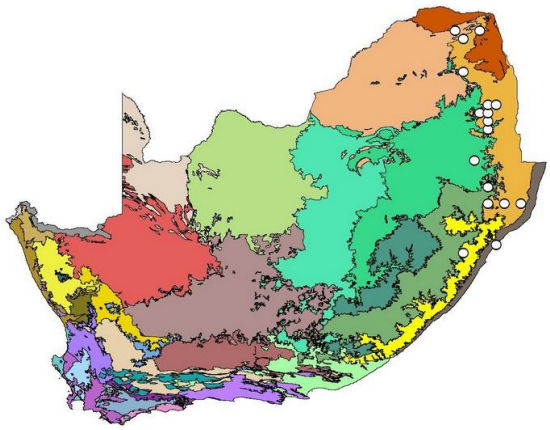
Desmodium gangeticum (L.) DC.

Desmodieae ①

Dwarf shrub, herb; P; Ht 0.3–0.5; Alt 60–760

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (63)	Indian Ocean Coastal Belt; Mesic Highveld Grassland; Central Bushveld (13)
Biome	Savanna (80)	Grassland; Indian Ocean (10)
Rainfall (mm)	>800 (41)	400–800 (35)
Min temp (°C)	2–8 (59)	>6 (35)
Max temp (°C)	25–29 (53)	27–35 (47)
Phosphorus (ppm)	<10 (76)	5–35 (24)
pH	<6.4 (71)	5.5–7.4 (24)
ESP	Non (100)	
QDGCs	2531 (30)	2230; 2831 (12)

NOTES: **Antiquality:** Alkaloid in root and seed (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



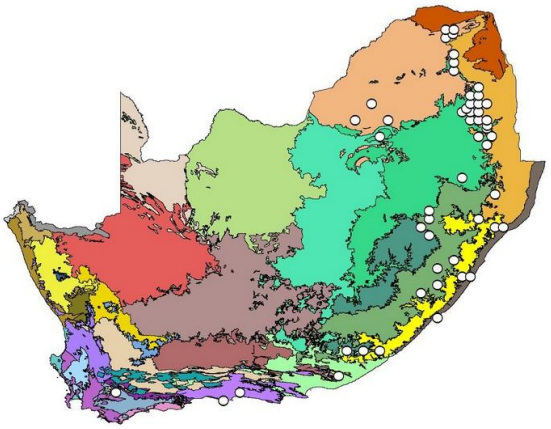
Desmodium repandum (Vahl) DC.

Desmodieae ①

Herb, shrub; P; Ht 0.3–3; Alt 15–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (36)	Mesic Highveld Grassland (21)
Biome	Savanna (50)	Grassland (43)
Rainfall (mm)	>800 (58)	600–1000 (22)
Min temp (°C)	2–8 (66)	0–4 (22)
Max temp (°C)	25–29 (76)	<27; 27–35 (12)
Phosphorus (ppm)	<10 (68)	5–35 (32)
pH	<6.4 (80)	5.5–7.4 (16)
ESP	Non (86)	Medium (14)
QDGCs	2530 (15)	2430; 2531 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Summer, autumn, winter (Pooley 1998).



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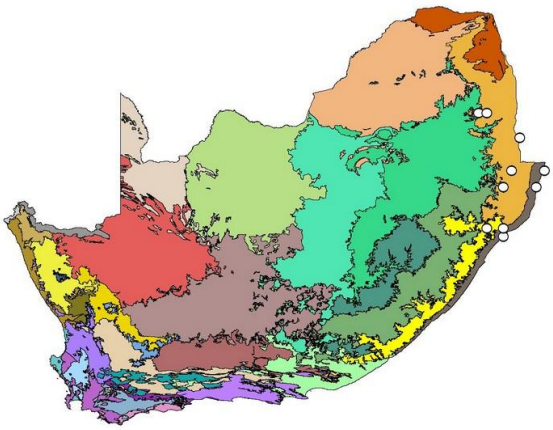
Desmodium salicifolium (Poir.) DC. var. *salicifolium*

Desmodieae ③

Dwarf shrub, shrub, herb; P; Ht 1.2–2.5; Alt 30–640

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Lowveld (50)	
Biome	Indian Ocean; Savanna (50)	
Rainfall (mm)	>800 (50)	400–800 (40)
Min temp (°C)	>6 (70)	2–8 (30)
Max temp (°C)	27–35 (70)	25–29 (30)
Phosphorus (ppm)	<10 (90)	5–35 (10)
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	2731; 2732; 2831 (20)	2530; 2531; 2632; 2931 (10)

NOTES: **Livestock feed** (Morris 1997). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer, autumn (Pooley 1998).



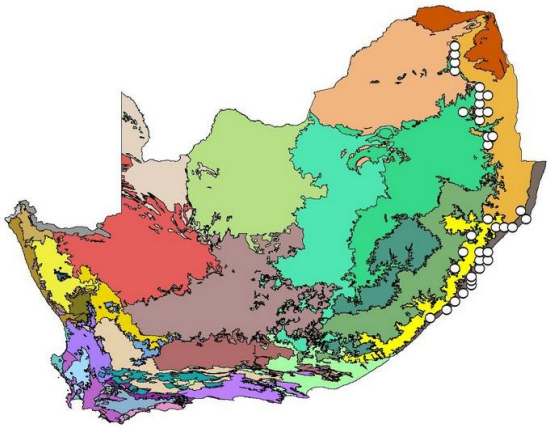
Desmodium setigerum (E.Mey.) Benth. ex Harv.

Desmodieae ③

Herb, climber; P; Ht 0.15–1.5; Alt 5–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (70)	Lowveld (20)
Biome	Indian Ocean (67)	Savanna (33)
Rainfall (mm)	>800 (80)	600–1000 (17)
Min temp (°C)	2–8; >6 (49)	0–4 (2)
Max temp (°C)	25–29 (66)	27–35 (29)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (86)	5.5–7.4 (14)
ESP	Non (100)	
QDGCs	3030 (17)	2530; 2831; 2930 (11)

NOTES: **Cultivated** (Glen 2002). **Soil conservation:** Cover crop (Morris 1997). **Flowering:** Spring, summer, autumn (Pooley 1998).



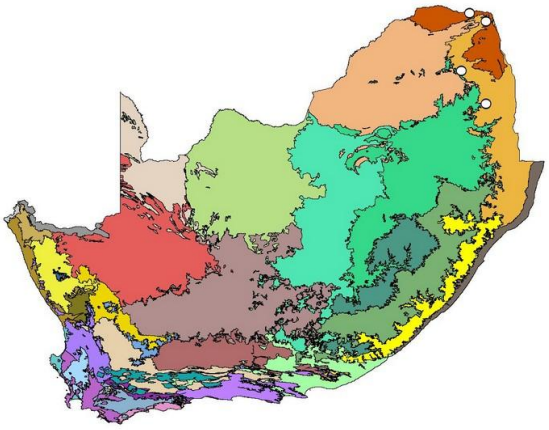
Desmodium velutinum (Willd.) DC.

Desmodieae ②

Dwarf shrub, herb; P; Ht 1–3; Alt 520–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld; Mopane (50)	
Biome	Savanna (100)	
Rainfall (mm)	<400; 200–600; 400–800; >800 (25)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	<6.4 (50)	6.5–7.4; 6.5–8.4 (25)
ESP	Non (100)	
QDGCs	2230; 2231; 2430; 2531 (25)	

NOTES: **Livestock feed** (Cook *et al.* 2005). **CP:** 17–26% (Schultze-Kraft *et al.* 2005). **Soil conservation:** Cover crop (Morris 1997).



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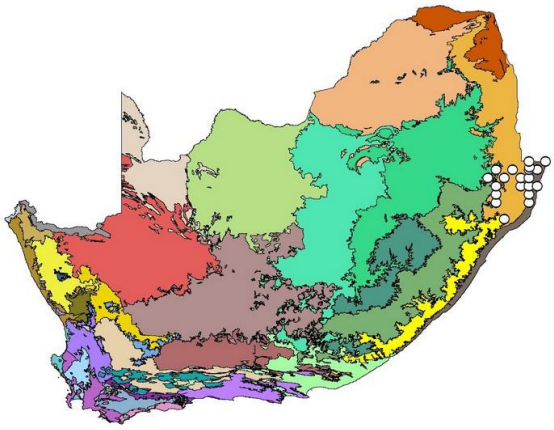
Dialium schlechteri Harms

Cassieae ①

Tree; P; Ht 0.7–16; Alt 0–150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (57)	Indian Ocean Coastal Belt (43)
Biome	Savanna (75)	Indian Ocean (25)
Rainfall (mm)	400–800 (74)	>800 (21)
Min temp (°C)	>6 (74)	2–8 (26)
Max temp (°C)	27–35 (79)	25–29 (21)
Phosphorus (ppm)	<10 (79)	5–35 (21)
pH	5.5–7.4 (53)	<6.4 (37)
ESP	Non (100)	
QDGCs	2732 (45)	2731 (30)

NOTES: **Biocultural:** Medicine for humans (Hutchings *et al.* 1996).



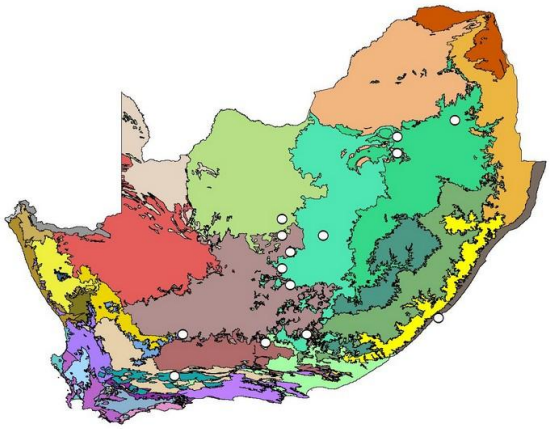
[E]*Dichilus gracilis* Eckl. & Zeyh.

Genisteae ②

Dwarf shrub, herb; P; Ht 0.3–1; Alt 762–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Dry Highveld Grassland; Mesic Highveld Grassland; Eastern Kalahari Bushveld (25)	
Biome	Grassland (60)	Indian Ocean; Savanna (20)
Rainfall (mm)	<400 (50)	400–800 (29)
Min temp (°C)	<2 (50)	0–4 (29)
Max temp (°C)	27–35 (71)	25–29 (21)
Phosphorus (ppm)	<10 (43)	5–35 (36)
pH	<6.4; 6.5–8.4; >7.5 (29)	6.5–7.4 (13)
ESP	Non (100)	
QDGCs	2628 (16)	2530; 2824; 2924; 2925; 2926; 3024; 3025; 3129; 3221; 3224; 3225; 3321 (7)

NOTES: **Livestock feed** (Shearing & Van Heerden 1997). **Antiquality:** Toxic to small stock (Watt & Breyer-Brandwijk 1962).



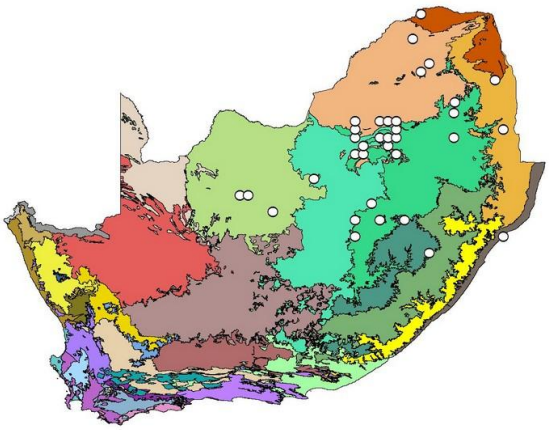
Dichilus lebeckioides DC.

Genisteae ①

Dwarf shrub, herb; P; Ht 0.3–1.5; Alt 305–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (38)	Mesic Highveld Grassland (25)
Biome	Savanna (50)	Grassland (45)
Rainfall (mm)	400–800 (71)	<400 (11)
Min temp (°C)	<2 (40)	0–4 (29)
Max temp (°C)	27–35 (54)	25–29 (31)
Phosphorus (ppm)	<10 (89)	5–35 (11)
pH	<6.4 (66)	6.5–7.4 (17)
ESP	Non (100)	
QDGCs	2627 (14)	2628 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Summer (Germishuizen & Clark 2003).



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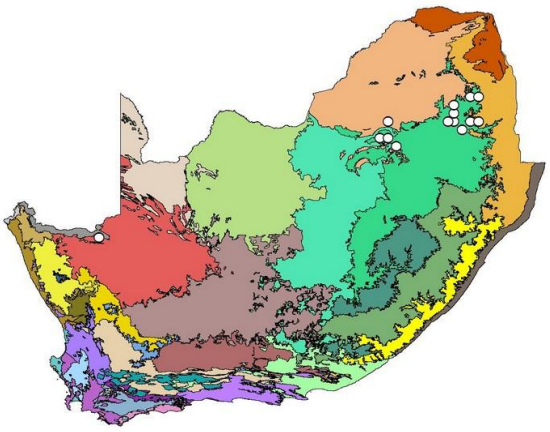
[E]*Dichilus pilosus Conrath* ex Schinz

Genisteae ③

Dwarf shrub, herb; P; Ht 0.2–1; Alt 1281–2255

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (80)	Central Bushveld (20)
Biome	Grassland (100)	
Rainfall (mm)	400–800 (43)	>800 (29)
Min temp (°C)	0–4; 2–8 (43)	<2 (14)
Max temp (°C)	25–29 (57)	<27 (29)
Phosphorus (ppm)	<10 (93)	>20 (7)
pH	<6.4 (86)	5.5–7.4; >7.5 (7)
ESP	Non (100)	
QDGCs	2530 (43)	2430; 2628 (14)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



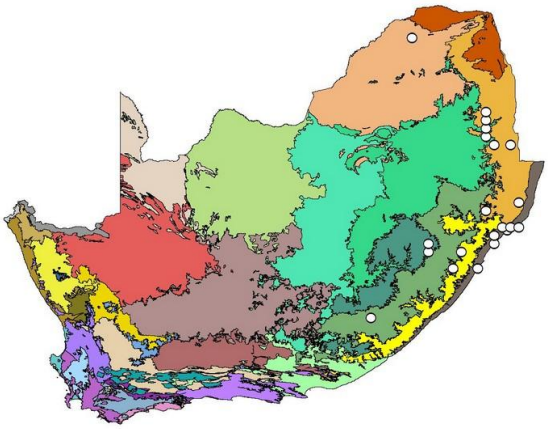
Dichilus reflexus (N.E.Br.) A.L.Schutte

Genisteae ①

Dwarf shrub, herb; P; Ht 0.2–1; Alt 5–2715

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Lowveld (36)	Drakensberg Grassland; Sub-Escarpment Grassland; Central Bushveld (9)
Biome	Savanna (40)	Grassland; Indian Ocean (30)
Rainfall (mm)	>800 (75)	600–1000 (20)
Min temp (°C)	2–8 (45)	>6 (40)
Max temp (°C)	25–29 (60)	27–35 (30)
Phosphorus (ppm)	<10 (90)	5–35 (10)
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	2831 (19)	2531; 2631 (14)

NOTES: **Flowering:** Summer (Pooley 2003).



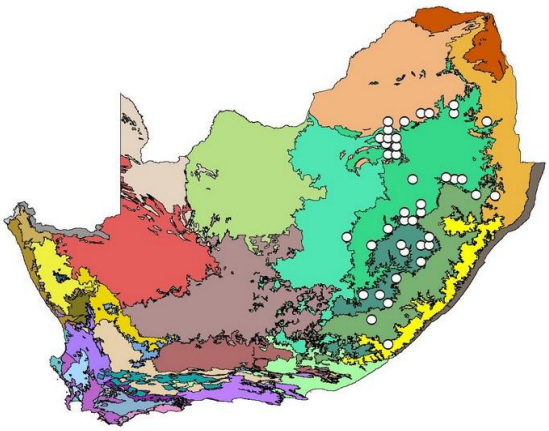
Dichilus strictus E.Mey.

Genisteae ①

Dwarf shrub, shrub, herb; P; Ht 0.5–2; Alt 655–2590

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (38)	Drakensberg Grassland (31)
Biome	Grassland (96)	Savanna (4)
Rainfall (mm)	400–800 (44)	600–1000; >800 (27)
Min temp (°C)	<2 (46)	0–4 (32)
Max temp (°C)	25–29 (46)	<27 (44)
Phosphorus (ppm)	<10 (98)	5–35 (2)
pH	<6.4 (85)	5.5–7.4 (15)
ESP	Non (100)	
QDGCs	2628 (14)	2730; 2828; 2929 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for humans (Letsela *et al.* 2003).



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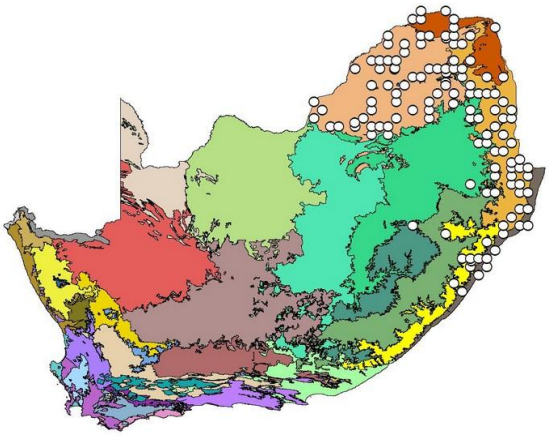
Dichrostachys cinerea (L.) Wight & Arn. subsp. *africana* Brenan & Brummitt var. *africana*

Mimoseae

Shrub, tree; P; Ht 1–15; Alt 0–1550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (51)	Lowveld (30)
Biome	Savanna (91)	Indian Ocean (60)
Rainfall (mm)	400–800 (54)	>800 (23)
Min temp (°C)	2–8 (51)	>6 (39)
Max temp (°C)	27–35 (66)	25–29 (33)
Phosphorus (ppm)	<10 (71)	5–35 (29)
pH	<6.4 (45)	5.5–7.4 (34)
ESP	Non (100)	
QDGCs	2328 (9)	2229; 2531; 2631 (5)



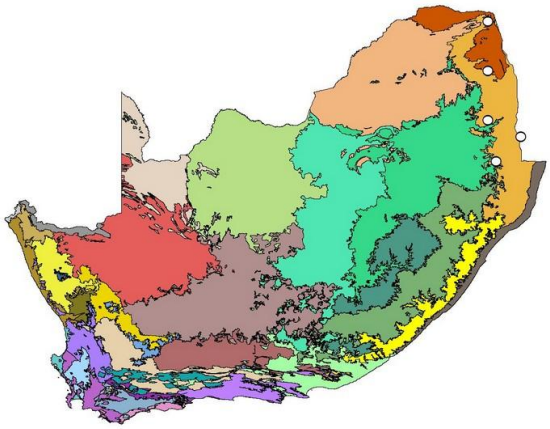
NOTES: **Livestock feed:** Low value (Smith 1992); (Le Houérou 1980; Lewis *et al.* 2005). **CP:** Pods 20% (Smith *et al.* 2005). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Alkaloids and saponin in leaves and roots (Hutchings *et al.* 1996); Tested negatively for hydrocyanic acid (Watt & Breyer-Brandwijk 1962). **Biocultural:** Fibre; fuel; gum; magical; medicine for humans and livestock; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Van Wyk *et al.* 2000).

Dichrostachys cinerea (L.) Wight & Arn. subsp. *africana* Brenan & Brummitt var. *pubescens* Brenan & Brummitt

Mimoseae

Shrub, tree; P; Ht 1.5–3; Alt 150–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	600–1000 (40)	200–600; 400–800; >800 (20)
Min temp (°C)	>6 (60)	2–8 (40)
Max temp (°C)	27–35 (60)	25–29 (40)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4; 5.5–7.4 (40)	6.5–7.4 (20)
ESP	Non (100)	
QDGCs	2231; 2431; 2531; 2631; 2632 (20)	



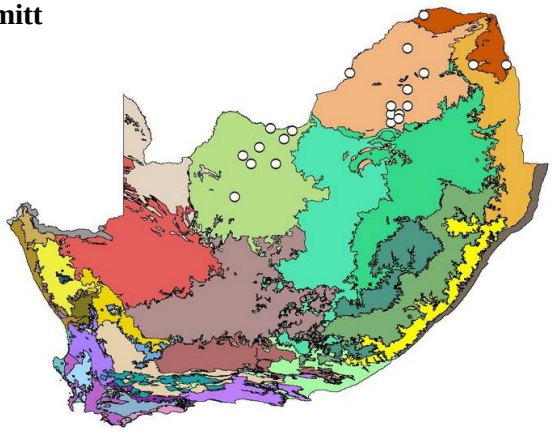
NOTES: **Livestock feed:** Low value (Smith 1992); (Le Houérou 1980; Lewis *et al.* 2005). **CP:** Pods 20% (Smith *et al.* 2005). **Antiquality:** Tested negatively for hydrocyanic acid (Watt & Breyer-Brandwijk 1962). **Biocultural:** Fibre; fuel; gum; magical; medicine for humans and livestock; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Van Wyk *et al.* 2000).

Dichrostachys cinerea (L.) Wight & Arn. subsp. *africana* Brenan & Brummitt var. *setulosa* (Welw. ex Oliv.) Brenan & Brummitt

Mimoseae

Shrub, tree; P; Ht 0.6–4.5; Alt 400–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Eastern Kalahari Bushveld (47)	Mopane (6)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (55)	200–600 (25)
Min temp (°C)	2–8 (45)	<2 (30)
Max temp (°C)	27–35 (60)	>33 (30)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	5.5–7.4 (45)	6.5–7.4 (25)
ESP	Non (100)	
QDGCs	2528 (25)	2624 (15)



NOTES: **Livestock feed:** Low value (Smith 1992); (Le Houérou 1980; Lewis *et al.* 2005). **CP:** Pods 20% (Smith *et al.* 2005). **Antiquality:** Tested negatively for hydrocyanic acid (Watt & Breyer-Brandwijk 1962). **Biocultural:** Fibre; fuel; gum; magical; medicine for humans and livestock; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Van Wyk *et al.* 2000).

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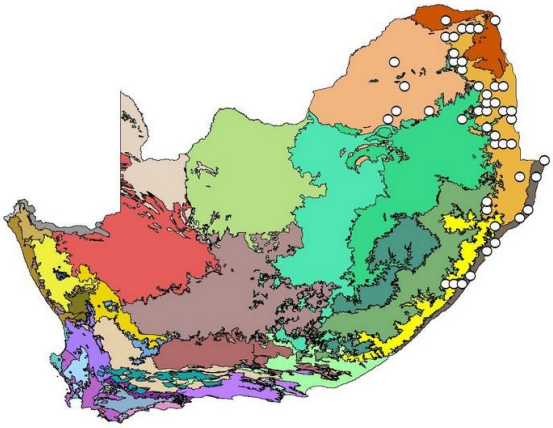
Dichrostachys cinerea (L.) Wight & Arn. subsp. *nyassana* (Taub.) Brenan — Mimoseae

Shrub, tree; P; Ht 0.5–6; Alt 0–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (52)	Central Bushveld (92)
Biome	Savanna (86)	Indian Ocean (14)
Rainfall (mm)	400–800 (38)	>800 (36)
Min temp (°C)	>6 (53)	2–8 (45)
Max temp (°C)	27–35 (60)	25–29 (38)
Phosphorus (ppm)	<10 (70)	5–35 (30)
pH	<6.4 (62)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	2531 (15)	2631 (9)

NOTES: **Livestock feed:** Low value (Smith 1992); (Le Houérou 1980; Lewis *et al.* 2005). **CP:** Pods 20% (Smith *et al.* 2005). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Hydrocyanic acid in mature pods (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Van Wyk *et al.* 2000).

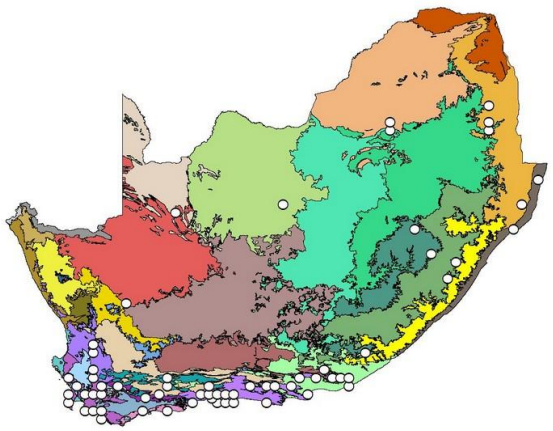


Dipogon lignosus (L.) Verdc. — Phaseoleae

Herb, climber; P; Ht 0.01–3.65; Alt 5–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (37)	Indian Ocean Coastal Belt; Southwest Fynbos; Lowveld (11)
Biome	Fynbos (76)	Savanna (10)
Rainfall (mm)	200–600; 400–800 (27)	600–1000 (19)
Min temp (°C)	2–8 (60)	>6 (22)
Max temp (°C)	25–29 (65)	27–35 (17)
Phosphorus (ppm)	5–35 (73)	<10 (24)
pH	<6.4 (52)	5.5–7.4 (24)
ESP	Non (63)	Medium (37)
QDGCs	3319 (9)	3322; 3326 (8)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Soil conservation:** Green manure; cover crop (Lewis *et al.* 2005). **Flowering:** All seasons (Manning 2003).

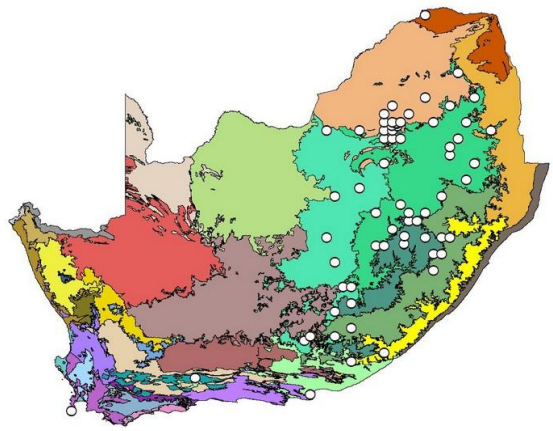


Dolichos angustifolius Eckl. & Zeyh. — Phaseoleae

Herb; P; Ht 0.15–0.5; Alt 1220–2030

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (33)	Central Bushveld (26)
Biome	Grassland (82)	Savanna (16)
Rainfall (mm)	400–800 (56)	600–1000 (21)
Min temp (°C)	<2 (45)	0–4; 2–8 (26)
Max temp (°C)	27–35 (37)	25–29 (32)
Phosphorus (ppm)	<10 (76)	5–35 (23)
pH	<6.4 (65)	5.5–7.4 (13)
ESP	Non (100)	
QDGCs	2528 (15)	2828; 2929 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Germishuizen & Clark 2003).



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***Dolichos angustissimus* E.Mey.** **Phaseoleae** –

Herb; P; Ht 0.01–0.5; Alt 1220–1936

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

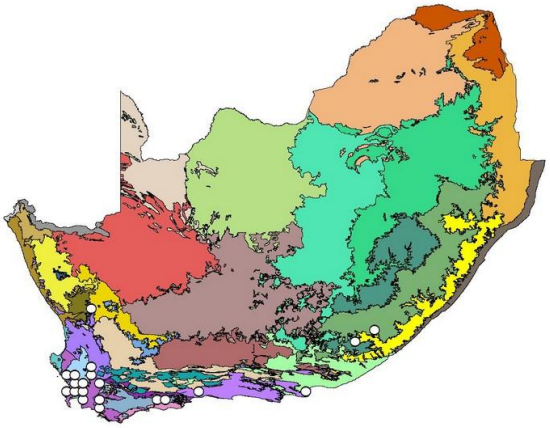
NOTES: –

[E]***Dolichos decumbens* Thunb.** **Phaseoleae** ①

Herb, climber; P; Ht 0.2–2; Alt 15–1380

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (40)	400–800 (30)
Min temp (°C)	2–8 (55)	>6 (25)
Max temp (°C)	25–29 (95)	27–35 (5)
Phosphorus (ppm)	5–35 (90)	<10; >20 (5)
pH	<6.4 (65)	5.5–7.4 (25)
ESP	Ecotone	
QDGCs	3318 (35)	3319 (15)

NOTES: **Flowering:** Winter, spring (Manning & Goldblatt 2002).

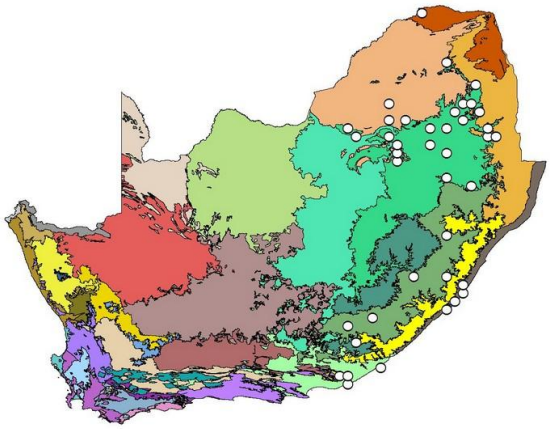


***Dolichos falciformis* E.Mey.** **Phaseoleae** ①

Herb; P; Ht 0.06–1.2; Alt 60–2135

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (47)	Albany Thicket; Indian Ocean Coastal Belt; Sub-Escarpment Grassland; Central Bushveld (12)
Biome	Grassland (64)	Albany Thicket; Indian Ocean; Savanna (12)
Rainfall (mm)	400–800 (51)	>800 (32)
Min temp (°C)	0–4; 2–8 (32)	<2 (20)
Max temp (°C)	25–29 (63)	<27 (22)
Phosphorus (ppm)	<10 (76)	5–35 (24)
pH	<6.4 (78)	5.5–7.4 (12)
ESP	Non (100)	
QDGCs	2530 (12)	2628 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans (Mintsa Mi Nzue 2009).



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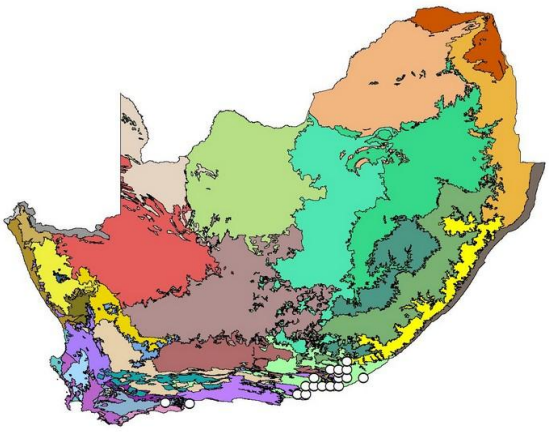
[E]*Dolichos hastaeformis* E.Mey.

Phaseoleae ①

Herb; P; Ht 0.3–0.5; Alt 30–702

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (100)	
Biome	Albany Thicket (71)	Fynbos (29)
Rainfall (mm)	400–800 (76)	200–600 (24)
Min temp (°C)	2–8 (53)	>6 (47)
Max temp (°C)	25–29 (76)	27–35 (18)
Phosphorus (ppm)	5–35 (94)	<10 (6)
pH	5.5–7.4; 6.5–8.4 (41)	6.5–7.4 (12)
ESP	Non (100)	
QDGCs	3326 (50)	3325 (28)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer, autumn (Manning 2001).



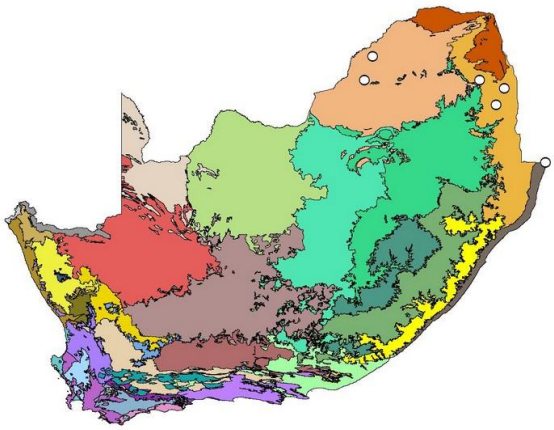
Dolichos junodii (Harms) Verdc.

Phaseoleae ①

Herb; P; Ht ?; Alt 900–1524

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (50)	Central Bushveld (33)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4; 5.5–7.4 (33)	6.5–7.4; 6.5–8.4 (17)
ESP	Non (100)	
QDGCs	2327; 2427; 2430; 2431; 2531; 2632 (17)	

NOTES: –



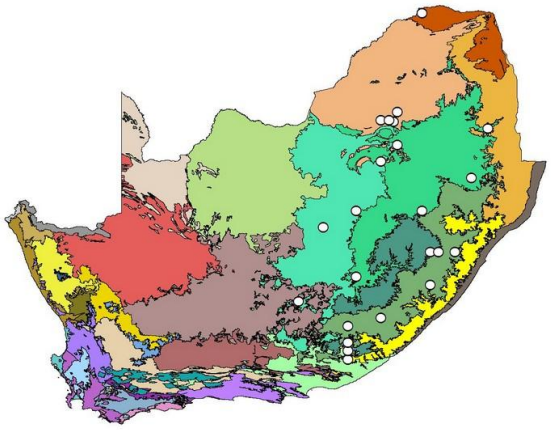
Dolichos linearis E.Mey.

Phaseoleae ①

Herb, climber; P; Ht 0.01–0.5; Alt 152–1921

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland; Central Bushveld (36)	Dry Highveld Grassland; Mesic Highveld Grassland; Mopane (9)
Biome	Grassland (77)	Savanna (23)
Rainfall (mm)	400–800 (57)	>800 (22)
Min temp (°C)	2–8 (43)	<2 (35)
Max temp (°C)	27–35 (43)	25–29 (35)
Phosphorus (ppm)	<10 (70)	5–35 (30)
pH	<6.4 (52)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2528 (17)	3226 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



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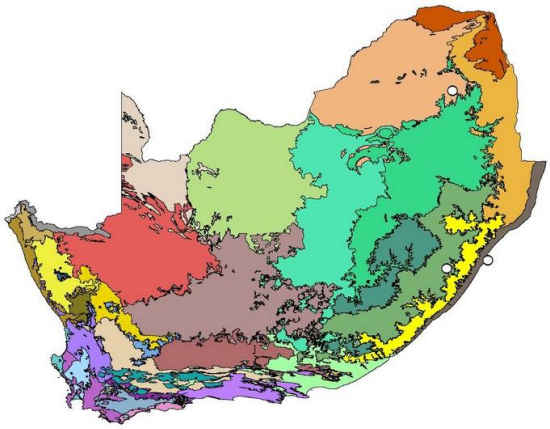
[E]*Dolichos peglerae* L.Bolus

Phaseoleae ①

Herb, climber; P; Ht ?; Alt 40–1464

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Central Bushveld (50)	
Biome	Grassland; Indian Ocean; Savanna (33)	
Rainfall (mm)	>800 (67)	400–800 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (67)	>7.5 (33)
ESP	Non (100)	
QDGCs	2430; 2931; 3029 (33)	

NOTES: –



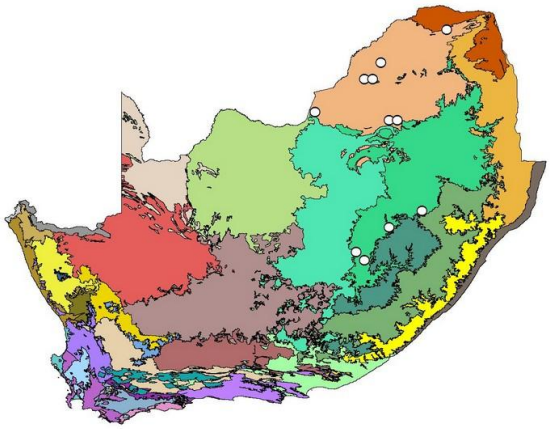
Dolichos pratensis (E.Mey.) Taub.

Phaseoleae ①

Herb, climber; P; Ht 0.3–1.5; Alt 1030–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (80)	Mesic Highveld Grassland (20)
Biome	Grassland (57)	Savanna (43)
Rainfall (mm)	400–800 (73)	200–600; 600–1000; >800 (9)
Min temp (°C)	2–8 (55)	<2 (36)
Max temp (°C)	27–35 (45)	<27; 25–29 (27)
Phosphorus (ppm)	<10 (64)	5–35 (36)
pH	<6.4 (73)	6.5–8.4 (18)
ESP	Non (100)	
QDGCs	2427; 2528; 2927 (18)	2229; 2327; 2525; 2828; 2829 (9)

NOTES: **Biocultural:** Fuel, medicine for humans (Letsela *et al.* 2003).



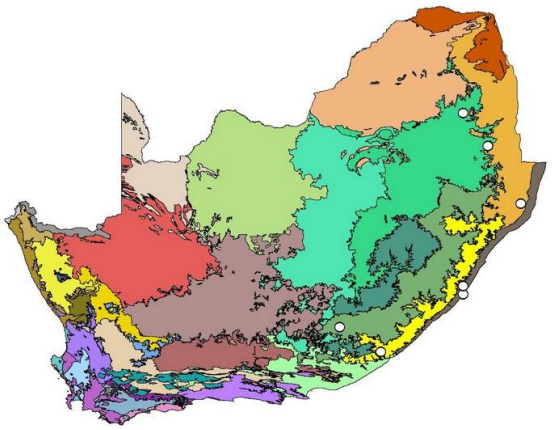
Dolichos sericeus E.Mey. subsp. *sericeus*

Phaseoleae ①

Herb, climber; P; Ht 0.01–1.2; Alt 5–1891

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Mesic Highveld Grassland; Sub-Escarpment Grassland; Lowveld (25)	
Biome	Grassland; Indian Ocean; Savanna (33)	
Rainfall (mm)	600–1000; >800 (43)	200–600 (14)
Min temp (°C)	2–8; >6 (43)	0–4 (14)
Max temp (°C)	25–29 (72)	<27; 27–35 (14)
Phosphorus (ppm)	5–35 (57)	<10 (43)
pH	<6.4 (71)	5.5–7.4; >7.5 (14)
ESP	Non (100)	
QDGCs	3030 (30)	2530; 2631; 2832; 3126; 3227 (14)

NOTES: –



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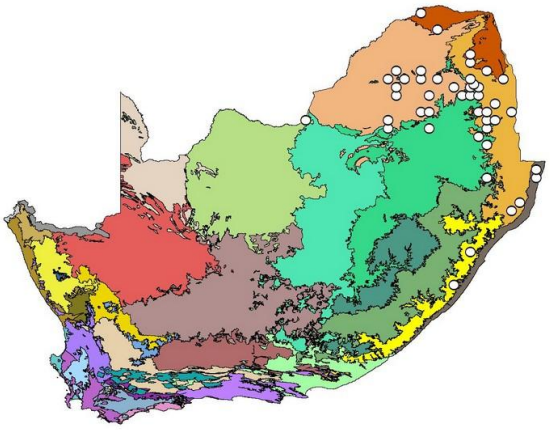
Dolichos trilobus L. subsp. *transvaalicus* Verdc.

Phaseoleae ①

Herb, climber; P; Ht 0.01–0.6; Alt 320–1850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (50)	Lowveld (23)
Biome	Savanna (87)	Indian Ocean (9)
Rainfall (mm)	400–800 (64)	>800 (27)
Min temp (°C)	2–8 (66)	>6 (30)
Max temp (°C)	25–29 (55)	27–35 (45)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	5.5–7.4 (48)	<6.4 (36)
ESP	Non (100)	
QDGCs	2430 (17)	2531 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



Dolichos trilobus L. subsp. *trilobus* var. *trilobus*

Phaseoleae –

Herb, climber; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

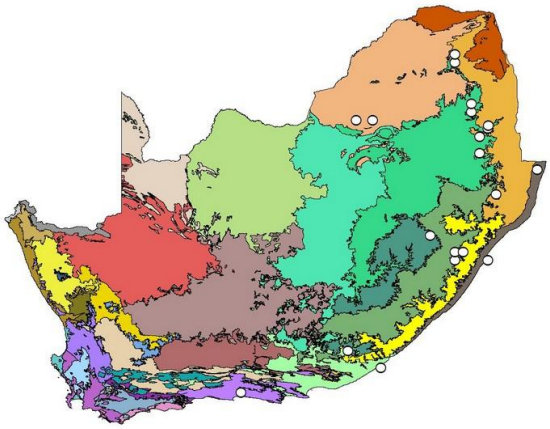
Dumasia villosa DC. var. *villosa*

Phaseoleae ①

Herb, climber; P; Ht 1.5–3; Alt 55–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Central Bushveld (24)	Albany Thicket; Eastern Fynbos-Renosterveld; Mesic Highveld Grassland; Sub-Escarpment Grassland (13)
Biome	Grassland; Indian Ocean; Savanna (29)	Albany Thicket (13)
Rainfall (mm)	>800 (58)	400–800 (26)
Min temp (°C)	2–8 (58)	0–4 (26)
Max temp (°C)	25–29 (53)	27–35 (32)
Phosphorus (ppm)	<10 (74)	5–35 (26)
pH	<6.4 (79)	5.5–7.4 (21)
ESP	Non (88)	Medium (13)
QDGCs	2930 (15)	2330; 2527; 2530; 2531; 2630 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer (Pooley 1998).



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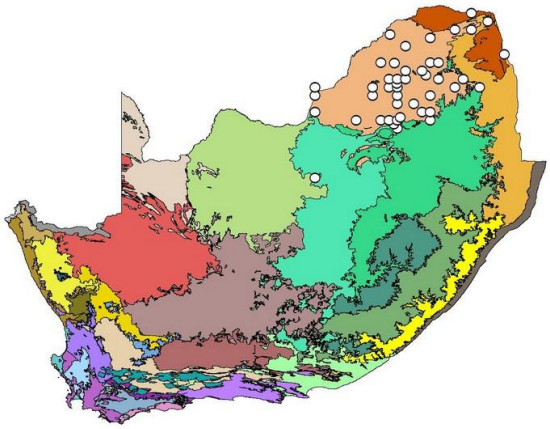
Elephantorrhiza burkei Benth.

Mimoseae ☠①

Shrub, tree; P; Ht 0.3–10; Alt 350–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (97)	Mopane (3)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (83)	200–600 (12)
Min temp (°C)	2–8 (80)	>6 (10)
Max temp (°C)	27–35 (54)	25–29 (46)
Phosphorus (ppm)	<10 (63)	5–35 (37)
pH	<6.4 (44)	5.5–7.4 (37)
ESP	Non (100)	
QDGCs	2428; 2528 (16)	2230; 2328; 2329; 2429; 2430; 2529 (7)

NOTES: **Antiquality:** Tannin in root (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Van Wyk & Malan 1998).



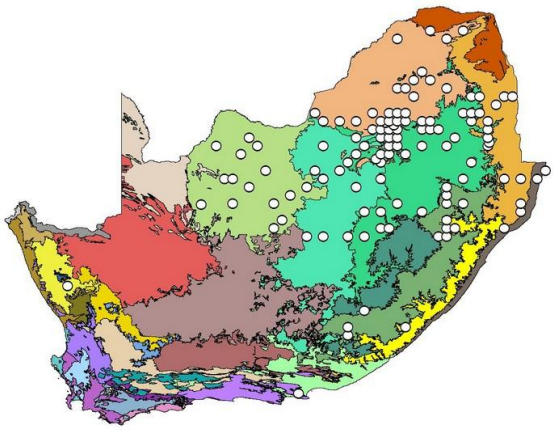
Elephantorrhiza elephantina (Burch.) Skeels

Mimoseae ☠②

Dwarf shrub, shrub; P; Ht 0.2–2; Alt 250–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (28)	Eastern Kalahari Bushveld (25)
Biome	Savanna (51)	Grassland (44)
Rainfall (mm)	400–800 (64)	600–1000 (13)
Min temp (°C)	<2 (35)	0–4 (31)
Max temp (°C)	27–35 (46)	25–29 (42)
Phosphorus (ppm)	<10 (88)	5–35 (11)
pH	<6.4 (50)	5.5–7.4 (28)
ESP	Non (98)	Medium (2)
QDGCs	2528 (8)	2627 (6)

NOTES: **Livestock feed** (Pooley 1998). **Antiquality:** Unpalatable (Van Rooyen 2001); Tannin in root and bark; seed a mouth irritant (Steyn 1934); Seed toxic (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Magical (Hutchings *et al.* 1996); Beverage; dye; medicine for humans and livestock (Steyn 1934; Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Pooley 1998).



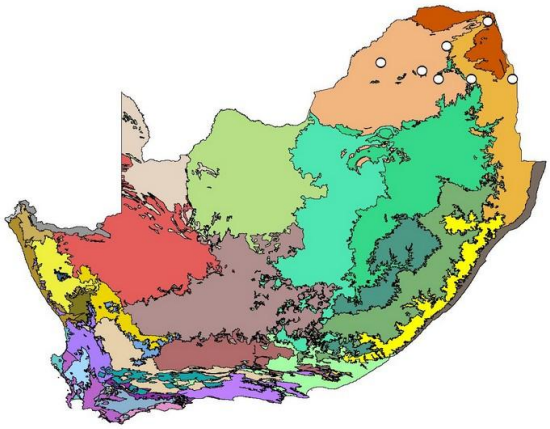
Elephantorrhiza goetzei (Harms) Harms subsp. *goetzei*

Mimoseae ①

Shrub, tree; P; Ht 0.5–7; Alt 200–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (67)	Lowveld (33)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (86)	200–600 (14)
Min temp (°C)	2–8 (71)	>6 (29)
Max temp (°C)	27–35 (57)	25–29 (43)
Phosphorus (ppm)	5–35 (71)	<10 (29)
pH	5.5–7.4; 6.5–7.4 (43)	<6.4 (14)
ESP	Non (100)	
QDGCs	2429 (30)	2231; 2327; 2329; 2430; 2431 (14)

NOTES: –



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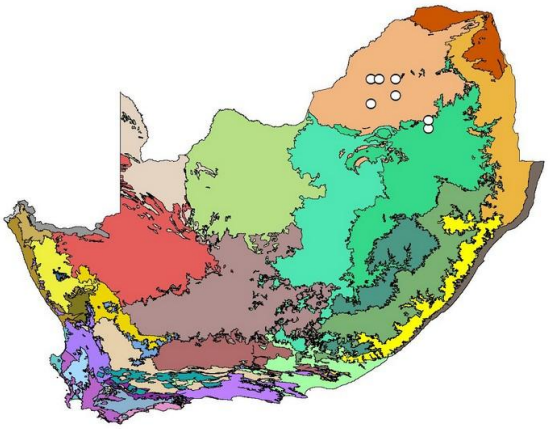
[E]*Elephantorrhiza obliqua* Burtt Davy var. *glabra* E.Phillips **Mimoseae** ①

Dwarf shrub; P; Ht 0.2–0.3; Alt 1000–1580

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (67)	Mesic Highveld Grassland (33)
Biome	Savanna (67)	Grassland (33)
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (86)	0–4 (14)
Max temp (°C)	25–29 (71)	27–35 (29)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4 (57)	5.5–7.4 (43)
ESP	Non (100)	
QDGCs	2427; 2428; 2529 (29)	2527 (13)

NOTES: –



[E]*Elephantorrhiza obliqua* Burtt Davy var. *obliqua* **Mimoseae** –

Dwarf shrub; P; Ht 0.2–0.3; Alt 1700–1850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

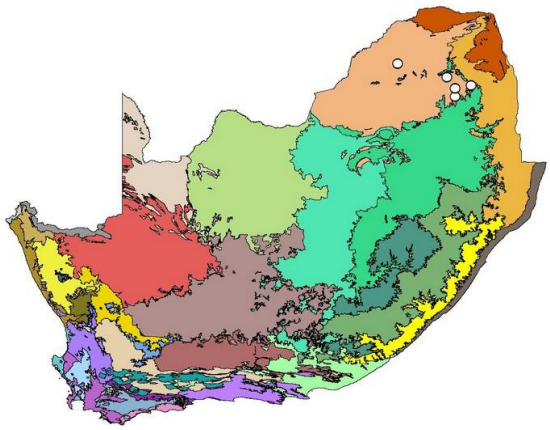
NOTES: –

[E]*Elephantorrhiza praetermissa* J.H.Ross **Mimoseae** ①

Shrub; P; Ht 1–2; Alt 1050–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	<10 (100)	
pH	6.5–8.4 (40)	<6.4; 5.5–7.4; >7.5 (20)
ESP	Non (100)	
QDGCs	2430 (60)	2328; 2429 (20)

NOTES: –



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***Elephantorrhiza woodii* E.Phillips var. *pubescens* E.Phillips** **Mimoseae** –

Dwarf shrub; P; Ht 0.01–0.6; Alt 1000–1850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

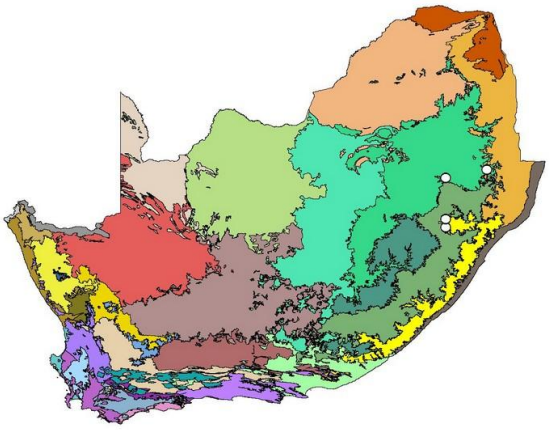
NOTES: –

[E]***Elephantorrhiza woodii* E.Phillips var. *woodii*** **Mimoseae** ①

Dwarf shrub; P; Ht 0.01–0.6; Alt 900–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (75)	>800 (25)
Min temp (°C)	0–4 (75)	2–8 (25)
Max temp (°C)	27–35 (50)	<27; 25–29 (25)
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	2829 (50)	2729; 2731 (25)

NOTES: –

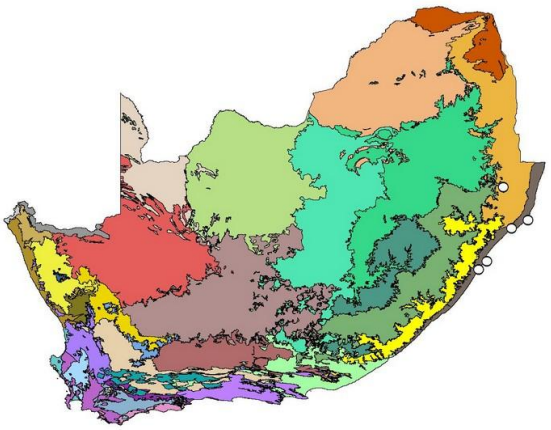


***Entada rheedii* Spreng.** **Mimoseae** ☠ ①

Climber; P; Ht ?; Alt 3–20

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (80)	400–800 (20)
Min temp (°C)	>6 (80)	2–8 (20)
Max temp (°C)	27–35 (80)	25–29 (20)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (60)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	2731; 2831; 2832; 2931; 3030 (20)	

NOTES: **Antiquality:** Hydrocyanic acid in bark and stem; saponin in seed; tannin in bark (Watt & Breyer-Brandwijk 1962). **Biocultural:** Magical (Hutchings *et al.* 1996); Beverage; medicine for humans; piscicide; seed as food (Watt & Breyer-Brandwijk 1962).



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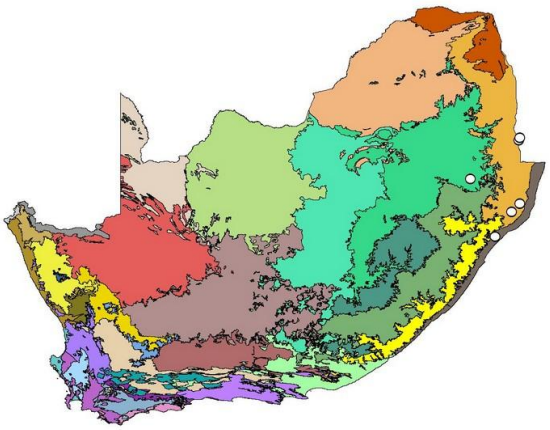
***Entada wahlbergii* Harv.** **Mimoseae** ①

Climber; P; Ht 3–10; Alt 90–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (75)	Mesic Highveld Grassland (25)
Biome	Savanna (75)	Grassland (25)
Rainfall (mm)	600–1000 (60)	>800 (40)
Min temp (°C)	>6 (80)	0–4 (20)
Max temp (°C)	27–35 (60)	25–29 (40)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (60)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	2632 (32)	2730; 2831; 2832; 2931 (17)

NOTES: –

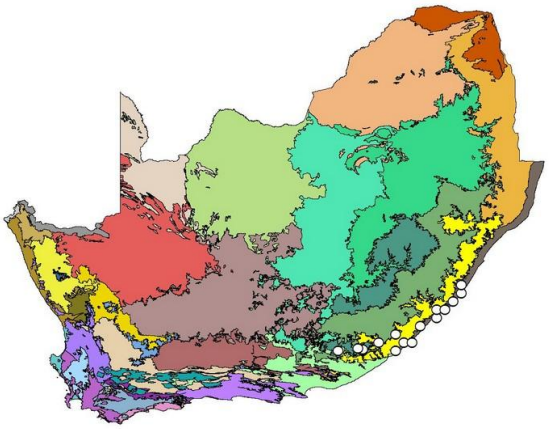


[E]***Eriosema acuminatum* (Eckl. & Zeyh.) C.H.Stirt.** **Phaseoleae** ①

Herb, climber; P; Ht 0.01–0.25; Alt 30–2135

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (75)	Sub-Escarpment Grassland (25)
Biome	Indian Ocean (80)	Grassland (20)
Rainfall (mm)	>800 (67)	600–1000 (27)
Min temp (°C)	>6 (67)	2–8 (27)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (73)	<10 (27)
pH	<6.4 (80)	5.5–7.4 (13)
ESP	Non (100)	
QDGCs	3228 (25)	3129; 3227 (19)

NOTES: –

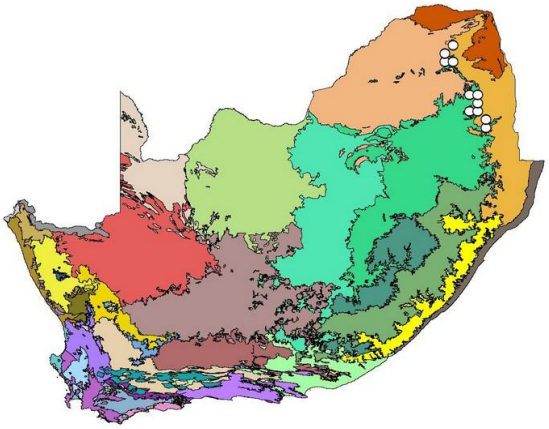


[E]***Eriosema angustifolium* Burtt Davy** **Phaseoleae** ①

Herb; P; Ht 0.1–1; Alt 152–1690

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	>800 (55)	400–800 (27)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (73)	27–35 (27)
Phosphorus (ppm)	<10 (64)	5–35 (36)
pH	<6.4 (82)	5.5–7.4 (18)
ESP	Ecotone	
QDGCs	2530 (28)	2329; 2330; 2430; 2531 (18)

NOTES: –



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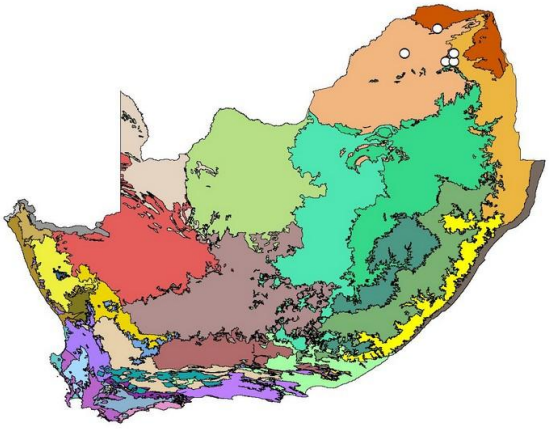
Eriosema buchananii Baker f. var. *buchananii*

Phaseoleae ①

Dwarf shrub, herb; P; Ht 0.5–0.6; Alt 1451–1555

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800; 600–1000 (40)	200–600 (20)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (60)	25–29 (40)
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	<6.4 (60)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	2330 (40)	2229; 2328; 2329 (20)

NOTES: –



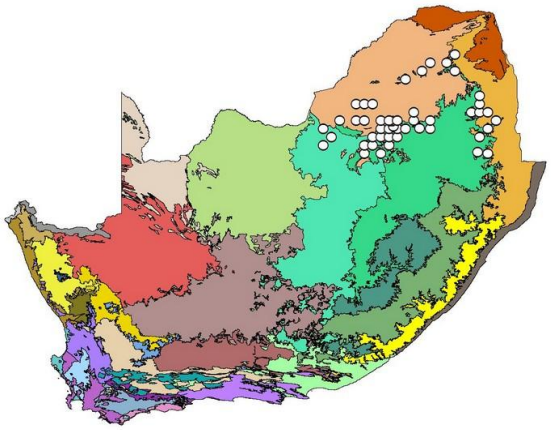
Eriosema burkei Benth. ex Harv. var. *burkei*

Phaseoleae ①

Herb; P; Ht 0.2–0.6; Alt 915–1640

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (69)	Dry Highveld Grassland; Mesic Highveld Grassland (13)
Biome	Savanna (60)	Grassland (40)
Rainfall (mm)	400–800 (74)	>800 (22)
Min temp (°C)	2–8 (54)	0–4 (30)
Max temp (°C)	25–29 (52)	27–35 (48)
Phosphorus (ppm)	<10 (91)	5–35 (9)
pH	<6.4 (83)	5.5–7.4 (15)
ESP	Non (100)	
QDGCs	2528 (20)	2527 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



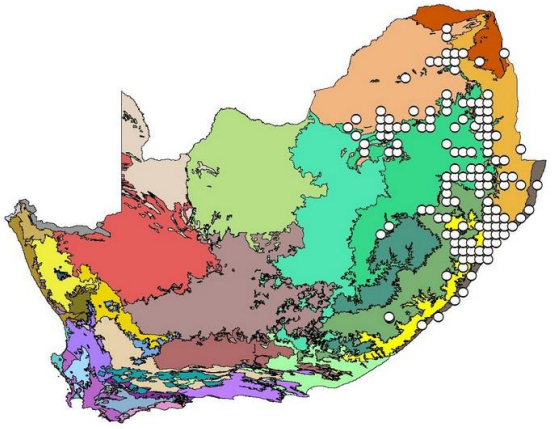
Eriosema cordatum E.Mey.

Phaseoleae ①

Herb; P; Ht 0.05–0.6; Alt 0–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (33)	Indian Ocean Coastal Belt; Central Bushveld (18)
Biome	Grassland (46)	Savanna (39)
Rainfall (mm)	>800 (40)	400–800 (31)
Min temp (°C)	2–8 (42)	0–4 (28)
Max temp (°C)	25–29 (57)	27–35 (32)
Phosphorus (ppm)	<10 (89)	5–35 (11)
pH	<6.4 (80)	5.5–7.4 (17)
ESP	Non (100)	
QDGCs	2930 (8)	2530; 2730 (6)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans and livestock (Hutchings *et al.* 1996). **Flowering:** All seasons (Pooley 1998).



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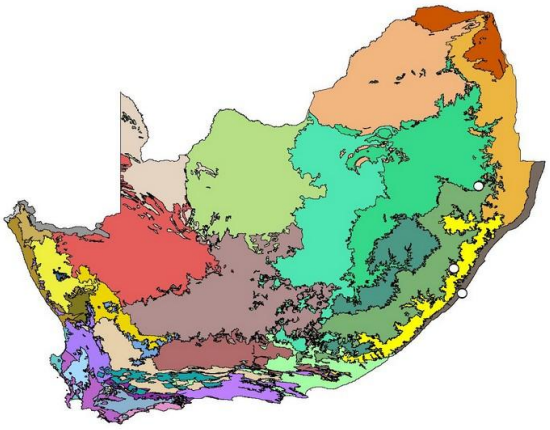
***Eriosema cordatum* E.Mey. × *E. kraussianum* Meisn.** **Phaseoleae** ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (67)	600–1000 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3030 (67)	2730 (33)

NOTES: –

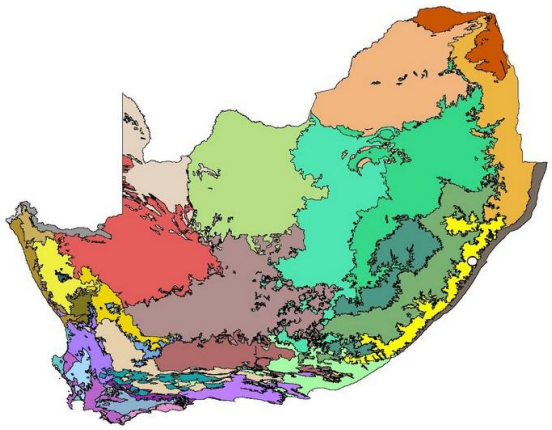


***Eriosema cordatum* E.Mey. × *E. preptum* C.H.Stirt.** **Phaseoleae** ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2930 (100)	

NOTES: –

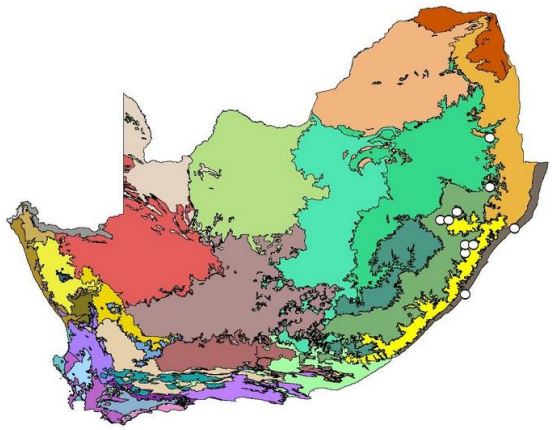


***Eriosema cordatum* E.Mey. × *E. salignum* E.Mey.** **Phaseoleae** ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (50)	600–1000 (40)
Min temp (°C)	2–8 (60)	0–4; >6 (20)
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (70)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	2930 (30)	2829 (20)

NOTES: –



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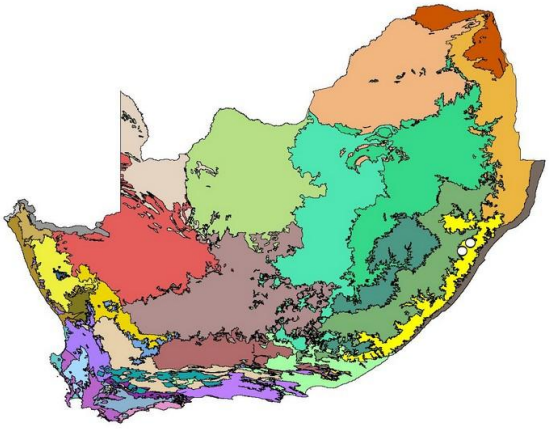
***Eriosema cordatum* E.Mey. × *E. squarrosum* (Thunb.) Walp.** **Phaseoleae** ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	600–1000; >800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	2930 (100)	

NOTES: –

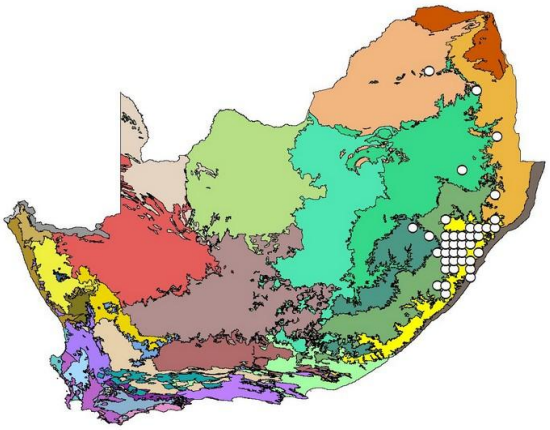


[E]***Eriosema distinctum* N.E.Br.** **Phaseoleae** ①

Herb; P; Ht 0.07–0.3; Alt 1–1575

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (58)	Drakensberg Grassland; Mesic Highveld Grassland; Central Bushveld (14)
Biome	Grassland (82)	Savanna (18)
Rainfall (mm)	>800 (79)	600–1000 (18)
Min temp (°C)	2–8 (53)	0–4 (32)
Max temp (°C)	25–29 (76)	<27 (21)
Phosphorus (ppm)	<10 (89)	5–35 (11)
pH	<6.4 (84)	5.5–7.4 (16)
ESP	Non (100)	
QDGCs	2930 (34)	2929 (16)

NOTES: **Livestock feed:** Unpalatable to cattle (Pooley 1998). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Spring, summer, autumn (Pooley 1998, 2003)

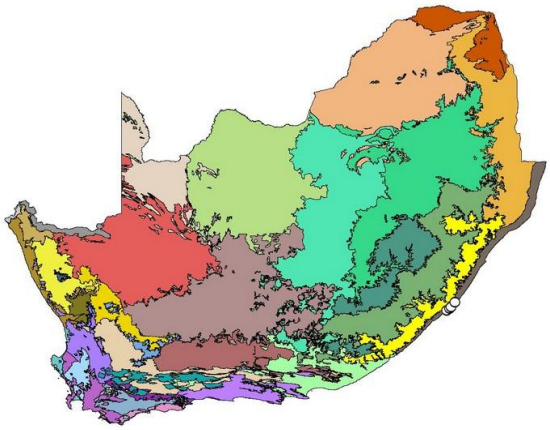


[E]***Eriosema dregei* E.Mey.** **Phaseoleae** ①

Dwarf shrub, herb; P; Ht 0.01–0.4; Alt 9–175

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3130 (67)	3129 (33)

NOTES: –



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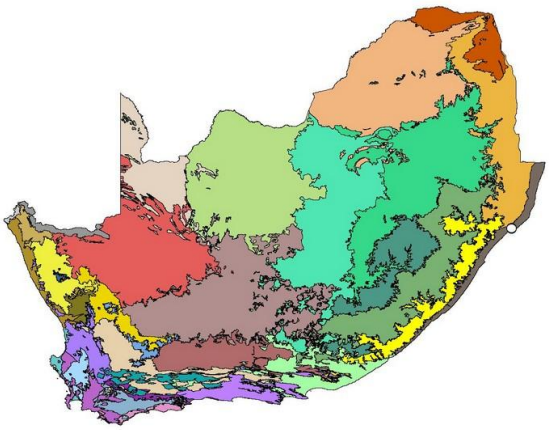
[E]*Eriosema durnfordensis* C.H.Stirt.

Phaseoleae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2831 (100)	

NOTES: –



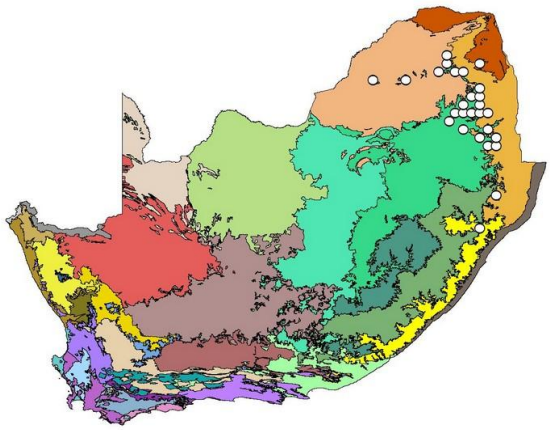
Eriosema ellipticifolium Schinz

Phaseoleae ①

Herb; P; Ht 0.09–0.25; Alt 945–2072

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (83)	Lowveld (17)
Biome	Grassland (57)	Savanna (43)
Rainfall (mm)	>800 (52)	400–800 (33)
Min temp (°C)	2–8 (81)	0–4 (15)
Max temp (°C)	25–29 (70)	<27 (19)
Phosphorus (ppm)	<10 (74)	5–35 (26)
pH	<6.4 (81)	5.5–7.4 (19)
ESP	Non (100)	
QDGCs	2530 (26)	2430 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



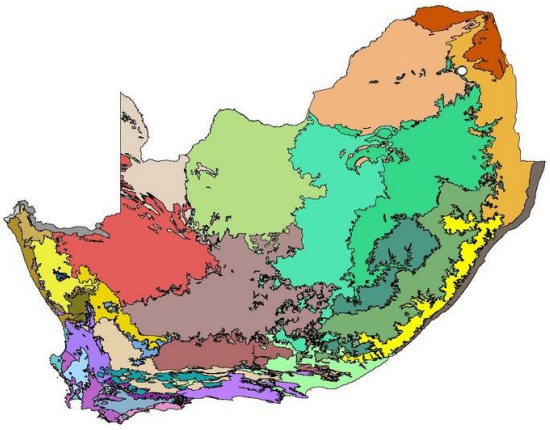
[E]*Eriosema fasciculatum* Schinz

Phaseoleae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2430 (100)	

NOTES: –



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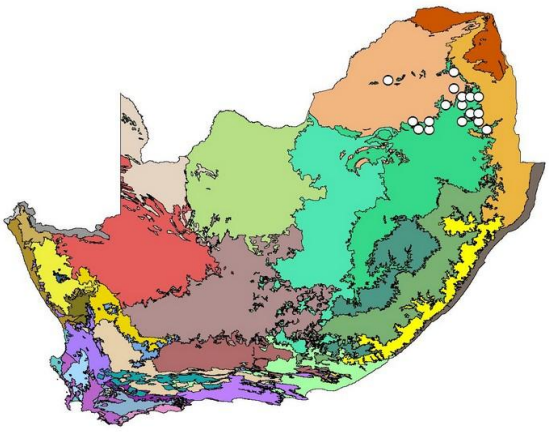
[E]*Eriosema gunniae* C.H.Stirt.

Phaseoleae ①

Herb; P; Ht 0.08–0.5; Alt 1200–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (67)	Central Bushveld (33)
Biome	Grassland (60)	Savanna (40)
Rainfall (mm)	400–800 (53)	>800 (35)
Min temp (°C)	2–8 (76)	0–4 (24)
Max temp (°C)	25–29 (88)	<27 (12)
Phosphorus (ppm)	<10 (94)	5–35 (6)
pH	<6.4 (76)	5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2430; 2530 (29)	2529 (24)

NOTES: –



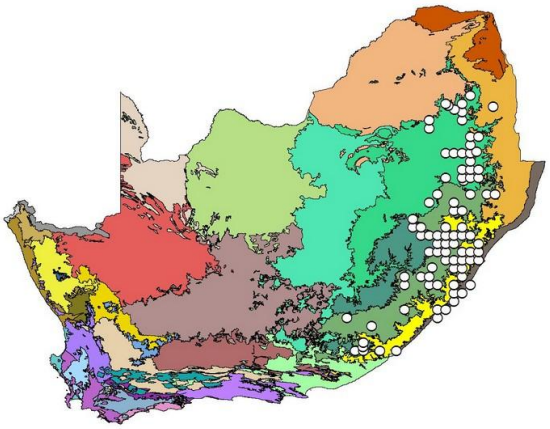
Eriosema kraussianum Meisn.

Phaseoleae ①

Herb; P; Ht 0.25–0.4; Alt 30–2440

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (44)	Sub-Escarpment Grassland (33)
Biome	Grassland (88)	Indian Ocean (7)
Rainfall (mm)	>800 (51)	600–1000 (38)
Min temp (°C)	0–4 (47)	2–8 (24)
Max temp (°C)	25–29 (65)	<27 (30)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (85)	5.5–7.4 (14)
ESP	Non (100)	
QDGCs	2930 (13)	2929 (11)

NOTES: **Flowering:** Spring (Pooley 1998).



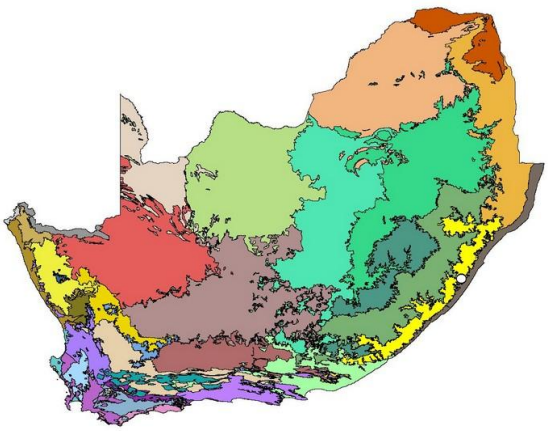
Eriosema kraussianum Meisn. × *E. squarrosum* (Thunb.) Walp.

Phaseoleae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3030 (100)	

NOTES: –



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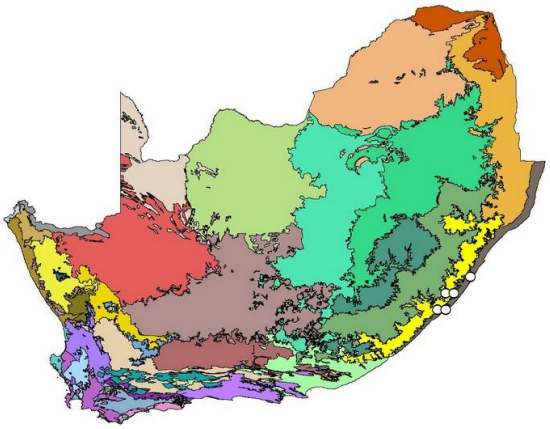
[E]*Eriosema latifolium* (Benth. ex Harv.) C.H.Stirt.

Phaseoleae ①

Dwarf shrub, herb; P; Ht 0.01–1; Alt ?–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (80)	2–8 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3030; 3129 (40)	3029 (20)

NOTES: –



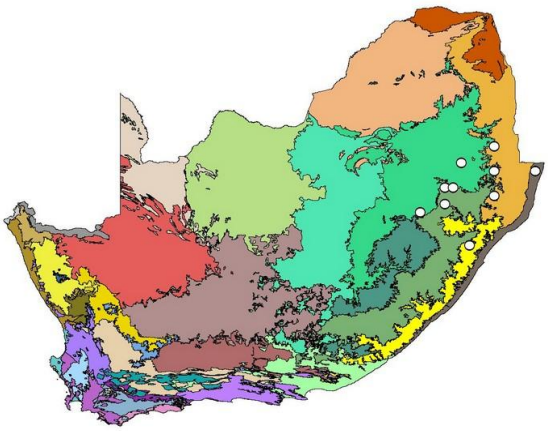
[E]*Eriosema lucipetum* C.H.Stirt.

Phaseoleae ①

Herb; P; Ht 0.1–0.8; Alt 4–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Mesic Highveld Grassland; Sub-Escarpment Grassland (33)	
Biome	Grassland (83)	Indian Ocean (17)
Rainfall (mm)	600–1000 (60)	>800 (30)
Min temp (°C)	0–4; 2–8 (40)	<2; >6 (10)
Max temp (°C)	25–29 (80)	<27; 27–35 (10)
Phosphorus (ppm)	<10 (90)	5–35 (10)
pH	<6.4 (90)	5.5–7.4 (10)
ESP	Non (100)	
QDGCs	2731; 2829 (20)	2630; 2631; 2729; 2730; 2732; 2930 (10)

NOTES: –



Eriosema lucipetum C.H.Stirt. × *E. cordatum* E.Mey.

Phaseoleae –

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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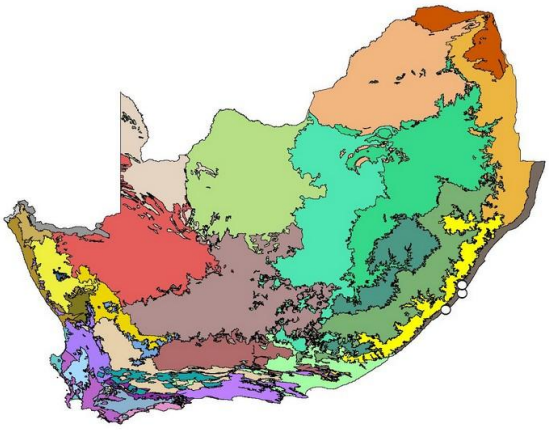
[E]*Eriosema luteopetalum* C.H.Stirt.

Phaseoleae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt 4–160

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3030 (67)	3129 (33)

NOTES: –



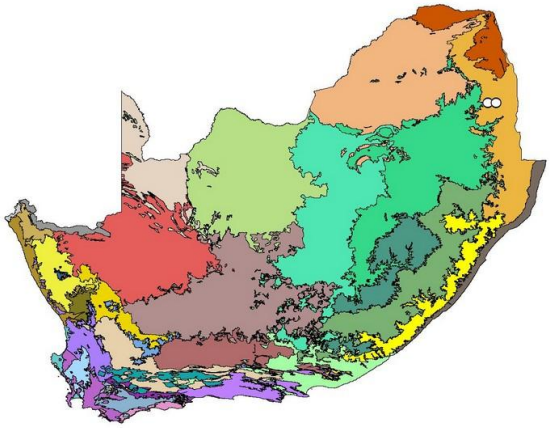
[E]*Eriosema naviculare* C.H.Stirt.

Phaseoleae ①

Herb; P; Ht 0.5–0.6; Alt ?–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2531 (100)	

NOTES: –



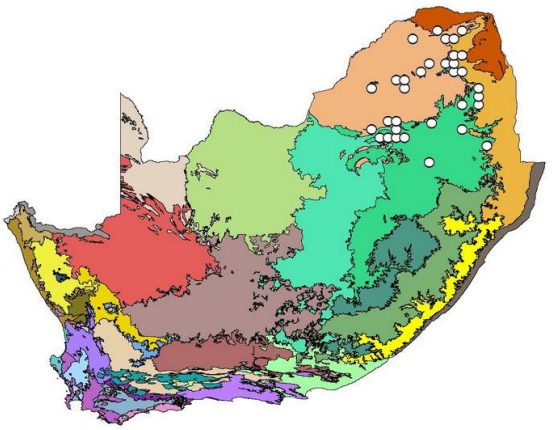
Eriosema nutans Schinz

Phaseoleae ①

Dwarf shrub, herb; P; Ht 0.3–1.5; Alt 1372–2074

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (64)	Mesic Highveld Grassland (36)
Biome	Savanna (64)	Grassland (36)
Rainfall (mm)	400–800 (61)	600–1000 (18)
Min temp (°C)	2–8 (70)	<2; 0–4 (12)
Max temp (°C)	25–29 (70)	27–35 (21)
Phosphorus (ppm)	<10 (61)	5–35 (39)
pH	<6.4 (73)	5.5–7.4 (24)
ESP	Non (100)	
QDGCs	2330; 2430 (12)	2329; 2428; 2528; 2530; 2628 (9)

NOTES: **N_2 fixation:** Nodulated (Mapfumo *et al*. 2005). **Flowering:** Summer, autumn (Germishuizen & Clark 2003).



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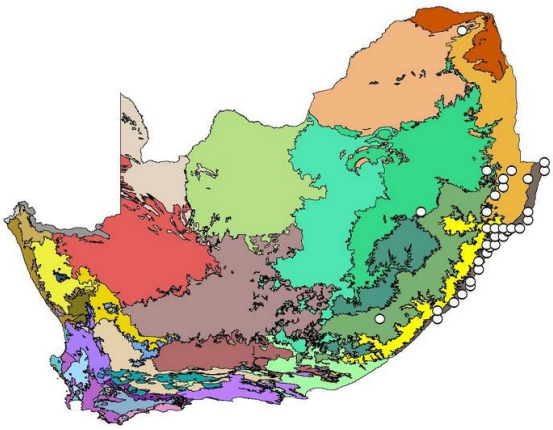
Eriosema parviflorum E.Mey. subsp. *parviflorum*

Phaseoleae ③

Dwarf shrub; P; Ht 0.15–0.6; Alt 2–518

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (81)	Lowveld (13)
Biome	Indian Ocean (69)	Savanna (19)
Rainfall (mm)	>800 (69)	400–800 (19)
Min temp (°C)	>6 (75)	2–8 (22)
Max temp (°C)	25–29 (56)	27–35 (41)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<10 (78)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2831 (20)	2931 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Cover crop (Morris 1997).



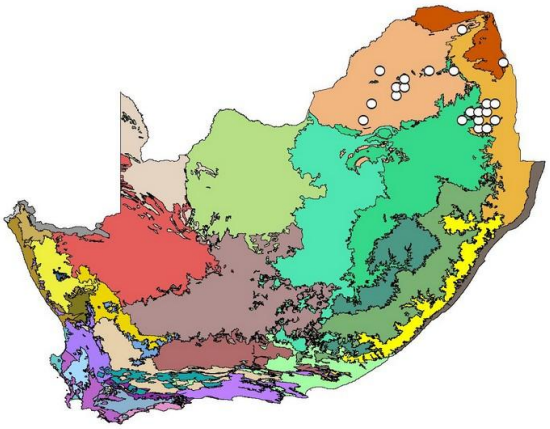
Eriosema pauciflorum Klotzsch var. *pauciflorum*

Phaseoleae ①

Herb; P; Ht 0.2–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (64)	Lowveld (27)
Biome	Savanna (100)	
Rainfall (mm)	400–800; >800 (43)	600–1000 (10)
Min temp (°C)	2–8 (76)	>6 (14)
Max temp (°C)	25–29 (52)	27–35 (43)
Phosphorus (ppm)	<10 (76)	5–35 (24)
pH	<6.4 (67)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	2530; 2531 (24)	2428 (19)

NOTES: –



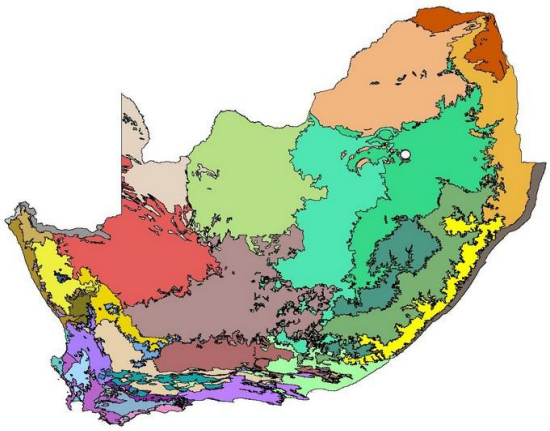
Eriosema pauciflorum Klotzsch × *E. salignum* E.Mey.

Phaseoleae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	<2 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2628 (100)	

NOTES: –



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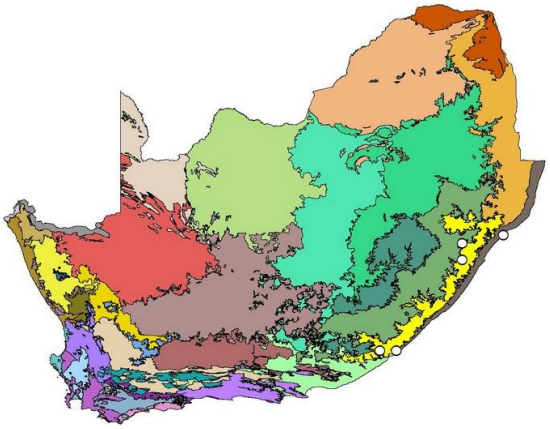
[E]*Eriosema populifolium* Benth. ex Harv. subsp. *capensis* C.H.Stirt. & Gordon-Gray **Phaseoleae** ①

Herb; P; Ht 0.15–0.2; Alt ?–366

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (80)	600–1000 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2930 (40)	2931; 3227; 3228 (20)

NOTES: –

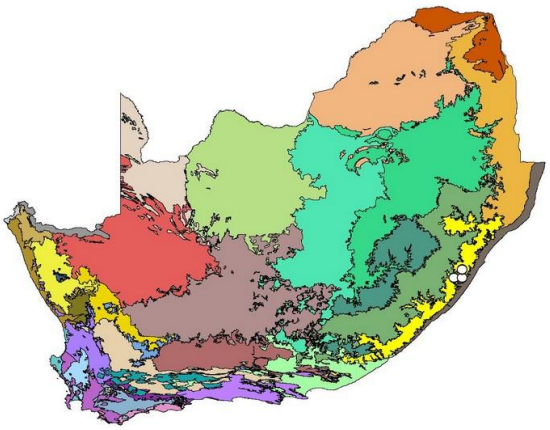


[E]*Eriosema populifolium* Benth. ex Harv. subsp. *populifolium* **Phaseoleae** ①

Herb; P; Ht 0.1–0.25; Alt 610–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Savanna (100)	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3030 (100)	

NOTES: –

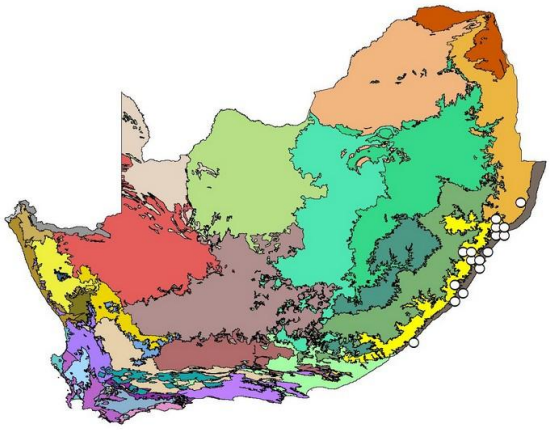


[E]*Eriosema preptum* C.H.Stirt. **Phaseoleae** ①

Herb; P; Ht 0.2–0.6; Alt 1.5–762

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (67)	Lowveld; Sub-Escarpment Savanna (17)
Biome	Indian Ocean (63)	Savanna (38)
Rainfall (mm)	>800 (94)	600–1000 (6)
Min temp (°C)	>6 (81)	2–8 (19)
Max temp (°C)	25–29 (81)	27–35 (19)
Phosphorus (ppm)	<10 (81)	5–35 (19)
pH	<6.4 (69)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	2930 (25)	2831; 2931; 3030 (19)

NOTES: **Flowering:** Spring, summer (Pooley 1998).



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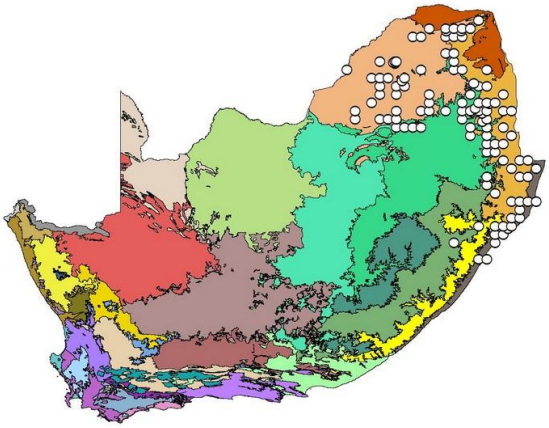
Eriosema psoraleoides (Lam.) G.Don

Phaseoleae ③❖

Dwarf shrub, shrub; P; Ht 0.15–2; Alt 6–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (45)	Lowveld (32)
Biome	Savanna (84)	Indian Ocean (9)
Rainfall (mm)	400–800 (48)	>800 (30)
Min temp (°C)	2–8 (57)	>6 (34)
Max temp (°C)	27–35 (51)	25–29 (45)
Phosphorus (ppm)	<10 (77)	5–35 (23)
pH	<6.4 (59)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	2530 (10)	2531 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Cover crop (Morris 1997). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Pooley 1998).



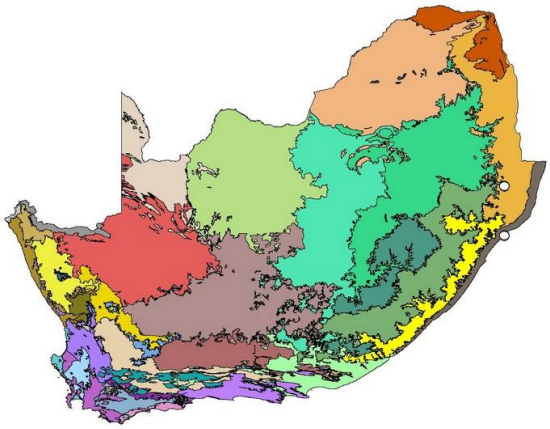
Eriosema psoraleoides (Lam.) G.Don × *E. salignum* E.Mey.

Phaseoleae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Non (100)	
QDGCs	2731; 2931 (50)	

NOTES: –



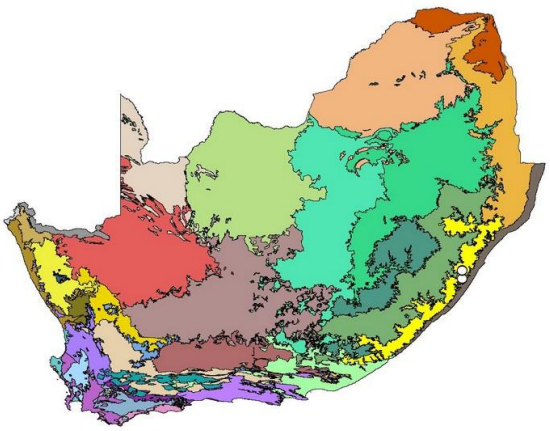
[EE]*Eriosema rossii* C.H.Stirt.

Phaseoleae ①

Herb; P; Ht 0.01–0.35; Alt 610–1067

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Savanna (100)	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3030 (100)	

NOTES: **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Spring, summer (Pooley 1998).



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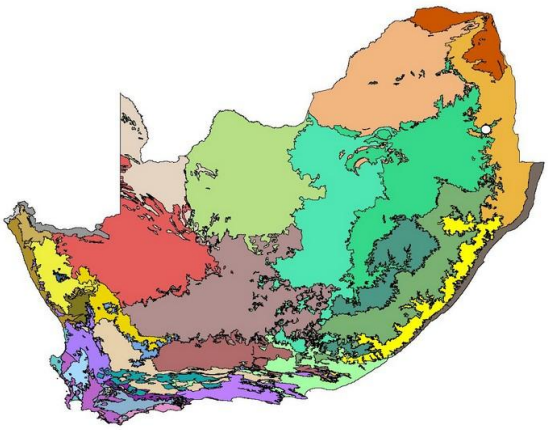
Eriosema rufescens Schinz

Phaseoleae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	252– (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2531 (100)	

NOTES: –



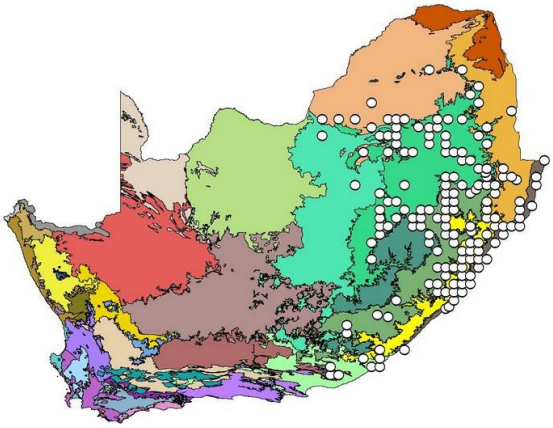
Eriosema salignum E.Mey.

Phaseoleae ①❖

Herb; P; Ht 0.1–0.6; Alt 15–1769

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (34)	Indian Ocean Coastal Belt (20)
Biome	Grassland (70)	Indian Ocean (15)
Rainfall (mm)	400–800; >800 (38)	600–1000 (24)
Min temp (°C)	0–4 (29)	2–8 (28)
Max temp (°C)	25–29 (58)	27–35 (24)
Phosphorus (ppm)	<10 (85)	5–35 (15)
pH	<6.4 (72)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	2930; 3030 (7)	2731; 2829 (6)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for livestock (Hutchings *et al.* 1996); Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** All seasons (Pooley 1998).



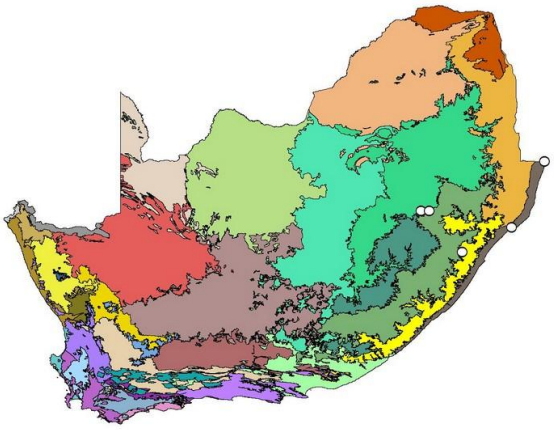
Eriosema salignum E.Mey. × *E. cordatum* E.Mey.

Phaseoleae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Grassland (67)	Savanna (33)
Rainfall (mm)	600–1000; >800 (40)	400–800 (20)
Min temp (°C)	>6 (40)	<2; 0–4; 2–8 (20)
Max temp (°C)	25–29; 27–35 (40)	<27 (20)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (60)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	2829 (40)	2632; 2831; 2930 (20)

NOTES: –



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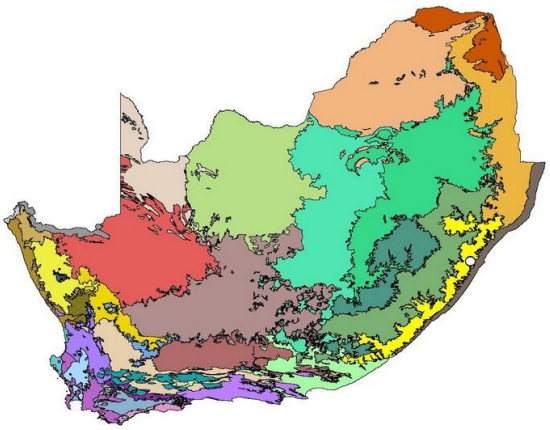
***Eriosema salignum* E.Mey. × *E. kraussianum* Meisn.** **Phaseoleae** ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2930 (100)	

NOTES: –



***Eriosema salignum* E.Mey. × *E. squarrosum* (Thunb.) Walp.** **Phaseoleae** –

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

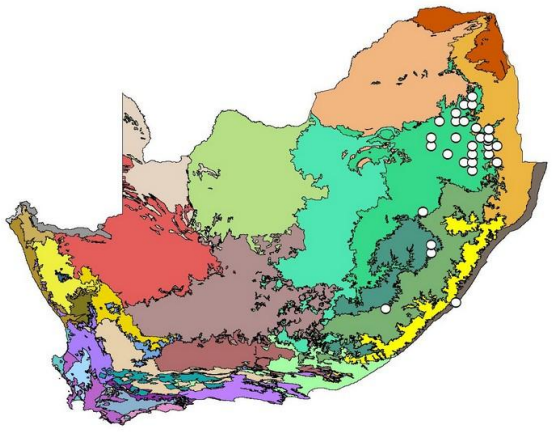
NOTES: –

***Eriosema simulans* C.H.Stirt.** **Phaseoleae** ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (88)	Drakensberg Grassland; Sub-Escarpment Grassland (6)
Biome	Grassland (100)	
Rainfall (mm)	>800 (41)	600–1000 (38)
Min temp (°C)	0–4 (38)	2–8 (31)
Max temp (°C)	25–29 (55)	<27 (45)
Phosphorus (ppm)	<10 (97)	5–35 (3)
pH	<6.4 (86)	5.5–7.4 (14)
ESP	Non (100)	
QDGCs	2530; 2631 (22)	2630 (19)

NOTES: –



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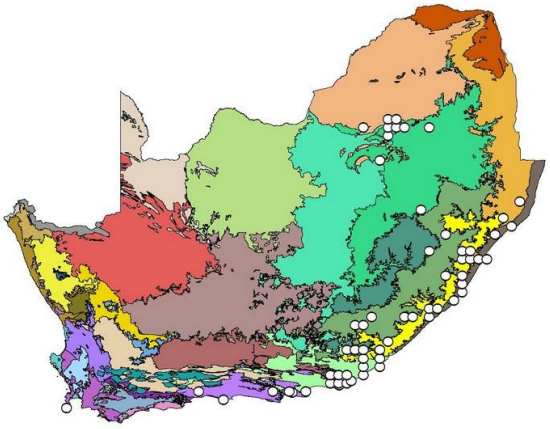
Eriosema squarrosum (Thunb.) Walp.

Phaseoleae ①

Herb; P; Ht 0.15–0.3; Alt 15–1402

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (24)	Indian Ocean Coastal Belt; Sub-Escarpment Grassland (18)
Biome	Grassland (38)	Albany Thicket (25)
Rainfall (mm)	400–800 (47)	>800 (33)
Min temp (°C)	2–8 (41)	>6 (40)
Max temp (°C)	25–29 (78)	27–35 (17)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (55)	5.5–7.4 (33)
ESP	Non (94)	Medium (6)
QDGCs	3326 (12)	2528; 2930; 3227 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer, autumn (Pooley 1998).



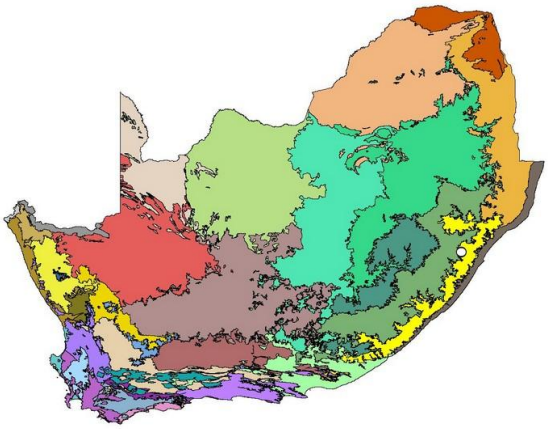
Eriosema squarrosum (Thunb.) Walp. × *E. cordatum* E.Mey.

Phaseoleae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2930 (100)	

NOTES: –



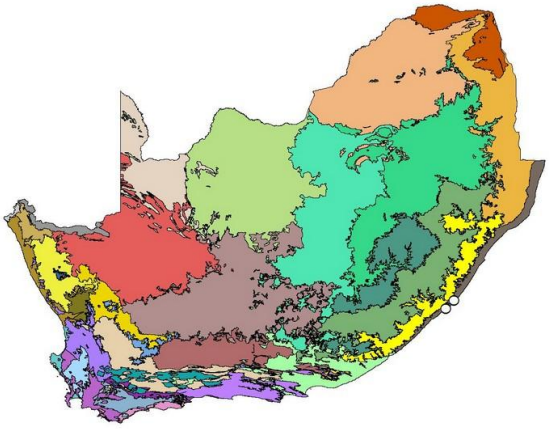
[E]*Eriosema streyi* C.H.Stirt.

Phaseoleae ①

Herb; P; Ht 0.01–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3129; 3130 (50)	

NOTES: –



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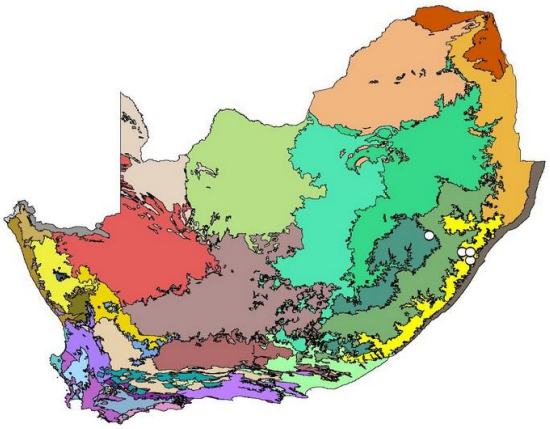
[E]*Eriosema superpositum* C.H.Stirt. — Phaseoleae ①

Herb; P; Ht ?; Alt 91–1769

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Savanna (100)	
Biome	Grassland; Savanna (50)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (50)	0–4; >6 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (75)	<6.4 (25)
ESP	Non (100)	
QDGCs	2930 (75)	2929 (25)

NOTES: –

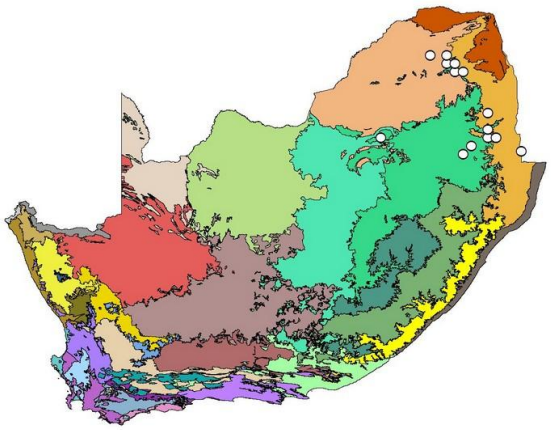


Eriosema transvaalense C.H.Stirt. — Phaseoleae ①

Herb; P; Ht 0.1–0.4; Alt 829–1690

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Lowveld (40)	Central Bushveld (20)
Biome	Savanna (67)	Grassland (33)
Rainfall (mm)	600–1000 (36)	400–800; >800 (29)
Min temp (°C)	2–8 (71)	0–4 (14)
Max temp (°C)	25–29 (64)	27–35 (36)
Phosphorus (ppm)	<10 (57)	5–35 (43)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2329 (21)	2430; 2531; 2630; 2631 (14)

NOTES: –

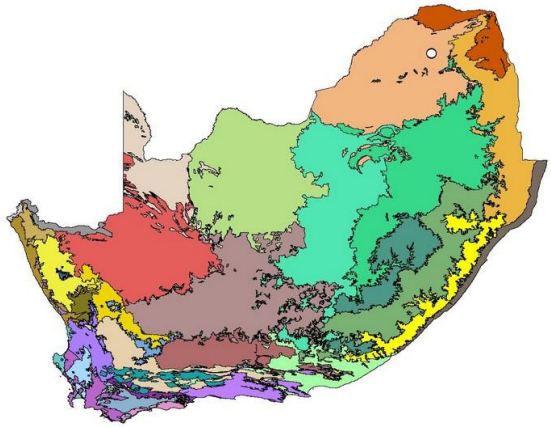


Eriosema transvaalense C.H.Stirt. × *E. angustifolium* Burtt Davy — Phaseoleae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2329 (100)	

NOTES: –



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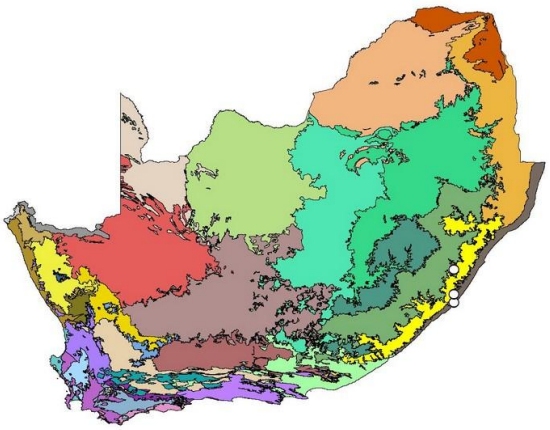
[E]*Eriosema umtamvunense* C.H.Stirt.

Phaseoleae ①

Herb; P; Ht 0.2–0.7; Alt 396–427

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3030 (67)	3130 (33)

NOTES: **Flowering:** Summer (Pooley 1998).



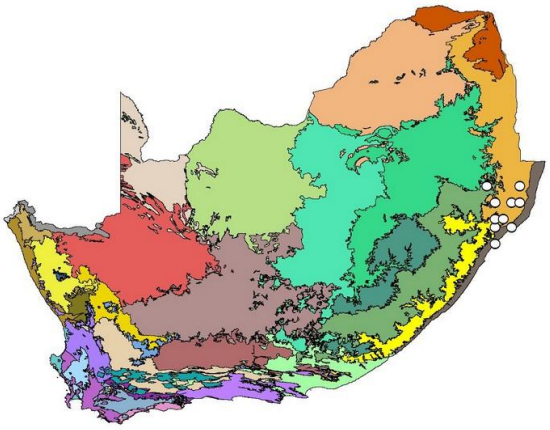
[E]*Eriosema zuluense* C.H.Stirt.

Phaseoleae ①

Herb; P; Ht 0.1–0.12; Alt 305–671

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (60)	Indian Ocean Coastal Belt (40)
Biome	Savanna (83)	Indian Ocean (17)
Rainfall (mm)	>800 (50)	600–1000 (30)
Min temp (°C)	>6 (80)	2–8 (20)
Max temp (°C)	27–35 (70)	25–29 (30)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (70)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	2831 (60)	2731; 2732; 2832; 2931 (10)

NOTES: –



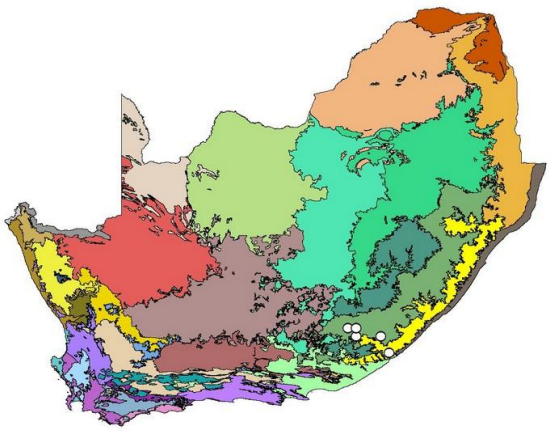
[E]*Erythrina acanthocarpa* E.Mey.

Phaseoleae ☠③

Shrub; P; Ht 1–2; Alt 250–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (80)	600–1000 (20)
Min temp (°C)	2–8 (60)	0–4; >6 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	5.5–7.4 (60)	<6.4; 6.5–8.4 (20)
ESP	Non (100)	
QDGCs	3227 (40)	3126; 3127; 3228 (20)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Alkaloids in seed (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Manning 2001).



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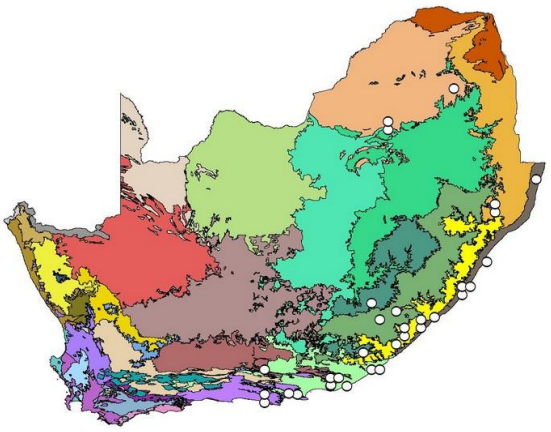
Erythrina caffra Thunb.

Phaseoleae ☠ ③

Tree; P; Ht 3–18; Alt 0–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (36)	Albany Thicket (21)
Biome	Indian Ocean (33)	Albany Thicket; Grassland; Savanna (20)
Rainfall (mm)	400–800 (45)	>800 (29)
Min temp (°C)	>6 (52)	2–8 (42)
Max temp (°C)	25–29 (74)	27–35 (16)
Phosphorus (ppm)	5–35 (58)	<10 (39)
pH	<6.4 (48)	5.5–7.4 (35)
ESP	Non (100)	
QDGCs	3326 (16)	3129 (9)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Alkaloids (Hutchings *et al.* 1996); None tested (Steyn 1934). **Flowering:** Winter (Manning 2001).



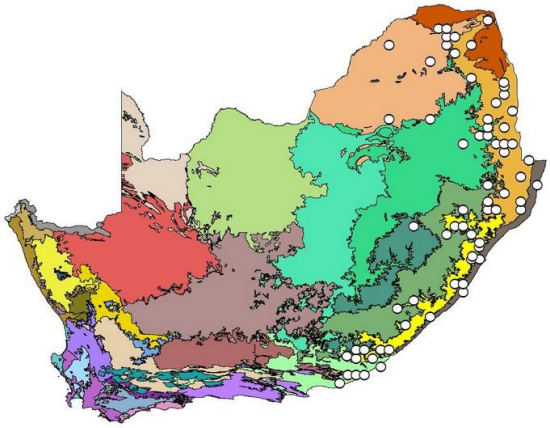
Erythrina humeana Spreng.

Phaseoleae ③

Shrub, tree; P; Ht 0.5–4; Alt 0–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (52)	Central Bushveld (16)
Biome	Savanna (72)	Albany Thicket; Grassland (100)
Rainfall (mm)	400–800 (40)	600–1000 (32)
Min temp (°C)	2–8 (46)	>6 (43)
Max temp (°C)	25–29 (60)	27–35 (35)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	<6.4 (49)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	2531; 2631; 2930; 3227 (8)	2329; 2330; 2830; 2831; 3030; 3128; 3327 (5)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer, autumn (Venter & Venter 1996).



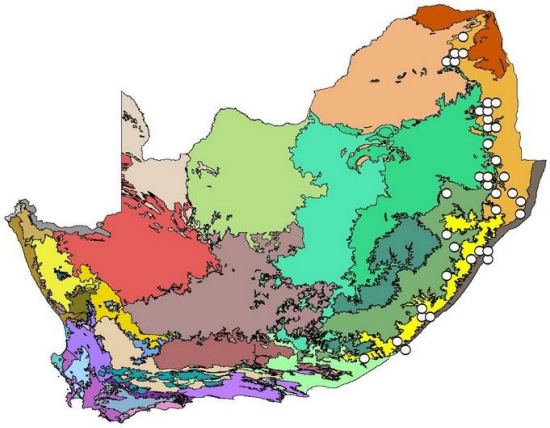
Erythrina latissima E.Mey.

Phaseoleae ☠ ③

Tree; P; Ht 3–12; Alt 150–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (50)	Indian Ocean Coastal Belt (30)
Biome	Savanna (69)	Indian Ocean (23)
Rainfall (mm)	>800 (49)	600–1000 (29)
Min temp (°C)	2–8 (63)	>6 (31)
Max temp (°C)	25–29 (57)	27–35 (43)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (69)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	2531 (17)	2731 (14)

NOTES: **Livestock feed:** Game (Venter & Venter 1996). **Cultivated** (Glen 2002). **Antiquality:** Alkaloids (Hutchings *et al.* 1996). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Winter, spring (Van Wyk *et al.* 2000).



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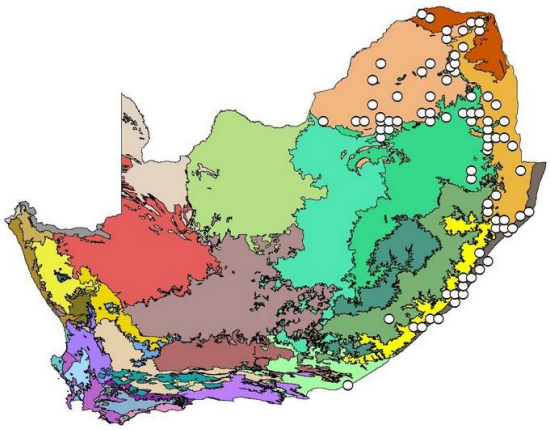
Erythrina lysistemon Hutch.

Phaseoleae ☠③

Tree; P; Ht 1.8–10; Alt 0–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (43)	Lowveld (20)
Biome	Savanna (74)	Indian Ocean (15)
Rainfall (mm)	>800 (39)	400–800 (35)
Min temp (°C)	2–8 (51)	>6 (39)
Max temp (°C)	25–29 (58)	27–35 (41)
Phosphorus (ppm)	<10 (73)	5–35 (27)
pH	<6.4 (68)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	2831 (11)	3030 (8)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Alkaloids in seed (Van Wyk & Van Wyk 1997). **Biocultural:** Medicine for humans (Van Wyk *et al.* 2000). **Flowering:** Winter, spring, summer (Venter & Venter 1996; Van Wyk *et al.* 2000).



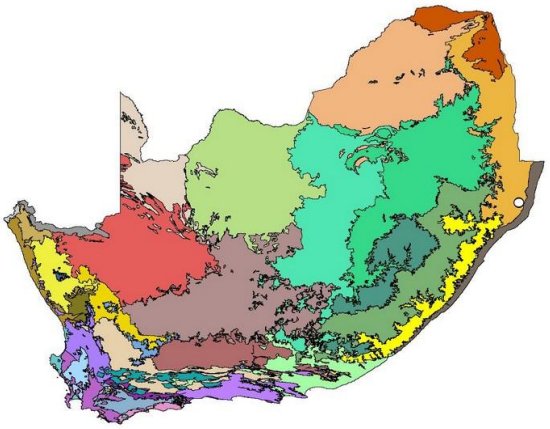
Erythrina × *coddii* Barneby & Krukoff

Phaseoleae ①

Tree; P; Ht 3–10; Alt 100–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	100	
QDGCs	2832 (100)	

NOTES: –



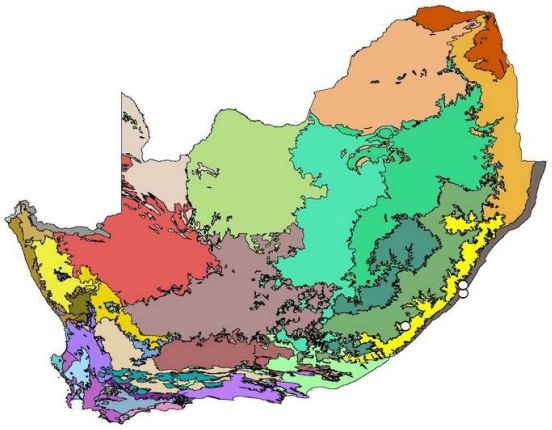
Erythrina × *dyeri* Hennessy

Phaseoleae ①

Tree; P; Ht 3–15; Alt 150–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (67)	600–1000 (33)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3030 (67)	3128 (33)

NOTES: –



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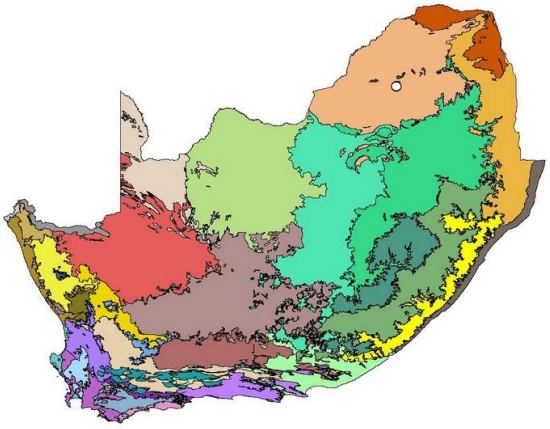
Erythrina × *hennessyae* Barneby & Krukoff

Phaseoleae ①

Shrub; P; Ht ?–3; Alt 1250–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	2428 (100)	

NOTES: –



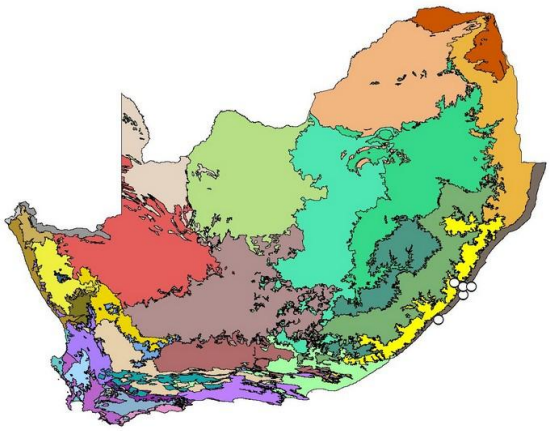
Erythrina × *johnsoniae* Hennessy

Phaseoleae ③

Tree; P; Ht 5–14; Alt 0–250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3030 (75)	3129 (25)

NOTES: **Cultivated** (Glen 2002).



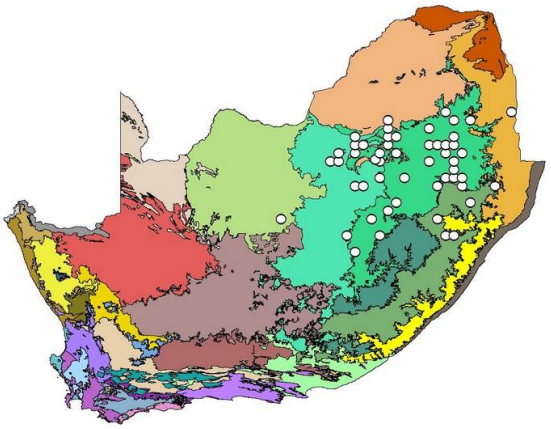
Erythrina zeyheri Harv.

Phaseoleae ③

Dwarf shrub, shrub; P; Ht 0.3–0.5; Alt 300–2050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (68)	Dry Highveld Grassland (18)
Biome	Grassland (94)	Savanna (6)
Rainfall (mm)	400–800 (69)	600–1000 (23)
Min temp (°C)	<2 (52)	0–4 (38)
Max temp (°C)	25–29; 27–35 (35)	<27 (30)
Phosphorus (ppm)	<10 (98)	5–35 (2)
pH	<6.4 (71)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2627 (13)	2629 (10)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Pooley 1998).



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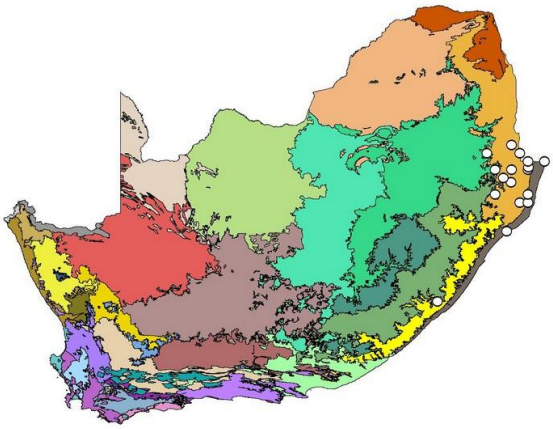
Erythrophleum lasianthum Corbishley

Caesalpinieae ①

Tree; P; Ht 5–23; Alt 20–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (83)	Indian Ocean Coastal Belt (17)
Biome	Savanna (100)	
Rainfall (mm)	400–800; >800 (40)	600–1000 (20)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (53)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2731 (25)	2632; 2732 (19)

NOTES: **Antiquality:** Toxic (Lewis *et al.* 2005); Alkaloids in bark and seed (Steyn 1934; Watt & Breyer-Brandwijk 1962). **Biocultural:** Criminal poisoning; medicine for humans (Steyn 1934; Hutchings *et al.* 1996).



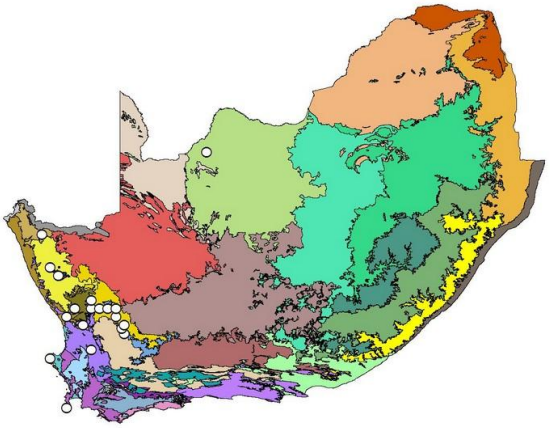
[E]*Euchlora hirsuta* (Thunb.) Druce

Crotalarieae ①

Herb; P; Ht 0.01–0.25; Alt 15–1159

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos; West Strandveld; Knersvlakte; Trans-Escarpment Succulent Karoo; Eastern Kalahari Bushveld (17)	
Biome	Succulent Karoo (56)	Fynbos (33)
Rainfall (mm)	<400 (89)	200–600; 400–800 (6)
Min temp (°C)	2–8 (56)	>6 (22)
Max temp (°C)	27–35 (61)	25–29 (33)
Phosphorus (ppm)	>20 (61)	5–35 (33)
pH	>7.5 (56)	6.5–8.4 (17)
ESP	Non (50)	Medium (33)
QDGCs	3119 (32)	3118 (16)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Winter, spring (Manning & Goldblatt 2002).



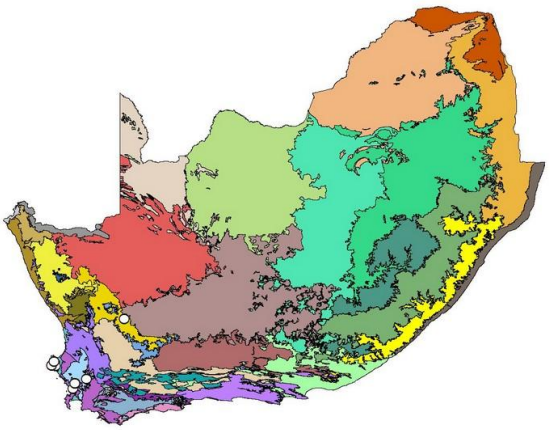
[E]*Ezoloba macrocarpa* (Eckl. & Zeyh.) B.-E.van Wyk & Boatwr.

Crotalarieae ①

Herb; P; Ht ?; Alt 120–283

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld; Trans-Escarpment Succulent Karoo (50)	
Biome	Fynbos (83)	Succulent Karoo (17)
Rainfall (mm)	<400 (67)	200–600 (33)
Min temp (°C)	>6 (66)	0–4; 2–8 (17)
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	<6.4; 6.5–8.4 (33)	5.5–7.4; >7.5 (17)
ESP	Medium (100)	
QDGCs	3318 (61)	3120; 3218; 3317 (13)

NOTES: –



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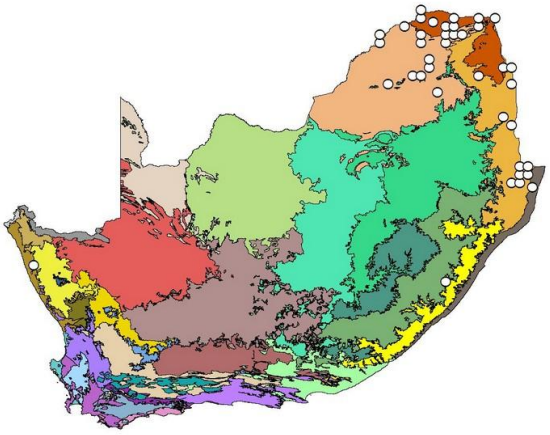
Faidherbia albida (Delile) A.Chev.

Ingeae ☠ ③

Tree; P; Ht 3–30; Alt 6–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Lowveld (39)	Mopane (22)
Biome	Savanna (100)	
Rainfall (mm)	27–35 (43)	25–29 (30)
Min temp (°C)	2–8 (51)	>6 (49)
Max temp (°C)	27–35 (70)	25–29 (27)
Phosphorus (ppm)	5–35 (70)	<10 (30)
pH	6.5–7.4 (32)	6.5–8.4 (27)
ESP	Non (100)	
QDGCs	2230 (16)	2229 (14)



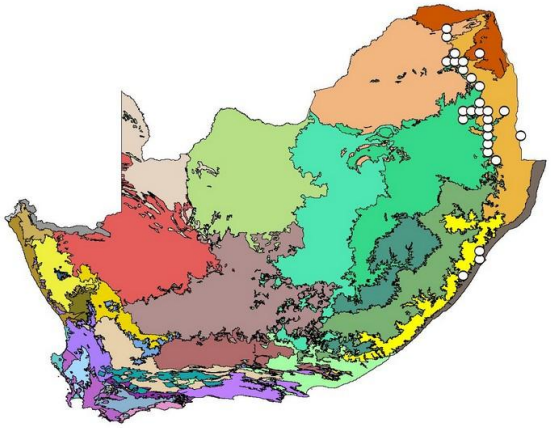
NOTES: **Livestock feed** (Dicko & Sikena 1992; Lewis *et al.* 2005). **DM:** 10 kg/tree/yr (Le Houérou 1980). **CP:** Leaves 15–20%; pods 10–15% (Le Houérou 1980). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983); *Rhizobium* isolates (Doignon-Bourcier *et al.* 2000). **Antiquality:** Tannin in bark and pods (Watt & Breyer-Brandwijk 1962). **Biocultural:** Pods as food (Hutchings *et al.* 1996); Fuel; medicine for humans; piscicide (Watt & Breyer-Brandwijk 1962). **Flowering:** Autumn, winter, spring (Venter & Venter 1996; Van Wyk *et al.* 2000).

Flemingia grahamiana Wight & Arn.

Phaseoleae ③

Herb, shrub; P; Ht 0.9–2; Alt 701–1601

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (50)	Mesic Highveld Grassland (25)
Biome	Savanna (100)	
Rainfall (mm)	>800 (52)	400–800; 600–1000 (22)
Min temp (°C)	2–8 (70)	>6 (26)
Max temp (°C)	25–29 (67)	27–35 (26)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (70)	5.5–7.4 (19)
ESP	Non (100)	
QDGCs	2530 (19)	2330; 2531; 2631 (15)



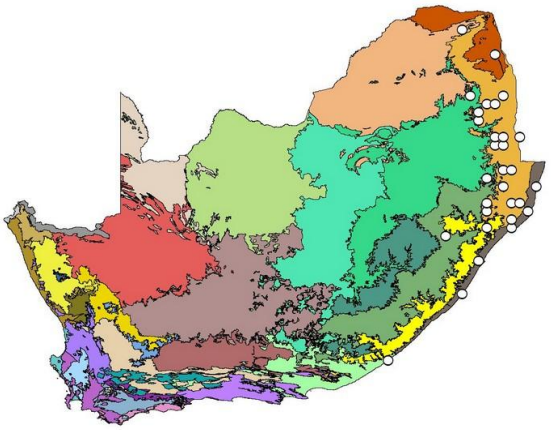
NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Soil conservation:** Cover crop (Bosch & Borus 2006). **Flowering:** Winter (Germishuizen & Clark 2003).

Galactia tenuiflora (Willd.) Wight & Arn. var. *villosa* (Wight & Arn.) Benth.

Phaseoleae ①

Herb, shrub; P; Ht 0.6–1.4; Alt 15–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (67)	Indian Ocean Coastal Belt (27)
Biome	Savanna (79)	Indian Ocean (21)
Rainfall (mm)	600–1000 (40)	>800 (37)
Min temp (°C)	>6 (57)	2–8 (40)
Max temp (°C)	27–35 (57)	25–29 (43)
Phosphorus (ppm)	<10 (87)	5–35 (13)
pH	<6.4 (67)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	2831 (20)	2631; 2731 (13)



NOTES: –

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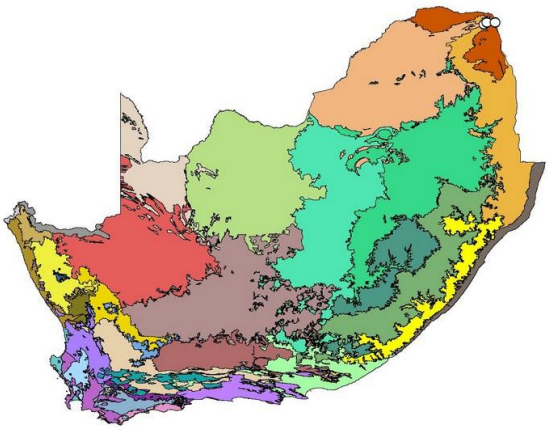
***Guibourtia conjugata* (Bolle) J.Léonard** **Detarieae** ①

Tree; P; Ht 2.5–12; Alt 320–520

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2231 (100)	

NOTES: **N_2 fixation:** No nodulation (Grobbelaar *et al.* 1983).

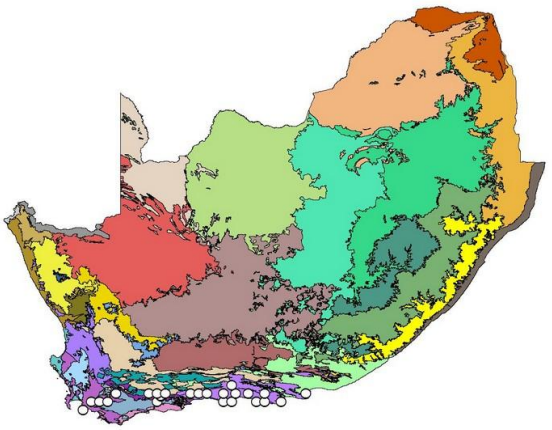


[E]*Hypocalyptus coluteoides* (Lam.) R.Dahlgren **Hypocalypteae** ①

Shrub; P; Ht 1.5–3; Alt 50–1150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos Renosterveld (89)	Southwest Fynbos (11)
Biome	Fynbos (100)	
Rainfall (mm)	400–800; 600–1000 (26)	200–600 (22)
Min temp (°C)	2–8 (78)	>6 (17)
Max temp (°C)	25–29 (57)	<27 (35)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (57)	5.5–7.4 (22)
ESP	Medium (89)	Non (11)
QDGCs	3321; 3323 (16)	3322; 3419; 3423 (12)

NOTES: **Flowering:** Spring (Manning 2001).

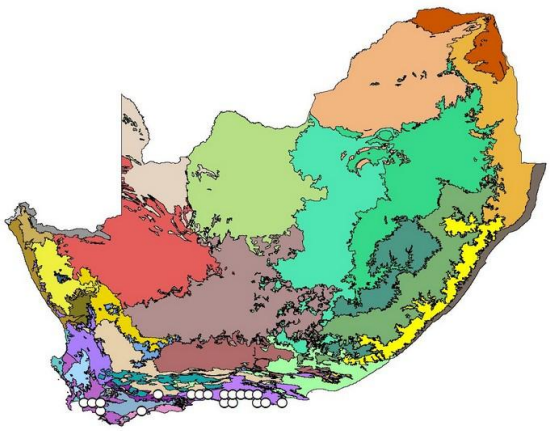


[E]*Hypocalyptus oxalidifolius* (Sims) Baill. **Hypocalypteae** ①

Dwarf shrub; P; Ht 0.1–0.6; Alt 50–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (42)	400–800 (32)
Min temp (°C)	2–8 (79)	>6 (21)
Max temp (°C)	<27; 25–29 (47)	27–35 (6)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (79)	5.5–7.4 (11)
ESP	Medium (100)	
QDGCs	3323 (21)	3322; 3419; 3424 (16)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring (Moriarty 1997).



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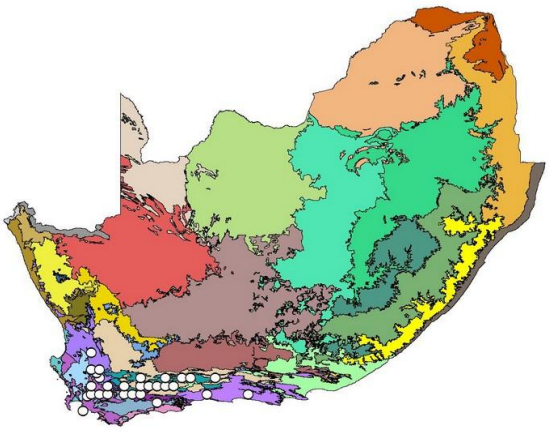
[E]*Hypocalyptus sophoroides* (P.J.Bergius) Baill.

Hypocalypteae ①

Shrub; P; Ht 1–4; Alt 200–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld (40)	Northwest Fynbos (20)
Biome	Fynbos (100)	
Rainfall (mm)	<400 (39)	200–600 (32)
Min temp (°C)	2–8 (71)	0–4 (29)
Max temp (°C)	25–29 (64)	27–35 (32)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	5.5–7.4 (25)	<6.4; >7.5 (21)
ESP	Non (60)	Medium (40)
QDGCs	3319 (31)	3320 (24)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Manning 2003).



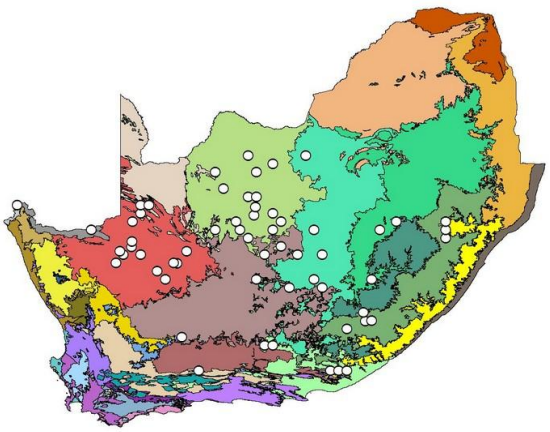
Indigastrum argyraeum (Eckl. & Zeyh.) Schrire

Indigofereae ②

Herb; P; Ht 0.01–0.05; Alt 90–1770

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (39)	Bushmanland (33)
Biome	Savanna (37)	Grassland; Nama Karoo (29)
Rainfall (mm)	<400 (61)	400–800 (20)
Min temp (°C)	<2 (61)	0–4 (20)
Max temp (°C)	27–35 (58)	>33 (27)
Phosphorus (ppm)	<10 (51)	>20 (29)
pH	>7.5 (41)	6.5–8.4 (20)
ESP	Non (97)	Medium (3)
QDGCs	2824 (8)	2820; 2920 (7)

NOTES: **Livestock feed** (Shearing & Van Heerden 1997). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



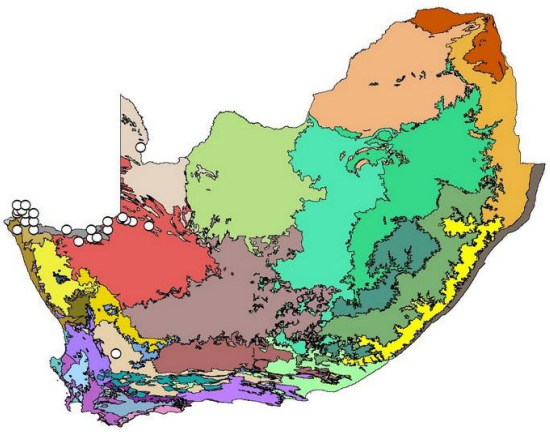
Indigastrum argyroides (E.Mey.) Schrire

Indigofereae ②

Herb; A; Ht 0.02–0.5; Alt 155–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (56)	Gariep Desert (22)
Biome	Nama Karoo (38)	Desert; Succulent Karoo (25)
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (55)	>6 (41)
Max temp (°C)	>33 (64)	27–35 (27)
Phosphorus (ppm)	>20 (86)	5–35 (14)
pH	>7.5 (95)	6.5–8.4 (5)
ESP	Non (67)	Medium (22)
QDGCs	2817 (27)	2820 (19)

NOTES: **Livestock feed** (Hendricks *et al.* 2002). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



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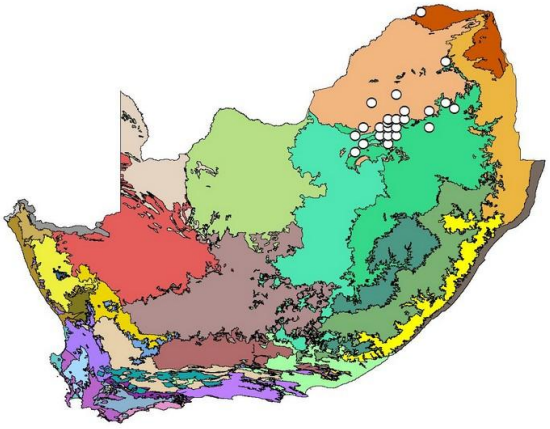
[E]*Indigastrum burkeanum* (Benth. ex Harv.) Schrire

Indigofereae ①

Herb; P; Ht 0.1–0.7; Alt 1372–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (67)	Mesic Highveld Grassland (22)
Biome	Savanna (57)	Grassland (43)
Rainfall (mm)	400–800 (92)	<400; 600–1000 (4)
Min temp (°C)	2–8 (52)	0–4 (35)
Max temp (°C)	27–35 (52)	25–29 (43)
Phosphorus (ppm)	<10 (91)	5–35 (9)
pH	<6.4 (83)	5.5–7.4 (13)
ESP	Non (100)	
QDGCs	2528 (32)	2527; 2529 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Van Wyk & Malan 1998).



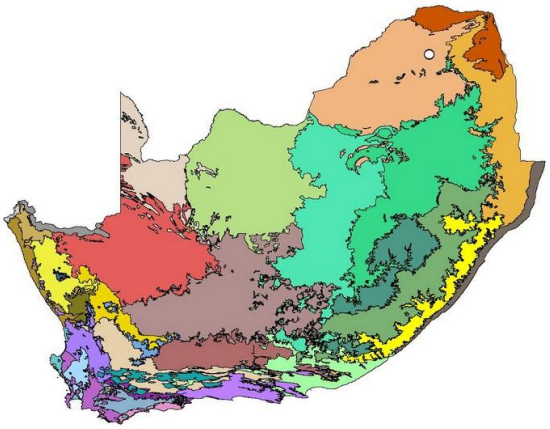
Indigastrum candidissimum (Dinter) Schrire

Indigofereae ①

Herb; P; Ht 0.01–0.15; Alt ?–1480

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2329 (100)	

NOTES: –



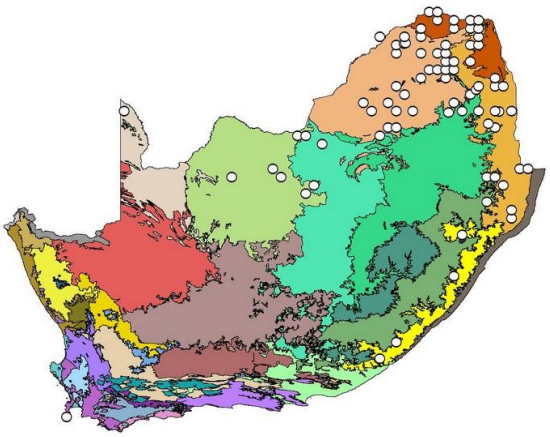
Indigastrum costatum (Guill. & Perr.) Schrire subsp. *macrum* (E.Mey.) Schrire

Indigofereae ①

Herb; P; Ht 0.1–0.7; Alt 45–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (44)	Mopane (20)
Biome	Savanna (94)	Grassland (4)
Rainfall (mm)	400–800 (57)	<400 (14)
Min temp (°C)	2–8 (58)	>6 (29)
Max temp (°C)	27–35 (70)	25–29 (26)
Phosphorus (ppm)	<10 (53)	5–35 (47)
pH	5.5–7.4 (35)	<6.4 (26)
ESP	Non (100)	
QDGCs	2329 (10)	2230 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972, 1975). **Flowering:** Spring, summer (Germishuizen & Clark 2003).



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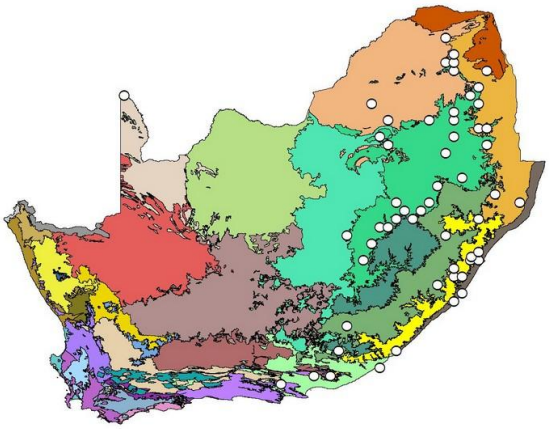
Indigastrum fastigiatum (E.Mey.) Schrire

Indigofereae ①

Herb; P; Ht 0.2–0.8; Alt 60–3500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (53)	Central Bushveld (18)
Biome	Grassland (72)	Savanna (20)
Rainfall (mm)	>800 (36)	400–800 (33)
Min temp (°C)	2–8 (44)	>2 (24)
Max temp (°C)	25–29 (58)	<27 (27)
Phosphorus (ppm)	<10 (71)	5–35 (29)
pH	<6.4 (71)	5.5–7.4 (24)
ESP	Non (100)	
QDGCs	2828 (9)	2530; 2930; 3030 (7)

NOTES: **Biocultural:** Magical; medicine for humans (Watt & Breyer-Brandwijk 1962).



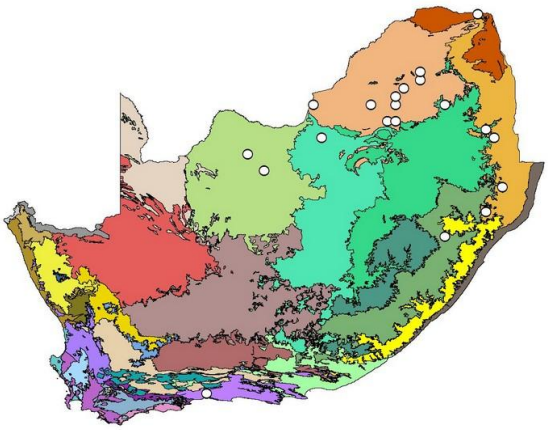
Indigastrum parviflorum (B.Heyne ex Wight & Arn.) Schrire subsp. *parviflorum* var. *parviflorum*

Indigofereae ①

Herb; A; Ht 0.15–5; Alt 915–1850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (57)	Eastern Kalahari Bushveld (21)
Biome	Savanna (90)	Grassland (10)
Rainfall (mm)	400–800 (67)	600–1000 (14)
Min temp (°C)	2–8 (67)	<2; 0–4 (14)
Max temp (°C)	27–35 (48)	25–29 (43)
Phosphorus (ppm)	<10 (76)	5–35 (24)
pH	<6.4 (43)	5.5–7.4 (38)
ESP	Non (93)	Medium (7)
QDGCs	2528 (14)	2428; 2429; 2525 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



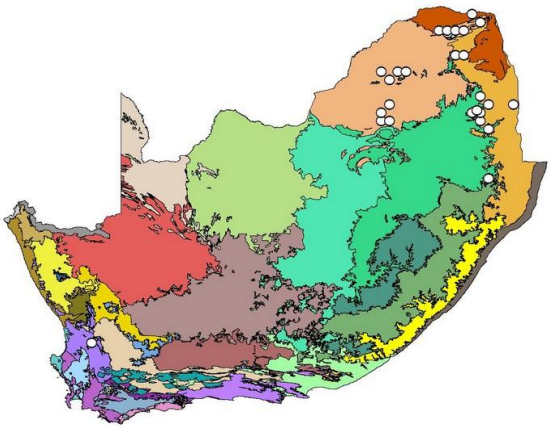
Indigofera adenoides Baker f.

Indigofereae ①

Shrub, dwarf shrub, herb, creeper; P; Ht 0.05–1.2; Alt 885–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (77)	Lowveld (15)
Biome	Savanna (94)	Fynbos (6)
Rainfall (mm)	400–800 (50)	>800 (23)
Min temp (°C)	2–8 (81)	>6 (15)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (69)	5–35 (31)
pH	<6.4 (69)	5.5–7.4; 6.5–8.4 (12)
ESP	Non (100)	
QDGCs	2230 (17)	2530 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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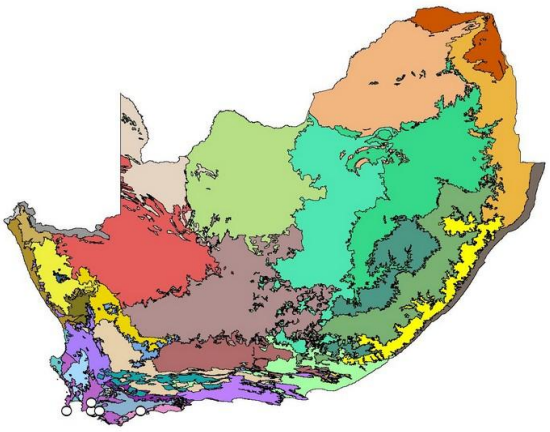
[E]*Indigofera alopecuroides* (Burm.f.) DC. var. *alopecuroides*

Indigofereae ①

Shrub, herb, creeper; P; Ht 0.15–0.91; Alt 30–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (60)	200–600; >800 (20)
Min temp (°C)	>6 (60)	2–8 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (80)	6.5–7.4 (20)
ESP	Non (100)	
QDGCs	3419 (66)	3418; 3420 (17)

NOTES: –



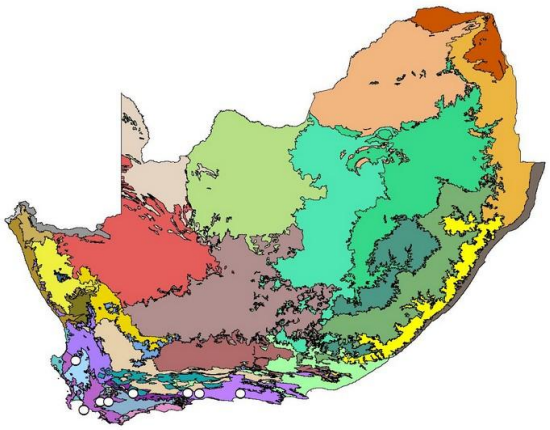
[E]*Indigofera alopecuroides* (Burm.f.) DC. var. *minor* E.Mey.

Indigofereae ①

Dwarf shrub, herb, creeper; P; Ht 0.15–6; Alt 153–1555

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (38)	400–800; 600–1000 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (88)	<27 (13)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (50)	<6.4 (38)
ESP	Non; Medium (50)	
QDGCs	3322; 3419 (24)	3218; 3320; 3323; 3418 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



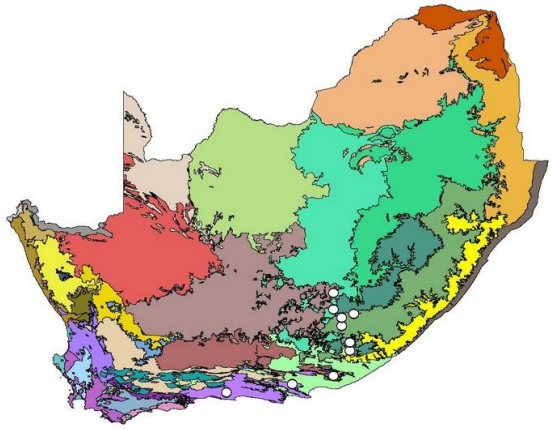
[E]*Indigofera alpina* Eckl. & Zeyh.

Indigofereae ①

Herb; P; Ht 0.01–0.2; Alt 610–1824

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (75)	Eastern Fynbos-Renosterveld (25)
Biome	Grassland (100)	
Rainfall (mm)	400–800 (60)	200–600 (30)
Min temp (°C)	0–4; 2–8 (40)	<2 (20)
Max temp (°C)	25–29 (80)	<27; 27–35 (10)
Phosphorus (ppm)	5–35 (70)	<10 (30)
pH	5.5–7.4; 6.5–8.4 (30)	6.5–7.4 (20)
ESP	Non (75)	Medium (25)
QDGCs	3126 (40)	3226 (20)

NOTES: –



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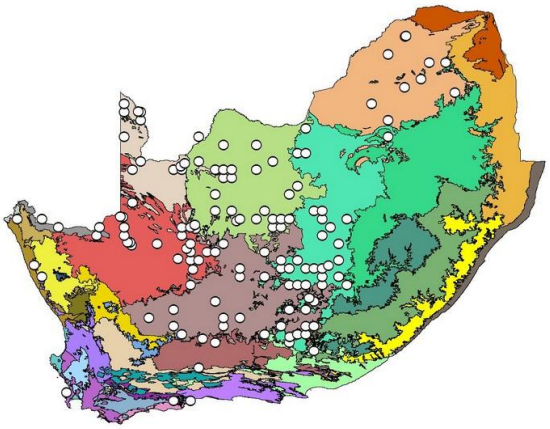
Indigofera alternans DC. var. *alternans*

Indigofereae ②

Herb; P; Ht 0.01–2; Alt 155–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (27)	Dry Highveld Grassland (23)
Biome	Savanna (42)	Grassland (31)
Rainfall (mm)	<400 (62)	400–800 (24)
Min temp (°C)	<2 (55)	2–8 (22)
Max temp (°C)	27–35 (59)	>33 (31)
Phosphorus (ppm)	5–35 (43)	<10 (35)
pH	>7.5 (42)	6.5–7.4 (22)
ESP	Non (97)	Medium (3)
QDGCs	2922 (5)	2824; 3025; 3026; 3125 (4)

NOTES: **Livestock feed** (Shearing & Van Heerden 1997). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Summer, autumn (Van Rooyen 2001).



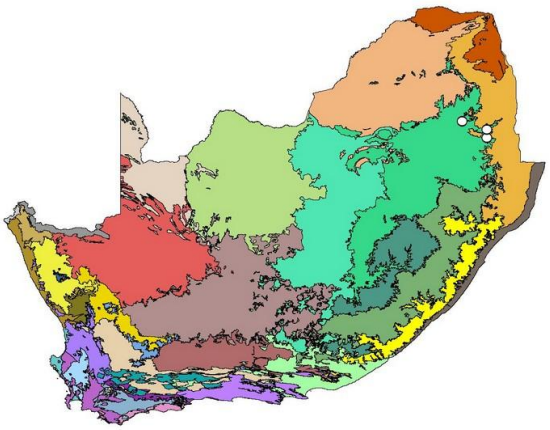
Indigofera amitina N.E.Br.

Indigofereae ①

Dwarf shrub, shrub; P; Ht 0.6–2; Alt 915–1335

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (67)	<27 (33)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2530; 2531; 2631 (33)	

NOTES: –



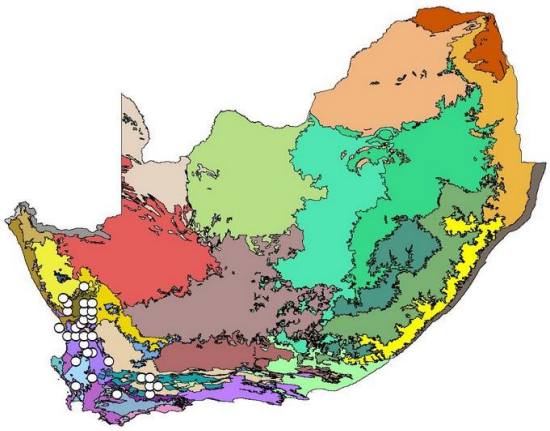
[E] *Indigofera amoena* Aiton

Indigofereae ①

Herb, shrub, climber; P; Ht 0.1–1.5; Alt 122–570

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Namaqualand Hardeveld; Namaqualand Sandveld (33)	
Biome	Fynbos (67)	Succulent Karoo (33)
Rainfall (mm)	<400 (62)	200–600 (38)
Min temp (°C)	2–8 (66)	>6 (28)
Max temp (°C)	27–35 (52)	25–29 (48)
Phosphorus (ppm)	5–35 (62)	>20 (38)
pH	>7.5 (34)	6.5–8.4 (28)
ESP	Non; Medium; High (33)	
QDGCs	3118 (26)	3218 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Flowering:** Winter, spring (Van Rooyen & Steyn 1999).



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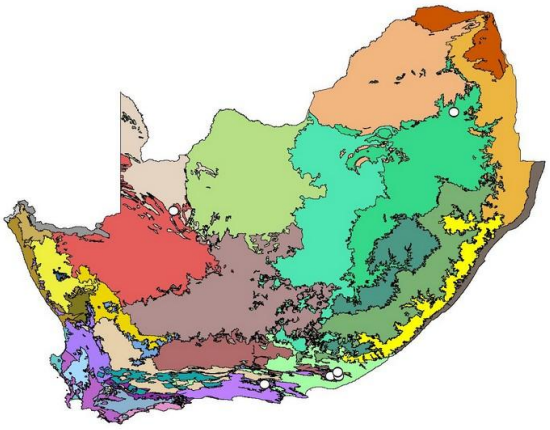
[E]*Indigofera angustata* E.Mey.

Indigofereae ①

Shrub, dwarf shrub, climber; P; Ht 0.01–1.83; Alt 305–700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (40)	<400; 400–800; 600–1000 (20)
Min temp (°C)	2–8 (60)	0–4 (40)
Max temp (°C)	25–29 (60)	<27; >33 (20)
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	5.5–7.4 (60)	<6.4; >7.5 (20)
ESP	Non (100)	
QDGCs	3326 (49)	2530; 2821; 3324 (17)

NOTES: –



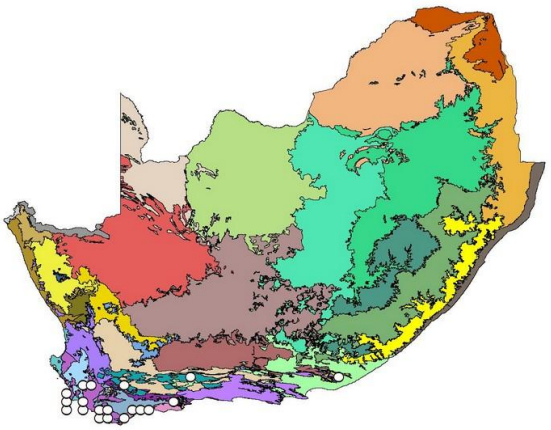
[E]*Indigofera angustifolia* L. var. *angustifolia*

Indigofereae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt 30–1415

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (32)	>800 (16)
Min temp (°C)	2–8 (58)	>6 (37)
Max temp (°C)	25–29 (95)	27–35 (5)
Phosphorus (ppm)	5–35 (79)	<10 (16)
pH	<6.4 (42)	5.5–7.4 (26)
ESP	Non (100)	
QDGCs	3418; 3419; 3420 (21)	3318 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Kidd 2002).



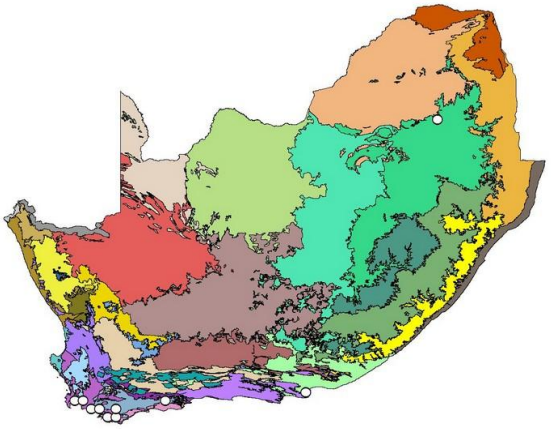
[E]*Indigofera angustifolia* L. var. *tenuifolia* (Lam.) Harv.

Indigofereae ①

Dwarf shrub; P; Ht 0.01–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (70)	200–600 (20)
Min temp (°C)	2–8 (60)	>6 (30)
Max temp (°C)	25–29 (90)	<27 (10)
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	<6.4 (50)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	3419 (50)	3418 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Kidd 2002).



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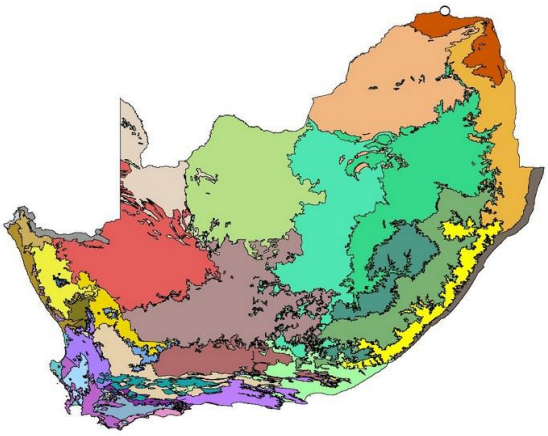
Indigofera aquae-nitentis Bremek.

Indigofereae ①

Dwarf shrub, shrub; P; Ht 0.01–0.5; Alt 200–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Non (100)	
QDGCs	2229 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



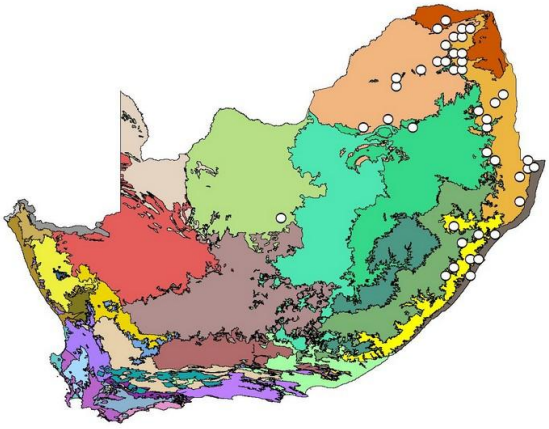
Indigofera arrecta Hochst. ex A.Rich.

Indigofereae ☠ ③

Dwarf shrub, shrub; P; Ht 0.3–3; Alt 10–1403

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (50)	Central Bushveld (25)
Biome	Savanna (94)	Indian Ocean (6)
Rainfall (mm)	400–800 (48)	>800 (29)
Min temp (°C)	2–8 (57)	>6 (36)
Max temp (°C)	25–29 (62)	27–35 (38)
Phosphorus (ppm)	<10 (62)	5–35 (38)
pH	<6.4 (52)	5.5–7.4 (38)
ESP	Non (100)	
QDGCs	2330 (12)	2930 (10)

NOTES: **Livestock feed** (Bosch & Borus 2006). **DM:** 2.7 t/ha (Hassen *et al.* 2008). **CP:** Plant 25% (Nezomba *et al.* 2009); Shoot 18–26% (Tjelele 2006). **Cultivated** (Glen 2002). **Antiquality:** Indospicine 126 mg/kg DM (Hassen *et al.*2008). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Cover crop; green manure (Bosch & Borus 2006); Organic N (Nezomba *et al.* 2009). **Ecology:** Seed (Tauro *et al.* 2007). **Biocultural:** Dye; medicine for humans (Watt & Breyer-Brandwijk 1962).



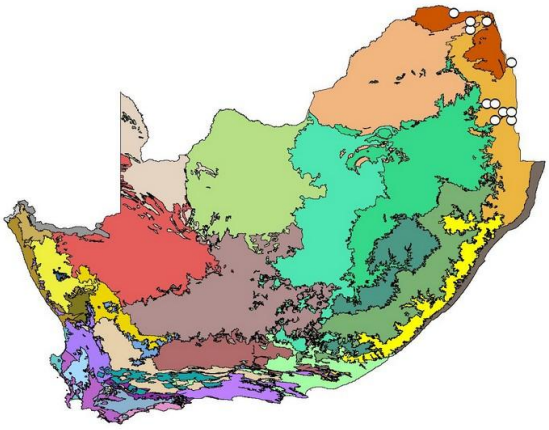
Indigofera astragalina DC.

Indigofereae ②

Herb; P; Ht 0.2–1.2; Alt 610–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (86)	Mopane (14)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (36)	200–600 (27)
Min temp (°C)	>6 (91)	2–8 (9)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (55)	5–35 (45)
pH	6.5–7.4 (45)	<6.4; 5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2531 (55)	2230 (27)

NOTES: **CP:** 12% (Nezomba *et al.* 2007). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967); *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Ecology:** Seed (Tauro *et al.* 2007).



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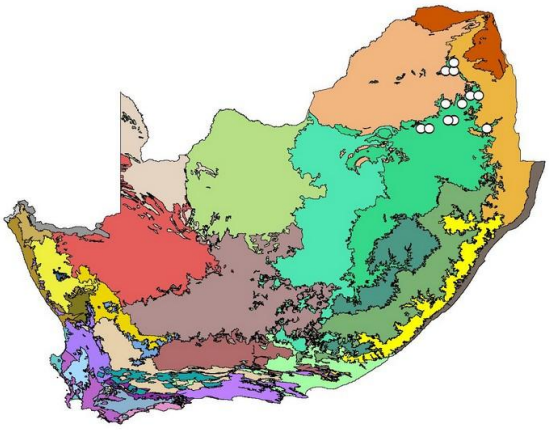
Indigofera atrata N.E.Br.

Indigofereae ①

Herb; P; Ht 0.1–0.6; Alt 900–1890

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (50)	600–1000 (33)
Min temp (°C)	2–8 (58)	0–4 (42)
Max temp (°C)	25–29 (67)	<27 (25)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2529 (33)	2430 (25)

NOTES: –



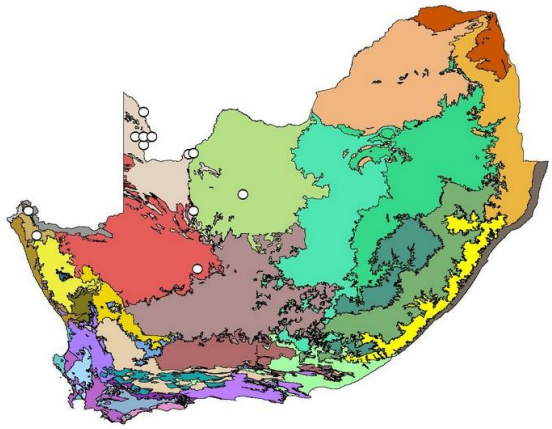
Indigofera auricoma E.Mey.

Indigofereae ①

Herb; P; Ht 0.1–1; Alt 755–1463

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Kalahari Duneveld (71)	Bushmanland; Eastern Kalahari Bushveld (14)
Biome	Savanna (80)	Nama Karoo; Succulent Karoo (10)
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (42)	<2 (25)
Max temp (°C)	>33 (67)	27–35 (25)
Phosphorus (ppm)	5–35 (42)	<10 (33)
pH	>7.5 (75)	6.5–7.4 (17)
ESP	Non (100)	
QDGCs	2620 (36)	2520; 2621; 2622; 2723; 2817; 2822; 2917; 3022 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).
Flowering: Summer (Van Rooyen 2001).



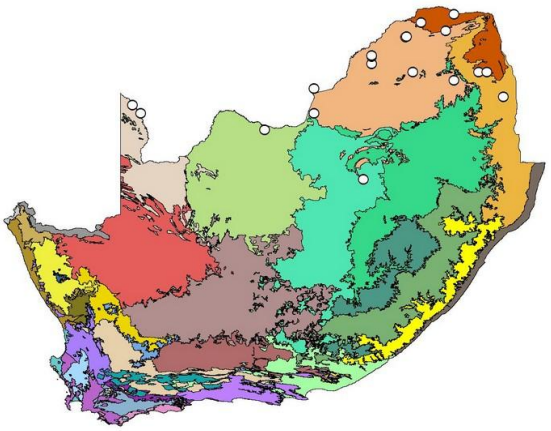
Indigofera bainesii Baker

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.2–1; Alt 305–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (42)	Kalahari Duneveld; Mopane (17)
Biome	Savanna (93)	Grassland (7)
Rainfall (mm)	27–35 (59)	<27 (24)
Min temp (°C)	2–8 (59)	>6 (24)
Max temp (°C)	27–35 (64)	25–29; >33 (18)
Phosphorus (ppm)	<10 (59)	5–35 (41)
pH	5.5–7.4 (47)	6.5–8.4; >7.5 (18)
ESP	Non (100)	
QDGCs	2327 (16)	2229; 2328; 2430; 2431; 2520 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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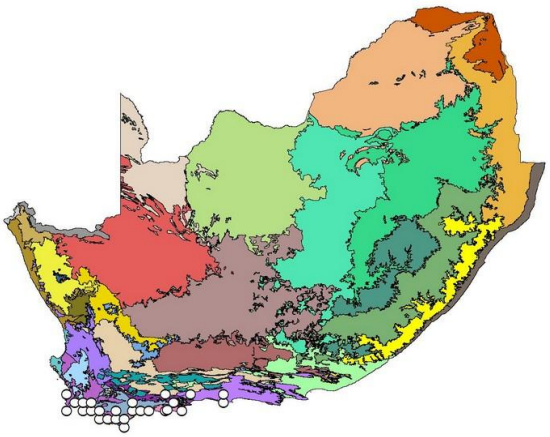
[E]*Indigofera brachystachya* (DC.) E.Mey.

Indigofereae ①

Dwarf shrub; P; Ht 0.3–6; Alt 3–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld (40)	South Coast Fynbos (20)
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (36)	>800 (16)
Min temp (°C)	2–8 (64)	>6 (36)
Max temp (°C)	25–29 (76)	<27 (16)
Phosphorus (ppm)	5–35 (88)	<10 (12)
pH	<6.4 (52)	5.5–7.4 (20)
ESP	Non (60)	Medium (40)
QDGCs	3419 (27)	3420 (23)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** All seasons (Manning 2003).



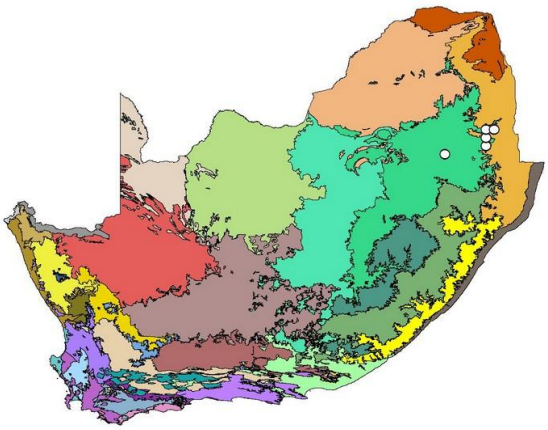
[E]*Indigofera buchananii* Burtt Davy

Indigofereae ①

Herb; P; Ht 0.4–0.6; Alt 1372–1524

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (60)	400–800; 600–1000 (20)
Min temp (°C)	2–8 (80)	<2 (20)
Max temp (°C)	25–29 (60)	<27; 27–35 (20)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	2531; 2631 (40)	2629 (20)

NOTES: **Antiquality:** Poisonous to livestock (Burtt-Davy 1921).



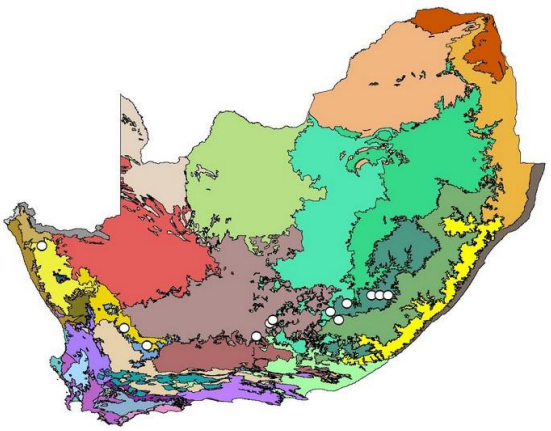
[E]*Indigofera burchellii* DC.

Indigofereae ①

Herb; P; Ht 0.01–0.4; Alt 915–2300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (50)	Sub-Escarpment Grassland; Trans-Escarpment Succulent Karoo (25)
Biome	Grassland (75)	Succulent Karoo (25)
Rainfall (mm)	<400 (36)	200–600; 400–800; 600–1000 (18)
Min temp (°C)	<2 (73)	0–4 (18)
Max temp (°C)	25–29 (73)	27–35 (18)
Phosphorus (ppm)	<10 (45)	>20 (36)
pH	6.5–8.4 (36)	<6.4; 5.5–7.4; 6.5–7.4 (18)
ESP	Non (75)	Medium (25)
QDGCs	3126 (25)	3027; 3124 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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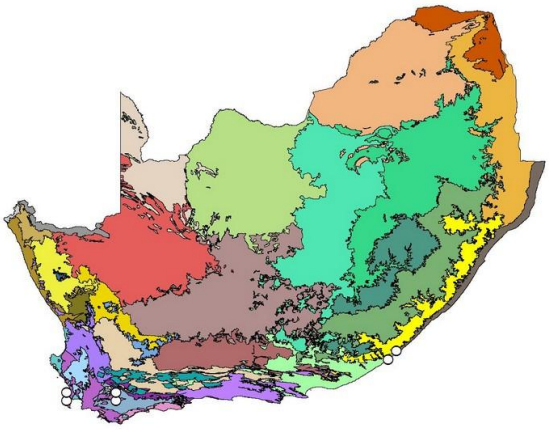
[E]*Indigofera candicans* Aiton

Indigofereae ①

Dwarf shrub; P; Ht 0.05–0.3; Alt 5–30

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (50)	200–600 (33)
Min temp (°C)	>6 (67)	0–4; 2–8 (17)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	6.5–7.4 (33)
ESP	Ecotone	
QDGCs	3228 (32)	3318; 3319; 3418; 3419 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).
Flowering: Spring, summer, autumn (Manning 2001).



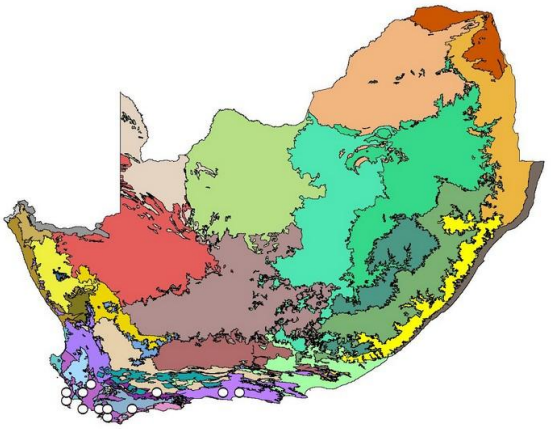
[E]*Indigofera candolleana* Meisn.

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.6–0.8; Alt 350–519

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (67)	Southwest Fynbos (33)
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (42)	200–600; 400–800; >800 (17)
Min temp (°C)	2–8 (75)	>6 (17)
Max temp (°C)	25–29 (75)	<27 (17)
Phosphorus (ppm)	5–35 (83)	<10 (17)
pH	<6.4 (58)	5.5–7.4 (25)
ESP	Medium (67)	Non (33)
QDGCs	3419 (25)	3318; 3323; 3418 (17)

NOTES: **Flowering:** Spring, summer (Kidd 2002).



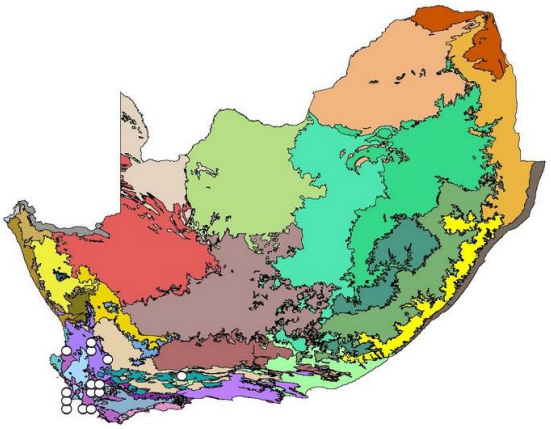
[E]*Indigofera capillaris* Thunb.

Indigofereae ①

Herb; P; Ht 0.1–1; Alt 185–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (75)	Northwest Fynbos (25)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (29)	400–800; >800 (21)
Min temp (°C)	2–8; >6 (36)	0–4 (29)
Max temp (°C)	25–29 (79)	27–35 (21)
Phosphorus (ppm)	5–35 (93)	>20 (7)
pH	<6.4; 5.5–7.4 (43)	6.5–8.4 (14)
ESP	Non (100)	
QDGCs	3319 (29)	3219; 3418 (21)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).
Flowering: Spring (Kidd 2002).



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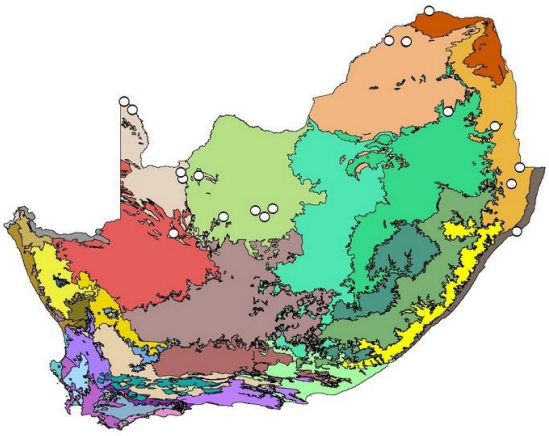
Indigofera charlieriana Schinz var. *charlieriana*

Indigofereae ①

Herb; A; Ht 0.1–0.7; Alt 885–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (31)	Kalahari Duneveld (23)
Biome	Savanna (93)	Indian Ocean (7)
Rainfall (mm)	<400 (53)	400–800 (24)
Min temp (°C)	2–8 (35)	<2; >6 (24)
Max temp (°C)	27–35 (59)	>33 (35)
Phosphorus (ppm)	<10 (59)	5–35 (41)
pH	>7.5 (29)	6.5–8.4 (24)
ESP	Non (100)	
QDGCs	2328; 2824 (16)	2721 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).
Flowering: Summer (Van Rooyen 2001).



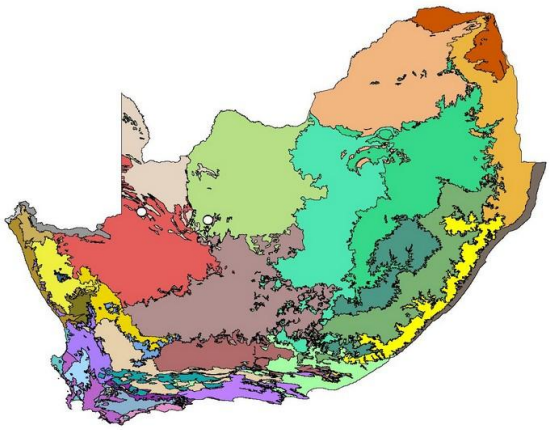
Indigofera charlieriana Schinz var. *lata* J.B.Gillett

Indigofereae ①

Herb; A; Ht 0.2–0.4; Alt 915–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (100)	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	27–35; >33 (50)	
Phosphorus (ppm)	<10; >20 (50)	
pH	6.5–8.4; >7.5 (50)	
ESP	Non (100)	
QDGCs	2820; 2822 (50)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



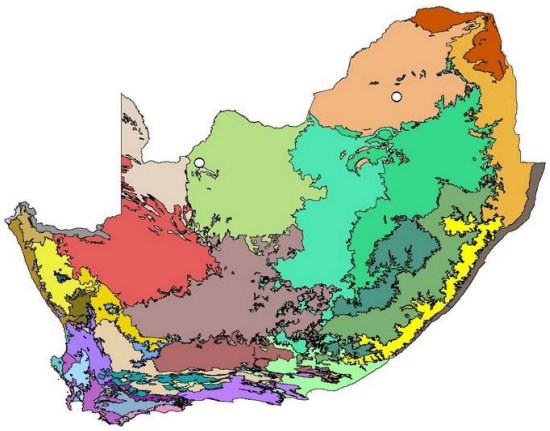
Indigofera charlieriana Schinz var. *scaberrima* (Schinz) J.B.Gillett

Indigofereae ①

Herb; A; Ht 0.01–0.3; Alt ?–1038

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400; 400–800 (50)	
Min temp (°C)	<2; 2–8 (50)	
Max temp (°C)	27–35; >33 (50)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	2428; 2622 (50)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



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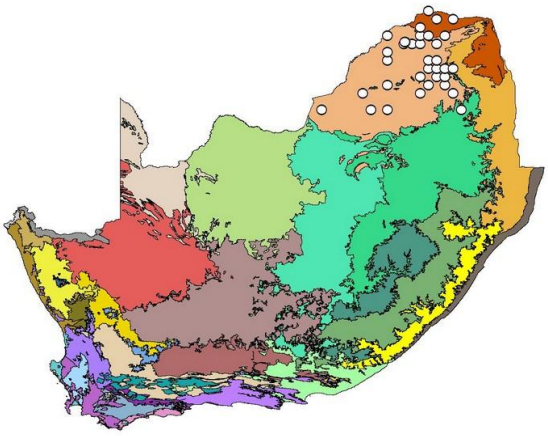
Indigofera circinnata Benth. ex Harv.

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.1–0.3; Alt 242–1405

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (81)	Mopane (15)
Biome	Savanna (97)	Grassland (3)
Rainfall (mm)	400–800 (56)	200–600 (24)
Min temp (°C)	2–8 (91)	0–4 (6)
Max temp (°C)	27–35 (59)	25–29 (38)
Phosphorus (ppm)	5–35 (76)	<10 (24)
pH	5.5–7.4; 6.5–8.4 (32)	<6.4 (26)
ESP	Non (100)	
QDGCs	2329 (19)	2229; 2328; 2429 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



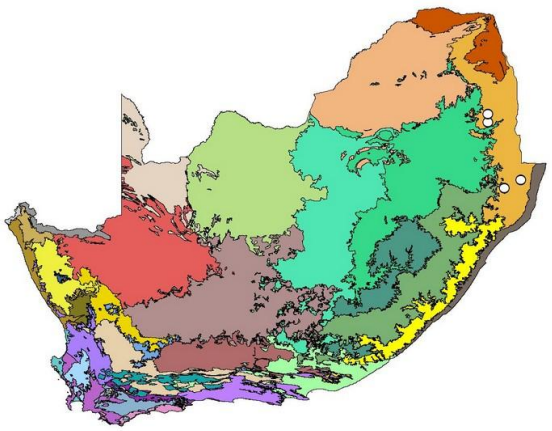
Indigofera colutea (Burm.f.) Merr. var. *colutea*

Indigofereae ①

Herb; P; Ht 0.05–0.75; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (75)	<6.4 (25)
ESP	Non (100)	
QDGCs	2531 (50)	2731; 3732 (25)

NOTES: –



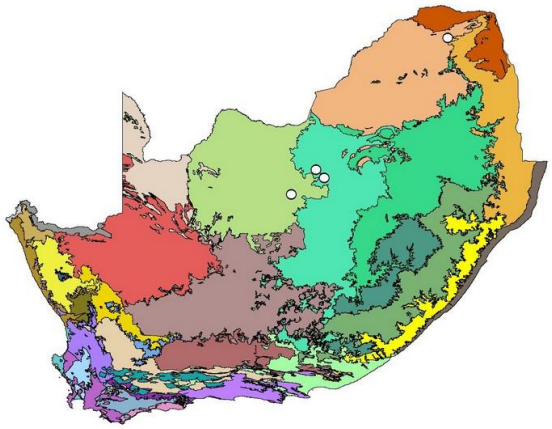
[E] *Indigofera commixta* N.E.Br.

Indigofereae ①

Dwarf shrub; P; Ht 0.01–0.3; Alt ?–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Eastern Kalahari Bushveld (50)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	<2 (75)	2–8 (25)
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	6.5–7.4 (50)	5.5–7.4; 6.5–8.4 (25)
ESP	Non (100)	
QDGCs	2725 (50)	2726; 2329 (25)

NOTES: –



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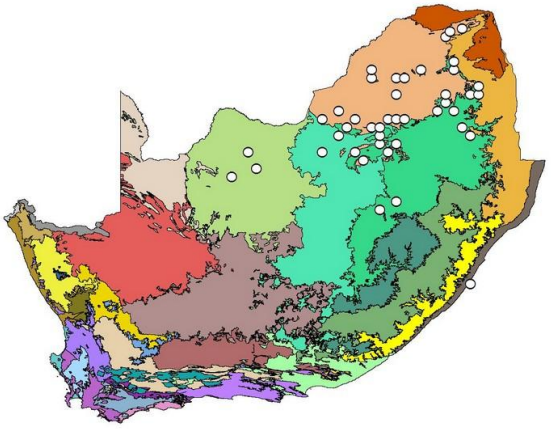
Indigofera comosa N.E.Br.

Indigofereae ①

Shrub; P; Ht 0.3–6; Alt 10–2010

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (45)	Mesic Highveld Grassland; Eastern Kalahari Bushveld (20)
Biome	Savanna (61)	Grassland (33)
Rainfall (mm)	400–800 (70)	600–1000 (14)
Min temp (°C)	2–8 (43)	0–4 (36)
Max temp (°C)	25–29 (48)	27–35 (39)
Phosphorus (ppm)	<10 (82)	5–35 (18)
pH	<6.4 (61)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	2430; 2627 (9)	2428; 2526; 2527; 2528 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



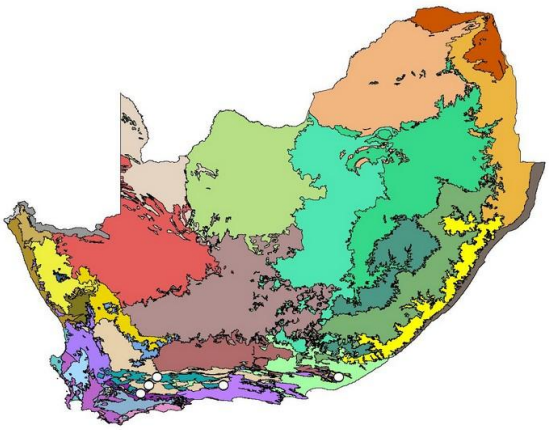
Indigofera complicata Eckl. & Zeyh.

Indigofereae ①

Dwarf shrub; P; Ht 0.2–0.6; Alt 100–366

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600 (40)	400–800 (20)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	5–35 (60)	>20 (40)
pH	>7.5 (40)	<6.4; 5.5–7.4; 6.5–7.4 (20)
ESP	Ecotone	
QDGCs	3320 (40)	3321; 3326 (20)

NOTES: **Flowering:** Winter, spring (Manning & Goldblatt 2000).



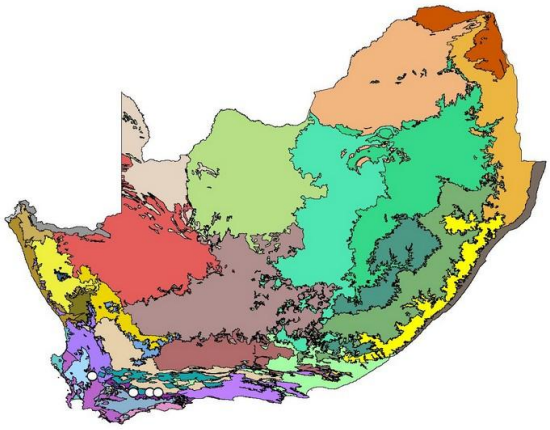
[E] *Indigofera concava* Harv.

Indigofereae ①

Dwarf shrub; P; Ht 0.2–0.3; Alt 600–1494

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	<400 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	<6.4; 5.5–7.4 (25)
ESP	Ecotone	
QDGCs	3320 (50)	3319; 3321 (25)

NOTES: –



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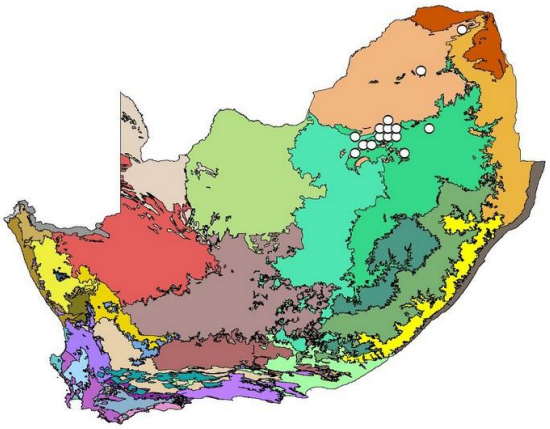
Indigofera confusa Prain & Baker f.

Indigofereae ①

Herb; P; Ht 0.2–0.5; Alt 1250–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Central Bushveld (50)	
Biome	Grassland (67)	Savanna (33)
Rainfall (mm)	400–800 (93)	600–1000 (7)
Min temp (°C)	0–4 (40)	2–8 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	<10 (87)	5–35 (13)
pH	<6.4 (87)	5.5–7.4 (13)
ESP	Non (100)	
QDGCs	2627 (33)	2528; 2628 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Summer, autumn (Pooley 1998).



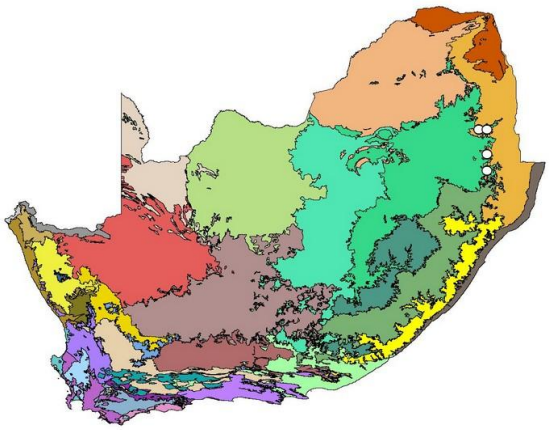
Indigofera crebra N.E.Br.

Indigofereae ①

Herb; P; Ht 0.2–0.3; Alt 1000–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2530; 2531; 2631; 2731 (25)	

NOTES: –



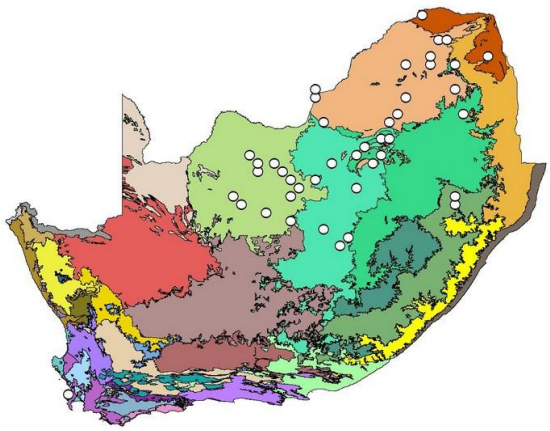
Indigofera cryptantha Benth. ex Harv. var. *cryptantha*

Indigofereae ☠③

Dwarf shrub, shrub; P; Ht 0.15–1; Alt 262–1485

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Eastern Kalahari Bushveld (38)	Dry Highveld Grassland (13)
Biome	Savanna (74)	Grassland (23)
Rainfall (mm)	400–800 (63)	200–600 (16)
Min temp (°C)	<2 (44)	2–8 (30)
Max temp (°C)	27–35 (74)	25–29 (19)
Phosphorus (ppm)	<10 (81)	5–35 (19)
pH	<6.4 (42)	5.5–7.4; 6.5–7.4 (21)
ESP	Non (100)	
QDGCs	2627 (12)	2329; 2725 (9)

NOTES: **CP:** Leaves and stems 8–28% (Tjelele 2006). **DM:** 800 kg/ha (Tjelele 2006). **Cultivated** (Glen 2002). **Antiquality:** Indospicine 35 mg/kg DM (Hassen *et al.* 2008). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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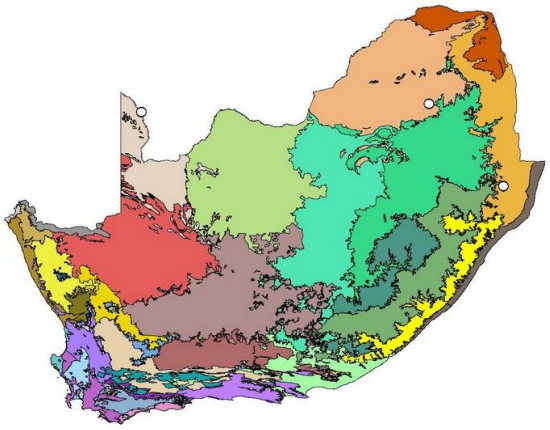
***Indigofera cryptantha* Benth. ex Harv. var. *occidentalis* Baker f.** **Indigofereae** ☠③

Dwarf shrub, shrub; P; Ht 0.3–1.5; Alt 410–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Kalahari Duneveld (50)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (67)	<400 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (67)	>33 (33)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	5.5–7.4 (67)	>7.5 (33)
ESP	Non (100)	
QDGCs	2520; 2529; 2731 (33)	

NOTES: **CP:** Leaves and stems 8–28% (Tjelele 2006). **DM:** 800 kg/ha (Tjelele 2006). **Antiquality:** Indospicine 35 mg/kg DM (Hassen *et al.* 2008). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1972).



[E]*Indigofera cuneifolia* Eckl. & Zeyh. var. *angustifolia* Harv. **Indigofereae** –

Shrub; P; Ht 0.01–1.22; Alt 600–2135

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

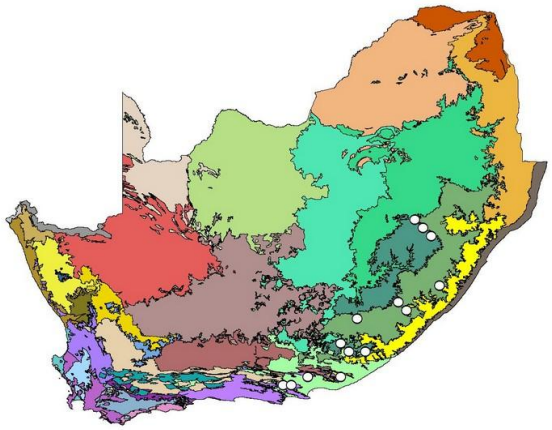
NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring (Pooley 2003).

Indigofera cuneifolia* Eckl. & Zeyh. var. *cuneifolia **Indigofereae** ①

Shrub; P; Ht 0.8–1.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Grassland (100)	
Rainfall (mm)	>800 (36)	400–800 (29)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (79)	<27 (21)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	5.5–7.4 (50)	<6.4 (36)
ESP	Ecotone	
QDGCs	3128; 3226; 3325 (15)	2828; 2829; 2929; 3029; 3127; 3227; 3324; 3326 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring (Pooley 2003).



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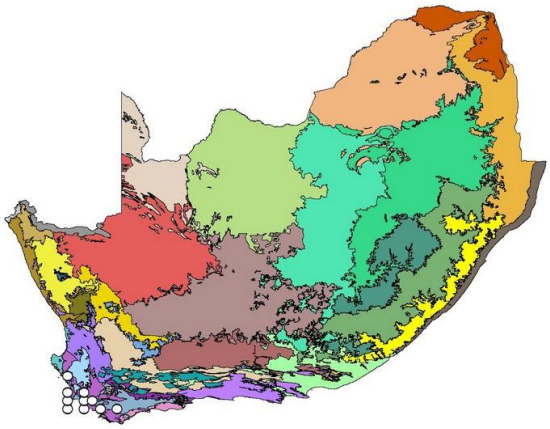
[E]*Indigofera cytisoides* (L.) L.

Indigofereae ①

Shrub; P; Ht 1–3; Alt 20–560

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000; >800 (30)	200–600; 400–800 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (90)	5.5–7.4 (10)
ESP	Non (100)	
QDGCs	3418 (40)	3118; 3419 (30)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Autumn (Kidd 2002).



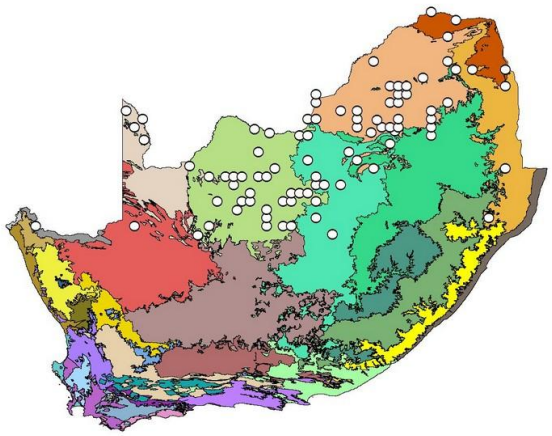
Indigofera daleoides Benth. ex Harv. var. *daleoides*

Indigofereae ①❖

Herb; P; Ht 0.3–2.4; Alt 30–1665

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (46)	Central Bushveld (32)
Biome	Savanna (89)	Grassland (10)
Rainfall (mm)	400–800 (61)	<400 (28)
Min temp (°C)	<2 (40)	2–8 (37)
Max temp (°C)	27–35 (63)	>33 (22)
Phosphorus (ppm)	<10 (82)	5–35 (16)
pH	<6.4; 6.5–7.4 (27)	6.5–8.4 (17)
ESP	Non (100)	
QDGCs	2428; 2723; 2725 (8)	2527 (6)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Spring, summer (Van Rooyen 2001).



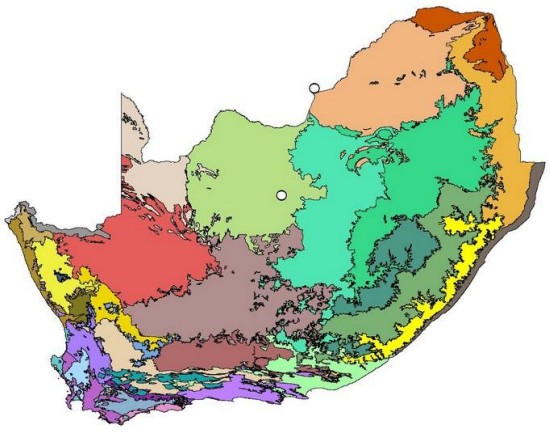
Indigofera daleoides Benth. ex Harv. var. *gossweileri* Baker f.

Indigofereae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Eastern Kalahari Bushveld (50)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	<2; 2–8 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 6.5–8.4 (50)	
ESP	Non (100)	
QDGCs	2425; 2724 (50)	

NOTES: –



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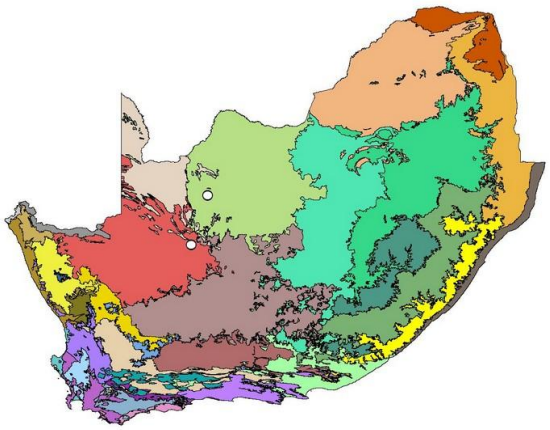
***Indigofera damarana* Merxm. & A.Schreib.** **Indigofereae** ①

Shrub; P; Ht 0.3–0.4; Alt 885–1068

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland; Eastern Kalahari Bushveld (50)	
Biome	Nama Karoo; Savanna (50)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	<2; 0–4 (50)	
Max temp (°C)	27–35; >33 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	6.5–8.4; >7.5 (50)	
ESP	Non (100)	
QDGCs	2722; 2922 (50)	

NOTES: –

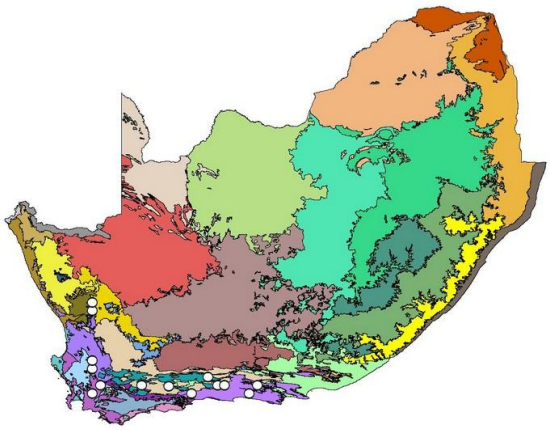


[E]***Indigofera declinata* E.Mey.** **Indigofereae** ①

Dwarf shrub; P; Ht 0.1–0.2; Alt 610–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (36)	<400 (29)
Min temp (°C)	2–8 (79)	0–4 (21)
Max temp (°C)	25–29 (71)	27–35 (21)
Phosphorus (ppm)	5–35 (71)	>20 (29)
pH	5.5–7.4 (36)	<6.4; >7.5 (29)
ESP	Non; Medium (50)	
QDGCs	3319; 3322 (21)	3119; 3323 (14)

NOTES: –

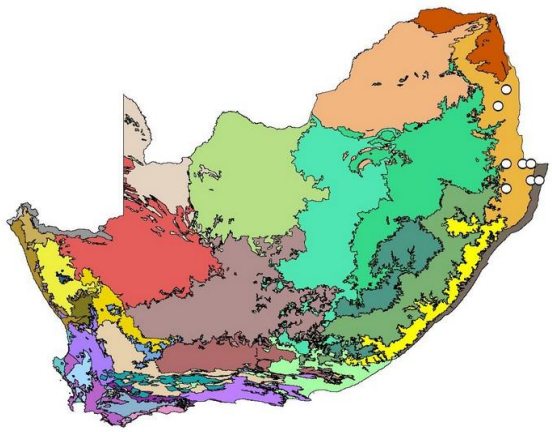


***Indigofera delagoaensis* Baker f. ex J.B.Gillett** **Indigofereae** ①

Herb; P; Ht 0.3–1; Alt 75–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (83)	Indian Ocean Coastal Belt (17)
Biome	Savanna (80)	Indian Ocean (20)
Rainfall (mm)	400–800 (88)	600–1000 (13)
Min temp (°C)	>6 (88)	2–8 (13)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (88)	5–35 (13)
pH	5.5–7.4 (50)	<6.4; 6.5–7.4 (25)
ESP	Non (100)	
QDGCs	2632; 2732 (24)	2431; 2531; 2631; 2731 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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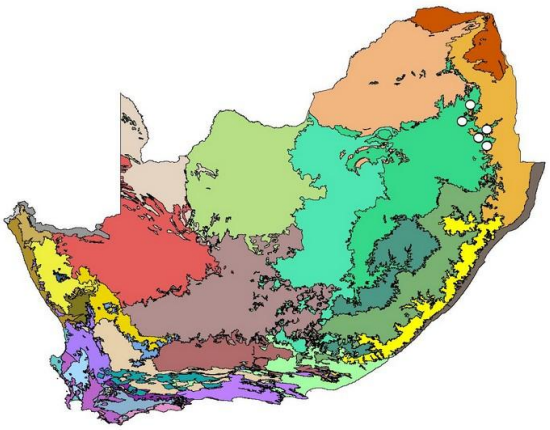
Indigofera densa N.E.Br.

Indigofereae ①

Herb; P; Ht 0.2–0.5; Alt 1220–2050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (60)	0–4 (40)
Max temp (°C)	25–29 (60)	<27 (40)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2530 (40)	2531; 2630; 2631 (20)

NOTES: –



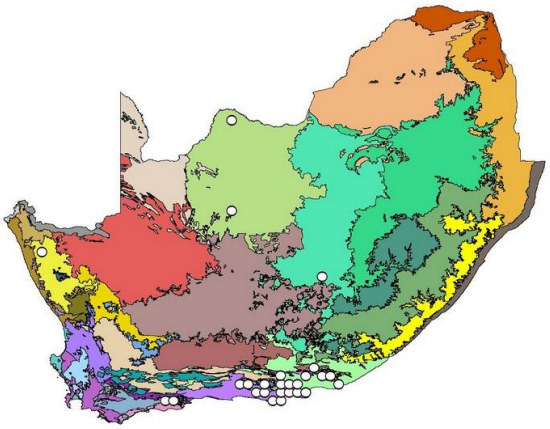
[E]*Indigofera denudata* L.f.

Indigofereae ①

Shrub; P; Ht 0.4–1.5; Alt 5–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (40)	Eastern Fynbos-Renosterveld; Dry Highveld Grassland; Namaqualand Hardeveld (20)
Biome	Savanna (40)	Fynbos; Grassland; Succulent Karoo (20)
Rainfall (mm)	400–800 (46)	200–600 (42)
Min temp (°C)	2–8 (62)	>6 (27)
Max temp (°C)	25–29 (69)	27–35 (15)
Phosphorus (ppm)	5–35 (77)	<10 (15)
pH	5.5–7.4; 6.5–8.4 (31)	<6.4 (27)
ESP	Non (60)	Medium (40)
QDGCs	3325 (27)	3324 (23)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



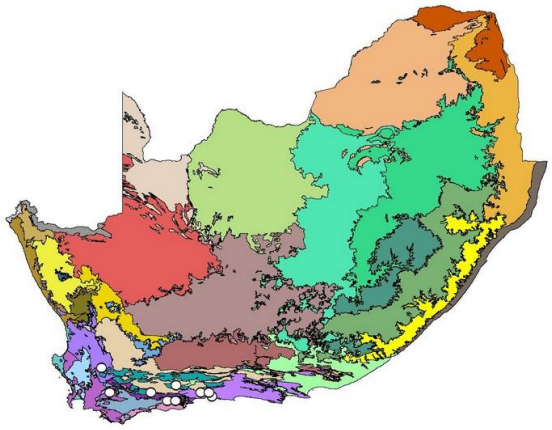
[E]*Indigofera depressa* Harv.

Indigofereae ①

Herb; P; Ht ?; Alt 60–795

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (63)	600–1000 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (88)	27–35 (13)
Phosphorus (ppm)	5–35 (88)	<10 (13)
pH	<6.4 (50)	6.5–8.4 (25)
ESP	Medium (100)	
QDGCs	3322 (33)	3319; 3421 (22)

NOTES: –



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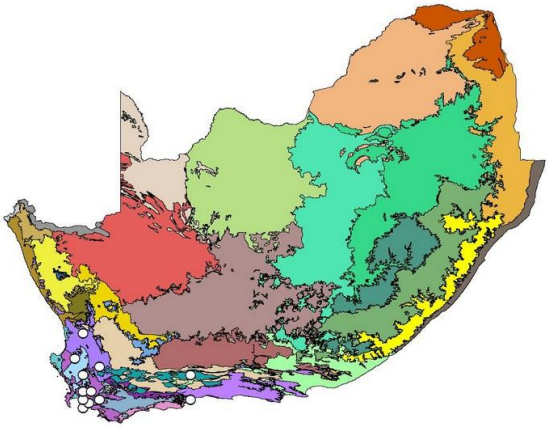
[E]*Indigofera digitata* Thunb.

Indigofereae ①

Herb, shrub; P; Ht 0.2–2; Alt 122–1007

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; >800 (33)	2–8 (17)
Min temp (°C)	2–8 (83)	0–4 (17)
Max temp (°C)	25–29 (67)	27–35 (25)
Phosphorus (ppm)	5–35 (92)	>20 (8)
pH	<6.4 (58)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3218; 3318; 3319; 3418; 3419 (17)	3322; 3422 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



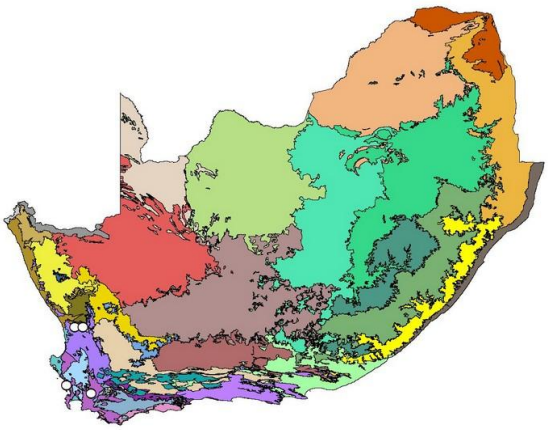
[E]*Indigofera dillwynioides* Benth. ex Harv.

Indigofereae ①

Dwarf shrub; P; Ht 0.2–0.4; Alt 170–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (50)	200–600; >800 (25)
Min temp (°C)	>6 (50)	0–4; 2–8 (25)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	<6.4; 5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3118 (50)	3318; 3319 (25)

NOTES: –



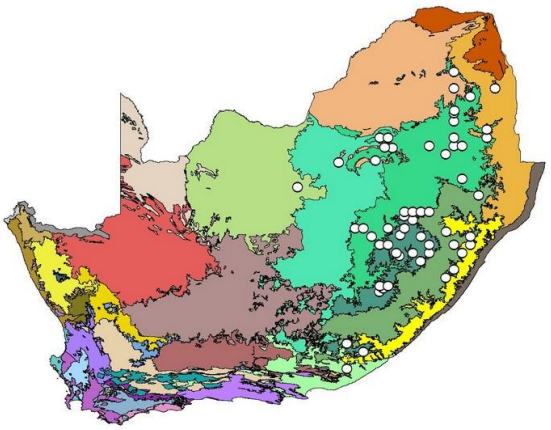
Indigofera dimidiata Vogel ex Walp.

Indigofereae ③

Herb; P; Ht 0.1–0.45; Alt 370–2745

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (46)	Drakensberg Grassland (25)
Biome	Grassland (89)	Savanna (8)
Rainfall (mm)	400–800 (40)	>800 (34)
Min temp (°C)	<2 (53)	0–4; 2–8 (23)
Max temp (°C)	<27 (45)	25–29 (43)
Phosphorus (ppm)	<10 (92)	5–35 (8)
pH	<6.4 (77)	5.5–7.4 (17)
ESP	Non (100)	
QDGCs	2828 (10)	2928; 2929 (8)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Pooley 1998).



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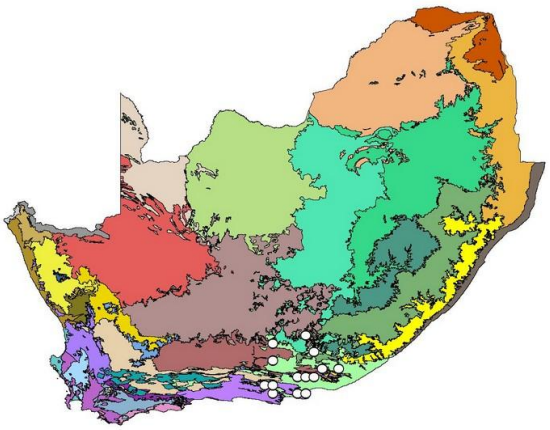
[E]*Indigofera disticha* Eckl. & Zeyh.

Indigofereae ①

Herb, climber; P; Ht 0.6–1.2; Alt 15–1144

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (57)	400–800 (29)
Min temp (°C)	2–8 (79)	>6 (14)
Max temp (°C)	25–29 (64)	27–35 (36)
Phosphorus (ppm)	5–35 (86)	>20 (14)
pH	5.5–7.4 (43)	6.5–8.4 (21)
ESP	Ecotone	
QDGCs	3325 (36)	3324 (21)

NOTES: –



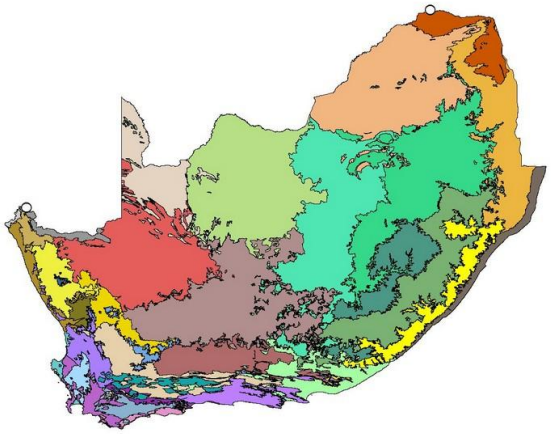
Indigofera dolichothyrsa Baker f.

Indigofereae ①

Shrub, climber; P; Ht 0.6–1; Alt 400–490

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35; >33 (50)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	6.5–8.4; >7.5 (50)	
ESP	Non (100)	
QDGCs	2229; 2817 (50)	

NOTES: –



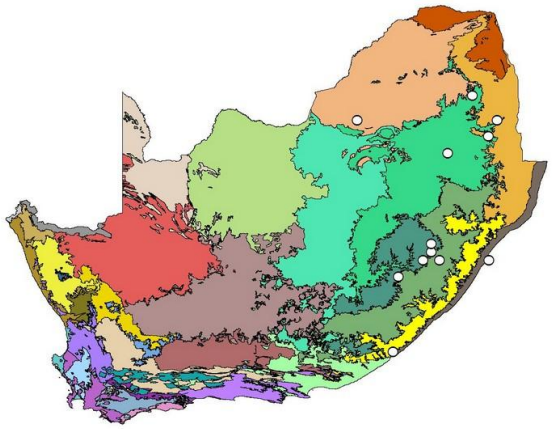
Indigofera dregeana E.Mey.

Indigofereae ①

Dwarf shrub; P; Ht 0.4–1.2; Alt 458–1950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Drakensberg Grassland; Mesic Highveld Grassland; Sub-Escarpment Grassland; Central Bushveld (20)	
Biome	Grassland (74)	Indian Ocean; Savanna (13)
Rainfall (mm)	>800 (66)	400–800; 600–1000 (17)
Min temp (°C)	<2 (42)	>6 (25)
Max temp (°C)	<27 (50)	25–29; 27–35 (25)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (83)	5.5–7.4 (17)
ESP	Non (100)	
QDGCs	2929 (36)	2430; 2527; 2531; 2629; 2631; 2931; 3028; 3228 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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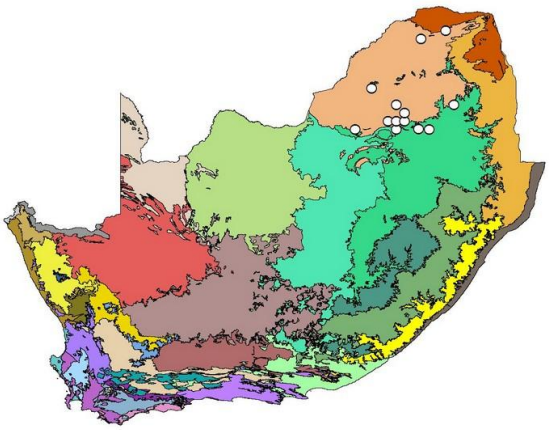
[E]*Indigofera egens* N.E.Br.

Indigofereae ①

Shrub; P; Ht 0.6–1.2; Alt 1068–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (75)	Mesic Highveld Grassland (25)
Biome	Savanna (71)	Grassland (29)
Rainfall (mm)	400–800 (85)	200–600 (15)
Min temp (°C)	2–8 (69)	0–4 (31)
Max temp (°C)	25–29 (54)	27–35 (46)
Phosphorus (ppm)	<10 (77)	5–35 (23)
pH	<6.4 (70)	5.5–7.4; 6.5–8.4 (15)
ESP	Non (100)	
QDGCs	2528 (46)	2529 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



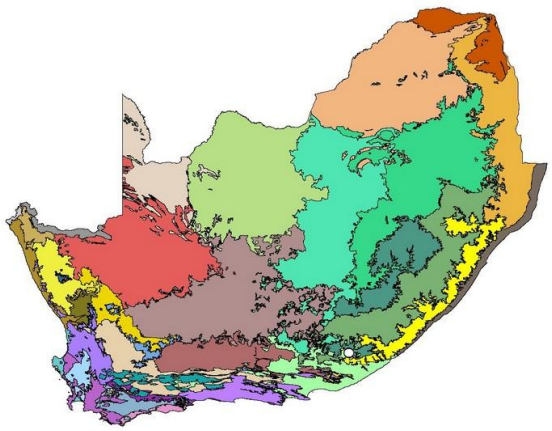
[E]*Indigofera elandsbergensis* Phillipson

Indigofereae ①

Shrub; P; Ht 0.7–1.5; Alt 1525–1640

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3226 (100)	

NOTES: –



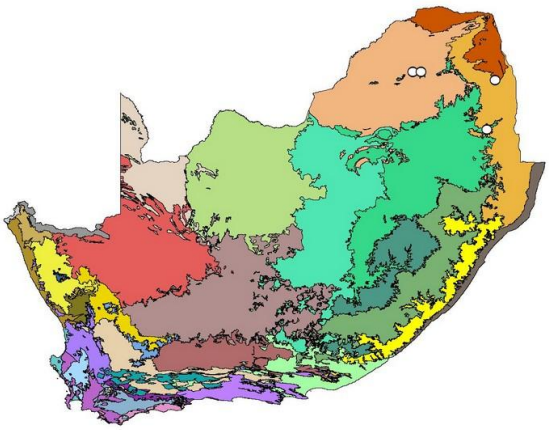
Indigofera enormis N.E.Br.

Indigofereae ①

Herb; P; Ht 0.2–0.4; Alt 460–1433

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (75)	>800 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	5.5–7.4 (50)	<6.4; 6.5–7.4 (25)
ESP	Ecotone	
QDGCs	2428; 2429; 2431; 2531 (25)	

NOTES: –



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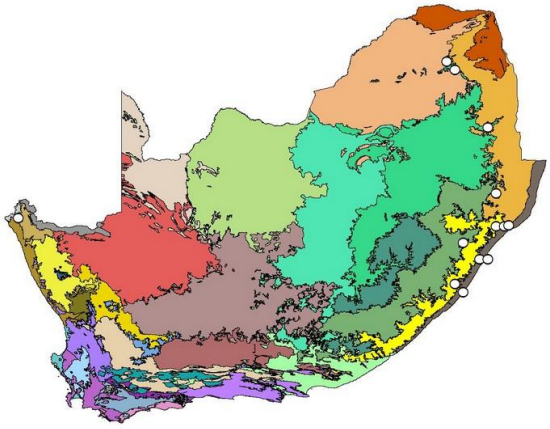
Indigofera eriocarpa E.Mey.

Indigofereae ①

Dwarf shrub, shrub; P; Ht 0.04–6.4; Alt 60–1068

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (76)	<400; 400–800; 600–1000 (8)
Min temp (°C)	>6 (62)	2–8 (38)
Max temp (°C)	25–29 (85)	27–35 (15)
Phosphorus (ppm)	<10 (69)	5–35 (23)
pH	<6.4 (84)	5.5–7.4; >7.5 (8)
ESP	Non (100)	
QDGCs	2831 (23)	2930; 3030 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Summer (Pooley 1998).



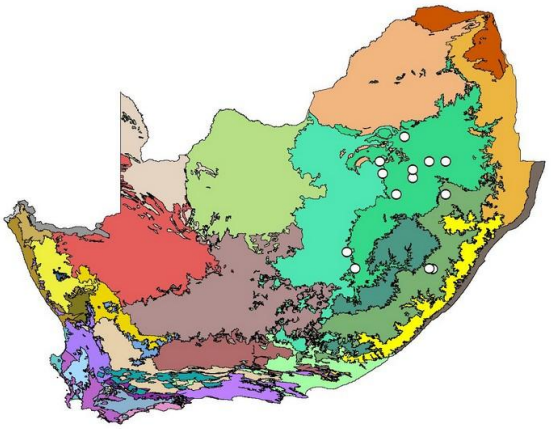
Indigofera evansiana Burtt Davy

Indigofereae ①

Herb; P; Ht 0.01–0.2; Alt 1586–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (75)	Sub-Escarpment Grassland (25)
Biome	Grassland (100)	
Rainfall (mm)	400–800 (83)	600–1000; >800 (8)
Min temp (°C)	<2 (92)	0–4 (8)
Max temp (°C)	25–29 (42)	<27 (33)
Phosphorus (ppm)	<10 (92)	5–35 (8)
pH	<6.4; 5.5–7.4 (42)	6.5–7.4 (17)
ESP	Non (100)	
QDGCs	2728 (23)	2629; 3029 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



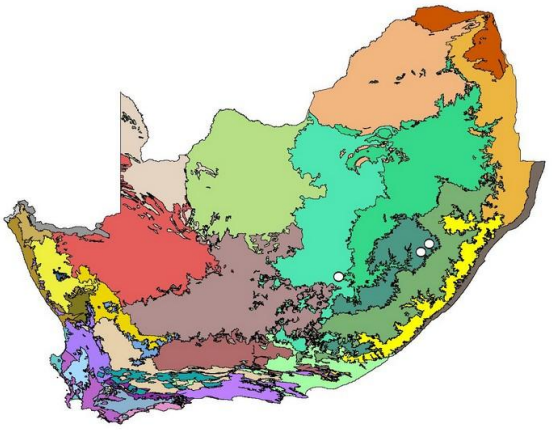
[E]*Indigofera evansii* Schltr.

Indigofereae ①

Herb; P; Ht ?; Alt 1800–2300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (67)	400–800 (33)
Min temp (°C)	<2 (100)	
Max temp (°C)	<27 (67)	27–35 (33)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2929 (67)	3026 (33)

NOTES: –



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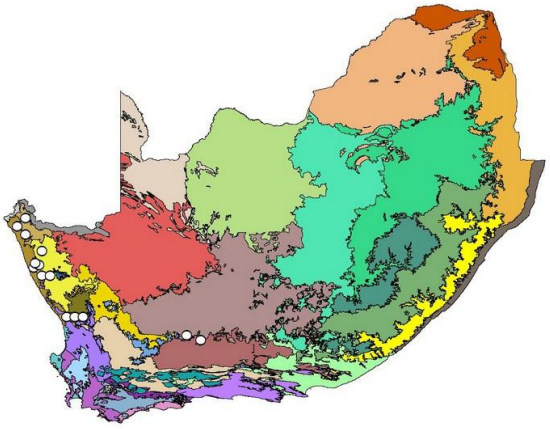
[E]*Indigofera exigua* Eckl. & Zeyh.

Indigofereae ①

Herb; P; Ht 0.04–0.1; Alt 190–350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (83)	Nama Karoo (17)
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (71)	2–8 (21)
Max temp (°C)	25–29 (57)	27–35 (43)
Phosphorus (ppm)	5–35 (57)	>20 (43)
pH	6.5–8.4 (50)	>7.5 (36)
ESP	Medium (100)	
QDGCs	3017 (29)	2917; 3118 (21)

NOTES: –



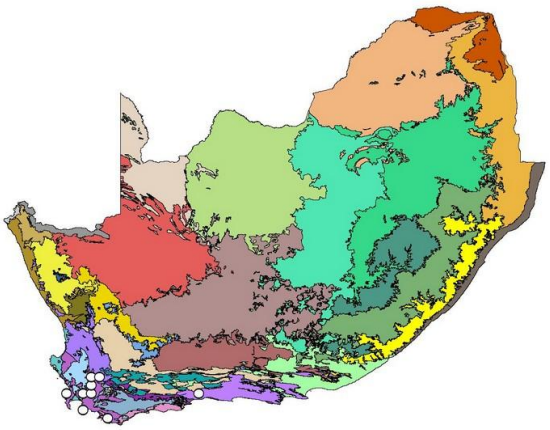
[E]*Indigofera filicaulis* Eckl. & Zeyh.

Indigofereae ①

Dwarf shrub; P; Ht 0.1–0.9; Alt 30–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000; >800 (33)	400–800 (22)
Min temp (°C)	0–4; 2–8 (44)	>6 (12)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	<6.4 (56)	5.5–7.4 (44)
ESP	Non (100)	
QDGCs	3319 (44)	3318 (22)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



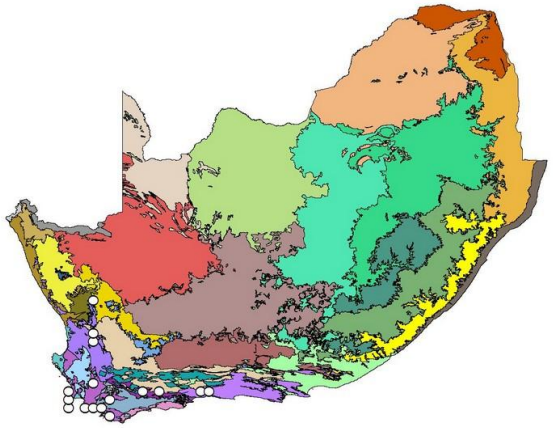
[E]*Indigofera filifolia* Thunb.

Indigofereae ①

Shrub; P; Ht 0.8–2; Alt 9–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (67)	Eastern Fynbos-Renosterveld (33)
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (31)	600–1000 (25)
Min temp (°C)	2–8 (69)	>6 (25)
Max temp (°C)	25–29 (88)	27–35 (12)
Phosphorus (ppm)	5–35 (88)	<10; >20 (6)
pH	<6.4 (56)	5.5–7.4 (25)
ESP	Non (67)	Medium (33)
QDGCs	3418; 3419 (24)	3219; 3322 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Spring, summer, autumn (Manning 2003).



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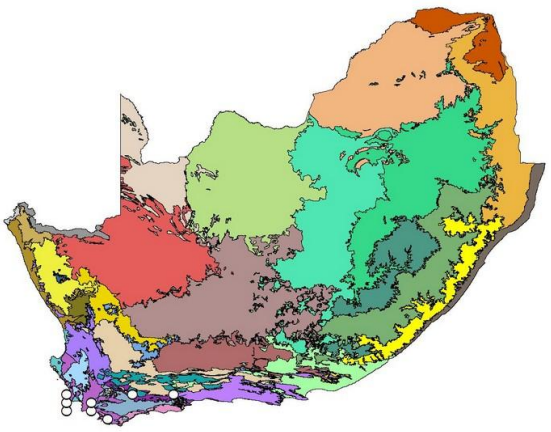
[E]*Indigofera filiformis* L.f.

Indigofereae ①

Dwarf shrub; P; Ht 0.3–1; Alt 30–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (38)	200–600; 600–1000 (25)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (88)	27–35 (12)
Phosphorus (ppm)	5–35 (88)	<10 (12)
pH	<6.4 (63)	5.5–7.4 (37)
ESP	Non (100)	
QDGCs	3419 (38)	3418 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Winter, spring, summer (Kidd 2002).



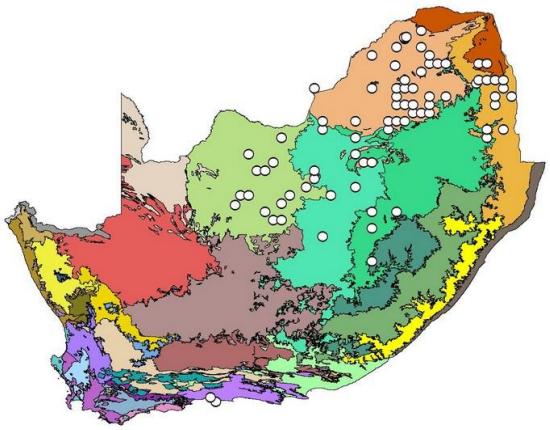
Indigofera filipes Benth. ex Harv.

Indigofereae ①

Dwarf shrub, shrub, herb; P; Ht 0.1–1; Alt 109–1585

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (50)	Eastern Kalahari Bushveld (27)
Biome	Savanna (85)	Grassland (13)
Rainfall (mm)	400–800 (79)	<400 (9)
Min temp (°C)	2–8 (46)	<2 (30)
Max temp (°C)	27–35 (72)	25–29 (18)
Phosphorus (ppm)	<10 (79)	5–35 (21)
pH	5.5–7.4 (37)	<6.4 (32)
ESP	Non (98)	Medium (2)
QDGCs	2528 (10)	2431 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Summer, autumn (Germishuizen & Clark 2003).



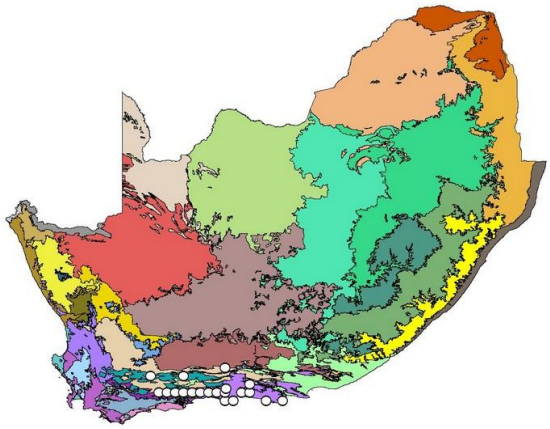
[E]*Indigofera flabellata* Harv.

Indigofereae ①

Dwarf shrub, shrub; P; Ht 0.3–1.8; Alt 80–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (37)	<400 (26)
Min temp (°C)	2–8 (84)	>6 (11)
Max temp (°C)	<27 (36)	25–29; 27–35 (32)
Phosphorus (ppm)	5–35 (89)	>20 (11)
pH	<6.4 (58)	6.5–8.4 (21)
ESP	Medium (100)	
QDGCs	3323 (29)	3321; 3322 (24)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



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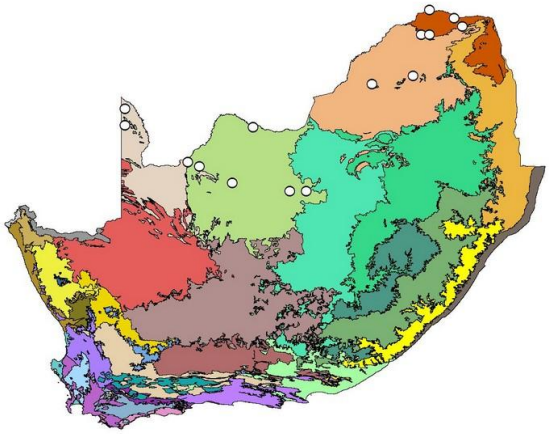
Indigofera flavicans Baker

Indigofereae ①

Herb; P; Ht 0.1–1.2; Alt 610–3000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (57)	Mopane (29)
Biome	Savanna (100)	
Rainfall (mm)	<400 (60)	400–800 (27)
Min temp (°C)	2–8 (53)	<2 (40)
Max temp (°C)	27–35 (47)	>33 (40)
Phosphorus (ppm)	5–35 (53)	>10 (47)
pH	6.5–8.4 (40)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	2229 (20)	2230; 2520; 2622; 2725 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Summer, autumn (Van Rooyen 2001).



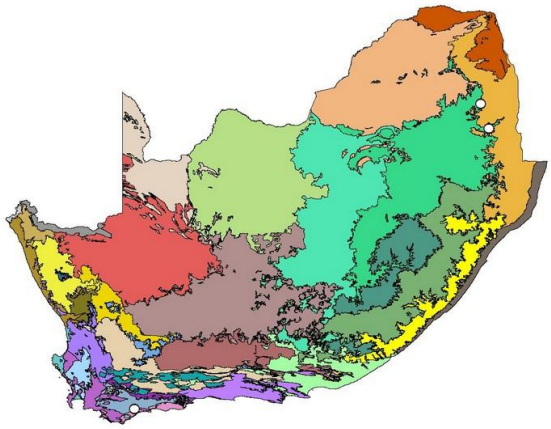
[E]*Indigofera floribunda* N.E.Br.

Indigofereae ①

Herb; P; Ht 0.01–0.6; Alt 151–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (67)	200–600 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (67)	6.5–8.4 (33)
ESP	Ecotone	
QDGCs	2530; 2531; 3420 (33)	

NOTES: –



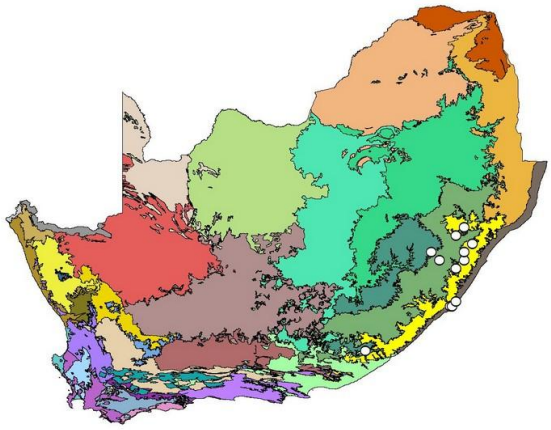
[E]*Indigofera foliosa* E.Mey.

Indigofereae ①

Dwarf shrub; P; Ht 0.8–0.9; Alt 175–1983

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Sub-Escarpment Grassland (50)	
Biome	Grassland (67)	Indian Ocean (33)
Rainfall (mm)	>800 (67)	600–1000 (33)
Min temp (°C)	2–8 (50)	>6 (25)
Max temp (°C)	25–29 (83)	<27 (17)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2930 (31)	3130 (23)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer (Pooley 2003).



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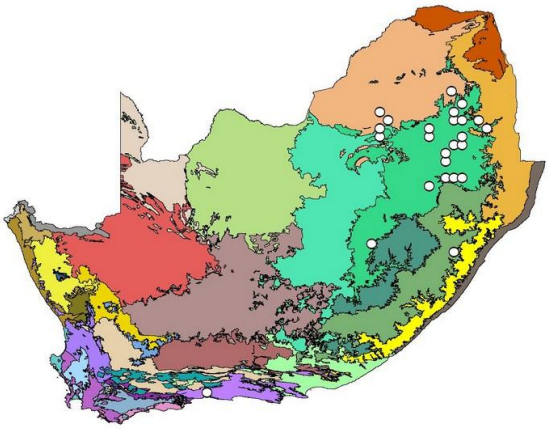
Indigofera frondosa N.E.Br.

Indigofereae ①

Shrub; P; Ht 0.4–1; Alt 1495–2135

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (74)	Central Bushveld (16)
Biome	Grassland (89)	Savanna (11)
Rainfall (mm)	400–800 (56)	600–1000 (24)
Min temp (°C)	0–4 (48)	<2 (28)
Max temp (°C)	<27 (52)	25–29 (36)
Phosphorus (ppm)	<10 (96)	5–35 (4)
pH	<6.4 (88)	5.5–7.4 (8)
ESP	Non (95)	Medium (5)
QDGCs	2530 (20)	2629; 2630 (12)

NOTES: –



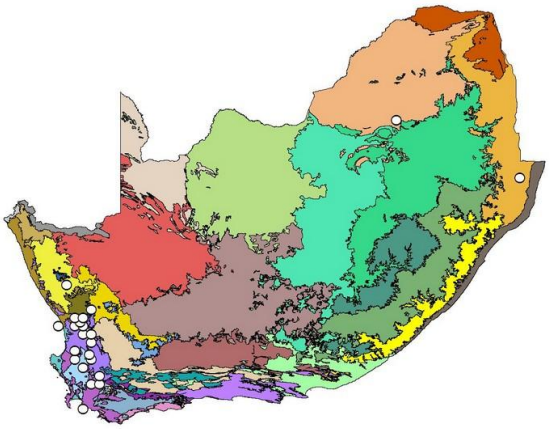
[E]*Indigofera frutescens* L.f.

Indigofereae ③

Shrub; P; Ht 1–3; Alt 155–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos; Namaqualand Hardeveld; Namaqualand Sandveld; Central Bushveld; Lowveld (17)	
Biome	Fynbos (75)	Succulent Karoo (17)
Rainfall (mm)	<400; 200–600 (33)	400–800 (24)
Min temp (°C)	2–8 (67)	>6 (19)
Max temp (°C)	25–29 (57)	27–35 (43)
Phosphorus (ppm)	5–35 (71)	>20 (19)
pH	5.5–7.4 (43)	6.5–7.4 (29)
ESP	Non (66)	Medium; High (17)
QDGCs	3118 (30)	3219 (17)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans and livestock (Watt & Breyer-Brandwijk 1962). **Flowering:** Winter, spring, summer (Van Rooyen & Steyn 1999; Manning 2001).



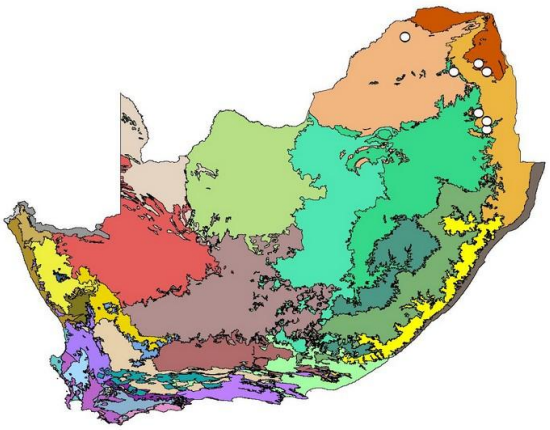
Indigofera galpinii N.E.Br.

Indigofereae ①

Herb; P; Ht 0.2–2; Alt 640–1420

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	>800 (43)	400–800 (29)
Min temp (°C)	2–8 (71)	>6 (29)
Max temp (°C)	25–29 (57)	27–35 (43)
Phosphorus (ppm)	<10 (57)	5–35 (43)
pH	5.5–7.4 (57)	<6.4 (43)
ESP	Non (100)	
QDGCs	2531 (30)	2328; 2330; 2430; 2431; 2530 (14)

NOTES: –



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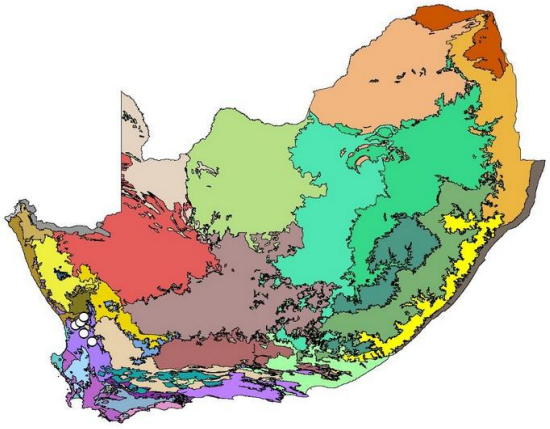
[E]*Indigofera gifbergensis* C.H.Stirt. & Jarvie

Indigofereae ①

Shrub; P; Ht 0.4–1; Alt 762–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (60)	200–600; 400–800 (20)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	27–35 (80)	25–29 (20)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (60)	<6.4; 5.5–7.4 (20)
ESP	Ecotone	
QDGCs	3118 (60)	3218; 3219 (20)

NOTES: –



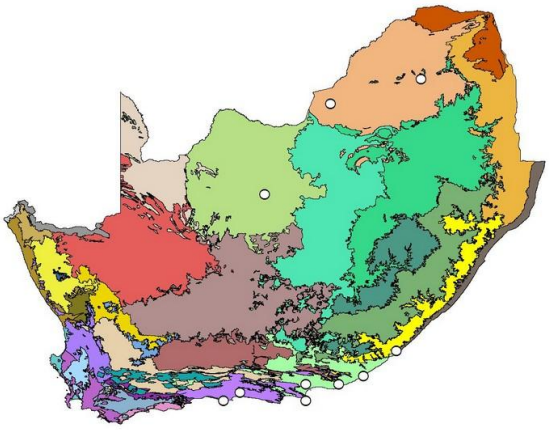
[E]*Indigofera glaucescens* Eckl. & Zeyh.

Indigofereae ①

Dwarf shrub; P; Ht 0.15–0.4; Alt 15–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (38)	Albany Thicket; Central Bushveld (25)
Biome	Albany Thicket; Savanna (40)	Fynbos (20)
Rainfall (mm)	400–800 (60)	>800 (20)
Min temp (°C)	>6 (50)	2–8 (30)
Max temp (°C)	25–29 (60)	<27; 27–35 (20)
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	<6.4; 6.5–8.4 (30)	6.5–7.4 (20)
ESP	Non (63)	Medium (37)
QDGCs	2429; 2526; 2724; 3228; 3323; 3325; 3326; 3327; 3423; 3425 (10)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



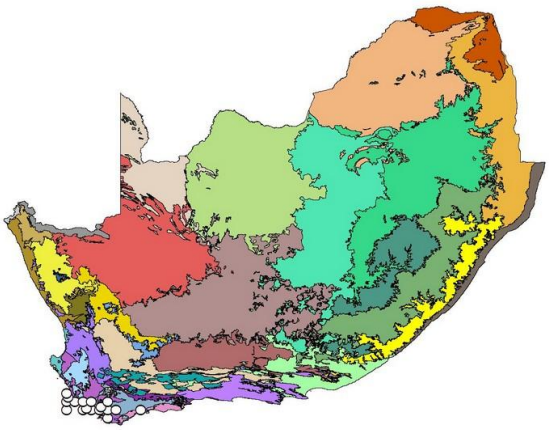
[E]*Indigofera glomerata* E.Mey.

Indigofereae ①

Dwarf shrub; P; Ht 0.07–0.2; Alt 30–1466

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (36)	200–600 (29)
Min temp (°C)	2–8 (57)	>6 (43)
Max temp (°C)	25–29 (93)	<27 (7)
Phosphorus (ppm)	5–35 (86)	<10 (14)
pH	<6.4 (64)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	3419 (47)	3418 (35)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Kidd 2002).



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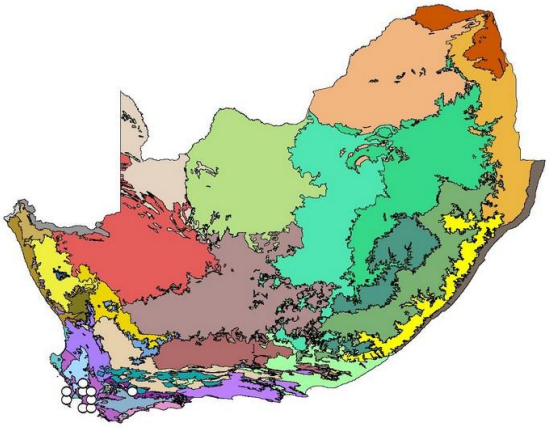
[E]*Indigofera gracilis* Spreng.

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.1–0.6; Alt 3–854

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000; >800 (33)	400–800 (22)
Min temp (°C)	2–8 (56)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (78)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	3318 (33)	3418; 3419 (22)

NOTES: –



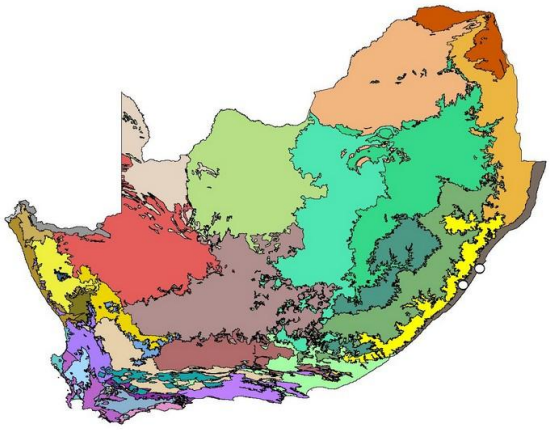
[E]*Indigofera grata* E.Mey.

Indigofereae ①

Shrub; P; Ht 0.5–0.6; Alt ?–3

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3030 (100)	

NOTES: –



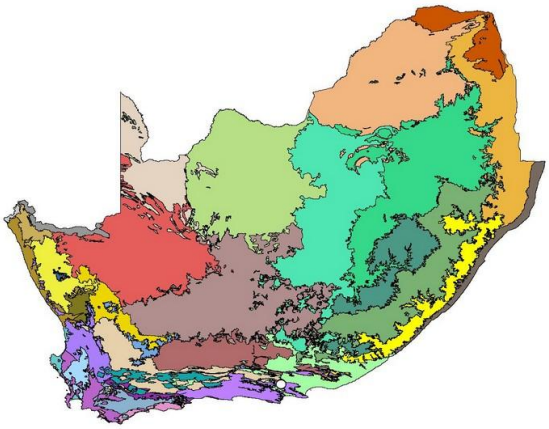
[E]*Indigofera grisophylla* Fourc.

Indigofereae ①

Dwarf shrub; P; Ht 0.01–0.6; Alt ?–763

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3324 (100)	

NOTES: –



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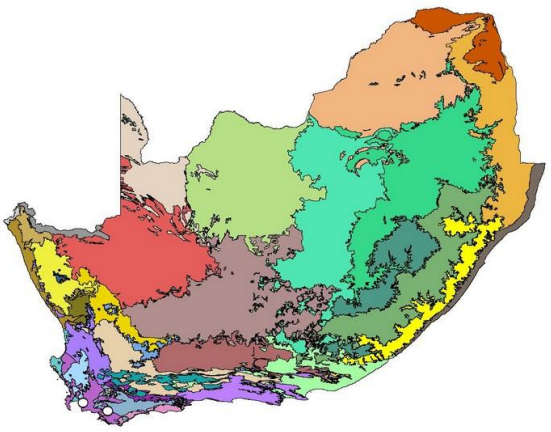
[E]*Indigofera guthriei* Bolus

Indigofereae ①

Dwarf shrub; P; Ht 0.05–0.3; Alt 395–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; >800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3418; 3419 (50)	

NOTES: –



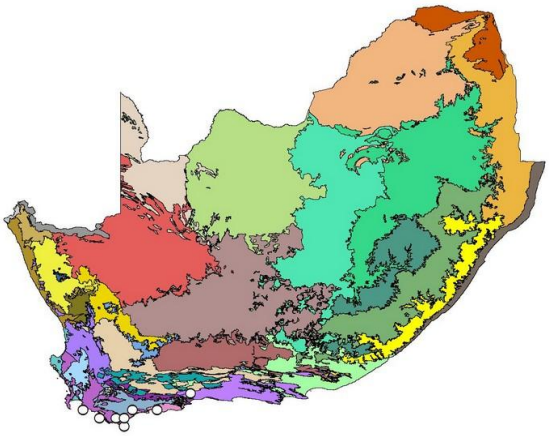
[E]*Indigofera hamulosa* Schltr.

Indigofereae ①

Dwarf shrub; P; Ht 0.6–0.9; Alt 15–215

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	200–600 (38)
Min temp (°C)	2–8 (63)	>6 (37)
Max temp (°C)	25–29 (88)	<27 (12)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–8.4 (38)	<6.4; 6.5–7.4 (12)
ESP	Non (100)	
QDGCs	3420 (38)	3419 (25)

NOTES: –



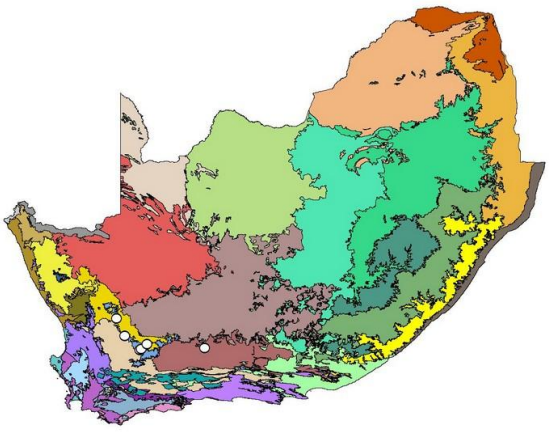
[E]*Indigofera hantamensis* Diels

Indigofereae ①

Dwarf shrub; P; Ht ?; Alt 1220–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	0–4; 2–8 (40)	<2 (20)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (80)	6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3220 (72)	3119; 3222 (14)

NOTES: –



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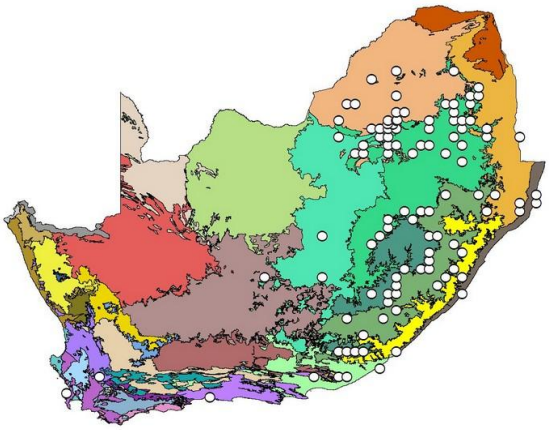
Indigofera hedyantha Eckl. & Zeyh.

Indigofereae ③

Herb; P; Ht 0.05–5; Alt 15–2379

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (33)	Central Bushveld (21)
Biome	Grassland (75)	Savanna (15)
Rainfall (mm)	400–800 (44)	>800 (29)
Min temp (°C)	2–8 (34)	0–4 (30)
Max temp (°C)	25–29 (49)	<27 (28)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (74)	5.5–7.4 (17)
ESP	Non (98)	Medium (2)
QDGCs	2528 (9)	2530 (7)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer (Pooley 1998).



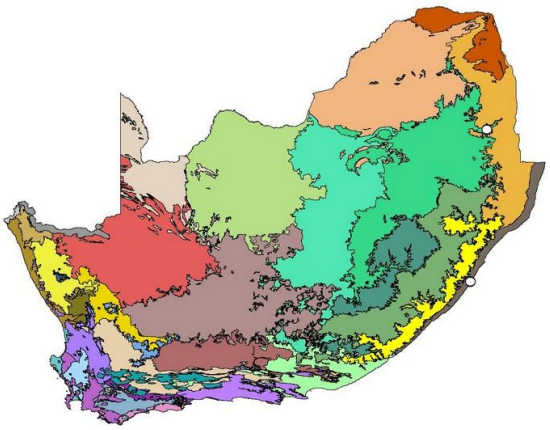
Indigofera hendecaphylla Jacq.

Indigofereae ①

Herb; P; Ht ?; Alt 30–137

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2531; 3030 (50)	

NOTES: –



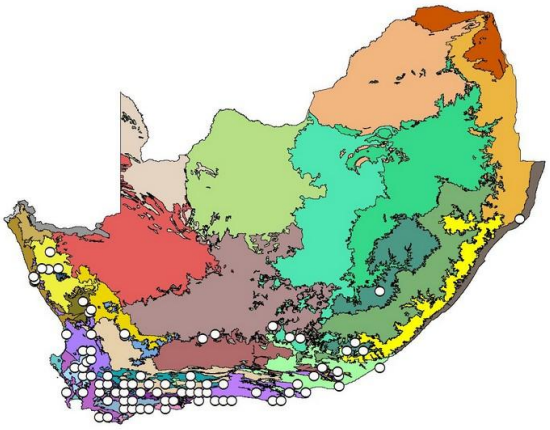
[E]*Indigofera heterophylla* Thunb.

Indigofereae ③

Dwarf shrub, herb; P; Ht 0.15–1.5; Alt 9–1650

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (44)	Albany Thicket; Northwest Fynbos; South Coast Fynbos; West Coast Renosterveld; Drakensberg Grassland; Namaqualand Hardeveld; Namaqualand Sandveld (8)
Biome	Fynbos (77)	Succulent Karoo (14)
Rainfall (mm)	200–800 (38)	<400 (30)
Min temp (°C)	2–8 (66)	>6 (18)
Max temp (°C)	25–29 (67)	27–35 (25)
Phosphorus (ppm)	5–35 (84)	>20 (11)
pH	5.5–7.4 (32)	<6.4 (24)
ESP	Medium (50)	Non (42)
QDGCs	3319; 3320; 3420 (7)	3318 (6)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation** (Barnard 1987). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Manning & Goldblatt 2002).



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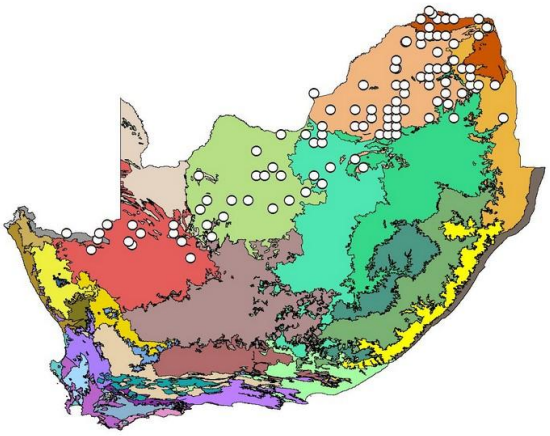
Indigofera heterotricha DC.

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.15–1.5; Alt 230–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (45)	Eastern Kalahari Bushveld (24)
Biome	Savanna (86)	Nama Karoo (7)
Rainfall (mm)	400–800 (60)	<400 (26)
Min temp (°C)	2–8 (51)	<2 (20)
Max temp (°C)	27–35 (65)	25–29 (20)
Phosphorus (ppm)	<10 (59)	5–35 (32)
pH	5.5–7.4 (26)	<6.4 (24)
ESP	Non (98)	Medium (2)
QDGCs	2229 (9)	2528 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer (Germishuizen & Clark 2003).



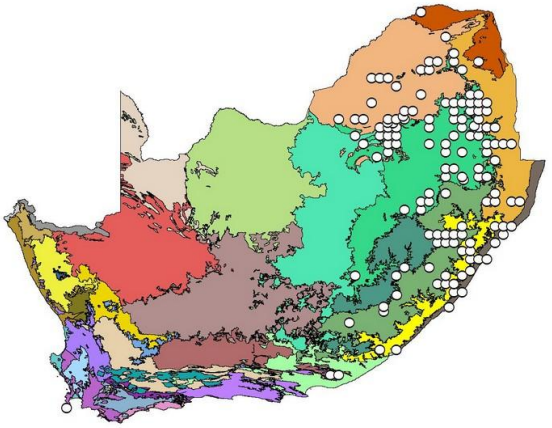
Indigofera hilaris Eckl. & Zeyh. var. *hilaris*

Indigofereae ①

Herb; P; Ht 0.1–0.3; Alt 45–2288

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (33)	Central Bushveld (28)
Biome	Grassland (57)	Savanna (35)
Rainfall (mm)	400–800 (38)	>800 (35)
Min temp (°C)	2–8 (42)	0–4 (27)
Max temp (°C)	25–29 (54)	27–35 (25)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (78)	5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2528 (7)	2530 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Antiquality:** Toxic to livestock (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Winter, spring, summer (Pooley 1998).



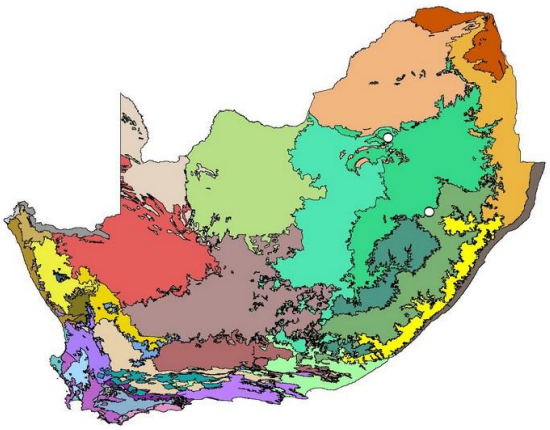
Indigofera hirsuta L. var. *hirsuta*

Indigofereae ③

Herb; P; Ht 0.22–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Grassland (100)	
Rainfall (mm)	400–800;600–1000 (50)	
Min temp (°C)	<2; 0–4 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2628; 2829 (50)	

NOTES: **Livestock feed** (Pietrosemoli *et al.* 2005). **Antiquality:** Nontoxic (Morris 1997). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967); *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Soil conservation:** Cover crop (Sampson 1928).



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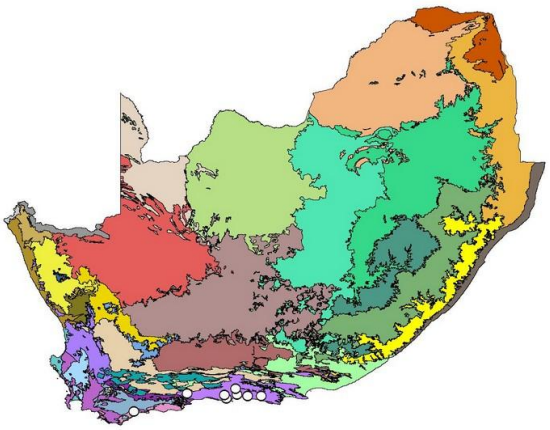
[E]*Indigofera hispida* Eckl. & Zeyh.

Indigofereae ①

Shrub; P; Ht 1–2; Alt 46–793

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (38)	200–600; 400–800 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	<27 (63)	25–29 (37)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (63)	5.5–7.4 (25)
ESP	Medium (100)	
QDGCs	3323 (50)	3322; 3324; 3420; 3423 (12.5)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer, autumn, winter (Manning 2001).



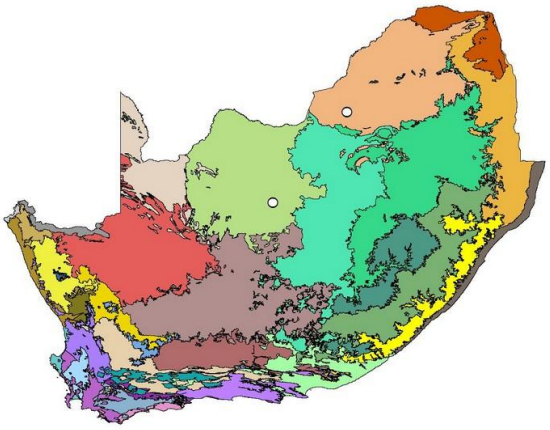
Indigofera hochstetteri Baker subsp. *streyana* (Merxm.) A.Schreib.

Indigofereae ②

Herb; A; Ht 0.01–0.5; Alt 1082–1475

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Eastern Kalahari Bushveld (50)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	<2; 2–8 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4; >7.5 (50)	
ESP	Non (100)	
QDGCs	2526; 2824 (50)	

NOTES: **Livestock feed** (Morgan 1981).



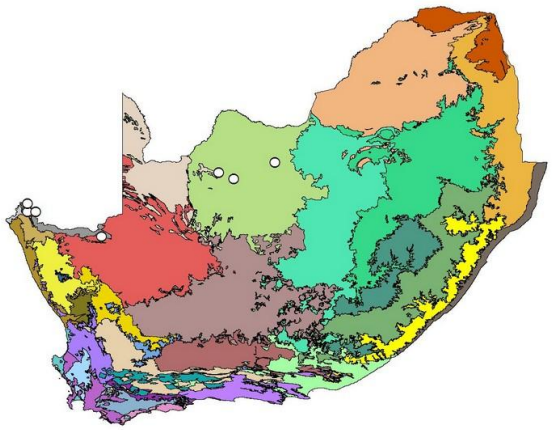
Indigofera hololeuca Benth. ex Harv.

Indigofereae ☠①

Herb; A; Ht ?; Alt 20–1006

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (86)	400–800 (14)
Min temp (°C)	<2; >6 (43)	2–8 (14)
Max temp (°C)	>33 (57)	27–35 (43)
Phosphorus (ppm)	>20 (57)	<10 (43)
pH	>7.5 (57)	6.5–7.4 (29)
ESP	Non (100)	
QDGCs	2817 (44)	2624; 2722; 2723; 2919 (14)

NOTES: **Antiquality:** Toxic to livestock (Watt & Breyer-Brandwijk 1962).



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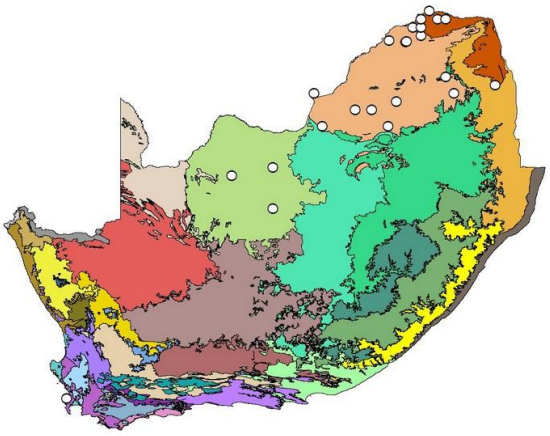
Indigofera holubii N.E.Br.

Indigofereae ①

Herb; A; Ht 0.05–0.2; Alt 520–855

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (53)	Mopane (29)
Biome	Savanna (95)	Fynbos (5)
Rainfall (mm)	400–800 (50)	<400 (36)
Min temp (°C)	2–8 (68)	<2; >6 (14)
Max temp (°C)	27–35 (82)	25–29 (14)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	6.5–8.4 (36)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	2229 (29)	2328 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



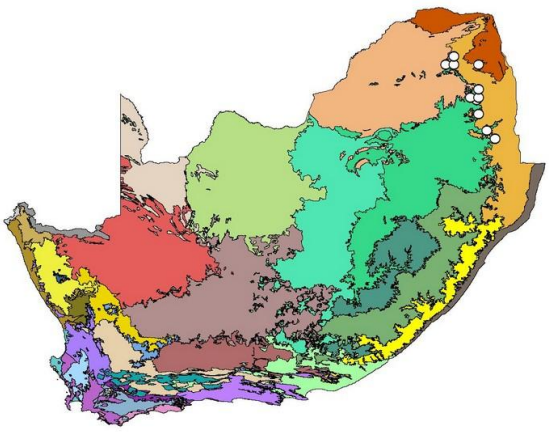
Indigofera homblei Baker f. & Martin subsp. *homblei*

Indigofereae ③

Shrub; P; Ht 0.01–2; Alt 915–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	>800 (50)	600–1000 (30)
Min temp (°C)	2–8 (90)	>6 (10)
Max temp (°C)	25–29 (70)	27–35 (30)
Phosphorus (ppm)	<10 (70)	5–35 (30)
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Ecotone	
QDGCs	2430 (36)	2330 (27)

NOTES: **Cultivated** (Glen 2002).



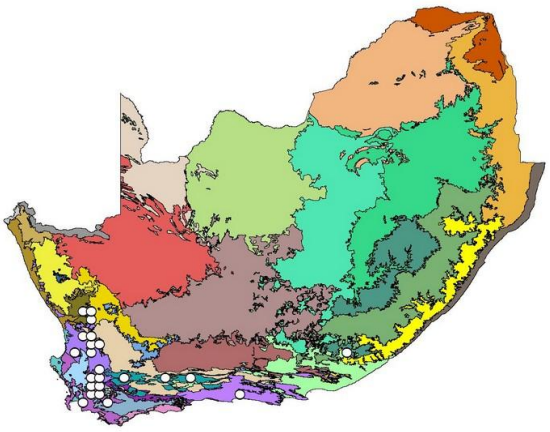
[E]*Indigofera humifusa* Eckl. & Zeyh.

Indigofereae ①

Herb; P; Ht 0.04–0.6; Alt 336–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos; Eastern Fynbos-Renosterveld (33)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (39)	<400 (30)
Min temp (°C)	2–8 (70)	0–4 (30)
Max temp (°C)	25–29 (74)	27–35 (22)
Phosphorus (ppm)	5–35 (78)	>20 (22)
pH	5.5–7.4 (48)	<6.4 (22)
ESP	Non (67)	Medium (33)
QDGCs	3319 (30)	3219 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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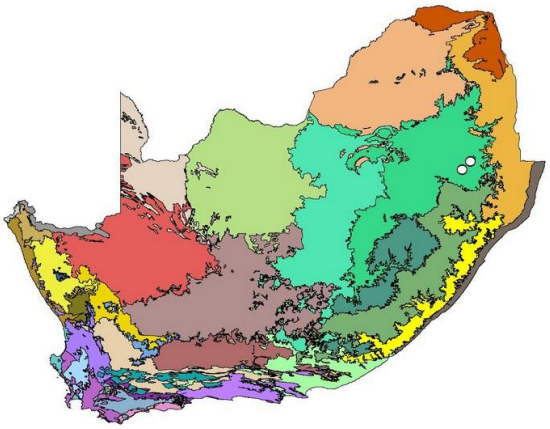
[E]*Indigofera hybrida* N.E.Br.

Indigofereae ①

Herb; P; Ht 0.01–0.4; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2630; 2730 (50)	

NOTES: –



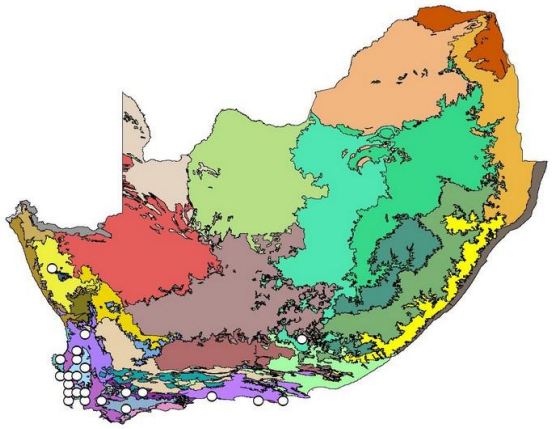
[E]*Indigofera incana* Thunb.

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.3–0.6; Alt 30–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (67)	Dry Highveld Grassland (33)
Biome	Fynbos (94)	Succulent Karoo (6)
Rainfall (mm)	200–600 (48)	<400; 600–1000 (17)
Min temp (°C)	2–8 (57)	>6 (39)
Max temp (°C)	25–29 (74)	27–35 (22)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (48)	5.5–7.4; 6.5–7.4; 6.5–8.4 (17)
ESP	Medium (67)	Non (33)
QDGCs	3318 (35)	3218 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Winter, spring (Manning 2003).



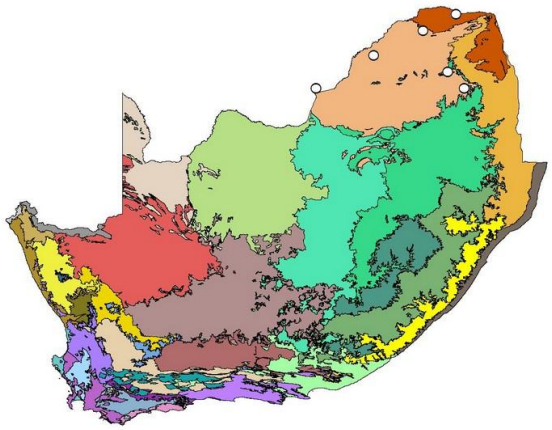
Indigofera ingrata N.E.Br.

Indigofereae ①

Herb; P; Ht 0.01–0.3; Alt 610–795

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (67)	Mopane (33)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (67)	<400 (33)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	5.5–7.4; 6.5–8.4 (33)	<6.4; >7.5 (17)
ESP	Non (100)	
QDGCs	2229; 2230; 2327; 2425; 2429; 2430 (17)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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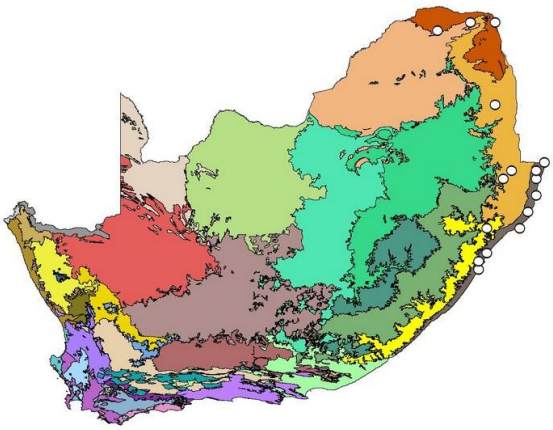
Indigofera inhambanensis Klotzsch

Indigofereae ①

Dwarf shrub; P; Ht 0.2–0.3; Alt 5–700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (80)	Lowveld (20)
Biome	Indian Ocean (54)	Savanna (46)
Rainfall (mm)	400–800 (44)	>800 (38)
Min temp (°C)	>6 (88)	2–8 (12)
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	<10 (56)	5–35 (44)
pH	<6.4 (44)	5.5–7.4 (38)
ESP	Non (100)	
QDGCs	2732 (19)	2731; 2832 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



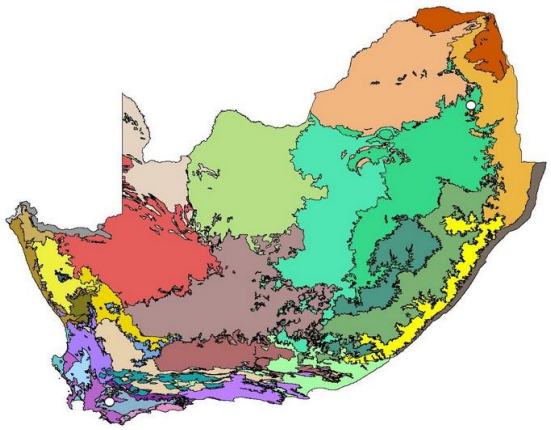
[E]*Indigofera inyangana* N.E.Br.

Indigofereae ①

Herb; P; Ht 0.07–0.3; Alt 1220–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; >800 (50)	
Min temp (°C)	25–29; 27–35 (50)	
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Non (100)	
QDGCs	2530; 3419 (50)	

NOTES: –



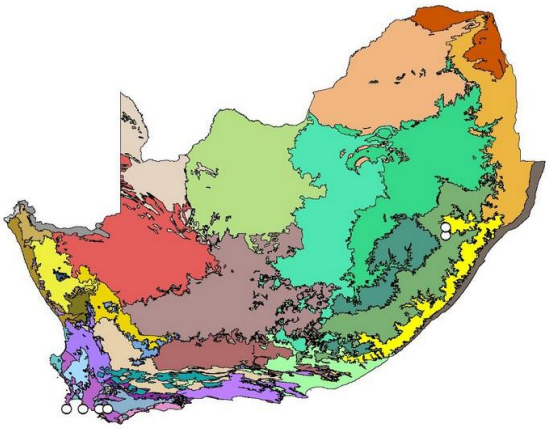
[E]*Indigofera ionii* Jarvie & C.H.Stirt.

Indigofereae ①

Herb; P; Ht 0.3–3.6; Alt 60–458

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; 600–1000 (33)	200–600; >800 (17)
Min temp (°C)	2–8 (50)	0–4 (33)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3418; 3419 (33)	2829; 2929 (17)

NOTES: –



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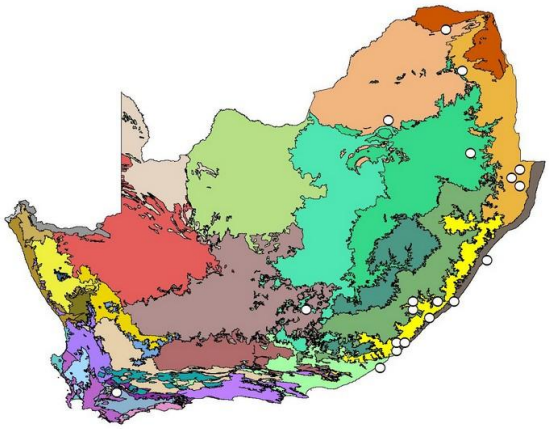
[E]*Indigofera jucunda* Schrire

Indigofereae ①

Shrub; P; Ht 0.8–7; Alt 8–3000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (35)	Albany Thicket; Indian Ocean Coastal Belt; Mesic Highveld Grassland; Central Bushveld; Sub-Escarpment Savanna (13)
Biome	Savanna (61)	Albany Thicket; Grassland; Indian Ocean (13)
Rainfall (mm)	400–800; >800 (32)	600–1000 (21)
Min temp (°C)	>6 (53)	2–8 (32)
Max temp (°C)	25–29 (68)	27–35 (32)
Phosphorus (ppm)	5–35 (58)	<10 (42)
pH	<6.4 (47)	5.5–7.4 (32)
ESP	Non (100)	
QDGCs	3228 (16)	2732; 3128; 3129 (11)

NOTES: –



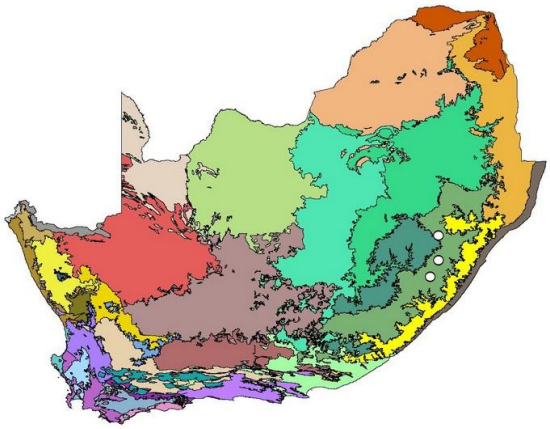
[E]*Indigofera krookii* Schltr. ex Zahlbr.

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.23–3; Alt 1220–2200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	<27 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2929 (67)	3029 (33)

NOTES: –



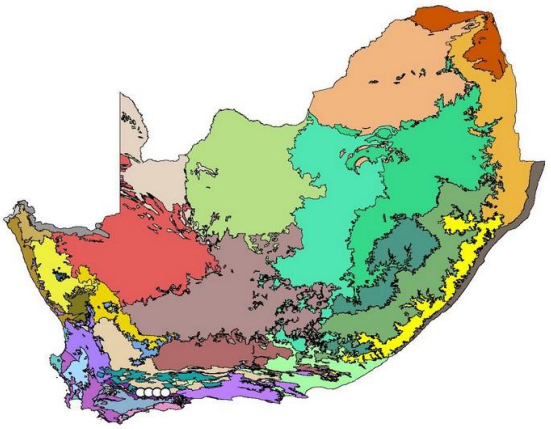
[E]*Indigofera langebergensis* L.Bolus

Indigofereae ③

Shrub; P; Ht 0.3–2; Alt 275–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (75)	6.5–7.4 (25)
ESP	Ecotone	
QDGCs	3320; 3321 (50)	

NOTES: **Cultivated** (Glen 2002).



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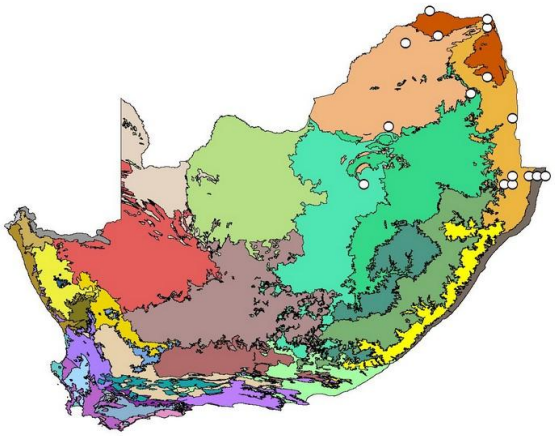
Indigofera laxeracemosa Baker f.

Indigofereae ①

Herb; P; Ht 0.15–0.6; Alt 5–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (33)	Indian Ocean Coastal Belt; Central Bushveld (22)
Biome	Savanna (73)	Indian Ocean (18)
Rainfall (mm)	400–800 (69)	200–600 (25)
Min temp (°C)	>6 (56)	2–8 (38)
Max temp (°C)	27–35 (81)	25–29 (13)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	5.5–7.4 (44)	6.5–7.4 (25)
ESP	Non (100)	
QDGCs	2731; 2732 (19)	2229; 2231 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



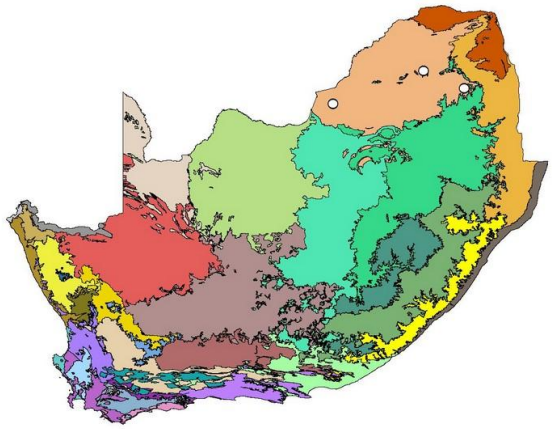
[E]*Indigofera leendertziae* N.E.Br.

Indigofereae ①

Dwarf shrub; P; Ht 0.01–0.4; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	5.5–7.4 (67)	6.5–8.4 (33)
ESP	Non (100)	
QDGCs	2429; 2430; 2526 (33)	

NOTES: –



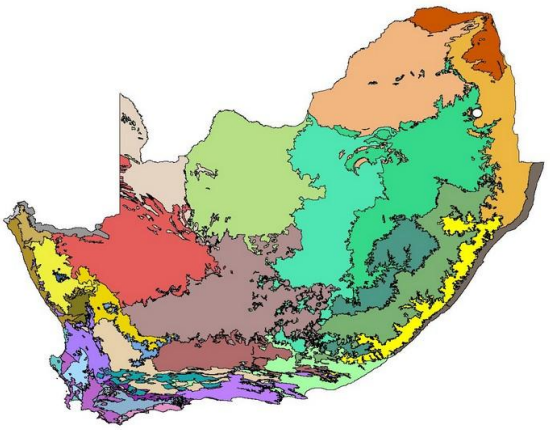
[E]*Indigofera lepida* N.E.Br.

Indigofereae ①

Dwarf shrub; P; Ht 0.01–0.4; Alt ?–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2530 (100)	

NOTES: –



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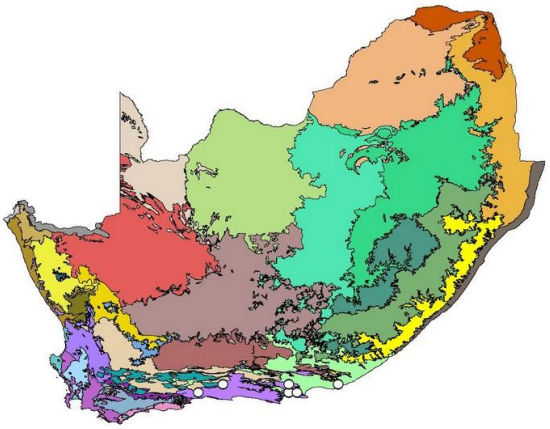
[E]*Indigofera leptocarpa* Eckl. & Zeyh.

Indigofereae ①

Dwarf shrub, herb; P; Ht ?; Alt 100–824

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (50)	200–600 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	<6.4 (33)
ESP	Ecotone	
QDGCs	3325 (49)	3322; 3323; 3326 (17)

NOTES: –



[E]*Indigofera limosa* L.Bolus

Indigofereae –

Herb; A; Ht 0.01–0.03; Alt ?–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

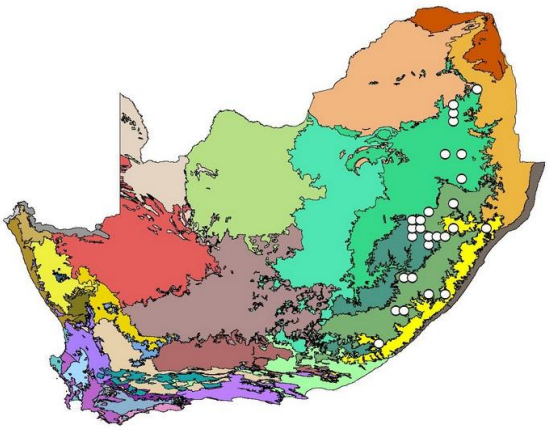
Indigofera longibarbata Engl.

Indigofereae ③

Dwarf shrub; P; Ht 0.15–0.3; Alt 1311–2255

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (46)	Drakensberg Grassland; Sub-Escarpment Grassland (27)
Biome	Grassland (100)	
Rainfall (mm)	>800 (48)	600–1000 (44)
Min temp (°C)	0–4 (52)	<2; 2–8 (22)
Max temp (°C)	25–29 (59)	<27 (41)
Phosphorus (ppm)	<10 (96)	5–35 (4)
pH	<6.4 (85)	5.5–7.4 (15)
ESP	Non (100)	
QDGCs	2929 (15)	2530; 2829 (11)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer (Pooley 1998).



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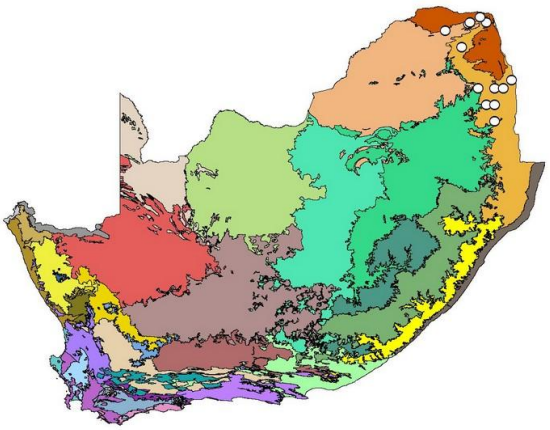
Indigofera lupatana Baker f.

Indigofereae ①

Shrub; P; Ht 0.5–2; Alt 365–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (42)	200–600 (33)
Min temp (°C)	>6 (75)	2–8 (25)
Max temp (°C)	27–35 (83)	25–29 (17)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	6.5–7.4 (42)	<6.4; 5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2230; 2431; 2531 (23)	2229; 2231; 2330; 2430; (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



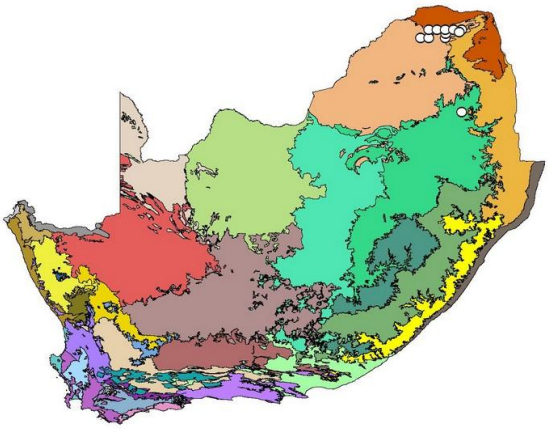
Indigofera lyalli Baker subsp. *lyalli*

Indigofereae ①

Shrub, tree; P; Ht 1.2–3; Alt 1068–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (80)	Mesic Highveld Grassland (20)
Biome	Savanna (100)	
Rainfall (mm)	200–600 (56)	400–800; 600–1000 (22)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (78)	<27; 27–35 (11)
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	6.5–8.4 (56)	<6.4; 5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2229; 2230 (33)	2329 (25)

NOTES: –



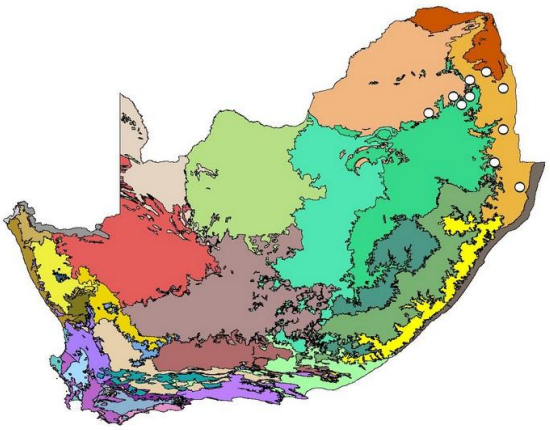
Indigofera lydenbergensis N.E.Br.

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.5–0.8; Alt 75–1464

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (60)	Mesic Highveld Grassland; Central Bushveld (20)
Biome	Savanna (80)	Grassland (20)
Rainfall (mm)	400–800 (70)	600–1000 (30)
Min temp (°C)	2–8 (50)	>6 (40)
Max temp (°C)	25–29 (50)	27–35 (40)
Phosphorus (ppm)	<10 (90)	5–35 (10)
pH	5.5–7.4 (60)	6.5–7.4 (20)
ESP	Non (100)	
QDGCs	2430 (25)	2431; 2530; 2531 (17)

NOTES: –



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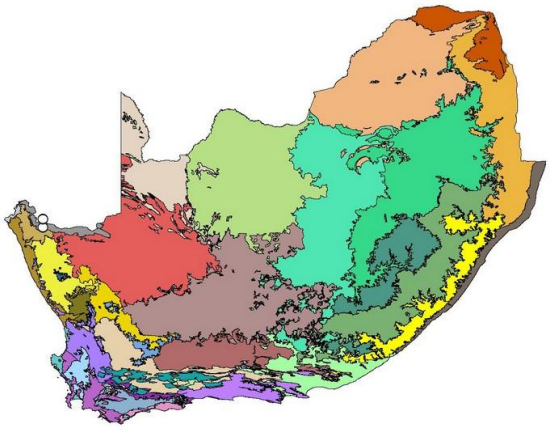
Indigofera maritima Baker

Indigofereae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Gariep Desert (100)	
Biome	Desert (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35; >33 (50)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Medium (100)	
QDGCs	2817 (100)	

NOTES: –



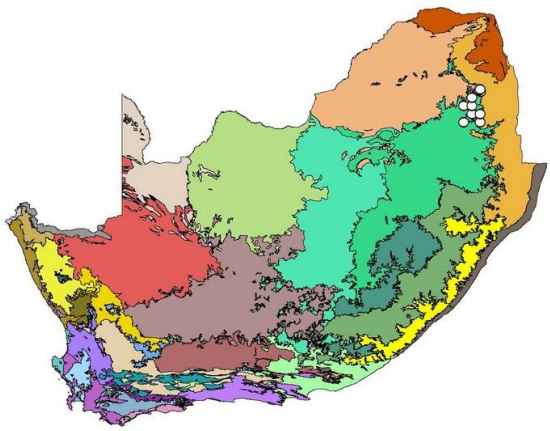
[E]*Indigofera masonae* N.E.Br.

Indigofereae ①

Shrub; P; Ht 0.4–1.5; Alt 1068–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (74)	400–800; 600–1000 (13)
Min temp (°C)	2–8 (63)	0–4 (38)
Max temp (°C)	25–29 (63)	<27 (38)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2530 (60)	2430 (40)

NOTES: –



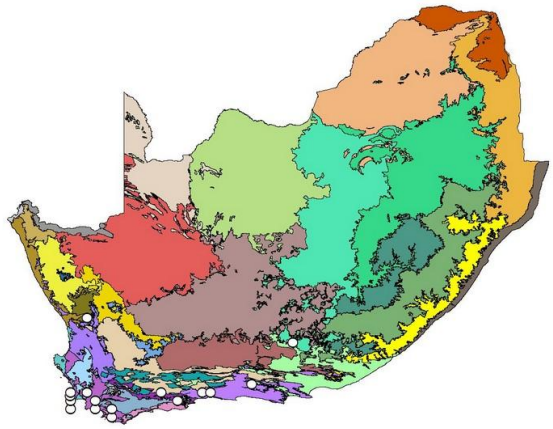
[E]*Indigofera mauritanica* (L.) Thunb.

Indigofereae ①

Dwarf shrub; P; Ht 0.15–0.9; Alt 10–1745

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	600–100 (33)	200–600 (27)
Min temp (°C)	2–8 (67)	>6 (27)
Max temp (°C)	25–29 (87)	27–35 (13)
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	<6.4 (67)	6.5–8.4 (20)
ESP	Non; Medium (50)	
QDGCs	3318; 3419 (24)	3322; 3418 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Winter (Kidd 2002).



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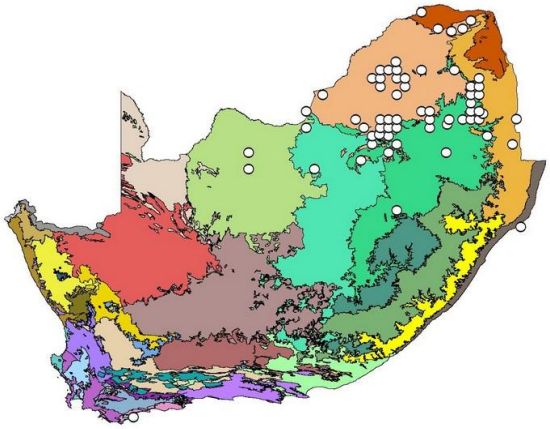
Indigofera melanadenia Benth. ex Harv.

Indigofereae ③

Herb, shrub; P; Ht 0.4–1.8; Alt 230–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (54)	Mesic Highveld Grassland (21)
Biome	Savanna (77)	Grassland (19)
Rainfall (mm)	400–800 (66)	>800 (16)
Min temp (°C)	2–8 (56)	0–4 (21)
Max temp (°C)	25–29 (50)	27–35 (37)
Phosphorus (ppm)	<10 (79)	5–35 (21)
pH	<6.4 (69)	5.5–7.4 (21)
ESP	Non (100)	
QDGCs	2530 (11)	2428; 2430; 2529 (9)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer (Germishuizen & Clark 2003).



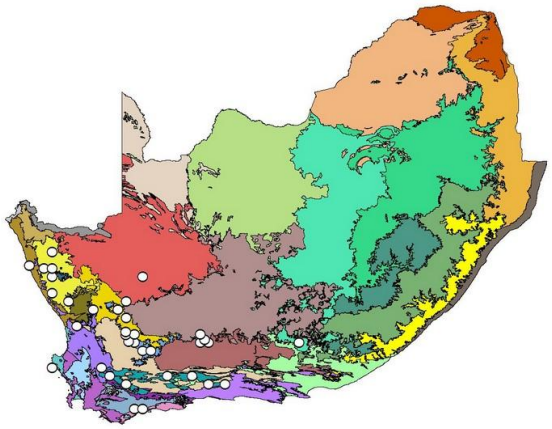
[E]*Indigofera meyeriana* Eckl. & Zeyh.

Indigofereae ②

Dwarf shrub, shrub; P; Ht 0.4–1; Alt 15–1720

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (22	West Strandveld; Dry Highveld Grassland; Bushmanland; Namaqualand Hardeveld; Namaqualand Sandveld; Trans-Escarpment Succulent Karoo; Rainshadow Valley Karoo (13)
Biome	Succulent Karoo (53)	Fynbos (40)
Rainfall (mm)	<400 (82)	200–600 (18)
Min temp (°C)	0–4; 2–8 (35)	>6 (24)
Max temp (°C)	27–35 (50)	25–29 (44)
Phosphorus (ppm)	5–35; >20 (50)	
pH	>7.5 (47)	6.5–8.4 (24)
ESP	Medium (50)	Non; High (25)
QDGCs	3220 (19)	3017 (14)

NOTES: **Livestock feed** (Shearing & Van Heerden 1997). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



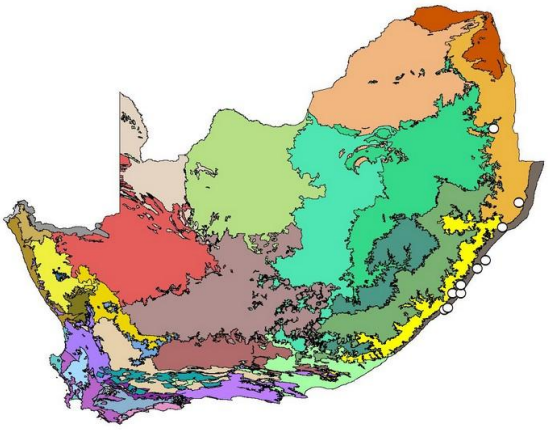
Indigofera micrantha E.Mey.

Indigofereae ③

Shrub; P; Ht 0.9–1.5; Alt 23–519

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (75)	Lowveld (25)
Biome	Indian Ocean (75)	Savanna (25)
Rainfall (mm)	>800 (78)	600–1000 (22)
Min temp (°C)	>6 (89)	2–8 (11)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (78)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	3030 (40)	3129 (20)

NOTES: **Cultivated** (Glen 2002). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996).



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Indigofera mimosoides* Baker var. *mimosoides **Indigofereae** –

Herb; occ. P; Ht –; Alt –

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

[E]***Indigofera mischocarpa* Schltr.** **Indigofereae** –

Dwarf shrub; P; Ht ?; Alt ?–366

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

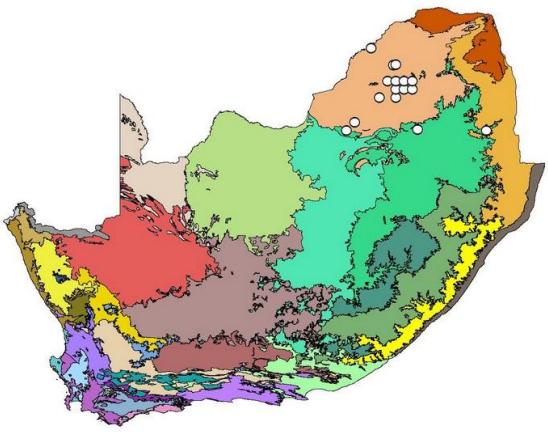
NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).

***Indigofera mollicoma* N.E.Br.** **Indigofereae** ①

Herb; P; Ht 0.2–1.8; Alt 900–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (91)	Mesic Highveld Grassland (9)
Biome	Savanna (91)	Grassland (9)
Rainfall (mm)	400–800 (93)	>800 (7)
Min temp (°C)	2–8 (80)	0–4 (20)
Max temp (°C)	25–29 (53)	27–35 (47)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (60)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2428 (50)	2328 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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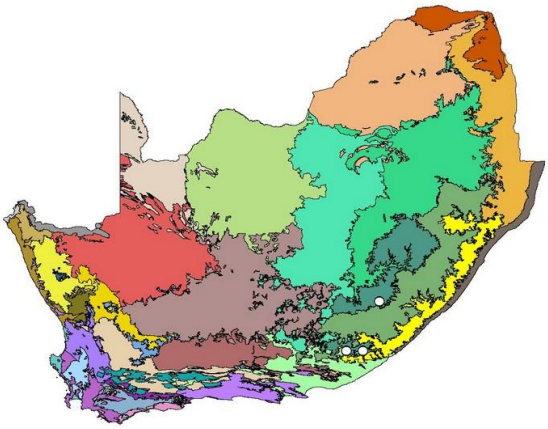
[E]*Indigofera mollis* Eckl. & Zeyh.

Indigofereae ①

Herb; P; Ht 0.01–0.12; Alt 155–1900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (67)	400–800 (33)
Min temp (°C)	2–8 (67)	<2 (33)
Max temp (°C)	25–29 (67)	<27 (33)
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Non (100)	
QDGCs	3127; 3226; 3227 (33)	

NOTES: –



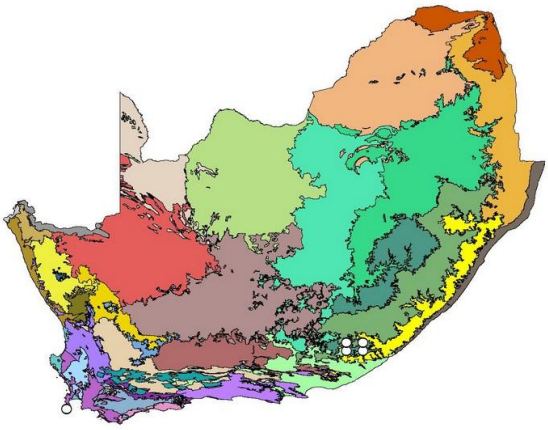
[E]*Indigofera monostachya* Eckl. & Zeyh.

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.01–0.3; Alt 854–1738

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (80)	600–1000 (20)
Min temp (°C)	2–8 (60)	0–4; >6 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	<6.4 (60)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	3226; 3227 (40)	3418 (20)

NOTES: –



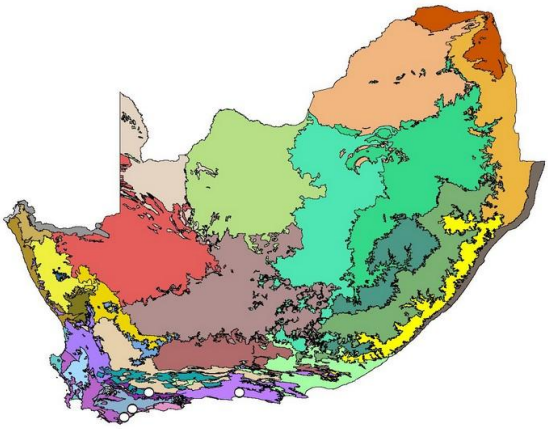
[E]*Indigofera mundiana* Eckl. & Zeyh.

Indigofereae ①

Dwarf shrub; P; Ht ?; Alt ?–30

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	600–1000 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (75)	<27 (25)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (75)	<6.4 (25)
ESP	Medium (100)	
QDGCs	3420 (50)	3320; 3323 (25)

NOTES: –



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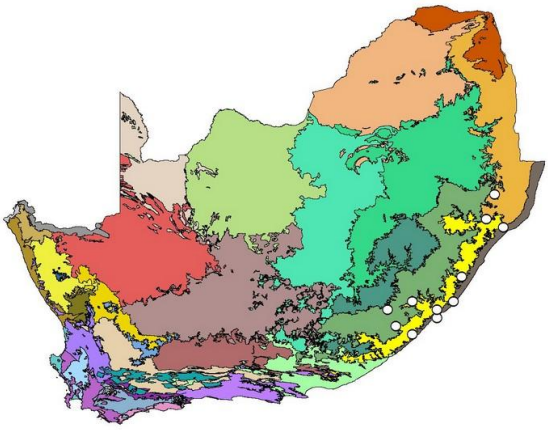
[E]*Indigofera natalensis* Bolus

Indigofereae ①

Dwarf shrub, shrub; P; Ht 1–5; Alt 20–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Sub-Escarpment Grassland (50)	
Biome	Grassland; Indian Ocean (50)	
Rainfall (mm)	>800 (73)	600–1000 (27)
Min temp (°C)	>6 (55)	2–8 (36)
Max temp (°C)	25–29 (91)	<27 (9)
Phosphorus (ppm)	5–35 (55)	<10 (45)
pH	<6.4 (73)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	3128 (27)	2831; 3129 (18)

NOTES: –



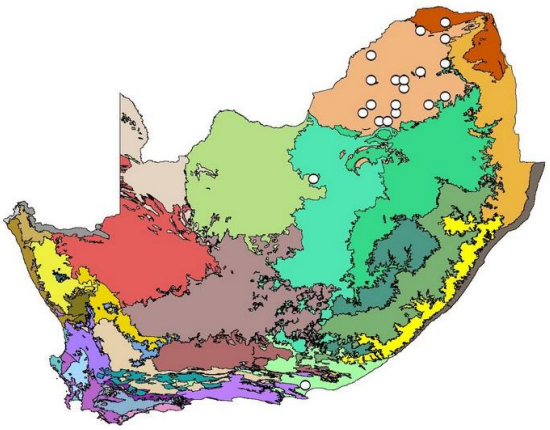
Indigofera nebrowniana J.B.Gillett

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.2–0.9; Alt 915–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (84)	Albany Thicket; Mopane (8)
Biome	Savanna (92)	Albany Thicket (8)
Rainfall (mm)	400–800 (85)	200–600 (10)
Min temp (°C)	2–8 (90)	<2; >6 (5)
Max temp (°C)	27–35 (55)	25–29 (45)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	5.5–7.4 (45)	<6.4 (30)
ESP	Non (100)	
QDGCs	2428; 2527; 2528 (15)	2229; 2329; 2429;

NOTES: –



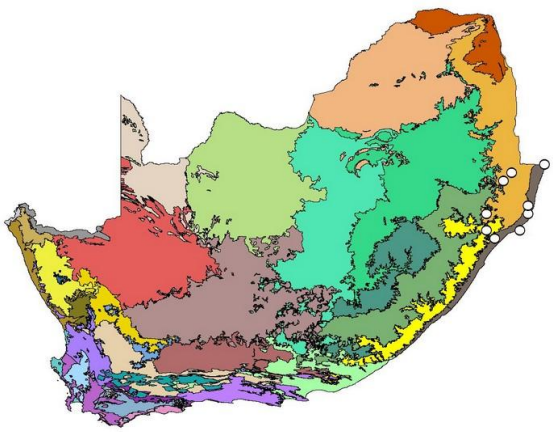
Indigofera neglecta N.E.Br.

Indigofereae ①

Herb; P; Ht 0.45–6; Alt 3–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (60)	Lowveld (40)
Biome	Indian Ocean; Savanna (50)	
Rainfall (mm)	>800 (56)	400–800 (33)
Min temp (°C)	>6 (78)	2–8 (22)
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (56)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2832 (33)	2731; 2831 (22)

NOTES: –



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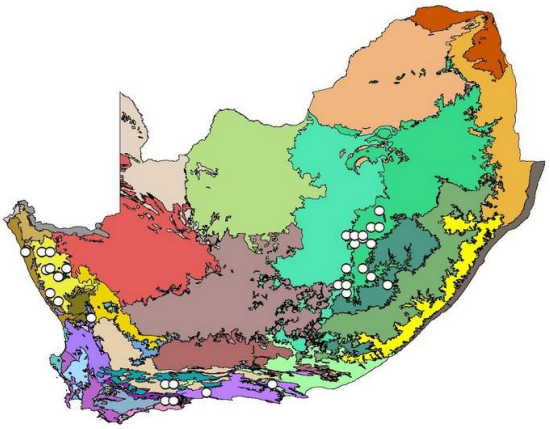
Indigofera nigromontana Eckl. & Zeyh.

Indigofereae ③

Dwarf shrub, shrub; P; Ht 0.05–1.5; Alt 395–1680

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (58)	Namaqualand Hardeveld (25)
Biome	Grassland (70)	Succulent Karoo (25)
Rainfall (mm)	<400 (37)	400–800 (33)
Min temp (°C)	<2 (50)	2–8 (37)
Max temp (°C)	25–29 (57)	27–35 (37)
Phosphorus (ppm)	<10 (53)	5–35 (33)
pH	<6.4 (30)	6.5–7.4 (27)
ESP	Non (58)	Medium (33)
QDGCs	2927 (15)	3026 (12)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



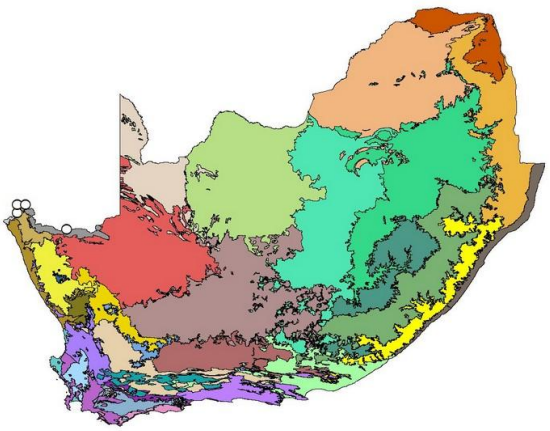
Indigofera nudicaulis E.Mey.

Indigofereae ①

Shrub; P; Ht 0.02–1.5; Alt ?–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Gariep Desert (100)	
Biome	Desert (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (75)	2–8 (25)
Max temp (°C)	>33 (75)	27–35 (25)
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Medium (100)	
QDGCs	2816; 2818 (40)	2817 (20)

NOTES: –



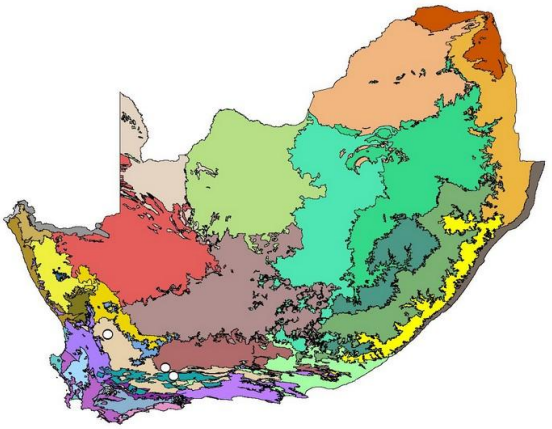
[E]*Indigofera obcordata* Eckl. & Zeyh.

Indigofereae ②

Dwarf shrub; P; Ht 0.25–1.4; Alt 400–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Rainshadow Valley Karoo (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (67)	5–35 (33)
pH	6.5–8.4 (67)	>7.5 (33)
ESP	High (100)	
QDGCs	3321 (67)	3219 (33)

NOTES: **Livestock feed** (Le Houérou 1980).



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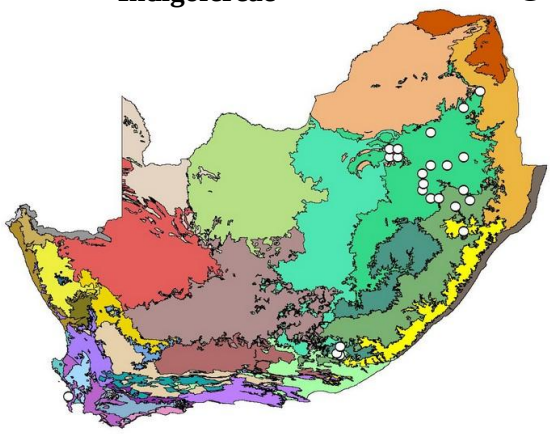
[E]*Indigofera obscura* N.E.Br. **Indigofereae** ①

Herb; P; Ht 0.01–0.3; Alt 1740–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (90)	Sub-Escarpment Grassland (10)
Biome	Grassland (92)	Fynbos (8)
Rainfall (mm)	400–800 (64)	600–1000 (32)
Min temp (°C)	0–4 (50)	<2 (32)
Max temp (°C)	25–29 (68)	<27 (32)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4 (73)	5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2729 (22)	2628 (17)

NOTES: –

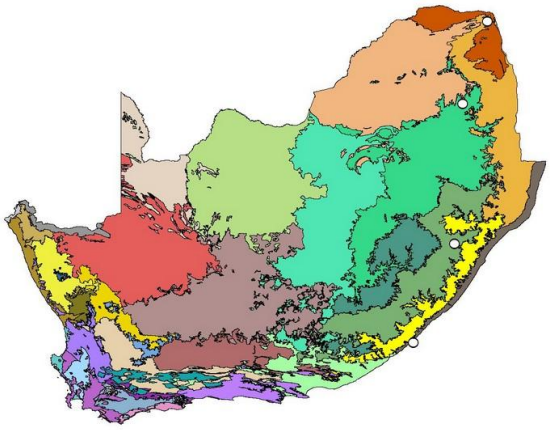


***Indigofera ormocarpoides* Baker** **Indigofereae** ①

Shrub; P; Ht 1.5–3; Alt ?–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Sub-Escarpment Grassland (50)	
Biome	Grassland (50)	Indian Ocean; Savanna (25)
Rainfall (mm)	>800 (50)	200–600; 400–800 (25)
Min temp (°C)	0–4; >6 (50)	
Max temp (°C)	<27 (50)	25–29; 27–35 (25)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (50)	5.5–7.4; 6.5–7.4 (25)
ESP	Non (100)	
QDGCs	2231; 2530; 2930; 3228 (25)	

NOTES: –

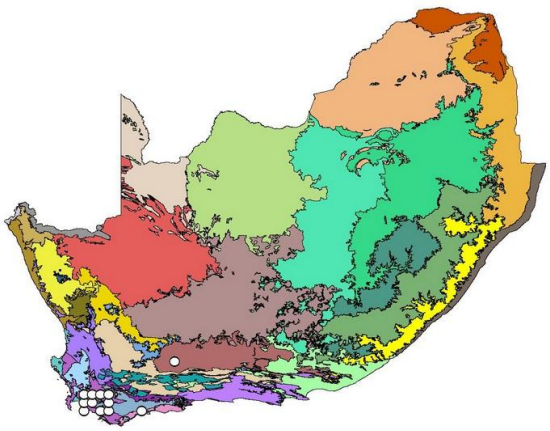


[E]*Indigofera ovata* L.f. **Indigofereae** ①

Herb; P; Ht 0.1–0.3; Alt 60–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (67)	Lower Karoo (33)
Biome	Fynbos (90)	Nama-Karoo (10)
Rainfall (mm)	200–600 (42)	>800 (33)
Min temp (°C)	2–8 (67)	0–4 (25)
Max temp (°C)	25–29 (92)	27–35 (8)
Phosphorus (ppm)	5–35 (84)	<10; >20 (8)
pH	<6.4 (42)	5.5–7.4 (33)
ESP	Non (67)	Medium (33)
QDGCs	3419 (33)	3319 (25)

NOTES: –



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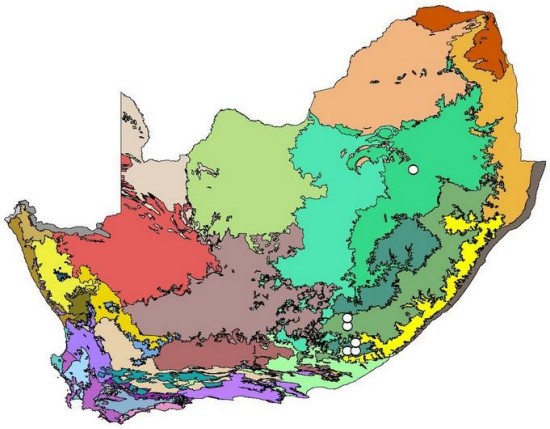
[E]*Indigofera ovina* Harv.

Indigofereae ①

Shrub; P; Ht 0.4–3; Alt 1068–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (67)	Mesic Highveld Grassland (33)
Biome	Grassland (100)	
Rainfall (mm)	400–800 (83)	600–1000 (17)
Min temp (°C)	0–4 (66)	<2; 2–8 (17)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	<6.4; 5.5–7.4; 6.5–8.4 (33)	
ESP	Non (100)	
QDGCs	3126; 3227 (33)	2728; 3226 (17)

NOTES: –



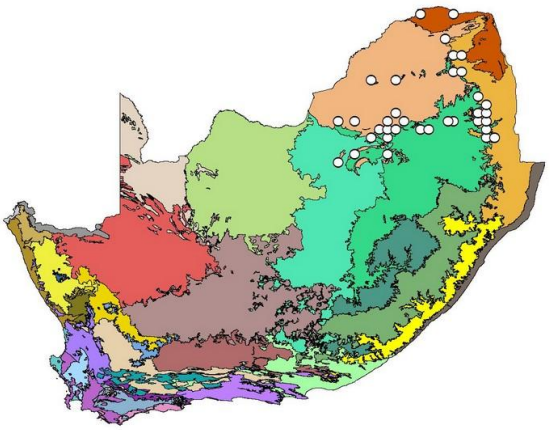
Indigofera oxalidea Welw. ex Baker

Indigofereae ①

Herb; P; Ht 0.08–2.3; Alt 152–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (36)	Mesic Highveld Grassland (29)
Biome	Savanna (62)	Grassland (38)
Rainfall (mm)	400–800 (57)	>800 (26)
Min temp (°C)	2–8 (60)	0–4 (29)
Max temp (°C)	25–29 (51)	27–35 (43)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (83)	5.5–7.4 (11)
ESP	Non (100)	
QDGCs	2528 (14)	2531 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



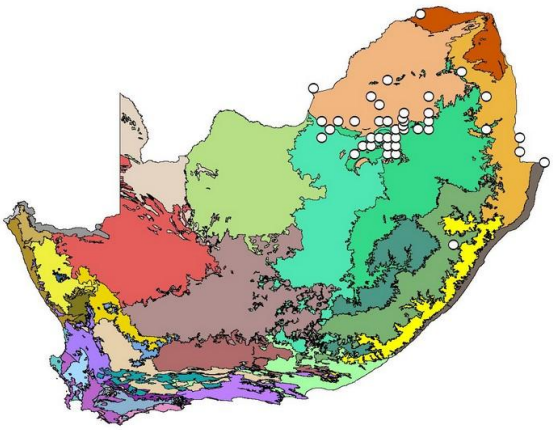
Indigofera oxytropis Benth. ex Harv.

Indigofereae ①

Herb; P; Ht 0.15–0.6; Alt 137–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (57)	Lowveld (14)
Biome	Savanna (72)	Grassland (28)
Rainfall (mm)	400–800 (85)	600–1000 (8)
Min temp (°C)	0–4 (41)	2–8 (38)
Max temp (°C)	27–35 (46)	25–29 (51)
Phosphorus (ppm)	<10 (90)	5–35 (10)
pH	<6.4 (82)	5.5–7.4 (15)
ESP	Non (100)	
QDGCs	2528 (17)	2628 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Manning 2003).



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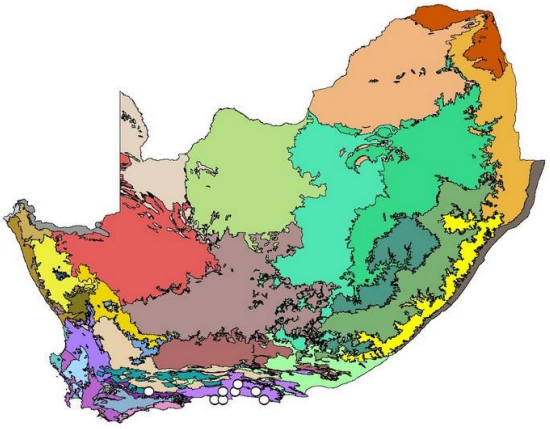
[E]*Indigofera pappei* Fourc.

Indigofereae ①

Dwarf shrub; P; Ht 0.3–1.8; Alt 245–1131

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–100 (38)	200–600; 400–800 (25)
Min temp (°C)	2–8 (88)	>6 (12)
Max temp (°C)	<27 (75)	25–29 (25)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (74)	5.5–7.4; 6.5–8.4 (13)
ESP	Medium (100)	
QDGCs	3323 (35)	3320; 3324; 3422; 3423; 3424 (13)

NOTES: –



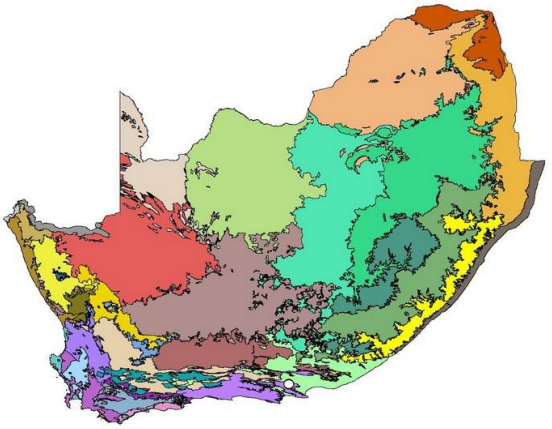
Indigofera pauciflora Eckl. & Zeyh.

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.01–0.4; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3325 (100)	

NOTES: –



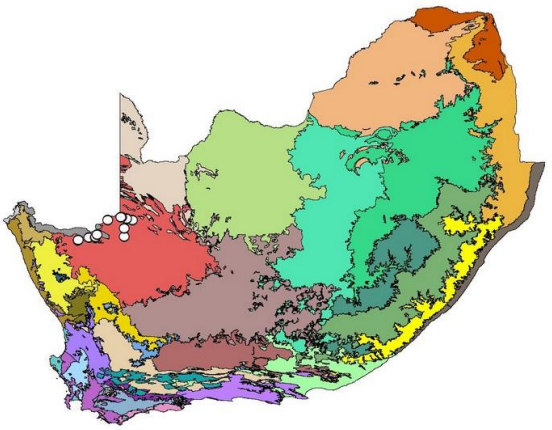
Indigofera pechuelii Kuntze

Indigofereae ①

Dwarf shrub, shrub; P; Ht 0.1–1.5; Alt 650–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (100)	
Biome	Nama-Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (74)	<2; 0–4 (13)
Max temp (°C)	>33 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Non (100)	
QDGCs	2820; 2919 (36)	2918 (14)

NOTES: –



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***Indigofera pilgeriana* Schltr.** **Indigofereae** –

Unknown

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

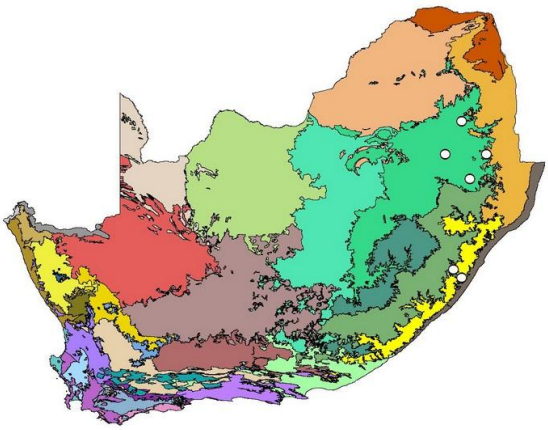
NOTES: –

***Indigofera placida* N.E.Br.** **Indigofereae** ①

Shrub; P; Ht 1–1.5; Alt 765–1295

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (66)	400–800; 600–1000 (17)
Min temp (°C)	0–4; 2–8 (33)	<2; >6 (17)
Max temp (°C)	25–29 (67)	<27 (33)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3030 (32)	2530; 2629; 2631; 2730 (17)

NOTES: –

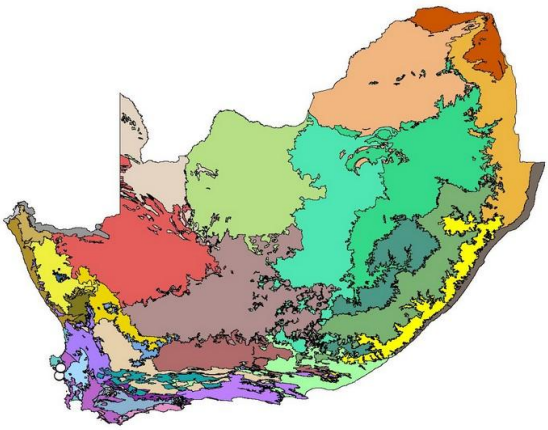


***E*Indigofera platypoda E.Mey.** **Indigofereae** ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: –



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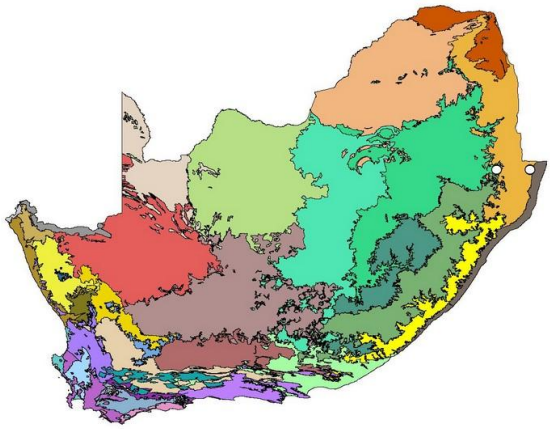
Indigofera podophylla Benth. ex Harv.

Indigofereae ①

Herb; P; Ht 0.3–0.6; Alt ?–92

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	2731; 3732 (50)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



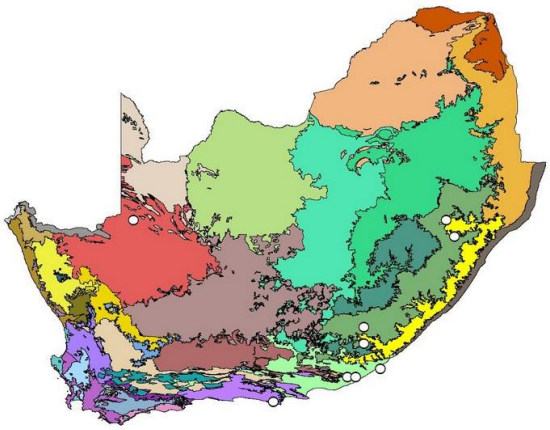
[E]*Indigofera poliotes* Eckl. & Zeyh.

Indigofereae ①

Dwarf shrub, shrub; P; Ht 0.3–1; Alt 15–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (50)	Sub-Escarpment Grassland; Bushmanland (25)
Biome	Albany Thicket (50)	Grassland; Nama-Karoo (25)
Rainfall (mm)	400–800 (67)	600–1000 (22)
Min temp (°C)	0–4; 2–8; >6 (33)	
Max temp (°C)	25–29 (67)	<27; 27–35; >33 (11)
Phosphorus (ppm)	<10; 5–35 (44)	>20 (12)
pH	5.5–7.4 (44)	<6.4; 6.5–7.4 (22)
ESP	Non (100)	
QDGCs	3327 (23)	2820; 2829; 2930; 3127; 3227; 3326; 3424 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



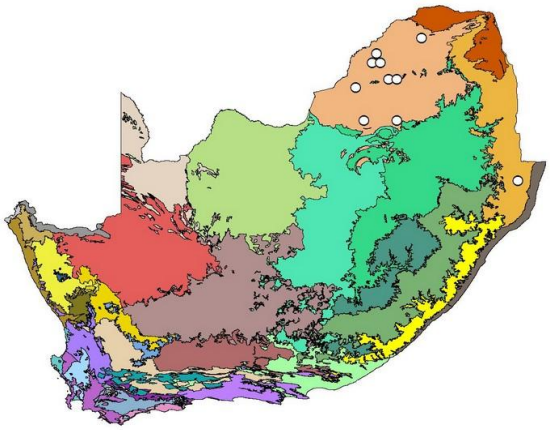
[E]*Indigofera pongolana* N.E.Br.

Indigofereae ①

Shrub, herb, creeper; P; Ht 0.05–2; Alt 855–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (89)	Lowveld (11)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (90)	200–600 (10)
Min temp (°C)	2–8 (80)	0–4; >6 (10)
Max temp (°C)	27–35 (70)	25–29 (30)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (50)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	2327 (30)	2428 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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***Indigofera porrecta* Eckl. & Zeyh. var. *bicolor* Harv.** **Indigofereae** –

Unknown

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

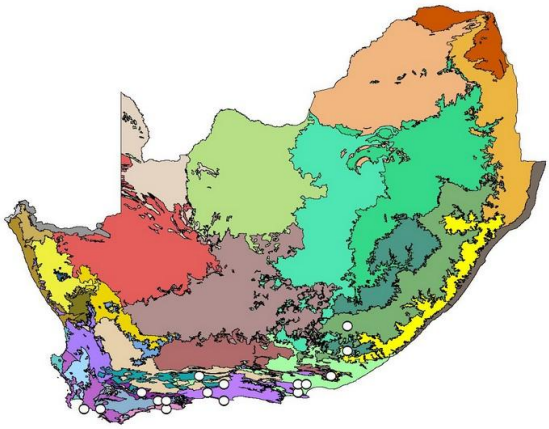
NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring (Moriarty 1997).

Indigofera porrecta* Eckl. & Zeyh. var. *porrecta **Indigofereae** ①

Herb; P; Ht 0.01–0.3; Alt 15–153

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (32)	Albany Thicket; Southwest Fynbos; South Coast Fynbos; Sub-Escarpment Grassland (17)
Biome	Fynbos (74)	Albany Thicket; Grassland (13)
Rainfall (mm)	200–600 (50)	400–800 (31)
Min temp (°C)	2–8 (81)	>6 (13)
Max temp (°C)	25–29 (94)	<27 (6)
Phosphorus (ppm)	5–35 (94)	>20 (6)
pH	<6.4 (38)	5.5–7.4; 6.5–8.4 (25)
ESP	Non (67)	Medium (33)
QDGCs	3325; 3421 (19)	3322 (13)

NOTES: **Flowering:** Spring (Moriarty 1997).

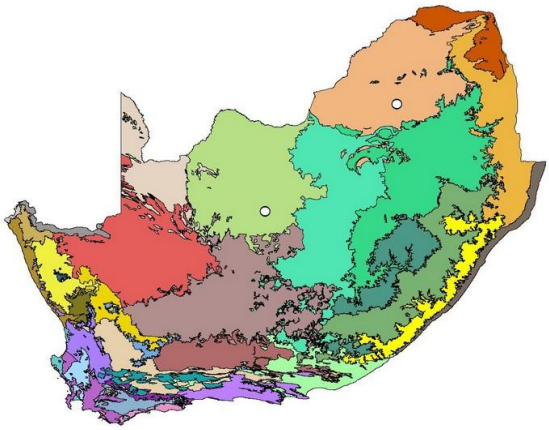


***Indigofera praticola* Baker f.** **Indigofereae** ①

Herb; A; Ht 0.01–0.5; Alt ?–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Eastern Kalahari Bushveld (50)	
Biome	Savanna (100)	
Rainfall (mm)	<400; 400–800 (50)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	27–35; >33 (50)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4; 6.5–8.4 (50)	
ESP	Non (100)	
QDGCs	2528; 2824 (50)	

NOTES: **N_2 fixation:** Nodulated (Mapfumo *et al*. 2005).



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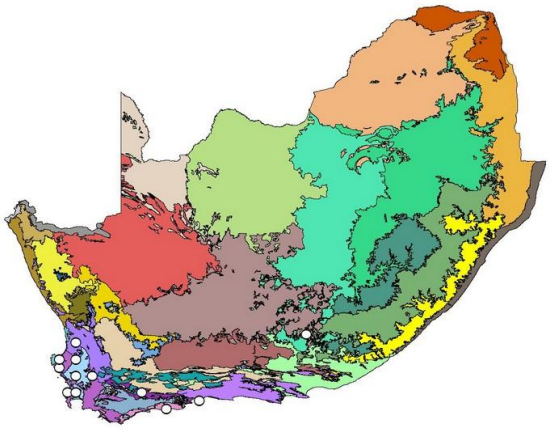
[E]*Indigofera procumbens* L.

Indigofereae ①

Herb, climber; P; Ht 0.05–0.4; Alt 3–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; South Coast Fynbos; Eastern Fynbos-Renosterveld (33)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	<400 (17)
Min temp (°C)	2–8; >6 (42)	25–29 (16)
Max temp (°C)	25–29 (58)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (49)	5.5–7.4; 6.5–7.4; 6.5–8.4 (17)
ESP	Non (67)	Medium (33)
QDGCs	3318 (33)	3218 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



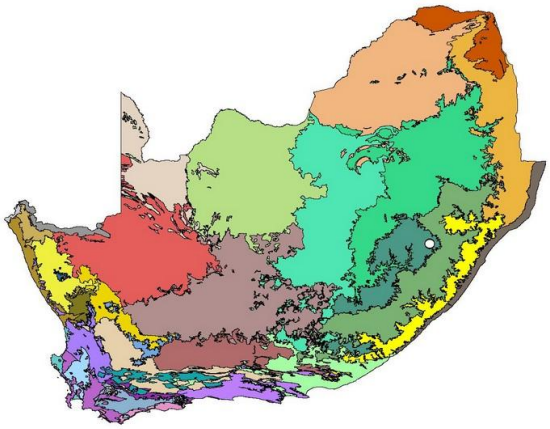
Indigofera pseudoevansii Hilliard & B.L.Burtt

Indigofereae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	<2 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2929 (100)	

NOTES: –



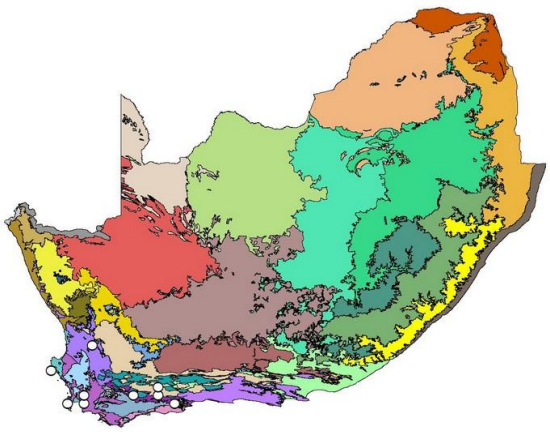
[E]*Indigofera psoraloides* (L.) L.

Indigofereae ①

Herb; P; Ht 0.25–0.8; Alt 30–517

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (33)	200–600; 600–1000 (22)
Min temp (°C)	2–8 (78)	>6 (22)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	<6.4 (56)	6.5–8.4 (22)
ESP	Medium (100)	
QDGCs	3318; 3321; 3418 (20)	3219; 3317; 3320; 3421 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



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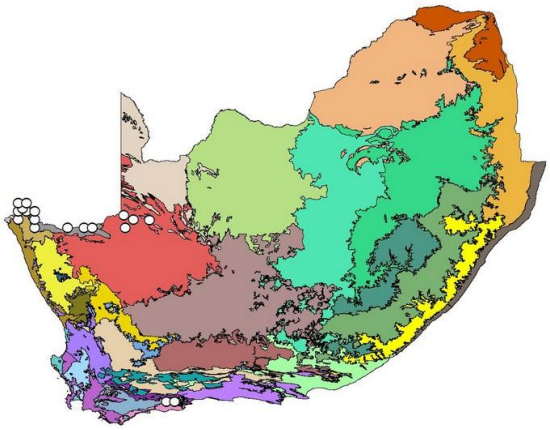
Indigofera pungens E.Mey.

Indigofereae ②

Dwarf shrub, shrub; P; Ht 0.3–1.2; Alt 91–793

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (57)	Gariep Desert (43)
Biome	Desert; Nama-Karoo (43)	Fynbos (14)
Rainfall (mm)	<400 (89)	200–600 (11)
Min temp (°C)	2–8 (50)	>6 (44)
Max temp (°C)	>33 (56)	27–35 (28)
Phosphorus (ppm)	>20 (83)	5–35 (11)
pH	>7.5 (88)	<6.4; 5.5–7.4 (6)
ESP	Non (57)	Medium (43)
QDGCs	2817 (32)	2820 (21)

NOTES: **Livestock feed** (Shearing & Van Heerden 1997).



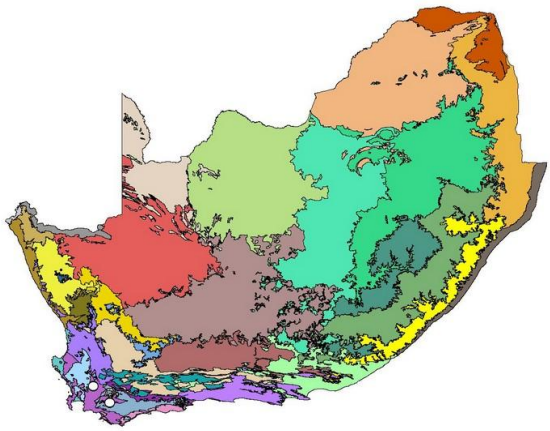
[E]*Indigofera quinquefolia* E.Mey.

Indigofereae ①

Dwarf shrub; P; Ht 0.01–0.3; Alt 397–1464

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; >800 (50)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319; 3419 (50)	

NOTES: –



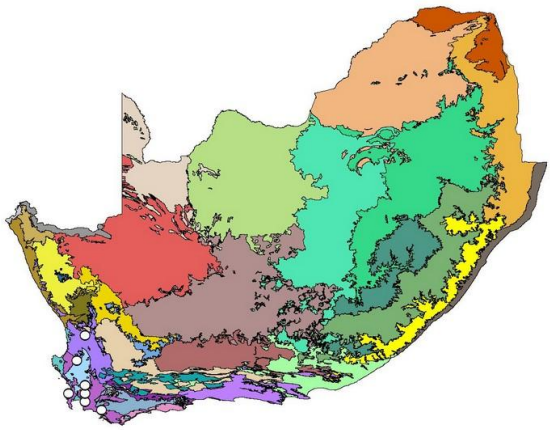
Indigofera racemosa L.

Indigofereae ①

Herb, shrub, climber; P; Ht 0.22–0.5; Alt 15–520

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800; 600–1000 (29)	>800 (13)
Min temp (°C)	2–8 (86)	>6 (14)
Max temp (°C)	25–29 (86)	27–35 (14)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (72)	5.5–7.4; 6.5–8.4 (14)
ESP	Ecotone	
QDGCs	3318 (50)	3218 (25)

NOTES: –



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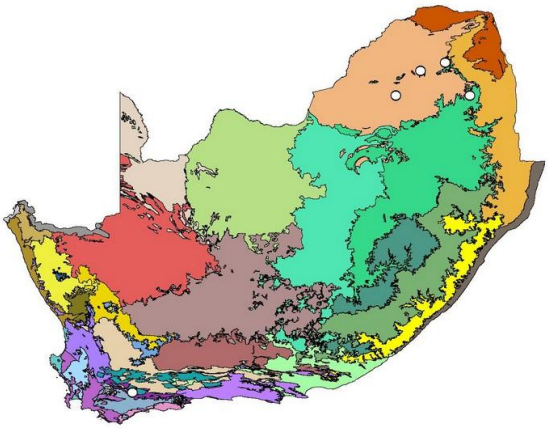
Indigofera reducta N.E.Br.

Indigofereae ①

Dwarf shrub, climber; P; Ht 0.03–1.2; Alt 305–2010

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (60)	200–600; 600–1000 (20)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (60)	<10 (40)
pH	5.5–7.4 (80)	<6.4 (20)
ESP	Non (100)	
QDGCs	2329; 2428; 2429; 2430; 3320 (20)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



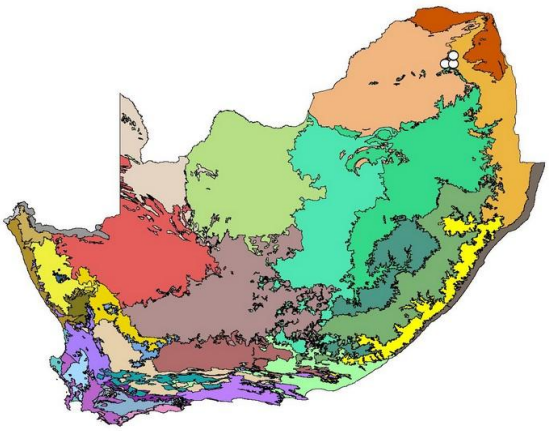
[E]*Indigofera rehmannii* Baker f.

Indigofereae ①

Shrub; P; Ht 0.3–1.2; Alt 1220–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	600–1000 (67)	400–800 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2330 (67)	2329 (33)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



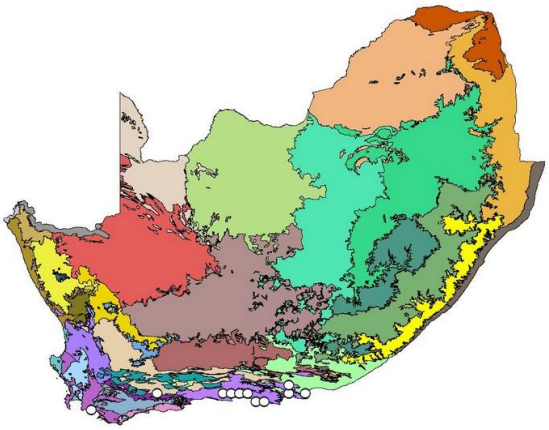
Indigofera rhodantha Fourc.

Indigofereae ①

Shrub; P; Ht 0.3–1; Alt 488–549

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; 600–1000 (36)	<400; 200–600; >800 (9)
Min temp (°C)	2–8 (64)	>6 (36)
Max temp (°C)	<27 (55)	25–29 (36)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (64)	6.5–8.4 (27)
ESP	Medium (100)	
QDGCs	3323 (36)	3325 (27)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



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***Indigofera rhytidocarpa* Benth. ex Harv. subsp. *angolensis* J.B.Gillett** **Indigofereae** –

Unknown

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

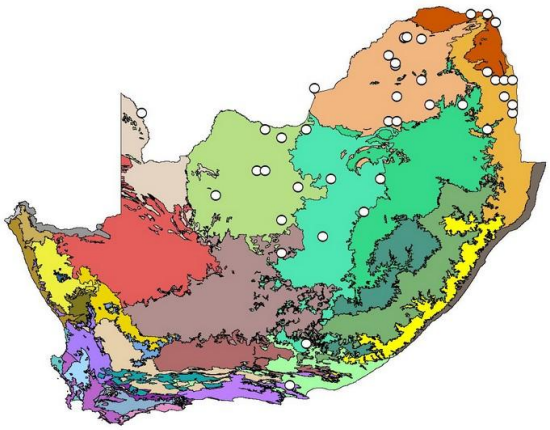
NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).

Indigofera rhytidocarpa* Benth. ex Harv. subsp. *rhytidocarpa **Indigofereae** ③

Herb; P; Ht 0.1–0.5; Alt 305–1555

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (37)	Eastern Kalahari Bushveld (26)
Biome	Savanna (83)	Grassland (17)
Rainfall (mm)	400–800 (66)	200–600 (21)
Min temp (°C)	2–8 (34)	<2 (32)
Max temp (°C)	27–35 (71)	25–29 (13)
Phosphorus (ppm)	<10 (71)	5–35 (29)
pH	6.5–7.4 (42)	5.5–7.4 (26)
ESP	Non (100)	
QDGCs	2328 (15)	2431 (12)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).

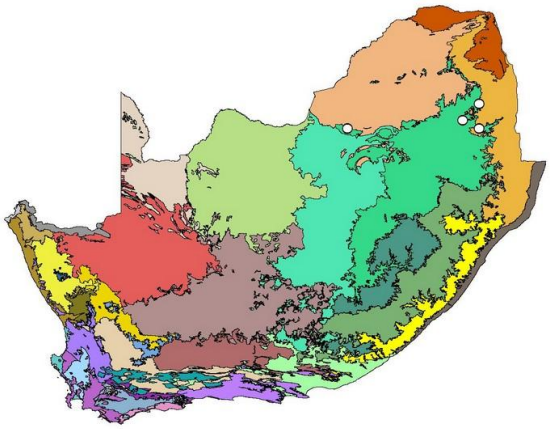


***[E]Indigofera ripae* N.E.Br.** **Indigofereae** ①

Herb; P; Ht 0.3–0.6; Alt ?–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Ecotone	
Rainfall (mm)	>800 (75)	400–800 (25)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (50)	<27; 27–35 (25)
Phosphorus (ppm)	<10 (100)	
pH	<6.5 (100)	
ESP	Non (100)	
QDGCs	2530 (75)	2526 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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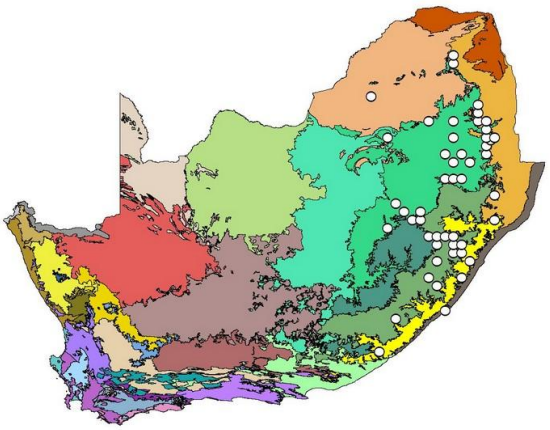
Indigofera rostrata Bolus

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.3–1.2; Alt 70–2090

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (67)	Sub-Escarpment Grassland (27)
Biome	Grassland (92)	Savanna (8)
Rainfall (mm)	>800 (58)	600–1000 (29)
Min temp (°C)	2–8 (44)	0–4 (38)
Max temp (°C)	25–29 (58)	<27 (35)
Phosphorus (ppm)	<10 (85)	5–35 (15)
pH	<6.4 (88)	5.5–7.4 (13)
ESP	Non (100)	
QDGCs	2930 (12)	2631; 2929 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Summer (Pooley 1998).



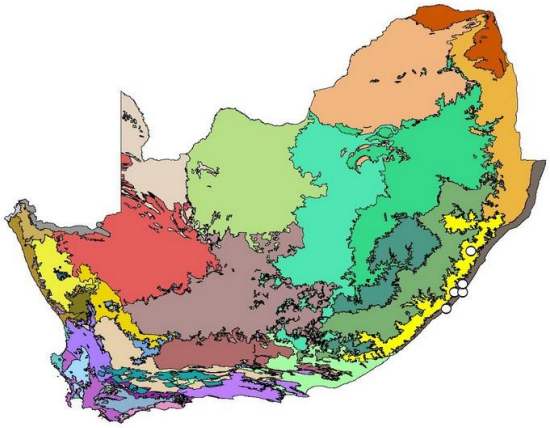
[E]*Indigofera rubroglandulosa* Germish.

Indigofereae ①

Herb; P; Ht 0.12–0.3; Alt 180–763

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Sub-Escarpment Savanna (50)	
Biome	Indian Ocean; Savanna (50)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	3030 (60)	2930; 3129 (20)

NOTES: –



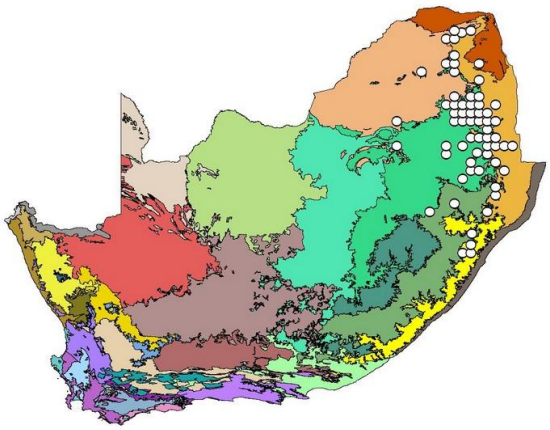
[E]*Indigofera sanguinea* N.E.Br.

Indigofereae ①❖

Herb; P; Ht 0.01–0.6; Alt 290–2195

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (56)	Lowveld (27)
Biome	Savanna (52)	Grassland (48)
Rainfall (mm)	>800 (37)	27–35 (35)
Min temp (°C)	2–8 (56)	0–4 (24)
Max temp (°C)	25–29 (65)	27–35 (21)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (81)	5.5–7.4 (17)
ESP	Non (100)	
QDGCs	2530 (19)	2631 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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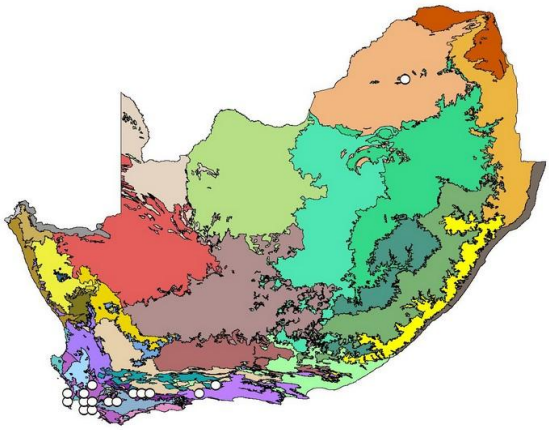
[E]*Indigofera sarmentosa* L.f.

Indigofereae ①

Dwarf shrub; P; Ht 0.2–0.6; Alt 100–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (38)	600–1000; >800 (25)
Min temp (°C)	2–8 (75)	>6 (19)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (94)	<10 (6)
pH	<6.4 (56)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3419 (25)	3320; 3418 (19)

NOTES: –



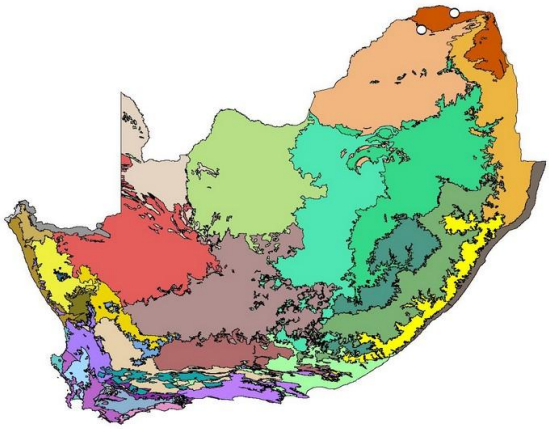
Indigofera schimperi Jaub. & Spach var. *baukeana* (Vatke) J.B.Gillett

Indigofereae ②

Herb; P; Ht 0.01–1.3; Alt 610–1850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8; >6 (150)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4; >7.5 (50)	
ESP	Non (100)	
QDGCs	2229; 2230 (50)	

NOTES: **Livestock feed** (Cook *et al.* 2005); Unpalatable (Jones 2009). **CP:** Leaf 20% (Jones *et al.* 2000). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



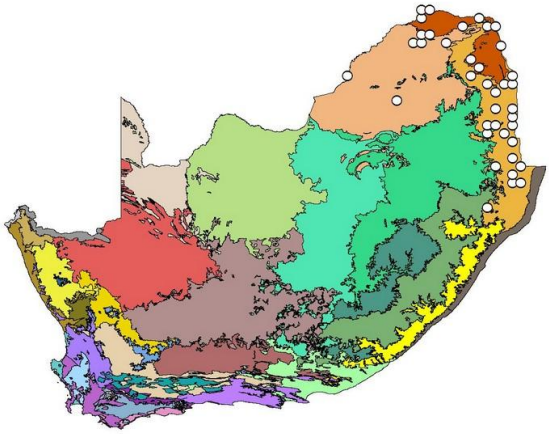
Indigofera schimperi Jaub. & Spach var. *schimperi*

Indigofereae ②

Shrub; P; Ht 0.15–1; Alt 30–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (62)	Central Bushveld; Mopane (19)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (46)	200–600 (23)
Min temp (°C)	>6 (59)	2–8 (41)
Max temp (°C)	27–35 (82)	25–29 (18)
Phosphorus (ppm)	<10 (62)	5–35 (38)
pH	5.5–7.4 (31)	6.5–7.4 (28)
ESP	Non (100)	
QDGCs	2531 (21)	2229; 2431 (13)

NOTES: **Livestock feed** (Morgan 1981; Cook *et al.* 2005); Unpalatable (Jones 2009). **CP:** Leaf 20% (Jones *et al.* 2000). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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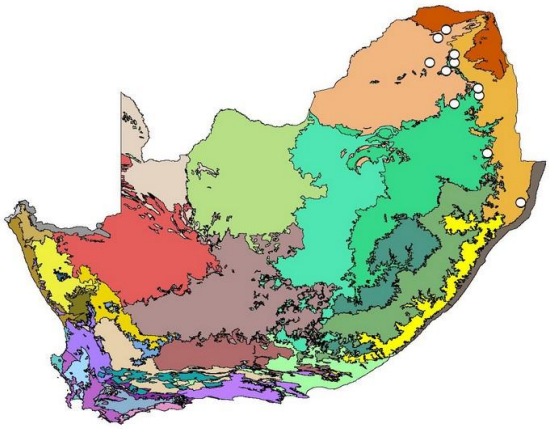
Indigofera schinzii N.E.Br.

Indigofereae ①

Herb; P; Ht 0.3–0.9; Alt 120–3000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (67)	Lowveld (33)
Biome	Savanna (100)	
Rainfall (mm)	400–800; 600–1000; >800 (27)	200–600 (19)
Min temp (°C)	2–8 (82)	0–4; >6 (9)
Max temp (°C)	25–29 (64)	27–35 (36)
Phosphorus (ppm)	<10 (55)	5–35 (45)
pH	<6.4 (64)	5.5–7.4; 6.5–8.4 (18)
ESP	Non (100)	
QDGCs	2329; 2330; 2430 (18)	2229; 2429; 2530; 2631; 2832 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



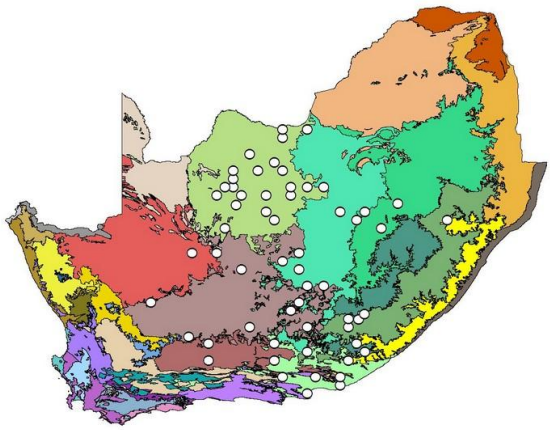
Indigofera sessilifolia DC.

Indigofereae ☠②

Dwarf shrub, herb; P; Ht 0.15–0.9; Alt 230–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (66)	Dry Highveld Grassland; Mesic Highveld Grassland; Sub-Escarpment Grassland; Upper Karoo (7)
Biome	Savanna (53)	Grassland (28)
Rainfall (mm)	<400 (44)	400–800 (42)
Min temp (°C)	<2 (43)	0–4 (29)
Max temp (°C)	27–35 (63)	25–29 (20)
Phosphorus (ppm)	<10 (54)	5–35 (34)
pH	6.5–8.4 (27)	6.5–7.4 (24)
ESP	Non (97)	Medium (3)
QDGCs	2723 (7)	2724; 2725; 2827; 3125; 3222 (5)

NOTES: **Livestock feed:** Highly palatable, high nutritional value (Le Roux *et al.* 1994); (Breebaart 2003). **Antiquality:** Toxic to livestock (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



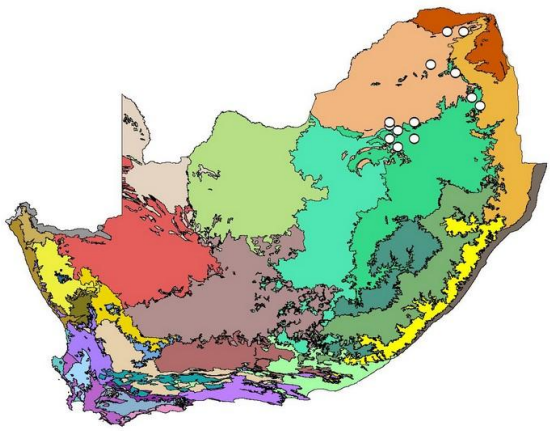
Indigofera setiflora Baker

Indigofereae ①

Herb; P; Ht 0.3–1.2; Alt 670–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (67)	Mesic Highveld Grassland (33)
Biome	Savanna (75)	Grassland (25)
Rainfall (mm)	400–800 (58)	600–1000 (25)
Min temp (°C)	2–8 (75)	<2 (25)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (84)	5.5–7.4; 6.5–8.4 (8)
ESP	Non (100)	
QDGCs	2528 (31)	2628 (23)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Summer (Germishuizen & Clarke 2003).



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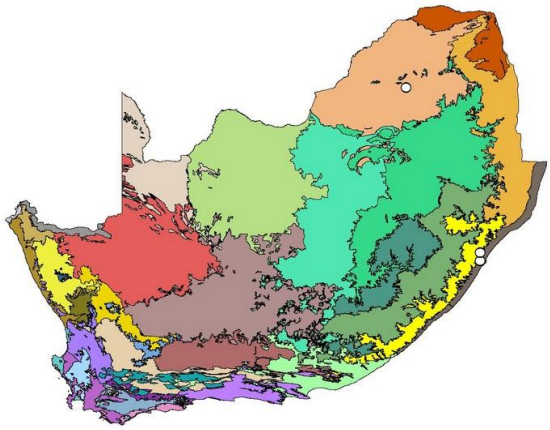
[E]*Indigofera setosa* N.E.Br.

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.01–0.45; Alt 305–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	>800 (67)	400–800 (33)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Non (100)	
QDGCs	2930 (67)	2428 (33)

NOTES: –



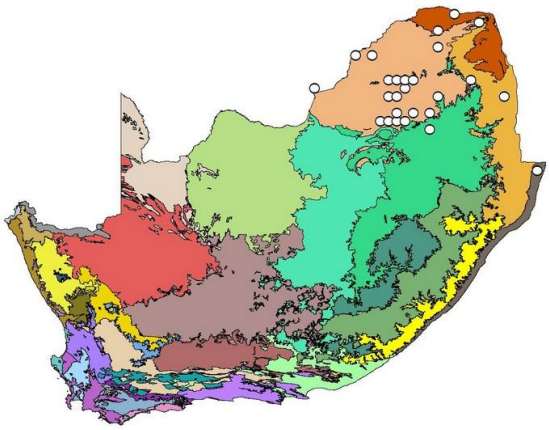
Indigofera sordida Benth. ex Harv.

Indigofereae ①

Herb; P; Ht 0.2–0.9; Alt 305–1650

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (80)	Indian Ocean Coastal Belt; Mesic Highveld Grassland; Lowveld; Mopane (5)
Biome	Savanna (88)	Grassland; Indian Ocean (6)
Rainfall (mm)	400–800 (85)	200–600 (12)
Min temp (°C)	2–8 (81)	>6 (15)
Max temp (°C)	27–35 (62)	25–29 (38)
Phosphorus (ppm)	<10 (73)	5–35 (27)
pH	<6.4 (46)	5.5–7.4 (38)
ESP	Non (100)	
QDGCs	2428 (27)	2528 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Germishuizen & Clarke 2003).



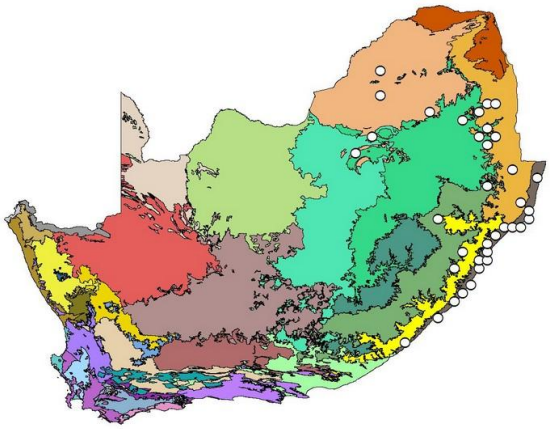
Indigofera spicata Forssk. var. *spicata*

Indigofereae ☠②

Herb, shrub; P; Ht 0.02–1; Alt 1–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (58)	Lowveld (21)
Biome	Indian Ocean (63)	Savanna (37)
Rainfall (mm)	>800 (69)	400–800 (25)
Min temp (°C)	>6 (56)	2–8 (33)
Max temp (°C)	25–29 (53)	27–35 (44)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (78)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2832; 2931; 3030 (11)	2531 (8)

NOTES: **Livestock feed** (Pooley 1998). **Antiquality:** Indospicine (Cook *et al.* 2005). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Breeding** (Hutton & Guerassimoff 1966). **Flowering:** All seasons (Pooley 1998).



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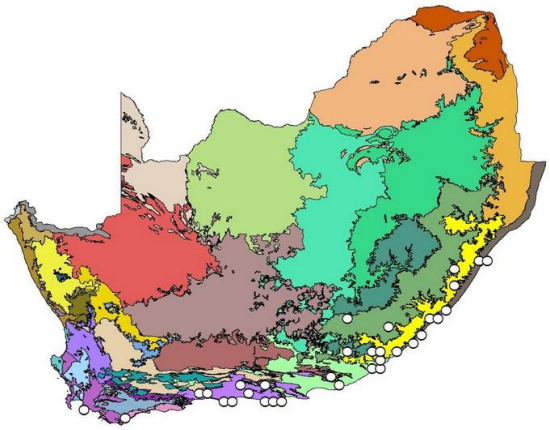
[E]*Indigofera stricta* L.f.

Indigofereae ①

Dwarf shrub, climber; P; Ht 0.3–0.6; Alt 0.6–1281

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (36)	Albany Thicket; Indian Ocean Coastal Belt; Sub-Escarpment Grassland (18)
Biome	Fynbos (36)	Indian Ocean (27)
Rainfall (mm)	>800 (38)	400–800 (31)
Min temp (°C)	>6 (53)	2–8 (44)
Max temp (°C)	25–29 (81)	<27 (16)
Phosphorus (ppm)	5–35 (81)	<10 (19)
pH	<6.4 (59)	5.5–7.4 (31)
ESP	Non (64)	Medium (36)
QDGCs	3129; 3227; 3424 (9)	3030; 3228; 3322; 3323; 3326; 3327; 3423 (6)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** All seasons (Manning 2001).



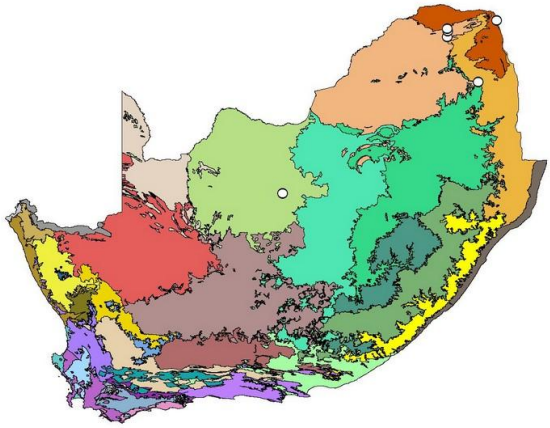
[E]*Indigofera subcorymbosa* Baker var. *subcorymbosa*

Indigofereae ①

Shrub; P; Ht 1–4; Alt 462–946

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Lowveld; Eastern Kalahari Bushveld (33)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (60)	200–600 (40)
Min temp (°C)	2–8; >6 (40)	<2 (20)
Max temp (°C)	27–35 (60)	25–29 (40)
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	6.5–8.4 (40)	<6.4; 5.5–7.4; 6.5–7.4 (20)
ESP	Non (100)	
QDGCs	2229; 2724 (29)	2231; 2329; 2430 (14)

NOTES: –



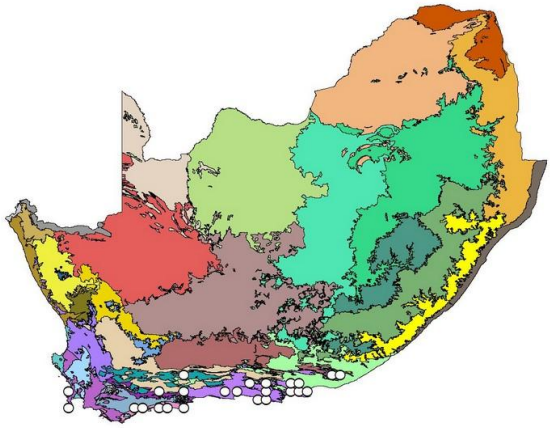
[E]*Indigofera sulcata* DC.

Indigofereae ①

Dwarf shrub; P; Ht 0.3–0.75; Alt 61–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (60)	Southwest Fynbos; South Coast Fynbos (20)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (42)	400–800 (33)
Min temp (°C)	2–8 (71)	>6 (29)
Max temp (°C)	25–29 (71)	<27 (21)
Phosphorus (ppm)	5–35 (92)	<10; >20 (4)
pH	<6.4 (42)	6.5–8.4 (29)
ESP	Medium (60)	Non (40)
QDGCs	3325 (20)	3321; 3323; 3421 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Autumn, winter (Manning 2001).



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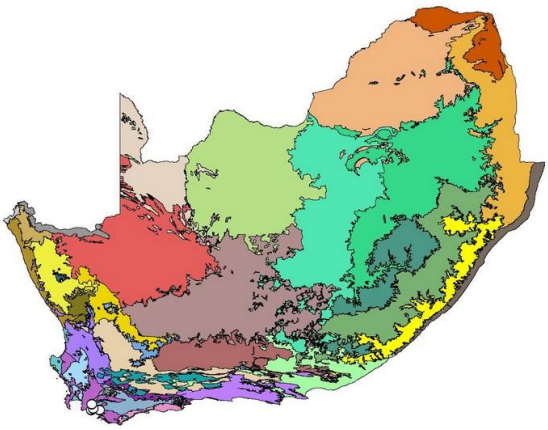
[E]*Indigofera superba* C.H.Stirt.

Indigofereae ①

Shrub; P; Ht 0.5–3; Alt 100–366

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (67)	>800 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: –



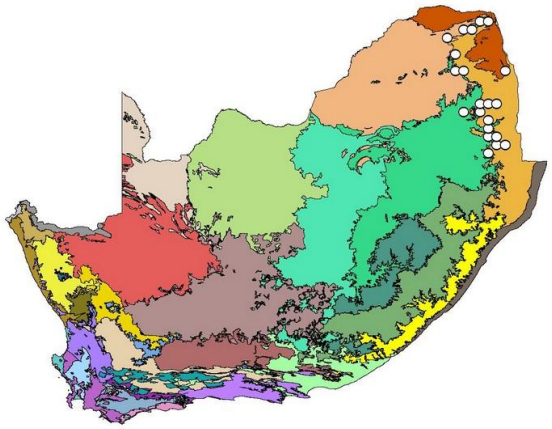
Indigofera swaziensis Bolus var. *perplexa* (N.E.Br.) J.B.Gillett

Indigofereae ①

Shrub; P; Ht 0.6–2.4; Alt 457–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (60)	Mesic Highveld Grassland; Central Bushveld (20)
Biome	Savanna (100)	
Rainfall (mm)	>800 (43)	400–800; 600–1000 (24)
Min temp (°C)	2–8 (71)	>6 (29)
Max temp (°C)	25–29 (57)	27–35 (38)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (72)	5.5–7.4; 6.5–7.4 (14)
ESP	Non (100)	
QDGCs	2631 (24)	2531 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



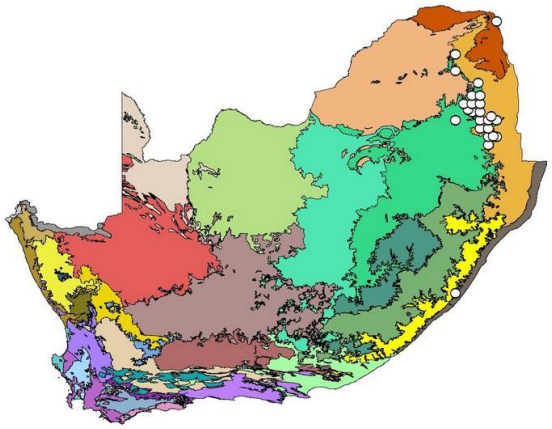
Indigofera swaziensis Bolus var. *swaziensis*

Indigofereae ③

Shrub; P; Ht 0.02–2; Alt 1220–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (75)	Lowveld (25)
Biome	Grassland (67)	Savanna (33)
Rainfall (mm)	>800 (67)	600–1000 (19)
Min temp (°C)	2–8 (67)	>6 (19)
Max temp (°C)	25–29 (67)	27–35 (19)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4 (76)	5.5–7.4 (19)
ESP	Non (100)	
QDGCs	2530 (40)	2430; 2531; 2631 (16)

NOTES: **Cultivated** (Glen 2002).



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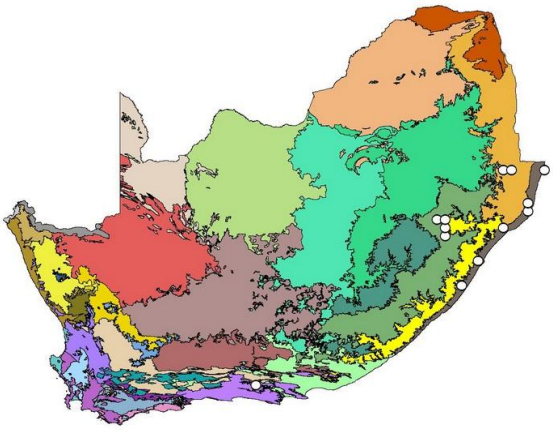
Indigofera tenuissima E.Mey.

Indigofereae ①

Herb; P; Ht 0.3–1.7; Alt 2–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (67)	Lowveld (33)
Biome	Indian Ocean (67)	Savanna (33)
Rainfall (mm)	600–1000; >800 (38)	400–800 (15)
Min temp (°C)	>6 (54)	0–4 (31)
Max temp (°C)	27–35 (62)	25–29 (38)
Phosphorus (ppm)	<10 (69)	5–35 (31)
pH	<6.4 (54)	5.5–7.4 (38)
ESP	Non (100)	
QDGCs	2829 (23)	2731; 2832 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996).



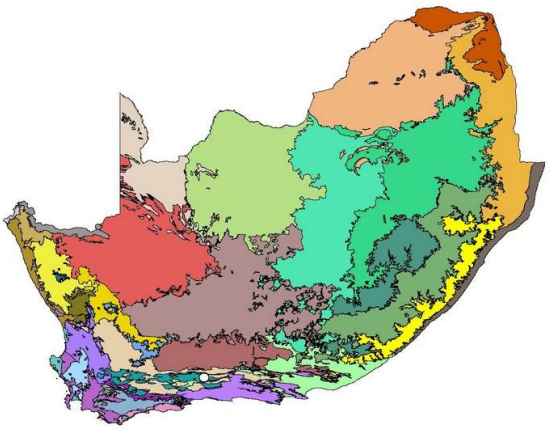
[E]*Indigofera thesioides* Jarvie & C.H.Stirt.

Indigofereae ①

Shrub; P; Ht 0.01–0.4; Alt ?–700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3322 (100)	

NOTES: –



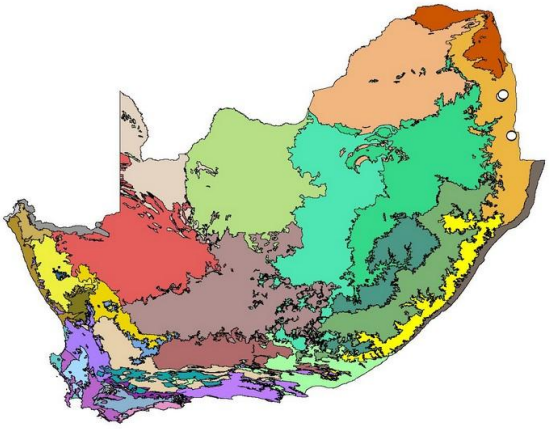
Indigofera tinctoria L. var. *arcuata* J.B.Gillett

Indigofereae ③

Herb; P; Ht 0.6–2; Alt 198–940

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800; 600–1000 (50)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Non (100)	
QDGCs	2431 (66)	2631 (33)

NOTES: **Livestock feed** (Bosch & Borus 2006). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975); *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Soil conservation:** Cover crop (Sampson 1928). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



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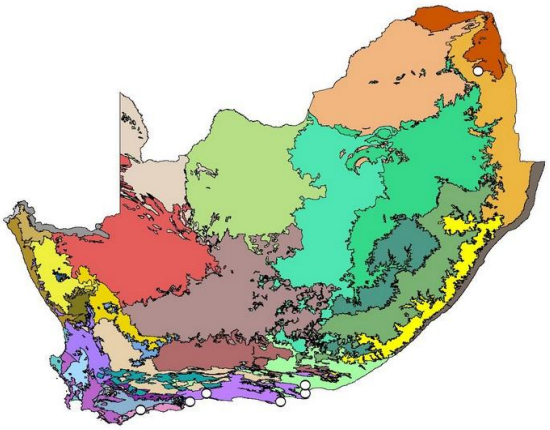
[E]*Indigofera tomentosa* Eckl. & Zeyh.

Indigofereae ①

Herb; P; Ht 0.3–0.6; Alt 9–90

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos (50)	Albany Thicket; Savanna (25)
Rainfall (mm)	400–800 (57)	200–600 (29)
Min temp (°C)	>6 (71)	2–8 (29)
Max temp (°C)	25–29 (72)	<27; 27–35 (14)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (43)	6.5–8.4 (29)
ESP	Non; Medium (50)	
QDGCs	3325 (30)	2430; 3322; 3420; 3422; 3424 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



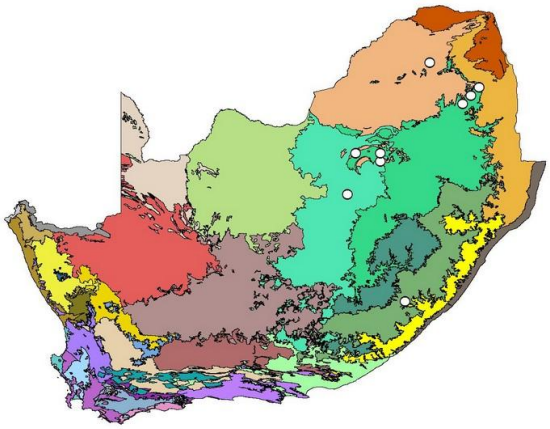
[E]*Indigofera torulosa* E.Mey. var. *angustiloba* (Baker f.) J.B.Gillett

Indigofereae ①

Herb; P; Ht 0.1–0.3; Alt 730–1678

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland; Mesic Highveld Grassland; Central Bushveld (33)	
Biome	Grassland (70)	Savanna (25)
Rainfall (mm)	400–800 (67)	>800 (22)
Min temp (°C)	<2; 0–4; 2–8 (33)	
Max temp (°C)	27–35 (56)	25–29 (33)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (56)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2627 (33)	2430 (22)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



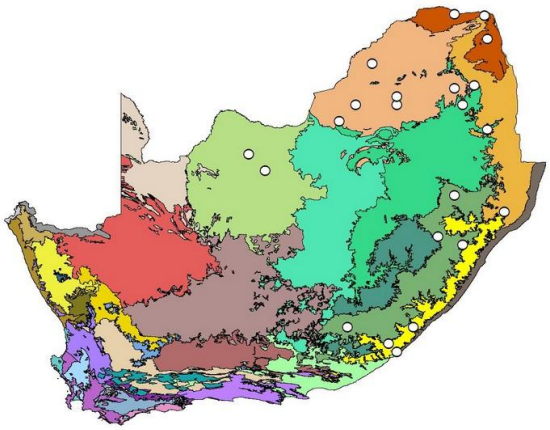
Indigofera torulosa E.Mey. var. *torulosa*

Indigofereae ①

Herb; P; Ht 0.1–0.3; Alt 60–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (40)	Sub-Escarpment Grassland; Eastern Kalahari Bushveld; Mopane (13)
Biome	Savanna (71)	Grassland (29)
Rainfall (mm)	400–800 (55)	>800 (23)
Min temp (°C)	2–8 (41)	>6 (27)
Max temp (°C)	27–35 (45)	25–29 (41)
Phosphorus (ppm)	<10 (64)	5–35 (36)
pH	<6.4 (36)	5.5–7.4 (32)
ESP	Non (100)	
QDGCs	2430; 3228 (9)	2230; 2231; 2327; 2331; 2428; 2526; 2427; 2528; 2530; 2531; 2623; 2724; 2730; 2831; 2929; 2930; 3126; 3128 (4.5)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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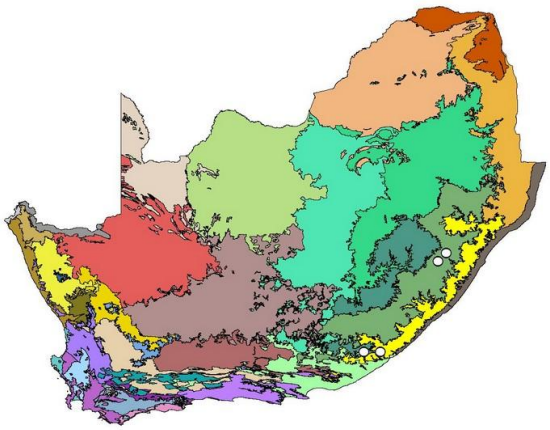
[E]*Indigofera trifolioides* Baker f.

Indigofereae ①

Herb; P; Ht ?; Alt 610–1678

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000; >800 (50)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2929; 3227 (50)	

NOTES: –



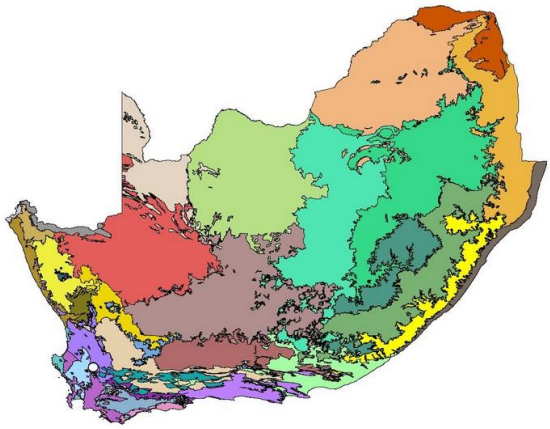
[E]*Indigofera triquetra* E.Mey.

Indigofereae ①

Herb; P; Ht 0.7–1.5; Alt ?–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



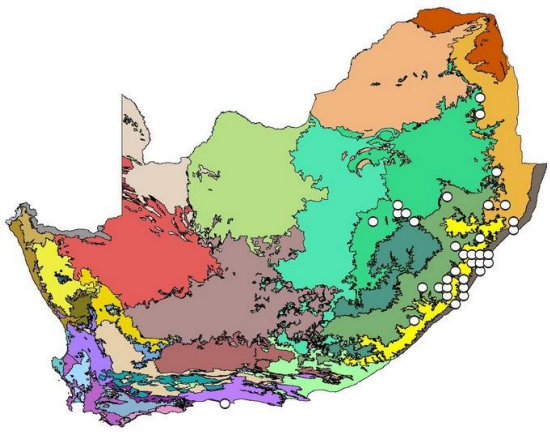
Indigofera tristis E.Mey.

Indigofereae ①

Dwarf shrub, shrub, herb; P; Ht 0.09–1.8; Alt 30–2300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (38)	Sub-Escarpment Grassland (23)
Biome	Grassland (57)	Indian Ocean (29)
Rainfall (mm)	>800 (74)	600–1000 (17)
Min temp (°C)	2–8; >6 (37)	0–4 (14)
Max temp (°C)	25–29 (63)	<27 (23)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (74)	5.5–7.4 (26)
ESP	Non (92)	Medium (8)
QDGCs	2930 (20)	3029; 3030 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Manning 2001).



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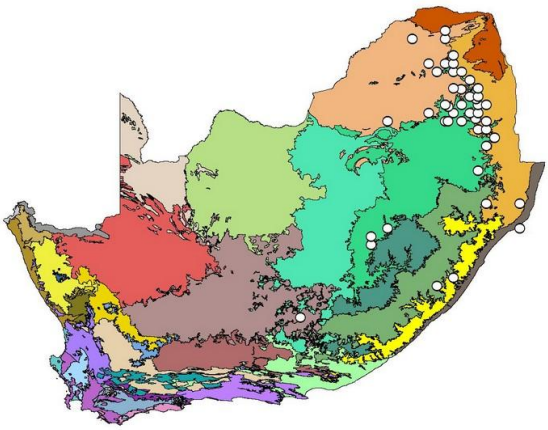
Indigofera tristoides N.E.Br.

Indigofereae ①

Shrub; P; Ht 0.15–2; Alt 155–1980

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Central Bushveld (40)	Lowveld (13)
Biome	Savanna (50)	Grassland (43)
Rainfall (mm)	>800 (40)	400–800 (35)
Min temp (°C)	2–8 (72)	0–4 (14)
Max temp (°C)	25–29 (63)	27–35 (21)
Phosphorus (ppm)	<10 (72)	5–35 (28)
pH	<6.4 (70)	5.5–7.4 (21)
ESP	Non (100)	
QDGCs	2430; 2530 (19)	2529 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



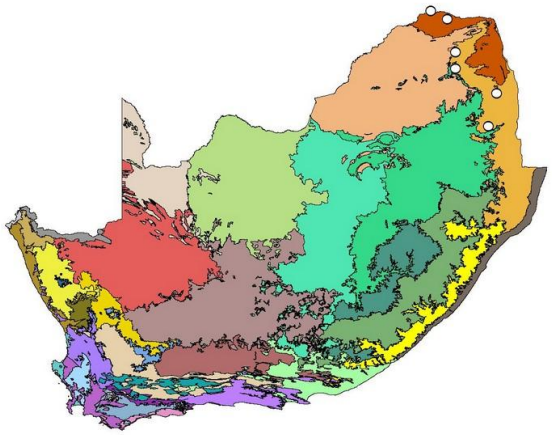
Indigofera trita L.f. subsp. *scabra* (Roth) de Kort & G.Thijsse

Indigofereae ①

Shrub; P; Ht 0.5–2; Alt 633–1123

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (67)	Lowveld (33)
Biome	Savanna (100)	
Rainfall (mm)	<400; 400–800 (33)	600–1000; >800 (17)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	27–35 (83)	25–29 (17)
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	<6.4; 5.5–7.4; 6.5–8.4 (33)	
ESP	Non (100)	
QDGCs	2229; 2330 (33)	2431; 2531 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



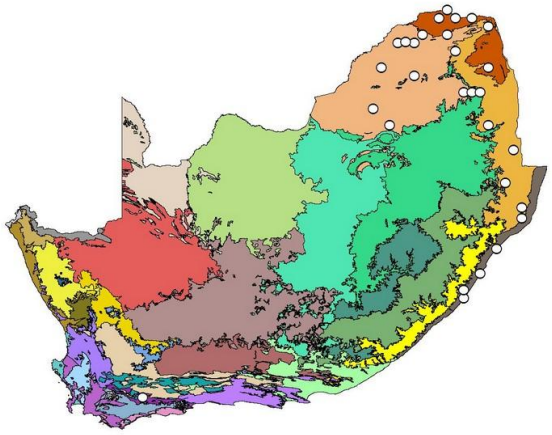
Indigofera trita L.f. subsp. *subulata* (Vahl ex Poir.) Ali

Indigofereae ①

Shrub; P; Ht 0.15–1; Alt 5–1158

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (44)	Mopane (25)
Biome	Savanna (81)	Indian Ocean (14)
Rainfall (mm)	400–800 (33)	>800 (23)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	27–35 (63)	25–29 (37)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4; 5.5–7.4 (33)	6.5–8.4 (23)
ESP	Non (100)	
QDGCs	2229 (13)	2328; 2430; 3030 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1972; Grobbelaar & Van Rooyen 1979).



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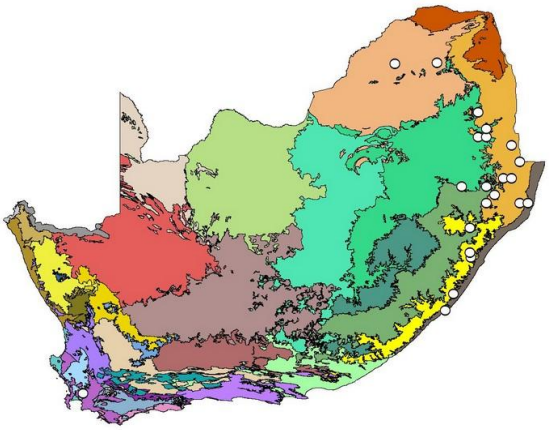
Indigofera velutina E.Mey.

Indigofereae ①

Herb; P; Ht 0.15–0.8; Alt 90–1664

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (57)	Central Bushveld (29)
Biome	Savanna (78)	Fynbos; Grassland (11)
Rainfall (mm)	>800 (50)	400–800 (27)
Min temp (°C)	2–8 (59)	>6 (36)
Max temp (°C)	25–29 (64)	27–35 (36)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4 (64)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	2731 (18)	2631; 2832; 2930 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Spring, summer (Pooley 1998).



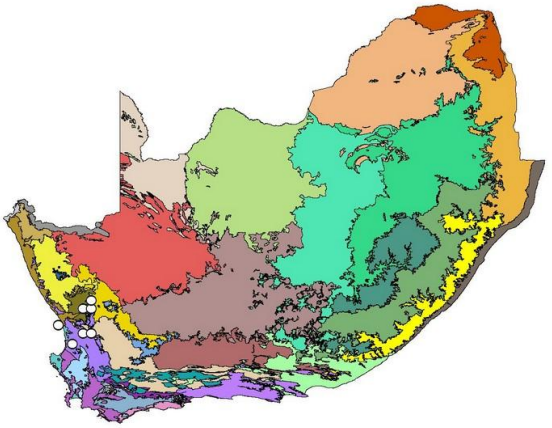
[E]*Indigofera venusta* Eckl. & Zeyh.

Indigofereae ①

Herb; P; Ht 0.3–0.5; Alt 305–780

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Namaqualand Sandveld (50)	
Biome	Fynbos; Succulent Karoo (50)	
Rainfall (mm)	<400 (57)	200–600 (43)
Min temp (°C)	2–8 (71)	>6 (29)
Max temp (°C)	27–35 (71)	25–29 (29)
Phosphorus (ppm)	>20 (57)	5–35 (43)
pH	5.5–7.4; >7.5 (43)	6.5–8.4 (14)
ESP	Non; High (50)	
QDGCs	3118; 3119; 3218 (29)	3219 (14)

NOTES: –



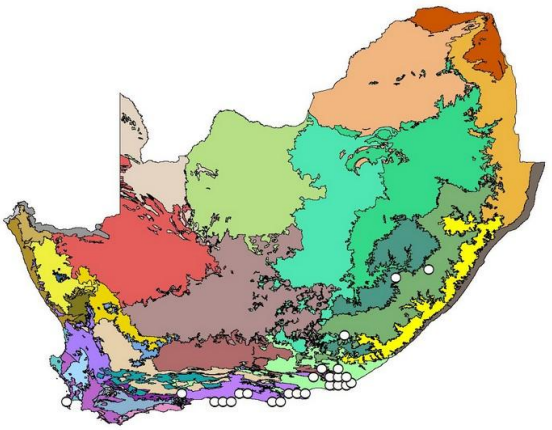
[E]*Indigofera verrucosa* Eckl. & Zeyh.

Indigofereae ①

Dwarf shrub, shrub; P; Ht 0.6–0.9; Alt 15–690

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (57)	Albany Thicket (29)
Biome	Fynbos; Grassland (38)	Albany Thicket (25)
Rainfall (mm)	400–800 (56)	600–1000 (20)
Min temp (°C)	2–8 (52)	>6 (36)
Max temp (°C)	25–29 (64)	<27 (32)
Phosphorus (ppm)	5–35 (88)	<10 (12)
pH	<6.4 (40)	5.5–7.4 (28)
ESP	Medium (57)	High (43)
QDGCs	3326 (32)	3325 (16)

NOTES: –



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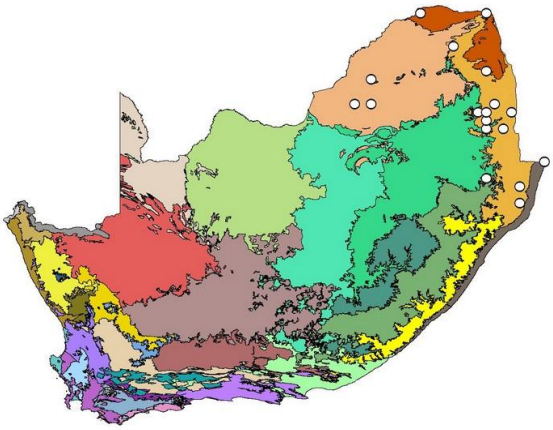
Indigofera vicioides Jaub. & Spach var. *rogersii* (R.E.Fr.) J.B.Gillett

Indigofereae

Herb; P; Ht 0.2–0.9; Alt 7–1594

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (60)	Central Bushveld (20)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (56)	>800 (22)
Min temp (°C)	2–8 (56)	>6 (44)
Max temp (°C)	27–35 (72)	25–29 (22)
Phosphorus (ppm)	<10 (72)	5–35 (28)
pH	5.5–7.4 (39)	<6.4 (33)
ESP	Non (100)	
QDGCs	2531 (33)	2527 (11)

NOTES: **Livestock feed** (Tjelele 2006). **CP:** Leaves and stem 13–24% (Tjelele 2006). **DM:** 1.4 t/ha (Hassen *et al.* 2008). **Cultivated** (Glen 2002). **Antiquality:** Indospicine 705 mg/kg DM (Hassen *et al.* 2008). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1972). **Physiology:** Drought tolerant (Hassen *et al.* 2007).



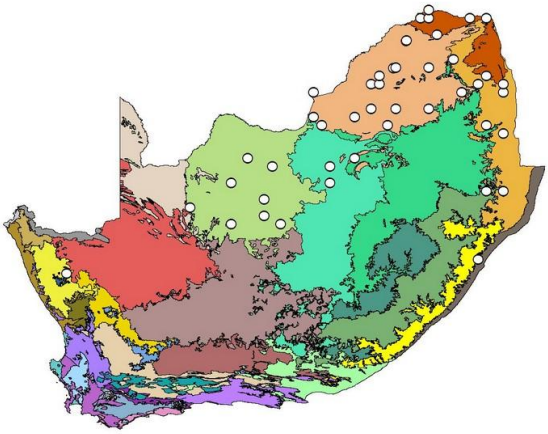
Indigofera vicioides Jaub. & Spach var. *vicioides*

Indigofereae

Herb; P; Ht 0.1–0.6; Alt 62–1670

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (41)	Eastern Kalahari Bushveld (22)
Biome	Savanna (92)	Grassland (8)
Rainfall (mm)	400–800 (60)	<400 (23)
Min temp (°C)	2–8 (51)	>6 (19)
Max temp (°C)	27–35 (74)	25–29 (14)
Phosphorus (ppm)	<10 (74)	5–35 (23)
pH	<6.4 (33)	5.5–7.4 (26)
ESP	Non (96)	Medium (4)
QDGCs	2229; 2328 (9)	2427; 2431 (7)

NOTES: **Livestock feed** (Tjelele 2006). **DM:** 1.4 t/ha (Hassen *et al.* 2008). **CP:** Leaves and stem 13–24% (Tjelele 2006). **Antiquality:** Indospicine 705 mg/kg DM (Hassen *et al.* 2008). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Physiology:** Drought tolerant (Hassen *et al.* 2007).



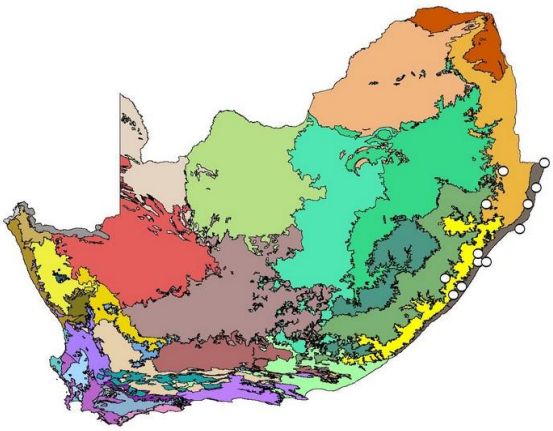
Indigofera williamsonii (Harv.) N.E.Br.

Indigofereae

Dwarf shrub, herb; P; Ht 0.4–0.9; Alt 6–763

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (75)	Savanna (25)
Rainfall (mm)	>800 (66)	400–800; 600–1000 (17)
Min temp (°C)	>6 (75)	2–8 (25)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<6.4 (67)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2832; 2930; 3030 (17)	2632; 2731; 2732; 2831; 2931; 3029 (8)

NOTES: –



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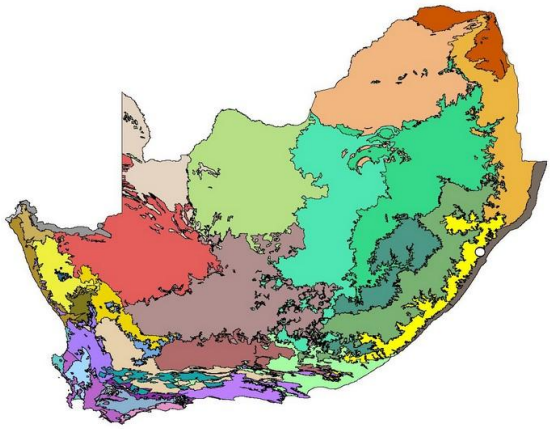
[E]*Indigofera woodii* Bolus var. *laxa* Bolus

Indigofereae ①

Herb, shrub; P; Ht ?; Alt ?–550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2930 (100)	

NOTES: **Flowering:** Summer (Pooley 1998).



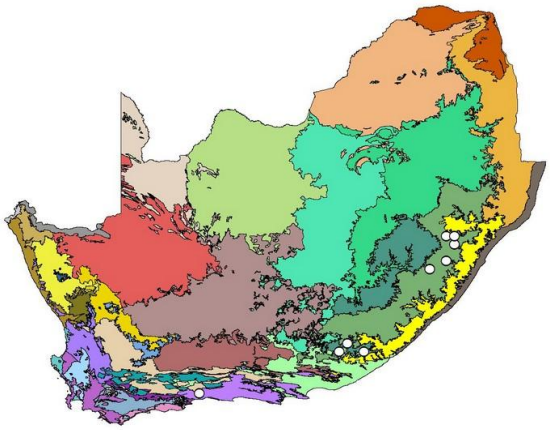
[E]*Indigofera woodii* Bolus var. *woodii*

Indigofereae ①

Herb, shrub; P; Ht 0.3–0.4; Alt 549–2044

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (44)	>800 (33)
Min temp (°C)	0–4; 2–8 (44)	<2 (12)
Max temp (°C)	25–29 (78)	<27 (22)
Phosphorus (ppm)	5–35 (56)	<10 (44)
pH	<6.4 (67)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2929; 2930; 3226 (22)	3029; 3227; 3322 (11)

NOTES: –



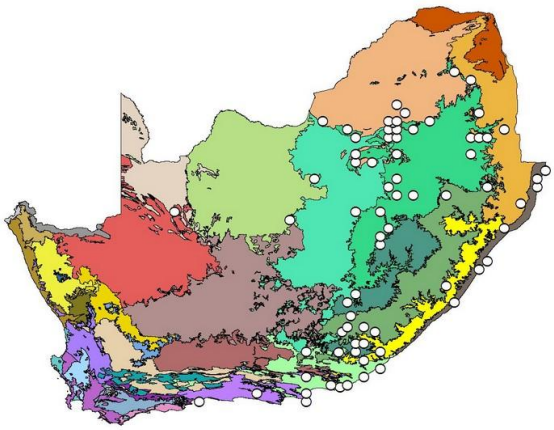
Indigofera zeyheri Spreng. ex Eckl. & Zeyh.

Indigofereae ①

Dwarf shrub, herb; P; Ht 0.2–1.5; Alt 24–1693

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Mesic Highveld Grassland (21)	Central Bushveld (17)
Biome	Grassland (55)	Indian Ocean (18)
Rainfall (mm)	400–800 (67)	800 (15)
Min temp (°C)	2–8 (30)	>6 (25)
Max temp (°C)	25–29 (60)	27–35 (30)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (52)	5.5–7.4 (22)
ESP	Non (93)	Medium (7)
QDGCs	2528 (11)	3227 (8)

NOTES: **Antiquality:** Toxic to humans and livestock (Watt & Breyer-Brandwijk 1962).**N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972, 1975). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Pooley 1998).



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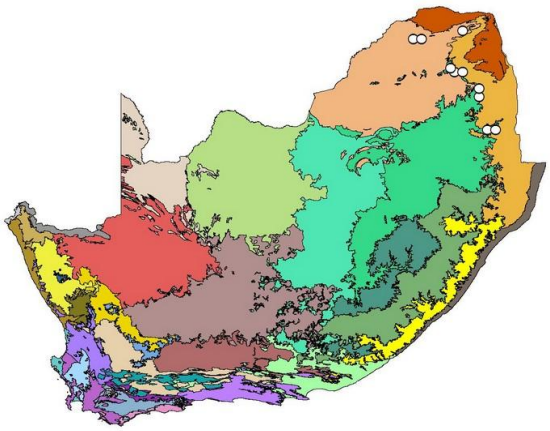
Kotschya parvifolia (Burtt Davy) Verdc.

Dalbergieae ①

Dwarf shrub, shrub; P; Ht 0.6–1.5; Alt 1220–1920

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	600–1000; >800 (33)	200–600 (22)
Min temp (°C)	27–35 (100)	
Max temp (°C)	0–4 (89)	2–8 (11)
Phosphorus (ppm)	5–35 (56)	<10 (44)
pH	<6.4 (67)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2430 (50)	2531 (20)

NOTES: –



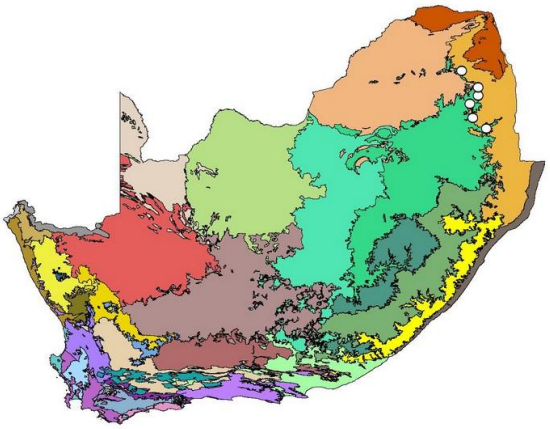
Kotschya thymodora (Baker f.) Wild subsp. *thymodora*

Dalbergieae ①

Shrub; P; Ht 0.7–1.5; Alt 915–1980

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Ecotone	
Rainfall (mm)	>800 (83)	400–800 (17)
Min temp (°C)	2–8 (83)	0–4 (17)
Max temp (°C)	25–29 (83)	<27 (17)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2430 (50)	2530 (33)

NOTES: –



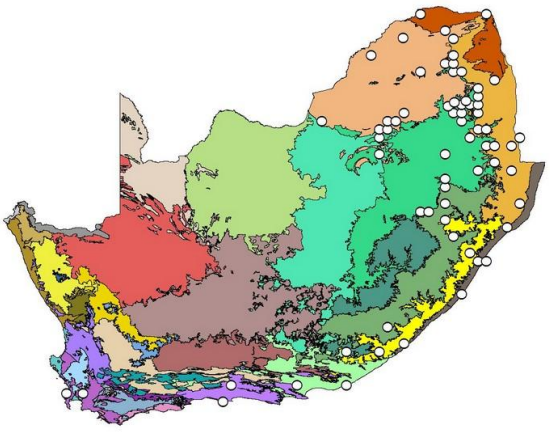
Lablab purpureus (L.) Sweet subsp. *uncinatus* Verdc.

Phaseoleae ☠ ③

Herb, climber; P; Ht 0.2–2.2; Alt 10–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Central Bushveld (23)	Lowveld (15)
Biome	Savanna (44)	Grassland (37)
Rainfall (mm)	600–1000 (35)	400–800 (30)
Min temp (°C)	2–8 (48)	0–4 (24)
Max temp (°C)	25–29 (53)	27–35 (32)
Phosphorus (ppm)	<10 (70)	5–35 (30)
pH	<6.4 (73)	5.5–7.4 (18)
ESP	Non (92)	Medium (8)
QDGCs	2530 (15)	2430; 2528; 2631; 2829 (6)

NOTES: **Livestock feed** (Pengelly & Maass 2001; Lewis *et al.* 2005; Maass *et al.* 2010; Whitbread *et al.* 2011). **DM:** Plant 5 t/ha (Murphy *et al.* 1999); Rongai Brown 7 t/ha (Ayisi *et al.* 2004). **CP:** Leaf meal 23% (Odunsi 2003); Plant 14–21% (Murphy *et al.* 1999). **Antiquality:** Cyanogenic glucosides (Smartt 1985). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1974; Grobbelaar *et al.* 1983); 215 kgN/ha (Sanginga 2003). **Soil conservation:** Green manure (Lewis *et al.* 2005; Odhiambo 2011); Cover crop (Lewis *et al.* 2005). **Ecology:** Seed (Gardener *et al.* 1993). **Biocultural use:** Seed as food (Murphy & Colucci 1999). **Flowering:** Summer, autumn (Germishuizen & Clarke 2003).



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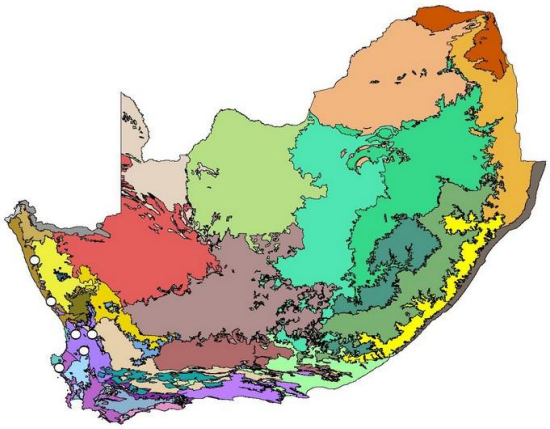
[E]*Lebeckia ambigua* E.Mey.

Crotalarieae ①

Unknown

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (67)	200–600 (33)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	6.5–8.4 (33)
ESP	Ecotone	
QDGCs	3218 (33)	2917; 3117; 3219; 3318 (17)

NOTES: –



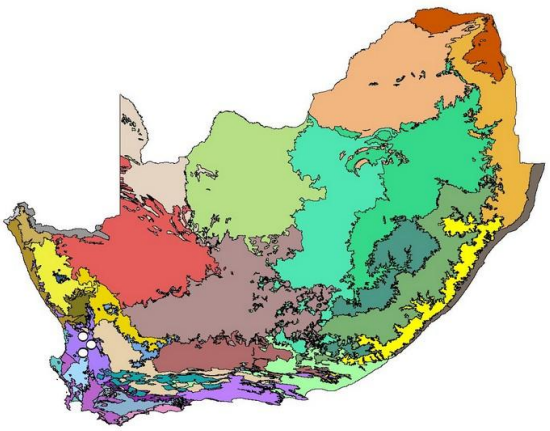
[E]*Lebeckia brevicarpa* M.M.le Roux & B.-E.van Wyk

Crotalarieae ①

Suffrutex; Ht ?–0.8; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Ecotone (100)	
QDGCs	3218 (67)	3219 (33)

NOTES: –



Lebeckia brevipes M.M.le Roux & B.-E.van Wyk

Crotalarieae –

Suffrutex; Ht ?–0.5; Alt 500–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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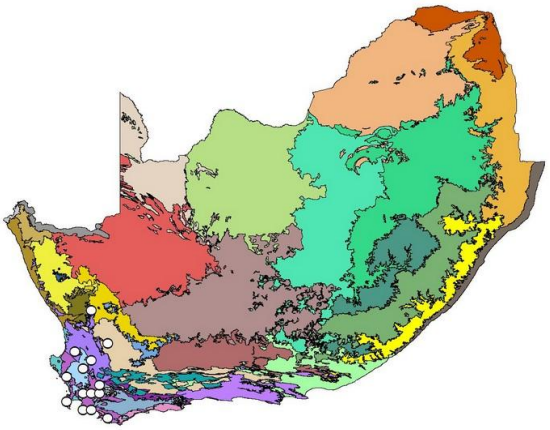
[E]*Lebeckia contaminata* (L.) Thunb.

Crotalarieae ①

Herb; P; Ht 0.3–0.6; Alt ?–45

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (57)	Rainshadow Valley Karoo (29)
Biome	Fynbos (92)	Succulent Karoo (8)
Rainfall (mm)	200–600 (38)	400–800 (21)
Min temp (°C)	2–8 (47)	>6 (32)
Max temp (°C)	25–29 (82)	27–35 (12)
Phosphorus (ppm)	5–35 (85)	>20 (12)
pH	<6.4 (41)	5.5–7.4 (29)
ESP	Non (57)	High (29)
QDGCs	3318; 3319 (21)	3219; 3418; 3419 (14)

NOTES: –



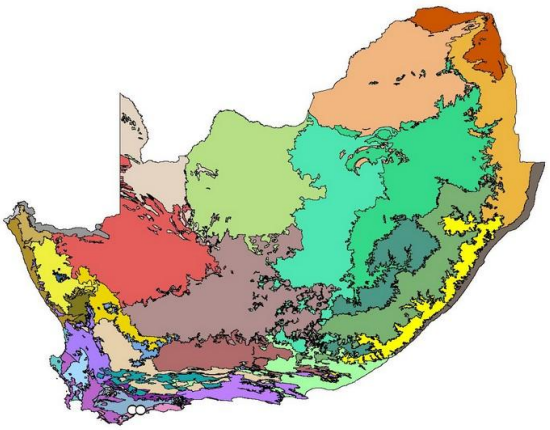
[E]*Lebeckia gracilis* Eckl. & Zeyh.

Crotalarieae ①

Suffrutex; Ht 0.15–0.8; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4; 6.5–8.4 (50)	
ESP	Ecotone	
QDGCs	3420 (100)	

NOTES: –



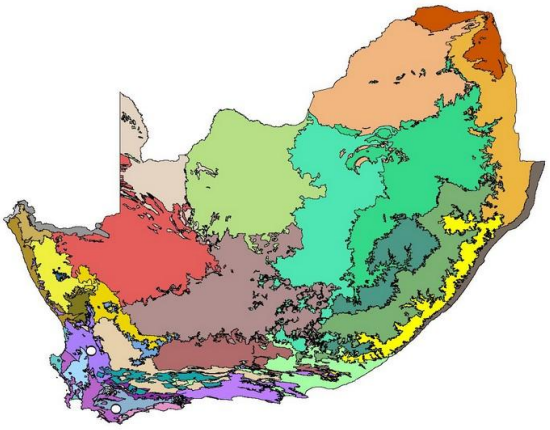
[E]*Lebeckia grandiflora* Benth.

Crotalarieae ①

Herb; P; Ht 0.2–0.3; Alt ?–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	3219; 3419 (50)	

NOTES: –



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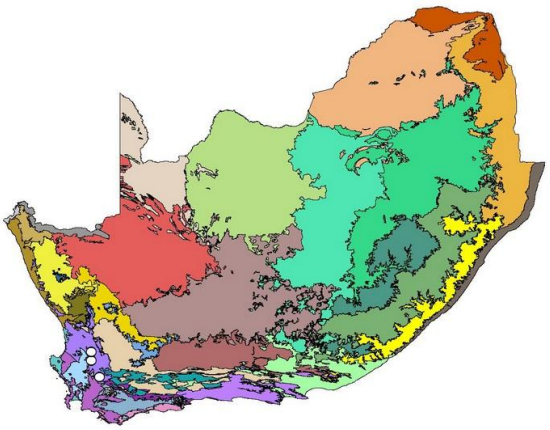
[E]*Lebeckia longipes* Bolus

Crotalarieae ①

Herb; P; Ht 0.3–0.6; Alt 458–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (67)	200–600 (33)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	3219 (67)	3319 (33)

NOTES: –



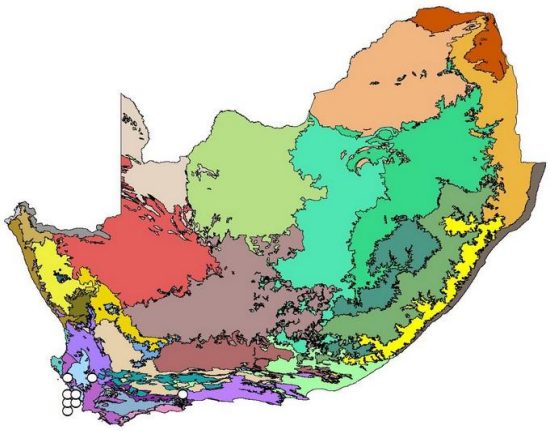
[E]*Lebeckia meyeriana* Eckl. & Zeyh.

Crotalarieae ①

Herb; P; Ht 0.3–0.4; Alt 20–488

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (40)	400–800 (20)
Min temp (°C)	>6 (80)	0–4; 2–8 (10)
Max temp (°C)	25–29 (90)	<27 (10)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	5.5–7.4 (10)
ESP	Non (100)	
QDGCs	3318; 3418 (38)	3319; 3321 (12)

NOTES: –



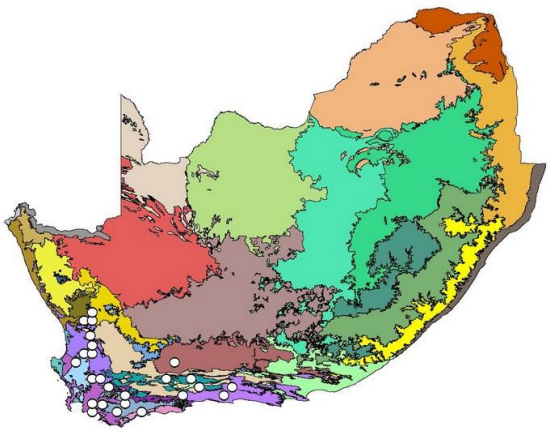
[E]*Lebeckia pauciflora* Eckl. & Zeyh.

Crotalarieae ①

Herb; P; Ht 0.45–0.6; Alt 122–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (50)	Northwest Fynbos; Lower Karoo (25)
Biome	Fynbos (93)	Nama-Karoo (7)
Rainfall (mm)	200–600 (48)	<400 (28)
Min temp (°C)	2–8 (80)	0–4 (12)
Max temp (°C)	25–29 (72)	27–35 (24)
Phosphorus (ppm)	5–35 (80)	>20 (20)
pH	5.5–7.4 (32)	<6.4; 6.5–8.4 (20)
ESP	Medium (75)	Non (25)
QDGCs	3419 (16)	3219; 3319 (12)

NOTES: –



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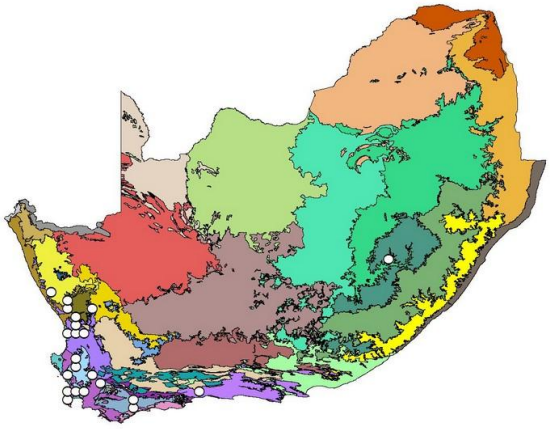
[E]*Lebeckia plukenetiana* E.Mey.

Crotalarieae ①

Herb; P; Ht 0.3–0.5; Alt 15–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Coast Renosterveld (100)	
Biome	Fynbos (86)	Grassland; Succulent Karoo (7)
Rainfall (mm)	200–600 (41)	<400 (36)
Min temp (°C)	>6 (50)	2–8 (36)
Max temp (°C)	25–29 (68)	27–35 (27)
Phosphorus (ppm)	5–35 (82)	>20 (14)
pH	<6.4 (36)	6.5–8.4 (27)
ESP	Non (100)	
QDGCs	3318 (23)	3118; 3218 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Manning 2003).



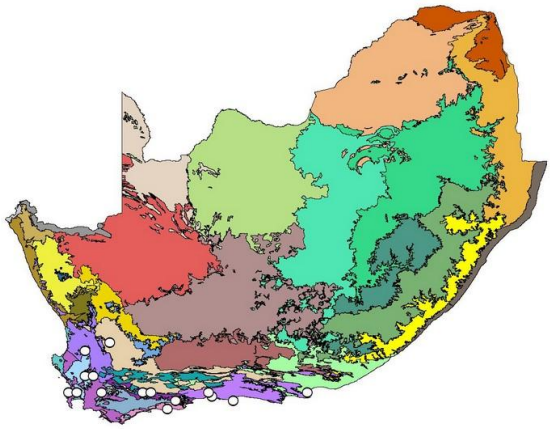
[E]*Lebeckia sepiaria* (L.) Thunb.

Crotalarieae ①

Herb; P; Ht 0.15–0.3; Alt 210–700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (43)	Northwest Fynbos (29)
Biome	Fynbos (96)	Succulent Karoo (4)
Rainfall (mm)	200–600 (52)	<400 (29)
Min temp (°C)	2–8 (71)	>6 (17)
Max temp (°C)	25–29 (67)	27–35 (31)
Phosphorus (ppm)	5–35 (86)	>20 (12)
pH	<6.4 (31)	5.5–7.4 (26)
ESP	Non; Medium (43)	High (14)
QDGCs	3318 (19)	3319; 3320; 3322; 3421 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Manning & Goldblatt 2002).



Lebeckia uniflora B.-E.van Wyk & M.M.le Roux

Crotalarieae –

Suffrutex; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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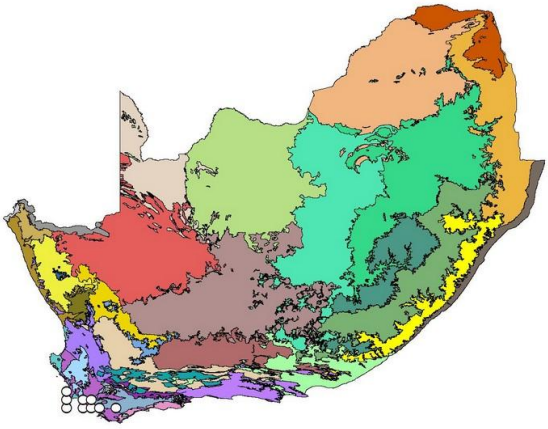
[E]*Lebeckia wrightii* (Harv.) Bolus — Crotalarieae ①

Herb; P; Ht 0.2–0.4; Alt 185–853

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800; 400–800 (33)	600–1000 (22)
Min temp (°C)	2–8 (55)	>6 (44)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (89)	5.5–7.4 (11)
ESP	Non (100)	
QDGCs	3418; 3419 (44)	3318 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



Lebeckia zeyheri M.M.le Roux & B.-E.van Wyk — Crotalarieae –

Suffrutex; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

[E]*Leobordea acuticarpa* (B.-E.van Wyk) B.-E.van Wyk & Boatwr. — Crotalarieae –

Herb; P; Ht 0.01–0.1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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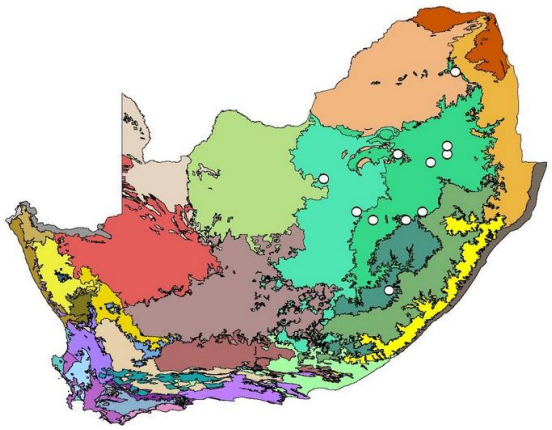
[E]*Leobordea adpressa* (N.E.Br.) B.-E.van Wyk & Boatwr. subsp. *adpressa* — Crotalarieae ①

Herb; P; Ht 0.01–0.1; Alt 1373–1678

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (64)	600–1000; >800 (18)
Min temp (°C)	<2 (82)	0–4; 2–8 (9)
Max temp (°C)	<27 (55)	25–29 (27)
Phosphorus (ppm)	<10 (91)	5–35 (9)
pH	<6.4 (73)	6.5–7.4 (18)
ESP	Non (100)	
QDGCs	2629 (27)	2827 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).

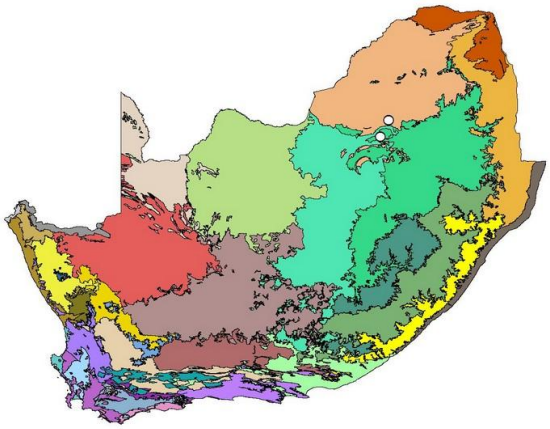


Leobordea adpressa (N.E.Br.) B.-E.van Wyk & Boatwr. subsp. *leptantha* (B.-E.van Wyk) B.-E.van Wyk & Boatwr. — Crotalarieae ①

Herb; P; Ht ?; Alt ?–1739

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2528; 2627 (50)	

NOTES: –

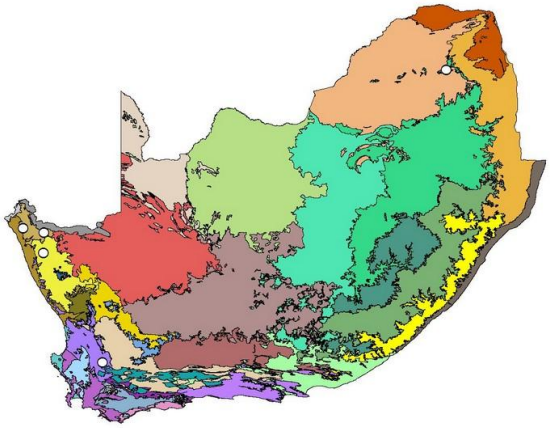


[E]*Leobordea anthylloides* (Harv.) B.-E.van Wyk & Boatwr. — Crotalarieae ①

Herb; A; Ht ?; Alt ?–850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld; Richtersveld (50)	
Biome	Succulent Karoo (75)	Fynbos (25)
Rainfall (mm)	<400 (60)	200–600; 400–800 (20)
Min temp (°C)	2–8; >6 (40)	0–4 (20)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (60)	>20 (40)
pH	>7.5 (40)	<6.4; 5.5–7.4; 6.5–8.4 (20)
ESP	Medium; High (50)	
QDGCs	2917 (40)	2429; 2817; 3319 (20)

NOTES: –



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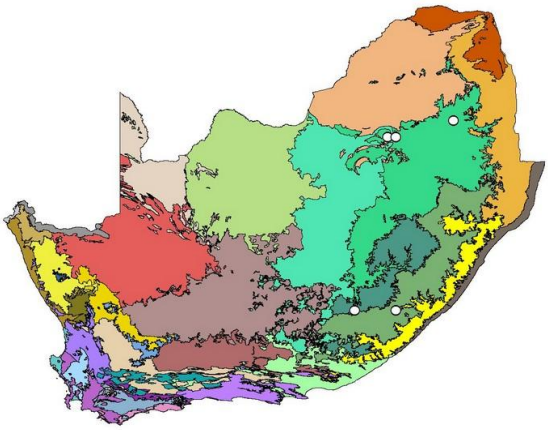
[E]*Leobordea arida* (Dummer) B.-E.van Wyk & Boatwr.

Crotalarieae ①

Herb; P; Ht ?; Alt 1360–1678

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Sub-Escarpment Grassland (50)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (60)	600–1000 (40)
Min temp (°C)	<2 (60)	0–4 (40)
Max temp (°C)	25–29 (60)	<27 (40)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	2628 (40)	2530; 3127; 3128 (20)

NOTES: –



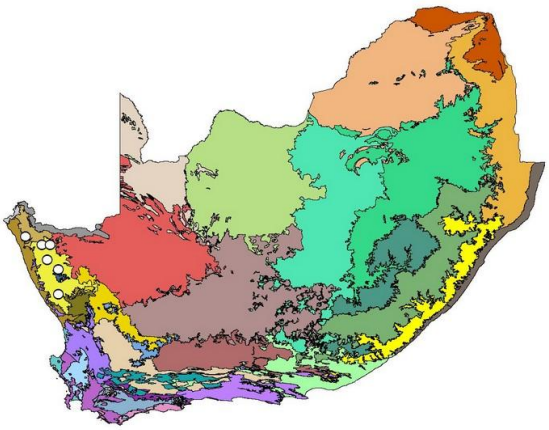
[E]*Leobordea benthamiana* (Dummer) B.-E.van Wyk & Boatwr.

Crotalarieae ①

Dwarf shrub, herb; P; Ht ?; Alt 349–1882

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	>20 (67)	5–35 (33)
pH	6.5–8.4 (66)	5.5–7.4; >7.5 (17)
ESP	Medium (100)	
QDGCs	2917 (67)	3018 (33)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



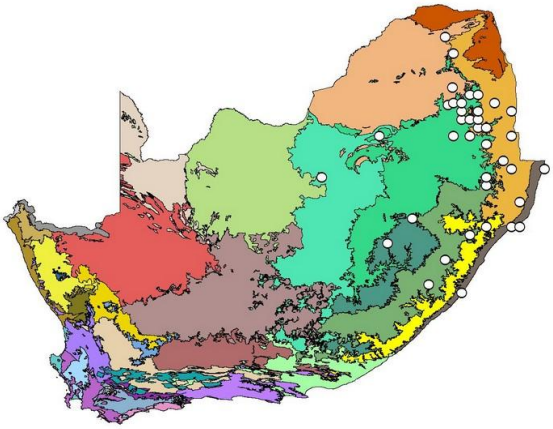
Leobordea carinata (E.Mey.) B.-E.van Wyk & Boatwr.

Crotalarieae ①

Herb; P; Ht 0.2–2; Alt 30–1647

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (33)	Indian Ocean Coastal Belt; Mesic Highveld Grassland (22)
Biome	Savanna (50)	Grassland (29)
Rainfall (mm)	>800 (42)	400–800 (37)
Min temp (°C)	2–8 (42)	>6 (29)
Max temp (°C)	25–29 (45)	27–35 (34)
Phosphorus (ppm)	<10 (89)	5–35 (11)
pH	<6.4 (79)	5.5–7.4 (13)
ESP	Non (100)	
QDGCs	2530 (21)	2430; 2631; 2731 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



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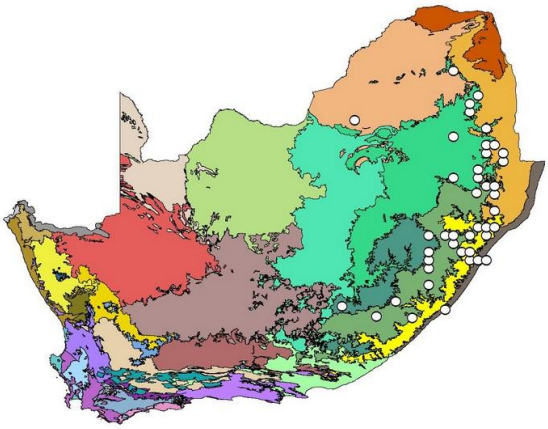
Leobordea corymbosa (E.Mey.) B.-E.van Wyk & Boatwr.

Crotalarieae ①

Herb; P; Ht 0.07–0.9; Alt 549–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (38)	Mesic Highveld Grassland (23)
Biome	Grassland (69)	Savanna (25)
Rainfall (mm)	>800 (58)	600–1000 (30)
Min temp (°C)	2–8 (42)	0–4 (26)
Max temp (°C)	25–29 (60)	<27 (23)
Phosphorus (ppm)	<10 (88)	5–35 (12)
pH	<6.4 (81)	5.5–7.4 (16)
ESP	Non (100)	
QDGCs	2930 (16)	2631 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Biocultural:** Medicine for humans (Hutchings *et al*. 1996). **Flowering:** Whole year (Pooley 1998).



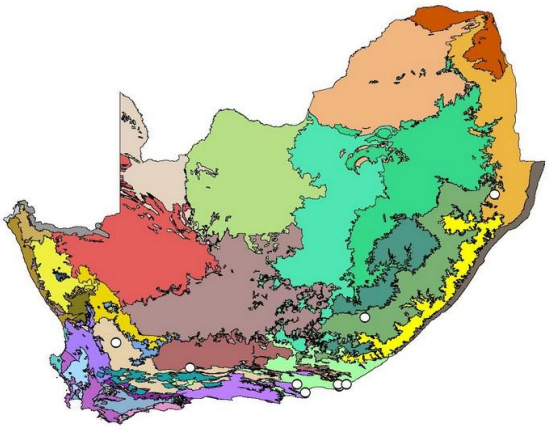
[E]*Leobordea decumbens* (Thunb.) B.-E.van Wyk & Boatwr. subsp. *decumbens*

Crotalarieae ①

Herb; P; Ht 0.1–0.5; Alt 6–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Sub-Escarpment Grassland; Rainshadow Valley Karoo (33)	
Biome	Albany Thicket; Grassland; Succulent Karoo (33)	
Rainfall (mm)	400–800 (50)	<400 (25)
Min temp (°C)	2–8 (50)	>6 (38)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	<10; 5–35 (38)	>20 (24)
pH	6.5–8.4 (38)	<6.4; >7.5 (25)
ESP	Medium (67)	High (33)
QDGCs	3326 (33)	3325 (22)

NOTES: **Biocultural:** medicine for humans (Watt & Breyer-Brandwijk 1962).



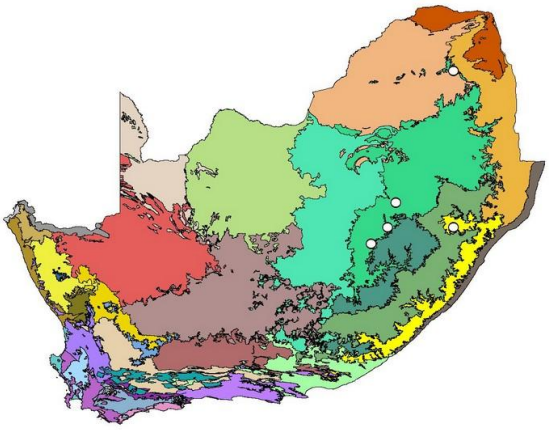
Leobordea decumbens (Thunb.) B.-E.van Wyk & Boatwr. subsp. *rehmannii* (Dummer) B.-E.van Wyk

Crotalarieae ①

Herb; P; Ht 0.05–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800; 600–1000 (40)	>800 (20)
Min temp (°C)	<2 (60)	2–8 (40)
Max temp (°C)	<27 (60)	25–29 (40)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (60)	5.5–7.4 (40)
ESP	Non (100)	
QDGCs	2828 (40)	2430; 2830; 2927 (20)

NOTES: **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



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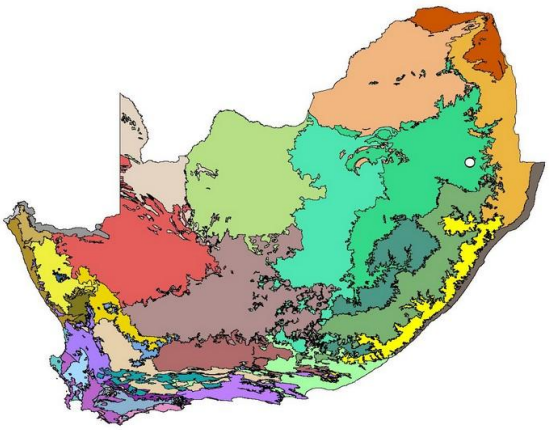
[E]*Leobordea difformis* (B.-E.van Wyk) B.-E.van Wyk & Boatwr. — Crotalarieae — ①

Herb; P; Ht 0.01–0.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2630 (100)	

NOTES: –



[E]*Leobordea diffusa* (Thunb.) B.-E.van Wyk & Boatwr. — Crotalarieae — –

Herb; A; Ht ?; Alt ?–458

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

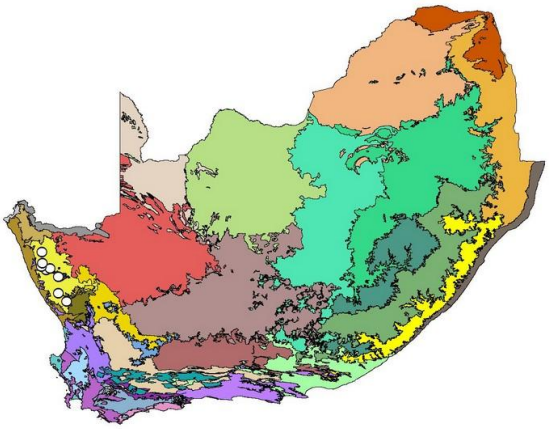
NOTES: –

[E]*Leobordea digitata* Harv. — Crotalarieae — ①

Dwarf shrub; P; Ht ?; Alt 366–700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (71)	2–8 (29)
Max temp (°C)	27–35 (71)	25–29 (29)
Phosphorus (ppm)	5–35 (71)	>20 (29)
pH	6.5–8.4 (43)	6.5–7.4 (29)
ESP	Medium (100)	
QDGCs	3017 (38)	2917; 3018 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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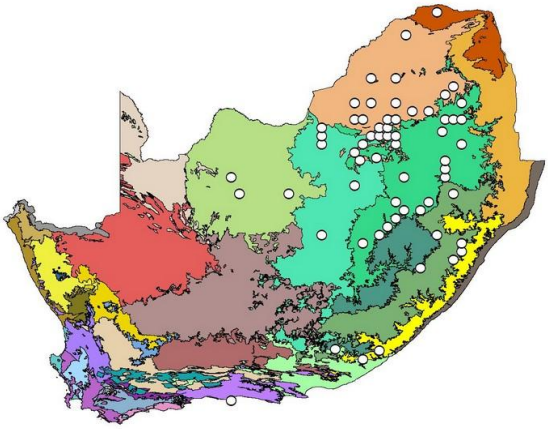
Leobordea divaricata Eckl. & Zeyh.

Crotalarieae ①

Herb; P; Ht 0.03–0.3; Alt 458–1730

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (38)	Central Bushveld (32)
Biome	Grassland (66)	Savanna (32)
Rainfall (mm)	400–800 (68)	600–1000 (15)
Min temp (°C)	<2 (44)	2–8 (34)
Max temp (°C)	27–35 (37)	25–29 (34)
Phosphorus (ppm)	<10 (85)	5–35 (15)
pH	<6.4 (61)	5.5–7.4 (24)
ESP	Non (97)	Medium (3)
QDGCs	2528; 2627 (10)	2527 (8)

NOTES: **Antiquality:** Hydrocyanic acid tested negatively (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972, 1975). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Pooley 1998).



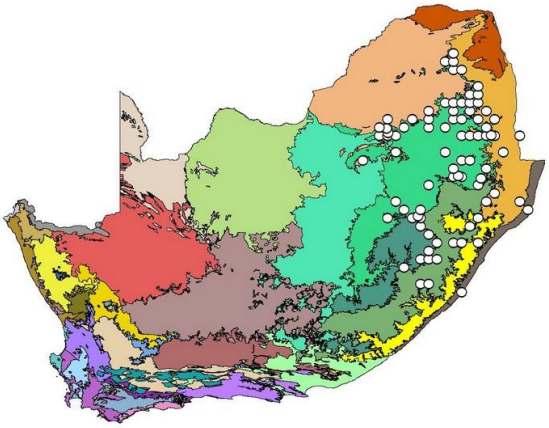
Leobordea eriantha (Benth.) B.-E.van Wyk & Boatwr.

Crotalarieae ①

Herb; P; Ht 0.1–2.3; Alt 50–2520

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (57)	Sub-Escarpment Grassland; Lowveld (14)
Biome	Grassland (81)	Savanna (14)
Rainfall (mm)	>800 (42)	600–1000 (30)
Min temp (°C)	2–8 (38)	0–4 (35)
Max temp (°C)	25–29 (51)	<27 (30)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4 (86)	5.5–7.4 (14)
ESP	Non (100)	
QDGCs	2530 (11)	2730; 2929 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Pooley 1998).



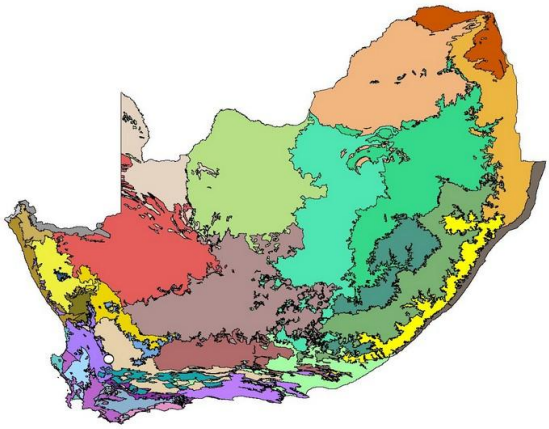
[E] *Leobordea esterhuyseniana* (B.-E.van Wyk) B.-E.van Wyk & Boatwr.

Crotalarieae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3219 (100)	

NOTES: –



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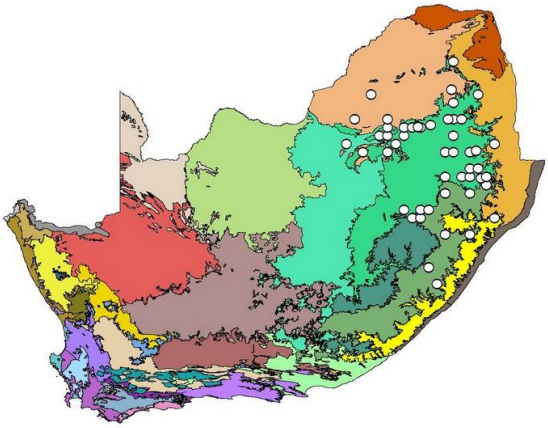
Leobordea foliosa (Bolus) B.-E.van Wyk & Boatwr. — Crotalarieae ①

Herb; P; Ht 0.08–2; Alt 610–2500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (62)	Central Bushveld (19)
Biome	Grassland (85)	Savanna (15)
Rainfall (mm)	400–800 (46)	600–1000 (33)
Min temp (°C)	0–4 (58)	2–8 (23)
Max temp (°C)	25–29 (48)	<27 (27)
Phosphorus (ppm)	<10 (94)	5–35 (6)
pH	<6.4 (96)	5.5–7.4; >7.5 (2)
ESP	Non (100)	
QDGCs	2730 (12)	2528; 2529; 2628; 2630 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).
Flowering: Spring, summer (Pooley 1998).

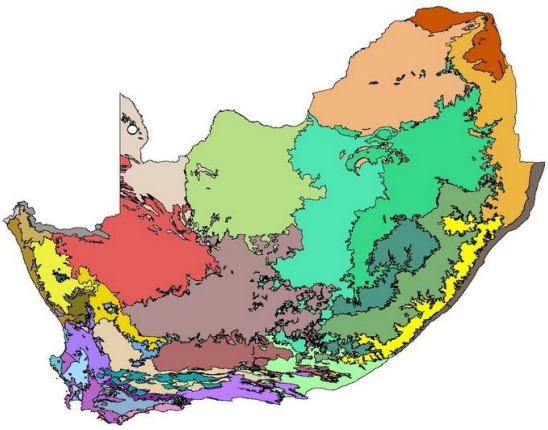


Leobordea furcata (Merxm. & A.Schreib.) B.-E.van Wyk & Boatwr. — Crotalarieae ①

Herb; A; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	>33 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	2520 (100)	

NOTES: –

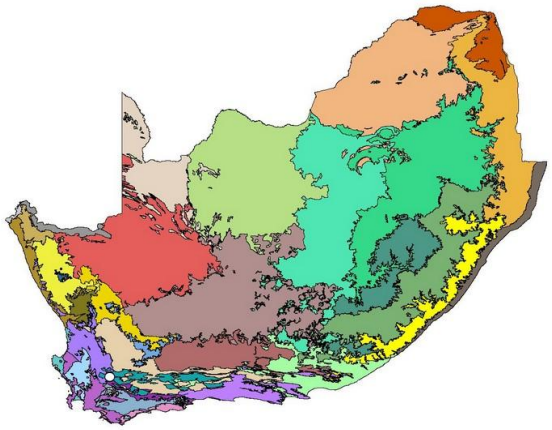


[E]*Leobordea globulosa* (B.-E.van Wyk) B.-E.van Wyk & Boatwr. — Crotalarieae ①

Herb; A; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



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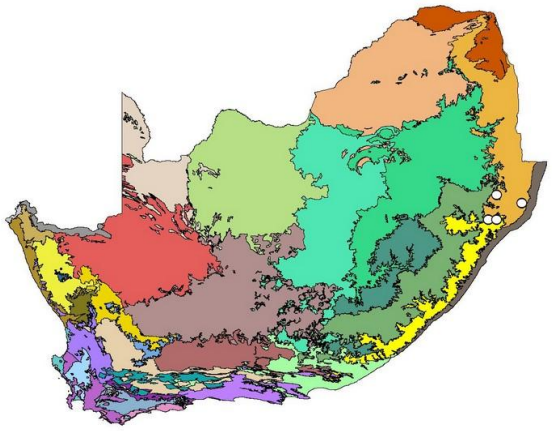
[E]*Leobordea grandis* (Dummer & Jenn.) B.-E.van Wyk & Boatwr. — Crotalarieae ①

Herb; P; Ht 0.15–0.3; Alt 543–1037

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	>800 (75)	600–1000 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	27–35 (75)	>33 (25)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2831 (50)	2731; 2832 (25)

NOTES: –

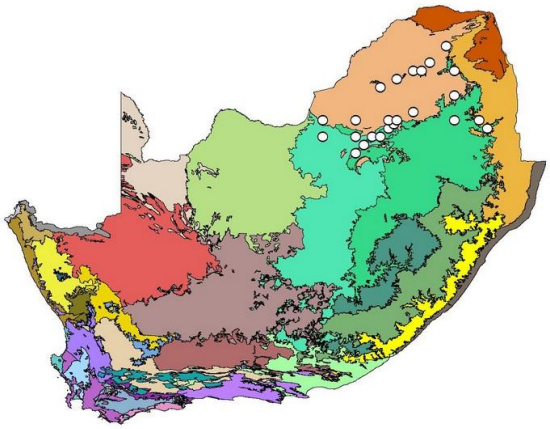


[E]*Leobordea hirsuta* (Schinz) B.-E.van Wyk & Boatwr. — Crotalarieae ①

Herb; P; Ht 0.1–5; Alt 1159–1713

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (78)	Dry Highveld Grassland; Mesic Highveld Grassland (11)
Biome	Savanna (71)	Grassland (29)
Rainfall (mm)	400–800 (82)	600–100; >800 (9)
Min temp (°C)	27–35 (61)	25–29 (30)
Max temp (°C)	25–29; 27–35 (48)	<27 (4)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (78)	5.5–7.4 (17)
ESP	Non (100)	
QDGCs	2528; 2627 (21)	2329; 2428; 2430; 2530 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).

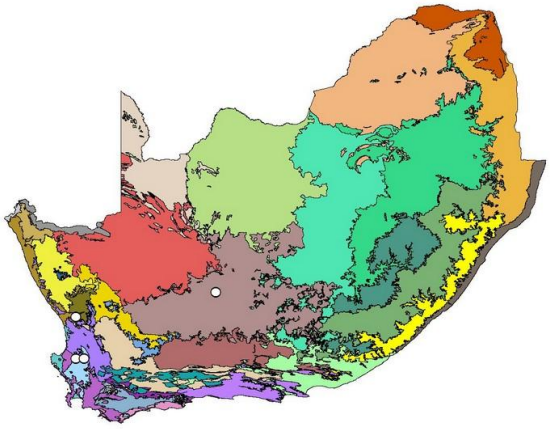


[E]*Leobordea lanata* (Thunb.) B.-E.van Wyk & Boatwr. — Crotalarieae ①

Herb; A; Ht 0.01–0.15; Alt 105–1275

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Upper Karoo (100)	
Biome	Fynbos (67)	Nama-Karoo (33)
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (50)	<2; >6 (25)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	6.5–8.4 (50)	5.5–7.4; >7.5 (25)
ESP	Non (100)	
QDGCs	3218 (50)	3022; 3118 (25)

NOTES: –



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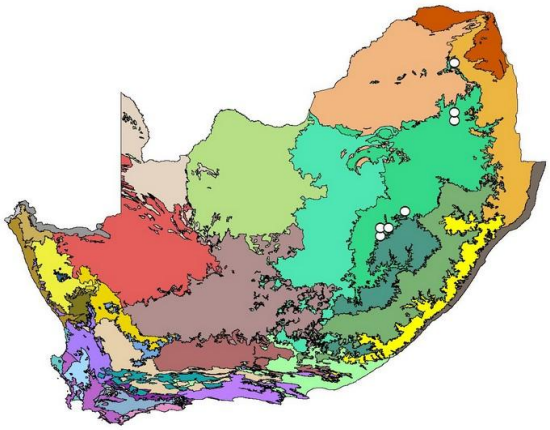
***Leobordea lanceolata* (E.Mey.) B.-E.van Wyk & Boatwr.** **Crotalarieae** ①

Herb; P; Ht 0.01–0.4; Alt 1662–2500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (57)	>800 (29)
Min temp (°C)	<2 (57)	0–4 (29)
Max temp (°C)	<27 (72)	25–29; 27–35 (14)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2530; 2828 (29)	2330; 2827; 2927 (14)

NOTES: **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



[E]*Leobordea laticeps* (B.-E.van Wyk) B.-E.van Wyk & Boatwr. **Crotalarieae** –

Herb; A; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

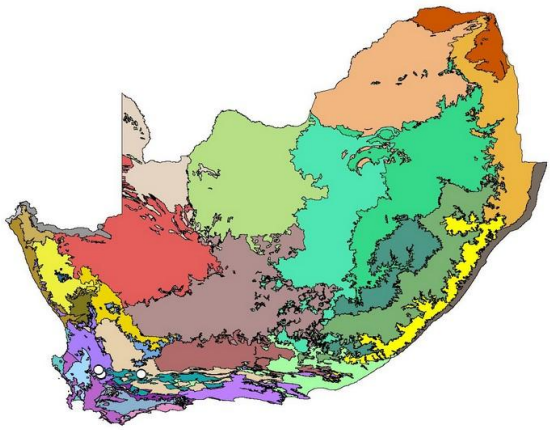
NOTES: –

[E]*Leobordea longicephala* (B.-E.van Wyk) B.-E.van Wyk & Boatwr. **Crotalarieae** ①

Herb; A; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; 400–800 (33)	
Min temp (°C)	0–4 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	<6.4; 5.5–7.4; >7.5 (33)	
ESP	Ecotone	
QDGCs	3319 (75)	3320 (25)

NOTES: –



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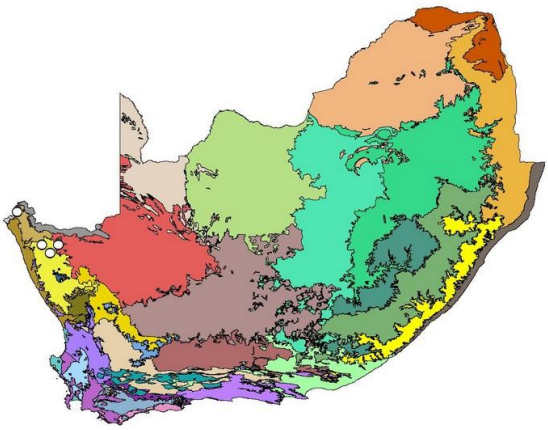
[E]*Leobordea longiflora* (Bolus) B.-E.van Wyk & Boatwr. — Crotalarieae — ①

Dwarf shrub; P; Ht ?; Alt ?–1005

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	>20 (75)	5–35 (25)
pH	>7.5 (50)	6.5–7.4; 6.5–8.4 (25)
ESP	Medium (100)	
QDGCs	2917 (50)	2816; 2918 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



[E]*Leobordea magnifica* (B.-E.van Wyk) B.-E.van Wyk & Boatwr. — Crotalarieae — –

Dwarf shrub; P; Ht 0.01–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No Records	

NOTES: –

[E]*Leobordea mollis* (E.Mey.) B.-E.van Wyk & Boatwr. — Crotalarieae — –

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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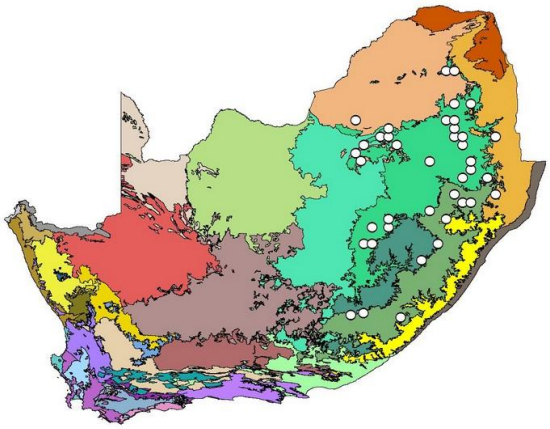
***Leobordea mucronata* (Conrath) B.-E.van Wyk & Boatwr.** **Crotalarieae** ①

Herb; P; Ht 0.01–0.3; Alt 1068–2500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (74)	Sub-Escarpment Grassland (21)
Biome	Grassland (96)	Savanna (4)
Rainfall (mm)	400–800 (53)	600–1000 (30)
Min temp (°C)	0–4 (53)	<2 (30)
Max temp (°C)	25–29 (55)	<27 (28)
Phosphorus (ppm)	<10 (93)	5–35 (8)
pH	<6.4 (85)	5.5–7.4 (13)
ESP	Non (100)	
QDGCs	2530; 2627; 2630	2730; 2929 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).

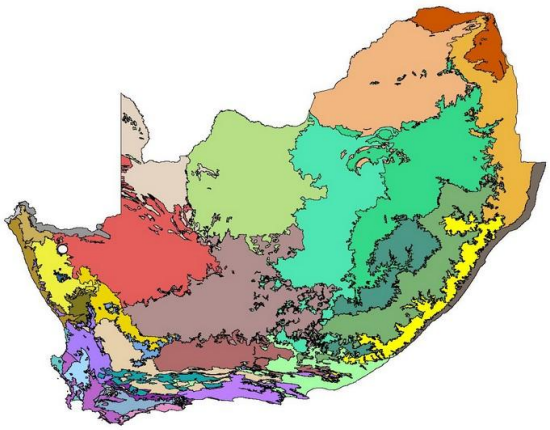


[E]*Leobordea oligocephala* (B.-E.van Wyk) B.-E.van Wyk & Boatwr. **Crotalarieae** ①

Herb; A; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	2918 (100)	

NOTES: –

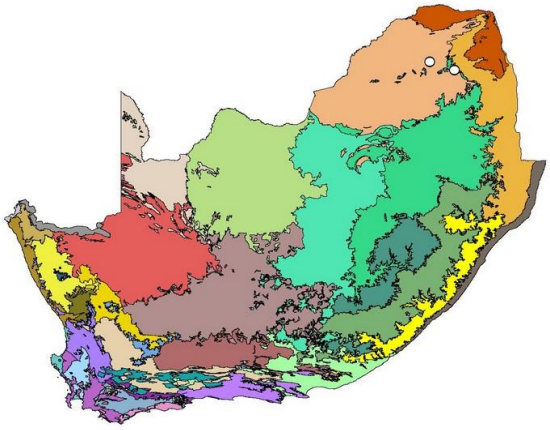


[E]*Leobordea pariflora* (N.E.Br.) B.-E.van Wyk & Boatwr. **Crotalarieae** ①

Herb; P; Ht 0.01–0.05; Alt ?–1920

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800; 600–1000 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2329; 2430 (50)	

NOTES: –



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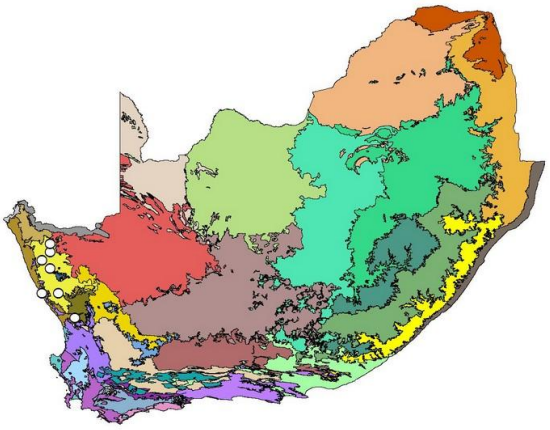
[E]*Leobordea pentaphylla* (E.Mey.) B.-E.van Wyk & Boatwr.

Crotalarieae ①

Herb; A; Ht 0.05–0.07; Alt 120–167

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (57)	2–8 (43)
Max temp (°C)	25–29 (57)	29–35 (43)
Phosphorus (ppm)	5–35 (71)	>20 (29)
pH	6.5–8.4 (57)	6.5–7.4 (29)
ESP	Medium (100)	
QDGCs	2917 (43)	3017 (29)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



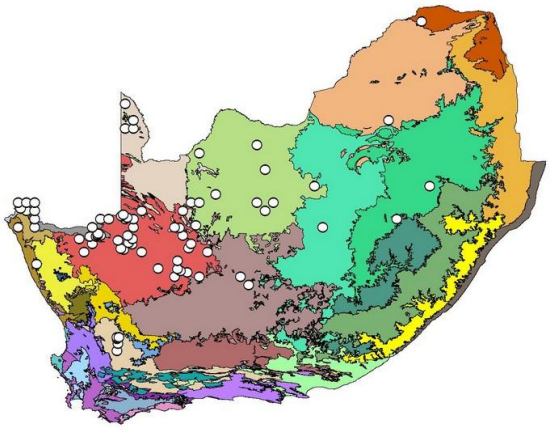
Leobordea platycarpa (Viv.) B.-E.van Wyk & Boatwr.

Crotalarieae ①

Herb; A; Ht 0.05–2; Alt 700–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (50)	Eastern Kalahari Bushveld (18)
Biome	Nama-Karoo (54)	Savanna (27)
Rainfall (mm)	<400 (89)	400–800 (8)
Min temp (°C)	<2 (41)	2–8 (28)
Max temp (°C)	27–35 (56)	25–29 (38)
Phosphorus (ppm)	>20 (58)	<10; 5–35 (21)
pH	>7.5 (79)	6.5–8.4 (11)
ESP	Non (86)	Medium; High (7)
QDGCs	2919 (11)	2820 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975; Grobbelaar & Van Rooyen 1979). **Flowering:** Spring, summer, autumn (Van Rooyen 2001).



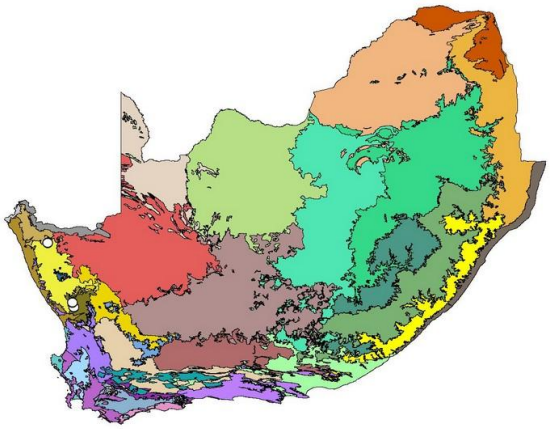
[E]*Leobordea plicata* (B.-E.van Wyk) B.-E.van Wyk & Boatwr.

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–870

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Knersvlakte; Namaqualand Hardeveld (50)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (67)	6.5–8.4 (33)
ESP	Medium; High (50)	
QDGCs	3118 (67)	2917 (33)

NOTES: –



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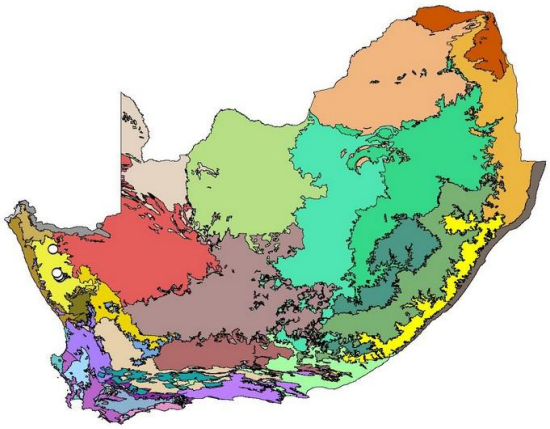
[E]*Leobordea polycephala* (E. Mey.) B.-E.van Wyk & Boatwr. — Crotalarieae — ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	6.5–7.4; 6.5–8.4 (50)	
ESP	Medium (100)	
QDGCs	3018 (80)	2917 (20)

NOTES: –

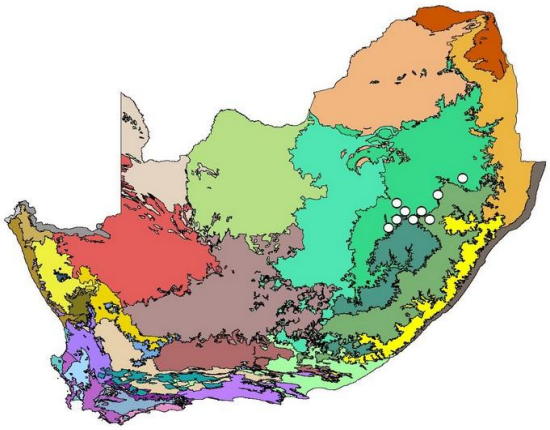


Leobordea procumbens (Bolus) B.-E.van Wyk & Boatwr. — Crotalarieae — ①

Herb; P; Ht 0.015–0.3; Alt 1678–2700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (75)	Sub-Escarpment Grassland (25)
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (56)	>800 (33)
Min temp (°C)	<2 (56)	0–4 (44)
Max temp (°C)	<27 (78)	25–29 (22)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (89)	5.5–7.4 (11)
ESP	Non (100)	
QDGCs	2828 (56)	2829 (22)

NOTES: **Flowering:** Spring, summer (Pooley 1998).



[E]*Leobordea prolifera* (E.Mey.) Eckl. & Zeyh. — Crotalarieae — –

Herb; P; Ht ?; Alt ?–1068

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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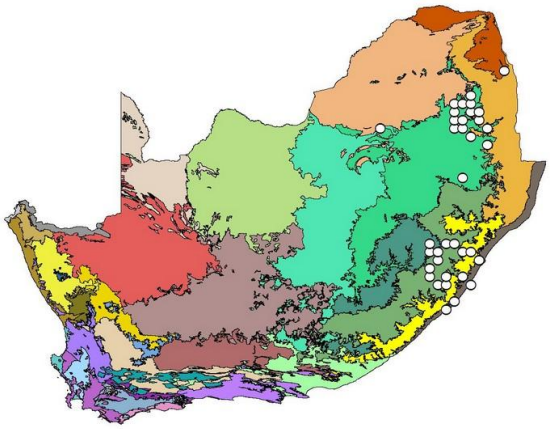
***Leobordea pulchra* (Dummer) B.-E.van Wyk & Boatwr.** **Crotalarieae** ①

Herb; P; Ht 0.05–2; Alt 1037–2317

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (50)	Sub-Escarpment Grassland (31)
Biome	Grassland (82)	Savanna (12)
Rainfall (mm)	>800 (75)	600–1000 (14)
Min temp (°C)	0–4 (47)	2–8 (25)
Max temp (°C)	25–29 (50)	<27 (44)
Phosphorus (ppm)	<10 (81)	5–35 (19)
pH	<6.4 (81)	5.5–7.4 (17)
ESP	Non (100)	
QDGCs	2530 (31)	2929; 3029 (14)

NOTES: **Flowering:** Summer (Pooley 1998).

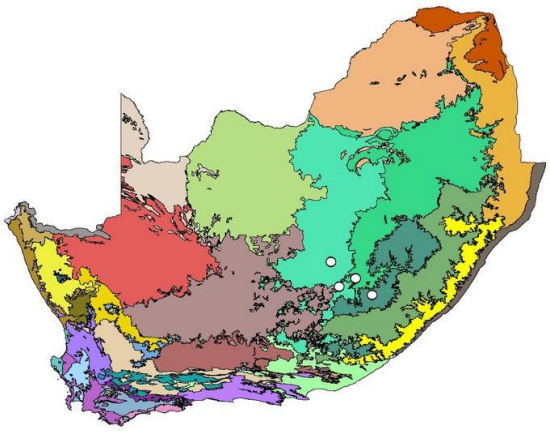


[E]*Leobordea pusilla* (Dummer) B.-E.van Wyk & Boatwr. **Crotalarieae** ①

Herb; P; Ht ?; Alt 1373–1769

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland; Dry Highveld Grassland (50)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (75)	600–1000 (25)
Min temp (°C)	<2 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (100)	
pH	6.5–7.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	3027 (50)	2926; 3026 (25)

NOTES: –

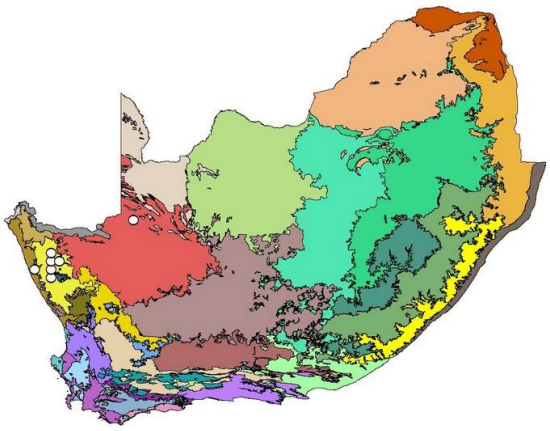


[E]*Leobordea quinata* (Thunb.) B.-E.van Wyk & Boatwr. **Crotalarieae** ①

Dwarf shrub; P; Ht ?; Alt 305–700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (80)	Bushmanland (20)
Biome	Succulent Karoo (80)	Nama-Karoo (20)
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (86)	>6 (14)
Max temp (°C)	25–29 (57)	27–35 (29)
Phosphorus (ppm)	5–35 (71)	>20 (29)
pH	6.5–7.4 (43)	6.5–8.4 (29)
ESP	Medium (80)	Non (20)
QDGCs	3017 (43)	2917 (29)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



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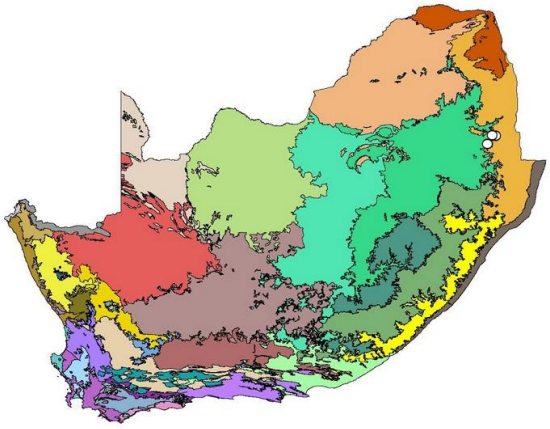
***Leobordea spicata* (Compton) B.-E.van Wyk & Boatwr.** **Crotalarieae** ①

Herb; P; Ht 0.01–0.2; Alt 1000–1357

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2631 (100)	

NOTES: –

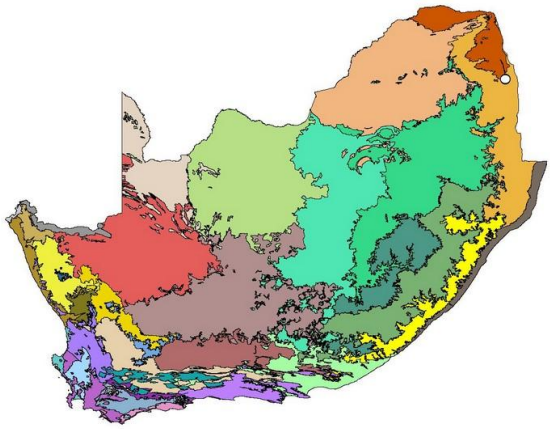


***Leobordea stipulosa* (Baker f.) B.-E.van Wyk & Boatwr.** **Crotalarieae** ①

Herb; A; Ht 0.01–0.2; Alt ?–458

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2431 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



[E]*Leobordea sutherlandii* (Dummer) B.-E.van Wyk & Boatwr. **Crotalarieae** –

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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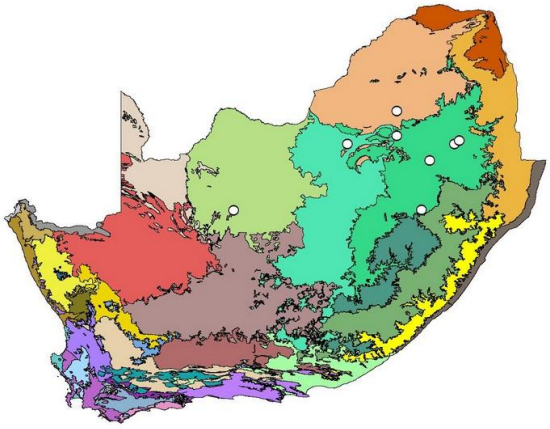
[E]*Lessertia affinis* Burtt Davy

Galegeae ①

Herb; P; Ht 0.01–0.3; Alt 641–1760

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (49)	Dry Highveld Grassland; Central Bushveld; Eastern Kalahari Bushveld (17)
Biome	Grassland (75)	Savanna (25)
Rainfall (mm)	400–800 (74)	<400; 600–1000 (13)
Min temp (°C)	<2 (88)	2–8 (12)
Max temp (°C)	<27; 27–35 (38)	25–29 (24)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (74)	5.5–7.4; 6.5–7.4 (13)
ESP	Non (100)	
QDGCs	2630 (22)	2528; 2626; 2628; 2629; 2823; 2829 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



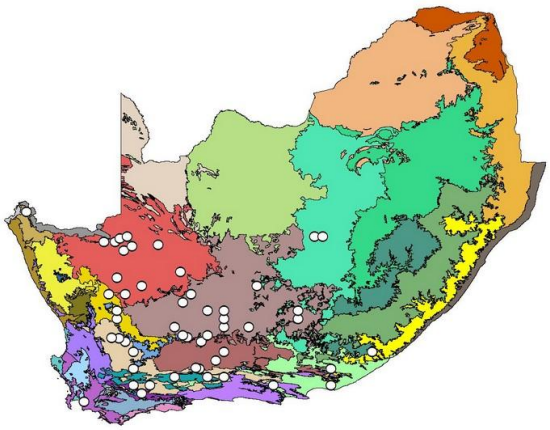
Lessertia annularis Burch.

Galegeae ①

Herb; A; Ht 0.1–0.8; Alt 650–1373

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (43)	Upper Karoo (26)
Biome	Nama-Karoo (72)	Succulent Karoo (14)
Rainfall (mm)	<400 (82)	200–600; 400–800 (8)
Min temp (°C)	<2 (37)	2–8 (31)
Max temp (°C)	27–35 (67)	25–29 (18)
Phosphorus (ppm)	>20 (63)	5–35 (33)
pH	>7.5 (75)	6.5–8.4 (14)
ESP	Non (78)	Medium (9)
QDGCs	3222 (9)	3123; 3320 (8)

NOTES: **Antiquality:** Toxic (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



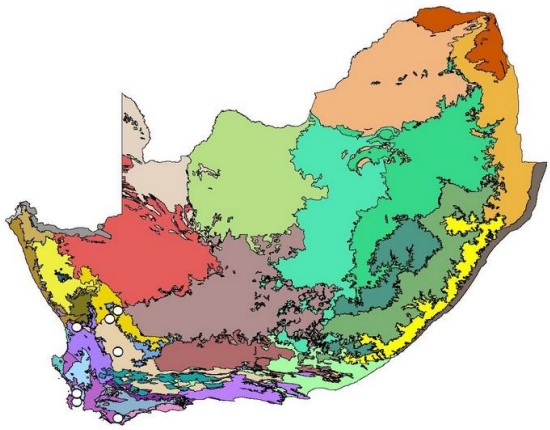
[E]*Lessertia argentea* Harv.

Galegeae ①

Herb; P; Ht 0.3–1; Alt 6–153

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Rainshadow Valley Karoo (100)	
Biome	Fynbos (60)	Succulent Karoo (40)
Rainfall (mm)	<400 (57)	400–800 (29)
Min temp (°C)	2–8; >6 (43)	0–4 (14)
Max temp (°C)	27–35 (57)	25–29 (29)
Phosphorus (ppm)	5–35 (71)	>20 (29)
pH	<6.4; 6.5–8.4; >7.5 (29)	6.5–7.4 (13)
ESP	High (100)	
QDGCs	3119 (30)	3118; 3219; 3318; 3418; 3419 (14)

NOTES: **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



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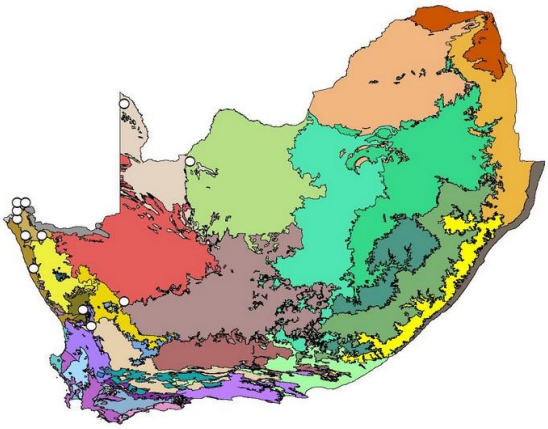
Lessertia benguellensis Baker f.

Galegeae ①

Dwarf shrub, herb; P; Ht 0.2–0.5; Alt 1128–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Kalahari Duneveld (100)	
Biome	Savanna; Succulent Karoo (50)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (50)	2–8 (33)
Max temp (°C)	25–29; 27–35; >33 (33)	
Phosphorus (ppm)	>20 (67)	5–35 (25)
pH	>7.5 (75)	6.5–8.4 (17)
ESP	Non (100)	
QDGCs	2816 (25)	2917 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



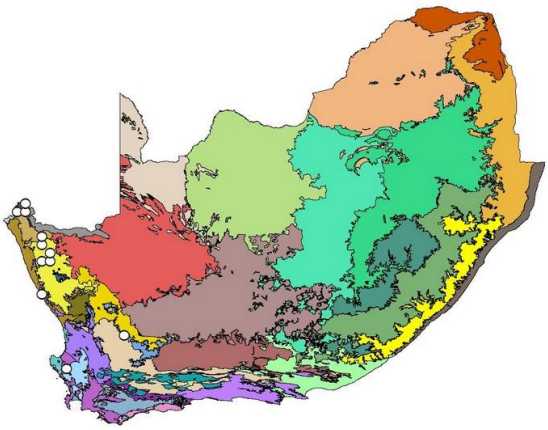
Lessertia brachypus Harv.

Galegeae ①

Dwarf shrub, shrub; P; Ht 0.2–3; Alt 250–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (86)	Fynbos (14)
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (64)	2–8 (27)
Max temp (°C)	25–29 (55)	27–35 (36)
Phosphorus (ppm)	>20 (55)	5–35 (45)
pH	>7.5 (45)	5.5–7.4 (27)
ESP	Medium (100)	
QDGCs	2917 (45)	2817 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



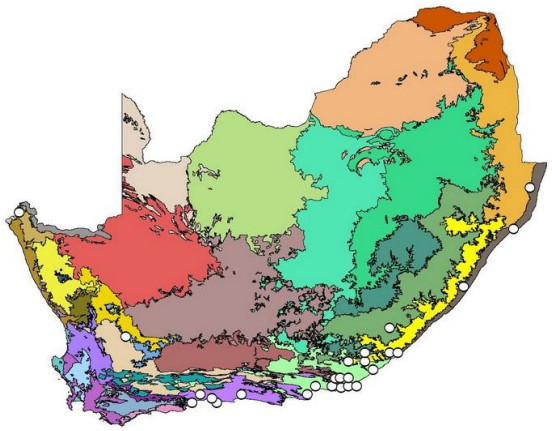
[E]*Lessertia brachystachya* DC.

Galegeae ☠③

Dwarf shrub; P; Ht 0.3–1; Alt 3–549

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (50)	Eastern Fynbos-Renosterveld (25)
Biome	Albany Thicket (57)	Fynbos (29)
Rainfall (mm)	400–800 (54)	600–1000 (27)
Min temp (°C)	>6 (50)	2–8 (46)
Max temp (°C)	25–29 (69)	27–35 (19)
Phosphorus (ppm)	5–35 (77)	<10 (15)
pH	<6.4 (38)	5.5–7.4 (31)
ESP	Non (75)	Medium (25)
QDGCs	3326 (23)	3227; 3228; 3322; 3325; 3327; 3422 (8)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Toxic to livestock (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Organic N (Morris 1997).



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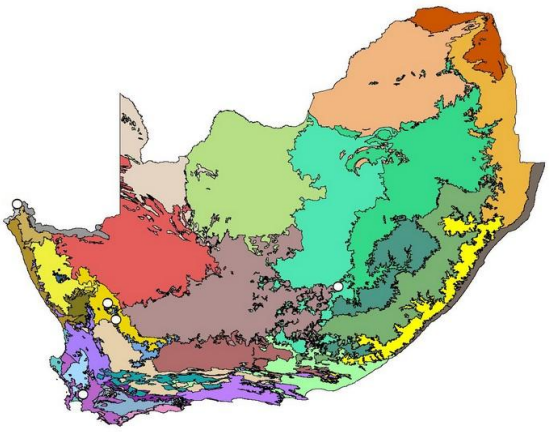
***Lessertia candida* E.Mey.** **Galegeae** ①

Shrub; P; Ht 0.3–0.4; Alt ?–10

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos; Succulent Karoo (50)	
Rainfall (mm)	<400 (60)	400–800; 600–1000 (20)
Min temp (°C)	2–8 (60)	<2; >6 (20)
Max temp (°C)	27–35 (60)	25–29; >33 (20)
Phosphorus (ppm)	>20 (60)	<10; 5–35 (20)
pH	>7.5 (60)	<6.4; 6.5–7.4 (20)
ESP	Ecotone	
QDGCs	3119 (40)	2816; 3026; 3318 (20)

NOTES: –



***Lessertia canescens* Goldblatt & J.C.Manning** **Galegeae** –

Unknown

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

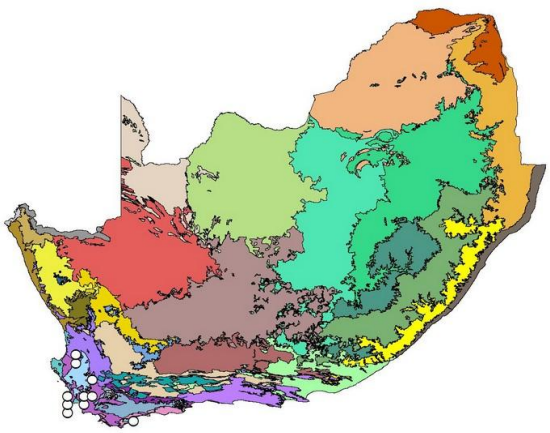
NOTES: –

[E]*Lessertia capensis* (P.J.Bergius) Druce **Galegeae** ①

Dwarf shrub, herb; P; Ht 0.2–0.5; Alt 6–763

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (30)	>800 (20)
Min temp (°C)	2–8; >6 (40)	0–4 (20)
Max temp (°C)	25–29 (90)	<27 (10)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (60)	5.5–7.4; 6.5–7.4; 6.5–8.4; >7.5 (10)
ESP	Non (100)	
QDGCs	3418 (30)	3218; 3318; 3319 (20)

NOTES: **Flowering:** Spring (Kidd 2002).



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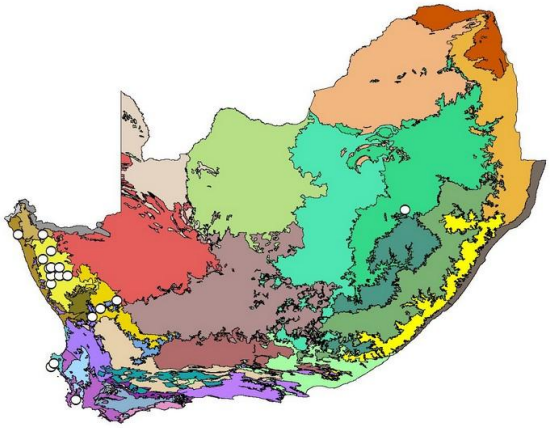
***Lessertia capitata* E.Mey.** **Galegeae** ①

Herb; P; Ht 0.03–0.25; Alt 15–702

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (60)	West Strandveld; Namaqualand Sandveld (20)
Biome	Succulent Karoo (70)	Fynbos (20)
Rainfall (mm)	<400 (88)	400–800; 600–1000 (6)
Min temp (°C)	2–8 (63)	>6 (31)
Max temp (°C)	25–29 (50)	27–35 (38)
Phosphorus (ppm)	>20 (50)	5–35 (44)
pH	6.5–8.4 (38)	>7.5 (25)
ESP	Medium (80)	High (20)
QDGCs	3017 (22)	2917; 3018; 3119 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).

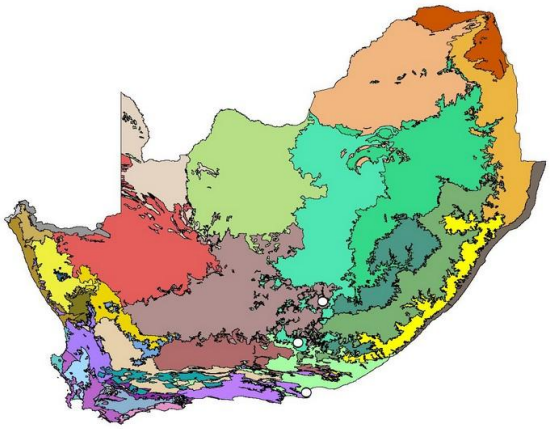


[E]*Lessertia carnosa* Eckl. & Zeyh. **Galegeae** ①

Dwarf shrub; P; Ht 0.01–0.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (100)	
Biome	Ecotone	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	<2; 0–4; >6 (33)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Non (100)	
QDGCs	3126; 3225; 3325 (33)	

NOTES: –

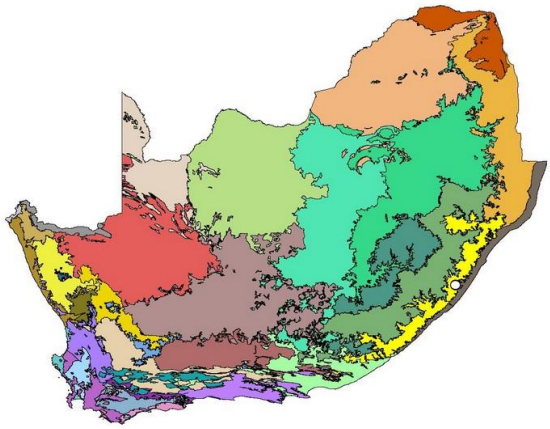


[E]*Lessertia contracta* M.Balkwill **Galegeae** ①

Dwarf shrub; P; Ht ?; Alt ?–100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3030 (100)	

NOTES: –



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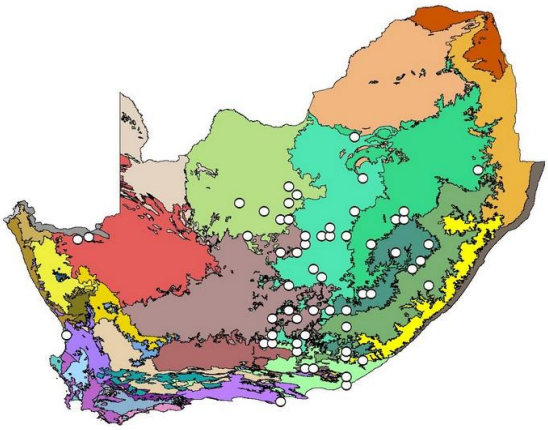
Lessertia depressa Harv.

Galegeae ②

Dwarf shrub; P; Ht 0.08–0.6; Alt 1205–1586

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (33)	Eastern Kalahari Bushveld (29)
Biome	Grassland (76)	Savanna (17)
Rainfall (mm)	400–800 (40)	<400 (24)
Min temp (°C)	<2 (62)	2–8 (19)
Max temp (°C)	27–35 (53)	25–29 (26)
Phosphorus (ppm)	<10 (57)	5–35 (33)
pH	6.5–7.4; 6.5–8.4 (24)	<6.4 (19)
ESP	Non (100)	
QDGCs	2828; 2925; 2926; 3125; 3126; 3224; 3225 (5)	2725; 2824; 2825; 2929; 3025; 3027; 3226; 3325; 3326 (4)

NOTES: **Livestock feed:** Highly palatable, high nutritional value, low grazing resistance (Le Roux *et al.* 1994). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Physiology:** Low drought resistance (Le Roux *et al.* 1994).



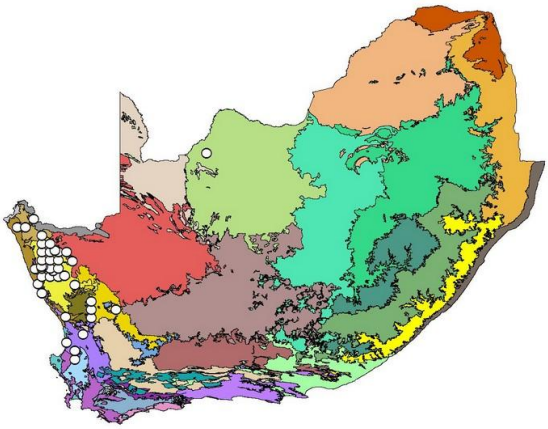
Lessertia diffusa R.Br.

Galegeae ②

Herb; P; Ht 0.05–0.45; Alt 122–1140

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (67)	Bushmanland; Richtersveld; Eastern Kalahari Bushveld (11)
Biome	Succulent Karoo (74)	Fynbos (16)
Rainfall (mm)	<400 (91)	200–600 (9)
Min temp (°C)	2–8 (51)	>6 (37)
Max temp (°C)	25–29 (60)	27–35 (37)
Phosphorus (ppm)	5–35; >20 (49)	<10 (2)
pH	6.5–8.4 (46)	>7.5 (26)
ESP	Medium (67)	Non (22)
QDGCs	3017 (26)	2917 (18)

NOTES: **Livestock feed** (Le Roux & Schelpe 1997). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



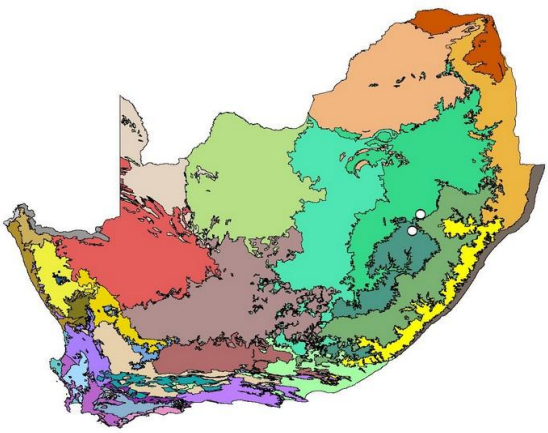
[E]*Lessertia dykei* L.Bolus

Galegeae ①

Herb; P; Ht 0.15–1.2; Alt 2440–3203

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000; >800 (50)	
Min temp (°C)	<2 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2828; 2829 (50)	

NOTES: –



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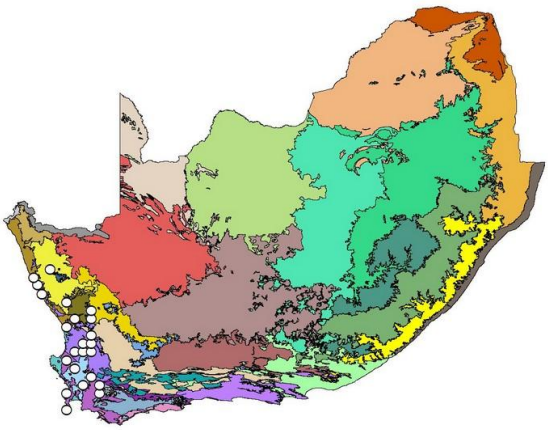
[E]*Lessertia excisa* DC.

Galegeae ①

Herb; P; Ht 0.2–0.4; Alt ?–153

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos; West Coast Renosterveld (33)	
Biome	Fynbos (73)	Succulent Karoo (27)
Rainfall (mm)	<400 (43)	200–600 (39)
Min temp (°C)	2–8 (48)	>6 (39)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	<6.4; 5.5–7.4; 6.5–8.4 (26)	6.5–7.4 (13)
ESP	Non (100)	
QDGCs	3017; 3218 (17)	3118; 3219; 3318; 3319 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



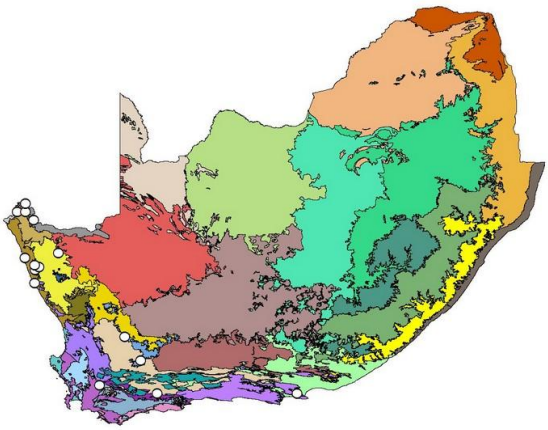
Lessertia falciformis DC.

Galegeae ①

Dwarf shrub; P; Ht 0.3–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Sandveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (86)	200–600; 400–800 (7)
Min temp (°C)	>6 (67)	0–4 (20)
Max temp (°C)	27–35 (47)	25–29 (40)
Phosphorus (ppm)	5–35 (53)	>20 (47)
pH	>7.5 (47)	6.5–8.4 (33)
ESP	High (100)	
QDGCs	2817; 3017 (20)	2917; 3220 (13)

NOTES: –



[E]*Lessertia flanaganii* L.Bolus

Galegeae –

Herb; P; Ht 0.8–1; Alt ?–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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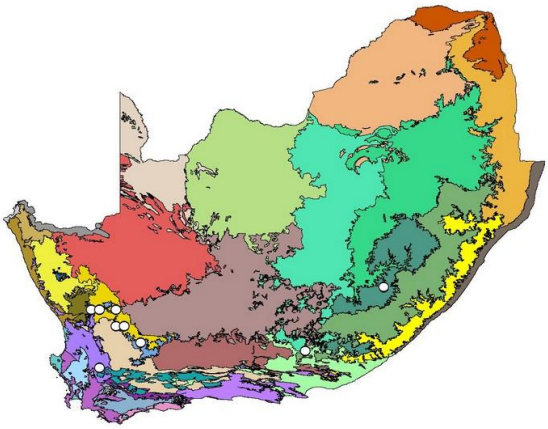
[E]*Lessertia flexuosa* E.Mey.

Galegeae ①

Shrub; P; Ht 0.9–2; Alt 1159–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Trans-Escarpment Succulent Karoo (100)	
Biome	Fynbos; Grassland; Succulent Karoo (33)	
Rainfall (mm)	<400 (67)	200–600 (22)
Min temp (°C)	<2; 0–4; 2–8 (33)	
Max temp (°C)	27–35 (56)	25–29 (33)
Phosphorus (ppm)	>20 (67)	5–35 (22)
pH	>7.5 (56)	<6.4 (22)
ESP	Medium (100)	
QDGCs	3119 (40)	3028 (20)

NOTES: –



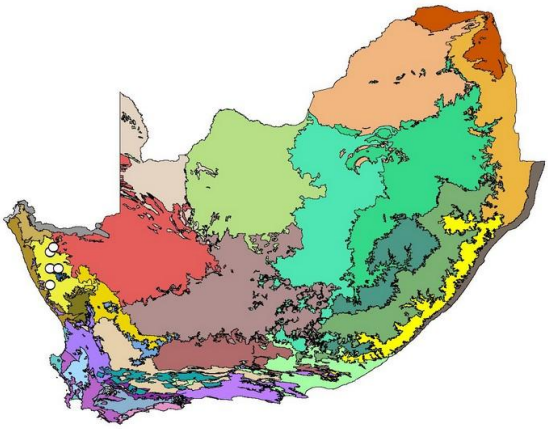
[E]*Lessertia fruticosa* Lindl.

Galegeae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt 458–976

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	5–35 (60)	>20 (40)
pH	6.5–8.4 (60)	6.5–7.4 (40)
ESP	Medium (100)	
QDGCs	2917; 3017 (40)	3018 (20)

NOTES: –



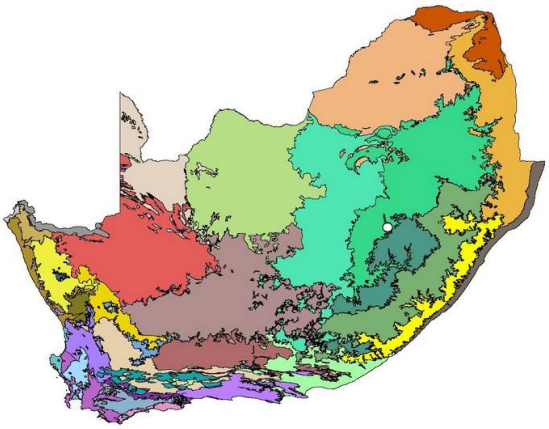
Lessertia glabricaulis L.Bolus

Galegeae ①

Herb; P; Ht 0.01–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	<2 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2828 (100)	

NOTES: –



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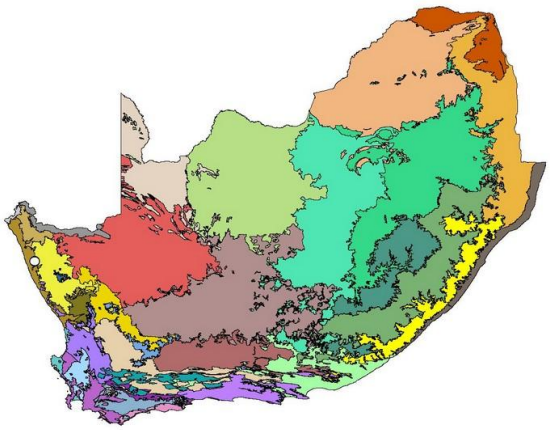
[E]*Lessertia globosa* L.Bolus

Galegeae ①

Herb; P; Ht ?; Alt ?–92

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	2917 (100)	

NOTES: –



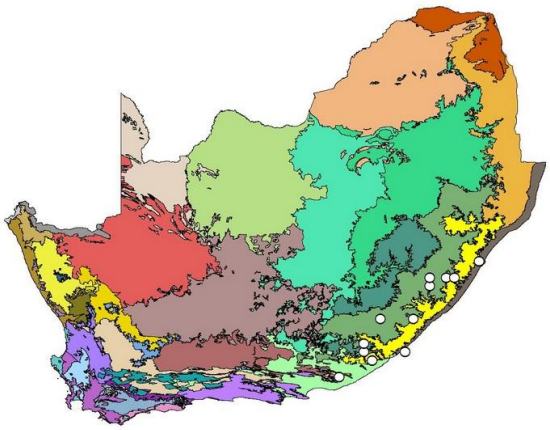
[E]*Lessertia harveyana* L.Bolus

Galegeae ①

Herb; P; Ht 0.4–1; Alt 5–2227

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (75)	Indian Ocean Coastal Belt (25)
Biome	Grassland (67)	Indian Ocean (33)
Rainfall (mm)	>800 (50)	400–800; 600–1000 (25)
Min temp (°C)	2–8 (58)	>6 (25)
Max temp (°C)	25–29 (83)	<27 (17)
Phosphorus (ppm)	<10 (58)	5–35 (42)
pH	<6.4 (58)	5.5–7.4 (42)
ESP	Non (100)	
QDGCs	3029; 3227 (25)	2930; 3127; 3128; 3228; 3226 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



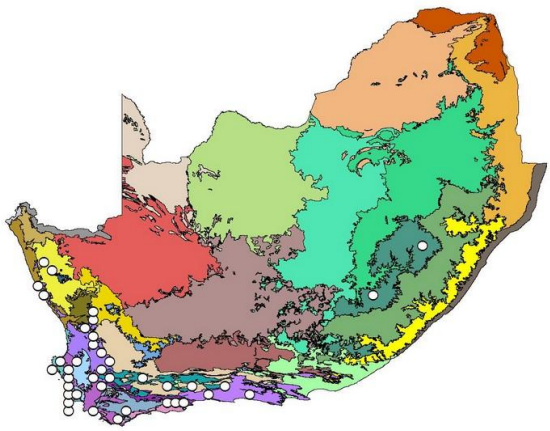
Lessertia herbacea (L.) Druce

Galegeae ③

Herb; occ. P; Ht 0.03–1; Alt 30–961

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern-Fynbos Renosterveld; Drakensberg Grassland (29)	Southwest Fynbos; West Strandveld; Namaqualand Sandveld (14)
Biome	Fynbos (75)	Succulent Karoo (17)
Rainfall (mm)	200–600 (38)	<400 (36)
Min temp (°C)	2–8 (51)	>6 (33)
Max temp (°C)	25–29 (74)	27–35 (21)
Phosphorus (ppm)	5–35 (82)	<10 (10)
pH	<6.4 (41)	5.5–7.4 (23)
ESP	Non; Medium (43)	High (14)
QDGCs	3318 (13)	3219; 3319 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Soil conservation:** Organic N (Morris 1997).



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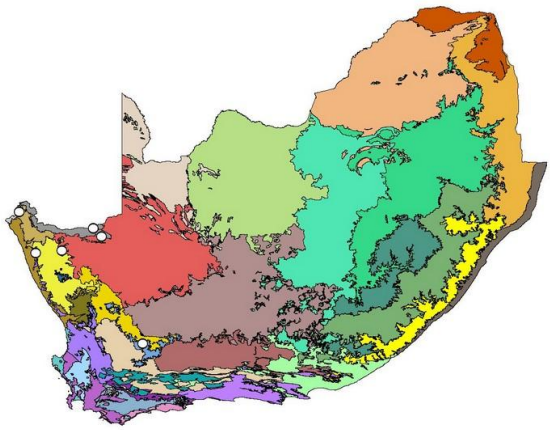
Lessertia incana Schinz

Galegeae ①

Dwarf shrub; P; Ht 0.02–0.7; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Gariep Desert (100)	
Biome	Desert; Succulent Karoo (50)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (50)	>6 (33)
Max temp (°C)	25–29; 27–35; >33 (33)	
Phosphorus (ppm)	>20 (83)	5–35 (17)
pH	>7.5 (67)	6.5–8.4 (33)
ESP	Medium (100)	
QDGCs	2816; 2819; 2917; 2918; 2919; 3220 (16.5)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



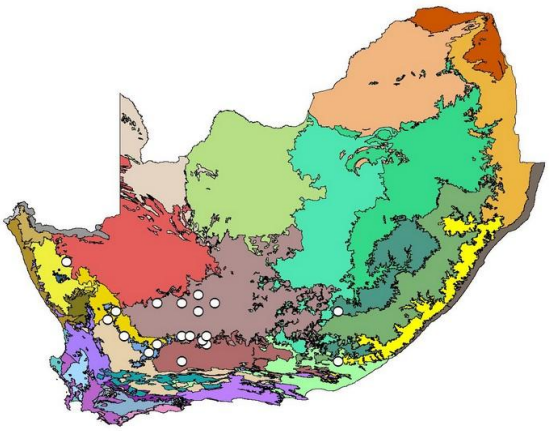
[E]*Lessertia inflata* Harv.

Galegeae ②

Herb; P; Ht 0.1–0.2; Alt 1676–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Upper Karoo (80)	Lower Karoo (20)
Biome	Nama-Karoo (78)	Grassland; Succulent Karoo (11)
Rainfall (mm)	<400 (89)	400–800 (11)
Min temp (°C)	<2; 0–4 (39)	2–8 (22)
Max temp (°C)	27–35 (89)	25–29 (11)
Phosphorus (ppm)	>20 (89)	5–35 (11)
pH	>7.5 (78)	6.5–7.4; 6.5–8.4 (11)
ESP	Non (80)	Medium (20)
QDGCs	3222 (21)	3221 (16)

NOTES: **Livestock feed** (Shearing & Van Heerden 1997). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



[E]*Lessertia ingeliensis* M.Balkwill

Galegeae –

Herb; A; Ht 0.01–0.2; Alt 1800–1983

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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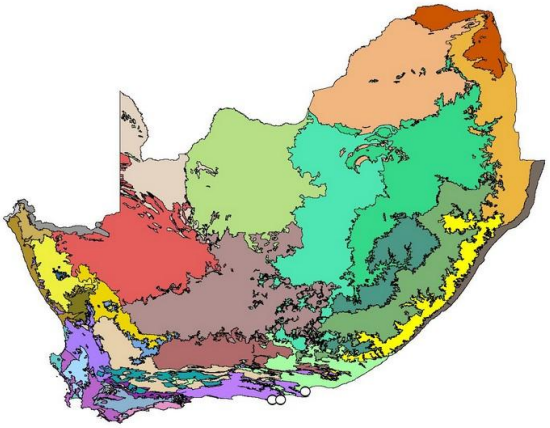
[E]*Lessertia kensitii* L.Bolus

Galegeae ①

Herb; P; Ht 0.01–0.4; Alt ?–6

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (67)	<27 (33)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	6.5–8.4 (33)
ESP	Ecotone	
QDGCs	3424 (67)	3325 (33)

NOTES: –



[E]*Lessertia lanata* Harv.

Galegeae –

Shrub; P; Ht 0.01–1.6; Alt ?–580

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

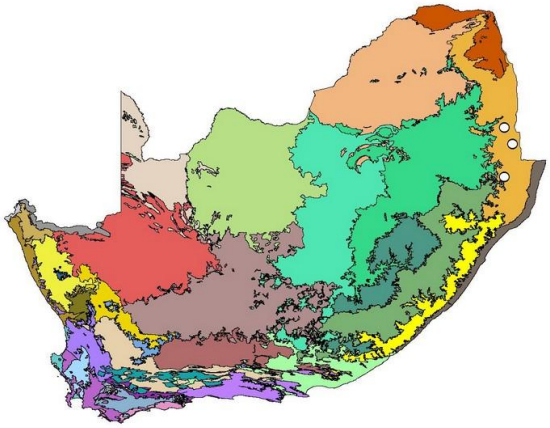
Lessertia macroflora M.Balkwill

Galegeae ①

Dwarf shrub; P; Ht 0.3–0.4; Alt 250–366

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	600–1000 (67)	400–800 (33)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 5.5–7.4; 6.5–7.4 (33)	
ESP	Non (100)	
QDGCs	2531; 2631; 2731 (33)	

NOTES: –



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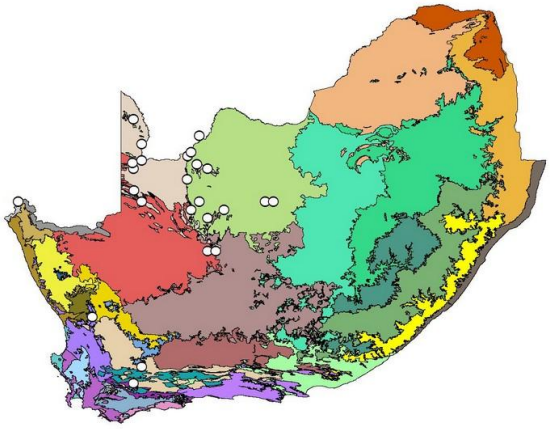
Lessertia macrostachya* DC. var. *macrostachya **Galegeae** ①

Dwarf shrub, herb; P; Ht 0.01–0.8; Alt ?–1037

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (75)	Kalahari Duneveld (25)
Biome	Savanna (85)	Nama-Karoo (15)
Rainfall (mm)	<400 (92)	400–800 (8)
Min temp (°C)	2–8 (42)	<2 (29)
Max temp (°C)	>33 (63)	27–35 (29)
Phosphorus (ppm)	<10 (46)	5–35 (42)
pH	>7.5 (63)	6.5–7.4 (21)
ESP	Non (100)	
QDGCs	2622 (16)	2620; 2822 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).
Flowering: Summer (Van Rooyen 2001).

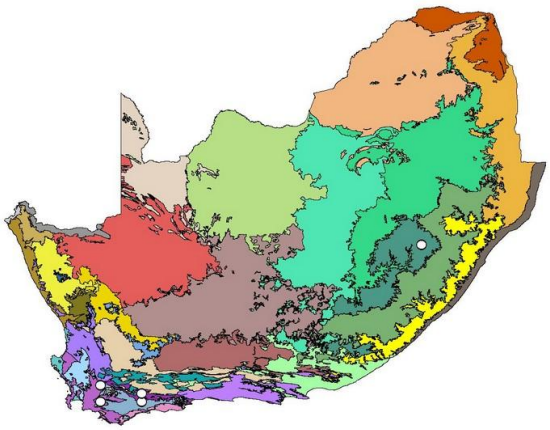


[E]*Lessertia margaritacea* E.Mey. **Galegeae** ①

Shrub; P; Ht 0.9–1; Alt 120–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (100)	
Biome	Fynbos (75)	Grassland (25)
Rainfall (mm)	200–600 (60)	400–800 (40)
Min temp (°C)	2–8 (60)	<2; 0–4 (20)
Max temp (°C)	25–29 (80)	<27 (20)
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	5.5–7.4 (60)	<6.4; 6.5–7.4 (20)
ESP	Non (100)	
QDGCs	2929; 3319; 3320; 3419; 3420 (20)	

NOTES: –



[E]*Lessertia microcarpa* E.Mey. **Galegeae** –

Herb; P; Ht ?; Alt ?–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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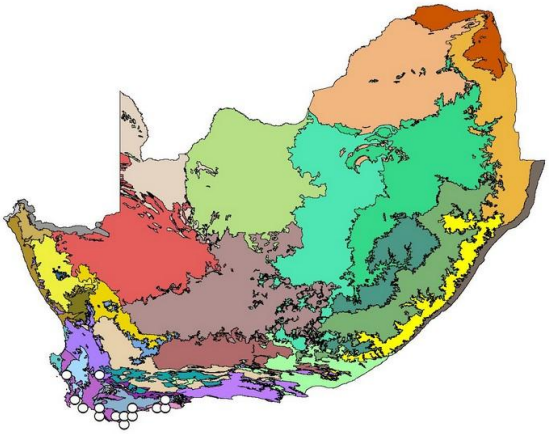
[E]*Lessertia miniata* T.M.Salter

Galegeae ①

Herb; P; Ht 0.2–1; Alt 3–198

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; South Coast Fynbos (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (43)	<400; >800 (7)
Min temp (°C)	2–8 (50)	>6 (43)
Max temp (°C)	25–29 (79)	<27 (21)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (36)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	3420 (29)	3419; 3421 (22)

NOTES: –



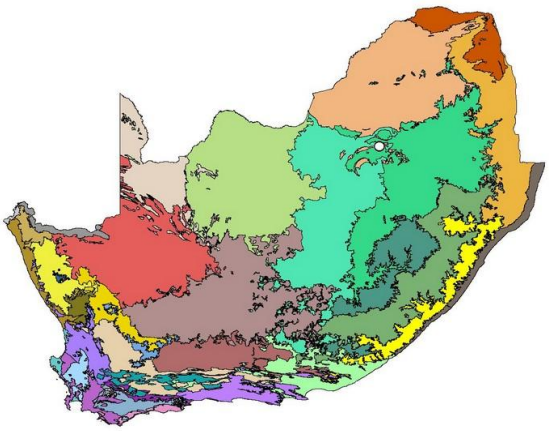
[E]*Lessertia mossii* R.G.N.Young

Galegeae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2627 (100)	

NOTES: –



[E]*Lessertia muricata* T.M.Salter

Galegeae –

Herb; P; Ht 0.2–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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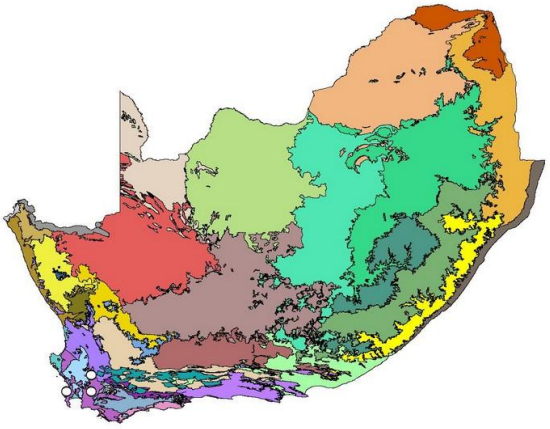
[E]*Lessertia pappeana* Harv.

Galegeae ①

Herb; P; Ht 0.3–0.4; Alt ?–763

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000; >800 (33)	
Min temp (°C)	0–4 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3319 (67)	3318 (33)

NOTES: –



[E]*Lessertia parviflora* Harv.

Galegeae –

Herb; P; Ht ?; Alt ?–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

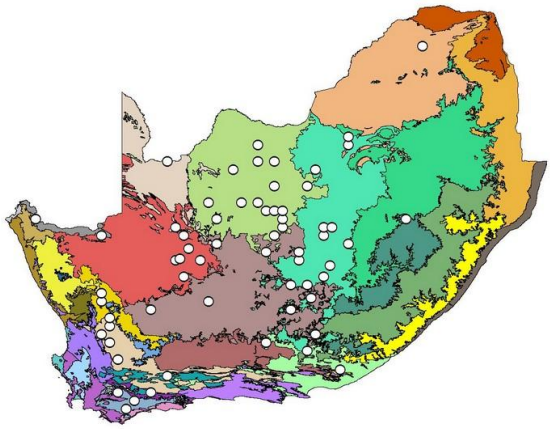
Lessertia pauciflora Harv. var. *pauciflora*

Galegeae ②

Herb; P; Ht 0.2–1.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (42)	Dry Highveld Grassland (23)
Biome	Savanna (42)	Grassland (26)
Rainfall (mm)	<400 (52)	400–800 (25)
Min temp (°C)	<2 (59)	2–8 (25)
Max temp (°C)	27–35 (75)	>33 (16)
Phosphorus (ppm)	<10 (41)	5–35 (38)
pH	>7.5 (36)	6.5–8.4 (33)
ESP	Non (90)	High (6)
QDGCs	2824 (10)	2624; 2921; 2922; 3119; 3219 (5)

NOTES: **Livestock feed:** Highly palatable, high nutritional value, low grazing resistance (Le Roux *et al.* 1994). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Ecology :** Indicator of good veld (Le Roux *et al.* 1994). **Physiology:** Low drought resistance (Le Roux *et al.* 1994).



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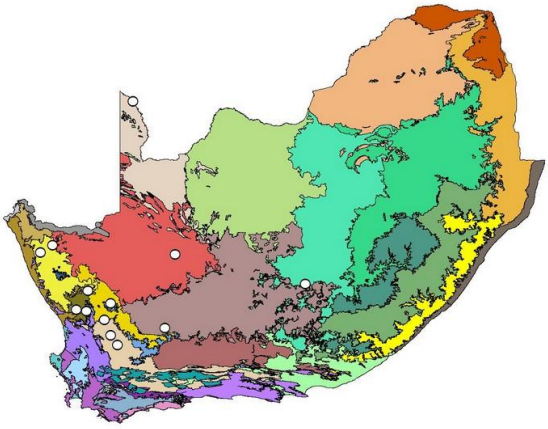
[E]*Lessertia pauciflora* Harv. var. *schlechteri* L.Bolus

Galegeae ②

Herb; P; Ht ?; Alt 372–1373

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld; Rainshadow Valley Karoo (24)	Bushmanland; Upper Karoo; Knersvlakte; Kalahari Duneveld (13)
Biome	Succulent Karoo (70)	Nama-Karoo (20)
Rainfall (mm)	<400 (92)	200–600 (8)
Min temp (°C)	2–8 (62)	<2 (23)
Max temp (°C)	27–35 (77)	>33 (15)
Phosphorus (ppm)	>20 (69)	5–35 (31)
pH	>7.5 (77)	6.5–8.4 (23)
ESP	Non; High (38)	Medium (25)
QDGCs	2917; 3118; 3119; 3219 (15)	2520; 2921; 3019; 3025; 3121 (8)

NOTES: **Livestock feed:** Highly palatable, high nutritional value, low grazing resistance (Le Roux *et al.* 1994). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Ecology :** Indicator of good veld (Le Roux *et al.* 1994). **Physiology:** Low drought resistance (Le Roux *et al.* 1994).



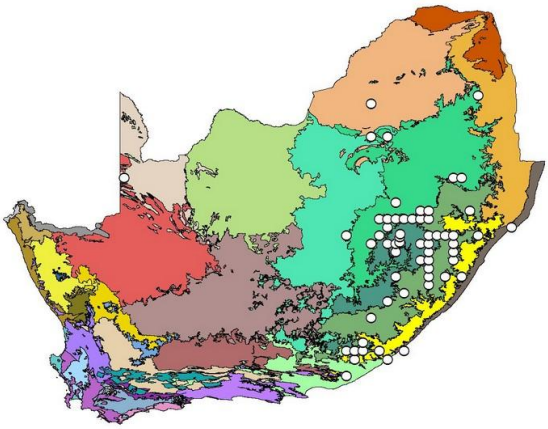
Lessertia perennans (Jacq.) DC. var. *perennans*

Galegeae ①❖

Dwarf shrub, herb; P; Ht 0.6–1.6; Alt 366–2325

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland; Sub-Escarpment Grassland (33)	Mesic Highveld Grassland (21)
Biome	Grassland (94)	Indian Ocean; Savanna (3)
Rainfall (mm)	>800 (48)	600–1000 (27)
Min temp (°C)	<2 (40)	0–4 (30)
Max temp (°C)	<27 (48)	25–29 (45)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (82)	5.5–7.4 (15)
ESP	Non (100)	
QDGCs	2929 (13)	2928 (12)

NOTES: **Flowering:** Spring, summer (Pooley 1998).



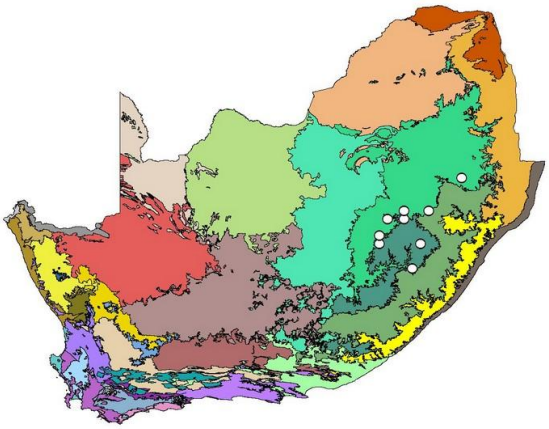
Lessertia perennans (Jacq.) DC. var. *polystachya* (Harv.) L.Bolus

Galegeae ①

Dwarf shrub, herb; P; Ht 0.1–1.5; Alt 1220–2440

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland; Mesic Highveld Grassland (50)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (56)	600–1000 (33)
Min temp (°C)	<2 (78)	0–4 (22)
Max temp (°C)	<27 (78)	25–29 (22)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (89)	5.5–7.4 (11)
ESP	Non (100)	
QDGCs	2828 (33)	2927 (22)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Pooley 1998).



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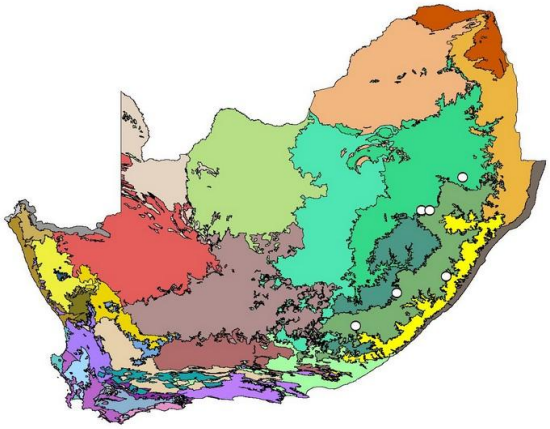
[E]*Lessertia perennans* (Jacq.) DC. var. *sericea* L.Bolus

Galegeae ①

Dwarf shrub; P; Ht 0.5–1.5; Alt 1800–2074

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Sub-Escarpment Grassland (50)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (50)	>800 (33)
Min temp (°C)	0–4 (50)	2–8 (33)
Max temp (°C)	25–29 (67)	<27 (33)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (83)	5.5–7.4 (17)
ESP	Non (100)	
QDGCs	2829 (32)	2730; 3028; 3029; 3127 (17)

NOTES: **Flowering:** Spring, summer (Pooley 1998).



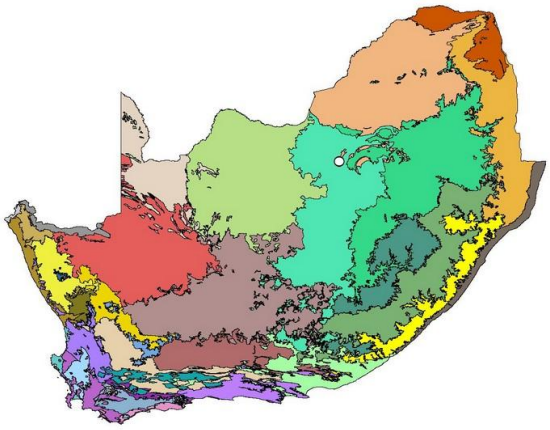
[E]*Lessertia phillipsiana* Burtt Davy

Galegeae ①

Herb; P; Ht ?; Alt ?–1693

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	<2 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2626 (100)	

NOTES: –



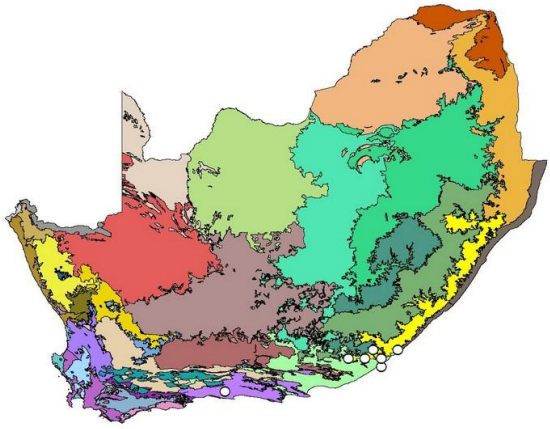
[E]*Lessertia physodes* Eckl. & Zeyh.

Galegeae ①

Dwarf shrub; P; Ht 0.01–0.45; Alt 30–656

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Eastern Fynbos-Renosterveld (50)	
Biome	Albany Thicket (100)	
Rainfall (mm)	400–800 (57)	600–1000 (29)
Min temp (°C)	2–8 (57)	>6 (43)
Max temp (°C)	25–29 (72)	<27; 27–35 (14)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (57)	<6.4 (43)
ESP	Non; Medium (50)	
QDGCs	3227 (44)	3226; 3228; 3323; 3327 (14)

NOTES: **Antiquality:** None tested (Steyn 1934); Not toxic (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Van Rooyen 2001).



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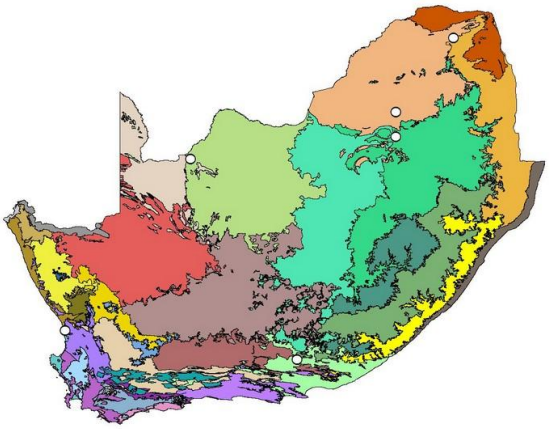
[E]*Lessertia prostata* DC.

Galegeae ①

Herb; P; Ht ?; Alt 650–1403

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (60)	Fynbos; Grassland (20)
Rainfall (mm)	<400; 400–800 (33)	200–600; 600–1000 (17)
Min temp (°C)	<2; 2–8; >6 (33)	
Max temp (°C)	27–35 (50)	25–29 (33)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4; 6.5–7.4 (50)	
ESP	Non (100)	
QDGCs	2330; 2528; 2622; 2628; 3218; 3225 (16.5)	

NOTES: –



Lessertia purpurea R.G.N.Young

Galegeae –

Unknown

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

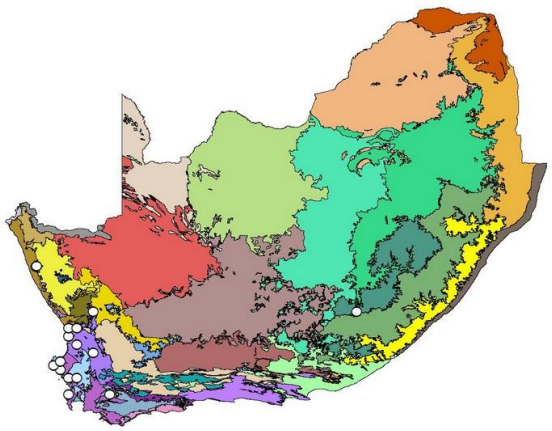
[E]*Lessertia rigida* E.Mey.

Galegeae ①

Dwarf shrub; P; Ht 0.4–0.6; Alt 30–76

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (67)	West Strandveld (33)
Biome	Fynbos (90)	Grassland (10)
Rainfall (mm)	<400 (56)	200–600 (31)
Min temp (°C)	>6 (69)	2–8 (19)
Max temp (°C)	25–29 (56)	27–35 (44)
Phosphorus (ppm)	5–35 (88)	<10; >20 (6)
pH	6.5–8.4 (31)	5.5–7.4 (25)
ESP	Non (67)	Medium (33)
QDGCs	3318 (25)	3218 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Manning & Goldblatt 2000).



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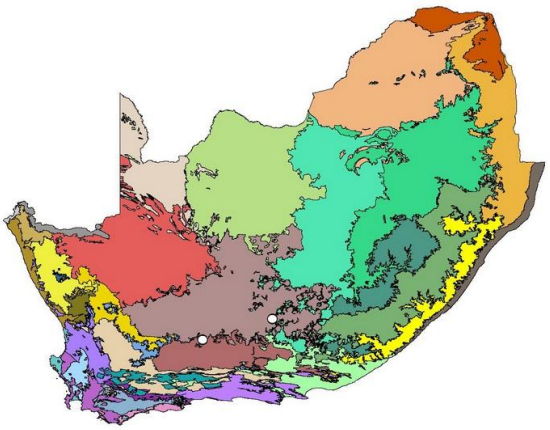
[E]*Lessertia sneeuwbergensis* Germish.

Galegeae ①

Herb; A; Ht 0.03–0.2; Alt 1678–1982

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	<2; 2–8 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	6.5–7.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3124; 3222 (50)	

NOTES: –



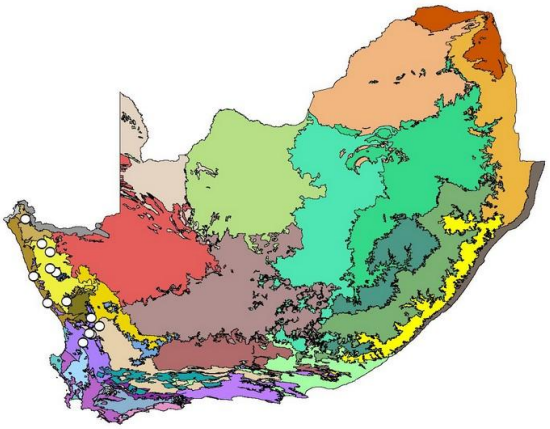
[E]*Lessertia spinescens* E.Mey.

Galegeae ②

Dwarf shrub, shrub; P; Ht 0.3–8; Alt 610–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld; Rainshadow Valley Karoo (50)	
Biome	Succulent Karoo (86)	Fynbos (14)
Rainfall (mm)	<400 (83)	200–600 (17)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35; >20 (50)	
pH	6.5–8.4 (33)	6.5–7.4; >7.5 (25)
ESP	Medium; High (50)	
QDGCs	2917; 3017; 3118; 3119; 3219 (15)	2817; 3018; 3218 (8)

NOTES: **Livestock feed** (Le Roux & Schelpe 1997). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Flowering:** Autumn, winter, spring (Manning & Goldblatt 2000).



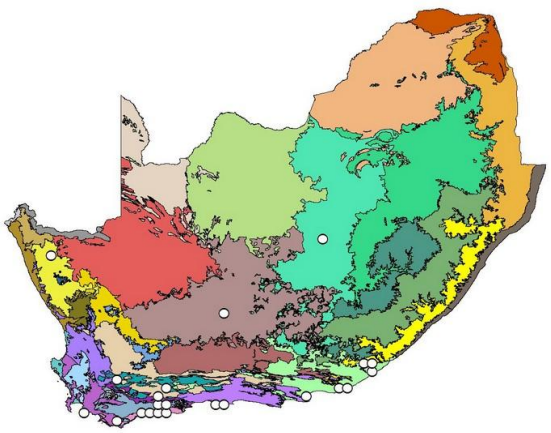
[E]*Lessertia stenoloba* E.Mey.

Galegeae ③

Herb; P; Ht 0.01–0.3; Alt 15–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (25)	South West Fynbos; South Coast Fynbos; Eastern-Fynbos Renosterveld; Dry Highveld Grassland; Upper Karoo; Namaqualand Hardeveld (13)
Biome	Fynbos (64)	Albany Thicket (14)
Rainfall (mm)	400–800 (36)	200–600 (27)
Min temp (°C)	2–8 (55)	>6 (32)
Max temp (°C)	25–29 (73)	27–35 (18)
Phosphorus (ppm)	5–35 (86)	<10 (9)
pH	5.5–7.4 (32)	6.5–7.4 (23)
ESP	Non (75)	Medium (25)
QDGCs	3421 (18)	3227; 3321; 3326; 3420 (5)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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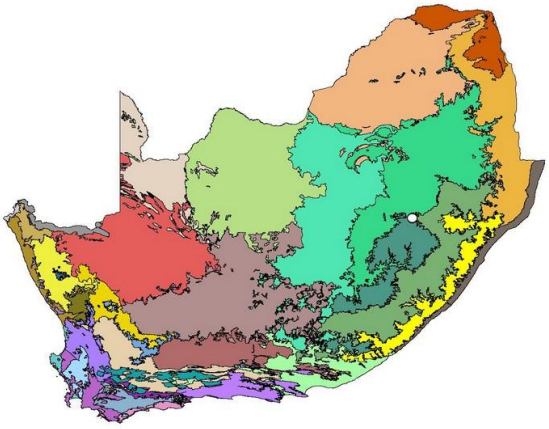
Lessertia stipulata Baker f.

Galegeae ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Grassland (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2828 (100)	

NOTES: –



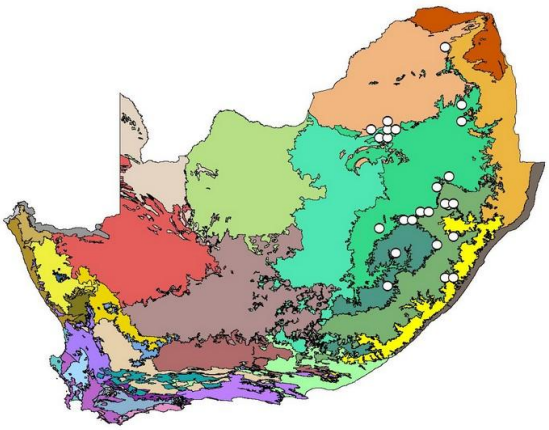
Lessertia stricta L.Bolus

Galegeae ③

Herb; P; Ht 0.5–1; Alt 1678–2005

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (50)	Drakensberg Grassland; Sub-Escarpment Grassland; Central Bushveld (17)
Biome	Grassland (92)	Savanna (8)
Rainfall (mm)	400–800 (42)	600–1000; >800 (29)
Min temp (°C)	0–4 (46)	<2 (29)
Max temp (°C)	<27; 25–29 (42)	27–35 (17)
Phosphorus (ppm)	Non (92)	Medium (8)
pH	<6.4 (88)	5.5–7.4 (13)
ESP	Non (100)	
QDGCs	2829 (16)	2528 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Soil conservation:** Organic N (Morris 1997). **Flowering:** Summer (Germishuizen & Clarke 2003).



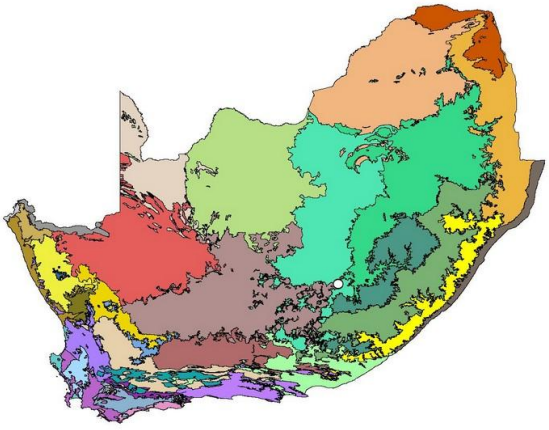
[E]*Lessertia tenuifolia* E.Mey.

Galegeae ①

Herb; P; Ht 0.2–0.3; Alt ?–1403

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	<2 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3026 (100)	

NOTES: –



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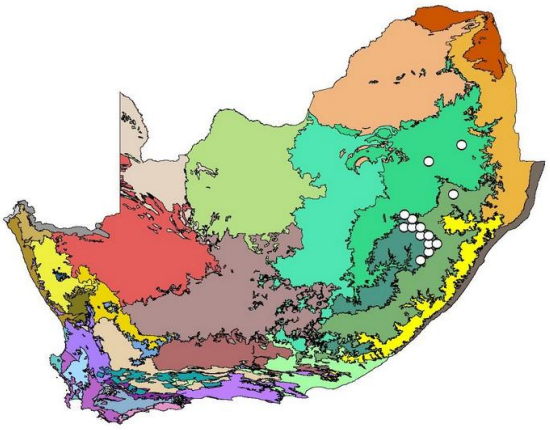
***Lessertia thodei* L.Bolus** **Galegeae** ①

Herb; P; Ht 0.1–0.6; Alt 2135–3279

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (57)	Mesic Highveld Grassland (29)
Biome	Grassland (100)	
Rainfall (mm)	>800 (71)	400–800 (21)
Min temp (°C)	<2 (71)	0–4 (29)
Max temp (°C)	<27 (71)	25–29 (21)
Phosphorus (ppm)	<10 (93)	5–35 (7)
pH	<6.4 (93)	5.5–7.4 (7)
ESP	Non (100)	
QDGCs	2929 (43)	2828 (29)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Summer (Pooley 2003).

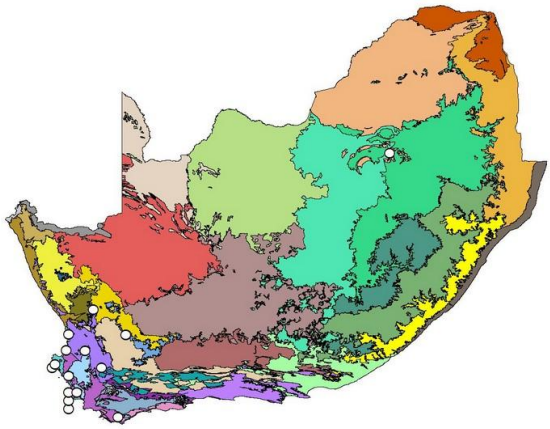


[E]*Lessertia tomentosa* DC. **Galegeae** ①

Herb; P; Ht 0.2–0.4; Alt ?–15

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; West Strandveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (36)	200–600 (29)
Min temp (°C)	>6 (58)	0–4; 2–8 (21)
Max temp (°C)	25–29 (71)	27–35 (29)
Phosphorus (ppm)	5–35 (79)	>20 (14)
pH	<6.4 (50)	6.5–7.4; 6.5–8.4; >7.5 (14)
ESP	Non; Medium (50)	
QDGCs	3218; 3318 (19)	3220; 3317; 3418 (13)

NOTES: **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).

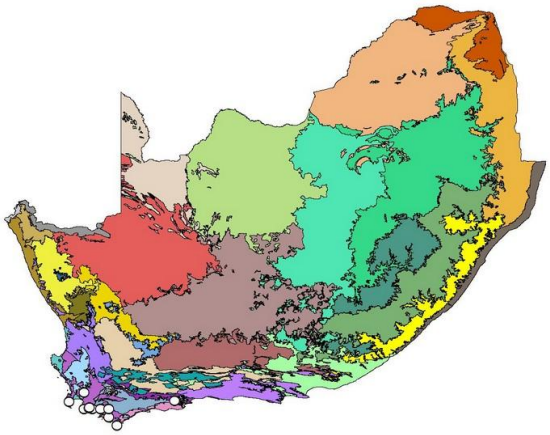


[E]*Liparia angustifolia* (Eckl. & Zeyh.) A.L.Schutte **Podalyrieae** ①

Shrub; P; Ht 0.01–0.3; Alt 30–75

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; South Strandveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (44)	200–600; 600–1000 (22)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	<6.4 (67)	5.5–7.4 (22)
ESP	Non; Medium (50)	
QDGCs	3419 (64)	3418 (18)

NOTES: –



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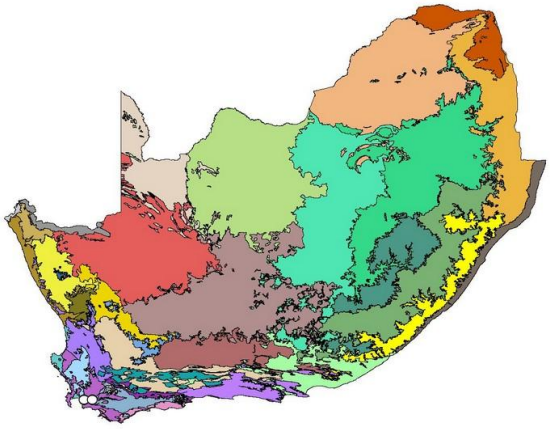
[E]*Liparia bonaespei* A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 0.01–3; Alt ?–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3418; 3419 (50)	

NOTES: –



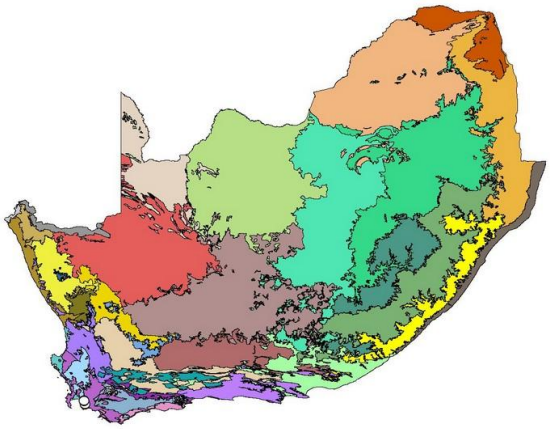
[E]*Liparia boucheri* (E.G.H.Oliv. & Fellingham) A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 0.01–0.5; Alt 1120–1130

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3418 (100)	

NOTES: –



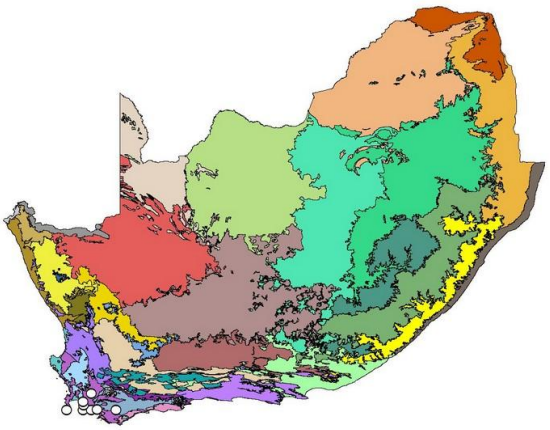
[E]*Liparia calycina* (L.Bolus) A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 1–3; Alt 300–980

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; >800 (43)	200–600 (14)
Min temp (°C)	2–8 (57)	>6 (29)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (71)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	3418 (50)	3419 (38)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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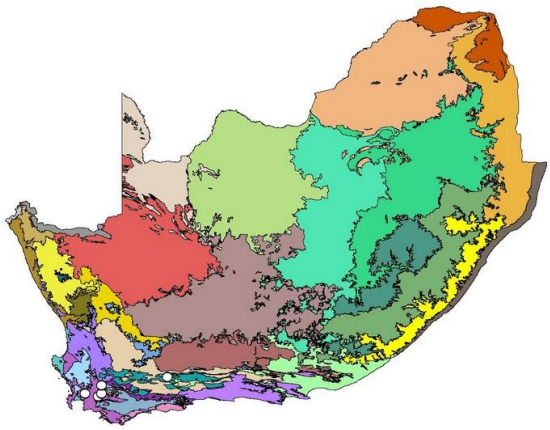
[E]*Liparia capitata* Thunb.

Podalyrieae ①

Shrub; P; Ht 0.01–0.6; Alt 1220–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400; 600–1000 (25)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	5.5–7.4 (50)	<6.4; >7.5 (25)
ESP	Ecotone	
QDGCs	3319 (60)	3318; 3321 (20)

NOTES: –



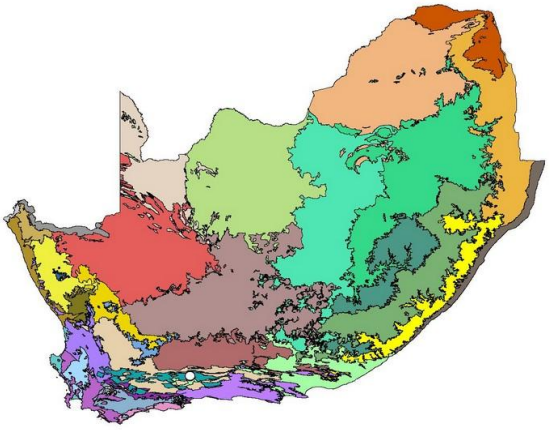
[E]*Liparia confusa* A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 0.3–0.6; Alt ?–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3322 (100)	

NOTES: –



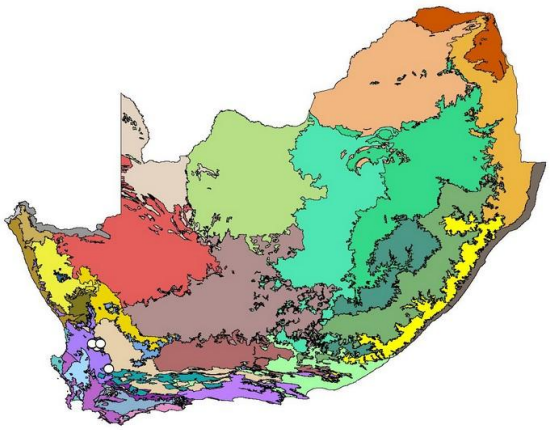
[E]*Liparia congesta* A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 1–2; Alt 1600–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; 400–800 (33)	
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Ecotone	
QDGCs	3219 (75)	3319 (25)

NOTES: –



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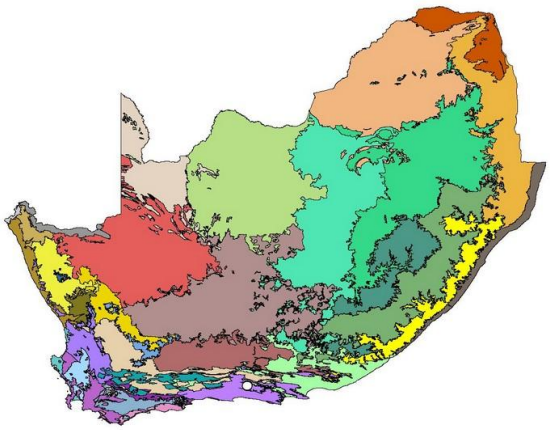
[E]*Liparia genistoides* (Lam.) A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 2.5–4; Alt 1220–1660

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3323 (100)	

NOTES: –



[E]*Liparia graminifolia* L.

Podalyrieae –

Shrub; P; Ht 0.01–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

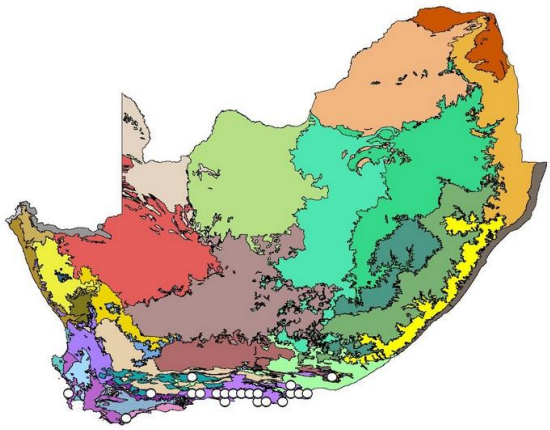
[E]*Liparia hirsuta* Thunb.

Podalyrieae ③

Shrub; P; Ht 0.6–3; Alt 30–1066

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; 600–1000 (38)	200–600 (14)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (52)	<27 (43)
Phosphorus (ppm)	5–35 (95)	>20 (5)
pH	<6.4 (57)	6.5–8.4 (24)
ESP	Medium (100)	
QDGCs	3322; 3323; 3325 (19)	3424 (14)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Flowering:** Autumn (Moriarty 1997).



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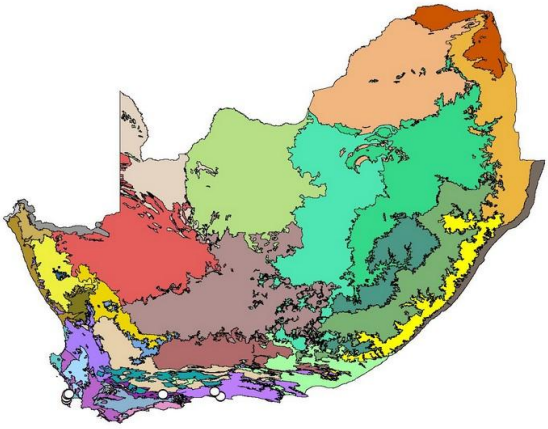
[E]*Liparia laevigata* (L.) Thunb.

Podalyrieae ①

Shrub; P; Ht 1.5–4; Alt 366–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (60)	<400; >800 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	<27; 25–29 (40)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (80)	6.5–8.4 (20)
ESP	Medium (100)	
QDGCs	3318; 3418 (29)	3321; 3322; 3423 (14)

NOTES: –



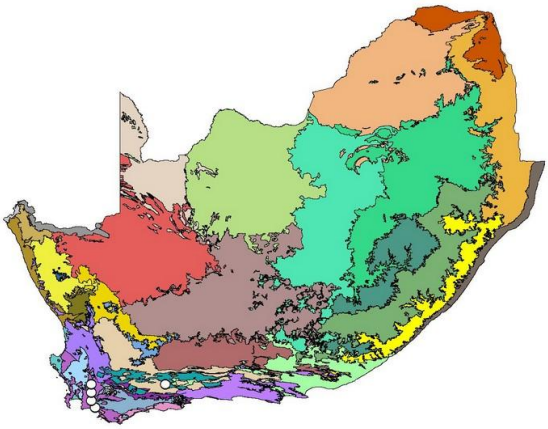
[E]*Liparia latifolia* (Benth.) A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 0.7–1.5; Alt 666–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (60)	<400; 400–800 (20)
Min temp (°C)	2–8 (60)	0–4 (40)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (40)	>7.5 (20)
ESP	Non (100)	
QDGCs	3319; 3419 (40)	3321 (20)

NOTES: –



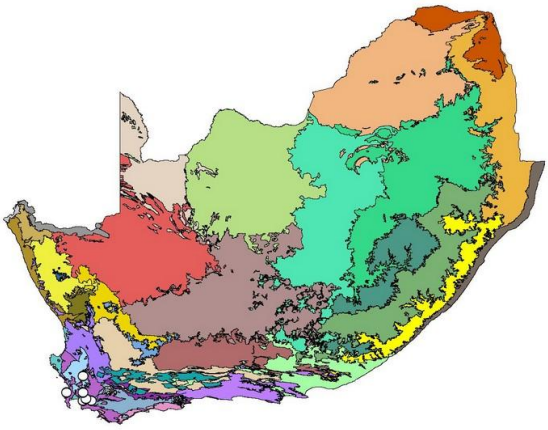
[E]*Liparia myrtifolia* Thunb.

Podalyrieae ①

Shrub; P; Ht 1–3; Alt 300–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000; >800 (40)	200–600 (20)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (42)	3418; 3419 (29)

NOTES: –



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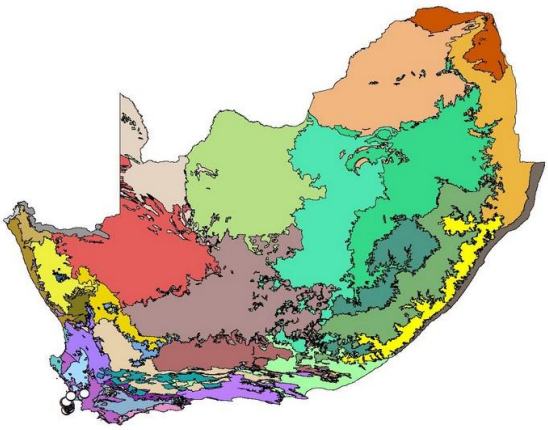
[E]*Liparia parva* Vogel ex Walp.

Podalyrieae ①

Dwarf shrub; P; Ht 0.15–2; Alt 25–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (50)	200–600; 400–800 (25)
Min temp (°C)	>6 (75)	2–8 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3418 (92)	3318 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** All seasons (Kidd 2002).



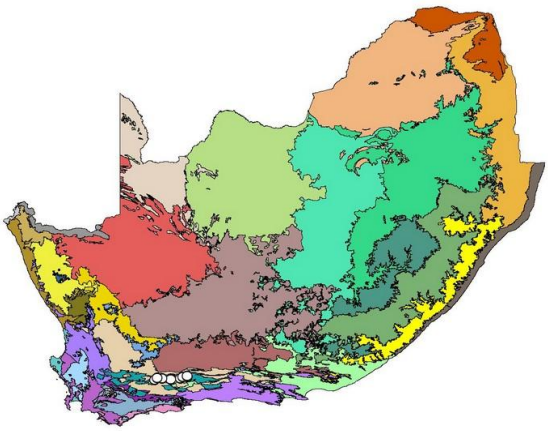
[E]*Liparia racemosa* A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 3–4; Alt 1464–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (60)	6.5–8.4 (40)
ESP	Ecotone	
QDGCs	3321 (67)	3322 (33)

NOTES: –



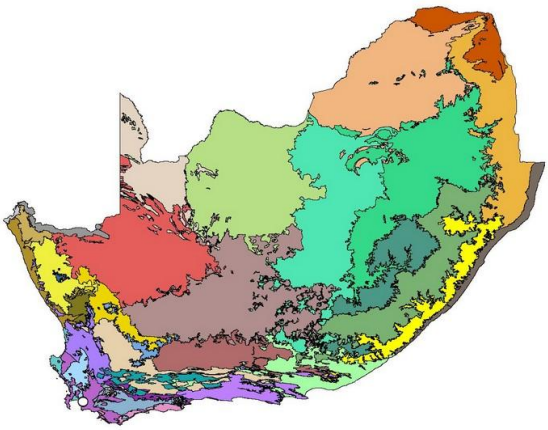
[E]*Liparia rafnioides* A.L.Schutte

Podalyrieae ①

Shrub; P; Ht 0.01–4; Alt 500–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3418 (100)	

NOTES: –



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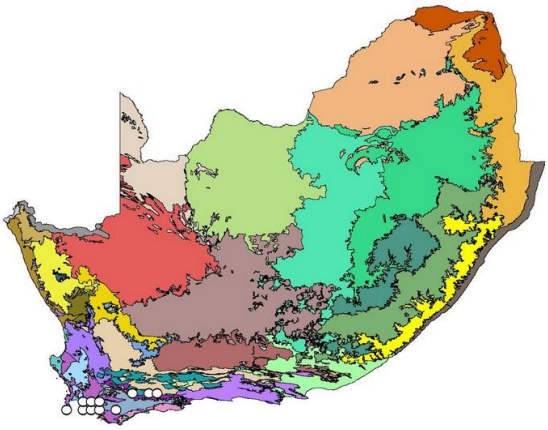
[E]*Liparia splendens* (Burm.f.) Bos & de Wit subsp. *comantha* (Eckl. & Zeyh.) Bos & de Wit **Podalyrieae** ①

Shrub; P; Ht 0.3–0.9; Alt 125–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (36)	200–600; >800 (27)
Min temp (°C)	2–8 (82)	>6 (18)
Max temp (°C)	25–29 (91)	27–35 (9)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (55)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	3419 (45)	3418 (27)

NOTES: **Flowering:** All seasons (Mustart *et al.* 2003).

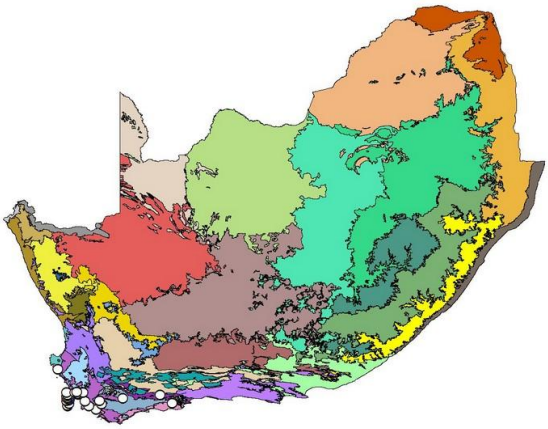


[E]*Liparia splendens* (Burm.f.) Bos & de Wit subsp. *splendens* **Podalyrieae** ①

Shrub; P; Ht 0.3–2.5; Alt 100–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (31)	200–600; 600–1000 (23)
Min temp (°C)	2–8 (54)	>6 (46)
Max temp (°C)	25–29 (85)	27–35 (15)
Phosphorus (ppm)	5–35 (92)	<10 (8)
pH	<6.4 (69)	5.5–7.4 (15)
ESP	Non (100)	
QDGCs	3418 (45)	3318 (37)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** All seasons (Mustart *et al.* 2003).

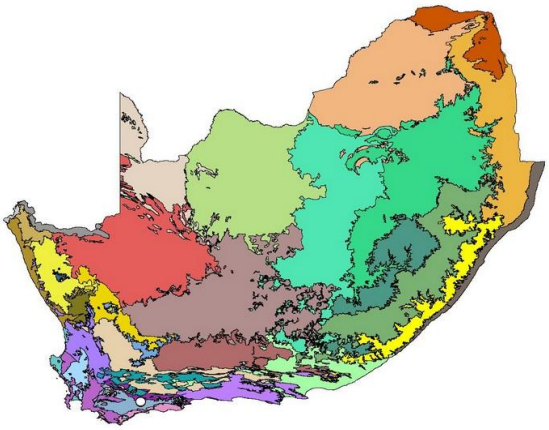


[E]*Liparia striata* A.L.Schutte **Podalyrieae** ①

Shrub; P; Ht 0.01–1; Alt ?–200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3420 (100)	

NOTES: –



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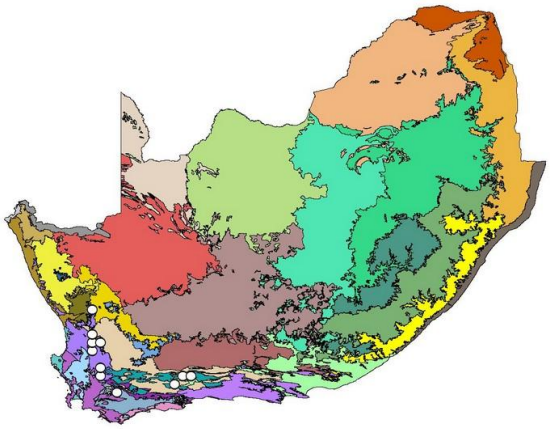
[E]*Liparia umbellifera* Thunb.

Podalyrieae ①

Shrub; P; Ht 1–5; Alt 1000–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (45)	200–600 (36)
Min temp (°C)	2–8 (73)	0–4 (27)
Max temp (°C)	25–29 (64)	27–35 (36)
Phosphorus (ppm)	5–35 (73)	>20 (27)
pH	5.5–7.4 (36)	<6.4; 6.5–8.4; >7.5 (18)
ESP	Non (100)	
QDGCs	3219 (36)	3319 (27)

NOTES: –



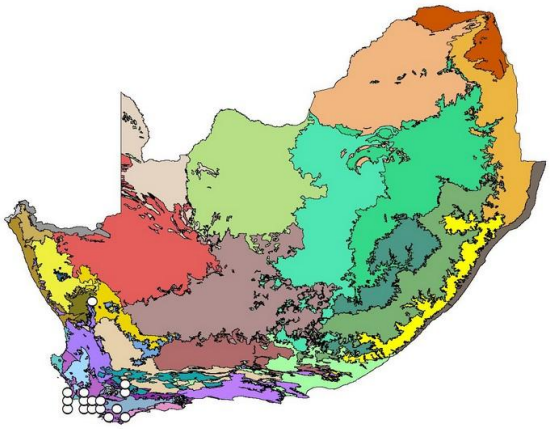
[E]*Liparia vestita* Thunb.

Podalyrieae ①

Shrub; P; Ht 1–2.5; Alt 100–1067

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (31)	200–600; 600–1000; >800 (19)
Min temp (°C)	2–8 (69)	>6 (31)
Max temp (°C)	25–29 (94)	27–35 (6)
Phosphorus (ppm)	5–35 (88)	<10; >20 (6)
pH	<6.4 (56)	5.5–7.4 (19)
ESP	Non (100)	
QDGCs	3419 (38)	3418 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



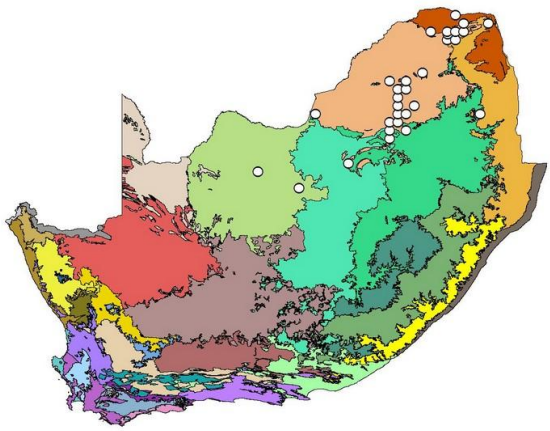
Listia bainesii (Baker) B.-E.van Wyk & Boatwr.

Crotalarieae ③

Herb, climber, creeper; P; Ht 0.12–6; Alt 945–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (80)	Eastern Kalahari Bushveld (13)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (69)	200–600 (17)
Min temp (°C)	2–8 (69)	<2 (14)
Max temp (°C)	27–35 (59)	25–29 (41)
Phosphorus (ppm)	<10 (62)	5–35 (38)
pH	<6.4 (48)	5.5–7.4 (28)
ESP	Non (100)	
QDGCs	2528 (27)	2428 (17)

NOTES: **Livestock feed** (Ogwang 1985; Thro *et al.* 1987; Lewis *et al.* 2005). **Cultivated** (Glen 2002); Low P levels (Pang *et al.* 2010). **DM:** 3.8 t/ha (Clatworthy & Madakadze 1988). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Law & Strijdom 1984; Jaftha *et al.* 2000); *Rhizobium* isolates (Ardley *et al.* 2009); 62 kg/ha/yr (Stewart 1977). **Soil conservation:** Reinforcement (Clatworthy 1980). **Breeding** (Real & Altier 2005). **Ecology:** Seed (Gardener *et al.* 1993).



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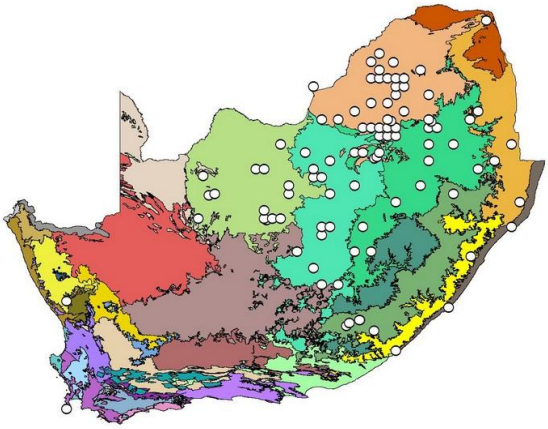
***Listia heterophylla* E. Mey.** **Crotalarieae** ③

Herb; P; Ht 0.05–0.6; Alt 30–1708

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (33)	Eastern Kalahari Bushveld (24)
Biome	Savanna (55)	Grassland (42)
Rainfall (mm)	400–800 (74)	<400 (9)
Min temp (°C)	<2 (40)	2–8 (31)
Max temp (°C)	27–35 (56)	25–29 (31)
Phosphorus (ppm)	<10 (88)	5–35 (11)
pH	<6.4 (48)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2428; 2528; 2627 (6)	2527; 2824 (5)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967); *Rhizobium* isolates (Yates *et al.* 2007; Ardley *et al.* 2009). **Soil conservation:** Reinforcement (Clatworthy 1980, 1984). **Flowering:** Spring, summer, autumn (Pooley 1998; Germishuizen & Clarke 2003).

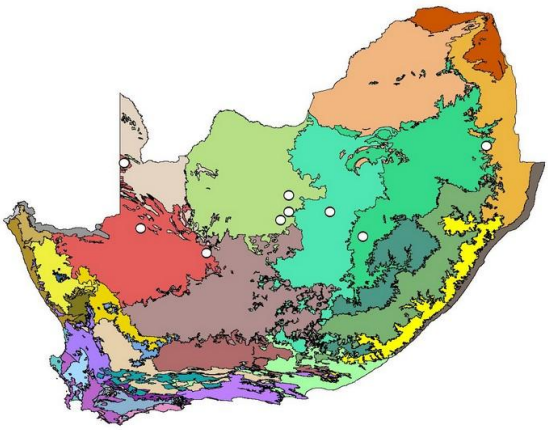


***Listia marlothii* (Engl.) B.-E.van Wyk & Boatwr.** **Crotalarieae** ①

Herb; P; Ht ?; Alt 640–1340

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (49)	Dry Highveld Grassland; Mesic Highveld Grassland; Bushmanland (17)
Biome	Grassland; Nama-Karoo; Savanna (33)	
Rainfall (mm)	400–800 (56)	<400 (33)
Min temp (°C)	<2 (56)	2–8 (33)
Max temp (°C)	27–35 (56)	25–29; >33 (22)
Phosphorus (ppm)	<10 (67)	5–35 (22)
pH	>7.5 (56)	<6.4 (22)
ESP	Non (100)	
QDGCs	2620; 2631; 2725; 2820; 2824; 2825; 2826; 2922; 2927 (11)	

NOTES: –

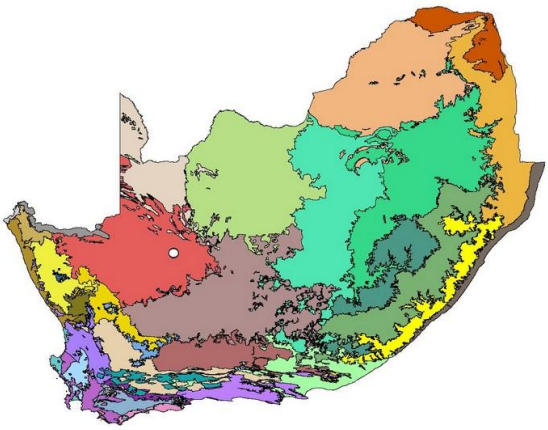


[E]*Listia minima* (B.-E.van Wyk) B.-E.van Wyk & Boatwr. **Crotalarieae** ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (100)	
Biome	Nama-Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	<2 (100)	
Max temp (°C)	>33 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Non (100)	
QDGCs	2921 (100)	

NOTES: –



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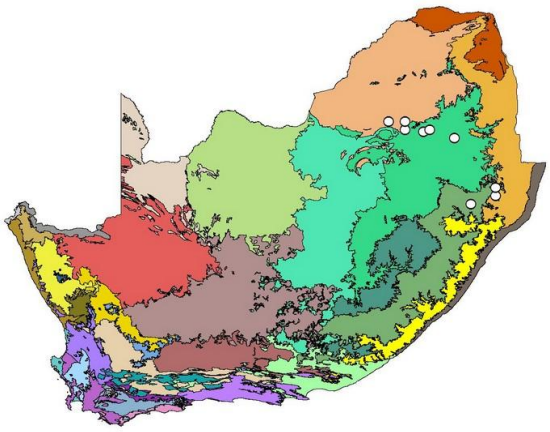
[E]*Listia solitudinis* (Dummer) B.-E.van Wyk & Boatwr. — Crotalarieae ①

Herb; P; Ht ?; Alt 915–2200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (60)	Sub-Escarpment Grassland (20)
Biome	Grassland (100)	
Rainfall (mm)	400–800 (78)	600–1000; >800 (12)
Min temp (°C)	0–4; 2–8 (44)	<2 (12)
Max temp (°C)	25–29 (56)	27–35 (33)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2528 (33)	2529; 2731 (22)

NOTES: **N_2 fixation:** *Rhizobium* isolates (Yates *et al.* 2007; Ardley *et al.* 2009).

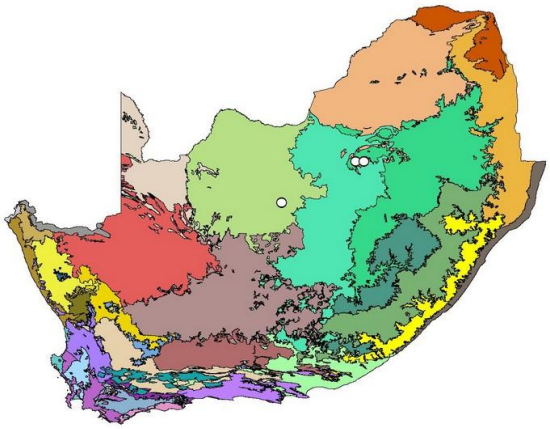


[E]*Listia subulata* (B.-E.van Wyk) B.-E.van Wyk & Boatwr. — Crotalarieae ①

Herb, creeper; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	0–4 (67)	<2 (33)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (67)	>7.5 (33)
ESP	Non (100)	
QDGCs	2627 (67)	2824 (33)

NOTES: –

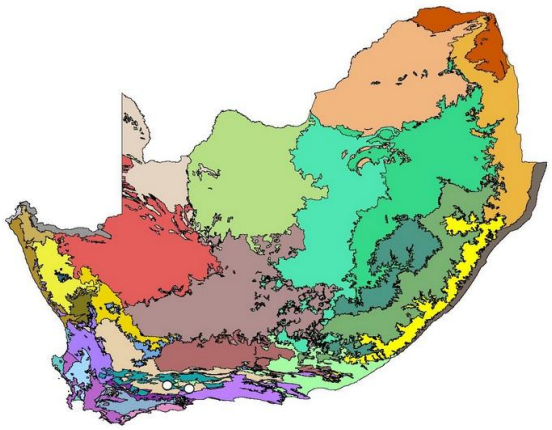


[E]*Lotononis acocksii* B.-E.van Wyk — Crotalarieae ①

Dwarf shrub; P; Ht 0.5–1; Alt ?–290

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3321; 3322 (50)	

NOTES: –



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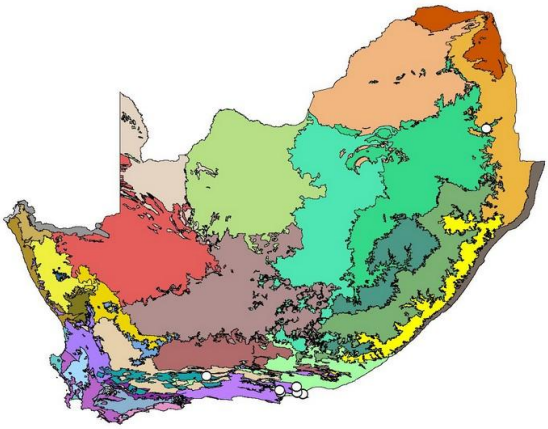
[E]*Lotononis acuminata* Eckl. & Zeyh. — Crotalarieae — ①

Dwarf shrub, herb; P; Ht 0.15–0.2; Alt 30–1654

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (50)	200–600 (33)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (66)	<10; >20 (14)
pH	6.5–8.4 (50)	<6.4 (33)
ESP	Ecotone	
QDGCs	3325 (43)	3324 (29)

NOTES: –



[E]*Lotononis acutiflora* Benth. — Crotalarieae — –

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

Lotononis affinis Burtt Davy — Crotalarieae — –

No records

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

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[E]*Lotononis alpina* (Eckl. & Zeyh.) B.-E.van Wyk subsp. *alpina* **Crotalarieae** –

Shrub; P; Ht 0.01–1.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

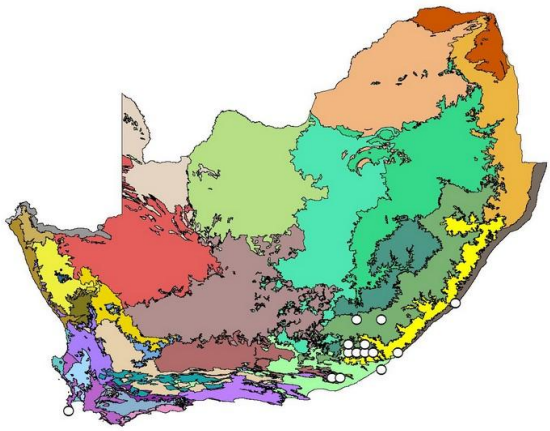
NOTES: –

[E]*Lotononis alpina* (Eckl. & Zeyh.) B.-E.van Wyk subsp. *multiflora* (Eckl. & Zeyh.) B.-E.van Wyk **Crotalarieae** ①

Dwarf shrub; P; Ht 0.6–1.5; Alt 61–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Southwest Fynbos; Sub-Escarpment Grassland (33)	
Biome	Grassland (50)	Albany Thicket; Fynbos (25)
Rainfall (mm)	400–800 (64)	600–1000 (21)
Min temp (°C)	2–8 (50)	>6 (29)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (79)	<10 (21)
pH	<6.4 (57)	5.5–7.4 (43)
ESP	Non (100)	
QDGCs	3227 (29)	3127; 3226; 3326 (14)

NOTES: –

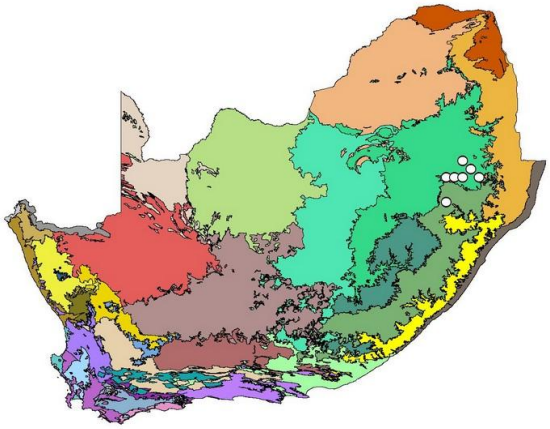


[E]*Lotononis amajubica* (Burtt Davy) B.-E.van Wyk **Crotalarieae** ①

Dwarf shrub; P; Ht ?; Alt 763–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (80)	Sub-Escarpment Grassland (20)
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (86)	>800 (14)
Min temp (°C)	0–4 (86)	2–8 (14)
Max temp (°C)	25–29 (57)	<27 (29)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2730 (58)	2630; 2729; 2829 (14)

NOTES: **Flowering:** Spring, summer (Pooley 1998).



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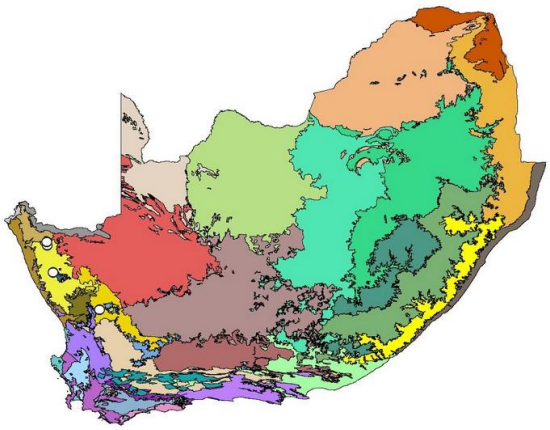
[E]*Lotononis arenicola* Schltr.

Crotalarieae ①

Herb; A; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	>20 (75)	5–35 (25)
pH	6.5–8.4 (50)	6.5–7.4; >7.5 (25)
ESP	Medium (100)	
QDGCs	2917 (50)	3017; 3119 (25)

NOTES: –



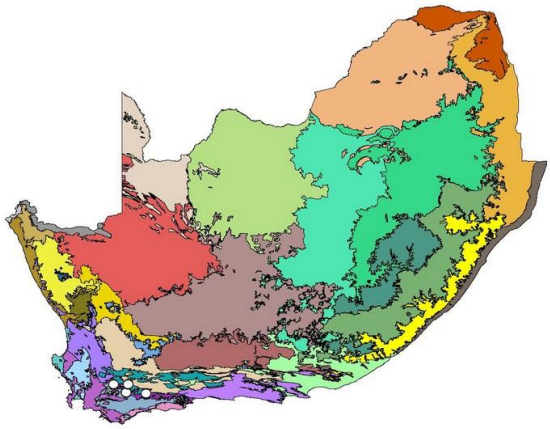
[E]*Lotononis argentea* Eckl. & Zeyh.

Crotalarieae ①

Dwarf shrub, herb; P; Ht 0.01–0.15; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	<400 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3320 (75)	3319 (25)

NOTES: –



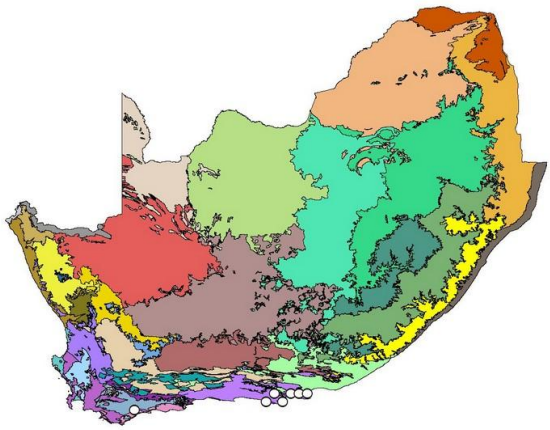
[E]*Lotononis azurea* (Eckl. & Zeyh.) Benth.

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.3; Alt 60–1160

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (86)	200–600 (14)
Min temp (°C)	>6 (57)	2–8 (43)
Max temp (°C)	25–29 (86)	<27 (14)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 6.5–8.4 (43)	5.5–7.4 (14)
ESP	Ecotone	
QDGCs	3325 (43)	3424 (29)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Moriarty 1982; Manning 2001).



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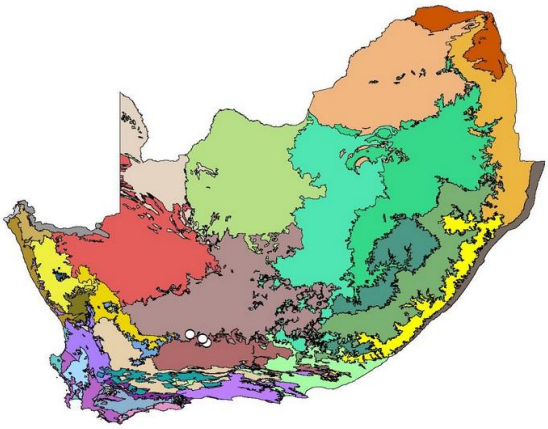
[E]*Lotononis azureoides* B.-E.van Wyk

Crotalarieae ②

Dwarf shrub; P; Ht 0.01–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Nama-Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3222 (100)	

NOTES: **Livestock feed** (Shearing & Van Heerden 1997). **DM:** Low production (Shearing & Van Heerden 1997).



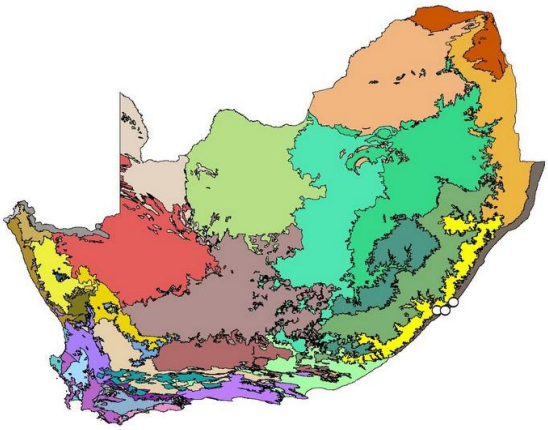
[E]*Lotononis bachmanniana* Dummer

Crotalarieae ①

Herb; P; Ht 0.01–0.2; Alt 15–450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3129 (67)	3130 (33)

NOTES: **Flowering:** Autumn (Pooley 1998).



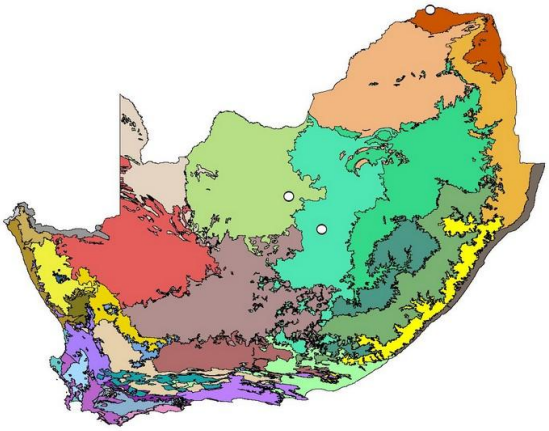
Lotononis brachyantha Harms

Crotalarieae ①

Herb; P; Ht 0.01–0.4; Alt 1250–1524

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland; Eastern Kalahari Bushveld; Mopane (33)	
Biome	Savanna (67)	Grassland (33)
Rainfall (mm)	400–800 (67)	<400 (33)
Min temp (°C)	<2 (67)	2–8 (33)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	6.5–8.4 (100)	
ESP	Non (100)	
QDGCs	2229; 2725; 2826 (33)	

NOTES: –



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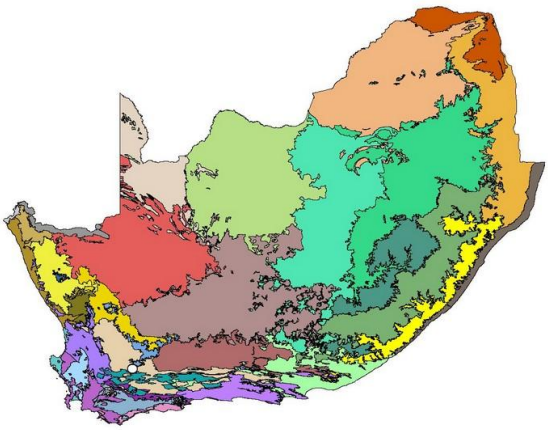
[E]*Lotononis brevicaulis* B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3320 (100)	

NOTES: –



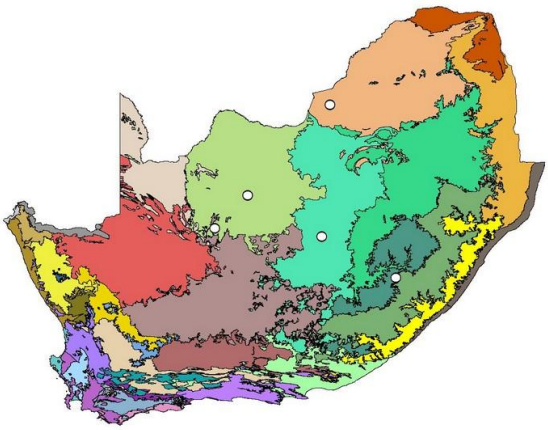
[E]*Lotononis burchellii* Benth.

Crotalarieae ①

Herb; P; Ht ?; Alt ?–1068

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland; Central Bushveld; Eastern Kalahari Bushveld (33)	
Biome	Grassland; Savanna (50)	
Rainfall (mm)	<400; 400–800 (40)	>800 (20)
Min temp (°C)	<2 (80)	0–4 (20)
Max temp (°C)	27–35 (80)	<27 (20)
Phosphorus (ppm)	<10 (100)	
pH	6.5–7.4 (40)	<6.4; 5.5–7.4; 6.5–8.4 (20)
ESP	Non (100)	
QDGCs	2526; 2723; 2822; 2926; 3028 (20)	

NOTES: –



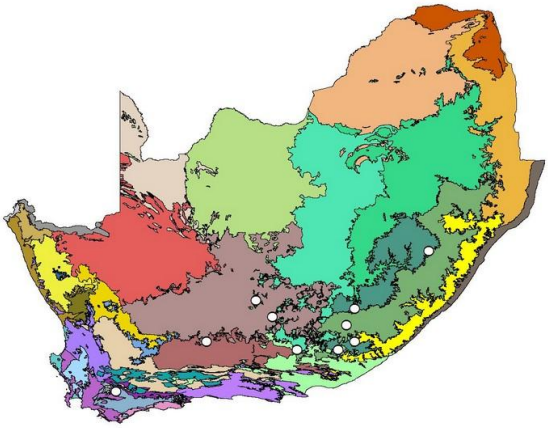
[E]*Lotononis caerulescens* (E.Mey.) B.-E.van Wyk

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.2–0.5; Alt 1068–1678

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (40)	<400 (30)
Min temp (°C)	<2; 0–4 (40)	2–8 (20)
Max temp (°C)	25–29 (70)	27–35 (20)
Phosphorus (ppm)	5–35 (60)	<10; >20 (20)
pH	6.5–7.4; 6.5–8.4 (30)	<6.4 (20)
ESP	Non (100)	
QDGCs	3124 (20)	2929; 3126; 3127; 3222; 3225; 3226; 3227; 3319 (10)

NOTES: –



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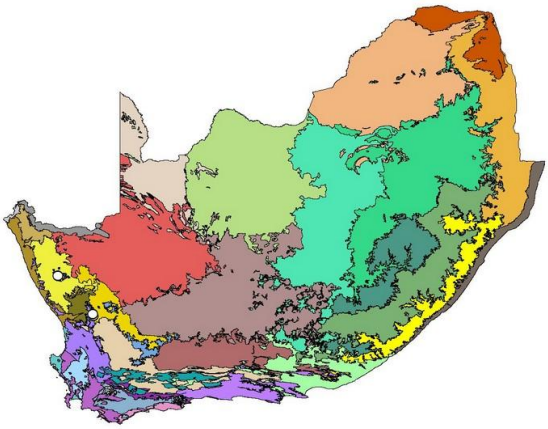
[E]*Lotononis carnea* B.-E.van Wyk

Crotalarieae ①

Herb, creeper; A; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	>20 (100)	
pH	6.5–8.4 (67)	>7.5 (33)
ESP	Ecotone	
QDGCs	3119 (67)	3018 (33)

NOTES: –



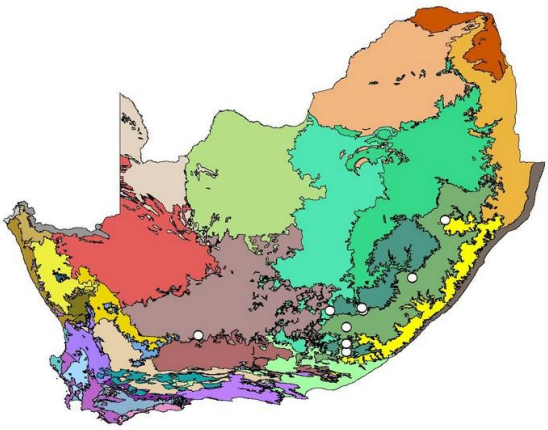
[E]*Lotononis carnosa* (Eckl. & Zeyh.) Benth. subsp. *carnosa*

Crotalarieae ☠ ①

Dwarf shrub, shrub; P; Ht 0.3–1.5; Alt 1342–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (63)	600–1000 (25)
Min temp (°C)	0–4 (63)	<2 (25)
Max temp (°C)	25–29 (74)	<27; 27–35 (13)
Phosphorus (ppm)	5–35 (50)	<10 (38)
pH	5.5–7.4 (48)	<6.4; 6.5–7.4; 6.5–8.4; >7.5 (13)
ESP	Non (100)	
QDGCs	3126; 3127; 3226 (22)	2829; 3028; 3222 (11)

NOTES: **Antiquality:** Hydrocyanic acid (Watt & Breyer-Brandwijk 1962).



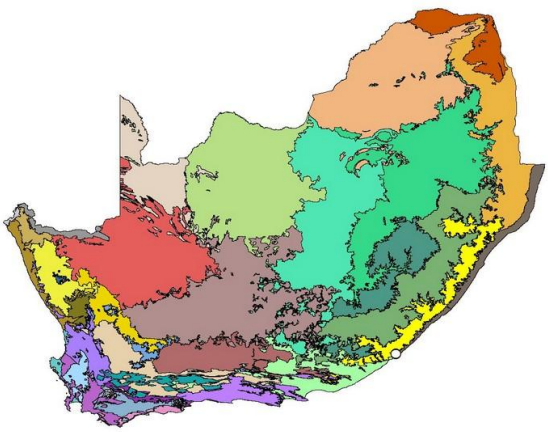
[E]*Lotononis carnosa* (Eckl. & Zeyh.) Benth. subsp. *condensata* (Harv.) B.-E.van Wyk

Crotalarieae ☠ ①

Dwarf shrub, shrub; P; Ht ?; Alt ?–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3228 (100)	

NOTES: **Antiquality:** Hydrocyanic acid (Watt & Breyer-Brandwijk 1962).



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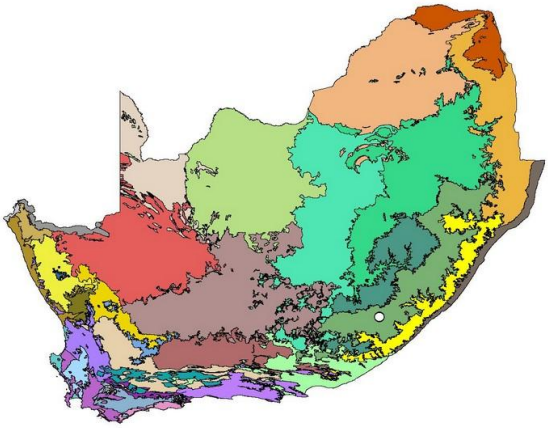
[E]*Lotononis carnosa* (Eckl. & Zeyh.) Benth. subsp. *latifolia* B.-E.van Wyk

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.6–0.9; Alt 854–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3127 (100)	

NOTES: –



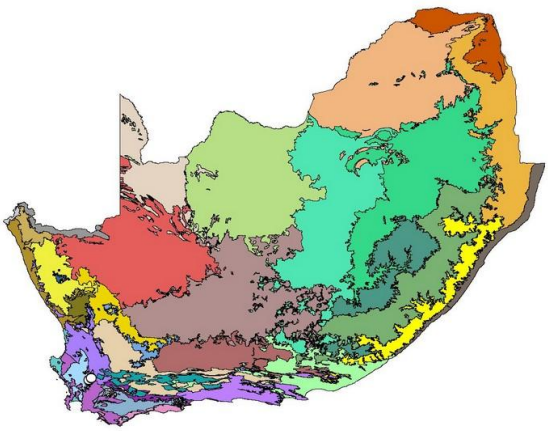
[E]*Lotononis complanata* B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



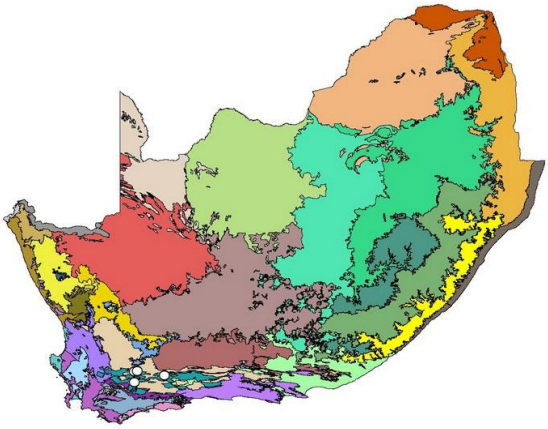
[E]*Lotononis comptonii* B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.2–0.4; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	5–35; >20 (50)	
pH	>7.5 (50)	6.5–7.4; 6.5–8.4 (25)
ESP	Ecotone	
QDGCs	3320 (80)	3321 (20)

NOTES: –



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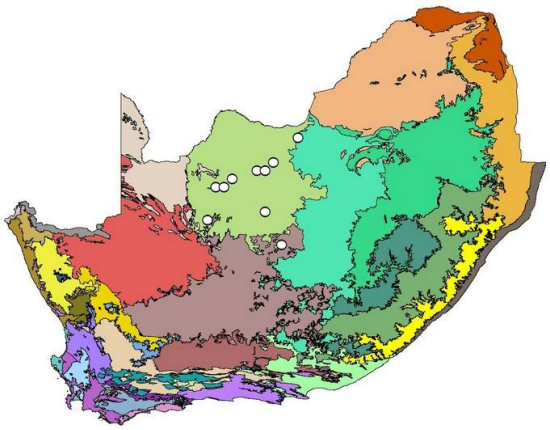
Lotononis crumanina Burch. ex Benth.

Crotalarieae ①

Herb; P; Ht 0.05–0.2; Alt 700–1190

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (60)	400–800 (30)
Min temp (°C)	<2 (80)	0–4 (20)
Max temp (°C)	27–35 (60)	>33 (40)
Phosphorus (ppm)	<10 (100)	
pH	6.5–7.4 (60)	6.5–8.4 (20)
ESP	Non (100)	
QDGCs	2723; 2724 (20)	2624; 2625; 2722; 2822; 2824; 2924 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



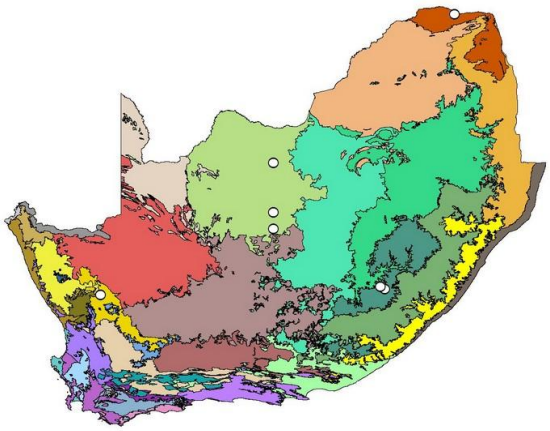
Lotononis curtii Harms

Crotalarieae ①

Herb; occ. P; Ht 0.01–0.02; Alt 800–1465

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (60)	Trans-Escarpment Succulent Karoo; Mopane (20)
Biome	Savanna (57)	Grassland (29)
Rainfall (mm)	<400 (58)	400–800; 600–1000; >800 (14)
Min temp (°C)	<2 (72)	2–8; >6 (14)
Max temp (°C)	27–35 (58)	<27; 25–29; >33 (14)
Phosphorus (ppm)	<10 (72)	5–35; >20 (14)
pH	<6.4 (43)	5.5–7.4; 6.5–8.4; >7.5 (29)
ESP	Non (80)	Medium (20)
QDGCs	2824 (30)	2230; 2624; 3019; 3027; 3028 (14)

NOTES: –



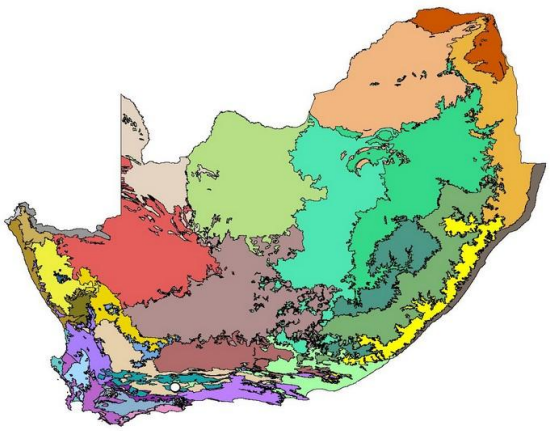
[E]*Lotononis dahlgrenii* B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.01–1.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3321 (100)	

NOTES: –



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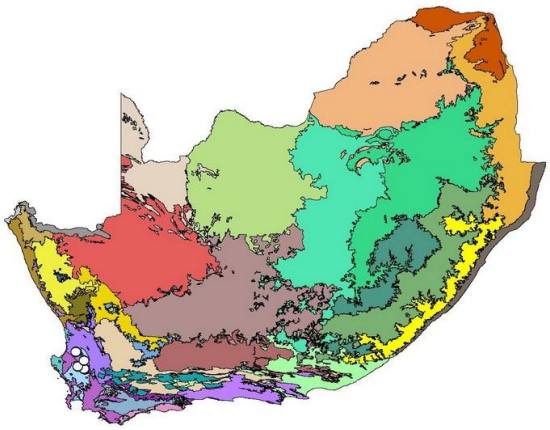
[E]*Lotononis densa* (Thunb.) Harv. subsp. *congesta* B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Coast Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (75)	6.5–7.4 (25)
ESP	Non (100)	
QDGCs	3318 (60)	3218 (40)

NOTES: –



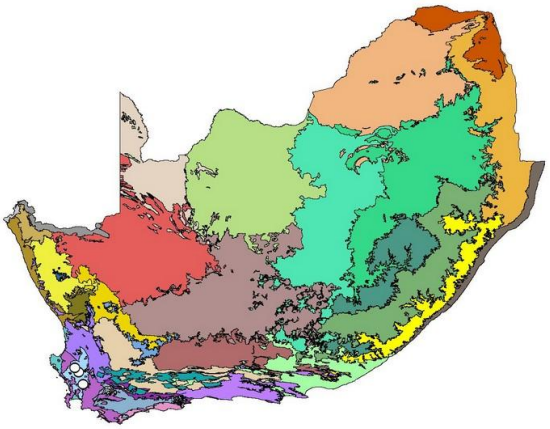
[E]*Lotononis densa* (Thunb.) Harv. subsp. *densa*

Crotalarieae ①

Shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Coast Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3318 (100)	

NOTES: –



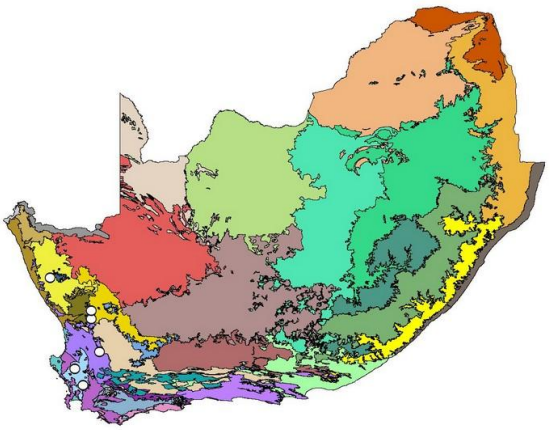
[E]*Lotononis densa* (Thunb.) Harv. subsp. *gracilis* (E.Mey.) B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.3–0.6; Alt 153–1160

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Coast Renosterveld; Namaqualand Hardeveld (50)	
Biome	Fynbos (67)	Succulent Karoo (33)
Rainfall (mm)	<400 (50)	200–600 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (83)	400–800 (17)
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	5.5–7.4 (32)	<6.4; 6.5–7.4; 6.5–8.4; >7.5 (17)
ESP	Non; Medium (50)	
QDGCs	3119; 3318 (33)	3017; 3219; (17)

NOTES: **Flowering:** Summer (Van Rooyen 2001).



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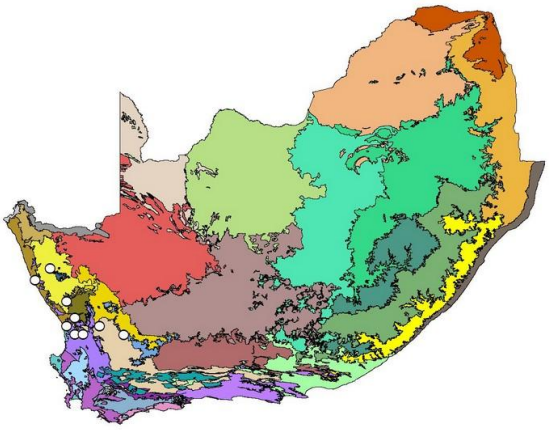
[E]*Lotononis densa* (Thunb.) Harv. subsp. *leucoclada* (Schltr.) B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.3–1.2; Alt 120–122

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Rainshadow Valley Karoo (100)	
Biome	Succulent Karoo (80)	Fynbos (20)
Rainfall (mm)	<400 (89)	200–600 (11)
Min temp (°C)	>6 (56)	2–8 (33)
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	6.5–8.4 (33)	5.5–7.4; 6.5–7.4; >7.5 (22)
ESP	High (100)	
QDGCs	3118 (33)	3017; 3218 (22)

NOTES: –



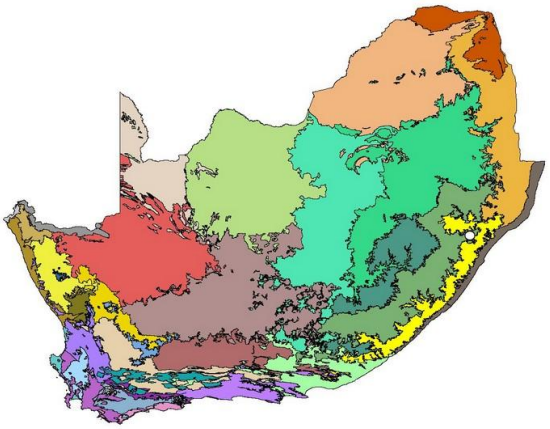
[E]*Lotononis dichiloides* Sond.

Crotalarieae ①

Herb; P; Ht ?; Alt 122–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2930 (100)	

NOTES: –



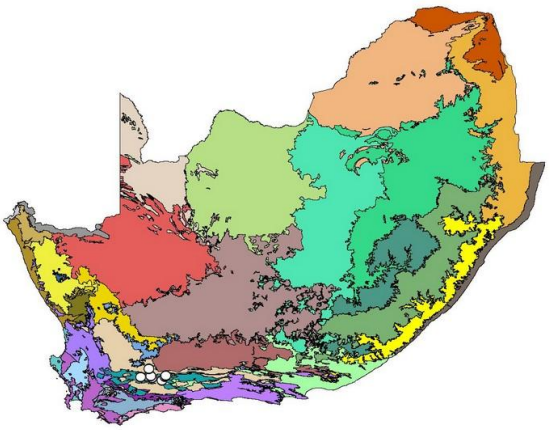
[E]*Lotononis dissitinodis* B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.3–1.2; Alt 700–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Rainshadow Valley Karoo (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (75)	25–29 (25)
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	High (100)	
QDGCs	3320 (57)	3321 (43)

NOTES: –



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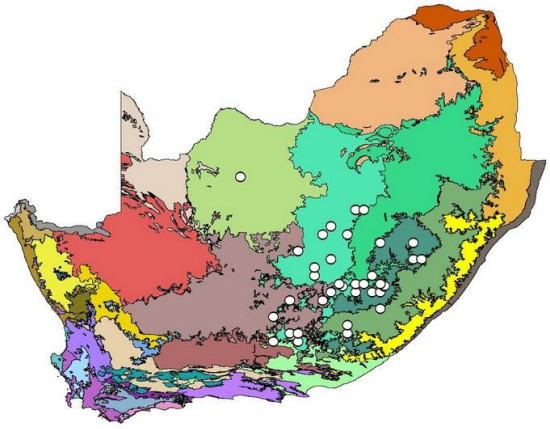
Lotononis divaricata (Eckl. & Zeyh.) Benth.

Crotalarieae ②

Shrub; P; Ht 0.6–2; Alt 1372–2745

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (60)	Drakensberg Grassland (20)
Biome	Grassland (96)	Savanna (4)
Rainfall (mm)	400–800 (35)	200–600; 600–1000 (21)
Min temp (°C)	<2 (79)	0–4 (18)
Max temp (°C)	27–35 (44)	25–29 (38)
Phosphorus (ppm)	<10 (62)	5–35 (35)
pH	6.5–7.4; 6.5–8.4 (29)	<6.4 (18)
ESP	Non (100)	
QDGCs	3027 (22)	3225 (11)

NOTES: **Livestock feed:** Highly palatable, high nutritional value (Le Roux *et al.* 1994). **DM:** Good production (Le Roux *et al.* 1994). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



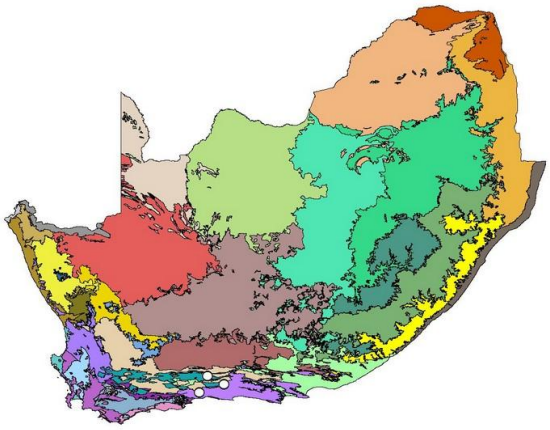
[E]*Lotononis elongata* (Thunb.) D.Dietr.

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.2; Alt ?–1647

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (67)	600–1000 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	<6.4 (67)	>7.5 (33)
ESP	Ecotone	
QDGCs	3322 (67)	3323 (33)

NOTES: –



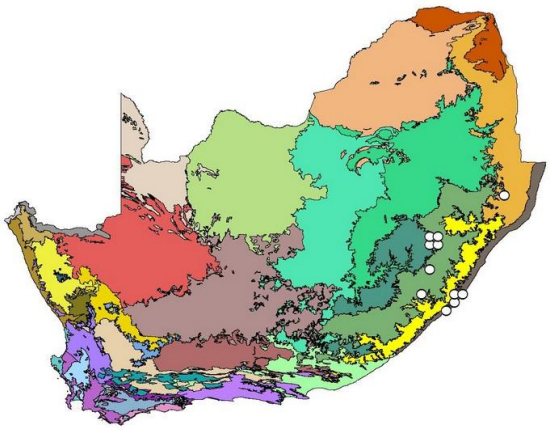
Lotononis eriocarpa (E.Mey.) B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.08–2; Alt 240–1967

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Drakensberg Grassland; Sub-Escarpment Grassland; Lowveld (25)	
Biome	Grassland (83)	Indian Ocean (17)
Rainfall (mm)	>800 (91)	400–800 (9)
Min temp (°C)	>6 (36)	0–4 (27)
Max temp (°C)	25–29 (64)	<27 (27)
Phosphorus (ppm)	<10 (55)	5–35 (45)
pH	<6.4 (91)	5.5–7.4 (9)
ESP	Non (100)	
QDGCs	2929 (36)	3029; 3030 (18)

NOTES: **Flowering:** All seasons (Pooley 1998).



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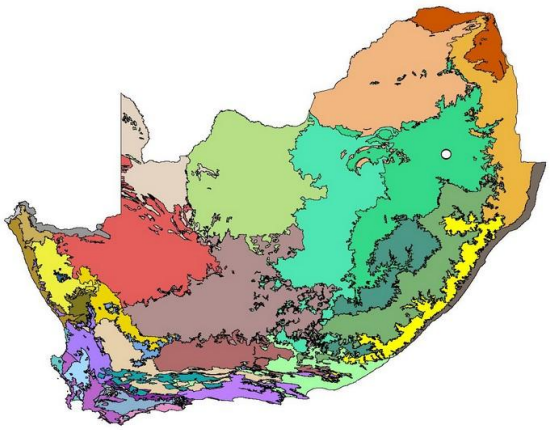
[E]*Lotononis evansiana* Burtt Davy

Crotalarieae ①

No records

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	<2 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2629 (100)	

NOTES: –



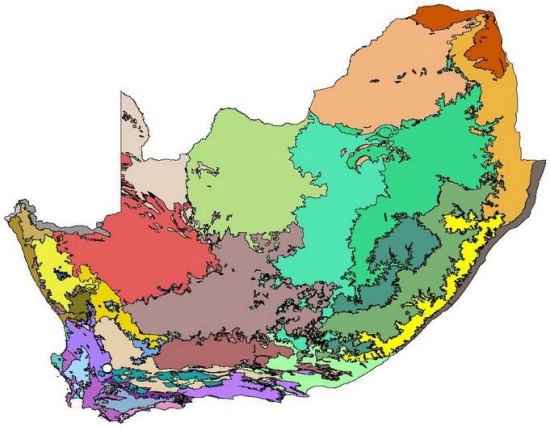
[E]*Lotononis exstipulata* L.Bolus

Crotalarieae ①

Herb; P; Ht 0.01–0.1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



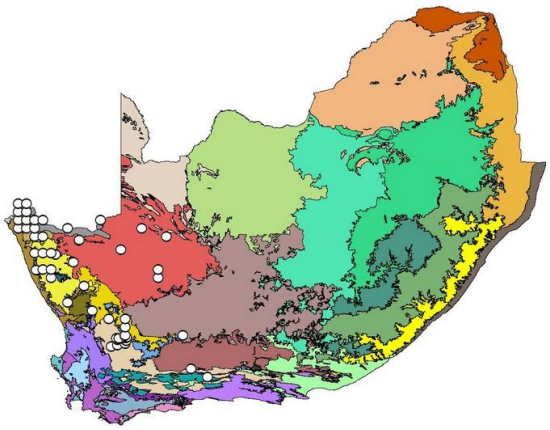
Lotononis falcata (E.Mey.) Benth.

Crotalarieae ①

Herb; P; Ht 0.1–0.5; Alt 90–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (32)	Rainshadow Valley Karoo (21)
Biome	Succulent Karoo (71)	Nama-Karoo (21)
Rainfall (mm)	<400 (98)	200–600 (2)
Min temp (°C)	>6 (40)	2–8 (36)
Max temp (°C)	27–35 (42)	25–29 (33)
Phosphorus (ppm)	>20 (80)	5–35 (20)
pH	>7.5 (80)	6.5–8.4 (11)
ESP	Medium (37)	Non; High (32)
QDGCs	3220 (15)	2817 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



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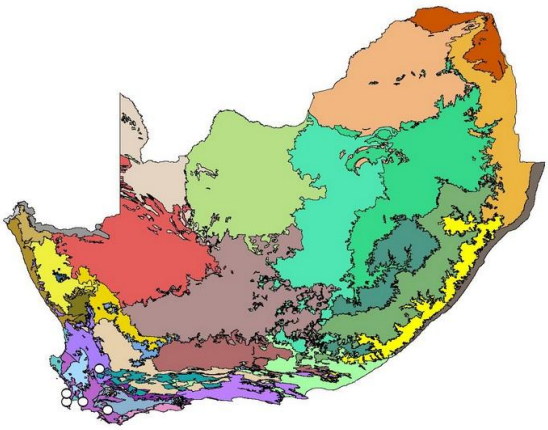
[E]*Lotononis fastigiata* (E.Mey.) B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.4; Alt 30–244

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (40)	>800 (20)
Min temp (°C)	2–8; >6 (40)	0–4 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (80)	<10 (20)
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Ecotone	
QDGCs	3418 (40)	3318; 3319; 3419 (20)

NOTES: **Flowering:** Summer (Kidd 2002).



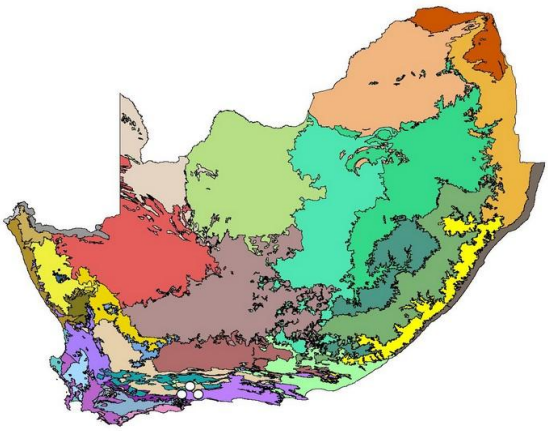
[E]*Lotononis filiformis* B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt 488–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600; 600–1000 (33)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (67)	29–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4; 6.5–8.4 (33)	
ESP	Ecotone	
QDGCs	3322 (67)	3321 (33)

NOTES: **Flowering:** Summer (Moriarty 1997).



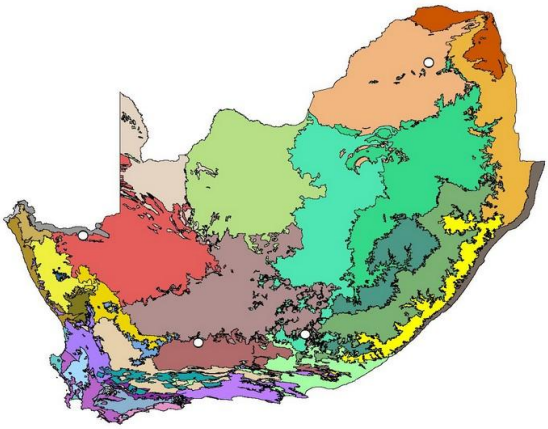
[E]*Lotononis fruticoides* B.-E.van Wyk

Crotalarieae ①

Herb; A; Ht 0.3–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (50)	200–600; 400–600 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	27–35 (75)	>33 (25)
Phosphorus (ppm)	5–35; >20 (50)	
pH	>7.5 (50)	<6.4; 6.5–7.4 (25)
ESP	Non (100)	
QDGCs	2329; 2918; 3222; 3225 (25)	

NOTES: –



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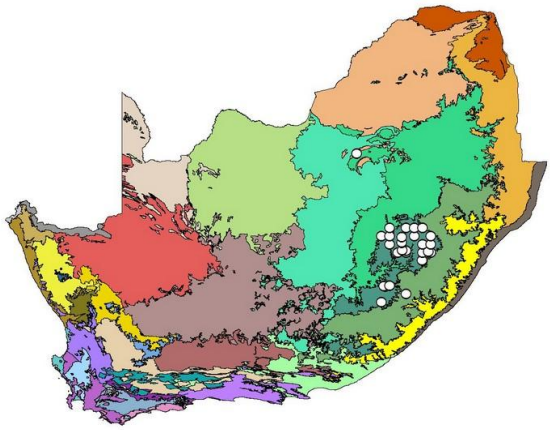
Lotononis galpinii Dummer

Crotalarieae ③

Dwarf shrub, shrub, herb; P; Ht 0.2–1.8; Alt 1647–3447

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (84)	Mesic Highveld Grassland; Sub-Escarpment Grassland (8)
Biome	Grassland (100)	
Rainfall (mm)	>800 (61)	600–1000 (22)
Min temp (°C)	<2 (83)	0–4 (17)
Max temp (°C)	<27 (83)	25–29 (13)
Phosphorus (ppm)	<10 (96)	5–35 (4)
pH	<6.4 (91)	5.5–7.4 (9)
ESP	Non (100)	
QDGCs	2928 (34)	2929 (28)

NOTES**: Livestock feed** (Pooley 2003). **Cultivated** (Glen 2002). **Flowering:** Summer (Pooley 1998).



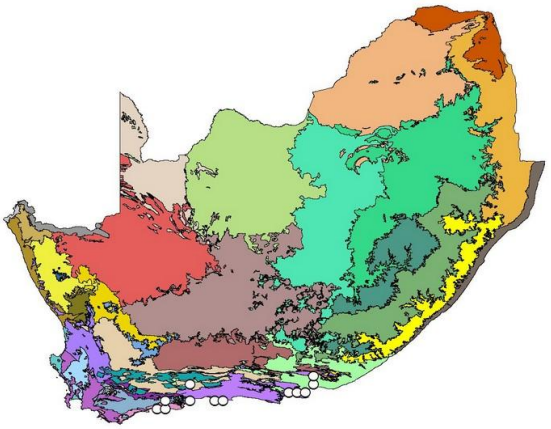
[E]*Lotononis glabra* (Thunb.) D.Dietr.

Crotalarieae ①

Herb; P; Ht 0.05–0.25; Alt 15–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; South Coast Fynbos; Eastern Fynbos-Renosterveld (33)	
Biome	Fynbos (83)	Albany Thicket (17)
Rainfall (mm)	400–800 (42)	200–600 (33)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (67)	<27 (25)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (42)	<6.4 (33)
ESP	Non (67)	Medium (33)
QDGCs	3325 (42)	3421 (25)

NOTES: –



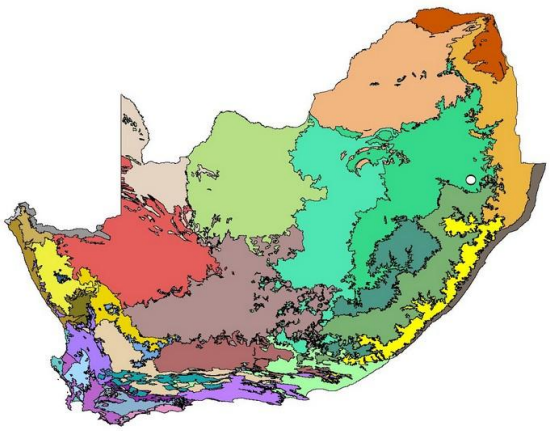
[E]*Lotononis glabrescens* (Dummer) B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht ?; Alt ?–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2730 (100)	

NOTES: –



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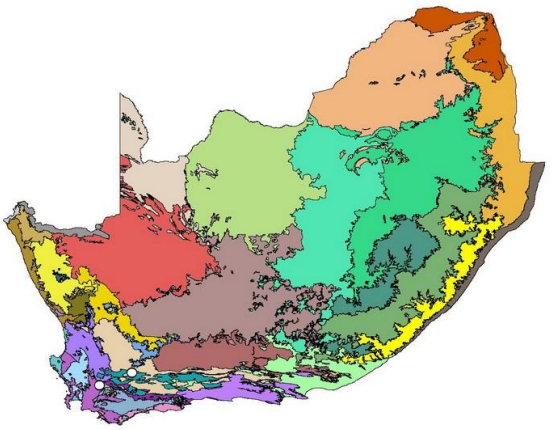
[E]*Lotononis gracilifolia* B.-E.van Wyk — Crotalarieae — ①

Dwarf shrub; P; Ht 0.01–0.15; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–8.4 (50)	
ESP	Ecotone	
QDGCs	3319; 3320 (50)	

NOTES: –



[E]*Lotononis harveyi* B.-E.van Wyk — Crotalarieae — –

Dwarf shrub, shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

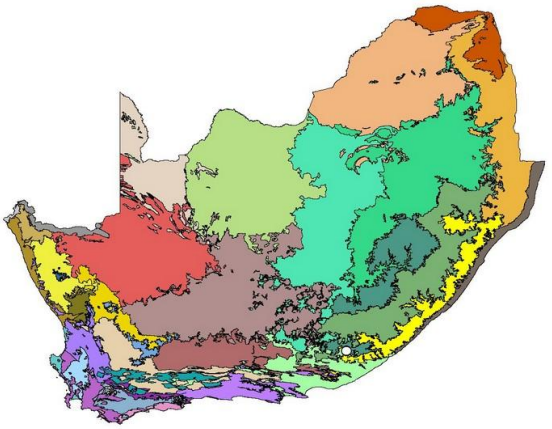
NOTES: –

[E]*Lotononis holosericea* (E.Mey.) B.-E.van Wyk — Crotalarieae — ①

Shrub; P; Ht 1–2; Alt 1647–1769

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3226 (100)	

NOTES: –



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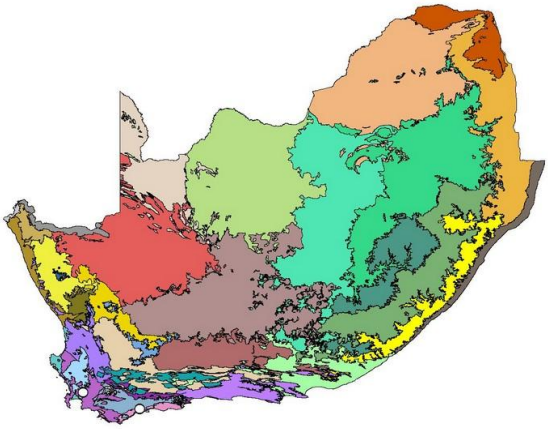
[E]*Lotononis involucrata* (P.J.Bergius) Benth. subsp. *bracteata* B.-E.van Wyk

Crotalarieae ①

Herb; P; Ht 0.01–0.35; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3318; 3420 (50)	

NOTES: **Antiquality:** Hydrocyanic acid in fresh plant (Steyn 1934). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



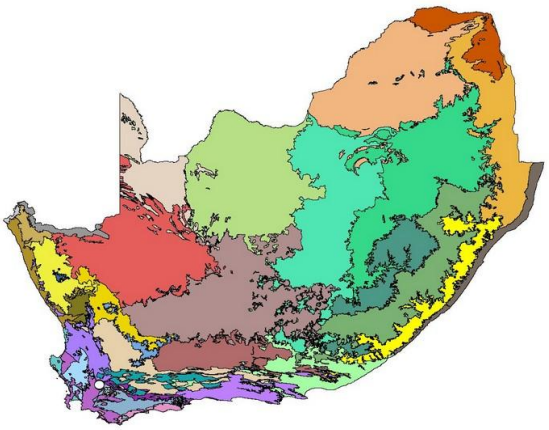
[E]*Lotononis involucrata* (P.J.Bergius) Benth. subsp. *digitata* B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: **Antiquality:** Hydrocyanic acid in fresh plant (Steyn 1934). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



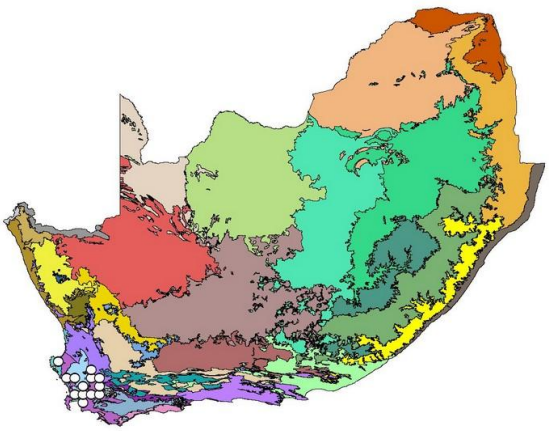
[E]*Lotononis involucrata* (P.J.Bergius) Benth. subsp. *involucrata*

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt 61–458

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (46)	400–800 (23)
Min temp (°C)	0–4 (46)	2–8 (31)
Max temp (°C)	25–29 (85)	27–35 (15)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (62)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	3319 (46)	3318 (38)

NOTES: **Antiquality:** Hydrocyanic acid in fresh plant (Steyn 1934). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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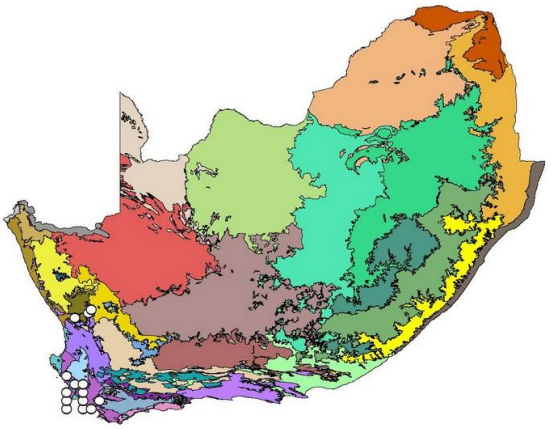
[E]*Lotononis involucrata* (P.J.Bergius) Benth. subsp. *peduncularis* (E.Mey.) B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.3; Alt 6–305

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (31)	600–1000 (23)
Min temp (°C)	>6 (54)	2–8 (46)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (85)	>20 (15)
pH	<6.4 (76)	5.5–7.4; 6.5–8.4; >7.5 (8)
ESP	Non (100)	
QDGCs	3318 (36)	3418 (29)

NOTES: **Antiquality:** Hydrocyanic acid in fresh plant (Steyn 1934). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Kidd 2002).



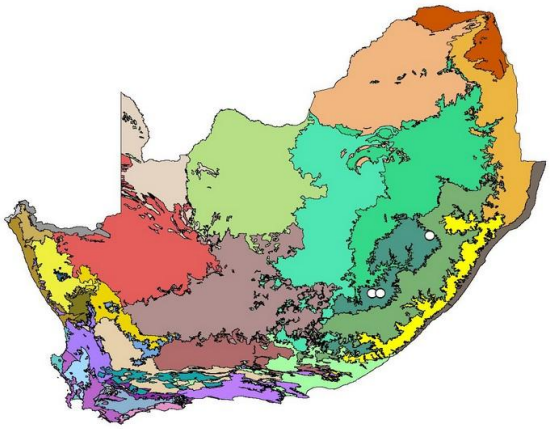
Lotononis jacottetii (Schinz) B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.2–1.2; Alt 1830–2010

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (67)	>800 (33)
Min temp (°C)	<2 (67)	0–4 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3027 (67)	2929 (33)

NOTES: –



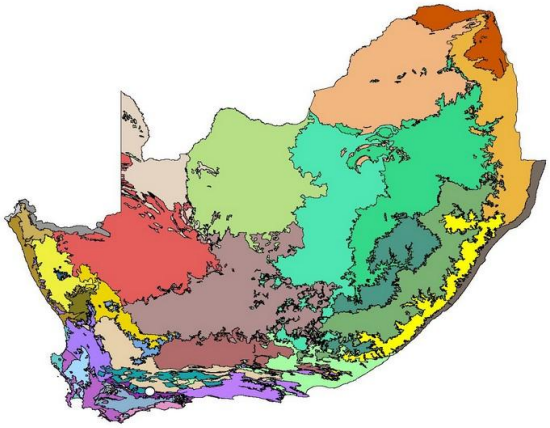
[E]*Lotononis lamprifolia* B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3320 (100)	

NOTES: –



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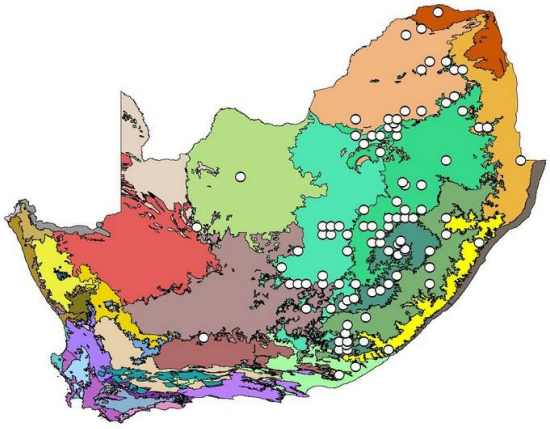
Lotononis laxa Eckl. & Zeyh.

Crotalarieae ☠ ②

Herb; P; Ht 0.1–4; Alt 610–2200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (25)	Central Bushveld (22)
Biome	Grassland (82)	Savanna (16)
Rainfall (mm)	400–800 (59)	>800 (14)
Min temp (°C)	<2 (54)	2–8 (27)
Max temp (°C)	25–29 (40)	27–35 (33)
Phosphorus (ppm)	<10 (69)	5–35 (30)
pH	<6.4 (48)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	2928 (8)	2528; 2828; 3226 (7)

NOTES: **Livestock feed** (Shearing & Van Heerden 1997). **DM:** Low production (Shearing & Van Heerden 1997). **Antiquality:** Hydrocyanic acid in plant (Watt & Breyer-Brandwijk 1962).**N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1972). **Flowering:** Summer (Pooley 2003).



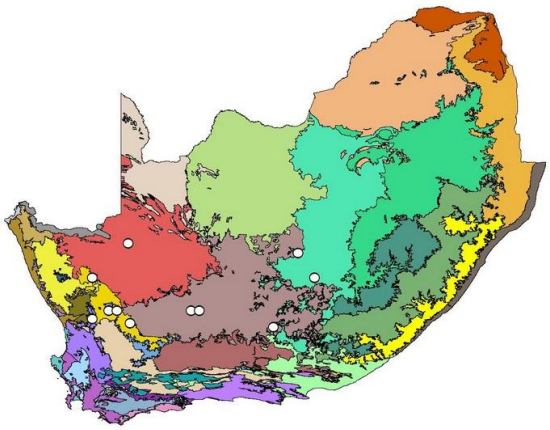
[E]*Lotononis lenticula* (E.Mey.) Benth.

Crotalarieae ①

Herb; A; Ht 0.15–0.25; Alt 137–1388

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Upper Karoo (50)	Dry Highveld Grassland; Bushmanland (25)
Biome	Nama-Karoo (75)	Grassland (25)
Rainfall (mm)	<400 (82)	200–600 (18)
Min temp (°C)	<2 (64)	0–4; 2–8 (18)
Max temp (°C)	27–35 (73)	25–29 (18)
Phosphorus (ppm)	>20 (73)	5–35 (27)
pH	>7.5 (64)	6.5–8.4 (36)
ESP	Non (100)	
QDGCs	3119 (27)	3122 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



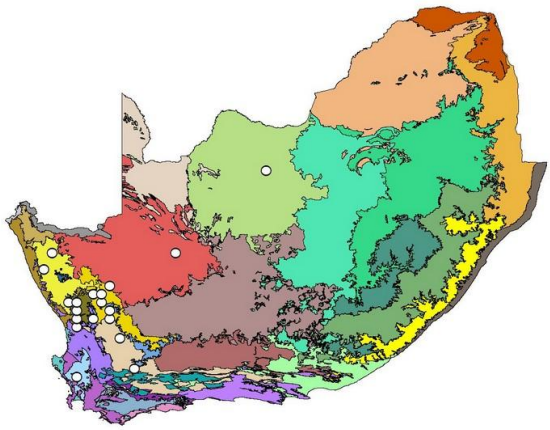
[E]*Lotononis leptoloba* Bolus

Crotalarieae ①

Herb; A; Ht 0.03–0.3; Alt 183–1007

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland; Knersvlakte; Namaqualand Hardeveld; Trans-Escarpment Succulent Karoo; Rainshadow Valley Karoo; Eastern Kalahari Bushveld (17)	
Biome	Succulent Karoo (76)	Fynbos; Nama-Karoo; Savanna (8)
Rainfall (mm)	<400 (90)	200–600; 400–800 (5)
Min temp (°C)	2–8 (47)	>6 (32)
Max temp (°C)	27–35 (68)	25–29 (21)
Phosphorus (ppm)	>20 (68)	5–35 (26)
pH	>7.5 (58)	6.5–8.4 (21)
ESP	Non; Medium; High (33)	
QDGCs	3118 (26)	3119 (21)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



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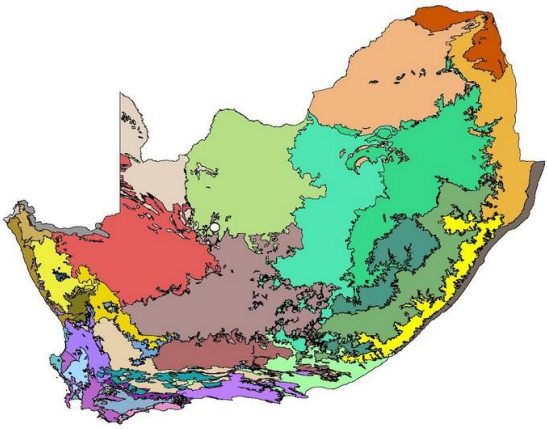
Lotononis linearifolia B.-E.van Wyk

Crotalarieae ①

Herb; A; Ht 0.01–0.1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	<2 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2822 (100)	

NOTES: –



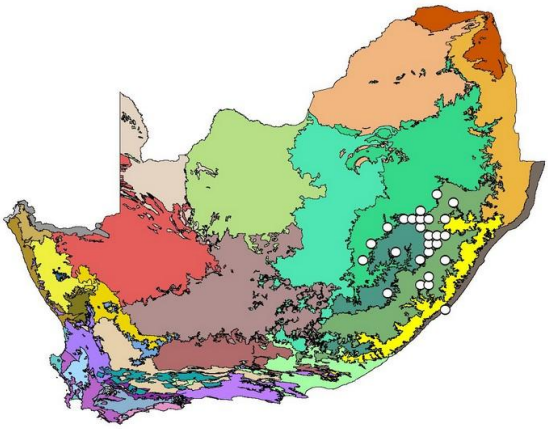
Lotononis lotononoides (Scott-Elliot) B.-E.van Wyk

Crotalarieae ③

Dwarf shrub, shrub; P; Ht 0.3–5; Alt 1300–2450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (50)	Drakensberg Grassland (25)
Biome	Grassland (95)	Indian Ocean (5)
Rainfall (mm)	>800 (62)	600–1000 (27)
Min temp (°C)	0–4 (54)	<2 (38)
Max temp (°C)	<27 (62)	25–29 (35)
Phosphorus (ppm)	<10 (85)	5–35 (15)
pH	<6.4 (92)	5.5–7.4 (8)
ESP	Non (100)	
QDGCs	2929 (33)	2829 (19)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Summer, autumn (Pooley 1998).



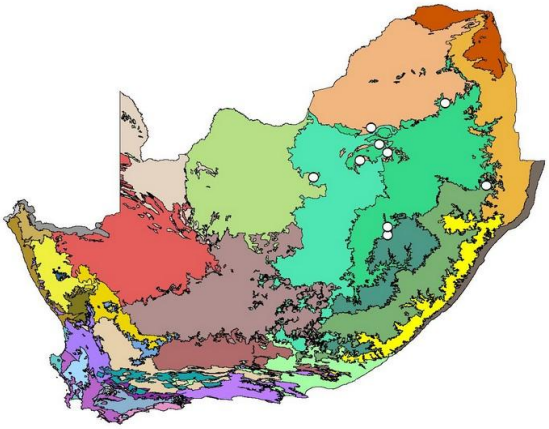
Lotononis macrosepala Conrath

Crotalarieae ①

Herb; P; Ht 0.01–0.15; Alt 1430–1890

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (78)	800 (22)
Min temp (°C)	0–4 (44)	<2 (33)
Max temp (°C)	27–35 (44)	25–29 (33)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (78)	5.5–7.4; 6.5–7.4 (11)
ESP	Non (100)	
QDGCs	2627 (23)	2527; 2529; 2628; 2725; 2731; 2828; 2928 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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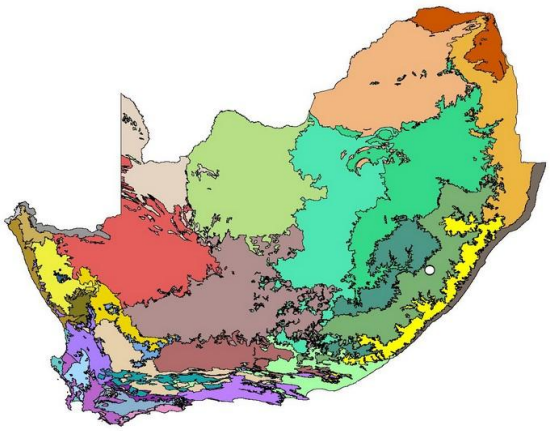
Lotononis maculata Dummer

Crotalarieae ①

Herb; P; Ht ?; Alt 1052–1130

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	<2 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3029 (100)	

NOTES: –



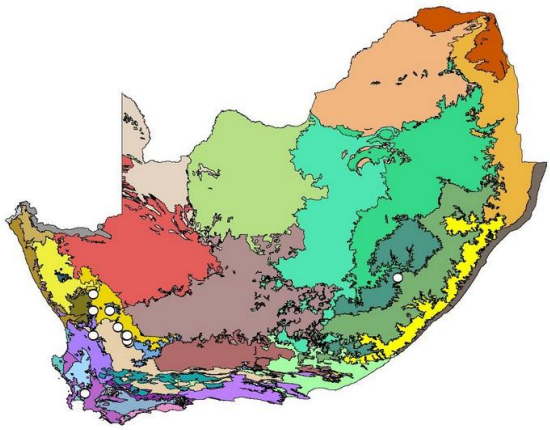
[E]*Lotononis maximiliani* Schltr. ex De Wild.

Crotalarieae ①

Herb; P; Ht 0.01–0.6; Alt 5–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Rainshadow Valley Karoo (100)	
Biome	Succulent Karoo (50)	Fynbos; Grassland (25)
Rainfall (mm)	<400 (67)	200–600; 600–1000; >800 (11)
Min temp (°C)	2–8 (56)	0–4 (33)
Max temp (°C)	27–35 (44)	25–29 (33)
Phosphorus (ppm)	>20 (67)	5–35 (22)
pH	>7.5 (67)	<6.4 (22)
ESP	High (100)	
QDGCs	3220 (36)	3119 (27)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



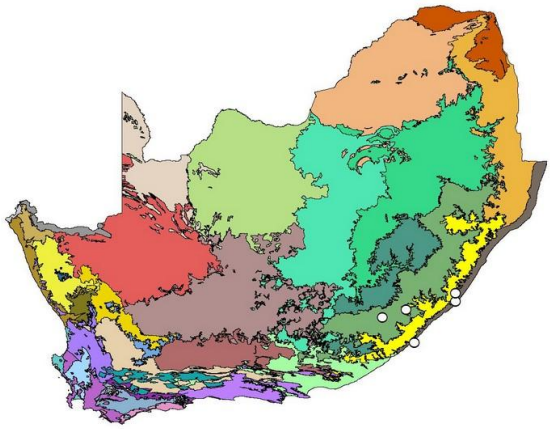
[E]*Lotononis meyeri* (C.Presl) B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.3–1; Alt 610–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland; Indian Ocean (50)	
Rainfall (mm)	>800 (80)	600–1000 (20)
Min temp (°C)	>6 (60)	2–8 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3030; 3127; 3128; 3130; 3228 (20)	

NOTES: –



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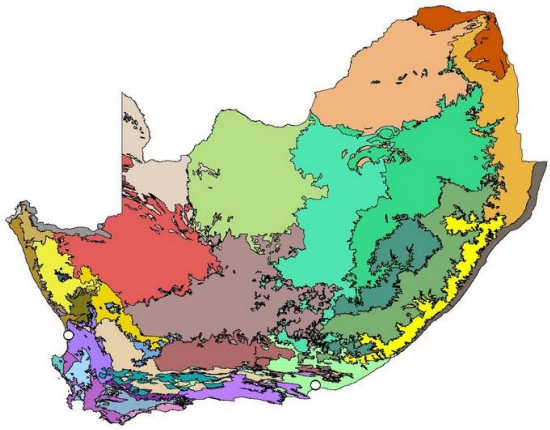
[E]*Lotononis micrantha* Eckl. & Zeyh.

Crotalarieae ①

Herb; P; Ht 0.01–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (100)	
Biome	Albany Thicket; Fynbos (50)	
Rainfall (mm)	<400; 400–800 (50)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–7.4 (50)	
ESP	Non (100)	
QDGCs	3218; 3325 (50)	

NOTES: –



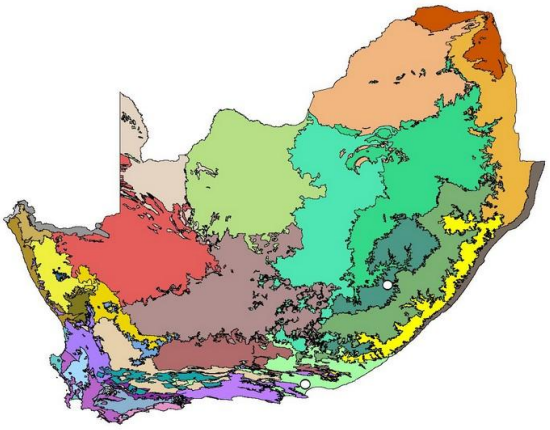
[E]*Lotononis minor* Dummer & Jenn.

Crotalarieae ①

Shrub; P; Ht ?; Alt 2440–2745

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (100)	
Biome	Albany Thicket; Grassland (50)	
Rainfall (mm)	200–600; >800 (50)	
Min temp (°C)	<2; >6 (50)	
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4; 6.5–8.4 (50)	
ESP	Non (100)	
QDGCs	3028; 3325 (50)	

NOTES: –



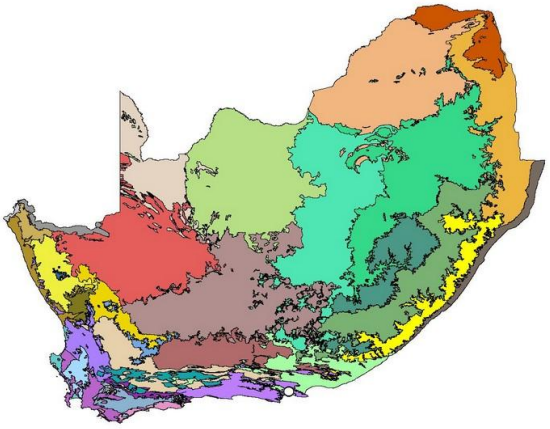
[E]*Lotononis monophylla* Harv.

Crotalarieae ①

Herb; P; Ht 0.05–0.1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3325 (100)	

NOTES: –



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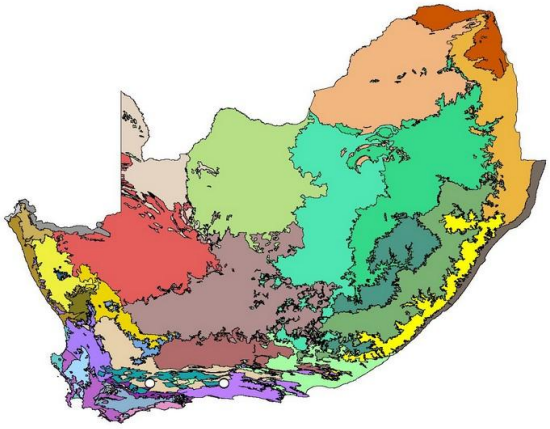
[E]*Lotononis nutans* B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht ?; Alt ?–550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	<6.4; >7.5 (50)	
ESP	Ecotone	
QDGCs	3320; 3323 (50)	

NOTES: –



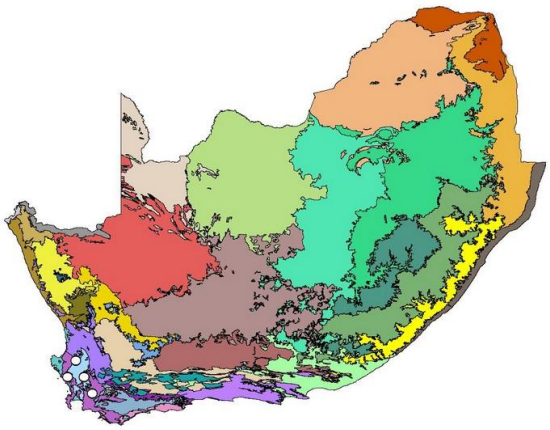
[E]*Lotononis oxyptera* (E.Mey.) Benth.

Crotalarieae ①

Herb; A; Ht ?; Alt 153–255

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	>800 (25)
Min temp (°C)	2–8 (50)	0–4; >6 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (50)	5.5–7.4; 6.5–8.4 (25)
ESP	Non (100)	
QDGCs	3318 (50)	3218; 3319 (25)

NOTES: –



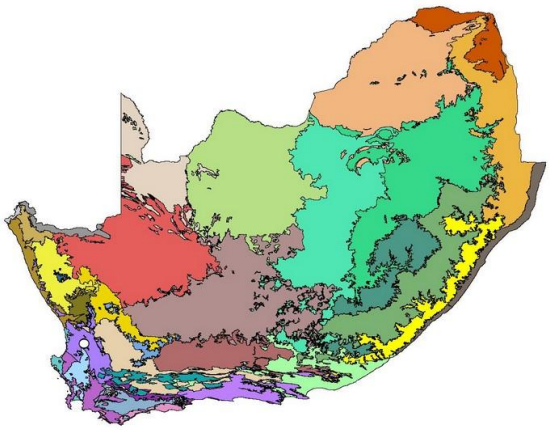
[E]*Lotononis pallens* (Eckl. & Zeyh.) Benth.

Crotalarieae ①

Herb; A; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3218 (100)	

NOTES: –



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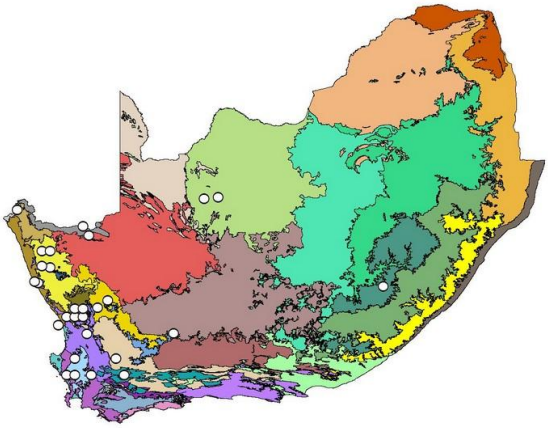
[E]*Lotononis parviflora* (P.J.Bergius) D.Dietr.

Crotalarieae ①

Herb; P; Ht 0.01–0.6; Alt 30–1037

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld; Namaqualand Sandveld; Eastern Kalahari Bushveld (22)	Gariep Desert; Knersvlakte; Rainshadow Valley Karoo (11)
Biome	Succulent Karoo (50)	Fynbos (25)
Rainfall (mm)	<400 (79)	200–600 (18)
Min temp (°C)	2–8 (46)	>6 (36)
Max temp (°C)	27–35 (54)	25–29 (36)
Phosphorus (ppm)	5–35 (54)	>20 (36)
pH	6.5–8.4 (32)	>7.5 (29)
ESP	High (44)	Medium (33)
QDGCs	3118 (21)	3017 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



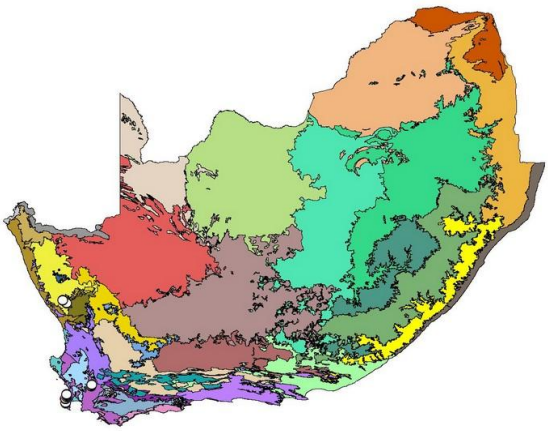
[E]*Lotononis perplexa* (E.Mey.) Eckl. & Zeyh.

Crotalarieae ①

Herb; P; Ht ?; Alt 397–763

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (75)	Succulent Karoo (25)
Rainfall (mm)	600–1000 (50)	<400; >800 (25)
Min temp (°C)	>6 (75)	0–4 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	<6.4 (50)	5.5–7.4; >7.5 (25)
ESP	Ecotone	
QDGCs	3318 (47)	3418 (27)

NOTES: –



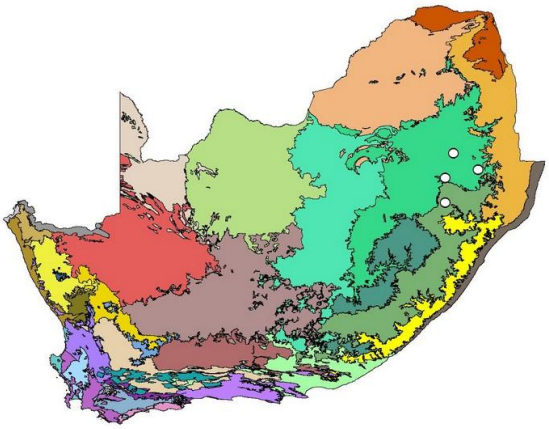
[E]*Lotononis pottiae* Burtt Davy

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Sub-Escarpment Grassland (50)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	<27 (50)	25–29; 27–35 (25)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2630; 2729; 2730; 2829 (25)	

NOTES: –



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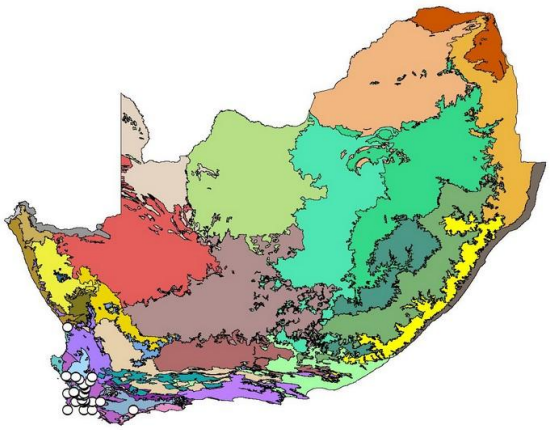
[E]*Lotononis prostrata* (L.) Benth.

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–0.2; Alt 30–570

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (29)	>800 (24)
Min temp (°C)	2–8 (47)	>6 (41)
Max temp (°C)	25–29 (82)	27–35 (12)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (76)	5.5–7.4 (12)
ESP	Non (100)	
QDGCs	3318 (52)	3418 (26)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Winter, spring (Kidd 2002).



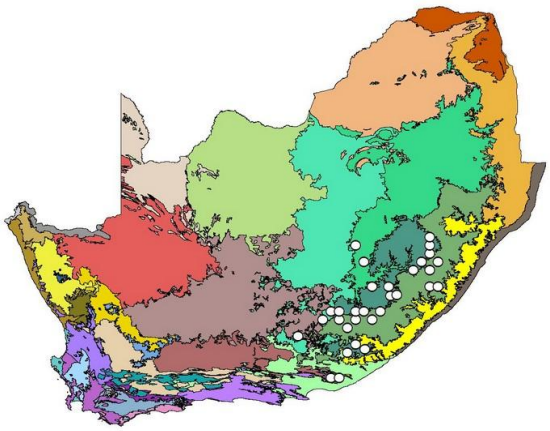
Lotononis pulchella (E.Mey.) B.-E.van Wyk

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.3–6; Alt 1140–2440

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (74)	Drakensberg Grassland; Mesic Highveld Grassland (13)
Biome	Grassland (100)	
Rainfall (mm)	400–800 (39)	>800 (35)
Min temp (°C)	0–4 (45)	<2 (42)
Max temp (°C)	25–29 (58)	<27 (39)
Phosphorus (ppm)	<10 (61)	5–35 (39)
pH	<6.4 (58)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	2929; 3126; 3127 (16)	3028 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Pooley 2003).



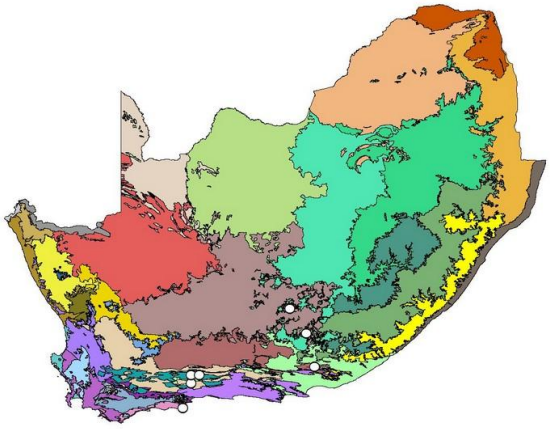
[E]*Lotononis pumila* Eckl. & Zeyh.

Crotalarieae ①

Herb; A; Ht 0.1–0.2; Alt 336–763

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (57)	<400 (43)
Min temp (°C)	2–8 (71)	0–4 (29)
Max temp (°C)	27–35 (57)	25–29 (43)
Phosphorus (ppm)	5–35; >20 (43)	<10 (14)
pH	6.5–7.4; 6.5–8.4; >7.5 (29)	<6.4 (13)
ESP	Ecotone	
QDGCs	3322 (44)	3125; 3225; 3325; 3421 (14)

NOTES: –



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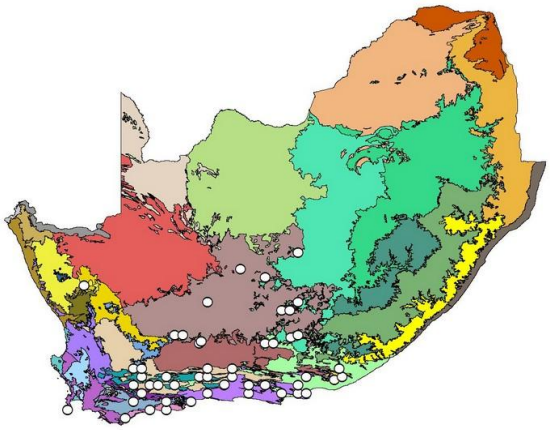
[E]*Lotononis pungens* Eckl. & Zeyh.

Crotalarieae ①

Herb; P; Ht 0.05–1; Alt 5–1650

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld; Upper Karoo (33)	Southwest Fynbos; South Coast Fynbos (17)
Biome	Fynbos (73)	Nama-Karoo (18)
Rainfall (mm)	<400 (49)	200–600 (31)
Min temp (°C)	2–8 (65)	0–4; >6 (12)
Max temp (°C)	27–35 (51)	25–29 (45)
Phosphorus (ppm)	5–35 (71)	>20 (29)
pH	>7.5 (37)	6.5–8.4 (20)
ESP	Non (67)	Medium (33)
QDGCs	3320; 3323 (12)	3322 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



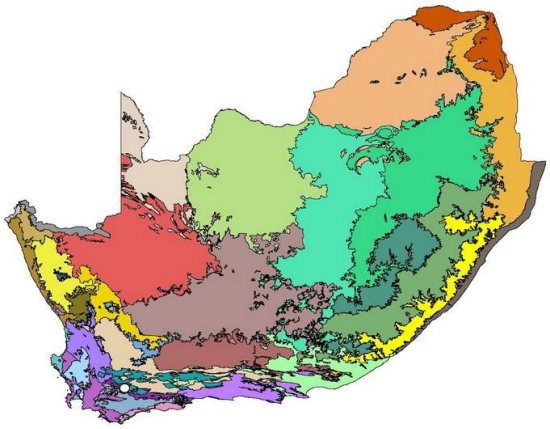
[E]*Lotononis purpurescens* B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3320 (100)	

NOTES: –



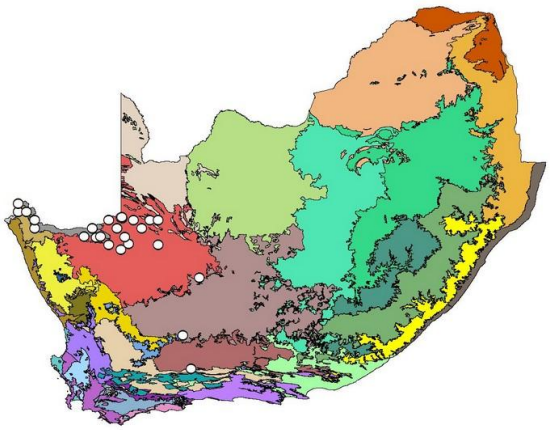
Lotononis rabenaviana Dinter & Harms

Crotalarieae ①

Herb; A; Ht 0.04–0.2; Alt 280–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (92)	Gariep Desert (8)
Biome	Nama-Karoo (92)	Desert (8)
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (48)	<2; >6 (20)
Max temp (°C)	>33 (68)	27–35 (32)
Phosphorus (ppm)	>20 (92)	5–35 (8)
pH	>7.5 (100)	
ESP	Non (92)	Medium (8)
QDGCs	2820 (19)	2819; 2919 (15)

NOTES: –



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[E]*Lotononis racemiflora* B.-E.van Wyk **Crotalarieae** –

Dwarf shrub, herb; A; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

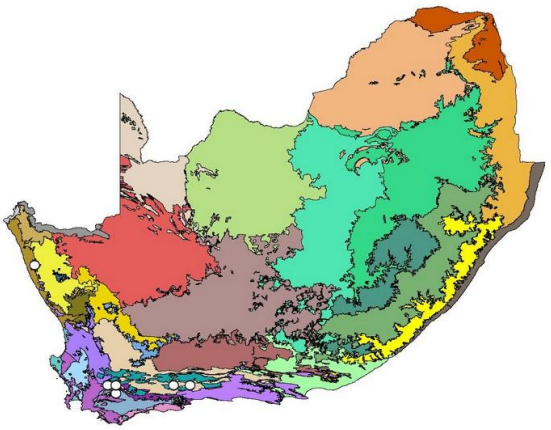
NOTES: –

***Lotononis rigida* (E.Mey.) Benth.** **Crotalarieae** ①

Dwarf shrub; P; Ht 0.6–1.5; Alt 366–427

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	0–4 (50)	2–8 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4; 6.5–8.4 (50)	
ESP	Ecotone	
QDGCs	3319 (50)	2917; 3321; 3322 (17)

NOTES: –

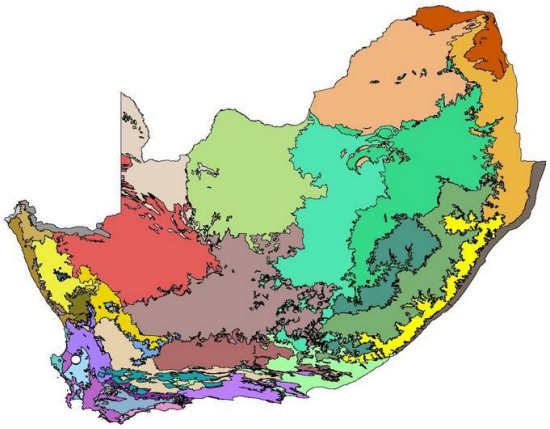


[E]*Lotononis rostrata* Benth. subsp. *brachybotrys* B.-E.van Wyk **Crotalarieae** ①

Herb; A; Ht ?; Alt ?–153

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3218 (100)	

NOTES: –



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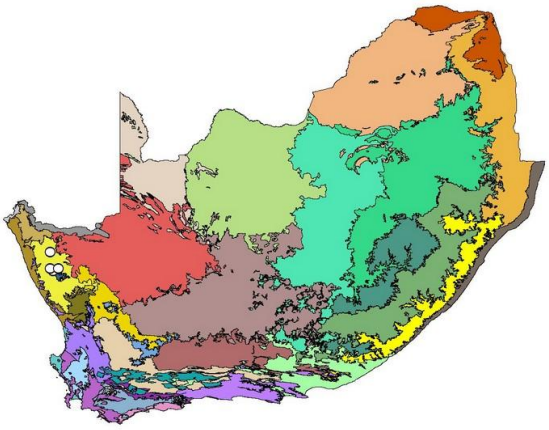
[E]*Lotononis rostrata* Benth. subsp. *namaquensis* (Bolus) B.-E.van Wyk — Crotalarieae ①

Herb; A; Ht 0.01–0.33; Alt 640–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	6.5–7.4 (67)	6.5–8.4 (33)
ESP	Medium (100)	
QDGCs	3017 (50)	2917; 3018 (25)

NOTES: –

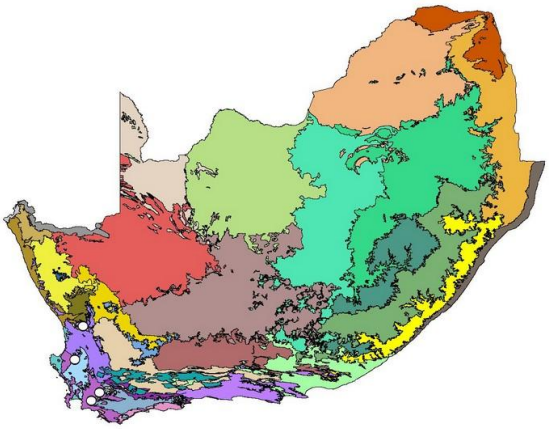


[E]*Lotononis rostrata* Benth. subsp. *rostrata* — Crotalarieae ①

Herb; A; Ht 0.01–0.4; Alt ?–214

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	<400; >800 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	<6.4; 5.5–7.4 (25)
ESP	Ecotone	
QDGCs	3118; 3218; 3319; 3419 (25)	

NOTES: –

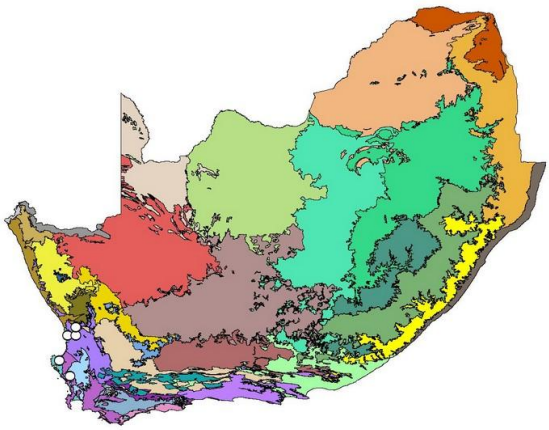


[E]*Lotononis sabulosa* T.M.Salter — Crotalarieae ①

Herb; P; Ht ?; Alt ?–150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (80)	200–600 (20)
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (80)	25–29 (20)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (40)	<6.4; 5.5–7.4; 6.5–7.4 (20)
ESP	Ecotone	
QDGCs	3218 (60)	3118; 3318 (20)

NOTES: –



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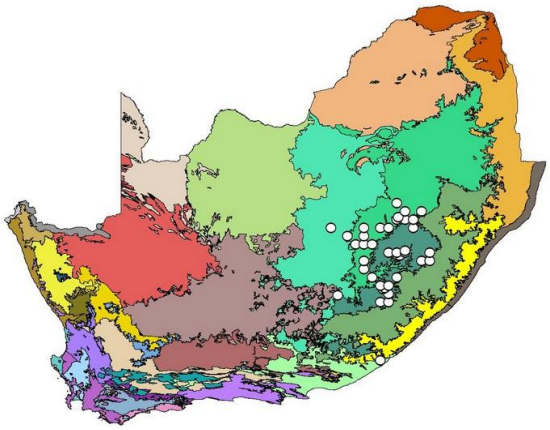
***Lotononis sericophylla* Benth.** **Crotalarieae** ①

Shrub; P; Ht 0.2–2.4; Alt 1220–2898

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (87)	Drakensberg Grassland (25)
Biome	Grassland (100)	
Rainfall (mm)	400–800 (39)	>800 (33)
Min temp (°C)	<2 (91)	0–4 (6)
Max temp (°C)	<27 (64)	25–29 (27)
Phosphorus (ppm)	<10 (94)	5–35 (6)
pH	<6.4 (73)	5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2828; 2928 (20)	2927 (12)

NOTES: **Flowering:** Summer (Pooley 1998).

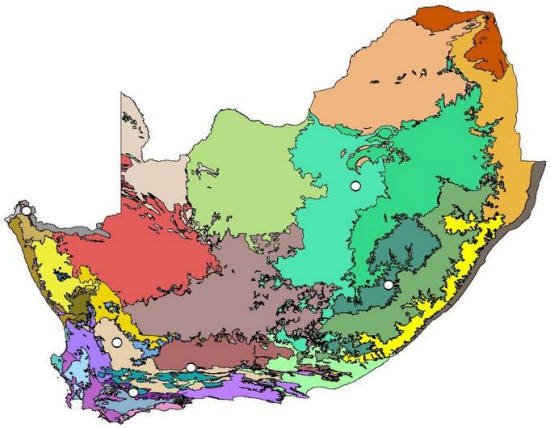


***Lotononis sparsiflora* (E.Mey.) B.-E.van Wyk** **Crotalarieae** ①

Herb; A; Ht 0.01–0.2; Alt 280–1357

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland; Rainshadow Valley Karoo (50)	
Biome	Grassland (67)	Succulent Karoo (33)
Rainfall (mm)	<400 (49)	200–600; 400–800; >800 (17)
Min temp (°C)	2–8 (50)	<2 (33)
Max temp (°C)	27–35 (67)	<27; 25–29 (17)
Phosphorus (ppm)	>20 (50)	<10 (33)
pH	>7.5 (50)	5.5–7.4 (33)
ESP	Non; High (50)	
QDGCs	2727; 2817; 3028; 3219; 3320; 3322 (17)	

NOTES: –

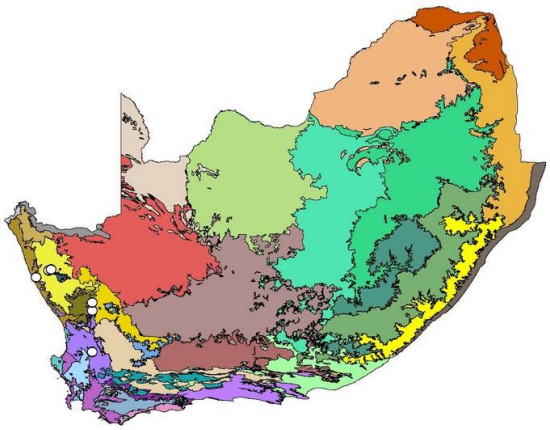


[E]***Lotononis stenophylla* (Eckl. & Zeyh.) B.-E.van Wyk** **Crotalarieae** ①

Herb; A; Ht ?; Alt 640–732

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Succulent Karoo (67)	Fynbos (33)
Rainfall (mm)	<400 (80)	200–600 (20)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	5–35 (60)	>20 (40)
pH	6.5–7.4; >7.5 (40)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	3017 (50)	3119 (33)

NOTES: –



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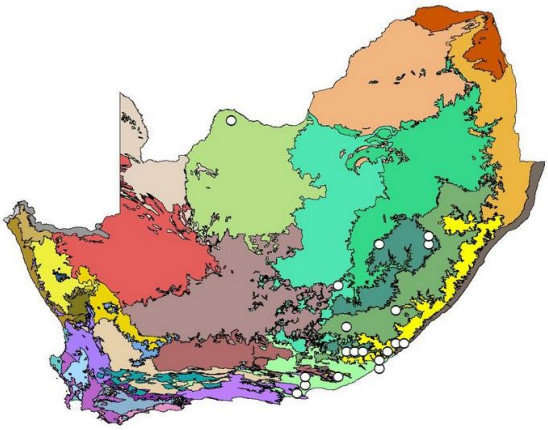
Lotononis stricta (Eckl. & Zeyh.) B.-E.van Wyk

Crotalarieae ③

Dwarf shrub, shrub; P; Ht 0.1–1.2; Alt 15–2135

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Sub-Escarpment Grassland (29)	Drakensberg Grassland; Eastern Kalahari Bushveld; Sub-Escarpment Savanna (14)
Biome	Grassland (56)	Albany Thicket; Savanna (22)
Rainfall (mm)	400–800; 600–1000 (32)	200–600; >800 (21)
Min temp (°C)	>6 (37)	<2; 0–4; 2–8 (21)
Max temp (°C)	25–29 (74)	<27 (16)
Phosphorus (ppm)	5–35 (68)	<10 (32)
pH	<6.4 (47)	5.5–7.4 (26)
ESP	Non (100)	
QDGCs	3227; 3228; 3325 (16)	2929 (11)

NOTES: **Cultivated** (Glen 2002). **Flowering:** Autumn, winter (Manning 2001).



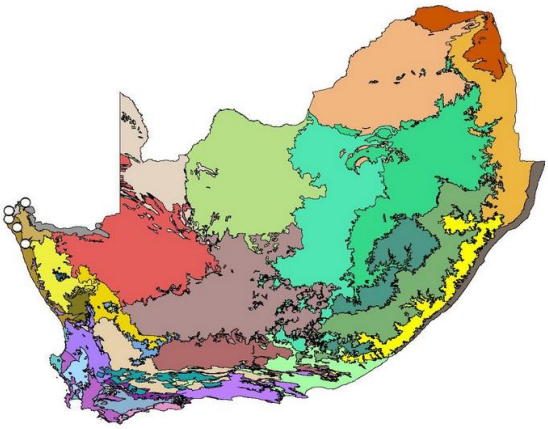
Lotononis strigillosa (Merxm. & A.Schreib.) A.Schreib.

Crotalarieae ①

Herb; A; Ht ?; Alt ?–61

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southern Namib Desert (100)	
Biome	Succulent Karoo (67)	Desert (33)
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (60)	27–35; >33 (20)
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Medium (100)	
QDGCs	2816 (60)	2817; 2917 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



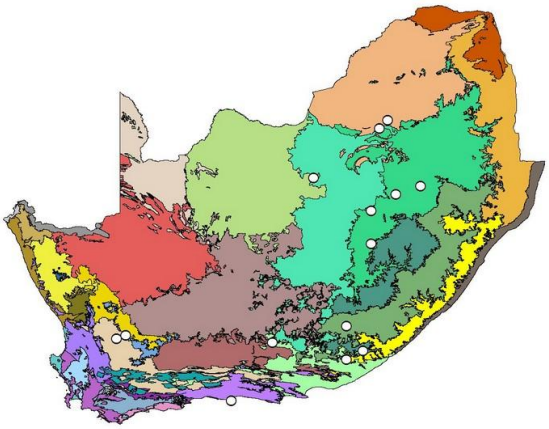
[E]*Lotononis tenella* (E.Mey.) Eckl. & Zeyh.

Crotalarieae ②

Herb; P; Ht 0.01–0.03; Alt 15–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (44)	Eastern Fynbos-Renosterveld; Sub-Escarpment Grassland; Rainshadow Valley Karoo; Central Bushveld (14)
Biome	Grassland (72)	Fynbos; Succulent Karoo (14)
Rainfall (mm)	400–800 (64)	<400 (21)
Min temp (°C)	2–8 (43)	<2 (36)
Max temp (°C)	27–35 (58)	<27; 25–29 (21)
Phosphorus (ppm)	<10 (50)	5–35 (29)
pH	<6.4 (43)	5.5–7.4; 6.5–7.4 (21)
ESP	Non (72)	Medium; High (14)
QDGCs	2527; 2528; 2725; 2728; 2729; 2827; 2927; 3126; 3219; 3220; 3224; 3226; 3227; 3423 (7)	

NOTES: **Livestock feed** (Shearing & Van Heerden 1997). **DM:** Low production (Shearing & Van Heerden 1997). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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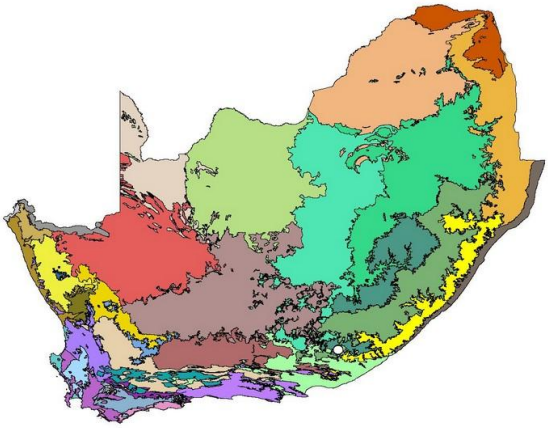
[E]*Lotononis trichodes* (E.Mey.) B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht ?; Alt 1525–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3226 (100)	

NOTES: –



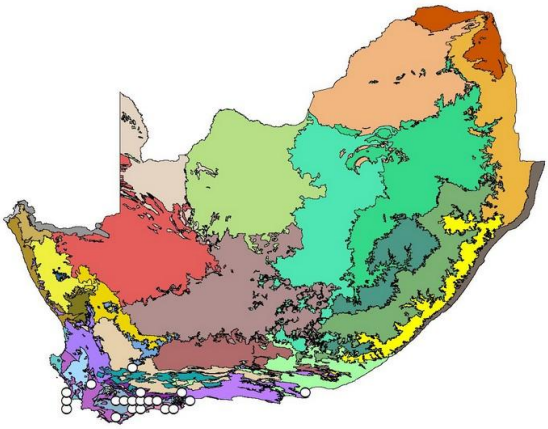
[E]*Lotononis umbellata* (L.) Benth.

Crotalarieae ①

Herb; P; Ht 0.05–5; Alt 18–488

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (67)	Southwest Fynbos (33)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (60)	400–800 (20)
Min temp (°C)	2–8 (70)	>6 (25)
Max temp (°C)	25–29 (80)	27–35 (15)
Phosphorus (ppm)	5–35 (95)	<10 (5)
pH	<6.4; 5.5–7.4 (30)	6.5–7.4 (25)
ESP	Non (100)	
QDGCs	3420 (30)	3421 (15)

NOTES: **Flowering:** Winter, spring (Kidd 2002).



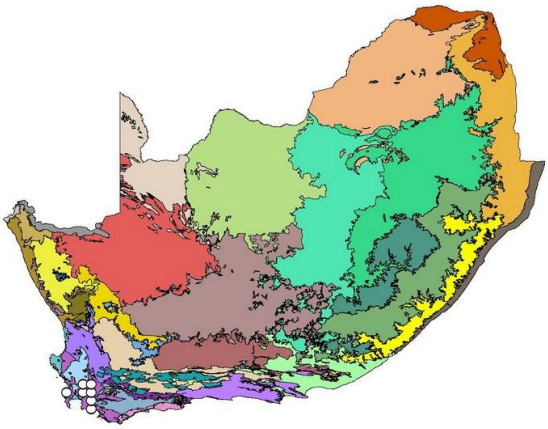
[E]*Lotononis varia* (E.Mey.) Steud.

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.35; Alt 458–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (42)	400–800; 600–1000 (29)
Min temp (°C)	2–8 (42)	0–4; >6 (29)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (71)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	3318 (42)	3319; 3419 (29)

NOTES: –



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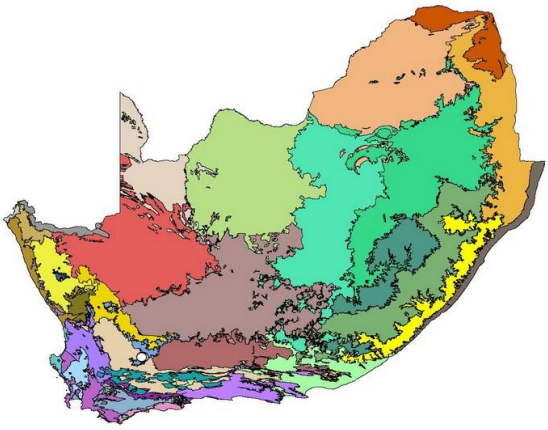
[E]*Lotononis venosa* B.-E.van Wyk

Crotalarieae ①

Herb; A; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3220 (100)	

NOTES: –



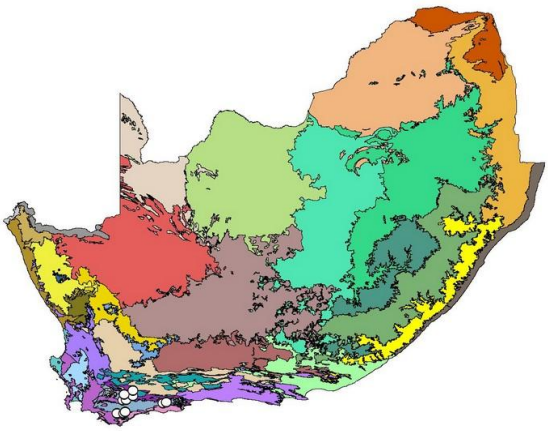
[E]*Lotononis viborgioides* Benth.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.2–0.6; Alt 120–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (83)	<400 (17)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (50)	6.5–7.4 (33)
ESP	Ecotone	
QDGCs	3420 (45)	3320 (27)

NOTES: –



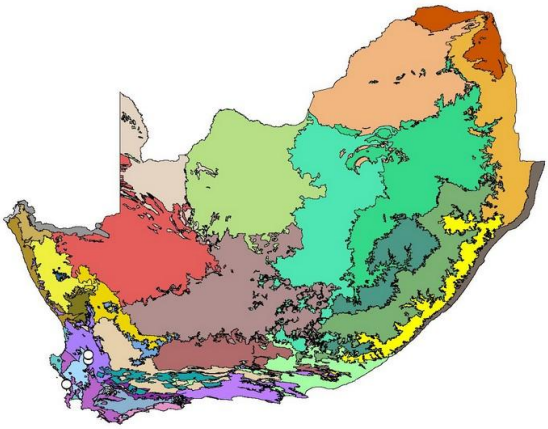
[E]*Lotononis villosa* (E.Mey.) Steud.

Crotalarieae ①

Dwarf shrub; P; Ht ?; Alt ?–183

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Non (100)	
QDGCs	3219 (67)	3318 (33)

NOTES: –



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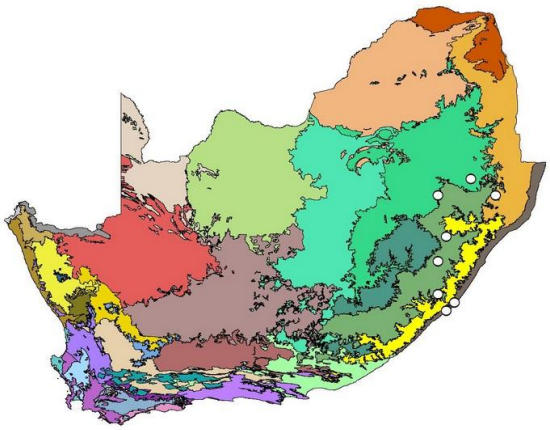
[E]*Lotononis viminea* (E.Mey.) B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.5–1.2; Alt 280–1647

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Sub-Escarpment Grassland (50)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (63)	600–1000 (37)
Min temp (°C)	0–4 (50)	2–8; >6 (25)
Max temp (°C)	25–29 (63)	<27 (37)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2929 (22)	2729; 2730; 2731; 3029; 3129; 3130 (13)

NOTES: **Flowering:** Summer, autumn (Pooley 1998).



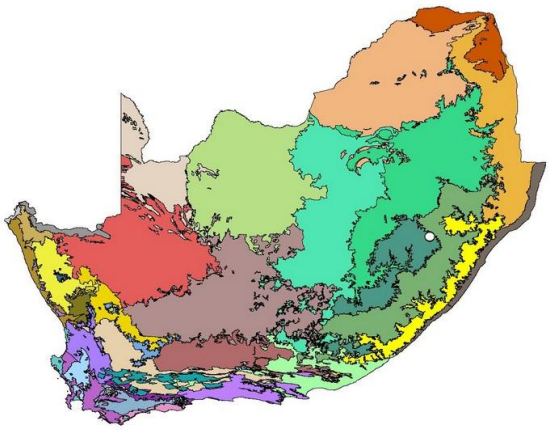
[E]*Lotononis virgata* B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.45; Alt 122–1678

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Grassland (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2929 (100)	

NOTES: –



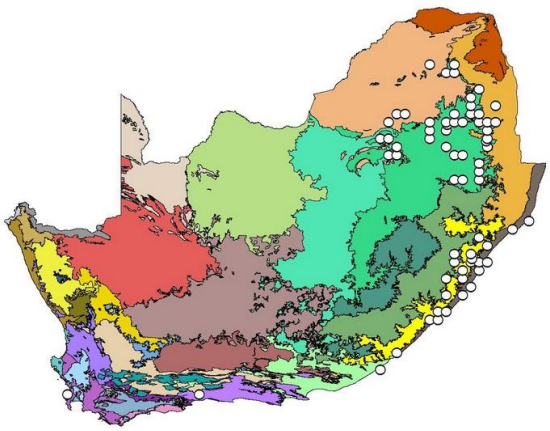
Lotus discolor E.Mey. subsp. *discolor*

Loteae ①

Herb; P; Ht 0.05–6; Alt 6–2196

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (47)	Indian Ocean Coastal Belt (23)
Biome	Grassland (48)	Indian Ocean (24)
Rainfall (mm)	>800 (54)	400–800 (28)
Min temp (°C)	2–8 (38)	>6 (31)
Max temp (°C)	25–29 (65)	27–35 (18)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (83)	5.5–7.4 (17)
ESP	Non (100)	
QDGCs	2530; 2930 (10)	2529; 3030 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Spring, summer (Germishuizen & Clarke 2003).



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***Lotus mossamedensis* Welw. ex Baker** **Loteae** –

Herb; A; Ht ?–0.6; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

***Lotus namulensis* Brand** **Loteae** –

Unknown

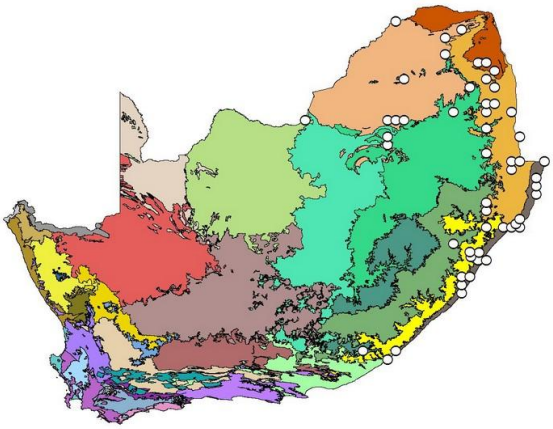
OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

Macrotyloma axillare* (E.Mey.) Verdc. var. *axillare **Phaseoleae** ③

Herb, climber; P; Ht 0.1–0.6; Alt 10–1647

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (42)	Indian Ocean Coastal Belt (31)
Biome	Savanna (70)	Indian Ocean (22)
Rainfall (mm)	400–800 (44)	>800 (38)
Min temp (°C)	>6 (58)	2–8 (33)
Max temp (°C)	27–35 (52)	25–29 (44)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<6.4 (63)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	2531; 2831; 2930 (9)	3030 (8)



NOTES: **Livestock feed** (Maposse *et al.* 2003; Lewis *et al.* 2005; Hassan *et al.* 2007). **Cultivated** (Clatworthy 1984; Glen 2002). **DM:** 4.9 t/ha (Clatworthy & Madakadze 1988). **Ecology:** Adapted to rainy and dry seasons (Maposse *et al.* 2003). **Biocultural:** Medicine for livestock (Hutchings *et al.* 1996). **Flowering:** Whole year (Pooley 1998).

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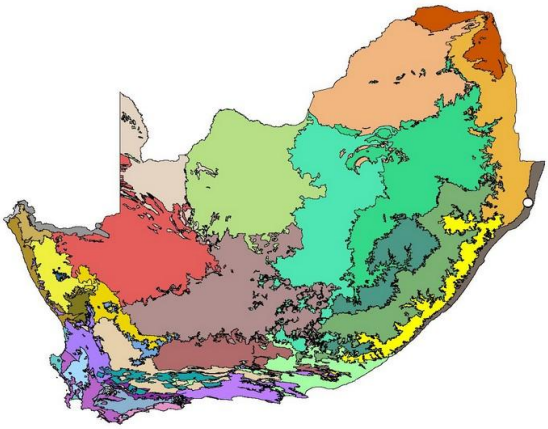
***Macrotyloma axillare* (E.Mey.) Verdc. var. *glabrum* (E.Mey.) Verdc.** **Phaseoleae** ②

Herb; P; Ht 0.01–3; Alt 92–1120

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	6.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2832 (100)	

NOTES: **Livestock feed** (Maposse *et al.* 2003; Lewis *et al.* 2005).
Flowering: Whole year (Pooley 1998).

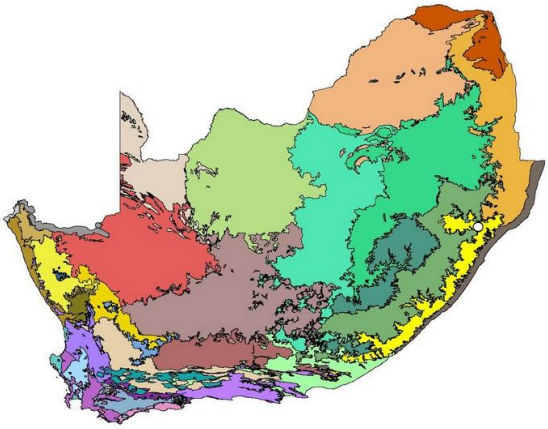


[E]*Macrotyloma coddii* Verdc. **Phaseoleae** ①

Herb; P; Ht 0.01–0.4; Alt 1020–1037

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2830 (100)	

NOTES: –

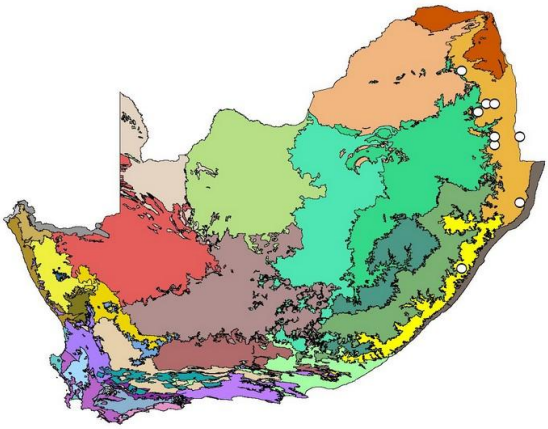


***Macrotyloma maranguense* (Taub.) Verdc.** **Phaseoleae** ①

Herb; P; Ht 0.3–0.6; Alt 259–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (80)	Sub-Escarpment Savanna (20)
Biome	Savanna (100)	
Rainfall (mm)	>800 (56)	600–1000; >800 (22)
Min temp (°C)	2–8 (56)	>6 (44)
Max temp (°C)	25–29 (56)	27–35 (44)
Phosphorus (ppm)	<10 (89)	5–35 (11)
pH	<6.4 (89)	5.5–7.4 (11)
ESP	Non (100)	
QDGCs	2531; 2631 (22)	2430; 2530; 2632; 2832; 3030 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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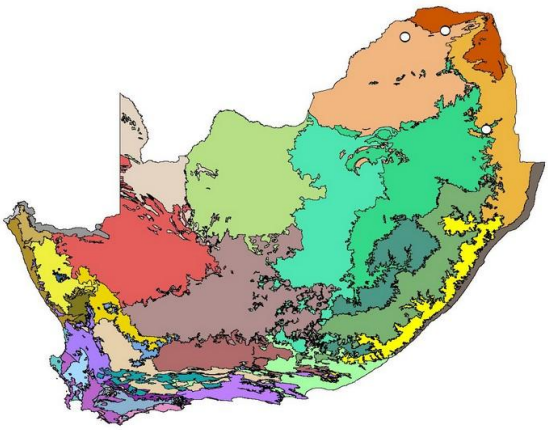
***Macrotyloma uniflorum* (Lam.) Verdc. var. *stenocarpum* (Brenan) Verdc.** **Phaseoleae** ①

Herb; P; Ht 0.6–1; Alt 910–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (67)	>800 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	<6.4; 5.5–7.4; 6.5–8.4 (33)	
ESP	Non (100)	
QDGCs	2229; 2328; 2531 (33)	

NOTES: **Ecology:** Seed (Norton *et al.* 1989).

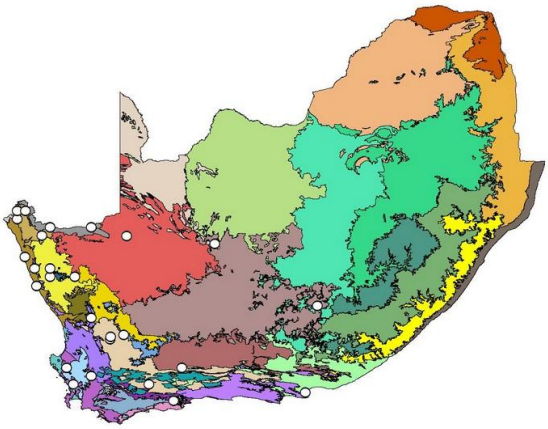


***Melolobium adenodes* Eckl. & Zeyh.** **Genisteae** ①

Dwarf shrub; P; Ht 0.15–1; Alt 75–1140

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Gariep Desert; Namaqualand Sandveld; Rainshadow Valley Karoo (25)	Bushmanland; Namaqualand Hardeveld (12)
Biome	Succulent Karoo (58)	Fynbos (25)
Rainfall (mm)	<400 (81)	200–600 (15)
Min temp (°C)	2–8; >6 (38)	0–4 (15)
Max temp (°C)	27–35 (46)	25–29 (42)
Phosphorus (ppm)	>20 (54)	5–35 (42)
pH	>7.5 (50)	6.5–8.4 (23)
ESP	High (50)	Medium (38)
QDGCs	3017 (15)	2816; 2817; 2917; 3219; 3318 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).

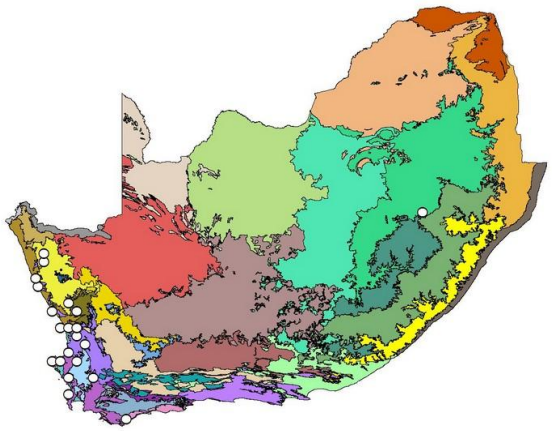


***E*Melolobium aethiopicum (L.) Druce** **Genisteae** ①

Dwarf shrub; P; Ht 0.2–0.7; Alt 30–1585

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Sandveld (40)	West Strandveld; Knersvlakte; Namaqualand Hardeveld (20)
Biome	Fynbos (56)	Succulent Karoo (39)
Rainfall (mm)	<400 (67)	200–600 (24)
Min temp (°C)	>6 (81)	2–8 (10)
Max temp (°C)	27–35 (48)	25–29 (43)
Phosphorus (ppm)	5–35 (81)	>20 (14)
pH	6.5–8.4 (38)	<6.4 (24)
ESP	High (60)	Medium (40)
QDGCs	3118; 3218 (24)	3017 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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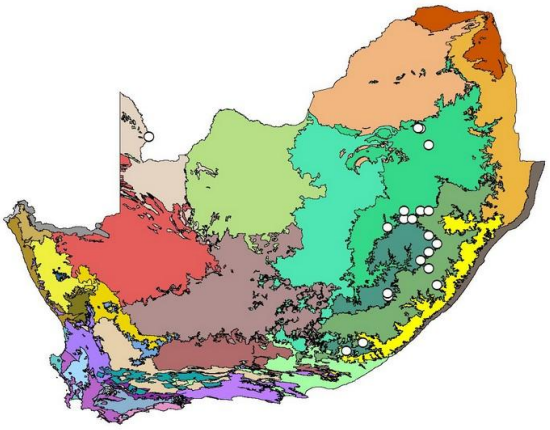
Melolobium alpinum Eckl. & Zeyh.

Genisteae ①

Dwarf shrub, shrub, herb; P; Ht 0.3–1.5; Alt 730–2324

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (60)	Sub-Escarpment Grassland; Kalahari Duneveld (20)
Biome	Grassland (93)	Savanna (7)
Rainfall (mm)	>800 (56)	400–800 (22)
Min temp (°C)	<2 (50)	0–4 (33)
Max temp (°C)	<27 (67)	25–29 (28)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (83)	5.5–7.4 (11)
ESP	Non (100)	
QDGCs	2828; 2929 (20)	2529; 2829; 3028; 3029 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer (Pooley 1998).



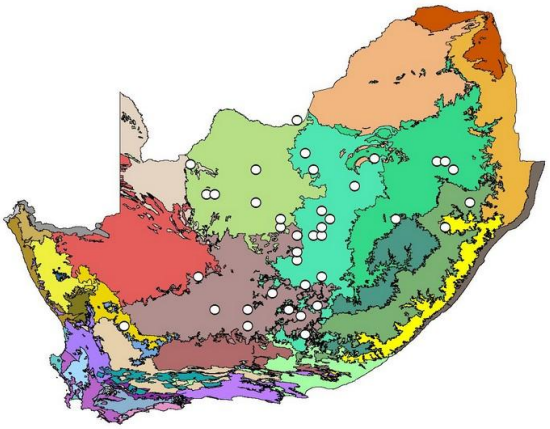
Melolobium calycinum Benth.

Genisteae ①

Dwarf shrub; P; Ht 0.2–0.61; Alt 854–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (39)	Eastern Kalahari Bushveld (26)
Biome	Grassland (54)	Savanna (31)
Rainfall (mm)	400–800 (37)	<400 (32)
Min temp (°C)	<2 (79)	0–4 (21)
Max temp (°C)	27–35 (82)	<27 (11)
Phosphorus (ppm)	<10 (66)	5–35 (26)
pH	6.5–8.4 (29)	6.5–7.4; >7.5 (24)
ESP	Non (94)	Medium (4)
QDGCs	2925 (11)	2824; 2826; 3125 (8)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



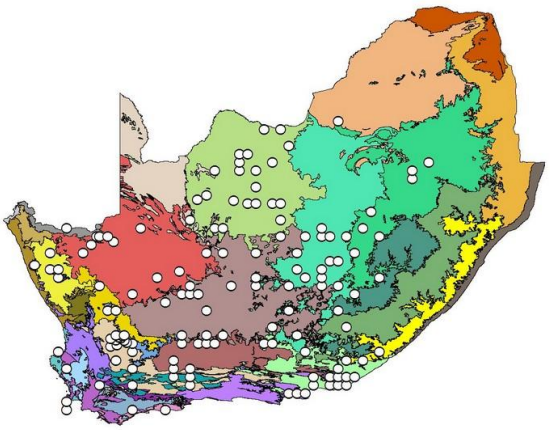
Melolobium candicans (E.Mey.) Eckl. & Zeyh.

Genisteae ☠ ②

Dwarf shrub, shrub, herb; P; Ht 0.3–1; Alt 138–1920

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (30)	Dry Highveld Grassland (15)
Biome	Grassland (28)	Nama-Karoo; Savanna (24)
Rainfall (mm)	<400 (59)	400–800 (31)
Min temp (°C)	<2 (45)	2–8 (31)
Max temp (°C)	27–35 (58)	25–29 (27)
Phosphorus (ppm)	5–35 (36)	<10 (34)
pH	>7.5 (37)	6.5–8.4 (22)
ESP	Non (83)	High (10)
QDGCs	3219; 3220; 3326 (5)	2919; 2926; 3222; 3325 (4)

NOTES: **Livestock feed:** Not grazed (Shearing & Van Heerden 1997). **Antiquality:** Suspected to be toxic (Watt & Breyer-Brandwijk 1962; Shearing & Van Heerden 1997). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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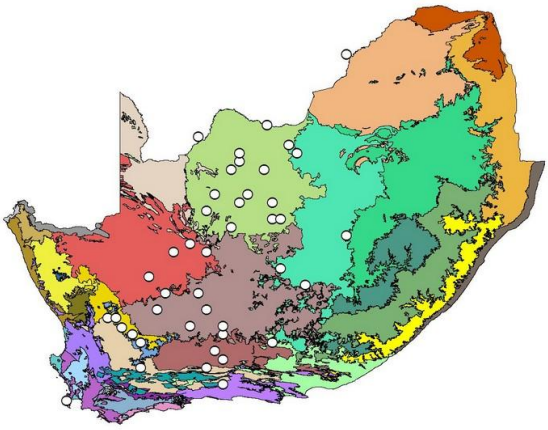
Melolobium canescens Benth.

Genisteae ②

Dwarf shrub, shrub; P; Ht 0.3–1; Alt 915–1340

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (52)	Upper Karoo (16)
Biome	Savanna (42)	Nama-Karoo (39)
Rainfall (mm)	<400 (77)	400–800 (12)
Min temp (°C)	<2 (65)	2–8 (21)
Max temp (°C)	27–35 (74)	>33 (21)
Phosphorus (ppm)	<10; >20 (42)	5–35 (16)
pH	>7.5 (51)	6.5–7.4 (19)
ESP	Non (88)	Medium (12)
QDGCs	2824 (7)	2625; 2723; 2823; 2922; 3119; 3122; 3220; 3223 (5)

NOTES: **Livestock feed:** Unpalatable, very spinous, pods eaten (Le Roux *et al.* 1994). **DM:** Low longevity (Le Roux *et al.* 1994).



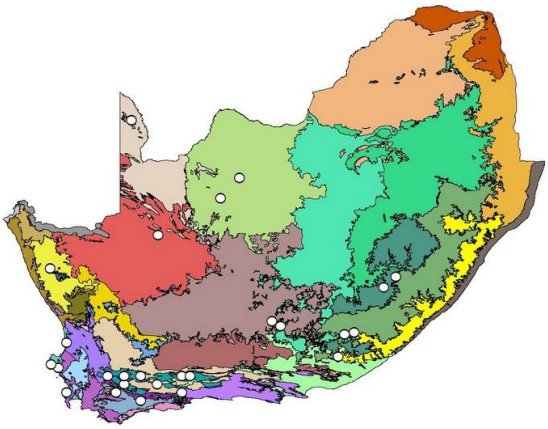
[E]*Melolobium exudans* Harv.

Genisteae ①

Dwarf shrub, herb; P; Ht 0.2–0.8; Alt 280–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (50)	West Strandveld; Bushmanland (25)
Biome	Fynbos (46)	Grassland; Savanna (23)
Rainfall (mm)	<400 (62)	200–600 (15)
Min temp (°C)	2–8 (46)	<2; 0–4 (19)
Max temp (°C)	25–29 (50)	27–35 (27)
Phosphorus (ppm)	5–35 (73)	<10 (15)
pH	6.5–7.4 (38)	5.5–7.4; >7.5 (19)
ESP	Non (75)	Medium (25)
QDGCs	3320; 3321 (12)	2723; 3028; 3124; 3226; 3318; 3319 (8)

NOTES: –



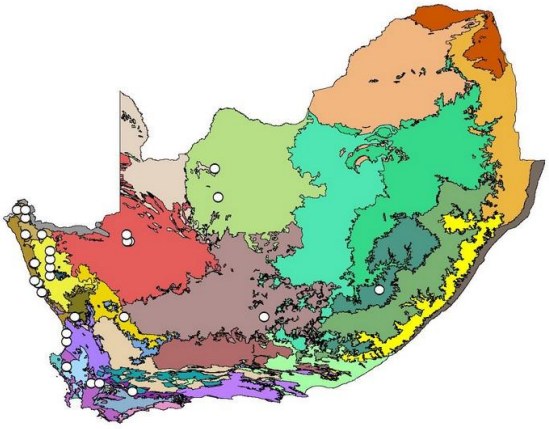
[E]*Melolobium humile* Eckl. & Zeyh.

Genisteae ①

Dwarf shrub; P; Ht 0.2–0.5; Alt 134–875

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland; Namaqualand Hardeveld (27)	Drakensberg Grassland; Upper Karoo; Namaqualand Sandveld; Trans-Escarpment Succulent Karoo; Eastern Kalahari Bushveld (9)
Biome	Succulent Karoo (45)	Fynbos; Nama-Karoo (20)
Rainfall (mm)	<400 (86)	200–600 (7)
Min temp (°C)	>6 (45)	<2 (24)
Max temp (°C)	25–29 (62)	27–35 (21)
Phosphorus (ppm)	5–35 (52)	>20 (38)
pH	>7.5 (31)	6.5–7.4 (28)
ESP	Non (55)	Medium (36)
QDGCs	3017 (21)	2917 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



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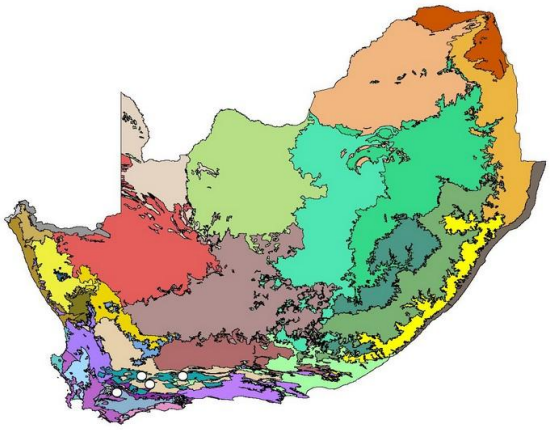
[E]*Melolobium lampolobum* (E.Mey.) Moteetee & B.-E.van Wyk

Genisteae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt 450–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (75)	200–600 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	>20 (75)	5–35 (25)
pH	>7.5 (50)	6.5–7.4; 6.5–8.4 (25)
ESP	Ecotone	
QDGCs	3320 (50)	3319; 3321 (25)

NOTES: –



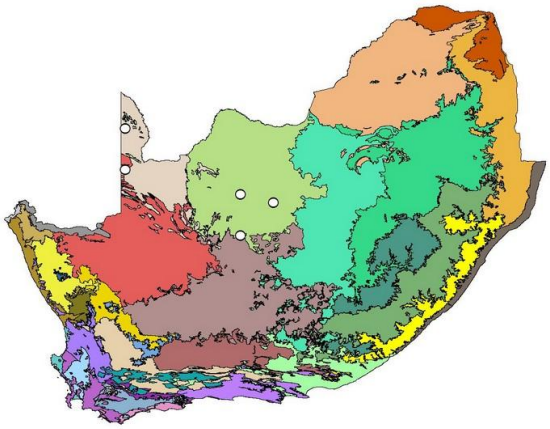
Melolobium macrocalyx Dummer var. *longifolium* Dummer

Genisteae ①

Dwarf shrub, shrub; P; Ht 0.4–1; Alt 800–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (67)	Kalahari Duneveld (33)
Biome	Savanna (100)	
Rainfall (mm)	<400 (80)	400–800 (20)
Min temp (°C)	<2; 2–8 (40)	0–4 (20)
Max temp (°C)	27–35 (60)	>33 (40)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	>7.5 (60)	6.5–7.4 (40)
ESP	Non (100)	
QDGCs	2520; 2720; 2723; 2824; 2923 (20)	

NOTES: –



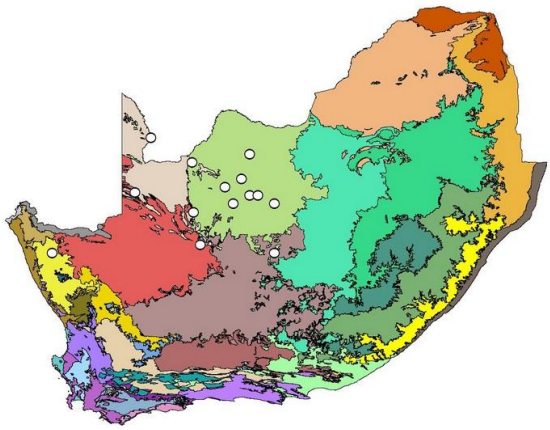
Melolobium macrocalyx Dummer var. *macrocalyx*

Genisteae ①

Dwarf shrub, shrub; P; Ht 0.3–0.8; Alt 900–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (78)	Namaqualand Hardeveld; Kalahari Duneveld (11)
Biome	Savanna (82)	Succulent Karoo (9)
Rainfall (mm)	<400 (86)	200–600; 400–800 (14)
Min temp (°C)	<2 (64)	2–8 (21)
Max temp (°C)	>33 (57)	27–35 (36)
Phosphorus (ppm)	<10 (64)	5–35 (36)
pH	6.5–7.4 (43)	>7.5 (29)
ESP	Non (89)	Medium (11)
QDGCs	2723 (23)	2620; 2622; 2623; 2720; 2724; 2822; 2823; 2824; 2917; 2922; 2924 (7)

NOTES: –



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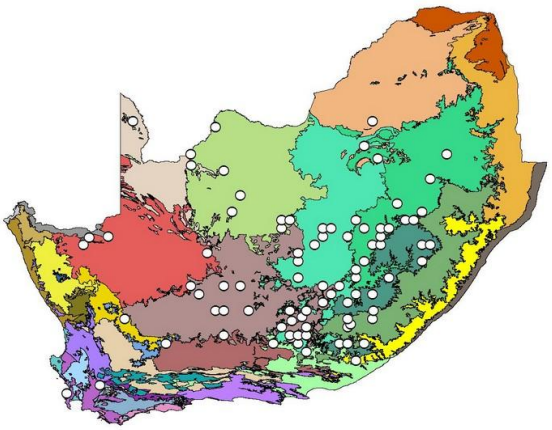
Melolobium microphyllum (L.f.) Eckl. & Zeyh.

Genisteae ①

Dwarf shrub, shrub, herb; P; Ht 0.15–1; Alt 1100–2300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (21)	Mesic Highveld Grassland (18)
Biome	Grassland (63)	Savanna (19)
Rainfall (mm)	400–800 (36)	<400 (33)
Min temp (°C)	<2 (63)	0–4 (25)
Max temp (°C)	27–35 (46)	25–29 (26)
Phosphorus (ppm)	<10 (56)	5–35 (29)
pH	<6.4 (26)	>7.5 (24)
ESP	Non (97)	Medium (3)
QDGCs	3225 (7)	3125; 3126 (6)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Magical; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Van Rooyen 2001).



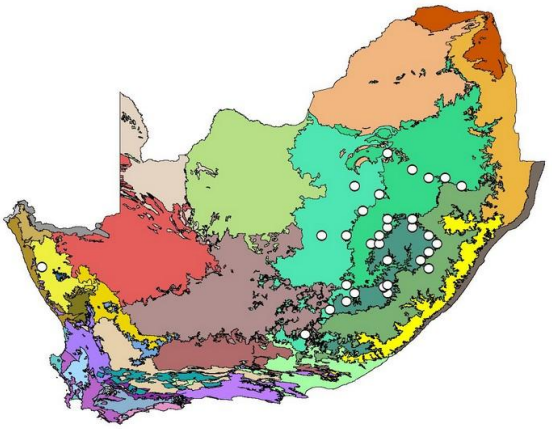
Melolobium obcordatum Harv.

Genisteae ①

Dwarf shrub; P; Ht 0.15–0.5; Alt 1370–2900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (43)	Mesic Highveld Grassland (29)
Biome	Grassland (97)	Succulent Karoo (3)
Rainfall (mm)	400–800 (42)	>800 (39)
Min temp (°C)	<2 (74)	0–4 (23)
Max temp (°C)	<27 (52)	25–29 (26)
Phosphorus (ppm)	<10 (84)	5–25 (16)
pH	<6.4 (58)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	2828; 2929; 3028 (12)	2927 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



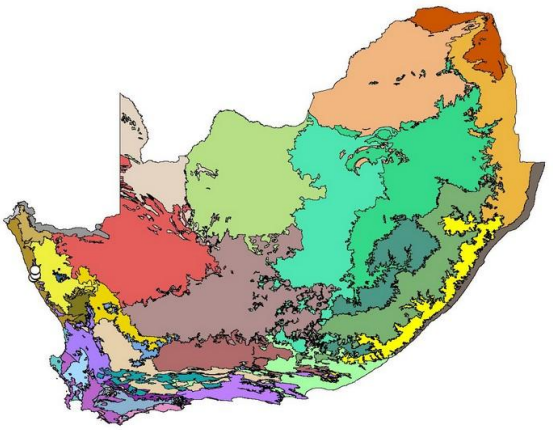
[E]*Melolobium stipulatum* (Thunb.) Harv.

Genisteae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt 762–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4; 6.5–8.4 (50)	
ESP	Ecotone	
QDGCs	3017 (100)	

NOTES: –



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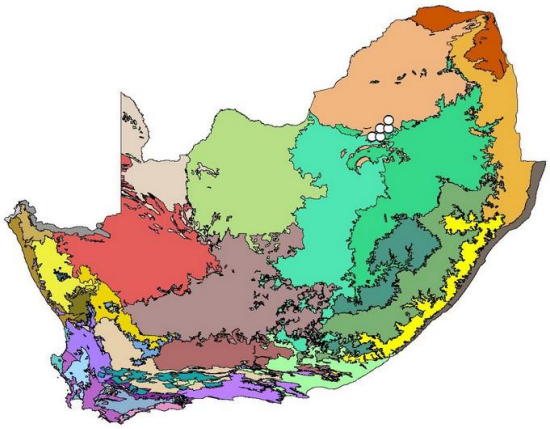
[E]*Melolobium subspicatum* Conrath

Genisteae ③

Dwarf shrub; P; Ht 0.3–0.6; Alt 1500–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	0–4 (60)	2–8 (40)
Max temp (°C)	27–35 (60)	25–29 (40)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2528; 2627 (40)	2527 (20)

NOTES: **Cultivated** (Glen 2002).



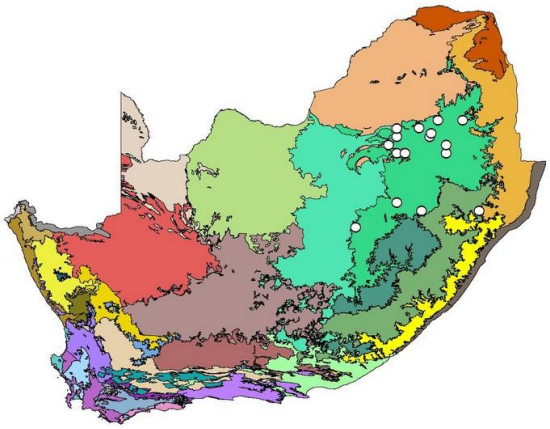
[E]*Melolobium wilmsii* Harms

Genisteae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt ?–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (80)	600–1000 (13)
Min temp (°C)	<2 (53)	0–4 (33)
Max temp (°C)	25–29 (60)	<27 (40)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (73)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	2628; 2629 (25)	2529 (13)

NOTES: –



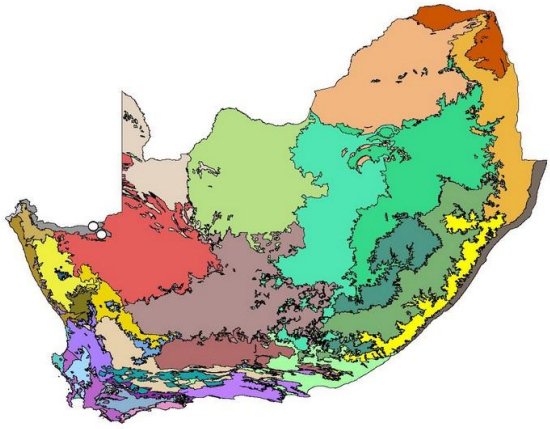
Microcharis disjuncta (J.B.Gillett) Schrire var. *disjuncta*

Indigofereae ①

Herb; A; Ht 0.08–0.35; Alt 610–1090

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Desert (100)	
Biome	Desert (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	>33 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Medium (100)	
QDGCs	2819; 2919 (50)	

NOTES: –



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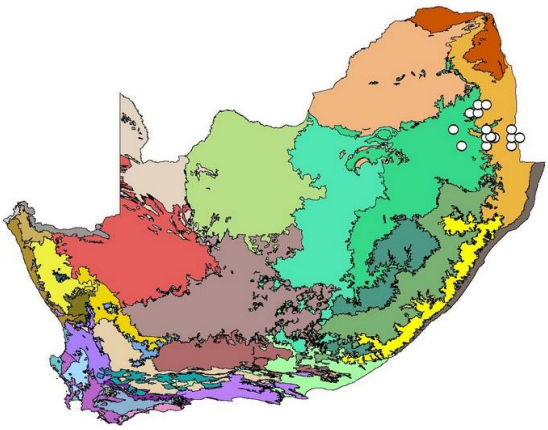
Microcharis galpinii N.E.Br.

Indigofereae ①

Herb; A; Ht 0.1–0.4; Alt 610–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (71)	Mesic Highveld Grassland (29)
Biome	Savanna (71)	Grassland (29)
Rainfall (mm)	>800 (57)	600–1000 (36)
Min temp (°C)	2–8 (57)	>6 (29)
Max temp (°C)	25–29 (57)	27–35 (36)
Phosphorus (ppm)	<10 (93)	5–35 (7)
pH	<6.4 (93)	6.5–8.4 (7)
ESP	Non (100)	
QDGCs	2631 (44)	2530 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



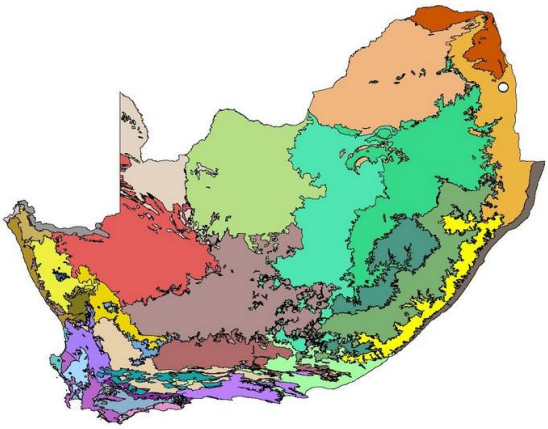
Microcharis latifolia Benth.

Indigofereae ①

Herb; A; Ht 0.01–0.2; Alt ?–381

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	6.5–7.4 (100)	
ESP	Non (100)	
QDGCs	2431 (100)	

NOTES: –



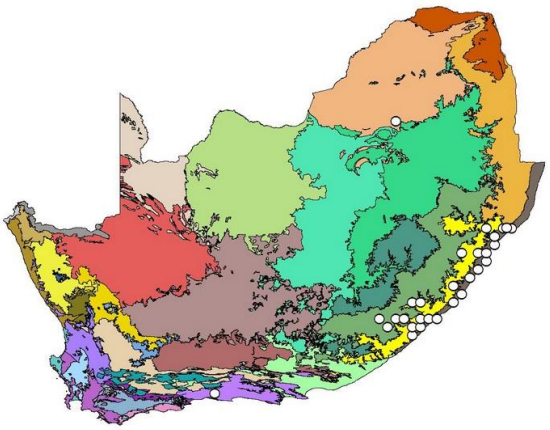
[E]*Millettia grandis* (E.Mey.) Skeels

Millettieae ☠ ③

Tree; P; Ht 3–11; Alt 0–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (58)	Sub-Escarpment Grassland (17)
Biome	Indian Ocean (67)	Grassland (33)
Rainfall (mm)	>800 (75)	600–1000 (21)
Min temp (°C)	>6 (64)	2–8 (36)
Max temp (°C)	25–29 (79)	27–35 (18)
Phosphorus (ppm)	<10 (68)	5–35 (32)
pH	<6.4 (64)	5.5–7.4 (36)
ESP	Non (92)	Medium (8)
QDGCs	3128; 3129 (17)	2831; 2931; 3030 (14)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Toxin in plant and seed (Watt & Breyer-Brandwijk 1962). **Biocultural:** Fuel (Van Wyk *et al.* 2000); Poison arrows (Hutchings *et al.* 1996); Medicine for humans; piscicide; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Venter & Venter 1996; Van Wyk *et al.* 2000).



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***Millettia stuhlmannii* Taub.** **Millettieae** –

Tree; P; Ht 3–20; Alt 100–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

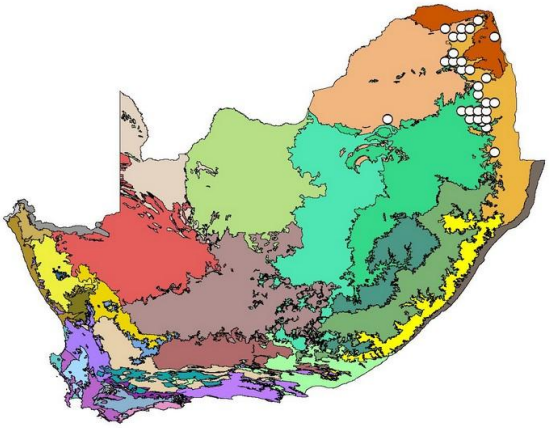
NOTES: –

***Mucuna coriacea* Baker subsp. *irritans* (Burtt Davy) Verdc.** **Phaseoleae** ☠ ③

Herb, climber; P; Ht 3–4; Alt 365–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (67)	Mesic Highveld Grassland; Central Bushveld; Mopane (11)
Biome	Savanna (100)	
Rainfall (mm)	>800 (36)	400–800 (32)
Min temp (°C)	2–8 (71)	>6 (29)
Max temp (°C)	25–29 (54)	27–35 (43)
Phosphorus (ppm)	<10 (57)	5–35 (43)
pH	<6.4 (71)	5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2530 (21)	2330; 2531 (17)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Hairs on pods highly irritant (Watt & Breyer-Brandwijk 1962; Pooley 1998). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans and livestock (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer, autumn (Pooley 1998).

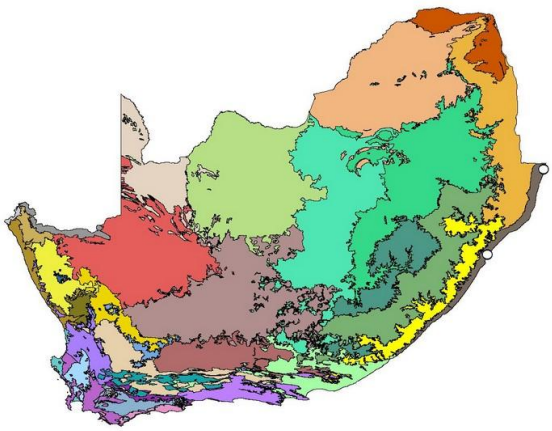


Mucuna gigantea* (Willd.) DC. subsp. *gigantea **Phaseoleae** ①

Climber; P; Ht ?; Alt ?–2

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2732; 2931 (50)	

NOTES: –



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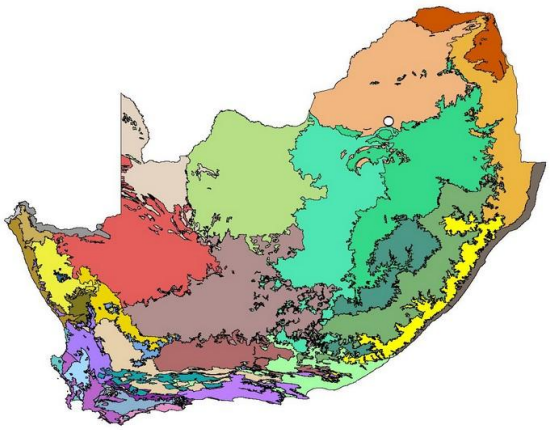
Mucuna pruriens (L.) DC. var. *pruriens*

Phaseoleae

Herb, climber; P; Ht 0.01–3; Alt 488–763

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2528 (100)	



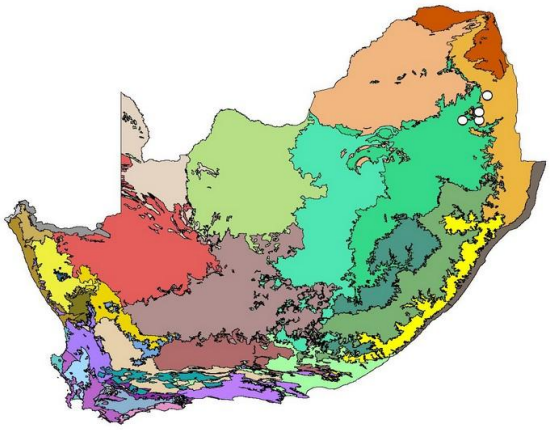
NOTES: **Livestock feed** (Lewis *et al.* 2005). **Cultivated** (Glen 2002). **DM:** 0.8–2.5 t/ha (Odhiambo 2004); 2–10 t/ha (Adjolohoun *et al.* 2008). **CP:** 11–26% (Adjolohoun *et al.* 2008). **Antiquality:** Hairs on pods highly irritant; alkaloids (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1974); 242 kgN/ha (Sanginga 2003). **Soil conservation:** Cover crop (Tarawali *et al.* 1999; Lewis *et al.* 2005; Odhiambo 2011); Green manure (Lewis *et al.* 2005). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).

Mucuna pruriens (L.) DC. var. *utilis* (Wall. ex Wight) Baker ex Burck

Phaseoleae

Herb, climber; P; Ht 0.01–3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Lowveld (50)	
Biome	Savanna (100)	
Rainfall (mm)	>800 (75)	600–1000 (25)
Min temp (°C)	2–8 (50)	0–4; >6 (25)
Max temp (°C)	25–29 (50)	<10; 27–35 (25)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2530 (75)	2431 (25)



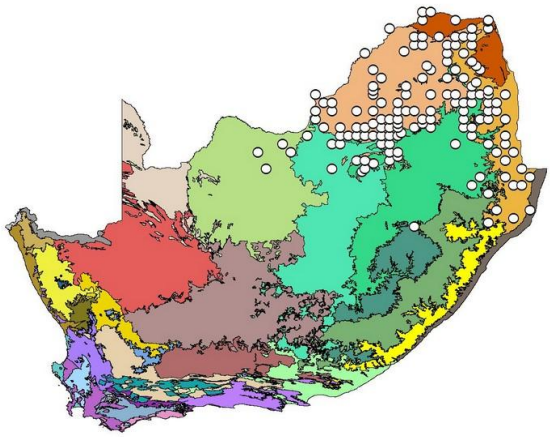
NOTES: **Livestock feed** (Lewis *et al.* 2005). **Cultivated** (Glen 2002). **DM:** 0.8–2.5 t/ha (Odhiambo 2004). **Antiquality:** Hairs on pods highly irritant; alkaloids (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1974); 242 kgN/ha (Sanginga 2003). **Soil conservation:** Cover crop (Tarawali *et al.* 1999; Lewis *et al.* 2005; Odhiambo 2011); Green manure (Lewis *et al.* 2005). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).

Mundulea sericea (Willd.) A.Chev. subsp. *sericea*

Millettieae

Shrub, tree; P; Ht 1–7; Alt 25–1850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (55)	Lowveld (22)
Biome	Savanna (91)	Grassland (9)
Rainfall (mm)	400–800 (67)	600–1000 (11)
Min temp (°C)	2–8 (51)	0–4; >6 (20)
Max temp (°C)	27–35 (65)	25–29 (29)
Phosphorus (ppm)	<10 (74)	5–35 (26)
pH	<6.4 (51)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	2528 (8)	2527 (7)



NOTES: **Livestock feed** (Van Wyk *et al.* 2000). **Cultivated** (Glen 2002). **Antiquality:** Flavonoids in bark (Hutchings *et al.* 1996); Glucoside in bark and root; alkaloids, rotenone and tephrosin in bark; hydrocyanic acid in plant (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Insecticide; magical; medicine for humans; timber (Watt & Breyer-Brandwijk 1962); Piscicide (Steyn 1934; Greenway 1936). **Flowering:** Spring, summer (Van Wyk & Malan 1998).

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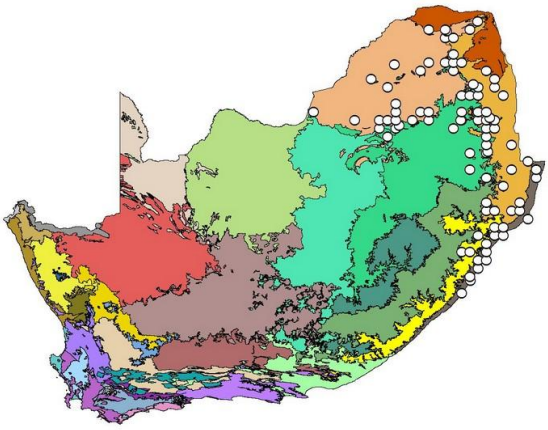
Neonotonia wightii (Wight. ex Arn.) J.A.Lackey

Phaseoleae ③

Climber; P; Ht 0.6–4.5; Alt 0–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (33)	Lowveld (28)
Biome	Savanna (71)	Indian Ocean (21)
Rainfall (mm)	400–800 (43)	>800 (37)
Min temp (°C)	2–8 (54)	>6 (37)
Max temp (°C)	25–29 (51)	27–35 (45)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (61)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2528 (8)	2430; 2530; 2531; 2831 (7)

NOTES: **Livestock feed** (Le Roux *et al.* 1988; Maposse *et al.* 2003; Lewis *et al.* 2005). **DM:** 4.8 t/ha (Clatworthy & Madakadze 1988). **CP:** Plant 21% (Nezomba *et al.* 2009). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Soil conservation:** Green manure; Cover crop (Lewis *et al.* 2005); Organic N (Nezomba *et al.* 2009); Reinforcement (Clatworthy 1980; Barnes *et al.* 1986). **Ecology:** Seed (Gardener *et al.* 1993; Tauro *et al.* 2007). **Flowering:** Spring, summer, autumn (Pooley 1998).



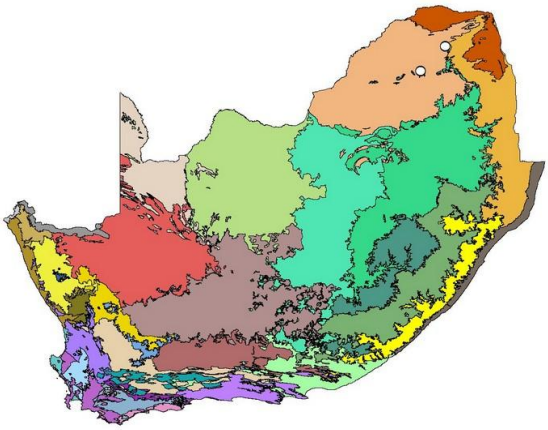
Neorautanenia brachypus (Harms) C.A.Sm.

Phaseoleae ①

Unknown

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	2329; 2429 (50)	

NOTES: **Antiquality:** None tested (Watt & Breyer-Brandwijk 1962; Steyn 1934). **Biocultural:** Piscicide (Watt & Breyer-Brandwijk 1962).



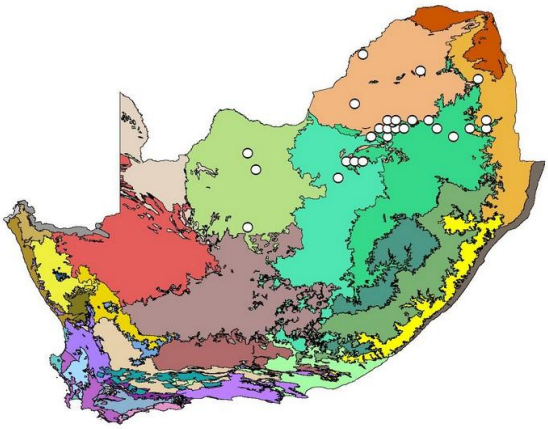
Neorautanenia ficifolia (Benth. ex Harv.) C.A.Sm.

Phaseoleae ①

Herb, climber; P; Ht 0.15–1.5; Alt 365–1713

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Eastern Kalahari Bushveld (33)	Mesic Highveld Grassland (17)
Biome	Savanna (67)	Grassland (33)
Rainfall (mm)	400–800 (78)	>800 (11)
Min temp (°C)	2–8 (44)	0–4 (30)
Max temp (°C)	27–35 (52)	25–29 (37)
Phosphorus (ppm)	<10 (93)	5–35 (7)
pH	<6.4 (59)	5.5–7.4; 6.5–7.4 (19)
ESP	Non (100)	
QDGCs	2528 (25)	2627 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Van Wyk & Malan 1998; Germishuizen & Clarke 2003).



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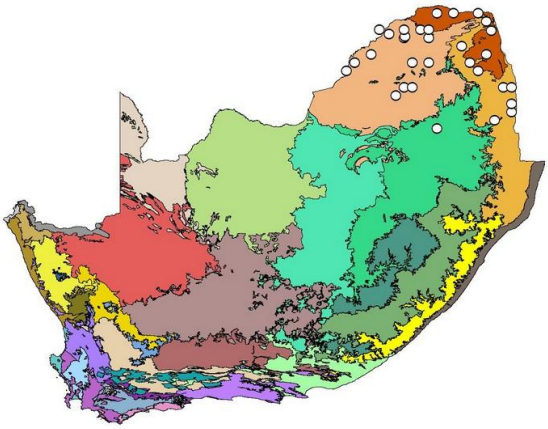
***Neorautanenia mitis* (A.Rich.) Verdc.** **Phaseoleae** ①

Dwarf shrub, herb, succulent; P; Ht 0.89–3; Alt 305–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (57)	Lowveld (22)
Biome	Savanna (96)	Grassland (4)
Rainfall (mm)	400–800 (50)	200–600 (30)
Min temp (°C)	2–8 (53)	>6 (43)
Max temp (°C)	27–35 (90)	25–29 (10)
Phosphorus (ppm)	5–35 (57)	<10 (43)
pH	5.5–7.4; 6.5–7.4 (33)	6.5–8.4 (20)
ESP	Non (100)	
QDGCs	2328 (13)	2229; 2428; 2531 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Tuber toxic (Watt & Breyer-Brandwijk 1962). **Biocultural:** Fluid from tuber; insecticide; piscicide (Watt & Breyer-Brandwijk 1962).

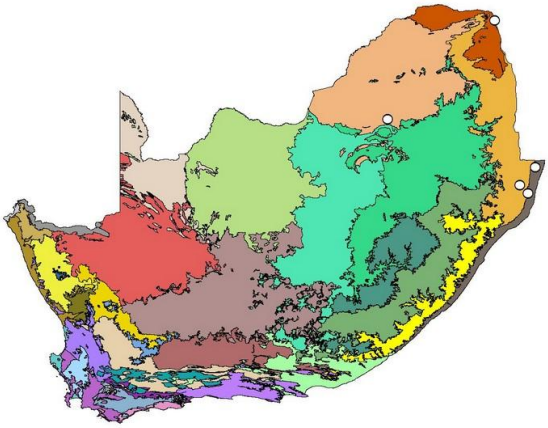


***Neptunia oleracea* Lour.** **Mimoseae** ①

Herb, climber; P; Ht 0.01–0.2; Alt 25–1150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Central Bushveld; Lowveld (33)	
Biome	Savanna (67)	Indian Ocean (33)
Rainfall (mm)	400–800 (80)	200–600 (20)
Min temp (°C)	>6 (80)	2–8 (20)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	5.5–7.4 (60)	<6.4; 6.5–7.4 (20)
ESP	Non (100)	
QDGCs	2732 (60)	2231; 2528 (20)

NOTES: –

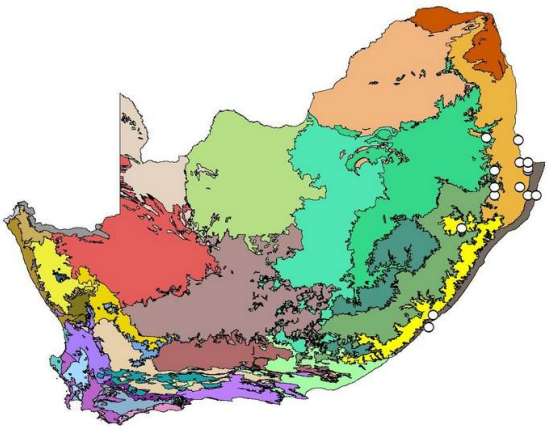


Newtonia hildebrandtii* (Vatke) Torre var. *hildebrandtii **Mimoseae** ①

Tree; P; Ht 9–18; Alt 0–120

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (80)	Indian Ocean Coastal Belt (20)
Biome	Savanna (80)	Indian Ocean (20)
Rainfall (mm)	400–800 (58)	>800 (25)
Min temp (°C)	>6 (58)	2–8 (42)
Max temp (°C)	27–35 (58)	25–29 (42)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	5.5–7.4 (50)	<6.4 (42)
ESP	Non (100)	
QDGCs	2732 (36)	2632; 2731 (22)

NOTES: **Biocultural:** Magical (Hutchings *et al.* 1996).



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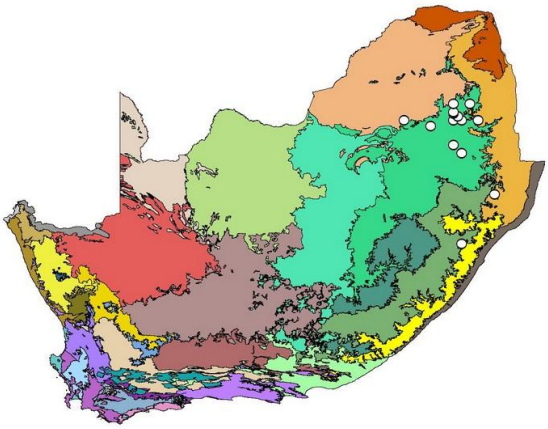
***Pearsonia grandifolia* (Bolus) Polhill subsp. *latibracteolata* (Dummer) Polhill** **Crotalarieae** ①

Herb; P; Ht ?; Alt ?–2285

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (42)	400–800 (33)
Min temp (°C)	0–4 (58)	2–8 (33)
Max temp (°C)	25–29 (50)	<27 (42)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2530 (57)	2630 (14)

NOTES: **Flowering:** Spring, summer (Pooley 1998).

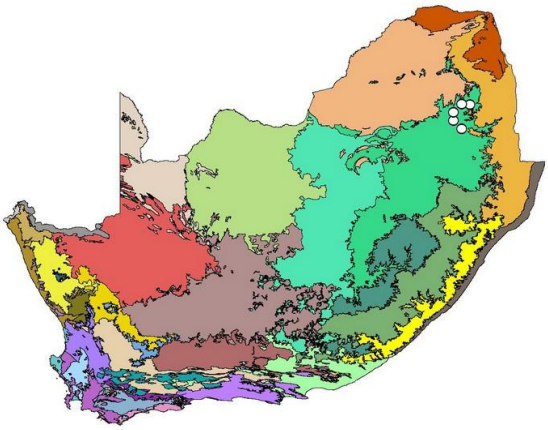


[E]***Pearsonia hirsuta* Germish.** **Crotalarieae** ①

Herb; P; Ht 0.01–0.15; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000; >800 (40)	400–800 (20)
Min temp (°C)	0–4 100	
Max temp (°C)	<27 100	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	2530 (100)	

NOTES: –

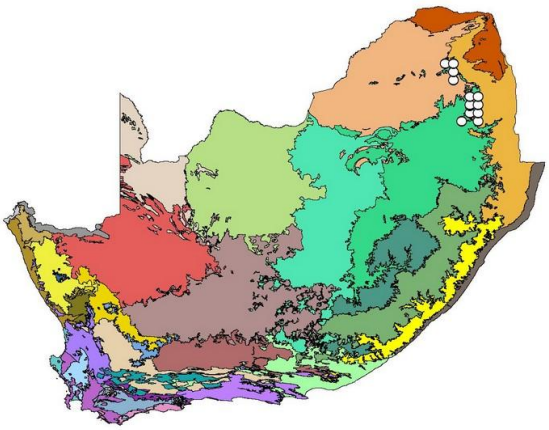


[E]***Pearsonia obovata* (Schinz) Polhill** **Crotalarieae** ①

Herb; P; Ht 0.05–0.8; Alt 1235–2195

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (67)	Central Bushveld (33)
Biome	Savanna (100)	
Rainfall (mm)	>800 (58)	600–1000 (25)
Min temp (°C)	2–8 (83)	0–4 (17)
Max temp (°C)	25–29 (75)	<27 (17)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<6.4 (84)	5.5–7.4; 6.5–8.4 (8)
ESP	Non (100)	
QDGCs	2530 (54)	2430 (31)

NOTES: –



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***Pearsonia podalyriafolia* Dummer** **Crotalarieae** –

Unknown

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

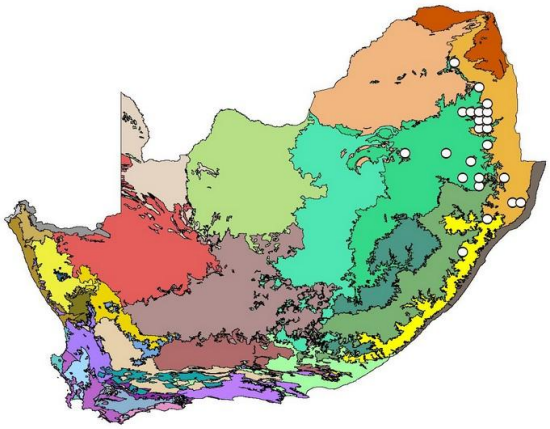
NOTES: –

***Pearsonia sessilifolia* (Harv.) Dummer subsp. *filifolia* (Bolus) Polhill** **Crotalarieae** ①

Dwarf shrub; P; Ht 0.1–0.6; Alt 305–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Lowveld (50)	
Biome	Savanna (57)	Grassland (43)
Rainfall (mm)	>800 (57)	600–1000 (30)
Min temp (°C)	2–8 (73)	<2; 0–4; >6 (9)
Max temp (°C)	25–29 (61)	27–35 (30)
Phosphorus (ppm)	<10 (96)	5–35 (4)
pH	<6.4 (74)	5.5–7.4 (26)
ESP	Non (100)	
QDGCs	2530 (22)	2531 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer, autumn (Pooley 1998).

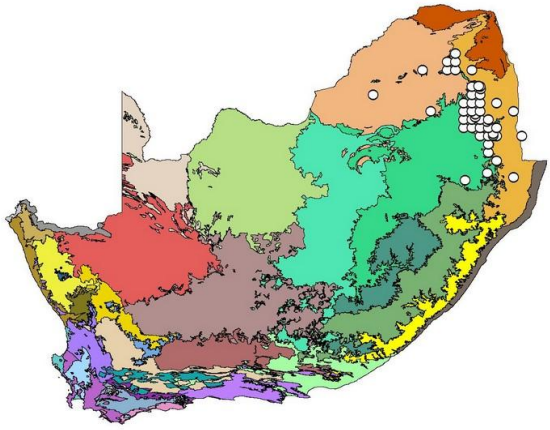


***Pearsonia sessilifolia* (Harv.) Dummer subsp. *marginata* (Schinz) Polhill** **Crotalarieae** ①❖

Dwarf shrub, herb; P; Ht 0.2–1; Alt 300–2135

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (46)	Lowveld (38)
Biome	Savanna (67)	Grassland (33)
Rainfall (mm)	>800 (53)	400–800 (28)
Min temp (°C)	2–8 (78)	0–4 (13)
Max temp (°C)	25–29 (65)	27–35 (23)
Phosphorus (ppm)	<10 (83)	5–35 (18)
pH	<6.4 (70)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2530 (30)	2430 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972, 1975). **Flowering:** Spring, summer, autumn (Pooley 1998).



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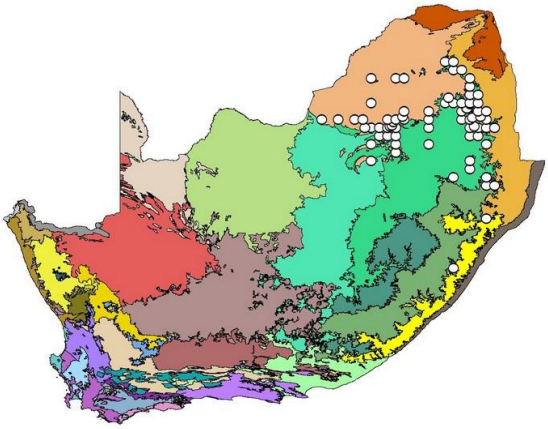
Pearsonia sessilifolia (Harv.) Dummer subsp. *sessilifolia*

Crotalarieae ①

Dwarf shrub, herb; P; Ht 0.05–1; Alt 457–2195

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Central Bushveld (47)	Lowveld (6)
Biome	Grassland (58)	Savanna (42)
Rainfall (mm)	400–800 (60)	>800 (26)
Min temp (°C)	2–8 (63)	0–4 (31)
Max temp (°C)	25–29 (62)	27–35 (29)
Phosphorus (ppm)	<10 (91)	5–35 (9)
pH	<6.4 (82)	5.5–7.4 (17)
ESP	Non (100)	
QDGCs	2530 (22)	2528 (14)

NOTES: **Flowering:** Spring, summer, autumn (Pooley 1998).



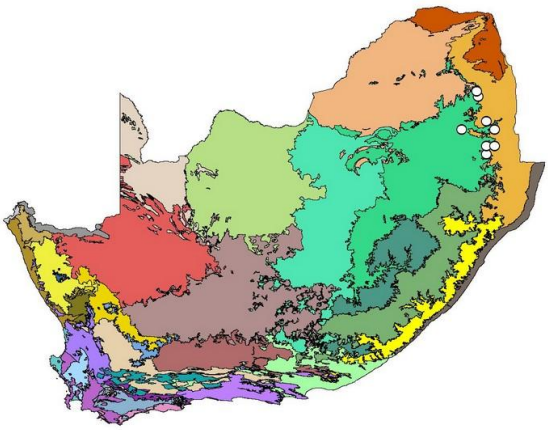
Pearsonia sessilifolia (Harv.) Dummer subsp. *swaziensis* (Bolus) Polhill

Crotalarieae ①

Dwarf shrub, herb; P; Ht 0.25–1; Alt 759–1371

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (88)	600–1000 (12)
Min temp (°C)	2–8 (88)	0–4 (12)
Max temp (°C)	25–29 (74)	<27; 27–35 (13)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2631 (38)	2531 (25)

NOTES: **Flowering:** Spring, summer, autumn (Pooley 1998).



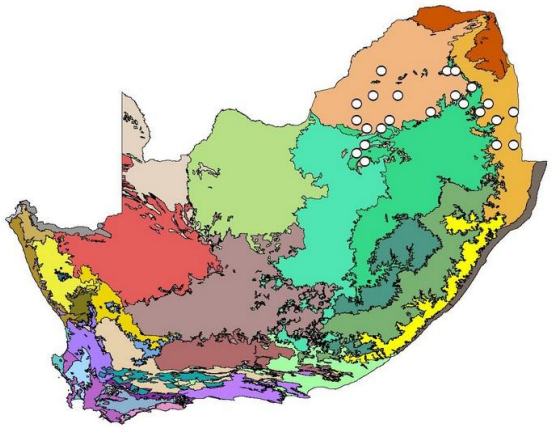
Pearsonia uniflora (Kensit) Polhill

Crotalarieae ①

Herb; P; Ht 0.15–0.45; Alt 457–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (64)	Lowveld (27)
Biome	Savanna (89)	Grassland (11)
Rainfall (mm)	400–800 (74)	>800 (17)
Min temp (°C)	2–8 (57)	0–4 (30)
Max temp (°C)	27–35 (61)	25–29 (35)
Phosphorus (ppm)	<10 (87)	5–35 (13)
pH	<6.4 (52)	5.5–7.4 (35)
ESP	Non (100)	
QDGCs	2527 (17)	2430; 2531; 2627 (13)

NOTES: –



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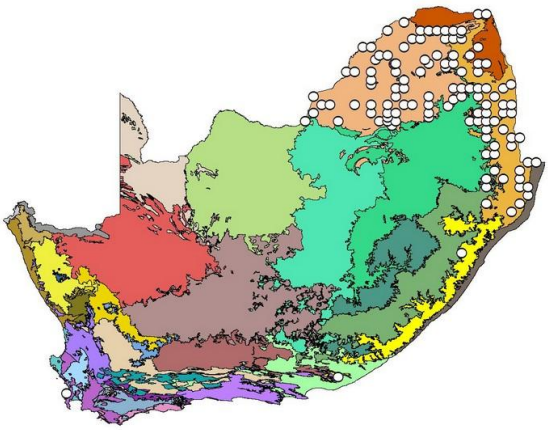
Peltophorum africanum Sond.

Caesalpinieae ☠ ③

Tree; P; Ht 0.5–18; Alt 60–1950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (64)	Lowveld (31)
Biome	Savanna (99)	Fynbos (1)
Rainfall (mm)	400–800 (62)	>800 (14)
Min temp (°C)	2–8 (65)	>6 (28)
Max temp (°C)	27–35 (63)	25–29 (35)
Phosphorus (ppm)	<10 (70)	5–35 (30)
pH	<6.4 (41)	5.5–7.4 (36)
ESP	Non (100)	
QDGCs	2531 (9)	2430 (8)

NOTES: **Livestock feed** (Van Wyk *et al.* 2000); Rejected by kudus (Owen-Smith & Cooper 1987). **CP:** Leaves 12% (Lukhele & Van Ryssen 2000). **Cultivated** (Glen 2002). **Antiquality:** Gum poisonous (Hutchings *et al.* 1996);Tannin in bark and root (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** No nodulation (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans and livestock (Watt & Breyer-Brandwijk 1962); Timber (Van Wyk *et al.* 2000). **Flowering:** Spring, summer, autumn (Venter & Venter 1996; Van Wyk *et al.* 2000).



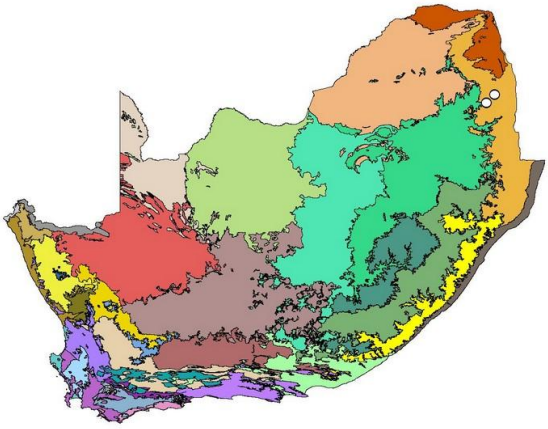
Philenoptera bussei (Harms) Schrire

Millettieae ①

Tree; P; Ht 3–15; Alt 200–400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2431; 2531 (50)	

NOTES: **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



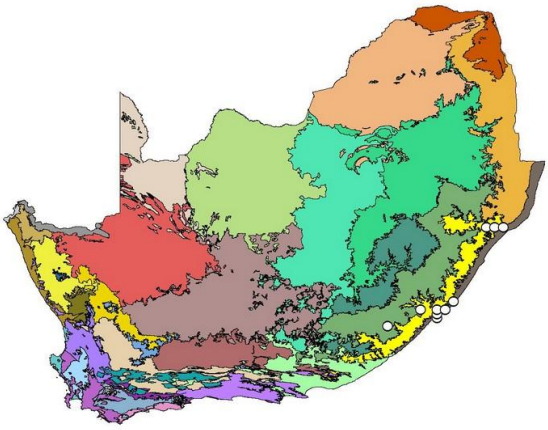
[E]*Philenoptera sutherlandii* (Harv.) Schrire

Millettieae ☠ ③

Tree; P; Ht 2.5–21.5; Alt 50–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Sub-Escarpment Grassland (50)	
Biome	Grassland; Indian Ocean (50)	
Rainfall (mm)	>800 (89)	600–1000 (11)
Min temp (°C)	>6 (78)	2–8 (22)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (78)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	3129 (100)	

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Tannin in bark (Watt & Breyer-Brandwijk 1962).



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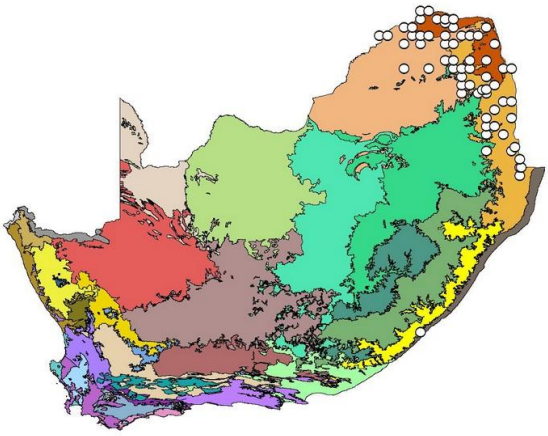
Philenoptera violacea (Klotzsch) Schrire

Millettieae ☠ ③

Tree; P; Ht 4.5–20; Alt 50–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (43)	Mopane (30)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (38)	<400 (21)
Min temp (°C)	2–8 (52)	>6 (48)
Max temp (°C)	27–35 (76)	25–29 (24)
Phosphorus (ppm)	5–35 (59)	<10 (41)
pH	5.5–7.4 (28)	<6.4 (26)
ESP	Non (100)	
QDGCs	2229 (13)	2531 (11)

NOTES: **Livestock feed** (Dicko & Sikena 1992). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Saponin in root bark (Hutchings *et al.* 1996); Toxic bark and root (Watt & Breyer-Brandwijk 1962). **Biocultural:** Magical; medicine for humans; piscicide; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Venter & Venter 1996).



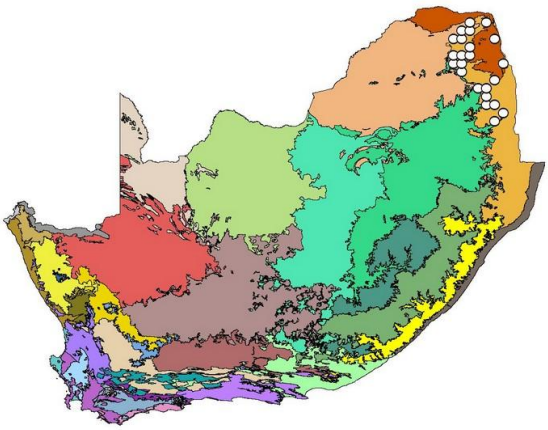
Piliostigma thonningii (Schumach.) Milne-Redh.

Cercideae ☠ ③

Shrub, tree; P; Ht 1–13; Alt 250–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (75)	Mopane (25)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (39)	600–1000 (300
Min temp (°C)	>6 (74)	2–8 (26)
Max temp (°C)	27–35 (78)	25–29 (22)
Phosphorus (ppm)	<10 (52)	5–35 (48)
pH	<6.4 (48)	6.5–7.4 (30)
ESP	Non (100)	
QDGCs	2330 (35)	2531 (17)

NOTES: **Livestock feed:** Low value (Smith 1992); (Le Houérou 1980; Dicko & Sikena 1992; Lewis *et al.* 2005). **CP:** Pods 14% (Mlambo *et al.* 2001). **Cultivated** (Glen 2002). **N_2 fixation:** No nodulation (Grobbelaar *et al.* 1983). **Antiquality:** Tannin in bark and twigs (Watt & Breyer-Brandwijk 1962). **Biocultural:** Beverage; dye; fibre; gum; magical; medicine for humans; pods as food (Watt & Breyer-Brandwijk 1962); Fuel (Van Wyk *et al.* 2000). **Flowering:** Summer, autumn (Venter & Venter 1996; Van Wyk *et al.* 2000).



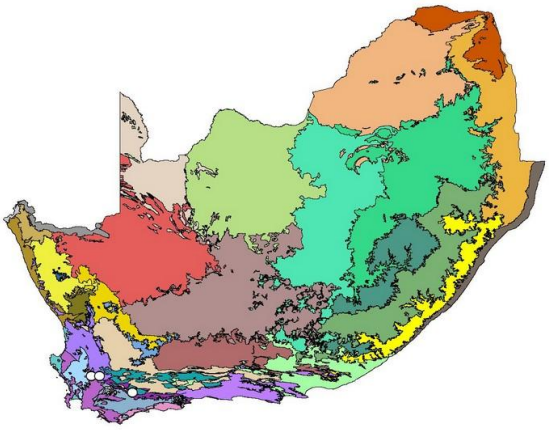
[E]*Podalyria amoena* Eckl. & Zeyh.

Podalyrieae ①

Shrub; P; Ht 1–2; Alt 300–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	0–4 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Ecotone	
QDGCs	3319 (67)	3320 (33)

NOTES: –



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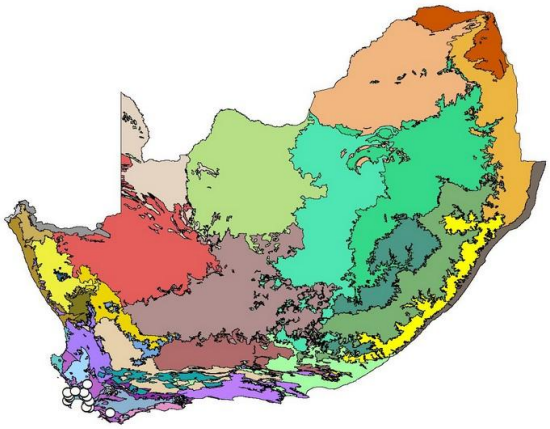
[E]*Podalyria argentea* Salisb.

Podalyrieae ①

Shrub; P; Ht 0.9–1.2; Alt 150–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; 600–1000; >800 (30)	200–600 (10)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (90)	<10 (10)
pH	<6.4 (90)	5.5–7.4 (10)
ESP	Non (100)	
QDGCs	3318 (42)	3418 (33)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Kidd 2002).



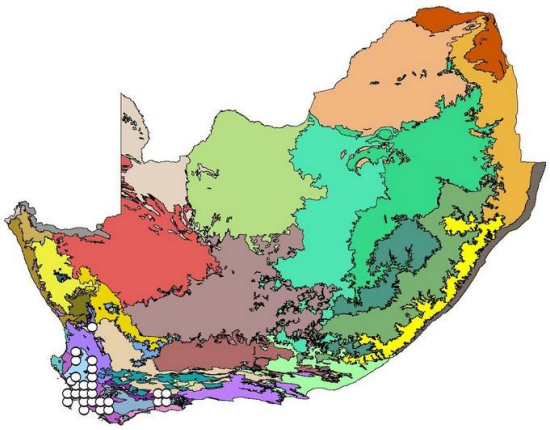
[E]*Podalyria biflora* Lam.

Podalyrieae ①

Dwarf shrub, shrub; P; Ht 0.4–2.5; Alt 50–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (38)	400–800; >800 (19)
Min temp (°C)	2–8 (70)	0–4; >6 (15)
Max temp (°C)	25–29 (85)	27–35 (15)
Phosphorus (ppm)	5–35 (96)	<10 (4)
pH	<6.4 (50)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	3318 (26)	3419 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Mustart *et al.* 2003).



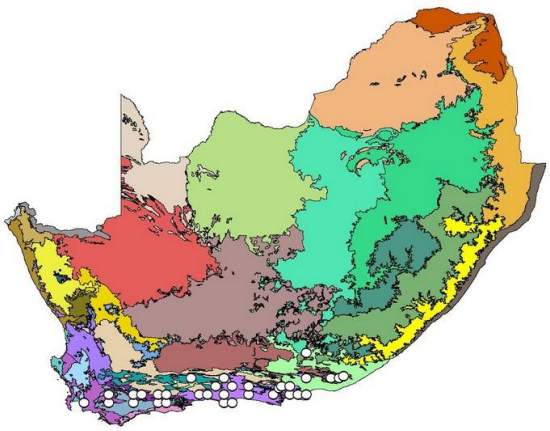
[E]*Podalyria burchellii* DC.

Podalyrieae ①

Shrub; P; Ht 0.2–2.5; Alt 50–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (44)	400–800 (22)
Min temp (°C)	2–8 (91)	>6 (6)
Max temp (°C)	25–29 (72)	27–35 (16)
Phosphorus (ppm)	5–35 (94)	<10; >20 (3)
pH	5.5–7.4 (38)	<6.4 (28)
ESP	Medium (100)	
QDGCs	3323; 3325 (15)	3322 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Flowering:** Autumn, winter (Manning 2001).



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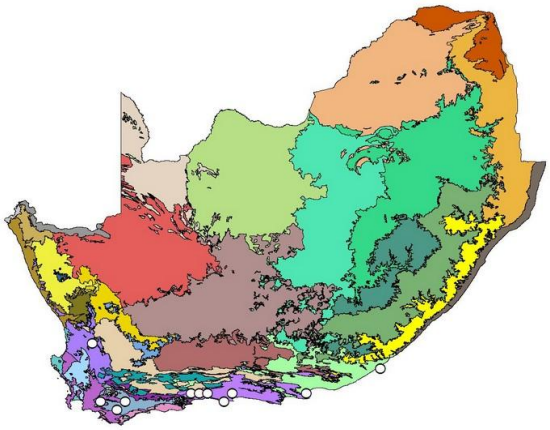
[E]*Podalyria buxifolia* (Retz.) Willd.

Podalyrieae ☠①

Dwarf shrub; P; Ht 0.5–1.5; Alt 15–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (75)	Albany Thicket (25)
Biome	Fynbos (80)	Albany Thicket (20)
Rainfall (mm)	400–800 (45)	600–1000 (27)
Min temp (°C)	2–8 (82)	>6 (18)
Max temp (°C)	25–29 (73)	<27 (18)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (45)	5.5–7.4 (36)
ESP	Medium (75)	Non (25)
QDGCs	3322 (27)	3419 (18)

NOTES: **Antiquality:** Alkaloid in stem (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Moriarty 1997).



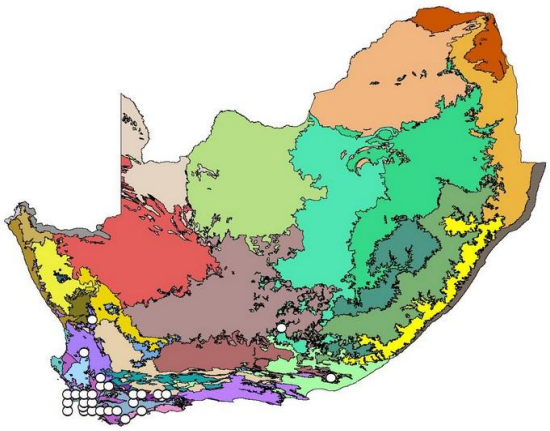
[E]*Podalyria calyptrata* (Retz.) Willd.

Podalyrieae ☠③

Shrub, tree; P; Ht 0.3–6; Alt 0–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (41)	400–800 (19)
Min temp (°C)	2–8 (56)	>6 (26)
Max temp (°C)	25–29 (89)	27–35 (11)
Phosphorus (ppm)	5–35 (92)	<10; >20 (4)
pH	<6.4 (37)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3418; 3419 (17)	3319 (14)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Antiquality:** Alkaloid in plant; saponin (Watt & Breyer-Brandwijk 1962). **Physiology:** Photosynthesis (Musil *et al.* 2003). **Flowering:** Winter, spring (Kidd 2002).



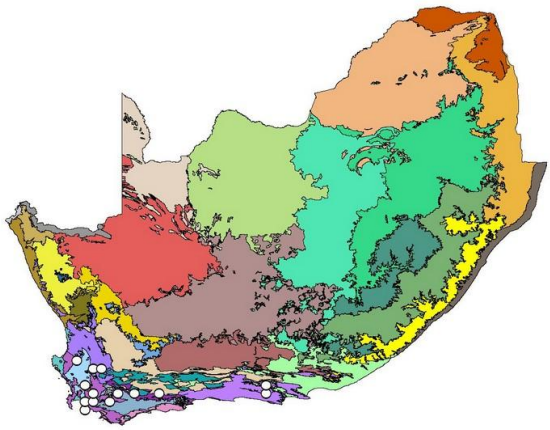
[E]*Podalyria canescens* E.Mey.

Podalyrieae ①

Shrub; P; Ht 0.7–2.5; Alt 300–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (43)	>800 (29)
Min temp (°C)	2–8 (71)	0–4 (29)
Max temp (°C)	25–29 (86)	<27; 27–35 (7)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (50)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	3319 (29)	3324; 3418; 3419 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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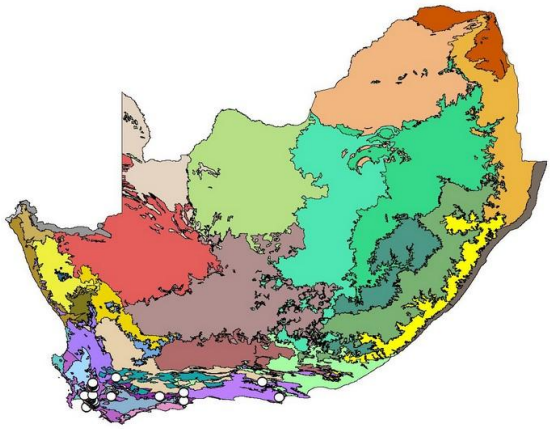
[E]*Podalyria cordata* R.Br.

Podalyrieae ①

Shrub; P; Ht 0.5–4.5; Alt 300–1150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; >800 (38)	<400; 400–800; 600–1000 (8)
Min temp (°C)	2–8 (69)	0–4 (23)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (92)	<10 (8)
pH	5.5–7.4 (54)	<6.4 (46)
ESP	Non (100)	
QDGCs	3419 (47)	3319 (26)

NOTES: –



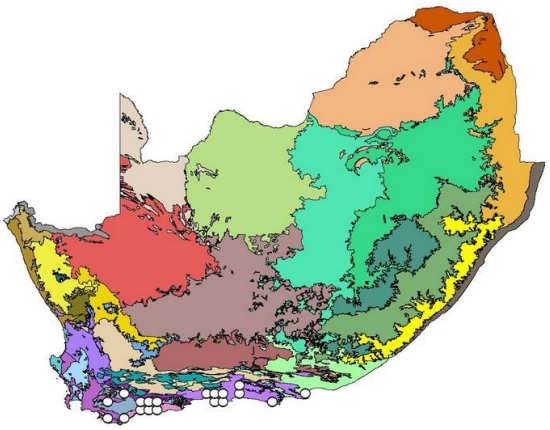
[E]*Podalyria cuneifolia* Vent.

Podalyrieae ③

Shrub; P; Ht 0.3–3; Alt 0–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (53)	600–1000 (26)
Min temp (°C)	2–8 (74)	>6 (26)
Max temp (°C)	25–29 (68)	<27 (32)
Phosphorus (ppm)	5–35 (95)	<10 (5)
pH	<6.4; 5.5–7.4 (37)	6.5–7.4 (16)
ESP	Medium (100)	
QDGCs	3420 (26)	3323 (16)

NOTES: **Cultivated** (Glen 2002).



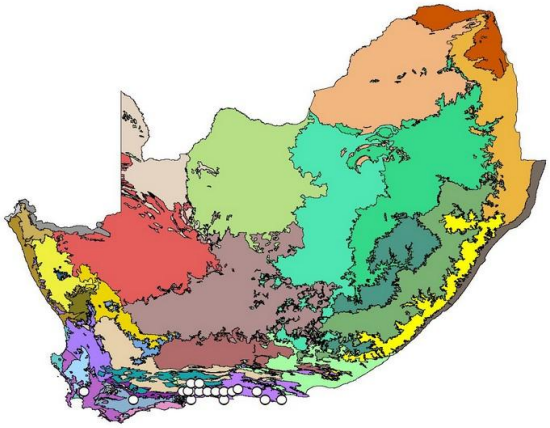
[E]*Podalyria glauca* DC.

Podalyrieae ①

Dwarf shrub, shrub; P; Ht 0.3–1.5; Alt 50–1150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (41)	400–800 (29)
Min temp (°C)	2–8 (88)	>6 (12)
Max temp (°C)	<27 (47)	25–29 (35)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (71)	5.5–7.4 (18)
ESP	Medium (100)	
QDGCs	3322 (39)	3323 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring (Moriarty 1982).



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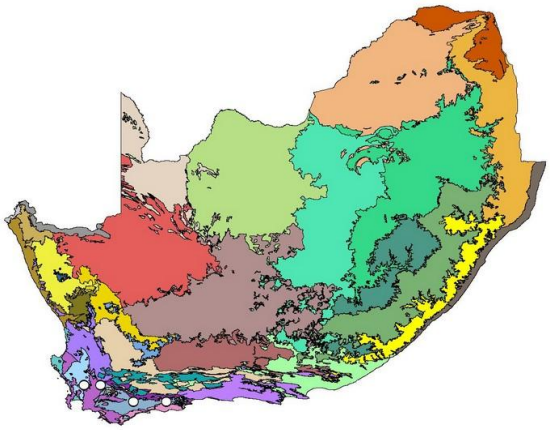
[E]*Podalyria hamata* E.Mey.

Podalyrieae ①

Shrub; P; Ht 0.6–1; Alt 60–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	400–800 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (75)	<6.4 (25)
ESP	Ecotone	
QDGCs	3318; 3319; 3420; 3421 (25)	

NOTES: –



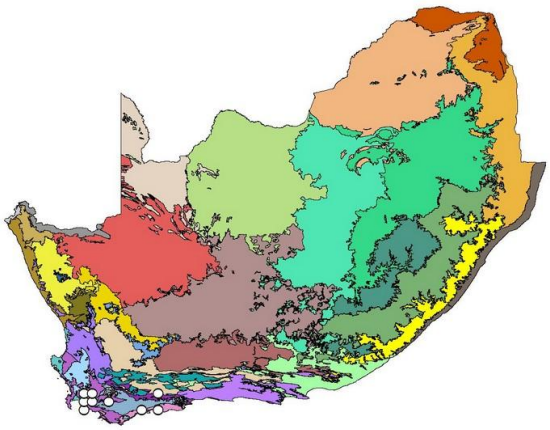
[E]*Podalyria hirsuta* (Aiton) Willd.

Podalyrieae ①

Shrub; P; Ht 0.7–2.5; Alt 50–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (44)	200–600 (33)
Min temp (°C)	2–8 (78)	0–4; >6 (11)
Max temp (°C)	25–29 (89)	27–35 (11)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (44)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3418; 3419 (22)	3318; 3319; 3321; 3420; 3421 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



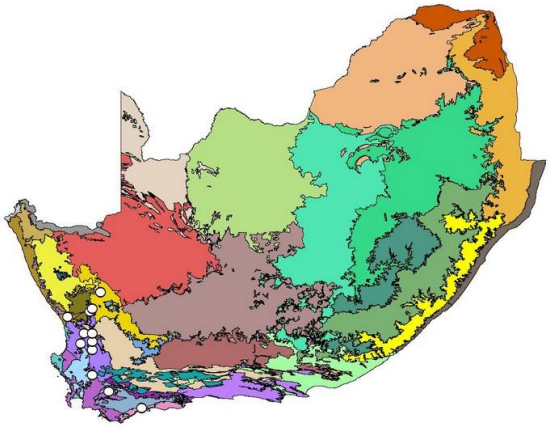
[E]*Podalyria leipoldtii* L.Bolus

Podalyrieae ①

Shrub; P; Ht 1–3; Alt 150–1150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Trans-Escarpment Succulent Karoo (50)	
Biome	Fynbos (83)	Succulent Karoo (17)
Rainfall (mm)	200–600 (64)	<400 (27)
Min temp (°C)	2–8 (64)	0–4; >6 (18)
Max temp (°C)	25–29 (82)	27–35 (18)
Phosphorus (ppm)	5–35 (82)	>20 (18)
pH	<6.4; 5.5–7.4 (27)	6.5–7.4; >7.5 (18)
ESP	Non; Medium (50)	
QDGCs	3219 (25)	3119; 3218; 3319 (17)

NOTES: **Flowering:** Spring (Van Rooyen & Steyn 1999).



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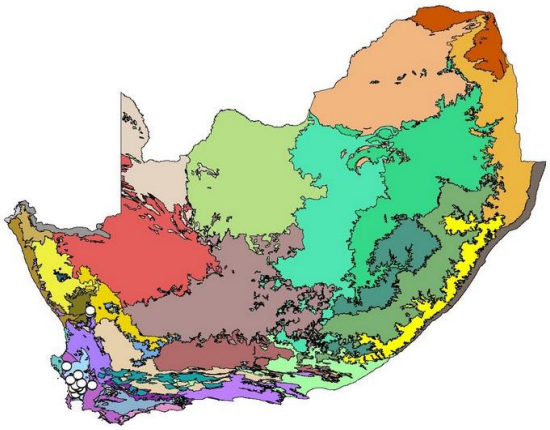
[E]*Podalyria microphylla* E.Mey.

Podalyrieae ①

Shrub; P; Ht 0.5–1; Alt 75–200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (44)	<400 (22)
Min temp (°C)	2–8; >6 (44)	0–4 (12)
Max temp (°C)	25–29 (89)	27–35 (11)
Phosphorus (ppm)	5–35 (89)	>20 (11)
pH	<6.4 (67)	5.5–7.4 (22)
ESP	Ecotone	
QDGCs	3318 (80)	3119 (13)

NOTES: –



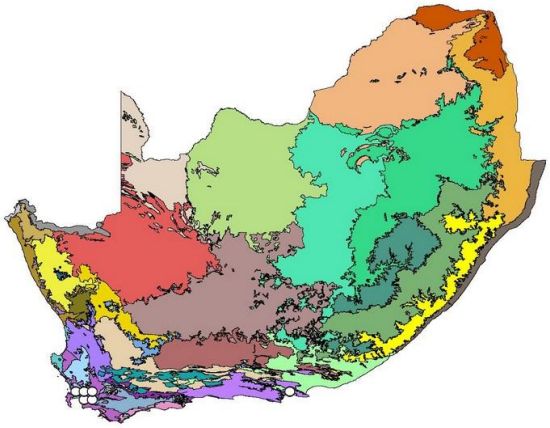
[E]*Podalyria montana* Hutch.

Podalyrieae ①

Shrub; P; Ht 0.7–1; Alt 150–1150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (49)	200–600; 400–800; 600–1000 (17)
Min temp (°C)	2–8 (66)	0–4; >6 (17)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3318 (32)	3319; 3325; 3418; 3419 (17)

NOTES: –



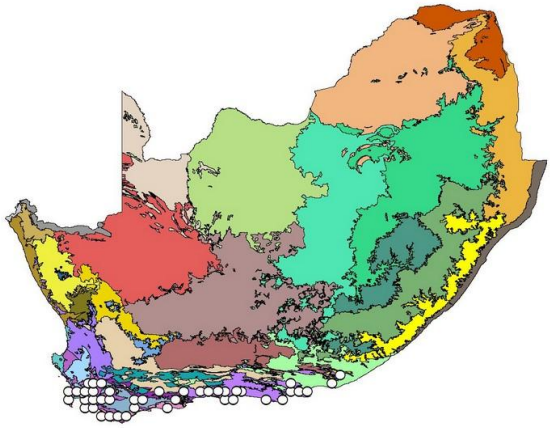
[E]*Podalyria myrtillifolia* (Retz.) Willd.

Podalyrieae ①

Shrub; P; Ht 0.2–3; Alt 0–850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (70)	Southwest Fynbos (20)
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (31)	200–600 (29)
Min temp (°C)	2–8 (64)	>6 (26)
Max temp (°C)	25–29 (79)	<27 (17)
Phosphorus (ppm)	5–35 (95)	<10 (5)
pH	<6.4 (50)	5.5–7.4 (29)
ESP	Medium (70)	Non (30)
QDGCs	3419 (16)	3318 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Winter, spring (Manning 2001).



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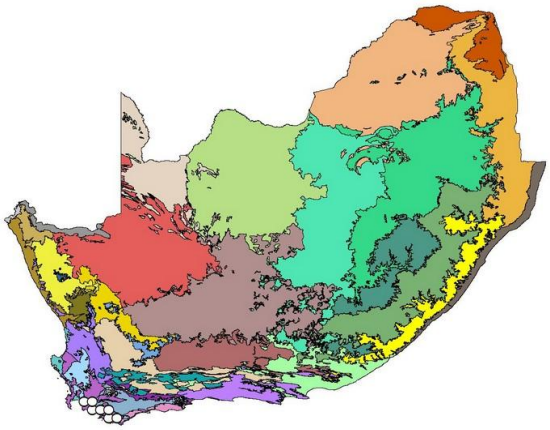
[E]*Podalyria oleaefolia* Salisb.

Podalyrieae ①

Dwarf shrub; P; Ht 0.1–0.5; Alt 50–350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (57)	>800 (29)
Min temp (°C)	2–8 (86)	>6 (14)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (71)	<10 (29)
pH	<6.4 (57)	5.5–7.4 (29)
ESP	Ecotone	
QDGCs	3419 (86)	3418 (14)

NOTES: –



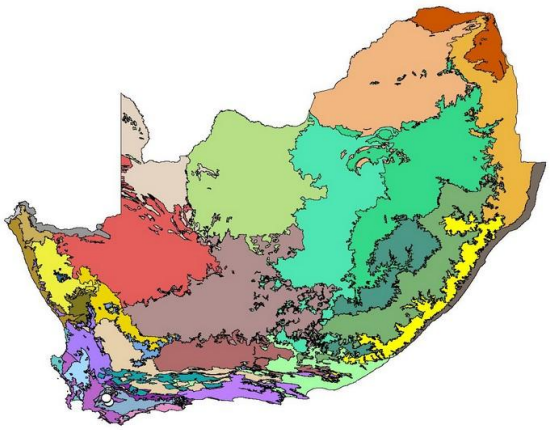
[E]*Podalyria orbicularis* E.Mey.

Podalyrieae ①

Shrub; P; Ht 0.01–0.6; Alt 300–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: –



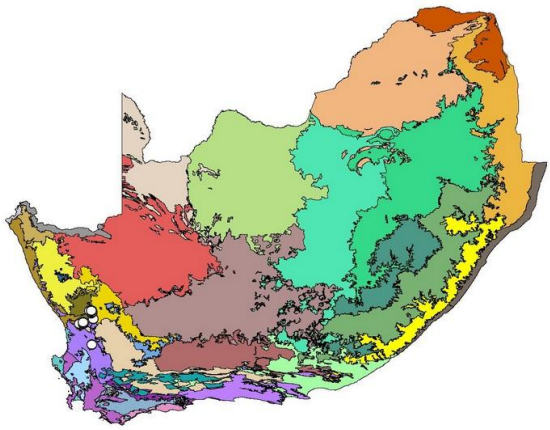
[E]*Podalyria pearsonii* E.Phillips

Podalyrieae ①

Shrub; P; Ht 0.3–1; Alt 300–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (83)	400–800 (17)
Min temp (°C)	2–8 (83)	>6 (17)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	6.5–8.4 (66)	<6.4; >7.5 (17)
ESP	Ecotone	
QDGCs	3118; 3119 (47)	3219 (6)

NOTES: **Flowering:** Spring (Van Rooyen & Steyn 1999).



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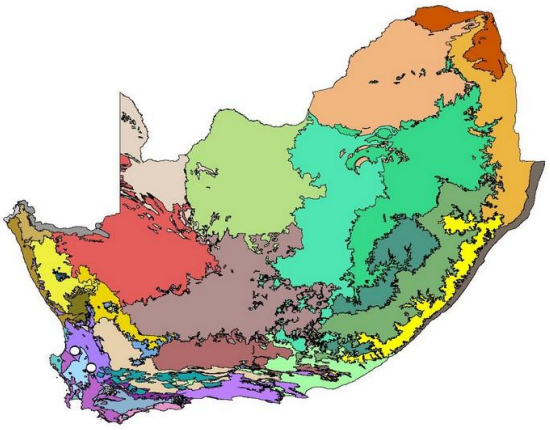
[E]*Podalyria pulcherrima* Schinz

Podalyrieae ①

Dwarf shrub; P; Ht 0.15–0.5; Alt 100–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3218; 3319 (50)	

NOTES: –



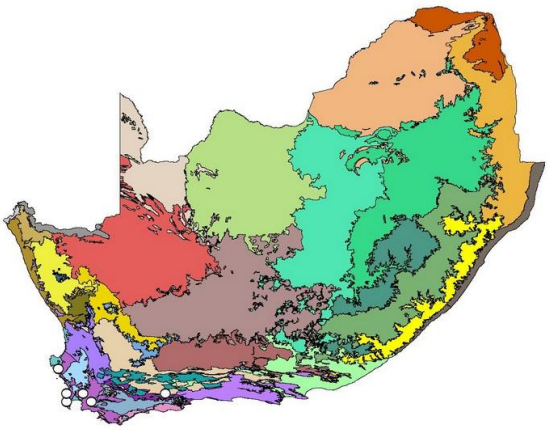
[E]*Podalyria racemulosa* Eckl. & Zeyh.

Podalyrieae ①

Shrub; P; Ht 0.41–1; Alt 30–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (60)	<400; >800 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (80)	6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3318 (49)	3321; 3418; 3419 (17)

NOTES: –



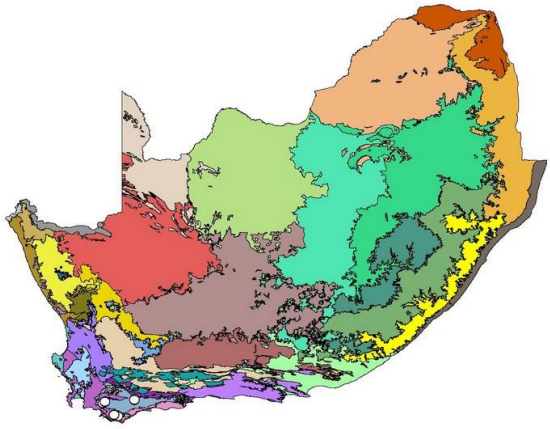
[E]*Podalyria reticulata* Harv.

Podalyrieae ①

Shrub; P; Ht 0.3–0.6; Alt 90–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (67)	200–600 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	6.5–7.4 (33)
ESP	Ecotone	
QDGCs	3419 (80)	3420 (20)

NOTES: –



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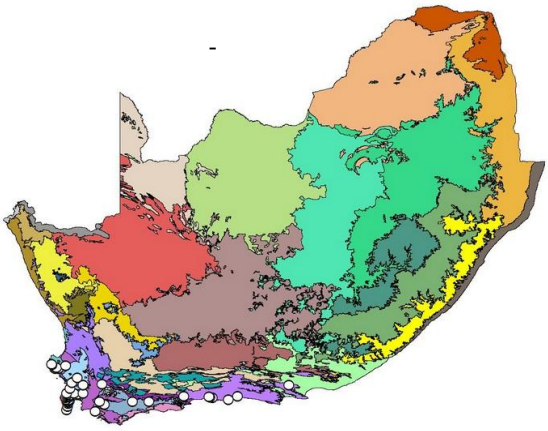
[E]*Podalyria sericea* (Andrews) R.Br. ex Aiton f.

Podalyrieae ☠ ③

Shrub; P; Ht 0.3–3; Alt 0–550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern-Fynbos Renosterveld (50)	West Strandveld (33)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (40)	600–1000 (28)
Min temp (°C)	2–8 (52)	>6 (44)
Max temp (°C)	25–29 (72)	27–35 (16)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (56)	5.5–7.4 (32)
ESP	Medium (83)	Non (17)
QDGCs	3318 (46)	3418 (27)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Antiquality:** Alkaloid in plant (Watt & Breyer-Brandwijk 1962). **Flowering:** Winter (Manning 2003).



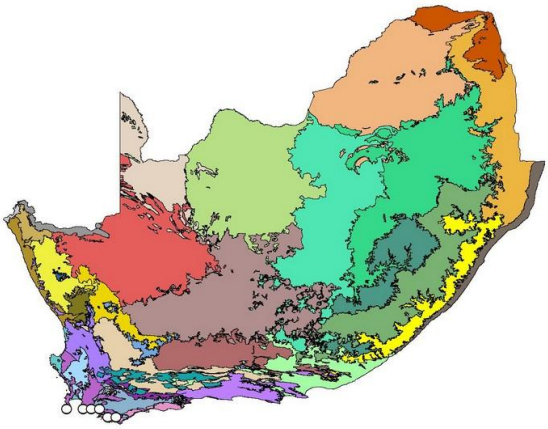
[E]*Podalyria speciosa* Eckl. & Zeyh.

Podalyrieae ①

Shrub; P; Ht 0.3–1.5; Alt 75–575

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (83)	>800 (17)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (83)	<10 (17)
pH	<6.4 (66)	5.5–7.4; 6.5–7.4 (17)
ESP	Non (100)	
QDGCs	3419 (67)	3418 (33)

NOTES: –



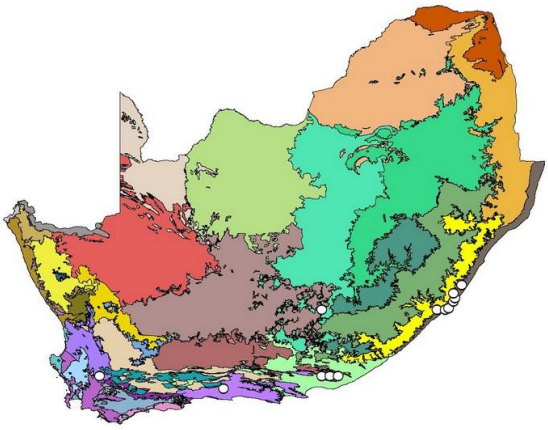
[E]*Podalyria velutina* Burch. ex Benth.

Podalyrieae ①

Shrub; P; Ht 0.4–3; Alt 50–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Eastern Fynbos-Renosterveld (50)	
Biome	Fynbos; Indian Ocean (50)	
Rainfall (mm)	>800 (50)	400–800 (33)
Min temp (°C)	>6 (50)	2–8 (33)
Max temp (°C)	25–29 (92)	<27 (8)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	<6.4 (58)	5.5–7.4 (33)
ESP	Non; Medium (50)	
QDGCs	3129; 3130; 3326 (21)	3030 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Flowering:** Winter, spring (Pooley 1998).



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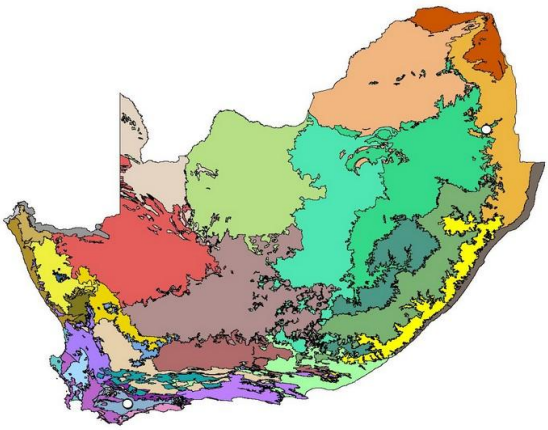
[E]*Polhillia brevicalyx* (C.H.Stirt.) B.-E.van Wyk & A.L.Schutte

Genisteae ①

Shrub; P; Ht 0.3–0.4; Alt ?–210

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; >800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3420 (67)	2531 (33)

NOTES: –



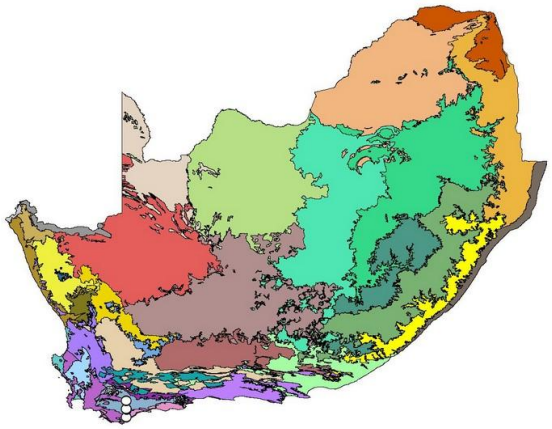
[E]*Polhillia canescens* C.H.Stirt.

Genisteae ①

Shrub; P; Ht 0.01–1.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	<400 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (67)	6.5–7.4 (33)
ESP	Ecotone	
QDGCs	3420 (100)	

NOTES: –



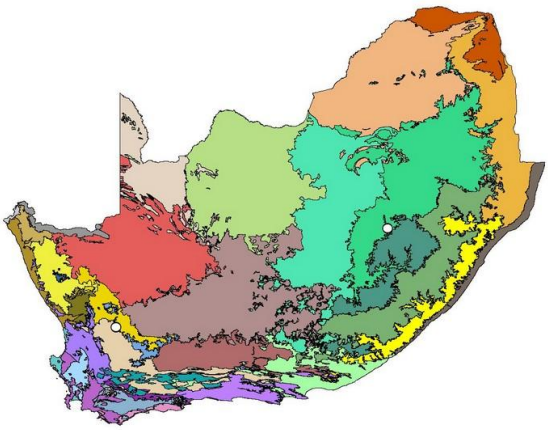
[E]*Polhillia connata* (Harv.) C.H.Stirt.

Genisteae ①

Shrub; P; Ht 1–1.2; Alt ?–1675

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	<400; >800 (50)	
Min temp (°C)	<2; 0–4 (50)	
Max temp (°C)	<27; 27–35 (50)	
Phosphorus (ppm)	<10; >20 (50)	
pH	<6.4; >7.5 (50)	
ESP	Non (100)	
QDGCs	2828; 3119 (50)	

NOTES: –



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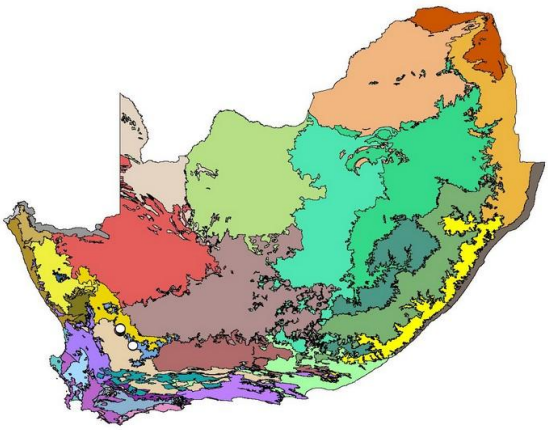
[E]*Polhillia involucrata* (Thunb.) B.-E.van Wyk & A.L.Schutte — Genisteae ①

Shrub; P; Ht 0.01–1; Alt ?–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Trans-Escarpment Succulent Karoo (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	0–4 (67)	<2 (33)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (67)	6.5–8.4 (33)
ESP	Medium (100)	
QDGCs	3120 (60)	3119; 3220 (20)

NOTES: –

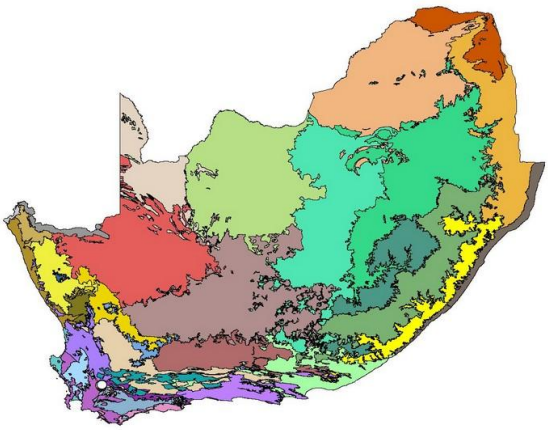


[E]*Polhillia obsoleta* (Harv.) B.-E.van Wyk — Genisteae ①

Shrub; P; Ht 0.5–0.8; Alt ?–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –

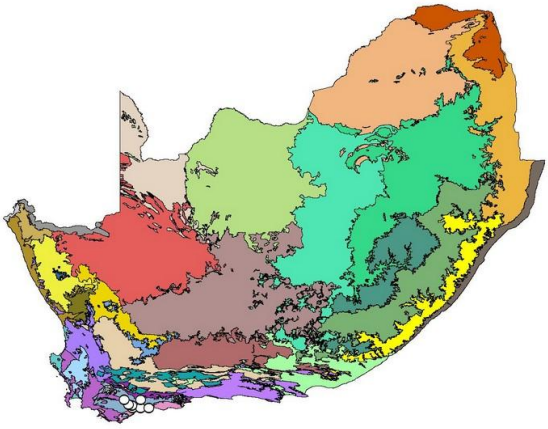


[E]*Polhillia pallens* C.H.Stirt. — Genisteae ①

Shrub; P; Ht 0.01–1; Alt ?–30

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (60)	5.5–7.4; 6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3420 (100)	

NOTES: –



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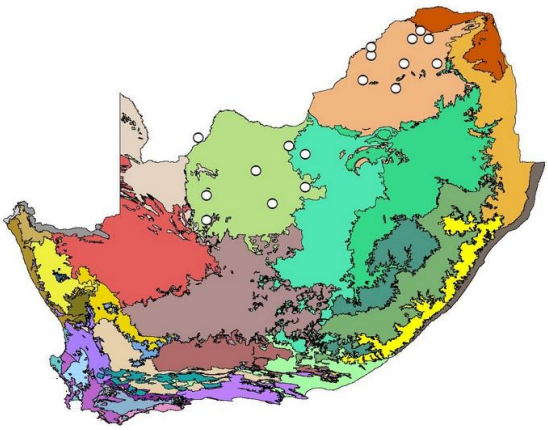
Pomaria burchellii* (DC.) B.B.Simpson & G.P.Lewis subsp. *burchellii **Caesalpinieae** ①

Herb; –; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (53)	Eastern Kalahari Bushveld (40)
Biome	Savanna (93)	Grassland (7)
Rainfall (mm)	400–800 (59)	<400 (24)
Min temp (°C)	2–8 (53)	<2 (35)
Max temp (°C)	27–35 (71)	25–29 (24)
Phosphorus (ppm)	<10 (71)	5–35 (29)
pH	5.5–7.4 (41)	6.5–8.4 (35)
ESP	Non (100)	
QDGCs	2327; 2328; 2329; 2625 (11)	2229; 2427; 2428; 2622; 2722; 2724; 2725; 2822; 2824 (6)

NOTES: **Flowering:** Spring, summer, autumn (Van Rooyen 2001).



***Pomaria burchellii* (DC.) B.B.Simpson & G.P.Lewis subsp. *rubro-violacea* (Baker f.) Brummitt** **Caesalpinieae** –

Dwarf shrub, herb; P; Ht 0.3–0.5; Alt 800–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

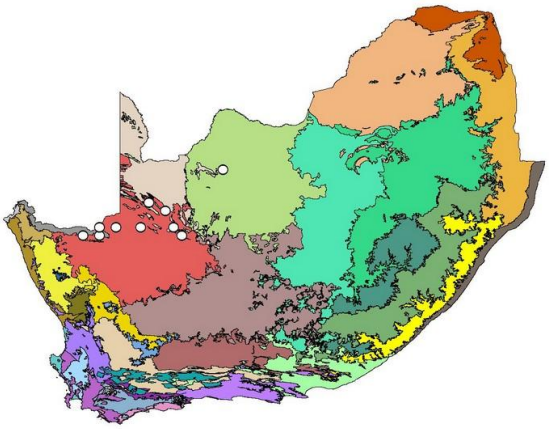
NOTES: –

***Pomaria lactea* (Schinz) B.B.Simpson & G.P.Lewis** **Caesalpinieae** ①

Shrub; P; Ht 0.3–0.5; Alt 600–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (67)	Eastern Kalahari Bushveld (33)
Biome	Nama-Karoo (67)	Savanna (33)
Rainfall (mm)	<400 (100)	
Min temp (°C)	0–4 (50)	2–8 (40)
Max temp (°C)	>33 (100)	
Phosphorus (ppm)	>20 (60)	5–35 (30)
pH	>7.5 (90)	6.5–7.4 (10)
ESP	Non (100)	
QDGCs	2819; 2820; 2821 (20)	2723; 2918; 2919; 2921 (10)

NOTES: –



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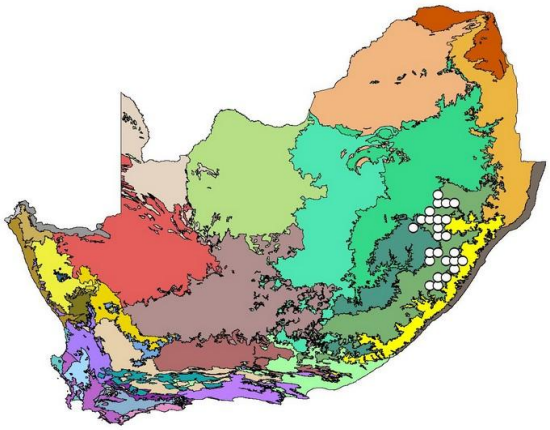
[E]*Pomaria sandersonii* (Harv.) B.B.Simpson & G.P.Lewis

Caesalpinieae ①

Dwarf shrub; A; Ht 0.1–0.5; Alt 600–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (86)	Drakensberg Grassland (14)
Biome	Grassland (100)	
Rainfall (mm)	>800 (60)	600–1000 (40)
Min temp (°C)	0–4 (64)	2–8 (24)
Max temp (°C)	25–29 (52)	<27 (36)
Phosphorus (ppm)	<10 (84)	5–35 (16)
pH	<6.4 (84)	5.5–7.4 (16)
ESP	Non (100)	
QDGCs	2829 (32)	2929 (24)

NOTES: **Flowering:** Spring (Pooley 1998).



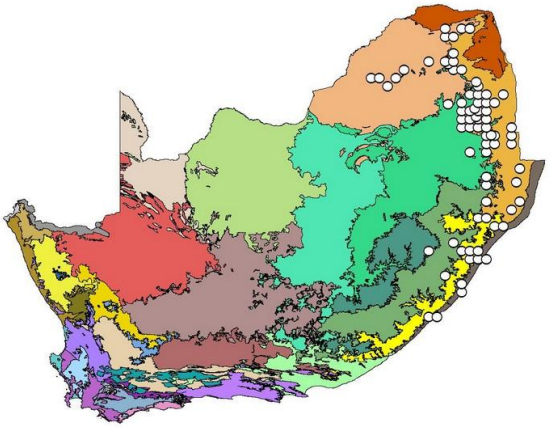
Pseudarthria hookeri Wight & Arn. var. *hookeri*

Desmodieae ③❖

Dwarf shrub, herb; P; Ht 0.3–3; Alt 30–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (48)	Mesic Highveld Grassland (19)
Biome	Savanna (71)	Grassland (18)
Rainfall (mm)	>800 (53)	400–800 (26)
Min temp (°C)	2–8 (60)	>6 (32)
Max temp (°C)	25–29 (64)	27–35 (28)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<6.4 (75)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2530 (18)	2631 (10)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Sticky hairs on pods (Pooley 1998). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Ecology:** Spreads easily (Pooley 1998). **Flowering:** All seasons (Pooley 1998).



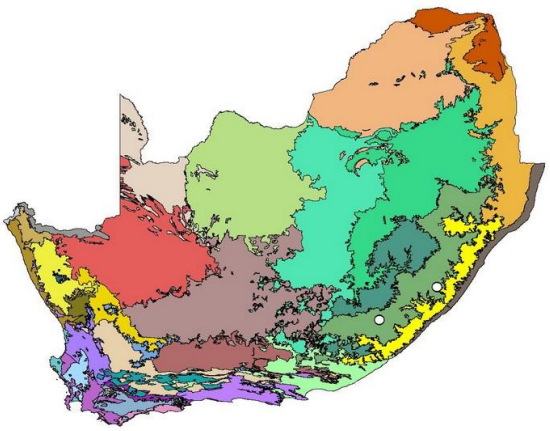
[E]*Psoralea abbottii* C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.15–1.5; Alt 300–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000; >800 (50)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3029; 3127 (50)	

NOTES: **Flowering:** Summer, autumn (Pooley 1998).



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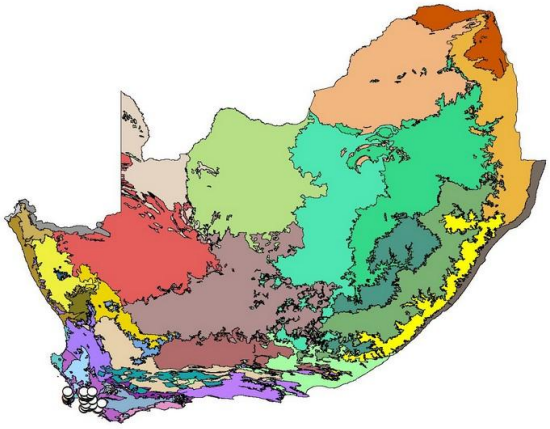
[E]*Psoralea aculeata* L.

Psoraleeae ①

Shrub; P; Ht 0.15–2; Alt 30–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (40)	400–800; 600–1000 (30)
Min temp (°C)	2–8 (60)	>6 (30)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Non (100)	
QDGCs	3418 (39)	3318 (31)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Spring (Kidd 2002).



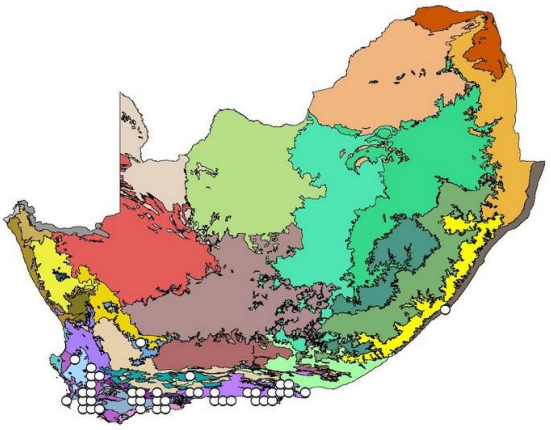
[E]*Psoralea affinis* Eckl. & Zeyh.

Psoraleeae ①

Shrub; P; Ht 0.15–3; Alt 100–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (70)	Southwest Fynbos (20)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (30)	400–800 (28)
Min temp (°C)	2–8 (65)	>6 (23)
Max temp (°C)	25–29 (70)	<27 (23)
Phosphorus (ppm)	5–35 (96)	<10; >20 (2)
pH	<6.4 (56)	5.5–7.4 (28)
ESP	Medium (70)	Non (30)
QDGCs	3319 (11)	3322; 3324; 3419; 3420; 3421 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Flowering:** Spring, summer (Moriarty 1997).



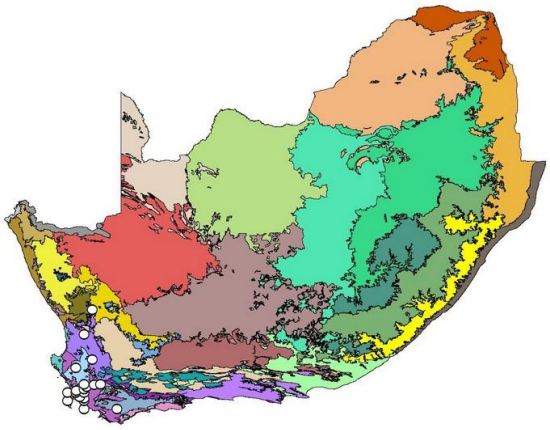
[E]*Psoralea alata* (Thunb.) T.M.Salter

Psoraleeae ①

Dwarf shrub; P; Ht 0.01–0.1; Alt 100–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; West Coast Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (36)	600–1000; >800 (21)
Min temp (°C)	2–8 (64)	>6 (21)
Max temp (°C)	25–29 (86)	27–35 (14)
Phosphorus (ppm)	5–35 (93)	>20 (7)
pH	<6.4 (50)	5.5–7.4 (43)
ESP	Non (100)	
QDGCs	3318 (42)	3418 (26)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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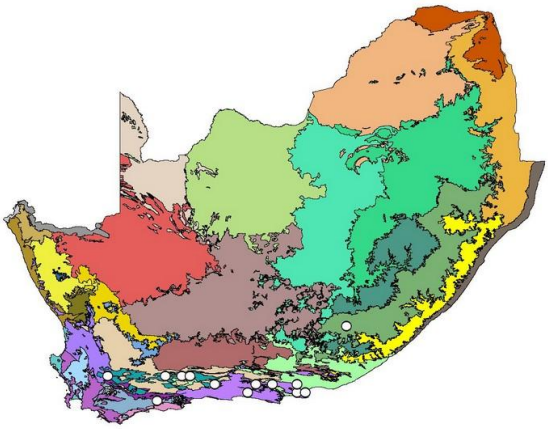
[E]*Psoralea angustifolia* Jacq.

Psoraleeae ①

Shrub, tree; P; Ht 0.15–4; Alt 330–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld; Sub-Escarpment Grassland (50)	
Biome	Fynbos (67)	Grassland (33)
Rainfall (mm)	200–600 (46)	<400; 400–800 (23)
Min temp (°C)	2–8 (70)	0–4; >6 (15)
Max temp (°C)	25–29 (69)	27–35 (23)
Phosphorus (ppm)	5–35 (77)	>20 (23)
pH	6.5–8.4 (38)	5.5–7.4 (31)
ESP	Non; Medium (50)	
QDGCs	3325 (23)	3321; 3322; 3324 (15)

NOTES: –



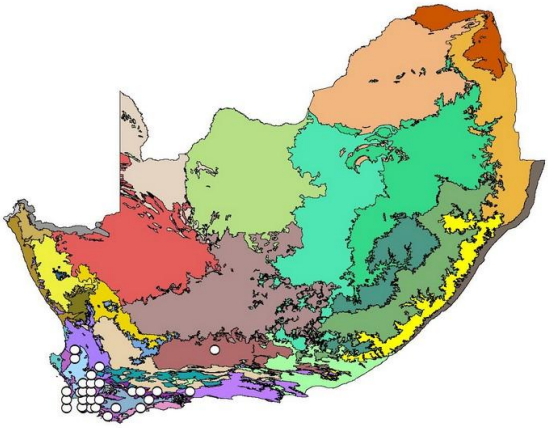
[E]*Psoralea aphylla* L.

Psoraleeae ③

Shrub; P; Ht 0.15–4; Alt 80–1460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (75)	Lower Karoo (25)
Biome	Fynbos (96)	Nama-Karoo (4)
Rainfall (mm)	200–600 (37)	400–800 (26)
Min temp (°C)	2–8 (59)	0–4 (22)
Max temp (°C)	25–29 (93)	27–35 (7)
Phosphorus (ppm)	5–35 (93)	<10; >20 (4)
pH	<6.4 (44)	5.5–7.4 (33)
ESP	Non (75)	Medium (25)
QDGCs	3419 (20)	3319; 3418 (17)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer, autumn (Manning 2003).



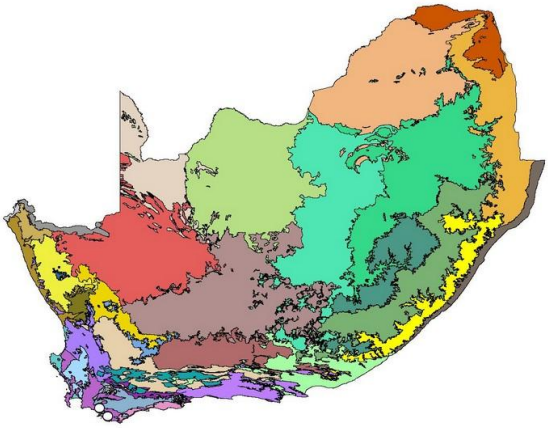
Psoralea aphylla L. × *pinnata* L.

Psoraleeae ①

Shrub; P; Ht ?–1.5; Alt 250–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: –



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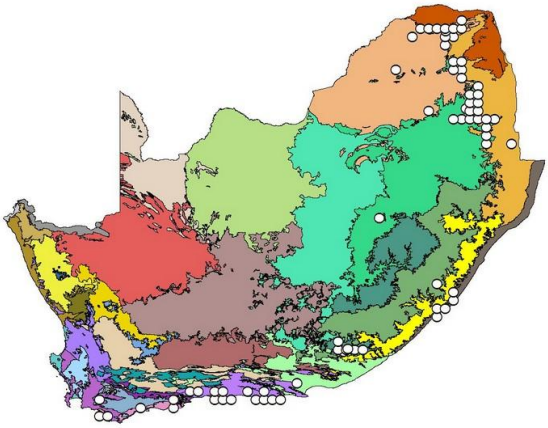
Psoralea arborea Sims

Psoraleeae ③

Shrub, tree; P; Ht 0.15–3; Alt 30–330

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (32)	Central Bushveld (26)
Biome	Savanna (58)	Fynbos (31)
Rainfall (mm)	>800 (32)	400–800 (27)
Min temp (°C)	2–8 (69)	>6 (21)
Max temp (°C)	25–29 (68)	<27 (20)
Phosphorus (ppm)	5–35 (61)	<10 (39)
pH	5.5–6.4 (43)	5.5–7.4 (18)
ESP	Non (68)	Medium (32)
QDGCs	2530 (11)	3226 (8)

NOTES: **Cultivated** (Glen 2002).



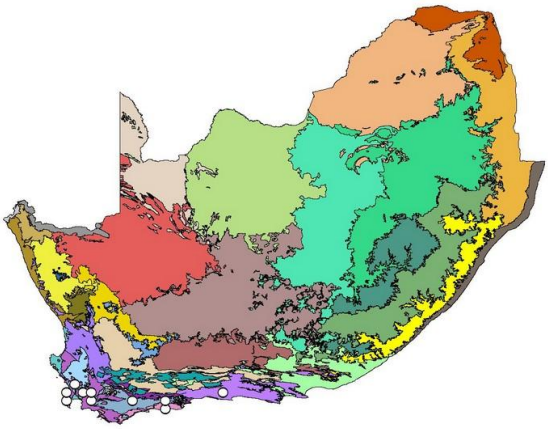
[E]*Psoralea asarina* (P.J.Bergius) T.M.Salter

Psoraleeae ①

Dwarf shrub; P; Ht 0.15–0.6; Alt 20–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; South Coast Fynbos; Eastern Fynbos-Renosterveld (33)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (40)	>800 (20)
Min temp (°C)	2–8 (60)	>6 (30)
Max temp (°C)	25–29 (80)	<27; 27–35 (10)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (70)	5.5–7.4 (30)
ESP	Non (67)	Medium (33)
QDGCs	3318 (30)	3421 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer, autumn (Kidd 2002).



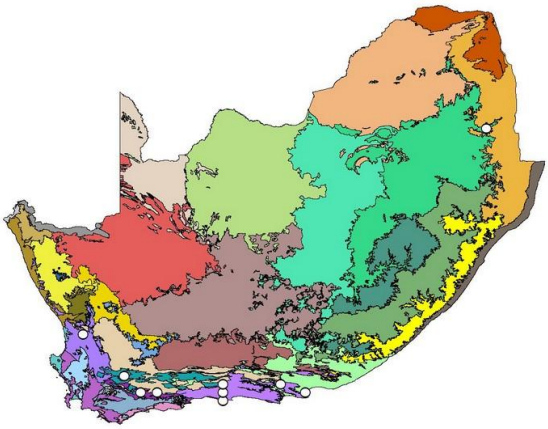
[E]*Psoralea axillaris* L.

Psoraleeae ①

Shrub; P; Ht 0.15–3; Alt 330–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (40)	<400; >800 (20)
Min temp (°C)	2–8 (90)	>6 (10)
Max temp (°C)	25–29 (60)	<27; 27–35 (20)
Phosphorus (ppm)	5–35 (90)	<10 (10)
pH	<6.4 (40)	5.5–7.4; 6.5–7.4; 6.5–8.4 (20)
ESP	Medium (100)	
QDGCs	3320; 3323 (20)	2531; 3218; 3321; 3324; 3325; 3423 (10)

NOTES: –



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[E]*Psoralea cataracta* C.H.Stirt.

Psoraleeae –

Dwarf shrub; P; Ht 0.15–0.6; Alt 150–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

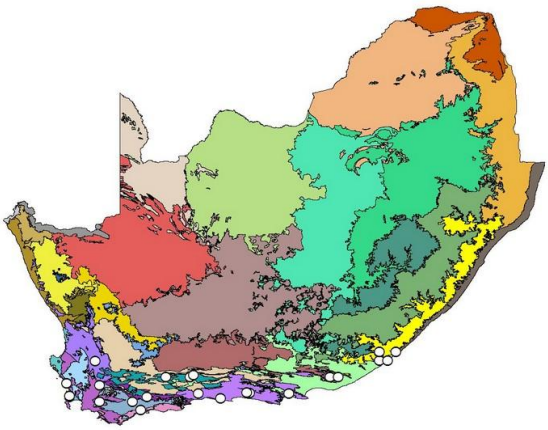
[E]*Psoralea ensifolia* (Houtt.) Merr.

Psoraleeae ①

Shrub; P; Ht 0.15–1.2; Alt 0–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (30)	200–600; 400–800 (25)
Min temp (°C)	2–8 (65)	>6 (30)
Max temp (°C)	25–29 (75)	27–35 (15)
Phosphorus (ppm)	5–35 (90)	>20 (10)
pH	<6.4; 5.5–7.4 (40)	>7.5 (10)
ESP	Medium (100)	
QDGCs	3318; 3322 (13)	3227; 3228; 3323; 3326; 3420 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Summer, autumn (Manning 2001).



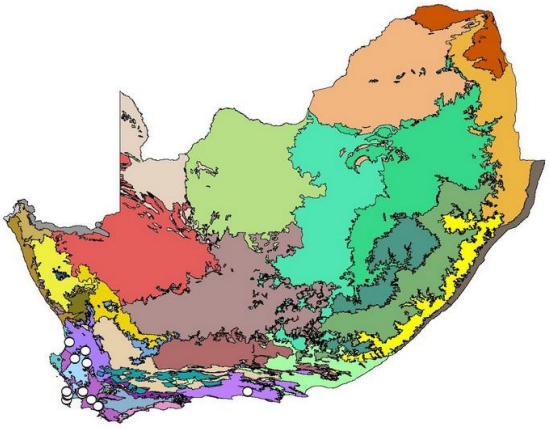
[E]*Psoralea fascicularis* DC.

Psoraleeae ①

Shrub; P; Ht 0.15–2.5; Alt 100–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (40)	200–600 (30)
Min temp (°C)	2–8 (70)	>6 (30)
Max temp (°C)	25–29 (70)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (60)	5.5–7.4 (20)
ESP	Medium (100)	
QDGCs	3318 (43)	3218; 3419 (22)

NOTES: –



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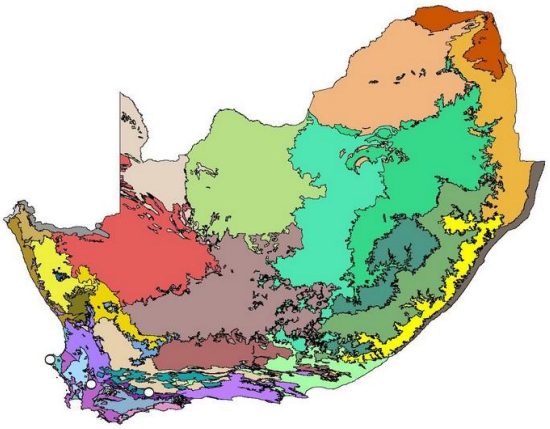
[E]*Psoralea filifolia* Thunb.

Psoraleeae ①

Shrub; P; Ht 0.15–3; Alt 0–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; >800 (33)	
Min temp (°C)	0–4; 2–8; >6 (33)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–7.4; 6.5–8.4 (33)	
ESP	Medium (100)	
QDGCs	3217; 3319; 3320 (33)	

NOTES: –



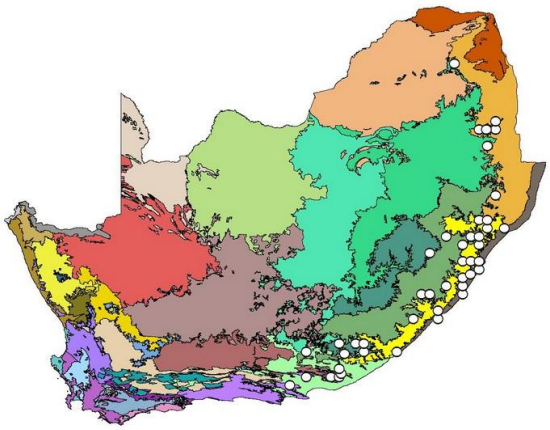
Psoralea glabra E.Mey.

Psoraleeae ①

Dwarf shrub, shrub; P; Ht 0.15–1.5; Alt 0–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (75)	Grassland (25)
Rainfall (mm)	>800 (63)	400–800 (16)
Min temp (°C)	2–8 (60)	>6 (28)
Max temp (°C)	25–29 (84)	27–35 (9)
Phosphorus (ppm)	<10 (58)	5–35 (42)
pH	<6.4 (60)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2930 (16)	3030 (11)

NOTES: **Flowering:** Summer , autumn, winter (Manning 2001).



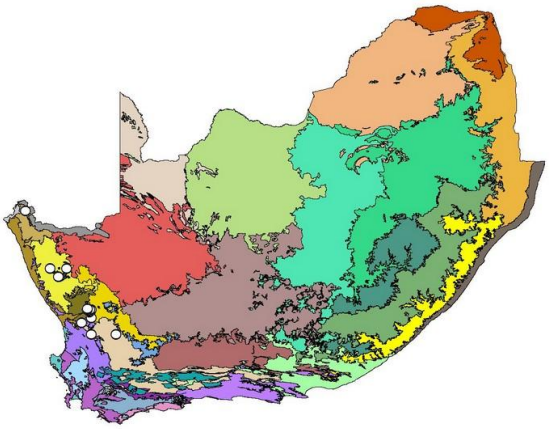
[E]*Psoralea glaucescens* Eckl. & Zeyh.

Psoraleeae ①

Shrub; P; Ht 0.15–2; Alt 760–1260

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld; Rainshadow Valley Karoo (50)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (89)	200–600 (11)
Min temp (°C)	2–8 (78)	0–4; >6 (11)
Max temp (°C)	25–29; 27–35 (44)	>33 (12)
Phosphorus (ppm)	>20 (67)	5–35 (33)
pH	6.5–8.4 (44)	>7.5 (33)
ESP	Medium; High (50)	
QDGCs	3119 (63)	3018; 3219 (11)

NOTES: –



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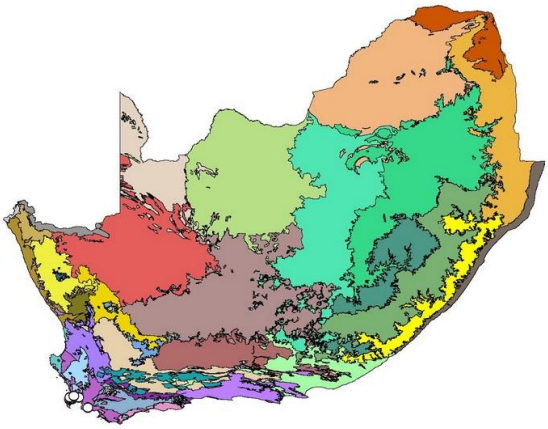
[E]*Psoralea glaucina* Harv.

Psoraleeae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt 0–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	200–600; 600–1000 (25)
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (75)	<27 (25)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3418 (78)	3318; 3419 (11)

NOTES: –



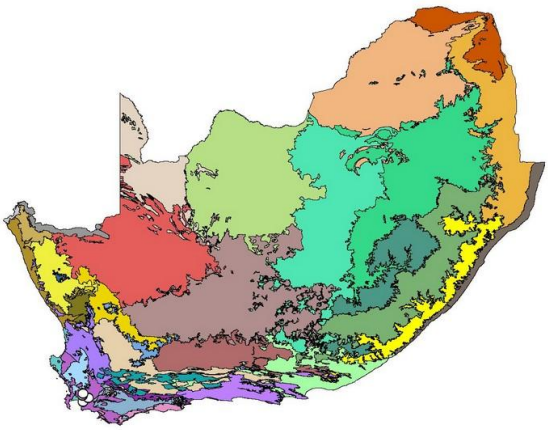
[E]*Psoralea gueinzii* Harv.

Psoraleeae ①

Dwarf shrub; P; Ht 0.15–1; Alt 100–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (67)	600–1000 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (50)	3418; 3419 (25)

NOTES: –



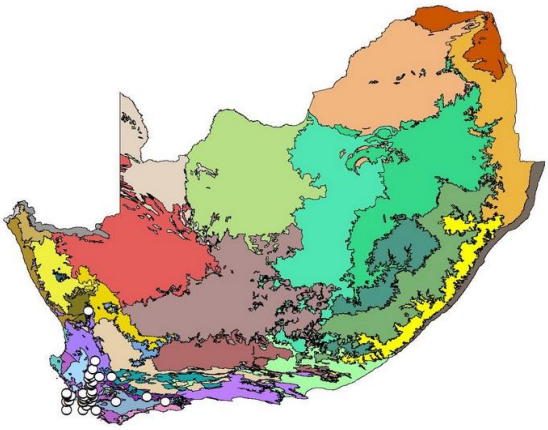
[E]*Psoralea imbricata* (L.) T.M.Salter

Psoraleeae ①

Dwarf shrub; P; Ht 0.15–0.5; Alt 180–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800; >800 (25)	600–1000 (15)
Min temp (°C)	2–8 (50)	0–4 (30)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (95)	>20 (5)
pH	<6.4 (55)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	3319 (33)	3318; 3418 (23)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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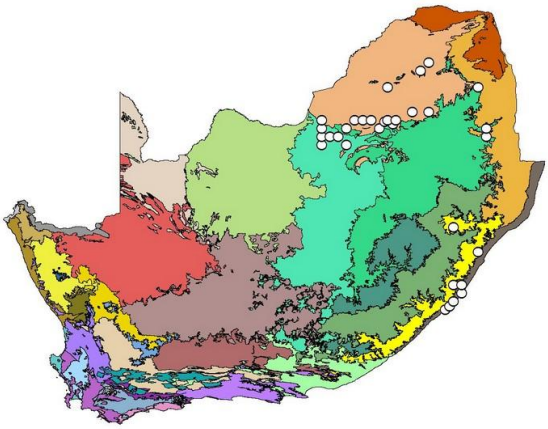
Ophrestia oblongifolia* (E.Mey.) H.M.L.Forbes var. *oblongifolia **Phaseoleae** ①

Herb; P; Ht 0.15–3; Alt 12–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (59)	Dry Highveld Grassland (29)
Biome	Savanna (46)	Grassland (38)
Rainfall (mm)	400–800 (63)	>800 (33)
Min temp (°C)	2–8 (37)	>6 (23)
Max temp (°C)	27–35 (53)	25–29 (47)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (77)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	2528 (16)	2527 (13)

NOTES: **Flowering:** Summer (Pooley 1998).

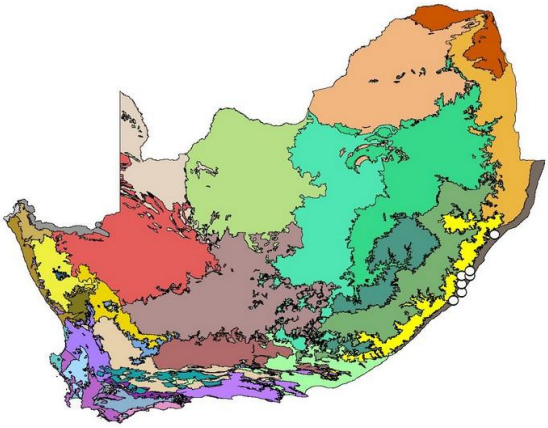


***E*Ophrestia oblongifolia (E.Mey.) H.M.L.Forbes var. *velutinosa* H.M.L.Forbes** **Phaseoleae** ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (57)	<10 (43)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3030 (72)	2931; 3130 (14)

NOTES: **Flowering:** Summer (Pooley 1998).

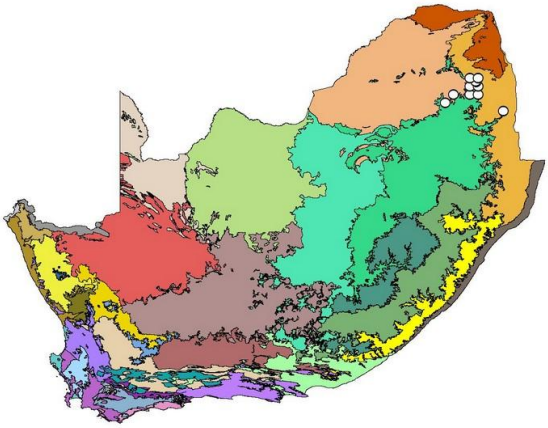


***Ormocarpum kirkii* S.Moore** **Dalbergieae** ③

Shrub, tree; P; Ht 2–9; Alt 550–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (56)	600–1000; >800 (22)
Min temp (°C)	2–8 (78)	>6 (22)
Max temp (°C)	25–29 (78)	27–35 (22)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (44)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2430 (82)	2529; 2531 (9)

NOTES: **Cultivated** (Glen 2002). **Flowering:** Summer (Van Wyk *et al.* 2000).



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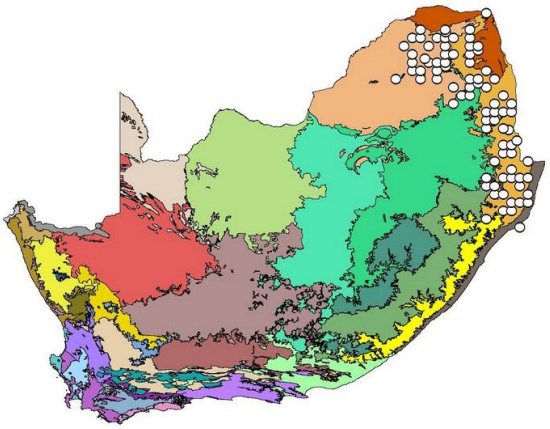
Ormocarpum trichocarpum (Taub.) Engl.

Dalbergieae ②

Shrub, tree; P; Ht 2–5; Alt 50–1550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (6)	Lowveld (4)
Biome	Savanna (98)	Indian Ocean (2)
Rainfall (mm)	400–800 (58)	600–1000 (21)
Min temp (°C)	>6 (50)	2–8 (49)
Max temp (°C)	27–35 (65)	25–29 (33)
Phosphorus (ppm)	<10 (65)	5–35 (35)
pH	5.5–7.4 (41)	<6.4 (35)
ESP	Non (100)	
QDGCs	2531 (15)	2329 (12)

NOTES: **Livestock feed** (Morgan 1981; Lusigi *et al.* 1984). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Magical; medicine for humans (Hutchings *et al.* 1996).



[E]*Otholobium accrescens* C.H.Stirt.

Psoraleeae –

Shrub; P; Ht 0.01–0.2; Alt 50–150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: –

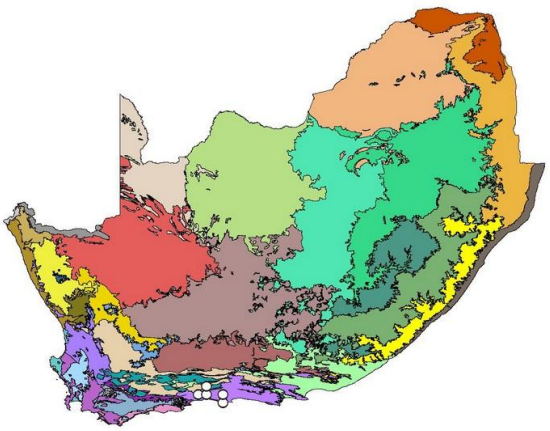
[E]*Otholobium acuminatum* (Lam.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–2; Alt 160–540

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	600–1000 (60)	<400; >800 (20)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (60)	<27 (40)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (80)	5.5–7.4 (20)
ESP	Medium (100)	
QDGCs	3322 (60)	3323; 3423 (20)

NOTES: –



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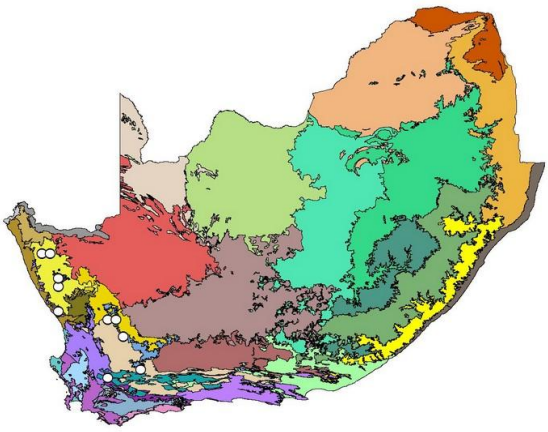
[E]*Otholobium arborescens* C.H.Stirt.

Psoraleeae ①

Shrub, tree; P; Ht 0.01–5; Alt 250–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (83)	Fynbos (17)
Rainfall (mm)	<400 (90)	200–600 (10)
Min temp (°C)	2–8 (60)	0–4; >6 (20)
Max temp (°C)	27–35 (60)	25–29 (40)
Phosphorus (ppm)	5–35; >20 (50)	
pH	6.5–8.4; >7.5 (40)	5.5–7.4; 6.5–7.4 (10)
ESP	Medium (100)	
QDGCs	2917; 3018; 3119 (20)	3118; 3220; 3319; 3320 (10)

NOTES: **Flowering:** Spring, summer (Manning & Goldblatt 2002).



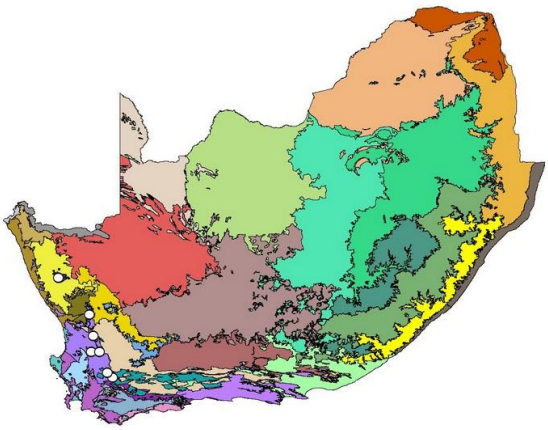
[E]*Otholobium argenteum* (Thunb.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (57)	<400 (43)
Min temp (°C)	2–8 (71)	0–4 (29)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (71)	>20 (29)
pH	5.5–7.4 (72)	6.5–8.4; >7.5 (14)
ESP	Non (100)	
QDGCs	3219 (50)	3319 (25)

NOTES: –



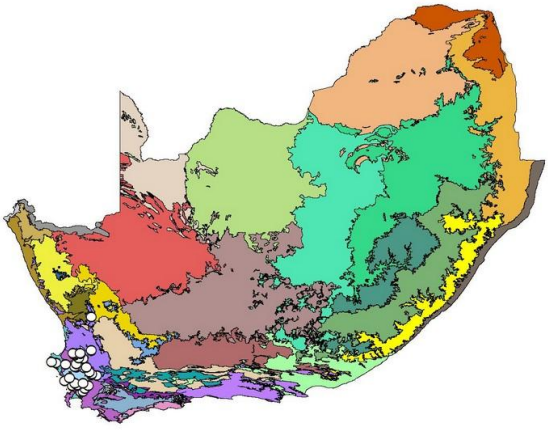
[E]*Otholobium bolusii* (H.M.L.Forbes) C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht 0.01–0.4; Alt 30–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; West Coast Renosterveld; West Strandveld (33)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (58)	<400 (21)
Min temp (°C)	2–8 (53)	>6 (32)
Max temp (°C)	25–29 (79)	27–35 (21)
Phosphorus (ppm)	5–35 (95)	>20 (5)
pH	5.5–7.4 (47)	<6.4 (32)
ESP	Non (67)	Medium (33)
QDGCs	3318 (50)	3218 (22)

NOTES: –



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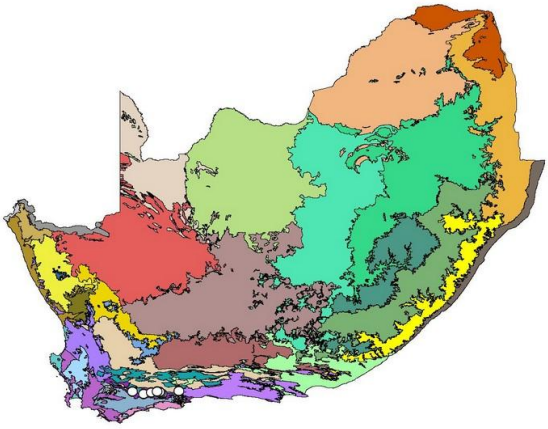
[E]*Otholobium bowieanum* (Harv.) C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht 0.01–0.5; Alt 60–650

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	<400 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	5.5–7.4 (33)
ESP	Ecotone	
QDGCs	3321 (75)	3320 (25)

NOTES: –



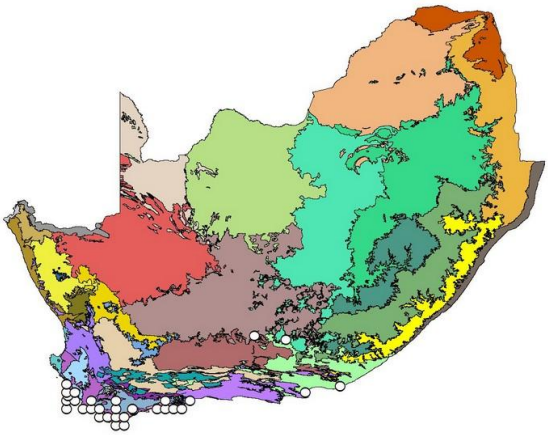
[E]*Otholobium bracteolatum* (Eckl. & Zeyh.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–2; Alt 0–170

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; South Coast Fynbos (40)	Eastern Fynbos-Renosterveld (20)
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (43)	600–1000; >800 (14)
Min temp (°C)	2–8; >6 (47)	0–4 (7)
Max temp (°C)	25–29 (90)	<27 (10)
Phosphorus (ppm)	5–35 (87)	<10 (10)
pH	<6.4 (47)	6.5–8.4 (23)
ESP	Non (80)	Medium (20)
QDGCs	3419 (27)	3420; 3421 (15)

NOTES: –



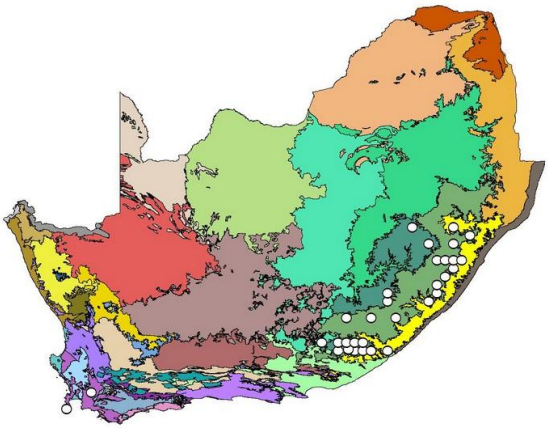
[E]*Otholobium caffrum* (Eckl. & Zeyh.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–2; Alt 550–3000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (50)	Southwest Fynbos; Drakensberg Grassland (25)
Biome	Grassland (82)	Fynbos (18)
Rainfall (mm)	>800 (47)	400–800 (31)
Min temp (°C)	2–8 (44)	0–4 (41)
Max temp (°C)	25–29 (72)	<27 (28)
Phosphorus (ppm)	<10 (59)	5–35 (41)
pH	<6.4 (74)	5.5–7.4; 6.5–8.4 (13)
ESP	Non (100)	
QDGCs	3226 (18)	3227 (15)

NOTES: **Flowering:** Spring, summer, autumn (Manning 2001).



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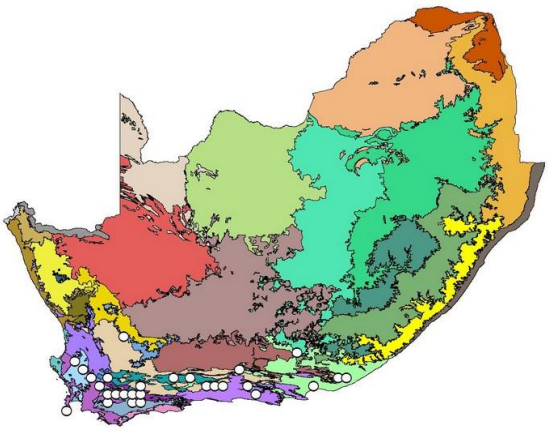
[E]*Otholobium candicans* (Eckl. & Zeyh.) C.H.Stirt.

Psoraleeae ③

Shrub; P; Ht 0.01–1.2; Alt 130–920

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Southwest Fynbos; Eastern Fynbos-Renosterveld (33)	
Biome	Fynbos (90)	Albany Thicket (10)
Rainfall (mm)	200–600 (61)	<400 (21)
Min temp (°C)	2–8 (68)	0–4 (25)
Max temp (°C)	25–29 (75)	27–35 (21)
Phosphorus (ppm)	5–35 (82)	>20 (14)
pH	5.5–7.4 (39)	6.5–7.4 (25)
ESP	Non (67)	Medium (33)
QDGCs	3319 (18)	3320 (14)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



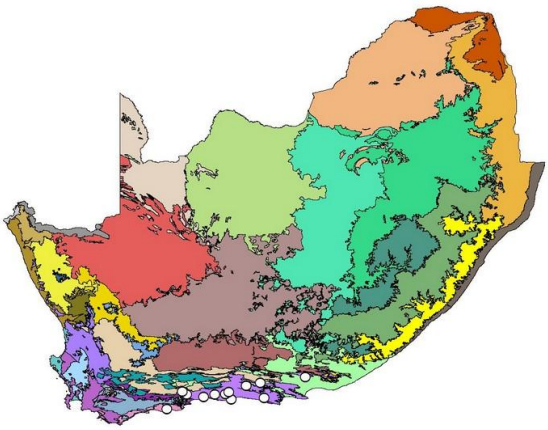
[E]*Otholobium carneum* (E.Mey.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–0.2; Alt 550–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (83)	South Coast Fynbos (17)
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (42)	400–800 (16)
Min temp (°C)	2–8 (92)	>6 (8)
Max temp (°C)	25–29 (58)	<27 (42)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (67)	5.5–7.4 (33)
ESP	Medium (83)	Non (17)
QDGCs	3322; 3323 (26)	3321; 3324; 3325; 3421; 3423; 3424 (8)

NOTES: –



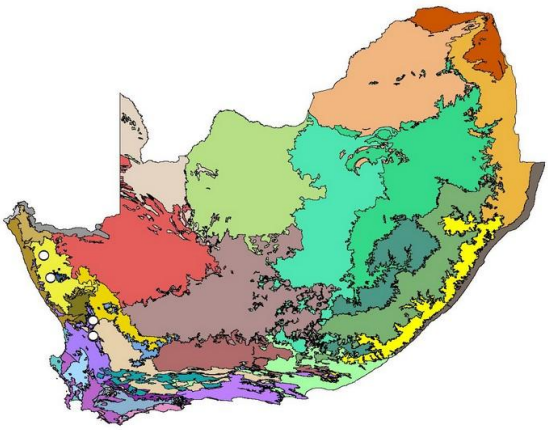
[E]*Otholobium flexuosum* C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–2.5; Alt 250–850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (75)	200–600 (25)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	6.5–8.4 (50)	5.5–7.4; 6.5–7.4 (25)
ESP	Medium (100)	
QDGCs	3219 (40)	3017; 3119; 2917 (20)

NOTES: –



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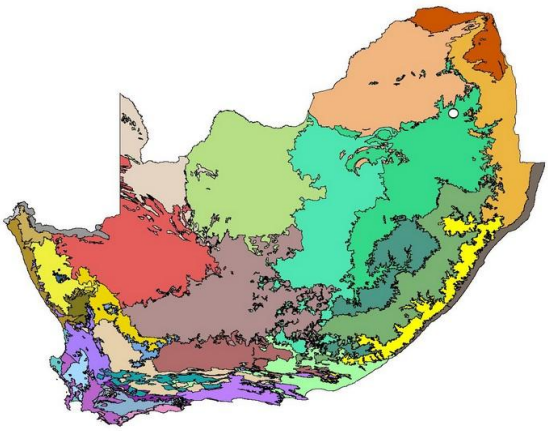
Otholobium foliosum (Oliv.) C.H.Stirt. subsp. *gazense* (Baker f.) Verdc. **Psoraleeae** ①

Shrub; P; Ht 0.01–2; Alt 1200–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	<27	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (42)	
ESP	Non (100)	
QDGCs	2530 (100)	

NOTES: –

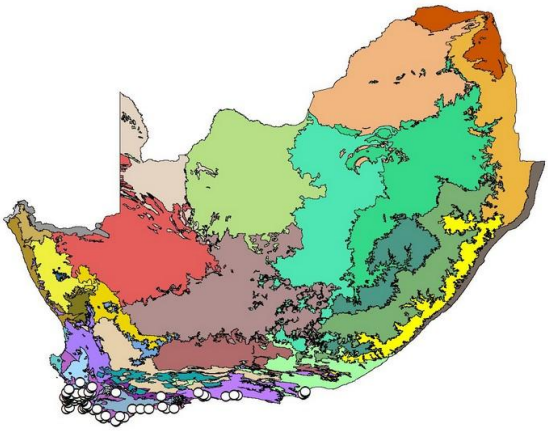


[E]*Otholobium fruticans* (L.) C.H.Stirt. **Psoraleeae** ①

Dwarf shrub; P; Ht 0.01–0.4; Alt 160–400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (44)	Southwest Fynbos (33)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (32)	400–800 (29)
Min temp (°C)	2–8 (48)	>6 (42)
Max temp (°C)	25–29 (87)	<27 (13)
Phosphorus (ppm)	5–35 (94)	<10 (6)
pH	<6.4 (61)	5.5–7.4 (16)
ESP	Non (56)	Medium (44)
QDGCs	3318 (28)	3418 (27)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Winter, spring, summer (Mustart *et al.* 2003).

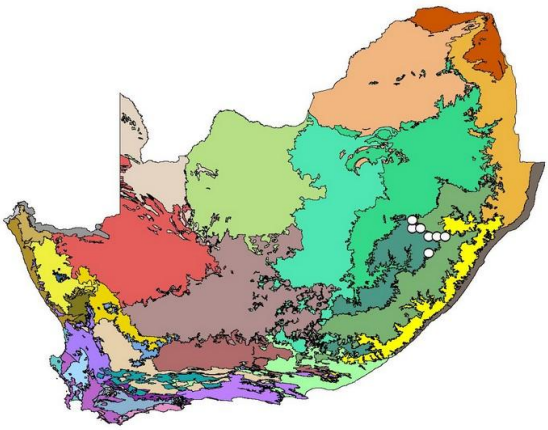


[E]*Otholobium fumeum* C.H.Stirt. **Psoraleeae** ①

Shrub; P; Ht 0.01–3; Alt 1600–3200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (86)	600–1000 (14)
Min temp (°C)	0–4 (71)	<2 (29)
Max temp (°C)	25–29 (57)	<27 (43)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2929 (57)	2828 (29)

NOTES: –



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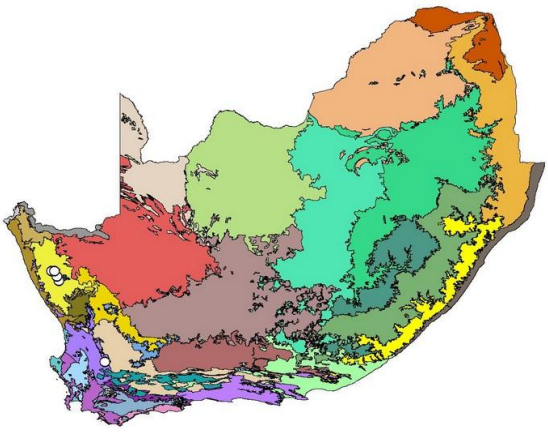
[E]*Otholobium hamatum* (Harv.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–1.5; Alt 300–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (75)	200–600 (25)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35; >20 (50)	
pH	6.5–8.4 (50)	5.5–7.4; 6.5–7.4 (25)
ESP	Ecotone	
QDGCs	3018 (57)	3017 (29)

NOTES: –



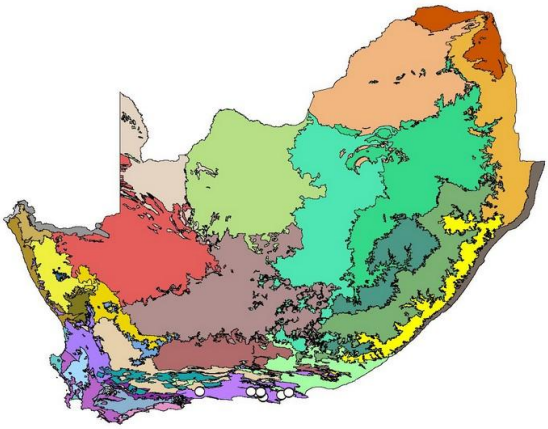
[E]*Otholobium heterosepalum* (Fourc.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–2; Alt 260–730

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (71)	600–1000 (29)
Min temp (°C)	2–8 (71)	>6 (29)
Max temp (°C)	<27 (57)	25–29 (43)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (86)	5.5–7.4 (14)
ESP	Medium (100)	
QDGCs	3324 (50)	3424 (20)

NOTES: –



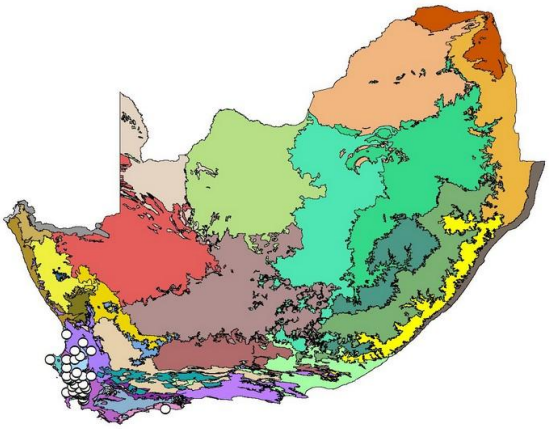
[E]*Otholobium hirtum* (L.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–2; Alt 160–330

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; South Coast Fynbos; West Strandveld (33)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (60)	<400 (20)
Min temp (°C)	2–8 (55)	>6 (40)
Max temp (°C)	25–29 (70)	27–35 (30)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (60)	5.5–7.4; 6.5–7.4 (15)
ESP	Non (67)	Medium (33)
QDGCs	3318 (68)	3218 (15)

NOTES: **Flowering:** Spring, summer (Manning & Goldblatt 2000).



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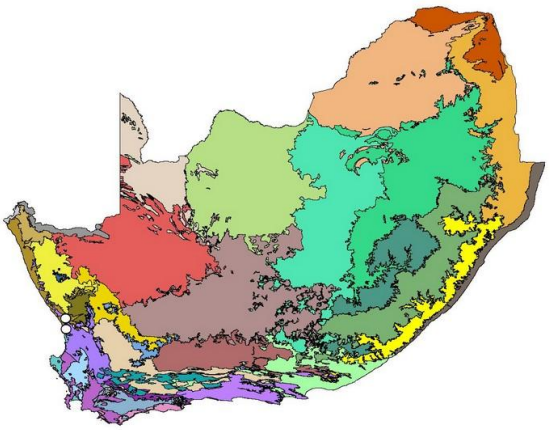
[E]*Otholobium incanum* C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–1; Alt 60–130

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3118 (100)	

NOTES: –



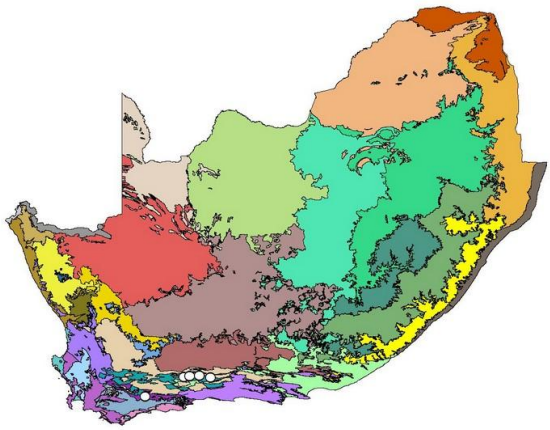
[E]*Otholobium macradenium* (Harv.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–2; Alt 400–1850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (60)	<400 (40)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	>20 (80)	5–35 (20)
pH	>7.5 (60)	6.5–7.4; 6.5–8.4 (20)
ESP	Ecotone	
QDGCs	3322 (60)	3320; 3321 (20)

NOTES: –



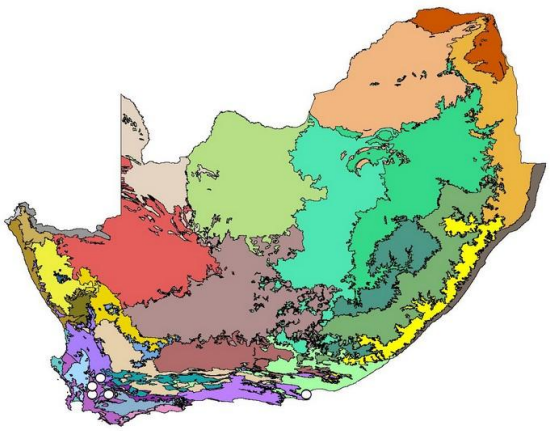
[E]*Otholobium mundianum* (Eckl. & Zeyh.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–1; Alt 1200–1580

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; >800 (40)	200–600 (20)
Min temp (°C)	0–4 (80)	>6 (20)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (60)	6.5–7.4; 6.5–8.4 (20)
ESP	Non (100)	
QDGCs	3319 (80)	3325 (20)

NOTES: –



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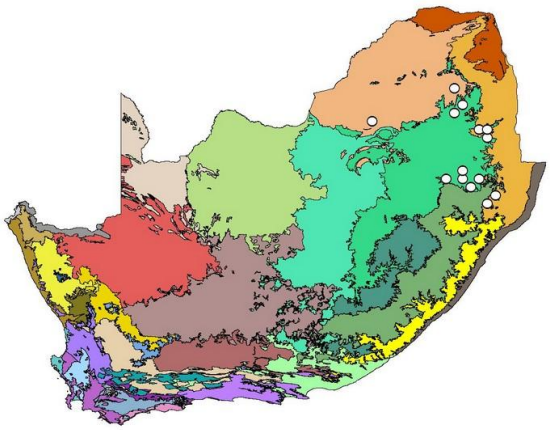
***Otholobium nigricans* C.H.Stirt.** **Psoraleeae** ①

Shrub; P; Ht 0.01–1.5; Alt 1500–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (67)	Central Bushveld (33)
Biome	Grassland (75)	Savanna (25)
Rainfall (mm)	600–1000 (43)	>800 (36)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (64)	<27 (21)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (86)	5.5–7.4; >7.5 (7)
ESP	Non (100)	
QDGCs	2730 (29)	2530 (21)

NOTES: –

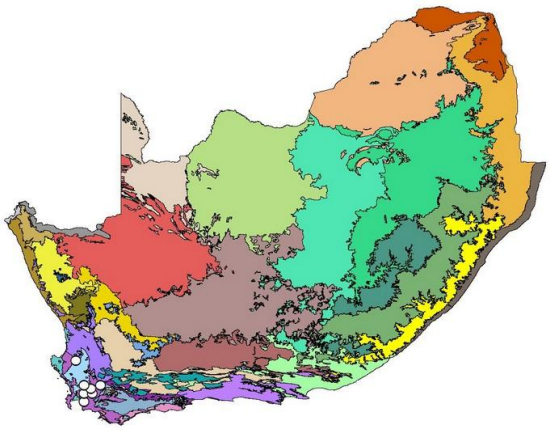


[E]***Otholobium obliquum* (E.Mey.) C.H.Stirt.** **Psoraleeae** ①

Shrub; P; Ht 0.01–1.2; Alt 360–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (43)	200–600 (29)
Min temp (°C)	2–8 (57)	0–4 (43)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (43)	6.5–8.4 (14)
ESP	Non (100)	
QDGCs	3319 (43)	3318 (29)

NOTES: –

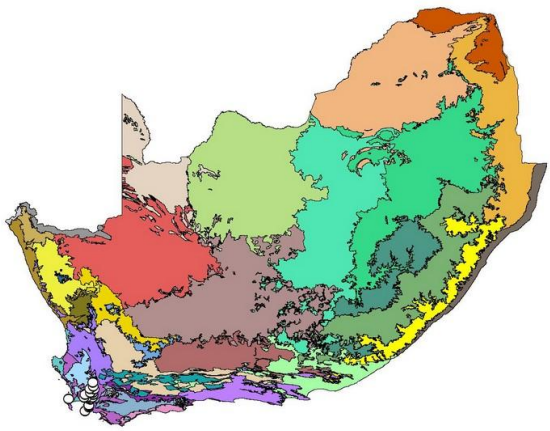


[E]***Otholobium parviflorum* (E.Mey.) C.H.Stirt.** **Psoraleeae** ①

Shrub; P; Ht 0.01–1; Alt 260–1160

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (71)	600–1000 (29)
Min temp (°C)	2–8 (57)	0–4 (29)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (71)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	3319 (41)	3318 (27)

NOTES: –



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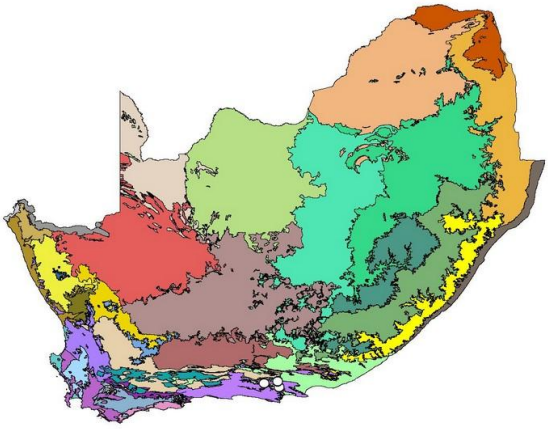
[E]*Otholobium pictum* C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–2; Alt 630–1330

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (33)
ESP	Ecotone	
QDGCs	3324 (100)	

NOTES: –



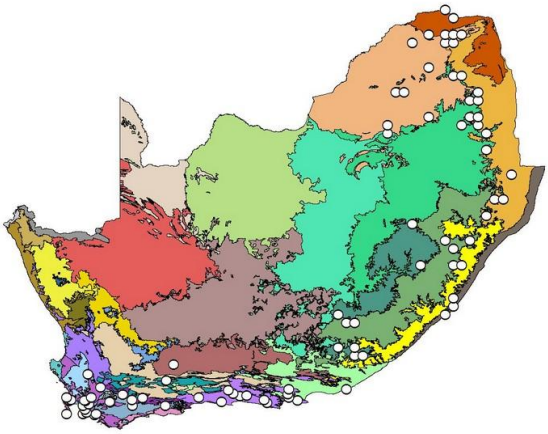
[E]*Otholobium polyphyllum* (Eckl. & Zeyh.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–1; Alt 400–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (31)	Eastern Fynbos-Renosterveld (8)
Biome	Fynbos (43)	Savanna (35)
Rainfall (mm)	400–800 (32)	>800 (28)
Min temp (°C)	2–8 (63)	>6 (18)
Max temp (°C)	25–29 (72)	<27; 27–35 (14)
Phosphorus (ppm)	5–35 (61)	<10 (37)
pH	<6.4 (62)	5.5–7.4 (20)
ESP	Non (77)	Medium (23)
QDGCs	3318 (9)	3418; 3419 (6)

NOTES: –



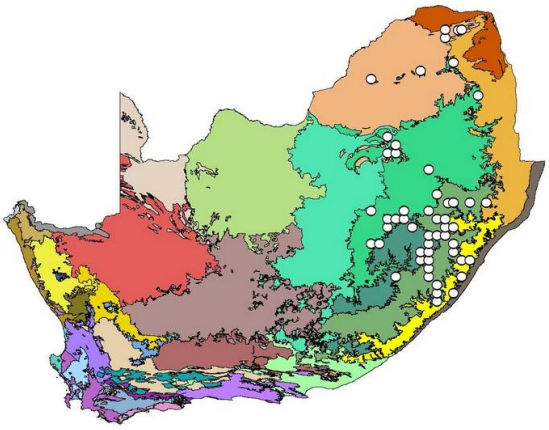
Otholobium polystictum (Benth. ex Harv.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–2; Alt 450–2300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (46)	Drakensberg Grassland; Mesic Highveld Grassland (23)
Biome	Grassland (90)	Savanna (10)
Rainfall (mm)	>800 (47)	600–1000 (31)
Min temp (°C)	<2 (37)	0–4 (31)
Max temp (°C)	25–29 (47)	<27 (43)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (76)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2929 (15)	2828 (12)

NOTES: **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Pooley 1998).



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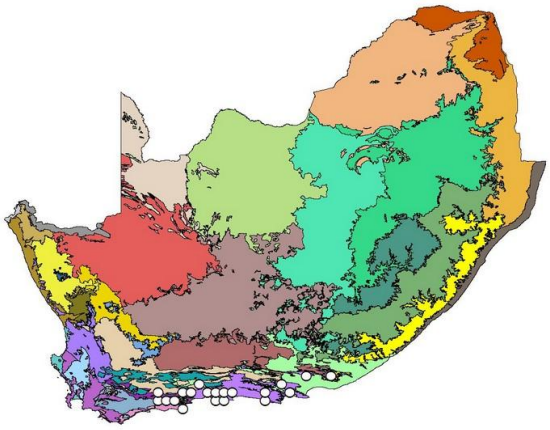
***Otholobium prodiens* C.H.Stirt.** **Psoraleeae** ①

Shrub; P; Ht 0.01–2.5; Alt 260–700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (35)	400–800; 600–1000 (25)
Min temp (°C)	2–8 (95)	>6 (5)
Max temp (°C)	25–29 (55)	<27 (35)
Phosphorus (ppm)	5–35 (90)	<10 (10)
pH	<6.4 (50)	5.5–7.4 (40)
ESP	Medium (100)	
QDGCs	3322; 3421 (20)	3321; 3323; 3324; 3325 (10)

NOTES: –

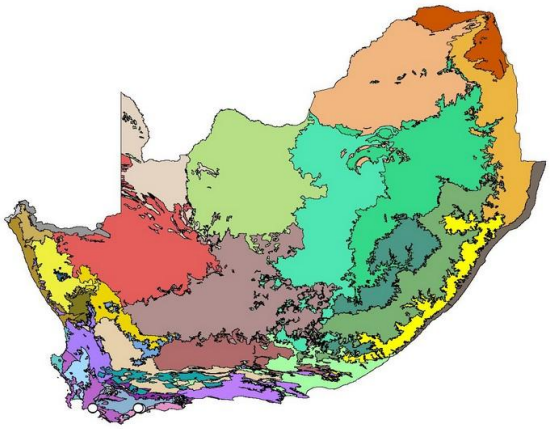


[E]***Otholobium pungens* C.H.Stirt.** **Psoraleeae** ①

Shrub; P; Ht 0.01–0.4; Alt 20–160

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3420 (67)	3419 (33)

NOTES: –

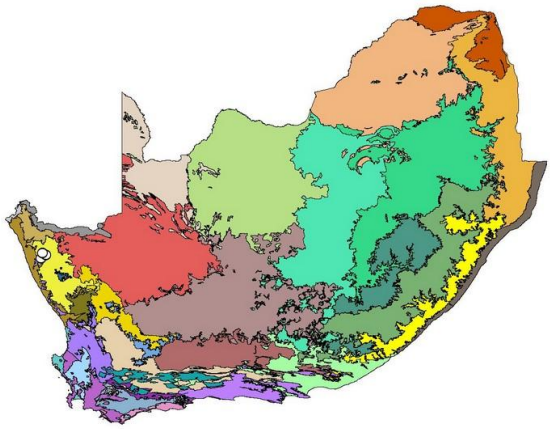


[E]***Otholobium pustulatum* C.H.Stirt.** **Psoraleeae** ①

Shrub; P; Ht 0.01–1; Alt 700–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–8.4 (100)	
ESP	Medium (100)	
QDGCs	2917 (100)	

NOTES: –



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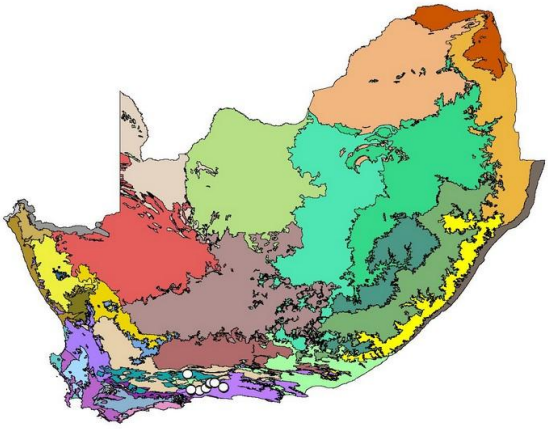
[E]*Otholobium racemosum* (Thunb.) C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht 0.01–0.8; Alt 600–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	600–1000 (43)	<400 (29)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (72)	<27; 27–35 (14)
Phosphorus (ppm)	5–35 (86)	>20 (14)
pH	<6.4; 5.5–7.4 (43)	>7.5 (14)
ESP	Medium (100)	
QDGCs	3322 (75)	3323 (25)

NOTES: –



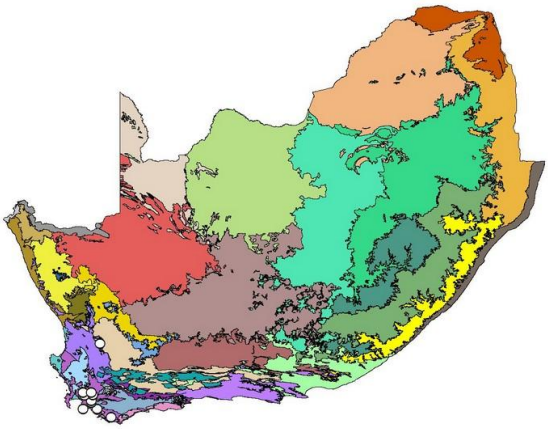
[E]*Otholobium rotundifolium* (L.f.) C.H.Stirt.

Psoraleeae ②

Dwarf shrub; P; Ht 0.01–0.2; Alt 430–530

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (43)	400–800 (29)
Min temp (°C)	2–8 (86)	0–4 (14)
Max temp (°C)	25–29 (86)	27–35 (14)
Phosphorus (ppm)	5–35 (86)	<10 (14)
pH	<6.4 (57)	5.5–7.4 (43)
ESP	Non (100)	
QDGCs	3419 (45)	3318; 3319 (18)

NOTES: **Livestock feed** (Venter & Venter 1996). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Venter & Venter 1996).



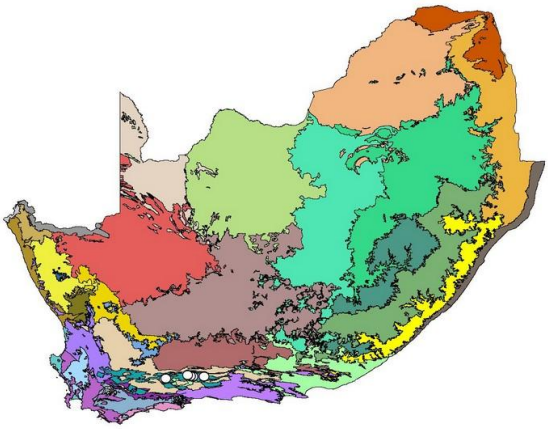
[E]*Otholobium rubicundum* C.H.Stirt.

Psoraleeae ①

Dwarf shrub, shrub; P; Ht 0.01–1.5; Alt 1000–1460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (67)	200–600 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3322 (71)	3321 (29)

NOTES: –



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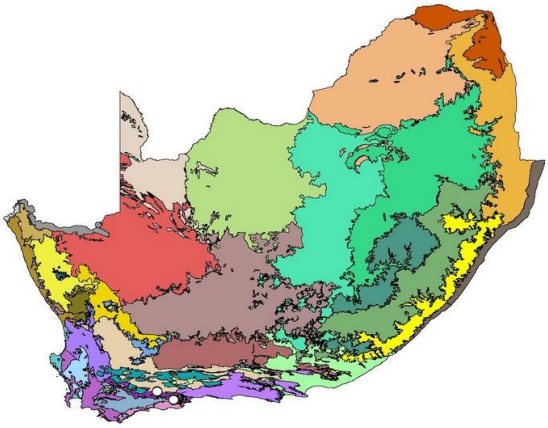
[E]*Otholobium saxosum* C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht ?–0.2; Alt ?–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4; 6.5–8.4 (50)	
ESP	Ecotone	
QDGCs	3321; 3421 (50)	

NOTES: –



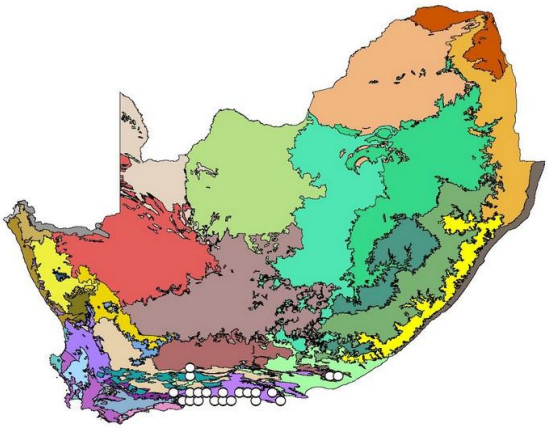
[E]*Otholobium sericeum* (Poir.) C.H.Stirt.

Psoraleeae ①

Dwarf shrub, shrub; P; Ht 0.01–2; Alt 10–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; 600–1000 (36)	<400; 200–600; >800 (9)
Min temp (°C)	2–8 (86)	>6 (14)
Max temp (°C)	<27 (50)	25–29 (36)
Phosphorus (ppm)	5–35 (86)	>20 (9)
pH	<6.4 (73)	5.5–7.4 (18)
ESP	Medium (100)	
QDGCs	3322 (23)	3323; 3422; 3423 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



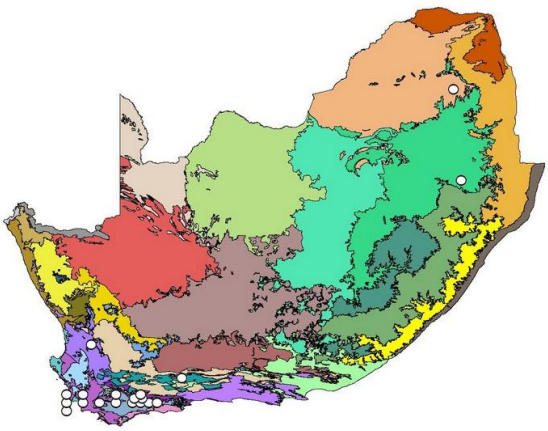
[E]*Otholobium spicatum* (L.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–3; Alt 30–400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Mesic Highveld Grassland; Central Bushveld (33)	
Biome	Fynbos (86)	Grassland; Savanna (7)
Rainfall (mm)	200–600 (41)	400–800 (24)
Min temp (°C)	2–8 (71)	>6 (18)
Max temp (°C)	25–29 (88)	27–35 (12)
Phosphorus (ppm)	5–35 (82)	<10 (12)
pH	<6.4 (41)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	3420 (26)	3418 (16)

NOTES: –



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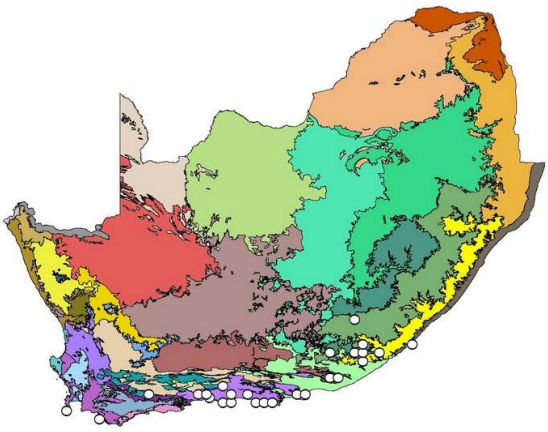
[E]*Otholobium stachyerum* (Eckl. & Zeyh.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–3; Alt 200–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (86)	Southwest Fynbos (14)
Biome	Fynbos (66)	Grassland; Indian Ocean (17)
Rainfall (mm)	400–800 (48)	600–1000 (32)
Min temp (°C)	2–8 (60)	>6 (32)
Max temp (°C)	25–29 (72)	<27 (28)
Phosphorus (ppm)	5–35 (92)	<10 (8)
pH	<6.4 (64)	5.5–7.4 (20)
ESP	Medium (86)	Non (14)
QDGCs	3227 (19)	3322; 3323; 3423 (12)

NOTES: **Flowering:** Spring (Pooley 1998).



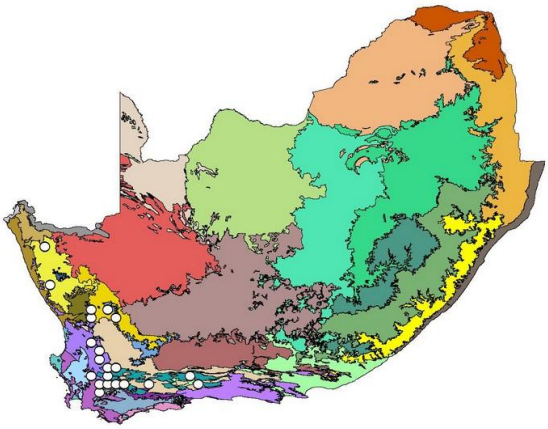
[E]*Otholobium striatum* (Thunb.) C.H.Stirt.

Psoraleeae ①

Shrub, tree; P; Ht 0.01–2.5; Alt 300–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Namaqualand Hardeveld (50)	
Biome	Fynbos (57)	Succulent Karoo (43)
Rainfall (mm)	<400 (52)	200–600 (43)
Min temp (°C)	2–8 (52)	0–4 (38)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	5.5–7.4; >7.5 (24)	6.5–7.4; 6.5–8.4 (19)
ESP	Non; Medium (50)	
QDGCs	3319 (38)	3119 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



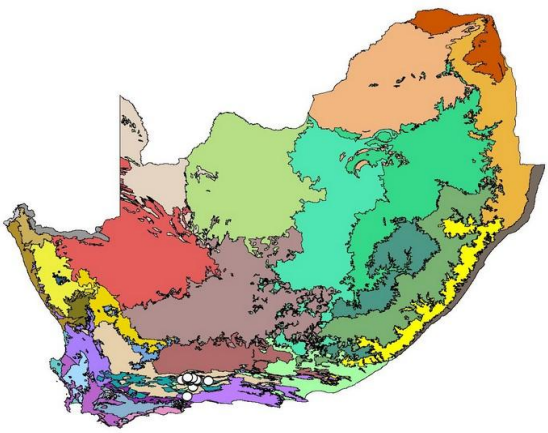
[E]*Otholobium swartbergense* C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht 0.01–0.3; Alt 1560–1860

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (50)	200–600 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	>20 (67)	5–35 (33)
pH	>7.5 (50)	6.5–8.4 (33)
ESP	Ecotone	
QDGCs	3322 (94)	3321 (6)

NOTES: –



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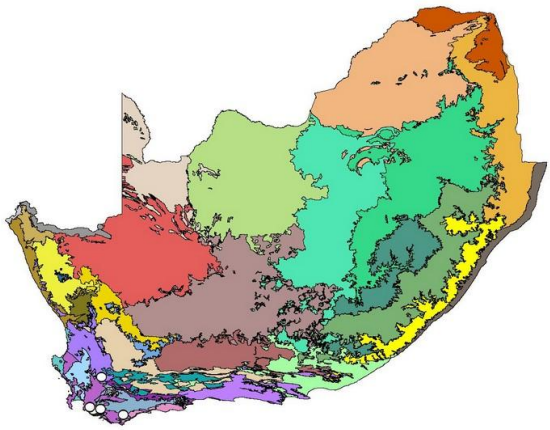
[E]*Otholobium thomii* (Harv.) C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht 0.01–0.4; Alt 0–150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (75)	200–600 (25)
Min temp (°C)	>6 (50)	0–4; 2–8 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (50)	5.5–7.4; 6.5–8.4 (25)
ESP	Ecotone	
QDGCs	3419 (84)	3319; 3420 (8)

NOTES: –



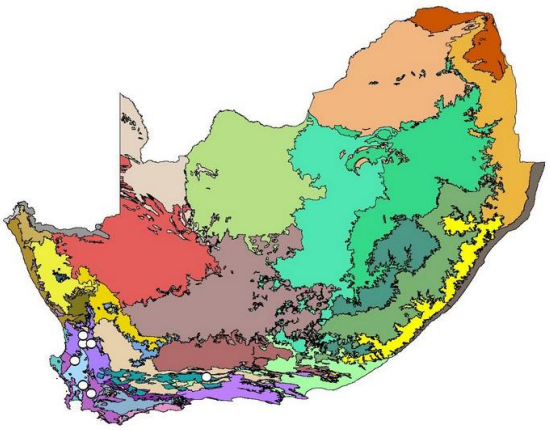
[E]*Otholobium trianthum* (E.Mey.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–2; Alt 100–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (57)	400–800 (29)
Min temp (°C)	2–8 (86)	0–4 (14)
Max temp (°C)	25–29 (86)	27–35 (14)
Phosphorus (ppm)	5–35 (86)	>20 (14)
pH	<6.4 (43)	5.5–7.4 (29)
ESP	Non (100)	
QDGCs	3218 (44)	3219; 3318; 3319; 3322 (14)

NOTES: –



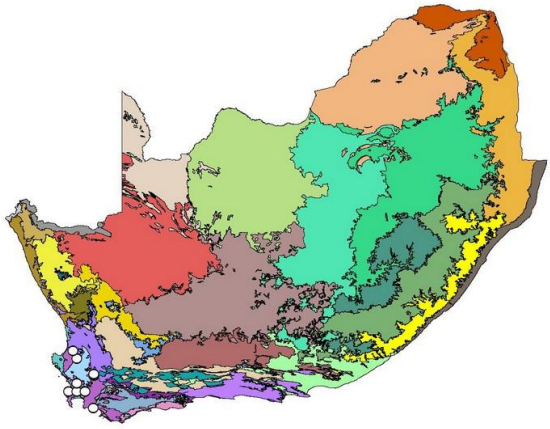
[E]*Otholobium uncinatum* (Eckl. & Zeyh.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–0.9; Alt 0–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (63)	600–1000 (25)
Min temp (°C)	>6 (50)	2–8 (38)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (74)	6.5–7.4; 6.5–8.4 (13)
ESP	Ecotone	
QDGCs	3318 (40)	3319 (30)

NOTES: –



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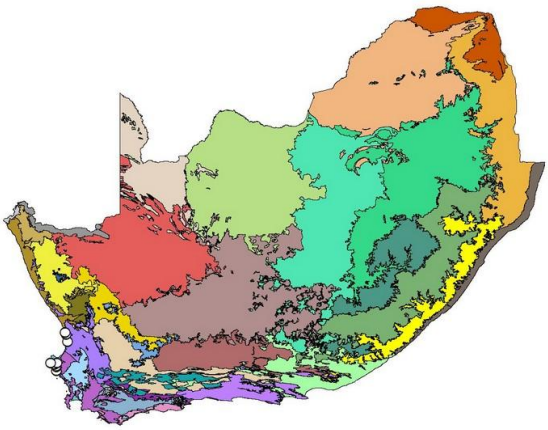
[E]*Otholobium venustum* (Eckl. & Zeyh.) C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht 0.01–1; Alt 100–200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (80)	25–29 (20)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (60)	5.5–7.4; 6.5–8.4 (20)
ESP	Medium (100)	
QDGCs	3218; 3318 (44)	3217 (12)

NOTES: –



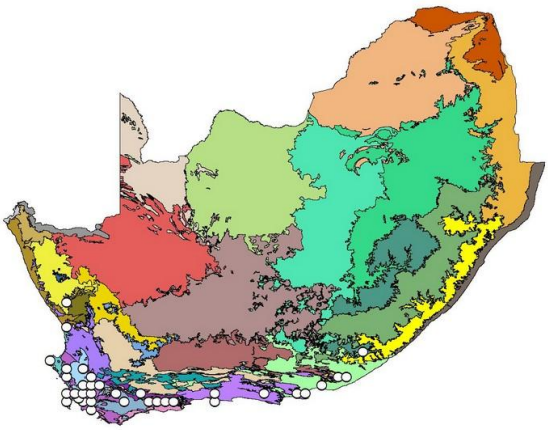
Otholobium virgatum (Burm.f.) C.H.Stirt.

Psoraleeae ①

Shrub; P; Ht 0.01–0.2; Alt 0–400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Southwest Fynbos; Eastern Fynbos-Renosterveld; West Strandveld (25)	
Biome	Fynbos (92)	Albany Thicket; Succulent Karoo (4)
Rainfall (mm)	200–600 (34)	400–800 (26)
Min temp (°C)	2–8 (49)	>6 (37)
Max temp (°C)	25–29 (78)	<27; 27–35 (11)
Phosphorus (ppm)	5–35 (91)	<10 (6)
pH	<6.4 (46)	5.5–7.4 (26)
ESP	Non; Medium (50)	
QDGCs	3318 (20)	3319 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Beverage (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Kidd 2002).



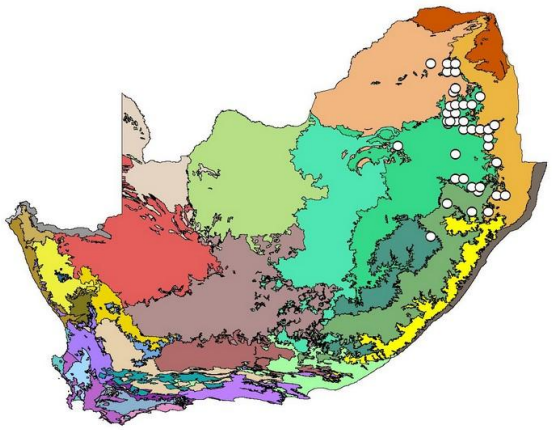
Otholobium wilmsii (Harms) C.H.Stirt.

Psoraleeae ①

Shrub, tree; P; Ht 0.01–3; Alt 950–2300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (64)	Sub-Escarpment Grassland; Lowveld (15)
Biome	Grassland (93)	Savanna (7)
Rainfall (mm)	>800 (43)	600–1000 (37)
Min temp (°C)	2–8 (52)	0–4 (41)
Max temp (°C)	25–29 (67)	<27 (24)
Phosphorus (ppm)	<10 (93)	5–35 (7)
pH	<6.4 (93)	5.5–7.4 (6)
ESP	Non (100)	
QDGCs	2530 (22)	2529 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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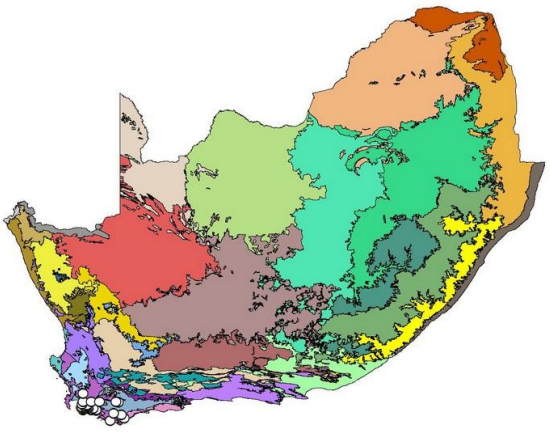
[E]*Otholobium zeyheri* (Harv.) C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht 0.01–0.4; Alt 60–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (36)	200–600; >800 (27)
Min temp (°C)	2–8 (82)	>6 (18)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (91)	<10 (9)
pH	<6.4 (55)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	3418 (47)	3419 (43)

NOTES: –



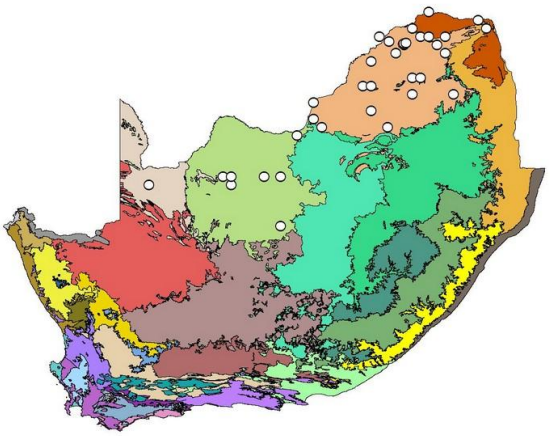
Otoptera burchellii DC.

Phaseoleae ③

Shrub, herb, climber; P; Ht 0.34–3; Alt 365–1650

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (62)	Eastern Kalahari Bushveld (29)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (55)	<400 (24)
Min temp (°C)	2–8 (61)	0–4 (18)
Max temp (°C)	27–35 (70)	25–29 (18)
Phosphorus (ppm)	5–35 (55)	<10 (45)
pH	6.5–7.4 (30)	5.5–7.4; 6.5–8.4 (24)
ESP	Non (100)	
QDGCs	2328 (17)	2229 (11)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Soil conservation:** Sand binders and soil stabilisers (Lewis *et al.* 2005).



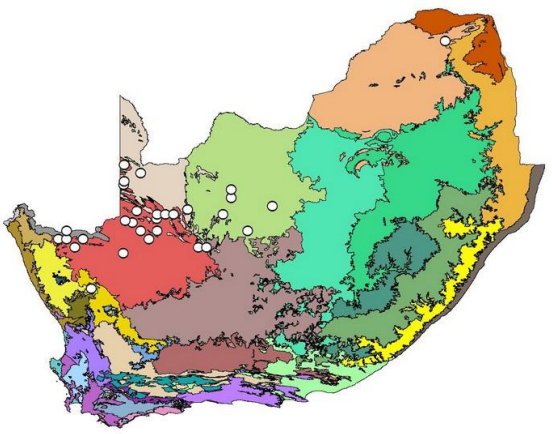
Parkinsonia africana Sond.

Caesalpinieae ③

Shrub, tree; P; Ht 0.4–6; Alt 100–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (47)	Eastern Kalahari Bushveld (33)
Biome	Nama-Karoo (47)	Savanna (41)
Rainfall (mm)	<400 (93)	400–800 (7)
Min temp (°C)	2–8 (52)	0–4 (31)
Max temp (°C)	27–35 (69)	>33 (28)
Phosphorus (ppm)	>20 (45)	5–35 (34)
pH	>7.5 (76)	6.5–7.4 (14)
ESP	Non (93)	Medium (7)
QDGCs	2820; 2821; 2918 (13)	2720 (10)

NOTES: **Livestock feed** (Van Rooyen 2001). **Cultivated** (Glen 2002). **N_2 fixation:** No nodulation (Grobbelaar & Van Rooyen 1979). **Biocultural:** Beverage; fuel (Van Wyk *et al.* 2000). **Flowering:** Spring, summer (Van Wyk *et al.* 2000; Van Rooyen 2001).



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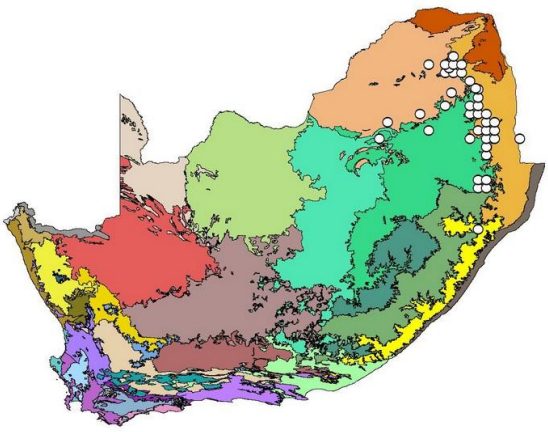
Pearsonia aristata (Schinz) Dummer

Crotalarieae ①

Herb; P; Ht 0.15–1.8; Alt 152–1940

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (44)	Lowveld (33)
Biome	Savanna (86)	Grassland (14)
Rainfall (mm)	>800 (42)	400–800 (37)
Min temp (°C)	2–8 (82)	0–4 (11)
Max temp (°C)	25–29 (66)	27–35 (32)
Phosphorus (ppm)	<10 (79)	5–35 (21)
pH	<6.4 (79)	5.5–7.4 (18)
ESP	Non (100)	
QDGCs	2430 (18)	2530; 2531 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Pooley 1998).



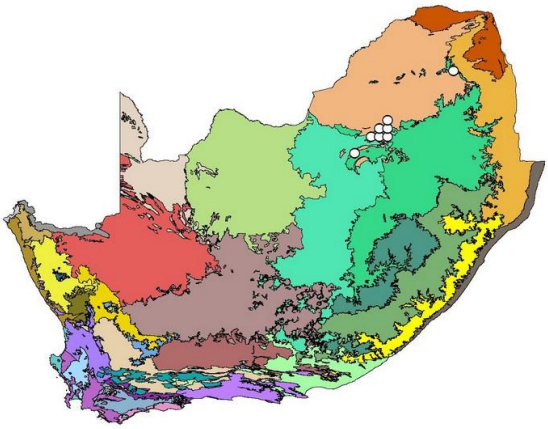
[E]*Pearsonia bracteata* (Benth.) Polhill

Crotalarieae ①

Herb; P; Ht 0.1–0.35; Alt 1525–1713

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Ecotone	
Rainfall (mm)	400–800 (88)	600–1000 (12)
Min temp (°C)	0–4 (50)	2–8 (38)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (88)	5–35 (12)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2627 (38)	2528 (25)

NOTES: –



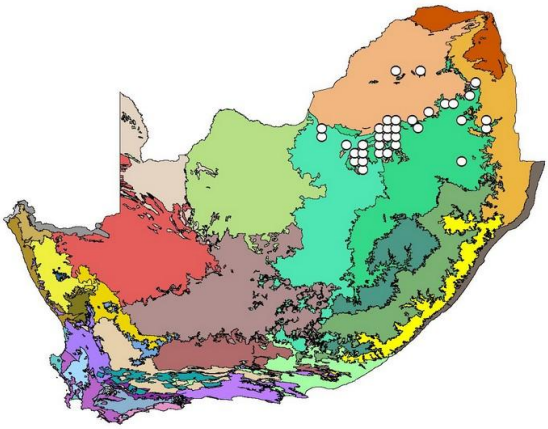
[E]*Pearsonia cajanifolia* (Harv.) Polhill subsp. *cajanifolia*

Crotalarieae ①

Herb; P; Ht 0.2–1.5; Alt 855–1740

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (40)	Mesic Highveld Grassland (30)
Biome	Grassland (86)	Savanna (14)
Rainfall (mm)	400–800 (83)	>800 (11)
Min temp (°C)	0–4; 2–8 (37)	<2 (23)
Max temp (°C)	25–29 (54)	27–35 (43)
Phosphorus (ppm)	<10 (94)	5–35 (6)
pH	<6.4 (74)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	2627 (23)	2528 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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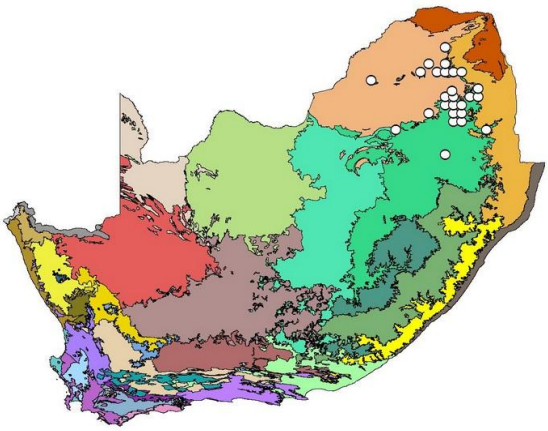
Pearsonia cajanifolia (Harv.) Polhill subsp. *cryptantha* (Baker) Polhill — Crotalarieae — ①

Dwarf shrub; P; Ht 0.25–1.5; Alt 946–2257

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (67)	Central Bushveld (33)
Biome	Grassland (57)	Savanna (33)
Rainfall (mm)	400–800 (65)	600–1000 (19)
Min temp (°C)	2–8 (77)	0–4 (19)
Max temp (°C)	25–29 (69)	<27 (23)
Phosphorus (ppm)	<10 (65)	5–35 (35)
pH	<6.4 (58)	5.5–7.4 (31)
ESP	Non (100)	
QDGCs	2430 (26)	2530 (22)

NOTES: **Flowering:** Spring, summer (Germishuizen & Clarke 2003).



[E]*Pearsonia callistoma* Campb.-Young & K.Balkwill — Crotalarieae — –

Dwarf shrub; U; Ht 0.2–0.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

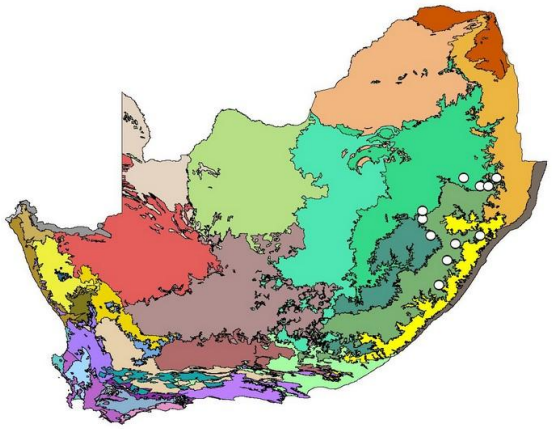
NOTES: –

[E]*Pearsonia grandifolia* (Bolus) Polhill subsp. *grandifolia* — Crotalarieae — ①

Herb; P; Ht ?; Alt 880–2075

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Sub-Escarpment Grassland (50)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (64)	400–800; 600–1000 (18)
Min temp (°C)	0–4; 2–8 (45)	<2 (10)
Max temp (°C)	25–29 (55)	<27 (27)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (91)	5.5–7.4 (9)
ESP	Non (100)	
QDGCs	2730; 2731; 2829; 2929; 2930 (18)	3029 (10)

NOTES: **Flowering:** Spring, summer (Pooley 1998).



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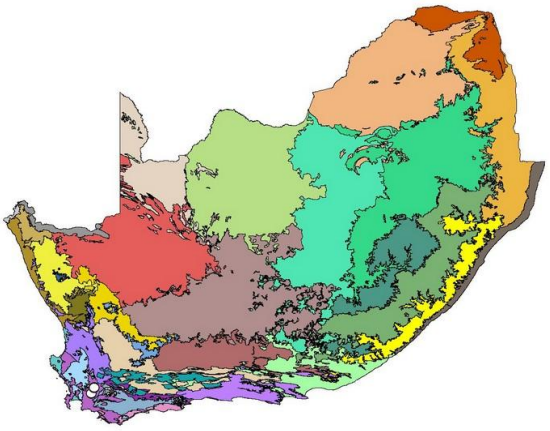
[E]*Psoralea implexa* C.H.Stirt.

Psoraleeae ①

Unknown

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Non (100)	
QDGCs	3319 (100)	

NOTES: –



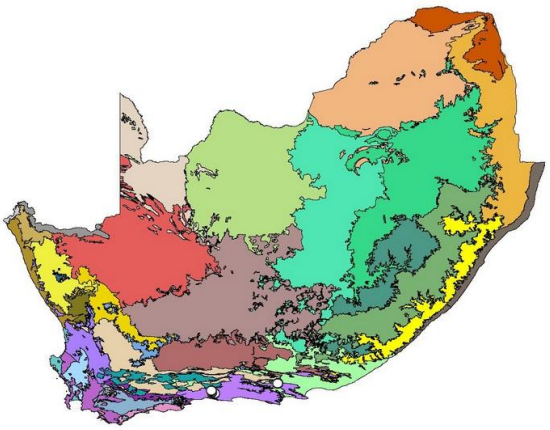
[E]*Psoralea keetii* Schönland

Psoraleeae ①

Shrub; P; Ht 0.15–2; Alt 830–1560

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	200–600; 600–1000 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Medium (100)	
QDGCs	3322 (67)	3324 (33)

NOTES: –



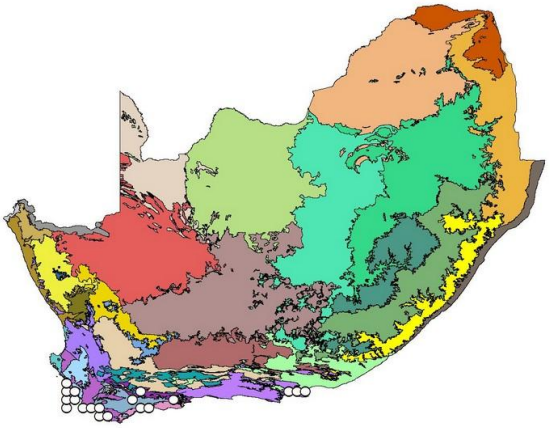
[E]*Psoralea laxa* T.M.Salter

Psoraleeae ①

Dwarf shrub; P; Ht 0.15–0.4; Alt 30–1160

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (47)	200–600 (37)
Min temp (°C)	>6 (63)	2–8 (37)
Max temp (°C)	25–29 (90)	<27; 27–35 (5)
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	<6.4 (53)	5.5–7.4 (21)
ESP	Non (100)	
QDGCs	3418; 3419 (21)	3318; 3325; 3420 (16)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer, autumn (Kidd 2002).



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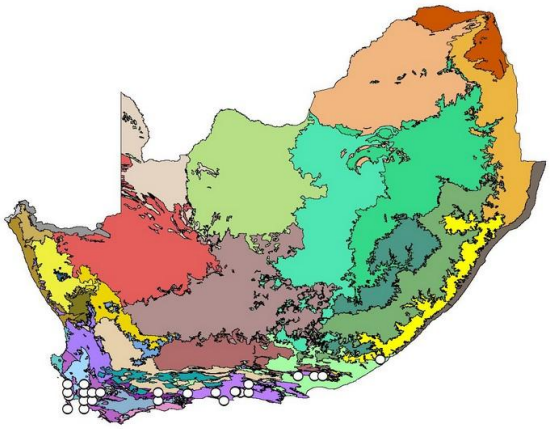
[E]*Psoralea monophylla* (L.) C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht 0.15–0.3; Alt 230–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (63)	Southwest Fynbos (38)
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (30)	200–600 (26)
Min temp (°C)	2–8 (74)	>6 (17)
Max temp (°C)	25–29 (74)	<27 (22)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (61)	5.5–7.4 (30)
ESP	Medium (63)	Non (38)
QDGCs	3318; 3323 (20)	3418 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



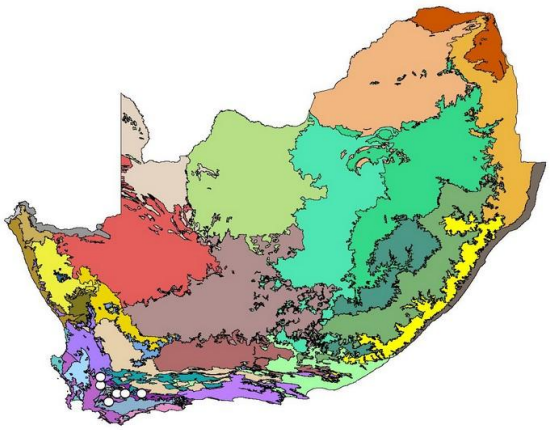
[E]*Psoralea odoratissima* Jacq.

Psoraleeae ①

Shrub; P; Ht 0.15–2; Alt 300–1330

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (83)	400–800 (17)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3319 (50)	3320 (33)

NOTES: –



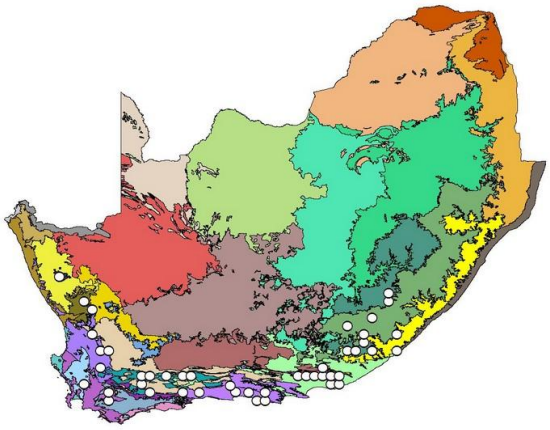
[E]*Psoralea oligophylla* Eckl. & Zeyh.

Psoraleeae ③

Shrub; P; Ht 0.15–2; Alt 0–1850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (71)	Sub-Escarpment Grassland (29)
Biome	Fynbos; Grassland (50)	
Rainfall (mm)	400–800 (28)	200–600 (26)
Min temp (°C)	2–8 (72)	0–4; >6 (13)
Max temp (°C)	25–29 (67)	<27 (17)
Phosphorus (ppm)	5–35 (67)	>20 (20)
pH	<6.4 (35)	5.5–7.4 (33)
ESP	Medium (71)	Non (29)
QDGCs	3326 (13)	3227; 3320 (9)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer, autumn (Manning 2001).



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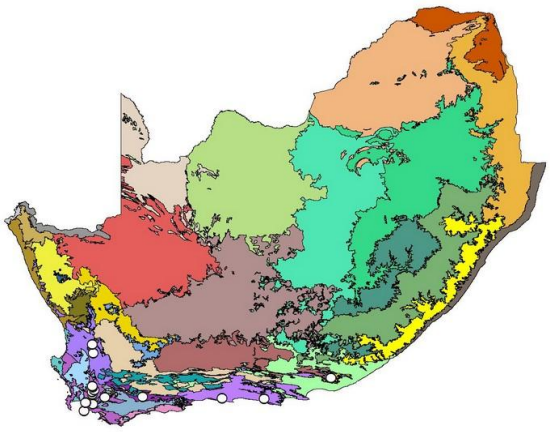
[E]*Psoralea oreophila* Schltr.

Psoraleeae ①

Dwarf shrub; P; Ht 0.15–0.5; Alt 460–1660

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (50)	Northwest Fynbos; Eastern Fynbos-Renosterveld (25)
Biome	Fynbos (100)	
Rainfall (mm)	>800 (50)	200–600; 400–800 (25)
Min temp (°C)	2–8 (67)	0–4 (25)
Max temp (°C)	25–29 (83)	<27 (17)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (50)	5.5–7.4 (33)
ESP	Non (75)	Medium (25)
QDGCs	3319 (47)	3418 (16)

NOTES: –



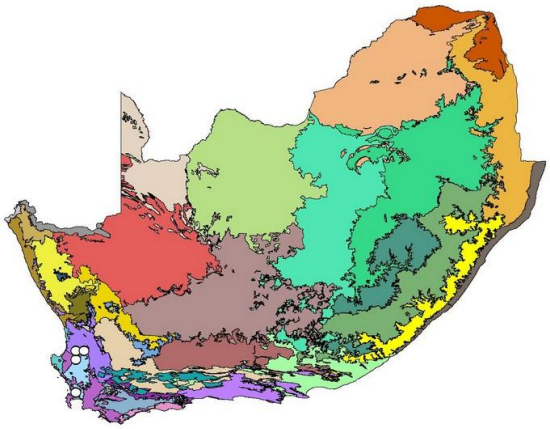
[E]*Psoralea peratica* C.H.Stirt.

Psoraleeae ①

Shrub, tree; P; Ht 0.15–5; Alt 500–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4; 6.5–7.4; 6.5–8.4 (25)	
ESP	Ecotone	
QDGCs	3218 (75)	3318 (25)

NOTES: –



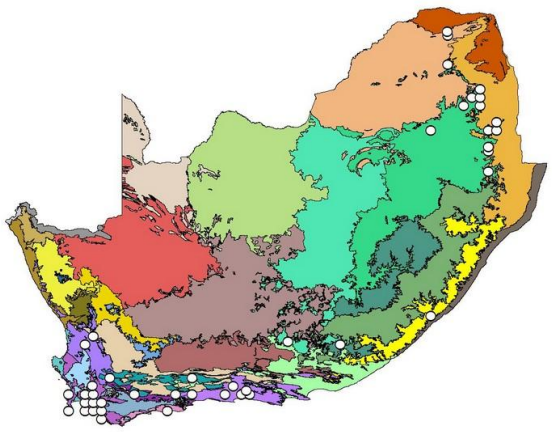
[E]*Psoralea pinnata* L. var. *pinnata*

Psoraleeae ③

Shrub, tree; P; Ht 0.15–4; Alt 230–1060

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (40)	Southwest Fynbos (30)
Biome	Fynbos (83)	Grassland (11)
Rainfall (mm)	>800 (31)	400–800 (26)
Min temp (°C)	2–8 (69)	0–4 (18)
Max temp (°C)	25–29 (80)	<27; 27–35 (100
Phosphorus (ppm)	5–35 (69)	<10 (28)
pH	<6.4 (54)	5.5–7.4 (36)
ESP	Non (60)	Medium (40)
QDGCs	3323; 3419 (12)	3319; 3418 (7)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** No alkaloids (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Magical (Hutchings *et al.* 1996); Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** All seasons (Mustart *et al.* 2003).



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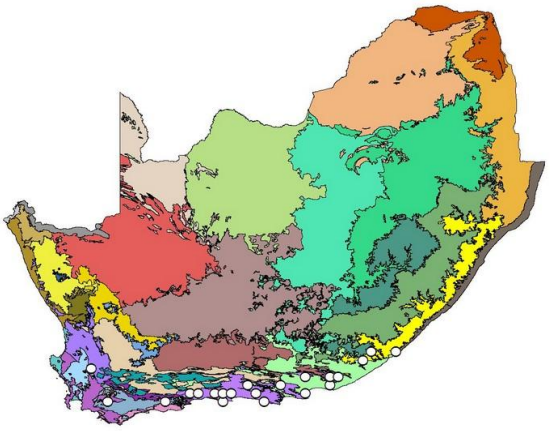
[E]*Psoralea plauta* C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht 0.15–0.6; Alt 240–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (48)	200–600 (24)
Min temp (°C)	2–8 (76)	>6 (19)
Max temp (°C)	25–29 (71)	<27 (29)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (52)	5.5–7.4 (38)
ESP	Medium (100)	
QDGCs	3322; 3323; 3326 (14)	3227; 3324; 3325 (10)

NOTES: –



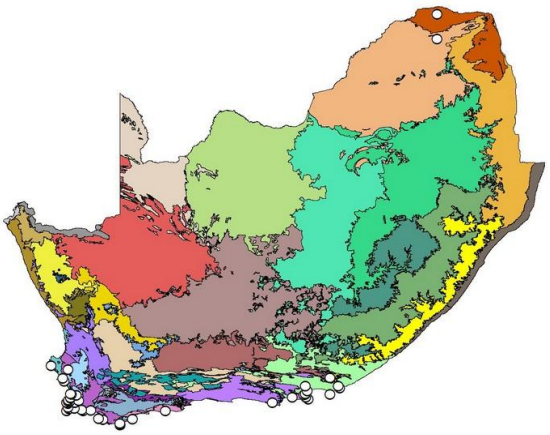
[E]*Psoralea repens* L.

Psoraleeae ①

Dwarf shrub; P; Ht 0.15–0.2; Alt 0–50

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Southwest Fynbos (22)	South Coast Fynbos; Eastern Fynbos-Renosterveld; West Strandveld; Central Bushveld; Mopane (11)
Biome	Fynbos (80)	Albany Thicket; Savanna (10)
Rainfall (mm)	400–800 (50)	200–600 (23)
Min temp (°C)	>6 (77)	2–8 (23)
Max temp (°C)	25–29 (77)	<27 (15)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (42)	6.5–8.4 (27)
ESP	Non (78)	Medium (22)
QDGCs	3418 (35)	3318 (19)

NOTES: –



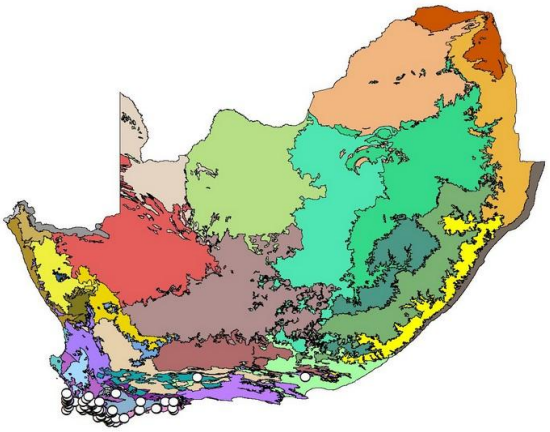
[E]*Psoralea restioides* Eckl. & Zeyh.

Psoraleeae ①

Dwarf shrub; P; Ht 0.15–0.6; Alt 30–960

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (75)	South Coast Fynbos (25)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (44)	400–800 (33)
Min temp (°C)	2–8 (59)	>6 (33)
Max temp (°C)	25–29 (96)	<27 (4)
Phosphorus (ppm)	5–35 (81)	<10 (15)
pH	<6.4 (41)	5.5–7.4 (37)
ESP	Non (100)	
QDGCs	3419 (56)	3418 (26)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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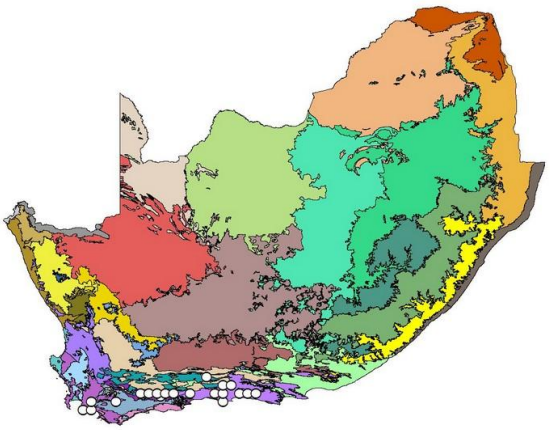
[E]*Psoralea speciosa* Eckl. & Zeyh.

Psoraleeae ①

Shrub; P; Ht 0.15–2; Alt 600–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (88)	Southwest Fynbos (12)
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (37)	600–1000 (21)
Min temp (°C)	2–8 (95)	>6 (5)
Max temp (°C)	25–29 (53)	<27 (32)
Phosphorus (ppm)	5–35 (95)	>20 (5)
pH	<6.4 (53)	5.5–7.4; 6.5–8.4 (16)
ESP	Medium (88)	Non (12)
QDGCs	3323 (25)	3321 (20)

NOTES: –



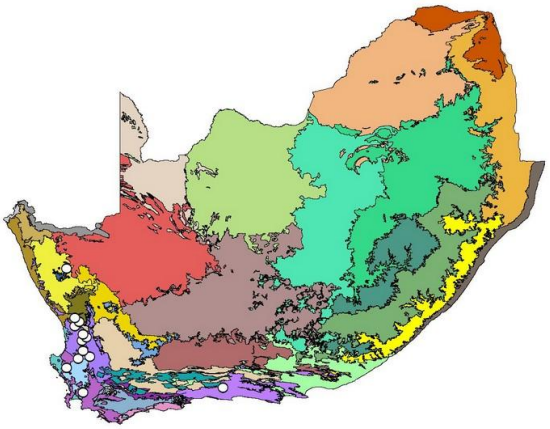
[E]*Psoralea tenuifolia* L.

Psoraleeae ①

Shrub, tree; P; Ht 0.15–5; Alt 260–830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600 (42)	400–800; 600–1000 (8)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	6.5–8.4 (42)	5.5–7.4 (33)
ESP	Medium (100)	
QDGCs	3218 (38)	3318 (15)

NOTES: –



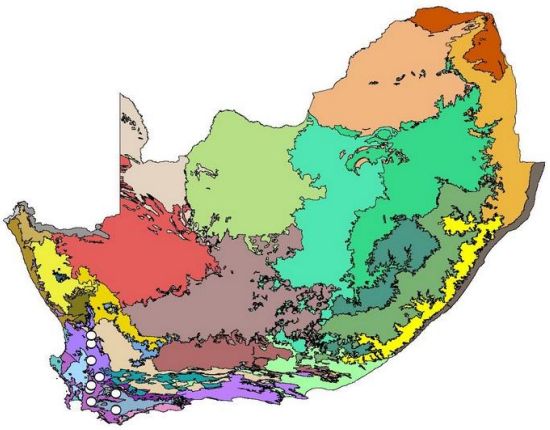
[E]*Psoralea tenuissima* E.Mey.

Psoraleeae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt 960–1330

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800; >800 (33)	
Min temp (°C)	2–8 (56)	0–4 (44)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	<6.4 (22)
ESP	Non (100)	
QDGCs	3319 (44)	3219 (33)

NOTES: –



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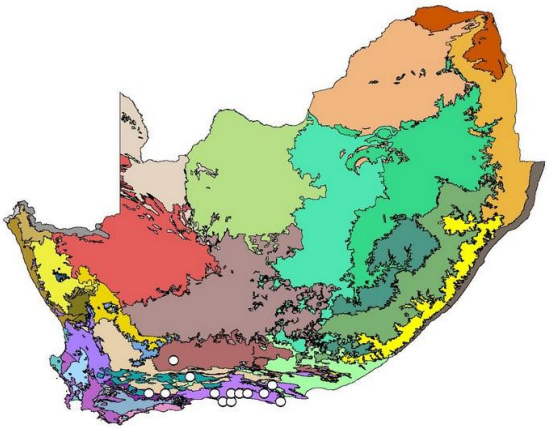
[E]*Psoralea triflora* Thunb.

Psoraleeae ①

Dwarf shrub; P; Ht 0.15–2; Alt 100–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (86)	Lower Karoo (14)
Biome	Fynbos; Nama-Karoo (50)	
Rainfall (mm)	600–1000 (38)	<400 (23)
Min temp (°C)	2–8 (92)	>6 (8)
Max temp (°C)	<27 (54)	25–29; 27–35 (23)
Phosphorus (ppm)	5–35 (85)	>20 (15)
pH	<6.4 (62)	6.5–8.4 (23)
ESP	Medium (100)	
QDGCs	3323 (23)	3322; 3324 (15)

NOTES: –



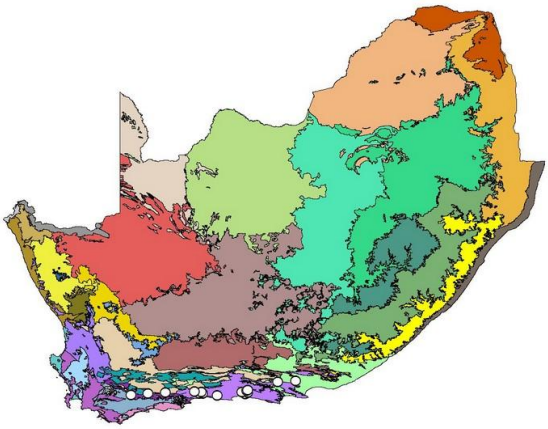
[E]*Psoralea trullata* C.H.Stirt.

Psoraleeae ①

Dwarf shrub; P; Ht ?–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	600–1000 (50)	200–600 (40)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (60)	<27 (30)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (50)	6.5–8.4 (30)
ESP	Medium (100)	
QDGCs	3322; 3323 (33)	3320 (13)

NOTES: –



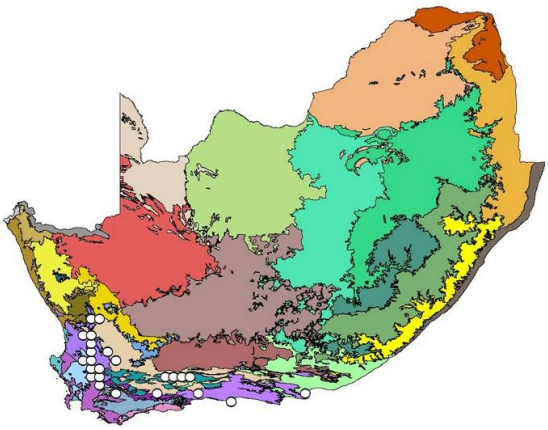
[E]*Psoralea verrucosa* Willd.

Psoraleeae ①

Shrub; P; Ht 0.15–2; Alt 400–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Eastern Fynbos-Renosterveld; Rainshadow Valley Karoo (33)	
Biome	Fynbos (82)	Succulent Karoo (18)
Rainfall (mm)	<400 (38)	200–600 (33)
Min temp (°C)	2–8 (71)	0–4 (25)
Max temp (°C)	25–29 (58)	27–35 (38)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	5.5–7.4 (33)	<6.4; 6.5–8.4 (25)
ESP	Non; Medium; High (33)	
QDGCs	3219; 3319 (25)	3321 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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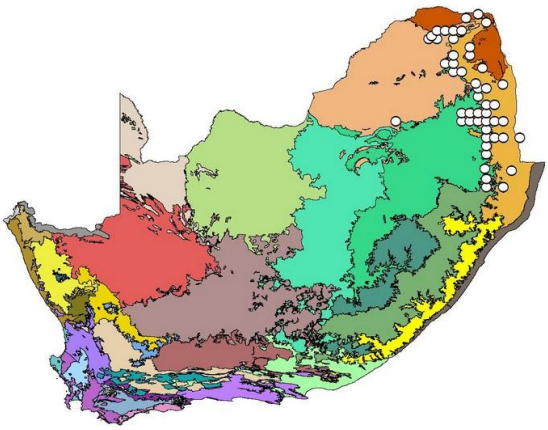
Pterocarpus angolensis DC. — Dalbergieae

Tree; P; Ht 5–20; Alt 300–1550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (53)	Central Bushveld (27)
Biome	Savanna (100)	
Rainfall (mm)	>800 (37)	400–800 (30)
Min temp (°C)	2–8 (67)	>6 (30)
Max temp (°C)	25–29 (50)	27–35 (46)
Phosphorus (ppm)	<10 (70)	5–35 (30)
pH	<6.4 (70)	5.5–7.4 (15)
ESP	Non (100)	
QDGCs	2531 (15)	2530 (13)

NOTES: **Livestock feed** (Bosch & Borus 2006). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983). **Antiquality:** Phenol and tannin in wood; skin irritant in wood (Watt & Breyer-Brandwijk 1962). **Biocultural:** Magical (Hutchings *et al.* 1996); Medicine for humans; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Venter & Venter 1996; Van Wyk *et al.* 2000).

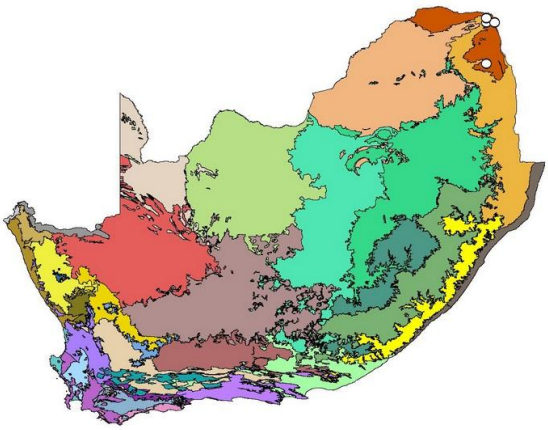


Pterocarpus lucens Lepr. ex Guill. & Perr. subsp. *antunesii* (Taub.) Rojo — Dalbergieae

Tree; P; Ht 2.5–8; Alt 300–1150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	6.5–7.4 (67)	5.5–7.4 (33)
ESP	Ecotone	
QDGCs	2231 (75)	2331 (25)

NOTES: **Livestock feed** (Le Houérou 1980; Dicko & Sikena 1992). **DM:** 1.8–4.5 kg/tree/yr (Le Houérou 1980). **CP:** Leaves 15% (Le Houérou 1980). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983); 11–29 kgN/ha (Sylla *et al.* 2002).

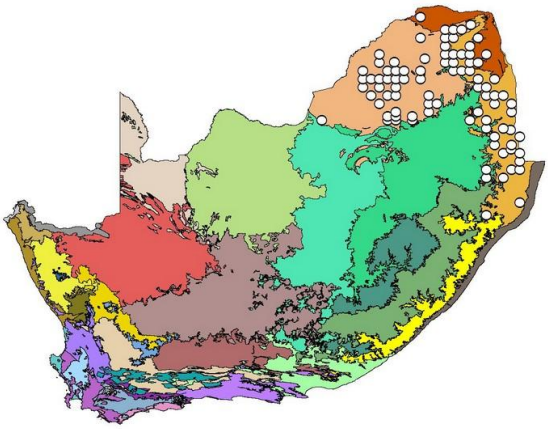


Pterocarpus rotundifolius (Sond.) Druce subsp. *rotundifolius* — Dalbergieae

Shrub, tree; P; Ht 3–20; Alt 0–1550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (55)	Lowveld (39)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (69)	600–1000 (17)
Min temp (°C)	2–8 (65)	>6 (33)
Max temp (°C)	27–35 (63)	25–29 (37)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (54)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	2330; 2428 (11)	2427; 2531 (9)

NOTES: **Livestock feed** (Van Wyk *et al.* 2000). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans; timber (Van Wyk *et al.* 2000). **Flowering:** Spring, summer (Van Wyk *et al.* 2000).



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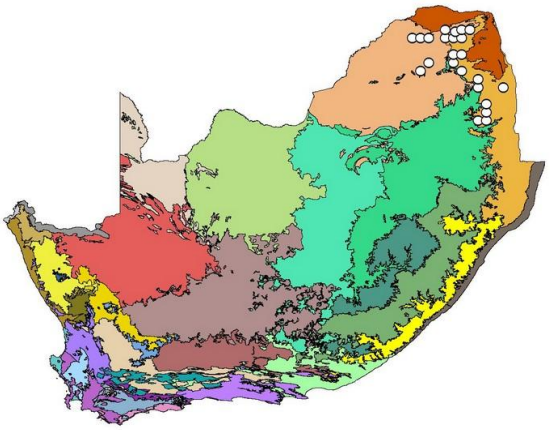
Pterolobium stellatum (Forssk.) Brenan

Caesalpinieae

Shrub, climber; P; Ht 3–15; Alt 250–1550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (60)	Lowveld (40)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (39)	600–1000; >800 (22)
Min temp (°C)	2–8 (74)	>6 (26)
Max temp (°C)	25–29 (61)	27–35 (39)
Phosphorus (ppm)	5–35 (65)	<10 (35)
pH	<6.4 (52)	5.5–7.4 (30)
ESP	Non (100)	
QDGCs	2330 (22)	2329 (17)

NOTES: **Antiquality:** Tannin in bark (Watt & Breyer-Brandwijk 1962).
Biocultural: Dye; medicine for humans (Watt & Breyer-Brandwijk 1962).



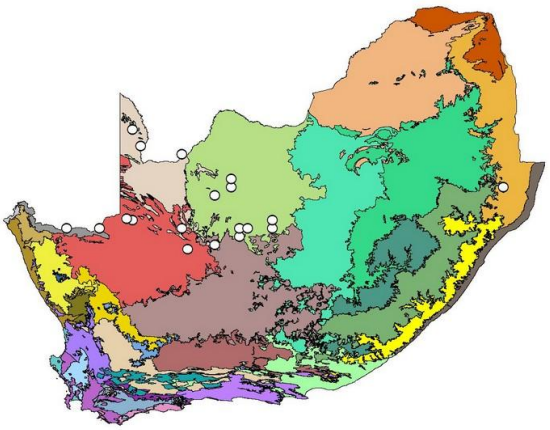
Ptycholobium biflorum (E.Mey.) Brummitt subsp. *biflorum*

Millettieae

Dwarf shrub, herb; P; Ht 0.3–0.4; Alt 610–1442

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (54)	Bushmanland (23)
Biome	Savanna (71)	Nama-Karoo (21)
Rainfall (mm)	<400 (95)	400–800 (5)
Min temp (°C)	2–8 (36)	<2; 0–4 (32)
Max temp (°C)	>33 (58)	27–35 (42)
Phosphorus (ppm)	<10 (53)	5–35 (26)
pH	>7.5 (42)	6.5–7.4 (37)
ESP	Non (92)	Medium (8)
QDGCs	2723; 2820; 2823; 2824; 2922 (11)	2520; 2620; 2621; 2722; 2731; 2818; 2819; 2821; 2923 (5)

NOTES: **Flowering:** Spring, summer (Van Rooyen 2001).



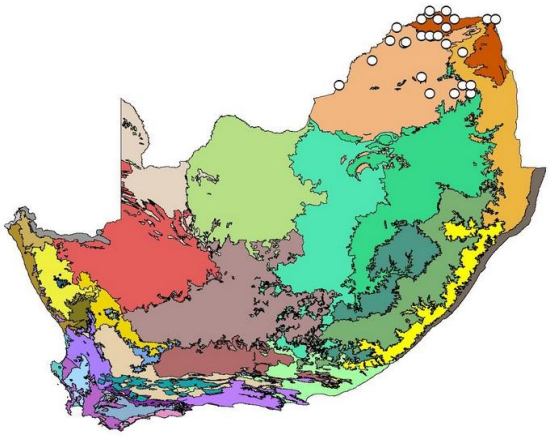
Ptycholobium contortum (N.E.Br.) Brummitt

Millettieae

Dwarf shrub, herb; P; Ht 0.2–0.8; Alt 275–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (50)	Mopane (44)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (38)	200–600 (33)
Min temp (°C)	2–8 (79)	>6 (21)
Max temp (°C)	27–35 (58)	25–29 (29)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	6.5–8.4 (42)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2229 (37)	2430 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975; Grobbelaar *et al.* 1983).



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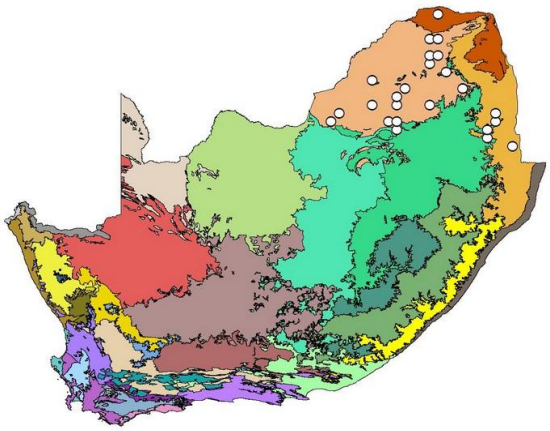
Ptycholobium plicatum* (Oliv.) Harms subsp. *plicatum **Millettieae** ①

Dwarf shrub, herb; P; Ht 0.2–0.4; Alt 244–1129

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (82)	Lowveld (12)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (58)	200–600 (17)
Min temp (°C)	2–8 (79)	>6 (13)
Max temp (°C)	27–35 (63)	25–29 (37)
Phosphorus (ppm)	<10 (63)	5–35 (37)
pH	<6.4; 5.5–7.4 (42)	6.5–8.4 (16)
ESP	Non (100)	
QDGCs	2329 (21)	2528 (17)

NOTES: –

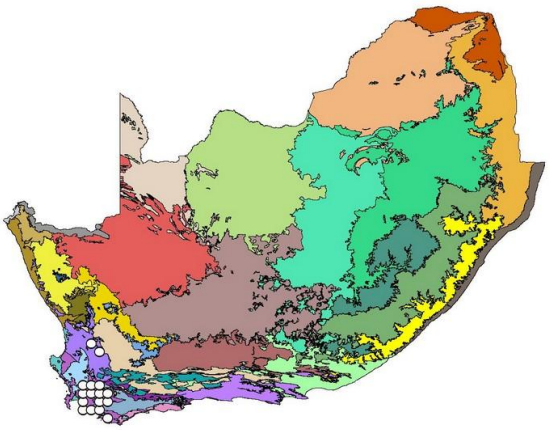


[E]***Rafnia acuminata* (E.Mey.) G.J.Campbell & B.-E.van Wyk** **Crotalarieae** ①

Shrub; P; Ht 0.01–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (38)	200–600 (31)
Min temp (°C)	2–8 (63)	0–4 (31)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (94)	<10 (6)
pH	5.5–7.4 (50)	<6.4 (44)
ESP	Non (100)	
QDGCs	3319; 3419 (32)	3219; 3318; 3418 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).

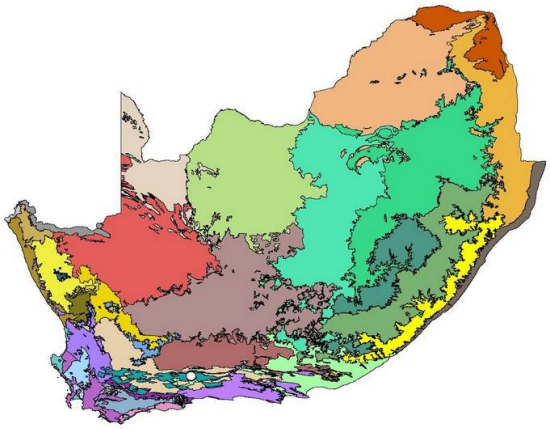


[E]***Rafnia alata* G.J.Campbell & B.-E.van Wyk** **Crotalarieae** ①

Shrub; P; Ht 0.15–0.4; Alt 30–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3322 (100)	

NOTES: –



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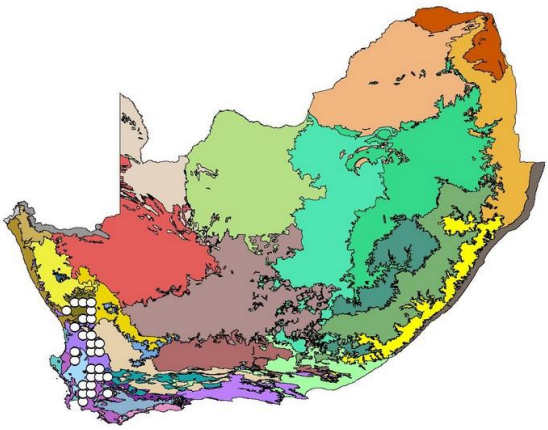
[E]*Rafnia amplexicaulis* (L.) Thunb.

Crotalarieae ①

Shrub; P; Ht 0.3–2.5; Alt 30–1295

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos (50)	
Biome	Fynbos (93)	Succulent Karoo (7)
Rainfall (mm)	200–600 (37)	<400 (33)
Min temp (°C)	2–8 (59)	0–4 (30)
Max temp (°C)	25–29 (72)	27–35 (26)
Phosphorus (ppm)	5–35 (81)	>20 (19)
pH	5.5–7.4 (33)	<6.4 (26)
ESP	Non (100)	
QDGCs	3319 (30)	3219 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Van Rooyen & Steyn 1999).



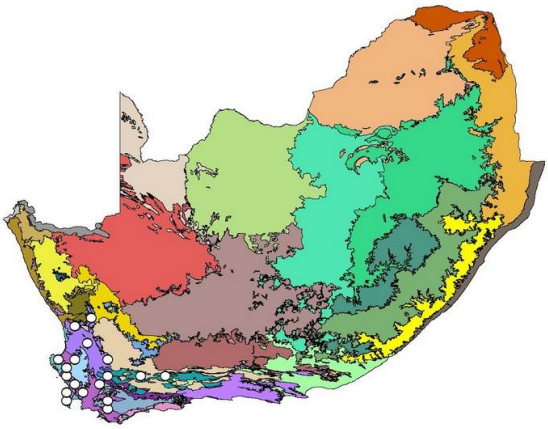
[E]*Rafnia angulata* Thunb. subsp. *angulata*

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–2.2; Alt 75–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (44)	<400 (33)
Min temp (°C)	2–8 (50)	>6 (39)
Max temp (°C)	25–29 (78)	27–35 (22)
Phosphorus (ppm)	5–35 (78)	>20 (17)
pH	<6.4; 5.5–7.4 (33)	6.5–8.4 (22)
ESP	Ecotone	
QDGCs	3318 (28)	3218; 3219; 3319; 3419 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer, autumn (Kidd 2002).



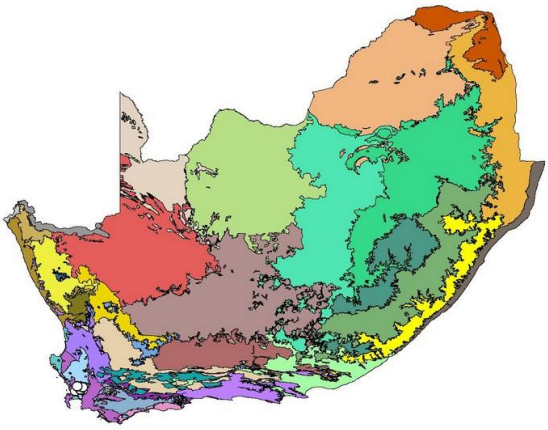
[E]*Rafnia angulata* Thunb. subsp. *ericifolia* (T.M.Salter) G.J.Campbell & B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.2–0.5; Alt ?–92

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (50)	400–800; 600–1000 (25)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3318 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Manning 2003).



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[E]*Rafnia angulata* Thunb. subsp. *humilis* (Eckl. & Zeyh.) G.J.Campbell & B.-E.van Wyk

Crotalarieae –

Shrub; P; Ht 0.01–0.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Manning 2003).

[E]*Rafnia angulata* Thunb. subsp. *montana* G.J.Campbell & B.-E.van Wyk

Crotalarieae –

Shrub; P; Ht 0.01–0.15; Alt ?–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Manning 2003).

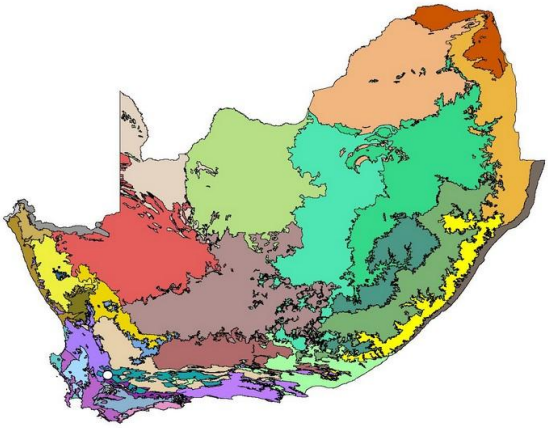
[E]*Rafnia angulata* Thunb. subsp. *thunbergii* (Harv.) G.J.Campbell & B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–1.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Manning 2003).



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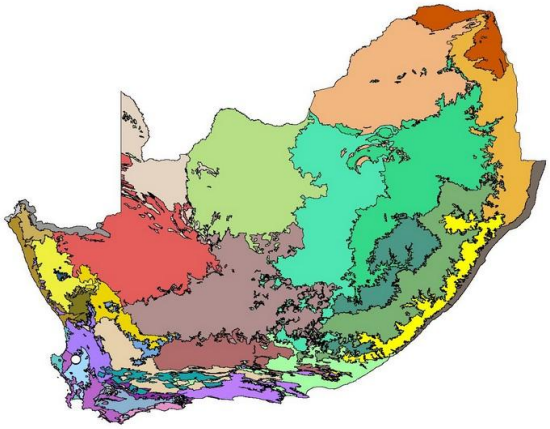
[E]*Rafnia capensis* (L.) Schinz subsp. *calycina* G.J.Campbell & B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.2–0.5; Alt 610–793

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3218 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



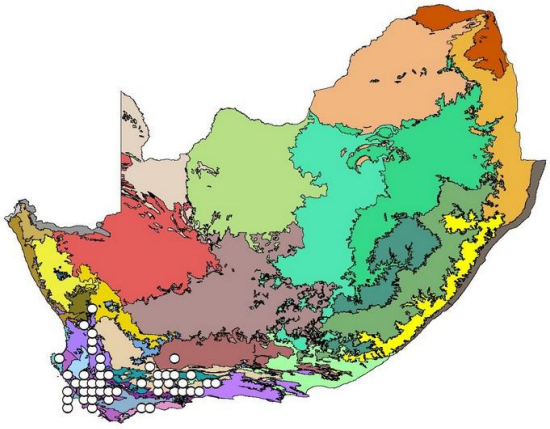
[E]*Rafnia capensis* (L.) Schinz subsp. *capensis*

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–1.2; Alt 61–1829

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos (33)	Lower Karoo; Rainshadow Valley Karoo (16)
Biome	Fynbos (92)	Nama-Karoo; Succulent Karoo (4)
Rainfall (mm)	200–600 (38)	<400 (32)
Min temp (°C)	2–8 (62)	0–4; >6 (19)
Max temp (°C)	25–29 (68)	27–35 (32)
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	<6.4 (32)	5.5–7.4 (30)
ESP	Non (66)	Medium; High (17)
QDGCs	3321 (21)	3319 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972; Grobbelaar *et al.* 1983).



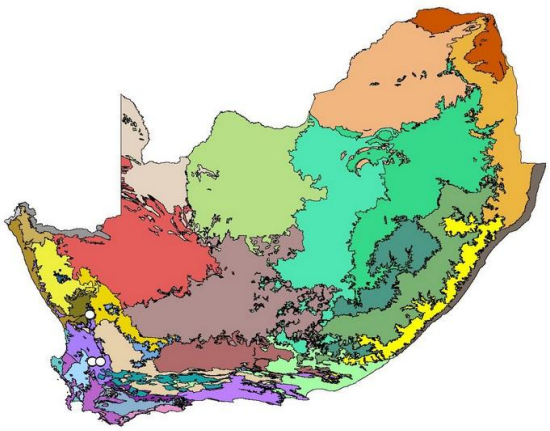
[E]*Rafnia capensis* (L.) Schinz subsp. *carinata* G.J.Campbell & B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.3–0.4; Alt 960–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; 400–800 (33)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	<6.4; 5.5–7.4; >7.5 (33)	
ESP	Non (100)	
QDGCs	3219 (67)	3119 (33)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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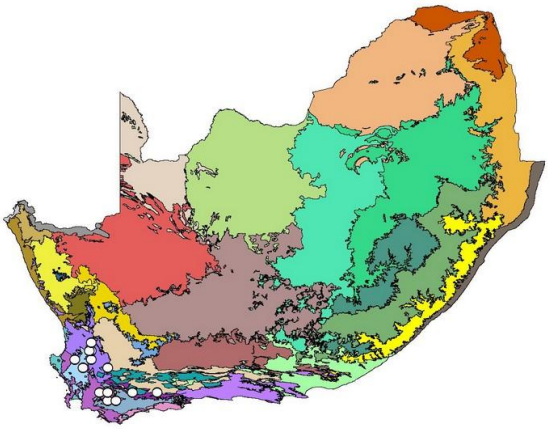
Crotalarieae ①

[E]*Rafnia capensis* (L.) Schinz subsp. *dichotoma* (Eckl. & Zeyh.) G.J.Campbell & B.-E.van Wyk

Shrub; P; Ht 0.2–1; Alt 1128–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (75)	400–800 (17)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (58)	6.5–7.4; 6.5–8.4 (17)
ESP	Non (100)	
QDGCs	3219 (29)	3319 (21)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



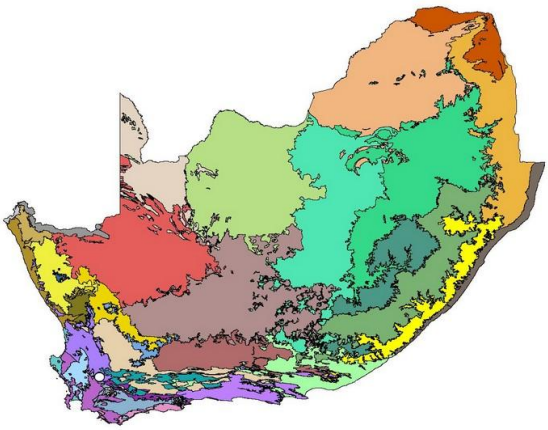
Crotalarieae ①

[E]*Rafnia capensis* (L.) Schinz subsp. *elsieae* G.J.Campbell & B.-E.van Wyk

Dwarf shrub; P; Ht 0.01–0.3; Alt 1525–1678

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



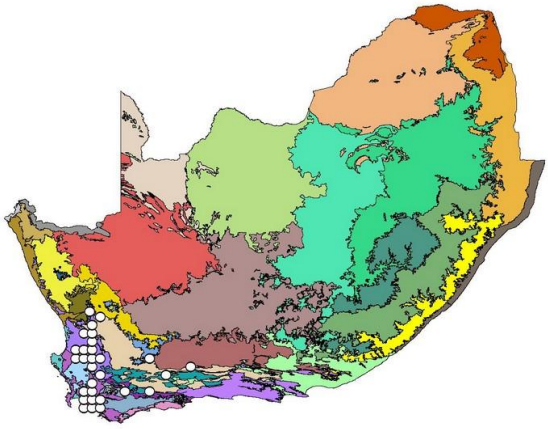
Crotalarieae ①

[E]*Rafnia capensis* (L.) Schinz subsp. *ovata* (P.J.Bergius) G.J.Campbell & B.-E.van Wyk

Shrub; P; Ht 0.1–3; Alt 244–1037

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos (50)	
Biome	Fynbos (95)	Succulent Karoo (5)
Rainfall (mm)	200–600 (34)	400–800 (24)
Min temp (°C)	2–8 (83)	0–4 (14)
Max temp (°C)	25–29 (79)	27–35 (21)
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	5.5–7.4 (34)	<6.4 (31)
ESP	Non (100)	
QDGCs	3218; 3219 (17)	3319; 3419 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972; Grobbelaar *et al.* 1983).



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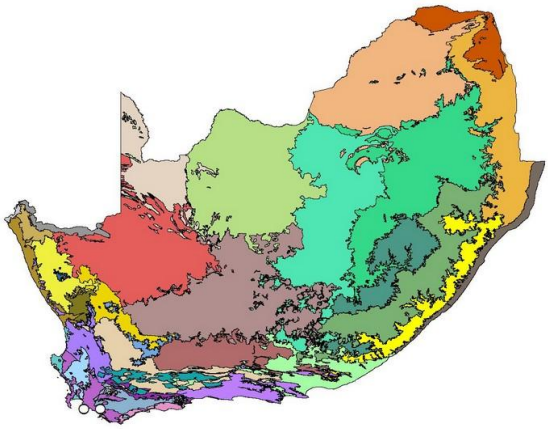
[E]*Rafnia capensis* (L.) Schinz subsp. *pedicellata* G.J.Campbell & B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.35–0.5; Alt 30–458

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3418; 3419 (50)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



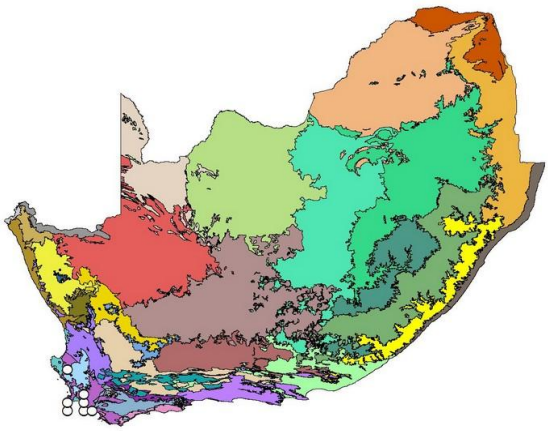
[E]*Rafnia crassifolia* Harv.

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–1.2; Alt 10–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; 600–1000; >800 (29)	<400 (13)
Min temp (°C)	>6 (57)	2–8 (43)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (86)	5.5–7.4 (14)
ESP	Non (100)	
QDGCs	3418 (57)	3318 (29)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



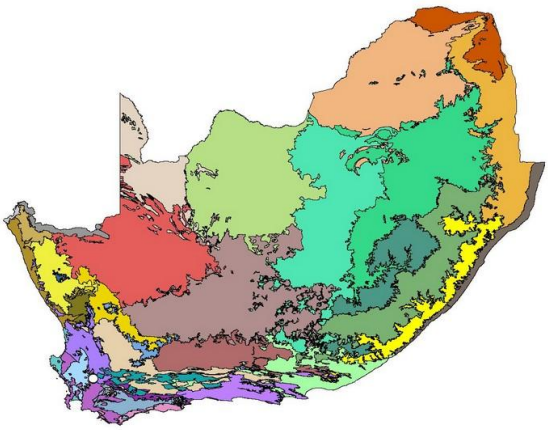
[E]*Rafnia crispa* C.H.Stirt.

Crotalarieae ①

Dwarf shrub, herb; P; Ht 0.01–0.4; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3319 (100)	

NOTES: –



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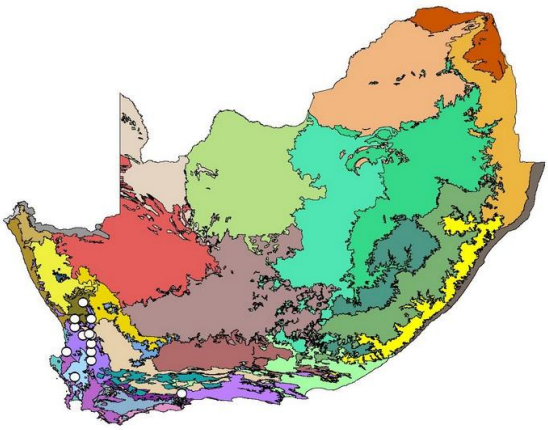
[E]*Rafnia diffusa* Thunb.

Crotalarieae ①

Dwarf shrub; P; Ht 0.1–2; Alt 30–1219

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600 (42)	400–800 (16)
Min temp (°C)	2–8 (75)	>6 (25)
Max temp (°C)	25–29 (58)	27–35 (42)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	5.5–7.4 (42)	6.5–8.4 (33)
ESP	Non (100)	
QDGCs	3219 (38)	3118 (23)

NOTES: **Flowering:** Spring, summer (Van Rooyen & Steyn 1999).



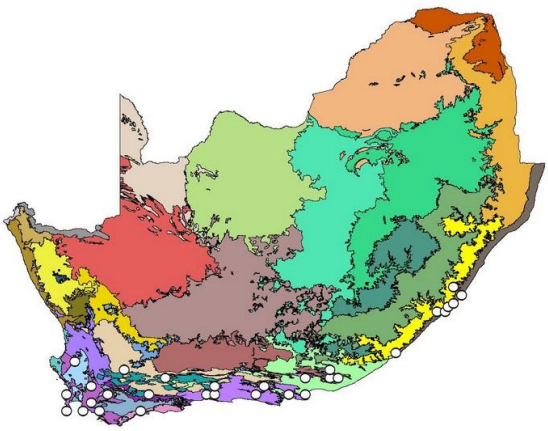
[E]*Rafnia elliptica* Thunb.

Crotalarieae ①

Shrub; P; Ht 0.3–1; Alt 30–1341

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (50)	Southwest Fynbos (33)
Biome	Fynbos (89)	Indian Ocean (11)
Rainfall (mm)	>800 (33)	200–600 (27)
Min temp (°C)	2–8 (57)	>6 (37)
Max temp (°C)	25–29 (86)	<27; 27–35 (7)
Phosphorus (ppm)	5–35 (87)	<10 (10)
pH	<6.4 (50)	5.5–7.4 (27)
ESP	Non; Medium (50)	
QDGCs	3129; 3322; 3325; 3326 (10)	3030; 3319; 3320; 3324; 3418; 3419 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972; Grobbelaar *et al.* 1983). **Flowering:** Spring, summer, autumn (Pooley 1998).



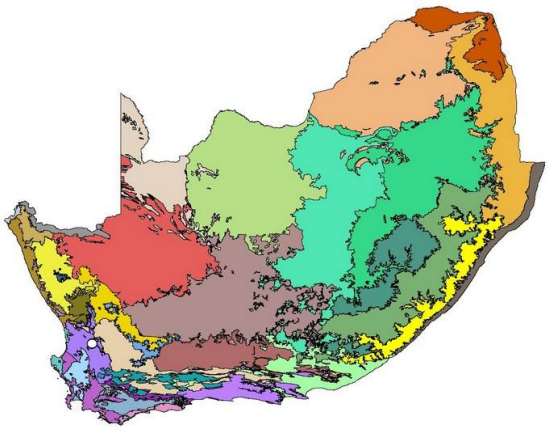
[E]*Rafnia globosa* G.J.Campbell & B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt 488–820

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	3219 (100)	

NOTES: –



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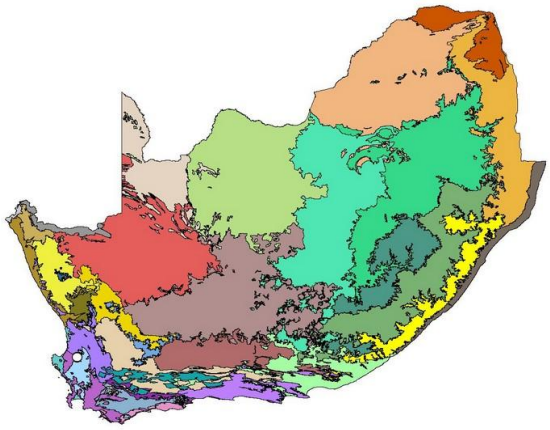
[E]*Rafnia inaequalis* G.J.Campbell & B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3218 (100)	

NOTES: –



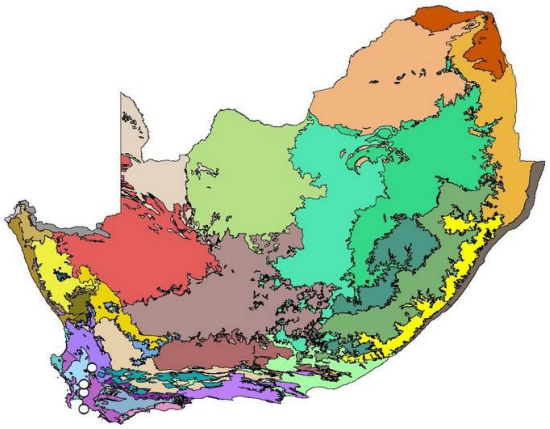
[E]*Rafnia lancea* (Thunb.) DC.

Crotalarieae ①

Dwarf shrub; P; Ht 0.15–0.3; Alt ?–61

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	600–1000; >800 (25)
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3318 (50)	3319; 3418 (25)

NOTES: –



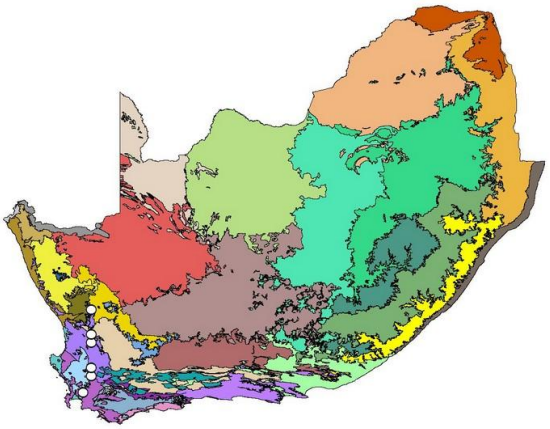
[E]*Rafnia ovata* E.Mey.

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–1.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (33)	<400; 600–1000 (17)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	<6.4 (66)	5.5–7.4; >7.5 (17)
ESP	Ecotone	
QDGCs	3219; 3319 (33)	3119; 3318 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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[E]*Rafnia racemosa* Eckl. & Zeyh. subsp. *pumila* G.J.Campbell & B.-E.van Wyk **Crotalarieae** –

Shrub; P; Ht 0.2–0.3; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

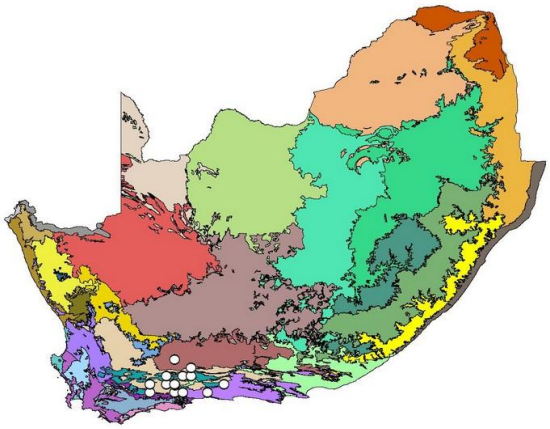
NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).

[E]*Rafnia racemosa* Eckl. & Zeyh. subsp. *racemosa* **Crotalarieae** ①

Shrub; P; Ht 0.3–1.5; Alt 365–1798

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld; Lower Karoo (50)	
Biome	Nama-Karoo (100)	
Rainfall (mm)	<400 (62)	200–600 (31)
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (69)	25–29 (31)
Phosphorus (ppm)	5–35 (54)	>20 (46)
pH	>7.5 (38)	6.5–8.4 (31)
ESP	Medium (100)	
QDGCs	3321 (53)	3322 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).

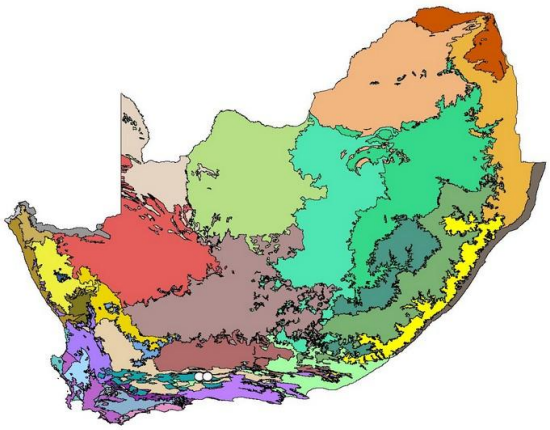


[E]*Rafnia rostrata* G.J.Campbell & B.-E.van Wyk subsp. *pluriflora* G.J.Campbell & B.-E.van Wyk **Crotalarieae** ①

Dwarf shrub; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<20 (100)	
pH	>7.5 (100)	
ESP	Ecotone	
QDGCs	3322 (100)	

NOTES: –



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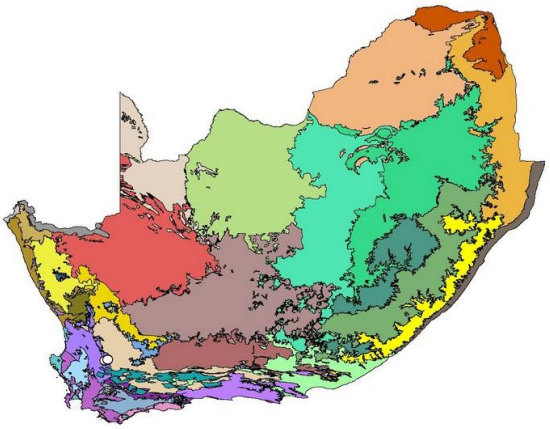
[E]*Rafnia rostrata* G.J.Campbell & B.-E.van Wyk subsp. *rostrata*

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–0.3; Alt 976–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
ESP	Ecotone	
QDGCs	3219 (100)	

NOTES: –



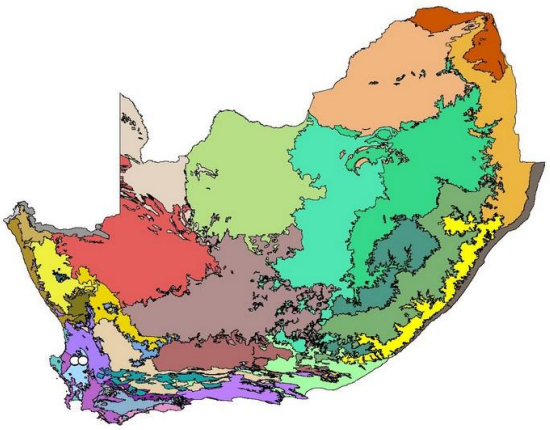
[E]*Rafnia schlechteriana* Schinz

Crotalarieae ①

Dwarf shrub; P; Ht 0.4–0.6; Alt 300–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4; 6.5–8.4 (50)	
ESP	Ecotone	
QDGCs	3218 (100)	

NOTES: –



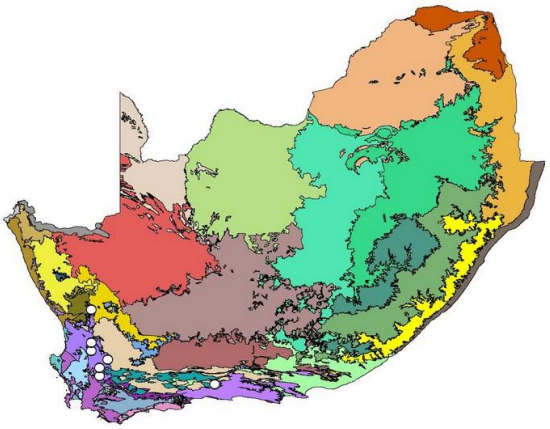
[E]*Rafnia spicata* Thunb.

Crotalarieae ①

Dwarf shrub; P; Ht 0.3–0.4; Alt 488–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (57)	400–800 (29)
Min temp (°C)	2–8 (71)	0–4 (29)
Max temp (°C)	25–29 (86)	27–35 (14)
Phosphorus (ppm)	5–35 (86)	20 (14)
pH	5.5–7.4 (57)	<6.4 (29)
ESP	Non (100)	
QDGCs	3219 (43)	3319 (29)

NOTES: **Flowering:** Spring (Van Rooyen & Steyn 1999).



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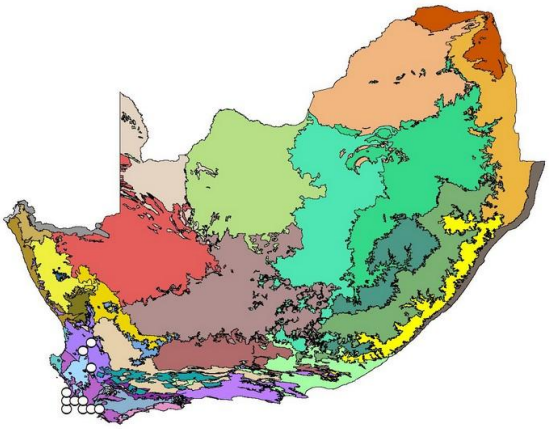
[E]*Rafnia triflora* Thunb.

Crotalarieae ①

Shrub; P; Ht 0.3–2; Alt 10–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (50)	600–1000; >800 (17)
Min temp (°C)	2–8 (50)	>6 (42)
Max temp (°C)	25–29 (92)	<27 (8)
Phosphorus (ppm)	5–35 (92)	>20 (8)
pH	<6.4 (84)	5.5–7.4; 6.5–8.4 (8)
ESP	Non (100)	
QDGCs	3418 (45)	3419 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Mustart *et al.* 2003).



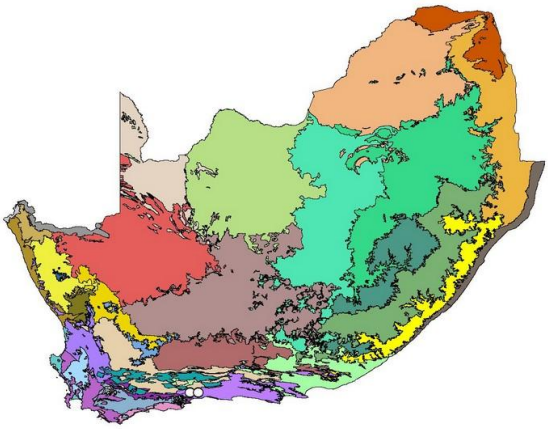
[E]*Rafnia vlokii* G.J.Campbell & B.-E.van Wyk

Crotalarieae ①

Dwarf shrub; P; Ht 0.01–2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800; 600–1000 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3322 (100)	

NOTES: –



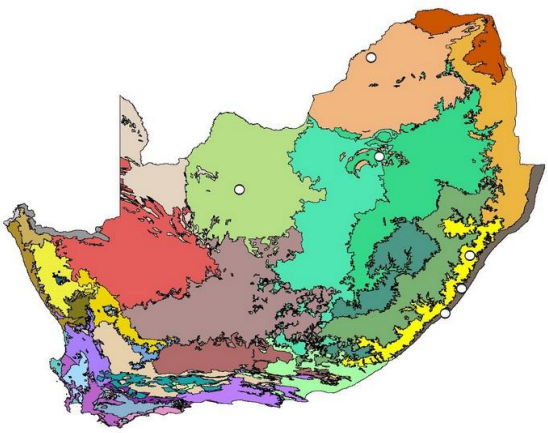
Requienia pseudosphaerosperma (Schinz) Brummitt

Millettieae ①

Herb, shrub; P; Ht 0.9–1.5; Alt 885–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Central Bushveld; Eastern Kalahari Bushveld; Sub-Escarpment Savanna (25)	
Biome	Savanna (60)	Grassland; Indian Ocean (20)
Rainfall (mm)	>800 (50)	400–800 (33)
Min temp (°C)	>6 (50)	<2 (33)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (50)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2327; 2627; 2723; 2930; 3030; 3130 (17)	

NOTES: –



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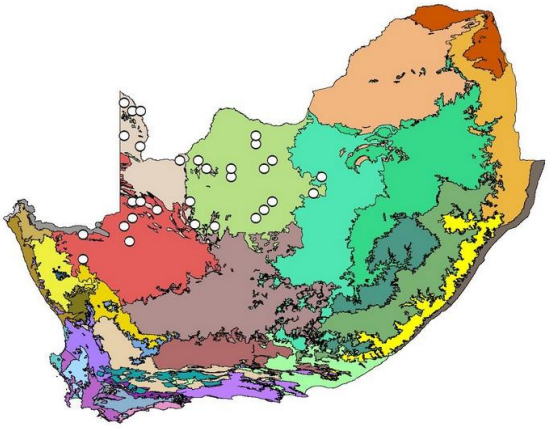
Requienia sphaerosperma DC.

Millettieae ①

Herb; P; Ht 0.21–1; Alt 900–1485

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (47)	Kalahari Duneveld (32)
Biome	Savanna (81)	Nama-Karoo (19)
Rainfall (mm)	<400 (80)	400–800 (17)
Min temp (°C)	<2 (40)	0–4 (33)
Max temp (°C)	>33 (73)	27–35 (27)
Phosphorus (ppm)	<10 (53)	5–35 (30)
pH	>7.5 (53)	6.5–7.4 (23)
ESP	Non (100)	
QDGCs	2820 (13)	2520; 2624; 2822; 2824 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Flowering:** Summer (Van Rooyen 2001).



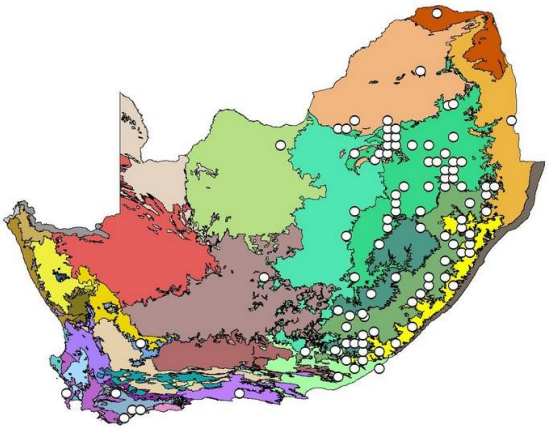
Rhynchosia adenodes Eckl. & Zeyh.

Phaseoleae ②

Herb; P; Ht 0.1–0.6; Alt 10–2195

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (44)	Sub-Escarpment Grassland (19)
Biome	Grassland (76)	Savanna (12)
Rainfall (mm)	400–800 (51)	600–1000 (24)
Min temp (°C)	2–8 (32)	<2 (31)
Max temp (°C)	25–29 (59)	<27 (23)
Phosphorus (ppm)	<10 (73)	5–35 (26)
pH	<6.4 (54)	5.5–7.4 (29)
ESP	Non (97)	Medium (3)
QDGCs	3227 (7)	2628; 2930 (6)

NOTES: **Livestock feed** (Pooley 2003). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** All seasons (Pooley 1998).



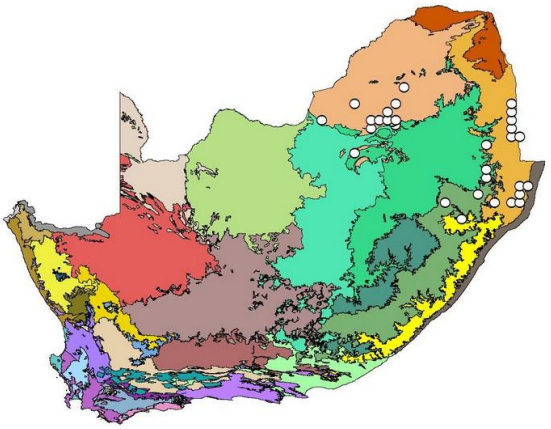
Rhynchosia albissima Gand.

Phaseoleae ①

Dwarf shrub, herb; P; Ht 0.3–1.2; Alt 90–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (48)	Central Bushveld (43)
Biome	Savanna (89)	Grassland (11)
Rainfall (mm)	400–800 (63)	600–1000 (30)
Min temp (°C)	2–8; >6 (40)	0–4 (20)
Max temp (°C)	27–35 (73)	25–29 (27)
Phosphorus (ppm)	<10 (93)	5–35 (7)
pH	<6.4 (57)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	2528 (19)	2527; 2531 (13)

NOTES: –



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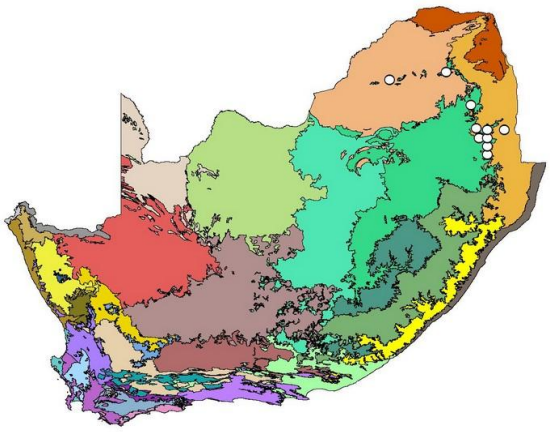
***Rhynchosia angulosa* Schinz** **Phaseoleae** ①

Herb; P; Ht 0.01–0.6; Alt 915–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Central Bushveld; Lowveld (33)	
Biome	Savanna (100)	
Rainfall (mm)	>800 (70)	400–800 (20)
Min temp (°C)	2–8 (80)	0–4; >6 (10)
Max temp (°C)	25–29 (80)	<27; 27–35 (10)
Phosphorus (ppm)	<10 (90)	5–35 (10)
pH	<6.4 (80)	5.5–7.4; 6.5–7.4 (10)
ESP	Non (100)	
QDGCs	2631 (30)	2530; 2531 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).

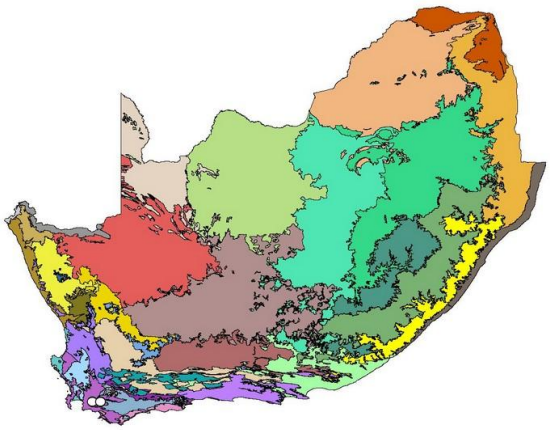


[E]*Rhynchosia angustifolia* (Jacq.) DC. **Phaseoleae** ①

Shrub, climber; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
ESP	Ecotone	
QDGCs	3419 (100)	

NOTES: –

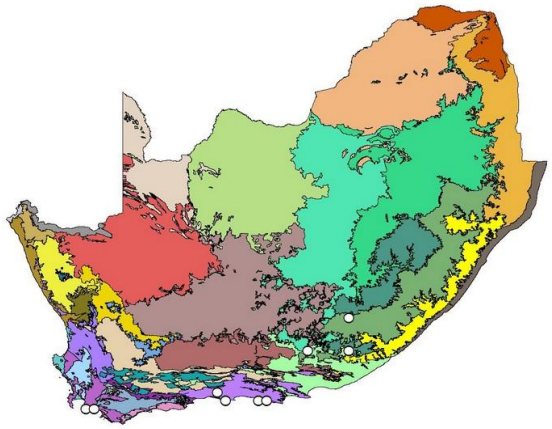


[E]*Rhynchosia argentea* (Thunb.) Harv. **Phaseoleae** ①

Shrub, climber; P; Ht ?; Alt 360–1280

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (60)	Southwest Fynbos; Sub-Escarpment Grassland (20)
Biome	Fynbos (75)	Grassland (25)
Rainfall (mm)	400–800 (44)	>800 (33)
Min temp (°C)	2–8 (56)	>6 (33)
Max temp (°C)	25–29 (56)	<27 (44)
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	<6.4 (67)	5.5–7.4; 6.5–7.4; 6.5–8.4 (11)
ESP	Medium (60)	Non (40)
QDGCs	3423 (23)	3126; 3225; 3226; 3322; 3418; 3419; 3424 (11)

NOTES: –



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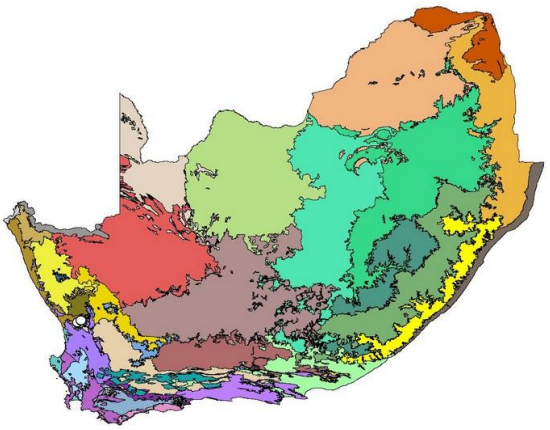
[E]*Rhynchosia arida* C.H.Stirt.

Phaseoleae ①

Shrub; P; Ht 0.01–1; Alt 260–450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	6.5–8.4 (100)	
ESP	Ecotone	
QDGCs	3118 (100)	

NOTES: –



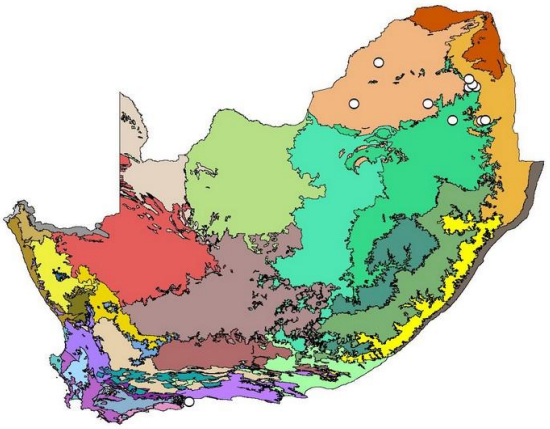
[E]*Rhynchosia atropurpurea* Germish.

Phaseoleae ①

Herb, shrub, climber; P; Ht 0.01–1; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (75)	Mesic Highveld Grassland (25)
Biome	Savanna (60)	Fynbos; Grassland (20)
Rainfall (mm)	400–800 (67)	>800 (22)
Min temp (°C)	2–8 (89)	0–4 (11)
Max temp (°C)	25–29 (44)	27–35 (33)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4; 5.5–7.4 (44)	6.5–8.4 (12)
ESP	Non (100)	
QDGCs	2430 (42)	2531 (17)

NOTES: –



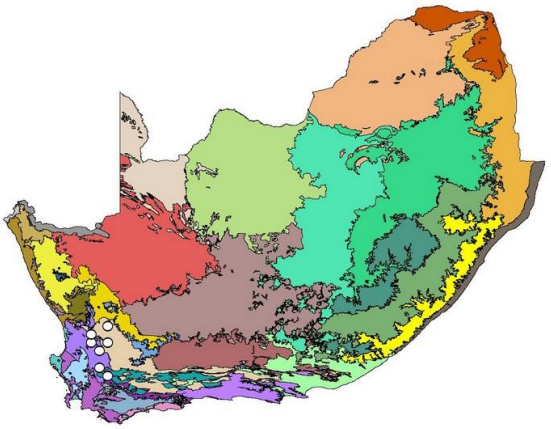
[E]*Rhynchosia bullata* Benth. ex Harv.

Phaseoleae ①

Dwarf shrub; P; Ht 0.3–0.8; Alt 182–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Rainshadow Valley Karoo (100)	
Biome	Fynbos (75)	Succulent Karoo (25)
Rainfall (mm)	200–600 (67)	<400; 400–800 (17)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	5–35 (83)	>20 (17)
pH	5.5–7.4 (50)	<6.4 (33)
ESP	High (100)	
QDGCs	3219 (57)	3319 (29)

NOTES: –



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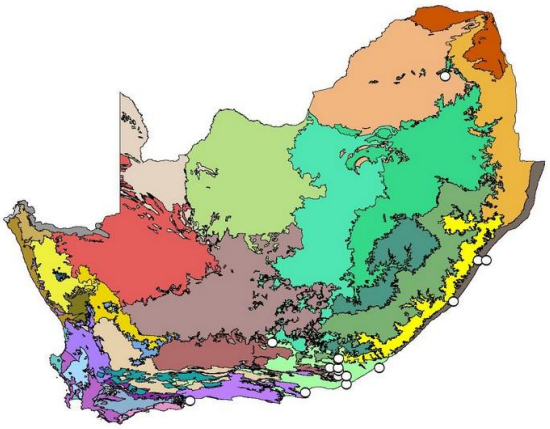
[E]*Rhynchosia calvescens* Meikle

Phaseoleae ①

Herb, climber; P; Ht 0.01–1.5; Alt 155–855

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (50)	Indian Ocean Coastal Belt; Central Bushveld (25)
Biome	Albany Thicket (40)	Fynbos; Indian Ocean; Savanna (20)
Rainfall (mm)	400–800 (64)	>800 (21)
Min temp (°C)	2–8 (57)	>6 (43)
Max temp (°C)	25–29 (64)	27–35 (29)
Phosphorus (ppm)	5–35 (57)	<10 (36)
pH	5.5–7.4 (36)	<6.4; 6.5–7.4 (21)
ESP	Non (100)	
QDGCs	3326 (38)	3226 (13)

NOTES: –



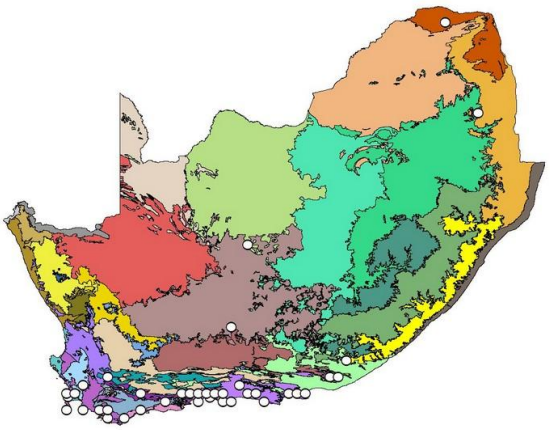
[E]*Rhynchosia capensis* (Burm.f.) Schinz

Phaseoleae ①

Herb, climber; P; Ht 0.15–1; Alt 6–1275

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (73)	Southwest Fynbos (18)
Biome	Fynbos (90)	Nama-Karoo; Savanna (50)
Rainfall (mm)	400–800 (41)	200–600 (27)
Min temp (°C)	2–8 (68)	>6 (24)
Max temp (°C)	25–29 (65)	<27 (24)
Phosphorus (ppm)	5–35 (86)	<10 (11)
pH	<6.4 (49)	5.5–7.4 (30)
ESP	Medium (73)	Non (27)
QDGCs	3322 (13)	3318 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



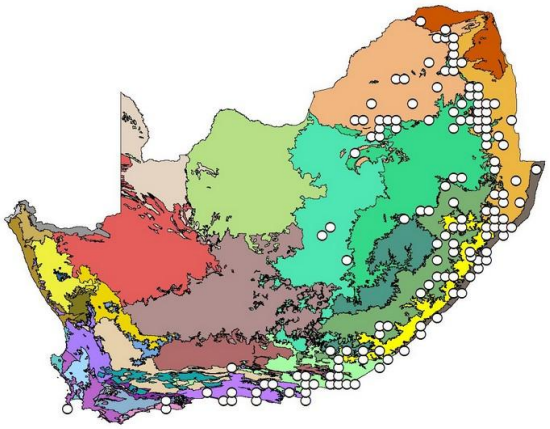
Rhynchosia caribaea (Jacq.) DC.

Phaseoleae ③

Herb, climber; P; Ht 0.3–1; Alt 5–2010

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Lowveld (17)	Indian Ocean Coastal Belt (14)
Biome	Savanna (41)	Grassland (30)
Rainfall (mm)	>800 (37)	400–800 (36)
Min temp (°C)	2–8 (54)	>6 (28)
Max temp (°C)	25–29 (61)	27–35 (26)
Phosphorus (ppm)	<10 (63)	5–35 (37)
pH	<6.4 (61)	5.5–7.4 (26)
ESP	Non (89)	Medium (11)
QDGCs	2530; 2831 (6)	2531 (4)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1972). **Flowering:** All seasons (Pooley 1998).



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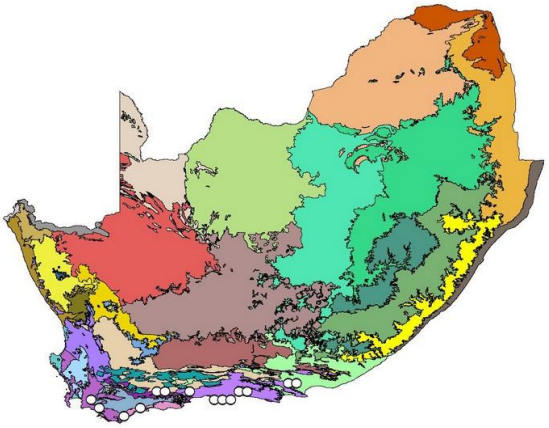
[E]*Rhynchosia chrysoscias* Benth. ex Harv.

Phaseoleae ①

Shrub, climber; P; Ht 0.01–1; Alt 154–700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 600–1000 (29)	<400; 400–800; >800 (14)
Min temp (°C)	2–8 (86)	>6 (14)
Max temp (°C)	25–29 (50)	<27 (36)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (50)	6.5–8.4 (36)
ESP	Medium (100)	
QDGCs	3321; 3323; 3325; 3419; 3420; 3423 (14)	3322; 3422 (7)

NOTES: **Flowering:** Winter, spring (Moriarty 1997).



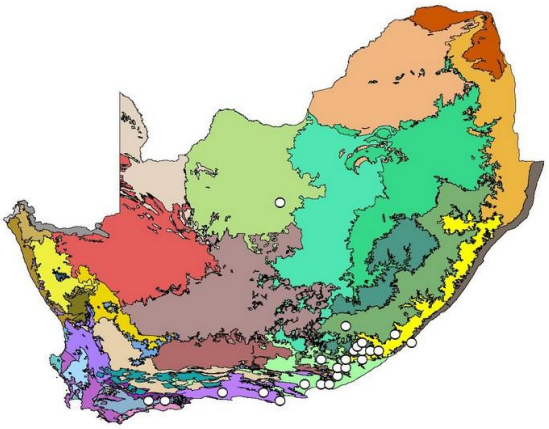
[E]*Rhynchosia ciliata* (Thunb.) Schinz

Phaseoleae ①

Dwarf shrub; P; Ht 0.05–0.3; Alt 215–1980

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (49)	Eastern Fynbos-Renosterveld; Sub-Escarpment Grassland; Eastern Kalahari Bushveld (17)
Biome	Albany Thicket (38)	Fynbos (25)
Rainfall (mm)	400–800 (58)	600–1000 (21)
Min temp (°C)	2–8 (63)	>6 (21)
Max temp (°C)	25–29 (75)	27–35 (17)
Phosphorus (ppm)	5–35 (88)	<10 (13)
pH	<6.4 (42)	5.5–7.4 (29)
ESP	Non (83)	Medium (17)
QDGCs	3227 (29)	3326 (21)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



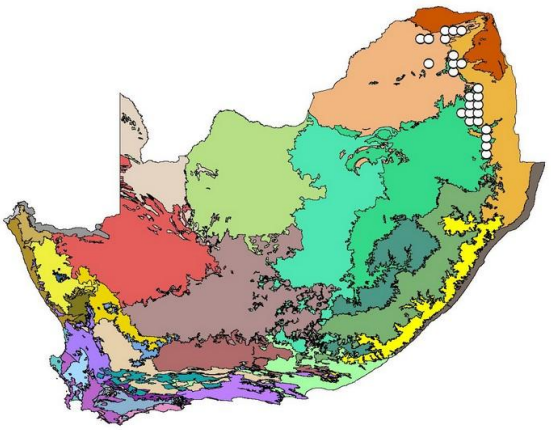
Rhynchosia clivorum S.Moore subsp. *clivorum*

Phaseoleae ①

Herb, shrub; P; Ht 0.4–3; Alt 610–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (63)	Mesic Highveld Grassland (25)
Biome	Savanna (100)	
Rainfall (mm)	>800 (48)	600–1000 (24)
Min temp (°C)	2–8 (92)	0–4; >6 (4)
Max temp (°C)	25–29 (76)	27–35 (16)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	<6.4 (72)	5.5–7.4 (16)
ESP	Non (100)	
QDGCs	2530 (28)	2329; 2430 (16)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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***Rhynchosia clivorum* S.Moore subsp. *pycnantha* (Harms) Verdc.** **Phaseoleae** –

Unknown

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

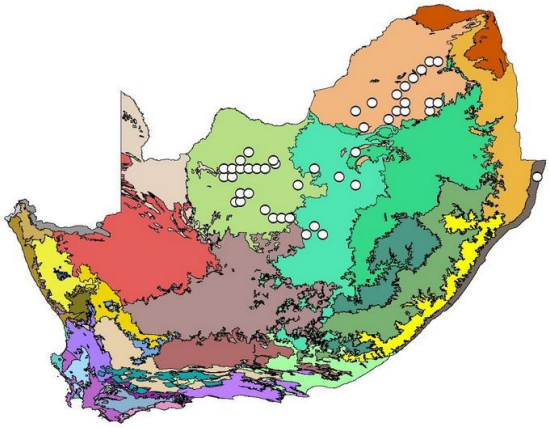
NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).

***Rhynchosia confusa* Burtt Davy** **Phaseoleae** ③

Herb, climber; P; Ht 0.1–0.4; Alt 370–1560

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (54)	Central Bushveld (33)
Biome	Savanna (84)	Grassland (14)
Rainfall (mm)	400–800 (64)	<400 (31)
Min temp (°C)	<2 (56)	2–8 (33)
Max temp (°C)	27–35 (64)	>33 (22)
Phosphorus (ppm)	<10 (91)	5–35 (9)
pH	5.5–7.4 (36)	6.5–7.4 (33)
ESP	Non (100)	
QDGCs	2723 (18)	2528 (9)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).

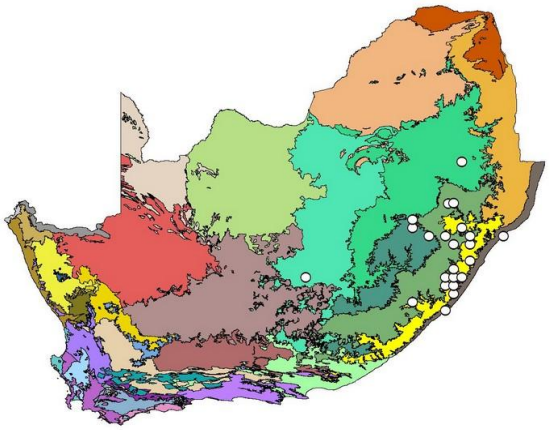


***Rhynchosia cooperi* (Harv. ex Baker f.) Burtt Davy** **Phaseoleae** ①

Herb, climber; P; Ht ?; Alt 260–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (32)	Indian Ocean Coastal Belt; Drakensberg Grassland; Dry Highveld Grassland; Mesic Highveld Grassland (17)
Biome	Grassland (88)	Indian Ocean (12)
Rainfall (mm)	>800 (61)	600–1000 (35)
Min temp (°C)	0–4; 2–8 (35)	>6 (22)
Max temp (°C)	25–29 (74)	<27 (17)
Phosphorus (ppm)	<10 (87)	5–35 (13)
pH	<6.4 (78)	5.5–7.4 (17)
ESP	Non (100)	
QDGCs	3030 (22)	2930 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Pooley 1998).



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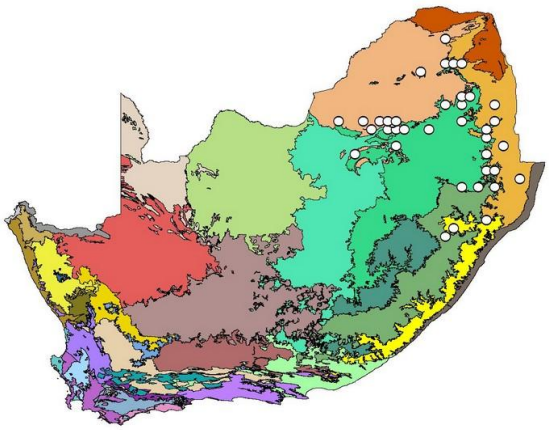
***Rhynchosia crassifolia* Benth. ex Harv.** **Phaseoleae** ①

Herb, climber; P; Ht 0.2–0.3; Alt 610–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (46)	Lowveld (31)
Biome	Savanna (70)	Grassland (30)
Rainfall (mm)	400–800 (59)	>800 (22)
Min temp (°C)	25–29 (57)	27–35 (27)
Max temp (°C)	25–29 (54)	27–35 (41)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4 (76)	5.5–7.4 (24)
ESP	Non (100)	
QDGCs	2528 (16)	2527; 2531; 2631; 2731 (8)

NOTES: –

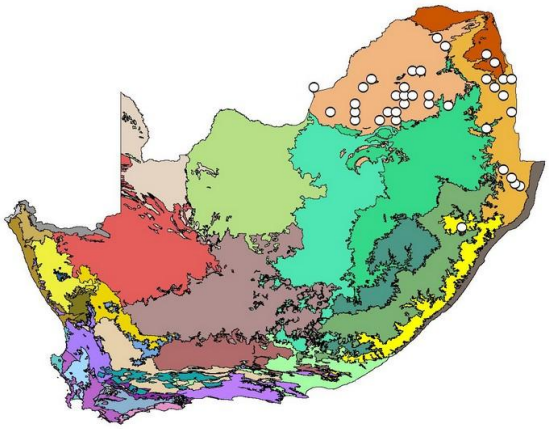


***Rhynchosia densiflora* (Roth) DC. subsp. *chrysadenia* (Taub.) Verdc.** **Phaseoleae** ①

Herb, climber; P; Ht 0.3–2; Alt 150–1372

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (64)	Lowveld (29)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (84)	200–600 (8)
Min temp (°C)	2–8 (62)	>6 (30)
Max temp (°C)	27–35 (78)	25–29 (22)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	5.5–7.4 (46)	<6.4 (27)
ESP	Non (100)	
QDGCs	2428; 2431 (14)	2527; 2528 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972; Grobbelaar & Van Rooyen 1979).

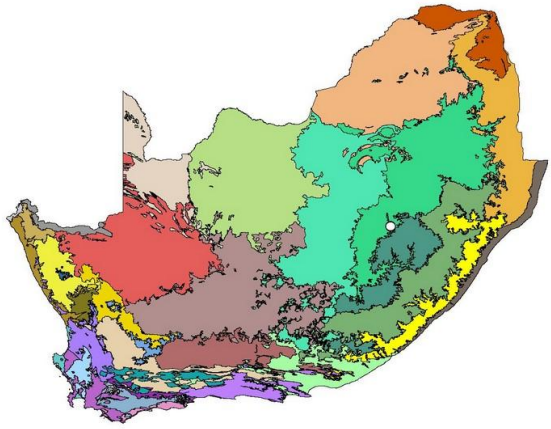


***Rhynchosia dieterlenae* Baker f.** **Phaseoleae** ①

Herb, climber; P; Ht ?; Alt ?–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	<2 (100)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2828 (100)	

NOTES: –



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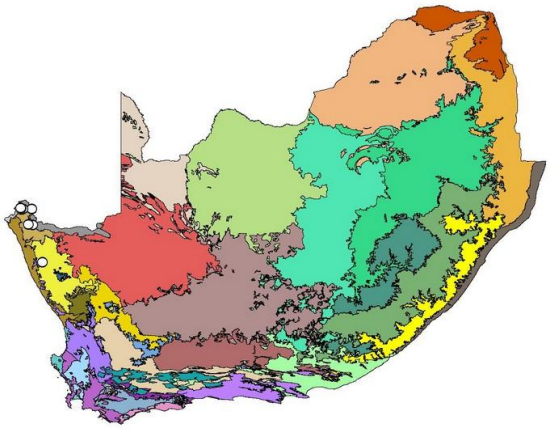
[E]*Rhynchosia emarginata* Germish.

Phaseoleae ②

Shrub; P; Ht 0.6–1; Alt 460–840

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Richtersveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (83)	25–29 (17)
Phosphorus (ppm)	>20 (83)	5–35 (17)
pH	>7.5 (83)	5.5–7.4 (17)
ESP	High (100)	
QDGCs	2816 (50)	2817 (40)

NOTES: **Livestock feed** (Hendricks *et al.* 2002).



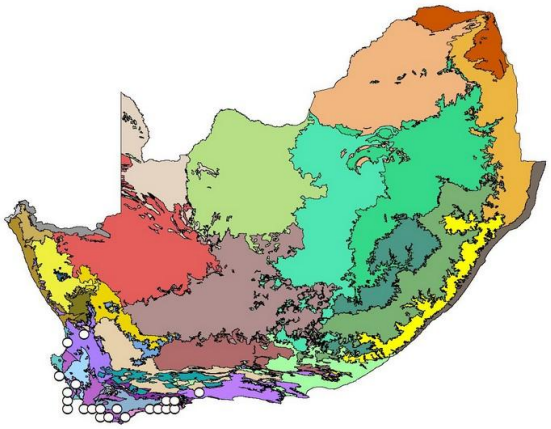
[E]*Rhynchosia ferulifolia* Benth. ex Harv.

Phaseoleae ①

Dwarf shrub; P; Ht 0.01–0.1; Alt 15–380

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; South Coast Fynbos (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (48)	400–800 (24)
Min temp (°C)	2–8 (52)	>6 (48)
Max temp (°C)	25–29 (90)	27–35 (10)
Phosphorus (ppm)	5–35 (86)	<10 (14)
pH	<6.4 (52)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3419; 3421 (24)	3318; 3418 (14)

NOTES: **Flowering:** Spring, summer (Kidd 2002).



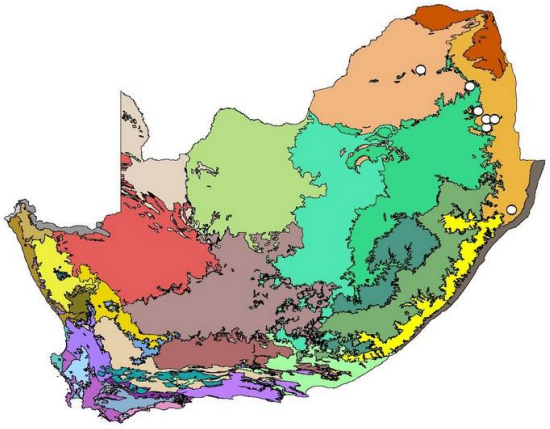
[E]*Rhynchosia galpinii* Baker f.

Phaseoleae ①

Shrub; P; Ht 0.01–0.9; Alt 245–876

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	>800 (71)	400–800 (29)
Min temp (°C)	2–8 (71)	>6 (29)
Max temp (°C)	25–29 (71)	27–35 (29)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	5.5–7.4 (71)	<6.4 (29)
ESP	Non (100)	
QDGCs	2531 (44)	2429; 2430; 2530; 2831 (14)

NOTES: –



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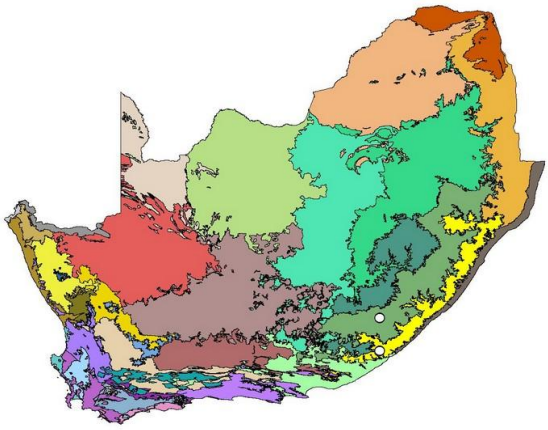
Rhynchosia harmsiana Schltr. ex Zahlbr. var. *burchellii* Burtt Davy — Phaseoleae ①

Herb, climber; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	3127; 3227 (50)	

NOTES: **Flowering:** Summer (Pooley 2003).

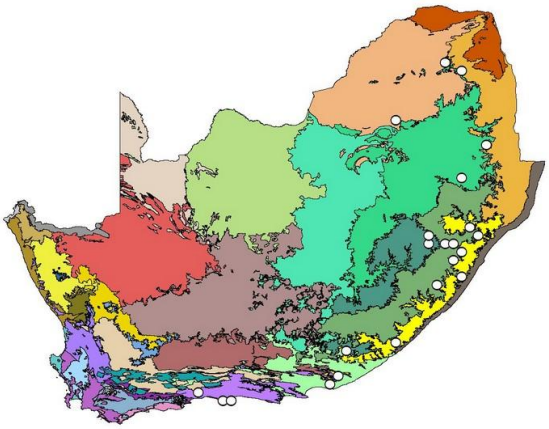


Rhynchosia harmsiana Schltr. ex Zahlbr. var. *harmsiana* — Phaseoleae ①

Herb, climber; P; Ht 0.01–1; Alt 365–1981

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld; Sub-Escarpment Grassland (24)	Drakensberg Grassland; Mesic Highveld Grassland; Central Bushveld; Sub-Escarpment Savanna (13)
Biome	Grassland (72)	Fynbos; Savanna (14)
Rainfall (mm)	>800 (59)	400–800 (27)
Min temp (°C)	2–8 (59)	0–4 (23)
Max temp (°C)	25–29 (68)	<27 (27)
Phosphorus (ppm)	5–35 (55)	<10 (45)
pH	<6.4 (82)	5.5–7.4 (14)
ESP	Non (75)	Medium (25)
QDGCs	2930 (18)	2929 (14)

NOTES: **Flowering:** Summer (Pooley 2003).

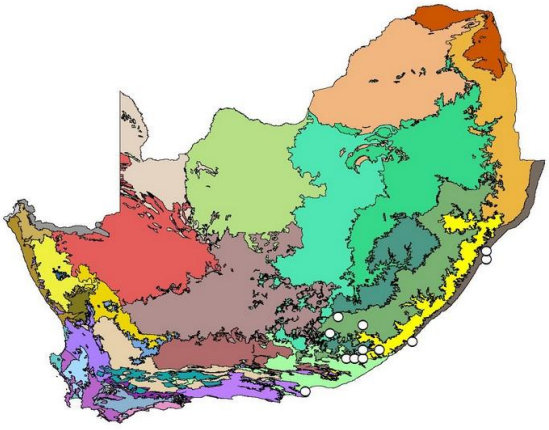


[E] *Rhynchosia harveyi* Eckl. & Zeyh. — Phaseoleae ①

Herb, climber; P; Ht 0.01–0.3; Alt 90–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Sub-Escarpment Grassland (50)	
Biome	Indian Ocean (60)	Grassland (40)
Rainfall (mm)	400–800 (42)	>800 (25)
Min temp (°C)	2–8 (42)	>6 (33)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	<6.4 (42)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	3227 (33)	2931; 3226 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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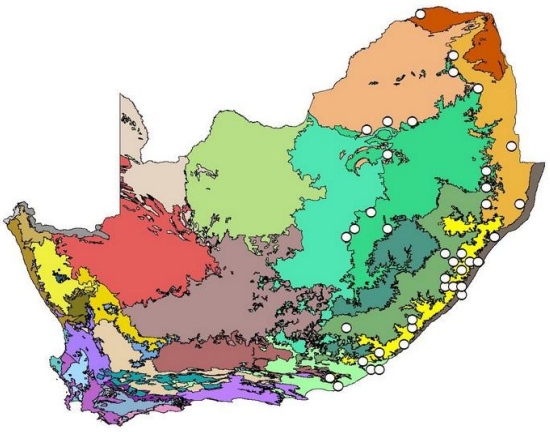
Rhynchosia hirsuta Eckl. & Zeyh.

Phaseoleae ①

Herb, climber; P; Ht 0.01–0.2; Alt 10–2285

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Mesic Highveld Grassland; Sub-Escarpment Grassland; Eastern Kalahari Bushveld; Sub-Escarpment Savanna (15)	Indian Ocean Coastal Belt; Kalahari Duneveld; Mopane (8)
Biome	Grassland (50)	Savanna (25)
Rainfall (mm)	>800 (44)	400–800 (33)
Min temp (°C)	2–8 (46)	>6 (33)
Max temp (°C)	25–29 (72)	27–35 (23)
Phosphorus (ppm)	<10 (64)	5–35 (36)
pH	<6.4 (56)	5.5–7.4 (36)
ESP	Non (100)	
QDGCs	2930; 3030 (10)	2430; 2528; 2731; 2727; 3029; 3128; 3227; 3326; 3327 (5)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



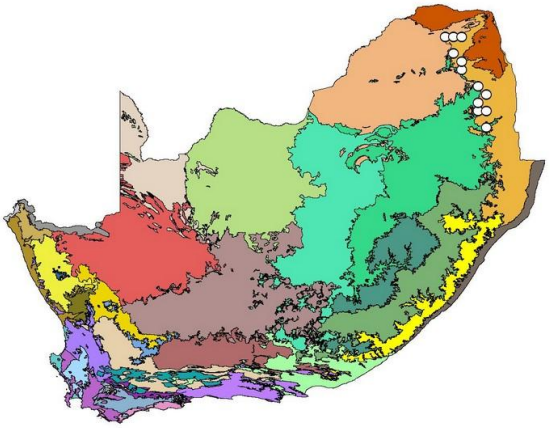
Rhynchosia hirta (Andrews) Meikle & Verdc.

Phaseoleae ①

Herb, climber; P; Ht 2–8; Alt 755–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (75)	Central Bushveld (25)
Biome	Savanna (100)	
Rainfall (mm)	>800 (42)	400–800 (33)
Min temp (°C)	2–8 (67)	6 (33)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	<10 (58)	5–35 (42)
pH	<6.4 (83)	5.5–7.4 (17)
ESP	Non (100)	
QDGCs	2330 (33)	2430; 2530; 2531 (17)

NOTES: –



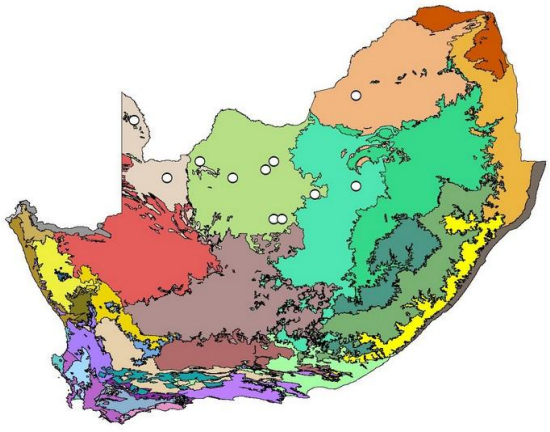
Rhynchosia holosericea Schinz

Phaseoleae ①

Herb, climber; P; Ht ?; Alt 915–1372

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (61)	Dry Highveld Grassland; Central Bushveld; Kalahari Duneveld (13)
Biome	Savanna (90)	Grassland (10)
Rainfall (mm)	400–800 (55)	<400 (45)
Min temp (°C)	<2 (82)	2–8 (18)
Max temp (°C)	27–35 (55)	>33 (45)
Phosphorus (ppm)	<10 (91)	5–35 (9)
pH	5.5–7.4; 6.5–8.4; >7.5 (27)	6.5–7.4 (19)
ESP	Non (100)	
QDGCs	2824 (19)	2427; 2520; 2622; 2624; 2721; 2723; 2724; 2725; 2727 (9)

NOTES: –



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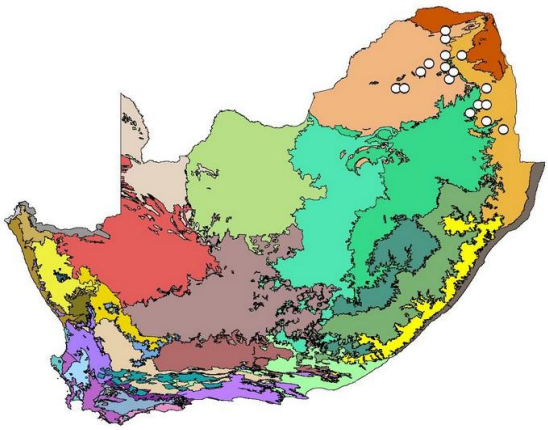
Rhynchosia komatiensis Harms

Phaseoleae ①

Shrub; P; Ht 0.7–1.2; Alt 303–1435

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (63)	Lowveld (37)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (53)	>800 (24)
Min temp (°C)	2–8 (82)	>6 (18)
Max temp (°C)	25–29 (65)	27–35 (35)
Phosphorus (ppm)	<10 (53)	5–35 (47)
pH	<6.4 (47)	5.5–7.4 (35)
ESP	Non (100)	
QDGCs	2329 (24)	2531 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



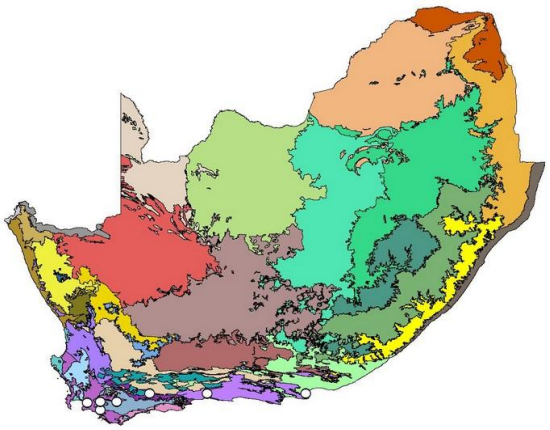
[E]*Rhynchosia leucoscias* Benth. ex Harv.

Phaseoleae ①

Shrub, climber; P; Ht ?; Alt 15–1030

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (43)	200–600 (29)
Min temp (°C)	2–8 (86)	>6 (14)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (43)	6.5–8.4 (29)
ESP	Medium (100)	
QDGCs	3419 (44)	3320; 3322; 3325; 3418 (14)

NOTES: –



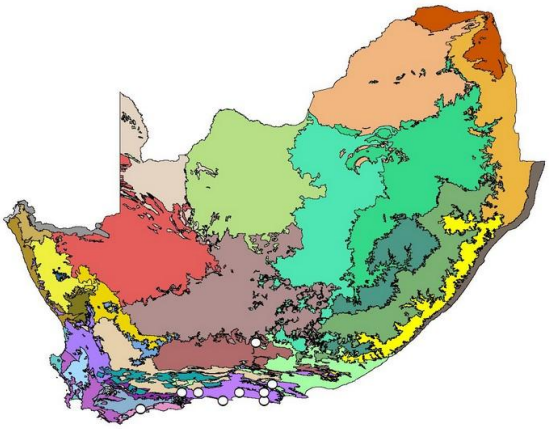
[E]*Rhynchosia microscias* Benth. ex Harv.

Phaseoleae ①

Shrub, climber; P; Ht 0.01–1.5; Alt 155–1065

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (33)	400–800; 600–1000 (22)
Min temp (°C)	2–8 (67)	>6 (22)
Max temp (°C)	<27; 25–29 (44)	27–35 (12)
Phosphorus (ppm)	5–35 (89)	>20 (11)
pH	<6.4 (56)	5.5–7.4 (22)
ESP	Medium (100)	
QDGCs	3324 (23)	3224; 3321; 3322; 3323; 3420; 3423; 3424 (11)

NOTES: –



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Rhynchosia minima (L.) DC. var. *falcata* (E.Mey.) Verdc. — Phaseoleae ②

Herb, climber; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
ESP		
QDGCs	No records	

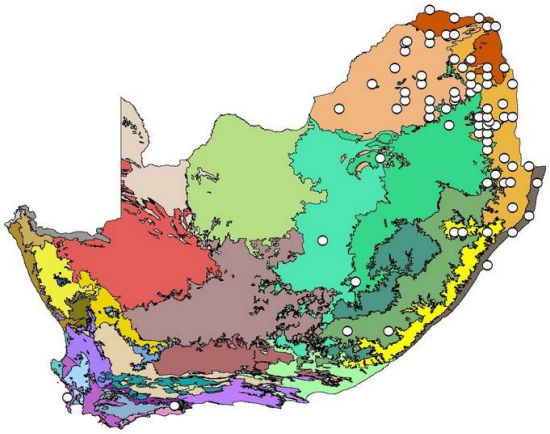
NOTES: **Livestock feed** (Le Houérou 1980; Maposse *et al.* 2003). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967); *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Flowering:** Spring, summer, autumn (Pooley 1998).

Rhynchosia minima (L.) DC. var. *minima* — Phaseoleae ③

Herb, climber; P; Ht ?; Alt 30–2440

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (38)	Central Bushveld (35)
Biome	Savanna (78)	Grassland (13)
Rainfall (mm)	400–800 (51)	>800 (21)
Min temp (°C)	2–8 (56)	>6 (37)
Max temp (°C)	27–35 (59)	25–29 (40)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	5.5–7.4 (38)	<6.4 (32)
ESP	Non (100)	
QDGCs	2531 (10)	2430 (9)

NOTES: **Livestock feed** (Le Houérou 1980; Maposse *et al.* 2003). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1975); *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Flowering:** Spring, summer, autumn (Pooley 1998).

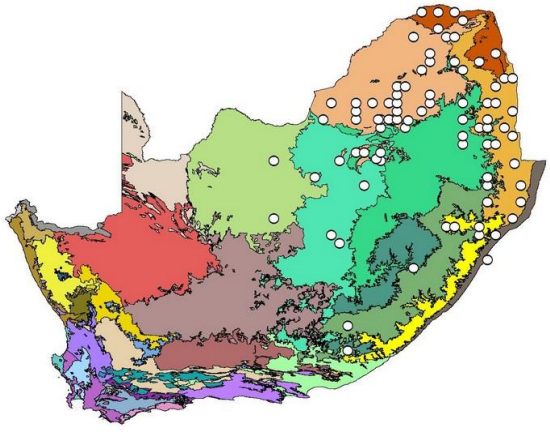


Rhynchosia minima (L.) DC. var. *prostrata* (Harv.) Meikle — Phaseoleae ③

Herb, climber; P; Ht 0.1–1.5; Alt 30–1669

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (46)	Lowveld (21)
Biome	Savanna (78)	Grassland (20)
Rainfall (mm)	400–800 (60)	>800 (16)
Min temp (°C)	2–8 (49)	>6 (21)
Max temp (°C)	27–35 (67)	25–29 (28)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (47)	5.5–7.4 (35)
ESP	Non (100)	
QDGCs	2528 (12)	2531 (7)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999); Nodulated (Grobbelaar & Clarke 1972).



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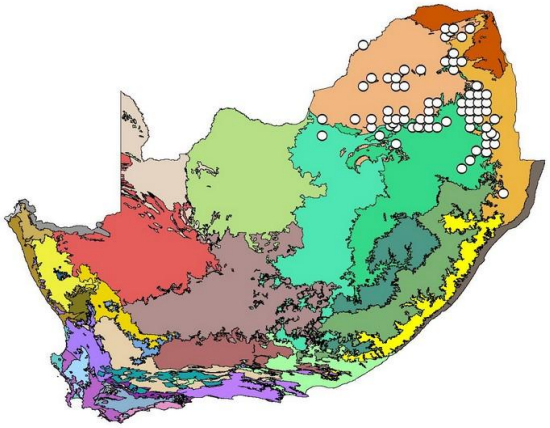
Rhynchosia monophylla Schltr.

Phaseoleae ①❖

Herb; P; Ht 0.01–0.5; Alt 610–2050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (53)	Mesic Highveld Grassland (28)
Biome	Savanna (70)	Grassland (30)
Rainfall (mm)	400–800 (59)	>800 (28)
Min temp (°C)	2–8 (67)	0–4 (23)
Max temp (°C)	25–29 (61)	27–35 (33)
Phosphorus (ppm)	<10 (81)	5–35 (19)
pH	<6.4 (75)	5.5–7.4 (22)
ESP	Non (100	
QDGCs	2529 (13)	2528; 2530 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Winter, spring (Pooley 1998).



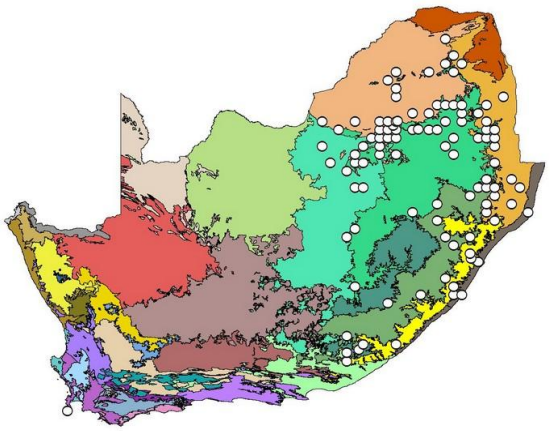
Rhynchosia nervosa Benth. ex Harv. var. *nervosa*

Phaseoleae ①

Herb; P; Ht ?; Alt 15–2440

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (32)	Mesic Highveld Grassland (24)
Biome	Grassland (53)	Savanna (40)
Rainfall (mm)	400–800 (59)	>800 (22)
Min temp (°C)	2–8 (43)	0–4 (29)
Max temp (°C)	25–29 (55)	27–35 (34)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4 (69)	5.5–7.4 (28)
ESP	Non (100)	
QDGCs	2528 (9)	2627 (7)

NOTES: **Biocultural:** Magical (Hutchings *et al.* 1996). **Flowering:** Summer (Germishuizen & Clarke 2003).



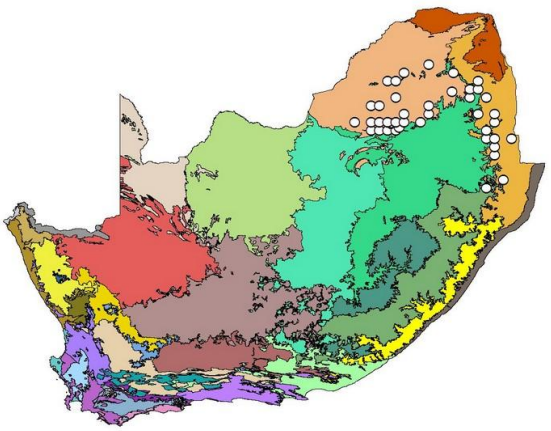
Rhynchosia nitens Benth. ex Harv.

Phaseoleae ③

Shrub; P; Ht 0.3–2; Alt 155–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (79)	Lowveld (21)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (67)	>800 (18)
Min temp (°C)	2–8 (77)	>6 (13)
Max temp (°C)	27–35 (56)	25–29 (44)
Phosphorus (ppm)	<10 (92)	5–35 (8)
pH	<6.4 (74)	5.5–7.4 (23)
ESP	Non (100)	
QDGCs	2528 (21)	2527 (17)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer, autumn (Germishuizen & Clarke 2003).



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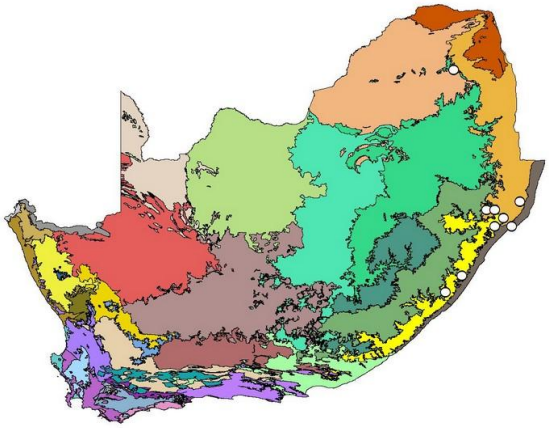
Rhynchosia ovata J.M.Wood & M.S.Evans

Phaseoleae ①

Herb; P; Ht ?; Alt 30–1035

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (67)	Indian Ocean Coastal Belt (33)
Biome	Savanna (100)	
Rainfall (mm)	>800 (67)	600–1000 (33)
Min temp (°C)	>6 (56)	2–8 (44)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (89)	5.5–7.4 (11)
ESP	Non (100)	
QDGCs	2831 (56)	2430; 2832; 3029; 3030 (11)

NOTES: –



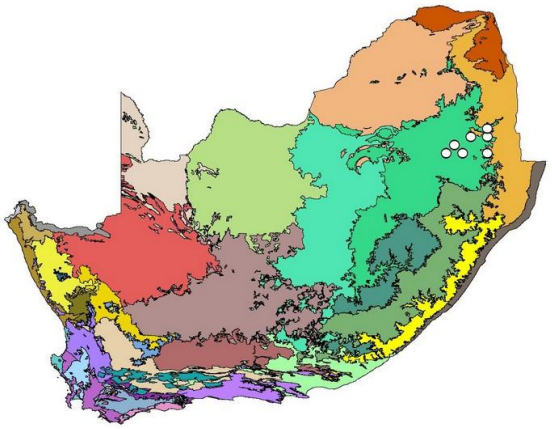
Rhynchosia pauciflora Bolus

Phaseoleae ①

Herb; P; Ht 0.01–0.5; Alt ?–1470

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (42)	400–800; 600–1000 (29)
Min temp (°C)	2–8 (42)	<2; 0–4 (29)
Max temp (°C)	25–29 (71)	<27 (29)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2630 (43)	2631 (29)

NOTES: –



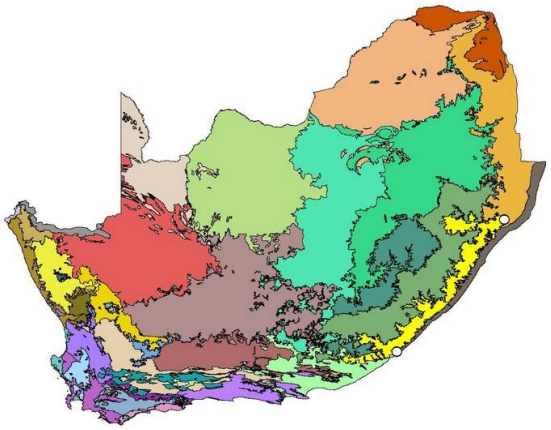
[E]*Rhynchosia peglerae* Baker f.

Phaseoleae ①

Herb; P; Ht 0.01–0.5; Alt ?–460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2831; 3228 (50)	

NOTES: –



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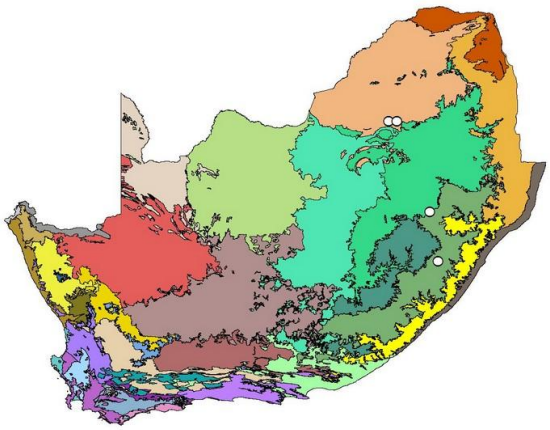
Rhynchosia pentheri Schltr. ex Zahlbr. var. *hutchinsoniana* Burtt Davy — Phaseoleae ③

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (67)	Sub-Escarpment Grassland (33)
Biome	Grassland (100)	
Rainfall (mm)	400–800 (50)	600–1000; >800 (25)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	27–35 (50)	<27; 25–29 (25)
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<6.4 (100)	
ESP	Non (100)	
QDGCs	2528 (50)	2829; 2929 (25)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).

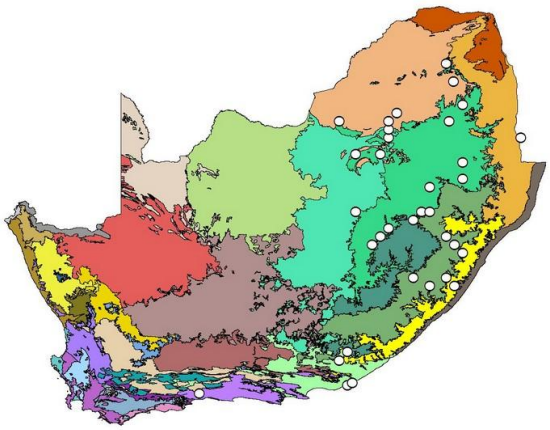


Rhynchosia pentheri Schltr. ex Zahlbr. var. *pentheri* — Phaseoleae ①

Herb; P; Ht 0.25–0.7; Alt 36–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (40)	Central Bushveld (27)
Biome	Grassland (75)	Savanna (15)
Rainfall (mm)	400–800 (53)	>800 (26)
Min temp (°C)	0–4 (32)	2–8 (29)
Max temp (°C)	25–29 (41)	<27 (32)
Phosphorus (ppm)	<10 (85)	5–35 (15)
pH	<6.4 (71)	5.5–7.4 (15)
ESP	Non (100)	
QDGCs	2528 (9)	2627; 2828; 2829; 2927; 2930; 3029; 3226 (6)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).

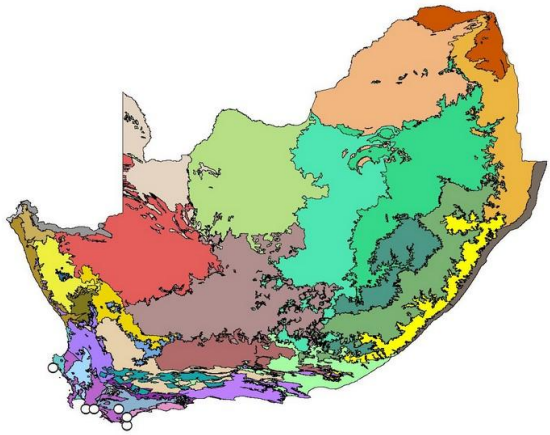


[E]*Rhynchosia pinnata* Harv. — Phaseoleae ①

Dwarf shrub; P; Ht 0.01–0.1; Alt 5–45

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; West Strandveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600; 400–800 (33)	<400; >800 (17)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (66)	<27; 27–35 (17)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	<6.4 (33)
ESP	Non; Medium (50)	
QDGCs	3419; 3420 (33)	3317; 3418 (17)

NOTES: –



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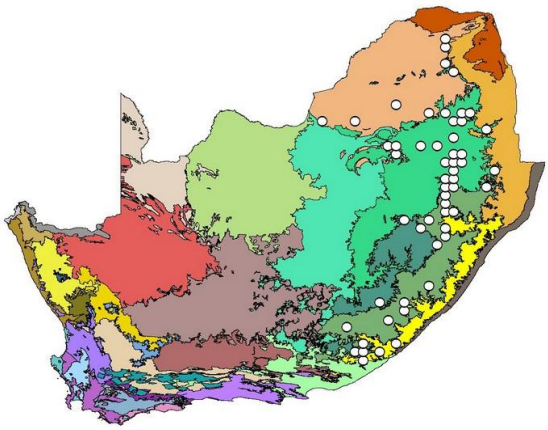
***Rhynchosia reptabunda* N.E.Br.** **Phaseoleae** ③

Herb, climber; P; Ht 0.01–0.3; Alt 245–2200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (50)	Sub-Escarpment Grassland (25)
Biome	Grassland (83)	Savanna (17)
Rainfall (mm)	600–1000 (46)	400–800 (35)
Min temp (°C)	0–4 (52)	2–8 (33)
Max temp (°C)	25–29 (57)	<27 (30)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (80)	5.5–7.4 (19)
ESP	Non (100)	
QDGCs	2630; 2829; 3227 (9)	2530 (7)

NOTES: **Soil conservation:** Organic N (Morris 1997).

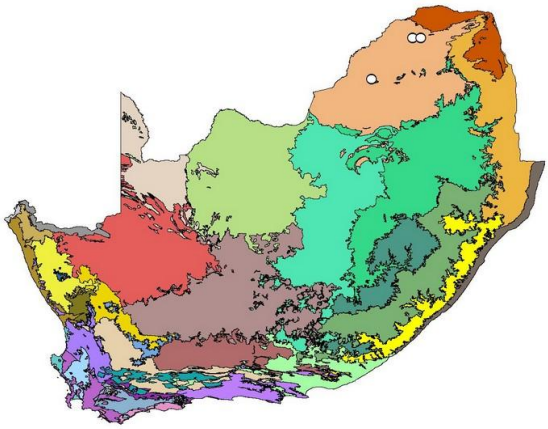


***Rhynchosia resinosa* (Hochst. ex A.Rich.) Baker** **Phaseoleae** ①

Shrub, climber; P; Ht 0.6–1.5; Alt ?–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	6.5–8.4 (33)
ESP	Non (100)	
QDGCs	2328; 2329; 2427 (33)	

NOTES: –

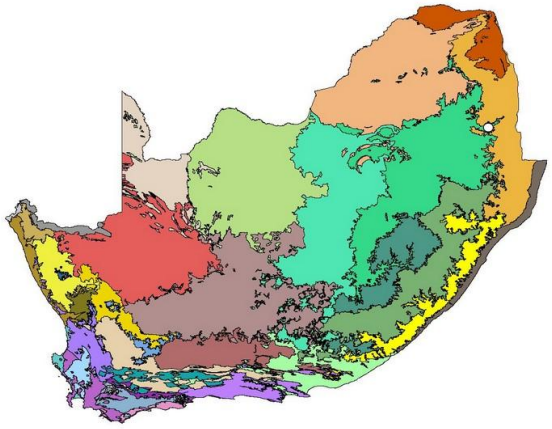


***[E]Rhynchosia rogersii* Schinz** **Phaseoleae** ①

Herb; P; Ht 0.01–0.6; Alt ?–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
ESP	Ecotone	
QDGCs	2531 (100)	

NOTES: –



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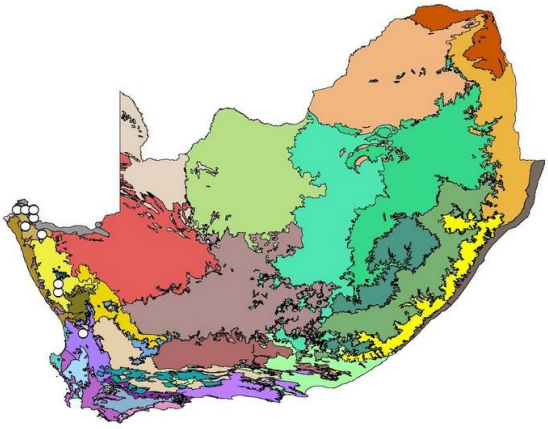
[E]*Rhynchosia schlechteri* Baker f.

Phaseoleae ①

Shrub; P; Ht 0.01–3; Alt 540–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (67)	Richtersveld (33)
Biome	Succulent Karoo (100)	
Rainfall (mm)	<200 (89)	200–600 (11)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	27–35 (78)	25–29 (22)
Phosphorus (ppm)	>20 (67)	5–35 (33)
pH	>7.5 (67)	6.5–8.4 (22)
ESP	Medium (67)	High (33)
QDGCs	2817 (44)	3018 (22)

NOTES: –



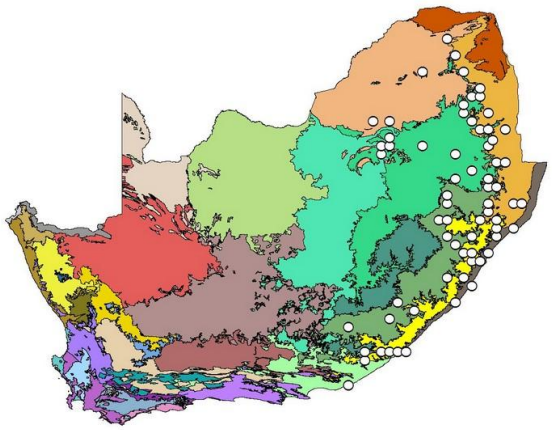
Rhynchosia sordida (E.Mey.) Schinz

Phaseoleae ①

Dwarf shrub, shrub, herb; P; Ht 0.15–2; Alt 45–1740

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Lowveld (23)	Sub-Escarpment Grassland (19)
Biome	Grassland (50)	Savanna (33)
Rainfall (mm)	600–1000; >800 (37)	400–800 (26)
Min temp (°C)	2–8 (46)	>6 (25)
Max temp (°C)	25–29 (66)	27–35 (22)
Phosphorus (ppm)	<10 (78)	5–35 (22)
pH	<6.4 (73)	5.5–7.4 (22)
ESP	Non (100)	
QDGCs	2831; 2930 (9)	2430; 2530; 2631 (6)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer (Pooley 1998).



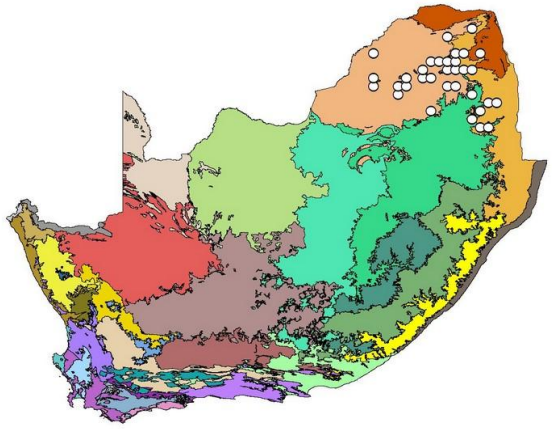
[E]*Rhynchosia spectabilis* Schinz

Phaseoleae ①

Dwarf shrub, shrub, herb; P; Ht 0.45–2.4; Alt 305–1645

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (76)	Lowveld (18)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (70)	600–1000; >800 (15)
Min temp (°C)	2–8 (88)	>6 (12)
Max temp (°C)	25–29 (67)	27–35 (33)
Phosphorus (ppm)	5–35 (52)	<10 (48)
pH	5.5–7.4 (48)	<6.4 (39)
ESP	Non (100)	
QDGCs	2429; 2430 (15)	2329; 2330; 2428 (12)

NOTES: –



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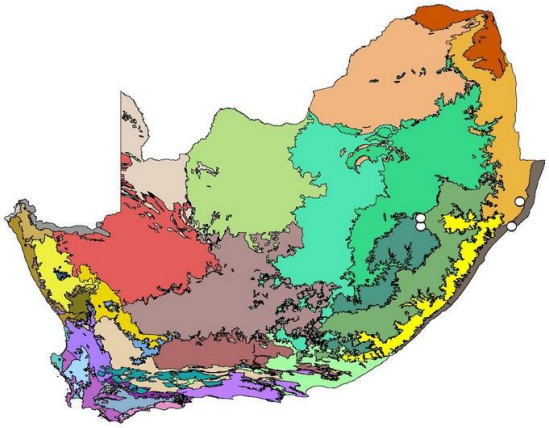
[E]*Rhynchosia stenodon* Baker f.

Phaseoleae ①

Herb, climber; P; Ht ?; Alt 460–1935

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Lowveld (50)	
Biome	Grassland (67)	Savanna (33)
Rainfall (mm)	>800 (75)	600–1000 (25)
Min temp (°C)	0–4; >6 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
ESP	Non (100)	
QDGCs	2829 (50)	2831; 2832 (25)

NOTES: –



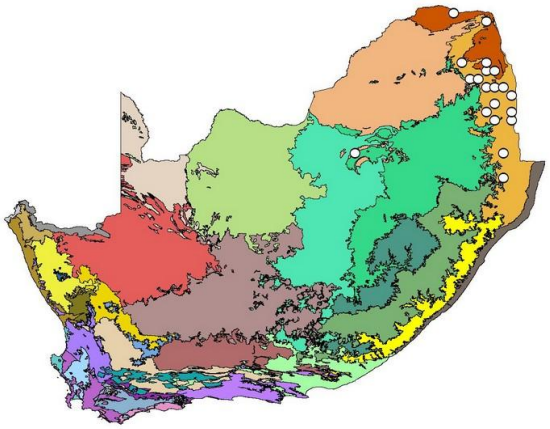
Rhynchosia sublobata (Schumach.) Meikle

Phaseoleae ②

Herb, climber; P; Ht 0.5–2; Alt 155–1740

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (85)	Mopane (15)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (71)	200–600; >800 (10)
Min temp (°C)	>6 (81)	2–8 (14)
Max temp (°C)	27–35 (95)	25–29 (5)
Phosphorus (ppm)	<10 (71)	5–35 (29)
pH	5.5–7.4 (33)	<6.4; 6.5–7.4 (29)
ESP	Non (100)	
QDGCs	2431 (29)	2531 (24)

NOTES: **Livestock feed** (Lusigi *et al.* 1984). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



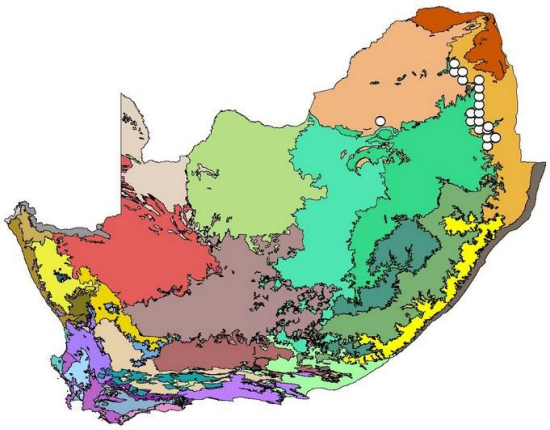
Rhynchosia thorncroftii (Baker f.) Burtt Davy

Phaseoleae ①

Herb, shrub; P; Ht 0.2–1; Alt 915–1824

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Lowveld (50)	
Biome	Savanna (100)	
Rainfall (mm)	>800 (67)	400–800 (22)
Min temp (°C)	2–8 (94)	>6 (6)
Max temp (°C)	25–29 (83)	27–35 (17)
Phosphorus (ppm)	<10 (72)	5–35 (28)
pH	<6.4 (94)	5.5–7.4 (6)
ESP	Non (100)	
QDGCs	2430; 2530 (32)	2631 (16)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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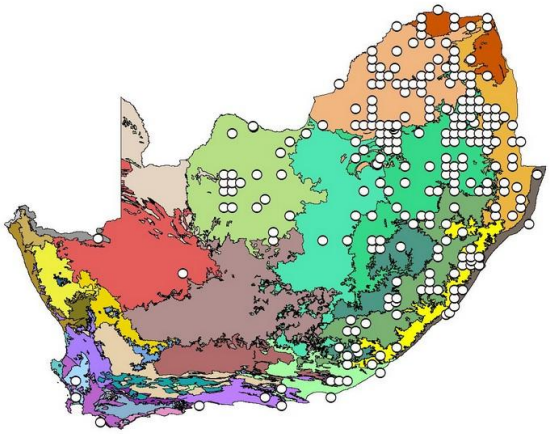
Rhynchosia totta (Thunb.) DC. var. *totta*

Phaseoleae ③❖

Herb, climber; P; Ht ?; Alt 50–2090

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (30)	Mesic Highveld Grassland (22)
Biome	Savanna (54)	Grassland (39)
Rainfall (mm)	400–800 (48)	>800 (19)
Min temp (°C)	2–8 (40)	<2 (23)
Max temp (°C)	25–29; 27–35 (39)	<27 (18)
Phosphorus (ppm)	<10 (74)	5–35 (26)
pH	<6.4 (54)	5.5–7.4 (26)
ESP	Non (99)	Medium (1)
QDGCs	2530 (6)	2528; 2531; 2930 (4)

NOTES: **Livestock feed** (Maposse *et al.* 2003). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans (Letsela *et al.* 2003). **Flowering:** Spring, summer, autumn (Pooley 1998).



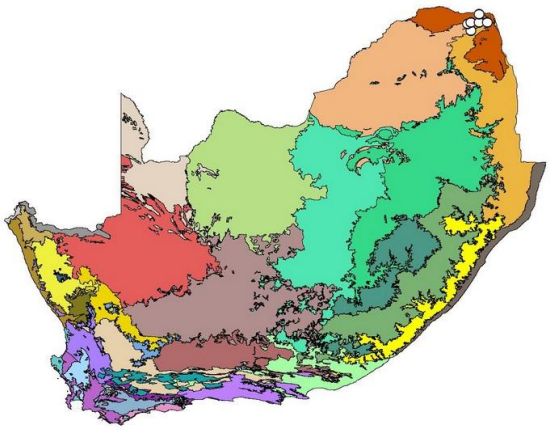
[E]*Rhynchosia vendae* C.H.Stirt.

Phaseoleae ①

Herb, climber; P; Ht 0.4–0.9; Alt 490–670

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (80)	400–800 (20)
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (80)	5.5–7.4 (20)
ESP	Ecotone	
QDGCs	2230 (83)	2231 (17)

NOTES: –



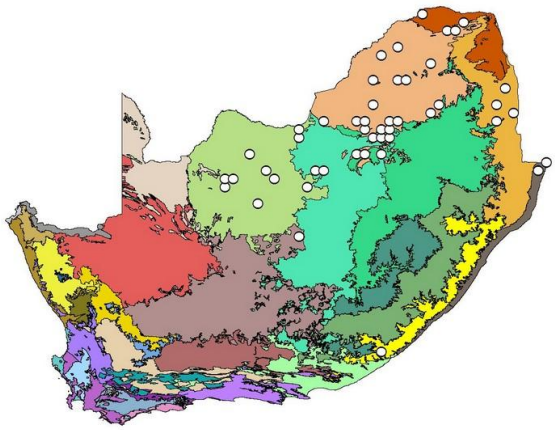
Rhynchosia venulosa (Hiern) K.Schum.

Phaseoleae ③

Herb, climber; P; Ht 0.01–0.2; Alt 55–1725

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (41)	Eastern Kalahari Bushveld (30)
Biome	Savanna (92)	Grassland; Indian Ocean (4)
Rainfall (mm)	400–800 (77)	<400 (13)
Min temp (°C)	2–8 (36)	<2; 0–4 (26)
Max temp (°C)	27–35 (68)	25–29 (23)
Phosphorus (ppm)	<10 (77)	5–35 (23)
pH	<6.4 (43)	5.5–7.4 (21)
ESP	Non (100)	
QDGCs	2527; 2627 (11)	2528; 2531; 2723; (6)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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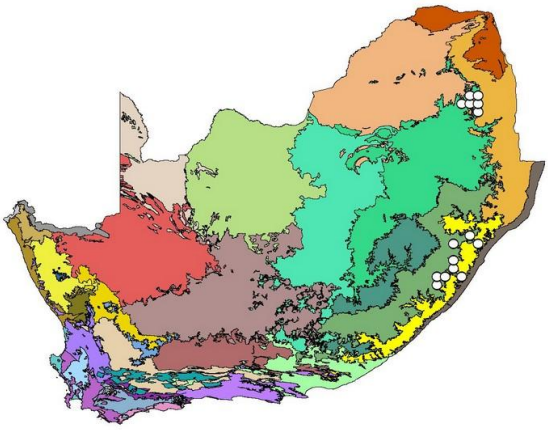
[E]*Rhynchosia villosa* (Meisn.) Druce

Phaseoleae ①

Herb; P; Ht 0.2–1; Alt 800–1950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Sub-Escarpment Grassland (50)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (80)	600–1000 (13)
Min temp (°C)	2–8 (47)	0–4 (40)
Max temp (°C)	25–29 (60)	<27 (40)
Phosphorus (ppm)	<10 (93)	5–35 (7)
pH	<6.4 (87)	5.5–7.4 (13)
ESP	Non (100)	
QDGCs	2530; 2930 (27)	3029 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972; Grobbelaar *et al.* 1983). **Flowering:** Spring, summer (Pooley 1998).



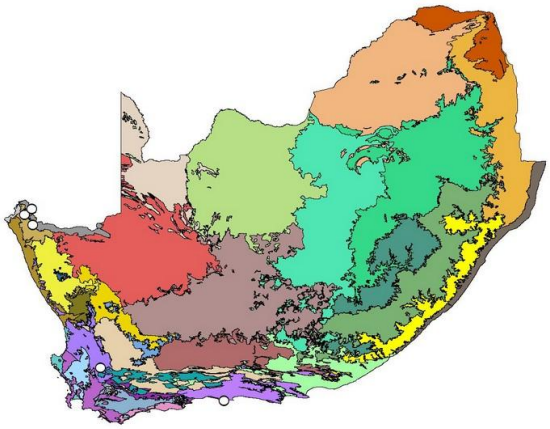
[E]*Rhynchosia viscidula* Steud.

Phaseoleaea ①

Dwarf shrub; P; Ht 0.01–0.3; Alt ?–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400 (60)	200–600 (20)
Min temp (°C)	>6 (60)	0–4; 2–8 (20)
Max temp (°C)	27–35 (60)	<27; 25–29 (20)
Phosphorus (ppm)	>20 (60)	5–35 (40)
pH	>7.5 (60)	<6.4 (40)
ESP	Medium (100)	
QDGCs	2817 (60)	3319; 3423 (20)

NOTES: –



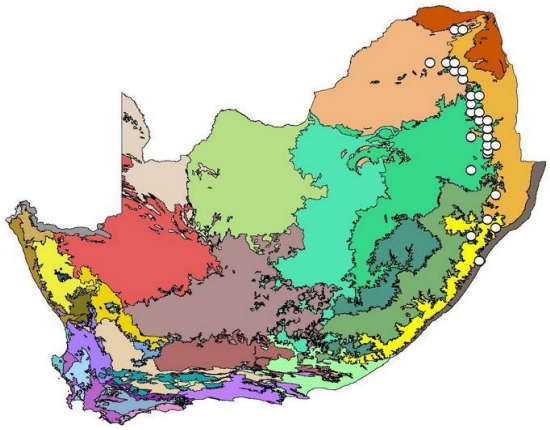
Rhynchosia woodii Schinz

Phaseoleae ①

Herb; P; Ht 0.15–1; Alt 600–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Central Bushveld (50)	
Biome	Savanna (75)	Grassland (25)
Rainfall (mm)	>800 (56)	600–1000 (26)
Min temp (°C)	2–8 (78)	0–4 (15)
Max temp (°C)	25–29 (86)	<27; 27–35 (14)
Phosphorus (ppm)	<10 (70)	5–35 (30)
pH	<6.4 (81)	5.5–7.4 (19)
ESP	Non (100)	
QDGCs	2631 (21)	2430 (17)

NOTES: –



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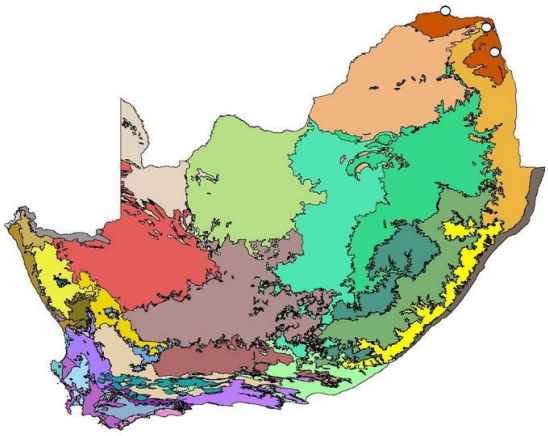
Rothia hirsuta (Guill. & Perr.) Baker

Crotalarieae ③

Herb; A; Ht 0.01–0.15; Alt 409–518

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400; 200–600; 400–800 (33)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (66)	6.5–8.4 (33)
ESP	Non (100)	
QDGCs	2229; 2231; 2331 (33)	

NOTES: **Livestock feed** (Lewis *et al.* 2005). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



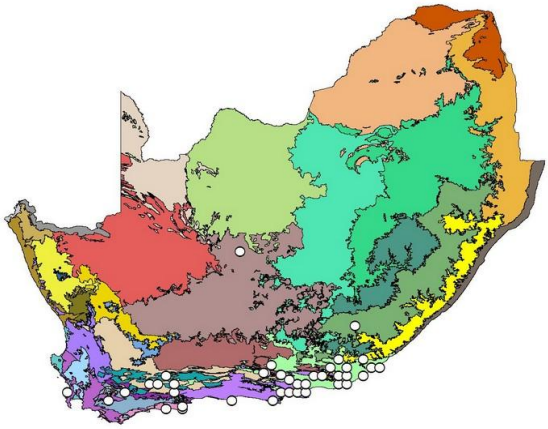
[E]*Schotia afra* (L.) Thunb. var. *afra*

Detarieae ☠ ③

Shrub, tree; P; Ht 0.5–7; Alt 0–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (60)	South Coast Fynbos; Eastern Fynbos-Renosterveld; Sub-Escarpment Grassland; Upper Karoo (10)
Biome	Albany Thicket (50)	Fynbos (33)
Rainfall (mm)	400–800 (47)	200–600 (31)
Min temp (°C)	2–8 (67)	>6 (31)
Max temp (°C)	25–29 (64)	27–35 (28)
Phosphorus (ppm)	5–35 (78)	>20 (14)
pH	5.5–7.4 (31)	6.5–8.4 (28)
ESP	Non (90)	Medium (10)
QDGCs	3326 (18)	3324; 3325 (15)

NOTES: **Livestock feed** (Lewis *et al.* 2005). **Cultivated** (Glen 2002). **Antiquality:** Tannin in bark (Watt & Breyer-Brandwijk 1962). **Biocultural:** Fuel; medicine for humans; seed as food; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Moriarty 1997; Manning 2001).



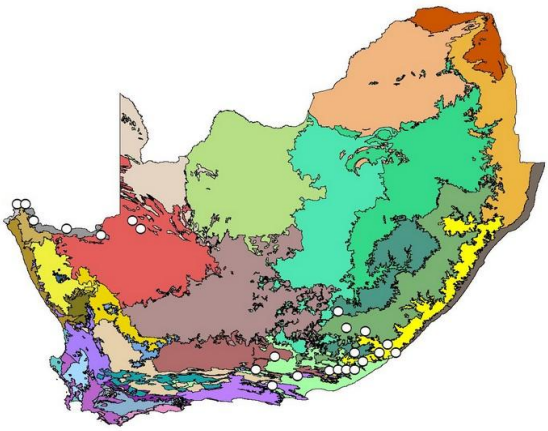
Schotia afra (L.) Thunb. var. *angustifolia* (E.Mey.) Harv.

Detarieae ③

Shrub, tree; P; Ht 2.7–6; Alt 125–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (33)	Albany Thicket; Sub-Escarpment Grassland (22)
Biome	Nama-Karoo (40)	Grassland (30)
Rainfall (mm)	<400 (42)	400–800 (29)
Min temp (°C)	2–8 (63)	0–4; >6 (17)
Max temp (°C)	25–29 (50)	>33 (29)
Phosphorus (ppm)	5–35 (58)	>20 (42)
pH	>7.5 (38)	5.5–7.4 (25)
ESP	Non (78)	Medium (22)
QDGCs	3227; 3326 (12)	2817; 2820; 3126; 3127; 3228; 3324 (8)

NOTES: **Livestock feed** (Lewis *et al.* 2005). **Cultivated** (Glen 2002). **Flowering:** Spring (Manning 2001).



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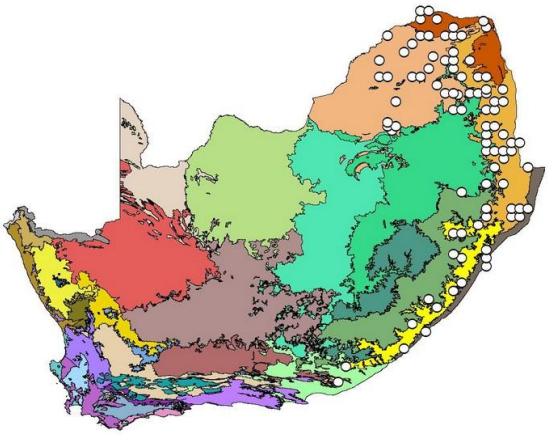
Schotia brachypetala Sond.

Detarieae ☠ ③

Tree; P; Ht 1–16; Alt 25–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (41)	Central Bushveld (36)
Biome	Savanna (89)	Indian Ocean (6)
Rainfall (mm)	400–800 (38)	>800 (26)
Min temp (°C)	2–8 (61)	>6 (35)
Max temp (°C)	27–35 (55)	25–29 (41)
Phosphorus (ppm)	<10 (64)	5–35 (36)
pH	<6.4 (46)	5.5–7.4 (33)
ESP	Non (100)	
QDGCs	2631 (9)	2229 (8)

NOTES: **Livestock feed:** Game (Venter & Venter 1996; Lewis *et al.* 2005). **Cultivated** (Glen 2002). **N_2 fixation:** No nodulation (Grobbelaar & Clarke 1975). **Antiquality:** Tannin in root and wood; wood dust eye irritant (Watt & Breyer-Brandwijk 1962). **Biocultural:** Dye (Hutchings *et al.* 1996); Medicine for humans; seed as food; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Manning 2001).



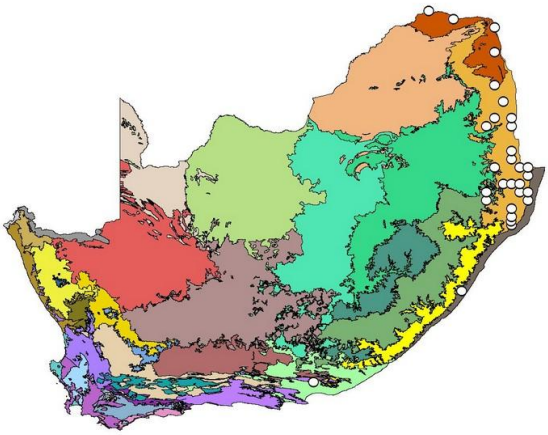
Schotia capitata Bolle

Detarieae ③

Shrub, tree; P; Ht 0.5–9; Alt 50–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (81)	Mopane (19)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (52)	600–1000; >800 (17)
Min temp (°C)	>6 (76)	2–8 (24)
Max temp (°C)	27–35 (83)	25–29 (17)
Phosphorus (ppm)	<10 (72)	5–35 (28)
pH	5.5–7.4 (48)	<6.4; 6.5–7.4 (21)
ESP	Non (100)	
QDGCs	2732 (17)	2731 (14)

NOTES: **Livestock feed** (Lewis *et al.* 2005). **Cultivated** (Glen 2002). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996).



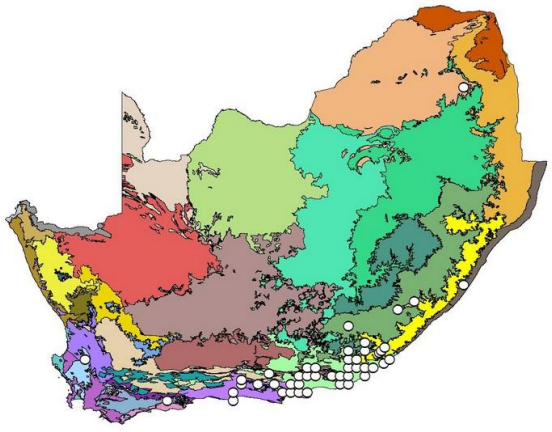
Schotia latifolia Jacq.

Detarieae ③

Tree; P; Ht 0.6–10; Alt 0–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (56)	Eastern Fynbos-Renosterveld; Sub-Escarpment Grassland (22)
Biome	Albany Thicket (50)	Fynbos (30)
Rainfall (mm)	400–800 (48)	200–600 (31)
Min temp (°C)	2–8 (69)	>6 (26)
Max temp (°C)	25–29 (83)	27–35 (10)
Phosphorus (ppm)	58–35 (81)	<10 (12)
pH	5.5–7.4 (40)	<6.4; 6.5–8.4 (24)
ESP	Non (78)	Medium (22)
QDGCs	3325 (23)	3227 (16)

NOTES: **Livestock feed** (Lewis *et al.* 2005). **Cultivated** (Glen 2002). **Biocultural:** Dye; seed as food; timber (Watt & Breyer-Brandwijk 1962).



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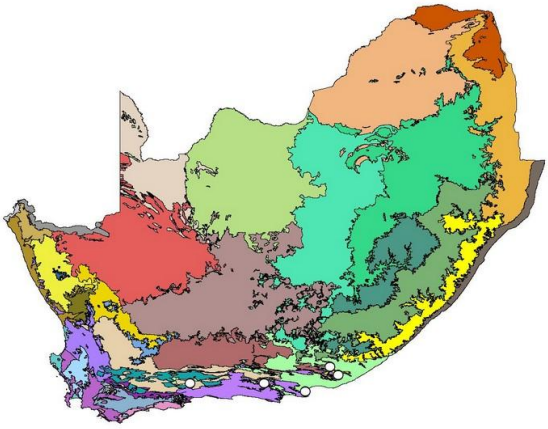
Schotia latifolia Jacq. × *S. afra* (L.) Thunb. form A

Detarieae ②

Shrub, tree; P; Ht 2–3; Alt 0–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	200–600; 400–800 (40)	<400 (20)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (60)	6.5–8.4 (40)
ESP	Ecotone	
QDGCs	3326 (40)	3322; 3324; 3325 (20)

NOTES: **Livestock feed** (Lewis *et al.* 2005).



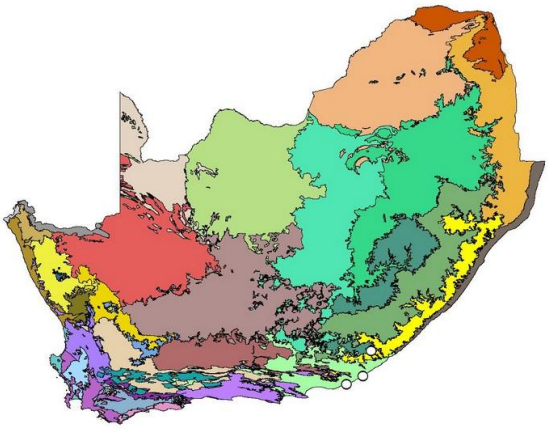
Schotia latifolia Jacq. × *S. afra* (L.) Thunb. form B

Detarieae ②

Shrub, tree; P; Ht 3–8; Alt 0–350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (100)	
Biome	Albany Thicket (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	6.5–7.4 (67)	<6.4 (33)
ESP	Non (100)	
QDGCs	3227; 3326; 3327 (33)	

NOTES: **Livestock feed** (Lewis *et al.* 2005).



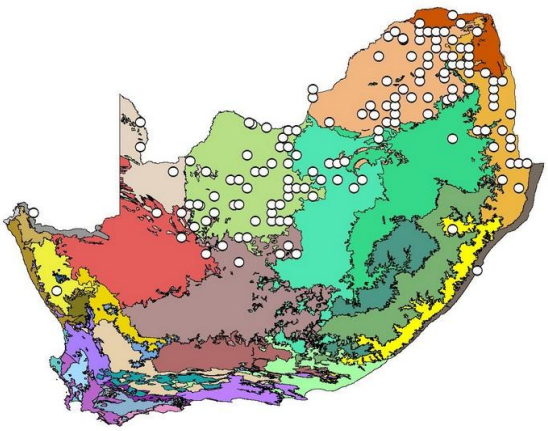
Senna italica Mill. subsp. *arachoides* (Burch.) Lock

Cassieae ☠③❖

Herb; P; Ht 0.4–1; Alt 50–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (34)	Central Bushveld (33)
Biome	Savanna (89)	Grassland (7)
Rainfall (mm)	400–800 (55)	<400 (26)
Min temp (°C)	2–8 (36)	<2 (33)
Max temp (°C)	27–35 (67)	25–29; >33 (16)
Phosphorus (ppm)	<10 (72)	5–35 (27)
pH	6.5–7.4 (25)	5.5–7.4 (22)
ESP	Non (99)	Medium (1)
QDGCs	2330 (6)	2429; 2725 (5)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Tannin; toxicity unresolved (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** No nodulation (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans (Steyn 1934; Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Pooley 1998).



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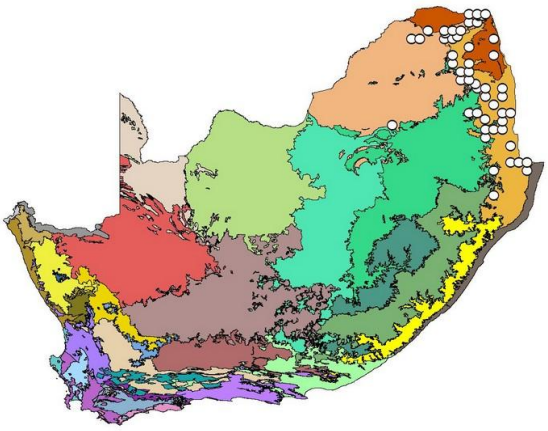
Senna petersiana (Bolle) Lock

Cassieae ☠ ③

Shrub, tree; P; Ht 0.8–7; Alt 50–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (64)	Central Bushveld (23)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (39)	600–1000 (22)
Min temp (°C)	>6 (53)	2–8 (47)
Max temp (°C)	27–35 (59)	25–29 (39)
Phosphorus (ppm)	<10 (51)	5–35 (49)
pH	<6.4 (41)	5.5–7.4 (27)
ESP	Non (100)	
QDGCs	2531 (15)	2230 (13)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** No nodulation (Grobbelaar & Clarke 1975). **Antiquality:** Tannin in leaf (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



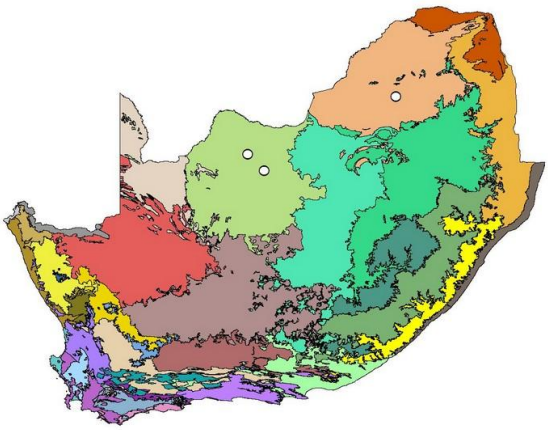
Sesbania brevipedunculata J.B.Gillett

Sesbanieae ①

Herb; A; Ht 0.6–1.5; Alt 850–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (67)	Central Bushveld (33)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (67)	<400 (33)
Min temp (°C)	<2 (67)	2–8 (33)
Max temp (°C)	27–35 (67)	>33 (33)
Phosphorus (ppm)	<10 (100)	
pH	5.5–7.4 (67)	6.5–7.4 (33)
Sodic	Non (100)	
QDGCs	2428; 2623; 2724 (33)	

NOTES: –



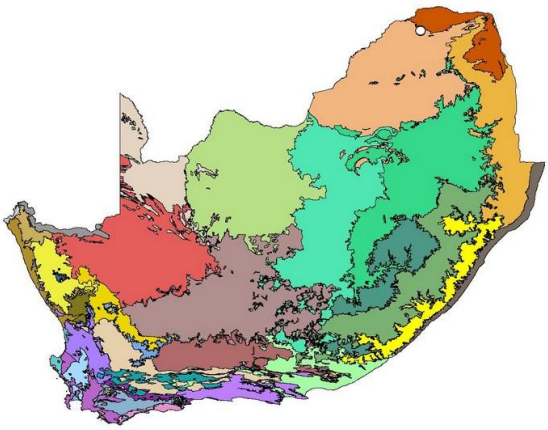
Sesbania macowaniana Schinz

Sesbanieae ①

Herb; A; Ht 0.5–1.5; Alt 800–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
Sodic	Ecotone	
QDGCs	2229 (100)	

NOTES: –



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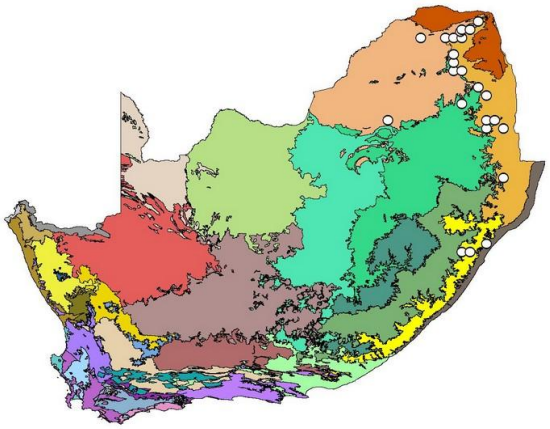
***Sesbania macrantha* Welw. ex E.Phillips & Hutch. var. *levis* J.B.Gillett** **Sesbanieae** ③

Shrub, tree; P; Ht 1–6; Alt 150–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (43)	Lowveld (29)
Biome	Savanna (91)	Grassland (9)
Rainfall (mm)	400–800; 600–1000; >800 (30)	200–600 (10)
Min temp (°C)	2–8 (57)	>6 (39)
Max temp (°C)	25–29 (57)	27–35 (39)
Phosphorus (ppm)	<10 (57)	5–35 (43)
pH	<6.4 (52)	5.5–7.4 (35)
Sodic	Non (100)	
QDGCs	2230; 2330; 2531 (17)	2430 (13)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).

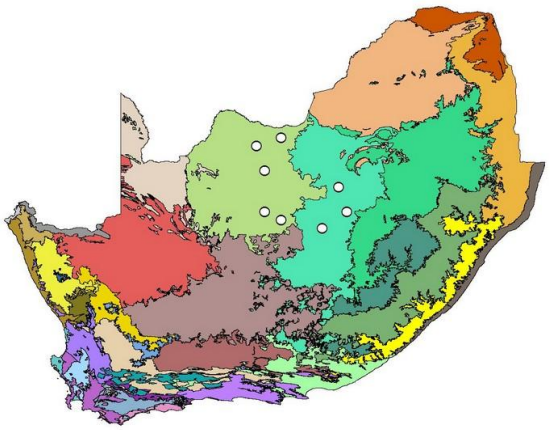


[E]*Sesbania notialis* J.B.Gillett **Sesbanieae** ①

Herb; A; Ht 0.4–0.9; Alt 1150–1550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (63)	Dry Highveld Grassland (37)
Biome	Savanna (63)	Grassland (37)
Rainfall (mm)	400–800 (74)	<400; 200–600 (13)
Min temp (°C)	<2 (75)	0–4 (25)
Max temp (°C)	27–35 (63)	>33 (37)
Phosphorus (ppm)	<10 (100)	
pH	6.5–7.4 (50)	>7.5 (25)
Sodic	Non (100)	
QDGCs	2624; 2824; 2826 (25)	2724; 2726 (12)

NOTES: –

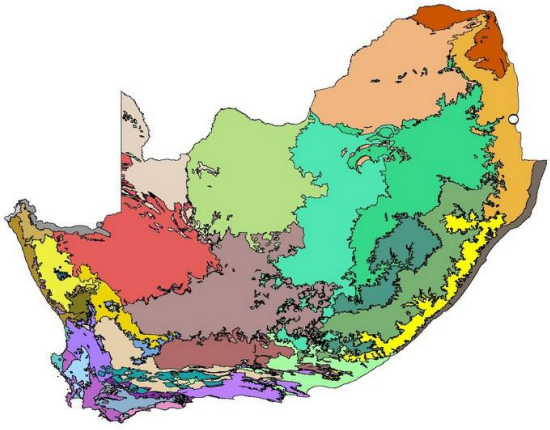


***Sesbania rogersii* E.Phillips & Hutch.** **Sesbanieae** ①

Herb; A; Ht 0.3–0.7; Alt 175–275

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	6.5–8.4 (100)	
Sodic	Non (100)	
QDGCs	2531 (100)	

NOTES: –



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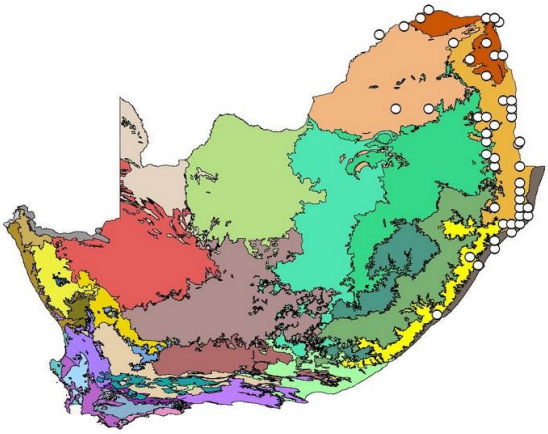
Sesbania sesban (L.) Merr. subsp. *sesban* var. *nubica* Chiov.

Sesbanieae ☠ ③

Shrub, tree; P; Ht 1–7; Alt 0–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (48)	Mopane (22)
Biome	Savanna (92)	Indian Ocean (8)
Rainfall (mm)	>800 (40)	400–800 (31)
Min temp (°C)	>6 (71)	2–8 (29)
Max temp (°C)	27–35 (69)	25–29 (26)
Phosphorus (ppm)	<10 (81)	5–35 (19)
pH	5.5–7.4 (40)	<6.4 (33)
Sodic	Non (100)	
QDGCs	2531; 2832 (12)	2831 (9)



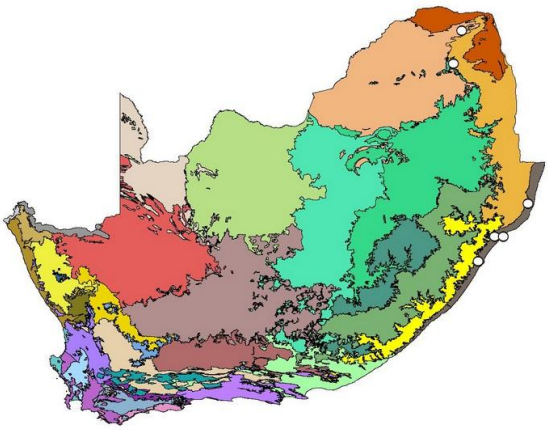
NOTES: **Livestock feed:** High value (Smith 1992); (Le Houérou 1980). **CP:** Leaves 19–26% (Gutteridge 1998). **Antiquality:** Saponin in leaf and seed (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Bala *et al.* 2002). **Soil conservation:** Organic N (Chikowo *et al.* 2006). **Biocultural:** Fibre; flower as food; insecticide; medicine for humans (Watt & Breyer-Brandwijk 1962).

Sesbania sesban (L.) Merr. subsp. *sesban* var. *sesban*

Sesbanieae ☠ ③

Tree; P; Ht 1–3; Alt 150–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean; Savanna (50)	
Rainfall (mm)	>800 (67)	600–1000 (33)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (66)	5.5–7.4; 6.5–7.4 (17)
Sodic	Non (100)	
QDGCs	2931 (33)	2230; 2330; 2832; 2930 (17)



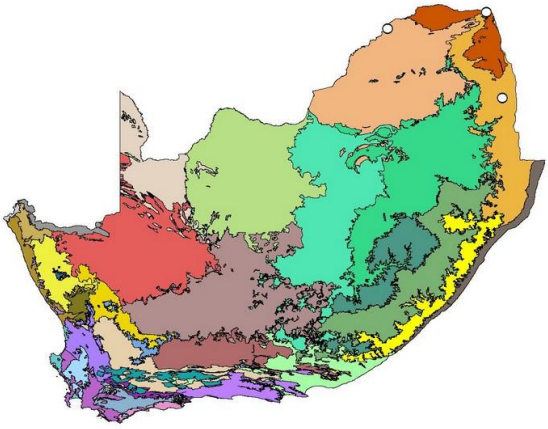
NOTES: **Livestock feed:** High value (Smith 1992); (Le Houérou 1980). **CP:** Leaves 19–26% (Gutteridge 1998). **Cultivated** (Glen 2002). **Antiquality:** Saponin in leaf and seed (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Bala *et al.* 2002). **Soil conservation:** Organic N (Chikowo *et al.* 2006). **Biocultural:** Fibre; flower as food; insecticide; medicine for humans (Watt & Breyer-Brandwijk 1962).

Sesbania sesban (L.) Merr. subsp. *sesban* var. *zambesiaca* J.B.Gillett

Sesbanieae ☠ ③

Shrub, tree; P; Ht 1–4; Alt 500–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Lowveld (50)	
Biome	Savanna (100)	
Rainfall (mm)	<400; 200–600; 400–800 (33)	
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	27–35 (67)	>33 (33)
Phosphorus (ppm)	5–35 (67)	<10 (33)
pH	5.5–7.4; 6.5–7.4; 6.5–8.4 (33)	
Sodic	Non (100)	
QDGCs	2228; 2231; 2431 (33)	



NOTES: **Livestock feed:** High value (Smith 1992); (Le Houérou 1980). **CP:** Leaves 19–26% (Gutteridge 1998). **Antiquality:** Saponin in leaf and seed (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Bala *et al.* 2002). **Soil conservation:** Organic N (Chikowo *et al.* 2006). **Biocultural:** Fibre; flower as food; insecticide; medicine for humans (Watt & Breyer-Brandwijk 1962).

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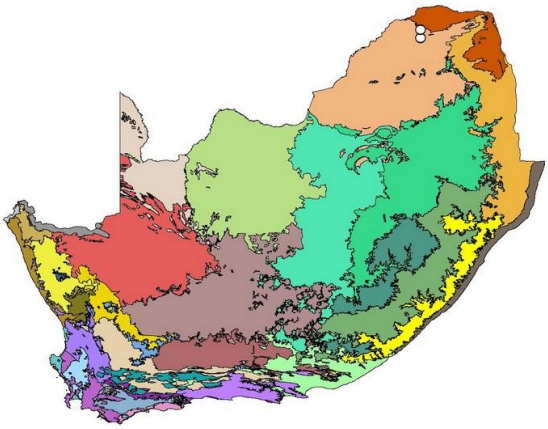
Sesbania tetraptera Hochst. ex Baker subsp. *tetraptera*

Sesbanieae ③

Herb; A; Ht 1–2; Alt 800–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
Sodic	Non (100)	
QDGCs	2229; 2329 (50)	

NOTES: **Soil conservation:** Green manure (Morris 1997).



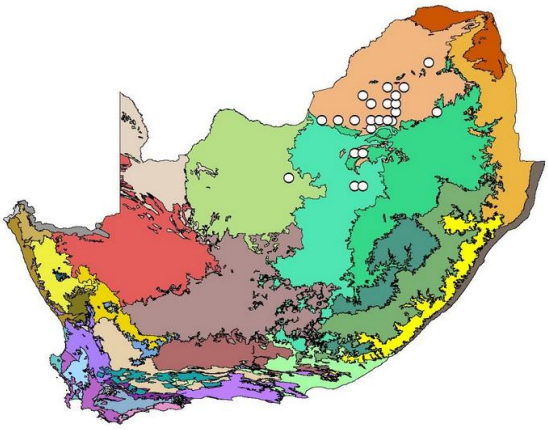
Sesbania transvaalensis J.B.Gillett

Sesbanieae ③

Herb; A; Ht 0.8–2.5; Alt 1000–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (79)	Dry Highveld Grassland (11)
Biome	Savanna (88)	Grassland (13)
Rainfall (mm)	400–800 (96)	<400 (4)
Min temp (°C)	2–8 (52)	0–4 (35)
Max temp (°C)	27–35 (87)	25–29 (13)
Phosphorus (ppm)	<10 (87)	5–35 (13)
pH	<6.4 (61)	5.5–7.4 (26)
Sodic	Non (100)	
QDGCs	2527; 2528 (21)	2428 (13)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



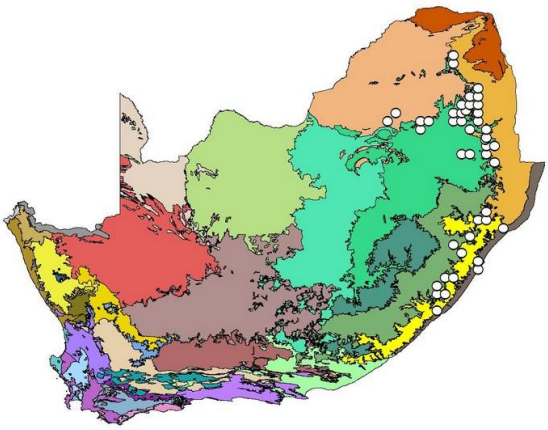
Smithia erubescens (E.Mey.) Baker f.

Dalbergieae ①

Dwarf shrub, shrub, herb; P; Ht 0.3–1.75; Alt 305–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (64)	Central Bushveld (14)
Biome	Grassland (78)	Indian Ocean; Savanna (11)
Rainfall (mm)	>800 (61)	600–1000 (25)
Min temp (°C)	2–8 (66)	0–4 (25)
Max temp (°C)	25–29 (68)	<27 (23)
Phosphorus (ppm)	<10 (95)	5–35 (5)
pH	<6.4 (91)	5.5–7.4 (9)
Sodic	Non (100)	
QDGCs	2530 (24)	2631 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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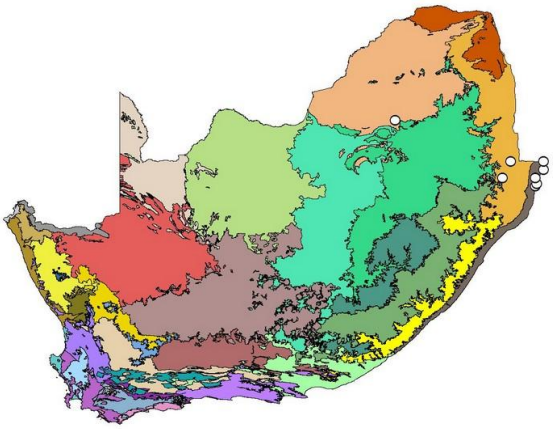
Sophora inhambanensis Klotzsch

Sophoreae ①

Shrub, tree; P; Ht 1–4; Alt 0–50

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (66)	Central Bushveld; Lowveld (17)
Biome	Indian Ocean (60)	Savanna (40)
Rainfall (mm)	400–800 (86)	600–1000 (14)
Min temp (°C)	2–8 (71)	>6 (29)
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (57)	5–35 (43)
pH	<6.4 (57)	5.5–7.4 (43)
Sodic	Non (100)	
QDGCs	2732 (50)	2528; 2631; 2632; 2731 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



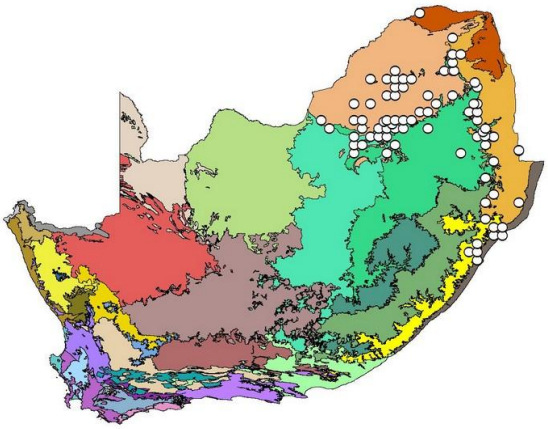
Sphenostylis angustifolia Sond.

Phaseoleae ③❖

Dwarf shrub, herb; P; Ht 0.15–0.8; Alt 105–2225

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (65)	Lowveld (12)
Biome	Savanna (86)	Grassland (9)
Rainfall (mm)	400–800 (58)	>800 (27)
Min temp (°C)	2–8 (58)	0–4 (20)
Max temp (°C)	25–29 (61)	27–35 (39)
Phosphorus (ppm)	<10 (89)	5–35 (11)
pH	<6.4 (76)	5.5–7.4 (20)
Sodic	Non (100)	
QDGCs	2428; 2528 (11)	2627 (8)

NOTES: **Livestock feed** (Pooley 1998). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Spring, summer, autumn (Pooley 1998).



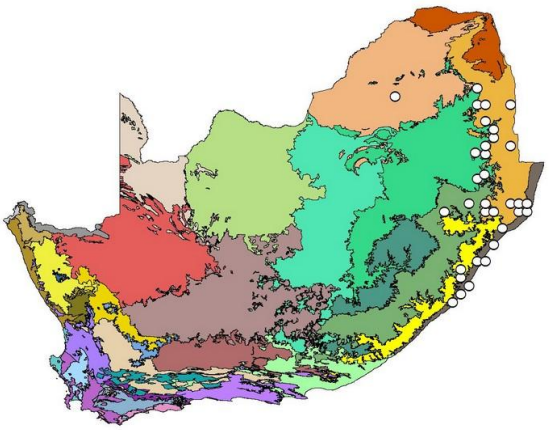
Sphenostylis marginata E.Mey. subsp. *marginata*

Phaseoleae ①

Dwarf shrub, herb, climber; P; Ht 0.15–1.8; Alt 15–1280

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (40)	Indian Ocean Coastal Belt (33)
Biome	Savanna (54)	Indian Ocean (38)
Rainfall (mm)	>800 (67)	600–1000 (27)
Min temp (°C)	>6 (48)	2–8 (42)
Max temp (°C)	25–29 (58)	27–35 (42)
Phosphorus (ppm)	<10 (88)	5–35 (12)
pH	<6.4 (70)	5.5–7.4 (24)
Sodic	Non (100)	
QDGCs	2631; 2831 (15)	2531; 2832; 3030 (12)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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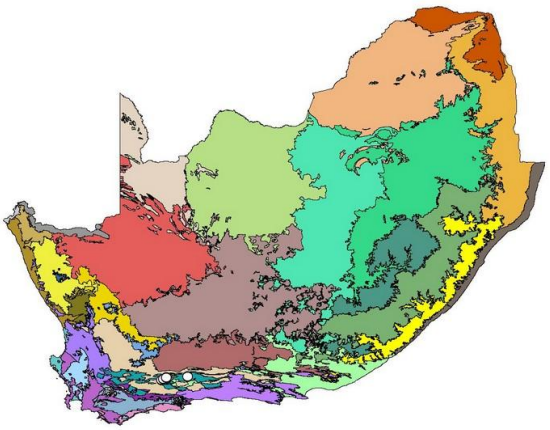
[E]*Stirtonanthus chrysanthus* (Adamson) B.-E.van Wyk & A.L.Schutte — Podalyrieae ①

Shrub, climber; P; Ht 1.5–4; Alt 900–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
Sodic	Ecotone	
QDGCs	3321 (67)	3322 (33)

NOTES: –

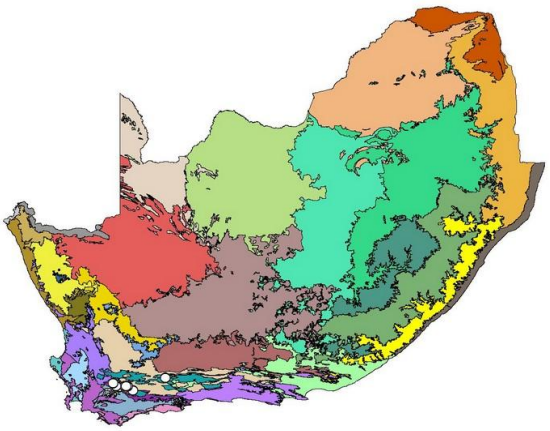


[E]*Stirtonanthus insignis* (Compton) B.-E.van Wyk & A.L.Schutte — Podalyrieae ①

Shrub; P; Ht 1–2; Alt 600–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (75)	0–4 (25)
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	6.5–7.4 (50)	5.5–7.4; >7.5 (25)
Sodic	Ecotone	
QDGCs	3320 (50)	3319 (38)

NOTES: –

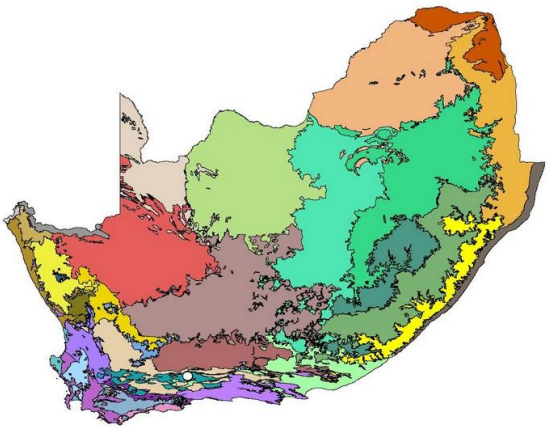


[E]*Stirtonanthus taylorianus* (L.Bolus) B.-E.van Wyk & A.L.Schutte — Podalyrieae ①

Shrub, tree; P; Ht 1.5–4; Alt 850–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
Sodic	Ecotone	
QDGCs	3322 (100)	

NOTES: –



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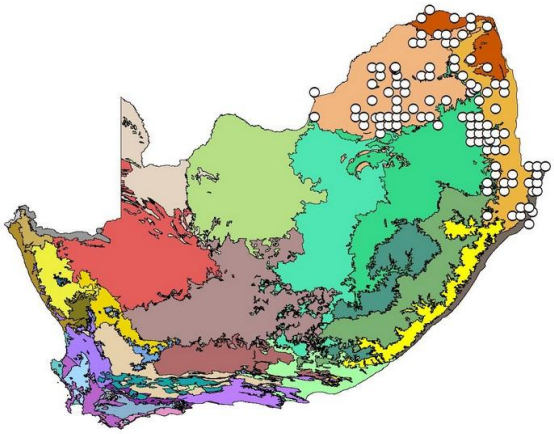
Stylosanthes fruticosa (Retz.) Alston

Dalbergieae ③

Dwarf shrub, herb; P; Ht 0.1–0.5; Alt 15–1370

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (55)	Lowveld (21)
Biome	Savanna (90)	Indian Ocean (10)
Rainfall (mm)	400–800 (59)	>800 (19)
Min temp (°C)	2–8 (64)	>6 (29)
Max temp (°C)	27–35 (62)	25–29 (37)
Phosphorus (ppm)	<10 (72)	5–35 (28)
pH	<6.4 (49)	5.5–7.4 (33)
Sodic	Non (100)	
QDGCs	2528 (8)	2527 (7)



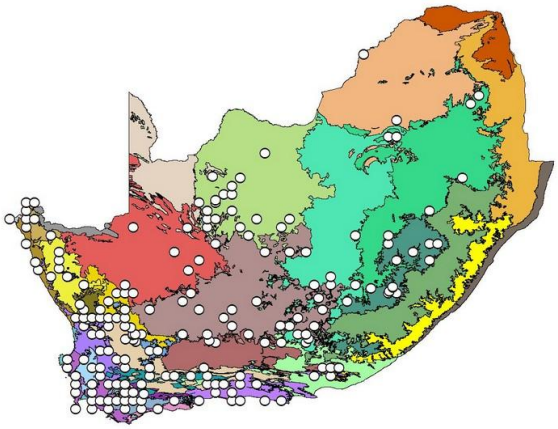
NOTES: **Livestock feed** (Le Houérou 1980; Maposse *et al.* 2003). **Cultivated** (Hakiza *et al.* 1988b; Glen 2002). **DM:** 3–5 t/ha (Adjolohoun *et al.* 2008). **CP:** >8% (Adjolohoun *et al.* 2008). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1972). **Soil conservation:** Reinforcement (Clatworthy 1980, 1984). **Flowering:** Spring, summer, autumn (Pooley 1998).

Sutherlandia frutescens (L.) R.Br.

Galegeae ☠ ③

Dwarf shrub, shrub; P; Ht 0.4–3; Alt 10–2318

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (23)	Upper Karoo (13)
Biome	Fynbos (29)	Succulent Karoo (20)
Rainfall (mm)	<400 (55)	200–600 (22)
Min temp (°C)	2–8 (38)	<2 (27)
Max temp (°C)	27–35 (43)	25–29 (38)
Phosphorus (ppm)	5–35 (45)	>20 (32)
pH	>7.5 (34)	<6.4 (19)
Sodic	Non (68)	Medium (18)
QDGCs	3119 (5)	3220 (4)



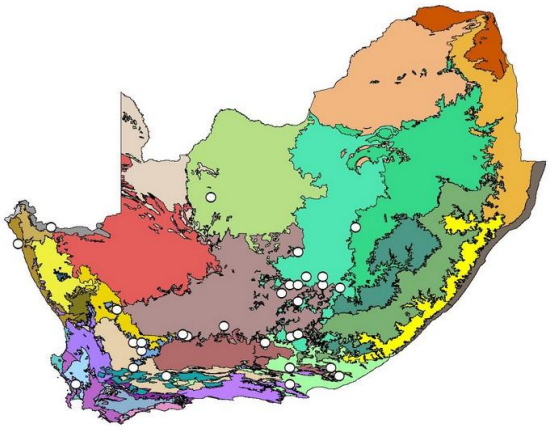
NOTES: **Livestock feed:** Highly palatable, high nutritional value (Le Roux *et al.* 1994). **DM:** Good production, low longevity (Le Roux *et al.* 1994). **Cultivated** (Glen 2002). **Antiquality:** High intake gives bitter taste to milk (Shearing & Van Heerden 1997). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Medicine for humans (Muir 1906; Watt & Breyer-Brandwijk 1962). **Flowering:** Winter, spring, summer (Manning 2003).

[E]*Sutherlandia humilis* E.Phillips & R.A.Dyer

Galegeae ①

Dwarf shrub, shrub; P; Ht 0.3–0.7; Alt 915–1540

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (32)	Gariep Desert; Upper Karoo; Namaqualand Sandveld; Eastern Kalahari Bushveld (17)
Biome	Grassland; Nama-Karoo (33)	Fynbos; Savanna; Succulent Karoo (11)
Rainfall (mm)	<400 (63)	200–600 (20)
Min temp (°C)	<2 (37)	0–4 (30)
Max temp (°C)	27–35 (77)	25–29 (23)
Phosphorus (ppm)	5–35 (43)	>20 (40)
pH	6.5–8.4 (40)	>7.5 (33)
Sodic	Non (67)	Medium; High (17)
QDGCs	3025; 3026; 3220 (10)	3225; 3325; 3326 (7)



NOTES: **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).

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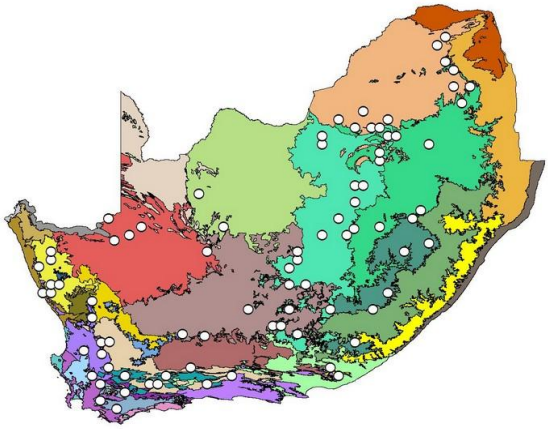
Sutherlandia microphylla Burch. ex DC.

Galegeae ☠ ③

Shrub; P; Ht 0.6–1.3; Alt 458–2200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Dry Highveld Grassland (31)	Central Bushveld (21)
Biome	Grassland (53)	Succulent Karoo (14)
Rainfall (mm)	<400 (41)	400–800 (36)
Min temp (°C)	2–8 (37)	<2 (34)
Max temp (°C)	27–35 (46)	25–29 (40)
Phosphorus (ppm)	5–35 (46)	<10 (39)
pH	5.5–7.4 (31)	<6.4 (22)
Sodic	Non (83)	Medium (14)
QDGCs	2527 (5)	2329; 2430; 2827; 3025; 3219; 3319; 3320 (4)



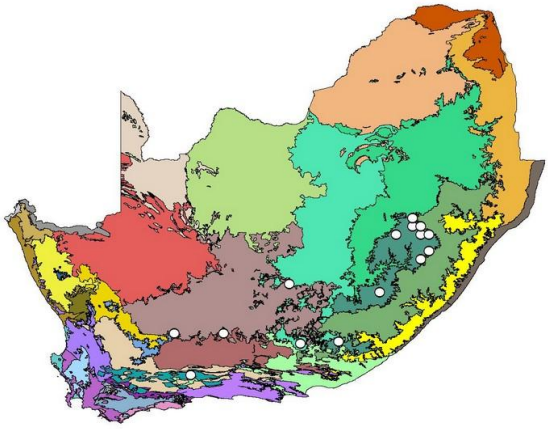
NOTES: **Livestock feed:** Highly palatable, high nutritional value (Le Roux *et al.* 1994). **DM:** Good production, low longevity (Le Roux *et al.* 1994). **Cultivated** (Glen 2002). **Antiquality:** High intake gives bitter taste to milk (Shearing & Van Heerden 1997). **Soil conservation:** Organic N (Morris 1997; Reclamation (Wilcock *et al.* 2004). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring (Moriarty 1997).

Sutherlandia montana E.Phillips & R.A.Dyer

Galegeae ③

Shrub; P; Ht 1–2; Alt 1140–2318

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (80)	Dry Highveld Grassland (20)
Biome	Grassland (90)	Nama-Karoo (10)
Rainfall (mm)	>800 (53)	<400 (27)
Min temp (°C)	<2 (47)	0–4 (40)
Max temp (°C)	<27 (40)	25–29 (33)
Phosphorus (ppm)	<10 (60)	5–35; >20 (20)
pH	<6.4 (60)	>7.5 (20)
Sodic	Non (100)	
QDGCs	2929 (27)	2828 (13)



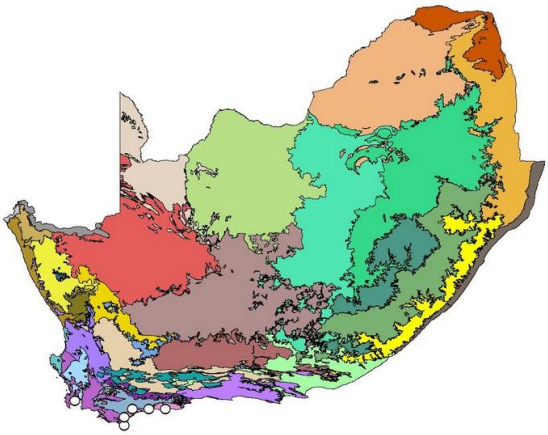
NOTES: **Livestock feed** (Pooley 1998). **Cultivated** (Glen 2002). **Physiology:** Survives snow and frost (Pooley 1998). **Flowering:** All seasons (Pooley 1998, 2003).

[E]*Sutherlandia tomentosa* Eckl. & Zeyh.

Galegeae ①

Shrub; P; Ht 0.4–0.9; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (67)	400–800 (33)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (67)	<27 (33)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (50)	<6.4 (33)
Sodic	Non (100)	
QDGCs	3420 (67)	3418; 3421 (17)



NOTES: –

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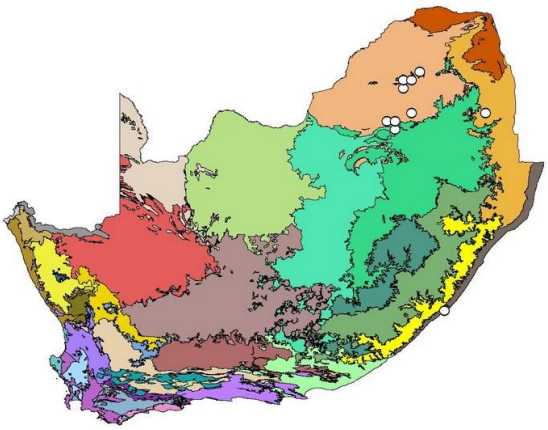
Tephrosia acaciifolia Baker

Millettieae ①

Herb; A; Ht 0.5–1; Alt ?–1210

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (83)	Lowveld (17)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (80)	>800 (20)
Min temp (°C)	2–8 (90)	>6 (10)
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (70)	5.5–7.4 (30)
Sodic	Non (100)	
QDGCs	2528 (40)	2428 (30)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Summer (Van Wyk & Malan 1998).



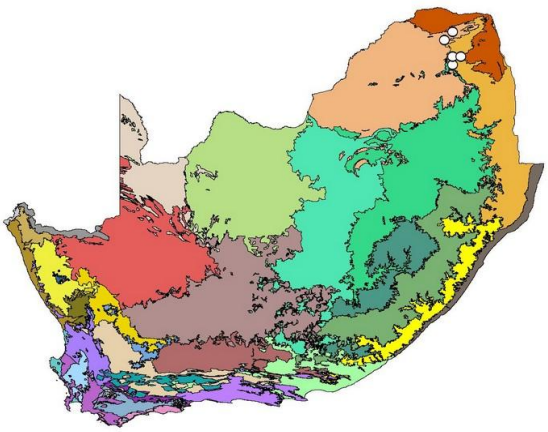
Tephrosia aequilata Baker subsp. *australis* Brummitt

Millettieae ①

Shrub; P; Ht 1–2; Alt 1007–1538

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	600–1000 (60)	400–800 (40)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	27–35 (60)	25–29 (40)
Phosphorus (ppm)	5–35 (60)	<10 (40)
pH	5.5–7.4 (60)	<6.4 (40)
Sodic	Non (100)	
QDGCs	2330 (60)	2230; 2329 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans (Watt & Breyer-Brandwijk 1962).



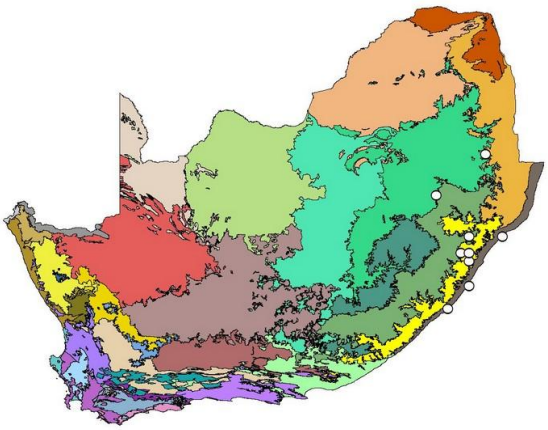
Tephrosia albissima H.M.L.Forbes subsp. *albissima*

Millettieae ①

Herb; P; Ht ?; Alt 763–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (67)	Sub-Escarpment Savanna (33)
Biome	Indian Ocean (50)	Grassland; Savanna (25)
Rainfall (mm)	>800 (78)	600–100 (22)
Min temp (°C)	>6 (44)	2–8 (33)
Max temp (°C)	25–29 (67)	<27 (22)
Phosphorus (ppm)	<10 (89)	5–35 (11)
pH	<6.4 (67)	5.5–7.4 (33)
Sodic	Non (100)	
QDGCs	2930 (45)	2631; 2729; 2931; 3030; 3129 (11)

NOTES: –



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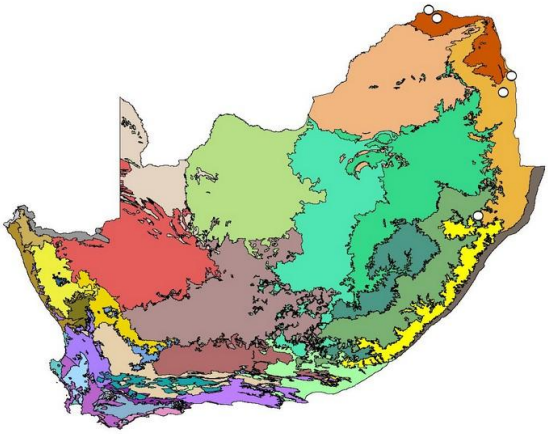
[E]*Tephrosia albissima* H.M.L.Forbes subsp. *zuluensis* (H.M.L.Forbes) Schrire

Millettieae ①

Herb; P; Ht 0.01–0.5; Alt ?–1281

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld; Mopane (50)	
Biome	Savanna (100)	
Rainfall (mm)	<400; 400–800 (40)	600–1000 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	27–35 (80)	25–29 (20)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	6.5–7.4; 6.5–8.4 (40)	<6.4 (20)
Sodic	Non (100)	
QDGCs	2229; 2431 (40)	2830 (20)

NOTES: –



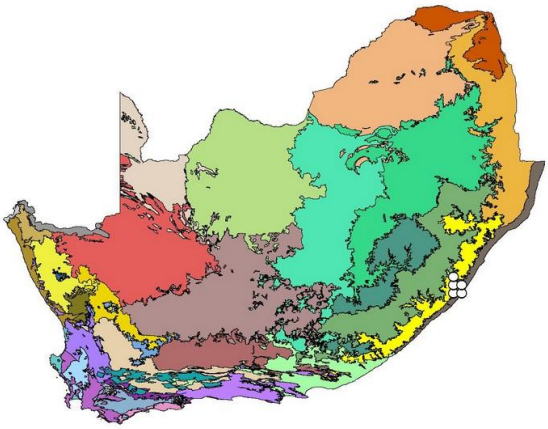
[E]*Tephrosia bachmannii* Harms

Millettieae ①

Dwarf shrub, shrub, herb; P; Ht 0.5–3; Alt 15–1184

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (80)	2–8 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	<6.4 (100)	
Sodic	Non (100)	
QDGCs	3030 (100)	

NOTES: –



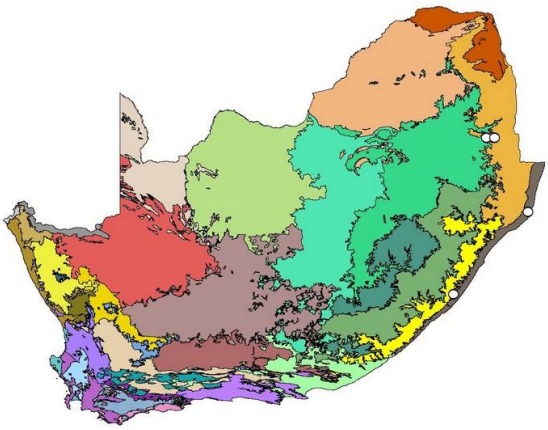
Tephrosia brummittii Schrire

Millettieae ①

Herb; P; Ht 0.01–0.6; Alt 300–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
Sodic	Non (100)	
QDGCs	2631 (50)	2832; 3030 (25)

NOTES: –



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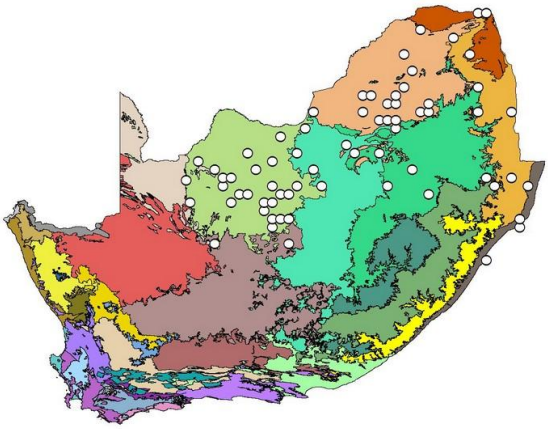
Tephrosia burchellii Burtt Davy

Millettieae ①❖

Herb; occ. P; Ht 0.1–0.7; Alt 280–1474

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (47)	Central Bushveld (33)
Biome	Savanna (84)	Grassland (12)
Rainfall (mm)	400–800 (61)	<400 (24)
Min temp (°C)	<2 (41)	2–8 (31)
Max temp (°C)	27–35 (66)	>33 (17)
Phosphorus (ppm)	<10 (87)	5–35 (13)
pH	5.5–7.4 (27)	<6.4; 6.5–7.4 (26)
Sodic	Non (100)	
QDGCs	2824 (9)	2528; 2723 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



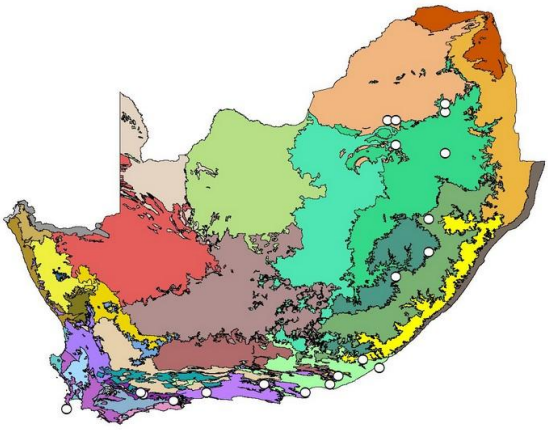
[E]*Tephrosia capensis* (Jacq.) Pers. var. *acutifolia* E.Mey.

Millettieae ☠①

Dwarf shrub, shrub, herb; P; Ht 0.03–0.5; Alt 30–1403

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Central Bushveld (25)	Albany Thicket; Southwest Fynbos; Eastern Fynbos-Renosterveld; Sub-Escarpment Grassland (12)
Biome	Grassland (63)	Fynbos (25)
Rainfall (mm)	400–800 (63)	200–600 (16)
Min temp (°C)	2–8 (47)	<2; >6 (21)
Max temp (°C)	25–29 (74)	<27 (16)
Phosphorus (ppm)	<10 (53)	5–35 (47)
pH	<6.4 (63)	5.5–7.4 (21)
Sodic	Non (88)	Medium (12)
QDGCs	2528; 2529; 3320; 3326 (10)	2628; 2629; 2829; 2929; 3028; 3227; 3322; 3324; 3325; 3327; 3418; 3421 (5)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1972). **Biocultural:** Root as arrow poison; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** All seasons (Kidd 2002).



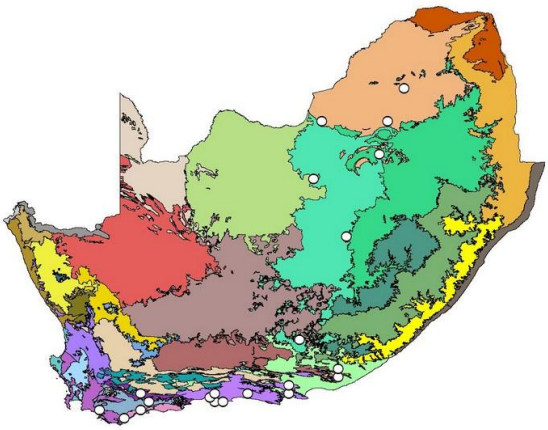
[E]*Tephrosia capensis* (Jacq.) Pers. var. *angustifolia* E.Mey.

Millettieae ☠①

Herb; P; Ht 0.2–0.5; Alt 30–1983

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (50)	Central Bushveld (38)
Biome	Fynbos (67)	Grassland (22)
Rainfall (mm)	400–800 (43)	200–600 (33)
Min temp (°C)	2–8 (67)	<2 (14)
Max temp (°C)	25–29 (52)	27–35 (29)
Phosphorus (ppm)	5–35 (76)	<10 (24)
pH	<6.4 (43)	5.5–7.4 (29)
Sodic	Non; Medium (50)	
QDGCs	3420 (14)	3322; 3325; 3326 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar *et al.* 1983). **Biocultural:** Root as arrow poison; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Moriarty 1997).



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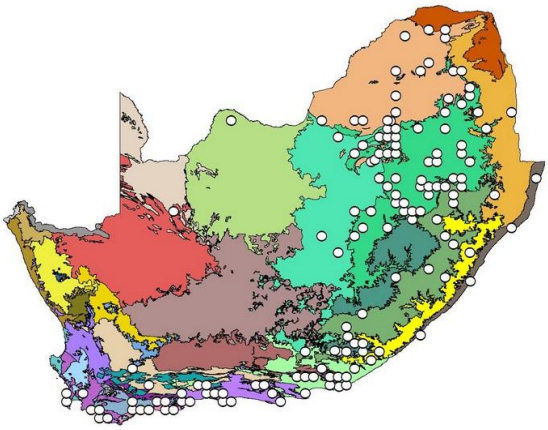
Tephrosia capensis (Jacq.) Pers. var. *capensis*

Millettieae ☠③

Dwarf shrub, shrub, herb; P; Ht 0.1–3; Alt 945–1983

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (44)	Central Bushveld (18)
Biome	Grassland (58)	Fynbos (22)
Rainfall (mm)	400–800 (54)	600–1000 (16)
Min temp (°C)	2–8 (42)	<2 (25)
Max temp (°C)	25–29 (59)	27–35 (21)
Phosphorus (ppm)	<10 (57)	5–35 (42)
pH	<6.4 (56)	5.5–7.4 (25)
Sodic	Non (91)	Medium (9)
QDGCs	3326 (5)	2627; 2729; 2828 (4)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar *et al.* 1983). **Biocultural:** Root as arrow poison; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Moriarty 1997).



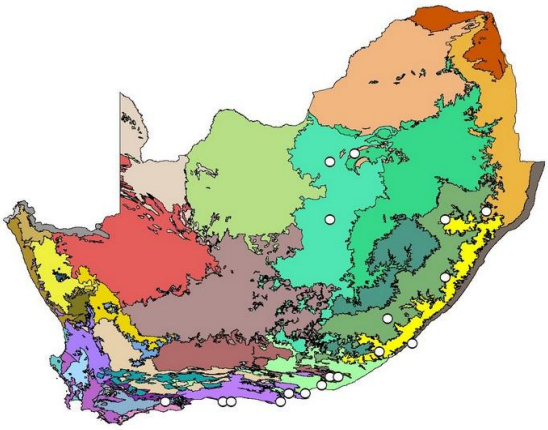
Tephrosia capensis (Jacq.) Pers. var. *hirsuta* Harv.

Millettieae ☠①

Dwarf shrub, shrub, herb; P; Ht 0.05–0.4; Alt 8–1068

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld; Dry Highveld Grassland (29)	Albany Thicket; Sub-Escarpment Grassland; Lowveld (14)
Biome	Grassland (43)	Fynbos (29)
Rainfall (mm)	400–800 (50)	600–1000 (28)
Min temp (°C)	2–8 (56)	>6 (22)
Max temp (°C)	25–29 (67)	27–35 (22)
Phosphorus (ppm)	5–35 (61)	<10 (39)
pH	<6.4 (56)	5.5–7.4 (28)
Sodic	Non (71)	Medium (29)
QDGCs	3326 (17)	3325; 3423 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1975). **Ecology:** Seed (Tauro *et al.* 2007). **Biocultural:** Root as arrow poison; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Moriarty 1997).



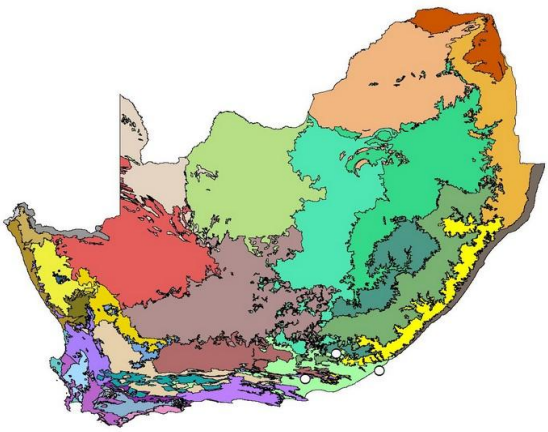
[E]*Tephrosia capensis* (Jacq.) Pers. var. *longipetiolata* H.M.L.Forbes

Millettieae ☠①

Herb; P; Ht ?; Alt 17–915

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket (100)	
Biome	Albany Thicket (100)	
Rainfall (mm)	400–800 (67)	200–600 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (67)	6.5–8.4 (33)
Sodic	Non (100)	
QDGCs	3226; 3325; 3327 (33)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Root as arrow poison; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Moriarty 1997).



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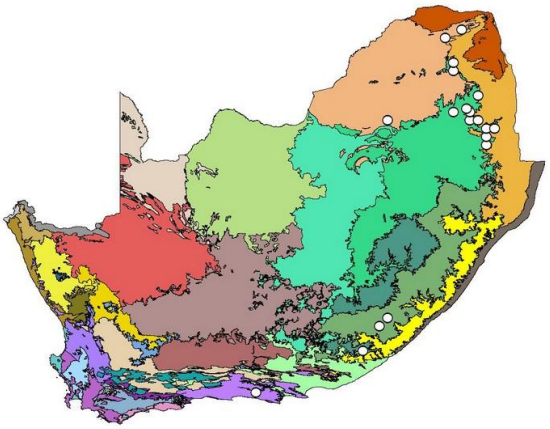
Tephrosia cordata Hutch. & Burtt Davy

Millettieae ③

Dwarf shrub, shrub; P; Ht 0.5–3; Alt 763–2074

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland; Central Bushveld (33)	Eastern Fynbos-Renosterveld; Mesic Highveld Grassland (17)
Biome	Grassland (60)	Savanna (40)
Rainfall (mm)	600–1000; >800 (39)	400–800 (22)
Min temp (°C)	2–8 (94)	0–4 (6)
Max temp (°C)	25–29 (72)	27–35 (17)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (83)	5.5–7.4 (17)
Sodic	Non (83)	Medium (17)
QDGCs	2530 (26)	2430; 2531; 2631 (11)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



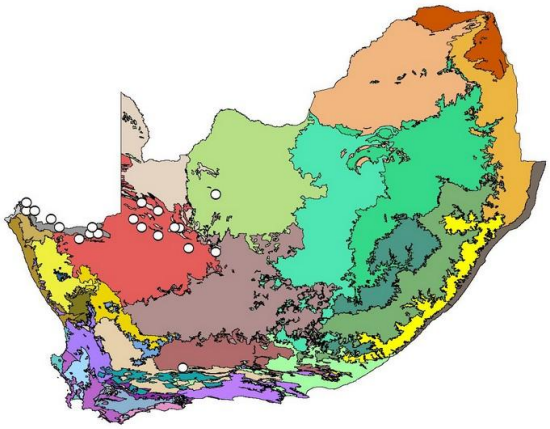
Tephrosia dregeana E.Mey. var. *dregeana*

Millettieae ①

Dwarf shrub, herb; A; Ht 0.3–1; Alt 280–1585

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (50)	Gariep Desert (38)
Biome	Nama-Karoo (50)	Desert (38)
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (45)	0–4 (25)
Max temp (°C)	>33 (75)	27–35 (25)
Phosphorus (ppm)	>20 (60)	5–35 (35)
pH	>7.5 (90)	6.5–7.4; 6.5–8.4 (5)
Sodic	Non (63)	Medium (38)
QDGCs	2817 (19)	2820; 2821 (14)

NOTES: –



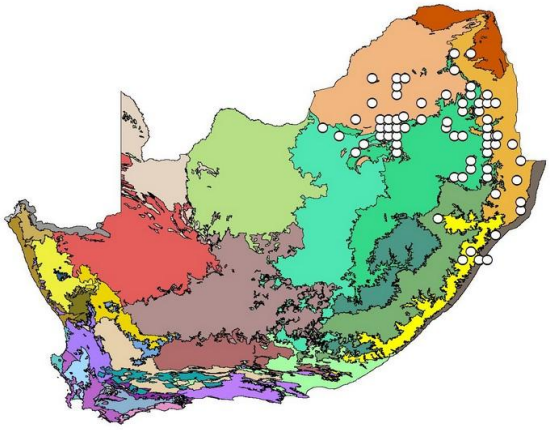
Tephrosia elongata E.Mey. var. *elongata*

Millettieae ③

Dwarf shrub, shrub, herb; P; Ht 0.1–2.4; Alt 61–2080

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (34)	Central Bushveld (28)
Biome	Savanna (56)	Grassland (41)
Rainfall (mm)	400–800 (54)	>800 (28)
Min temp (°C)	2–8 (50)	0–4 (22)
Max temp (°C)	25–29 (51)	27–35 (40)
Phosphorus (ppm)	<10 (96)	5–35 (4)
pH	<6.4 (72)	5.5–7.4 (26)
Sodic	Non (100)	
QDGCs	2631 (10)	2528 (9)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Medicine for humans (Hutchings *et al.* 1996). **Flowering:** Spring, summer, autumn (Pooley 1998).



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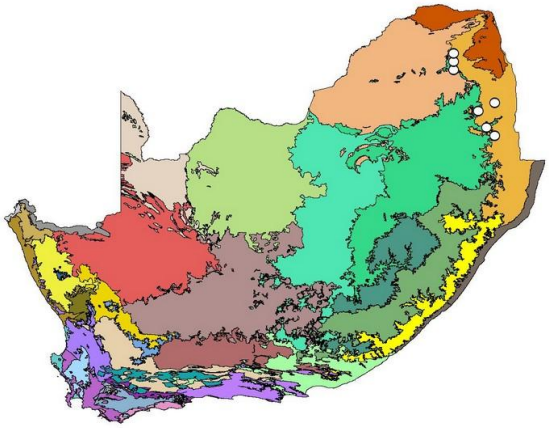
***Tephrosia elongata* E.Mey. var. *tzaneenensis* (H.M.L.Forbes) Brummitt** **Millettieae** ①

Dwarf shrub, herb; P; Ht 0.6–6; Alt 610–991

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	600–1000; >800 (43)	400–800 (14)
Min temp (°C)	2–8 (86)	>6 (14)
Max temp (°C)	25–29 (57)	27–35 (43)
Phosphorus (ppm)	<10 (71)	5–35 (29)
pH	<6.4 (100)	
Sodic	Non (100)	
QDGCs	2330; 2531 (29)	2430; 2530; 2631 (14)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972; Grobbelaar & Van Rooyen 1979).

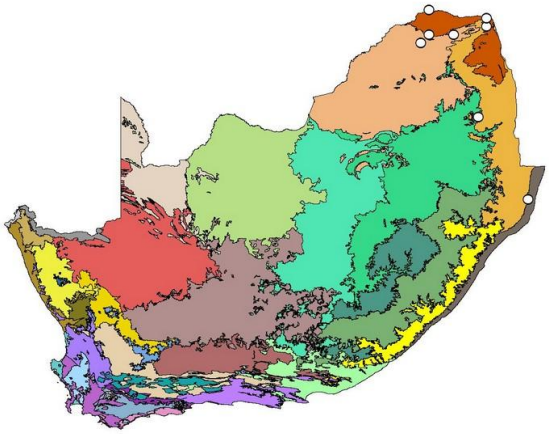


[E]*Tephrosia euchroa* I.Verd. **Millettieae** ①

Dwarf shrub, herb; P; Ht 0.3–1.5; Alt 458–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (67)	Mopane (33)
Biome	Savanna (100)	
Rainfall (mm)	200–600 (50)	400–800 (25)
Min temp (°C)	2–8 (63)	>6 (38)
Max temp (°C)	27–35 (50)	25–29 (38)
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	6.5–8.4 (38)	5.5–7.4; 6.5–7.4 (25)
Sodic	Non (100)	
QDGCs	2229; 2231 (24)	2230; 2329; 2530; 2732 (13)

NOTES: –

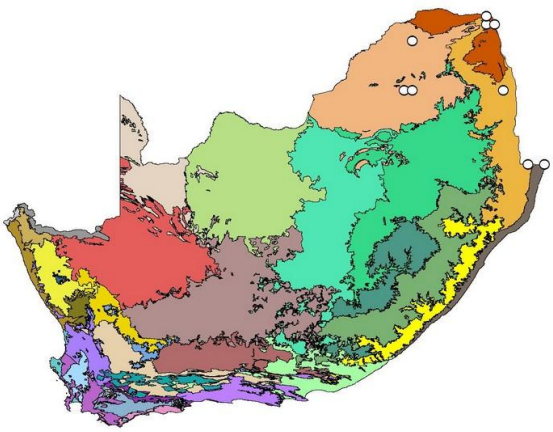


***Tephrosia forbesii* Baker subsp. *interior* Brummitt** **Millettieae** ①

Herb; P; Ht 0.01–0.5; Alt 381–1050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (50)	Lowveld (33)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (56)	200–600 (44)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	27–35 (67)	25–29 (22)
Phosphorus (ppm)	5–35 (89)	<10 (11)
pH	6.5–7.4 (56)	5.5–7.4 (44)
Sodic	Non (100)	
QDGCs	2231 (33)	2428 (22)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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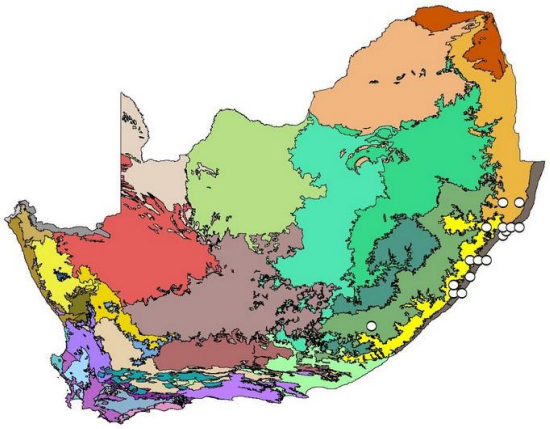
[E]*Tephrosia glomeruliflora* Meisn. subsp. *glomeruliflora*

Millettieae ①

Dwarf shrub, shrub, herb; P; Ht 1–1.8; Alt ?–30

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (63)	Lowveld (25)
Biome	Indian Ocean (57)	Savanna (29)
Rainfall (mm)	>800 (80)	600–1000 (13)
Min temp (°C)	>6 (87)	2–8 (13)
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	<10 (87)	5–35 (13)
pH	<6.4 (73)	5.5–7.4 (27)
Sodic	Non (100)	
QDGCs	2831 (31)	3030 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



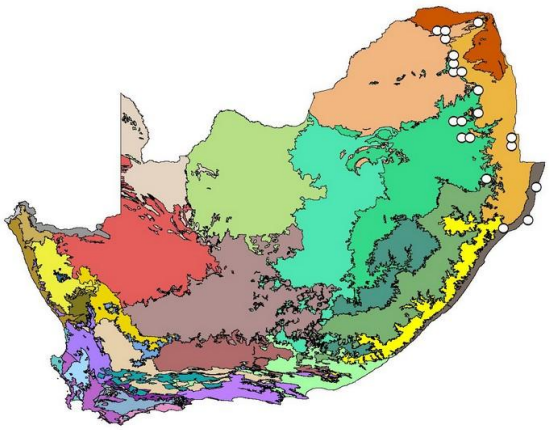
Tephrosia glomeruliflora Meisn. subsp. *meisneri* (Hutch. & Burtt Davy) Schrire

Millettieae ①

Herb, shrub; P; Ht 0.2–1.5; Alt 30–1260

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (38)	Indian Ocean Coastal Belt; Lowveld (25)
Biome	Savanna (60)	Grassland; Indian Ocean (20)
Rainfall (mm)	600–1000 (40)	>800 (25)
Min temp (°C)	2–8 (50)	>6 (30)
Max temp (°C)	25–29 (50)	27–35 (40)
Phosphorus (ppm)	<10 (65)	5–35 (35)
pH	<6.4 (70)	5.5–7.4 (15)
Sodic	Non (100)	
QDGCs	2430; 2530 (15)	2229; 2330; 2630; 2631 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979; Grobbelaar *et al.* 1983).



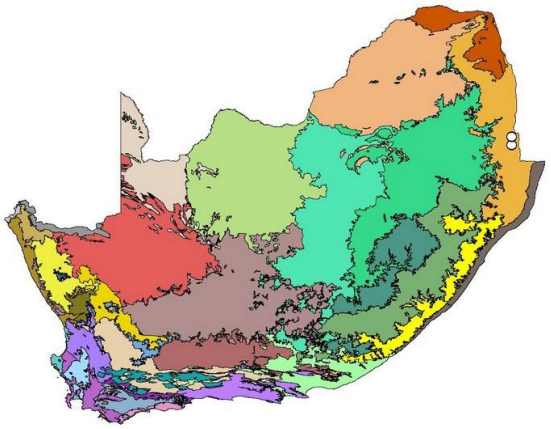
Tephrosia gobensis Brummitt

Millettieae ①

Shrub; P; Ht ?; Alt 229–458

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
Sodic	Non (100)	
QDGCs	2631 (100)	

NOTES: –



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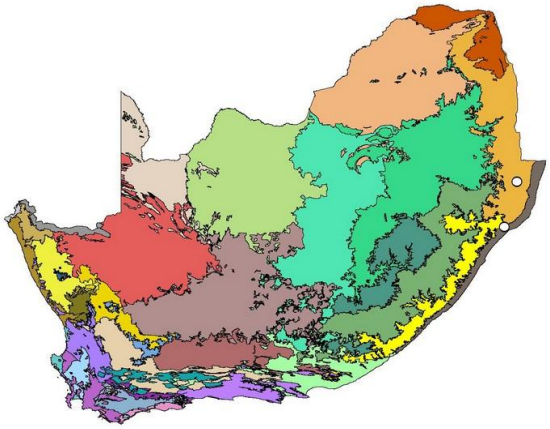
[E]*Tephrosia gracilenta* H.M.L.Forbes

Millettieae ①

Herb; P; Ht ?; Alt ?–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800; >800 (50)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 5.5–7.4 (50)	
Sodic	Non (100)	
QDGCs	2732; 2831 (50)	

NOTES: –



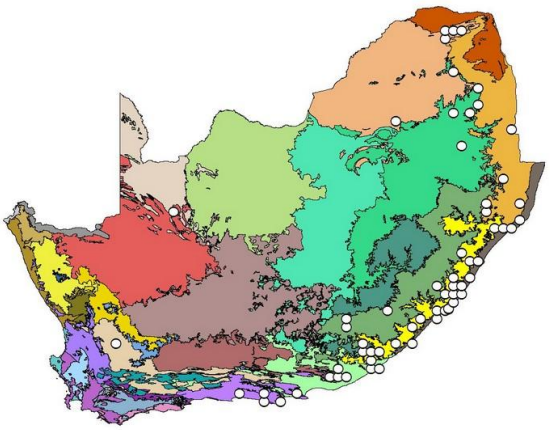
[E]*Tephrosia grandiflora* (Aiton) Pers.

Millettieae ☠ ③

Shrub; P; Ht 0.6–5; Alt 6–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (19)	Sub-Escarpment Grassland; Central Bushveld; Lowveld (14)
Biome	Savanna (35)	Grassland (25)
Rainfall (mm)	>800 (43)	400–800 (33)
Min temp (°C)	2–8 (46)	>6 (43)
Max temp (°C)	25–29 (75)	27–35 (13)
Phosphorus (ppm)	<10; 5–35 (49)	>20 (2)
pH	<6.4 (61)	5.5–7.4 (26)
Sodic	Non (90)	Medium (5)
QDGCs	3030; 3129 (10)	2831; 3227 (8)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Toxic (Hutchings *et al.* 1996); No alkaloids in leaf (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Insecticide; medicine for humans; piscicide (Watt & Breyer-Brandwijk 1962). **Flowering:** All seasons (Pooley 1998).



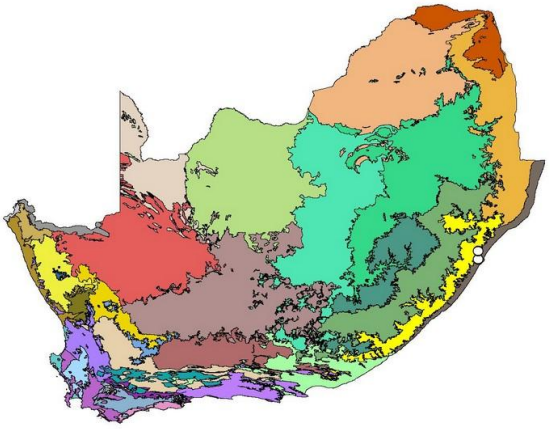
[E]*Tephrosia inandensis* H.M.L.Forbes

Millettieae ①

Dwarf shrub; P; Ht 0.01–1.5; Alt ?–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 5.5–7.4 (50)	
Sodic	Ecotone	
QDGCs	2930 (100)	

NOTES: –



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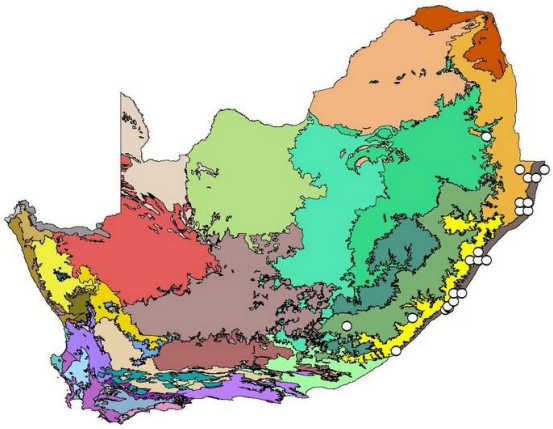
Tephrosia kraussiana Meisn.

Millettieae ①

Dwarf shrub, herb; P; Ht 0.4–1; Alt 9–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (63)	Lowveld (25)
Biome	Indian Ocean (63)	Savanna (25)
Rainfall (mm)	>800 (65)	400–800 (25)
Min temp (°C)	>6 (80)	2–8 (15)
Max temp (°C)	25–29 (55)	27–35 (45)
Phosphorus (ppm)	<10 (65)	5–35 (35)
pH	<6.4 (50)	5.5–7.4 (40)
Sodic	Non (100)	
QDGCs	2732; 2832 (18)	2930 (14)

NOTES: **Antiquality:** Saponin in roots (Watt & Breyer-Brandwijk 1962). **Biocultural:** Magical (Hutchings *et al.* 1996); Medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Autumn (Manning 2001).



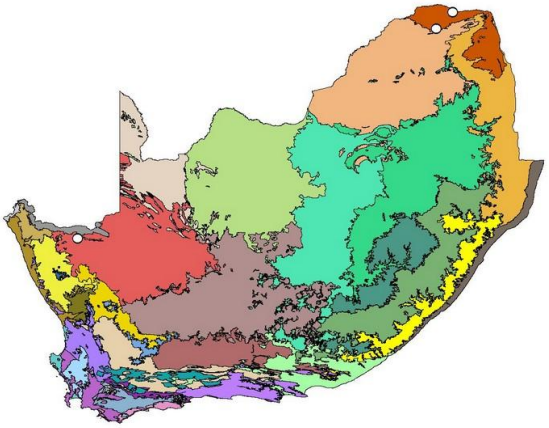
Tephrosia limpopoensis J.B.Gillett

Millettieae ①

Herb; P; Ht 0.13–0.5; Alt 793–1168

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (67)	200–600 (33)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29; 27–35; >33 (33)	
Phosphorus (ppm)	5–35 (67)	>20 (33)
pH	>7.5 (67)	6.5–8.4 (33)
Sodic	Non (100)	
QDGCs	2229; 2230; 2918 (33)	

NOTES: –



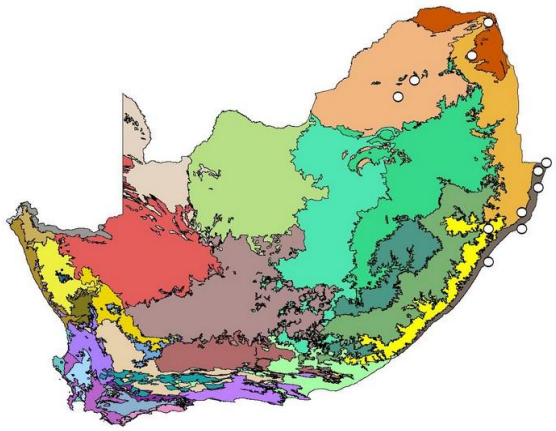
Tephrosia linearis (Willd.) Pers.

Millettieae ①

Herb; A; Ht 0.7–6; Alt 46–60

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (63)	Central Bushveld (25)
Biome	Savanna (56)	Indian Ocean (44)
Rainfall (mm)	400–800 (55)	>800 (36)
Min temp (°C)	>6 (82)	2–8 (18)
Max temp (°C)	27–35 (82)	25–29 (18)
Phosphorus (ppm)	<10 (64)	5–35 (36)
pH	5.5–7.4 (64)	<6.4 (27)
Sodic	Non (100)	
QDGCs	2428; 2732; 2832 (18)	2231; 2330; 2632; 2831; 2931 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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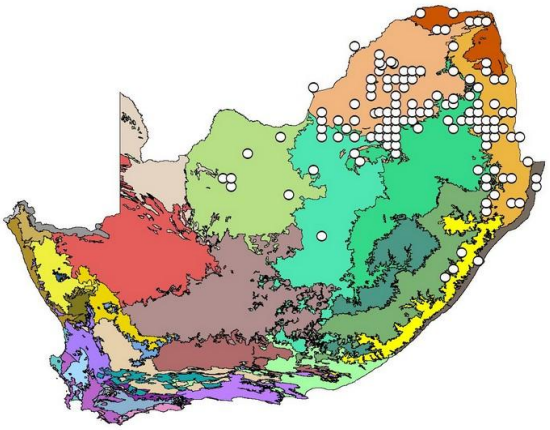
Tephrosia longipes Meisn. subsp. *longipes* var. *longipes*

Millettieae ①❖

Dwarf shrub, shrub, herb; P; Ht 0.8–5; Alt 427–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (52)	Lowveld (18)
Biome	Savanna (85)	Grassland (11)
Rainfall (mm)	400–800 (65)	>800 (16)
Min temp (°C)	2–8 (54)	0–4; >6 (18)
Max temp (°C)	27–35 (53)	25–29 (41)
Phosphorus (ppm)	<10 (85)	5–35 (15)
pH	<6.4 (54)	5.5–7.4 (26)
Sodic	Non (100)	
QDGCs	2528 (8)	2428; 2530 (7)

NOTES: **CP:** Plant 15% (Nezomba *et al.* 2009). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1975). **Soil conservation:** Organic N (Nezomba *et al.* 2009). **Biocultural:** Magical; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer, autumn (Germishuizen & Clarke 2003).



Tephrosia longipes Meisn. subsp. *longipes* var. *uncinata* Harv.

Millettieae ①

Unknown

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
Sodic		
QDGCs	No records	

NOTES: **CP:** Plant 15% (Nezomba *et al.* 2009). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Soil conservation:** Organic N (Nezomba *et al.* 2009). **Biocultural:** Magical; medicine for humans (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer, autumn (Germishuizen & Clarke 2003).

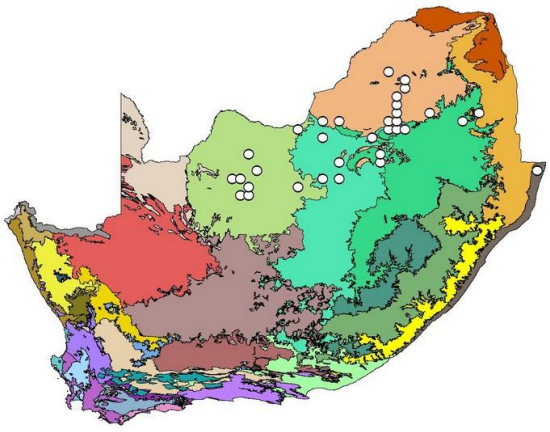
Tephrosia lupinifolia DC.

Millettieae ☠①

Herb; P; Ht 0.1–1; Alt 55–1713

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (42)	Eastern Kalahari Bushveld (38)
Biome	Savanna (74)	Grassland (21)
Rainfall (mm)	400–800 (74)	<400 (15)
Min temp (°C)	<2 (41)	2–8 (35)
Max temp (°C)	27–35 (68)	25–29 (18)
Phosphorus (ppm)	<10 (94)	5–35 (6)
pH	<6.4 (44)	6.5–7.4 (29)
Sodic	Non (100)	
QDGCs	2528 (21)	2723 (15)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Poison for abortion and suicide (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Pooley 1998).



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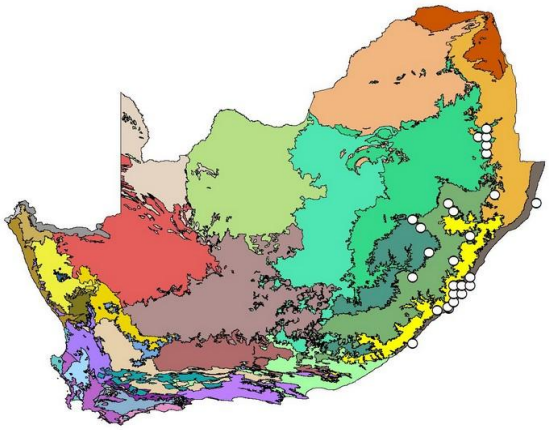
Tephrosia macropoda (E.Mey.) Harv. var. *diffusa* (E.Mey.) Schrire

Millettieae ☠③

Herb; P; Ht 0.06–0.6; Alt 10–1952

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (75)	Sub-Escarpment Grassland (25)
Biome	Grassland (56)	Indian Ocean (44)
Rainfall (mm)	>800 (84)	600–1000 (16)
Min temp (°C)	>6 (44)	2–8 (32)
Max temp (°C)	25–29 (80)	<27 (16)
Phosphorus (ppm)	<10 (80)	5–35 (20)
pH	<6.4 (92)	5.5–7.4; 6.5–7.4 (4)
Sodic	Non (100)	
QDGCs	3030 (23)	2631 (12)



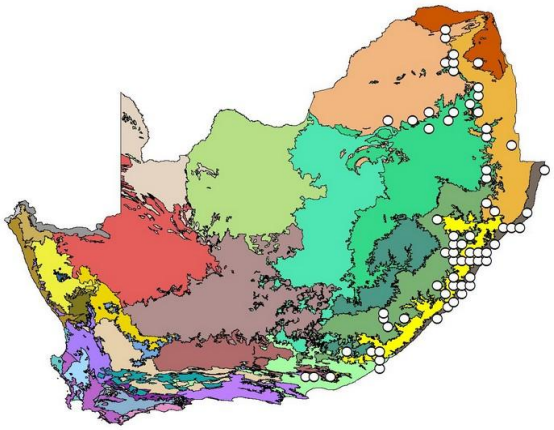
NOTES: **Antiquality:** Plant toxic to livestock (Hutchings *et al.* 1996); Roots toxic (Steyn 1934); Hydrocyanic acid (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Green manure (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Steyn 1934); Insecticide; medicine for humans and livestock; piscicide (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Pooley 1998).

Tephrosia macropoda (E.Mey.) Harv. var. *macropoda*

Millettieae ☠③

Herb; P; Ht 0.2–2; Alt 2–1678

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (42)	Sub-Escarpment Grassland (19)
Biome	Indian Ocean (38)	Grassland (33)
Rainfall (mm)	>800 (54)	400–800; 600–1000 (21)
Min temp (°C)	2–8 (51)	>6 (34)
Max temp (°C)	25–29 (67)	27–35 (21)
Phosphorus (ppm)	<10 (66)	5–35 (34)
pH	<6.4 (73)	5.5–7.4 (25)
Sodic	Non (100)	
QDGCs	2930 (16)	3030 (9)



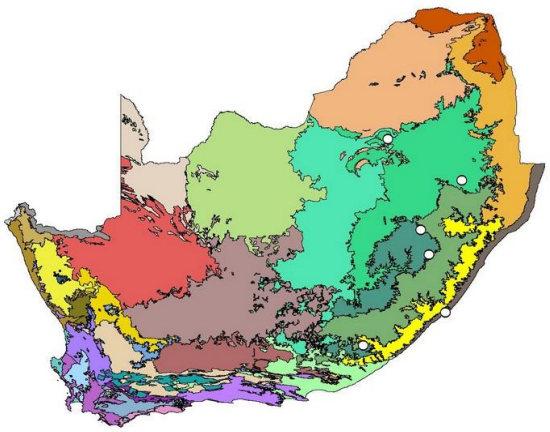
NOTES: **Antiquality:** Plant toxic to livestock (Hutchings *et al.* 1996); Roots toxic (Steyn 1934); Hydrocyanic acid (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Green manure (Watt & Breyer-Brandwijk 1962). **Biocultural:** Medicine for humans (Steyn 1934); Insecticide; medicine for humans and livestock; piscicide (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Pooley 1998).

[E]*Tephrosia marginella* H.M.L.Forbes

Millettieae ①

Herb; P; Ht 0.01–0.33; Alt 1158–2135

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Mesic Highveld Grassland (50)	
Biome	Grassland (75)	Indian Ocean (25)
Rainfall (mm)	>800 (67)	400–800 (33)
Min temp (°C)	<2; 0–4 (33)	2–8; >6 (17)
Max temp (°C)	25–29 (83)	<27 (17)
Phosphorus (ppm)	<10 (83)	5–35 (17)
pH	<6.4 (100)	
Sodic	Non (100)	
QDGCs	2628; 2730; 2829; 2929; 3130; 3227 (16)	



NOTES: **Biocultural:** Magical (Hutchings *et al.* 1996). **Flowering:** Summer (Pooley 2003).

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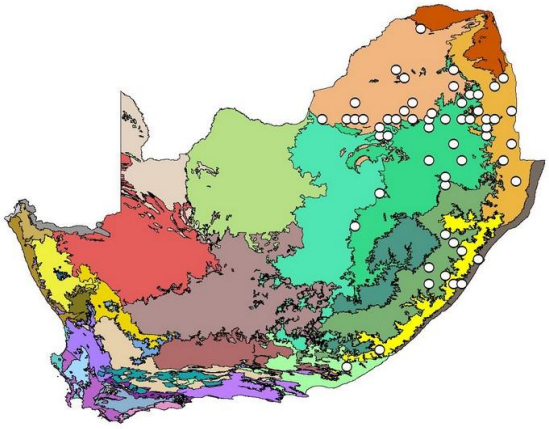
Tephrosia multijuga R.G.N.Young

Millettieae ③

Dwarf shrub, shrub, herb; P; Ht 1–1.5; Alt 430–1800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (43)	Mesic Highveld Grassland (23)
Biome	Savanna (55)	Grassland (41)
Rainfall (mm)	400–800 (53)	>800 (28)
Min temp (°C)	2–8 (45)	0–4 (28)
Max temp (°C)	25–29 (47)	27–35 (38)
Phosphorus (ppm)	<10 (88)	5–35 (12)
pH	<6.4 (64)	5.5–7.4 (22)
Sodic	Non (100)	
QDGCs	2528 (9)	2430; 2527; 2529; 2530; 2531 (7)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer, autumn (Pooley 1998).



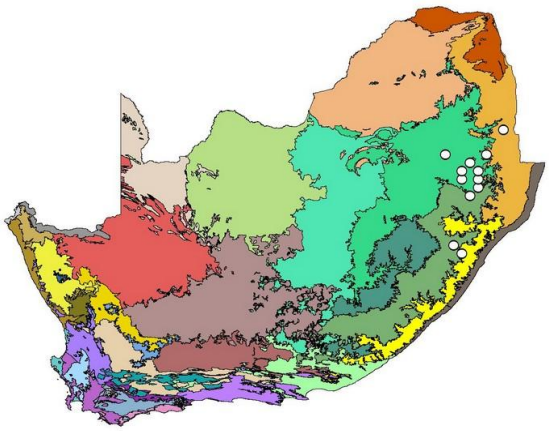
Tephrosia natalensis H.M.L.Forbes subsp. *natalensis*

Millettieae ①

Herb; P; Ht 0.01–0.12; Alt 1600–1678

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (57)	Sub-Escarpment Grassland (29)
Biome	Grassland (86)	Savanna (14)
Rainfall (mm)	600–1000 (58)	>800 (33)
Min temp (°C)	0–4 (50)	2–8 (33)
Max temp (°C)	25–29 (58)	27–35 (25)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (84)	5.5–7.4; 6.5–7.4 (8)
Sodic	Non (100)	
QDGCs	2730 (50)	2930 (17)

NOTES: –



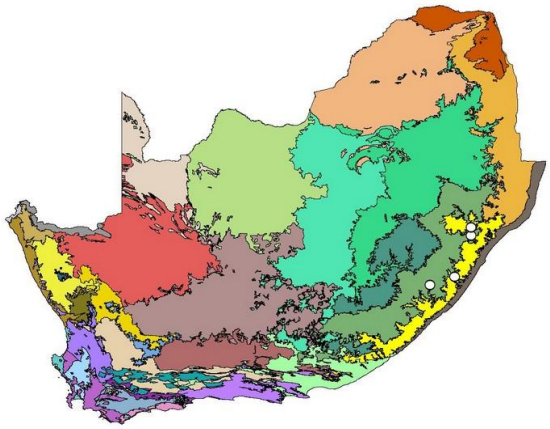
[E] *Tephrosia natalensis* H.M.L.Forbes subsp. *pseudocapitata* (H.M.L.Forbes) Schrire

Millettieae ①

Herb; P; Ht ?; Alt 1068–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Ecotone	
Rainfall (mm)	>800 (75)	600–1000 (25)
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	<10 (75)	5–35 (25)
pH	<6.4 (75)	5.5–7.4 (25)
Sodic	Non (100)	
QDGCs	2830; 2930; 3029; 3030 (25)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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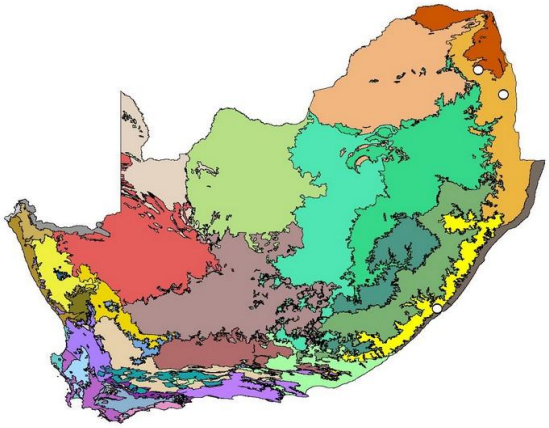
Tephrosia noctiflora Bojer ex Baker

Millettieae ①

Dwarf shrub; P; Ht 0.6–1.5; Alt ?–458

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (67)	>800 (33)
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (67)	25–29 (33)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	5.5–7.4 (67)	<6.4 (33)
Sodic	Non (100)	
QDGCs	2430; 2431; 3129 (33)	

NOTES: –



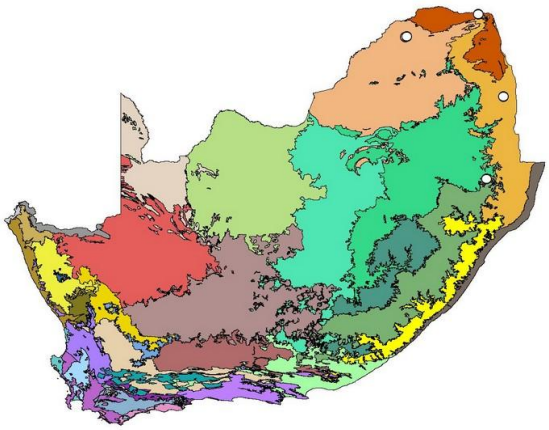
[E]*Tephrosia pietersii* H.M.L.Forbes

Millettieae ①

Herb; P; Ht 0.01–0.2; Alt 300–854

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Lowveld (50)	
Biome	Savanna (100)	
Rainfall (mm)	200–600; 400–800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	5.5–7.4 (50)	<6.4; 6.5–7.4 (25)
Sodic	Non (100)	
QDGCs	2328 (40)	2230; 2431; 2731 (20)

NOTES: –



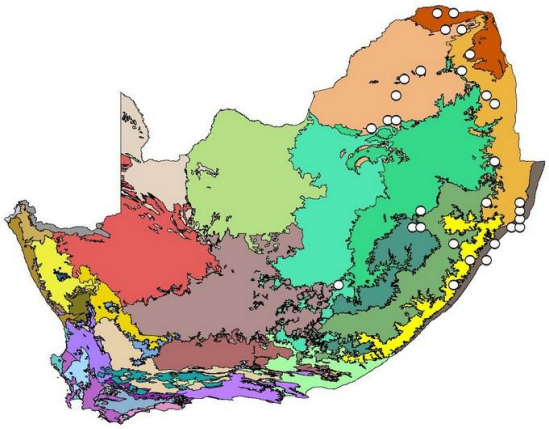
Tephrosia polystachya E.Mey. var. *hirta* Harv.

Millettieae ③

Herb, shrub; P; Ht 0.01–1.4; Alt 6–1340

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (27)	Central Bushveld; Lowveld; Mopane (20)
Biome	Savanna (56)	Grassland (25)
Rainfall (mm)	>800 (37)	400–800 (33)
Min temp (°C)	2–8; >6 (40)	<2; 0–4 (10)
Max temp (°C)	27–35 (57)	25–29 (33)
Phosphorus (ppm)	<10 (77)	5–35 (23)
pH	<6.4 (63)	5.5–7.4 (23)
Sodic	Non (100)	
QDGCs	2832 (13)	2229; 2230; 2428; 2528; 2829; 2831; 2930; 2931 (7)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Organic N (Morris 1997). **Flowering:** Summer, autumn (Pooley 1998).



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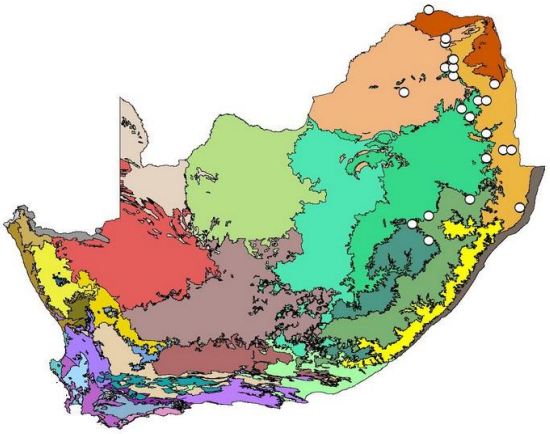
Tephrosia polystachya E.Mey. var. *latifolia* Harv.

Millettieae ③

Dwarf shrub, shrub; P; Ht 0.4–5; Alt 1080–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (44)	Central Bushveld (22)
Biome	Savanna (64)	Grassland (36)
Rainfall (mm)	600–1000 (41)	>800 (27)
Min temp (°C)	2–8 (55)	20–4; >6 (3)
Max temp (°C)	25–29 (55)	27–35 (36)
Phosphorus (ppm)	<10 (68)	5–35 (32)
pH	<6.4 (68)	5.5–7.4 (18)
Sodic	Non (100)	
QDGCs	2631 (14)	2229; 2329; 2330; 2430; 2431; 2530 (9)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Soil conservation:** Organic N (Morris 1997).



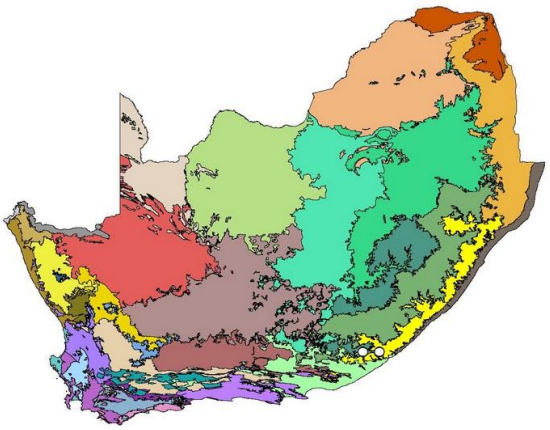
[E]*Tephrosia polystachya* E.Mey. var. *longidens* H.M.L.Forbes

Millettieae ③

Dwarf shrub, shrub; P; Ht 0.6–0.8; Alt 366–1220

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	600–1000 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
Sodic	Ecotone	
QDGCs	3227 (100)	

NOTES: **Soil conservation:** Organic N (Morris 1997).



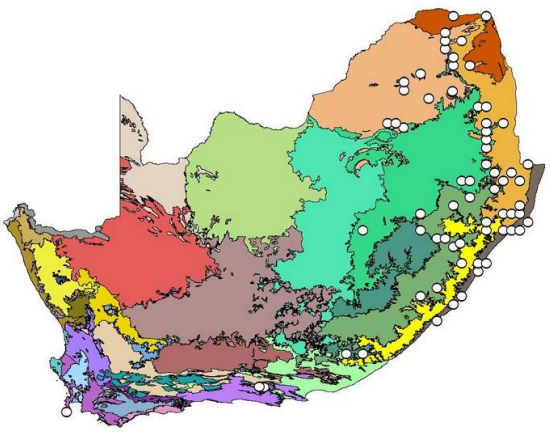
Tephrosia polystachya E.Mey. var. *polystachya*

Millettieae ③

Dwarf shrub, shrub, herb; P; Ht 0.05–5; Alt 6–1700

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Lowveld (26)	Central Bushveld (22)
Biome	Savanna (52)	Grassland (26)
Rainfall (mm)	>800 (45)	400–800 (30)
Min temp (°C)	2–8 (45)	>6 (36)
Max temp (°C)	25–29 (59)	27–35 (35)
Phosphorus (ppm)	<10 (70)	5–35 (30)
pH	<6.4 (65)	5.5–7.4 (27)
Sodic	Non (100)	
QDGCs	2831 (9)	2330; 2528; 2531; 2731; 2832; 2930 (6)

NOTES: **Soil conservation:** Organic N (Morris 1997).



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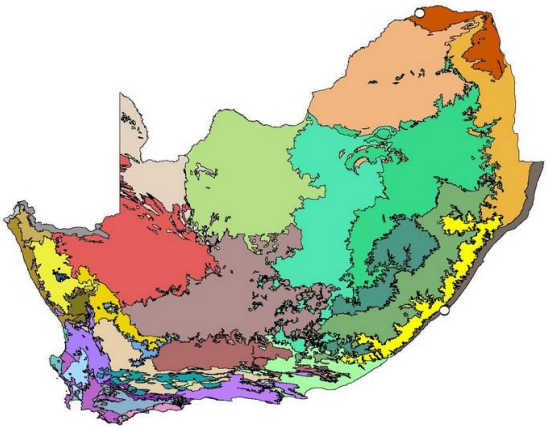
[E]*Tephrosia pondoensis* (Codd) Schrire

Millettieae ①

Tree; P; Ht 1.5–3; Alt ?–366

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400; >800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4; >7.5 (50)	
Sodic	Non (100)	
QDGCs	2229; 3129 (50)	

NOTES: –



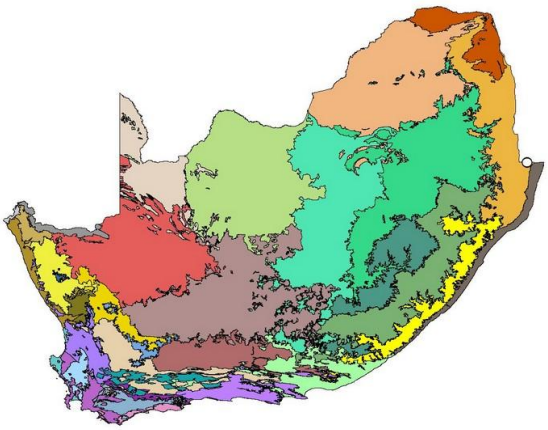
Tephrosia pumila (Lam.) Pers. var. *pumila*

Millettieae ①

Herb; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
Sodic	Non (100)	
QDGCs	2632 (100)	

NOTES: –



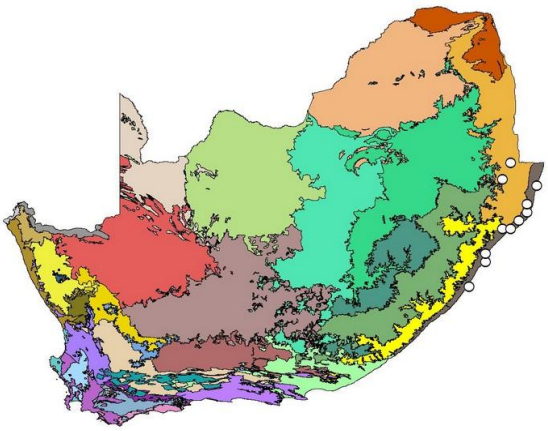
Tephrosia purpurea (L.) Pers. subsp. *canescens* (E.Mey.) Brummitt

Millettieae ☠③

Herb; P; Ht 0.3–1; Alt 1–460

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (86)	Lowveld (14)
Biome	Indian Ocean (83)	Savanna (17)
Rainfall (mm)	>800 (73)	400–800 (18)
Min temp (°C)	>6 (91)	2–8 (9)
Max temp (°C)	27–35 (82)	25–29 (18)
Phosphorus (ppm)	<10 (91)	5–35 (9)
pH	<6.4 (55)	5.5–7.4 (36)
Sodic	Non (100)	
QDGCs	2832 (25)	2732; 2831; 2931 (17)

NOTES: **Livestock feed** (Le Houérou 1980). **Cultivated** (Glen 2002). **CP:** 9% (Nezomba *et al.* 2007). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983); *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Antiquality:** Alkaloids in leaves; flavonoids in roots (Hutchings *et al.* 1996); Tephrosin in root (Watt & Breyer-Brandwijk 1962). **Soil conservation:** Green manure (Watt & Breyer-Brandwijk 1962). **Ecology:** Seed (Tauro *et al.* 2007). **Biocultural:** Dye; medicine for humans; piscicide (Watt & Breyer-Brandwijk 1962). **Flowering:** All seasons (Pooley 1998).



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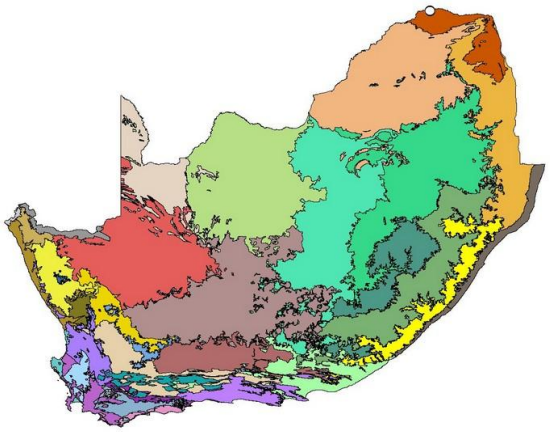
***Tephrosia purpurea* (L.) Pers. subsp. *leptostachya* (DC.) Brummitt var. *delagoensis* (H.M.L.Forbes) Brummitt** **Millettieae** ③

Dwarf shrub; P; Ht 0.6–0.7; Alt 500–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
Sodic	Non (100)	
QDGCs	2229 (100)	

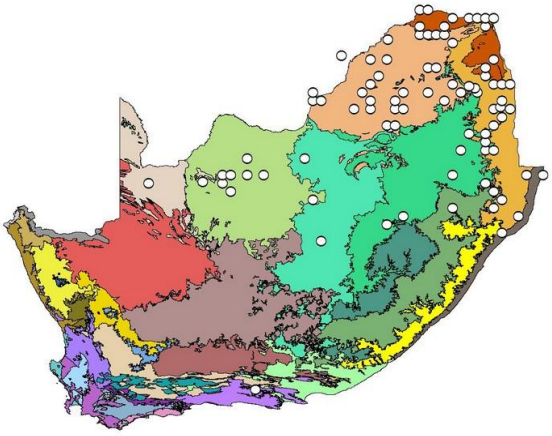


NOTES: **Livestock feed** (Le Houérou 1980). **Cultivated** (Glen 2002). **CP:** 9% (Nezomba *et al.* 2007). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975); *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Antiquality:** Alkaloids in leaves; flavonoids in roots (Hutchings *et al.* 1996); Tephrosin in root (Watt & Breyer-Brandwijk 1962). **Soil conservation:** Green manure (Watt & Breyer-Brandwijk 1962). **Ecology:** Seed (Tauro *et al.* 2007). **Biocultural:** Dye; medicine for humans; piscicide (Watt & Breyer-Brandwijk 1962). **Flowering:** All seasons (Pooley 1998).

Tephrosia purpurea* (L.) Pers. subsp. *leptostachya* (DC.) Brummitt var. *leptostachya **Millettieae** ③

Herb; P; Ht 0.1–3; Alt 150–1518

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (41)	Lowveld; Eastern Kalahari Bushveld; Mopane (16)
Biome	Savanna (88)	Grassland (10)
Rainfall (mm)	400–800 (51)	<400 (16)
Min temp (°C)	2–8 (49)	>6 (29)
Max temp (°C)	27–35 (60)	25–29 (26)
Phosphorus (ppm)	<10 (65)	5–35 (35)
pH	<6.4 (32)	5.5–7.4 (26)
Sodic	Non (100)	
QDGCs	2229 (9)	2531 (7)



NOTES: **Livestock feed** (Le Houérou 1980). **Cultivated** (Glen 2002). **CP:** 9% (Nezomba *et al.* 2007). **N_2 fixation:** *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Antiquality:** Alkaloids in leaves; flavonoids in roots (Hutchings *et al.* 1996); Tephrosin in root (Watt & Breyer-Brandwijk 1962). **Soil conservation:** Green manure (Watt & Breyer-Brandwijk 1962). **Ecology:** Seed (Tauro *et al.* 2007). **Biocultural:** Dye; medicine for humans; piscicide (Watt & Breyer-Brandwijk 1962). **Flowering:** All seasons (Pooley 1998).

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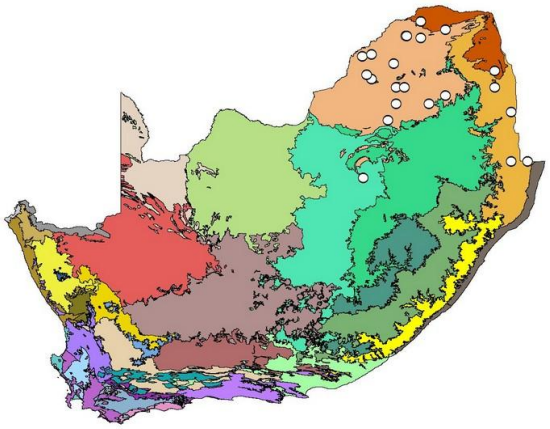
Tephrosia purpurea (L.) Pers. subsp. *leptostachya* (DC.) Brummitt var. *pubescens* Baker

Millettieae ☠③

Herb; A; Ht 0.2–4; Alt 8–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (65)	Lowveld (24)
Biome	Savanna (94)	Grassland (6)
Rainfall (mm)	400–800 (76)	200–600 (14)
Min temp (°C)	2–8 (71)	>6 (24)
Max temp (°C)	27–35 (71)	25–29 (29)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	5.5–7.4 (43)	6.5–7.4; 6.5–8.4 (19)
Sodic	Non (100)	
QDGCs	2328 (14)	2229; 2327; 2427; 2428; 2431; 2528 (9)



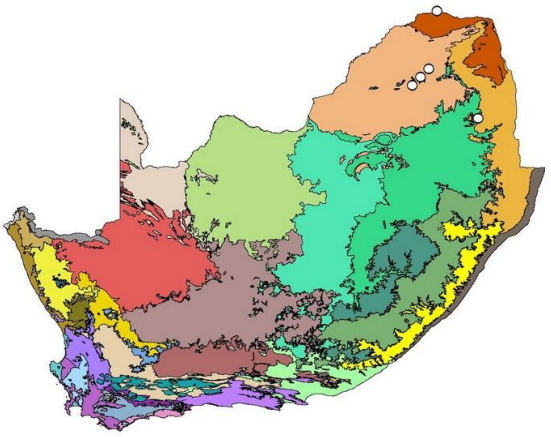
NOTES: **Livestock feed** (Le Houérou 1980). **Cultivated** (Glen 2002). **CP:** 9% (Nezomba *et al.* 2007). **N_2 fixation:** *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000); Nodulated (Grobbelaar & Clarke 1972). **Antiquality:** Alkaloids in leaves; flavonoids in roots (Hutchings *et al.* 1996); Tephrosin in root (Watt & Breyer-Brandwijk 1962). **Soil conservation:** Green manure (Watt & Breyer-Brandwijk 1962). **Ecology:** Seed (Tauro *et al.* 2007). **Biocultural:** Dye; medicine for humans; piscicide (Watt & Breyer-Brandwijk 1962). **Flowering:** All seasons (Pooley 1998).

Tephrosia radicans Baker

Millettieae ①

Herb; P; Ht 0.01–0.4; Alt 1128–1403

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (67)	Mopane (33)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (60)	<400; >800 (20)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (60)	27–35 (40)
Phosphorus (ppm)	5–35 (60)	<10 (40)
pH	<6.4; 5.5–7.4 (40)	6.5–8.4 (20)
Sodic	Non (100)	
QDGCs	2229; 2329; 2428; 2429; 2530 (20)	



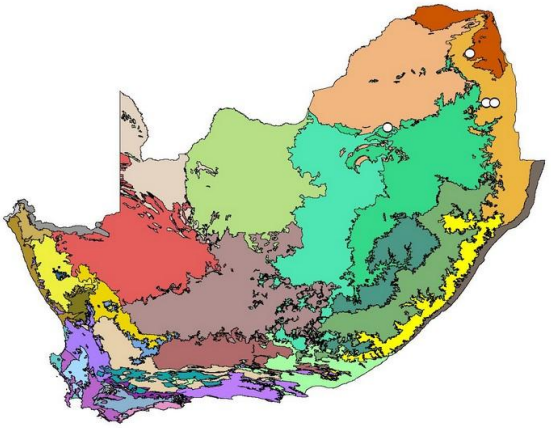
NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Ecology:** Seed (Tauro *et al.* 2007).

Tephrosia reptans Baker var. *reptans*

Millettieae ①

Shrub; P; Ht 0.7–3.5; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (67)	Mopane (33)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (75)	>800 (25)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (75)	5.5–7.4 (25)
Sodic	Non (100)	
QDGCs	2531 (50)	2330; 2528 (25)



NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).

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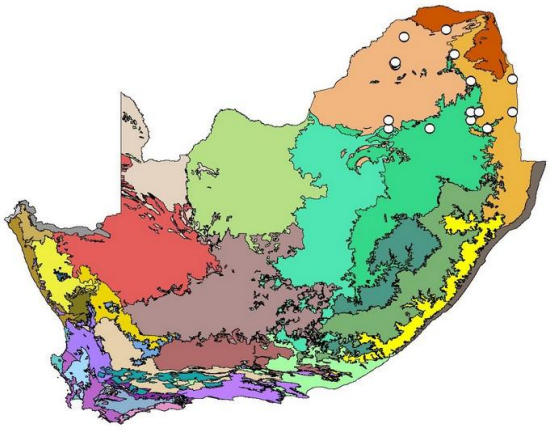
Tephrosia retusa Burtt Davy

Millettieae ①

Herb; P; Ht 0.3–1.5; Alt 235–763

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (50)	Lowveld (33)
Biome	Savanna (83)	Grassland (17)
Rainfall (mm)	400–800 (50)	>800 (29)
Min temp (°C)	2–8 (79)	>6 (14)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (79)	5–35 (21)
pH	<6.4 (64)	5.5–7.4; 6.5–7.4 (14)
Sodic	Non (100)	
QDGCs	2328 (25)	2530 (18)

NOTES: –



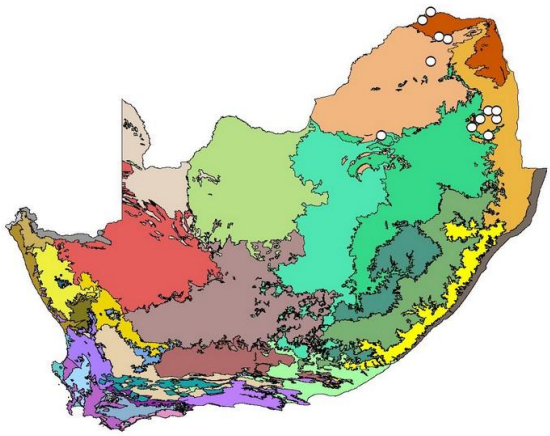
Tephrosia rhodesica Baker f. var. *evansii* (Hutch. & Burtt Davy) Brummitt

Millettieae ③

Dwarf shrub, shrub; P; Ht 0.5–1.5; Alt 275–1373

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (50)	Mopane (33)
Biome	Savanna (100)	
Rainfall (mm)	>800 (33)	200–600 (25)
Min temp (°C)	2–8 (75)	>6 (17)
Max temp (°C)	27–35 (58)	25–29 (42)
Phosphorus (ppm)	<10 (58)	5–35 (42)
pH	<6.4 (58)	6.5–8.4 (33)
Sodic	Non (100)	
QDGCs	2229; 2531 (33)	2530 (17)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Soil conservation:** Organic N (Morris 1997). **Flowering:** Summer (Germishuizen & Clarke 2003).



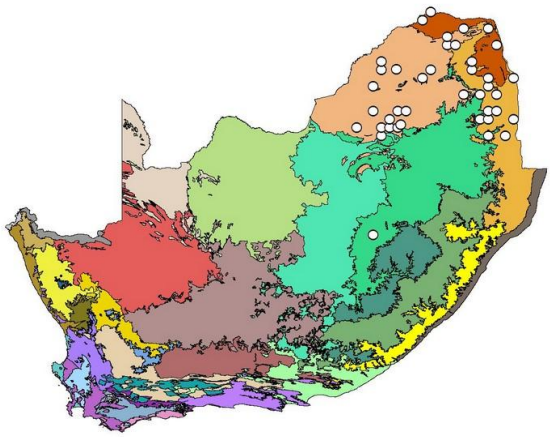
Tephrosia rhodesica Baker f. var. *rhodesica*

Millettieae ③

Dwarf shrub, shrub, herb; P; Ht 0.5–3; Alt 300–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (50)	Lowveld (31)
Biome	Savanna (97)	Grassland (3)
Rainfall (mm)	400–800 (67)	>800 (13)
Min temp (°C)	2–8 (59)	>6 (31)
Max temp (°C)	27–35 (74)	25–29 (26)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (44)	5.5–7.4 (31)
Sodic	Non (100)	
QDGCs	2528; 2531 (15)	2431; 2527 (10)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Soil conservation:** Organic N (Morris 1997). **Flowering:** Summer (Germishuizen & Clarke 2003).



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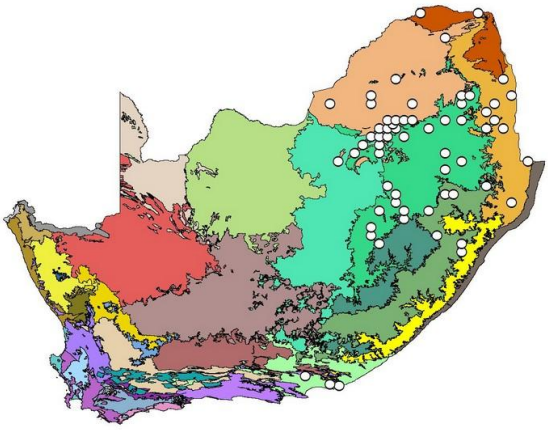
Tephrosia semiglabra Sond.

Millettieae ①

Herb; P; Ht 0.1–4; Alt 793–1891

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (43)	Central Bushveld (23)
Biome	Grassland (61)	Savanna (39)
Rainfall (mm)	400–800 (69)	>800 (15)
Min temp (°C)	2–8 (33)	<2 (26)
Max temp (°C)	25–29 (46)	27–35 (39)
Phosphorus (ppm)	<10 (85)	5–35 (15)
pH	<6.4 (61)	5.5–7.4 (21)
Sodic	Non (100)	
QDGCs	2528 (13)	2627 (10)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



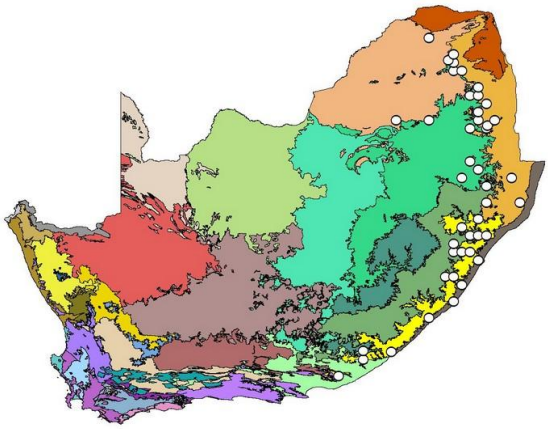
Tephrosia shiluwanensis Schinz

Millettieae ①

Dwarf shrub, shrub, herb; P; Ht 0.3–2; Alt 763–1980

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (30)	Mesic Highveld Grassland; Sub-Escarpment Grassland; Central Bushveld (20)
Biome	Grassland; Savanna (50)	
Rainfall (mm)	>800 (51)	600–1000 (28)
Min temp (°C)	2–8 (65)	>6 (23)
Max temp (°C)	25–29 (72)	27–35 (21)
Phosphorus (ppm)	<10 (70)	5–35 (30)
pH	<6.4 (72)	5.5–7.4 (23)
Sodic	Non (100)	
QDGCs	2930 (16)	2430 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Summer, autumn (Pooley 1998).



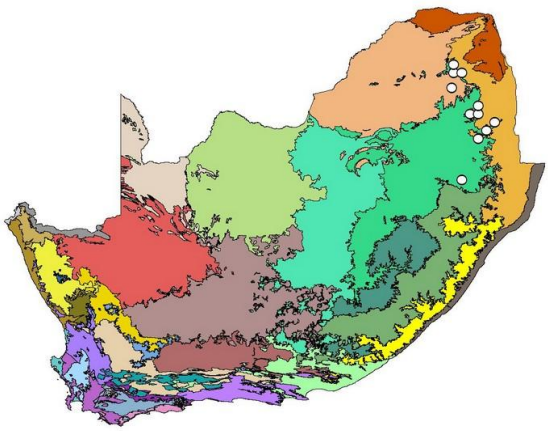
[E]*Tephrosia subulata* Hutch. & Burtt Davy

Millettieae ①

Dwarf shrub, shrub; P; Ht 0.01–2; Alt 1220–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Central Bushveld (50)	
Biome	Grassland; Savanna (50)	
Rainfall (mm)	>800 (64)	400–800; 600–100 (18)
Min temp (°C)	2–8 (82)	0–4; >6 (9)
Max temp (°C)	25–29 (82)	27–35 (18)
Phosphorus (ppm)	<10 (73)	5–35 (27)
pH	<6.4 (82)	5.5–7.4; >7.5 (9)
Sodic	Non (100)	
QDGCs	2430; 2530 (27)	2531 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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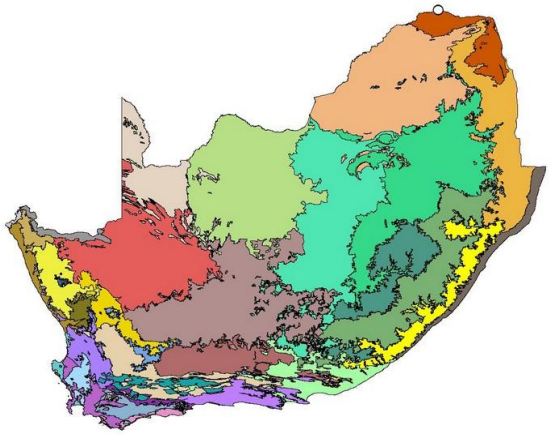
Tephrosia uniflora Pers. subsp. *uniflora*

Millettieae ③

Shrub; P; Ht 0.51–1; Alt 350–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
Sodic	Non (100)	
QDGCs	2229 (100)	

NOTES: **Livestock feed** (Morgan 1981). **Soil conservation:** Organic N (Morris 1997).



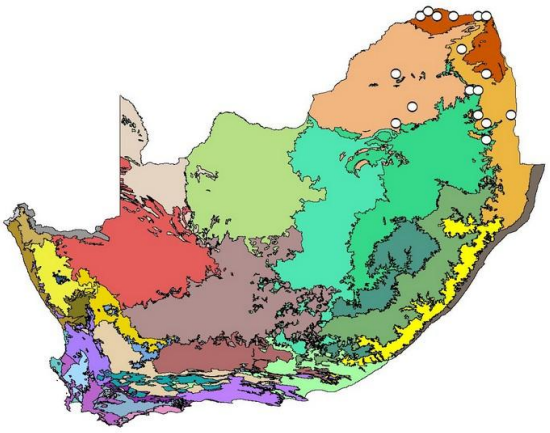
Tephrosia villosa (L.) Pers. subsp. *ehrenbergiana* (Schweinf.) Brummitt var. *daviesii* Brummitt

Millettieae ③

Dwarf shrub, herb; A; Ht 0.3–1.3; Alt 366–458

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (44)	Central Bushveld (33)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (41)	<400; >800 (24)
Min temp (°C)	2–8 (65)	>6 (35)
Max temp (°C)	27–35 (65)	25–29 (29)
Phosphorus (ppm)	<10 (65)	5–35 (35)
pH	<6.4; 5.5–7.4 (29)	6.5–7.4; 6.5–8.4 (18)
Sodic	Non (100)	
QDGCs	2229 (18)	2230; 2430; 2528; 2531 (12)

NOTES: **Cultivated** (Anonymous 1999). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975); *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Soil conservation:** Organic N (Morris 1997).



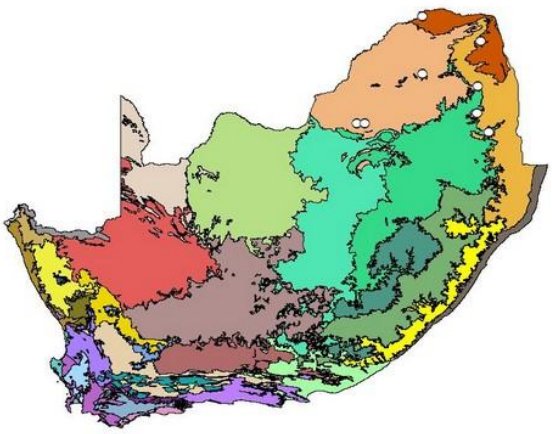
Tephrosia villosa (L.) Pers. subsp. *ehrenbergiana* (Schweinf.) Brummitt var. *ehrenbergiana*

Millettieae ③

Dwarf shrub, herb; A; Ht 0.01–2; Alt 315–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Mopane (40)	Lowveld (20)
Biome	Savanna (100)	
Rainfall (mm)	400–800 (63)	>800 (25)
Min temp (°C)	2–8 (50)	0–4; >6 (25)
Max temp (°C)	27–35 (63)	25–29 (38)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (61)	5.5–7.4; 6.5–7.4; 6.5–8.4 (13)
Sodic	Non (100)	
QDGCs	2229; 2527 (22)	2330; 2429; 2430; 2530; 2531 (11)

NOTES: **Cultivated** (Anonymous 1999). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975); *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Soil conservation:** Organic N (Morris 1997).



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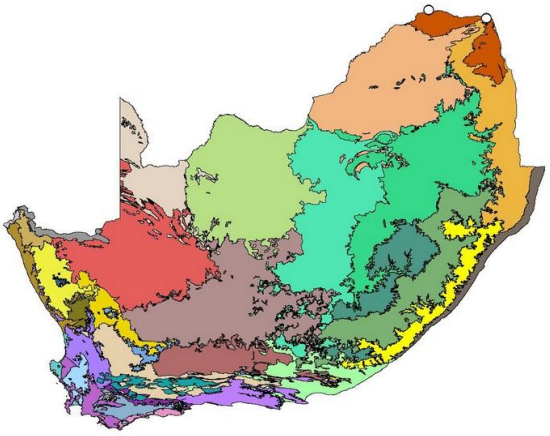
[E]*Tephrosia virgata* H.M.L.Forbes

Millettieae ①

Dwarf shrub; P; Ht 0.01–0.2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	27–35; >33 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4; 6.5–8.4 (50)	
Sodic	Non (100)	
QDGCs	2229; 2231 (50)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



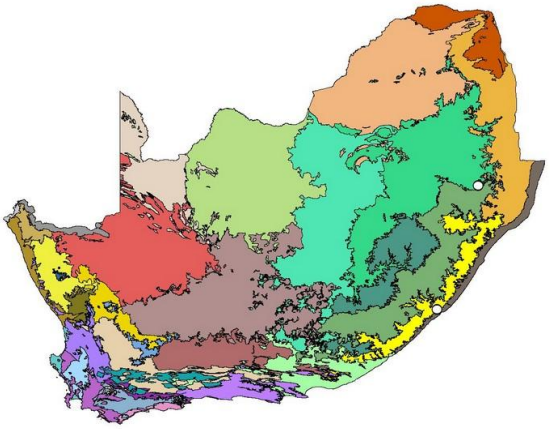
Tephrosia vogelii Hook.f.

Millettieae ☠③

Herb; P; Ht 0.01–2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	600–1000; >800 (50)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
Sodic	Ecotone	
QDGCs	2730; 3129 (50)	

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Antiquality:** Tephrosin in leaves (Steyn 1934). **Soil conservation:** Cover crop (Sampson 1928). **Biocultural:** Medicine for humans (Steyn 1934); Dye; insecticide; medicine for humans; piscicide (Watt & Breyer-Brandwijk 1962).



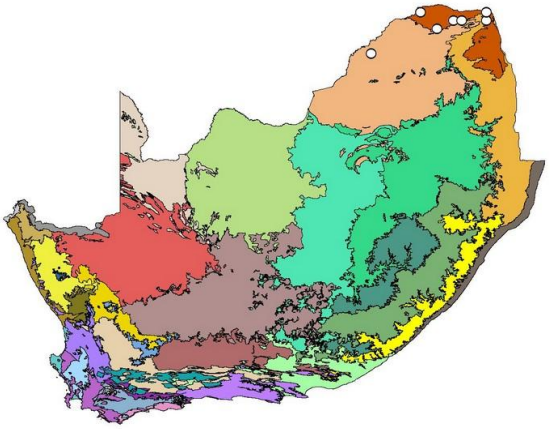
Tephrosia zoutpansbergensis Bremek.

Millettieae ①

Dwarf shrub, shrub; P; Ht 0.3–2; Alt ?–885

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Mopane (50)	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (72)	<400; 400–800 (14)
Min temp (°C)	2–8 (57)	>6 (43)
Max temp (°C)	27–35 (72)	25–29; >33 (14)
Phosphorus (ppm)	5–35 (86)	<10 (14)
pH	6.5–8.4 (57)	6.5–7.4 (29)
Sodic	Non (100)	
QDGCs	2229; 2230; 2231 (29)	2327 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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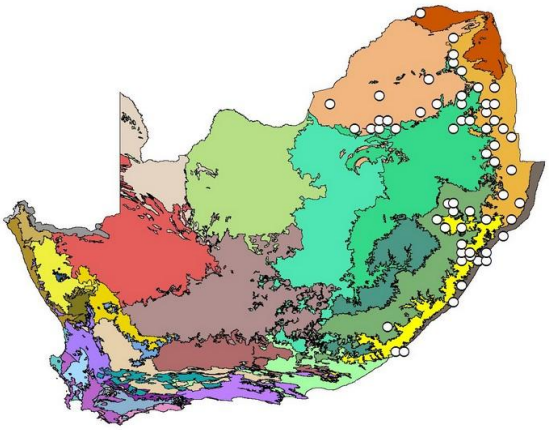
Teramnus labialis (L.f.) Spreng. subsp. *labialis*

Phaseoleae ③

Herb; P; Ht 0.3–3; Alt 0–1550

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Lowveld (35)	Central Bushveld (23)
Biome	Savanna (66)	Grassland; Indian Ocean (17)
Rainfall (mm)	>800 (40)	400–800 (31)
Min temp (°C)	2–8 (50)	>6 (31)
Max temp (°C)	25–29 (50)	27–35 (45)
Phosphorus (ppm)	<10 (79)	5–35 (21)
pH	<6.4 (69)	5.5–7.4 (28)
Sodic	Non (100)	
QDGCs	2531; 2930 (10)	2527; 2530; 2631; 2830 (7)

NOTES: **Cultivated** (Glen 2002). **DM:** 2.0 t/ha (Clatworthy & Madakadze 1988). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Cover crop (Sampson 1928).



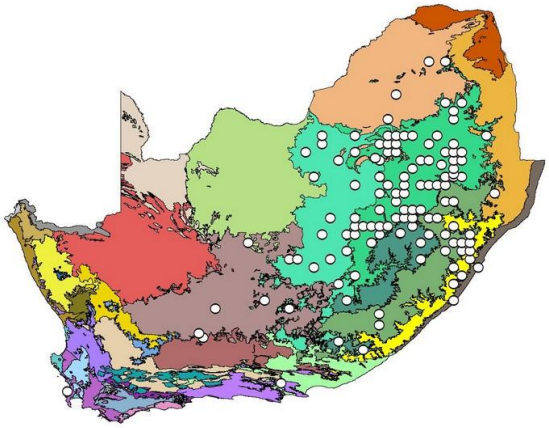
Trifolium africanum Ser. var. *africanum*

Trifolieae ③

Herb, climber; P; Ht 0.1–0.5; Alt 50–2600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (56)	Dry Highveld Grassland (17)
Biome	Grassland (93)	Savanna (4)
Rainfall (mm)	400–800 (50)	600–1000 (21)
Min temp (°C)	<2 (55)	0–4 (26)
Max temp (°C)	25–29 (44)	27–35 (31)
Phosphorus (ppm)	<10 (86)	5–35 (12)
pH	<6.4 (60)	5.5–7.4 (23)
Sodic	Non (100)	
QDGCs	2628 (7)	2828 (6)

NOTES: **Cultivated** (Kahurananga 1988). **N_2 fixation:** Nodulated (Goldschmidt & Orchard 1940; Grobbelaar *et al.* 1967; Jones *et al.* 1974; Grobbelaar & Clarke 1975). **Biocultural:** Magical; medicine for humans (Watt & Breyer-Brandwijk 1962). **Physiology:** Photoperiod (‘T Mannetje & Pritchard 1968). **Flowering:** Spring, summer, autumn (Germishuizen & Clarke 2003).



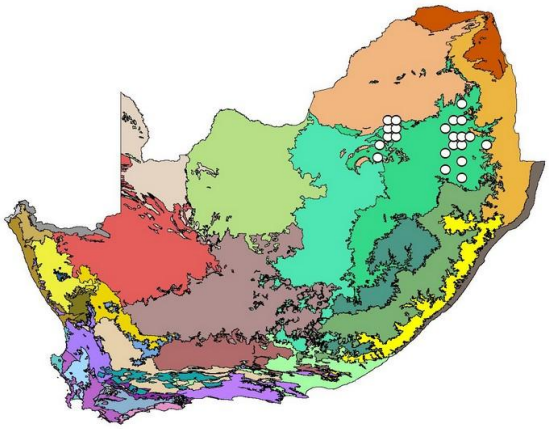
Trifolium africanum Ser. var. *lydenburgense* J.B.Gillett

Trifolieae ③

Herb; P; Ht 0.1–0.4; Alt 1300–2050

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (86)	Central Bushveld (14)
Biome	Grassland (100)	
Rainfall (mm)	400–800 (68)	600–1000 (18)
Min temp (°C)	<2 (41)	0–4 (36)
Max temp (°C)	25–29 (45)	<27 (36)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (91)	5.5–7.4 (9)
Sodic	Non (100)	
QDGCs	2630 (27)	2528 (18)

NOTES: **N_2 fixation:** Nodulated (Jones *et al.* 1974). **Cultivated** (Kahurananga 1988; Glen 2002). **Physiology:** Photoperiod (‘T Mannetje & Pritchard 1968).



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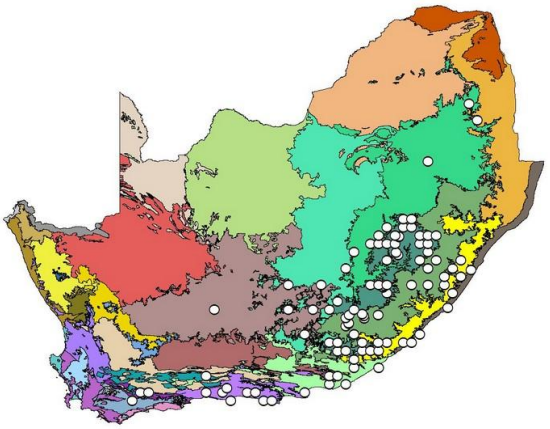
Trifolium burchellianum Ser. subsp. *burchellianum*

Trifolieae ③

Herb; P; Ht 0.05–0.25; Alt 0–3250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Drakensberg Grassland (31)	Sub-Escarpment Grassland (28)
Biome	Grassland (82)	Fynbos (8)
Rainfall (mm)	400–800; >800 (37)	600–1000 (15)
Min temp (°C)	<2 (36)	2–8 (30)
Max temp (°C)	25–29 (54)	<27 (37)
Phosphorus (ppm)	<10 (53)	5–35 (46)
pH	<6.4 (62)	5.5–7.4 (17)
Sodic	Non (83)	Medium (17)
QDGCs	2928 (10)	2929 (8)

NOTES: **Livestock feed** (Pooley 2003). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Jones *et al.* 1974). **Physiology:** Photoperiod (‘T Mannetje & Pritchard 1968). **Flowering:** Spring, summer (Pooley 1998).



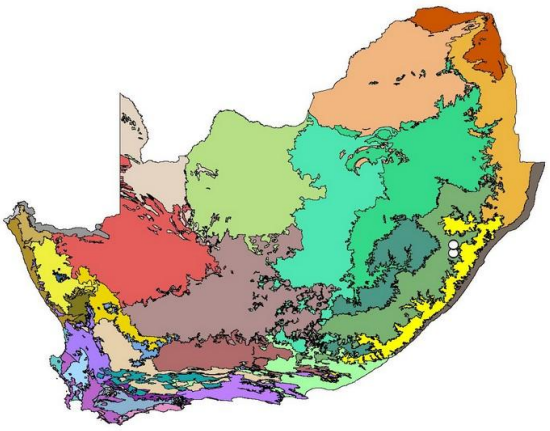
Trifolium burchellianum Ser. subsp. *johnstonii* (Oliv.) Cufod. ex J.B.Gillett

Trifolieae ③

Herb; P; Ht 0.05–0.25; Alt 600–1450

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	0–4; 2–8 (50)	
Max temp (°C)	<27 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
Sodic	Non (100)	
QDGCs	2930 (100)	

NOTES: **Livestock feed** (Pooley 2003). **Cultivated** (Kahurananga 1988). **Soil conservation:** Cover crop; green manure (Sampson 1928). **Physiology:** Photoperiod (‘T Mannetje & Pritchard 1968). **Flowering:** Spring, summer (Pooley 1998).



[E] *Trifolium stipulaceum* Thunb.

Trifolieae –

Herb; A; Ht 0.08–0.15; Alt 100–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
Sodic		
QDGCs	No Records	

NOTES: –

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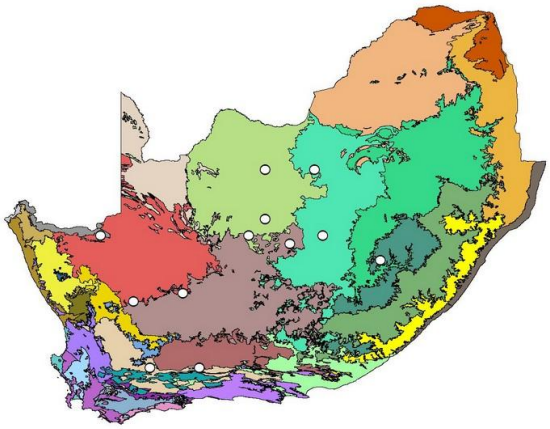
Trigonella anguina Delile

Trifolieae ①

Herb; A; Ht 0.05–0.1; Alt 650–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Kalahari Bushveld (50)	Dry Highveld Grassland; Rainshadow Valley Karoo (25)
Biome	Grassland; Nama-Karoo; Savanna (29)	Succulent Karoo (13)
Rainfall (mm)	<400 (67)	400–800 (25)
Min temp (°C)	<2 (75)	2–8 (25)
Max temp (°C)	27–35 (75)	>33 (17)
Phosphorus (ppm)	<10 (58)	>20 (42)
pH	>7.5 (42)	6.5–7.4; 6.5–8.4 (25)
Sodic	Non (75)	High (25)
QDGCs	2724; 2725; 2824; 2919; 2923; 2925; 2926; 2927; 3021; 3120; 3320; 3322 (8)	

NOTES: –



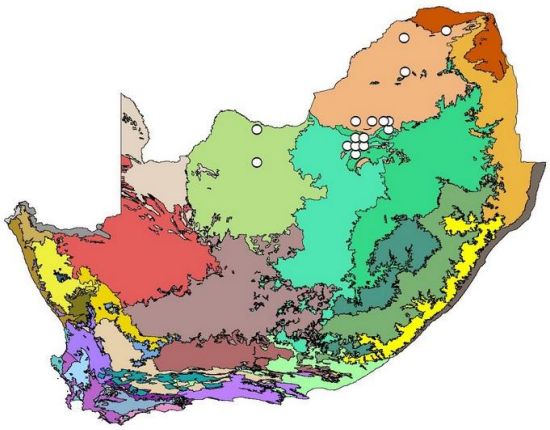
Tylosema esculentum (Burch.) A.Schreib.

Cercideae ③

Shrub; A; Ht 1.8–9; Alt 925–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (55)	Eastern Kalahari Bushveld (27)
Biome	Savanna (89)	Grassland (11)
Rainfall (mm)	400–800 (76)	200–600 (18)
Min temp (°C)	0–4; 2–8 (35)	<2 (30)
Max temp (°C)	27–35 (71)	25–29 (18)
Phosphorus (ppm)	<10 (88)	5–35 (12)
pH	<6.4 (71)	5.5–7.4; 6.5–7.4 (12)
Sodic	Non (100)	
QDGCs	2627 (29)	2527 (18)

NOTES: **Livestock feed:** Not browsed (Watt & Breyer-Brandwijk 1962). **Cultivated:** Semi-arid (Powell 1987; Lewis *et al.* 2005). **CP:** Seed 32% (Bower *et al.* 1988). **Ecology:** Seed (Bower *et al.* 1988). **Biocultural:** Seed and stem as food (Watt & Breyer-Brandwijk 1962; Vietmeyer 1986). **Flowering:** Summer (Van Rooyen 2001).



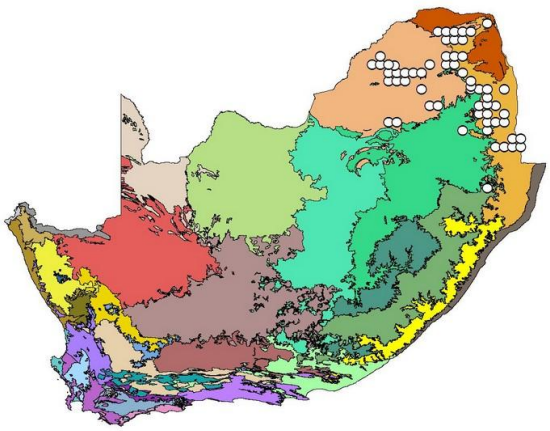
Tylosema fassoglensis (Schweinf.) Torre & Hillc.

Cercideae ③

Shrub, climber; P; Ht 1–6; Alt 150–1850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (55)	Lowveld (41)
Biome	Savanna (97)	Grassland (3)
Rainfall (mm)	400–800 (55)	600–1000 (22)
Min temp (°C)	2–8 (69)	>6 (29)
Max temp (°C)	27–35 (57)	25–29 (41)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (66)	5.5–7.4 (24)
Sodic	Non (100)	
QDGCs	2531 (13)	2428 (12)

NOTES: **Livestock feed** (Pooley 1998). **Cultivated** (Glen 2002). **N_2 fixation:** No nodulation (Grobbelaar & Clarke 1975). **Antiquality:** Tannin in leaves and pods (Watt & Breyer-Brandwijk 1962). **Biocultural:** Gum; fibre; medicine for livestock; seed as food (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Pooley 1998).



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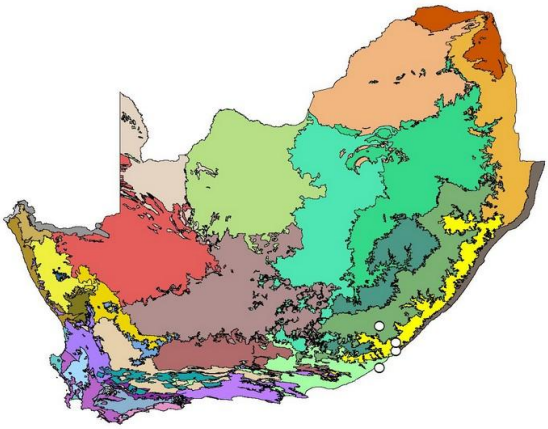
[E]*Umtiza listeriana* Sim

Caesalpinieae ③

Tree; P; Ht 2.5–12; Alt 0–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Sub-Escarpment Grassland; Sub-Escarpment Savanna (33)	
Biome	Albany Thicket; Grassland; Savanna (33)	
Rainfall (mm)	400–800 (50)	600–1000; >800 (25)
Min temp (°C)	>6 (75)	2–8 (25)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (75)	<10 (25)
pH	<6.4; 5.5–7.4 (50)	
Sodic	Non (100)	
QDGCs	3228 (50)	3127; 3327 (25)

NOTES: **Cultivated** (Glen 2002).



Vigna friesiorum Harms var. *friesiorum*

Phaseoleae –

Herb; P; Ht ?; Alt ?–152

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion		
Biome		
Rainfall (mm)		
Min temp (°C)		
Max temp (°C)		
Phosphorus (ppm)		
pH		
Sodic		
QDGCs	No Records	

NOTES: –

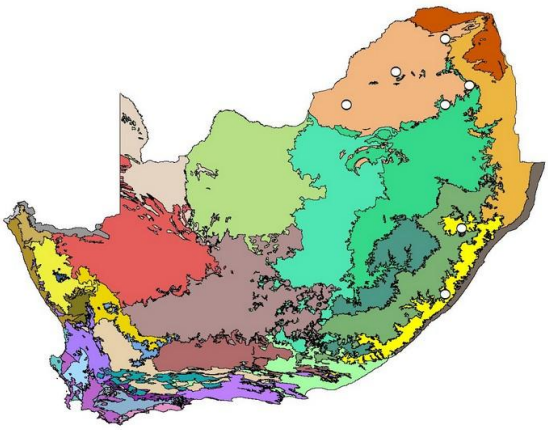
Vigna frutescens A.Rich. subsp. *frutescens* var. *frutescens*

Phaseoleae ①

Herb, climber; P; Ht 0.1–1; Alt 61–1647

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (100)	
Biome	Savanna (100)	
Rainfall (mm)	400–800 (72)	600–1000; >800 (14)
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (71)	27–35 (29)
Phosphorus (ppm)	<10 (86)	5–35 (14)
pH	<6.4; 5.5–7.4 (43)	6.5–8.4 (14)
Sodic	Non (100)	
QDGCs	2329; 2428; 2430; 2526; 2529; 2830; 3029 (14)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Flowering:** Spring, summer (Pooley 1998; Germishuizen & Clarke 2003).



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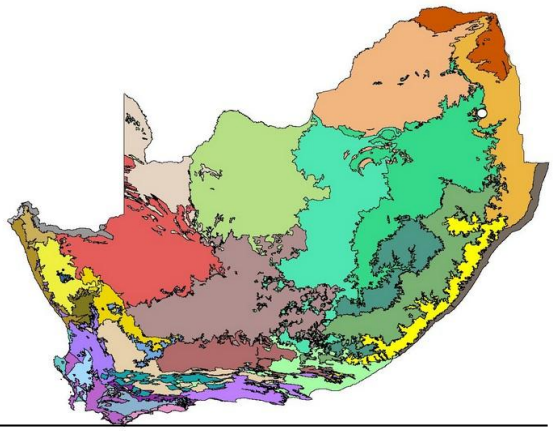
Vigna kokii B.J.Pienaar

Phaseoleae ①

Herb, climber; P; Ht ?; Alt 305–458

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
Sodic	Ecotone	
QDGCs	2530 (100)	

NOTES: –



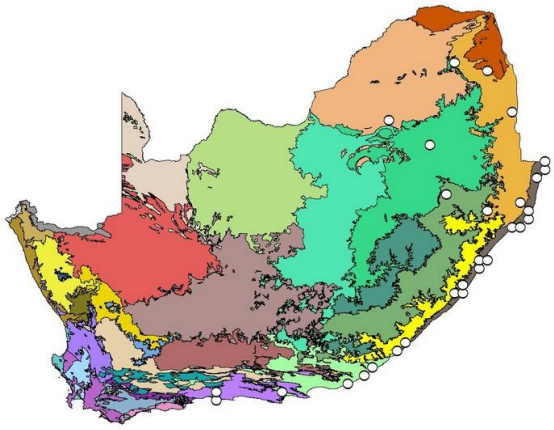
Vigna luteola (Jacq.) Benth. var. *luteola*

Phaseoleae ②

Herb, climber; P; Ht 0.3–1.52; Alt 3–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (50)	Albany Thicket; Lowveld (15)
Biome	Indian Ocean (44)	Savanna (22)
Rainfall (mm)	>800 (41)	400–800 (38)
Min temp (°C)	>6 (76)	2–8 (17)
Max temp (°C)	25–29; 27–35 (45)	<27 (10)
Phosphorus (ppm)	<10 (55)	5–35 (45)
pH	<6.4 (59)	5.5–7.4 (31)
Sodic	Non (95)	Medium (5)
QDGCs	2832; 3030 (14)	2831 (7)

NOTES: **Livestock feed (**Rootman *et al.* 2004). **DM:** 0.9 t/ha (Nyoka *et al.* 2004). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975). **Biocultural:** Magical; medicine for humans (Hutchings *et al.* 1996). **Flowering:** All seasons (Pooley 1998).



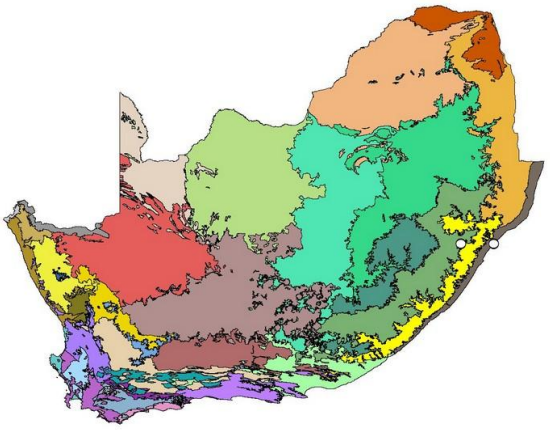
Vigna marina (Burm.) Merr.

Phaseoleae ①

Herb; P; Ht ?; Alt 0–580

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
Sodic	Non (100)	
QDGCs	2930; 2931 (50)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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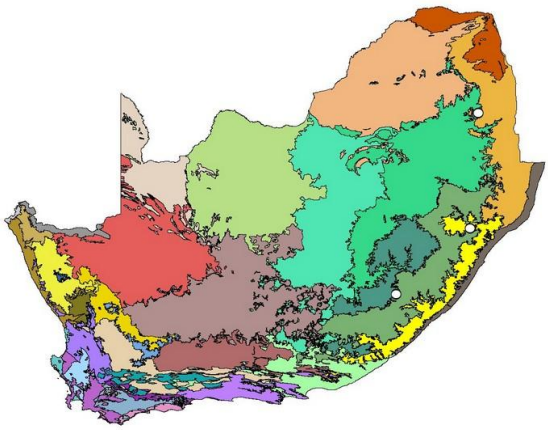
[E]*Vigna mudenia* B.J.Pienaar

Phaseoleae ①

Herb, climber; P; Ht ?; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Grassland (100)	
Rainfall (mm)	>800 (67)	600–1000 (33)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (67)	<27 (33)
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (100)	
Sodic	Ecotone	
QDGCs	2530; 2830; 3028 (33)	

NOTES: –



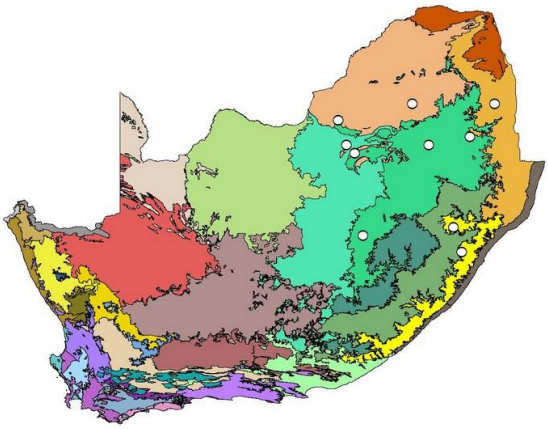
Vigna oblongifolia A.Rich. var. *oblongifolia*

Phaseoleae ③

Herb, climber; A; Ht ?; Alt 335–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Central Bushveld (33)	Dry Highveld Grassland; Lowveld (17)
Biome	Grassland (60)	Savanna (40)
Rainfall (mm)	400–800 (70)	600–1000 (20)
Min temp (°C)	<2; 0–4; 2–8 (30)	>6 (10)
Max temp (°C)	27–35 (50)	25–29 (40)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (60)	5.5–7.4 (40)
Sodic	Non (100)	
QDGCs	2526; 2528; 2531; 2626; 2627; 2629; 2630; 2830; 2927; 2930 (10)	

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



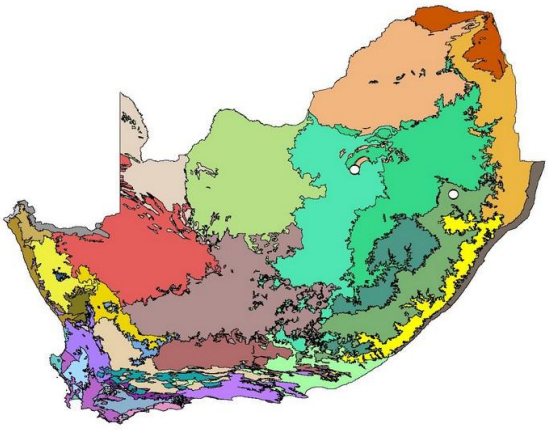
Vigna oblongifolia A.Rich. var. *parviflora* (Baker) Verdc.

Phaseoleae ①

Herb, climber; A; Ht ?; Alt 930–1312

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (100)	
Biome	Grassland (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	<2; 0–47 (50)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4; 5.5–7.4 (50)	
Sodic	Non (100)	
QDGCs	2727; 2730 (50)	

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975).



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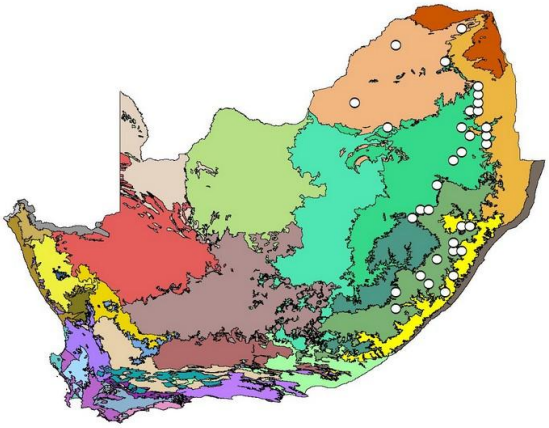
Vigna schlechteri Harms

Phaseoleae ①

Herb, climber; P; Ht 0.11–0.8; Alt 915–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland (55)	Mesic Highveld Grassland (27)
Biome	Grassland (81)	Savanna (9)
Rainfall (mm)	>800 (55)	600–1000 (33)
Min temp (°C)	2–8 (58)	0–4 (33)
Max temp (°C)	25–29 (55)	<27 (36)
Phosphorus (ppm)	<10 (82)	5–35 (18)
pH	<6.4 (85)	5.5–7.4 (9)
Sodic	Non (100)	
QDGCs	2530 (12)	2630; 2930; 3029 (9)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



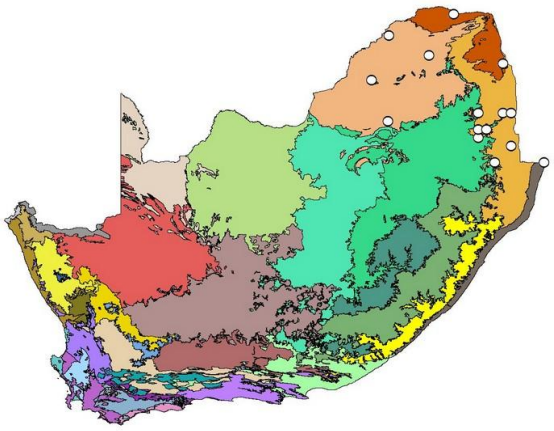
Vigna unguiculata (L.) Walp. subsp. *dekindtiana* (Harms) Verdc. var. *dekindtiana*

Phaseoleae ③

Herb, climber; A; Ht 0.2–6; Alt 152–1150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld; Lowveld (38)	Indian Ocean Coastal Belt; Mopane (12)
Biome	Savanna (100)	
Rainfall (mm)	400–800; >800 (27)	200–600; 600–1000 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	27–35 (60)	25–29 (40)
Phosphorus (ppm)	<10 (60)	5–35 (40)
pH	<6.4 (53)	6.5–7.4 (20)
Sodic	Non (100)	
QDGCs	2531 (20)	2530; 2631 (13)

NOTES: **Livestock feed** (Maposse *et al.* 2003). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975); *Rhizobium* isolates (Doignon-Bourcier *et al.* 2000); 44–87 kgN/ha (Makoi *et al.* 2009). **Breeding:** Dual-purpose (Kristjanson *et al.* 2002). **Ecology:** Drought stress (Osonubi 1985). **Flowering:** Spring, summer (Pooley 1998).



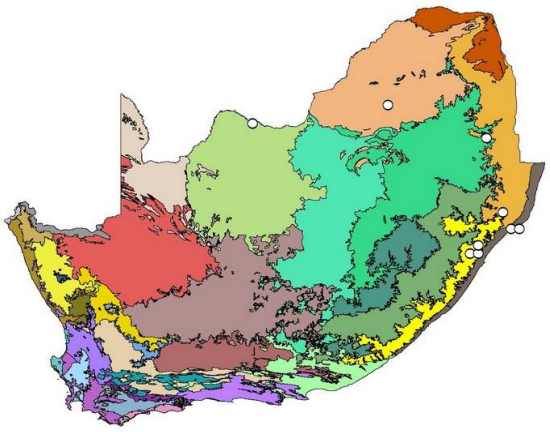
Vigna unguiculata (L.) Walp. subsp. *dekindtiana* (Harms) Verdc. var. *huillensis* (Welw. ex Baker) B.J.Pienaar

Phaseoleae ③

Herb, climber; A; Ht ?; Alt 381–1494

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (32)	Central Bushveld; Lowveld; Eastern Kalahari Bushveld; Sub-Escarpment Savanna (17)
Biome	Savanna (80)	Indian Ocean (20)
Rainfall (mm)	>800 (67)	<400; 400–800; 600–1000 (11)
Min temp (°C)	>6 (67)	2–8 (22)
Max temp (°C)	25–29; 27–35 (44)	>33 (12)
Phosphorus (ppm)	<10 (89)	5–35 (11)
pH	<6.4 (78)	5.5–7.4; 6.5–7.4 (11)
Sodic	Non (100)	
QDGCs	2930 (33)	2831 (22)

NOTES: **Livestock feed** (Maposse *et al.* 2003). **Cultivated** (Glen 2002). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975); *Rhizobium* isolates (Doignon-Bourcier *et al.* 2000). **Breeding:** Dual-purpose (Kristjanson *et al.* 2002). **Ecology:** Drought stress (Osonubi 1985). **Flowering:** Spring, summer (Pooley 1998).



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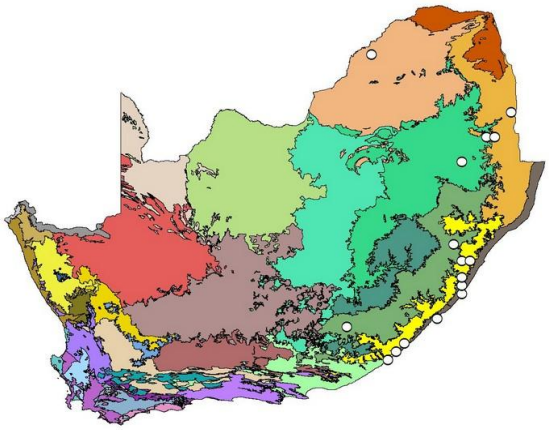
Vigna unguiculata (L.) Walp. subsp. *protracta* (E.Mey.) B.J.Pienaar

Phaseoleae ③

Herb; P; Ht 0.01–0.8; Alt 15–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt; Sub-Escarpment Grassland (29)	Mesic Highveld Grassland; Central Bushveld; Lowveld (14)
Biome	Grassland (42)	Indian Ocean; Savanna (29)
Rainfall (mm)	>800 (69)	400–800 (19)
Min temp (°C)	>6 (50)	2–8 (31)
Max temp (°C)	25–29 (81)	27–35 (13)
Phosphorus (ppm)	<10; 5–35 (50)	
pH	<6.4 (75)	5.5–7.4 (13)
Sodic	Non (100)	
QDGCs	2930; 3030; 3228 (19)	2631 (13)

NOTES: **Livestock feed** (Maposse *et al.* 2003). **Cultivated** (Glen 2002). **N_2 fixation:** *Rhizobium* isolates (Doignon-Bourcier *et al.* 2000). **Breeding:** Dual-purpose (Kristjanson *et al.* 2002). **Ecology:** Drought stress (Osonubi 1985). **Flowering:** Spring, summer (Pooley 1998).



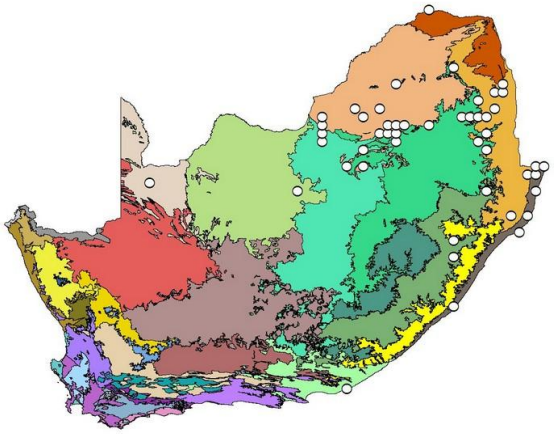
Vigna unguiculata (L.) Walp. subsp. *stenophylla* (Harv.) Maréchal, Mascherpa & Stainier

Phaseoleae ③

Herb, climber; P; Ht 0.2–0.6; Alt 15–2100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (29)	Indian Ocean Coastal Belt; Lowveld (21)
Biome	Savanna (64)	Indian Ocean (18)
Rainfall (mm)	400–800 (65)	>800 (25)
Min temp (°C)	2–8 (46)	>6 (29)
Max temp (°C)	27–35 (65)	25–29 (29)
Phosphorus (ppm)	<10 (81)	5–35 (19)
pH	<6.4 (58)	5.5–7.4 (27)
Sodic	Non (100)	
QDGCs	2528 (10)	2527 (8)

NOTES: **Livestock feed** (Maposse *et al.* 2003). **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1975); *Rhizobium* isolates (Doignon-Bourcier *et al.* 2000). **Breeding:** Dual-purpose (Kristjanson *et al.* 2002). **Ecology:** Drought stress (Osonubi 1985). **Flowering:** Spring, summer (Pooley 1998).



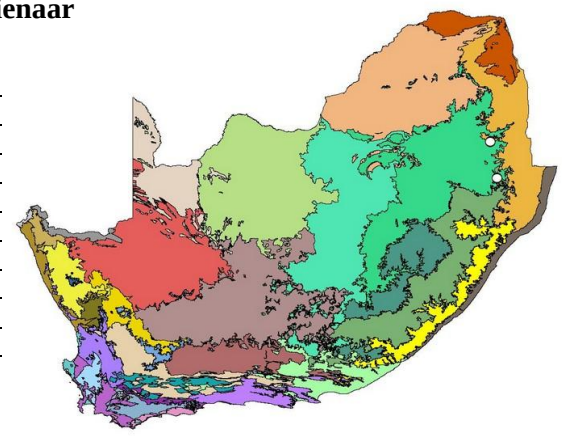
[E]*Vigna unguiculata* (L.) Walp. subsp. *tenuis* (E.Mey.) Maréchal, Mascherpa & Stainier var. *ovata* (E.Mey.) B.J.Pienaar

Phaseoleae ②

Herb, climber; P; Ht ?; Alt 3–950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	>800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
Sodic	Ecotone	
QDGCs	2630; 2731 (50)	

NOTES: **Livestock feed** (Maposse *et al.* 2003). **N_2 fixation:** *Rhizobium* isolates (Doignon-Bourcier *et al.* 2000). **Breeding:** Dual-purpose (Kristjanson *et al.* 2002). **Ecology:** Drought stress (Osonubi 1985). **Flowering:** Spring, summer (Pooley 1998).



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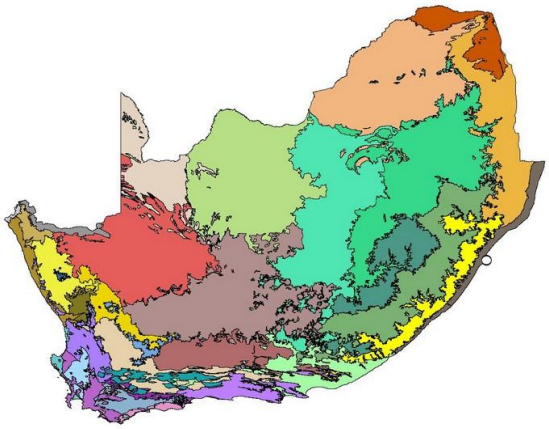
Vigna unguiculata (L.) Walp. subsp. *tenuis* (E.Mey.) Maréchal, Mascherpa & Stainier var. *tenuis*

Phaseoleae ②

Herb, climber; P; Ht ?; Alt 50–730

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (100)	
Biome	Indian Ocean (100)	
Rainfall (mm)	>800 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
Sodic	Non (100)	
QDGCs	2931 (100)	



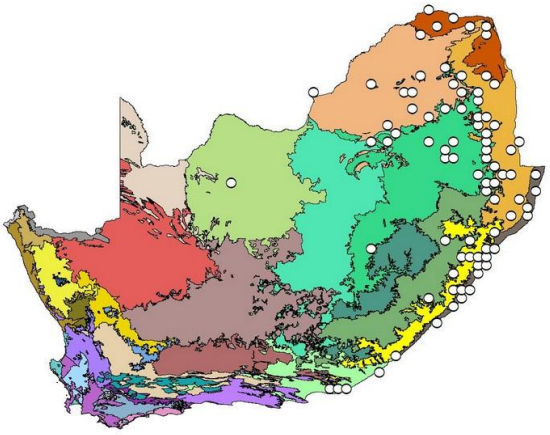
NOTES: **Livestock feed** (Maposse *et al.* 2003). **N_2 fixation:** *Rhizobium* isolates (Doignon-Bourcier *et al.* 2000). **Breeding:** Dual-purpose (Kristjanson *et al.* 2002). **Ecology:** Drought stress (Osonubi 1985). **Flowering:** Spring, summer (Pooley 1998).

Vigna unguiculata (L.) Walp. subsp. *unguiculata* var. *unguiculata*

Phaseoleae ☠③

Herb, climber; A; Ht 0.2–2; Alt 5–1713

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Indian Ocean Coastal Belt (28)	Central Bushveld (19)
Biome	Savanna (54)	Indian Ocean (24)
Rainfall (mm)	400–800 (43)	>800 (39)
Min temp (°C)	>6 (43)	2–8 (42)
Max temp (°C)	25–29 (50)	27–35 (38)
Phosphorus (ppm)	<10 (73)	5–35 (27)
pH	<6.4 (57)	5.5–7.4 (25)
Sodic	Non (100)	
QDGCs	2731; 3030 (7)	2430; 2631; 2930 (6)



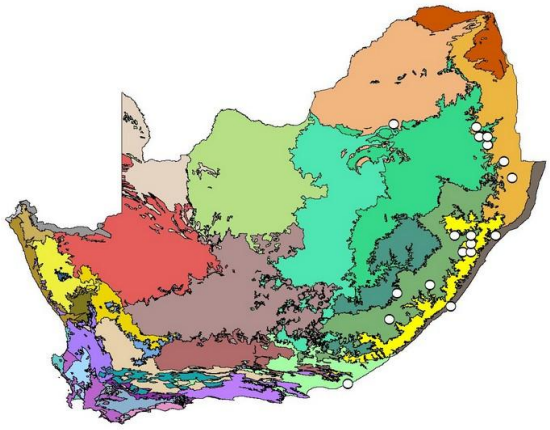
NOTES: **Livestock feed** (Maposse *et al.* 2003). **Cultivated** (Glen 2002). **Antiquality:** Alkaloids in plant (Hutchings *et al.* 1996). **N_2 fixation:** *Rhizobium* isolates (Doignon-Bourcier *et al.* 2000); 44–87 kgN/ha (Makoi *et al.* 2009). **Breeding:** Dual-purpose (Kristjanson *et al.* 2002). **Ecology:** Drought stress (Osonubi 1985). **Biocultural:** Magical; medicine for humans and livestock (Hutchings *et al.* 1996). **Flowering:** Spring, summer (Pooley 1998).

Vigna vexillata (L.) A.Rich. var. *angustifolia* (Schumach. & Thonn.) Baker

Phaseoleae ③

Herb, climber; P; Ht 0.01–0.6; Alt 91–1678

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Sub-Escarpment Grassland; Lowveld (24)	Albany Thicket; Indian Ocean Coastal Belt; Central Bushveld; Sub-Escarpment Savanna (13)
Biome	Grassland; Savanna (33)	Albany Thicket; Indian Ocean (17)
Rainfall (mm)	>800 (50)	600–1000 (33)
Min temp (°C)	2–8 (44)	>6 (33)
Max temp (°C)	25–29 (66)	<27; 27–35 (17)
Phosphorus (ppm)	<10 (94)	5–35 (6)
pH	<6.4 (67)	5.5–7.4 (22)
Sodic	Non (100)	
QDGCs	2930 (28)	2631 (17)



NOTES: **Livestock feed** (Maposse *et al.* 2003; Damayanti *et al.* 2010). **Cultivated** (Glen 2002). **DM:** 2.0 t/ha (Clatworthy & Madakadze 1988). **Antiquality:** None tested (Steyn 1934). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Reinforcement (Barnes *et al.* 1986). **Biocultural:** Magical; medicine for humans; tubers as food (Hutchings *et al.* 1996). **Flowering:** Spring, summer (Pooley 1998).

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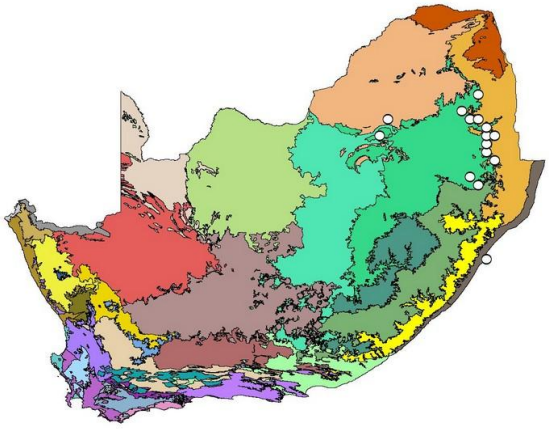
Vigna vexillata (L.) A.Rich. var. *davyi* (Bolus) B.J.Pienaar

Phaseoleae ③

Herb, climber; P; Ht 0.2–0.3; Alt 579–1600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (50)	Indian Ocean Coastal Belt; Central Bushveld (25)
Biome	Grassland; Indian Ocean (50)	
Rainfall (mm)	>800 (60)	600–1000 (27)
Min temp (°C)	2–8 (80)	0–4 (13)
Max temp (°C)	25–29 (80)	27–35 (13)
Phosphorus (ppm)	<10 (100)	
pH	<6.4 (100)	
Sodic	Non (100)	
QDGCs	2631 (33)	2530 (20)



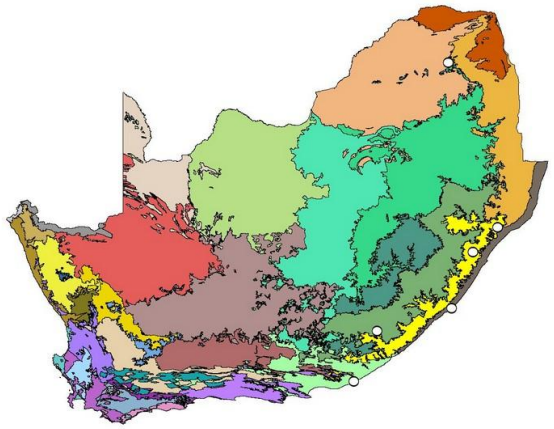
NOTES: **Livestock feed** (Maposse *et al.* 2003; Damayanti *et al.* 2010). **DM:** 2.0 t/ha (Clatworthy & Madakadze 1988). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967; Grobbelaar & Clarke 1975). **Antiquality:** None tested (Steyn 1934). **Soil conservation:** Reinforcement (Barnes *et al.* 1986). **Biocultural:** Magical; medicine for humans; tubers as food (Hutchings *et al.* 1996). **Flowering:** Spring, summer (Pooley 1998).

Vigna vexillata (L.) A.Rich. var. *ovata* (E.Mey.) B.J.Pienaar

Phaseoleae ③

Herb, creeper; P; Ht 0.1–0.9; Alt 8–1525

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Albany Thicket; Sub-Escarpment Savanna (50)	
Biome	Albany Thicket; Savanna (50)	
Rainfall (mm)	>800 (50)	400–800 (33)
Min temp (°C)	>6 (67)	2–8 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	<10 (67)	5–35 (33)
pH	<6.4 (50)	5.5–7.4 (33)
Sodic	Non (100)	
QDGCs	2329; 2831; 2930; 3129; 3227; 3327 (16)	



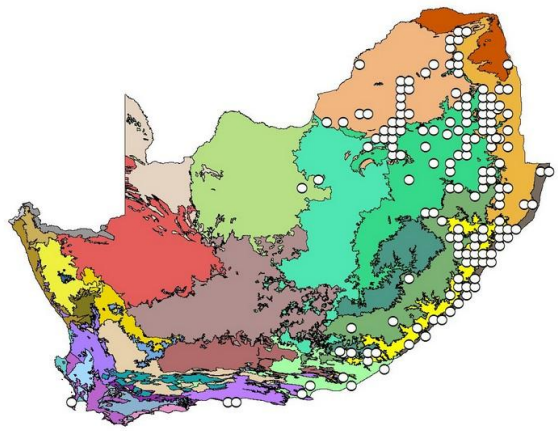
NOTES: **Livestock feed** (Maposse *et al.* 2003; Damayanti *et al.* 2010). **DM:** 2.0 t/ha (Clatworthy & Madakadze 1988). **Antiquality:** None tested (Steyn 1934). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Reinforcement (Barnes *et al.* 1986). **Biocultural:** Magical; medicine for humans; tubers as food (Hutchings *et al.* 1996). **Flowering:** Spring, summer (Pooley 1998).

Vigna vexillata (L.) A.Rich. var. *vexillata*

Phaseoleae ③❖

Herb, climber; P; Ht 0.15–1.2; Alt 5–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland; Central Bushveld (25)	Indian Ocean Coastal Belt; Lowveld (15)
Biome	Savanna (43)	Grassland (36)
Rainfall (mm)	400–800 (42)	>800 (33)
Min temp (°C)	2–8 (45)	>6 (27)
Max temp (°C)	25–29 (60)	27–35 (28)
Phosphorus (ppm)	<10 (76)	5–35 (24)
pH	<6.4 (69)	5.5–7.4 (21)
Sodic	Non (97)	Medium (3)
QDGCs	2930 (8)	2530 (6)



NOTES: **Livestock feed** (Maposse *et al.* 2003; Damayanti *et al.* 2010). **Cultivated** (Glen 2002). **Antiquality:** None tested (Steyn 1934). **DM:** 2.0 t/ha (Clatworthy & Madakadze 1988). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Soil conservation:** Reinforcement (Barnes *et al.* 1986). **Biocultural:** Magical; medicine for humans; tubers as food (Hutchings *et al.* 1996). **Flowering:** Spring, summer, autumn (Pooley 1998; Germishuizen & Clarke 2003).

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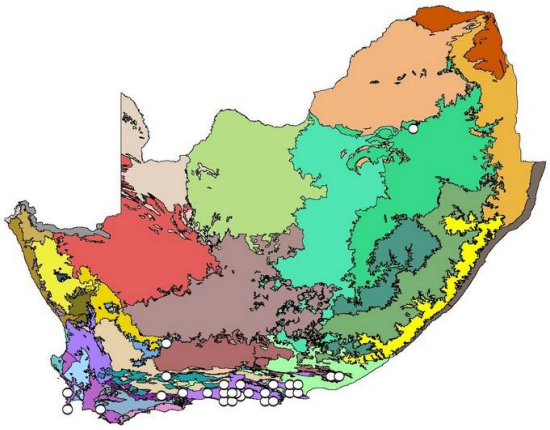
[E]*Virgilia divaricata* Adamson

Podalyrieae ☠③

Tree; P; Ht 4–16; Alt 0–1300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (88)	Southwest Fynbos (12)
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (38)	600–1000 (27)
Min temp (°C)	2–8 (77)	>6 (19)
Max temp (°C)	25–29 (58)	<27 (35)
Phosphorus (ppm)	5–35 (92)	<10; >20 (4)
pH	<6.4 (58)	5.5–7.4 (23)
Sodic	Medium (88)	Non (13)
QDGCs	3323 (24)	3321; 3325 (14)

NOTES: **Cultivated** (Glen 2002). **N_2 fixation:** No nodulation (Grobbelaar & Clarke 1975). **Antiquality:** Alkaloid in twigs (Watt & Breyer-Brandwijk 1962). **Biocultural:** Fuel; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer (Moriarty 1997).



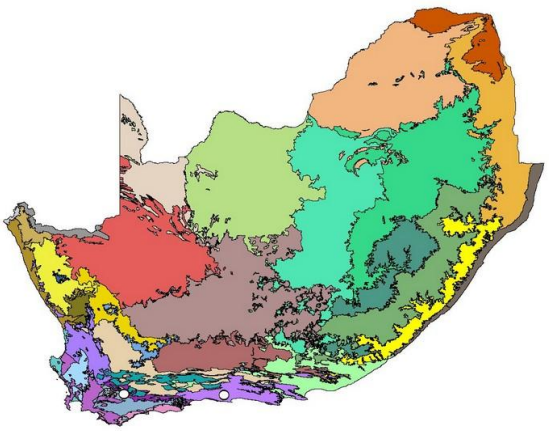
[E]*Virgilia oroboides* (P.J.Bergius) T.M.Salter subsp. *ferruginea* B.-E.van Wyk

Podalyrieae ☠③

Tree; P; Ht 5–15; Alt 0–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (100)	
Biome	Ecotone	
Rainfall (mm)	200–600; 600–1000 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	<27; 25–29 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 6.5–7.4 (50)	
Sodic	Medium (100)	
QDGCs	3320; 3323 (50)	

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Alkaloid in twigs (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Fuel; gum; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Spring, summer, autumn (Van Wyk *et al.* 2000; Kidd 2002).



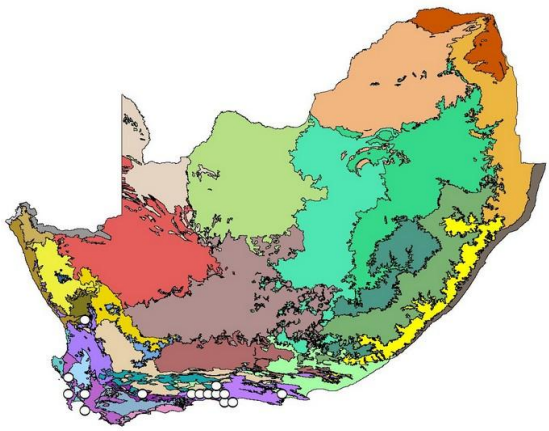
[E]*Virgilia oroboides* (P.J.Bergius) T.M.Salter subsp. *oroboides*

Podalyrieae ☠③

Tree; P; Ht 3–15; Alt 30–1100

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Eastern Fynbos-Renosterveld (83)	Southwest Fynbos (17)
Biome	Fynbos (100)	
Rainfall (mm)	600–1000 (47)	200–600 (20)
Min temp (°C)	2–8 (80)	>6 (20)
Max temp (°C)	25–29 (67)	<27 (27)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (73)	5.5–7.4 (13)
Sodic	Medium (83)	Non (17)
QDGCs	3322 (33)	3318 (20)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Alkaloid in twigs (Watt & Breyer-Brandwijk 1962). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Fuel; gum; timber (Watt & Breyer-Brandwijk 1962). **Flowering:** Summer, autumn (Kidd 2002).



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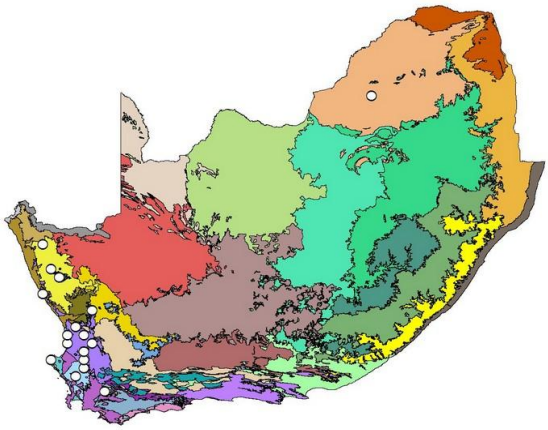
[E]*Wiborgia fusca* Thunb. subsp. *fusca*

Crotalarieae ①

Shrub; P; Ht 0.4–1.5; Alt 30–850

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld; Central Bushveld (50)	
Biome	Fynbos (67)	Succulent Karoo (25)
Rainfall (mm)	<400 (53)	200–600 (35)
Min temp (°C)	2–8 (59)	>6 (35)
Max temp (°C)	27–35 (59)	25–29 (41)
Phosphorus (ppm)	5–35 (82)	>20 (18)
pH	5.5–7.4; 6.5–7.4 (29)	6.5–8.4 (24)
Sodic	Non; Medium (50)	
QDGCs	3218 (29)	3017; 3318 (12)

NOTES: **Flowering:** Winter, spring (Manning & Goldblatt 2000).



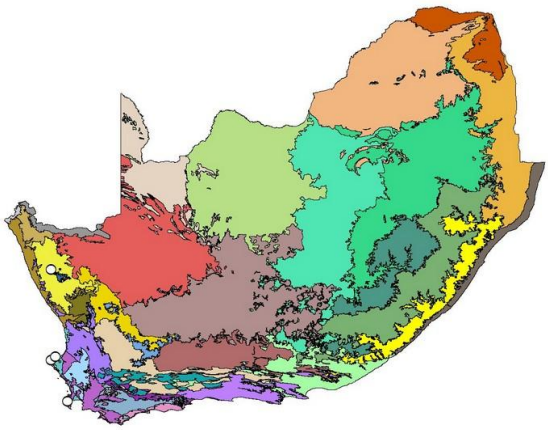
[E]*Wiborgia fusca* Thunb. subsp. *macrocarpa* R.Dahlgren

Crotalarieae ①

Shrub; P; Ht 0.01–2; Alt 50–200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	West Strandveld (100)	
Biome	Fynbos (75)	Succulent Karoo (25)
Rainfall (mm)	<400 (75)	600–1000 (25)
Min temp (°C)	>6 (75)	2–8 (25)
Max temp (°C)	27–35 (75)	285–29 (25)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (50)	<6.4; 6.5–8.4 (25)
Sodic	Medium (100)	
QDGCs	3017; 3217; 3218; 3418 (25)	

NOTES: –



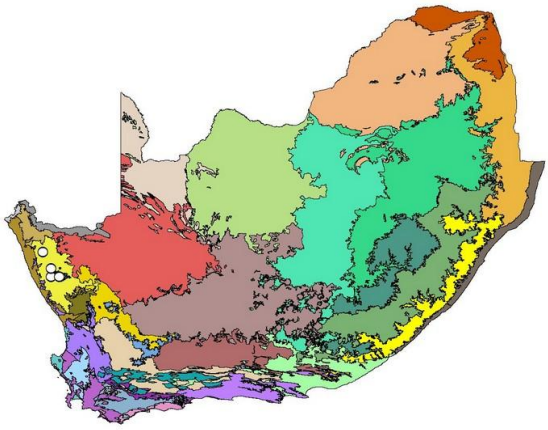
[E]*Wiborgia incurvata* E.Mey.

Crotalarieae ①

Dwarf shrub; P; Ht 0.2–0.6; Alt 300–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (100)	
Rainfall (mm)	<400 (100)	
Min temp (°C)	72–8 (5)	>6 (25)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	6.5–7.4; 6.5–8.4 (50)	
Sodic	Medium (100)	
QDGCs	3017 (50)	3018; 2917 (25)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1983).



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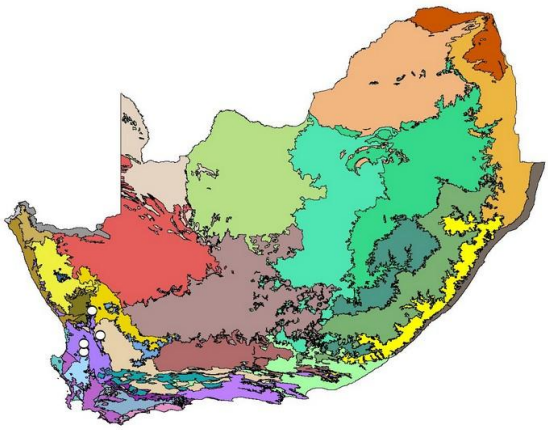
[E]*Wiborgia leptoptera* R.Dahlgren subsp. *cedarbergensis* R.Dahlgren — Crotalarieae ①

Shrub; P; Ht 0.8–1.5; Alt 100–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600 (50)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (75)	27–35 (25)
Phosphorus (ppm)	5–35 (75)	>20 (25)
pH	5.5–7.4 (50)	<6.4; >7.5 (25)
Sodic	Ecotone	
QDGCs	3218 (50)	3119; 3219 (25)

NOTES: –

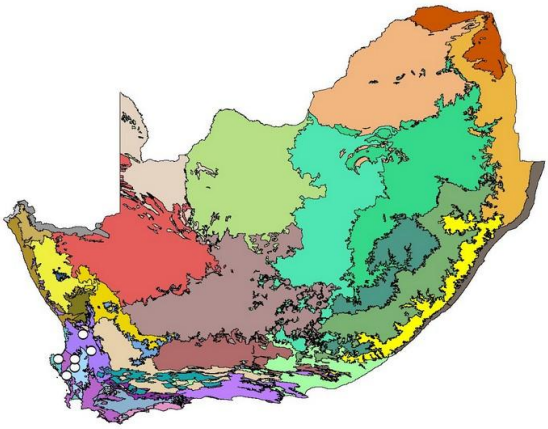


[E]*Wiborgia leptoptera* R.Dahlgren subsp. *leptoptera* — Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.3–0.6; Alt 100–250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; West Coast Renosterveld (50)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (83)	<400 (17)
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (50)	6.5–8.4 (33)
Sodic	Non (100)	
QDGCs	3218 (50)	3318 (33)

NOTES: –

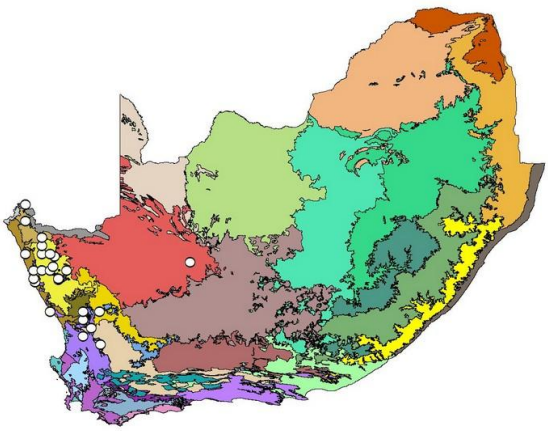


[E]*Wiborgia monoptera* E.Mey. — Crotalarieae ②

Shrub; P; Ht 0.6–1; Alt 150–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (60)	Bushmanland; Namaqualand Sandveld (20)
Biome	Succulent Karoo (89)	Nama-Karoo (11)
Rainfall (mm)	<400 (95)	200–600 (5)
Min temp (°C)	2–8 (55)	>6 (41)
Max temp (°C)	27–35 (50)	25–29 (41)
Phosphorus (ppm)	5–35 (59)	>20 (41)
pH	6.5–8.4 (36)	>7.5 (32)
Sodic	Medium (60)	Non; High (20)
QDGCs	3017 (24)	2917 (20)

NOTES: **Livestock feed** (Le Roux & Schelpe 1997). **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979). **Flowering:** Winter, spring (Manning & Goldblatt 2002).



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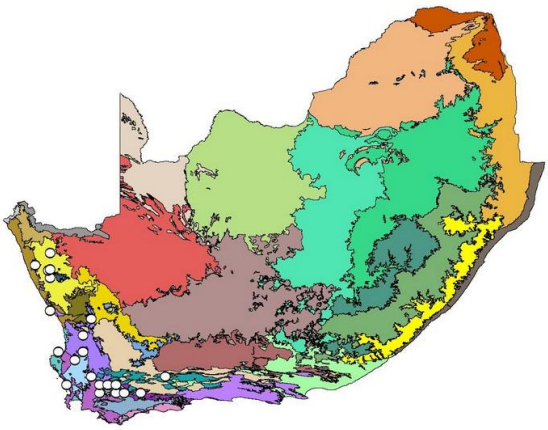
[E]*Wiborgia mucronata* (L.f.) Druce

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 1–2.5; Alt 0–1250

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Fynbos (67)	Succulent Karoo (33)
Rainfall (mm)	200–600 (60)	<400 (40)
Min temp (°C)	2–8 (50)	0–4 (30)
Max temp (°C)	25–29 (75)	27–35 (20)
Phosphorus (ppm)	5–35 (90)	>20 (10)
pH	6.5–7.4 (45)	5.5–7.4 (20)
Sodic	Medium (100)	
QDGCs	3319 (29)	3218 (19)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Autumn, winter, spring (Moriarty 1997).



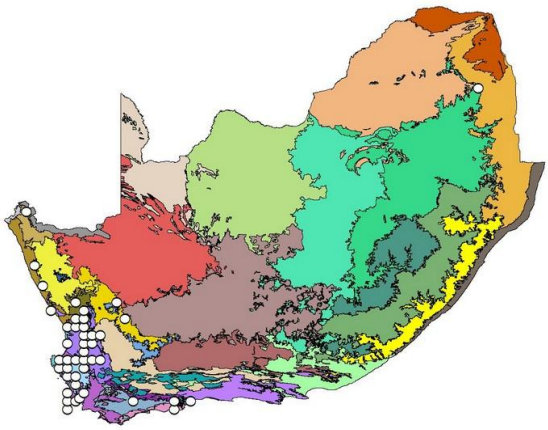
[E]*Wiborgia obcordata* (P.J.Bergius) Thunb.

Crotalarieae ①

Shrub; P; Ht 1–3.5; Alt 0–1350

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos; South Coast Fynbos; Trans-Escarpment Succulent Karoo (25)	
Biome	Fynbos (92)	Succulent Karoo (8)
Rainfall (mm)	<400 (45)	200–600 (33)
Min temp (°C)	2–8 (52)	>6 (45)
Max temp (°C)	25–29 (50)	27–35 (43)
Phosphorus (ppm)	5–35 (79)	>20 (14)
pH	<6.4 (36)	5.5–7.4; 6.5–8.4 (24)
Sodic	Non (75)	Medium (25)
QDGCs	3218 (20)	3318 (18)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972). **Flowering:** Spring, summer (Kidd 2002).



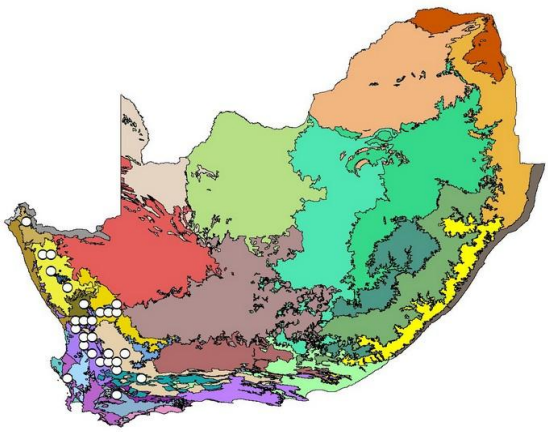
[E]*Wiborgia sericea* Thunb.

Crotalarieae ①

Dwarf shrub, shrub; P; Ht 0.3–1.2; Alt 100–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (42)	Northwest Fynbos; Rainshadow Valley Karoo (29)
Biome	Succulent Karoo (60)	Fynbos (40)
Rainfall (mm)	<400 (70)	200–600 (30)
Min temp (°C)	2–8 (70)	>6 (19)
Max temp (°C)	27–35 (56)	25–29 (41)
Phosphorus (ppm)	5–35 (63)	>20 (37)
pH	>7.5 (33)	6.5–8.4 (22)
Sodic	Medium (42)	Non; High (29)
QDGCs	3219 (22)	3119 (19)

NOTES: –



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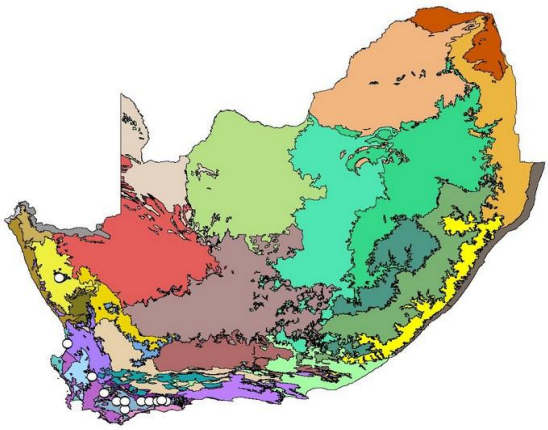
[E]*Wiborgia tenuifolia* E.Mey.

Crotalarieae ①

Shrub; P; Ht 0.7–1.4; Alt 50–400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (73)	<400 (27)
Min temp (°C)	2–8 (73)	0–4 (18)
Max temp (°C)	25–29 (82)	27–35 (18)
Phosphorus (ppm)	5–35 (91)	>20 (9)
pH	5.5–7.4; 6.5–7.4 (36)	6.5–8.4 (18)
Sodic	Ecotone	
QDGCs	3420 (33)	3421 (25)

NOTES: –



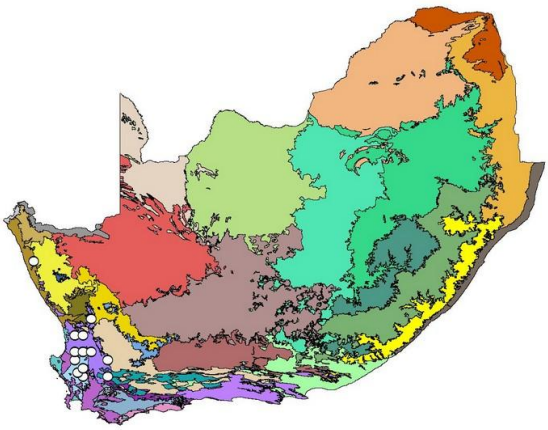
[E]*Wiborgia tetraptera* E.Mey.

Crotalarieae ①

Shrub; P; Ht 0.6–1.5; Alt 100–750

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (77)	<400 (23)
Min temp (°C)	2–8 (77)	>6 (15)
Max temp (°C)	25–29 (54)	27–35 (46)
Phosphorus (ppm)	5–35 (92)	>20 (8)
pH	5.5–7.4 (54)	6.5–8.4 (23)
Sodic	Non (100)	
QDGCs	3218 (38)	3318 (23)

NOTES: **Flowering:** Spring (Van Rooyen & Steyn 1999).



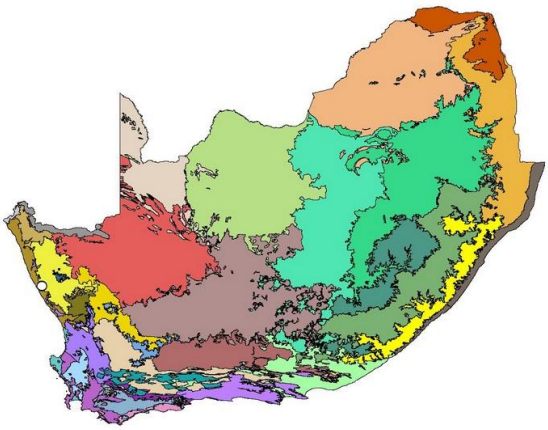
Wiborgiella bowieana (Benth.) Boatwr. & B.-E.van Wyk

Crotalarieae ①

Shrub; P; Ht 0.2–2; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (100)	
Sodic	Ecotone	
QDGCs	3017 (100)	

NOTES: –



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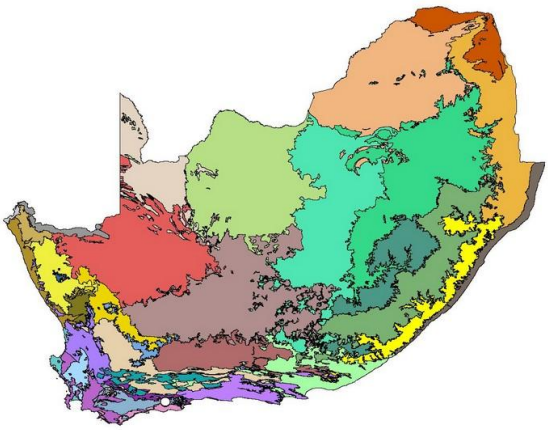
***Wiborgiella fasciculata* (Benth.) Boatwr. & B.-E.van Wyk** **Crotalarieae** ①

Dwarf shrub; P; Ht ?–0.4; Alt ?

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
Sodic	Ecotone	
QDGCs	3421 (100)	

NOTES: –

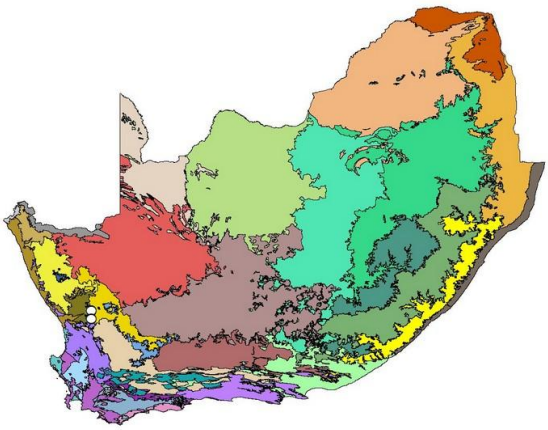


***Wiborgiella humilis* (Thunb.) Boatwr. & B.-E.van Wyk** **Crotalarieae** ①

Dwarf shrub; P; Ht ?–0.34; Alt 400–600

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	>20 (100)	
pH	6.5–8.4; >7.5 (50)	
Sodic	Ecotone	
QDGCs	3119 (100)	

NOTES: –

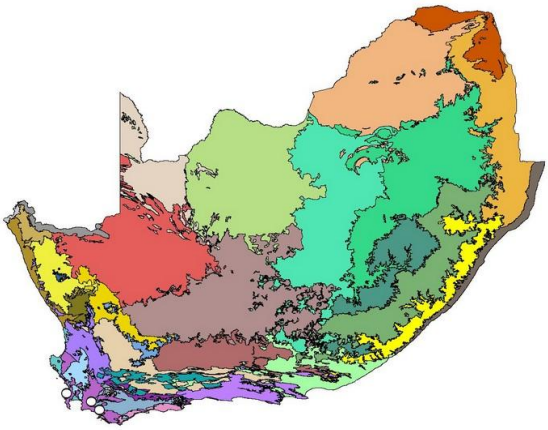


***Wiborgiella inflata* (Bolus) Boatwr. & B.-E.van Wyk** **Crotalarieae** ①

Herb; P; Ht 0.15–0.25; Alt 41–793

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800; 600–1000; >800 (33)	
Min temp (°C)	2–8 (67)	>6 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (100)	
Sodic	Ecotone	
QDGCs	3419 (67)	3318 (33)

NOTES: –



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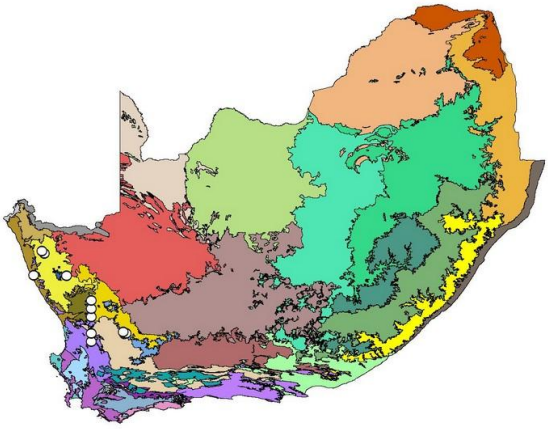
***Wiborgiella leipoldtiana* (Schltr. ex R.Dahlgren) Boatwr. & B.-E.van Wyk** **Crotalarieae** ①

Shrub; P; Ht 0.5–1; Alt 619–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Namaqualand Hardeveld (100)	
Biome	Succulent Karoo (75)	Fynbos (25)
Rainfall (mm)	<400 (84)	200–600; 400–800 (8)
Min temp (°C)	2–8 (46)	0–4 (31)
Max temp (°C)	27–35 (54)	25–29 (46)
Phosphorus (ppm)	>20 (62)	5–35 (38)
pH	>7.5 (46)	6.5–8.4 (31)
Sodic	Medium (100)	
QDGCs	3220 (31)	3119 (23)

NOTES: **Flowering:** Spring (Manning & Goldblatt 2002).

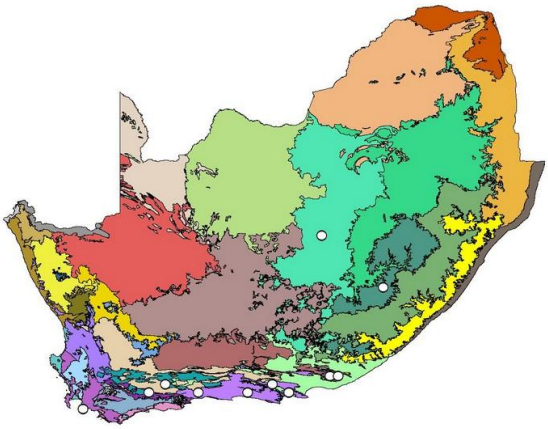


***Wiborgiella mucronata* (Benth.) Boatwr. & B.-E.van Wyk** **Crotalarieae** ①

Dwarf shrub; P; Ht 0.2–0.89; Alt 100–765

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos; Eastern Fynbos-Renosterveld; Dry Highveld Grassland (33)	
Biome	Grassland (67)	Fynbos (33)
Rainfall (mm)	400–800 (36)	600–1000 (27)
Min temp (°C)	2–8 (82)	<2 (18)
Max temp (°C)	25–29 (73)	27–35 (18)
Phosphorus (ppm)	5–35 (82)	<10 (18)
pH	<6.4; 5.5–7.4 (36)	6.5–8.4 (18)
Sodic	Non (67)	Medium (33)
QDGCs	3226 (19)	2926; 3027; 3320; 3321; 3322; 3323; 3324; 3325; 3418 (9)

NOTES: –

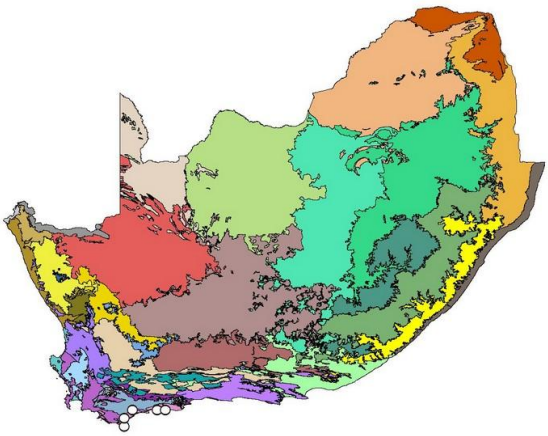


***Wiborgiella sessilifolia* (Eckl. & Zeyh.) Boatwr. & B.-E.van Wyk** **Crotalarieae** ①

Shrub; P; Ht 0.4–1.5; Alt 60–300

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	South Coast Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (80)	400–800 (20)
Min temp (°C)	2–8 (60)	>6 (40)
Max temp (°C)	25–29 (80)	<27 (20)
Phosphorus (ppm)	5–35 (100)	
pH	6.5–8.4 (60)	<6.4; 5.5–7.4 (20)
Sodic	Non (100)	
QDGCs	3420 (60)	3421 (40)

NOTES: –



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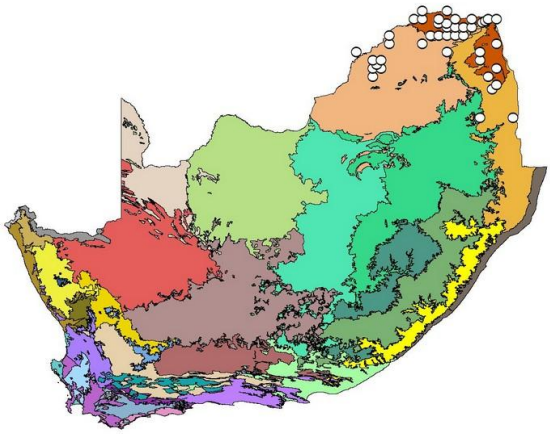
Xanthocercis zambesiaca (Baker) Dumaz-le-Grand

Sophoreae ☠ ③

Tree; P; Ht 7–40; Alt 200–1150

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (54)	Central Bushveld (42)
Biome	Savanna (100)	
Rainfall (mm)	200–600 (38)	400–800 (35)
Min temp (°C)	2–8 (59)	>6 (41)
Max temp (°C)	27–35 (78)	25–29 (16)
Phosphorus (ppm)	5–35 (78)	<10 (22)
pH	6.5–8.4 (41)	6.5–7.4 (27)
Sodic	Non (100)	
QDGCs	2229; 2230 (21)	2327 (13)

NOTES: **Cultivated** (Glen 2002). **Antiquality:** Irritant in wood (Watt & Breyer-Brandwijk 1962). **Biocultural:** Pods as food (Watt & Breyer-Brandwijk 1962); Timber (Van Wyk *et al.* 2000). **Flowering:** Spring (Van Wyk *et al.* 2000).



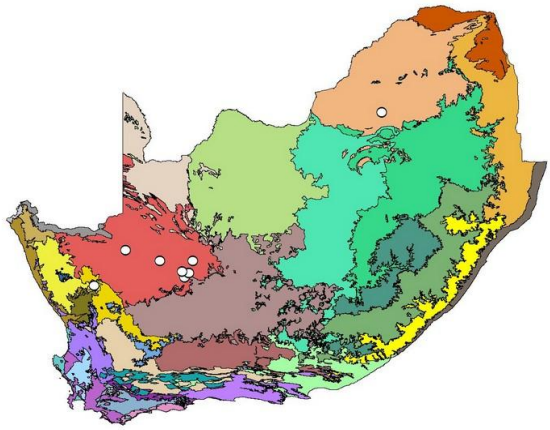
Xerocladia viridiramis (Burch.) Taub.

Mimoseae ①

Shrub; P; Ht 0.1–2; Alt 100–1200

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Bushmanland (86)	Central Bushveld (14)
Biome	Nama-Karoo (74)	Savanna; Succulent Karoo (13)
Rainfall (mm)	<400 (88)	400–800 (12)
Min temp (°C)	<2 (74)	0–4; 2–8 (13)
Max temp (°C)	27–35 (75)	>33 (25)
Phosphorus (ppm)	>20 (63)	5–35 (25)
pH	>7.5 (88)	<6.4 (130
Sodic	Non (100)	
QDGCs	3021 (22)	2527; 2920; 2921; 2922; 3019; 3022 (13)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Van Rooyen 1979).



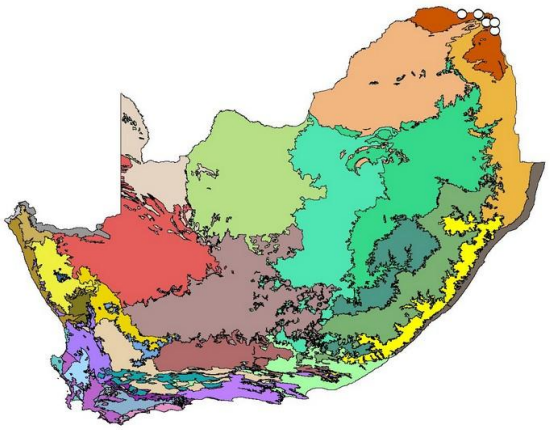
Xeroderris stuhlmannii (Taub.) Mendonça & E.C.Sousa

Millettieae ③

Tree; P; Ht 5–18; Alt 200–1000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mopane (100)	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (80)	<400 (20)
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (80)	6.5–8.4 (20)
Sodic	Non (100)	
QDGCs	2230; 2231 (50)	

NOTES: **Livestock feed** (Lewis *et al.* 2005). **Cultivated** (Glen 2002). **Biocultural:** Medicine for humans; timber (Watt & Breyer-Brandwijk 1962); Seed as food (Van Wyk *et al.* 2000). **Flowering:** Spring, summer (Venter & Venter 1996; Van Wyk *et al.* 2000).



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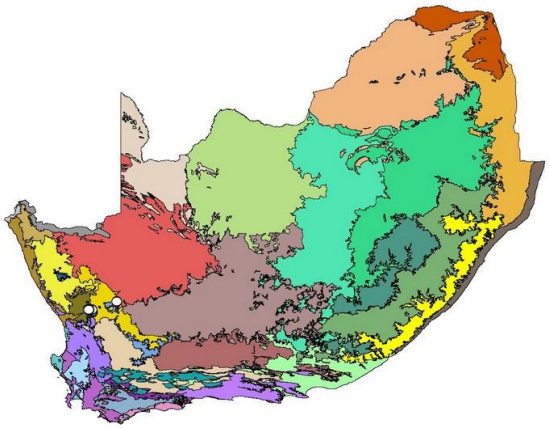
[E]*Xiphotheca canescens* (Thunb.) A.L.Schutte & B.-E.van Wyk

Podalyrieae ①

Shrub; P; Ht 1–2; Alt ?–820

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	<400 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29; 27–35 (50)	
Phosphorus (ppm)	>20 (100)	
pH	>7.5 (100)	
Sodic	Ecotone	
QDGCs	3119 (100)	

NOTES: **Flowering:** Spring (Manning & Goldblatt 2002).



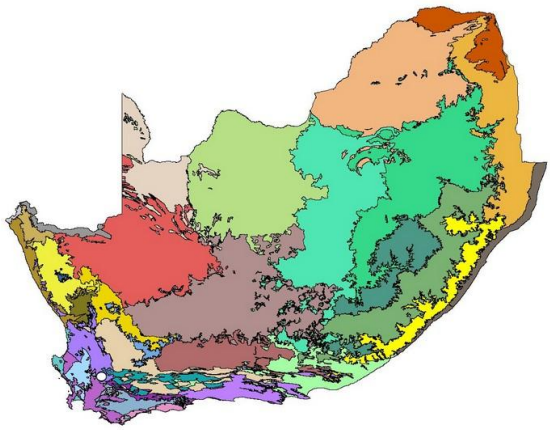
[E]*Xiphotheca cordifolia* A.L.Schutte & B.-E.van Wyk

Podalyrieae ①

Shrub; P; Ht 0.01–2.5; Alt 1333–1666

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	0–4 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
Sodic	Ecotone	
QDGCs	3319 (100)	

NOTES: –



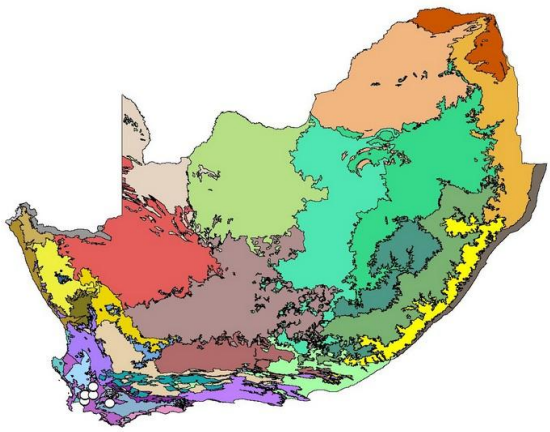
[E]*Xiphotheca elliptica* (DC.) A.L.Schutte & B.-E.van Wyk

Podalyrieae ①

Dwarf shrub; P; Ht 0.4–0.7; Alt 366–1400

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (60)	200–600; 600–1000 (20)
Min temp (°C)	2–8 (60)	0–4 (40)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (60)	<6.4 (40)
Sodic	Non (100)	
QDGCs	3319 (40)	3318; 3418; 3419 (20)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar & Clarke 1972).



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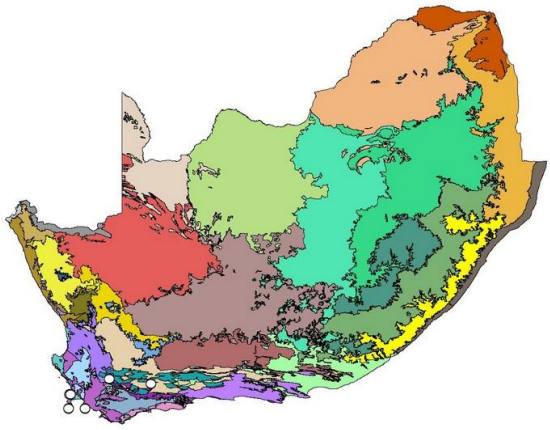
[E]*Xiphotheca fruticosa* (L.) A.L.Schutte & B.-E.van Wyk

Podalyrieae ①

Dwarf shrub; P; Ht 1.2–2.5; Alt 397–900

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Southwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; 400–800; 600–1000; >800 (20)	
Min temp (°C)	2–8; >6 (40)	0–4 (20)
Max temp (°C)	25–29 (80)	27–35 (20)
Phosphorus (ppm)	5–35 (80)	>20 (20)
pH	<6.4 (60)	5.5–7.4; >7.5 (20)
Sodic	Non (100)	
QDGCs	3318; 3418 (33)	3319; 3320 (17)

NOTES: **Flowering:** Autumn, winter, spring (Kidd 2002).



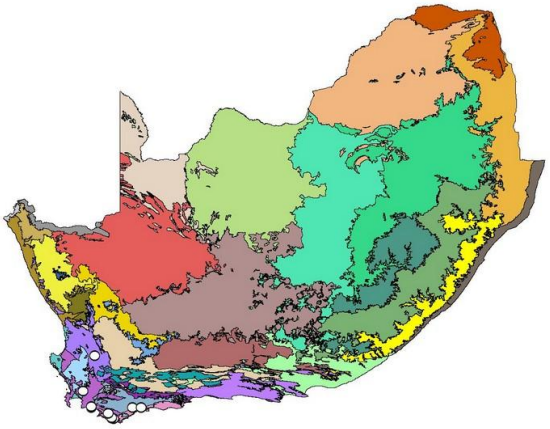
[E]*Xiphotheca guthriei* (L.Bolus) A.L.Schutte & B.-E.van Wyk

Podalyrieae ①

Dwarf shrub; P; Ht 0.15–0.3; Alt 61–130

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	400–800 (57)	200–600 (29)
Min temp (°C)	2–8 (71)	>6 (29)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (86)	<10 (14)
pH	<6.4; 5.5–7.4; 6.5–7.4 (29)	6.5–8.4 (13)
Sodic	Ecotone	
QDGCs	3419 (60)	3420 (20)

NOTES: –



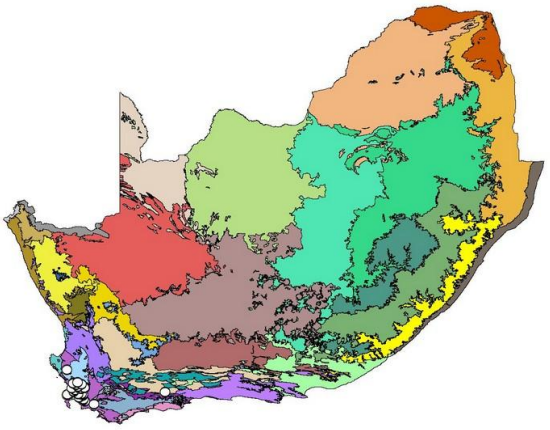
[E]*Xiphotheca lanceolata* (E.Mey.) Eckl. & Zeyh.

Podalyrieae ①

Dwarf shrub; P; Ht 0.3–0.6; Alt 35–610

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Fynbos (100)	
Rainfall (mm)	<400; 200–600; 600–1000; >800 (22)	400–800 (12)
Min temp (°C)	2–8 (56)	>6 (44)
Max temp (°C)	25–29 (89)	27–35 (11)
Phosphorus (ppm)	5–35 (100)	
pH	<6.4 (78)	5.5–7.4; 6.5–8.4 (11)
Sodic	Ecotone	
QDGCs	3318 (79)	3418 (14)

NOTES: –



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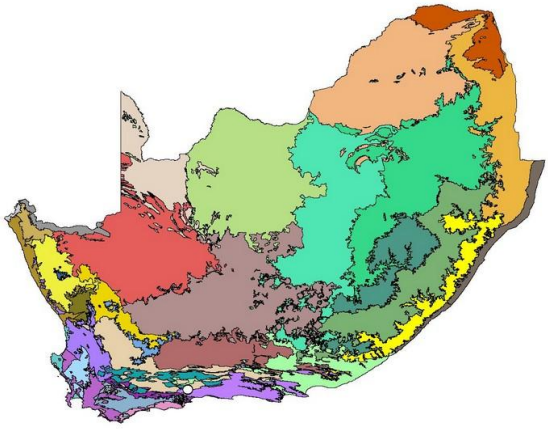
[E]*Xiphotheca phylicoides* A.L.Schutte & B.-E.van Wyk — Podalyrieae ①

Shrub; P; Ht 0.01–1.2; Alt 530–800

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Ecotone	
Rainfall (mm)	400–800 (100)	
Min temp (°C)	2–8 (100)	
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	5.5–7.4 (100)	
Sodic	Ecotone	
QDGCs	3322 (100)	

NOTES: –

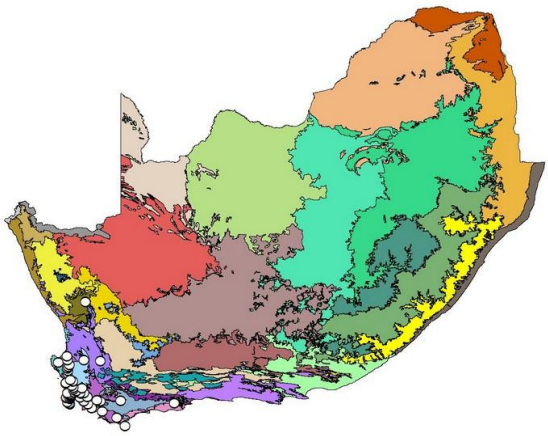


[E]*Xiphotheca reflexa* (Thunb.) A.L.Schutte & B.-E.van Wyk — Podalyrieae ①

Dwarf shrub; P; Ht 0.2–1.2; Alt 30–1500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos (100)	
Biome	Fynbos (100)	
Rainfall (mm)	200–600 (36)	400–800 (27)
Min temp (°C)	2–8; >6 (50)	
Max temp (°C)	25–29 (73)	27–35 (23)
Phosphorus (ppm)	5–35 (90)	<10; >20 (5)
pH	<6.4 (59)	5.5–7.4; 6.5–8.4 (14)
Sodic	Non (100)	
QDGCs	3318 (56)	3418 (19)

NOTES: –

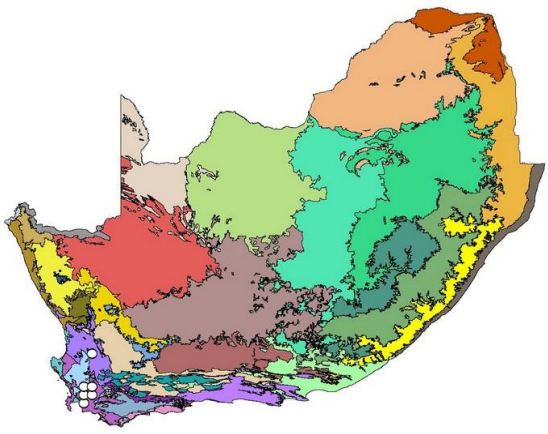


[E]*Xiphotheca tecta* (Thunb.) A.L.Schutte & B.-E.van Wyk — Podalyrieae ①

Dwarf shrub, shrub; P; Ht 0.3–1.8; Alt 300–702

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Northwest Fynbos; Southwest Fynbos (50)	
Biome	Fynbos (100)	
Rainfall (mm)	>800 (49)	200–600; 400–800; 600–1000 (17)
Min temp (°C)	2–8 (67)	0–4 (33)
Max temp (°C)	25–29 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	<6.4; 5.5–7.4 (50)	
Sodic	Non (100)	
QDGCs	3318; 3319 (33)	3219; 3418 (17)

NOTES: –



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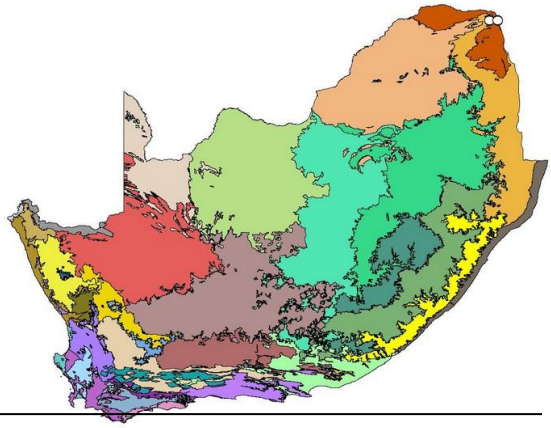
Xylia torreana Brenan

Mimoseae ①

Tree; P; Ht 6–15; Alt 250–500

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Ecotone	
Biome	Savanna (100)	
Rainfall (mm)	200–600 (100)	
Min temp (°C)	>6 (100)	
Max temp (°C)	27–35 (100)	
Phosphorus (ppm)	5–35 (100)	
pH	6.5–7.4 (100)	
Sodic	Ecotone	
QDGCs	2231 (100)	

NOTES: **N_2 fixation:** No nodulation (Grobbelaar *et al.* 1983).



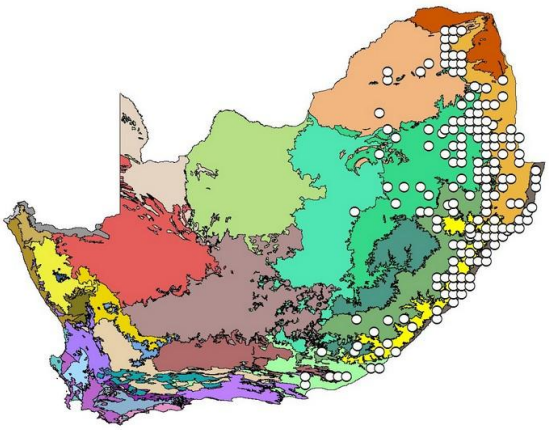
Zornia capensis Pers. subsp. *capensis*

Dalbergieae ①❖

Herb; P; Ht 0.05–3; Alt 5–2000

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Mesic Highveld Grassland (28)	Indian Ocean Coastal Belt; Lowveld (24)
Biome	Grassland (40)	Savanna (38)
Rainfall (mm)	>800 (43)	400–800 (30)
Min temp (°C)	2–8 (42)	>6 (34)
Max temp (°C)	25–29 (59)	27–35 (31)
Phosphorus (ppm)	<10 (77)	5–35 (23)
pH	<6.4 (70)	5.5–7.4 (24)
Sodic	Non (100)	
QDGCs	2530; 2930 (7)	2631; 3030 (6)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Biocultural:** Magical (Hutchings *et al.* 1996). **Flowering:** Spring, summer, autumn (Pooley 1998).



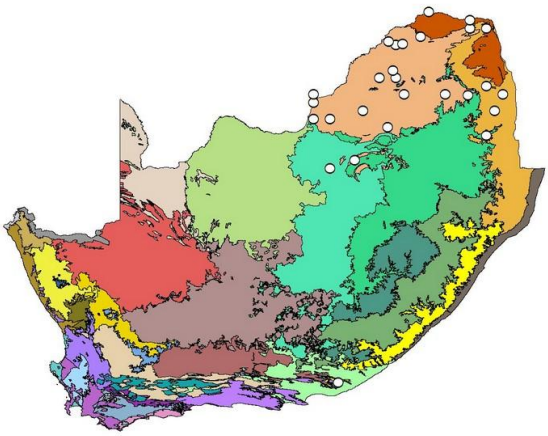
Zornia glochidiata Rchb. ex DC.

Dalbergieae ③

Herb; A; Ht 0.1–0.5; Alt 380–1112

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (65)	Lowveld; Mopane (15)
Biome	Savanna (95)	Grassland (5)
Rainfall (mm)	400–800 (64)	200–600 (18)
Min temp (°C)	2–8 (61)	>6 (21)
Max temp (°C)	27–35 (82)	25–29 (18)
Phosphorus (ppm)	<10 (61)	5–35 (39)
pH	<6.4 (43)	6.5–8.4 (25)
Sodic	Non (100)	
QDGCs	2328 (14)	2229 (11)

NOTES: **Cultivated** (Hakiza *et al.* 1988a). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967); *Rhizobium* isolates (Doignon-Bourcier *et al.* 1999, 2000). **Soil conservation:** Organic N (Morris 1997).



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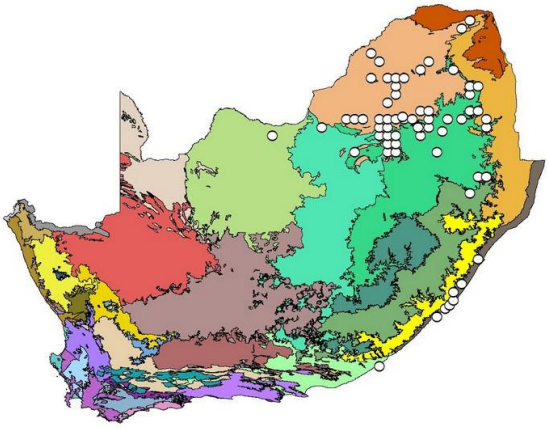
Zornia linearis E.Mey.

Dalbergieae ①

Herb; P; Ht 0.1–0.4; Alt 90–1830

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (56)	Mesic Highveld Grassland (26)
Biome	Savanna (58)	Grassland (31)
Rainfall (mm)	400–800 (69)	>800 (21)
Min temp (°C)	2–8 (50)	0–4 (23)
Max temp (°C)	25–29 (61)	27–35 (31)
Phosphorus (ppm)	<10 (81)	5–35 (19)
pH	<6.4 (74)	5.5–7.4 (23)
Sodic	Non (100)	
QDGCs	2529 (12)	2528 (11)

NOTES: **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967). **Flowering:** Spring, summer (Pooley 1998).



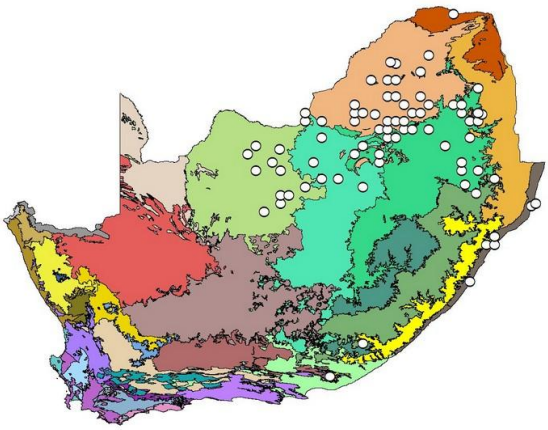
Zornia milneana Mohlenbr.

Dalbergieae ②

Herb; P; Ht 0.1–0.75; Alt 15–1950

OCCURRENCE	HIGHEST (%)	SECOND HIGHEST (%)
Bioregion	Central Bushveld (43)	Eastern Kalahari Bushveld (25)
Biome	Savanna (65)	Grassland (30)
Rainfall (mm)	400–800 (71)	>800 (12)
Min temp (°C)	2–8 (41)	<2 (27)
Max temp (°C)	27–35 (59)	25–29 (33)
Phosphorus (ppm)	<10 (93)	5–35 (7)
pH	<6.4 (56)	5.5–7.4 (24)
Sodic	Non (100)	
QDGCs	2528 (10)	2530 (9)

NOTES: **Livestock feed** (Maposse *et al.* 2003). **N_2 fixation:** Nodulated (Grobbelaar *et al.* 1967).



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CHAPTER 6

LEGUMINOCHORIA

6.1 Introduction

6.1.1 Origin of flora in southern Africa

A short description on the possible origin of the vegetation and flora of southern Africa relevant to this study follows, based on Goldblatt (1978), Van Wyk & Smith (2001), Bredenkamp *et al.* (2002) and Linder *et al.* (2005). The findings of Steenkamp *et al.* 2005 will be highlighted when describing the Leguminochoria later in this chapter.

Reasons for the high floristic diversity in southern Africa are (1) environmental diversity, i.e. from coastal to temperate montane to desert regions, (2) different climatic regimes, namely areas of summer, winter and all-year rainfall, (3) climatic fluctuations since the mid-Pliocene (5–2 million ya) that resulted in speciation in plants, especially in arid regions and in diverse soil types, and (4) some relics that survived in sheltered areas of cool climates along the coast in summer and winter rainfall areas (Goldblatt 1978).

Goldblatt (1978) defined six phytogeographic regions in southern Africa:

The *Zambezian Region* includes the northern savanna region, with woody and shrubby Leguminosae well represented.

The *Kalahari-Highveld Transition Zone* lies between the Zambezian Region and arid Karoo-Namib Region. Grassland with some woody species, especially species of *Acacia*, are present in this region. As a result of being a transitional zone, it has relatively low species richness and few endemic species. The windblown sand deposits of the Kalahari, not its aridity, are argued to be responsible for its uniqueness (Steenkamp *et al.* 2005). Even though southern Africa has relatively few annual species, the relatively high occurrence of annuals recorded in the southern Kalahari (Leistner 1967) is also supported in this study (see 6.3.3.7 Kalahari Bushveld Region). The Leguminosae are well presented in the Kalahari-Highveld Transition Zone.

In the *Karoo-Namib Region* endemism is very high. The highly endemic nature of the Karoo-Namib flora suggests that it may well have evolved from ancient xeric stock. Additions to this stock probably came from tropical African elements and from the Cape flora. Goldblatt (1978) confirms the importance of the close relation of the Cape and Karoo floras as highlighted by Acocks (1953).

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The *Tongaland-Pondoland Region* is a combination of forest and coastal grassland, with elements of the Afromontane Region.

The *Afromontane Region* (high-altitude areas around the Drakensberg Mountains) consists mainly of grassland with a rich herbaceous flora and some characteristic forest taxa. Many of the typical Afromontane taxa originate from neighbouring lowland flora. Steenkamp *et al.* (2005) states that the floristic link between the Cape and Drakensberg Alpine grasslands reflects the ecotonal status of the Drakensberg, being the link between the Cape and the non-forest Afromontane flora.

The *Cape Region* has not only a very high species richness but also displays high endemism for a continental area. The origin of the large and diverse Cape flora is twofold: (1) an ancient temperate southern African flora, and (2) tropical African elements, thus fundamentally an African flora. *Aspalathus*, containing the largest number of legume species, is found mainly in the Cape Region but members have spread into the Drakensberg area.

The regions of floristic endemism in southern Africa are described by Van Wyk & Smith (2001). Regions and centres corresponding to the Leguminochoria defined in this study will be noted for their floristic congruence. The floristic links of the Succulent Karoo Region are essentially with the Cape Region rather than with the Nama-Karoo. There is, however, support for a Greater Cape flora that includes the Succulent Karoo and the Cape Floristic Region. The Gariep Centre, Little Karoo Centre and the Worcester-Robertson Karoo Centre relate to Leguminochoria of this study. As far as legumes are concerned, the Gariep Centre is floristically linked with the Nama-Karoo but has no link with the Cape. The Little Karoo Centre has strong links with the Albany Centre. The Worcester-Robertson Karoo Centre has links with both the Karoo-Namib and Cape Floristic Region. According to Van Wyk & Smith (2001), the particular geology and geomorphological evolution of the Cape Floristic Region are primarily responsible for its existence. Furthermore, the location and orientation of the Cape mountains and successive climate changes have added to its uniqueness. Floristic elements of the Karoo-Namib, Cape, Afromontane Region, Kalahari-Highveld and Maputaland-Pondoland converge in the Albany Centre. The Drakensberg Alpine Centre is a regional specialisation within the Afromontane Region, linked with the Cape Floristic Region. The Maputaland-Pondoland Region is the second richest floristic region in southern Africa. The Wolkberg Centre is essentially part of the Afromontane Region and is floristically linked with the Barberton, Sekhukhuneland and Soutpansberg Centres. The wetter parts of the Soutpansberg Centre form part of the Afromontane Region, with links to the Wolkberg Centre and Zambezian Region. The Griqualand West Centre is described as the most pronounced local centre of endemism within the Kalahari-Highveld Regional Transition Zone, with links to the Karoo-Namib and Zambezian Regions.

The biomes of southern Africa (as they essentially occur today) are speculated to have been established some 7 000 years BP, with only smaller fluctuations that continued until recently (Bredenkamp *et al.* 2002). Grassland is generally typified by low temperatures and occurrences of frost, and trees of subtropical or tropical origin are therefore excluded from such regions. Therefore, grassland types cover regions of high altitude and high rainfall (e.g.

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Afromontane of the Eastern Escarpment) that are too cold for tree growth. Even the central plateaux of mid-altitudes are too cold for subtropical or tropical trees. Only in transitional savanna areas, *Acacia karroo* sometimes encroaches in degraded grassland. This species is described as '*a forerunner in the evolution of woody species of tropical origin and adapted to the colder conditions prevailing in the grassland biome*' (Bredenkamp *et al.* 2002). The Tall Grassland east of the Great Escarpment (Acocks 1953) is considered secondary owing to early Iron-age activities and is suitable for subtropical and tropical trees, but this view is disputed by many ecologists.

In a recent study, Linder *et al.* (2005) re-evaluated the sub-Saharan phytochoria. The Cape Floristic Region was clearly delineated from the surrounding Namib-Karoo and Eastern Karoo phytochoria. The distinction between the Succulent Karoo and Nama-Karoo was, however, not determined. In the analyses, the Cape and Nama-Karoo regions were widely separated, the former lying closer to the mesic Natal phytochorion. The Afromontane elements and coastal thicket floras shared with the Cape phytochorion are believed to be the reason for this link. Noteworthy though, the Lesotho Highlands was incorporated in the semi-arid Eastern Karoo phytochorion, and the Afromontane and Pondoland-Tongaland Region were included in the Natal phytochorion. The authors suggest that a new African analysis of the Afromontane region is needed to determine whether it is a phytochorion or merely a biogeographical track, i.e. a relict of previous climates that shows a disjunct distribution (Linder *et al.* 2005).

6.1.2 Defining vegetation, phytochoria and vegetation types

Plant life in a region can be mapped on the basis of three broad approaches as described by Van Wyk & Smith (2001). These classifications can be based on:

A. Growth form of plants irrespective of taxonomic identity

   Classifying the growth form of some or all of the plant species in combination results in defining *vegetation* groups, for example principal vegetation types such as fynbos, savanna and grassland, often called biomes (Rutherford & Westfall 1986). Such vegetation groups are determined mainly by climatic conditions prevailing over large regions (Van Wyk & Smith 2001). Biomes are thus not determined floristically, but they do to some extent relate to floristic units.

B. Total geographical range of taxa irrespective of growth form

   Classifying the flora in geographical regions with their own distinctive species and some overlapping geographical elements, results in defining *phytochoria* such as the Cape, Karoo-Namib and Kalahari-Highveld phytogeographical regions. The Cape Floristic Region is the only major floristic region matching the range of a major biome, in this case the Fynbos Biome (Van Wyk & Smith 2001).

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C. Growth form and/or floristic composition irrespective of the distribution ranges of taxa

Classifying broad vegetation units into smaller, more homogeneous units results in defining *vegetation types* such as the Bankenveld, Springbok Flats Turf Thornveld and Sour Bushveld of Acocks (1953). The distribution range of a species in a study area and not its total distribution range is considered, often reflecting differences in mean annual rainfall and edaphic factors (Van Wyk & Smith 2001).

6.1.3 Use of plant collection (herbarium) databases

The use of collection data to generate outcomes such as species richness and distribution maps, poses several problems. Sampling efforts may not be consistent (Robertson & Barker 2006), with some quarter degree grid cells (QDGCs) sampled excessively owing to geographical bias (along main roads or in a nature reserve), taxonomic bias (species that are easy to collect or more conspicuous) and temporal bias (collected in one season). Other problems include: (1) incorrect identification of specimens; (2) outdated taxonomy; and (3) incorrect georeferencing (Soberón & Peterson 2004). The history of PRECIS is summarised by Gibbs Russell & Arnold (1989) and additional information is given by Steenkamp *et al.* 2005.

The Leguminosae data obtained from the National Herbarium (PRE) Computerised Information System (PRECIS) evidently suffered from similar integrated problems as stated above. One problem encountered with a specific cluster in this study was that many of the grids containing only one legume species were grouped in this cluster. These ‘residue’ grids resulted in a large diverse cluster (see 6.3.3.4 Generalist Group). Furthermore, the mean area of a QDGC is 675 km^2, quite a large area to categorise in terms of bioregions, biomes, and climatic and soil properties. Some clusters lie in ecotonal areas and could therefore not be accurately defined.

6.2 Statistical procedures and layout of chapter

6.2.1 Statistical procedures

To obtain meaningful distribution patterns of indigenous legume species recorded in QDGCs, a cluster analyses was performed using XLSTAT 2010.6.01 Software (Addinsoft). Agglomerative (starting with each entity in a class of its own and fusing the classes into larger groups) Hierarchical Clustering (AHC) applying the Euclidean metrics with the

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Ward's linkage method was used to establish and describe functional legume clusters. The Ward's method is used where clusters are formed by maximising homogeneity. As stated by Tan *et al.* (2006), the goal of clustering is to assemble objects or species so that those within a group are similar to one another and different from objects or species in other groups. A more distinct cluster is the result where clustering shows great similarity within a group and great difference between groups. Within each group, a key species is identified and, where possible, used as the identifier for naming the distinct group or phytochorion.

The AHC was applied to the presence or absence of legume species in QDGCs according to PRECIS records. Hierarchical clustering is commonly used in analysing plant genetic diversity (Mohammadi & Prasanna 2003). Input data contained 1 580 species and 1 619 grids. Some species were recorded only once, but such rare species were not seen as noise and were therefore included in the data set. The statistical results are given in Table 6.1.

Clusters were not grouped at a consistent level of similarity. Instead, each main cluster (A–E) was mapped and divided into smaller cluster groups to ascertain whether further divisions formed clear boundaries. The resulting dendrogram (Figure 6.1) was compared with results obtained from PC-Ord (McCune & Mefford 2006) purely to compare a program not developed to analyse biological data with one that was. Comparable clusters were formed but differently arranged on the y-axis (Appendix 1 and 2). The reason for using XLSTAT was essentially the easy access to a consulting biometrician assisting with statistical analysis of all datasets generated for this study. The Datametric Department of the Agricultural Research Council (ARC) offers an accessible, professional service to all ARC researchers.

Table 6.1. Statistical results of the clustering analysis using the Agglomerative Hierarchical Clustering method (XLSTAT 2010.6.01 Software (Addinsoft)).
A. Variance decomposition for the optimal classification:

	Absolute	**%**
Within-class	14.521	88.8
Between-classes	1.833	11.2
Total	16.354	100.0

B. Results by class:

	Cluster				
	A	**B**	**C**	**D**	**E**
Within-class variance	28.698	7.713	58.008	43.081	53.756
Minimum distance to centroid	3.177	0.975	5.596	4.762	5.780
Average distance to centroid	5.208	2.474	7.463	6.433	7.150
Maximum distance to centroid	9.233	8.523	11.251	11.748	10.890
Centroid QDGC	2928AB	2727CD	3418BA	2529AC	2431CC

The distribution maps were created using Mucina & Rutherford's bioregions map (Rutherford *et al.* 2006) as base map and the QDGCs assigned to unique clusters using

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ArcView GIS 3.2, ESRI Inc. 2002. The data used in tables defining the bioregions, biomes and predominant climate and soil properties originate from the dataset described in Chapter 4.

Species richness was calculated by firstly removing all the duplicate species in a cluster. The total number of single species was then divided by the total number of QDGCs contained in a cluster. The deletion of duplicate species, however, resulted in a lower total number of QDGCs per cluster (a QDGC that contained only duplicates was removed from the datasheet). To determine the standard deviation for species richness in a cluster, the reduced number of QDGCs inevitably had to be used.

The percentage occurrence of a species was calculated by dividing the total count of an individual species in a cluster by the number of QDGCs in the same cluster, i.e. if Species A occurred in 30 of the 50 QDGCs of Cluster A1, it would have a 60% occurrence in that cluster. The first 20 species in a cluster were selected as *key species*. From an agricultural viewpoint, a species more widely adapted and with a high occurrence could have higher potential as a pasture crop than a rare species with a narrow distribution. A species is labelled *diagnostic* when its occurrence is 70% or higher in a given cluster.

A list of all species contained in the QDGCs assigned to a particular cluster group was compiled with the purpose of identifying key and diagnostic species. For some cluster groups, it was evident that outlier grids should be eliminated from the data set to create a core species list. Table 6.2 lists the QDGCs within each cluster group that were removed to identify diagnostic species.

Table 6.2. Quarter degree grid cells (QDGCs) removed from clusters to obtain a list of key species for each cluster group.

Cluster No.	**QDGCs**
A1	2531CD
A2	2929BB
A3	2926AA
A4	2530AC, 2530CA, 2629DB, 2730AD
A5	None
B1	2824BA
B2	3221DC
B3	2327CA, 2328DA, 2728BB, 2817AB, 2817DA, 3017AA, 3217DB, 3325DB
B4	None
B5	3422AB
B6	2725BD
B7	None
C	3326AD, 3326BC
D1	None
D2	2327DA, 2425DB
E	None

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The PHYTOTAB-PC program package of Westfall (1992) was used to classify the 20 key species recorded in the 16 clusters. The aim of this classification method was to ascertain whether floristic links between clusters existed. This program allows the user to decide on the number of groups classified. The accepted minimum percentage difference between groups is 33% where, in this case, PHYTOTAB-PC formed 10 groups. Increasing the percentage from 38% to 50% resulted in six groups for both percentages and therefore the analysis was done at the 38% difference between groups. The classification efficiency was 86%, higher than the 60% considered adequate for classification (Westfall 1992).

6.2.2 Layout of chapter

The discussion of the Leguminochoria is introduced by describing the results of the cluster analysis and clarifying the numbering of clusters showed in the dendrogram. The classification and additional information regarding climatology and agrohydrology of Leguminochoria are presented in table format. The description of the 16 uniquely formed Leguminochoria that follows, focuses on defining the bioregions and biomes where clusters are formed, as well as on the key climate and soil properties. A table containing the diagnostic and key species recorded in each cluster is given, also indicating the presence of a species as a key species in other clusters. The growth form of key species is not recorded in the tables, but can be obtained from Chapter 5. The distribution maps of all key species of a cluster are shown in one figure. A larger map for each species can be accessed on the CD accompanying this thesis. The chapter concludes with a general discussion, comparing the differences between Leguminochoria's bioregions and biomes. The climate and soil properties of the various Leguminochoria are compared along with their species richness, species range, and key and diagnostic species. The growth forms of the key and diagnostic species of the Leguminochoria/clusters are discussed. Finally, the floristic links between the Leguminochoria are established, both by examining and comparing key species common to clusters and by following the classification results of PHYTOTAB-PC.

6.3 Description of Leguminochoria

6.3.1 Introduction

Figure 6.1 is the dendrogram of the distribution pattern of legume species recorded in the various QDGCs grouped within five main clusters (A to E). Each main cluster was examined for meaningful groups until relatively natural groups in terms of distribution patterns in the study area were formed. The five main clusters and their subdivisions are numbered as shown

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in Figure 6.1. Cluster A, the second largest main cluster, was subdivided into five smaller clusters with distinct vegetational patterns mainly in the grassland and savanna regions. Cluster B has the largest weight and was subdivided into seven distinct smaller clusters. This cluster includes the broadest distribution pattern, referred to as the generalist group (B4). Cluster C represents the Cape Floristic Region. The two subdivisions of Cluster D are located in the savanna regions. Cluster E, the smallest cluster, represents a forest area. The subdivision of the five main clusters resulted in 16 smaller clusters.

Table 6.3 gives relevant information on the legume species richness per cluster (all duplicates contained in a QDGC removed) as well as the lowest and highest number of legumes collected (duplicates not removed) in the QDGCs within each cluster. It is evident that Cluster E contains the largest number of legume species per QDGC while Clusters B3 and B4 contain the lowest number of legume species per QDGC. The quite high species richness of Cluster A2 is also noteworthy, to be discussed later in this chapter.

Table 6.3. Statistics related to the cluster analysis for the distribution of legume species in South Africa, Lesotho and Swaziland. Species richness = Species/Quarter degree grid cell (QDGC); Species range = lowest and highest species count/QDGC.

Cluster	% QDGC	Species richness	Species range	Species range mean
A1	2.3	7.7 ±6.0	10–62	26.5 ±11.8
A2	1.3	11.9 ±13.0	15–65	36.3 ±15.9
A3	2.4	6.5 ±7.7	10–49	26.8 ±9.5
A4	2.5	7.4 ±9.1	8–60	25.4 ±13.6
A5	2.4	9.1 ±10.7	26–104	51.4 ±20.5
B1	4.6	5.3 ±4.4	4–47	17.2 ±9.3
B2	4.1	7.3 ±7.2	9–74	23.4 ±12.3
B3	16.7	3.0 ±3.3	1–31	5.3 ±4.8
B4	34.4	2.0 ±1.7	1–21	3.6 ±3.0
B5	12.2	3.2 ±2.6	1–25	9.1 ±5.4
B6	5.0	4.6 ±4.1	5–36	18.1 ±6.8
B7	1.4	5.9 ±6.7	11–36	20.6 ±7.5
C	4.2	11.9 ±15.3	34–174	69.6 ±29.1
D1	1.7	12.6 ±16.6	29–198	67.3 ±34.3
D2	2.7	9.3 ±10.4	4–76	47.6 ±13.8
E	2.1	13.5 ±19.2	28–213	83.6 ±37.1
Mean	**100.0**	**7.6**	**12–79**	

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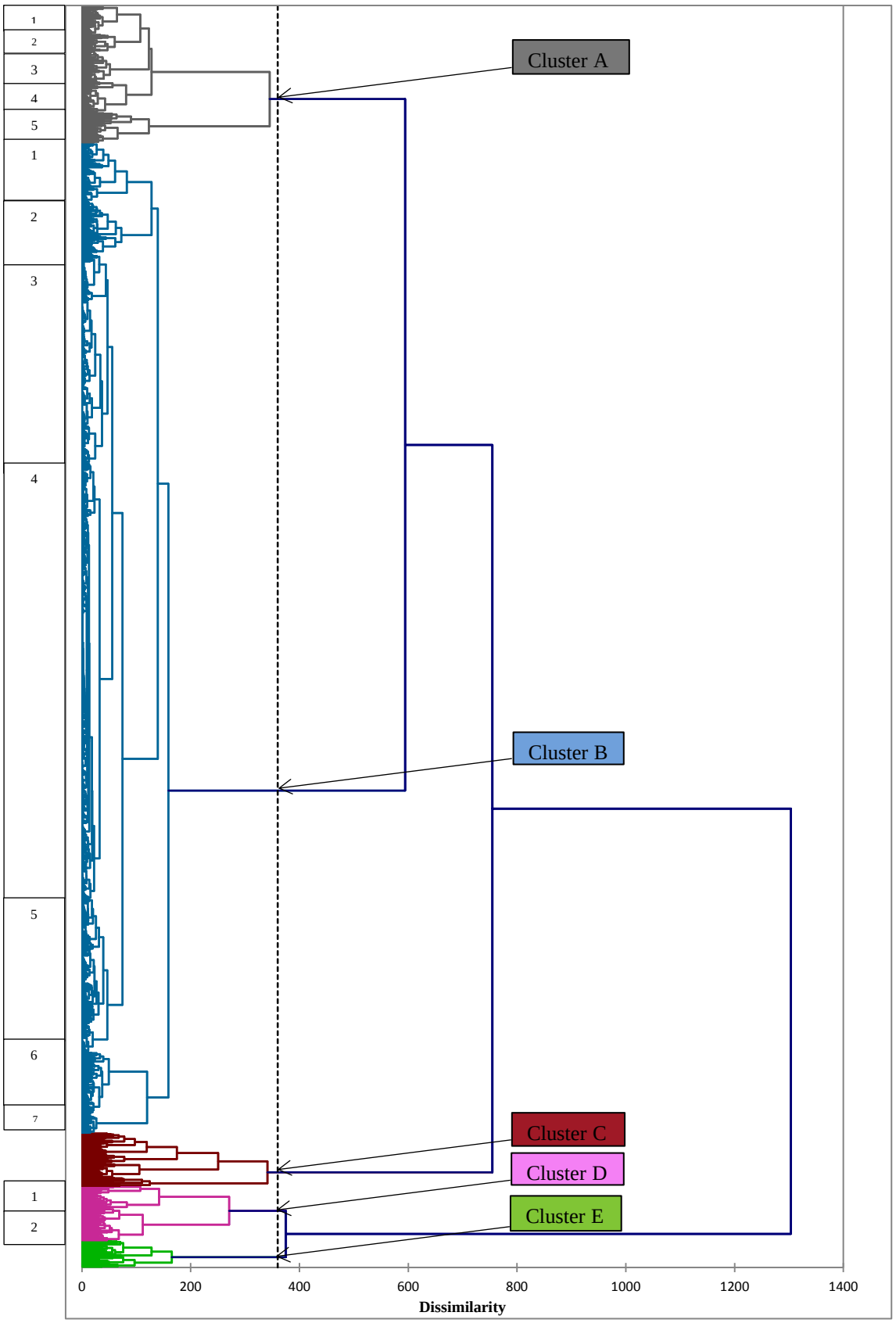

Figure 6.1. Dendrogram of Leguminochoria indigenous to South Africa, Lesotho and Swaziland.

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The classification of cluster groups as phytochoria, henceforth referred to as Leguminochoria, is listed in Table 6.4. The key bioregions (Rutherford *et al.* 2006) and additional vegetational description (Acocks 1988; Low & Rebelo 1996; Van Wyk & Smith 2001) further the delineation of cluster groups. It is apparent that distinct cluster groups were formed, except for Cluster B4 termed the generalist group. Clusters A1 and A3, B2 and C were formed mainly on the basis of variations in rainfall. Clusters A2 and A4 fall in centres of endemism as described by Van Wyk & Smith (2001). Cluster E is part of the Northern Mistbelt Forest as defined by Mucina & Geldenhuys (2006). The remaining clusters are named according to specific vegetation regions in South Africa.

Table 6.5 lists descriptive attributes for each cluster in terms of climatological and agrohydrological variables as described by Schulze (2007). It is evident that Clusters A1 to A5 differ greatly from each other in terms of the given variables, where only early summer to midsummer rain is noted at all clusters except Cluster A2. Most of Cluster B falls within the arid to semi-arid and sweetveld regions, with the exception of the diverse group B4 and the summer rainfall group B5. Cluster C falls within a frost-free area with all-year and winter rain. The dry northeastern part of South Africa is the core part of Cluster D whereas a temperate (including frost-free pockets), mountainous region describes the last cluster, Cluster E.

A discussion of distinctive attributes of the 16 Leguminochoria as listed in Table 6.4 follows.

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Table 6.4. Classification of Leguminochoria of South Africa, Lesotho and Swaziland.

Cluster	Cluster name	Key bioregions[1] (Rutherford *et al.* 2006)	Additional description[2]
A	**Sourveld and Mixed Veld Group (medium- to high-rainfall areas)**		
A1	Southern Afromontane	MHG, SEG, SES	Forest Biome (L&R); Moist subtropical (Kru)
A2	Albany Centre	AT, DG, SEG	Forest Biome (L&R); Dry subtropical (Kru); Albany Centre (VW&S)
A3	Northern Highveld Region	CBV, DHG, MHG	Bankenveld & N-E Sandy Highveld (Ac); Rocky Highveld Grassland (L&R); Moist subtropical (Kru)
A4	Drakensberg Alpine Centre	DG, MHG, SEG	*Themeda-Festuca* Alpine Veld (Ac); Forest Biome (L&R); Alpine (Kru); Drakensberg Alpine Centre (VW&S)
A5	Drakensberg Foothill & Coastal Region	IOCB, LV, SES	Coastal Bushveld-Grassland (L&R); Moist & humid subtropical (Kru); Maputaland-Pondoland Region (VW&S)
B	**Seasonal Rainfall Group (all-year, winter and summer rainfall)**		
B1	Arid Western Region	NHV, BML	Namaqualand Broken Veld, Succulent Karoo & Strandveld (Ac); Warm desert (Kru); Gariep Centre (VW&S)
B2	Lower-rainfall Cape Floristic Region	AT, EFR	Coastal Fynbos & Coastal Renosterveld (Ac); Maritime (Kru); Karoo Mountain, Langebaan, Agulhas Plain & Southeastern Centres (G&M)
B3	Central Arid Region	EKB, NK	Nama-Karoo and Western Savanna Biomes; Cold & warm desert, Dry subtropical (Kru)
B4	Generalist Group	All regions except: Fynbos, Northern Mistbelt Afromontane, IOCB	Non-specific, Non-Cape group
B5	Summer Rainfall Region	MHG, CBV	
B6	Northern and Northeastern Savanna Region	CBV, LV	Mopane Bushveld, Mixed Lowveld Bushveld, Mixed Bushveld (L&R)
B7	Kalahari Bushveld Region	EKB	Kalahari Thornveld (Ac); Kimberley Thorn Bushveld & Kalahari Plateau Bushveld (L&R); Griqualand West Centre (VW&S)
C	**Higher-rainfall Cape Floristic Region**	EFR, SWF	False Sclerophyllous Bush types & Coastal Renosterveld (Ac); Mediterranean (Kru); mainly Southwestern and Northwestern Centres (G&M)
D	**Savanna Group**		
D1	Central Bushveld Region	CBV	Springbok Flats Turf Thornveld & Sour Bushveld (Ac); Moist subtropical (Kru)
D2	Subtropical Lowveld & Mopane Region	LV, M	Mopane Bushveld & Mixed Lowveld Bushveld (L&R); Dry and moist tropical (Kru)
E	**Northern Mistbelt Forest**	Transitional MHG, LV, CBV	Tropical Forest Type (Ac); Afromontane Forest (L&R); Inland Moist tropical & moist subtropical (Kru)

[1]AT: Albany Thicket; BML: Bushmanland; CBV: Central Bushveld; DG: Drakensberg Grassland; DHG: Dry Highveld Grassland; EFR: Eastern Fynbos-Renosterveld; EKB: Eastern Kalahari Bushveld; IOCB: Indian Ocean Coastal Belt: LV: Lowveld; M: Mopane; MHG: Mesic Highveld Grassland; NHV: Namaqualand Hardeveld; NK: Nama-Karoo; SEG: Sub-Escarpment Grassland; SES: Sub-Escarpment Savanna; SWF: Southwest Fynbos.

[2]Ac: Acocks (1988); L&R: Low & Rebelo (1996); Kru: Kruger 1999; VW&S: Van Wyk & Smith (2001); G&M: Goldblatt & Manning (2002).

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Table 6.5. Additional information regarding climatology and agrohydrology of Leguminochoria (from Schulze 2007). Not all variables are noted with each cluster.

Cluster No.	Notes on climatology and agrohydrology
A1	36–42°C extreme maximum temperatures, >6 $tha^{-1}yr^{-1}$ net primary production, early summer to midsummer rain, 600–1200 mm annual rain, 400–1500 m altitude, <20 days heavy frost/yr with frost-free areas
A2	>40°C extreme maximum temperatures, 2–6 $tha^{-1}yr^{-1}$ net primary production, all-year and late and very late summer rain, 200–600 mm annual rain, 0–800 m altitude, <20 days heavy frost/yr with frost-free areas
A3	30–36°C extreme maximum temperatures , 4–8 $tha^{-1}yr^{-1}$ net primary production, early summer to midsummer rain, 400–1000 mm annual rain, 800–2000 m altitude, <60 days heavy frost/yr, higher monthly solar radiation compared to A1 and A2
A4	Mainly <36°C extreme maximum temperatures, 4–10 $tha^{-1}yr^{-1}$ net primary production, mainly early summer to midsummer rain, 400–1000 mm annual rain, mainly >2000 m altitude, <80 days heavy frost/yr, partly high relative relief, >6 extreme cold spells/yr lower than -2.5°C on 3 or more consecutive days, high mountains
A5	Mainly >40°C extreme maximum temperatures, >4 $tha^{-1}yr^{-1}$ net primary production, early to mid- to late summer rain, 600–1200 m annual rain, <800 m altitude, frost-free areas, low to medium relief, mainly sourveld, tropically wet with dry winter season
B1	Mainly >44°C extreme maximum temperatures, mainly <2 $tha^{-1}yr^{-1}$ net primary production, mainly winter rainfall, <400 mm annual rain, <800 m altitude, mainly frost-free areas and <20 days of heavy frost/yr, mainly 25–150 relative relief, high solar radiation during Nov–Feb, sweetveld, arid, hot and dry areas
B2	36–42°C extreme maximum temperatures, 0.5–4.0 $tha^{-1}yr^{-1}$ net primary production, all-year rainfall, mainly 200–600 mm annual rain, mainly 0–200 m altitude, mainly frost-free and <40 days heavy frost/yr, mainly >50 relative relief, mainly semi-arid, cool and dry
B3	<4 $tha^{-1}yr^{-1}$ net primary production, mainly late to very late summer rain, mainly between 400–1250 m altitude, mainly <50 relative relief, semi-arid to arid, hot, cool and dry, largely sweetveld
B4	Extremely diverse in terms of given variables
B5	>4 $tha^{-1}yr^{-1}$ net primary production, early to mid- to late summer rain, >400 mm annual rain
B6	Mainly >40°C extreme maximum temperature, midsummer rain, frost-free areas and <20 days of heavy frost, <50 relative relief, sweetveld, semi-arid, hot and dry, the only cluster with 16 occurrences of heat waves >30°C on 3 or more consecutive days/yr
B7	2–6 $tha^{-1}yr^{-1}$ net primary production, mainly late summer rain, 200–600 mm annual rain, 1000–1500 m altitude, mainly 20–60 days heavy frost/yr, <50 relative relief, sweetveld, semi-arid and dry, plains and pans
C	Mainly 2–4 $tha^{-1}yr^{-1}$ net primary production, all-year and winter rain, 400–1200 mm annual rain, frost-free areas, mixed veld, mainly long, dry summers hot or cool
D1	Mainly 36–40°C extreme maximum temperature, 2–6 $tha^{-1}yr^{-1}$ net primary production, early summer to midsummer rain, mainly 400–600 mm annual rain, 600–1500 m altitude, <40 days heavy frost/yr, 25–200 relative relief, dry and hot or cool
D2	>40°C extreme maximum temperature, 2–8 $tha^{-1}yr^{-1}$ net primary production, midsummer rain, 200–800 mm annual rain, <800 m altitude, mainly frost-free, <50 relative relief, mainly sweetveld, dry and hot
E	30–40°C maximum extreme temperature, >4 $tha^{-1}yr^{-1}$ net primary production, mainly early summer rain, >600 mm annual rain, 600–2000 m altitude, mainly frost-free areas, >50 relative relief, sourveld, long winters, low mountains

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6.3.2 Cluster A: Sourveld and Mixed Veld Group (medium- to high-rainfall areas)

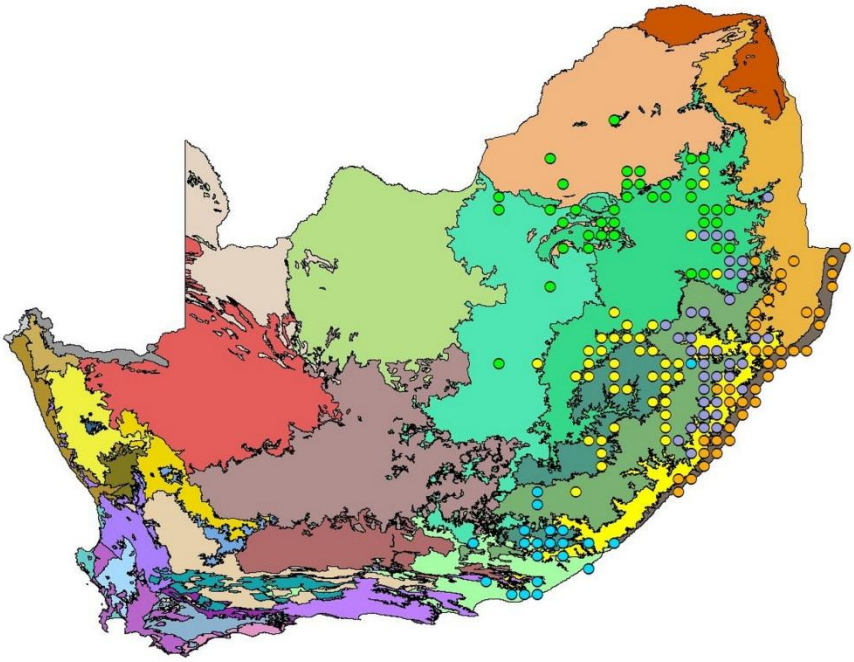

Figure 6.2. The Sourveld and Mixed Veld Group (Cluster A) mapped on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006). Purple dots: Southern Afromontane (A1); blue dots: Albany Centre (A2); green dots: Northern Highveld Region (A3); yellow dots: Drakensberg Alpine Centre (A4); orange dots: Drakensberg Foothill & Coastal Region (A5).

The Sourveld and Mixed Veld Group lies in the medium- to high-rainfall areas of South Africa, Lesotho and Swaziland. This region receives summer rain and frost occurs in the interior. The region is relatively high in net primary production. Sourveld refers mainly to the grass component and is defined as being unacceptable to grazers and less nutritious on reaching maturity (Acocks 1988). Grasses in the mixed veld maintain their quality for longer and could thus maintain animals for an extended period of more or less two months longer than sourveld.

The Sourveld and Mixed Veld Group is subdivided into:

- Southern Afromontane (Cluster A1)
- Albany Centre (Cluster A2)
- Northern Highveld Region (Cluster A3)
- Drakensberg Alpine Centre (Cluster A4)
- Drakensberg Foothill & Coastal Region (Cluster A5)

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6.3.2.1 The Southern Afromontane (Cluster A1)

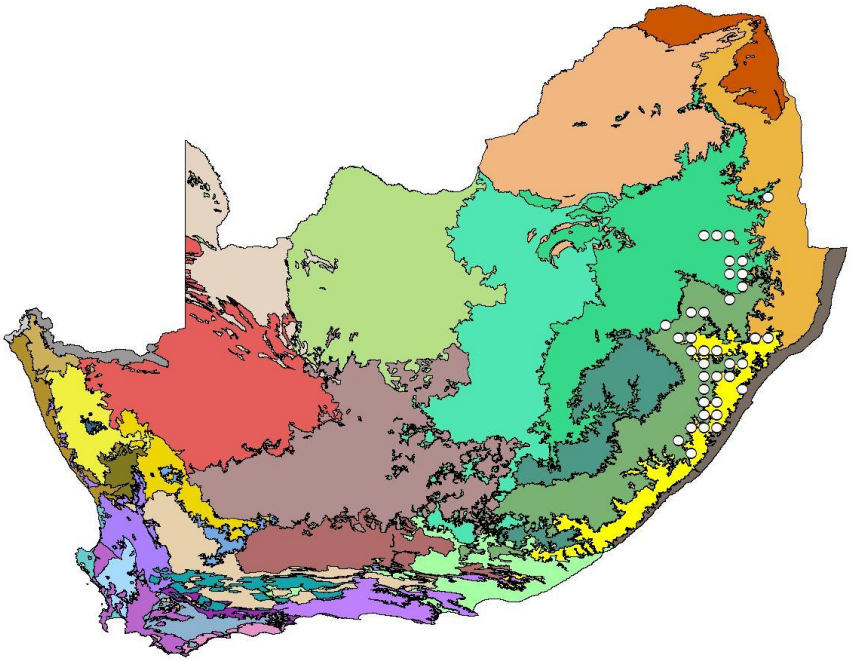

Figure 6.3. The Southern Afromontane (Cluster A1) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.2.1.1 Bioregions and biomes

The Southern Afromontane cluster includes legume species mainly confined to the Mesic Highveld Grassland, Sub-Escarpment Grassland and Sub-Escarpment Savanna Bioregions evident from Figure 6.3 (Rutherford *et al.* 2006) and Table 6.6. In terms of biomes, mostly Grassland is represented in this cluster. As stated previously (Chapter 4), a QDGC that contained only one distinct bioregion or biome was named according to Rutherford *et al.* (2006). QDGCs containing two or more bioregions were termed ecoregions and were not included in the statistics of the clusters. The result is that clusters that lie mainly in transitional zones could not be clearly defined in terms of bioregions.

6.3.2.1.2 Climate and soil

A summary of the predominant climate and soil properties of these regions is given in Table 6.6. The relatively high rainfall (>600 mm) and moderate minimum (0–8°C) and maximum (25–29°C) temperatures denote this cluster as a relatively highly productive region (Table 6.5). Extreme maximum temperatures of 36–42°C are noted for this cluster. Species are

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adapted to soil with a low phosphorus content (<10 mgkg^{-1}), to low pH (<6.4) and to non-sodic soils. Legume species adapted to low soil phosphorus and pH could play an important role as pasture species in other subtropical and tropical regions (Oberson *et al.* 2006).

Table 6.6. Southern Afromontane (Cluster A1): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**MHG**	**SEG**	**SES**		
	50.0	40.0	10.0		
Biomes	**GL**	**SV**			
	90.9	9.1			
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	0.0	0.0	0.0	56.8	43.2
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	0.0	46.0	46.0	8.0	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	13.5	70.3	16.2	0.0	
Phosphorus	**<10**	**5–35**	**>20**		
(mgkg^{-1})	94.6	5.4	0.0		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	81.1	18.9	0.0	0.0	0.0
ESP	**Non-sodic**				
	100.0				

MHG: Mesic Highveld Grassland; SEG: Sub-Escarpment Grassland; SES: Sub-Escarpment Savanna; GL: Grassland; SV: Savanna; ESP: Exchangeable Sodium Percentage.

6.3.2.1.3 Legume species

The species richness is relatively average compared to the other clusters (Table 6.3), with a relatively average species range of 10–62 in a QDGC.

The key species present in the cluster are listed in Table 6.7. Most key species are perennial herbs, with only one shrub/tree, *Dalbergia obovata*. Many of the herbs are climbers, possibly meriting further investigation into the interaction between functional types and competitiveness as suggested by Pausas & Austin (2001). Two annuals are key species, namely *Crotalaria globifera* and *Pomaria sandersonii*.

Relatively high occurrence (69%) is evident for *Eriosema cordatum* and *E. salignum*, the latter also a diagnostic species in Cluster E. It is noteworthy that key species are present in the 'A', B5 and E clusters except *Rhynchosia totta* var. *totta*, which is also found in the 'D' cluster. Cluster B5 represents the Summer Rainfall Region of South Africa and Cluster E the

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Northern Mistbelt Forest, both containing regions of high rainfall, low soil phosphorus and pH. Cluster D is found in areas of South Africa with relatively lower rainfall and higher minimum and maximum temperatures. It is noteworthy that *Zornia capensis* subsp. *capensis* is a diagnostic species in Clusters A5 (Drakensberg Foothill & Coastal Region) and E (Northern Mistbelt Forest) and also has a high occurrence in Cluster A1.

The fact that eight species are not key species in any other cluster, suggests that they are important species within the Southern Afromontane Cluster. The relatively high occurrence of *Eriosema distinctum* and *Argyrolobium speciosum* makes these species especially important. Distribution patterns of *Pomaria sandersonii* and *Rhynchosia cooperi* are confined to this cluster (Figure 6.4).

Table 6.7. Key species (% occurrence) found in the Southern Afromontane Cluster (A1). Bold-formatted cluster denotes diagnostic species.

Key species	**%**	**Also present in Cluster**
Eriosema cordatum	69	A3, A5, B5
Eriosema salignum	69	A3, A4, **A5**, B5
Eriosema kraussianum	58	B5
Vigna vexillata var. *vexillata*	56	A3, A5, B5, **E**
Zornia capensis subsp. *capensis*	56	**A5**, B5, **E**
Crotalaria globifera	47	A5
Argyrolobium tomentosum	44	A2, **E**
Eriosema distinctum	42	None
Argyrolobium speciosum	39	None
Dalbergia obovata	33	A5
Otholobium polystictum	33	A4
Rhynchosia totta var. *totta*	33	A2, A3, A4, B5, **D1**, D2, E
Tephrosia macropoda var. *macropoda*	33	A5
Trifolium africanum var. *africanum*	33	A3, A4, B5
Leobordea foliosa	31	None
Lotus discolor subsp. *discolor*	31	None
Pomaria sandersonii	31	None
Alysicarpus rugosus subsp. *perennirufus*	28	None
Indigofera hilaris var. *hilaris*	28	A3, B5
Rhynchosia cooperi	28	None
Rhynchosia sordida	28	None

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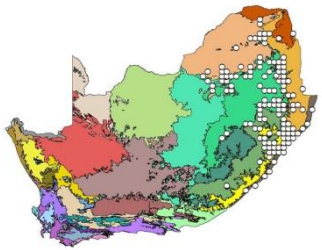
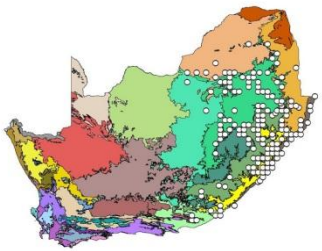
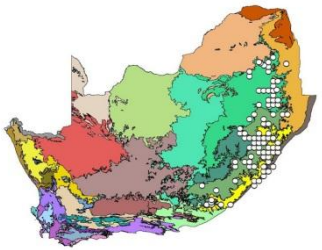


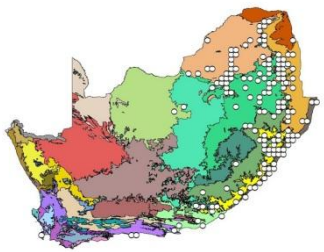
Eriosema cordatum



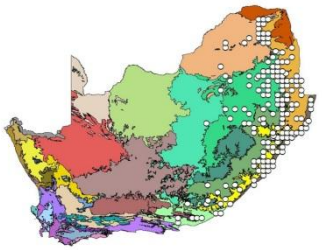
Eriosema salignum



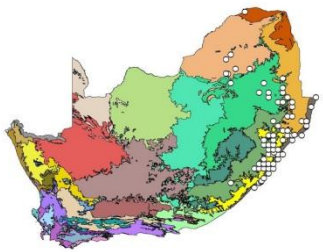
Eriosema kraussianum



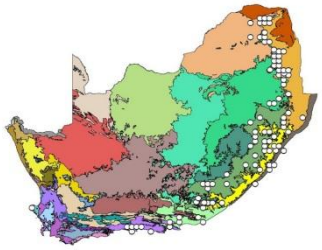
Vigna vexillata var. *vexillata*



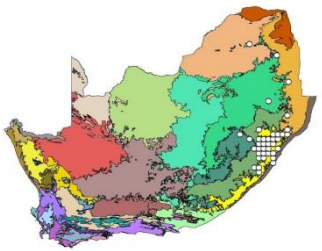
Zornia capensis subsp. *capensis*



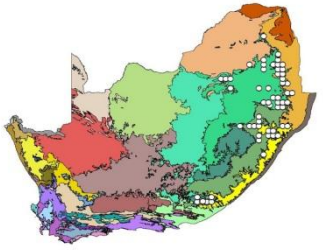
Crotalaria globifera



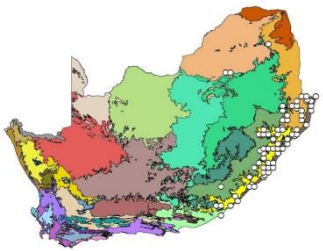
Argyrolobium tomentosum



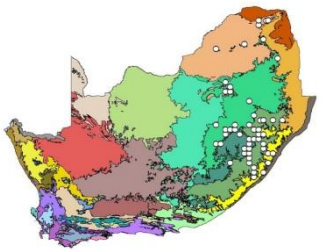
Eriosema distinctum



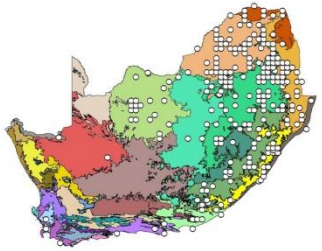
Argyrolobium speciosum



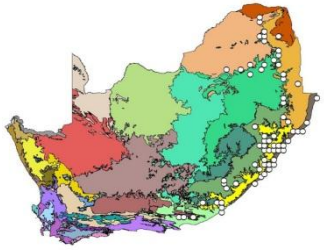
Dalbergia obovata



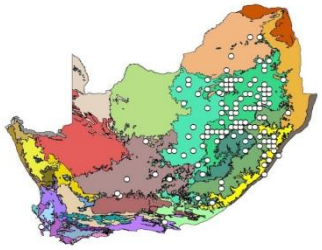
Otholobium polystictum



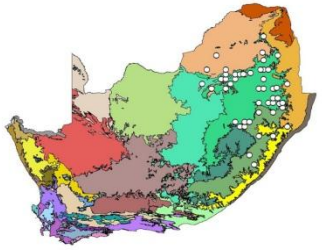
Rhynchosia totta var. *totta*



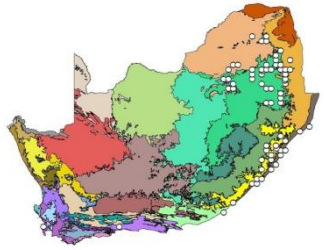
Tephrosia macropoda var. *macropoda*



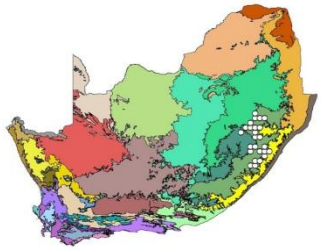
Trifolium africanum var. *africanum*



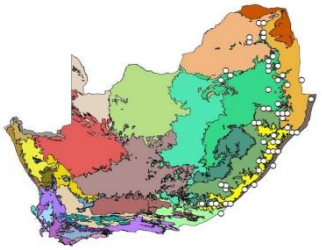
Leobordea foliosa



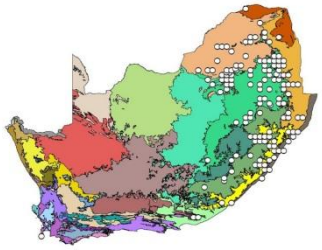
Lotus discolor subsp. *discolor*



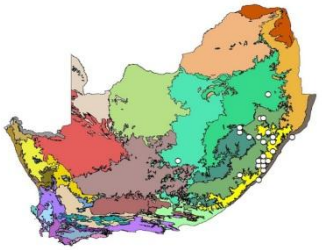
Pomaria sandersonii



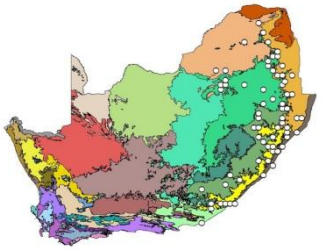
Alysicarpus rugosus subsp. *perennirufus*



Indigofera hilaris var. *hilaris*



Rhynchosia cooperi



Rhynchosia sordida

Figure 6.4. Distribution patterns of key species of the Southern Afromontane (Cluster A1).

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6.3.2.2 The Albany Centre (Cluster A2)

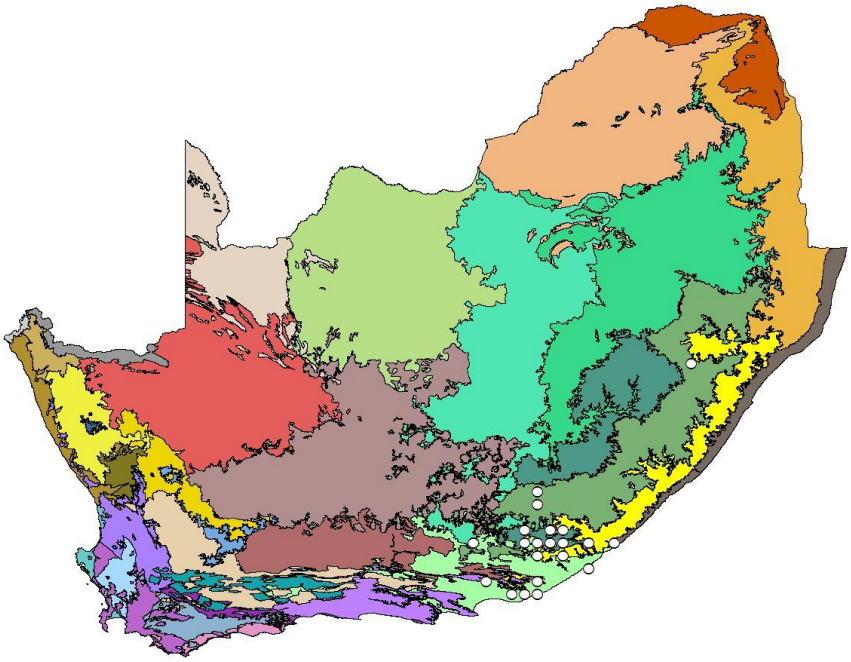

Figure 6.5. The Albany Centre (Cluster A2) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.2.2.1 Bioregions and biomes

The distribution pattern for this cluster is shown in Figure 6.5. In terms of bioregions, the cluster is shared equally in the Albany Thicket and Sub-Escarpment Grassland and in the Albany Thicket and Grassland Biomes (Table 6.8).

6.3.2.2.2 Climate and soil

The climate that prevail in this region (Table 6.8) are a medium annual rainfall (400–800 mm), minimum temperatures of mainly 2–8°C and moderate maximum temperatures of 25–29°C. The phosphorus content of soils is mainly 5–35 $mgkg^{-1}$, with non-sodic soils and a wide range of pH levels. The relatively high extreme temperatures (>40°C) noted for this cluster is also noted for Cluster A5 (Drakensberg Foothill & Coastal Region).

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Table 6.8. Albany Centre (Cluster A2): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**AT**	**SEG**			
	50.0	50.0			
Biomes	**AT**	**GL**			
	50.0	50.0			
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	0.0	9.5	66.7	19.1	4.7
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	0.0	28.6	47.6	23.8	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	0.0	95.2	4.8	0.0	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	23.8	76.2	0.0		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	33.3	23.8	14.3	28.6	0.0
ESP	**Non-sodic**				
	100.0				

AT: Albany Thicket; GL: Grassland; SEG: Sub-Escarpment Grassland; ESP: Exchangeable Sodium Percentage.

6.3.2.2.3 Legume species

Table 6.3 indicates that this cluster has relatively high species richness (11.9) even though only 1.3% of QDGCs are included in this cluster compared to the other four 'A' clusters. This is significant in terms of the available genetic resources in a relatively small cluster. The species range is relatively average.

The key species for this cluster are shown in Table 6.9. All species are perennials, with most key species a mixture of herbs, dwarf shrubs and shrubs. Two tree forms are present, namely *Schotia latifolia* and *Calpurnia aurea* subsp. *aurea*, and are not listed as key species in any other cluster. The distribution pattern of *Schotia latifolia* (Figure 6.6) is similar to the pattern of this cluster, but *Calpurnia aurea* subsp. *aurea* is also present in the Indian Ocean Coastal Belt, Lowveld and Central Bushveld Bioregion. No key species in this cluster are annual.

The only diagnostic species are *Rhynchosia totta* var. *totta* found in Cluster D1 (Central Bushveld Region) and *Argyrolobium tomentosum* found in Cluster E (Northern Mistbelt Forest). It is clear that both species have less importance in this cluster if their distribution pattern (Figure 6.6) is considered, where the former is found mainly in the northeastern part and the latter in the afromontane regions of South Africa.

Some of the key species are also found in the 'B' cluster, mainly B4 (Generalist Group) and B5 (Summer Rainfall Region). The climate and soil properties of the latter are very similar to those of Cluster A2. The species with the highest occurrence (65%), namely *Indigofera*

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zeyheri and *Tephrosia capensis* var. *capensis*, have summer rainfall distribution patterns (Figure 6.6). If the distribution patterns of key species not present in other clusters are considered, it is evident that *Schotia latifolia*, *Rhynchosia ciliata*, *Crotalaria obscura* and *Lessertia brachystachya* are uniquely present in this cluster (Figure 6.6).

Table 6.9. Key species (% occurrence) found in the Albany Centre (Cluster A2). Bold-formatted cluster denotes diagnostic species.

Key species	**%**	**Also present in Cluster**
Indigofera zeyheri	65	B5
Tephrosia capensis var. *capensis*	65	B2, B4, B5
Aspalathus spinosa subsp. *spinosa*	55	B2, C
Rhynchosia adenodes	55	B4, B5
Trifolium burchellianum subsp. *burchellianum*	55	A4, B4
Eriosema squarrosum	50	None
Melolobium candicans	50	B3, B4
Rhynchosia totta var. *totta*	50	A1, A3, A4, B5, **D1**, D2, E
Schotia latifolia	50	None
Argyrolobium tomentosum	45	A1, **E**
Calpurnia aurea subsp. *aurea*	45	None
Indigofera hedyantha	45	A3, A4
Rhynchosia ciliata	45	None
Aspalathus chortophila	40	None
Crotalaria obscura	40	None
Indigofera sessilifolia	40	B3, B7
Lessertia brachystachya	40	None
Otholobium caffrum	40	None
Psoralea oligophylla	40	B2
Rhynchosia caribaea	40	A5, B4, E

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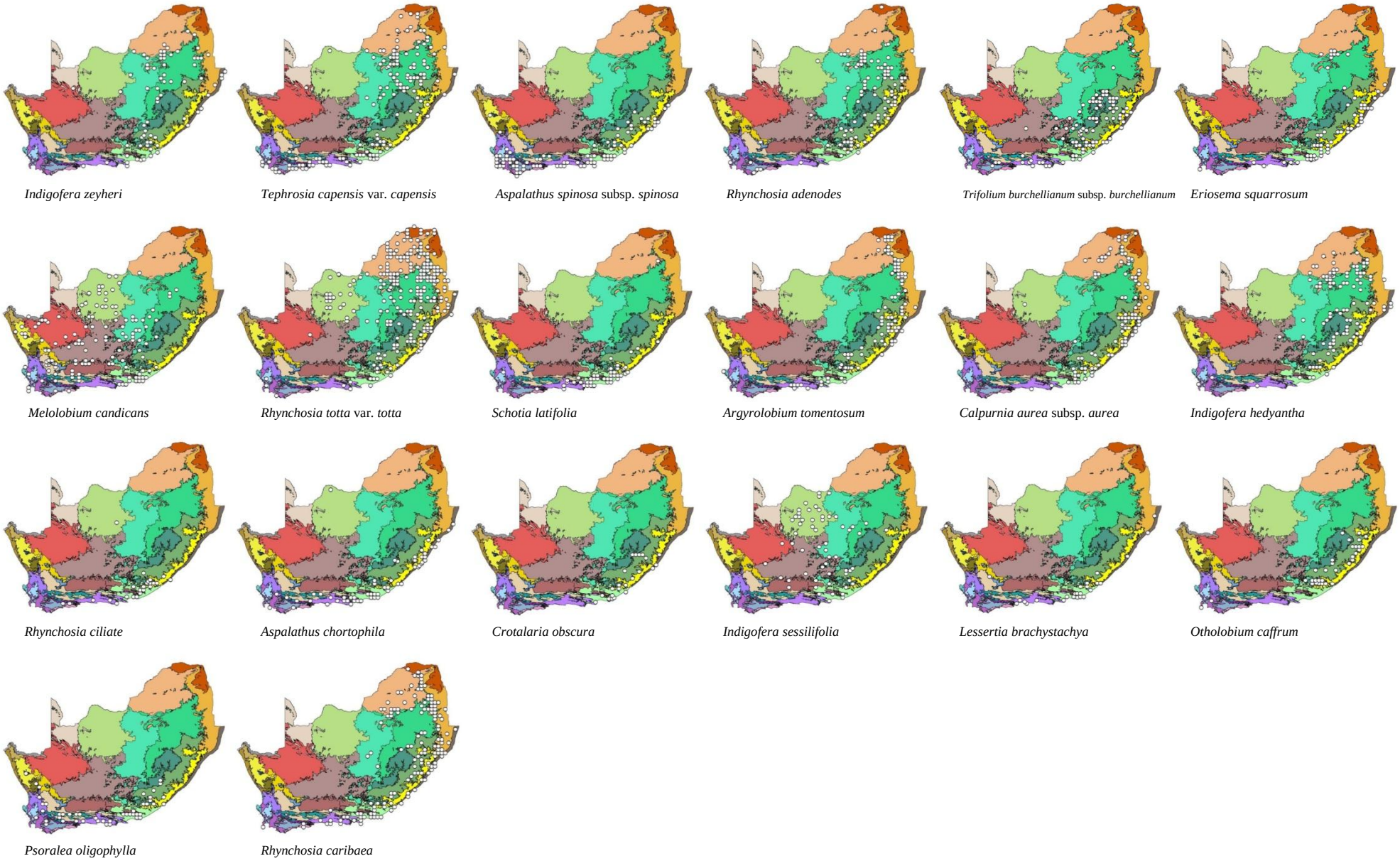

Figure 6.6. Distribution patterns of key species of the Albany Centre (Cluster A2).

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6.3.2.3 Northern Highveld Region (Cluster A3)

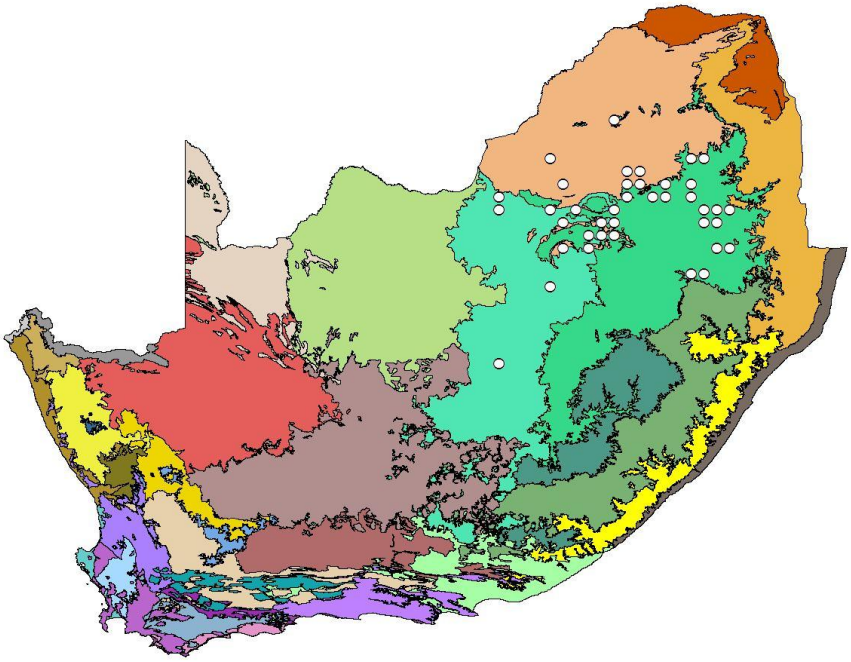

Figure 6.7. The Northern Highveld Region (Cluster A3) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.2.3.1 Bioregions and biomes

Figure 6.7 shows the distribution pattern of the Northern Highveld Region. This cluster does not lie exclusively in the afromontane; most QDGCs lie within areas of higher altitude and lower rainfall compared to the Southern Afromontane. The Mesic Highveld Grassland is the major bioregion present in this cluster, while Grassland is the biome that is best represented (Table 6.10).

6.3.2.3.2 Climate and soil

The main difference between the Northern Highveld Region and Southern Afromontane Clusters (compare Table 6.6 and 6.9) is the lower rainfall noted for the former (400–800 mm). The low minimum temperatures (mainly <4°C) and the relatively high number of frost days per year (Table 6.5) occurring in the Northern Highveld Region are also in contrast to the Southern Afromontane. Low soil phosphorus values (<10 $mgkg^{-1}$), low pH (<6.4) and non-sodic soils are noted for this cluster. Information derived from Schulze (2007) shows that

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high altitudes (800–2000 m) are documented for this cluster, higher than for the Southern Afromontane but lower than for the Drakensberg Alpine Centre (Table 6.5).

Table 6.10. Northern Highveld Region (Cluster A3): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**CBV**	**DHG**	**MHG**		
	22.2	16.7	61.1		
Biomes	**GL**	**SV**			
	81.0	19.0			
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	0.0	0.0	84.6	15.4	0.0
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	33.3	46.2	20.5	0.0	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	15.4	48.7	35.9	0.0	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	100.0	0.0	0.0		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	82.1	12.8	0.0	5.1	0.0
ESP	**Non-sodic**				
	100.0				

CBV: Central Bushveld; DHG: Dry Highveld Grassland; GL: Grassland; MHG: Mesic Highveld Grassland; SV: Savanna; ESP: Exchangeable Sodium Percentage.

6.3.2.3.3 Legume species

The species richness and the range of number of species are relatively low compared to the other 'A' clusters (Table 6.3).

Table 6.11 lists the key species for the cluster. *Tephrosia longipes* subsp. *longipes* var. *longipes*, *Elephantorrhiza elephantina*, *Tephrosia elongata* var. *elongata* and *Erythrina zeyheri* are the only dwarf shrub and shrub growth forms. No trees are listed as key species. Bredenkamp *et al.* (2002) state that trees are excluded from frost prone regions, whereas Bond *et al.* (2003) believe that the invasion of alien Australian trees into the Highveld suggests that the occurrence of fire, not frost, is probably the limiting factor. The distribution pattern of *Acacia karroo* clearly shows that it is present in the Dry Highveld Grassland Bioregion but mostly absent from the Mesic Highveld Grassland. The remaining key species are perennial herbs.

The species with the highest occurrence, *Rhynchosia totta* var. *totta* and *Tephrosia longipes* subsp. *longipes* var. *longipes*, are also diagnostic species in Cluster D1 (Central Bushveld

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Region (Table 6.11). The former species is widely distributed in the north to eastern part of the study area whereas the latter is found mostly in the Central Bushveld Bioregion (Figure 6.8).

Most of the key species are also present in the 'A' cluster group as well as in Cluster B5 (Summer Rainfall Region). Figure 6.8 shows that the key species are noticeably present in the Summer Rainfall Region. *Eriosema burkei* var. *burkei*, *Indigofera oxytropis*, *Pearsonia sessilifolia* subsp. *sessilifolia* and *Pearsonia cajanifolia* subsp. *cajanifolia* are not present as key species in any other cluster. Figure 6.8 demonstrates that their distribution patterns correspond with the Northern Highveld Region and they are therefore critical species to this region.

Table 6.11. Key species (% occurrence) found in the Northern Highveld Region (Cluster A3). Bold-formatted cluster denotes diagnostic species.

Key species	**%**	**Also present in Cluster**
Indigofera hilaris var. *hilaris*	47	A1
Rhynchosia totta var. *totta*	47	A1, A2, A4, B5, **D1**, D2, E
Tephrosia longipes subsp. *longipes* var. *longipes*	47	B5, **D1**, D2
Leobordea divaricata	45	None
Elephantorrhiza elephantina	42	B4, B5, B7
Leobordea eriantha	39	A4
Vigna vexillata var. *vexillata*	39	A1, A5, B5, **E**
Zornia linearis	39	D1
Eriosema burkei var. *burkei*	37	None
Indigofera oxytropis	37	None
Pearsonia sessilifolia subsp. *sessilifolia*	37	None
Rhynchosia nervosa var. *nervosa*	37	B5
Tephrosia elongata var. *elongata*	37	None
Trifolium africanum var. *africanum*	37	A1, A4, B5
Zornia milneana	37	B7
Eriosema cordatum	34	A1, A5, B5
Eriosema salignum	34	A1, A4
Erythrina zeyheri	34	None
Indigofera hedyantha	34	A2, A4
Pearsonia cajanifolia subsp. *cajanifolia*	34	None

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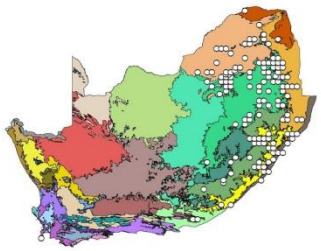
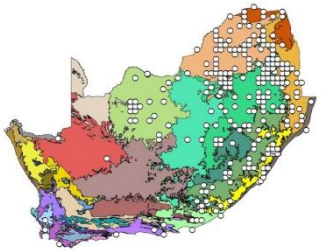
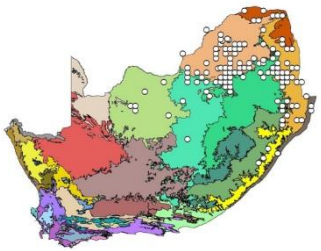


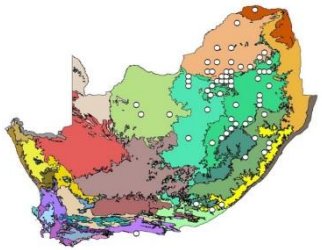
Indigofera hilaris var. *hilaris*



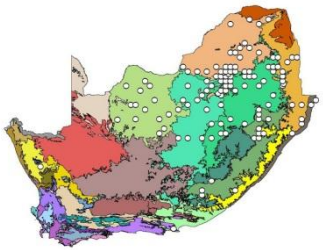
Rhynchosia totta var. *totta*



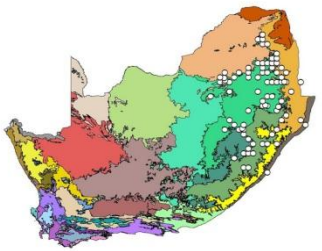
Tephrosia longipes subsp. *longipes* var. *longipes*



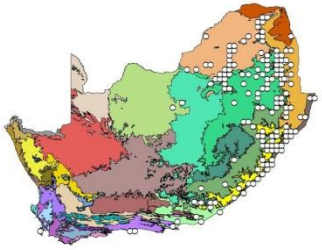
Leobordea divaricata



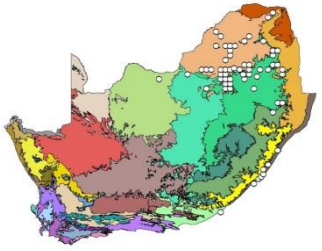
Elephantorrhiza elephantina



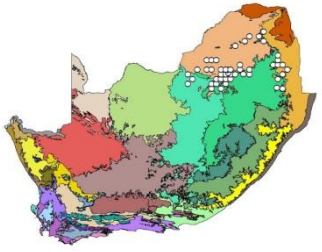
Leobordea eriantha



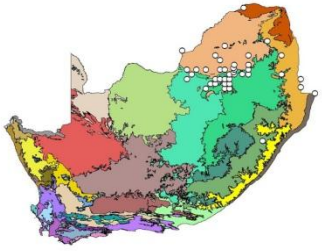
Vigna vexillata var. *vexillata*



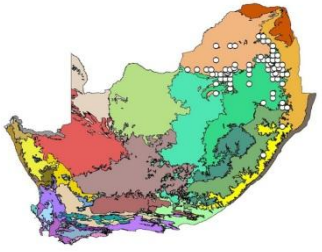
Zornia linearis



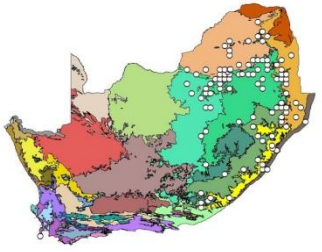
Eriosema burkei var. *burkei*



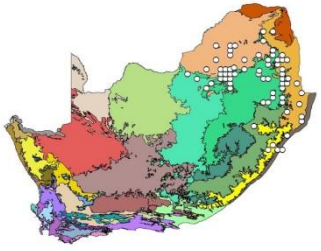
Indigofera oxytropis



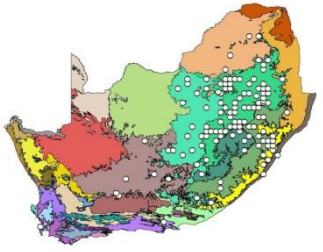
Pearsonia sessilifolia subsp. *sessilifolia*



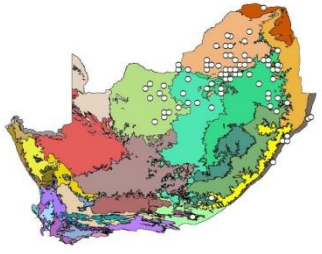
Rhynchosia nervosa var. *nervosa*



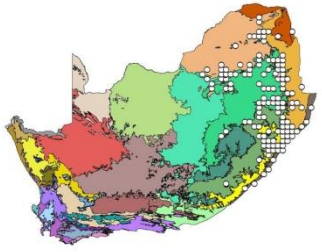
Tephrosia elongata var. *elongata*



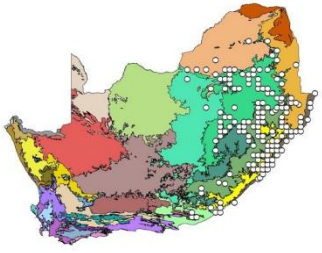
Trifolium africanum var. *africanum*



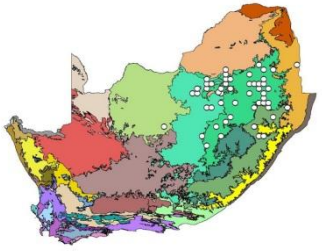
Zornia milneana



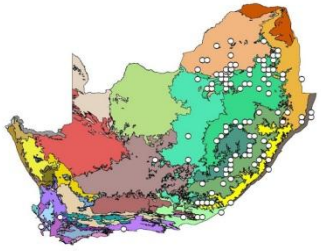
Eriosema cordatum



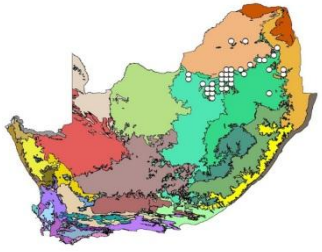
Eriosema salignum



Erythrina zeyheri



Indigofera hedyantha



Pearsonia cajanifolia subsp. *cajanifolia*

Figure 6.8. Distribution patterns of key species of the Northern Highveld Region (Cluster A3).

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6.3.2.4 Drakensberg Alpine Centre (Cluster A4)

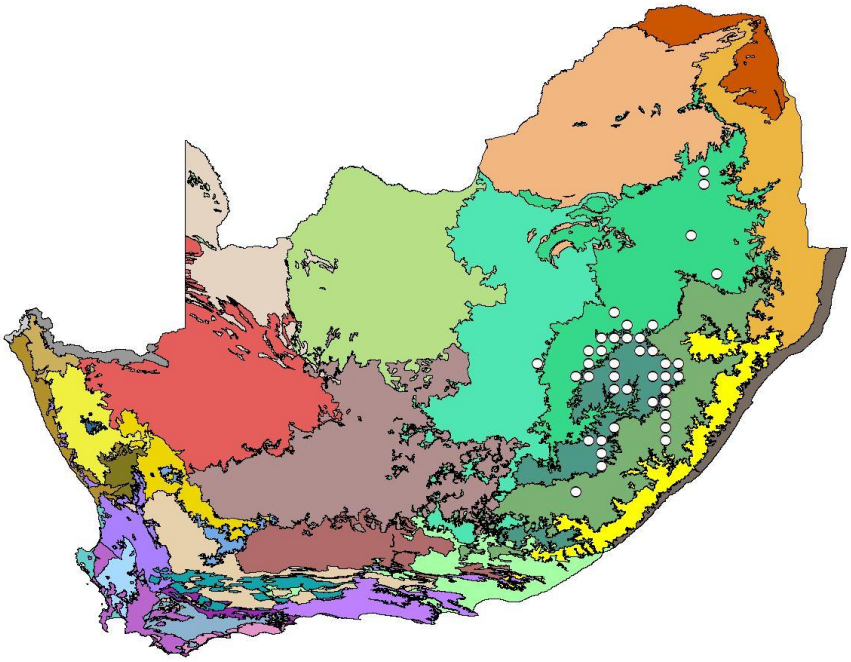

Figure 6.9. Drakensberg Alpine Centre (Cluster A4) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.2.4.1 Bioregions and biomes

The distribution pattern for the Drakensberg Alpine Centre is shown in Figure 6.9. The Mesic Highveld, Drakensberg Grassland and Sub-Escarpment form the major bioregions for this cluster, with Grassland the only biome part of this cluster.

6.3.2.4.2 Climate and soil

Table 6.12 clearly shows that the Drakensberg Alpine Centre falls in a high-rainfall area (mostly >800 mm) with relatively low minimum (<2°C) and maximum (<27°C) temperatures. Owing to the high rainfall, the low soil phosphorus content of <10 $mgkg^{-1}$ and pH (<6.4) is to be expected. As in the case of Cluster A1, legume species adapted to low soil phosphorus and pH have an important role to play in subtropical and tropical regions (Oberson *et al.* 2006). This cluster is further defined by a high number of days of heavy frost per year (<80 days) and more than six cold spells per year with temperatures lower than -2.5°C on three or more consecutive days (Table 6.5). Also noteworthy is that this cluster has the highest altitude range of all the clusters.

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Table 6.12. Drakensberg Alpine Centre (Cluster A4): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**DG**	**MHG**	**SEG**		
	35.3	41.2	23.5		
Biomes	**GL**				
	100.0				
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	0.0	2.5	17.5	22.5	57.5
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	70.0	30.0	0.0	0.0	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	80.0	17.5	2.5	0.0	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	90.0	10.0	0.0		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	87.5	12.5	0.0	0.0	0.0
ESP	**Non-sodic**				
	100.0				

DG: Drakensberg Grassland; GL: Grassland; MHG: Mesic Highveld Grassland; SEG: Sub-Escarpment Grassland; ESP: Exchangeable Sodium Percentage.

6.3.2.4.3 Legume species

Species richness is relatively low compared to the other 'A' clusters and the range of species per QDGC is also relatively low (Table 6.3).

The key species are listed in Table 6.13. The dominant plant growth form in the Drakensberg Alpine Centre is essentially perennial herbs, with some dwarf shrubs and shrubs species. No annuals or tree forms are present as key species.

Lessertia perennans var. *perennans* is a diagnostic species present in this cluster (Table 6.13). The fact that it does not appear as a key species in any other cluster indicates its uniqueness in the Drakensberg Alpine Centre. *Rhynchosia totta* var. *totta* and *Eriosema salignum* are diagnostic species in Clusters D1 and A5 respectively. The former species is diagnostic in the Central Bushveld Region and the latter in the Drakensberg Foothill & Coastal Region. Both species are present in the northern and eastern parts of South Africa as shown in Figure 6.10.

Many key species in the Drakensberg Alpine Centre are also key species in Cluster A3 (Northern Highveld Region). Both these clusters form part of the Mesic Highveld Afromontane Bioregion, defined as having soils with low pH values (compare Tables 6.9 and 6.11). *Lotononis sericophylla* and *Lotononis galpinii* is noteworthy since their distribution pattern closely represents the Drakensberg Alpine Centre, thus uniquely found here (Figure 6.10).

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Table 6.13. Key species (% occurrence) found in the Drakensberg Alpine Centre (Cluster A4). Bold-formatted species and clusters denote diagnostic species.

Key species	**%**	**Also present in Cluster**
Lessertia perennans* var. *perennans	**72**	None
Lotononis sericophylla	58	None
Trifolium burchellianum subsp. *burchellianum*	58	A2, B4
Lotononis laxa	56	B4
Argyrolobium rupestre subsp. *rupestre*	53	None
Argyrolobium lotoides	50	None
Otholobium polystictum	47	A1
Lotononis lotononoides	44	None
Rhynchosia totta var. *totta*	44	A1, A2, A3, B5, **D1**, D2, E
Trifolium africanum var. *africanum*	44	A1, A3, B5
Dichilus strictus	42	None
Indigofera hedyantha	42	A2, A3
Lotononis galpinii	42	None
Melolobium obcordatum	42	None
Argyrolobium tuberosum	39	None
Eriosema salignum	39	A1, A3, **A5**, B5
Melolobium microphyllum	39	B3, B4
Argyrolobium harveyanum	33	None
Dolichos angustifolius	33	None
Leobordea eriantha	33	A3

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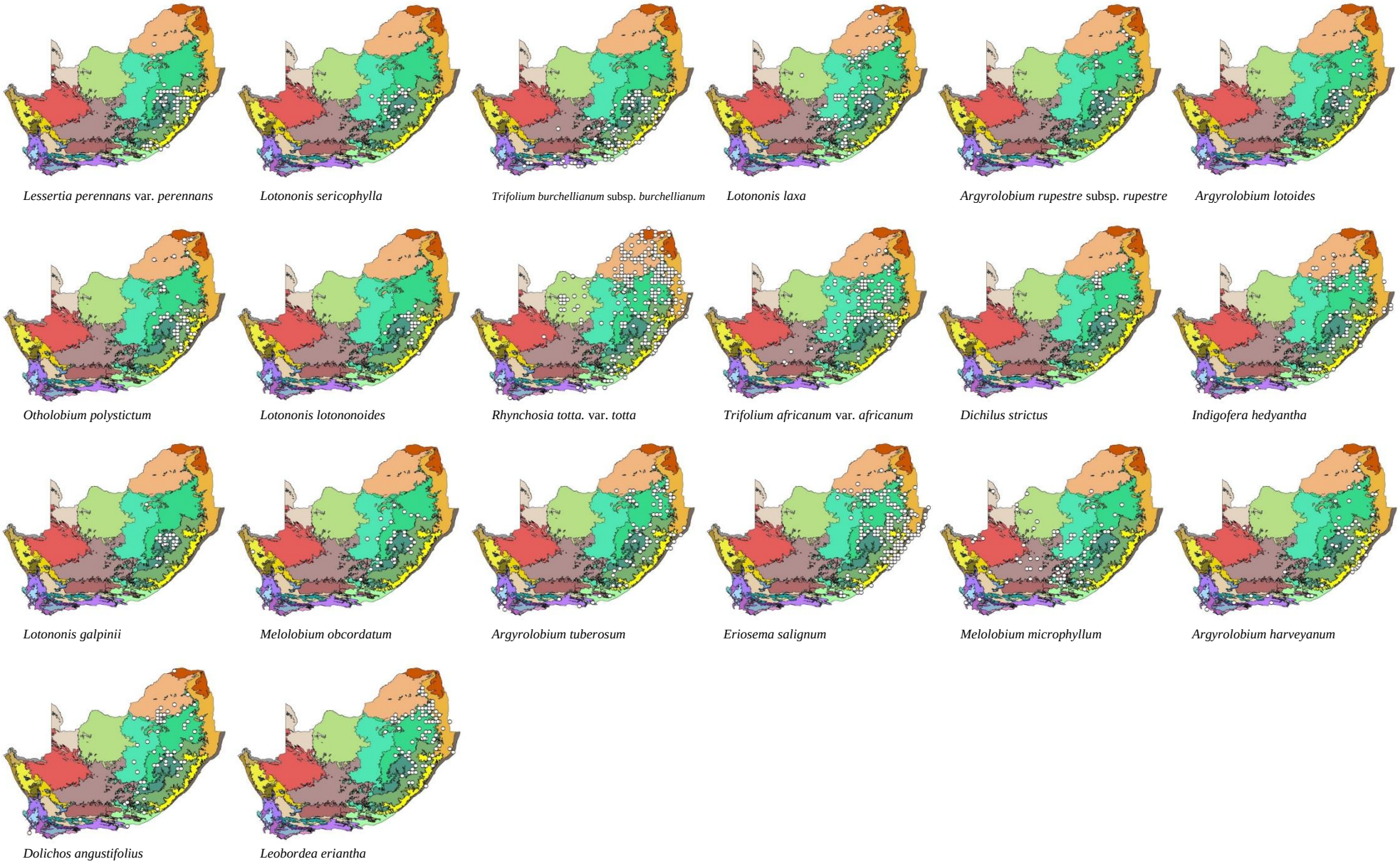

Figure 6.10. Distribution patterns of key species of the Drakensberg Alpine Centre (Cluster A4).

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6.3.2.5 Drakensberg Foothill & Coastal Region (Cluster A5)

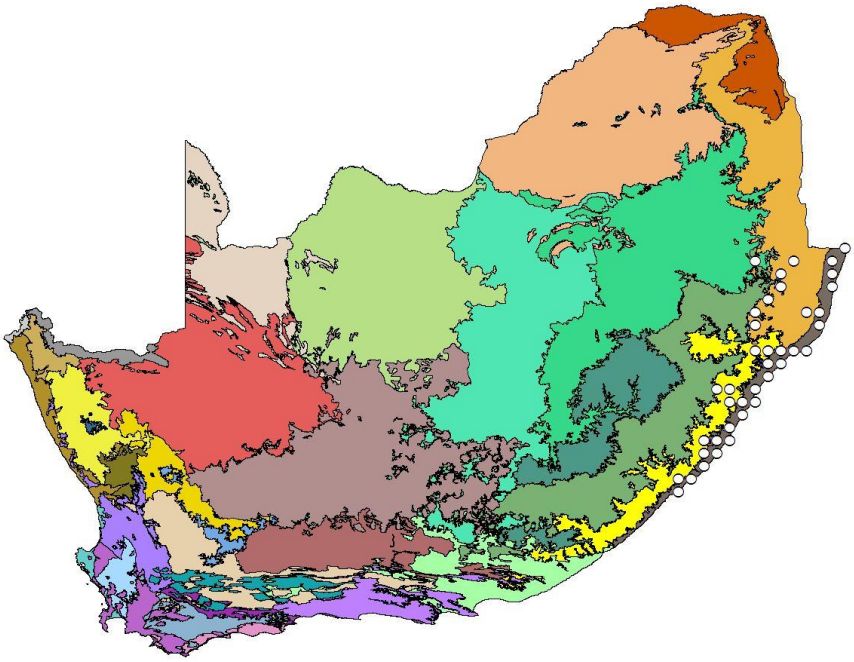

Figure 6.11. The Drakensberg Foothill & Coastal Region (Cluster A5) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.2.5.1 Bioregions and biomes

The distribution pattern of the Drakensberg Foothill & Coastal Region is shown in Figure 6.11. The Indian Ocean Coastal Belt Bioregion contains most QDGCs found in the cluster, followed by the Lowveld and Sub-Escarpment Savanna Bioregion. In terms of biomes, the Indian Ocean is highly represented in this cluster, followed by the Savanna Biome.

6.3.2.5.2 Climate and soil

High annual rainfall (>800 mm/year), high minimum temperatures (>6°C) and moderate to high maximum temperatures represent the climatic conditions of this cluster (Table 6.14). As in the case of most of the 'A' clusters, relatively low phosphorus and pH levels as well as non-sodic soils are typical properties of the Drakensberg Foothill & Coastal Region. The fact that this cluster lies in a frost-free area with extreme maximum temperatures of >40°C (Table 6.5) could be important when selecting legume species for further evaluation.

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Table 6.14. Drakensberg Foothill & Coastal Region (Cluster A5): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**IOCB**	**LV**	**SES**		
	79.0	15.8	5.2		
Biomes	**IOCB**	**SV**			
	76.5	23.5			
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	0.0	0.0	18.0	7.6	74.4
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	0.0	0.0	20.5	79.5	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	0.0	59.0	41.0	0.0	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	79.5	20.5	0.0		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	66.7	30.8	2.5	0.0	0.0
ESP	**Non-sodic**				
	100.0				

IOCB: Indian Ocean Coastal Belt; LV: Lowveld; SES: Sub-Escarpment Savanna; SV: Savanna; ESP: Exchangeable Sodium Percentage.

6.3.2.5.3 Legume species

Relatively high species richness is noted for this cluster (Table 6.3), with a wide species range of 26–104 species per QDGC.

Table 6.15 lists the key species. The perennial herb growth form dominates this cluster. The occurrence of several climbers in this cluster is noteworthy, where a low-lying, coastal environment can sustain various climbing legume species. *Acacia karroo*, *Dalbergia obovata* and *Albizia adianthifolia* var. *adianthifolia* are trees.

Zornia capensis subsp. *capensis*, *Chamaecrista mimosoides* and *Eriosema salignum* are diagnostic species (Table 6.15), the first-mentioned also a diagnostic species in the Northern Mistbelt Forest (Cluster E). Even though the distribution patterns of these species differ from one another, a relatively large presence is noted in the Indian Ocean Coastal Belt Bioregion (Figure 6.12).

Many of the key species, including the diagnostic species *Zornia capensis* subsp. *capensis* and *Eriosema salignum*, are also found in the Southern Afromontane (Cluster A1). This is not surprising in the light of the closeness of these two clusters as is evident in Figures 6.3 and 6.11. Mean annual rainfall, maximum temperatures and soil properties of the two clusters are relatively similar. Species not present in any other cluster are, in particular, the dwarf shrub

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and shrub growth forms. *Eriosema parviflorum* subsp. *parviflorum* and *Desmodium dregeanum* are dwarf shrub species uniquely representing this cluster (Figure 6.12).

Table 6.15. Key species (% occurrence) found in the Drakensberg Foothill & Coastal Region (Cluster A5). Bold-formatted species and clusters denote diagnostic species.

Key species	**%**	**Also present in Cluster**
Zornia capensis* subsp. *capensis	**87**	A1, B5, **E**
Chamaecrista mimosoides	**82**	B5, D1
Eriosema salignum	**77**	A1, A3, A4, B5
Acacia karroo	67	B2, B3, B4, B5, B6, B7, **D1**, **E**
Dalbergia obovata	67	A1
Vigna vexillata var. *vexillata*	67	A1, A3, B5, **E**
Crotalaria globifera	64	A1
Eriosema parviflorum subsp. *parviflorum*	64	None
Crotalaria capensis	62	None
Eriosema cordatum	59	A1, A3, B5
Desmodium dregeanum	56	None
Aeschynomene micrantha	54	None
Abrus laevigatus	51	None
Dalbergia armata	51	None
Vigna unguiculata subsp. *unguiculata* var. *unguiculata*	51	None
Albizia adianthifolia var. *adianthifolia*	49	None
Crotalaria lanceolata subsp. *lanceolata*	49	None
Neonotonia wightii	49	None
Rhynchosia caribaea	49	A2, B4, E
Tephrosia grandiflora	49	None
Tephrosia macropoda var. *macropoda*	49	A1

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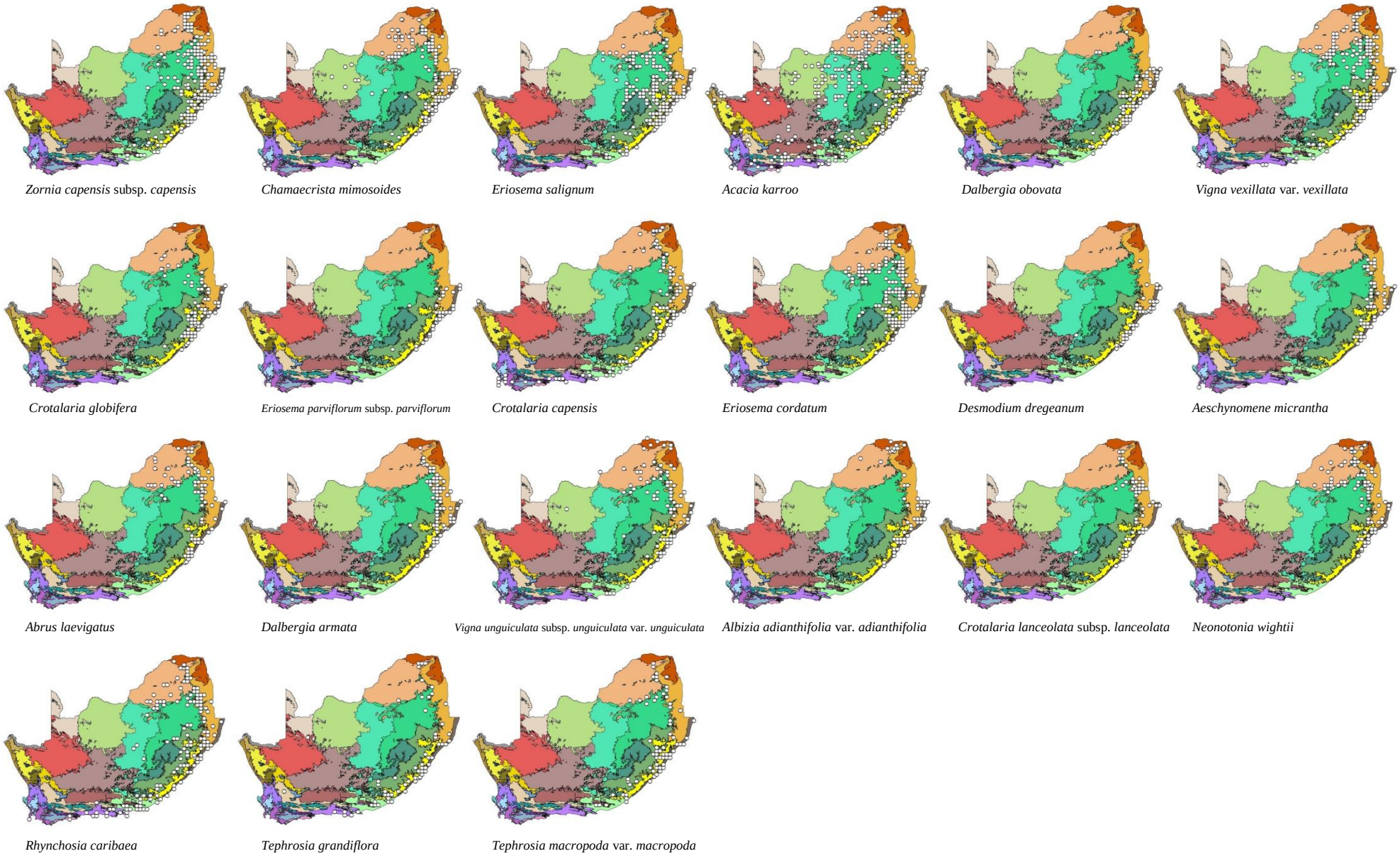

Figure 6.12. Distribution patterns of key species of the Drakensberg Foothill & Coastal Region (Cluster A5).

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6.3.3 Cluster B: Seasonal Rainfall Group (all-year, winter and summer rainfall)

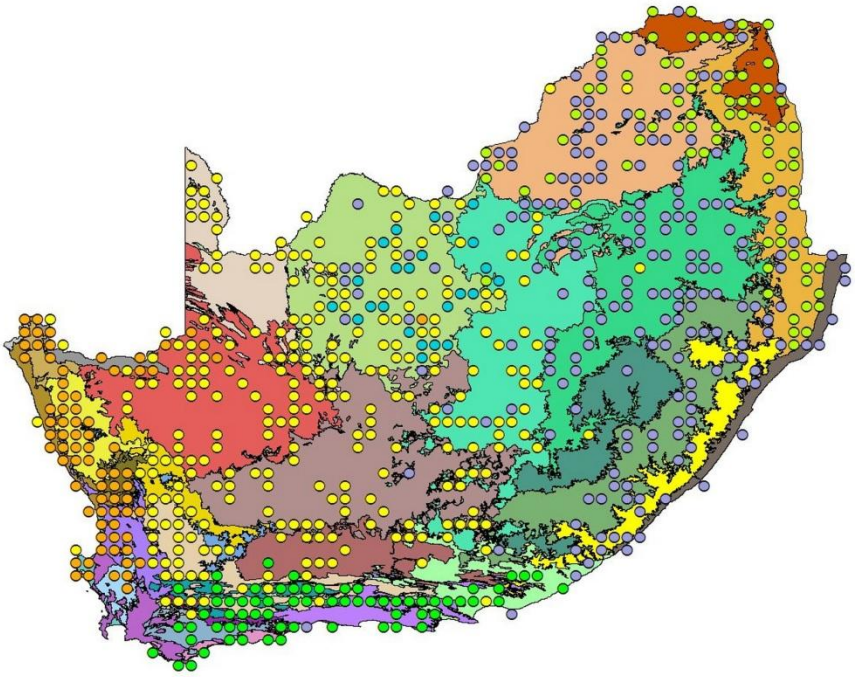

Figure 6.13. The Seasonal Rainfall Group (Cluster B) mapped on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006). Orange dots: Arid Western Region; green dots: Lower-rainfall Cape Floristic Region; yellow dots: Central Arid Region; blue dots: Kalahari Bushveld Region; purple dots: Summer Rainfall Region; light green dots: Northern and Northeastern Savanna Region; omitted: Generalist Group.

Regions in South Africa, Lesotho and Swaziland that receive rain throughout the year or in either winter or summer are essentially grouped in this cluster. Cluster 'B' is the largest cluster and includes the Generalist Group, which falls mainly in the summer rainfall region. Owing to the wide distribution of legume species contained in this cluster, defining the climate and soil properties are not feasible.

The Seasonal Rainfall Group is subdivided into:

- Arid Western Region (Cluster B1)
- Lower-rainfall Cape Floristic Region (Cluster B2)
- Central Arid Region (Cluster B3)
- Generalist Group (Cluster B4)
- Summer Rainfall Region (Cluster B5)
- Northern and Northeastern Savanna Region (Cluster B6)
- Kalahari Bushveld Region (Cluster B7)

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6.3.3.1 Arid Western Region (Cluster B1)

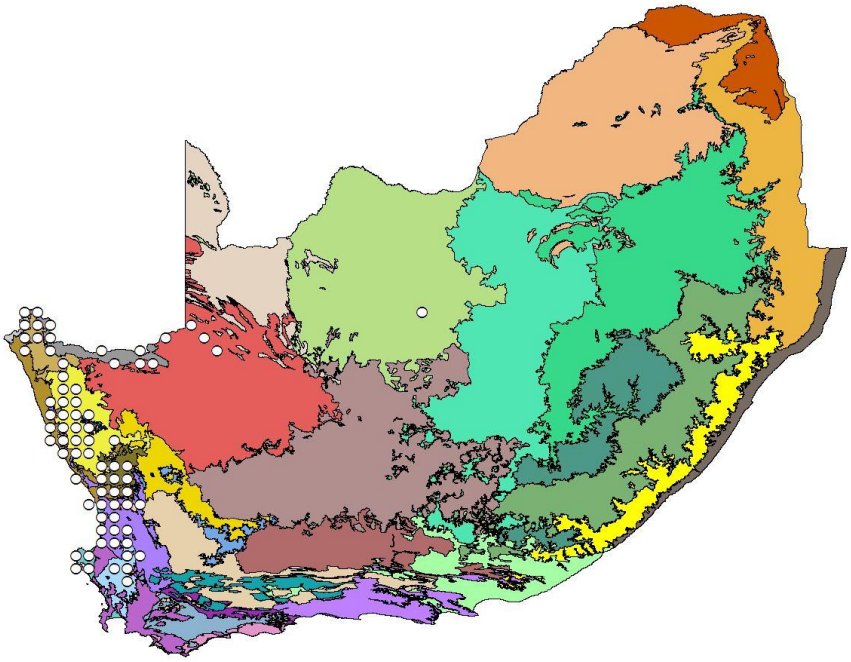

Figure 6.14. The Arid Western Region (Cluster B1) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.3.1.1 Bioregions and biomes

The distribution pattern of the Arid Western Region is shown in Figure 6.14. The Namaqualand Hardeveld Bioregion is well represented in this cluster, followed by the Bushmanland Bioregion. Succulent Karoo and Fynbos are the major biomes present in this cluster (Table 6.14).

6.3.3.1.2 Climate and soil

Low annual rainfall (<400 mm) with high minimum and maximum temperatures denotes the Arid Western Region Cluster (Table 6.16). The high soil pH (>7.5) and medium soil phosphorus content is to be expected in the light of the low rainfall in the region. This is the first cluster noted for its medium (52.4%) and highly sodic soils (14.3%) containing relatively high amounts of sodium. The poor infiltration rate and drainage when the soil is wet and hardness when it is dry are especially problematic for good seed germination and erosion control (Qadir & Oster 2004). The information derived from Schulze (2007) as described in

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Table 6.5 shows that the extreme maximum temperatures measured exceed 44°C, with high solar radiation from November to February.

Table 6.16. Arid Western Region (Cluster B1): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**BML**	**EKB**	**GD**	**KV**	**NHV**
	19.1	4.8	9.5	4.8	33.2
	NS	**NWF**	**WCR**	**WSV**	
	9.5	4.8	4.8	9.5	
Biomes	**D**	**FB**	**NK**	**SV**	**SK**
	4.6	38.6	6.8	2.3	47.7
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	86.7	10.7	2.6	0.0	0.0
Min temperature	**<2**	**0-4**	**2-8**	**>6**	
(°C)	1.3	0.0	41.3	57.4	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	1.3	36.0	48.0	14.7	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	1.3	57.3	41.4		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	2.7	13.3	14.7	33.3	36.0
ESP	**Non-sodic**	**Medium Sodic**	**Highly Sodic**		
	33.3	52.4	14.3		

BML: Bushmanland; D: Desert; EKB: Eastern Kalahari Bushveld; FB: Fynbos; GD: Gariep Desert; KV: Knersvlakte; NHV: Namaqualand Hardeveld; NK: Nama-Karoo; NS: Namaqualand Sandveld; NWF: Northwest Fynbos; SK: Succulent Karoo; SV: Savanna; WCR: West Coast Renosterveld; WSV: West Strandveld; ESP: Exchangeable Sodium Percentage.

6.3.3.1.3 Legume species

Legume species richness is relatively low (5.3), with a species range of 4–47 in a QDGC (Table 6.3). Cowling *et al*. (1998) describe the Succulent Karoo as a region known for its high diversity due to unusual predictable seasonal rainfall and relatively mild summers. However, the low species richness could be the result of low legume collecting intensities in the region where most grids contain less than 25 legume species (Chapter 3).

Table 6.17 lists the key species in the Arid Western Region Cluster. Most growth forms present are a mixture of perennial herbs, dwarf shrubs and shrubs. There are three annual herbs noted in this cluster, namely *Leobordea platycarpa*, *Crotalaria effusa* and *Lotononis rabenaviana*, and one tree, *Adenolobus garipensis*.

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The species with the highest occurrence, *Calobota angustifolia* and *C. sericea*, are not present as key species in any other cluster. Figure 6.15 shows the distribution pattern of these species, confirming their uniqueness in this cluster.

Cluster C (Higher-rainfall Cape Floristic Region) and Cluster B2 (Lower-rainfall Cape Floristic Region) are the only clusters worth mentioning as having mutual key species (Table 6.17). *Aspalathus acuminata* subsp. *acuminata*, especially, corresponds exactly with into the distribution pattern of Cluster C. Furthermore, most key species are noted as not being present in any other clusters. *Indigastrum argyroides*, *Indigofera pungens*, *Adenolobus garipensis* and *Lotononis rabenaviana* are present in the Gariep Desert Bioregion. This concludes that most key species found within the Arid Western Region are uniquely associated with this cluster. No diagnostic species are noted.

Table 6.17. Key species (% occurrence) found in the Arid Western Region (Cluster B1).

Key species	**%**	**Also present in Cluster**
Calobota angustifolia	43	None
Calobota sericea	43	None
Sutherlandia frutescens	30	B2, B3, B4, C
Lessertia diffusa	28	None
Lotononis falcata	27	B4
Wiborgia obcordata	26	None
Indigastrum argyroides	23	None
Aspalathus spinescens subsp. *lepida*	22	None
Leobordea platycarpa	22	B3
Melolobium humile	22	None
Crotalaria effusa	20	None
Melolobium aethiopicum	20	None
Wiborgia monoptera	20	None
Calobota spinescens	19	None
Indigofera heterophylla	19	B2, C
Lotononis parviflora	19	None
Crotalaria excisa subsp. *excisa*	18	None
Indigofera amoena	16	None
Indigofera pungens	16	None
Adenolobus garipensis	15	None
Aspalathus acuminata subsp. *acuminata*	15	C
Aspalathus quinquefolia subsp. *virgata*	15	None
Indigofera exigua	15	None
Lessertia excisa	15	None
Lotononis rabenaviana	15	None
Wiborgia fusca subsp. *fusca*	15	None

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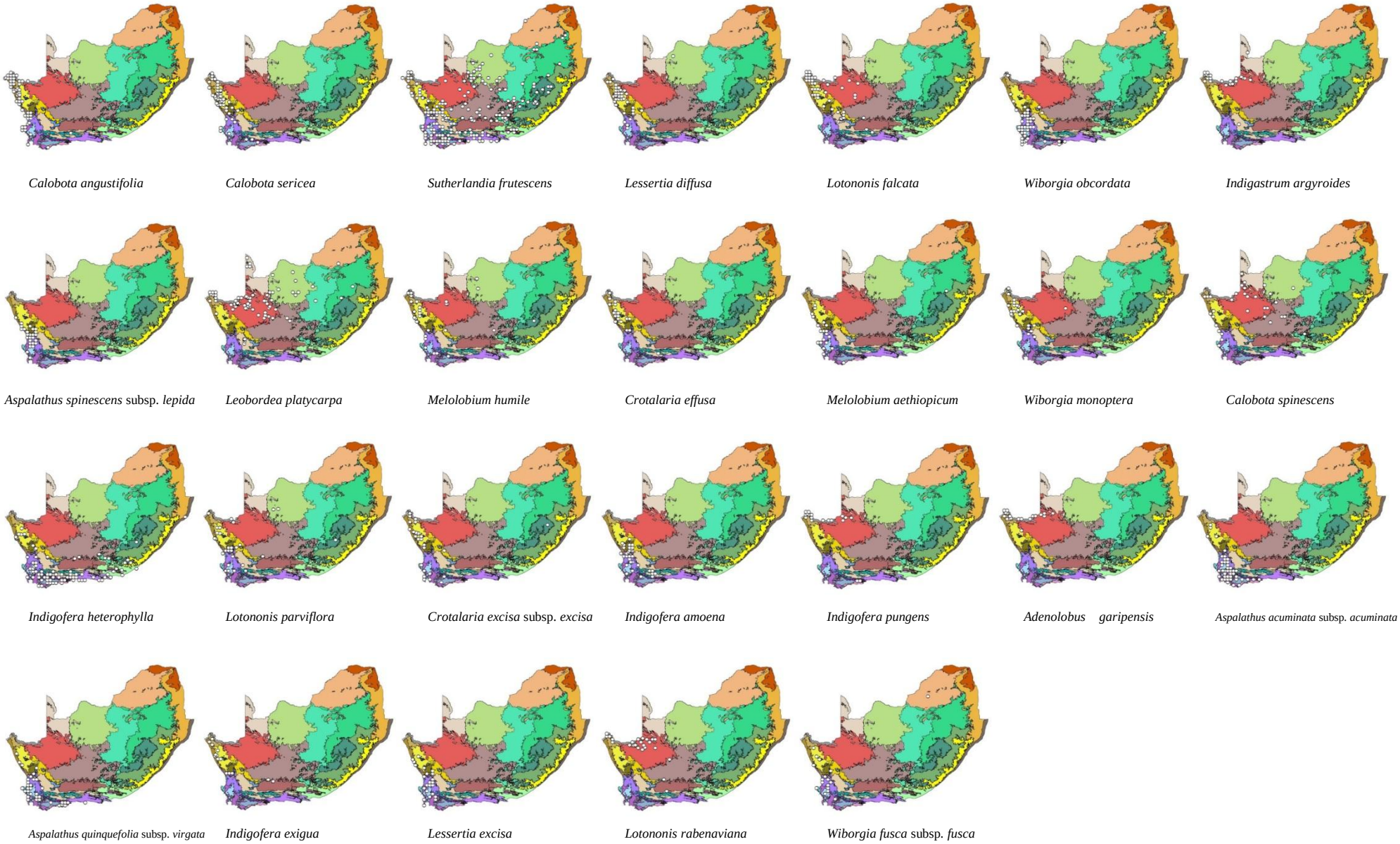

Figure 6.15. Distribution patterns of key species of the Arid Western Region (Cluster B1).

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6.3.3.2 Lower-rainfall Cape Floristic Region (Cluster B2)

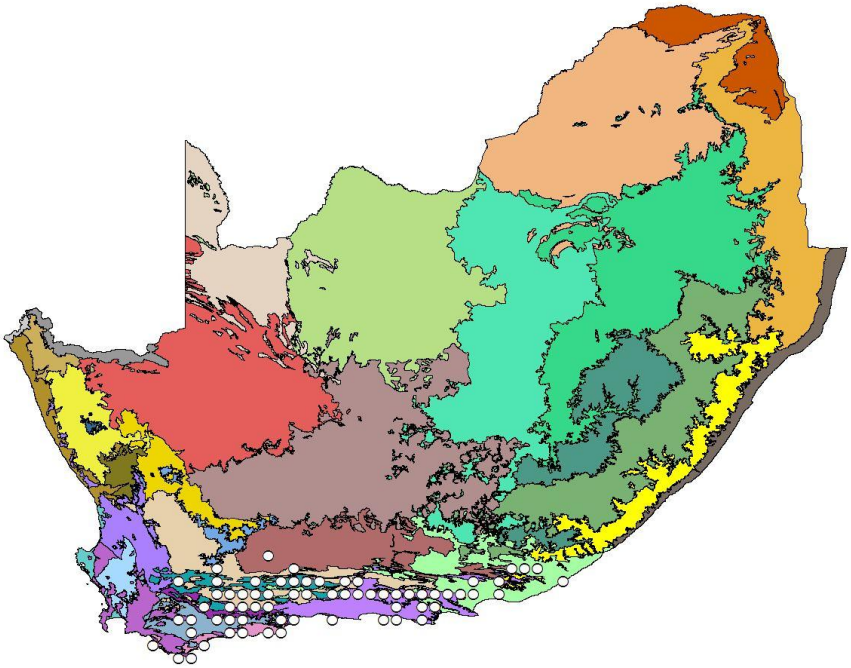

Figure 6.16. The Lower-rainfall Cape Floristic Region (Cluster B2) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.3.2.1 Bioregions and biomes

The distribution pattern of the Lower-rainfall Cape Floristic Region is presented in Figure 6.16. The Albany Thicket and Eastern Fynbos Renosterveld are well represented in this cluster. Fynbos is the predominant biome, followed by Albany Thicket.

6.3.3.2.2 Climate and soil

The annual rainfall figures in Table 6.18 indicate that 200–600 mm annual rain is expected for this cluster but <400 mm is also a probability. Relatively high minimum (2–8°C) and moderate maximum (25–28°C) temperatures are noted. The soil pH varies greatly, with predominantly acidic soils. Half of the soils in this cluster are medium sodic, similar to those of Cluster B1. From Table 6.5 it is clear that this region is mainly semi-arid, cool and dry, with extreme maximum temperatures 36–42°C. It is mainly a frost-free area but there is a likelihood of <40 days of heavy frost per year.

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Table 6.18. Lower-rainfall Cape Floristic Region (Cluster B2): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**AT**	**EFR**	**LK**	**SCF**	
	40.0	40.0	10.0	10.0	
Biomes	**AT**	**FB**	**NK**		
	20.0	75.0	5.0		
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	31.8	43.9	19.7	3.0	1.6
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	0.0	1.5	80.3	18.2	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	12.1	56.1	31.8	0.0	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	4.6	78.8	16.6		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	21.2	28.8	7.6	25.8	16.6
ESP	**Non-sodic**	**Medium Sodic**			
	50.0	50.0			

AT: Albany Thicket; EFR: Eastern Fynbos Renosterveld; FB: Fynbos; LK: Lower Karoo; NK: Nama-Karoo; SCF: South Coast Fynbos; ESP: Exchangeable Sodium Percentage.

6.3.3.2.3 Legume species

Even though this cluster contains the same percentage of QDGCs (4.1%) as the Higher-rainfall Cape Floristic Region (4.2% in Cluster C), the relatively lower legume species count of this cluster indicates that these clusters could be distinguished on the basis of species richness (Table 6.3). The range of legume species is also far lower than in Cluster C.

The key species of the Lower-rainfall Cape Floristic Region are listed in Table 6.19. Perennial shrubs are the main growth form. *Lotononis pungens* and *Podalyria burchellii* are the only herbs and *Acacia karroo* and *Schotia afra* var. *afra* the only trees. No annuals are present in the key species group.

Species of *Aspalathus* are listed as having the highest occurrence in this cluster (Table 6.19). None of the key species listed are diagnostic in any other cluster; the only exception is *Acacia karroo*.

The key species common to this cluster and Cluster C are apparent in Table 6.19. Five of these are also key species in the Higher-rainfall Cape Floristic Region. Key species of which the distribution pattern corresponds with this cluster fall into two groups: a) *Aspalathus shawii* subsp. *shawii* and *A. hirta* subsp. *hirta* extend mainly into the Northwest Fynbos; b) the remaining key species that follow this cluster more closely.

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Table 6.19. Key species (% occurrence) found in the Lower-rainfall Cape Floristic Region (Cluster B2). Bold-formatted clusters denote diagnostic species.

Key species	**%**	**Also present in Cluster**
Aspalathus rubens	32	None
Aspalathus collina subsp. *collina*	31	None
Aspalathus subtingens	31	None
Sutherlandia frutescens	31	B1, B3, B4, C
Lotononis pungens	28	B3
Aspalathus setacea	26	None
Aspalathus nigra	25	C
Aspalathus hystrix	23	None
Indigofera heterophylla	23	B1, C
Psoralea affinis	23	C
Acacia karroo	22	A5, B3, B4, B5, B6, B7, **D1**, **E**
Schotia afra var. *afra*	22	None
Aspalathus pinguis subsp. *pinguis*	20	None
Podalyria burchellii	20	None
Aspalathus kougaensis	18	None
Aspalathus shawii subsp. *shawii*	18	None
Aspalathus steudeliana	18	None
Tephrosia capensis var. *capensis*	18	A2, B4, B5
Aspalathus hirta subsp. *hirta*	17	None
Aspalathus spinosa subsp. *spinosa*	17	A2, C
Hypocalyptus sophoroides	17	None
Indigofera denudata	17	None
Psoralea oligophylla	17	A2

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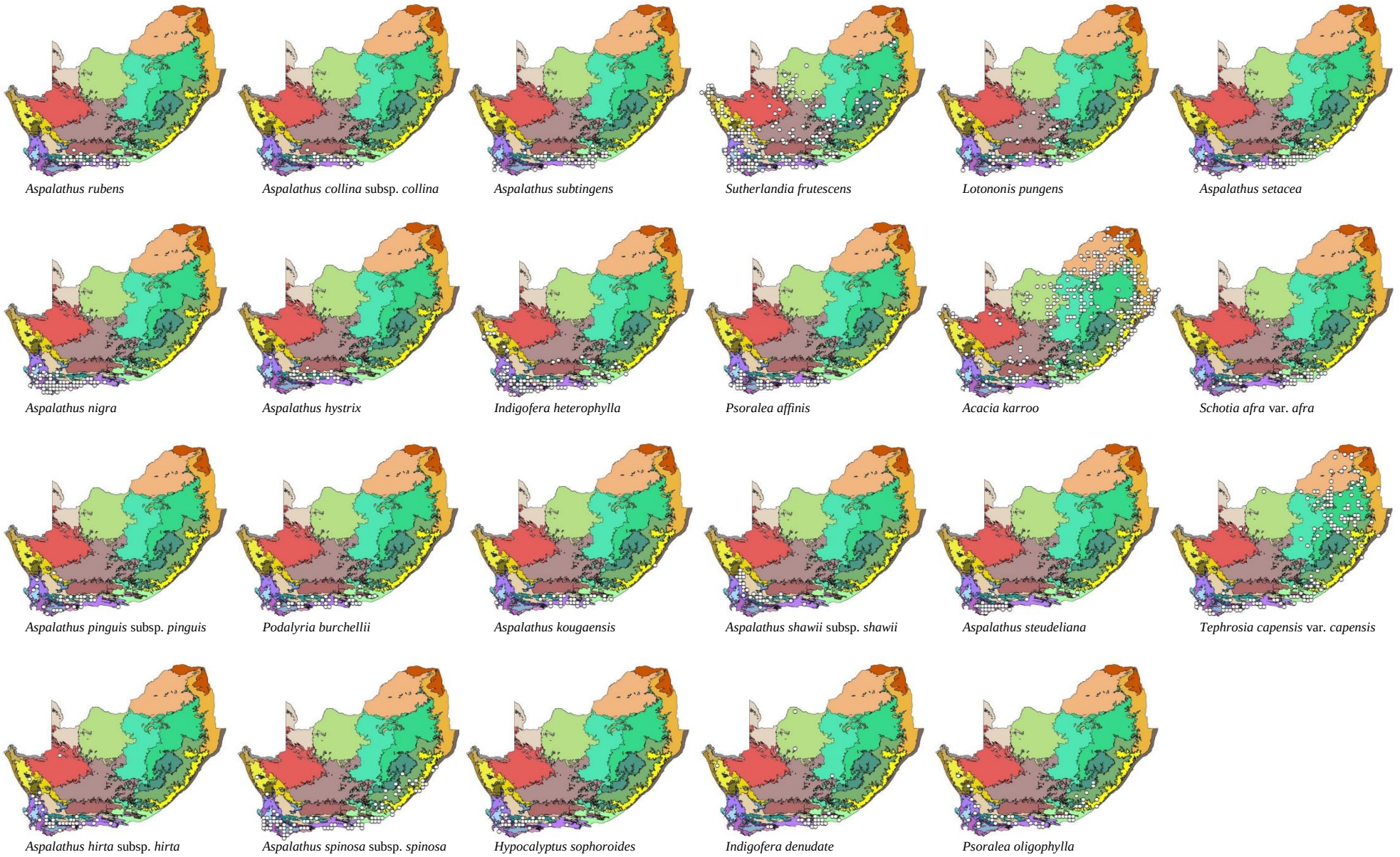

Figure 6.17. Distribution patterns of key species of the Lower-rainfall Cape Floristic Region (Cluster B2).

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6.3.3.3 Central Arid Region (Cluster B3)

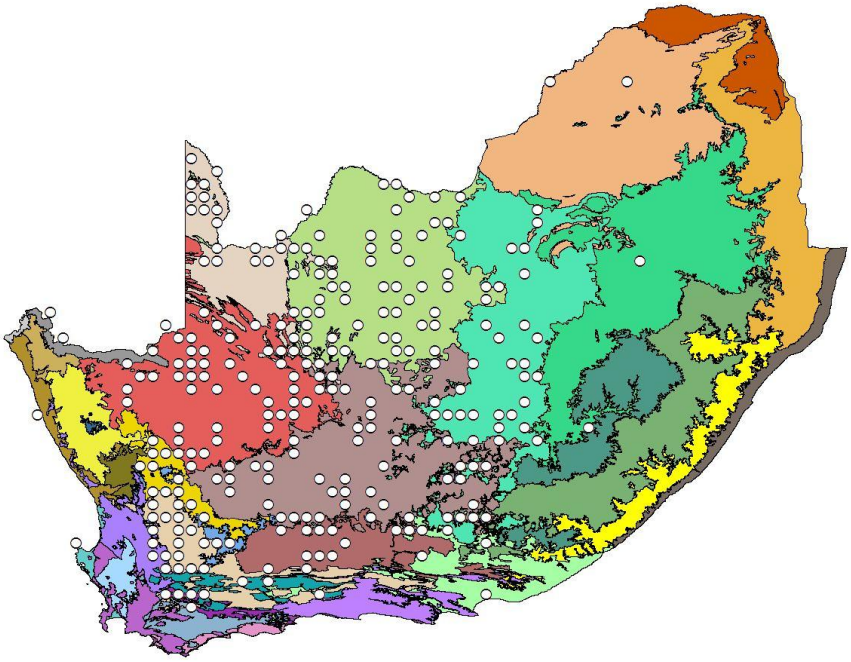

Figure 6.18. The Central Arid Region (Cluster B3) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.3.3.1 Bioregions and biomes

The distribution pattern of the Central Arid Region is shown in Figure 6.18. The map clearly shows that this cluster forms mainly in the dry Eastern Kalahari Bushveld, Bushmanland, Dry Highveld Grassland and Upper Karoo Bioregions. It is noteworthy that the Rainshadow Valley Karoo Bioregion is fairly well represented in this cluster. The Nama-Karoo and Savanna Biomes total 75% of this cluster.

6.3.3.3.2 Climate and soil

The low annual rainfall of <400 mm noted in Table 6.20 is to be expected. The relatively low minimum and high maximum temperatures are also normal for a semi-arid to arid region as Schulze (2007) describes this region in Table 6.5. The relatively low net primary production as compared to that of the other clusters is noteworthy. The high soil phosphorus content (>20 $mgkg^{-1}$) and high pH (>7.5) defined for the Central Arid Region are expected considering to the low annual rainfall. A very small percentage of soils in this cluster are termed medium or highly sodic.

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Table 6.20. Central Arid Region (Cluster B3): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**AT**	**BL**	**CBV**	**DHG**	**EKB**
	0.7	22.6	1.4	13.0	26.0
	GD	**KDV**	**LK**	**MHG**	**NS**
	1.4	8.9	2.7	0.7	0.7
	NWF	**RVK**	**TESK**	**UK**	**WS**
	0.7	4.8	1.4	14.3	0.7
Biomes	**AT**	**D**	**FB**	**GL**	**NK**
	0.6	1.1	1.1	14.8	38.6
	SV	**SK**			
	36.4	7.4			
Annual rainfall (mm)	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
	76.0	8.1	15.5	0.4	0.0
Min temperature (°C)	**<2**	**0–4**	**2–8**	**>6**	
	49.1	26.2	22.9	1.8	
Max temperature (°C)	**<27**	**25–29**	**27–35**	**>33**	
	0.0	7.0	63.1	29.9	
Phosphorus ($mgkg^{-1}$)	**<10**	**5–35**	**>20**		
	32.1	32.8	35.1		
pH (H_2O)	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
	2.6	8.7	18.8	16.2	53.5
ESP	**Non-sodic**	**Medium Sodic**	**Highly Sodic**		
	88.4	6.2	5.4		

AT: Albany Thicket; BL: Bushmanland; CBV: Central Bushveld; D: Desert; DHG: Dry Highveld Grassland; EKB: Eastern Kalahari Bushveld; FB: Fynbos; GD: Gariep Desert; GL: Grassland; KDV: Kalahari Duineveld; LK: Lower Karoo; MHG: Mesic Highveld Grassland; NWF: Northwest Fynbos; NK: Nama-Karoo; NS: Namaqualand sandveld; RVK: Rainshadow Valley Karoo; SK: Succulent Karoo; SV: Savanna; TESK: Trans-Escarpment Succulent Karoo; UK: Upper Karoo; WS: West Strandveld; ESP: Exchangeable Sodium Percentage.

6.3.3.3.3 Legume species

The cluster is characterised by a very low species richness and range of species per QDGC (Table 6.3). This indicates that the occurrence of species is extremely low even though the cluster contains the second highest QDGC% (16.7%). As in Cluster B1, this could be due to the low collecting intensities in this region (Chapter 3). Cowling *et al.* (1998) note that the Nama-Karoo flora is less known than the Succulent Karoo but that the Leguminosae is an important family in the region.

Table 6.21 shows the key species for the cluster. Most are perennial herbs, followed by shrubs. Only two annual herbs are recorded, namely *Leobordea platycarpa* and *Lessertia annularis*. In terms of trees, three *Acacia* tree forms are present, with *A. haematoxylon* noted as uniquely associated with this cluster (Figure 6.19).

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A very low occurrence of key species is recorded in Table 6.21. This is probably due to the high percentage of QDGCs found in the cluster, with nearly half of the QDGCs containing fewer than three species (Appendix 3). No diagnostic species are recorded for this cluster, but *Senna italica* subsp. *arachoides* and *Indigofera daleoides* var. *daleoides* are diagnostic species in Cluster B7 (Kalahari Bushveld Region). Both have a strong presence in the Eastern Kalahari Bushveld Bioregion (Figure 6.19).

Most of the key species are also present as key species in other clusters, mainly in Cluster B4 (Generalist Group) and Cluster B7 (Kalahari Bushveld Region) (Table 6.21). The Central Arid Region and Kalahari Bushveld Region show similar annual rainfall, minimum and maximum temperatures but different soil properties (compare Tables 6.20 and 6.28). *Lessertia annularis*, *Lessertia pauciflora* var. *pauciflora* and *Lessertia macrostachya* var. *macrostachya* are key species unique to this cluster (Figure 6.19).

Table 6.21. Key species (% occurrence) found in the Central Arid Region (Cluster B3). Bold-formatted clusters denote diagnostic species.

Key species	**%**	**Also present in Cluster**
Indigofera alternans var. *alternans*	29	B4, B7
Sutherlandia frutescens	25	B1, B2, B4, C
Melolobium candicans	24	A2, B4
Leobordea platycarpa	15	B1
Lessertia annularis	14	None
Lessertia pauciflora var. *pauciflora*	13	None
Senna italica subsp. *arachoides*	12	B4, B6, **B7**, D2
Acacia haematoxylon	11	None
Acacia karroo	11	A5, B2, B4, B5, B6, B7, **D1**, **E**
Cullen tomentosum	11	B7
Indigofera sessilifolia	10	A2, B7
Indigastrum argyraeum	8	B4, B7
Indigofera daleoides var. *daleoides*	7	**B7**
Requienia sphaerosperma	7	None
Sutherlandia microphylla	7	None
Melolobium canescens	6	B4
Acacia erioloba	6	B7
Melolobium microphyllum	6	A4, B4
Sutherlandia humilis	6	None
Indigofera meyeriana	5	None
Lessertia macrostachya var. *macrostachya*	5	None
Lotononis pungens	5	B2

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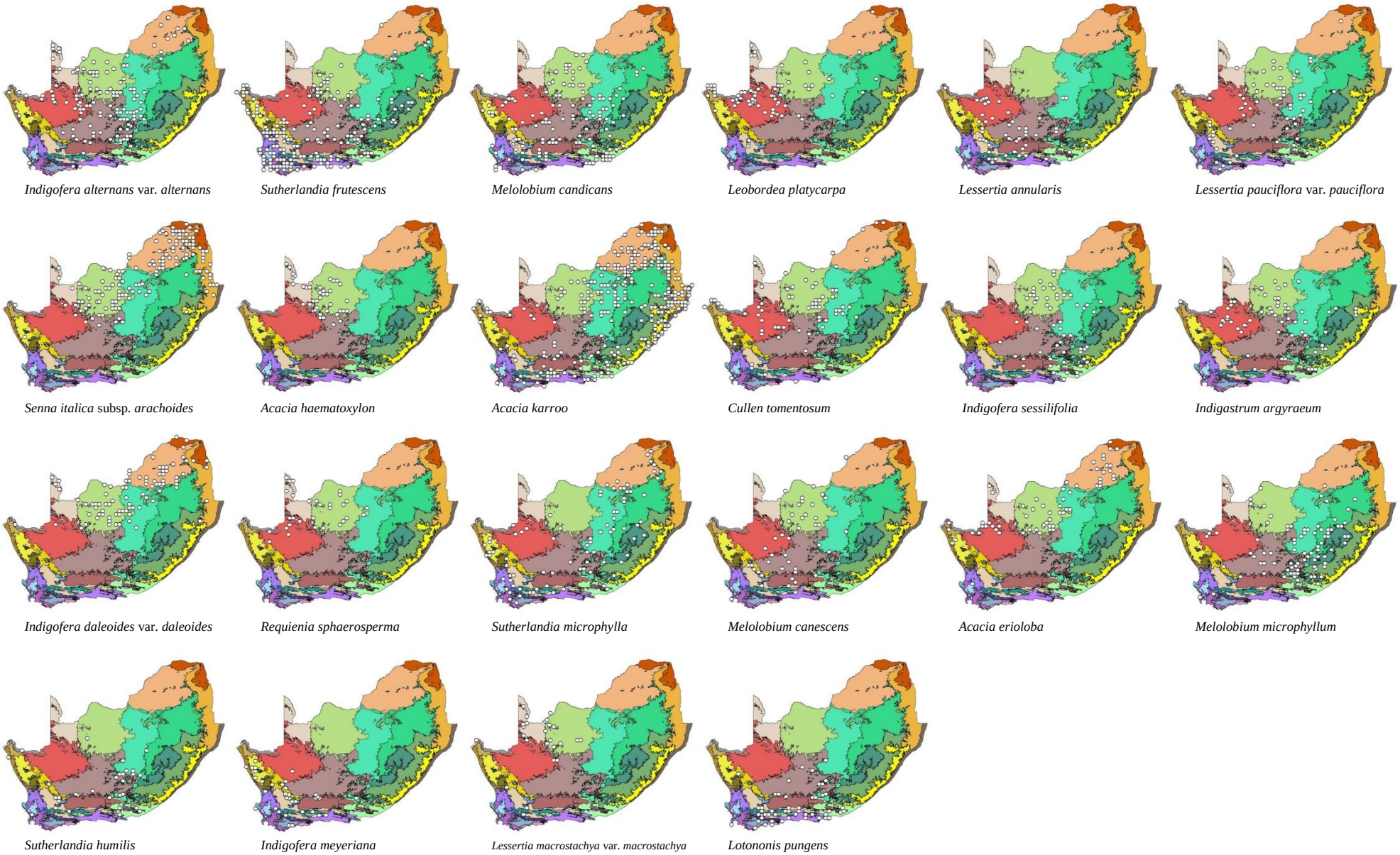

Figure 6.19. Distribution patterns of key species of the Central Arid Region (Cluster B3).

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6.3.3.4 Generalist Group (Cluster B4)

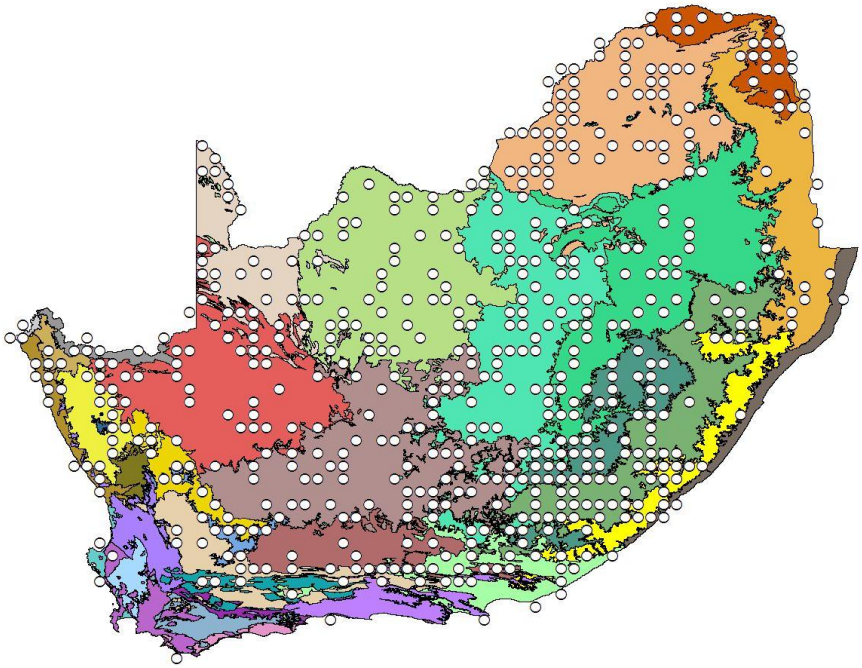

Figure 6.20. The Generalist Group (Cluster B4) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.3.4.1 Bioregions and biomes

Figure 6.20 shows the distribution pattern of the Generalist Group Cluster. The Fynbos, eastern parts of the Mesic Highveld Grassland, parts of the Sub-Escarpment Grassland and Savanna, Lowveld and Indian Ocean Coastal Belt areas are not represented in this cluster. The highest percentage bioregions present in this cluster are the Central Bushveld, Eastern Kalahari Bushveld and Dry Highveld Grassland Bioregions (Table 6.20). Savanna and Grassland total 75% of the biomes present in the Generalist Group. A further comparison between the Generalist Group and all the other clusters shows that this cluster overlaps minimally with the Southern Afromontane, Northern Highveld Region, Drakensberg Foothill & Coastal Region, Arid Western Region, Lower- and Higher-rainfall Cape Floristic Regions, the Savanna Group and the Northern Mistbelt Forest. The exclusion of these regions from the Generalist Group could indicate the distinctiveness of species within these clusters and merits further investigation.

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6.3.3.4.2 Climate and soil

The wide distribution pattern of the Generalist Group makes it difficult to describe the climatic and soil properties. Table 6.22 indicates that regions with relatively low annual rainfall (<400 mm), low minimum (<2°C) and high maximum (27–35°C) temperatures form part of this cluster. Soils are generally low in phosphorus (<10 $mgkg^{-1}$) and relatively alkaline (pH >7.5). Owing to the wide distribution pattern, Table 6.5 gives little additional climatic and agrohydrological information.

Table 6.22. Generalist Group (Cluster B4): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**AT**	**BML**	**CBV**	**DG**	**DHG**
	1.4	6.9	18.9	3.8	13.0
	EFR	**EKB**	**GD**	**IOCB**	**KDV**
	0.3	13.1	1.7	0.7	3.8
	LK	**LV**	**MHG**	**M**	**NH**
	1.4	3.4	7.9	4.8	1.4
	NS	**RVK**	**RV**	**SSV**	**SND**
	1.7	1.0	0.3	0.3	0.7
	SEG	**TESK**	**UK**		
	5.5	0.4	7.6		
Biomes	**AT**	**D**	**FB**	**GL**	**IOCB**
	1.1	1.4	1.7	37.0	0.5
	NK	**SV**	**SK**		
	14.5	38.2	5.6		
Annual rainfall (mm)	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
	42.6	9.5	35.6	7.5	4.8
Min temperature (°C)	**<2**	**0–4**	**2–8**	**>6**	
	40.8	16.7	30.3	12.2	
Max temperature (°C)	**<27**	**25–29**	**27–35**	**>33**	
	8.3	25.1	53.9	12.7	
Phosphorus ($mgkg^{-1}$)	**<10**	**5–35**	**>20**		
	47.4	31.2	21.4		
pH (H_2O)	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
	15.3	20.3	17.6	19.2	27.6
ESP	**Non-sodic**	**Medium Sodic**	**Highly Sodic**		
	90.7	6.2	3.1		

AT: Albany Thicket; BML: Bushmanland; CBV: Central Bushveld; D: Desert; DG: Drakensberg Grassland; DHG: Dry Highveld Grassland; EFR: Eastern Fynbos Renosterveld; EKB: Eastern Kalahari Bushveld; FB: Fynbos; GD: Gariep Desert; GL: Grassland; IOCB: Indian Ocean Coastal belt; KDV: Kalahari Duneveld; LK: Lower Karoo; LV: Lowveld; M: Mopane; MHG: Mesic Highveld Grassland; NH: Namaqualand Hardeveld; NK: Nama-Karoo; NS: Namaqualand Sandveld; RV: Richtersveld; RVK: Rainshadow Valley Karoo; SEG: Sub-Escarpment Grassland; SK: Succulent Karoo; SND: Southern Namib Desert; SSV: South Strandveld; SV: Savanna; TESK: Trans-Escarpment Succulent Karoo; UK: Upper Karoo; ESP: Exchangeable Sodium Percentage.

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6.3.3.4.3 Legume species

Table 6.3 shows extremely low species richness (2.0 per QDGC) in this cluster. Furthermore, 62% of the QDGCs contain fewer than three species (Appendix 3), clearly indicating that this cluster probably contains a large proportion of residue QDGCs.

The key species listed in Table 6.23 include all growth forms equally. *Acacia karroo* and *Parkinsonia africana* are the only tree forms listed and *Crotalaria sphaerocarpa* subsp. *sphaerocarpa* is the only annual species.

Acacia karroo is the species with the highest occurrence in this cluster and is a diagnostic species in Clusters D1 (Central Bushveld Region) and E (Northern Mistbelt Region) (Table 6.23). The low figure of 8% occurrence of *Acacia karroo* is probably due to the large region included in the distribution of the Generalist Group.

In terms of key species present in other clusters (Table 6.23), it is evident that Cluster B4 consists of a group of species found in most other clusters, especially the 'B' clusters. The diverse distribution pattern of key species of this cluster is depicted in Figure 6.21. For example *Trifolium burchellianum* subsp. *burchellianum* and *Indigofera heterotricha* show extreme differences in their distribution patterns. *Lessertia depressa* and *Lotononis divaricata* are the only key species not present in other clusters with similar distribution patterns.

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Table 6.23. Key species (% occurrence) found in the Generalist Group (Cluster B4). Bold-formatted clusters denote diagnostic species.

Key species	**%**	**Also present in Cluster**
Acacia karroo	8	A5, B2, B3, B5, B6, B7, **D1**, **E**,
Melolobium microphyllum	6	A4, B3
Trifolium burchellianum subsp. *burchellianum*	4	A2, A4
Crotalaria sphaerocarpa subsp. *sphaerocarpa*	4	B7, D1
Lotononis laxa	4	A4
Sutherlandia frutescens	4	B1, B2, B3, C
Melolobium candicans	4	A2, B3
Lessertia depressa	4	None
Lotononis divaricata	4	None
Tephrosia capensis var. *capensis*	4	A2, B2, B5
Rhynchosia caribaea	3	A2, A5, E
Senna italica subsp. *arachoides*	3	B3, B6, **B7**, D2
Indigastrum argyraeum	3	B3, B7
Indigofera alternans var. *alternans*	3	B3, B7
Elephantorrhiza elephantina	3	A3, B5, B7
Melolobium canescens	3	B3
Parkinsonia africana	3	None
Rhynchosia adenodes	3	A2, B5
Indigofera heterotricha	3	B7, D1
Lotononis falcata	3	B1
Lotononis pulchella	3	None
Melolobium calycinum	3	None

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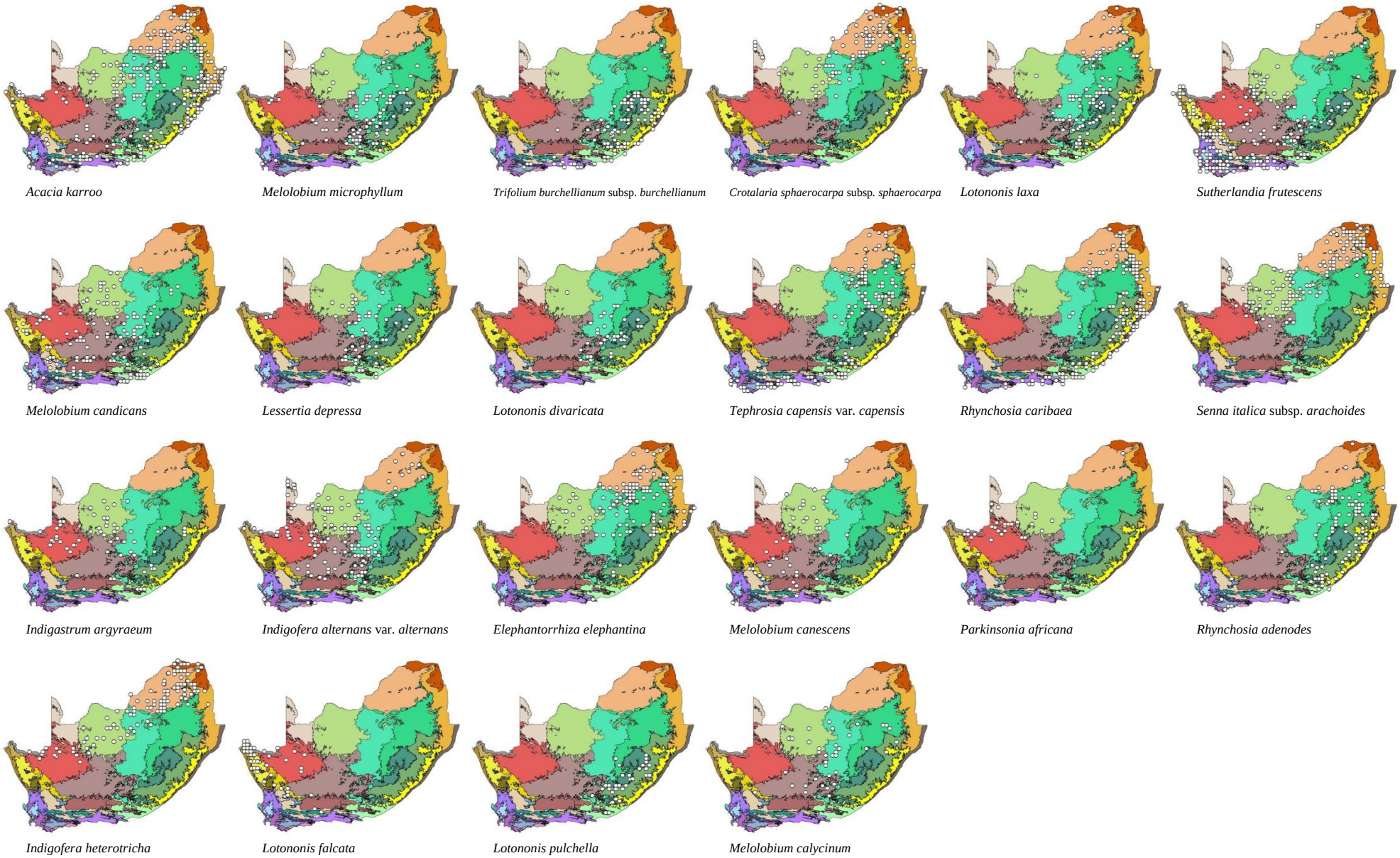

Figure 6.21. Distribution patterns of key species of the Generalist Group (Cluster B4).

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6.3.3.5 Summer Rainfall Region (Cluster B5)

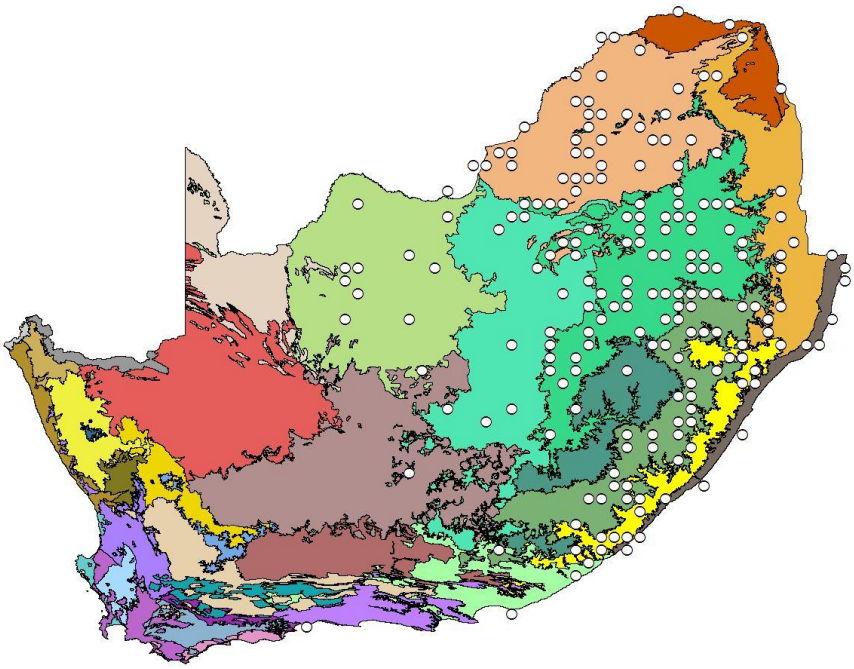

Figure 6.22. The Summer Rainfall Region (Cluster B5) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.3.5.1 Bioregions and biomes

The major bioregions that comprise the Summer Rainfall Region are the Mesic Highveld Grassland and the Central Bushveld, with Grassland and Savanna as major biomes (Figure 6.22 and Table 6.24).

6.3.3.5.2 Climate and soil

The Summer Rainfall Region falls in regions with an annual rainfall of mainly 400–800 mm. Very low minimum temperatures (<4°C) and moderate to high maximum temperatures are mostly noted for this cluster. The phosphorus content of soils grouped in the cluster is mainly below 10 $mgkg^{-1}$, with acidic and non-sodic soils. Owing to the wide distribution pattern, Table 6.5 gives little additional climatic and agrohydrological information.

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Table 6.24. Summer Rainfall Region (Cluster B5): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**AT**	**CBV**	**DG**	**DHG**	**EFR**
	1.6	26.6	0.8	5.7	0.8
	EKB	**IOCB**	**LV**	**MHG**	**M**
	8.9	5.7	4.0	29.8	1.6
	SEG	**SES**			
	12.9	1.6			
Biomes	**AT**	**FB**	**GL**	**IOCB**	**SV**
	1.4	0.7	54.6	5.0	38.3
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	7.1	3.5	50.3	21.3	17.8
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	31.0	24.4	28.9	15.7	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	17.8	40.6	38.6	3.0	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	77.7	22.3	0.0		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	56.9	22.8	14.7	4.1	1.5
ESP	**Non-sodic**	**Medium Sodic**			
	99.2	0.8			

AT: Albany Thicket; CBV: Central Bushveld; DG: Drakensberg Grassland; DHG: Dry Highveld Grassland; EFR: Eastern Fynbos-Renosterveld; EKB: Eastern Kalahari Bushveld; FB: Fynbos; GL: Grassland; IOCB: Indian Ocean Coastal Belt; LV: Lowveld; M: Mopane; MHG: Mesic Highveld Grassland; SEG: Sub-Escarpment Grassland; SES: Sub-Escarpment Savanna; SV: Savanna; ESP: Exchangeable Sodium Percentage.

6.3.3.5.3 Legume species

The low species richness of 3.2 species per QDGC is due to the relatively large region representing this cluster (12.2% of total number of grids) and to a relatively low range of species per QDGC (Table 6.3).

The key species, as shown in Table 6.25, are mainly perennial herbs. Only two tree species, *Mundulea sericea* subsp. *sericea* and *Acacia karroo*, are present as key species in the Summer Rainfall Region.

Rhynchosia totta var. *totta* has the highest occurrence, listed as a key species in most other clusters, except the 'B' clusters (Table 6.25). The aforementioned species together with *Mundulea sericea* subsp. *sericea*, *Acacia karroo* and *Tephrosia longipes* subsp. *longipes* var. *longipes* are noted as being diagnostic species in Cluster D1 (Central Bushveld Region). Similar climatic and soil conditions are noted for both clusters when Tables 6.24 and 6.31 are compared.

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This is the first cluster for which most key species are not unique to the distribution pattern of the cluster but are present as key species in other clusters as well. This is especially true for key species in Clusters A1 (Southern Afromontane) and A3 (Northern Highveld Region). All these clusters are found mainly in the Mesic Highveld Region. The distribution pattern of *Rhynchosia totta* var. *totta* corresponds very closely to Cluster B5 (Figure 6.23) and it is therefore strictly associated with the summer rainfall region of South Africa. However, only *Tephrosia semiglabra* is not present in any other cluster, denoting its uniqueness in this region.

Table 6.25. Key species (% occurrence) found in the Summer Rainfall Region (Cluster B5). Bold-formatted clusters denote diagnostic species.

Key species	**%**	**Also present in Cluster**
Rhynchosia totta var. *totta*	30	A1, A2, A3, A4, **D1**, D2, E
Eriosema salignum	20	A1, A3, A4, A5
Trifolium africanum var. *africanum*	20	A1, A3, A4
Zornia capensis subsp. *capensis*	17	A1, **A5**, **E**
Mundulea sericea subsp. *sericea*	16	B6, **D1**, D2
Acacia karroo	11	A5, B2, B3, B4, B6, B7, **D1**, **E**
Rhynchosia adenodes	11	A2, B4
Tephrosia longipes subsp. *longipes* var. *longipes*	10	A3, **D1**, D2
Eriosema cordatum	9	A1, A3, A5
Eriosema kraussianum	9	A1
Vigna vexillata var. *vexillata*	9	A1, A3, A5, **E**
Chamaecrista mimosoides	9	**A5**, D1
Stylosanthes fruticosa	9	D1, D2
Elephantorrhiza elephantina	8	A3, B4, B7
Indigofera hilaris var. *hilaris*	8	A1, A3
Rhynchosia nervosa var. *nervosa*	8	A3
Tephrosia capensis var. *capensis*	8	A2, B2, B4
Tephrosia purpurea subsp. *leptostachya* var. *leptostachya*	7	B6, D2
Indigofera zeyheri	7	A2
Listia heterophylla	7	B7, D1
Tephrosia semiglabra	7	None

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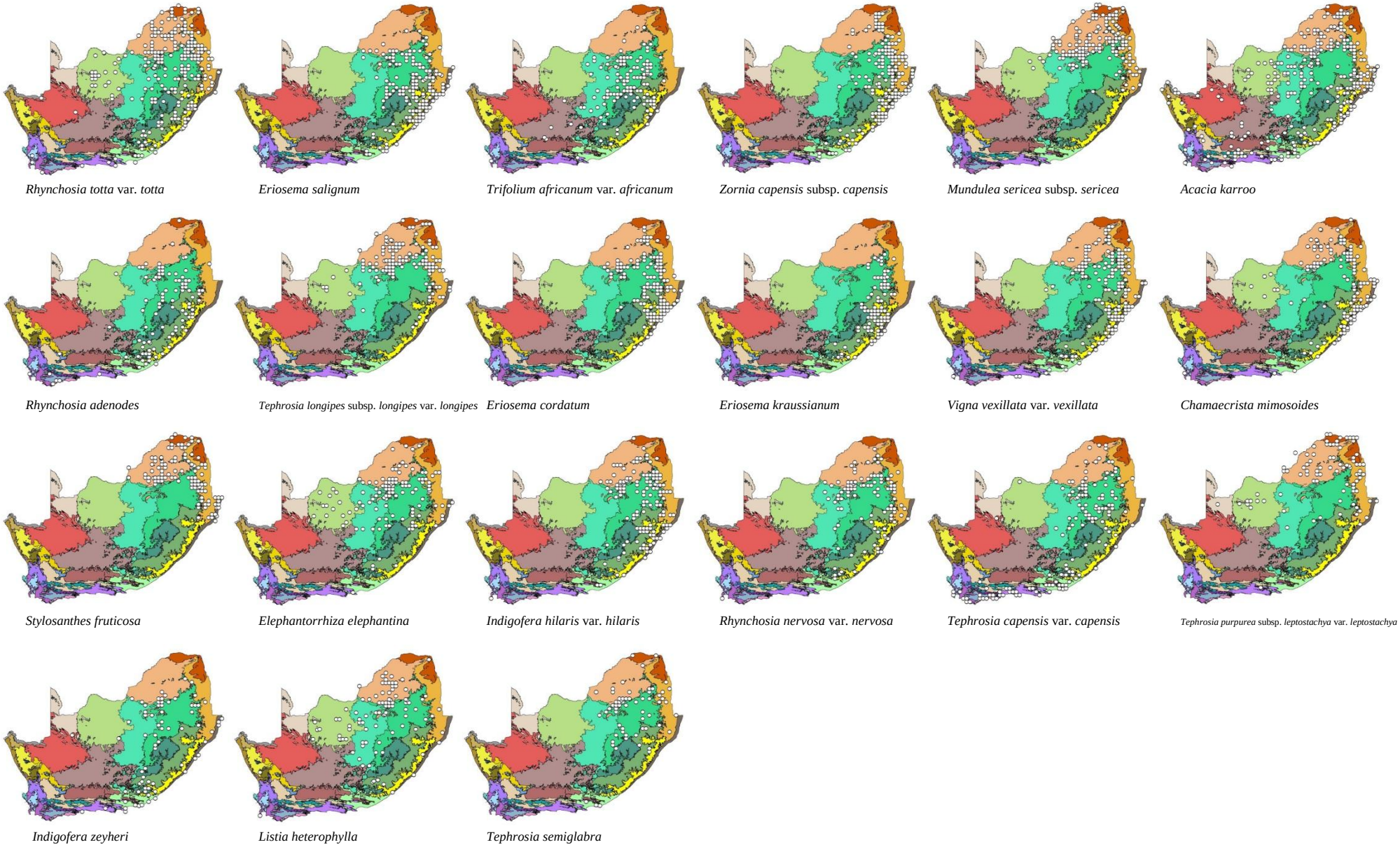

Figure 6.23. Distribution patterns of key species of the Summer Rainfall Region (Cluster B5).

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6.3.3.6 Northern and Northeastern Savanna Region (Cluster B6)

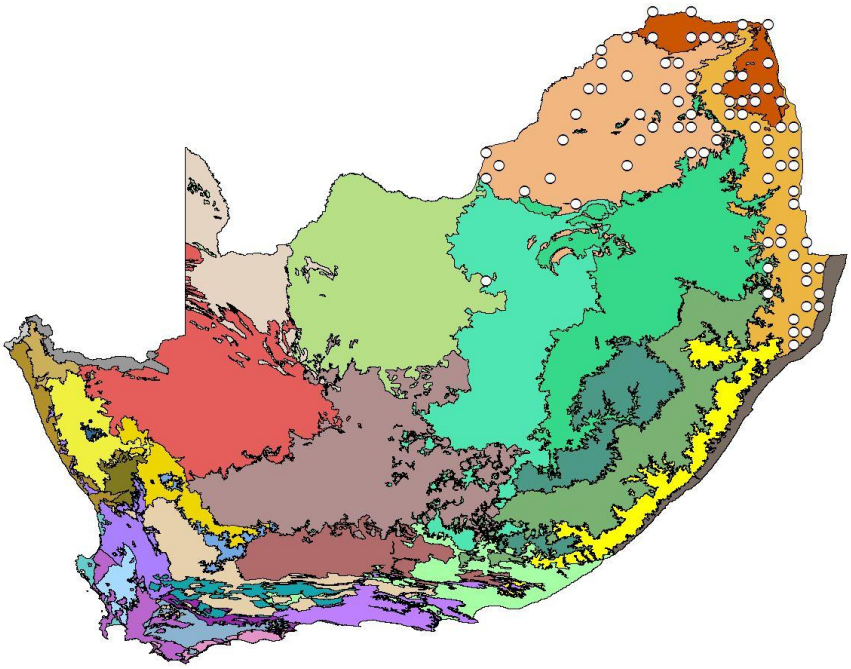

Figure 6.24. The Northern and Northeastern Savanna Region (Cluster B6) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.3.6.1 Bioregions and biomes

Figure 6.24 shows the distribution pattern of the Northern and Northeastern Savanna Region. The Central Bushveld and Lowveld are the major bioregions representing this cluster, with the Mopane Bioregion listed as a minor component. The Savanna Biome represents this cluster in full (Table 6.26).

6.3.3.6.2 Climate and soil

Medium annual rainfall (400–800 mm) and relatively high minimum (>6°C) and maximum (27–35°C) temperatures characterise the Northern and Northeastern Savanna Region (Table 6.26). Soils are generally low in phosphorus, acidic and non-sodic. This is the only cluster where 16 occurrences of heat waves of >30°C on three or more consecutive days per year are noted in Table 6.5. The description of this region as semi-arid, hot and dry could validate the similar data obtained for species richness and range of species in the QDGCs of this cluster and those of B1 (Arid Western Region) (Table 6.3).

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Table 6.26. Northern and Northeastern Savanna Region (Cluster B6): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**CBV**	**LV**	**M**		
	40.8	40.8	18.4		
Biomes	**SV**				
	100.0				
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	6.2	18.5	59.3	11.1	4.9
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	1.2	6.2	42.0	50.6	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	0.0	18.5	80.3	1.2	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	55.6	44.4	0.0		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	18.5	40.7	18.5	22.3	0.0
ESP	**Non-sodic**				
	100.0				

CBV: Central Bushveld; LV: Lowveld; M: Mopane; SV: Savanna; ESP: Exchangeable Sodium Percentage.

6.3.3.6.3 Legume species

In terms of species richness, this cluster has a relatively low figure (4.6 species per QDGC), with a low range of species per grid, namely 5–36 (Table 6.3). These figures compare well with the data for the Arid Western Region (Cluster B1).

The Northern and Northeastern Savanna Region has the highest occurrence of tree forms listed as key species compared to other clusters (Table 6.27). This dominance of the tree growth form is expected in the light of the distribution pattern that falls exclusively in the Savanna Biome.

Dichrostachys cinerea subsp. *africana* var. *africana* and *Peltophorum africanum* are the species with the highest occurrence (Table 6.26), while *Senna italica* subsp. *arachoides*, *Acacia karroo* and *Mundulea sericea* subsp. *sericea* are diagnostic species in Clusters B7 (Kalahari Bushveld Region), D1 (Central Bushveld Region) or E (Northern Mistbelt Forest).

Most key species of the Northern and Northeastern Savanna Region are also present as key species in Cluster D2 (Subtropical Lowveld & Mopane Region). The fact that the distribution of both clusters falls prominently in the Lowveld Bioregion, explains the high occurrence of key species in both these clusters (compare Figures 6.24 and 6.31). Key species not present as key species in other clusters are mostly found in the Mopane Bioregion, for example

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Faidherbia albida, *Xanthocercis zambesiaca* and *Colophospermum mopane* (Figure 6.25). These species are therefore uniquely associated with this cluster.

Table 6.27. Key species (% occurrence) found in the Northern and Northeastern Savanna Region (Cluster B6). Bold-formatted clusters denote diagnostic species.

Key species	**%**	**Also present in Cluster**
Dichrostachys cinerea subsp. *africana* var. *africana*	35	D1, D2
Peltophorum africanum	35	D1, D2
Tephrosia purpurea subsp. *leptostachya* var. *leptostachya*	28	B5, D2
Ormocarpum trichocarpum	26	D2
Senna italica subsp. *arachoides*	25	B3, B4, **B7**, D2
Acacia burkei	21	D2
Acacia karroo	21	A5, B2, B3, B4, B5, B7, **D1**, **E**
Mundulea sericea subsp. *sericea*	21	B5, **D1**, D2
Pterocarpus rotundifolius subsp. *rotundifolius*	21	None
Acacia caffra	20	D1, E
Acacia nigrescens	20	D2
Acacia tortilis subsp. *heteracantha*	20	B7, D2
Schotia brachypetala	20	D2
Acacia gerrardii subsp. *gerrardii* var. *gerrardii*	19	D2
Acacia nilotica subsp. *kraussiana*	19	D2
Faidherbia albida	19	None
Xanthocercis zambesiaca	19	None
Colophospermum mopane	18	None
Crotalaria monteiroi var. *monteiroi*	18	None
Indigastrum costatum subsp. *macrum*	18	None
Philenoptera violacea	18	D2
Rhynchosia minima var. *minima*	18	D2

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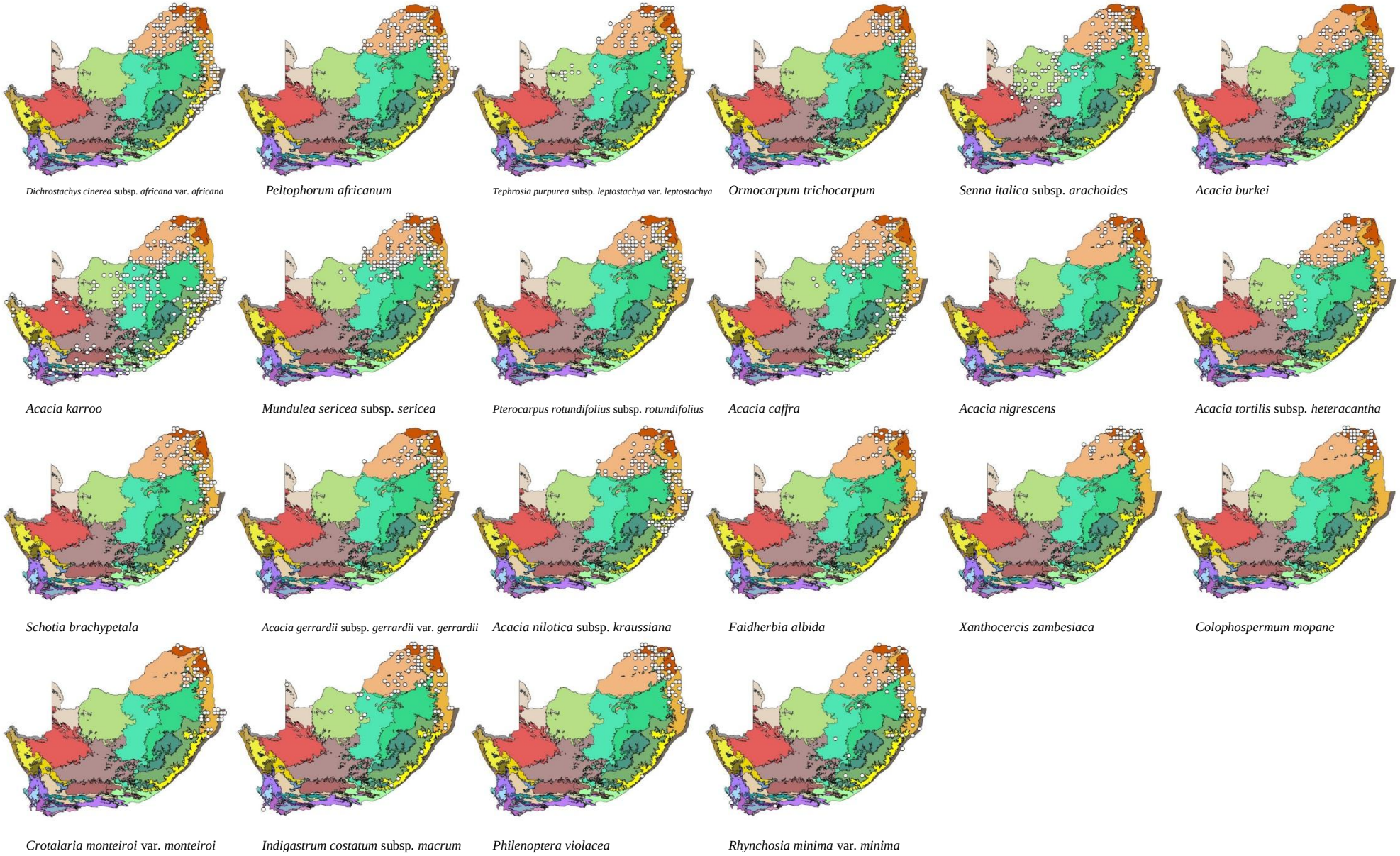

Figure 6.25. Distribution patterns of key species of the Northern and Northeastern Savanna Region (Cluster B6).

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6.3.3.7 Kalahari Bushveld Region (Cluster B7)

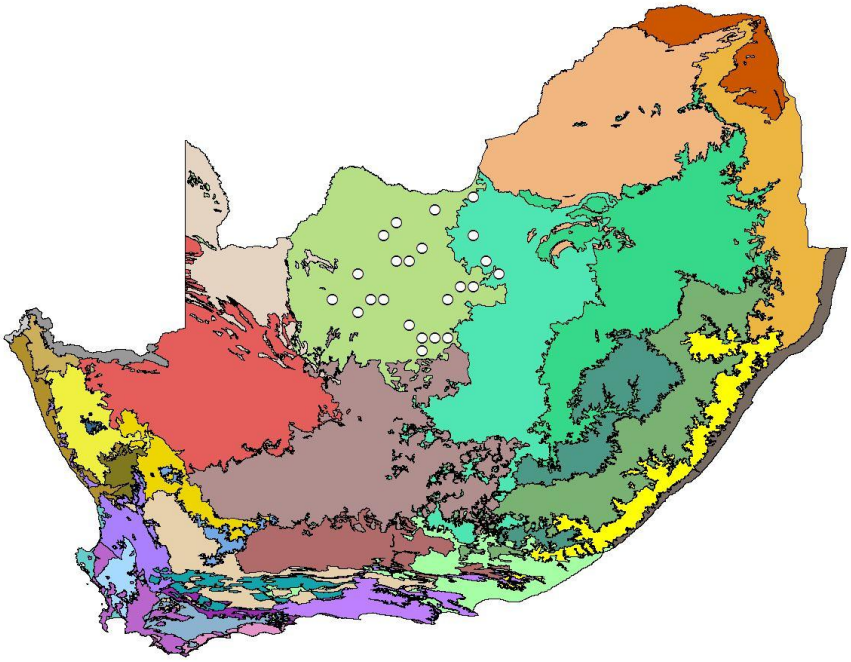

Figure 6.26. The Kalahari Bushveld Region (Cluster B7) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.3.7.1 Bioregions and biomes

The distribution pattern of the Kalahari Bushveld Region is shown in Figure 6.26. It is evident that the Eastern Kalahari Bushveld Bioregion nearly uniquely represents this cluster. In terms of biomes, this cluster lies nearly fully in Savanna. Even though the percentage of total QDGCs contained in this cluster is extremely low (1.4% in Table 6.3), the species richness compares well with other clusters of low rainfall such as Cluster B1 (Arid Western Region) and B6 (Northern and Northeastern Savanna Region).

6.3.3.7.2 Climate and soil

A relatively medium annual rainfall of 400–800 mm to very low rainfall of <400 mm occurs in the Kalahari Bushveld Region (Table 6.28). Low minimum temperatures (<2°C) and high maximum (>27°C) temperatures prevail in this cluster. The relatively low phosphorus content (<10 $mgkg^{-1}$), slightly acidic (pH = 6.5–7.4) and non-sodic soils are described as the main soil properties. Information derived from Schulze (2007) as described in Table 6.5 indicates that this is a semi-arid, dry area with plains and pans.

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Table 6.28. Kalahari Bushveld Region (Cluster B7): bioregions, biomes and predominant climate and soil properties (%). Shaded areas shows highest percentages

Bioregions	**DHG**	**EKB**			
	5.0	95.0			
Biomes	**GL**	**SV**			
	5.3	94.7			
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	39.1	13.1	47.8	0.0	0.0
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	91.3	8.7	0.0	0.0	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	0.0	0.0	69.6	30.4	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	100.0	0.0	0.0		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	0.0	21.7	47.8	17.4	13.1
ESP	**Non-sodic**				
	100.0				

DHG: Dry Highveld Grassland; EKB: Eastern Kalahari Bushveld; GL: Grassland; SV: Savanna; ESP: Exchangeable Sodium Percentage.

6.3.3.7.3 Legume species

Even though the total percentage QDGCs contained in this cluster is extremely low (1.4% in Table 6.3), the species richness compares well with other low-rainfall clusters such as Cluster B1 (Arid Western Region) and B6 (Northern and Northeastern Savanna Region).

The key species of the Kalahari Bushveld Region (Table 6.29) are predominantly perennial herbs. Many of the tree forms are species of *Acacia*.

The three species with the highest occurrence (*Indigofera daleoides* var. *daleoides*, *Tephrosia burchellii* and *Senna italica* subsp. *arachoides*) are diagnostic species. Their distribution patterns are similar, as shown in Figure 6.27, with a highly documented presence in the northern parts of South Africa, especially in the Central Bushveld Region. *Tephrosia burchellii* is not present as a key species in any other cluster, indicating its uniqueness in this cluster.

Many of the key species are also present in the Central Arid Region (Cluster B3) and in the Generalist Group (Cluster B4) (Table 6.29). This is to be expected since all clusters are well represented in the Eastern Kalahari Bushveld Bioregion. *Acacia hebeclada* subsp. *hebeclada* is not present as a key species in any other cluster. Its distribution pattern shows a wider adaptation, especially into the Central Bushveld Region. This is also true for most of the

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other species not found in any other clusters, with only *Crotalaria griquensis* having a similar distribution pattern to this cluster.

Table 6.29. Key species (% occurrence) found in the Kalahari Bushveld Region (Cluster B7). Bold-formatted species and clusters denote diagnostic species.

Key species	**%**	**Also present in Cluster**
Indigofera daleoides* var. *daleoides	**83**	B3
Tephrosia burchellii	**74**	None
Senna italica* subsp. *arachoides	**70**	B3, B4, B6, D2
Indigofera alternans var. *alternans*	61	B3, B4
Indigofera filipes	61	D1
Rhynchosia confusa	61	None
Acacia hebeclada subsp. *hebeclada*	57	None
Indigofera sessilifolia	57	A2, B3
Acacia erioloba	52	B3
Chamaecrista biensis	52	None
Crotalaria sphaerocarpa subsp. *sphaerocarpa*	48	B4, D1
Elephantorrhiza elephantina	43	A3, B4, B5
Indigofera heterotricha	43	B4, D1
Listia heterophylla	43	B5, D1
Acacia karroo	39	A5, B2, B3, B4, B5, B6, **D1**, **E**
Cullen tomentosum	39	B3
Crotalaria griquensis	35	None
Zornia milneana	35	A3
Acacia tortilis subsp. *heteracantha*	30	B6, D2
Crotalaria lotoides	30	D1
Indigastrum argyraeum	30	B3, B4
Indigofera cryptantha var. *cryptantha*	30	None
Indigofera rhytidocarpa subsp. *rhytidocarpa*	30	None
Tephrosia lupinifolia	30	None

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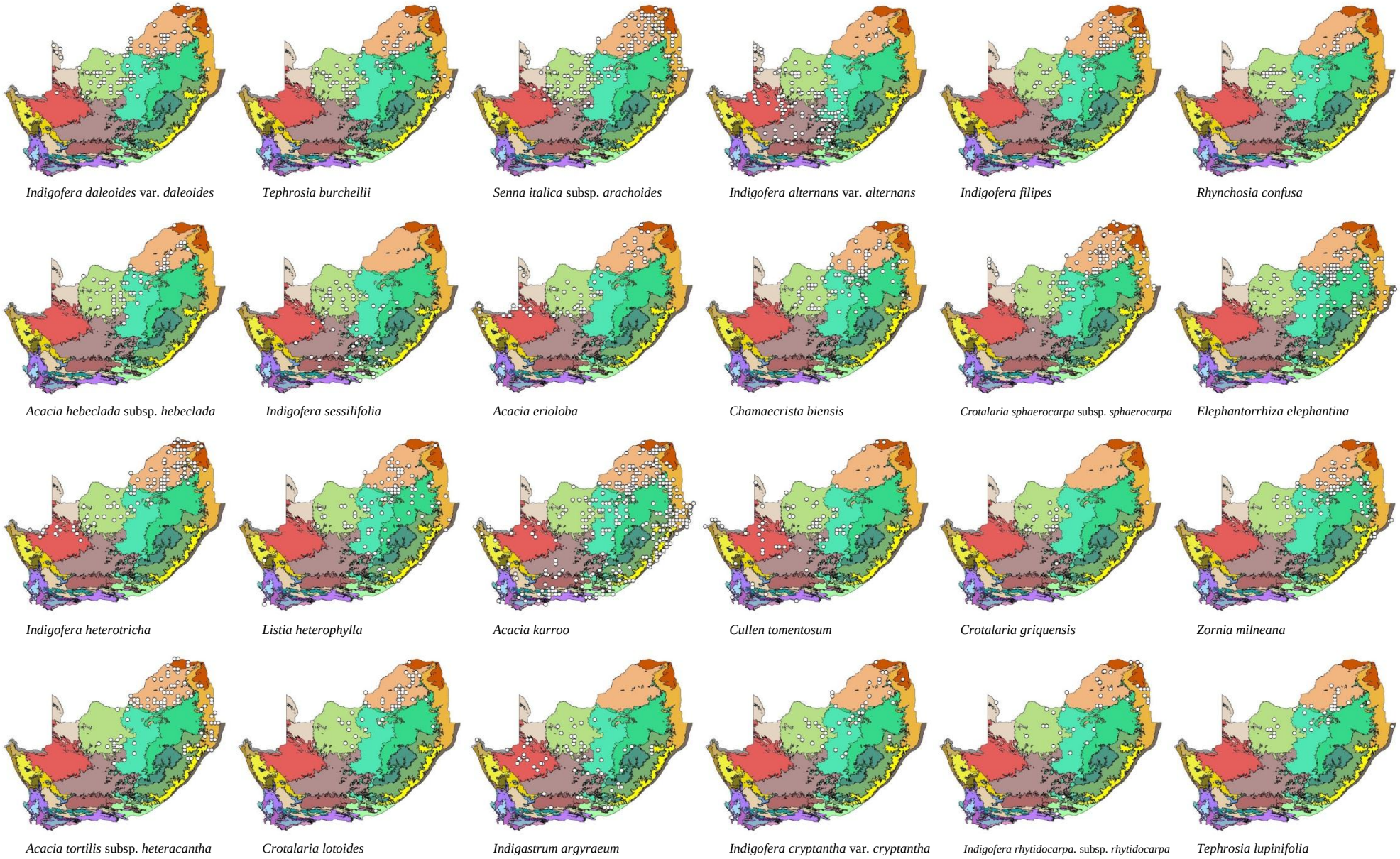

Figure 6.27. Distribution patterns of key species of the Kalahari Bushveld Region (Cluster B7).

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6.3.4 Higher-rainfall Cape Floristic Region (Cluster C)

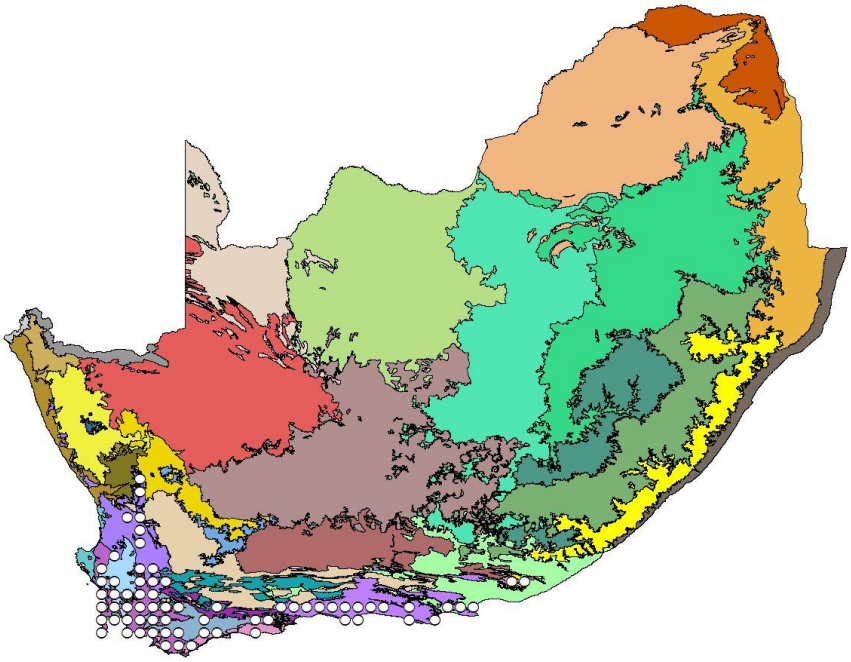

Figure 6.28. The Higher-rainfall Cape Floristic Region (Cluster C) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.4.1 Bioregions and biomes

The distribution pattern for the Higher-rainfall Cape Floristic Region is shown in Figure 6.28. The major bioregion present in this cluster is the Eastern Fynbos Renosterveld with the Southwest Fynbos second highest. This cluster lies entirely in the Fynbos Biome (Table 6.30).

6.3.4.2 Climate and soil

Table 6.30 indicates that annual rainfall is mostly 200–600 mm per year but that regions of higher rainfall are also included in this cluster. If this table is compared with Table 6.18 (Lower-rainfall Cape Floristic Region), it is evident that these clusters could be defined individually on the basis of lower and higher annual rainfall. Information derived from Schulze (2007) further confirms the higher rainfall in this cluster compared to Cluster B2 (Table 6.5). The minimum temperatures of 2–8°C and maximum temperatures of 25–29°C could be expected in this region but minimum temperatures > 6°C are also noted. A wide range of soil phosphorus content and mostly acidic soils relate to this cluster. A high

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percentage of soils are medium sodic (ESP 6–15%), indicating poor infiltration and drainage, with resultant loss of soil (Qadir & Oster 2004). The cluster formed in a frost-free area.

Table 6.30. Higher-rainfall Cape Floristic Region (Cluster C): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**EFR**	**NWF**	**SCF**	**SWF**	
	61.5	7.7	7.7	23.1	
Biomes	**FB**				
	100.0				
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	4.4	41.2	29.4	16.2	8.8
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	0.0	16.2	60.3	23.5	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	14.7	80.9	4.4	0.0	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	4.4	92.7	2.9		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	50.0	32.4	7.4	8.8	1.5
ESP	**Non-sodic**	**Medium Sodic**			
	38.5	61.5			

EFR: Eastern Fynbos-Renosterveld; FB: Fynbos; NWF: Northwest Fynbos; SCF: South Coast Fynbos; SWF: Southwest Fynbos; ESP: Exchangeable Sodium Percentage.

6.3.4.3 Legume species

It is evident from Table 6.3 that Cluster C has a very high species richness, similar to Clusters A2 (Albany Centre), D1 (Central Bushveld Region) and E (Northern Mistbelt Forest). The species range of 34–174 per QDGC is far above average (Table 6.3).

Most key species (Table 6.31) are perennial dwarf shrubs or shrubs. There are two perennial climbing herbs (*Dipogon lignosus* and *Rhynchosia capensis*) and one occasionally perennial herb (*Lessertia herbacea*) listed as key species.

Many species of *Aspalathus* are listed as key species, with the three species with the highest occurrence from this genus and notably not present in any other cluster (Table 6.31). This is an indication that species such as *Aspalathus ciliaris* and *Aspalathus hispida* subsp. *hispida* are uniquely associated with this cluster. No diagnostic species are listed as being present in any other cluster, indicating that diagnostic species are not significant species in this cluster.

Key species are mainly present as key species in Cluster B2 (Lower-rainfall Cape Floristic Region). The fact that the two clusters share the Eastern Fynbos Renosterveld Bioregion

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could probably explain the similarity in occurrence of species. Furthermore, most key species are uniquely present in this cluster (Figure 6.29). *Sutherlandia frutescens* is a noteworthy exception, with a wider adaptation noted in Figure 6.29.

Table 6.31. Key species (% occurrence) found in the Higher-rainfall Cape Floristic Region (Cluster C).

Key species	**%**	**Also present in Cluster**
Aspalathus ciliaris	67	None
Aspalathus hispida subsp. *hispida*	58	None
Aspalathus nigra	55	B2
Podalyria myrtillifolia	55	None
Aspalathus divaricata subsp. *divaricata*	52	None
Aspalathus spinosa subsp. *spinosa*	50	A2, B2
Aspalathus spicata	45	None
Sutherlandia frutescens	45	B1, B2, B3, B4
Aspalathus angustifolia subsp. *angustifolia*	44	None
Indigofera heterophylla	42	B1, B2
Rafnia capensis subsp. *capensis*	42	None
Aspalathus acuminata subsp. *acuminata*	41	B1
Dipogon lignosus	41	None
Otholobium fruticans	41	None
Psoralea affinis	41	B2
Rhynchosia capensis	39	None
Otholobium polyphyllum	38	None
Otholobium virgatum	35	None
Aspalathus juniperina subsp. *juniperina*	33	None
Lessertia herbacea	33	None
Psoralea aphylla	33	None

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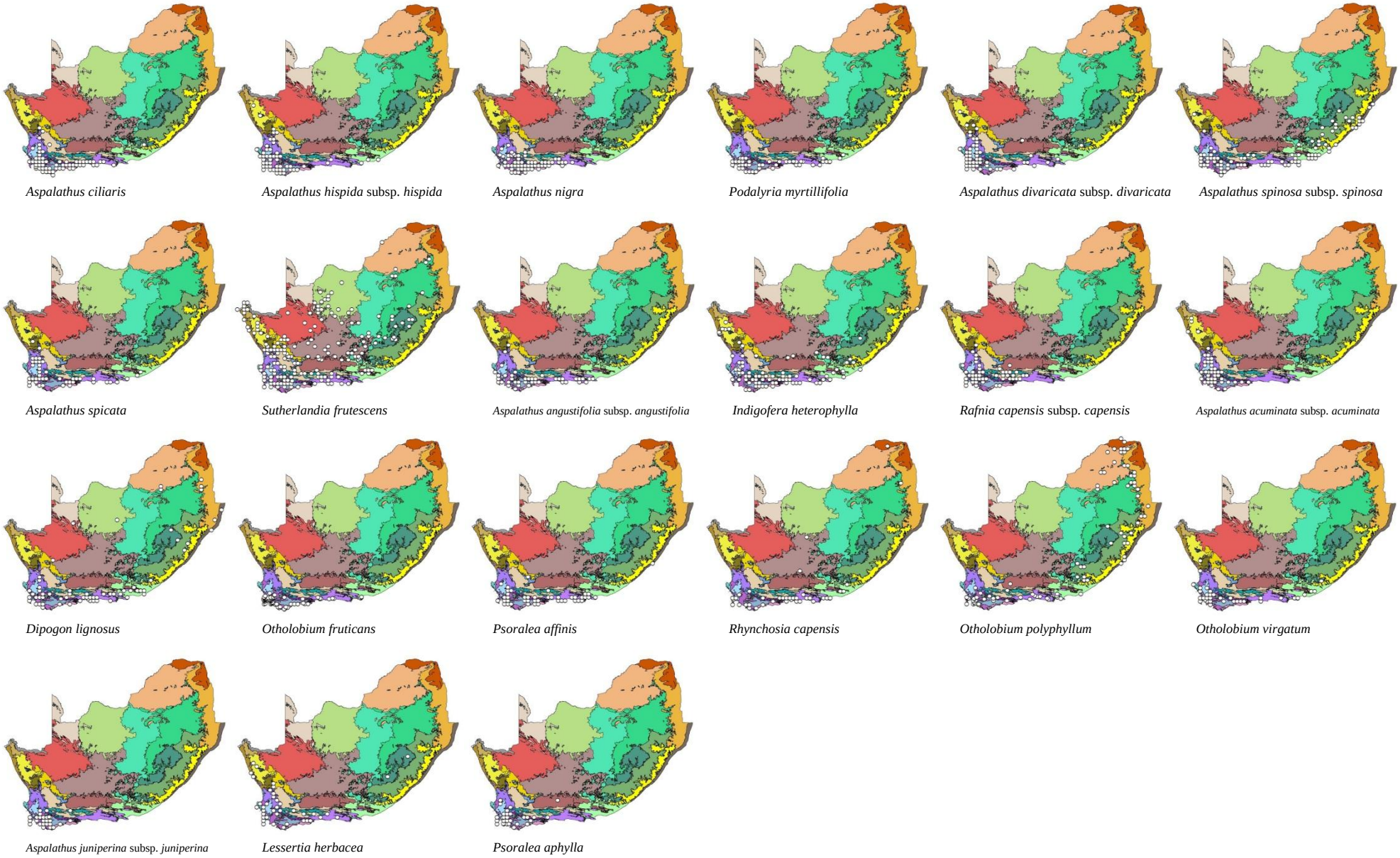

Figure 6.29. Distribution patterns of key species of the Higher-rainfall Cape Floristic Region (Cluster C).

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6.3.5 Cluster D: Savanna Group

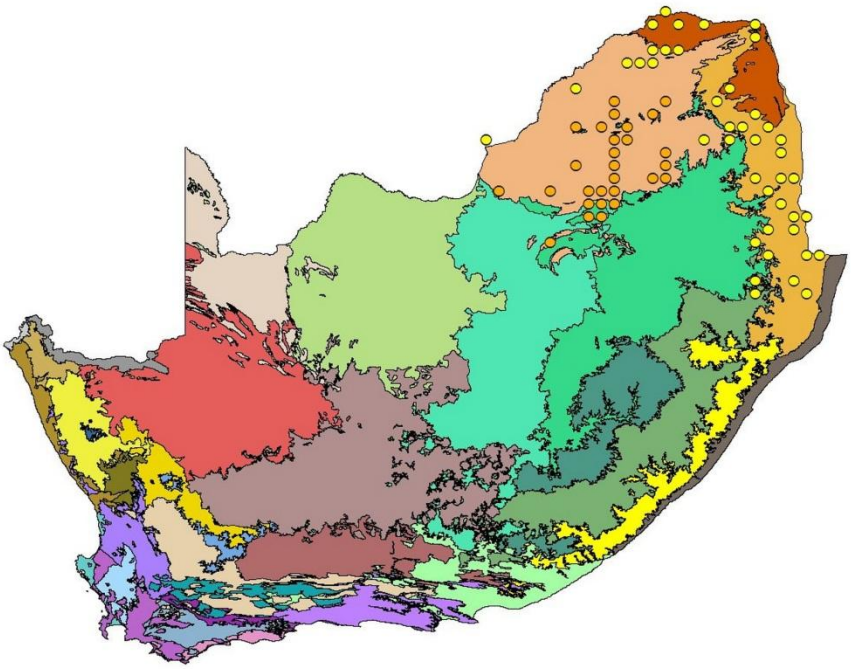

Figure 6.30. The Savanna Group (Cluster D) mapped on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006). Orange dots: Central Bushveld Region; yellow dots: Subtropical Lowveld & Mopane Region.

The 'D' cluster falls in the northern savanna regions. Relatively high extreme maximum temperatures with early summer to midsummer rain higher than 400 mm rain are described for this cluster. The region is dry and hot, with a relatively average net primary production.

The Savanna Group is subdivided into:

- Central Bushveld Region (Cluster D1)
- Subtropical Lowveld & Mopane Region (Cluster D2)

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6.3.5.1 Central Bushveld Region (Cluster D1)

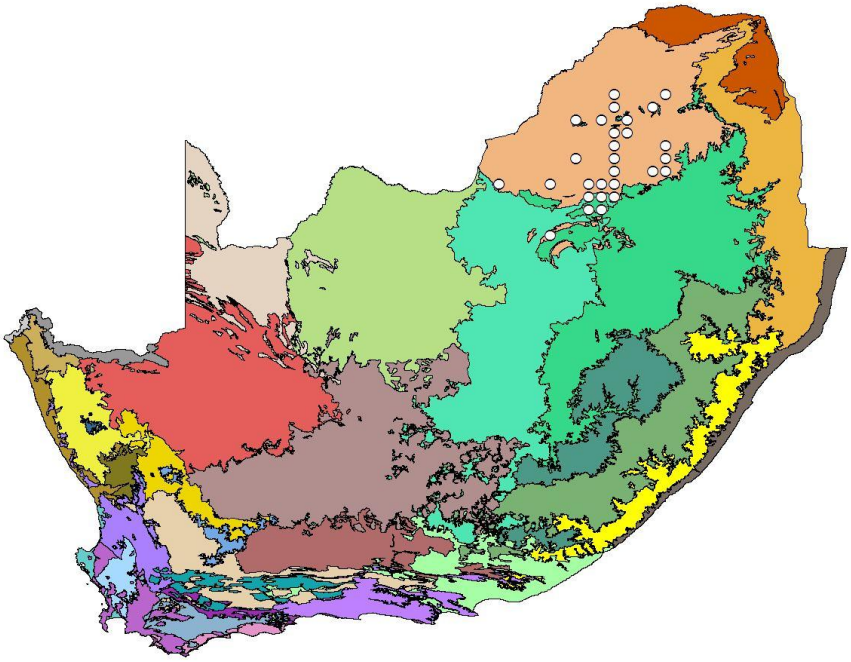

Figure 6.31. The Central Bushveld Region (Cluster D1) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.5.1.1 Bioregions and biomes

The distribution pattern for the Central Bushveld Region Cluster is shown in Figure 6.31. This cluster is uniquely formed in the Central Bushveld Bioregion and the Savanna Biome (Table 6.32), but a number of QDGCs lie in the transitional zone between the Central Bushveld and the Mesic Highveld Grassland Bioregion.

6.3.5.1.2 Climate and soil

The Central Bushveld Region lies in a zone of annual rainfall of 400–800 mm, with relatively high minimum (2–8°C) and maximum (27–35°C) temperatures (Table 6.32). Low phosphorus levels (<10 $mgkg^{-1}$), moderately acidic to neutral soils as well as non-sodic soils occur in this region. Information derived from Schulze (2007) describes this area as dry and hot or cool (Table 6.5).

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Table 6.32. Central Bushveld Region (Cluster D1): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**CBV**				
	100.0				
Biomes	**SV**				
	100.0				
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	0.0	0.0	100.0	0.0	0.0
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	3.5	17.9	78.6	0.0	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	0.0	39.3	60.7	0.0	
Phosphorus	**<10**	**5–35**	**>20**		
$mgkg^{-1}$	85.7	14.3	0.0		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	60.7	39.3	0.0	0.0	0.0
ESP	**Non-sodic**				
	100.0				

CBV: Central Bushveld; SV: Savanna; ESP: Exchangeable Sodium Percentage.

6.3.5.1.3 Legume species

Relatively high species richness (12.6 species per QDGC) is noted in Table 6.3, even though a very small percentage of total QDGCs fall in this cluster. The high range of species per QDGC (29–198) confirms that a large number of legume species are contained in this cluster.

Growth forms of key species present in this cluster are mostly trees, followed by shrubs (Table 6.33). There is one key species that is an annual, *Crotalaria sphaerocarpa* subsp. *sphaerocarpa*.

The most widely associated key species also found in many other clusters, *Acacia karroo* and *Rhynchosia totta* var. *totta*, are diagnostic species in the Central Bushveld Region Cluster (Table 6.33). In fact, the cluster contains six diagnostic species, which is noteworthy compared to the previously mentioned clusters. *Burkea africana* and *Sphenostylis angustifolia* are diagnostic species not present in any other cluster, indicating their uniqueness in the Central Bushveld Region.

Most of the key species are also present as key species in other clusters but the trees *Burkea africana* and *Acacia robusta* subsp. *robusta* are uniquely associated with this cluster. Key species present in the Cluster D1 are generally also present in the 'B' cluster. Especially key species present in Cluster B5 (Summer Rainfall Region) are noted as key species in Cluster D1 (Table 6.33). The distribution patterns of the key species shown in Figure 6.32 suggest

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that none of the species have a distribution pattern similar to that of the Central Bushveld Region Cluster (compare Figure 6.29). This is in contrast to previously described clusters where at least one key species compared well to the distribution pattern of the cluster. It is clear that most key species are not adapted to the Mesic Highveld Bioregion, especially *Mundulea sericea* subsp. *sericea*, *Dichrostachys cinerea* subsp. *africana* var. *africana* and *Peltophorum africanum*.

Table 6.33. Key species (% occurrence) found in the Central Bushveld Region (Cluster D1). Bold-formatted species and clusters denote diagnostic species.

Key species	**%**	**Also present in Cluster**
Acacia karroo	**82**	A5, B2, B3, B4, B5, B6, B7, **E**
Mundulea sericea* subsp. *sericea	**82**	B5, B6, D2
Burkea africana	**79**	None
Tephrosia longipes* subsp. *longipes* var. *longipes	**79**	A3, B5, D2
Rhynchosia totta* var. *totta	**75**	A1, A2, A3, A4, B5, D2, E
Sphenostylis angustifolia	**75**	None
Acacia caffra	68	B6, E
Acacia robusta subsp. *robusta*	68	None
Crotalaria sphaerocarpa subsp. *sphaerocarpa*	68	B4, B7
Eriosema psoraleoides	68	D2, E
Indigofera filipes	64	B7
Indigofera heterotricha	64	B4, B7
Indigofera melanadenia	64	None
Listia heterophylla	64	B5, B7
Rhynchosia minima var. *prostrata*	64	None
Zornia linearis	64	A3
Chamaecrista mimosoides	61	**A5**, B5
Crotalaria lotoides	61	B7
Dichrostachys cinerea subsp. *africana* var. *africana*	61	B6, D2
Peltophorum africanum	61	B6, D2
Stylosanthes fruticosa	61	B5, D2

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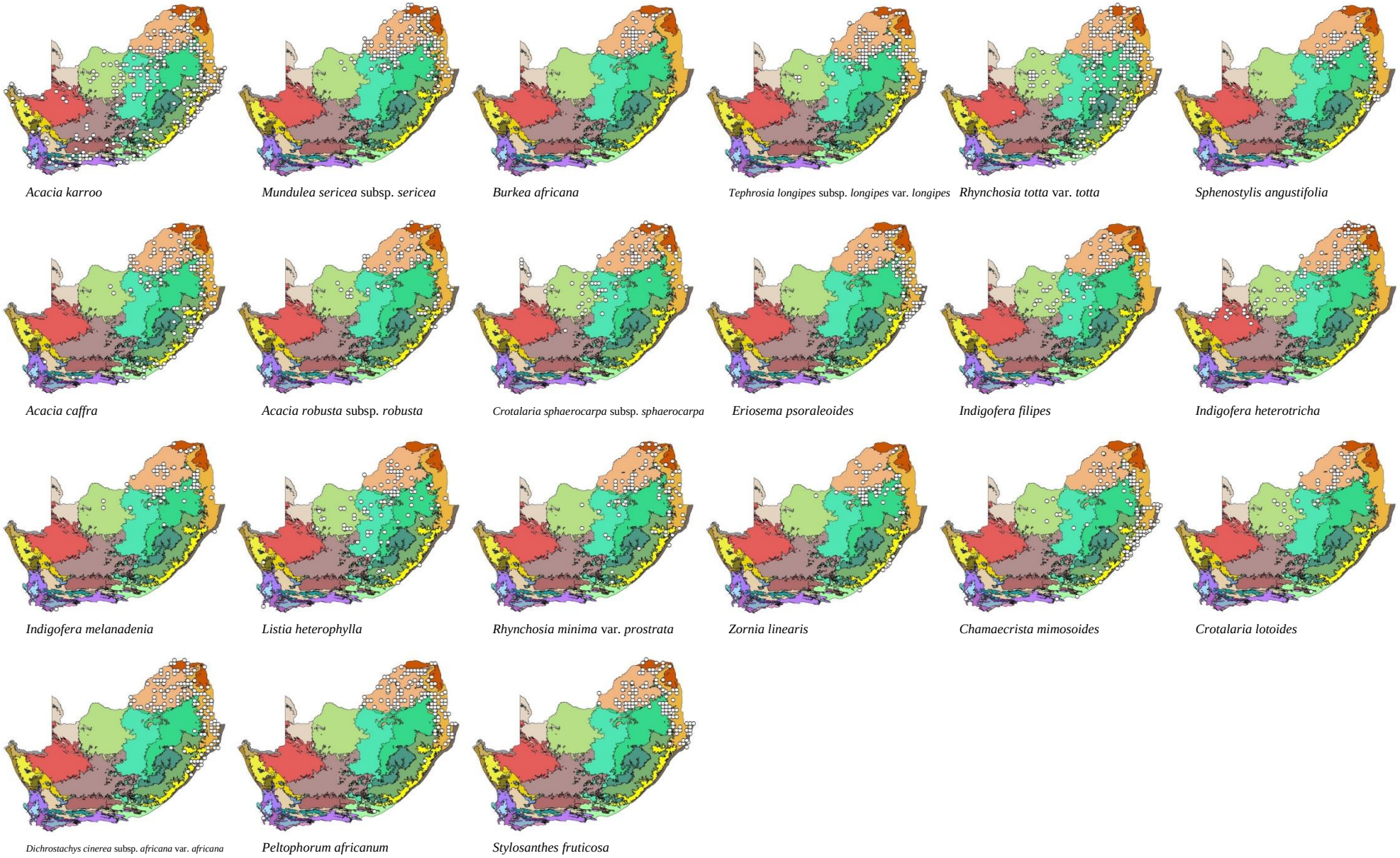

Figure 6.32. Distribution patterns of key species of the Central Bushveld Region (Cluster D1).

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6.3.5.2 Subtropical Lowveld & Mopane Region (Cluster D2)

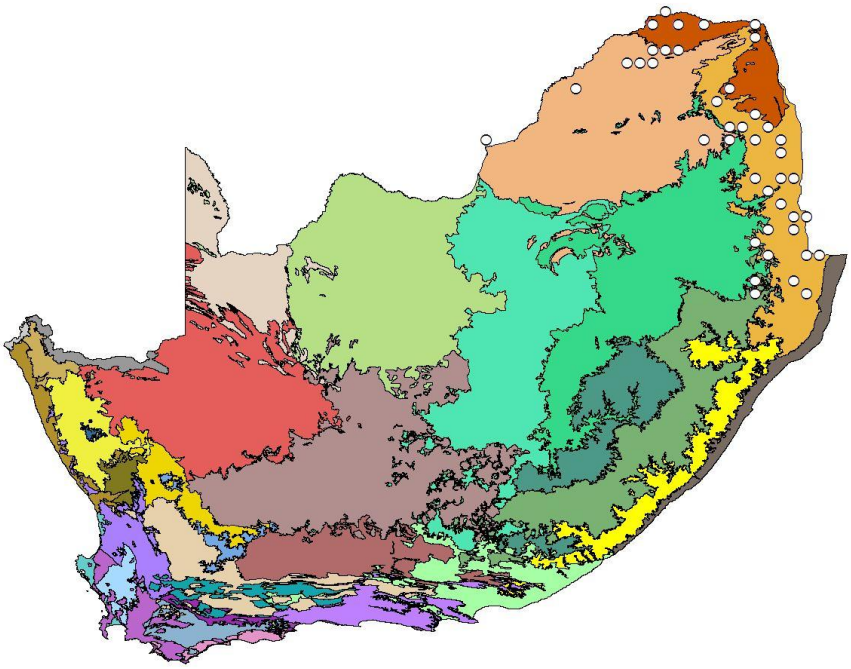

Figure 6.33. The Subtropical Lowveld & Mopane Region (Cluster D2) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.5.2.1 Bioregions and biomes

The distribution pattern of the Subtropical Lowveld & Mopane Region Cluster is shown in Figure 6.33. The main bioregion found in this cluster is the Lowveld, followed by the Central Bushveld and Mopane Bioregions (Table 6.33). Savanna is the only biome that represents the cluster.

6.3.5.2.2 Climate and soil

The expected annual rainfall for the cluster is 400–800 mm per year, but lower and higher rainfall figures are also likely (Table 6.34). Relatively high minimum (>6°C) and maximum (27–35°C) temperatures predominate this region. Most soils in the Subtropical Lowveld & Mopane Region Cluster are low in phosphorus, but a considerable portion contains more than 10 $mgkg^{-1}$. The pH range varies widely, with soils acidic to alkaline but mostly below 7.4. Only non-sodic soils are found in this cluster. The main differences between Cluster D1 and D2 are that wider ranges of rainfall and soil pH are noted for the latter. Table 6.5 shows that extreme maximum temperatures of >40°C are expected in this region.

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Table 6.34. Subtropical Lowveld & Mopane Region (Cluster D2): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**CBV**	**LV**	**M**		
	21.4	57.2	21.4		
Biomes	**SV**				
	100.0				
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	14.0	16.3	46.5	14.0	9.2
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	0.0	0.0	48.8	51.2	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	0.0	20.9	76.7	2.3	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	60.5	39.5	0.0		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	27.9	27.9	20.9	18.6	4.7
ESP	**Non-sodic**				
	100.0				

CBV: Central Bushveld; LV: Lowveld; M: Mopane; SV: Savanna; ESP: Exchangeable Sodium Percentage.

6.3.5.2.3 Legume species

The species richness for Cluster D2 is intermediate compared to that of the other clusters (Table 6.3), with a species range of 4–76 species per QDGC.

Most key species are trees, followed by perennial shrubs and herbs.

The key species for the cluster are listed in Table 6.36, showing *Dichrostachys cinerea* subsp. *africana* var. *africana* as having the highest occurrence. *Mundulea sericea* subsp. *sericea*, *Rhynchosia totta* var. *totta* and *Tephrosia longipes* subsp. *longipes* var. *longipes* are diagnostic species in Cluster D1 (Central Bushveld Region). A small number of QDGCs in Cluster D2 lie in the Central Bushveld Bioregion, possibly explaining the occurrence of these diagnostic species.

Most key species are also present in Cluster B6 (Northern and Northeastern Savanna Region) (Table 6.36). This similarity is to be expected considering that the Lowveld Bioregion is common to the two clusters. *Albizia anthelmintica*, *Acacia senegal* var. *rostrata* and *Crotalaria laburnifolia* subsp. *australis* are the only key species not present in any other cluster, indicating their uniqueness in the Subtropical Lowveld & Mopane Region. It is noteworthy that the distribution patterns of most key species are exclusively in the Central Bushveld and Mopane Bioregions (Figure 6.34).

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Table 6.35. Key species (% occurrence) found in the Subtropical Lowveld & Mopane Region (Cluster D2). Bold-formatted clusters denote diagnostic species.

Key species	**%**	**Also present in Cluster**
Dichrostachys cinerea subsp. *africana* var. *africana*	66	B6, D1
Ormocarpum trichocarpum	61	B6
Peltophorum africanum	61	B6, D1
Mundulea sericea subsp. *sericea*	59	B5, B6, **D1**
Acacia nigrescens	56	B6
Schotia brachypetala	56	B6
Stylosanthes fruticosa	56	B5, D1
Acacia nilotica subsp. *kraussiana*	54	B6
Philenoptera violacea	54	B6
Senna italica subsp. *arachoides*	51	B3, B4, B6, **B7**
Acacia gerrardii subsp. *gerrardii* var. *gerrardii*	49	B6
Albizia anthelmintica	49	None
Rhynchosia minima var. *minima*	49	B6
Rhynchosia totta var. *totta*	49	A1, A2, A3, A4, B5, **D1**, E
Acacia senegal var. *rostrata*	46	None
Eriosema psoraleoides	44	D1, **E**
Tephrosia longipes subsp. *longipes* var. *longipes*	44	A3, B5, **D1**
Tephrosia purpurea subsp. *leptostachya* var. *leptostachya*	44	B5, B6
Acacia burkei	41	B6
Acacia tortilis subsp. *heteracantha*	41	B6, B7
Crotalaria laburnifolia subsp. *australis*	41	None

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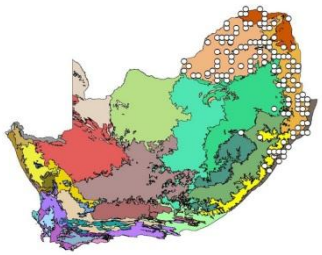
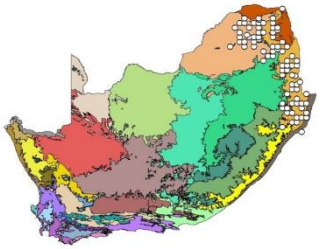
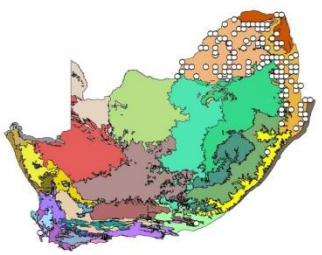


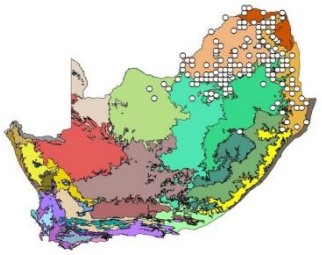
Dichrostachys cinerea subsp. *africana* var. *africana*



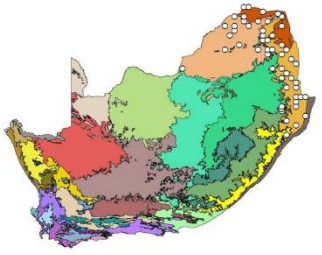
Ormocarpum trichocarpum



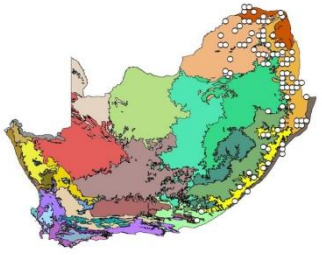
Peltophorum africanum



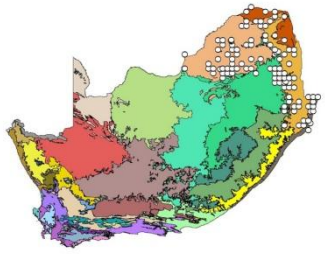
Mundulea sericea subsp. *sericea*



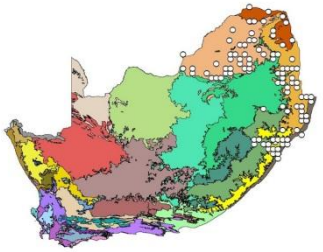
Acacia nigrescens



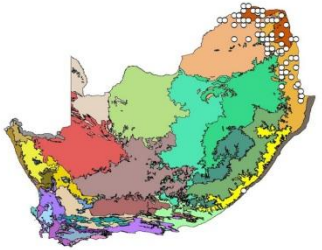
Schotia brachypetala



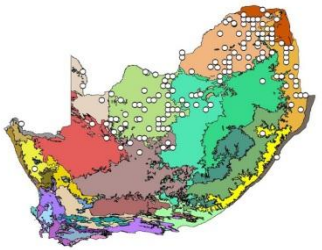
Stylosanthes fruticosa



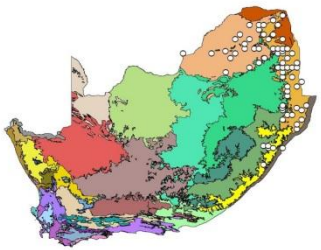
Acacia nilotica subsp. *kraussiana*



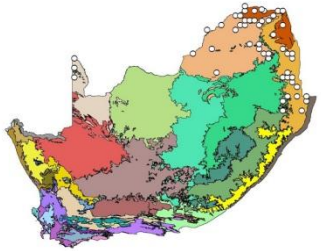
Philenoptera violacea



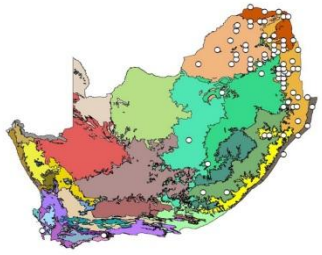
Senna italica subsp. *arachoides*



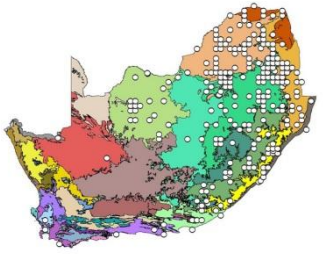
Acacia gerrardii subsp. *gerrardii* var. *gerrardii*



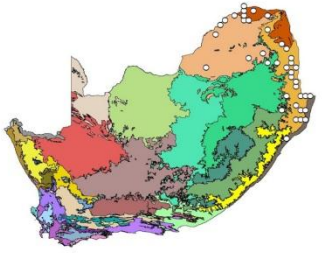
Albizia anthelmintica



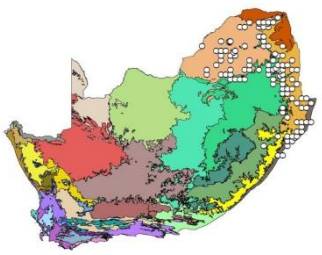
Rhynchosia minima var. *minima*



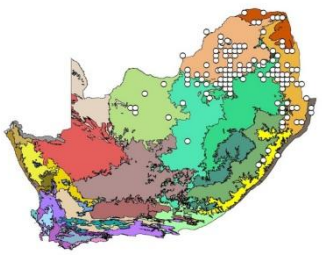
Rhynchosia totta var. *totta*



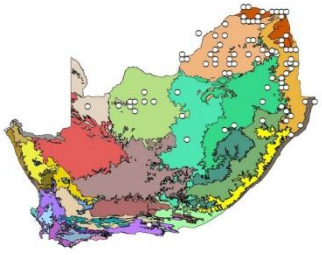
Acacia senegal var. *rostrata*



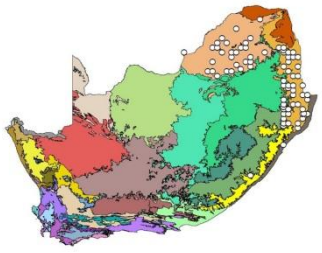
Eriosema psoraleoides



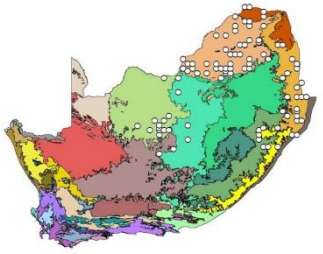
Tephrosia longipes subsp. *longipes* var. *longipes*



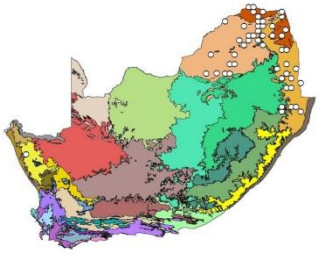
Tephrosia purpurea subsp. *leptostachya* var. *leptostachya*



Acacia burkei



Acacia tortilis subsp. *heteracantha*



Crotalaria laburnifolia subsp. *australis*

Figure 6.34. Distribution patterns of key species of the Subtropical Lowveld & Mopane Region (Cluster D2).

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6.3.6 Northern Mistbelt Forest (Cluster E)

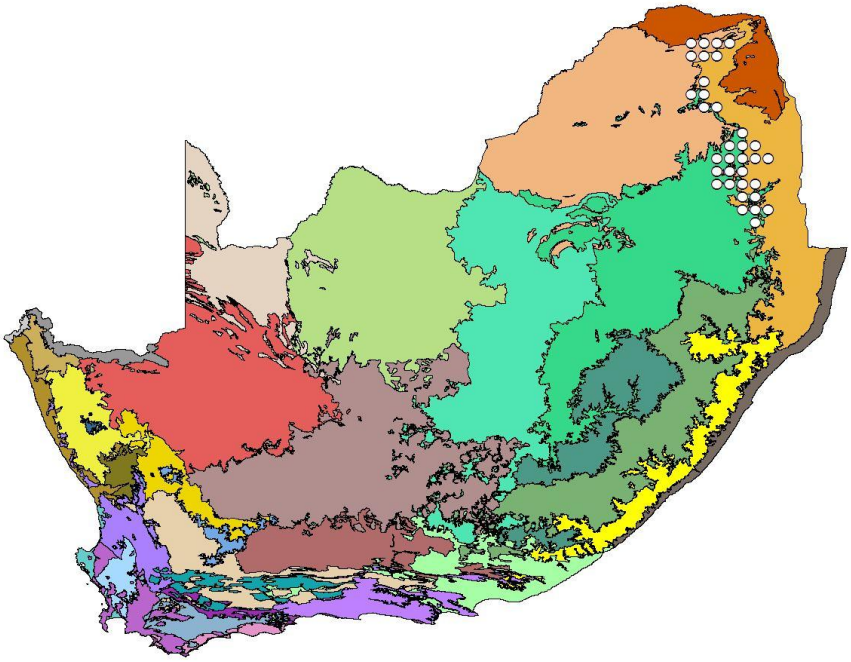

Figure 6.35. The Northern Mistbelt Forest (Cluster E) mapped (white dots) on the bioregions of South Africa, Lesotho and Swaziland (Rutherford *et al.* 2006).

6.3.6.1 Bioregions and biomes

Mesic Highveld Grassland, Lowveld and Central Bushveld are the major bioregions found in the Northern Mistbelt Forest Cluster whereas Savanna is the main biome presented in this cluster (Figure 6.35 and Table 6.36). It is clear from Figure 6.35 that this cluster lies in the transitional zone between the aforementioned bioregions.

6.3.6.2 Climate and soil

The high annual rainfall of >800 mm noted for half of the cluster is to be expected for the Northern Mistbelt Forest (Table 6.36). Moderate minimum temperatures of 2–8°C and maximum temperatures of 25–29°C are described for this cluster. Acidic (pH <6.4), non-sodic soils that are low in phosphorus (<10 $mgkg^{-1}$) are present in this cluster. According to Table 6.5, the cluster falls in a frost-free area, with altitudes of 600–200 m, slightly lower than in the case of the Drakensberg Alpine Centre.

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Table 6.36. Northern Mistbelt Forest (Cluster E): bioregions, biomes and predominant climate and soil properties (%). Shaded areas show highest percentages.

Bioregions	**CBV**	**LV**	**MHG**		
	22.2	33.3	44.5		
Biomes	**GL**	**SV**			
	9.1	90.9			
Annual rainfall	**<400**	**200–600**	**400–800**	**600–1000**	**>800**
(mm)	0.0	3.0	23.5	23.5	50.0
Min temperature	**<2**	**0–4**	**2–8**	**>6**	
(°C)	0.0	8.8	76.5	14.7	
Max temperature	**<27**	**25–29**	**27–35**	**>33**	
(°C)	11.8	70.6	17.7	0.0	
Phosphorus	**<10**	**5–35**	**>20**		
($mgkg^{-1}$)	67.7	32.4	0.0		
pH	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
(H_2O)	79.4	17.7	0.0	2.9	0.0
ESP	**Non-sodic**				
	100.00				

CBV: Central Bushveld; GL: Grassland; LV: Lowveld; MHG: Mesic Highveld Grassland; SV: Savanna; ESP: Exchangeable Sodium Percentage.

6.3.6.3 Legume species

The high species richness of 13.5 species per QDGC exceeds that of any other cluster. Furthermore, the range of species per grid is 28–213, which is the highest figure compared to all other clusters (Table 6.3), suggesting that this is an extremely important cluster in terms of legume species diversity.

The key species listed in Table 6.37 show that a mixture of growth forms such as perennial herbs, dwarf shrubs, shrubs and trees is the found in the Northern Mistbelt Forest Cluster. Many of the herb species are climbers. The presence of climbers is also noted in the Southern Afromontane (Cluster A1) and in the Drakensberg Foothill & Coastal Region (Cluster A5) that lies due south of the Northern Mistbelt Forest. No annual species are listed as key species.

A high occurrence of key species is evident in Table 6.37. This resulted in the presence of a large number of diagnostic species, clearly more than in any of the other clusters. Seven of the diagnostic species are not found in other clusters, indicating that these species are unique to the Northern Mistbelt Forest Cluster. They are *Acacia ataxacantha*, *Pseudarthria hookeri* var. *hookeri*, *Bauhinia galpinii*, *Indigofera sanguinea*, *Rhynchosia monophylla*, *Pearsonia sessilifolia* subsp. *marginata* and *Pterocarpus angolensis*.

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Key species present in other clusters are mainly from Cluster A1 (Southern Afromontane), A5 (Drakensberg Foothill & Coastal Region) and D1 (Central Bushveld Region). Climatic conditions common to all clusters are moderate maximum temperatures, low soil phosphorus content and acidic soils (compare Tables 6.5, 6.13, 6.31 and 6.35). It is noteworthy that most key species are found in the transitional zone between the Mesic Highveld Grassland, Lowveld and Central Bushveld Bioregions (Figure 6.36) and that the distribution patterns of *Pterocarpus angolensis* and *Acacia davyi* correspond most closely to Cluster E.

Table 6.37. Key species (% occurrence) found in the Northern Mistbelt Forest (Cluster E). Bold-formatted species and clusters denote diagnostic species.

Key species	**%**	**Also present in Cluster**
Acacia ataxacantha	**88**	None
Pseudarthria hookeri* var. *hookeri	**88**	None
Zornia capensis* subsp. *capensis	**82**	A1, **A5**, B5
Bauhinia galpinii	**79**	None
Indigofera sanguinea	**79**	None
Eriosema psoraleoides	**76**	D1, D2
Rhynchosia monophylla	**76**	None
Argyrolobium tomentosum	**74**	A1, A2
Vigna vexillata* var. *vexillata	**74**	A1, A3, A5, B5
Acacia karroo	**71**	A5, B2, B3, B4, B5, B6, B7, **D1**
Pearsonia sessilifolia* subsp. *marginata	**71**	None
Pterocarpus angolensis	**71**	None
Desmodium repandum	68	None
Rhynchosia caribaea	68	A2, A5, B4
Rhynchosia totta var. *totta*	68	A1, A2, A3, A4, B5, **D1**, D2
Acacia caffra	65	B6, D1
Acacia davyi	65	None
Aeschynomene rehmannii var. *leptobotrya*	65	None
Indigofera tristoides	65	None
Psoralea arborea	65	None

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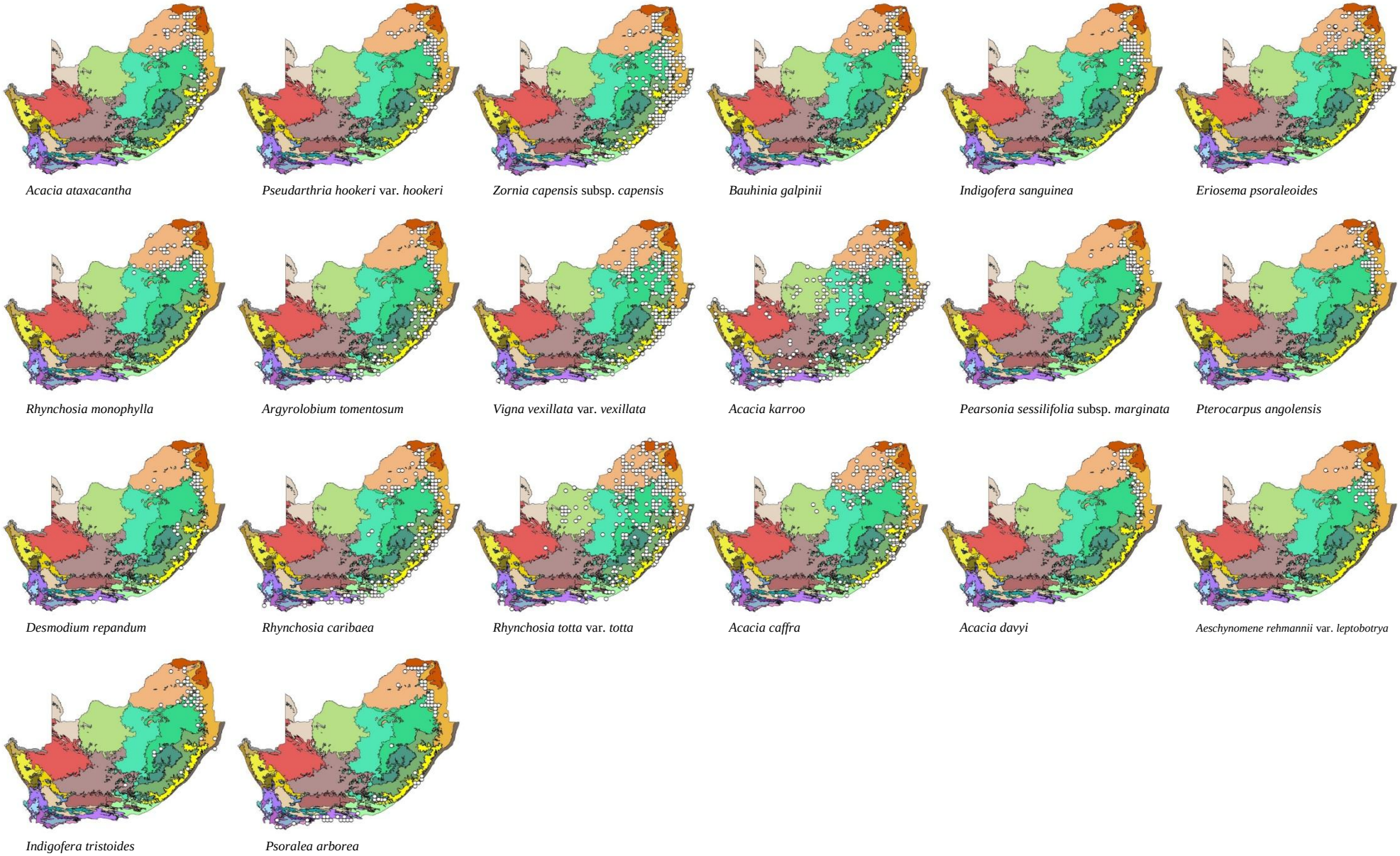

Figure 6.36. Distribution patterns of key species of the Northern Mistbelt Forest (Cluster E).

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6.4 General discussion

The cluster analysis of PRECIS data recorded in QDGCs and expressed as the presence or absence of legume species indigenous to South Africa, Lesotho and Swaziland showed that clusters formed:

a) Distinctive patterns based on either vegetational or geographical regions, for example Cluster B1 (Arid Western Region) where most key species are uniquely associated with this cluster.
b) Non-distinctive vegetational patterns, for example Cluster B4 (Generalist Group) where most vegetational types are present or where residue QDGCs (mainly QDGCs with fewer than three species) were grouped.
c) Functional types, for example Cluster B6 (Northern and Northeastern Savanna Region) where trees are the main growth form.

6.4.1 Bioregions and biomes

In general, Cluster ‘A’ (Sourveld and Mixed Veld Group) represents a group of legume species found mostly in the Grassland and Eastern Coastal Regions and to a lesser extent in the Albany Thicket and Lowveld Regions. This is the second largest cluster, with 10.9% of the total QDGCs (Table 6.3). The largest cluster, containing 78.4% QDGCs, is Cluster ‘B’ (Seasonal Rainfall Group) and it includes all regions except the Higher-rainfall Cape Floristic Region (Cluster C) and the Northern Mistbelt Forest (Cluster E), which are distinctly formed clusters. Cluster C forms mainly in the Eastern Fynbos-Renosterveld Bioregion and partly in the Southwest Fynbos. The Lower-rainfall Cape Floristic Region (Cluster B2) shares part of the Eastern Fynbos-Renosterveld Bioregion with Cluster C but is also found exclusively in the Albany Thicket. Cluster ‘D’ forms part of the Central Bushveld, Lowveld and Mopane Bioregions, similar to Cluster B6. A very low total QDGC value of 4.4% is grouped in this cluster. The smallest cluster, namely Cluster E (2.1% of total QDGCs), is found in the transitional zone between the Mesic Highveld Grassland, the Lowveld and the Central Bushveld Bioregions. The biomes representing the main clusters are as follows: Cluster ‘A’ mainly the Grassland Biome, Cluster ‘B’ all except the Forest Biome, Cluster C the Fynbos Biome, Cluster ‘D’ the Savanna Biome and Cluster E mainly the Savanna Biome.

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6.4.2 Climate and soil

The general description of climate and soil conditions recorded in the tables titled 'Bioregions, biomes and predominant climate and soil properties' will be discussed. For Cluster 'A' a commonality is the relatively high annual rainfall figures, low pH (< 6.4) and non-sodic soils noted. The minimum and maximum temperatures differ widely within the 'A' clusters. It is clear that Cluster A1 (Southern Afromontane) can be distinguished from Cluster A3 (Northern Highveld Region) purely on the basis of rainfall figures. The colder conditions that prevail in the Drakensberg Alpine Centre compared to those in the Southern Afromontane are evident from Tables 6.6 and 6.12, a conclusion also reached by Steenkamp *et al*. (2005). The 'B' cluster shows that the annual rainfall is relatively low and that a relatively high maximum temperature prevails. The phosphorus content and pH of this cluster vary widely, but soils are medium to highly sodic. The difference in climate between the two Cape Floristic Regions is evident where the Lower-rainfall Cape Floristic Region includes areas with annual rainfall figures of <400 mm, while the Higher-rainfall Floristic Region includes areas with annual rainfall figures of >400 mm. Cluster C is noted for its relatively medium annual rainfall figures, acidic and medium sodic soils. The medium annual rainfall and high minimum and maximum temperatures are distinct attributes of Cluster 'D'. The climatic and soil conditions for Cluster B6 (Northern and Northeastern Savanna Region) and Cluster 'D' are without doubt comparable owing to their similar distribution patterns (Figures 6.23, 6.29 and 6.31). Cluster E has a relatively high annual rainfall figure and moderate temperatures, similar to those of Cluster 'A'. A low phosphorus and pH value are recorded for this cluster.

6.4.3 Legume species

6.4.3.1 Species richness

The species richness (legume species per QDGC) for each cluster is shown in Figure 6.37. The smaller clusters (% of total QDGCs), namely Clusters C, 'D' and E, have very high species richness, whereas the largest cluster, Cluster 'B', has a below average species richness. This variation is probably due to the presence of Clusters C, 'D' and E in the higher-rainfall regions (both temperate and subtropical), while most of the 'B' clusters are present in the lower-rainfall (arid) regions. Pausas & Austin (2001) confirm that there is a tendency for species richness to increase with increasing availability of water.

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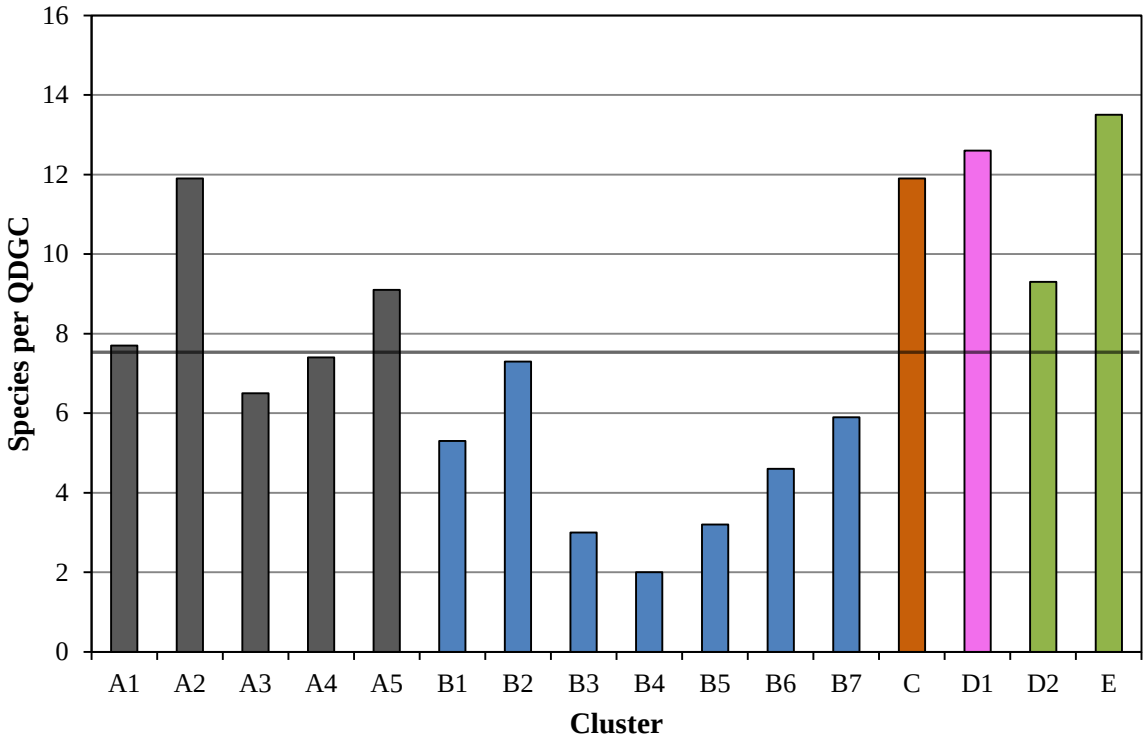

Figure 6.37. Species richness (species/QDGC) for all clusters. Solid line shows mean.

6.4.3.2 Species range

The species range within a cluster (Figure 6.38) shows that for Cluster 'A', the highest range is recorded in Cluster A5. The higher species range of Cluster B2 within the 'B' cluster is to be expected considering the well-known species richness of the Cape Floristic Region. It is noteworthy that a difference in species richness and species range is recorded between the Lower- and Higher-rainfall Cape Floristic Region. The Lower-rainfall Cape Floristic Region shows average records while the Higher-rainfall Cape Floristic Region shows above average records (Table 6.3). Also noteworthy is the relatively high species range of Cluster 'D' (Savanna Group) compared to that of Cluster B6, the two clusters having similar distribution patterns in mainly the Savanna Bioregion.

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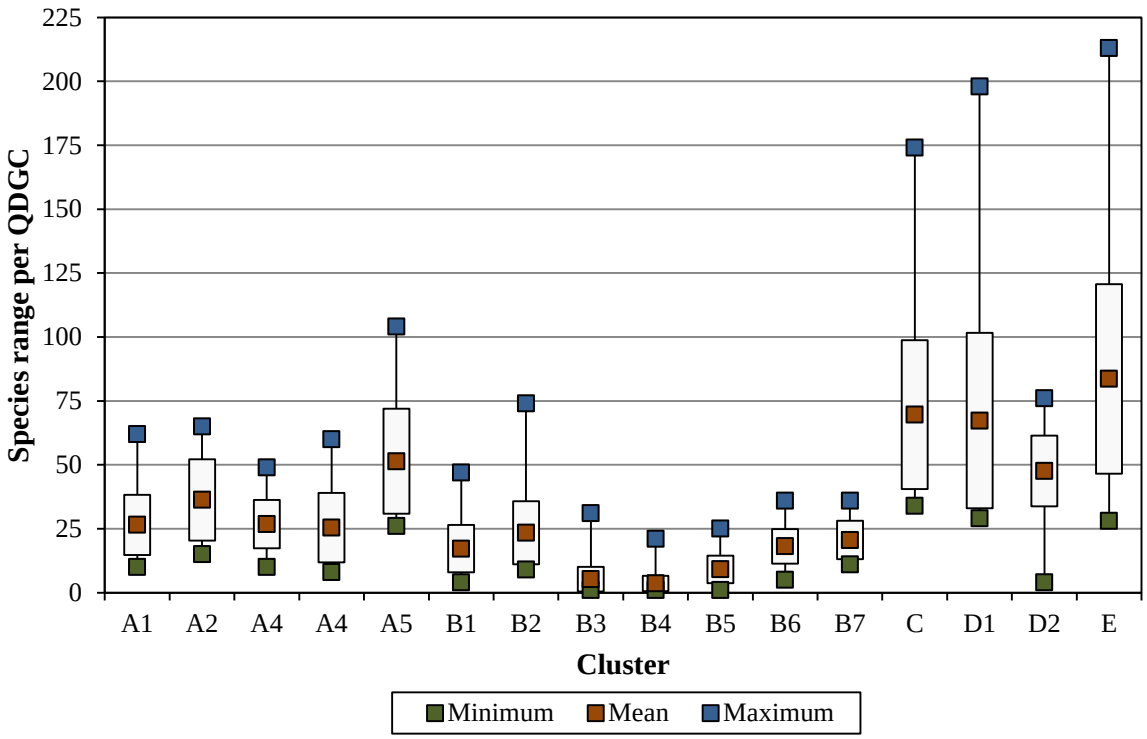

Figure 6.38. The species range recorded in the various clusters. The standard deviation is shown by the box shape.

6.4.3.3 Key species

A summary of the key species recorded in all clusters is presented in Appendix 4. *Acacia karroo* was the highest recorded (9) species, followed by *Rhynchosia totta* var. *totta* (8), *Eriosema salignum* (5), *Senna italica* subsp. *arachoides* (5), *Sutherlandia frutescens* (5) and *Vigna vexillata* var. *vexillata* (5). All these species, except *Sutherlandia frutescens*, have high occurrences in the Central Bushveld and Mesic Highveld Grassland Bioregions. The Eastern Kalahari Bushveld and Indian Ocean Coastal Belt are also noted as important bioregions. All species occur in regions with medium annual rainfall, moderate minimum and relatively high maximum temperatures, low soil phosphorus and pH levels. The distribution pattern of *Sutherlandia frutescens* shows a high occurrence in the Fynbos and Succulent Karoo Biomes and differs only in terms of its occurrence in regions with low annual rainfall, high soil pH level and medium sodic soils. This study confirms the low number of annual legumes found in southern Africa (Goldblatt 1978).

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6.4.3.4 Diagnostic species

Clusters A4, A5, B7, D1 and E are the only ones with diagnostic species as recorded in Table 6.38. It is evident that Cluster E (Northern Mistbelt Forest) contains the largest number of diagnostic species. Furthermore, most of these species are noted as being diagnostic in Cluster E only, signifying their uniqueness within this cluster. The recorded diagnostic species in Cluster D1 should also be highlighted considering the relatively high number of species present in this cluster only. *Acacia ataxacantha*, *Pseudarthria hookeri* var. *hookeri* and *Zornia capensis* subsp. *capensis* have the highest diagnostic occurrence. The distribution patterns of the former two species lie mainly in the transitional zone between the Central Bushveld, Lowveld and Mesic Highveld Grassland Bioregions, while the last-mentioned species extends further into the Sub-Escarpment Savanna and Indian Ocean Coastal Belt Bioregion (Figure 6.36).

Table 6.38. A list of diagnostic species (70% occurrence or higher) recorded in Clusters A4, A5, B7, D1 and E.

Diagnostic species	**%**	**Present in cluster**
Acacia ataxacantha	88	E
Acacia karroo	82, 71	D1, E
Argyrolobium tomentosum	74	E
Bauhinia galpinii	79	E
Burkea africana	79	D1
Chamaecrista mimosoides	82	A5
Eriosema psoraleoides	76	E
Eriosema salignum	77	A5
Indigofera daleoides var. *daleoides*	83	B7
Indigofera sanguinea	79	E
Lessertia perennans var. *perennans*	72	A4
Mundulea sericea subsp. *sericea*	82	D1
Pearsonia sessilifolia subsp. *marginata*	71	E
Pseudarthria hookeri var. *hookeri*	88	E
Pterocarpus angolensis	71	E
Rhynchosia monophylla	76	E
Rhynchosia totta var. *totta*	75	D1
Senna italica subsp. *arachoides*	70	B7
Sphenostylis angustifolia	75	D1
Tephrosia burchellii	74	B7
Tephrosia longipes subsp. *longipes* var. *longipes*	79	D1
Vigna vexillata var. *vexillata*	74	E
Zornia capensis subsp. *capensis*	87, 82	A5, E

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6.4.3.5 Growth form of key and diagnostic species

The different growth forms of key and diagnostic species for the clusters are shown in Figure 6.39. The dominant growth form in Cluster 'A' is perennial herbs, with a noteworthy number of climber species. Tree species are the least represented of all growth forms. In Cluster 'B' there is a clear increase in the number of shrubs and trees, especially in Cluster B2 (Lower-rainfall Cape Floristic Region) and Cluster B6 (Northern and Northeastern Savanna Region). The dominance of dwarf shrubs and shrubs in Cluster C (Higher-rainfall Cape Floristic Region) is similar to the situation in the Lower-rainfall Cape Floristic Region, except for a higher number of shrubs in the latter. All growth forms are present in Cluster 'D', with herbs dominating Cluster D1 (Central Bushveld Region) and trees Cluster D2 (Subtropical Lowveld and Mopane Region). The presence of trees and climbers as key species in Cluster E (Northern Mistbelt Forest) is to be expected owing to the presence of forest. The diagnostic species show dominance in the herb growth form, with nearly equal numbers of the remaining growth forms. It is noteworthy that an occasionally perennial species, namely *Tephrosia burchellii*, is recorded as a diagnostic species.

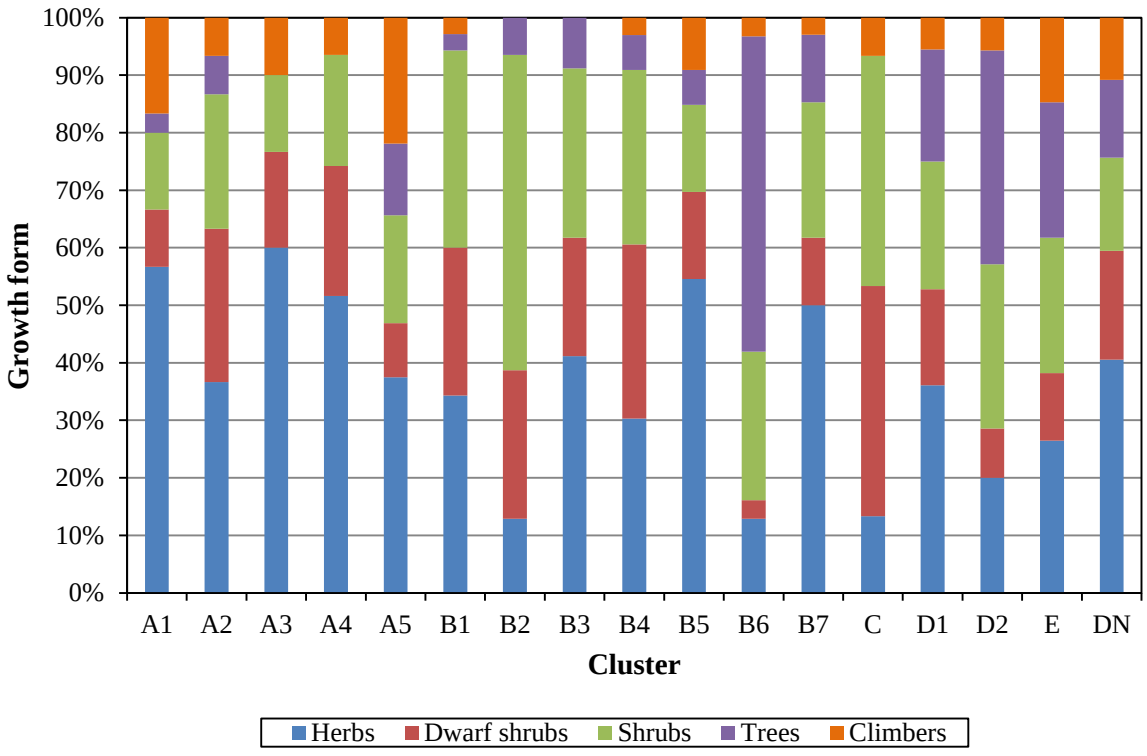

Figure 6.39. Summary of the different growth forms recorded as key and diagnostic (DN) species in the various clusters.

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6.4.4 Relationships between Leguminochoria and phytogeographical regions

Leguminochoria, as defined in this study, will be compared with southern African phytogeographical regions. The key species recorded in one Leguminochorion are compared with key species found in other Leguminochoria as listed in the various tables above. The assumption is made that if a considerable number of key species are also found in another cluster, the cluster could be floristically linked to the other cluster(s) involved. In the case of some clusters, the highest count of mutual key species is four, while the highest count for Cluster D2 was 14. Owing to its wide distribution pattern, the Generalist Group will be discussed under the 'B' cluster and is included in the PHYTOTAB-PC classification.

6.4.4.1 The 'A' clusters

The Southern Afromontane (Cluster A1) has some key species in common with the Northern Highveld Region, the Drakensberg Foothill & Coastal Region, the Summer Rainfall Region and the Northern Mistbelt Forest. A study by Linder *et al.* (2005) could not define the Afromontane but it is here clearly defined as the Southern Afromontane and Northern Mistbelt Forest, with various species related to both Leguminochoria. The presence of mutual key species between the Southern Afromontane and the Drakensberg Foothill & Coastal Region is also noted by Goldblatt (1978), who states that Afromontane taxa have originated from lowland flora. This Leguminochorion is included in the Maputaland-Pondoland Region (Van Wyk & Smith 2001), Natal (Linder *et al*. 2005) and Core Afromontane (Steenkamp *et al.* 2005).

The Albany Centre (Cluster A2) has some key species in common with the Summer Rainfall Region, the Northern Mistbelt Forest and the Drakensberg Alpine Centre. Van Wyk & Smith (2001) confirm that floristic elements of many other regions converge in the Albany Centre, although it is not strongly evident in this study. This Leguminochorion forms part of the Kalahari-Highveld Transition Zone and Afromontane (Goldblatt 1978), the Albany Centre (Van Wyk & Smith 2001), Natal (Linder *et al.* 2005) and the Southern Succulent Karoo and Southeastern Fynbos (Steenkamp *et al.* 2005).

The Northern Highveld Region (Cluster A3) has some key species in common mostly with the Southern Afromontane, the Drakensberg Alpine Centre and the Summer Rainfall Region. No comparable floristic affinities could be found. The Highveld phytochorion, described by Steenkamp *et al.* (2005), shows similar but a more confined pattern extending into the Central Bushveld Region. This Leguminochorion is included in the Zambezian Region and Kalahari-Highveld Transition Zone (Goldblatt 1978) and in the Highveld (Steenkamp *et al.* 2005).

The Drakensberg Alpine Centre (Cluster A4) has some mutual key species with the Southern Afromontane and the Northern Highveld Region. No link with the Cape flora can be

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established when comparing key species. The Afromontane (Goldblatt 1978), Drakensberg Alpine Centre (Van Wyk & Smith 2001), Natal (Linder *et al.* 2005) and the Drakensberg Alpine (Steenkamp *et al.* 2005) are included in this Leguminochorion.

The Drakensberg Foothill & Coastal Region (Cluster A5) has some key species in common with Southern Afromontane, the Summer Rainfall and the Northern Mistbelt Forest. The Tongaland-Pondoland Region has elements of the Afromontane (Goldblatt 1978) and it is confirmed here. This Leguminochorion forms part of the Tongaland-Pondoland Region (Goldblatt 1978), the Maputaland-Pondoland Region (Van Wyk & Smith 2001), the Natal and Zambezian Central (Linder *et al.* 2005) and Core Afromontane and Greater Maputaland (Steenkamp *et al.* 2005).

6.4.4.2 The 'B' clusters

The Arid Western Region (Cluster B1) has various key species in common with the Lower- and Higher-rainfall Cape Floristic Region. As noted previously, almost all key species of the Cape Floristic Region are uniquely associated with the Arid Western Region, confirming the highly endemic nature and ancient stock of the Karoo-Namib Region taxa as noted by Goldblatt (1978). Jürgens in Cowling *et al*. (1998), and Goldblatt & Manning (2002) recognised that the Succulent Karoo Region forms part of a greater Cape Flora rather than the Nama-Karoo Region and this study probably confirmed this theory. The Succulent Karoo Region, not identified as a phytochorion by Linder *et al.* (2005), is clearly delineated in this study. The Karoo-Namib Region and Cape Region (Goldblatt 1978), the Namaqualand-Namib Domain and Cape Floristic Region (Cowling *et al.* 1998), the Gariep Centre, Succulent Karoo and Cape Floristic Region (Van Wyk & Smith 2001), the Namib-Karoo and Cape (Linder *et al.* 2005) and the Northern Succulent Karoo, Southern Succulent Karoo and the Northwestern Fynbos (Steenkamp *et al.* 2005) are included in this Leguminochorion.

Key species of the Lower-rainfall Cape Floristic Region (Cluster B2) are mostly in common with the Higher-rainfall Cape Floristic Region. As in the previous cluster, most key species are not present in other clusters, indicating their uniqueness to this cluster. The floristic link of the Cape Region with the Drakensberg Alpine Centre as acknowledged by Goldblatt (1978) and Steenkamp *et al.* (2005) could not be confirmed with key species. A phytochorion termed Southeastern Fynbos, with a similar pattern except for the inclusion of the eastern part of the Cape Region, has also been defined by Steenkamp *et al*. (2005). The latter authors further speculate that the orientation of the regional mountains could be responsible for the Southeastern (east-west orientation) and Northwestern Fynbos (north-south orientation) phytochoria as described by them. This theory is valid for Cluster B2 but not for the Higher-rainfall Cape Floristic Region (Cluster C). Goldblatt & Manning's (2002) phytogeographical centres Karoo Mountains, Langeberg, Agulhas Plains and Southeastern Centre closely follow the east-west orientation of the Lower-rainfall Cape Floristic Region. This Leguminochorion forms part of the Cape Region (Goldblatt 1978), the Worcester-Roberson Karoo Centre, the

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Little Karoo Centre and the Cape Floristic Region (Van Wyk & Smith 2001), the Cape (Linder *et al.* 2005) and the Southeastern Fynbos (Steenkamp *et al.* 2005).

The Central Arid Region (Cluster B3) lies in the Karoo-Namib Region and the Kalahari-Highveld Transition Zone of Goldblatt (1978). Not surprisingly, most of the key species are also found as key species in the Kalahari Bushveld Region. Other regions that describe this cluster include the Namib-Karoo and Eastern Karoo (Linder *et al.* 2005) and the Central Karoo and the Southern Succulent Karoo (Steenkamp *et al.* 2005).

Notwithstanding its wide distribution, the Generalist Group (Cluster B4) has various key species that also occur in the Central Arid Region, the Kalahari Bushveld Region and the Albany Centre.

The Summer Rainfall Region (Cluster B5) has some key species related to the Southern Afromontane, the Northern Highveld Region and the Central Bushveld Region. However, these regions are incorporated in the Summer Rainfall Region and it is therefore to be expected that they would have key species in common. Three of Goldblatt's phytogeographical regions fall in this cluster, namely the Zambezian Region, the Kalahari-Highveld Transition Zone and the Tongaland-Pondoland Region (Goldblatt 1978).

The Northern and Northeastern Savanna Region (Cluster B6) shares many key species with the Subtropical Lowveld & Mopane Region (Cluster D2). This is to be expected taking into account the shared bioregions. The fact that considerably fewer key species are shared with the Central Bushveld Region (Cluster D1) could indicate that the latter cluster is distinct, even though it falls within the same bioregion. This Leguminochorion is included in the Zambezian and the Tongaland-Pondoland Regions (Goldblatt 1978), the Zambezian-central (Linder *et al.* 2005) and the Greater Maputaland (Steenkamp *et al.* 2005).

The Kalahari Bushveld Region (Cluster B7) has various key species that are associated with the Central Arid Region (Cluster B3) and with the Central Bushveld Region (Cluster D1). Even though the two clusters are from different bioregions, both Leguminochoria lie within the Savanna Biome and a floristic link is therefore to be expected. The Kalahari-Highveld Transition Zone (Goldblatt 1978), the Griqualand West Centre (Van Wyk & Smith 2001), the Eastern Karoo and the Karoo Transition (Linder *et al.* 2005) and the Central Karoo (Steenkamp *et al.* 2005) form part of this Leguminochorion.

6.4.4.3 Cluster C

Key species of the Higher-rainfall Cape Floristic Region (Cluster C) are found mostly in the Lower-rainfall Cape Floristic Region and only a few in the Arid Western Region. Most of the key species are not associated with any other cluster, signifying their unique association with this cluster. Key species in this region have no floristic link with the Drakensberg Alpine Centre as acknowledged by Goldblatt (1978) and Steenkamp *et al.* (2005). Goldblatt &

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Manning's (2002) phytogeographical centres termed the Northwestern Centre and especially the Southwestern Centre follow the north-south orientation found mainly in this cluster. This Leguminochorion forms part of the Cape Region (Goldblatt 1978), the Cape Floristic Region (Van Wyk & Smith 2001), the Cape (Linder *et al.* 2005) and the Northwestern and Southeastern Fynbos (Steenkamp *et al.* 2005).

6.4.4.4 The 'D' clusters

Key species of the Central Bushveld Region (Cluster D1) are found in the Summer Rainfall Region, the Kalahari Bushveld Region and the Subtropical Lowveld & Mopane Region, therefore largely in the Savanna Biome. The Zambezian Region (Goldblatt 1978), the Soutpansberg and Wolkberg Centres (Van Wyk & Smith 2001), the Zambezian-central (Linder *et al.* 2005) and the Highveld (Steenkamp *et al.* 2005) form part of this Leguminochorion.

The key species of the Subtropical Lowveld & Mopane Region (Cluster D2) are, predictably, linked mostly with the Northern and Northeastern Savanna Region. This Leguminochorion is included in the Zambezian Region and Tongaland-Pondoland Region (Goldblatt 1978), the Zambezian-central (Linder *et al.* 2005) and Greater Maputaland (Steenkamp *et al.* 2005).

6.4.4.5 Cluster E

The Northern Mistbelt Forest Cluster shares some key species with the Southern Afromontane, the Drakensberg Foothill & Coastal Region, the Summer Rainfall Region and the Central Bushveld Region. Goldblatt (1978) recognises that the typical Afromontane taxa originated from neighbouring lowland flora, termed the Drakensberg Foothill & Coastal Region in this study. The Afromontane (Goldblatt 1978), the Zambezian-central (Linder *et al.* 2005) and Core Afromontane (Steenkamp *et al.* 2005) are incorporated in this Leguminochorion.

6.4.4.6 Classification with PHYTOTAB-PC

PHYTOTAB-PC computed six different groups as listed in Table 6.39. The groups are based on the absence or presence of key species in the 16 different clusters, thus indicating floristic links between clusters. Group 1 contains the southern and western Cape Region. A similar observation was noted under the previous discussion, where all three clusters in the group

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were noted as having key species in common. Group 2 contains two relatively low-rainfall clusters and the Generalist Group. This confirms the inclusion of the Generalist Group with regions of relatively lower rainfall and high maximum temperature rather than with the grasslands of South Africa. Group 3 is represented by the Albany Centre, which is noted as a single entity, indicating no floristic links with any of the other clusters. Inclusion of the Savanna, Lowveld, Mopane and Bushveld Regions in Group 4 is to be expected and is logical. The validity of separating the cluster 'Northern and Northeastern Savanna Region' from the Savanna Group is therefore unclear. According to the results, the Drakensberg Alpine Centre in Group 5 has no floristic link with other Afromontane regions; a link with summer rainfall regions is more apparent. Group 6 is a well-defined Afromontane region that includes the foothills and coastal areas of the Drakensberg.

Table 6.39. Legume communities identified by PHYTOTAB-PC (86% classification efficiency), using the clusters derived from the XLSTAT analysis.

Group	Cluster description
1	Arid Western Region (B1), Lower-rainfall Cape Floristic Region (B2), Higher-rainfall Cape Floristic Region (C)
2	Central Arid Region (B3), Generalist Group (B4), Kalahari Bushveld Region (B7)
3	Albany Centre (A2)
4	Northern and Northeastern Savanna Region (B6), Central Bushveld Region (D1), Subtropical Lowveld & Mopane Region (D2)
5	Northern Highveld Region (A3), Drakensberg Alpine Centre (A4), Summer Rainfall Region (B5)
6	Southern Afromontane (A1), Drakensberg Foothill & Coastal Region (A5), Northern Mistbelt Forest (E)

The Discriminant Analysis for the communities described above is shown in Figure 6.40. Because of the large dataset that generates largely overlying groups, only the centroids, not all observations, are shown. The F1 function explains 61.43% of the independent variables and F2 23.59%. Group 6 is positioned to the extreme left and Group 2 to the extreme right on the F1 axis, while Group 1 is positioned to the extreme top and Group 5 to the extreme bottom of the F2 axis.

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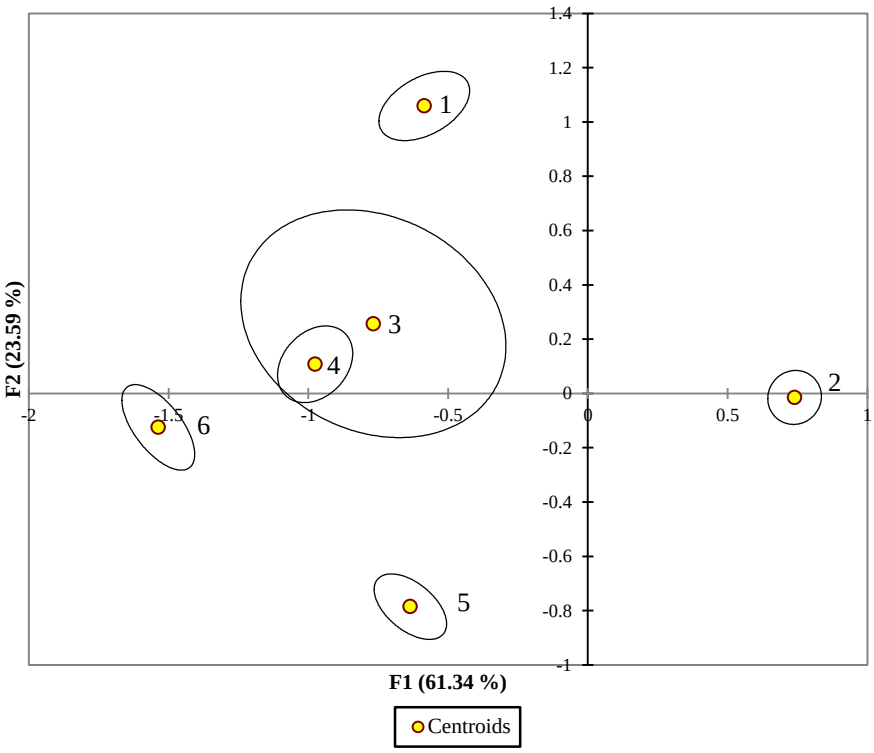

Figure 6.40. Discriminant Analysis for the PHYTOTAB-PC communities.
1= Arid Western Region, Lower-rainfall Cape Floristic Region, Higher-rainfall Cape Floristic Region; 2= Central Arid Region, Generalist Group, Kalahari Bushveld Region; 3= Albany Centre; 4= Northern and Northeastern Savanna Region, Central Bushveld Region, Subtropical Lowveld & Mopane Region; 5= Northern Highveld Region, Drakensberg Alpine Centre, Summer Rainfall Region; 6= Southern Afromontane , Drakensberg Foothill & Coastal Region, Northern Mistbelt Forest.

The correlation matrix (Table 6.40) indicates that for F1, soil pH and mean annual minimum temperatures (negative) are the main drivers for distinguishing between legume communities. Group 6 includes species adapted to high mean annual minimum temperatures and low soil pH levels, and Group 2 contains species adapted to opposite levels. The drivers for separating Groups 1 and 5 to opposite levels of the F2 scale are attributed to soil phosphorus levels (Table 6.40). It is therefore clear that soil properties play a far more important role in clustering legume communities than mean annual rainfall does.

Table 6.40. Correlation matrix between climate and soil variables for the PHYTOTAB-PC communities.

Variables	F1	F2	F3
AnnRain	-0.555	-0.550	0.149
TempMax	0.545	0.145	**0.695**
TempMin	**-0.646**	0.683	0.332
Phosphorus	0.391	**0.817**	-0.227
pH	**0.798**	0.516	0.195

Values in bold are different from 0 with a significance level alpha = 0.05.

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CHAPTER 7

ABIOTIC FACTORS AND RANGE OF TOLERANCE

7.1 Introduction

The protection of African plant diversity is extremely important since this continent is noted by the 'Intergovernmental Panel on Climate Change' to be most vulnerable to climate change (McClean *et al*. 2005). It is predicted that the geographical ranges of African plant species will decrease in size and/or shift to locations at higher altitude such as the Drakensberg, with large geographical changes in species composition. The impact of climate change on the potential production of forage crops is therefore particularly important when selecting new forage legume species for screening and breeding programmes. The need for developing legumes adapted to arid and semi-arid environments is imperative (Graham & Vance 2003; Sprent & Gehlot 2011), especially if the predictions of climate change in southern Africa is considered (Davis 2011). Stoddard *et al*. (2006) have described screening techniques for abiotic stresses such as drought, salinity and waterlogging.

The most important abiotic factors that control species distribution are temperature and moisture (Skarpe 1986; Woodward 1987; Ruiz-Vega 1994; Bond *et al*. 2003). The effect of rainfall on species composition was found to decrease with increasing rainfall. Therefore, along drier gradients, a change in rainfall patterns has a remarkable effect on patterns of floristic variation, while in more mesic regions no effect is noted (Kadmon & Danin 1999). Similarly, small increases in temperature are unlikely to affect plant distribution in a desert (Davis 2011), whereas in an arid to semi-arid ecotone, plants could disappear owing to a higher biophysical vulnerability to climate change. In addition to temperature and moisture, Bond *et al*. (2003) and Midgley *et al*. (2007) highlight the significant effect of fire on South African vegetation. Fynbos, at least in the more mesic areas, is a fire-dependent ecosystem and could support a forest or thicket. Summer-rainfall areas with an annual rainfall >650 mm could become forest with the exclusion of fire, and with <650 mm could show no compositional change in fire-intolerant forest or thicket species (climate-dependent grassy ecosystems).

Since many legumes acquire nitrogen through symbiotic nitrogen fixation, phosphorus is the most limiting element for growth in fixating legume plants (Vance 2001). Phosphorus is abundant in many soils but unavailable for uptake owing to microbes that incorporate phosphorus into organic matter. Soil in tropical and subtropical regions is especially phosphorus-deficient (e.g. the Northern and North Eastern Savanna Group (Cluster B6) and the Subtropical Lowveld & Mopane Region (Cluster D2)), and the use of legume cover crops to reclaim acid soils low in phosphorus and nitrogen is recommended by many researchers

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(Oberson *et al*. 2006). The predicted half depletion of rock phosphate reserves between 2040 and 2060 (Lambers *et al*. 2006) necessitate research into making plants more efficient at acquiring phosphorus, developing phosphorus-efficient germplasm and improving crop management that increase availability of phosphorus in the soil (Vance 2001; Sinclair & Vadez 2012). *Listia bainesii* was shown to produce more biomass under low phosphorus levels than lucerne in a glasshouse experiment (Pang *et al*. 2010), and therefore other indigenous legumes could also show promising results under low soil phosphorus levels. In another study with *Vigna unguiculata*, planted at high plant densities and intercropped with sorghum, the acid and alkaline phosphatase activities in the soil were significantly increased, especially with the farmer-selected cv. Sanzie (Makoi *et al*. 2010). The authors suggest that field-grown legumes are to be screened for high phosphorus acquisition efficiencies through assaying enzyme activities. The root clusters induced in *Aspalathus linearis* are known to maximize phosphorus uptake from soils low in this element (Lambers *et al*. 2006).

At present, the distribution of plants is limited by 'anthropogenic disturbance which may impact the ranges of species through habitat loss, alteration, or degradation, pollution, disease, introduction of non-native species, over-harvesting, and global climate change' (Mott 2010).

7.2 Statistical procedure and layout of chapter

In order to describe the vast number of indigenous legumes in terms of their adaptation or range of tolerance to rainfall, minimum and mean annual maximum temperature, soil pH and phosphorus levels, each tribe was examined for viable and coherent groups of taxa for data analysis. Where tribes consisted of a small group of taxa, the tribe was analysed completely. Where a tribe contained a genus with a large number of species, the genus was analysed separately. The remaining genera within the tribe subsequently formed a data set. The data sets comprised of taxa recorded in all quarter degree grid cells (QDGCs) with corresponding soil properties and climate conditions. Data sets were subjected to cluster analysis to determine meaningful groups. The resulting groups were assimilated into the discriminant analysis program of XLSTAT 2012.4.03 - Discriminant Analysis (DA) in order to investigate which predictor (driver) contributed mostly to separate groups. Jombart *et al.* (2010) stated that DA maximised the separation between groups and minimised the variation within groups, whereas Principle Component Analysis (PCA) failed to discriminate groups in their study of the genetic structure of biological populations.

The climate and soil data of each QDGC are the independent variables and therefore the predictors, while the species are the dependent variables and clustered in different groups. Groups overlapped in almost all the DA analyses. Where the overlap is small, the discriminant function separates the groups well, but where the overlap is large, the function discriminates poorly between the groups. A Pearson's correlation test was performed on the DA results using XLSTAT 2012.4.03 - Correlation tests. Each group (circles in e.g. Figure

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7.1) is described according to the correlation matrix results, where the drivers for the distribution patterns of species are defined in tables that list species recorded in each group (e.g. Table 7.2). This description is a visual interpretation of the discriminant analysis results and should therefore be used only as a screening tool to predict the soil properties and climatic conditions to which a species is adapted. There are tribes and species where the discriminant analysis did not clearly distinguish between lower, intermediate and higher levels of given variables, but in most instances a gradient is apparent.

When interpreting the results of the cluster analysis, a species' range of tolerances is described as narrow when it is recorded in only one group (e.g. *Adenolobus garipensis* in Table 7.2) or broad when recorded in all groups (e.g. *Bauhinia galpinii* in Table 7.2). However, where a species is recorded in only one group, it does not necessarily indicate a narrow range of tolerance as it could be related to collection bias or endemism as discussed in Chapter 6 under 6.1.3. The distribution patterns of species (Chapter 5: Inventory) should be considered when interpreting results.

The families and tribes follow the suprageneric classification of Lewis *et al*. (2005) and species within tribes are listed alphabetically.

7.3 Relationship between abiotic factors and the distribution patterns of legume species

7.3.1 Family: Caesalpinioideae

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7.3.1.1 Tribe: Cercideae

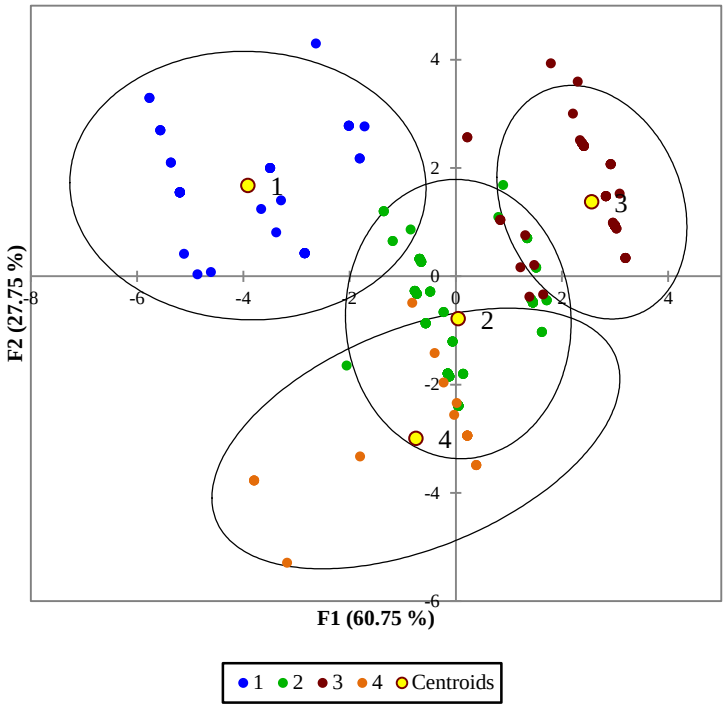

Figure 7.1. Discriminant Analysis for the tribe Cercideae. Dots represent species; circles represent groups.

The Cercideae consists of four genera, namely *Adenolobus*, *Bauhinia*, *Piliostigma* and *Tylosema*. These genera were clustered in four groups and the Discriminant Analysis (DA) predicted their relationship with the independent variables (climate and soil data) as shown in Figure 7.1. All the circles overlap, indicating confusion between groups. Where a small overlap is evident, the discriminant function separates the group well. The first function (F1) is estimated to explain 60.75% of the variation and the second function 27.75% (F2).

Table 7.1. Correlation matrix between climate and soil variables for the tribe Cercideae.

Variables	F1	F2	F3
F1	1.000	0.000	0.000
F2	0.000	1.000	0.000
F3	0.000	0.000	1.000
AnnRain	**0.967**	0.246	0.029
TempMin	0.091	**0.453**	-0.790
TempMax	-0.490	-0.235	0.212
Phosphorus	-0.587	0.319	-0.171
pH	**-0.830**	0.498	0.224

Values in bold are different from 0 with a significance level alpha=0.05

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The correlation matrix shows that mean annual rainfall is the main driver for the distribution patterns of species contained in Cercideae (Table 7.1). A high correlation with soil pH (negative) is also evident. If the distribution patterns of species are compared (Chapter 5: Inventory) it is evident that all species (except *Adenolobus garipensis*) are mostly found in the northern and northeastern part of South Africa, i.e. mainly the Central Bushveld and Lowveld Bioregions. *Adenolobus garipensis* is found in the Gariep Desert Bioregion, a low-rainfall region with high soil pH. This is the only species that is recorded in only one group, namely Group 1 (Table 7.2). As Figure 7.1 shows, this group lies to the left of the F1 level where the low rainfall and high soil pH levels lie. The F2 function shows a low correlation with mean annual minimum temperature, probably owing to taxa such as *Bauhinia petersiana* subsp. *macrantha* and *Tylosema esculentum* that are adapted to low and high mean annual minimum temperatures and *Piliostigma thonningii* not adapted to low mean annual minimum temperatures.

Most species of *Bauhinia* and *Tylosema* are found mainly in the Central Bushveld Bioregion with a mean annual rainfall of 400–800 mm, a mean annual minimum temperature of 2–8ºC and a soil pH<6.4 (Appendix 5, 6 and 7). *Piliostigma thonningii* is found mainly in the Lowveld Bioregion with a mean annual minimum temperature >6ºC but with mean annual rainfall and soil pH levels the same as mentioned above.

Table 7.2. Species of the tribe Cercideae clustered in four groups. Species in bold present in one group only. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature.

Group 1 **Lower MAR; Higher soil pH; Higher TMin**	**Group 2** **Intermediate MAR, soil pH and TMin**	**Group 3** **Higher MAR; Lower soil pH; Higher TMin**	**Group 4** **Intermediate MAR and soil pH; Lower TMin**
Adenolobus garipensis			
Bauhinia bowkeri	*Bauhinia bowkeri*	*Bauhinia bowkeri*	
Bauhinia galpinii	*Bauhinia galpinii*	*Bauhinia galpinii*	*Bauhinia galpinii*
	Bauhinia natalensis	*Bauhinia natalensis*	
Bauhinia petersiana subsp. *macrantha*	*Bauhinia petersiana* subsp. *macrantha*		*Bauhinia petersiana* subsp. *macrantha*
Bauhinia tomentosa	*Bauhinia tomentosa*	*Bauhinia tomentosa*	*Bauhinia tomentosa*
Piliostigma thonningii	*Piliostigma thonningii*	*Piliostigma thonningii*	
Tylosema esculentum	*Tylosema esculentum*		*Tylosema esculentum*
Tylosema fassoglensis	*Tylosema fassoglensis*	*Tylosema fassoglensis*	

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7.3.1.2 Tribe: Detarieae

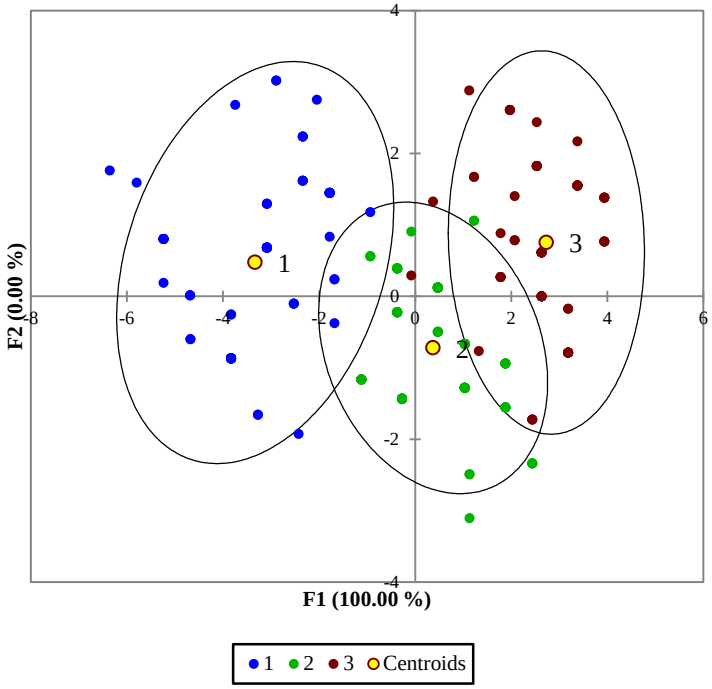

Figure 7.2. Discriminant Analysis for the tribe Detarieae. Dots represent species; circles represent groups.

The genera grouped in the Detarieae are *Afzelia*, *Brachystegia*, *Colophospermum*, *Guibourtia*, and *Schotia*. The DA analysis shows that species are divided into three groups and that F1 explains 100% of the variation of the independent variables (Figure 7.2). All the groups are interdependent, as indicated by overlapping circles.

Table 7.3. Correlation matrix between climate and soil variables for the tribe Detarieae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.870**	0.470
TempMin	0.199	-0.241
TempMax	-0.352	-0.246
Phosphorus	-0.590	0.026
pH	**-0.955**	0.188

Values in bold are different from 0 with a significance level alpha=0.05

Two drivers are identified in Table 7.3 as responsible for the distribution of aforementioned genera. The highest correlation (negative) is with soil pH, followed by the mean annual

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rainfall. Group 2 contains three species, *Brachystegia spiciformis*, *Guibourtia conjugata* and *Schotia latifolia* x *S. afra* form B, found only in this group (Table 7.4). These species seem to be narrowly adapted to relatively neutral soil pH compared to species grouped in Group 1, which are more adapted to alkaline soils. The distribution maps of the species mentioned (Chapter 5: Inventory) show that fewer than two occurrences were recorded in PRECIS, the reason for the narrow range of tolerances.

Afzelia and *Schotia* species are found mainly in the Lowveld Bioregion with a 400–800 mm mean annual rainfall and a soil pH<6.4 and 5.5–7.4 respectively (Appendix 5, 6 and 7). *Brachystegia* and *Guibourtia* species occur mainly in ecotonal regions with a mean annual rainfall of 200–600 mm and a soil pH of 6.5–7.4. *Colophospermum mopane* is found mainly in the Mopane Bioregion in the 400–800 mm mean annual rainfall region with a soil pH of 6.5–8.4.

Table 7.4. Species of the tribe Detarieae clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR and soil pH**	**Group 3** **Higher MAR; Lower soil pH**
	Afzelia quanzensis	*Afzelia quanzensis*
	Brachystegia spiciformis	
Colophospermum mopane	*Colophospermum mopane*	*Colophospermum mopane*
	Guibourtia conjugata	
Schotia afra var. *afra*	*Schotia afra* var. *afra*	*Schotia afra* var. *afra*
Schotia afra var. *angustifolia*	*Schotia afra.* var. *angustifolia*	*Schotia afra* var. *angustifolia*
Schotia brachypetala	*Schotia brachypetala*	*Schotia brachypetala*
Schotia capitata	*Schotia capitata*	*Schotia capitata*
Schotia latifolia	*Schotia latifolia*	*Schotia latifolia*
Schotia latifolia x *S. afra* form A	*Schotia latifolia* x *S. afra* form A	
	***Schotia latifolia* x *S. afra* form B**	

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7.3.1.3 Tribe: Cassieae

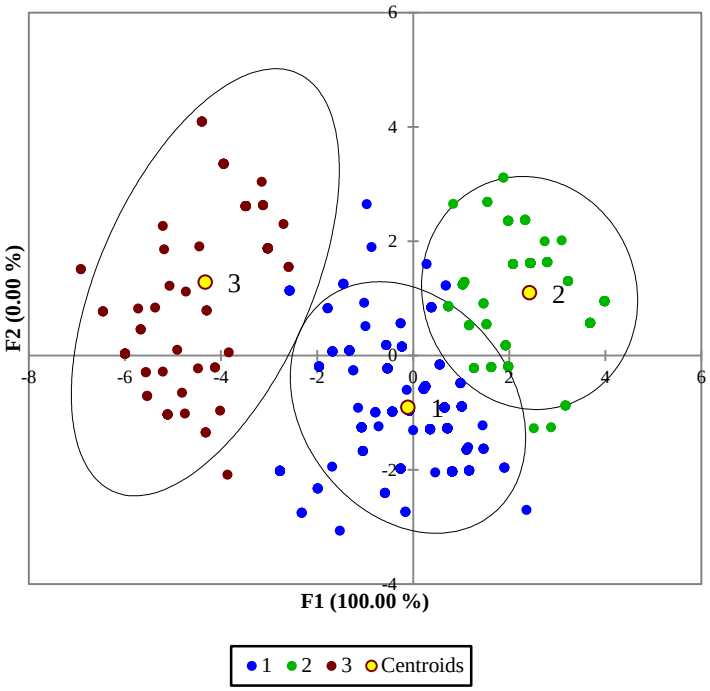

Figure 7.3. Discriminant Analysis for the tribe Cassieae. Dots represent species; circles represent groups.

The Cassieae tribe consists of *Cassia*, *Chamaecrista*, *Dialium* and *Senna*. Figure 7.3 show that F1 explains 100% of the variation of the independent variables. Group 3 is a unique group in that no overlapping with Groups 2 and 3 is noted. The species listed in Group 3 (Table 7.6) are therefore distinct in their range of tolerance to given climate and soil variables.

Table 7.5. Correlation matrix between climate and soil variables for the tribe Cassieae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.825**	0.536
TempMin	**0.745**	-0.353
TempMax	-0.595	-0.003
Phosphorus	0.069	-0.319
pH	**-0.649**	0.027

Values in bold are different from 0 with a significance level alpha=0.05

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Table 7.5 indicates that mean annual rainfall, mean annual minimum temperature and soil pH are the main drivers for the distribution patterns of species contained in Cassieae. Species listed in Group 3 are adapted to lower rainfall and mean annual minimum temperature as well as to high soil pH levels, whereas those listed in Group 2 are adapted to higher rainfall and mean annual minimum temperature as well as to low soil pH levels. *Chamaecrista plumosa* x *C. mimosoides* is noted once in Group 1 owing to a single occurrence in the Indian Ocean Coastal Belt Bioregion (Chapter 5: Inventory). As mentioned earlier, the few species listed in Group 3 are uniquely adapted to given climate and soil variables. It is not clear why these species are distinct, but a possible broader range of tolerance to lower mean annual minimum temperatures could be responsible (compare distribution patterns in Chapter 5: Inventory).

Species of *Cassia*, *Chamaecrista* and *Senna* are found mainly in the Central Bushveld with a mean annual rainfall of 400–800 mm, a mean annual minimum temperature of 2–8ºC and a soil pH of <6.4, except for *Cassia abbreviata* subsp. *beareana* which is adapted to higher soil pH levels (Appendix 5, 6 and 7). *Dialium schlechteri* present in the Lowveld Bioregion with a mean annual minimum temperature of >6ºC and a soil pH of 5.5–7.4.

Table 7.6. Species of the tribe Cassieae clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature.

Group 1 **Intermediate MAR and TMin**	**Group 2** **Higher MAR and TMin**	**Group 3** **Lower MAR and TMin**
Cassia abbreviata subsp. *beareana*	*Cassia abbreviata* subsp. *beareana*	
Chamaecrista absus	*Chamaecrista absus*	
Chamaecrista biensis	*Chamaecrista biensis*	*Chamaecrista biensis*
Chamaecrista capensis var. *capensis*	*Chamaecrista capensis* var. *capensis*	*Chamaecrista capensis* var. *capensis*
Chamaecrista capensis var. *flavescens*	*Chamaecrista capensis* var. *flavescens*	
Chamaecrista comosa var. *capricornia*	*Chamaecrista comosa* var. *capricornia*	*Chamaecrista comosa* var. *capricornia*
Chamaecrista comosa var. *comosa*	*Chamaecrista comosa* var. *comosa*	
Chamaecrista mimosoides	*Chamaecrista mimosoides*	*Chamaecrista mimosoides*
Chamaecrista plumosa var. *erecta*	*Chamaecrista plumosa* var. *erecta*	
Chamaecrista plumosa var. *plumosa*	*Chamaecrista plumosa* var. *plumosa*	
Chamaecrista plumosa* x *C. mimosoides		
Chamaecrista stricta	*Chamaecrista stricta*	
Dialium schlechteri	*Dialium schlechteri*	
Senna italica subsp. *arachoides*	*Senna italica* subsp. *arachoides*	*Senna italica* subsp. *arachoides*
Senna petersiana	*Senna petersiana*	

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7.3.1.4 Tribe: Caesalpinieae

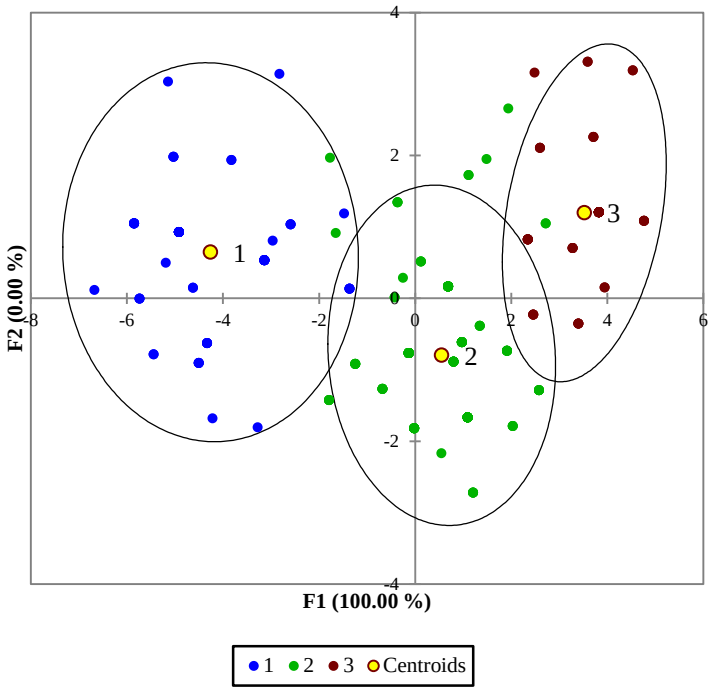

Figure 7.4. Discriminant Analysis for the tribe Caesalpinieae. Dots represent species; circles represent groups.

Burkea, *Caesalpinia*, *Erythrophleum*, *Parkinsonia*, *Peltophorum*, *Pomaria*, *Pterolobium* and *Umtiza* belong to the tribe Caesalpinieae. The DA separated species into three groups, with a small overlap between groups (Figure 7.4). F1 explains 100% of the variation of the independent variables.

Table 7.7. Correlation matrix between climate and soil variables for the tribe Caesalpinieae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.925**	0.261
TempMin	0.254	-0.472
TempMax	**-0.643**	-0.155
Phosphorus	-0.455	0.207
pH	**-0.924**	0.294

Values in bold are different from 0 with a significance level alpha=0.05

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A very high correlation with mean annual rainfall is shown in Table 7.7, followed by a high negative correlation with soil pH and a lower correlation with mean annual maximum temperature. Species classed in Group 1 are adapted to low rainfall and high soil pH and mean annual maximum temperatures, whereas species listed in Group 3 are adapted to opposite levels. *Caesalpinia bracteata* (one occurrence only) and *Pomaria lactea* are listed only in Group 1 where both are present in the Bushmanland Bioregion (Chapter 5: Inventory).

Species of *Burkea* and *Peltophorum* are found mainly in the Central Bushveld Bioregion with a mean annual rainfall 400–800 mm, a mean annual maximum temperature of 27–35ºC and a soil pH< 6.4 (Appendix 5, 6 and 7). Species of *Caesalpinia* and *Erythrophleum* occur mainly in the Indian Ocean Coastal Belt and Lowveld Bioregions respectively with a mean annual rainfall 400–800 mm to >800 mm, a mean annual maximum temperature of 27–35ºC and a soil pH< 6.4. The *Parkinsonia* species is found mainly in the Bushmanland Bioregion with a mean annual rainfall <400 mm, a mean annual maximum temperature of >33ºC and a soil pH>7.5. Species of *Pomaria* and *Pterolobium* are mainly recorded in the Central Bushveld Bioregion with a mean annual rainfall of >800 mm and 400–800 mm respectively, a mean annual maximum temperature of 27–35ºC and a soil pH< 6.4. Lastly, *Umtiza listeriana* is found in many bioregions with a mean annual rainfall of 400–800 mm, a mean annual maximum temperature of 25–29ºC and a soil pH< 6.4 or 5.5–7.4.

Table 7.8. Species of the tribe Caesalpinieae clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall, MaxT=Mean annual maximum temperature.

Group 1 **Lower MAR; Higher MaxT and soil pH**	**Group 2** **Intermediate MAR and MaxT; Higher soil pH**	**Group 3** **Higher MAR; Lower MaxT; Higher soil pH**
Burkea africana	*Burkea africana*	
	Caesalpinia bonduc	*Caesalpinia bonduc*
Caesalpinia bracteata		
	Caesalpinia rostrata	
	Erythrophleum lasianthum	*Erythrophleum lasianthum*
Parkinsonia africana	*Parkinsonia africana*	
Peltophorum africanum	*Peltophorum africanum*	*Peltophorum africanum*
Pomaria burchellii subsp. *burchellii*	*Pomaria burchellii* subsp. *burchellii*	
Pomaria lactea		
	Pomaria sandersonii	*Pomaria sandersonii*
Pterolobium stellatum	*Pterolobium stellatum*	*Pterolobium stellatum*
	Umtiza listeriana	*Umtiza listeriana*

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7.3.2 Family: Mimosoideae

7.3.2.1 Tribe: Mimoseae

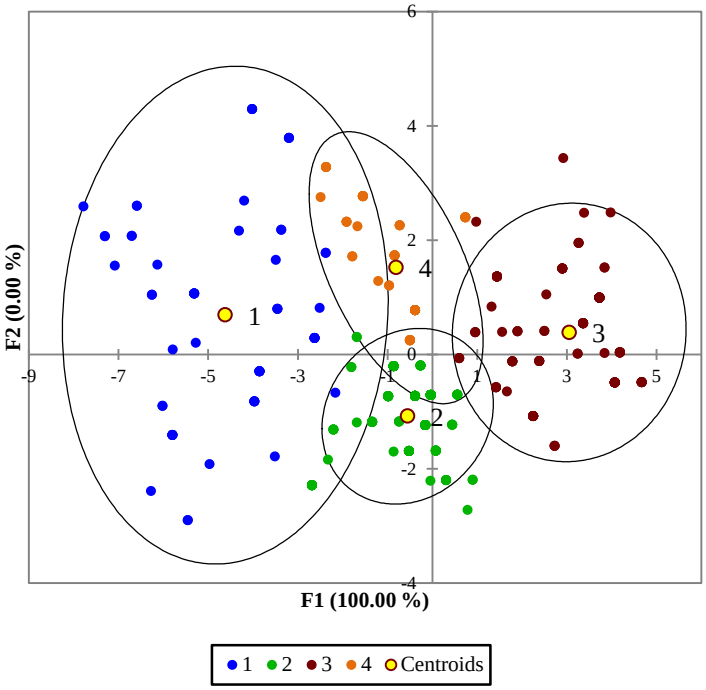

Figure 7.5. Discriminant Analysis for the tribe Mimoseae. Dots represent species; circles represent groups.

The genera grouped in the tribe Mimoseae are *Adenopodia*, *Dichrostachys*, *Elephantorrhiza*, *Entada*, *Neptunia*, *Newtonia*, *Xerocladia* and *Xylia*. Figure 7.5 show that there are four overlapping groups, with a relatively large Group 1. F1 explains 100% of the independent variables.

Table 7.9. Correlation matrix between climate and soil variables for the tribe Mimoseae.

Variables	F1	F2	F3
F1	1.000	0.000	0.000
F2	0.000	1.000	0.000
F3	0.000	0.000	1.000
AnnRain	**0.955**	0.205	0.180
TempMin	0.425	**-0.783**	0.402
TempMax	-0.425	-0.030	-0.058
Phosphorus	-0.290	-0.317	0.323
pH	**-0.743**	0.089	0.662

Values in bold are different from 0 with a significance level alpha=0.05

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A high correlation with mean annual rainfall and a negative correlation with soil pH are noted for the tribe Mimoseae (Table 7.9). Species listed in Group 1 are adapted to low mean annual rainfall and high soil pH levels, while species listed in Group 3 are adapted to the inverse. The grouping of some species in Table 7.10 in one group only is mainly due to low occurrences within the given climate and soil conditions (Chapter 5: Inventory). The low mean annual rainfall and high soil pH range of tolerance of species listed in Group 1 are mainly due to their presence in the Eastern Kalahari Bushveld, Mopane and the Bushmanland Bioregions. A relatively high correlation with mean annual minimum temperature (F2, Table 7.9) is noted. This could only be as a result of the separation of Groups 2 and 4, as shown in Figure 7.5, where species grouped in Group 2 are adapted to high mean annual minimum temperatures (e.g. Bushmanland and Eastern Kalahari Bushveld Bioregions) and those listed in Group 4 to low mean annual minimum temperatures (e.g. Grassland Biome).

Species of *Adenopodia* and *Entada* are mainly found in the Indian Ocean Coastal Belt Bioregion with a mean annual rainfall >800 mm, a mean annual minimum temperature of 2–8ºC and >6ºC respectively and a soil pH< 6.4 (Appendix 5, 6 and 7). Species of *Dichrostachys* and *Elephantorrhiza* are found mainly in the Central Bushveld Bioregion with a mean annual rainfall 400–800 mm, a mean annual minimum temperature of 2–8ºC and a soil pH< 6.4. *Neptunia* and *Newtonia* species are occur mainly in the ecotones and Lowveld Bioregion respectively, with a mean annual rainfall 400–800 mm, a mean annual minimum temperature of >6ºC and a soil pH of 5.5–7.4. *Xerocladia* spp. is mainly found in the Bushmanland Bioregion with a mean annual rainfall of <400 mm, a mean annual minimum temperature of <2ºC and a soil pH>7.5. *Xylia torreana* is found mainly in ecotones with a mean annual rainfall 200–600 mm, a mean annual minimum temperature of >6ºC and a soil pH of 6.5–7.4.

Table 7.10. Species of the tribe Mimoseae clustered in four groups. Species in bold present in one group only. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR and soil pH; Higher TMin**	**Group 3** **Higher MAR; Lower soil pH**	**Group 4** **Intermediate MAR and soil pH; Lower TMin**
Adenopodia spicata	*Adenopodia spicata*	*Adenopodia spicata*	
Dichrostachys cinerea subsp. *africana* var. *africana*	*Dichrostachys cinerea* subsp. *africana* var. *africana*	*Dichrostachys cinerea* subsp. *africana* var. *africana*	*Dichrostachys cinerea* subsp. *africana* var. *africana*
	Dichrostachys cinerea subsp. *africana* var. *pubescens*	*Dichrostachys cinerea* subsp. *africana* var. *pubescens*	
Dichrostachys cinerea subsp. *africana* var. *setulosa*	*Dichrostachys cinerea* subsp. *africana* var. *setulosa*		*Dichrostachys cinerea* subsp. *africana* var. *setulosa*
Dichrostachys cinerea subsp. *nyassana*	*Dichrostachys cinerea* subsp. *nyassana*	*Dichrostachys cinerea* subsp. *nyassana*	
Elephantorrhiza burkei	*Elephantorrhiza burkei*	*Elephantorrhiza burkei*	*Elephantorrhiza burkei*
Elephantorrhiza elephantina	*Elephantorrhiza elephantina*	*Elephantorrhiza elephantina*	*Elephantorrhiza elephantina*
	Elephantorrhiza goetzei		

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Group 1 Lower MAR; Higher soil pH	Group 2 Intermediate MAR and soil pH; Higher TMin	Group 3 Higher MAR; Lower soil pH	Group 4 Intermediate MAR and soil pH; Lower TMin
	subsp. *goetzei*		
	Elephantorrhiza obliqua var. *glabra*		*Elephantorrhiza obliqua* var. *glabra*
Elephantorrhiza praetermissa	*Elephantorrhiza praetermissa*		
		Elephantorrhiza woodii var. *woodii*	*Elephantorrhiza woodii* var. *woodii*
	Entada rheedii	*Entada rheedii*	
		Entada wahlbergii	
	Neptunia oleracea		
	Newtonia hildebrandtii var. *hildebrandtii*	*Newtonia hildebrandtii* var. *hildebrandtii*	
Xerocladia viridiramis			*Xerocladia viridiramis*
	Xylia torreana		

7.3.2.2 Tribe: Acacieae

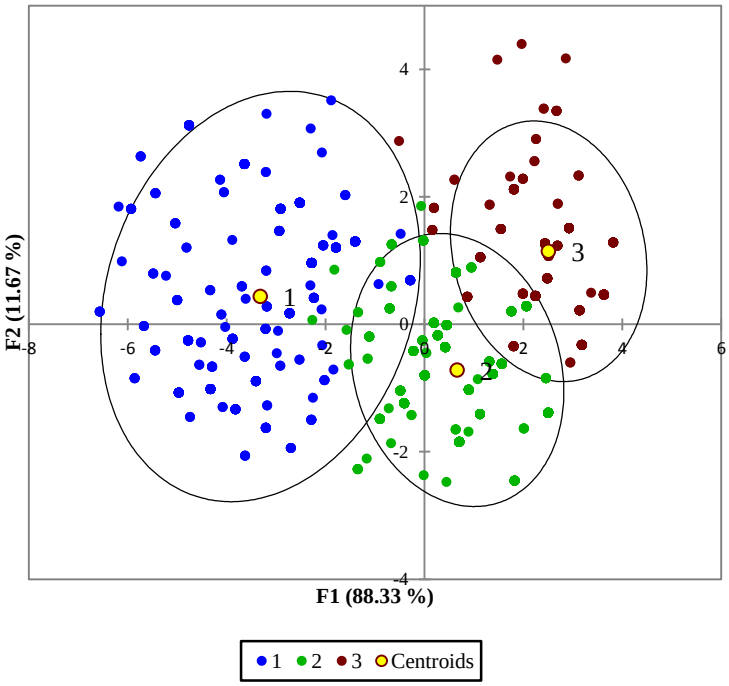

Figure 7.6. Discriminant Analysis for the tribe Acacieae. Dots represent species; circles represent groups.

Acacia is the only genus in the tribe Acacieae. Figure 7.6 shows the DA results where three overlapping groups are outlined. The F1 function explains 88.33% of the independent variables and F2 11.67%.

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Table 7.11. Correlation matrix between climate and soil variables for the tribe Acacieae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.853**	0.370
TempMin	0.499	-0.456
TempMax	-0.516	**-0.555**
Phosphorus	-0.335	0.047
pH	**-0.886**	0.109

Values in bold are different from 0 with a significance level alpha=0.05

The high correlation with annual rainfall and pH (negative) is responsible for the distribution patterns of *Acacia* species in Table 7.11. The 11.67% explained by F2 is attributed to a relatively low correlation with mean annual maximum temperature. *Acacia* species are widely distributed, mainly in the Eastern Kalahari Bushveld, Central Bushveld and the Lowveld Bioregions (*A. karroo* and *A. tortilis* subsp. *heteracantha*) and the Afromontane Region (*A. davyi*). There are species present in the Bushmanland and the Kalahari Duneveld Bioregions (*A. erioloba* and *A. haematoxylon*) responsible for the lower rainfall and alkaline soil range of tolerance as indicated in Table 7.11. *Acacia haematoxylon* is of special interest in that it is present only in Group 1 but with a wide distribution within the Eastern Kalahari Bushveld and Kalahari Duneveld Bioregions (Table 7.12). Mean annual maximum temperature has a low correlation with species distribution, mainly because Group 2 contains species adapted to high mean annual maximum temperatures and Group 3 to low mean annual maximum temperatures.

Most *Acacia* species fall in the 400–800 mm mean annual rainfall region, with a mean annual maximum temperature of 27–35ºC and a soil pH<6.4 level (Appendix 5, 6 and 7).

Table 7.12. Species of the tribe Acacieae clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall, MaxT=Mean annual maximum temperature.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR and soil pH; Higher MaxT**	**Group 3** **Higher MAR; Lower soil pH; Lower MaxT**
Acacia ataxacantha	*Acacia ataxacantha*	*Acacia ataxacantha*
	Acacia borleae	*Acacia borleae*
	Acacia brevispica subsp. *dregeana*	*Acacia brevispica* subsp. *dregeana*
Acacia burkei	*Acacia burkei*	*Acacia burkei*
Acacia caffra	*Acacia caffra*	*Acacia caffra*
Acacia davyi	*Acacia davyi*	*Acacia davyi*
Acacia erioloba	*Acacia erioloba*	
Acacia erioloba x *A. haematoxylon*	*Acacia erioloba* x *A. haematoxylon*	
Acacia erubescens	*Acacia erubescens*	*Acacia erubescens*
Acacia exuvialis	*Acacia exuvialis*	*Acacia exuvialis*
Acacia fleckii	*Acacia fleckii*	
Acacia galpinii	*Acacia galpinii*	*Acacia galpinii*

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Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR and soil pH; Higher MaxT**	**Group 3** **Higher MAR; Lower soil pH; Lower MaxT**
Acacia gerrardii subsp. *gerrardii* var. *gerrardii*	*Acacia gerrardii* subsp. *gerrardii* var. *gerrardii*	*Acacia gerrardii* subsp. *gerrardii* var. *gerrardii*
Acacia grandicornuta	*Acacia grandicornuta*	*Acacia grandicornuta*
Acacia haematoxylon		
Acacia hebeclada subsp. *hebeclada*	*Acacia hebeclada* subsp. *hebeclada*	*Acacia hebeclada* subsp. *hebeclada*
Acacia hereroensis	*Acacia hereroensis*	*Acacia hereroensis*
Acacia karroo	*Acacia karroo*	*Acacia karroo*
Acacia karroo x *A. tenuispina*	*Acacia karroo* x *A. tenuispina*	*Acacia karroo* x *A. tenuispina*
	Acacia kosiensis	
	Acacia kraussiana	*Acacia kraussiana*
Acacia luederitzii var. *luederitzii*	*Acacia luederitzii* var. *luederitzii*	
Acacia luederitzii var. *retinens*	*Acacia luederitzii* var. *retinens*	*Acacia luederitzii* var. *retinens*
Acacia mellifera subsp. *detinens*	*Acacia mellifera* subsp. *detinens*	*Acacia mellifera* subsp. *detinens*
	Acacia natalitia	*Acacia natalitia*
Acacia nebrownii	*Acacia nebrownii*	
Acacia nigrescens	*Acacia nigrescens*	*Acacia nigrescens*
Acacia nilotica subsp. *kraussiana*	*Acacia nilotica* subsp. *kraussiana*	*Acacia nilotica* subsp. *kraussiana*
Acacia ormocarpoides		
Acacia permixta	*Acacia permixta*	*Acacia permixta*
	Acacia polyacantha subsp. *campylacantha*	*Acacia polyacantha* subsp. *campylacantha*
Acacia rehmanniana	*Acacia rehmanniana*	*Acacia rehmanniana*
Acacia robusta subsp. *clavigera*	*Acacia robusta* subsp. *clavigera*	*Acacia robusta* subsp. *clavigera*
Acacia robusta subsp. *robusta*	*Acacia robusta* subsp. *robusta*	*Acacia robusta* subsp. *robusta*
Acacia schweinfurthii var. *schweinfurthii*	*Acacia schweinfurthii* var. *schweinfurthii*	*Acacia schweinfurthii* var. *schweinfurthii*
Acacia sekhukhuniensis		
Acacia senegal var. *leiorhachis*	*Acacia senegal* var. *leiorhachis*	*Acacia senegal* var. *leiorhachis*
Acacia senegal var. *rostrata*	*Acacia senegal* var. *rostrata*	*Acacia senegal* var. *rostrata*
Acacia sieberiana var. *woodii*	*Acacia sieberiana* var. *woodii*	*Acacia sieberiana* var. *woodii*
Acacia stuhlmannii		
Acacia swazica	*Acacia swazica*	*Acacia swazica*
Acacia tenuispina	*Acacia tenuispina*	
	Acacia theronii	*Acacia theronii*
Acacia tortilis subsp. *heteracantha*	*Acacia tortilis* subsp. *heteracantha*	*Acacia tortilis* subsp. *heteracantha*
Acacia tortilis* subsp. *spirocarpa* var. *spirocarpa		
Acacia welwitschii subsp. *delagoensis*	*Acacia welwitschii* subsp. *delagoensis*	
Acacia xanthophloea	*Acacia xanthophloea*	*Acacia xanthophloea*

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7.3.2.3 Tribe: Ingeae

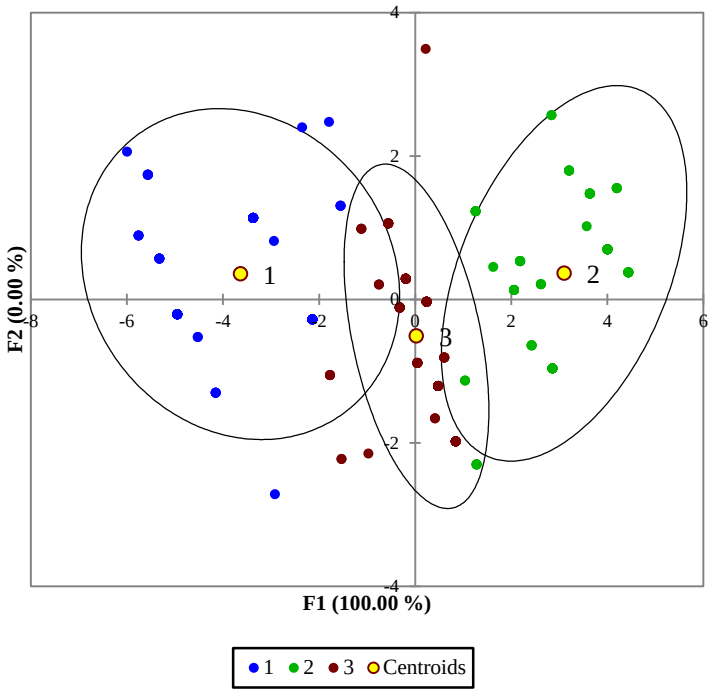

Figure 7.7. Discriminant Analysis for the tribe Ingeae. Dots represent species; circles represent groups.

Albizia, *Calliandra* and *Faidherbia* are genera belonging to the tribe Ingeae. F1 explains 100% of the independent variables, divided into three overlapping groups.

Table 7.13. Correlation matrix between climate and soil variables for the tribe Ingeae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.970**	0.229
TempMin	0.119	-0.018
TempMax	-0.339	-0.274
Phosphorus	**-0.654**	0.277
pH	**-0.862**	0.413

Values in bold are different from 0 with a significance level alpha=0.05

Three independent variables, annual rainfall, phosphorus (negative) and pH (negative), are shown to be correlated with the distribution patterns of species within the Ingeae. Species are therefore adapted to low rainfall and high soil phosphorus and pH on the lower level (Group 1), and to high rainfall and low soil phosphorus and pH on the upper level (Group 2).

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Albizia species are mainly found in the Lowveld Bioregion with a mean annual rainfall of 400–800 mm, a soil phosphorus of <10 $mgkg^{-1}$ and a pH<6.4 or 5.5–7.4 (Appendix 5, 6 and 7). *Calliandra redacta* is found only in Group 1, attributable to its presence in the Gariep Desert Bioregion, described as a region of low rainfall (<400 mm), high soil phosphorus (>20 $mgkg^{-1}$) and pH>7.4. The *Faidherbia* species is found mainly in the Central Bushveld and Lowveld Bioregions with a mean annual rainfall of 400–800 mm, a soil phosphorus of 5–35 $mgkg^{-1}$ and a pH of 6.5–7.4.

Table 7.14. Species of the tribe Ingeae clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall, P=Phosphorus.

Group 1 **Lower MAR; Higher soil P and pH**	**Group 2** **Higher MAR; Lower soil P and pH**	**Group 3** **Intermediate MAR, soil P and pH**
Albizia adianthifolia var. *adianthifolia*	*Albizia adianthifolia* var. *adianthifolia*	*Albizia adianthifolia* var. *adianthifolia*
Albizia amara subsp. *sericocephala*	*Albizia amara* subsp. *sericocephala*	*Albizia amara* subsp. *sericocephala*
Albizia anthelmintica	*Albizia anthelmintica*	*Albizia anthelmintica*
Albizia brevifolia	*Albizia brevifolia*	*Albizia brevifolia*
Albizia forbesii	*Albizia forbesii*	*Albizia forbesii*
Albizia harveyi	*Albizia harveyi*	*Albizia harveyi*
Albizia petersiana subsp. *evansii*	*Albizia petersiana* subsp. *evansii*	*Albizia petersiana* subsp. *evansii*
	Albizia suluensis	
Albizia tanganyicensis subsp. *tanganyicensis*		*Albizia tanganyicensis* subsp. *tanganyicensis*
Albizia versicolor	*Albizia versicolor*	*Albizia versicolor*
Calliandra redacta		
Faidherbia albida	*Faidherbia albida*	*Faidherbia albida*

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7.3.3 Family: Faboideae

7.3.3.1 Tribe: Swartzieae

Cordyla is the only genus indigenous to South Africa, Lesotho and Swaziland in the tribe Swartzieae. There were not sufficient data to perform a DA and it is therefore not part of the discussion.

7.3.3.2 Tribe: Sophoreae

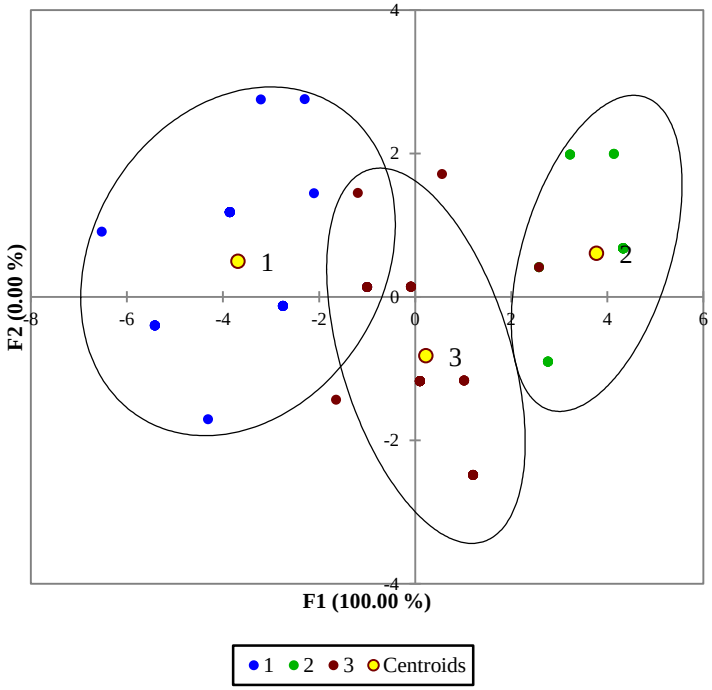

Figure 7.8. Discriminant Analysis for the tribe Sophoreae. Dots represent species; circles represent groups.

The genera *Baphia*, *Bolusanthus*, *Sophora* and *Xanthocercis* are contained in the tribe Sophoreae. Three groups are shown in Figure 7.8, with Group 2 distinctly different (no overlap) from the others. The first function, F1, explains 100% of the independent variables.

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Table 7.15. Correlation matrix between climate and soil variables for the tribe Sophoreae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.960**	0.262
TempMin	0.113	0.021
TempMax	-0.337	-0.439
Phosphorus	-0.598	0.212
pH	**-0.913**	0.356

Values in bold are different from 0 with a significance level alpha=0.05

A high correlation with mean annual rainfall and pH (negative) is noted in Table 7.15. The presence of *Baphia massaiensis* subsp. *obovata* var. *obovata* and *Xanthocercis zambesiaca* in the Mopane Bioregion is responsible for the low rainfall, high pH range of tolerance of Group 1 and *Baphia racemosa* and *Sophora inhambanensis* with narrow distribution patterns in the Lowveld and Indian Ocean Coastal Belt Bioregions are adapted to high mean annual rainfall and low soil pH levels. The two *Baphia* species occur at opposite rainfall and pH levels.

Baphia species fall mainly in the Indian Ocean Coastal Belt with a >800 mm mean annual and a soil pH<6.4 level (Appendix 5, 6 and 7). *Bolusanthus speciosus* is found mainly in the Lowveld Bioregion with a mean annual rainfall of 400–800 mm and a soil pH< 6.4 level. *Sophora inhambanensis* occur mainly in the Indian Ocean Coastal Belt with a 400–800 mm mean annual and a soil pH<6.4 level. *Xanthocercis zambesiaca* is found mainly in the Mopane Bioregion with a mean annual rainfall of 200–400 mm and a soil pH of 6.5–8.4.

Table 7.16. Species of the tribe Sophoreae clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Higher MAR; Lower soil pH**	**Group 3** **Intermediate MAR and soil pH**
Baphia massaiensis* subsp. *obovata* var. *obovata		
	Baphia racemosa	
Bolusanthus speciosus	*Bolusanthus speciosus*	*Bolusanthus speciosus*
	Sophora inhambanensis	*Sophora inhambanensis*
Xanthocercis zambesiaca	*Xanthocercis zambesiaca*	*Xanthocercis zambesiaca*

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7.3.3.3 Tribe: Podalyrieae

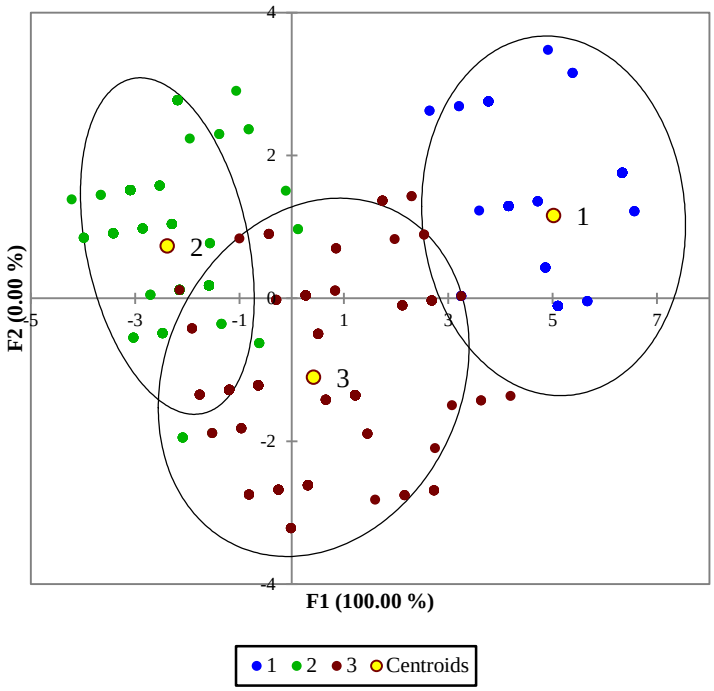

Figure 7.9. Discriminant Analysis for the tribe Podalyrieae. Dots represent species; circles represent groups.

Calpurnia, *Cyclopia*, *Liparia*, *Podalyria*, *Stirtonanthus*, *Virgilia* and *Xiphotheca* are genera contained in the tribe Podalyrieae. Figure 7.9 shows that three overlapping groups are identified, with the function F1 explaining 100% of the independent variables.

Table 7.17. Correlation matrix between climate and soil variables for the tribe Podalyrieae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**-0.879**	0.458
TempMin	0.173	-0.062
TempMax	0.573	0.001
Phosphorus	0.461	0.149
pH	**0.927**	0.342

Values in bold are different from 0 with a significance level alpha=0.05

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High correlations with mean annual rainfall (negative) and soil pH are shown to be the drivers for the distribution patterns of above-mentioned genera (Table 7.17). *Cyclopia aurescens*, *Liparia laevigata* and *Podalyria racemulosa* are recorded in Group 1 and 2, not in the intermediate group (Group 3) (Table 7.18) probably owing to relatively wide distribution patterns but low occurrences (compare species distribution in Chapter 5: Inventory).

Species of *Calpurnia* are mainly present in the Mesic Highveld Grassland and Sub-Escarpment Grassland, with a strong presence in Group 2 (high mean annual rainfall and low soil pH) (Appendix 5, 6 and 7). Most of the *Cyclopia* species are present in the Eastern Fynbos Renosterveld and South West Fynbos Bioregions, with those species present in only one group the result of fewer than four occurrences. Species of *Liparia*, *Podalyria* and *Virgilia* follow the same distribution patterns as *Cyclopia* species, with the occurrence of *Liparia racemosa* (Group 1 only) in the ecotone near the Rainshadow Valley Karoo Bioregion. Most *Stirtonanthus* and *Xiphotheca* species are found mainly in ecotonal regions or in the Fynbos Biome. *Podalyria velutina* and *Xiphotheca canescens* are present in the Indian Ocean Coastal Belt Bioregion and Succulent Karoo Biome respectively. *Calpurnia* species fall mainly in the >800 mm and 400–800 mm mean annual rainfall regions, *Cyclopia* species in the 200–600 mm and 600–1000 mm, *Stirtonanthus* species in the <400 mm and 200–600 mm and *Virgilia* species in the 400–800 mm and 600–1000 mm rainfall regions. The remaining genera (*Liparia*, *Podalyria* and *Xiphotheca*) fall mainly in the 200–600 mm and 400–800 mm mean annual rainfall regions. Except for *Stirtonanthus* species, which are mainly adapted to a soil pH>7.5, the remaining genera are mainly adapted to a soil pH<6.4.

Table 7.18. Species of the tribe Podalyrieae clustered in three groups. Species in bold present in one group only, '-' no intermediate occurrence.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Higher MAR; Lower soil pH**	**Group 3** **Intermediate MAR and soil pH**
Calpurnia aurea subsp. *aurea*	*Calpurnia aurea* subsp. *aurea*	*Calpurnia aurea* subsp. *aurea*
	Calpurnia capensis	
		Calpurnia floribunda
Calpurnia glabrata	*Calpurnia glabrata*	*Calpurnia glabrata*
	Calpurnia intrusa	
	Calpurnia reflexa	*Calpurnia reflexa*
	Calpurnia sericea	*Calpurnia sericea*
Calpurnia villosa var. *intrusa*	*Calpurnia villosa* var. *intrusa*	*Calpurnia villosa* var. *intrusa*
Calpurnia villosa var. *villosa*	*Calpurnia villosa* var. *villosa*	*Calpurnia villosa* var. *villosa*
	Calpurnia woodii	
Cyclopia alopecuroides		*Cyclopia alopecuroides*
	Cyclopia alpina	
Cyclopia aurescens	*Cyclopia aurescens*	-
Cyclopia bolusii		
Cyclopia bowieana	*Cyclopia bowieana*	*Cyclopia bowieana*
Cyclopia burtonii		*Cyclopia burtonii*
Cyclopia buxifolia	*Cyclopia buxifolia*	*Cyclopia buxifolia*
Cyclopia falcata	*Cyclopia falcata*	*Cyclopia falcata*
	Cyclopia galioides	*Cyclopia galioides*
Cyclopia genistoides	*Cyclopia genistoides*	*Cyclopia genistoides*
		Cyclopia glabra
Cyclopia intermedia.	*Cyclopia intermedia*	*Cyclopia intermedia*

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Group 1 Lower MAR; Higher soil pH	Group 2 Higher MAR; Lower soil pH	Group 3 Intermediate MAR and soil pH
	Cyclopia latifolia	
	Cyclopia laxiflora	
Cyclopia maculata	*Cyclopia maculata*	*Cyclopia maculata*
Cyclopia meyeriana	*Cyclopia meyeriana*	*Cyclopia meyeriana*
		Cyclopia plicata
Cyclopia sessiliflora		*Cyclopia sessiliflora*
	Cyclopia squamosa	
Cyclopia subternata	*Cyclopia subternata*	*Cyclopia subternata*
	Liparia angustifolia	*Liparia angustifolia*
	Liparia bonaespei	
	Liparia boucheri	
	Liparia calycina	*Liparia calycina*
Liparia capitata	*Liparia capitata*	*Liparia capitata*
Liparia confusa		
		Liparia congesta
		Liparia genistoides
Liparia hirsuta	*Liparia hirsuta*	*Liparia hirsuta*
Liparia laevigata	*Liparia laevigata*	-
Liparia latifolia	*Liparia latifolia*	*Liparia latifolia*
	Liparia myrtifolia	*Liparia myrtifolia*
	Liparia parva	*Liparia parva*
Liparia racemosa		
	Liparia rafnioides	
Liparia splendens subsp. *comantha*	*Liparia splendens* subsp. *comantha*	*Liparia splendens* subsp. *comantha*
Liparia splendens subsp. *splendens*	*Liparia splendens* subsp. *splendens*	*Liparia splendens* subsp. *splendens*
		Liparia striata
Liparia umbellifera		*Liparia umbellifera*
Liparia vestita	*Liparia vestita*	*Liparia vestita*
		Podalyria amoena
	Podalyria argentea	*Podalyria argentea*
Podalyria biflora	*Podalyria biflora*	*Podalyria biflora*
Podalyria burchellii	*Podalyria burchellii*	*Podalyria burchellii*
Podalyria buxifolia	*Podalyria buxifolia*	*Podalyria buxifolia*
Podalyria calyptrata	*Podalyria calyptrata*	*Podalyria calyptrata*
Podalyria canescens	*Podalyria canescens*	*Podalyria canescens*
	Podalyria cordata	*Podalyria cordata*
Podalyria cuneifolia	*Podalyria cuneifolia*	*Podalyria cuneifolia*
Podalyria glauca	*Podalyria glauca*	*Podalyria glauca*
		Podalyria hamata
Podalyria hirsuta	*Podalyria hirsuta*	*Podalyria hirsuta*
Podalyria leipoldtii		*Podalyria leipoldtii*
Podalyria microphylla	*Podalyria microphylla*	*Podalyria microphylla*
	Podalyria montana	*Podalyria montana*
Podalyria myrtillifolia	*Podalyria myrtillifolia*	*Podalyria myrtillifolia*
	Podalyria oleaefolia	*Podalyria oleaefolia*
		Podalyria orbicularis
Podalyria pearsonii		*Podalyria pearsonii*
		Podalyria pulcherrima
Podalyria racemulosa	*Podalyria racemulosa*	-
		Podalyria reticulata
Podalyria sericea	*Podalyria sericea*	*Podalyria sericea*
	Podalyria speciosa	*Podalyria speciosa*
Podalyria velutina	*Podalyria velutina*	*Podalyria velutina*
Stirtonanthus chrysanthus		
Stirtonanthus insignis		*Stirtonanthus insignis*
Stirtonanthus taylorianus		
Virgilia divaricata	*Virgilia divaricata*	*Virgilia divaricata*
	Virgilia oroboides subsp.	*Virgilia oroboides* subsp.

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Group 1 Lower MAR; Higher soil pH	Group 2 Higher MAR; Lower soil pH	Group 3 Intermediate MAR and soil pH
	ferruginea	*ferruginea*
Virgilia oroboides subsp. *oroboides*	*Virgilia oroboides* subsp. *oroboides*	*Virgilia oroboides* subsp. *oroboides*
Xiphotheca canescens		
		Xiphotheca cordifolia
	Xiphotheca elliptica	*Xiphotheca elliptica*
Xiphotheca fruticosa	*Xiphotheca fruticosa*	*Xiphotheca fruticosa*
Xiphotheca guthriei	*Xiphotheca guthriei*	*Xiphotheca guthriei*
Xiphotheca lanceolata	*Xiphotheca lanceolata*	*Xiphotheca lanceolata*
		Xiphotheca phylicoides
Xiphotheca reflexa	*Xiphotheca reflexa*	*Xiphotheca reflexa*
	Xiphotheca tecta	*Xiphotheca tecta*

7.3.3.3.1 Genus: *Amphithalea*

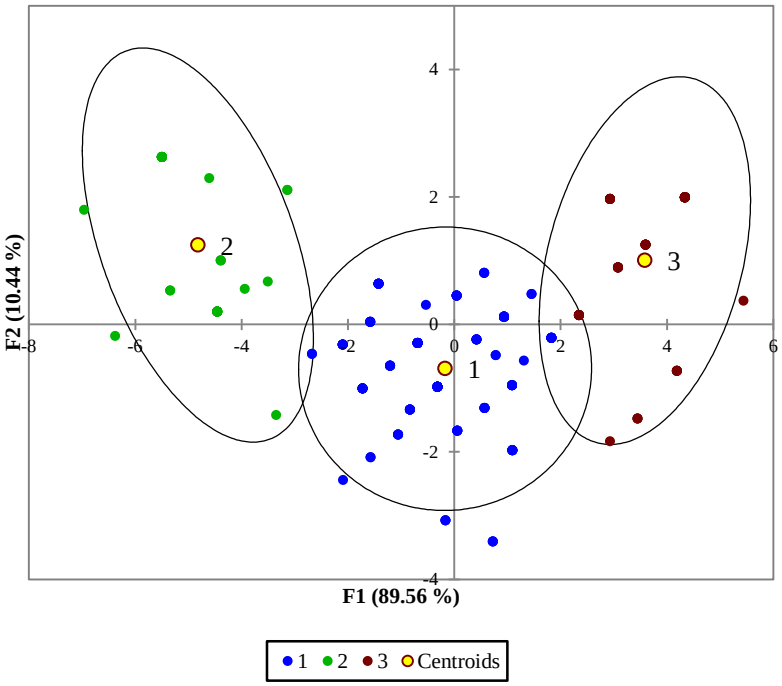

Figure 7.10. Discriminant Analysis for the genus *Amphithalea*. Dots represent species; circles represent groups.

Species of *Amphithalea* are arranged in three groups as shown in Figure 7.10. The first function (F1) is estimated to explain 89.56% of the variation and the second function (F2) 10.44%. A narrow overlap between Group 1 and Group 2 is evident, indicating that the latter is relatively unique.

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Table 7.19. Correlation matrix between climate and soil variables for the genus *Amphithalea*.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.901**	0.344
TempMin	0.139	0.021
TempMax	**-0.704**	0.377
Phosphorus	-0.430	**0.640**
pH	**-0.872**	0.261

Values in bold are different from 0 with a significance level alpha=0.05

Three drivers are identified in Table 7.19, namely mean annual rainfall, mean annual maximum temperature (negative) and soil pH (negative), as responsible for the separation of *Amphithalea* species into three groups. The second function, F2, further indicates that soil phosphorus is also correlated with the distribution patterns of *Amphithalea* species. The F1 drivers indicate that species listed in Group 2 are adapted to low mean annual rainfall and high mean annual maximum temperatures and soil pH, e.g. *A. villosa* and *A. williamsonii*. These species are found in ecotonal areas and in the Fynbos Biome. Species adapted to high mean annual rainfall and low mean annual maximum temperatures and soil pH are e.g. *A. cuneifolia* and *A. imbricata*, occurring mostly in the Southwest Fynbos and Eastern Fynbos Renosterveld Bioregions. Many species listed in the three groups are recorded only once, mainly as a result of one or two occurrences. The exceptions are *A. alba* and *A. sericea* with more than eight occurrences, probably owing to an exceptionally narrow range of tolerance to given climate and soil conditions.

Overall, *Amphithalea* species are found mainly in regions with 200–600 mm mean annual rainfall, 25–29ºC mean annual minimum temperatures, soils with a phosphorus level higher than 20 $mgkg^{-1}$ and acidic soils (Appendix 6 and 7).

Table 7.20. Species of the genus *Amphithalea* clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall, MaxT=Mean annual maximum temperature, P=Phosphorus.

Group 1 **Intermediate MAR, MaxT and pH; Lower soil P**	**Group 2** **Lower MAR; Higher MaxT and soil pH; Higher soil P**	**Group 3** **Higher MAR; Lower MaxT and soil pH; Higher soil P**
Amphithalea alba		
Amphithalea axillaris	*Amphithalea axillaris*	*Amphithalea axillaris*
Amphithalea biovulata		*Amphithalea biovulata*
		Amphithalea bodkinii
Amphithalea bowiei		*Amphithalea bowiei*
Amphithalea cedarbergensis	*Amphithalea cedarbergensis*	
Amphithalea ciliaris		*Amphithalea ciliaris*
		Amphithalea concava
Amphithalea cuneifolia		*Amphithalea cuneifolia*

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Group 1 **Intermediate MAR, MaxT and pH; Lower soil P**	**Group 2** **Lower MAR; Higher MaxT and soil pH; Higher soil P**	**Group 3** **Higher MAR; Lower MaxT and soil pH; Higher soil P**
	Amphithalea cymbifolia	
Amphithalea dahlgrenii		
Amphithalea ericifolia subsp. *erecta*		*Amphithalea ericifolia* subsp. *erecta*
Amphithalea ericifolia subsp. *ericifolia*	*Amphithalea ericifolia* subsp. *ericifolia*	*Amphithalea ericifolia* subsp. *ericifolia*
Amphithalea ericifolia subsp. *scoparia*		*Amphithalea ericifolia* subsp. *scoparia*
Amphithalea esterhuyseniae		
Amphithalea flava	*Amphithalea flava*	*Amphithalea flava*
Amphithalea fourcadei		*Amphithalea fourcadei*
Amphithalea imbricata	*Amphithalea imbricata*	*Amphithalea imbricata*
Amphithalea intermedia	*Amphithalea intermedia*	*Amphithalea intermedia*
Amphithalea micrantha	*Amphithalea micrantha*	
	Amphithalea minima	
Amphithalea monticola	*Amphithalea monticola*	
Amphithalea muirii	*Amphithalea muirii*	
Amphithalea muraltioides	*Amphithalea muraltioides*	*Amphithalea muraltioides*
	Amphithalea obtusiloba	
Amphithalea oppositifolia		*Amphithalea oppositifolia*
Amphithalea pageae	*Amphithalea pageae*	*Amphithalea pageae*
Amphithalea parvifolia	*Amphithalea parvifolia*	*Amphithalea parvifolia*
Amphithalea perplexa		*Amphithalea perplexa*
Amphithalea phylicoides		
Amphithalea purpurea		
Amphithalea rostrata		
Amphithalea sericea		
Amphithalea speciosa		*Amphithalea speciosa*
Amphithalea spinosa	*Amphithalea spinosa*	
Amphithalea stokoei		*Amphithalea stokoei*
Amphithalea tomentosa		*Amphithalea tomentosa*
Amphithalea tortilis		
Amphithalea villosa	*Amphithalea villosa*	
Amphithalea violacea	*Amphithalea violacea*	*Amphithalea violacea*
Amphithalea virgata		*Amphithalea virgata*
Amphithalea vlokii	*Amphithalea vlokii*	*Amphithalea vlokii*
Amphithalea williamsonii	*Amphithalea williamsonii*	

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7.3.3.4 Tribe: Crotalarieae

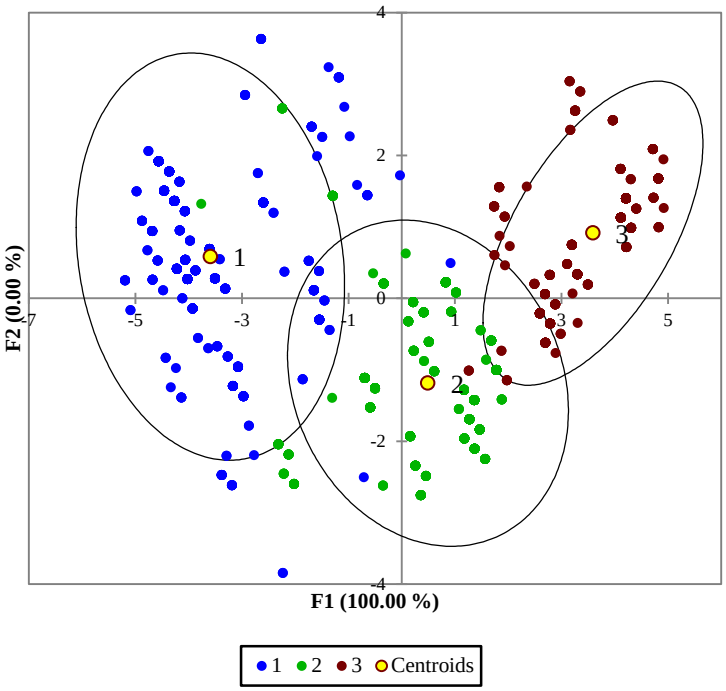

Figure 7.11. Discriminant Analysis for the tribe Crotalarieae. Dots represent species; circles represent groups.

Genera contained in the tribe Crotalarieae are *Aspalathus*, *Bolusia*, *Calobota*, *Euchlora*, *Ezoloba*, *Crotalaria*, *Lebeckia*, *Leobordea*, *Lotononis*, *Listia*, *Pearsonia*, *Rafnia*, *Rothia*, *Wiborgia* and *Wiborgiella*. Three genera, namely *Aspalathus*, *Crotalaria* and *Lotononis*, were analysed separately because of the large number of species within the genus. Figure 7.11 shows three overlapping groups for the species listed in the tribe Crotalarieae, with F1 explaining 100% of the independent variables.

Table 7.21. Correlation matrix between climate and soil variables for the tribe Crotalarieae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.960**	0.243
TempMin	-0.199	0.300
TempMax	-0.480	-0.048
Phosphorus	**-0.659**	0.229
pH	**-0.901**	0.410

Values in bold are different from 0 with a significance level alpha=0.05

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The independent variables that correlated with the distribution patterns of species are mean annual rainfall, phosphorus and soil pH (Table 7.21). Species listed in Group 1 are adapted to low mean annual rainfall and high soil pH levels. *Calobota* species, and to a lesser extent species of *Wiborgia* and *Wiborgiella*, are not included in Group 3 where species are adapted to opposite rainfall and soil pH levels (Table 7.22). *Calobota* species are mainly present in the Eastern Kalahari Bushveld Bioregion or the Succulent Karoo Biome, *Wiborgia* species in the Namaqualand Hardeveld Bioregion and *Wiborgiella* species in the Fynbos Biome (Chapter 5: Inventory). It also appears that *Pearsonia* species are more adapted to higher rainfall and lower soil pH levels (Group 2 and 3) owing to their presence mainly in the Mesic Highveld Grassland and Central Bushveld Bioregions. *Leobordea* species are present in the Mesic Highveld Grassland, Central Bushveld and Bushmanland Bioregions, i.e. from high to low rainfall regions but notably with very low occurrences for many species. *Listia* species follow the same pattern but species occur more in the drier Central Bushveld than in the Mesic Highveld Grassland Bioregion. *Wiborgia fusca* subsp. *macrocarpa* is not recorded in the intermediate group (Group 2), probably because of relatively wide distribution patterns but low occurrences (compare species distribution in Chapter 5: Inventory).

Species of *Lebeckia* and *Rafnia* occur mainly in the Fynbos Biome and owing to many ecotonal occurrences, bioregions cannot be identified. Species of *Calobota*, *Wiborgia* and *Wiborgiella* are found mainly in regions with less than 400 mm, *Rafnia* species in 200–600 mm and the remaining genera in 400–800 mm mean annual rainfall regions (Appendix 6 and 7). The negative correlation with soil phosphorus content is a result of low phosphorus levels in higher-rainfall areas, e.g. species of *Leobordea*, *Listia* and *Pearsonia* that are adapted mainly to phosphorus levels lower than 10 $mgkg^{-1}$. *Calobota* species and *Euchlora hirsuta* are adapted mainly to high soil pH levels, while the remaining species are adapted to soil pH< 6.4 (Chapter 5: Inventory). The listing of species in only one group is mainly due to less than five occurrences.

Table 7.22. Species of the tribe Crotalarieae clustered in three groups. Species in bold present in one group only, '-' no intermediate occurrence. MAR=Mean annual rainfall, P=Phosphorus.

Group 1 **Lower MAR; Higher soil P and pH**	**Group 2** **Intermediate MAR, soil P and pH**	**Group 3** **Higher MAR; Lower soil P and pH**
	Bolusia acuminata	
Calobota acanthoclada	*Calobota acanthoclada*	
Calobota angustifolia	*Calobota angustifolia*	
Calobota cinerea		
Calobota cuspidosa	*Calobota cuspidosa*	
Calobota cytisoides	*Calobota cytisoides*	
Calobota elongata	*Calobota elongata*	
Calobota halenbergensis		
Calobota linearifolia	*Calobota linearifolia*	
Calobota lotononoides	*Calobota lotononoides*	
Calobota psiloloba	*Calobota psiloloba*	
Calobota pungens	*Calobota pungens*	

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Group 1 **Lower MAR; Higher soil P and pH**	**Group 2** **Intermediate MAR, soil P and pH**	**Group 3** **Higher MAR; Lower soil P and pH**
Calobota sericea	*Calobota sericea*	
Calobota spinescens	*Calobota spinescens*	
Euchlora hirsuta	*Euchlora hirsuta*	
Ezoloba macrocarpa	*Ezoloba macrocarpa*	
Lebeckia ambigua	*Lebeckia ambigua*	
	Lebeckia brevicarpa	
Lebeckia contaminata	*Lebeckia contaminata*	*Lebeckia contaminata*
Lebeckia gracilis		
	Lebeckia grandiflora	
	Lebeckia longipes	
	Lebeckia meyeriana	*Lebeckia meyeriana*
Lebeckia pauciflora	*Lebeckia pauciflora*	*Lebeckia pauciflora*
Lebeckia plukenetiana	*Lebeckia plukenetiana*	*Lebeckia plukenetiana*
Lebeckia sepiaria	*Lebeckia sepiaria*	*Lebeckia sepiaria*
	Lebeckia wrightii	*Lebeckia wrightii*
	Leobordea adpressa subsp. *adpressa*	*Leobordea adpressa* subsp. *adpressa*
	Leobordea adpressa* subsp. *leptantha	
Leobordea anthylloides	*Leobordea anthylloides*	
	Leobordea arida	*Leobordea arida*
Leobordea benthamiana	*Leobordea benthamiana*	
Leobordea carinata	*Leobordea carinata*	*Leobordea carinata*
	Leobordea corymbosa	*Leobordea corymbosa*
Leobordea decumbens subsp. *decumbens*	*Leobordea decumbens* subsp. *decumbens*	*Leobordea decumbens* subsp. *decumbens*
	Leobordea decumbens subsp. *rehmannii*	*Leobordea decumbens* subsp. *rehmannii*
		Leobordea difformis
Leobordea digitata	*Leobordea digitata*	
Leobordea divaricata	*Leobordea divaricata*	*Leobordea divaricata*
	Leobordea eriantha	*Leobordea eriantha*
	Leobordea esterhuyseniana	
Leobordea foliosa	*Leobordea foliosa*	*Leobordea foliosa*
Leobordea furcata		
	Leobordea globulosa	
		Leobordea grandis
Leobordea hirsuta	*Leobordea hirsuta*	*Leobordea hirsuta*
Leobordea lanata	*Leobordea lanata*	
	Leobordea lanceolata	*Leobordea lanceolata*
Leobordea longicephala	*Leobordea longicephala*	
Leobordea longiflora		
Leobordea mucronata	*Leobordea mucronata*	*Leobordea mucronata*
Leobordea oligocephala		
		Leobordea pariflora
Leobordea pentaphylla	*Leobordea pentaphylla*	
Leobordea platycarpa	*Leobordea platycarpa*	*Leobordea platycarpa*
Leobordea plicata		
Leobordea polycephala		
	Leobordea procumbens	*Leobordea procumbens*
Leobordea pulchra	*Leobordea pulchra*	*Leobordea pulchra*
	Leobordea pusilla	*Leobordea pusilla*
Leobordea quinata	*Leobordea quinata*	
		Leobordea spicata
Leobordea stipulosa		
Listia bainesii	*Listia bainesii*	*Listia bainesii*
Listia heterophylla	*Listia heterophylla*	*Listia heterophylla*

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Group 1 **Lower MAR; Higher soil P and pH**	**Group 2** **Intermediate MAR, soil P and pH**	**Group 3** **Higher MAR; Lower soil P and pH**
Listia marlothii	*Listia marlothii*	*Listia marlothii*
Listia minima		
	Listia solitudinis	*Listia solitudinis*
	Listia subulata	
Pearsonia aristata	*Pearsonia aristata*	*Pearsonia aristata*
	Pearsonia bracteata	*Pearsonia bracteata*
	Pearsonia cajanifolia subsp. *cajanifolia*	*Pearsonia cajanifolia* subsp. *cajanifolia*
Pearsonia cajanifolia subsp. *cryptantha*	*Pearsonia cajanifolia* subsp. *cryptantha*	*Pearsonia cajanifolia* subsp. *cryptantha*
	Pearsonia grandifolia subsp. *grandifolia*	*Pearsonia grandifolia* subsp. *grandifolia*
	Pearsonia grandifolia subsp. *latibracteolata*	*Pearsonia grandifolia* subsp. *latibracteolata*
	Pearsonia hirsuta	*Pearsonia hirsuta*
Pearsonia obovata	*Pearsonia obovata*	*Pearsonia obovata*
	Pearsonia sessilifolia subsp. *filifolia*	*Pearsonia sessilifolia* subsp. *filifolia*
Pearsonia sessilifolia subsp. *marginata*	*Pearsonia sessilifolia* subsp. *marginata*	*Pearsonia sessilifolia* subsp. *marginata*
Pearsonia sessilifolia subsp. *sessilifolia*	*Pearsonia sessilifolia* subsp. *sessilifolia*	*Pearsonia sessilifolia* subsp. *sessilifolia*
		Pearsonia sessilifolia* subsp. *swaziensis
Pearsonia uniflora	*Pearsonia uniflora*	*Pearsonia uniflora*
Rafnia acuminata	*Rafnia acuminata*	*Rafnia acuminata*
Rafnia alata		
Rafnia amplexicaulis	*Rafnia amplexicaulis*	*Rafnia amplexicaulis*
Rafnia angulata subsp. *angulata*	*Rafnia angulata* subsp. *angulata*	*Rafnia angulata* subsp. *angulata*
	Rafnia angulata subsp. *ericifolia*	*Rafnia angulata* subsp. *ericifolia*
	Rafnia angulata* subsp. *thunbergii	
Rafnia capensis* subsp. *calycina		
Rafnia capensis subsp. *capensis*	*Rafnia capensis* subsp. *capensis*	*Rafnia capensis* subsp. *capensis*
Rafnia capensis subsp. *carinata*	*Rafnia capensis* subsp. *carinata*	
Rafnia capensis subsp. *dichotoma*	*Rafnia capensis* subsp. *dichotoma*	
	Rafnia capensis* subsp. *elsieae	
Rafnia capensis subsp. *ovata*	*Rafnia capensis* subsp. *ovata*	*Rafnia capensis* subsp. *ovata*
	Rafnia capensis subsp. *pedicellata*	*Rafnia capensis* subsp. *pedicellata*
	Rafnia crassifolia	*Rafnia crassifolia*
	Rafnia crispa	
Rafnia diffusa	*Rafnia diffusa*	
Rafnia elliptica	*Rafnia elliptica*	*Rafnia elliptica*
	Rafnia globosa	
Rafnia inaequalis		
	Rafnia lancea	*Rafnia lancea*
Rafnia ovata	*Rafnia ovata*	*Rafnia ovata*
Rafnia racemosa subsp. *racemosa*	*Rafnia racemosa* subsp. *racemosa*	*Rafnia racemosa* subsp. *racemosa*
Rafnia rostrata* subsp. *pluriflora		
	Rafnia rostrata* subsp. *rostrata	
Rafnia schlechteriana	*Rafnia schlechteriana*	
Rafnia spicata	*Rafnia spicata*	
Rafnia triflora	*Rafnia triflora*	*Rafnia triflora*
	Rafnia vlokii	*Rafnia vlokii*
Rothia hirsuta		
Wiborgia fusca subsp. *fusca*	*Wiborgia fusca* subsp. *fusca*	
Wiborgia fusca subsp. *macrocarpa*	-	*Wiborgia fusca* subsp. *macrocarpa*
Wiborgia incurvata		

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Group 1 Lower MAR; Higher soil P and pH	Group 2 Intermediate MAR, soil P and pH	Group 3 Higher MAR; Lower soil P and pH
Wiborgia leptoptera subsp. *cedarbergensis*	*Wiborgia leptoptera* subsp. *cedarbergensis*	
Wiborgia leptoptera subsp. *leptoptera*	*Wiborgia leptoptera* subsp. *leptoptera*	
Wiborgia monoptera	*Wiborgia monoptera*	
Wiborgia mucronata	*Wiborgia mucronata*	
Wiborgia obcordata	*Wiborgia obcordata*	*Wiborgia obcordata*
Wiborgia sericea	*Wiborgia sericea*	
Wiborgia tenuifolia	*Wiborgia tenuifolia*	
Wiborgia tetraptera	*Wiborgia tetraptera*	
Wiborgiella bowieana		
	Wiborgiella fasciculata	
Wiborgiella humilis		
	Wiborgiella inflata	*Wiborgiella inflata*
Wiborgiella leipoldtiana	*Wiborgiella leipoldtiana*	
Wiborgiella mucronata	*Wiborgiella mucronata*	*Wiborgiella mucronata*
Wiborgiella sessilifolia	*Wiborgiella sessilifolia*	

7.3.3.4.1 Genus: *Aspalathus*

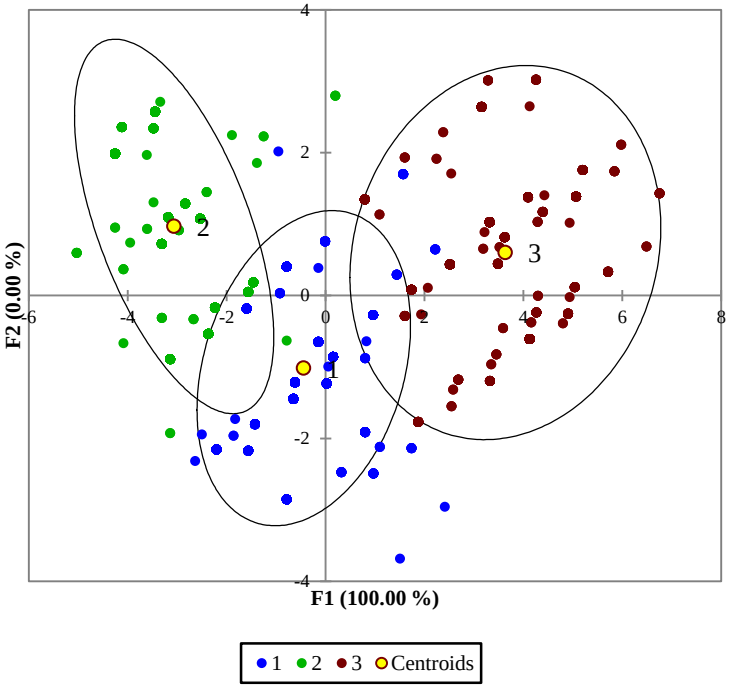

Figure 7.12. Discriminant Analysis for the genus *Aspalathus*. Dots represent species; circles represent groups.

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The DA indicates that *Aspalathus* species are divided into three overlapping groups, with F1 explaining 100% of the independent variables. *Aspalathus* is the largest genus of indigenous legumes, with 335 species.

Table 7.23. Correlation matrix between climate and soil variables for the genus *Aspalathus*.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**-0.814**	0.539
TempMin	0.189	0.179
TempMax	0.478	-0.195
Phosphorus	0.378	0.333
pH	**0.930**	0.287

Values in bold are different from 0 with a significance level alpha=0.05

The correlation matrix identified two drivers in Table 7.23, namely mean annual rainfall and soil pH (negative), responsible for the separation of *Aspalathus* species into three groups. Species listed in Group 3 fall in the lower rainfall, higher soil pH level and species listed in Group 2 in the higher rainfall, lower soil pH level. Many species occur in one group only mainly because of low occurrences. *Aspalathus astroites* is the exception, with eight occurrences, probably as a result of a narrow range of tolerance to given independent variables. The presence of many ecotonal regions within the Cape Floristic Region makes it difficult to assign major bioregions where *Aspalathus* species mainly occur. However, the Eastern Fynbos Renosterveld, Southwest, Northwest and South Coast Fynbos were clearly important bioregions. Except for *A. parviflora*, which has many occurrences near the West Coast Renosterveld Bioregion, the absence of species from the intermediate group (Group 1) is probably due to relatively wide distribution patterns but low occurrences (compare species distribution in Chapter 5: Inventory).

Overall, *Aspalathus* species are found mainly in regions with 200–600 mm mean annual rainfall and a soil pH<6.5 (Appendix 6 and 7).

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Table 7.24. Species of the genus *Aspalathus* clustered in three groups. Species in bold present in one group only, '-' no intermediate occurrence.

Group 1 **Intermediate MAR and soil pH**	**Group 2** **Higher MAR; Lower soil pH**	**Group 3** **Lower MAR; Higher soil pH**
Aspalathus abietina	*Aspalathus abietina*	
Aspalathus acanthes	*Aspalathus acanthes*	*Aspalathus acanthes*
	Aspalathus acanthiloba	
Aspalathus acanthoclada	*Aspalathus acanthoclada*	
Aspalathus acanthophylla		*Aspalathus acanthophylla*
Aspalathus acicularis subsp. *acicularis*	*Aspalathus acicularis* subsp. *acicularis*	*Aspalathus acicularis* subsp. *acicularis*
Aspalathus acicularis subsp. *planifolia*		*Aspalathus acicularis* subsp. *planifolia*
Aspalathus acidota		*Aspalathus acidota*
Aspalathus acifera		
Aspalathus aciloba		*Aspalathus aciloba*
Aspalathus aciphylla	*Aspalathus aciphylla*	*Aspalathus aciphylla*
Aspalathus acocksii	*Aspalathus acocksii*	*Aspalathus acocksii*
Aspalathus aculeata	*Aspalathus aculeata*	*Aspalathus aculeata*
Aspalathus acuminata subsp. *acuminata*	*Aspalathus acuminata* subsp. *acuminata*	*Aspalathus acuminata* subsp. *acuminata*
Aspalathus acuminata subsp. *pungens*	*Aspalathus acuminata* subsp. *pungens*	*Aspalathus acuminata* subsp. *pungens*
Aspalathus acutiflora		*Aspalathus acutiflora*
Aspalathus aemula	*Aspalathus aemula*	*Aspalathus aemula*
Aspalathus albens	*Aspalathus albens*	*Aspalathus albens*
Aspalathus alopecurus	*Aspalathus alopecurus*	*Aspalathus alopecurus*
Aspalathus alpestris	*Aspalathus alpestris*	*Aspalathus alpestris*
Aspalathus altissima	*Aspalathus altissima*	*Aspalathus altissima*
Aspalathus amoena	*Aspalathus amoena*	
Aspalathus angustifolia subsp. *angustifolia*	*Aspalathus angustifolia* subsp. *angustifolia*	*Aspalathus angustifolia* subsp. *angustifolia*
Aspalathus angustifolia subsp. *robusta*	*Aspalathus angustifolia* subsp. *robusta*	*Aspalathus angustifolia* subsp. *robusta*
Aspalathus araneosa	*Aspalathus araneosa*	*Aspalathus araneosa*
Aspalathus arenaria		
Aspalathus argyrella	*Aspalathus argyrella*	
Aspalathus argyrophanes	*Aspalathus argyrophanes*	*Aspalathus argyrophanes*
Aspalathus arida subsp. *arida*	*Aspalathus arida* subsp. *arida*	*Aspalathus arida* subsp. *arida*
Aspalathus arida subsp. *erecta*		*Aspalathus arida* subsp. *erecta*
Aspalathus arida subsp. *procumbens*	*Aspalathus arida* subsp. *procumbens*	*Aspalathus arida* subsp. *procumbens*
Aspalathus aristata	*Aspalathus aristata*	*Aspalathus aristata*
Aspalathus aristifolia		*Aspalathus aristifolia*
Aspalathus aspalathoides	*Aspalathus aspalathoides*	*Aspalathus aspalathoides*
Aspalathus asparagoides subsp. *asparagoides*	*Aspalathus asparagoides* subsp. *asparagoides*	*Aspalathus asparagoides* subsp. *asparagoides*
Aspalathus asparagoides subsp. *rubro-fusca*	*Aspalathus asparagoides* subsp. *rubro-fusca*	*Aspalathus asparagoides* subsp. *rubro-fusca*
	Aspalathus astroites	
Aspalathus attenuata	*Aspalathus attenuata*	

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Group 1 **Intermediate MAR and soil pH**	**Group 2** **Higher MAR; Lower soil pH**	**Group 3** **Lower MAR; Higher soil pH**
Aspalathus aurantiaca		
	Aspalathus barbata	
Aspalathus barbigera		*Aspalathus barbigera*
Aspalathus batodes subsp. *batodes*	*Aspalathus batodes* subsp. *batodes*	*Aspalathus batodes* subsp. *batodes*
Aspalathus batodes subsp. *spinulifolia*		*Aspalathus batodes* subsp. *spinulifolia*
Aspalathus bidouwensis	*Aspalathus bidouwensis*	
Aspalathus biflora subsp. *biflora*	*Aspalathus biflora* subsp. *biflora*	*Aspalathus biflora* subsp. *biflora*
-	*Aspalathus biflora* subsp. *longicarpa*	*Aspalathus biflora* subsp. *longicarpa*
Aspalathus bodkinii	*Aspalathus bodkinii*	*Aspalathus bodkinii*
	Aspalathus borboniifolia	
Aspalathus bowieana	*Aspalathus bowieana*	
Aspalathus bracteata	*Aspalathus bracteata*	*Aspalathus bracteata*
Aspalathus brevicarpa	*Aspalathus brevicarpa*	*Aspalathus brevicarpa*
		Aspalathus burchelliana
Aspalathus caespitosa		
Aspalathus calcarata		
Aspalathus calcarea		*Aspalathus calcarea*
Aspalathus caledonensis	*Aspalathus caledonensis*	*Aspalathus caledonensis*
Aspalathus callosa	*Aspalathus callosa*	*Aspalathus callosa*
Aspalathus campestris		
Aspalathus candicans	*Aspalathus candicans*	*Aspalathus candicans*
Aspalathus candidula		*Aspalathus candidula*
Aspalathus capensis	*Aspalathus capensis*	
	Aspalathus capitata	
Aspalathus carnosa	*Aspalathus carnosa*	*Aspalathus carnosa*
	Aspalathus cephalotes* subsp. *cephalotes	
Aspalathus cephalotes subsp. *obscurifolia*	*Aspalathus cephalotes* subsp. *obscurifolia*	*Aspalathus cephalotes* subsp. *obscurifolia*
Aspalathus cephalotes subsp. *violaceae*	*Aspalathus cephalotes* subsp. *violaceae*	*Aspalathus cephalotes* subsp. *violaceae*
Aspalathus cerrhantha	*Aspalathus cerrhantha*	
Aspalathus chenopoda subsp. *chenopoda*	*Aspalathus chenopoda* subsp. *chenopoda*	
Aspalathus chenopoda* subsp. *gracilis		
Aspalathus chortophila	*Aspalathus chortophila*	*Aspalathus chortophila*
Aspalathus chrysantha		*Aspalathus chrysantha*
Aspalathus ciliaris	*Aspalathus ciliaris*	*Aspalathus ciliaris*
Aspalathus cinerascens		*Aspalathus cinerascens*
Aspalathus citrina	*Aspalathus citrina*	
		Aspalathus cliffortiifolia
Aspalathus cliffortioides	*Aspalathus cliffortioides*	*Aspalathus cliffortioides*
Aspalathus collina subsp. *collina*	*Aspalathus collina* subsp. *collina*	*Aspalathus collina* subsp. *collina*
Aspalathus collina* subsp. *luculenta		
Aspalathus commutata	*Aspalathus commutata*	
Aspalathus compacta		

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Group 1 **Intermediate MAR and soil pH**	**Group 2** **Higher MAR; Lower soil pH**	**Group 3** **Lower MAR; Higher soil pH**
	Aspalathus complicata	
Aspalathus comptonii	*Aspalathus comptonii*	
-	*Aspalathus concava*	*Aspalathus concava*
	Aspalathus condensata	
Aspalathus confusa		*Aspalathus confusa*
Aspalathus congesta		*Aspalathus congesta*
Aspalathus cordata	*Aspalathus cordata*	*Aspalathus cordata*
		Aspalathus corniculata
Aspalathus corrudifolia	*Aspalathus corrudifolia*	
Aspalathus costulata	*Aspalathus costulata*	*Aspalathus costulata*
Aspalathus crassisepala	*Aspalathus crassisepala*	*Aspalathus crassisepala*
Aspalathus crenata	*Aspalathus crenata*	
Aspalathus cuspidata		*Aspalathus cuspidata*
Aspalathus cymbiformis	*Aspalathus cymbiformis*	*Aspalathus cymbiformis*
Aspalathus cytisoides	*Aspalathus cytisoides*	*Aspalathus cytisoides*
Aspalathus dasyantha	*Aspalathus dasyantha*	
Aspalathus decora	*Aspalathus decora*	
Aspalathus densifolia		
Aspalathus desertorum	*Aspalathus desertorum*	
Aspalathus dianthopora	*Aspalathus dianthopora*	*Aspalathus dianthopora*
-	*Aspalathus diffusa*	*Aspalathus diffusa*
Aspalathus digitifolia		
Aspalathus divaricata subsp. *divaricata*	*Aspalathus divaricata* subsp. *divaricata*	*Aspalathus divaricata* subsp. *divaricata*
Aspalathus divaricata subsp. *gracilior*	*Aspalathus divaricata* subsp. *gracilior*	
Aspalathus dunsdoniana	*Aspalathus dunsdoniana*	
-	*Aspalathus elliptica*	*Aspalathus elliptica*
Aspalathus empetrifolia		
Aspalathus ericifolia subsp. *ericifolia*	*Aspalathus ericifolia* subsp. *ericifolia*	*Aspalathus ericifolia* subsp. *ericifolia*
Aspalathus ericifolia subsp. *minuta*	*Aspalathus ericifolia* subsp. *minuta*	*Aspalathus ericifolia* subsp. *minuta*
Aspalathus ericifolia subsp. *pusilla*		*Aspalathus ericifolia* subsp. *pusilla*
Aspalathus esterhuyseniae	*Aspalathus esterhuyseniae*	
Aspalathus excelsa	*Aspalathus excelsa*	
Aspalathus fasciculata	*Aspalathus fasciculata*	
Aspalathus ferox		
Aspalathus filicaulis	*Aspalathus filicaulis*	
Aspalathus flexuosa	*Aspalathus flexuosa*	*Aspalathus flexuosa*
Aspalathus florifera	*Aspalathus florifera*	
Aspalathus florulenta	*Aspalathus florulenta*	*Aspalathus florulenta*
Aspalathus forbesii	*Aspalathus forbesii*	*Aspalathus forbesii*
	Aspalathus fourcadei	
Aspalathus frankenioides	*Aspalathus frankenioides*	*Aspalathus frankenioides*
Aspalathus fusca	*Aspalathus fusca*	*Aspalathus fusca*
Aspalathus galeata	*Aspalathus galeata*	*Aspalathus galeata*
Aspalathus gerrardii	*Aspalathus gerrardii*	*Aspalathus gerrardii*
Aspalathus glabrata	*Aspalathus glabrata*	*Aspalathus glabrata*
Aspalathus glabrescens	*Aspalathus glabrescens*	
Aspalathus globosa	*Aspalathus globosa*	

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Group 1 **Intermediate MAR and soil pH**	**Group 2** **Higher MAR; Lower soil pH**	**Group 3** **Lower MAR; Higher soil pH**
Aspalathus globulosa	*Aspalathus globulosa*	*Aspalathus globulosa*
		Aspalathus glossoides
Aspalathus grandiflora		*Aspalathus grandiflora*
Aspalathus granulata		*Aspalathus granulata*
Aspalathus grobleri		*Aspalathus grobleri*
Aspalathus heterophylla	*Aspalathus heterophylla*	*Aspalathus heterophylla*
Aspalathus hirta subsp. *hirta*	*Aspalathus hirta* subsp. *hirta*	*Aspalathus hirta* subsp. *hirta*
Aspalathus hirta subsp. *stellaris*	*Aspalathus hirta* subsp. *stellaris*	
Aspalathus hispida subsp. *albiflora*	*Aspalathus hispida* subsp. *albiflora*	*Aspalathus hispida* subsp. *albiflora*
Aspalathus hispida subsp. *hispida*	*Aspalathus hispida* subsp. *hispida*	*Aspalathus hispida* subsp. *hispida*
Aspalathus horizontalis		
	Aspalathus humilis	
Aspalathus hypnoides		
Aspalathus hystrix	*Aspalathus hystrix*	*Aspalathus hystrix*
		Aspalathus incana
Aspalathus incompta		*Aspalathus incompta*
Aspalathus incurva	*Aspalathus incurva*	*Aspalathus incurva*
Aspalathus incurvifolia		*Aspalathus incurvifolia*
Aspalathus inops		*Aspalathus inops*
Aspalathus intermedia	*Aspalathus intermedia*	*Aspalathus intermedia*
Aspalathus intervallaris	*Aspalathus intervallaris*	
		Aspalathus intricata* subsp. *anthospermoides
Aspalathus intricata* subsp. *intricata		
		Aspalathus intricata* subsp. *oxyclada
		Aspalathus isolata
Aspalathus joubertiana		*Aspalathus joubertiana*
Aspalathus juniperina* subsp. *gracilifolia		
Aspalathus juniperina subsp. *grandis*	*Aspalathus juniperina* subsp. *grandis*	*Aspalathus juniperina* subsp. *grandis*
Aspalathus juniperina subsp. *juniperina*	*Aspalathus juniperina* subsp. *juniperina*	*Aspalathus juniperina* subsp. *juniperina*
		Aspalathus juniperina* subsp. *monticola
		Aspalathus karrooensis
Aspalathus katbergensis	*Aspalathus katbergensis*	*Aspalathus katbergensis*
Aspalathus kougaensis	*Aspalathus kougaensis*	*Aspalathus kougaensis*
Aspalathus lactea subsp. *breviloba*	*Aspalathus lactea* subsp. *breviloba*	
Aspalathus lactea subsp. *lactea*	*Aspalathus lactea* subsp. *lactea*	*Aspalathus lactea* subsp. *lactea*
Aspalathus laeta	*Aspalathus laeta*	*Aspalathus laeta*
Aspalathus lamarckiana		*Aspalathus lamarckiana*
Aspalathus lanata	*Aspalathus lanata*	*Aspalathus lanata*
Aspalathus lanceicarpa		*Aspalathus lanceifolia*
Aspalathus lanceifolia	*Aspalathus lanceifolia*	
Aspalathus lanifera	*Aspalathus lanifera*	
Aspalathus laricifolia subsp. *canescens*	*Aspalathus laricifolia* subsp. *canescens*	*Aspalathus laricifolia* subsp. *canescens*

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Group 1 **Intermediate MAR and soil pH**	**Group 2** **Higher MAR; Lower soil pH**	**Group 3** **Lower MAR; Higher soil pH**
Aspalathus laricifolia subsp. *laricifolia*	*Aspalathus laricifolia* subsp. *laricifolia*	*Aspalathus laricifolia* subsp. *laricifolia*
Aspalathus latifolia	*Aspalathus latifolia*	*Aspalathus latifolia*
Aspalathus lebeckioides	*Aspalathus lebeckioides*	*Aspalathus lebeckioides*
	Aspalathus lenticula	
Aspalathus leptocoma	*Aspalathus leptocoma*	
Aspalathus leptoptera	*Aspalathus leptoptera*	
		Aspalathus leucophylla
Aspalathus linearifolia	*Aspalathus linearifolia*	
Aspalathus linearis	*Aspalathus linearis*	*Aspalathus linearis*
Aspalathus linguiloba	*Aspalathus linguiloba*	*Aspalathus linguiloba*
Aspalathus longifolia		*Aspalathus longifolia*
Aspalathus longipes		*Aspalathus longipes*
	Aspalathus lotiflora	
Aspalathus lotoides subsp. *lagopus*		*Aspalathus lotoides* subsp. *lagopus*
Aspalathus lotoides subsp. *lotoides*	*Aspalathus lotoides* subsp. *lotoides*	*Aspalathus lotoides* subsp. *lotoides*
	Aspalathus macrantha	
Aspalathus macrocarpa		
Aspalathus marginalis		
Aspalathus marginata	*Aspalathus marginata*	*Aspalathus marginalis*
Aspalathus microphylla	*Aspalathus microphylla*	*Aspalathus microphylla*
Aspalathus millefolia	*Aspalathus millefolia*	*Aspalathus millefolia*
	Aspalathus monosperma	
Aspalathus mundiana		*Aspalathus mundiana*
Aspalathus muraltioides	*Aspalathus muraltioides*	*Aspalathus muraltioides*
	Aspalathus myrtillifolia	
Aspalathus neglecta	*Aspalathus neglecta*	
Aspalathus nigra	*Aspalathus nigra*	*Aspalathus nigra*
Aspalathus nivea	*Aspalathus nivea*	*Aspalathus nivea*
Aspalathus nudiflora	*Aspalathus nudiflora*	
		Aspalathus obliqua
-	*Aspalathus oblongifolia*	*Aspalathus oblongifolia*
		Aspalathus obtusata
Aspalathus obtusifolia	*Aspalathus obtusifolia*	*Aspalathus obtusifolia*
Aspalathus odontoloba		
		Aspalathus oliveri
Aspalathus opaca subsp. *opaca*	*Aspalathus opaca* subsp. *opaca*	*Aspalathus opaca* subsp. *opaca*
Aspalathus opaca* subsp. *pappeana		
	Aspalathus opaca* subsp. *rostriloba	
	Aspalathus orbiculata	
Aspalathus pachyloba* subsp. *macroclada		
Aspalathus pachyloba subsp. *pachyloba*		*Aspalathus pachyloba* subsp. *pachyloba*
Aspalathus pachyloba subsp. *villicaulis*	*Aspalathus pachyloba* subsp. *villicaulis*	*Aspalathus pachyloba* subsp. *villicaulis*
Aspalathus pallescens		*Aspalathus pallescens*
-	*Aspalathus pallidiflora*	*Aspalathus pallidiflora*

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Group 1 **Intermediate MAR and soil pH**	**Group 2** **Higher MAR; Lower soil pH**	**Group 3** **Lower MAR; Higher soil pH**
-	*Aspalathus parviflora*	*Aspalathus parviflora*
		Aspalathus patens
Aspalathus pedicellata		
Aspalathus pedunculata	*Aspalathus pedunculata*	*Aspalathus pedunculata*
Aspalathus pendula	*Aspalathus pendula*	*Aspalathus pendula*
Aspalathus perfoliata subsp. *perfoliata*	*Aspalathus perfoliata* subsp. *perfoliata*	*Aspalathus perfoliata* subsp. *perfoliata*
Aspalathus perfoliata subsp. *phillipsii*		*Aspalathus perfoliata* subsp. *phillipsii*
Aspalathus perforata	*Aspalathus perforata*	*Aspalathus perforata*
Aspalathus petersonii		*Aspalathus petersonii*
Aspalathus pigmentosa	*Aspalathus pigmentosa*	
Aspalathus pilantha		
	Aspalathus pinea* subsp. *caudata	
Aspalathus pinea subsp. *pinea*	*Aspalathus pinea* subsp. *pinea*	
Aspalathus pinguis subsp. *australis*		*Aspalathus pinguis* subsp. *australis*
Aspalathus pinguis subsp. *longissima*		*Aspalathus pinguis* subsp. *longissima*
Aspalathus pinguis subsp. *occidentalis*		*Aspalathus pinguis* subsp. *occidentalis*
Aspalathus pinguis subsp. *pinguis*	*Aspalathus pinguis* subsp. *pinguis*	*Aspalathus pinguis* subsp. *pinguis*
Aspalathus polycephala subsp. *lanatifolia*	*Aspalathus polycephala* subsp. *lanatifolia*	
Aspalathus polycephala subsp. *polycephala*	*Aspalathus polycephala* subsp. *polycephala*	
Aspalathus polycephala subsp. *rigida*		*Aspalathus polycephala* subsp. *rigida*
		Aspalathus potbergensis
Aspalathus proboscidea		*Aspalathus proboscidea*
Aspalathus prostrata		*Aspalathus prostrata*
Aspalathus psoraleoides	*Aspalathus psoraleoides*	*Aspalathus psoraleoides*
Aspalathus puberula	*Aspalathus puberula*	
Aspalathus pulicifolia		*Aspalathus pulicifolia*
Aspalathus pycnantha		*Aspalathus pycnantha*
Aspalathus quadrata		*Aspalathus quadrata*
Aspalathus quinquefolia subsp. *compacta*	*Aspalathus quinquefolia* subsp. *compacta*	*Aspalathus quinquefolia* subsp. *compacta*
Aspalathus quinquefolia subsp. *hispida*	*Aspalathus quinquefolia* subsp. *hispida*	*Aspalathus quinquefolia* subsp. *hispida*
Aspalathus quinquefolia subsp. *quinquefolia*	*Aspalathus quinquefolia* subsp. *quinquefolia*	*Aspalathus quinquefolia* subsp. *quinquefolia*
Aspalathus quinquefolia subsp. *virgata*	*Aspalathus quinquefolia* subsp. *virgata*	*Aspalathus quinquefolia* subsp. *virgata*
	Aspalathus radiata* subsp. *pseudosericea	
Aspalathus radiata subsp. *radiata*	*Aspalathus radiata* subsp. *radiata*	
		Aspalathus ramosissima
Aspalathus ramulosa	*Aspalathus ramulosa*	
Aspalathus rectistyla		
Aspalathus recurva	*Aspalathus recurva*	*Aspalathus recurva*

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Group 1 **Intermediate MAR and soil pH**	**Group 2** **Higher MAR; Lower soil pH**	**Group 3** **Lower MAR; Higher soil pH**
		Aspalathus recurvispina
		Aspalathus repens
Aspalathus retroflexa* subsp. *angustipetala		
Aspalathus retroflexa subsp. *bicolor*	*Aspalathus retroflexa* subsp. *bicolor*	*Aspalathus retroflexa* subsp. *bicolor*
Aspalathus retroflexa subsp. *retroflexa*	*Aspalathus retroflexa* subsp. *retroflexa*	*Aspalathus retroflexa* subsp. *retroflexa*
Aspalathus rigidifolia	*Aspalathus rigidifolia*	*Aspalathus rigidifolia*
Aspalathus rosea	*Aspalathus rosea*	
Aspalathus rostrata		
Aspalathus rostripetala		
Aspalathus rubens	*Aspalathus rubens*	*Aspalathus rubens*
Aspalathus rubiginosa	*Aspalathus rubiginosa*	
Aspalathus rugosa	*Aspalathus rugosa*	*Aspalathus rugosa*
Aspalathus rupestris	*Aspalathus rupestris*	*Aspalathus rupestris*
Aspalathus rycroftii		
	Aspalathus salicifolia	
Aspalathus salteri	*Aspalathus salteri*	*Aspalathus salteri*
Aspalathus sanguinea subsp. *foliosa*		*Aspalathus sanguinea* subsp. *foliosa*
Aspalathus sanguinea subsp. *sanguinea*		*Aspalathus sanguinea* subsp. *sanguinea*
Aspalathus sceptrum-aureum	*Aspalathus sceptrum-aureum*	*Aspalathus sceptrum-aureum*
Aspalathus secunda		
Aspalathus securifolia	*Aspalathus securifolia*	*Aspalathus securifolia*
Aspalathus sericea	*Aspalathus sericea*	*Aspalathus sericea*
Aspalathus serpens	*Aspalathus serpens*	
Aspalathus setacea	*Aspalathus setacea*	*Aspalathus setacea*
		Aspalathus shawii* subsp. *glabripetala
Aspalathus shawii* subsp. *longispica		
Aspalathus shawii subsp. *shawii*	*Aspalathus shawii* subsp. *shawii*	*Aspalathus shawii* subsp. *shawii*
Aspalathus simii	*Aspalathus simii*	
		Aspalathus singuliflora
Aspalathus smithii		*Aspalathus smithii*
Aspalathus spectabilis	*Aspalathus spectabilis*	*Aspalathus spectabilis*
Aspalathus spicata	*Aspalathus spicata*	*Aspalathus spicata*
		Aspalathus spiculata
Aspalathus spinescens subsp. *lepida*	*Aspalathus spinescens* subsp. *lepida*	*Aspalathus spinescens* subsp. *lepida*
Aspalathus spinescens subsp. *spinescens*		*Aspalathus spinescens* subsp. *spinescens*
Aspalathus spinosa subsp. *flavispina*		*Aspalathus spinosa* subsp. *flavispina*
Aspalathus spinosa subsp. *glauca*		*Aspalathus spinosa* subsp. *glauca*
Aspalathus spinosa subsp. *spinosa*	*Aspalathus spinosa* subsp. *spinosa*	*Aspalathus spinosa* subsp. *spinosa*
Aspalathus spinosissima subsp. *spinosissima*	*Aspalathus spinosissima* subsp. *spinosissima*	*Aspalathus spinosissima* subsp. *spinosissima*

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Group 1 **Intermediate MAR and soil pH**	**Group 2** **Higher MAR; Lower soil pH**	**Group 3** **Lower MAR; Higher soil pH**
Aspalathus spinosissima subsp. *tenuiflora*	*Aspalathus spinosissima* subsp. *tenuiflora*	*Aspalathus spinosissima* subsp. *tenuiflora*
Aspalathus stenophylla	*Aspalathus stenophylla*	*Aspalathus stenophylla*
Aspalathus steudeliana		*Aspalathus steudeliana*
Aspalathus stokoei	*Aspalathus stokoei*	
Aspalathus stricticlada		*Aspalathus stricticlada*
	Aspalathus suaveolens	
Aspalathus submissa	*Aspalathus submissa*	*Aspalathus submissa*
Aspalathus subtingens	*Aspalathus subtingens*	*Aspalathus subtingens*
Aspalathus subulata		*Aspalathus subulata*
	Aspalathus sulphurea	
		Aspalathus taylorii
Aspalathus tenuissima	*Aspalathus tenuissima*	
Aspalathus teres subsp. *teres*	*Aspalathus teres* subsp. *teres*	*Aspalathus teres* subsp. *teres*
	Aspalathus teres* subsp. *thodei	
Aspalathus ternata	*Aspalathus ternata*	*Aspalathus ternata*
		Aspalathus theresae
Aspalathus tridentata subsp. *fragilis*	*Aspalathus tridentata* subsp. *fragilis*	*Aspalathus tridentata* subsp. *fragilis*
Aspalathus tridentata subsp. *rotunda*	*Aspalathus tridentata* subsp. *rotunda*	*Aspalathus tridentata* subsp. *rotunda*
Aspalathus tridentata subsp. *staurantha*	*Aspalathus tridentata* subsp. *staurantha*	*Aspalathus tridentata* subsp. *staurantha*
Aspalathus tridentata subsp. *tridentata*	*Aspalathus tridentata* subsp. *tridentata*	*Aspalathus tridentata* subsp. *tridentata*
Aspalathus triquetra	*Aspalathus triquetra*	*Aspalathus triquetra*
Aspalathus truncata	*Aspalathus truncata*	
Aspalathus tuberculata		*Aspalathus tuberculata*
Aspalathus tulbaghensis		
Aspalathus tylodes	*Aspalathus tylodes*	*Aspalathus tylodes*
Aspalathus ulicina subsp. *ulicina*	*Aspalathus ulicina* subsp. *ulicina*	*Aspalathus ulicina* subsp. *ulicina*
Aspalathus uniflora	*Aspalathus uniflora*	*Aspalathus uniflora*
	Aspalathus vacciniifolia	
Aspalathus varians	*Aspalathus varians*	
	Aspalathus variegata	
		Aspalathus venosa
Aspalathus verbasciformis		*Aspalathus verbasciformis*
Aspalathus vermiculata		*Aspalathus vermiculata*
Aspalathus villosa	*Aspalathus villosa*	*Aspalathus villosa*
Aspalathus vulnerans	*Aspalathus vulnerans*	*Aspalathus vulnerans*
		Aspalathus vulpina
Aspalathus willdenowiana	*Aspalathus willdenowiana*	*Aspalathus willdenowiana*
Aspalathus wittebergensis	*Aspalathus wittebergensis*	*Aspalathus wittebergensis*
Aspalathus wurmbeana	*Aspalathus wurmbeana*	*Aspalathus wurmbeana*
Aspalathus zeyheri	*Aspalathus zeyheri*	*Aspalathus zeyheri*

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7.3.3.4.2 Genus: *Crotalaria*

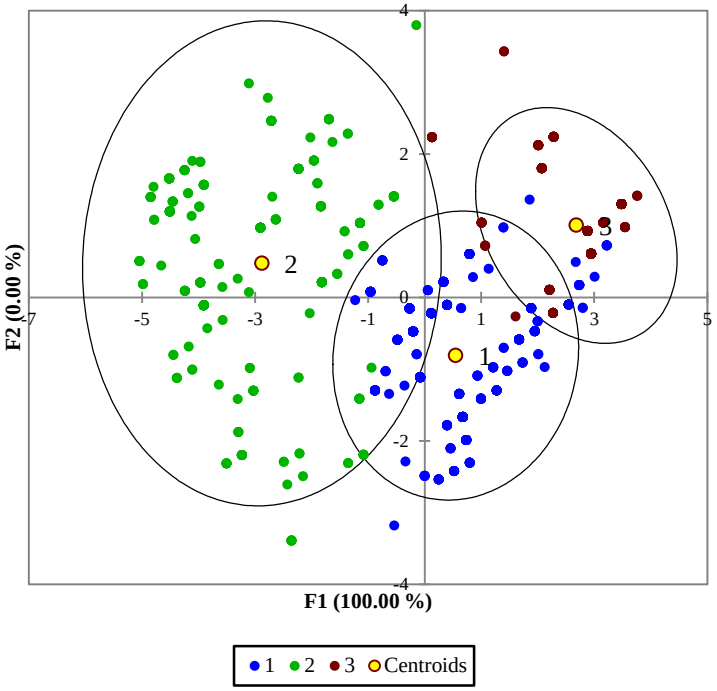

Figure 7.13. Discriminant Analysis for the genus *Crotalaria*. Dots represent species; circles represent groups.

The DA resulted in three overlapping groups for *Crotalaria* species, with F1 explaining 100% of the independent variables (Figure 7.13).

Table 7.25. Correlation matrix between climate and soil variables for the genus *Crotalaria*.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.938**	0.289
TempMin	0.182	0.441
TempMax	-0.454	-0.119
Phosphorus	-0.383	0.191
pH	**-0.894**	0.433

Values in bold are different from 0 with a significance level alpha=0.05.

A strong correlation with mean annual rainfall and soil pH (negative) is responsible for the distribution patterns of *Crotalaria* species as shown in Table 7.25. Species listed in Group 2 (Table 7.26) are adapted to low mean annual rainfall and high soil pH and species listed in Group 3 to opposite levels. Several species are listed only in Group 2, mostly because of a few occurrences. *Crotalaria effusa* and *C. meyeriana* are exceptions, with many occurrences

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in e.g. Namaqualand Hardeveld and Southern Namib Desert respectively. *Crotalaria pearsonii* is recorded in Groups 2 and 3 but not in the intermediate group (Group 1), probably because of a remote occurrence (Mesic Highveld Bioregion) far from its natural occurrence in the vicinity of the Richtersveld Bioregion.

Most *Crotalaria* species are found in the Central Bushveld, Lowveld and Eastern Kalahari Bushveld Bioregions, falling in the 400–800 mm mean annual rainfall region and a soil pH< 6.4.

Table 7.26. Species of the genus *Crotalaria* clustered in three groups. Species in bold present in one group only, '-' no intermediate occurrence. MAR=Mean annual rainfall.

Group 1 **Intermediate MAR and soil pH**	**Group 2** **Lower MAR; Higher soil pH**	**Group 3** **Higher MAR; Lower soil pH**
Crotalaria argyraea		
Crotalaria barkae subsp. *barkae*	*Crotalaria barkae* subsp. *barkae*	
Crotalaria brachycarpa	*Crotalaria brachycarpa*	*Crotalaria brachycarpa*
Crotalaria burkeana	*Crotalaria burkeana*	*Crotalaria burkeana*
Crotalaria capensis	*Crotalaria capensis*	*Crotalaria capensis*
Crotalaria damarensis	*Crotalaria damarensis*	*Crotalaria damarensis*
Crotalaria distans subsp. *distans*	*Crotalaria distans* subsp. *distans*	
Crotalaria distans subsp. *mediocris*	*Crotalaria distans* subsp. *mediocris*	*Crotalaria distans* subsp. *mediocris*
Crotalaria doidgeae	*Crotalaria doidgeae*	*Crotalaria doidgeae*
Crotalaria dura subsp. *dura*		*Crotalaria dura* subsp. *dura*
	Crotalaria effusa	
Crotalaria eremicola subsp. *eremicola*	*Crotalaria eremicola* subsp. *eremicola*	*Crotalaria eremicola* subsp. *eremicola*
Crotalaria excisa subsp. *excisa*	*Crotalaria excisa* subsp. *excisa*	*Crotalaria excisa* subsp. *excisa*
	Crotalaria excisa* subsp. *namaquensis	
Crotalaria gazensis subsp. *herbacea*	*Crotalaria gazensis* subsp. *herbacea*	*Crotalaria gazensis* subsp. *herbacea*
Crotalaria globifera	*Crotalaria globifera*	*Crotalaria globifera*
Crotalaria griquensis	*Crotalaria griquensis*	
	Crotalaria humilis	
Crotalaria laburnifolia subsp. *australis*	*Crotalaria laburnifolia* subsp. *australis*	*Crotalaria laburnifolia* subsp. *australis*
Crotalaria laburnifolia* subsp. *laburnifolia		
Crotalaria lanceolata subsp. *lanceolata*	*Crotalaria lanceolata* subsp. *lanceolata*	*Crotalaria lanceolata* subsp. *lanceolata*
	Crotalaria lebeckioides	
	Crotalaria leubnitziana	
Crotalaria longidens	*Crotalaria longidens*	*Crotalaria longidens*
Crotalaria lotoides	*Crotalaria lotoides*	
Crotalaria macrocarpa subsp. *macrocarpa*		*Crotalaria macrocarpa* subsp. *macrocarpa*
	Crotalaria meyeriana	
Crotalaria monophylla		
Crotalaria monteiroi var. *galpinii*	*Crotalaria monteiroi* var. *galpinii*	*Crotalaria monteiroi* var. *galpinii*
Crotalaria monteiroi var. *monteiroi*	*Crotalaria monteiroi* var. *monteiroi*	*Crotalaria monteiroi* var. *monteiroi*
Crotalaria natalensis	*Crotalaria natalensis*	*Crotalaria natalensis*
Crotalaria natalitia var. *natalitia*		*Crotalaria natalitia* var. *natalitia*

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Group 1 **Intermediate MAR and soil pH**	**Group 2** **Lower MAR; Higher soil pH**	**Group 3** **Higher MAR; Lower soil pH**
Crotalaria obscura	*Crotalaria obscura*	*Crotalaria obscura*
Crotalaria ochroleuca		*Crotalaria ochroleuca*
Crotalaria orientalis* subsp. *allenii		
Crotalaria orientalis subsp. *orientalis*	*Crotalaria orientalis* subsp. *orientalis*	
Crotalaria pallida var. *pallida*	*Crotalaria pallida* var. *pallida*	*Crotalaria pallida* var. *pallida*
-	*Crotalaria pearsonii*	*Crotalaria pearsonii*
Crotalaria pisicarpa	*Crotalaria pisicarpa*	
Crotalaria podocarpa	*Crotalaria podocarpa*	*Crotalaria podocarpa*
Crotalaria recta		*Crotalaria recta*
Crotalaria rhodesiae	*Crotalaria rhodesiae*	
Crotalaria schinzii	*Crotalaria schinzii*	*Crotalaria schinzii*
	Crotalaria schlechteri	
		Crotalaria spartea
Crotalaria spartioides	*Crotalaria spartioides*	
Crotalaria sphaerocarpa subsp. *sphaerocarpa*	*Crotalaria sphaerocarpa* subsp. *sphaerocarpa*	*Crotalaria sphaerocarpa* subsp. *sphaerocarpa*
	Crotalaria steudneri	
Crotalaria vasculosa		*Crotalaria vasculosa*
Crotalaria virgulata subsp. *grantiana*	*Crotalaria virgulata* subsp. *grantiana*	*Crotalaria virgulata* subsp. *grantiana*
Crotalaria virgultalis	*Crotalaria virgultalis*	

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7.3.3.4.3 Genus: *Lotononis*

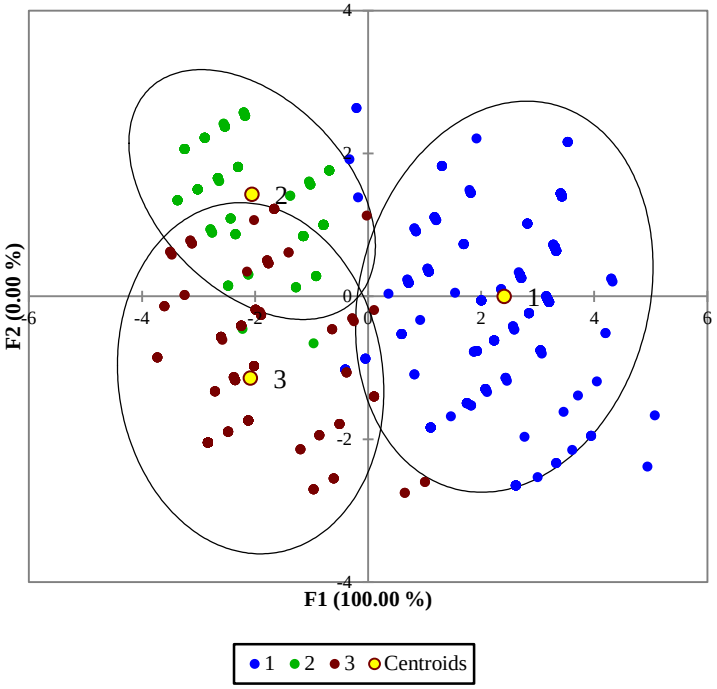

Figure 7.14. Discriminant Analysis for the genus *Lotononis*. Dots represent species; circles represent groups.

Lotononis species are arranged in three groups as shown in Figure 7.14. The first function (F1) is estimated to explain 100% of the variation. Group 1 has a narrow overlap with Groups 2 and 3, indicating that the former is relatively unique.

Table 7.27. Correlation matrix between climate and soil variables for the genus *Lotononis*.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**-0.836**	-0.310
TempMin	0.162	**0.840**
TempMax	0.689	0.337
Phosphorus	**0.609**	0.564
pH	**0.981**	0.028

Values in bold are different from 0 with a significance level alpha=0.05.

There are three drivers identified in Table 7.27 that are responsible for the distribution of *Lotononis* species. The highest correlation is with soil pH, followed by the mean annual

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rainfall (negative) and phosphorus. Even though the DA does not show that F2 explains any of the variation, a correlation with mean annual minimum temperature is evident in Table 7.28. Species listed in Groups 2 and 3 are adapted to high mean annual rainfall and low soil phosphorus and pH levels, while species listed in Group 1 are adapted to opposite levels. Species listed in Group 3 are adapted to low mean annual minimum temperatures and those in Group 2 to high mean annual minimum temperatures. The occurrence of *Lotononis* species in especially the Drakensberg Grassland and Sub-Escarpment Grassland Bioregions is attributed to the correlation with low mean annual minimum temperatures and species occurring in the Bushmanland and Albany Thicket Bioregions to high mean annual minimum temperatures. *Lotononis falcata* and *L. rabenaviana* are of special interest because they have a high number of occurrences but are listed only in Group 1. These species are found in regions of low mean annual rainfall and high phosphorus and soil pH levels, namely the Succulent Karoo and the Nama-Karoo Biomes. *Lotononis galpinii*, listed only in Group 3, is found in the high-rainfall Drakensberg Grassland Bioregion. The absence of an intermediate group (small overlap of groups in Figure 7.14) could be attributed to the recording of many *Lotononis* species in one group only (Table 7.28), therefore several unique occurrences.

Most species occur in the Mesic Highveld Grassland, the Sub-Escarpment Grassland and the Drakensberg Grassland Bioregions. The majority of species fall in a <400 mm mean annual rainfall region, with a mean annual minimum temperature of 2–8ºC, a phosphorus level of 5–35 $mgkg^{-1}$ and finally a soil pH level lower than 6.4. It is noteworthy that many *Lotononis* species have low occurrences (species in bold in Table 7.28) but are nonetheless found in almost all bioregions. It is suggested that the poor collection of specimens as reflected in the PRECIS database could be improved by renewed interest in collection trips by institutions such as the ARC-National Forage Genebank.

Table 7.28. Species of the genus *Lotononis* clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature, P=Phosphorus.

Group 1 **Lower MAR; Higher soil P and pH**	**Group 2** **Higher MAR; Lower soil P and pH; Higher TMin**	**Group 3** **Higher MAR; Lower soil P and pH; Lower TMin**
Lotononis acocksii		
Lotononis acuminata	*Lotononis acuminata*	
	Lotononis alpina subsp. *multiflora*	*Lotononis alpina* subsp. *multiflora*
		Lotononis amajubica
Lotononis arenicola		
Lotononis argentea		
Lotononis azurea	*Lotononis azurea*	
Lotononis azureoides		
	Lotononis bachmanniana	
Lotononis brachyantha		
Lotononis brevicaulis		
Lotononis burchellii		*Lotononis burchellii*
Lotononis caerulescens	*Lotononis caerulescens*	*Lotononis caerulescens*
Lotononis carnea		
Lotononis carnosa subsp. *carnosa*	*Lotononis carnosa* subsp. *carnosa*	*Lotononis carnosa* subsp. *carnosa*

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Group 1 Lower MAR; Higher soil P and pH	Group 2 Higher MAR; Lower soil P and pH; Higher TMin	Group 3 Higher MAR; Lower soil P and pH; Lower TMin
	Lotononis carnosa* subsp. *condensata	
	Lotononis carnosa* subsp. *latifolia	
	Lotononis complanata	
Lotononis comptonii		
Lotononis crumanina		
Lotononis curtii		*Lotononis curtii*
Lotononis dahlgrenii		
Lotononis densa subsp. *congesta*	*Lotononis densa* subsp. *congesta*	
	Lotononis densa* subsp. *densa	
Lotononis densa subsp. *gracilis*	*Lotononis densa* subsp. *gracilis*	
Lotononis densa subsp. *leucoclada*	*Lotononis densa* subsp. *leucoclada*	
		Lotononis dichiloides
Lotononis dissitinodis		
Lotononis divaricata		*Lotononis divaricata*
Lotononis elongata	*Lotononis elongata*	
	Lotononis eriocarpa	*Lotononis eriocarpa*
		Lotononis evansiana
	Lotononis exstipulata	
Lotononis falcata		
	Lotononis fastigiata	*Lotononis fastigiata*
Lotononis filiformis	*Lotononis filiformis*	
Lotononis fruticoides	*Lotononis fruticoides*	
		Lotononis galpinii
Lotononis glabra	*Lotononis glabra*	*Lotononis glabra*
		Lotononis glabrescens
Lotononis gracilifolia	*Lotononis gracilifolia*	
	Lotononis holosericea	
Lotononis involucrata subsp. *bracteata*	*Lotononis involucrata* subsp. *bracteata*	
	Lotononis involucrata* subsp. *digitata	
Lotononis involucrata subsp. *involucrata*	*Lotononis involucrata* subsp. *involucrata*	*Lotononis involucrata* subsp. *involucrata*
Lotononis involucrata subsp. *peduncularis*	*Lotononis involucrata* subsp. *peduncularis*	
		Lotononis jacottetii
Lotononis lamprifolia		
Lotononis laxa	*Lotononis laxa*	*Lotononis laxa*
Lotononis lenticula		
Lotononis leptoloba	*Lotononis leptoloba*	
Lotononis linearifolia		
	Lotononis lotononoides	*Lotononis lotononoides*
Lotononis macrosepala		*Lotononis macrosepala*
		Lotononis maculata
Lotononis maximiliani	*Lotononis maximiliani*	*Lotononis maximiliani*
	Lotononis meyeri	
Lotononis micrantha	*Lotononis micrantha*	
Lotononis minor		*Lotononis minor*
	Lotononis monophylla	
Lotononis nutans	*Lotononis nutans*	
Lotononis oxyptera	*Lotononis oxyptera*	*Lotononis oxyptera*
	Lotononis pallens	
Lotononis parviflora	*Lotononis parviflora*	*Lotononis parviflora*
Lotononis perplexa	*Lotononis perplexa*	*Lotononis perplexa*
		Lotononis pottiae
Lotononis prostrata	*Lotononis prostrata*	*Lotononis prostrata*

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Group 1 **Lower MAR; Higher soil P and pH**	**Group 2** **Higher MAR; Lower soil P and pH; Higher TMin**	**Group 3** **Higher MAR; Lower soil P and pH; Lower TMin**
Lotononis pulchella	*Lotononis pulchella*	*Lotononis pulchella*
Lotononis pumila		*Lotononis pumila*
Lotononis pungens	*Lotononis pungens*	*Lotononis pungens*
Lotononis purpurescens		
Lotononis rabenaviana		
Lotononis rigida		
Lotononis rostrata* subsp. *brachybotrys		
Lotononis rostrata* subsp. *namaquensis		
Lotononis rostrata subsp. *rostrata*	*Lotononis rostrata* subsp. *rostrata*	
Lotononis sabulosa	*Lotononis sabulosa*	
Lotononis sericophylla	*Lotononis sericophylla*	*Lotononis sericophylla*
Lotononis sparsiflora	*Lotononis sparsiflora*	*Lotononis sparsiflora*
Lotononis stenophylla	*Lotononis stenophylla*	
Lotononis stricta	*Lotononis stricta*	*Lotononis stricta*
Lotononis strigillosa		
Lotononis tenella	*Lotononis tenella*	*Lotononis tenella*
Lotononis trichodes		
Lotononis umbellata	*Lotononis umbellata*	*Lotononis umbellata*
	Lotononis varia	*Lotononis varia*
Lotononis venosa		
Lotononis viborgioides	*Lotononis viborgioides*	
	Lotononis villosa	
	Lotononis viminea	*Lotononis viminea*
		Lotononis virgata

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7.3.3.5 Tribe: Genisteae

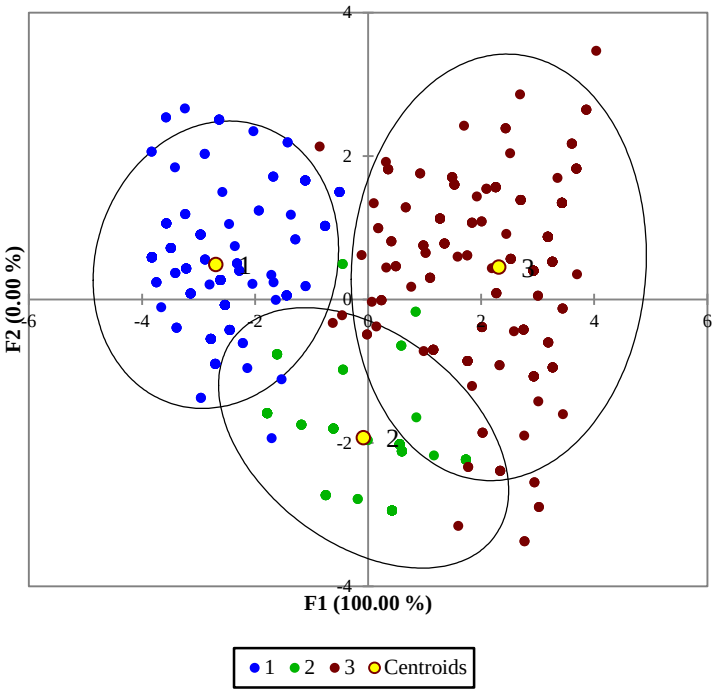

Figure 7.15. Discriminant Analysis for the tribe Genisteae. Dots represent species; circles represent groups.

Dichilus, *Melolobium* and *Polhillia* belong to the tribe Genisteae. From Figure 7.15 it is evident that this tribe is divided into three overlapping groups, with F1 explaining 100% of the independent variables.

Table 7.29. Correlation matrix between climate and soil variables for the tribe Genisteae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**-0.871**	0.104
TempMin	0.221	**0.656**
TempMax	**0.618**	-0.519
Phosphorus	**0.738**	0.551
pH	**0.967**	-0.091

Values in bold are different from 0 with a significance level alpha=0.05.

The correlation between soil pH, mean annual rainfall (negative), mean annual maximum temperature and phosphorus of the Genisteae is shown in Table 7.29. Species listed in Group 1 (Table 7.30) are adapted to high annual mean rainfall as well as low mean annual maximum

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temperatures, soil phosphorus and pH. Species listed in Group 3 are adapted to opposite levels. The correlation with mean annual minimum temperature (F2) is not clearly distinguished from Figure 7.15, but species listed in Group 2 could be adapted to lower mean annual minimum temperatures than those listed in Groups 1 and 3. The one occurrence of *Dichilus pilosus* in the Bushmanland Bioregion could explain its absence in the intermediate group. With *Melolobium* species (except *M. alpinum*) and *Polhillia pallens*, their absence from Group 2 is probably due to no occurrences in the lower mean annual minimum temperature levels, rather than to narrow distribution patterns and/or low occurrences (compare distribution patterns in Chapter 5: Inventory). The absence of the remaining *Polhillia* species from Group 2 is probably due to relatively wide distribution patterns but low occurrences.

Dichilus species occur mostly in the Mesic Highveld and Drakensberg Grassland Bioregions, adapted mainly to a mean annual rainfall of 400–800 mm, a minimum and mean annual maximum temperature of <2ºC and 25–29ºC respectively, a phosphorus level of <10 $mgkg^{-1}$ and a soil pH level of <6.5. *Melolobium* species are found mostly in the Eastern Kalahari Bushveld and Dry Highveld Grassland Bioregions, adapted mainly to a mean annual rainfall of <400 mm, a minimum and mean annual maximum temperature of <2ºC and 27–35ºC respectively, a phosphorus level of <10 $mgkg^{-1}$ and a soil pH level of >7.5. *Polhillia* species are found mostly in ecotonal regions, adapted mainly to a mean annual rainfall of 200–600 mm, a minimum and mean annual maximum temperature of 2–8ºC and 25–29ºC respectively, a phosphorus level of 5–35 $mgkg^{-1}$ and a soil pH level of 6.5–7.4.

Table 7.30. Species of the tribe Genisteae clustered in three groups. Species in bold present in one group only, '-' no intermediate occurrence. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature, MaxT=Mean annual maximum temperature, P=Phosphorus.

Group 1 **Higher MAR; Lower MaxT, soil P and pH;**	**Group 2** **Intermediate MAR, MaxT, soil P and pH; Lower TMin**	**Group 3** **Lower MAR, Higher MaxT, soil P and pH**
Dichilus gracilis	*Dichilus gracilis*	*Dichilus gracilis*
Dichilus lebeckioides	*Dichilus lebeckioides*	*Dichilus lebeckioides*
Dichilus pilosus	-	*Dichilus pilosus*
Dichilus reflexus		
Dichilus strictus	*Dichilus strictus*	
Melolobium adenodes	-	*Melolobium adenodes*
Melolobium aethiopicum	-	*Melolobium aethiopicum*
Melolobium alpinum	-	*Melolobium alpinum*
Melolobium calycinum	*Melolobium calycinum*	*Melolobium calycinum*
Melolobium candicans	*Melolobium candicans*	*Melolobium candicans*
Melolobium canescens	*Melolobium canescens*	*Melolobium canescens*
Melolobium exudans	*Melolobium exudans*	*Melolobium exudans*
Melolobium humile	*Melolobium humile*	*Melolobium humile*
		Melolobium lampolobum
	Melolobium macrocalyx var. *longifolium*	*Melolobium macrocalyx* var. *longifolium*
	Melolobium macrocalyx var. *macrocalyx*	*Melolobium macrocalyx* var. *macrocalyx*
Melolobium microphyllum	*Melolobium microphyllum*	*Melolobium microphyllum*

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Group 1 Higher MAR; Lower MaxT, soil P and pH;	Group 2 Intermediate MAR, MaxT, soil P and pH; Lower TMin	Group 3 Lower MAR, Higher MaxT, soil P and pH
Melolobium obcordatum	*Melolobium obcordatum*	*Melolobium obcordatum*
Melolobium subspicatum		***Melolobium stipulatum***
Melolobium wilmsii	*Melolobium wilmsii*	
Polhillia brevicalyx	-	*Polhillia brevicalyx*
		Polhillia canescens
Polhillia connata	-	*Polhillia connata*
		Polhillia involucrata
Polhillia obsoleta		
Polhillia pallens	-	*Polhillia pallens*

7.3.3.5.1 Genus: *Argyrolobium*

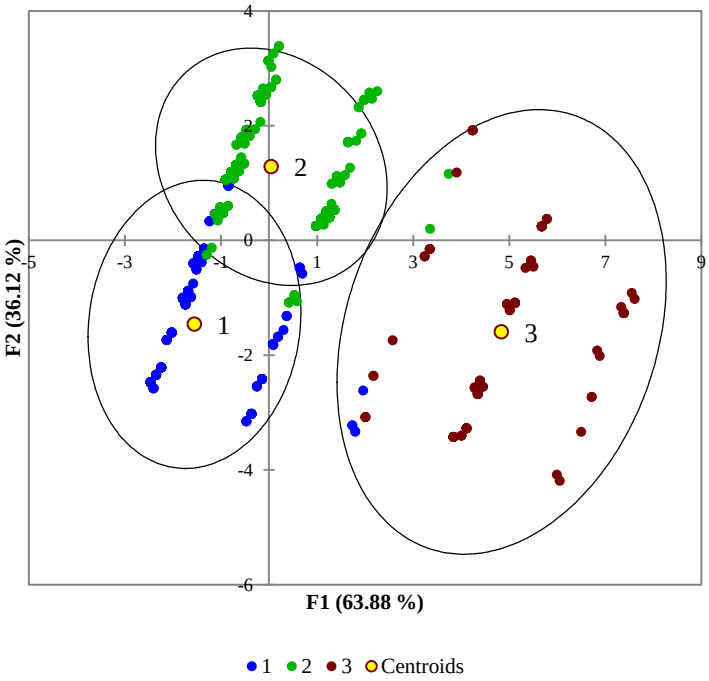

Figure 7.16. Discriminant Analysis for the genus *Argyrolobium*. Dots represent species; circles represent groups.

Argyrolobium species are arranged in three groups, as shown in Figure 7.16. The first function (F1) is estimated to explain 63.88% of the variation and the second function (F2) 36.12%. No overlap between Group 3 and the other two groups is evident, indicating that Group 3 is unique in terms of the independent variables that are correlated with species in the group. The reason for the linear arrangement of species (dots) is unknown. No meaningful explanation can be given, but it is noted that a negative correlation with mean annual rainfall and a positive correlation with soil pH levels result mostly in such linear patterns.

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Table 7.31. Correlation matrix between climate and soil variables for the genus *Argyrolobium*.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**-0.627**	0.203
TempMin	0.334	**0.914**
TempMax	0.506	0.401
Phosphorus	0.504	0.117
pH	**0.937**	-0.348

Values in bold are different from 0 with a significance level alpha=0.05.

The correlation matrix in Table 7.31 shows that mean annual rainfall, mean annual minimum temperature and soil pH levels are the main drivers for the different species distribution patterns. Species listed in Group 1 are adapted to higher mean annual rainfall and lower soil pH levels than those in Group 3, while species listed in Group 3 could be more adapted to low mean annual minimum temperatures compared to those listed in Group 1 and 2. Many species, notably *Argyrolobium megarrhizum* and *A. rotundifolium*, have wide distribution patterns but are listed only in Group 2. Regions of high mean annual rainfall (>800 mm) and low soil pH levels (<6.4) are recorded for these species, present in the Indian Ocean Coastal Belt, Sub-Escarpment Savanna and the Eastern Fynbos Renosterveld Bioregions.

Overall, *Argyrolobium* species are found mostly in the Mesic Highveld Grassland and Sub-Escarpment Grassland Bioregions, described as regions with high mean annual rainfall (>800 mm), average mean annual minimum temperatures (2–8ºC), low phosphorus levels (<10 $mgkg^{-1}$) and soil pH (<6.4).

Table 7.32. Species of the genus *Argyrolobium* clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature.

Group 1 **Higher MAR; Lower soil pH; Lower TMin**	**Group 2** **Intermediate MAP and pH; Higher TMin**	**Group 3** **Lower MAR, Higher soil pH**
Argyrolobium aciculare	*Argyrolobium aciculare*	
Argyrolobium amplexicaule	*Argyrolobium amplexicaule*	*Argyrolobium amplexicaule*
	Argyrolobium argenteum	*Argyrolobium argenteum*
	Argyrolobium ascendens	
	Argyrolobium baptisioides	
	Argyrolobium barbatum	*Argyrolobium barbatum*
Argyrolobium campicola	*Argyrolobium campicola*	
Argyrolobium candicans	*Argyrolobium candicans*	*Argyrolobium candicans*
Argyrolobium collinum	*Argyrolobium collinum*	*Argyrolobium collinum*
	Argyrolobium crassifolium	*Argyrolobium crassifolium*
Argyrolobium filiforme	*Argyrolobium filiforme*	*Argyrolobium filiforme*
	Argyrolobium frutescens	
		Argyrolobium harmsianum
Argyrolobium harveyanum	*Argyrolobium harveyanum*	*Argyrolobium harveyanum*

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Group 1 **Higher MAR; Lower soil pH; Lower TMin**	**Group 2** **Intermediate MAP and pH; Higher TMin**	**Group 3** **Lower MAR, Higher soil pH**
Argyrolobium humile	*Argyrolobium humile*	
	Argyrolobium incanum	
	Argyrolobium longifolium	
Argyrolobium lotoides	*Argyrolobium lotoides*	*Argyrolobium lotoides*
	Argyrolobium lunare* subsp. *lunare	
Argyrolobium lunare subsp. *sericeum*	*Argyrolobium lunare* subsp. *sericeum*	*Argyrolobium lunare* subsp. *sericeum*
Argyrolobium marginatum	*Argyrolobium marginatum*	
	Argyrolobium megarrhizum	
Argyrolobium molle	*Argyrolobium molle*	*Argyrolobium molle*
	Argyrolobium muddii	
Argyrolobium nanum		
Argyrolobium nigrescens		
	Argyrolobium parviflorum	
Argyrolobium pauciflorum	*Argyrolobium pauciflorum*	*Argyrolobium pauciflorum*
		Argyrolobium petiolare
	Argyrolobium polyphyllum	
Argyrolobium pseudotuberosum	*Argyrolobium pseudotuberosum*	
	Argyrolobium pumilum	*Argyrolobium pumilum*
		Argyrolobium rarum
	Argyrolobium rotundifolium	
Argyrolobium rupestre subsp. *rupestre*	*Argyrolobium rupestre* subsp. *rupestre*	*Argyrolobium rupestre* subsp. *rupestre*
Argyrolobium sankeyi		
Argyrolobium sericosemium	*Argyrolobium sericosemium*	
Argyrolobium speciosum	*Argyrolobium speciosum*	*Argyrolobium speciosum*
	Argyrolobium splendens	
Argyrolobium stipulaceum	*Argyrolobium stipulaceum*	
Argyrolobium tomentosum	*Argyrolobium tomentosum*	*Argyrolobium tomentosum*
Argyrolobium transvaalense	*Argyrolobium transvaalense*	*Argyrolobium transvaalense*
	Argyrolobium trifoliatum	*Argyrolobium trifoliatum*
Argyrolobium tuberosum	*Argyrolobium tuberosum*	*Argyrolobium tuberosum*
Argyrolobium velutinum	*Argyrolobium velutinum*	*Argyrolobium velutinum*
Argyrolobium wilmsii	*Argyrolobium wilmsii*	*Argyrolobium wilmsii*

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7.3.3.6 Tribe: Dalbergieae

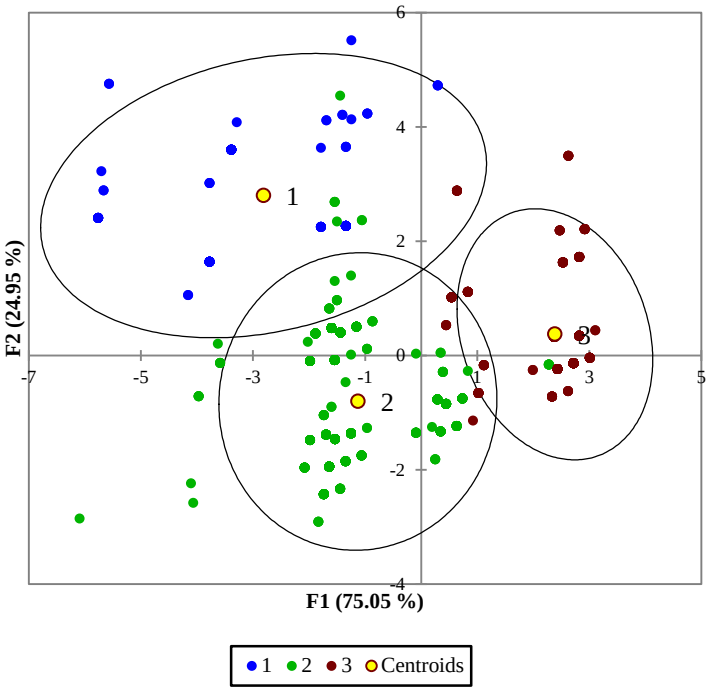

Figure 7.17. Discriminant Analysis for the tribe Dalbergieae. Dots represent species; circles represent groups.

Genera of the tribe Dalbergieae are *Aeschynomene*, *Dalbergia*, *Kotschya*, *Ormocarpum*, *Pterocarpus*, *Smithia*, *Stylosanthes*, and *Zornia*. From Figure 7.17 it is evident that three overlapping groups were formed to distinguish between the distribution patterns of species contained in the tribe. F1 explains 75.05% and F2 24.95% of the independent variables.

Table 7.33. Correlation matrix between climate and soil variables for the tribe Dalbergieae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.994**	-0.025
TempMin	0.109	0.379
TempMax	-0.448	0.028
Phosphorus	-0.382	0.218
pH	-0.503	**0.841**

Values in bold are different from 0 with a significance level alpha=0.05.

The mean annual rainfall and soil pH levels are indicated as the main drivers for species being divided into three groups (Table 7.33). Species listed in Group 3 are adapted to high

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mean annual rainfall compared to those listed in Groups 1 and 2 and species listed in Group 1 to higher soil pH levels compared to those listed in Groups 2 and 3.

The presence of the three species of *Aeschynomene* in only one group is due to low occurrences. *Aeschynomene* species occur mainly in the Lowveld and Mesic Highveld Grassland and *Dalbergia* species in the Lowveld and Indian Ocean Coastal Belt Bioregions. The two species have similar range of tolerances, with a mean annual rainfall of >800 mm and soil pH<6.4. *Kotschya* species are found mainly in ecotonal regions with a mean annual rainfall of >800 mm and soil pH<6.4. *Ormocarpum* species occur mainly in the Lowveld and Central Bushveld, with a mean annual rainfall of 400–800 mm and soil pH of 5.5–7.4. *Pterocarpus* species are found mainly in the Central Bushveld and Lowveld, and *Stylosanthes fruticosa* in the Central Bushveld. Both genera are adapted to a mean annual rainfall of 400–800 mm and soil pH<6.4. *Smithia erubescens* is found mainly in the Mesic Highveld Grassland with a mean annual rainfall of >800 mm and soil pH<6.4. Finally, *Zornia* species are found mainly in the Central Bushveld and Mesic Highveld Grassland Bioregions with a mean annual rainfall of 400–800 mm and soil pH<6.4.

Table 7.34. Species of the tribe Dalbergieae clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR; Lower soil pH**	**Group 3** **Higher MAR; Intermediate soil pH**
Aeschynomene indica	*Aeschynomene indica*	*Aeschynomene indica*
	Aeschynomene micrantha	*Aeschynomene micrantha*
Aeschynomene nodulosa* var. *glabrescens		
Aeschynomene nodulosa var. *nodulosa*	*Aeschynomene nodulosa* var. *nodulosa*	*Aeschynomene nodulosa* var. *nodulosa*
	Aeschynomene nyassana	*Aeschynomene nyassana*
Aeschynomene rehmannii var. *leptobotrya*	*Aeschynomene rehmannii* var. *leptobotrya*	*Aeschynomene rehmannii* var. *leptobotrya*
	Aeschynomene rehmannii var. *rehmannii*	*Aeschynomene rehmannii* var. *rehmannii*
	Aeschynomene rhodesiaca	
		Aeschynomene uniflora* var. *uniflora
Dalbergia armata	*Dalbergia armata*	*Dalbergia armata*
Dalbergia melanoxylon	*Dalbergia melanoxylon*	*Dalbergia melanoxylon*
	Dalbergia multijuga	*Dalbergia multijuga*
Dalbergia nitidula	*Dalbergia nitidula*	*Dalbergia nitidula*
Dalbergia obovata	*Dalbergia obovata*	*Dalbergia obovata*
Kotschya parvifolia	*Kotschya parvifolia*	*Kotschya parvifolia*
	Kotschya thymodora subsp. *thymodora*	*Kotschya thymodora* subsp. *thymodora*
Ormocarpum kirkii	*Ormocarpum kirkii*	*Ormocarpum kirkii*
Ormocarpum trichocarpum	*Ormocarpum trichocarpum*	*Ormocarpum trichocarpum*
Pterocarpus angolensis	*Pterocarpus angolensis*	*Pterocarpus angolensis*
Pterocarpus lucens subsp. *antunesii*	*Pterocarpus lucens* subsp. *antunesii*	
Pterocarpus rotundifolius subsp. *rotundifolius*	*Pterocarpus rotundifolius* subsp. *rotundifolius*	*Pterocarpus rotundifolius* subsp. *rotundifolius*

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Group 1 Lower MAR; Higher soil pH	Group 2 Intermediate MAR; Lower soil pH	Group 3 Higher MAR; Intermediate soil pH
	Smithia erubescens	*Smithia erubescens*
Stylosanthes fruticosa	*Stylosanthes fruticosa*	*Stylosanthes fruticosa*
Zornia capensis subsp. *capensis*	*Zornia capensis* subsp. *capensis*	*Zornia capensis* subsp. *capensis*
Zornia glochidiata	*Zornia glochidiata*	*Zornia glochidiata*
Zornia linearis	*Zornia linearis*	*Zornia linearis*
Zornia milneana	*Zornia milneana*	*Zornia milneana*

7.3.3.7 Tribe: Hypocalypteae

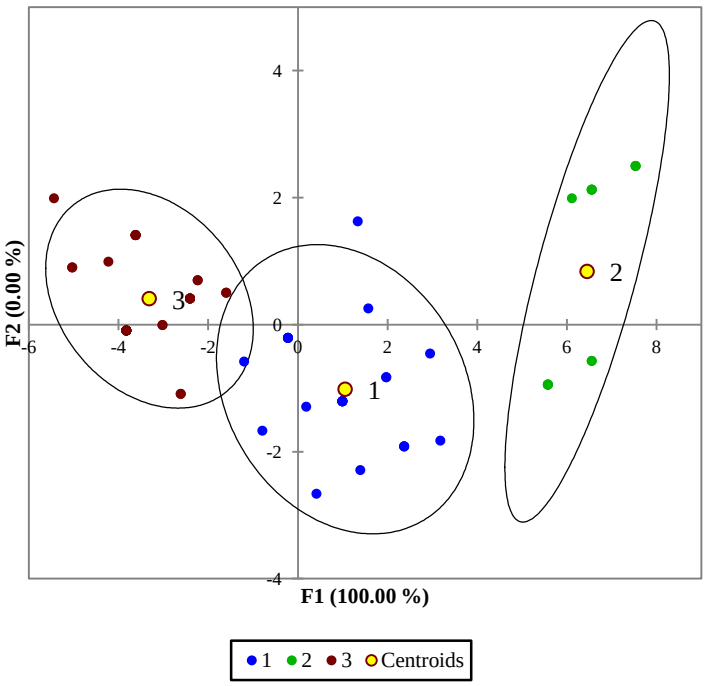

Figure 7.18. Discriminant Analysis for the tribe Hypocalypteae. Dots represent species; circles represent groups.

The tribe Hypocalypteae contains one genus, *Hypocalyptus*. Even though there are only three species, Figure 7.18 indicates that species listed in Group 2 do not overlap with the other groups and are therefore uniquely adapted to the given variables. F1 explains 100% of the independent variables.

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Table 7.35. Correlation matrix between climate and soil variables for the tribe Hypocalypteae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**-0.927**	0.245
TempMin	-0.153	0.426
TempMax	0.857	0.131
Phosphorus	0.611	**0.612**
pH	**0.946**	0.139

Values in bold are different from 0 with a significance level alpha=0.05.

Table 7.35 shows that species are highly correlated with soil pH and mean annual rainfall (negative). All three species are present in all the groups, indicating that *Hypocalyptus* species are widely adapted to mean annual rainfall and soil pH levels that prevail in the Fynbos Biome where it occurs. *Hypocalyptus sophoroides* occurs mostly at a mean annual rainfall lower than 400 mm and *H. coluteoides* and *H. oxalidifolius* are found mainly at 600–1000 mm.

Hypocalyptus species occur mainly in the Eastern Fynbos Renosterveld Bioregion, with a phosphorus level of 5–35 $mgkg^{-1}$ and a soil pH< 6.4.

Table 7.36. Species of the tribe Hypocalypteae clustered in three groups. MAR=Mean annual rainfall, P=Phosphorus.

Group 1 **Intermediate MAR and pH; Lower soil P**	**Group 2** **Lower MAR; Higher soil pH**	**Group 3** **Higher MAR; Lower soil pH**
Hypocalyptus coluteoides	*Hypocalyptus coluteoides*	*Hypocalyptus coluteoides*
Hypocalyptus oxalidifolius	*Hypocalyptus oxalidifolius*	*Hypocalyptus oxalidifolius*
Hypocalyptus sophoroides	*Hypocalyptus sophoroides*	*Hypocalyptus sophoroides*

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7.3.3.8 Tribe: Indigofereae

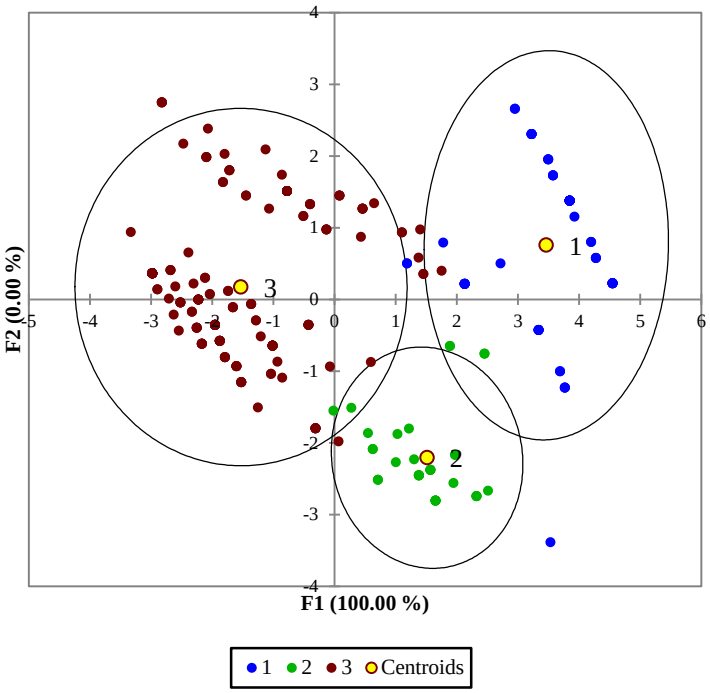

Figure 7.19. Discriminant Analysis for the tribe Indigofereae. Dots represent species; circles represent groups.

Four genera are contained in the tribe Indigofereae, namely *Cyamopsis*, *Indigastrum*, *Indigofera* and *Microcharis*. *Indigofera* totals 196 species and was therefore analysed separately. Figure 7.19 shows three overlapping groups, with F1 explaining 100% of the independent variables.

Table 7.37. Correlation matrix between climate and soil variables for the tribe Indigofereae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**-0.890**	0.090
TempMin	-0.187	0.722
TempMax	0.717	-0.092
Phosphorus	0.728	**0.659**
pH	**0.969**	0.055

Values in bold are different from 0 with a significance level alpha=0.05.

The correlation matrix of the independent variables is shown in Table 7.37. A high correlation with mean annual rainfall and soil pH is evident. Phosphorus is also indicated as being correlated with the distribution patterns of species of the Indigofereae. Species listed in

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Group 3 are adapted to high mean annual rainfall and low soil pH levels as opposed to those listed in Group 1. *Indigastrum argyroides* and *Microcharis galpinii* show many occurrences (Chapter 5: Inventory) but are present only in Group 1 and Group 3 respectively. The former species is adapted to low mean annual rainfall and high soil pH levels and the latter to opposite levels. Species listed in Group 2 (mainly *Indigastrum* species) are adapted to lower phosphorus levels (F2) as opposed to those in the other two groups. The two *Indigastrum* species not recorded in the intermediate group are widely distributed, even at low soil phosphorus levels, and it is therefore difficult to explain their absence from this group.

Cyamopsis species are found mainly in the Bushmanland and Eastern Kalahari Bushveld Bioregions at a low mean annual rainfall of <400 mm, a phosphorus level of <10 $mgkg^{-1}$ and a soil pH level of >7.5. *Indigastrum* species are found mainly in the Central Bushveld followed by the Eastern Kalahari Bushveld Bioregion and are adapted to a mean annual rainfall of 400–800 mm, a phosphorus level of <10 $mgkg^{-1}$ and a pH<6.4. *Microcharis* species are found mainly in Lowveld Bioregion, adapted to a mean annual rainfall >800 mm, a phosphorus level of <10 $mgkg^{-1}$ and a soil pH<6.4.

Table 7.38. Species of the tribe Indigofereae clustered in three groups. Species in bold present in one group only, '-' no intermediate occurrence. MAR=Mean annual rainfall, P=Phosphorus.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR and soil pH; Lower soil P**	**Group 3** **Higher MAR; Lower soil pH**
Cyamopsis dentata *Cyamopsis serrata* *Indigastrum argyraeum* ***Indigastrum argyroides*** *Indigastrum burkeanum* *Indigastrum costatum* subsp. *macrum* *Indigastrum fastigiatum* ***Microcharis disjuncta* var. *disjuncta***	 *Cyamopsis serrata* *Indigastrum argyraeum* - *Indigastrum costatum* subsp. *macrum* - *Indigastrum parviflorum* subsp. *parviflorum* var. *parviflorum*	 *Indigastrum argyraeum* *Indigastrum burkeanum* ***Indigastrum candidissimum*** *Indigastrum costatum* subsp. *macrum* *Indigastrum fastigiatum* *Indigastrum parviflorum* subsp. *parviflorum* var. *parviflorum* ***Microcharis galpinii*** ***Microcharis latifolia***

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7.3.3.8.1 Genus: *Indigofera*

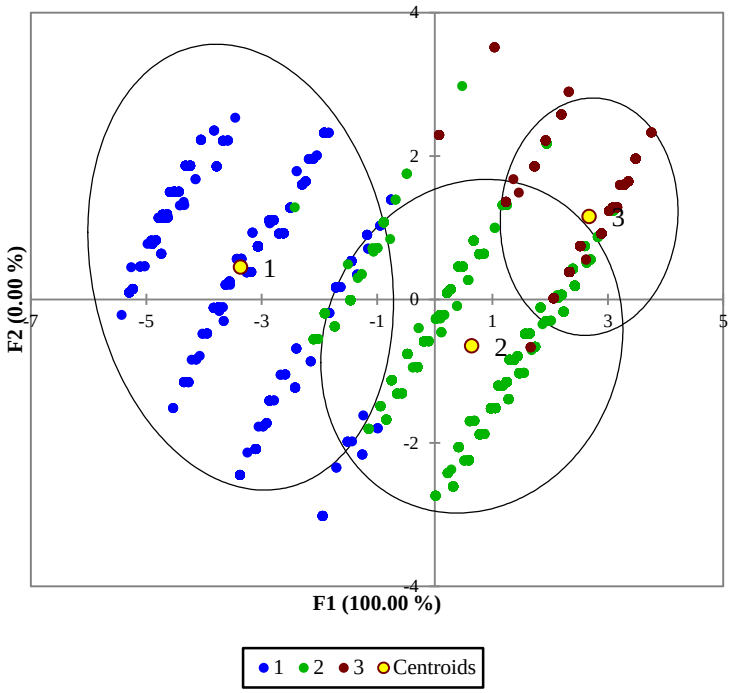

Figure 7.20. Discriminant Analysis for the genus *Indigofera*. Dots represent species; circles represent groups.

The results of the discriminant analysis for the species of *Indigofera* are shown in Figure 7.20. Three largely overlapping groups are identified, with F1 explaining 100% of the independent variables. There is a clear linear trend in the arrangement of the species in the three groups.

Table 7.39. Correlation matrix between climate and soil variables for the genus *Indigofera*.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.894**	0.311
TempMin	0.195	0.471
TempMax	-0.471	0.083
Phosphorus	-0.417	0.318
pH	**-0.932**	0.360

Values in bold are different from 0 with a significance level alpha=0.05.

A high correlation with mean annual rainfall and soil pH is evident for *Indigofera* species in Table 7.39. Species listed in Group 1 are adapted to low mean annual rainfall and high soil

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pH levels, while those listed in Group 3 are adapted to opposite levels. Species such as *Indigofera auricoma* and *I. exigua* are listed only in Group 1, but have several occurrences in the Kalahari Duneveld and Namaqualand Hardeveld Bioregions respectively. These species are therefore narrowly adapted to given climatic conditions. *Indigofera floribunda* is not recorded in the intermediate group (Group 2) probably because of relatively wide distribution patterns but low occurrences (compare species distribution in Chapter 5: Inventory).

Overall, *Indigofera* species are found mostly in the Central Bushveld and Mesic Highveld Grassland Bioregions and fall in the 400–800 mm mean annual rainfall regions and a soil pH level of <6.4.

Table 7.40. Species of the genus *Indigofera* clustered in three groups. Species in bold present in one group only, '-' no intermediate occurrence. MAR=Mean annual rainfall.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR and soil pH**	**Group 3** **Higher MAR; Lower soil pH**
Indigofera adenoides	*Indigofera adenoides*	*Indigofera adenoides*
Indigofera alopecuroides var. *alopecuroides*	*Indigofera alopecuroides* var. *alopecuroides*	*Indigofera alopecuroides* var. *alopecuroides*
Indigofera alopecuroides var. *minor*	*Indigofera alopecuroides* var. *minor*	*Indigofera alopecuroides* var. *minor*
Indigofera alpina	*Indigofera alpina*	*Indigofera alpina*
Indigofera alternans var. *alternans*	*Indigofera alternans* var. *alternans*	*Indigofera alternans* var. *alternans*
	Indigofera amitina	*Indigofera amitina*
Indigofera amoena	*Indigofera amoena*	
Indigofera angustata	*Indigofera angustata*	
Indigofera angustifolia var. *angustifolia*	*Indigofera angustifolia* var. *angustifolia*	*Indigofera angustifolia* var. *angustifolia*
Indigofera angustifolia var. *tenuifolia*	*Indigofera angustifolia* var. *tenuifolia*	*Indigofera angustifolia* var. *tenuifolia*
Indigofera aquae-nitentis		
Indigofera arrecta	*Indigofera arrecta*	*Indigofera arrecta*
Indigofera astragalina	*Indigofera astragalina*	*Indigofera astragalina*
	Indigofera atrata	*Indigofera atrata*
Indigofera auricoma		
Indigofera bainesii	*Indigofera bainesii*	
Indigofera brachystachya	*Indigofera brachystachya*	*Indigofera brachystachya*
	Indigofera buchananii	*Indigofera buchananii*
Indigofera burchellii	*Indigofera burchellii*	
	Indigofera candicans	*Indigofera candicans*
Indigofera candolleana	*Indigofera candolleana*	*Indigofera candolleana*
Indigofera capillaris	*Indigofera capillaris*	*Indigofera capillaris*
Indigofera charlieriana var. *charlieriana*	*Indigofera charlieriana* var. *charlieriana*	
Indigofera charlieriana* var. *lata		
Indigofera charlieriana var. *scaberrima*	*Indigofera charlieriana* var. *scaberrima*	*Indigofera charlieriana* var. *charlieriana*
Indigofera circinnata	*Indigofera circinnata*	
	Indigofera colutea var. *colutea*	*Indigofera colutea* var. *colutea*
Indigofera commixta	*Indigofera commixta*	
Indigofera comosa	*Indigofera comosa*	*Indigofera comosa*
Indigofera complicata	*Indigofera complicata*	
Indigofera concava	*Indigofera concava*	
	Indigofera confusa	*Indigofera confusa*

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Group 1 Lower MAR; Higher soil pH	Group 2 Intermediate MAR and soil pH	Group 3 Higher MAR; Lower soil pH
		Indigofera crebra
Indigofera cryptantha var. *cryptantha*	*Indigofera cryptantha* var. *cryptantha*	*Indigofera cryptantha* var. *cryptantha*
Indigofera cryptantha var. *occidentalis*	*Indigofera cryptantha* var. *occidentalis*	
Indigofera cuneifolia var. *cuneifolia*	*Indigofera cuneifolia* var. *cuneifolia*	*Indigofera cuneifolia* var. *cuneifolia*
	Indigofera cytisoides	*Indigofera cytisoides*
Indigofera daleoides var. *daleoides*	*Indigofera daleoides* var. *daleoides*	
Indigofera daleoides var. *gossweileri*	*Indigofera daleoides* var. *gossweileri*	
Indigofera damarana		
Indigofera declinata	*Indigofera declinata*	*Indigofera declinata*
	Indigofera delagoaensis	
	Indigofera densa	*Indigofera densa*
Indigofera denudata	*Indigofera denudata*	
Indigofera depressa	*Indigofera depressa*	*Indigofera depressa*
Indigofera digitata	*Indigofera digitata*	*Indigofera digitata*
Indigofera dillwynioides	*Indigofera dillwynioides*	
Indigofera dimidiata	*Indigofera dimidiata*	*Indigofera dimidiata*
Indigofera disticha	*Indigofera disticha*	
Indigofera dolichothyrsa		
	Indigofera dregeana	*Indigofera dregeana*
Indigofera egens	*Indigofera egens*	
	Indigofera elandsbergensis	
	Indigofera enormis	*Indigofera enormis*
Indigofera eriocarpa	*Indigofera eriocarpa*	*Indigofera eriocarpa*
	Indigofera evansiana	
	Indigofera evansii	
Indigofera exigua		
	Indigofera filicaulis	*Indigofera filicaulis*
Indigofera filifolia	*Indigofera filifolia*	*Indigofera filifolia*
	Indigofera filiformis	*Indigofera filiformis*
Indigofera filipes	*Indigofera filipes*	*Indigofera filipes*
Indigofera flabellata	*Indigofera flabellata*	*Indigofera flabellata*
Indigofera flavicans	*Indigofera flavicans*	
Indigofera floribunda	-	*Indigofera floribunda*
	Indigofera foliosa	*Indigofera foliosa*
Indigofera frondosa	*Indigofera frondosa*	*Indigofera frondosa*
Indigofera frutescens	*Indigofera frutescens*	*Indigofera frutescens*
	Indigofera galpinii	*Indigofera galpinii*
Indigofera gifbergensis	*Indigofera gifbergensis*	
Indigofera glaucescens	*Indigofera glaucescens*	*Indigofera glaucescens*
Indigofera glomerata	*Indigofera glomerata*	*Indigofera glomerata*
	Indigofera gracilis	*Indigofera gracilis*
		Indigofera grata
	Indigofera grisophylla	
	Indigofera guthriei	*Indigofera guthriei*
Indigofera hamulosa	*Indigofera hamulosa*	*Indigofera hamulosa*
Indigofera hantamensis		
Indigofera hedyantha	*Indigofera hedyantha*	*Indigofera hedyantha*
		Indigofera hendecaphylla
Indigofera heterophylla	*Indigofera heterophylla*	*Indigofera heterophylla*
Indigofera heterotricha	*Indigofera heterotricha*	*Indigofera heterotricha*
Indigofera hilaris var. *hilaris*	*Indigofera hilaris* var. *hilaris*	*Indigofera hilaris* var. *hilaris*
	Indigofera hirsuta* var. *hirsuta	
Indigofera hispida	*Indigofera hispida*	*Indigofera hispida*
Indigofera hochstetteri subsp.	*Indigofera hochstetteri* subsp.	

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Group 1 Lower MAR; Higher soil pH	Group 2 Intermediate MAR and soil pH	Group 3 Higher MAR; Lower soil pH
streyana	*streyana*	
Indigofera hololeuca	*Indigofera hololeuca*	
Indigofera holubii	*Indigofera holubii*	*Indigofera holubii*
	Indigofera homblei subsp. *homblei*	*Indigofera homblei* subsp. *homblei*
Indigofera humifusa	*Indigofera humifusa*	*Indigofera humifusa*
	Indigofera hybrida	
Indigofera incana	*Indigofera incana*	*Indigofera incana*
Indigofera ingrata	*Indigofera ingrata*	
Indigofera inhambanensis	*Indigofera inhambanensis*	*Indigofera inhambanensis*
	Indigofera inyangana	
	Indigofera ionii	*Indigofera ionii*
Indigofera jucunda	*Indigofera jucunda*	*Indigofera jucunda*
	Indigofera krookii	
Indigofera langebergensis	*Indigofera langebergensis*	
Indigofera laxeracemosa	*Indigofera laxeracemosa*	
Indigofera leendertziae	*Indigofera leendertziae*	
		Indigofera lepida
Indigofera leptocarpa	*Indigofera leptocarpa*	*Indigofera leptocarpa*
	Indigofera longibarbata	*Indigofera longibarbata*
Indigofera lupatana	*Indigofera lupatana*	*Indigofera lupatana*
Indigofera lyalli subsp. *lyalli*	*Indigofera lyalli* subsp. *lyalli*	*Indigofera lyalli* subsp. *lyalli*
Indigofera lydenbergensis	*Indigofera lydenbergensis*	*Indigofera lydenbergensis*
Indigofera maritima		
	Indigofera masonae	*Indigofera masonae*
Indigofera mauritanica	*Indigofera mauritanica*	*Indigofera mauritanica*
Indigofera melanadenia	*Indigofera melanadenia*	*Indigofera melanadenia*
Indigofera meyeriana	*Indigofera meyeriana*	
	Indigofera micrantha	*Indigofera micrantha*
	Indigofera mollicoma	*Indigofera mollicoma*
	Indigofera mollis	*Indigofera mollis*
	Indigofera monostachya	*Indigofera monostachya*
Indigofera mundiana	-	*Indigofera mundiana*
	Indigofera natalensis	*Indigofera natalensis*
Indigofera nebrowniana	*Indigofera nebrowniana*	
	Indigofera neglecta	*Indigofera neglecta*
Indigofera nigromontana	*Indigofera nigromontana*	*Indigofera nigromontana*
Indigofera nudicaulis		
Indigofera obcordata		
Indigofera obscura	*Indigofera obscura*	*Indigofera obscura*
Indigofera ormocarpoides	*Indigofera ormocarpoides*	*Indigofera ormocarpoides*
Indigofera ovata	*Indigofera ovata*	*Indigofera ovata*
Indigofera ovina	*Indigofera ovina*	
Indigofera oxalidea	*Indigofera oxalidea*	*Indigofera oxalidea*
Indigofera oxytropis	*Indigofera oxytropis*	*Indigofera oxytropis*
Indigofera pappei	*Indigofera pappei*	*Indigofera pappei*
Indigofera pauciflora		
Indigofera pechuelii		
	Indigofera placida	*Indigofera placida*
Indigofera platypoda		
	Indigofera podophylla	*Indigofera podophylla*
Indigofera poliotes	*Indigofera poliotes*	
Indigofera pongolana	*Indigofera pongolana*	
Indigofera porrecta var. *porrecta*	*Indigofera porrecta* var. *porrecta*	*Indigofera porrecta* var. *porrecta*
Indigofera praticola	*Indigofera praticola*	
Indigofera procumbens	*Indigofera procumbens*	*Indigofera procumbens*
	Indigofera pseudoevansii	
Indigofera psoraloides	*Indigofera psoraloides*	*Indigofera psoraloides*
Indigofera pungens	*Indigofera pungens*	

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Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR and soil pH**	**Group 3** **Higher MAR; Lower soil pH**
	Indigofera quinquefolia	
Indigofera racemosa	*Indigofera racemosa*	*Indigofera racemosa*
	Indigofera reducta	
	Indigofera rehmannii	
Indigofera rhodantha	*Indigofera rhodantha*	*Indigofera rhodantha*
Indigofera rhytidocarpa subsp. *rhytidocarpa*	*Indigofera rhytidocarpa* subsp. *rhytidocarpa*	*Indigofera rhytidocarpa* subsp. *rhytidocarpa*
	Indigofera ripae	*Indigofera ripae*
	Indigofera rostrata	*Indigofera rostrata*
		Indigofera rubroglandulosa
Indigofera sanguinea	*Indigofera sanguinea*	*Indigofera sanguinea*
Indigofera sarmentosa	*Indigofera sarmentosa*	*Indigofera sarmentosa*
Indigofera schimperi* var. *baukeana		
Indigofera schimperi var. *schimperi*	*Indigofera schimperi* var. *schimperi*	*Indigofera schimperi* var. *schimperi*
Indigofera schinzii	*Indigofera schinzii*	*Indigofera schinzii*
Indigofera sessilifolia	*Indigofera sessilifolia*	*Indigofera sessilifolia*
Indigofera setiflora	*Indigofera setiflora*	*Indigofera setiflora*
	Indigofera setosa	*Indigofera setosa*
Indigofera sordida	*Indigofera sordida*	
	Indigofera spicata var. *spicata*	*Indigofera spicata* var. *spicata*
Indigofera stricta	*Indigofera stricta*	*Indigofera stricta*
Indigofera subcorymbosa var. *subcorymbosa*	*Indigofera subcorymbosa* var. *subcorymbosa*	
Indigofera sulcata	*Indigofera sulcata*	*Indigofera sulcata*
	Indigofera superba	*Indigofera superba*
Indigofera swaziensis var. *perplexa*	*Indigofera swaziensis* var. *perplexa*	*Indigofera swaziensis* var. *perplexa*
Indigofera swaziensis var. *swaziensis*	*Indigofera swaziensis* var. *swaziensis*	*Indigofera swaziensis* var. *swaziensis*
	Indigofera tenuissima	*Indigofera tenuissima*
Indigofera thesioides		
	Indigofera tinctoria* var. *arcuata	
Indigofera tomentosa	*Indigofera tomentosa*	*Indigofera tomentosa*
	Indigofera torulosa var. *angustiloba*	*Indigofera torulosa* var. *angustiloba*
Indigofera torulosa var. *torulosa*	*Indigofera torulosa* var. *torulosa*	*Indigofera torulosa* var. *torulosa*
	Indigofera trifolioides	*Indigofera trifolioides*
	Indigofera triquetra	
	Indigofera tristis	*Indigofera tristis*
Indigofera tristoides	*Indigofera tristoides*	*Indigofera tristoides*
Indigofera trita subsp. *scabra*	*Indigofera trita* subsp. *scabra*	*Indigofera trita* subsp. *scabra*
Indigofera trita subsp. *subulata*	*Indigofera trita* subsp. *subulata*	*Indigofera trita* subsp. *subulata*
	Indigofera velutina	*Indigofera velutina*
Indigofera venusta	*Indigofera venusta*	
Indigofera verrucosa	*Indigofera verrucosa*	*Indigofera verrucosa*
Indigofera vicioides var. *rogersii*	*Indigofera vicioides* var. *rogersii*	*Indigofera vicioides* var. *rogersii*
Indigofera vicioides var. *vicioides*	*Indigofera vicioides* var. *vicioides*	*Indigofera vicioides* var. *vicioides*
	Indigofera williamsonii	*Indigofera williamsonii*
		Indigofera woodii* var. *laxa
Indigofera woodii var. *woodii*	*Indigofera woodii* var. *woodii*	*Indigofera woodii* var. *woodii*
Indigofera zeyheri	*Indigofera zeyheri*	*Indigofera zeyheri*

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7.3.3.9 Tribe: Millettieae

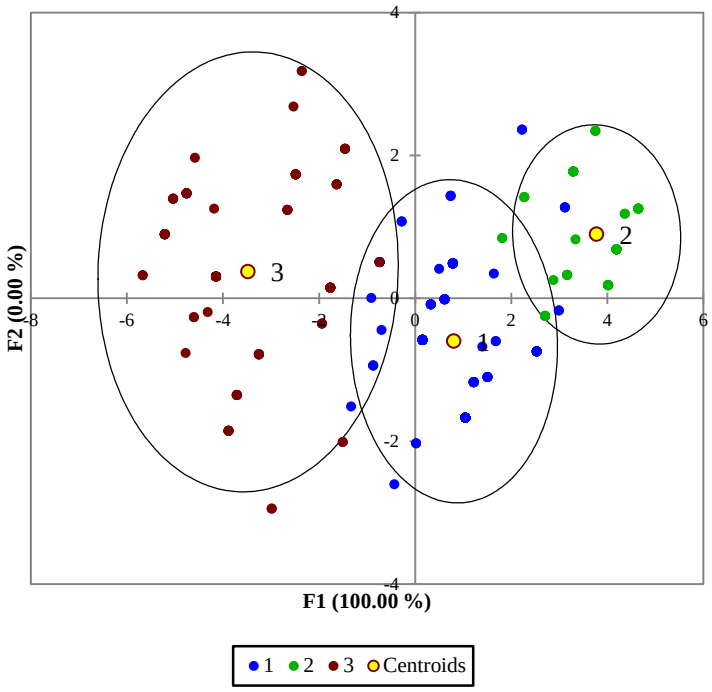

Figure 7.21. Discriminant Analysis for the tribe Millettieae. Dots represent species; circles represent groups.

Genera contained in the tribe Millettieae are *Craibia*, *Millettia*, *Mundulea*, *Philenoptera*, *Ptycholobium*, *Requienia*, *Tephrosia* and *Xeroderris*. The 62 *Tephrosia* species were analysed separately. Figure 7.21 shows that three overlapping groups are identified, with F1 explaining 100% of the independent variables.

Table 7.41. Correlation matrix between climate and soil variables for the tribe Millettieae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.958**	0.226
TempMin	0.305	0.342
TempMax	**-0.633**	-0.315
Phosphorus	-0.408	0.361
pH	**-0.870**	0.481

Values in bold are different from 0 with a significance level alpha=0.05.

Mean annual rainfall, mean annual maximum temperature (negative) and soil pH (negative) are indicated as drivers for the distribution patterns of the seven genera, excluding *Tephrosia*,

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in the tribe Millettieae. Species listed in Group 3 are adapted to low mean annual rainfall and high mean annual maximum temperatures and soil pH levels, while those listed in Group 2 are adapted to opposite levels.

Craibia zimmermannii is found mainly in the Indian Ocean Coastal Belt and Lowveld Bioregions, adapted to a mean annual rainfall of 400–800 mm, a mean annual maximum temperature of 27–35ºC and a soil pH level of 5.5–7.4. *Millettia grandis* occur mainly in the Indian Ocean Coastal Belt Bioregion, adapted to a mean annual rainfall of >800 mm, mean annual maximum temperatures of 25–29ºC and a soil pH<6.4. *Philenoptera* species are found mainly in the Lowveld Bioregion, adapted to a mean annual rainfall of 400–800 mm, a mean annual maximum temperature of 27–35ºC and a soil pH <6.4. *Ptycholobium* species are found mainly in the Central Bushveld Bioregion, adapted to a mean annual rainfall of <400 mm, a mean annual maximum temperature of 27–35ºC and a soil pH of 5.5–7.4. *Requienia* species are found mainly in the Eastern Kalahari Bushveld Bioregion, adapted to a mean annual rainfall of <400 mm, a mean annual maximum temperature of >33ºC and a soil pH>7.5. *Xeroderris stuhlmannii* is found mainly in the Mopane Bioregion, adapted to a mean annual rainfall of 200–600 mm, a mean annual maximum temperature of 27–35ºC and a soil pH of 6.5–7.4.

Table 7.42. Species of the tribe Millettieae clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall, MaxT=Mean annual maximum temperature.

Group 1 **Intermediate MAR, MaxT and soil pH**	**Group 2** **Higher MAR; Lower MaxT and soil pH**	**Group 3** **Lower MAR; Higher MaxT and soil pH**
	Craibia zimmermannii	
Millettia grandis	*Millettia grandis*	
Mundulea sericea subsp. *sericea*	*Mundulea sericea* subsp. *sericea*	*Mundulea sericea* subsp. *sericea*
Philenoptera bussei	*Philenoptera bussei*	
	Philenoptera sutherlandii	
Philenoptera violacea	*Philenoptera violacea*	*Philenoptera violacea*
Ptycholobium biflorum subsp. *biflorum*		*Ptycholobium biflorum* subsp. *biflorum*
Ptycholobium contortum		*Ptycholobium contortum*
Ptycholobium plicatum subsp. *plicatum*	*Ptycholobium plicatum* subsp. *plicatum*	*Ptycholobium plicatum* subsp. *plicatum*
Requienia pseudosphaerosperma	*Requienia pseudosphaerosperma*	*Requienia pseudosphaerosperma*
Requienia sphaerosperma		*Requienia sphaerosperma*
		Xeroderris stuhlmannii

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7.3.3.9.1 Genus: *Tephrosia*

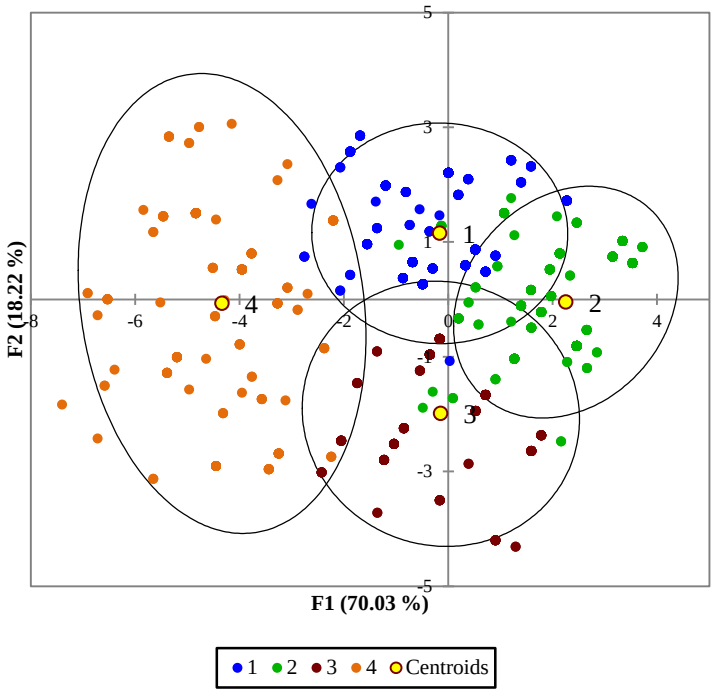

Figure 7.22. Discriminant Analysis for the genus *Tephrosia*. Dots represent species; circles represent groups.

Figure 7.22 shows that *Tephrosia* species are divided into four overlapping groups, with F1 explaining 70.03% and F2 18.22% of the independent variables.

Table 7.43. Correlation matrix between climate and soil variables for the genus *Tephrosia*.

Variables	F1	F2	F3
F1	1.000	0.000	0.000
F2	0.000	1.000	0.000
F3	0.000	0.000	1.000
AnnRain	**0.885**	-0.284	0.332
TempMin	0.403	**0.858**	0.264
TempMax	-0.359	0.472	0.107
Phosphorus	-0.264	0.372	0.210
pH	**-0.833**	0.244	0.484

Values in bold are different from 0 with a significance level alpha=0.05.

The drivers identified by the DA for the grouping of *Tephrosia* species are shown in Table 7.43. Mean annual rainfall, mean annual minimum temperature and soil pH (negative) are correlated with the distribution patterns of *Tephrosia* species. Species listed in Group 4 are

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adapted to low mean annual rainfall and high soil pH levels, while those listed in Group 2 (Table 7.44) are adapted to opposite levels. For the F2 axis, it appears that species listed in Group 3 are adapted to lower mean annual minimum temperatures than those listed in Group 1. *Tephrosia dregeana* var. *dregeana* occurs widely in the Bushmanland and Gariep Desert Bioregions, but is listed only in Group 4, indicating that this species is narrowly adapted to the given variables. *Tephrosia pondoensis* are not recorded in the intermediate groups (Groups 1 and 3) probably because of relatively wide distribution patterns but low occurrences (compare species distribution in Chapter 5: Inventory).

Overall, *Tephrosia* species are found mainly in the Central Bushveld, followed by the Lowveld Bioregions, adapted to a mean annual rainfall of 400–800 mm, a mean annual maximum temperature of 25–29ºC and a soil pH<6.4.

Table 7.44. Species of the genus *Tephrosia* clustered in four groups. Species in bold present in one group only, '-' no intermediate occurrence. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature.

Group 1 Intermediate MAR and soil pH; Higher TMin	**Group 2 Higher MAR; Lower soil pH**	**Group 3 Intermediate MAR and soil pH; Lower TMin**	**Group 4 Lower MAR; Higher soil pH**
Tephrosia acaciifolia	*Tephrosia acaciifolia*		
Tephrosia aequilata subsp. *australis*	*Tephrosia aequilata* subsp. *australis*		
	Tephrosia albissima subsp. *albissima*	*Tephrosia albissima* subsp. *albissima*	
Tephrosia albissima subsp. *zuluensis*	*Tephrosia albissima* subsp. *zuluensis*		*Tephrosia albissima* subsp. *zuluensis*
	Tephrosia bachmannii		
	Tephrosia brummittii		
Tephrosia burchellii	*Tephrosia burchellii*	*Tephrosia burchellii*	*Tephrosia burchellii*
Tephrosia capensis var. *acutifolia*	*Tephrosia capensis* var. *acutifolia*	*Tephrosia capensis* var. *acutifolia*	*Tephrosia capensis* var. *acutifolia*
Tephrosia capensis var. *angustifolia*	*Tephrosia capensis* var. *angustifolia*	*Tephrosia capensis* var. *angustifolia*	*Tephrosia capensis* var. *angustifolia*
Tephrosia capensis var. *capensis*	*Tephrosia capensis* var. *capensis*	*Tephrosia capensis* var. *capensis*	*Tephrosia capensis* var. *capensis*
Tephrosia capensis var. *hirsuta Harv.*	*Tephrosia capensis* var. *hirsuta*	*Tephrosia capensis* var. *hirsuta*	*Tephrosia capensis* var. *hirsuta*
Tephrosia capensis var. *longipetiolata*			*Tephrosia capensis* var. *longipetiolata*
Tephrosia cordata	*Tephrosia cordata*	*Tephrosia cordata*	
			Tephrosia dregeana* var. *dregeana
Tephrosia elongata var. *elongata*	*Tephrosia elongata* var. *elongata*	*Tephrosia elongata* var. *elongata*	*Tephrosia elongata* var. *elongata*
Tephrosia elongata var. *tzaneenensis*	*Tephrosia elongata* var. *tzaneenensis*		
Tephrosia euchroa	*Tephrosia euchroa*		*Tephrosia euchroa*
Tephrosia forbesii* subsp. *interior			
Tephrosia glomeruliflora subsp. *glomeruliflora*	*Tephrosia glomeruliflora* subsp. *glomeruliflora*		
Tephrosia glomeruliflora	*Tephrosia glomeruliflora*	*Tephrosia glomeruliflora*	*Tephrosia glomeruliflora*

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Group 1 Intermediate MAR and soil pH; Higher TMin	**Group 2 Higher MAR; Lower soil pH**	**Group 3 Intermediate MAR and soil pH; Lower TMin**	**Group 4 Lower MAR; Higher soil pH**
subsp. *meisneri*	subsp. *meisneri*	subsp. *meisneri*	subsp. *meisneri*
Tephrosia gobensis			
Tephrosia gracilenta	*Tephrosia gracilenta*		
Tephrosia grandiflora	*Tephrosia grandiflora*	*Tephrosia grandiflora*	*Tephrosia grandiflora*
	Tephrosia inandensis		
Tephrosia kraussiana	*Tephrosia kraussiana*		*Tephrosia kraussiana*
			Tephrosia limpopoensis
Tephrosia linearis	*Tephrosia linearis*		
Tephrosia longipes subsp. *longipes* var. *longipes*	*Tephrosia longipes* subsp. *longipes* var. *longipes*	*Tephrosia longipes* subsp. *longipes* var. *longipes*	*Tephrosia longipes* subsp. *longipes* var. *longipes*
Tephrosia lupinifolia	*Tephrosia lupinifolia*	*Tephrosia lupinifolia*	*Tephrosia lupinifolia*
	Tephrosia macropoda var. *diffusa*	*Tephrosia macropoda* var. *diffusa*	
Tephrosia macropoda var. *macropoda*	*Tephrosia macropoda* var. *macropoda*	*Tephrosia macropoda* var. *macropoda*	*Tephrosia macropoda* var. *macropoda*
Tephrosia marginella	*Tephrosia marginella*	*Tephrosia marginella*	
Tephrosia multijuga	*Tephrosia multijuga*	*Tephrosia multijuga*	*Tephrosia multijuga*
	Tephrosia natalensis subsp. *natalensis*	*Tephrosia natalensis* subsp. *natalensis*	
	Tephrosia natalensis subsp. *pseudocapitata*	*Tephrosia natalensis* subsp. *pseudocapitata*	
Tephrosia noctiflora	*Tephrosia noctiflora*		
Tephrosia pietersii			
Tephrosia polystachya var. *hirta*	*Tephrosia polystachya* var. *hirta*	*Tephrosia polystachya* var. *hirta*	*Tephrosia polystachya* var. *hirta*
Tephrosia polystachya var. *latifolia*	*Tephrosia polystachya* var. *latifolia*	*Tephrosia polystachya* var. *latifolia*	*Tephrosia polystachya* var. *latifolia*
	Tephrosia polystachya* var. *longidens		
Tephrosia polystachya var. *polystachya*	*Tephrosia polystachya* var. *polystachya*	*Tephrosia polystachya* var. *polystachya*	*Tephrosia polystachya* var. *polystachya*
-	*Tephrosia pondoensis*	-	*Tephrosia pondoensis*
Tephrosia pumila* var. *pumila			
Tephrosia purpurea subsp. *canescens*	*Tephrosia purpurea* subsp. *canescens*		
			Tephrosia purpurea* subsp. *leptostachya* var. *delagoensis
Tephrosia purpurea subsp. *leptostachya* var. *leptostachya*	*Tephrosia purpurea* subsp. *leptostachya* var. *leptostachya*	*Tephrosia purpurea* subsp. *leptostachya* var. *leptostachya*	*Tephrosia purpurea* subsp. *leptostachya* var. *leptostachya*
Tephrosia purpurea subsp. *leptostachya* var. *pubescens*		*Tephrosia purpurea* subsp. *leptostachya* var. *pubescens*	*Tephrosia purpurea* subsp. *leptostachya* var. *pubescens*
Tephrosia radicans	*Tephrosia radicans*		*Tephrosia radicans*
Tephrosia reptans var. *reptans*	*Tephrosia reptans* var. *reptans*		
Tephrosia retusa	*Tephrosia retusa*	*Tephrosia retusa*	*Tephrosia retusa*
Tephrosia rhodesica var. *evansii*	*Tephrosia rhodesica* var. *evansii*	*Tephrosia rhodesica* var. *evansii*	*Tephrosia rhodesica* var. *evansii*
Tephrosia rhodesica var. *rhodesica*	*Tephrosia rhodesica* var. *rhodesica*	*Tephrosia rhodesica* var. *rhodesica*	*Tephrosia rhodesica* var. *rhodesica*
Tephrosia semiglabra	*Tephrosia semiglabra*	*Tephrosia semiglabra*	*Tephrosia semiglabra*
Tephrosia shiluwanensis	*Tephrosia shiluwanensis*	*Tephrosia shiluwanensis*	*Tephrosia shiluwanensis*
Tephrosia subulata	*Tephrosia subulata*	*Tephrosia subulata*	*Tephrosia subulata*

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Group 1 Intermediate MAR and soil pH; Higher TMin	Group 2 Higher MAR; Lower soil pH	Group 3 Intermediate MAR and soil pH; Lower TMin	Group 4 Lower MAR; Higher soil pH
			Tephrosia uniflora* subsp. *uniflora
Tephrosia villosa subsp. *ehrenbergiana* var. *daviesii*	*Tephrosia villosa* subsp. *ehrenbergiana* var. *daviesii*		*Tephrosia villosa* subsp. *ehrenbergiana* var. *daviesii*
Tephrosia villosa subsp. *ehrenbergiana* var. *ehrenbergiana*	*Tephrosia villosa* subsp. *ehrenbergiana* var. *ehrenbergiana*	*Tephrosia villosa* subsp. *ehrenbergiana* var. *ehrenbergiana*	*Tephrosia villosa* subsp. *ehrenbergiana* var. *ehrenbergiana*
Tephrosia virgata	***Tephrosia vogelii***		*Tephrosia virgata*
Tephrosia zoutpansbergensis			*Tephrosia zoutpansbergensis*

7.3.3.10 Tribe: Abreae

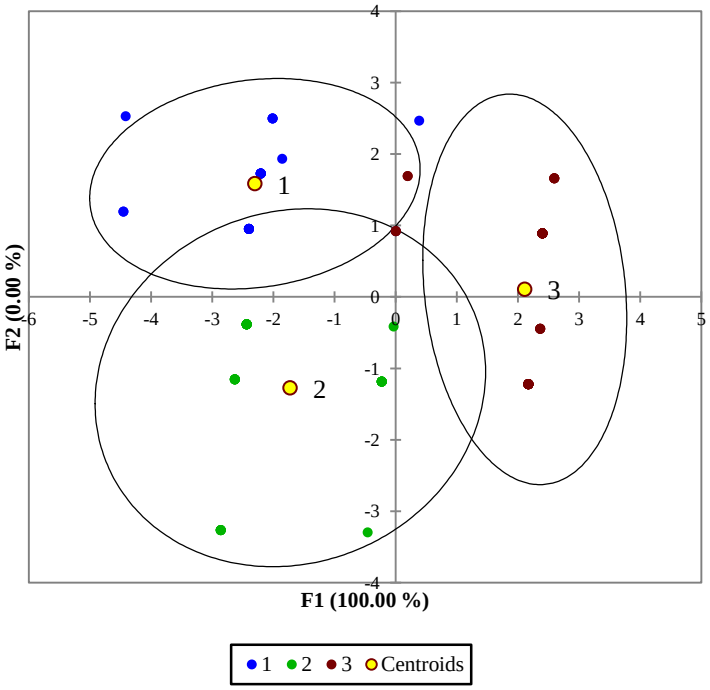

Figure 7.23. Discriminant Analysis for the tribe Abreae. Dots represent species; circles represent groups.

The tribe Abreae consists of only one genus, *Abrus*, with two representative species in the study area. Three overlapping groups are presented in Figure 7.23, with F1 explaining 100% of the independent variables.

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Table 7.45. Correlation matrix between climate and soil variables for the tribe Abreae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.996**	-0.084
TempMin	0.217	**0.908**
TempMax	-0.385	0.347
Phosphorus	-0.323	0.232
pH	-0.414	0.483

Values in bold are different from 0 with a significance level alpha=0.05.

From Table 7.45 it is evident that mean annual rainfall is the main driver for the distribution patterns of *Abrus* species. Even though the DA does not show that F2 explains any of the variation, a correlation with mean annual minimum temperature is evident in Table 7.45. Both *Abrus* species are present in all groups (Table 7.46) and are therefore adapted to the given variation in mean annual rainfall found in the Lowveld and Indian Ocean Coastal Belt Bioregions.

Abrus species are adapted mainly to a mean annual rainfall of >800 mm and mean annual minimum temperatures of 2–8ºC.

Table 7.46. Species of the tribe Abreae clustered in three groups. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature.

Group 1 **Lower MAR; Higher TMin**	**Group 2** **Lower MAR; Lower TMin**	**Group 3** **Higher MAR**
Abrus laevigatus *Abrus precatorius* subsp. *africanus*	*Abrus laevigatus* *Abrus precatorius* subsp. *africanus*	*Abrus laevigatus* *Abrus precatorius* subsp. *africanus*

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7.3.3.11 Tribe: Phaseoleae

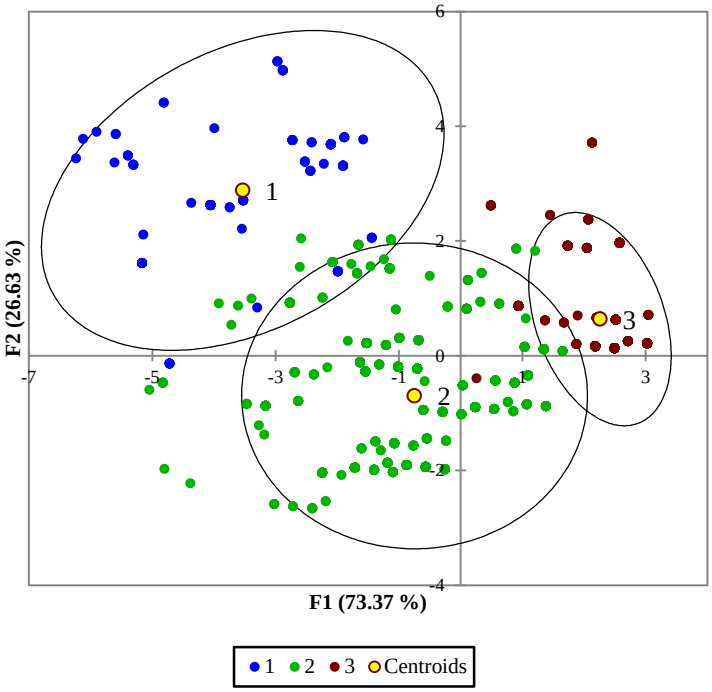

Figure 7.24. Discriminant Analysis for the tribe Phaseoleae. Dots represent species; circles represent groups.

The Phaseoleae is the largest tribe, containing genera *Alistilus*, *Bolusafra*, *Canavalia*, *Decorsea*, *Dipogon*, *Dolichos*, *Dumasia*, *Eriosema*, *Erythrina*, *Flemingia*, *Galactia*, *Lablab*, *Macrotyloma*, *Mucuna*, *Neonotonia*, *Neorautanenia*, *Ophrestia*, *Otoptera*, *Rhynchosia*, *Sphenostylis*, *Teramnus* and *Vigna*. *Eriosema* and *Rhynchosia* were analysed separately. From Figure 7.24 it is evident that three overlapping groups were identified, with F1 explaining 73.37% and F2 26.63% of the independent variables.

Table 7.47. Correlation matrix between climate and soil variables for the tribe Phaseoleae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.963**	0.126
TempMin	0.366	0.291
TempMax	-0.153	0.048
Phosphorus	-0.299	0.250
pH	-0.629	**0.758**

Values in bold are different from 0 with a significance level alpha=0.05.

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Mean annual rainfall and soil pH are the main drivers for the different distribution patterns of genera in Phaseoleae (Table 7.47). Species listed in Group 1 are adapted to low mean annual rainfall (F1) and to high soil pH levels (F2) (Table 7.48). The presence of species noted in only one group is due to a low occurrence. The absence of *Dolichos peglerae* from the intermediate group (Group 2) is probably due to relatively a wide distribution pattern but a low occurrence (compare species distribution in Chapter 5: Inventory).

Alistilus bechuanicus is found mainly in the Bushveld Bioregion with a mean annual rainfall of 400–800 mm and a soil pH<6.4. *Bolusafra bituminosa* is found in the Fynbos Biome with a mean annual rainfall that varies between 200–1000 mm and a soil pH<6.4. *Canavalia* species are found mainly in the Indian Ocean Coastal Belt Bioregion with a mean annual rainfall >800 mm and a soil pH<6.4. *Decorsea* species occur mainly in the Central Bushveld Bioregion with a mean annual rainfall 400–800 mm and a soil pH of 5.5–7.4. *Dipogon lignosus* is found mainly in the Eastern Fynbos Renosterveld Bioregion with a mean annual rainfall 200–800 mm and a soil pH<6.4. *Dolichos* species are found mainly in the Central Bushveld Bioregion with a mean annual rainfall 400–800 mm and a soil pH<6.4. *Dumasia villosa* var. *villosa* is found mainly in ecoregions in the northern parts of the study area with a mean annual rainfall >800 mm and a soil pH<6.4. *Erythrina* species are found mainly in the Lowveld Bioregion with a mean annual rainfall 400–800 mm and a soil pH<6.4. *Flemingia grahamiana* is found mainly in ecoregions (northern Afromontane) with a mean annual rainfall >800 mm and a soil pH<6.4. *Galactia tenuiflora* var. *villosa* is found mainly in the Lowveld Bioregion with a mean annual rainfall of 600–1000 mm and a soil pH<6.4. *Lablab purpureus* subsp. *uncinatus* occurs mainly in the Central Bushveld and Mesic Highveld Grassland Bioregion with a mean annual rainfall of 600–1000 mm and a soil pH<6.4. *Macrotyloma* and *Mucuna* species are found mainly in the Lowveld Bioregion with a mean annual rainfall of >800 mm and a soil pH<6.4. Species of *Neonotonia*, *Neorautanenia* and *Ophrestia* are found mainly in the Central Bushveld Bioregion with a mean annual rainfall of 400–800 mm and a soil pH<6.4. *Otoptera burchellii* is found mainly in the Central Bushveld Bioregion with a mean annual rainfall of 400–800 mm and a soil pH of 6.5–7.4. *Sphenostylis* species occur mainly in the Central Bushveld Bioregion with a mean annual rainfall of 400–800 mm and a soil pH<6.4. *Teramnus labialis* subsp. *labialis* is found mainly in the Lowveld Bioregion with a mean annual rainfall of >800 mm and a soil pH<6.4. Lastly, *Vigna* species are found mainly in the Central Bushveld Bioregion with a mean annual rainfall of >800 mm and a soil pH<6.4.

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Table 7.48. Species of the tribe Phaseoleae clustered in three groups. Species in bold present in one group only, '-' no intermediate occurrence. MAR=Mean annual rainfall.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR; Lower soil pH**	**Group 3** **Higher MAR**
Alistilus bechuanicus	*Alistilus bechuanicus*	
	Bolusafra bituminosa	*Bolusafra bituminosa*
	Canavalia bonariensis	*Canavalia bonariensis*
	Canavalia rosea	*Canavalia rosea*
Canavalia virosa	*Canavalia virosa*	*Canavalia virosa*
Decorsea galpinii	*Decorsea galpinii*	*Decorsea galpinii*
Decorsea schlechteri	*Decorsea schlechteri*	*Decorsea schlechteri*
Dipogon lignosus	*Dipogon lignosus*	*Dipogon lignosus*
Dolichos angustifolius	*Dolichos angustifolius*	*Dolichos angustifolius*
Dolichos decumbens	*Dolichos decumbens*	*Dolichos decumbens*
Dolichos falciformis	*Dolichos falciformis*	*Dolichos falciformis*
Dolichos hastaeformis	*Dolichos hastaeformis*	
Dolichos junodii	*Dolichos junodii*	
Dolichos linearis	*Dolichos linearis*	*Dolichos linearis*
Dolichos peglerae	-	*Dolichos peglerae*
Dolichos pratensis	*Dolichos pratensis*	
Dolichos sericeus subsp. *sericeus*	*Dolichos sericeus* subsp. *sericeus*	*Dolichos sericeus* subsp. *sericeus*
Dolichos trilobus subsp. *transvaalicus*	*Dolichos trilobus* subsp. *transvaalicus*	*Dolichos trilobus* subsp. *transvaalicus*
	Dumasia villosa var. *villosa*	*Dumasia villosa* var. *villosa*
Erythrina acanthocarpa	*Erythrina acanthocarpa*	
Erythrina caffra	*Erythrina caffra*	*Erythrina caffra*
Erythrina humeana	*Erythrina humeana*	*Erythrina humeana*
	Erythrina latissima	*Erythrina latissima*
Erythrina lysistemon	*Erythrina lysistemon*	*Erythrina lysistemon*
		Erythrina* x *coddii
	Erythrina x *dyeri*	*Erythrina* x *dyeri*
	Erythrina* x *hennessyae	
		Erythrina* x *johnsoniae
Erythrina zeyheri	*Erythrina zeyheri*	*Erythrina zeyheri*
Flemingia grahamiana	*Flemingia grahamiana*	*Flemingia grahamiana*
	Galactia tenuiflora var. *villosa*	*Galactia tenuiflora* var. *villosa*
Lablab purpureus subsp. *uncinatus*	*Lablab purpureus* subsp. *uncinatus*	*Lablab purpureus* subsp. *uncinatus*
Macrotyloma axillare var. *axillare*	*Macrotyloma axillare* var. *axillare*	*Macrotyloma axillare* var. *axillare*
		Macrotyloma axillare* var. *glabrum
		Macrotyloma coddii
	Macrotyloma maranguense	*Macrotyloma maranguense*
Macrotyloma uniflorum var. *stenocarpum*	*Macrotyloma uniflorum* var. *stenocarpum*	*Macrotyloma uniflorum* var. *stenocarpum*
Mucuna coriacea subsp. *irritans*	*Mucuna coriacea* subsp. *irritans*	*Mucuna coriacea* subsp. *irritans*
	Mucuna gigantea subsp. *gigantea*	*Mucuna gigantea* subsp. *gigantea*
	Mucuna pruriens* var. *pruriens	
	Mucuna pruriens var. *utilis*	*Mucuna pruriens* var. *utilis*
Neonotonia wightii	*Neonotonia wightii*	*Neonotonia wightii*
	Neorautanenia brachypus	
Neorautanenia ficifolia	*Neorautanenia ficifolia*	*Neorautanenia ficifolia*
Neorautanenia mitis	*Neorautanenia mitis*	*Neorautanenia mitis*
	Ophrestia oblongifolia var. *oblongifolia*	*Ophrestia oblongifolia* var. *oblongifolia*
		Ophrestia oblongifolia* var. *velutinosa
Otoptera burchellii	*Otoptera burchellii*	
Sphenostylis angustifolia	*Sphenostylis angustifolia*	*Sphenostylis angustifolia*

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Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR; Lower soil pH**	**Group 3** **Higher MAR**
	Sphenostylis marginata subsp. *marginata*	*Sphenostylis marginata* subsp. *marginata*
Teramnus labialis subsp. *labialis*	*Teramnus labialis* subsp. *labialis*	*Teramnus labialis* subsp. *labialis*
Vigna frutescens subsp. *frutescens* var. *frutescens*	*Vigna frutescens* subsp. *frutescens* var. *frutescens*	*Vigna frutescens* subsp. *frutescens* var. *frutescens*
		Vigna kokii
	Vigna luteola var. *luteola*	*Vigna luteola* var. *luteola*
		Vigna marina
	Vigna mudenia	*Vigna mudenia*
	Vigna oblongifolia var. *oblongifolia*	*Vigna oblongifolia* var. *oblongifolia*
	Vigna oblongifolia* var. *parviflora	
Vigna schlechteri	*Vigna schlechteri*	*Vigna schlechteri*
Vigna unguiculata subsp. *dekindtiana* var. *dekindtiana*	*Vigna unguiculata* subsp. *dekindtiana* var. *dekindtiana*	*Vigna unguiculata* subsp. *dekindtiana* var. *dekindtiana*
	Vigna unguiculata subsp. *dekindtiana* var. *huillensis*	*Vigna unguiculata* subsp. *dekindtiana* var. *huillensis*
Vigna unguiculata subsp. *protracta*	*Vigna unguiculata* subsp. *protracta*	*Vigna unguiculata* subsp. *protracta*
Vigna unguiculata subsp. *stenophylla*	*Vigna unguiculata* subsp. *stenophylla*	*Vigna unguiculata* subsp. *stenophylla*
		Vigna unguiculata* subsp. *tenuis* var. *ovata
		Vigna unguiculata* subsp. *tenuis* var. *tenuis
Vigna unguiculata subsp. *unguiculata* var. *unguiculata*	*Vigna unguiculata* subsp. *unguiculata* var. *unguiculata*	*Vigna unguiculata* subsp. *unguiculata* var. *unguiculata*
	Vigna vexillata var. *angustifolia*	*Vigna vexillata* var. *angustifolia*
	Vigna vexillata var. *davyi*	*Vigna vexillata* var. *davyi*
	Vigna vexillata var. *ovata*	*Vigna vexillata* var. *ovata*
Vigna vexillata var. *vexillata*	*Vigna vexillata* var. *vexillata*	*Vigna vexillata* var. *vexillata*

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7.3.3.11.1 Genus: *Eriosema*

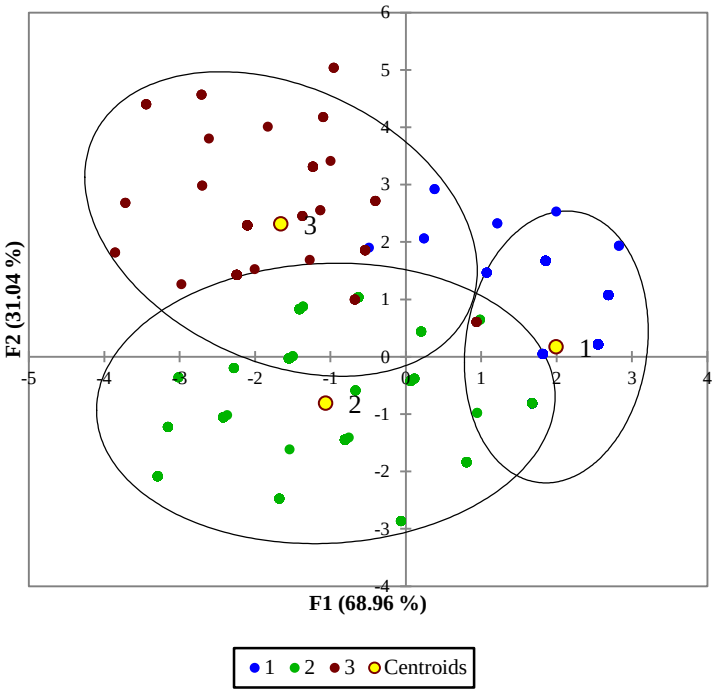

Figure 7.25. Discriminant Analysis for the genus *Eriosema*. Dots represent species; circles represent groups.

Figure 7.25 shows that the species of *Eriosema* are divided into three overlapping groups, with F1 explaining 68.96% and F2 31.04% of the independent variables.

Table 7.49. Correlation matrix between climate and soil variables for the genus *Eriosema*.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.920**	-0.274
TempMin	0.609	**0.698**
TempMax	-0.010	0.391
Phosphorus	-0.190	**0.670**
pH	-0.219	0.589

Values in bold are different from 0 with a significance level alpha=0.05

Mean annual rainfall is the main driver for F1 and mean annual minimum temperatures and phosphorus are the main drivers for F2 (Table 7.49). Species listed in Group 1 (Table 7.50) are adapted to higher mean annual rainfall levels compared to those in Group 3, while species listed in Group 3 are adapted to higher mean annual minimum temperatures and phosphorus

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levels compared to those in Group 2. *Eriosema preptum* is present only in Group 1 but is widely distributed in the Indian Ocean Coastal Belt, Lowveld and Sub-Escarpment Savanna Bioregions.

Overall, *Eriosema* species are found mainly in the Mesic Highveld Grassland Bioregion with a mean annual rainfall of >800 mm and a soil pH<6.4.

Table 7.50. Species of the genus *Eriosema* clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature, P=Phosphorus.

Group 1 **Higher MAR**	**Group 2** **Lower MAR; Lower TMin and soil P**	**Group 3** **Lower MAP; Higher TMin and soil P**
Eriosema acuminatum	*Eriosema acuminatum*	*Eriosema acuminatum*
Eriosema angustifolium	*Eriosema angustifolium*	*Eriosema angustifolium*
	Eriosema buchananii var. *buchananii*	*Eriosema buchananii* var. *buchananii*
Eriosema burkei var. *burkei*	*Eriosema burkei* var. *burkei*	*Eriosema burkei* var. *burkei*
Eriosema cordatum	*Eriosema cordatum*	*Eriosema cordatum*
Eriosema cordatum x *E. kraussianum*	*Eriosema cordatum* x *E. kraussianum*	
Eriosema cordatum* x *E. preptum		
Eriosema cordatum x *E. salignum*	*Eriosema cordatum* x *E. salignum*	
Eriosema cordatum x *E. squarrosum*	*Eriosema cordatum* x *E. squarrosum*	
Eriosema distinctum	*Eriosema distinctum*	*Eriosema distinctum*
Eriosema dregei		
Eriosema durnfordensis		
Eriosema ellipticifolium	*Eriosema ellipticifolium*	*Eriosema ellipticifolium*
		Eriosema fasciculatum
Eriosema gunniae	*Eriosema gunniae*	*Eriosema gunniae*
Eriosema kraussianum	*Eriosema kraussianum*	*Eriosema kraussianum*
Eriosema kraussianum* x *E. squarrosum		
Eriosema latifolium		
Eriosema lucipetum	*Eriosema lucipetum*	*Eriosema lucipetum*
Eriosema luteopetalum		
	Eriosema naviculare	*Eriosema naviculare*
Eriosema nutans	*Eriosema nutans*	*Eriosema nutans*
Eriosema parviflorum subsp. *parviflorum*	*Eriosema parviflorum* subsp. *parviflorum*	*Eriosema parviflorum* subsp. *parviflorum*
Eriosema pauciflorum var. *pauciflorum*	*Eriosema pauciflorum* var. *pauciflorum*	*Eriosema pauciflorum* var. *pauciflorum*
	Eriosema pauciflorum* x *E. salignum	
Eriosema populifolium subsp. *capensis*	*Eriosema populifolium.* subsp. *capensis*	
Eriosema populifolium* subsp. *populifolium		
Eriosema preptum		
Eriosema psoraleoides	*Eriosema psoraleoides*	*Eriosema psoraleoides*
Eriosema psoraleoides x *E. salignum.*	*Eriosema psoraleoides* x *E. salignum*	
Eriosema rossii		

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Group 1 Higher MAR	Group 2 Lower MAR; Lower TMin and soil P	Group 3 Lower MAP; Higher TMin and soil P
Eriosema rufescens		
Eriosema salignum	*Eriosema salignum*	*Eriosema salignum*
Eriosema salignum x *E. cordatum*	*Eriosema salignum* x *E. cordatum*	*Eriosema salignum* x *E. cordatum*
Eriosema salignum* x *E. kraussianum		
Eriosema simulans	*Eriosema simulans*	
Eriosema squarrosum	*Eriosema squarrosum*	*Eriosema squarrosum*
Eriosema squarrosum* x *E. cordatum		
Eriosema streyi		
Eriosema superpositum	*Eriosema superpositum*	
Eriosema transvaalense	*Eriosema transvaalense*	*Eriosema transvaalense*
		Eriosema transvaalense* x *E. angustifolium
Eriosema umtamvunense		
Eriosema zuluense	*Eriosema zuluense*	*Eriosema zuluense*

7.3.3.11.2 Genus: *Rhynchosia*

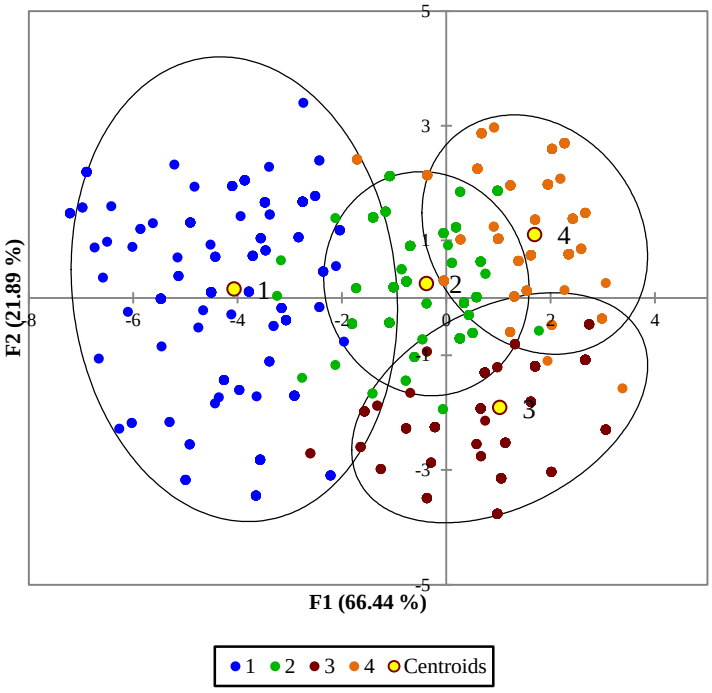

Figure 7.26. Discriminant Analysis for the genus *Rhynchosia*. Dots represent species; circles represent groups.

The discriminant analysis resulted in four overlapping groups for the species of *Rhynchosia*, with a relatively large Group 1 where F1 explains 66.44% and F2 21.89% of the independent variables (Figure 7.26).

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Table 7.51. Correlation matrix between climate and soil variables for the genus *Rhynchosia*.

Variables	F1	F2	F3
F1	1.000	0.000	0.000
F2	0.000	1.000	0.000
F3	0.000	0.000	1.000
AnnRain	**0.837**	0.323	0.419
TempMin	-0.082	**0.930**	-0.275
TempMax	-0.432	0.199	-0.178
Phosphorus	-0.372	0.328	-0.181
pH	**-0.921**	0.070	0.381

Values in bold are different from 0 with a significance level alpha=0.05

Three drivers are identified in Table 7.51, namely mean annual rainfall and soil pH (negative) for F1 and mean annual minimum temperature (negative) for F2 that are responsible for the separation of *Rhynchosia* species into four groups. Species listed in Group 1 (Table 7.52) are more adapted to low mean annual rainfall and high pH levels, while those listed in Groups 3 and 4 are adapted to opposite levels. Mean annual minimum temperature is a driver (F2 axis in Figure 7.51) where it appears that species listed in Group 3 are adapted to lower mean annual minimum temperatures than those listed in Group 4. The presence of species found in only one group is due to low occurrences. *Rhynchosia cooperi* has one occurrence in the low-rainfall level, explaining its absence from the intermediate group (Group 2). It is, however, not clear why *R. holosericea* is not recorded in Group 2.

Overall, *Rhynchosia* species are found mainly in the Central Bushveld Bioregion with a mean annual rainfall of 400–800 mm, a mean annual minimum temperature of 2–8ºC and a soil pH<6.4.

Table 7.52. Species of the genus *Rhynchosia* clustered in four groups. Species in bold present in one group only, '-' no intermediate occurrence. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR and soil pH**	**Group 3** **Higher MAR; Lower soil pH; Lower TMin**	**Group 4** **Higher MAR; Lower soil pH; Higher TMin**
Rhynchosia adenodes	*Rhynchosia adenodes*	*Rhynchosia adenodes*	*Rhynchosia adenodes*
Rhynchosia albissima	*Rhynchosia albissima*	*Rhynchosia albissima*	*Rhynchosia albissima*
	Rhynchosia angulosa	*Rhynchosia angulosa*	*Rhynchosia angulosa*
	Rhynchosia angustifolia		*Rhynchosia angustifolia*
Rhynchosia argentea	*Rhynchosia argentea*		*Rhynchosia argentea*
Rhynchosia arida			
Rhynchosia atropurpurea	*Rhynchosia atropurpurea*	*Rhynchosia atropurpurea*	*Rhynchosia atropurpurea*
Rhynchosia bullata	*Rhynchosia bullata*		
Rhynchosia calvescens	*Rhynchosia calvescens*		*Rhynchosia calvescens*
Rhynchosia capensis	*Rhynchosia capensis*		*Rhynchosia capensis*
Rhynchosia caribaea	*Rhynchosia caribaea*	*Rhynchosia caribaea*	*Rhynchosia caribaea*
Rhynchosia chrysoscias	*Rhynchosia chrysoscias*		*Rhynchosia chrysoscias*

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Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR and soil pH**	**Group 3** **Higher MAR; Lower soil pH; Lower TMin**	**Group 4** **Higher MAR; Lower soil pH; Higher TMin**
Rhynchosia ciliata	*Rhynchosia ciliata*	*Rhynchosia ciliata*	*Rhynchosia ciliata*
Rhynchosia clivorum var. *clivorum*	*Rhynchosia clivorum* var. *clivorum*	*Rhynchosia clivorum* var. *clivorum*	*Rhynchosia clivorum* var. *clivorum*
Rhynchosia confusa	*Rhynchosia confusa*	*Rhynchosia confusa*	
Rhynchosia cooperi	-	*Rhynchosia cooperi*	*Rhynchosia cooperi*
	Rhynchosia crassifolia	*Rhynchosia crassifolia*	*Rhynchosia crassifolia*
Rhynchosia densiflora subsp. *chrysadenia*	*Rhynchosia densiflora* subsp. *chrysadenia*	*Rhynchosia densiflora* subsp. *chrysadenia*	*Rhynchosia densiflora* subsp. *chrysadenia*
		Rhynchosia dieterlenae	
Rhynchosia emarginata	*Rhynchosia emarginata*		
Rhynchosia ferulifolia	*Rhynchosia ferulifolia*		*Rhynchosia ferulifolia*
	Rhynchosia galpinii		*Rhynchosia galpinii*
			Rhynchosia harmsiana* var. *burchellii
Rhynchosia harmsiana var. *harmsiana*	*Rhynchosia harmsiana* var. *harmsiana*	*Rhynchosia harmsiana* var. *harmsiana*	*Rhynchosia harmsiana* var. *harmsiana*
Rhynchosia harveyi	*Rhynchosia harveyi*	*Rhynchosia harveyi*	*Rhynchosia harveyi*
Rhynchosia hirsuta	*Rhynchosia hirsuta*	*Rhynchosia hirsuta*	*Rhynchosia hirsuta*
	Rhynchosia hirta		*Rhynchosia hirta*
Rhynchosia holosericea	-	*Rhynchosia holosericea*	
Rhynchosia komatiensis	*Rhynchosia komatiensis*		*Rhynchosia komatiensis*
Rhynchosia leucoscias	*Rhynchosia leucoscias*		*Rhynchosia leucoscias*
Rhynchosia microscias	*Rhynchosia microscias*		*Rhynchosia microscias*
Rhynchosia minima var. *minima*	*Rhynchosia minima* var. *minima*	*Rhynchosia minima* var. *minima*	*Rhynchosia minima* var. *minima*
Rhynchosia minima var. *prostrata*	*Rhynchosia minima*. var. *prostrata*	*Rhynchosia minima* var. *prostrata*	*Rhynchosia minima* var. *prostrata*
Rhynchosia monophylla	*Rhynchosia monophylla*	*Rhynchosia monophylla*	*Rhynchosia monophylla*
Rhynchosia nervosa var. *nervosa*	*Rhynchosia nervosa* var. *nervosa*	*Rhynchosia nervosa* var. *nervosa*	*Rhynchosia nervosa* var. *nervosa*
Rhynchosia nitens	*Rhynchosia nitens*	*Rhynchosia nitens*	*Rhynchosia nitens*
			Rhynchosia ovata
	-	*Rhynchosia pauciflora*	*Rhynchosia pauciflora*
			Rhynchosia peglerae
	Rhynchosia pentheri var. *hutchinsoniana*	*Rhynchosia pentheri* var. *hutchinsoniana*	*Rhynchosia pentheri* var. *hutchinsoniana*
Rhynchosia pentheri var. *pentheri*	*Rhynchosia pentheri* var. *pentheri*	*Rhynchosia pentheri* var. *pentheri*	*Rhynchosia pentheri* var. *pentheri*
Rhynchosia pinnata	*Rhynchosia pinnata*		*Rhynchosia pinnata*
Rhynchosia reptabunda	*Rhynchosia reptabunda*	*Rhynchosia reptabunda*	*Rhynchosia reptabunda*
Rhynchosia resinosa	*Rhynchosia resinosa*		
			Rhynchosia rogersii
Rhynchosia schlechteri	*Rhynchosia schlechteri*		
Rhynchosia sordida	*Rhynchosia sordida*	*Rhynchosia sordida*	*Rhynchosia sordida*
Rhynchosia spectabilis	*Rhynchosia spectabilis*		*Rhynchosia spectabilis*
	-	*Rhynchosia stenodon*	*Rhynchosia stenodon*
Rhynchosia sublobata	*Rhynchosia sublobata*	*Rhynchosia sublobata*	*Rhynchosia sublobata*
	Rhynchosia thorncroftii		*Rhynchosia thorncroftii*
Rhynchosia totta var. *totta*	*Rhynchosia totta* var. *totta*	*Rhynchosia totta* var. *totta*	*Rhynchosia totta* var. *totta*
Rhynchosia vendae	*Rhynchosia vendae*		
Rhynchosia venulosa	*Rhynchosia venulosa*	*Rhynchosia venulosa*	*Rhynchosia venulosa*
	-	*Rhynchosia villosa*	*Rhynchosia villosa*
Rhynchosia viscidula	*Rhynchosia viscidula*		*Rhynchosia viscidula*
	Rhynchosia woodii	*Rhynchosia woodii*	*Rhynchosia woodii*

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7.3.3.12 Tribe: Desmodieae

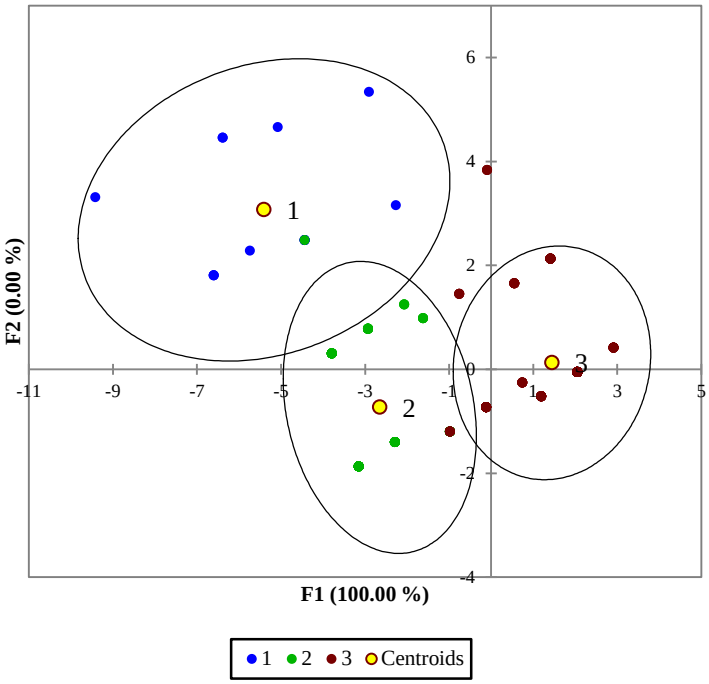

Figure 7.27. Discriminant Analysis for the tribe Desmodieae. Dots represent species; circles represent groups.

The Desmodieae includes the genera *Alysicarpus*, *Desmodium* and *Pseudarthria*. It is evident from Figure 7.27 that species are divided into three overlapping groups, with species listed in Group 1 relatively distinct from those in Groups 2 and 3. F1 explains 100% of the independent variables.

Table 7.53. Correlation matrix between climate and soil variables for the tribe Desmodieae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.966**	0.138
TempMin	-0.040	0.131
TempMax	-0.542	-0.129
Phosphorus	-0.294	0.021
pH	-0.544	**0.837**

Values in bold are different from 0 with a significance level alpha=0.05

Table 7.53 shows that mean annual rainfall (F1) and pH level (F2) are the main drivers for the separation of groups, although F2 is not indicated as being significant in the DA in Figure

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7.27. Species listed in Group 1 (Table 7.54) are adapted to lower mean annual rainfall compared to those in Group 3 and to higher soil pH levels compared to those in Group 2.

Alysicarpus species are found mainly in the Bushveld Bioregion with a mean annual rainfall of >800 mm and a soil pH<6.4 while species of both *Desmodium* and *Pseudarthria* are found mainly in the Lowveld Bioregion with a mean annual rainfall of >800 mm and a soil pH<6.4.

Table 7.54. Species of the tribe Desmodieae clustered in three groups. MAR=Mean annual rainfall.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Intermediate MAR; Lower soil pH**	**Group 3** **Higher MAR**
Alysicarpus glumaceus subsp. *glumaceus* var. *glumaceus*	*Alysicarpus glumaceus* subsp. *glumaceus* var. *glumaceus*	*Alysicarpus glumaceus* subsp. *glumaceus* var. *glumaceus*
	Alysicarpus rugosus subsp. *perennirufus*	*Alysicarpus rugosus* subsp. *perennirufus*
	Alysicarpus rugosus subsp. *rugosus*	*Alysicarpus rugosus* subsp. *rugosus*
Alysicarpus vaginalis var. *vaginalis*	*Alysicarpus vaginalis* var. *vaginalis*	*Alysicarpus vaginalis* var. *vaginalis*
Alysicarpus zeyheri	*Alysicarpus zeyheri*	*Alysicarpus zeyheri*
	Desmodium adscendens var. *robustum*	*Desmodium adscendens* var. *robustum*
	Desmodium barbatum var. *dimorphum*	*Desmodium barbatum* var. *dimorphum*
	Desmodium dregeanum	*Desmodium dregeanum*
Desmodium gangeticum	*Desmodium gangeticum*	*Desmodium gangeticum*
Desmodium repandum	*Desmodium repandum*	*Desmodium repandum*
	Desmodium salicifolium var. *salicifolium*	*Desmodium salicifolium* var. *salicifolium*
	Desmodium setigerum	*Desmodium setigerum*
Desmodium velutinum	*Desmodium velutinum*	*Desmodium velutinum*
Pseudarthria hookeri var. *hookeri*	*Pseudarthria hookeri* var. *hookeri*	*Pseudarthria hookeri* var. *hookeri*

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7.3.3.13 Tribe: Psoraleeae

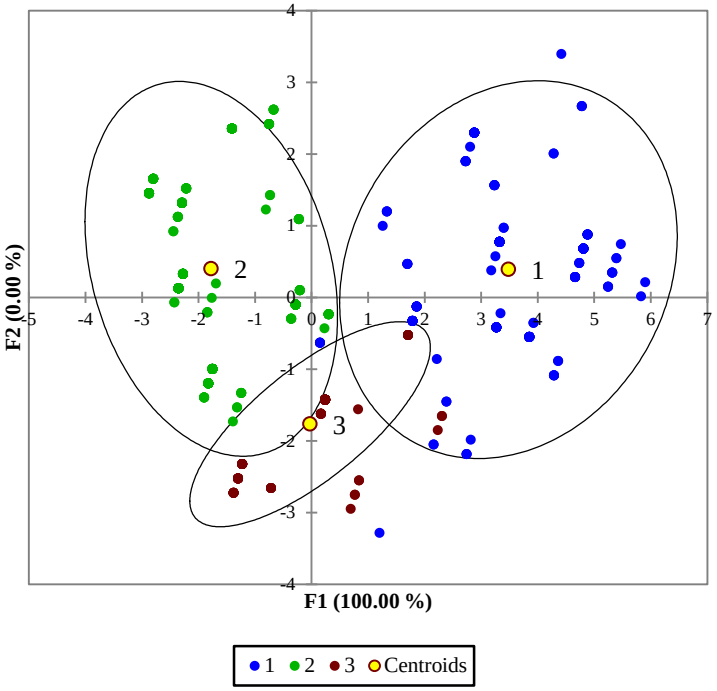

Figure 7.28. Discriminant Analysis for the tribe Psoraleeae. Dots represent species; circles represent groups.

Three genera of the tribe Psoraleeae are indigenous to the study area namely *Cullen*, *Otholobium* and *Psoralea*. Since *Otholobium* has 45 species, it was analysed separately. It is evident from Figure 7.28 that species are divided into three overlapping groups, with F1 explaining 100% of the independent variables.

Table 7.55. Correlation matrix between climate and soil variables for the tribe Psoraleeae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**-0.803**	0.581
TempMin	-0.243	0.046
TempMax	0.631	-0.077
Phosphorus	0.328	-0.063
pH	**0.978**	0.187

Values in bold are different from 0 with a significance level alpha=0.05

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Soil pH level and mean annual rainfall (negative) are indicated as drivers for the grouping of species in three groups (Table 7.55). Species listed in Group 1 (Table 7.56) are adapted to

low mean annual rainfall and high soil pH levels and those in especially Group 2 to the opposite. *Psoralea aculeata* is listed only in Group 2 but has several occurrences in the Southwest Fynbos Bioregion, indicating its narrow range of tolerance to relatively high rainfall and low soil pH levels (Chapter 5: Inventory).

Cullen species are found mainly in the Bushmanland Bioregion with a mean annual rainfall of <400 mm and a soil pH>7.5. *Psoralea* species are found mainly in the Eastern Fynbos Renosterveld Bioregion with a mean annual rainfall of 200–600 mm and a soil pH<6.4.

Table 7.56. Species of the tribe Psoraleeae clustered in three groups. Species in bold present in one group only, '-' no intermediate occurrence.

Group 1 **Lower MAR; Higher soil pH**	**Group 2** **Higher MAR; Lower soil pH**	**Group 3** **Intermediate MAR and soil pH**
Cullen biflora		
	Cullen holubii	
Cullen tomentosum	*Cullen tomentosum*	*Cullen tomentosum*
	Psoralea abbottii	
	Psoralea aculeata	
Psoralea affinis	*Psoralea affinis*	*Psoralea affinis*
Psoralea alata	*Psoralea alata*	*Psoralea alata*
Psoralea angustifolia	*Psoralea angustifolia*	*Psoralea angustifolia*
Psoralea aphylla	*Psoralea aphylla*	*Psoralea aphylla*
	Psoralea aphylla x pinnata	
Psoralea arborea	*Psoralea arborea*	*Psoralea arborea*
	Psoralea asarina	*Psoralea asarina*
Psoralea axillaris	*Psoralea axillaris*	*Psoralea axillaris*
Psoralea ensifolia	*Psoralea ensifolia*	*Psoralea ensifolia*
Psoralea fascicularis	*Psoralea fascicularis*	*Psoralea fascicularis*
Psoralea filifolia	*Psoralea filifolia*	-
Psoralea glabra	*Psoralea glabra*	*Psoralea glabra*
Psoralea glaucescens		*Psoralea glaucescens*
	Psoralea glaucina	*Psoralea glaucina*
	Psoralea gueinzii	
Psoralea imbricata	*Psoralea imbricata*	*Psoralea imbricata*
	Psoralea implexa	
	Psoralea keetii	*Psoralea keetii*
Psoralea laxa	*Psoralea laxa*	*Psoralea laxa*
Psoralea monophylla	*Psoralea monophylla*	*Psoralea monophylla*
Psoralea odoratissima	*Psoralea odoratissima*	*Psoralea odoratissima*
Psoralea oligophylla	*Psoralea oligophylla*	*Psoralea oligophylla*
Psoralea oreophila	*Psoralea oreophila*	*Psoralea oreophila*
Psoralea peratica		*Psoralea peratica*
Psoralea pinnata var. *pinnata*	*Psoralea pinnata* var. *pinnata*	*Psoralea pinnata* var. *pinnata*
Psoralea plauta	*Psoralea plauta*	*Psoralea plauta*
Psoralea repens	*Psoralea repens*	*Psoralea repens*
Psoralea restioides	*Psoralea restioides*	*Psoralea restioides*
Psoralea speciosa	*Psoralea speciosa*	*Psoralea speciosa*
Psoralea tenuifolia	*Psoralea tenuifolia*	*Psoralea tenuifolia*
	Psoralea tenuissima	*Psoralea tenuissima*
Psoralea triflora	*Psoralea triflora*	*Psoralea triflora*

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Group 1 Lower MAR; Higher soil pH	Group 2 Higher MAR; Lower soil pH	Group 3 Intermediate MAR and soil pH
Psoralea trullata *Psoralea verrucosa*	*Psoralea trullata* *Psoralea verrucosa*	*Psoralea trullata* *Psoralea verrucosa*

7.3.3.13.1 Genus: *Otholobium*

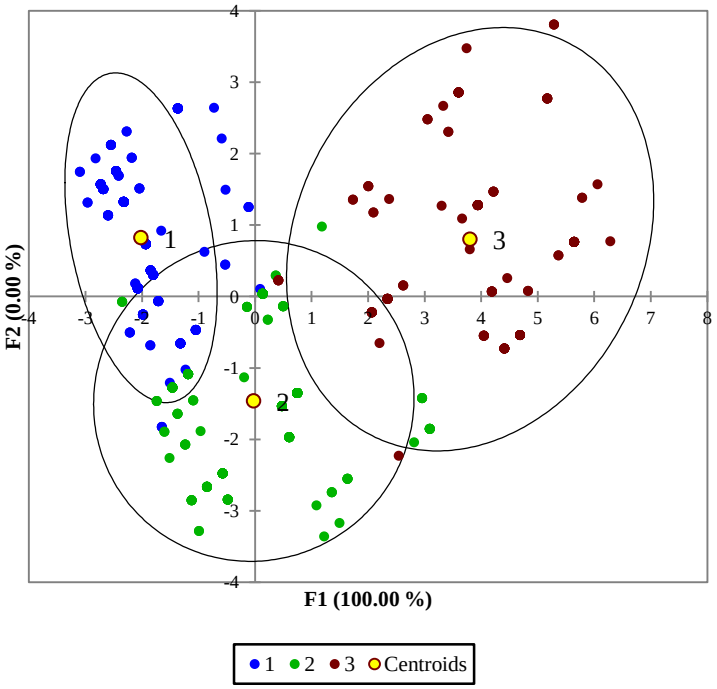

Figure 7.29. Discriminant Analysis for the genus *Otholobium*. Dots represent species; circles represent groups.

The DA results are presented in Figure 7.29, showing three overlapping groups and F1 explaining 100% of the independent variables.

Table 7.57. Correlation matrix between climate and soil variables for the genus *Otholobium*.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**-0.810**	0.573
TempMin	0.254	-0.154
TempMax	0.499	-0.309
Phosphorus	0.537	-0.089
pH	**0.967**	0.230

Values in bold are different from 0 with a significance level alpha=0.05

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Table 7.57 indicates that mean annual rainfall (negative) and soil pH levels are responsible for the grouping of species as listed in Table 7.58. Species listed in Group 3 are adapted to low mean annual rainfall and high soil pH levels and those in especially Group 1 to opposite levels. *Otholobium parviflorum* is listed only in Group 1 but has several occurrences in the Southwest Fynbos Bioregion (Chapter 5: Inventory). Acidic soils and relatively high mean annual rainfall are distinctive for this region.

Overall, *Otholobium* species are found mainly in the Eastern Fynbos Renosterveld with a mean annual rainfall of 200–600 mm and a soil pH<6.4.

Table 7.58. Species of the genus *Otholobium* clustered in three groups. Species in bold present in one group only. MAR=Mean annual rainfall.

Group 1 **Higher MAR; Lower soil pH**	**Group 2** **Intermediate MAR and soil pH**	**Group 3** **Lower MAR; Higher soil pH**
Otholobium acuminatum	*Otholobium acuminatum*	
	Otholobium arborescens	*Otholobium arborescens*
	Otholobium argenteum	*Otholobium argenteum*
Otholobium bolusii	*Otholobium bolusii*	*Otholobium bolusii*
	Otholobium bowieanum	*Otholobium bowieanum*
Otholobium bracteolatum	*Otholobium bracteolatum*	*Otholobium bracteolatum*
Otholobium caffrum	*Otholobium caffrum*	*Otholobium caffrum*
Otholobium candicans	*Otholobium candicans*	*Otholobium candicans*
Otholobium carneum	*Otholobium carneum*	
	Otholobium flexuosum	*Otholobium flexuosum*
Otholobium foliosum subsp. *gazense*	*Otholobium foliosum* subsp. *gazense*	*Otholobium foliosum* subsp. *gazense*
Otholobium fruticans	*Otholobium fruticans*	*Otholobium fruticans*
Otholobium fumeum		
	Otholobium hamatum	*Otholobium hamatum*
Otholobium heterosepalum	*Otholobium heterosepalum*	
Otholobium hirtum	*Otholobium hirtum*	*Otholobium hirtum*
		Otholobium incanum
		Otholobium macradenium
Otholobium mundianum	*Otholobium mundianum*	*Otholobium mundianum*
Otholobium nigricans	*Otholobium nigricans*	*Otholobium nigricans*
Otholobium obliquum	*Otholobium obliquum*	*Otholobium obliquum*
Otholobium parviflorum		
	Otholobium pictum	
Otholobium polyphyllum	*Otholobium polyphyllum*	*Otholobium polyphyllum*
Otholobium polystictum	*Otholobium polystictum*	*Otholobium polystictum*
Otholobium prodiens	*Otholobium prodiens*	*Otholobium prodiens*
	Otholobium pungens	*Otholobium pungens*
	Otholobium pustulatum	*Otholobium pustulatum*
Otholobium racemosum	*Otholobium racemosum*	*Otholobium racemosum*
Otholobium rotundifolium	*Otholobium rotundifolium*	
		Otholobium rubicundum
	Otholobium saxosum	*Otholobium saxosum*
Otholobium sericeum	*Otholobium sericeum*	*Otholobium sericeum*
Otholobium spicatum	*Otholobium spicatum*	*Otholobium spicatum*
Otholobium stachyerum	*Otholobium stachyerum*	*Otholobium stachyerum*
	Otholobium striatum	*Otholobium striatum*
	Otholobium swartbergense	*Otholobium swartbergense*
	Otholobium thomii	*Otholobium thomii*

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Group 1 Higher MAR; Lower soil pH	Group 2 Intermediate MAR and soil pH	Group 3 Lower MAR; Higher soil pH
Otholobium trianthum	*Otholobium trianthum*	*Otholobium trianthum*
Otholobium uncinatum	*Otholobium uncinatum*	*Otholobium uncinatum*
	Otholobium venustum	*Otholobium venustum*
Otholobium virgatum	*Otholobium virgatum*	*Otholobium virgatum*
Otholobium wilmsii	*Otholobium wilmsii*	*Otholobium wilmsii*
Otholobium zeyheri	*Otholobium zeyheri*	*Otholobium zeyheri*

7.3.3.14 Tribe: Sesbanieae

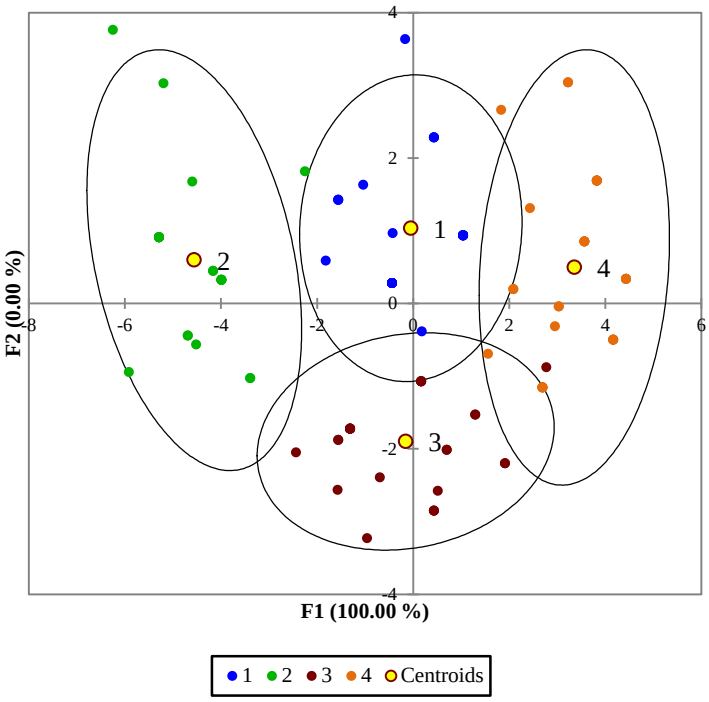

Figure 7.30. Discriminant Analysis for the tribe Sesbanieae. Dots represent species; circles represent groups.

The Sesbanieae contains only one genus, *Sesbania*. From Figure 7.30 it is evident that four groups are distinguished, with relatively narrow overlaps between Group 2 and the other three groups. F1 explains 100% of the independent variables.

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Table 7.59. Correlation matrix between climate and soil variables for the tribe Sesbanieae.

Variables	F1	F2	F3
F1	1.000	0.000	0.000
F2	0.000	1.000	0.000
F3	0.000	0.000	1.000
AnnRain	**0.896**	-0.056	0.432
TempMin	0.693	0.273	-0.461
TempMax	-0.347	0.481	-0.296
Phosphorus	-0.379	-0.246	-0.122
pH	-0.624	**0.717**	0.115

Values in bold are different from 0 with a significance level alpha=0.05

The correlation matrix indicates that mean annual rainfall (F1) and soil pH (F2) are drivers for the four groups of species listed in Table 7.60. Species listed in Group 2 are adapted to lower mean annual rainfall and those in Group 4 to higher mean annual rainfall regions. Even though the DA does not show that F2 explains any of the variation, a correlation with soil pH is evident in Table 7.59. Species listed in Group 3 are adapted to lower soil pH levels and those in Group 1 to higher soil pH levels.

Sesbania species are found mostly in the Central Bushveld Bioregion with a mean annual rainfall of 400–800 mm and a soil pH<6.4.

Table 7.60. Species of the genus *Sesbania* clustered in four groups. Species in bold present in one group only. MAR=Mean annual rainfall.

Group 1 **Intermediate MAR;** **Higher soil pH**	**Group 2** **Lower MAR**	**Group 3** **Intermediate MAR;** **Lower soil pH**	**Group 4** **Higher MAR**
Sesbania brevipedunculata	*Sesbania brevipedunculata*		
	Sesbania macowaniana		
Sesbania macrantha var. *levis*	*Sesbania macrantha* var. *levis*	*Sesbania macrantha* var. *levis*	*Sesbania macrantha* var. *levis*
	Sesbania notialis		
Sesbania rogersii			
Sesbania sesban subsp. *sesban* var. *nubica*	*Sesbania sesban* subsp. *sesban* var. *nubica*	*Sesbania sesban* subsp. *sesban* var. *nubica*	*Sesbania sesban* subsp. *sesban* var. *nubica*
Sesbania sesban subsp. *sesban* var. *zambesiaca*	*Sesbania sesban* subsp. *sesban* var. *zambesiaca*	*Sesbania sesban* subsp. *sesban* var. *sesban*	*Sesbania sesban* subsp. *sesban* var. *sesban*
	Sesbania tetraptera **subsp. *tetraptera***		
Sesbania transvaalensis	*Sesbania transvaalensis*	*Sesbania transvaalensis*	

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7.3.3.15 Tribe: Loteae

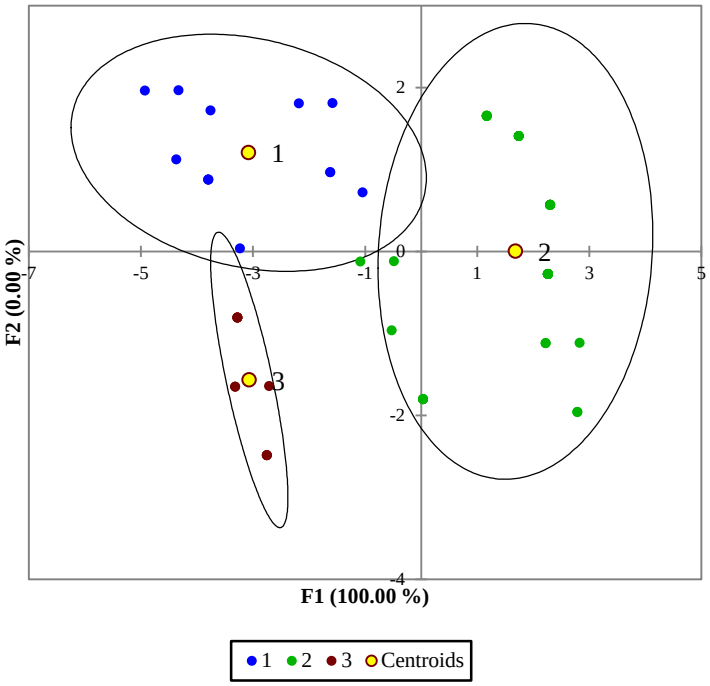

Figure 7.31. Discriminant Analysis for the tribe Loteae. Dots represent species; circles represent groups.

Figure 7.31 shows the results of the DA for the Loteae containing only one genus, *Lotus*, as three overlapping groups where F1 explains 100% of the independent variables.

Table 7.61. Correlation matrix between climate and soil variables for the tribe Loteae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**0.973**	0.206
TempMin	0.390	**0.868**
TempMax	-0.156	**0.725**
Phosphorus	-0.211	**0.618**
pH	0.032	0.176

Values in bold are different from 0 with a significance level alpha=0.05

Lotus discolor subsp. *discolor*, the only species present in the tribe, has correlations with mean annual rainfall, minimum and mean annual maximum temperature and soil phosphorus

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levels as shown in Table 7.61 . This species is present in all three groups (Table 7.62) and is therefore adapted to a wide range of climate and soil conditions.

Overall, *Lotus discolor* subsp. *discolor* is found mainly in the Mesic Highveld Grassland Bioregion with a mean annual rainfall >800 mm, a mean annual minimum temperature of 2–8ºC, a mean annual maximum temperature of 25–29ºC and a phosphorus level <10 mgkg^{-1}.

Table 7.62. The species of the tribe Loteae clustered in three groups. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature, TMax=Mean annual maximum temperature, P=Phosphorus.

Group 1 **Lower MAR; Higher TMin, TMax and soil P**	**Group 2** **Higher MAR**	**Group 3** **Lower MAR; Lower TMin, TMax and soil P**
Lotus discolor subsp. *discolor*	*Lotus discolor* subsp. *discolor*	*Lotus discolor* subsp. *discolor*

7.3.3.16 Tribe: Galegeae

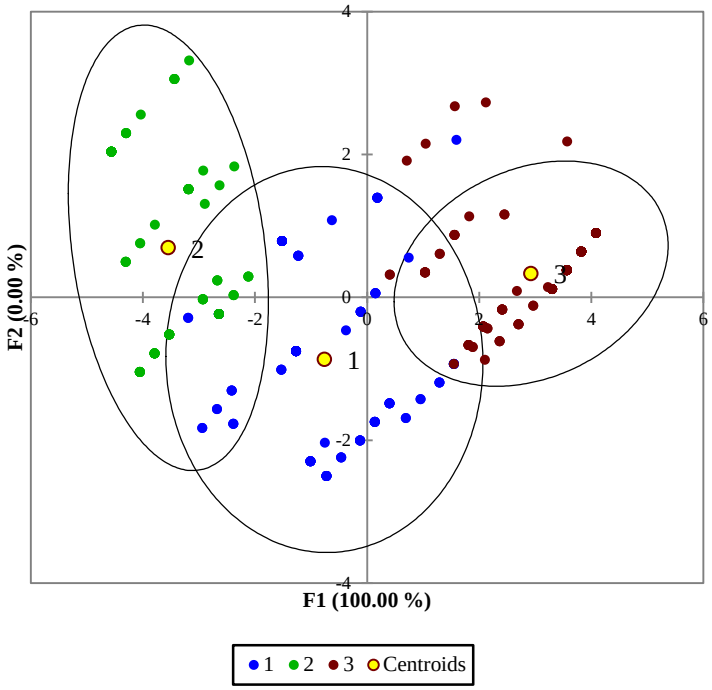

Figure 7.32. Discriminant Analysis for the tribe Galegeae. Dots represent species; circles represent groups.

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The three genera contained in the tribe Galegeae are *Astragalus*, *Lessertia* and *Sutherlandia*. *Lessertia* species were analysed separately. Three overlapping groups are shown in Figure 7.32, with F1 explaining 100% of the independent variables.

Table 7.63. Correlation matrix between climate and soil variables for the tribe Galegeae.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**-0.824**	0.562
TempMin	0.202	0.109
TempMax	0.524	-0.329
Phosphorus	**0.787**	0.108
pH	**0.977**	0.045

Values in bold are different from 0 with a significance level alpha=0.05

Mean annual rainfall as well as phosphorus and soil pH levels are correlated with the distribution patterns of species (Table 7.63). *Astragalus atropilosulus* subsp. *burkeanus* var. *burkeanus* is present only in Groups 1 and 2 (Table 7.64), indicating that it is adapted to high mean annual rainfall and to low soil phosphorus and pH levels. The *Sutherlandia* species are therefore more widely adapted compared to the above-mentioned species.

Overall, *Astragalus atropilosulus* subsp. *burkeanus* var. *burkeanus* is found mainly in the Central Bushveld Bioregion with a mean annual rainfall of 400–800 mm, a phosphorus level <10 $mgkg^{-1}$ and a soil pH<6.4. *Sutherlandia* species are found mainly in the Eastern Kalahari Bushveld Bioregion with a mean annual rainfall of <400 mm, a phosphorus level of 5–35m gkg^{-1} and a soil pH>7.5.

Table 7.64. Species of the tribe Galegeae clustered in three groups. MAR=Mean annual rainfall, P=Phosphorus.

Group 1 **Intermediate MAR, soil P and pH**	**Group 2** **Higher MAR; Lower soil P and pH**	**Group 3** **Lower MAR; Higher soil P and pH**
Astragalus atropilosulus subsp. *burkeanus* var. *burkeanus*	*Astragalus atropilosulus* subsp. *burkeanus* var. *burkeanus*	
Sutherlandia frutescens	*Sutherlandia frutescens*	*Sutherlandia frutescens*
Sutherlandia humilis	*Sutherlandia humilis*	*Sutherlandia humilis*
Sutherlandia microphylla	*Sutherlandia microphylla*	*Sutherlandia microphylla*
Sutherlandia montana	*Sutherlandia montana*	*Sutherlandia montana*
Sutherlandia tomentosa	*Sutherlandia tomentosa*	*Sutherlandia tomentosa*

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7.3.3.16.1 Genus: *Lessertia*

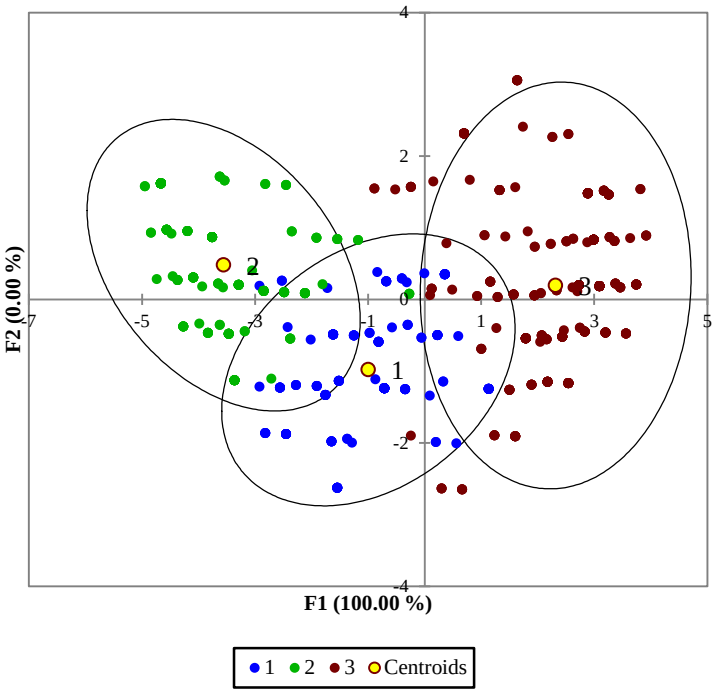

Figure 7.33. Discriminant Analysis for the genus *Lessertia*. Dots represent species; circles represent groups.

The DA resulted in three largely overlapping groups for the species of *Lessertia*, with F1 explaining 100% of the independent variables (Figure 7.33).

Table 7.65. Correlation matrix between climate and soil variables for the genus *Lessertia*.

Variables	F1	F2
F1	1.000	0.000
F2	0.000	1.000
AnnRain	**-0.930**	0.274
TempMin	0.145	**-0.753**
TempMax	**0.728**	0.053
Phosphorus	0.640	-0.200
pH	**0.943**	0.255

Values in bold are different from 0 with a significance level alpha=0.05

There are three drivers responsible for the distribution of *Lessertia* species identified in Table 7.65. The highest correlation is with soil pH, followed by the mean annual rainfall (negative) and mean annual maximum temperature. Even though the DA does not show that F2 explains

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any of the variation, a correlation with mean annual minimum temperature is evident in Table 7.65. Species listed in Group 2 (Table 7.66) are adapted to high mean annual rainfall, low mean annual maximum temperatures and low soil pH levels, while those listed in Group 3 are adapted to opposite levels. Of the species listed in one group only, *L. benguellensis*, *L. pauciflora* var. *schlechteri*, *L. perennans* var. *polystachya* and *L. thodei* have many occurrences in the Kalahari Duneveld, Namaqualand Hardeveld and Rainshadow Valley Karoo Bioregion (first two species) and the Drakensberg Grassland and Mesic Highveld Grassland Bioregions (last two species). *Lessertia candida* is not recorded in the intermediate group (Group 1), probably because of a relatively wide distribution pattern but low occurrence (compare species distribution in Chapter 5: Inventory).

Overall, *Lessertia* species are found mainly in the Eastern Kalahari Bushveld Bioregion with a mean annual rainfall of <400 mm, a mean annual minimum temperature of 2–8ºC, a mean annual maximum temperature of 25–29ºC and soil pH <6.4.

Table 7.66. Species of the genus *Lessertia* clustered in three groups. Species in bold present in one group only, '-' no intermediate occurrence.

Group 1 **Intermediate MAR, TMax and soil pH; Higher TMin**	**Group 2** **Higher MAR; Lower TMax and soil pH; Lower TMin**	**Group 3** **Lower MAR; Higher TMax and soil pH**
Lessertia affinis	*Lessertia affinis*	*Lessertia affinis*
Lessertia annularis	*Lessertia annularis*	*Lessertia annularis*
Lessertia argentea		*Lessertia argentea*
		Lessertia benguellensis
Lessertia brachypus		*Lessertia brachypus*
Lessertia brachystachya	*Lessertia brachystachya*	*Lessertia brachystachya*
-	*Lessertia candida*	*Lessertia candida*
Lessertia capensis	*Lessertia capensis*	*Lessertia capensis*
Lessertia capitata	*Lessertia capitata*	*Lessertia capitata*
Lessertia carnosa		*Lessertia carnosa*
	Lessertia contracta	
Lessertia depressa	*Lessertia depressa*	*Lessertia depressa*
Lessertia diffusa		*Lessertia diffusa*
	Lessertia dykei	
Lessertia excisa	*Lessertia excisa*	*Lessertia excisa*
Lessertia falciformis		*Lessertia falciformis*
Lessertia flexuosa	*Lessertia flexuosa*	*Lessertia flexuosa*
Lessertia fruticosa		*Lessertia fruticosa*
	Lessertia glabricaulis	
		Lessertia globosa
Lessertia harveyana	*Lessertia harveyana*	
Lessertia herbacea	*Lessertia herbacea*	*Lessertia herbacea*
		Lessertia incana
Lessertia inflata		*Lessertia inflata*
Lessertia kensitii		
Lessertia macroflora	*Lessertia macroflora*	
Lessertia macrostachya var. *macrostachya*		*Lessertia macrostachya* var. *macrostachya*
Lessertia margaritacea	*Lessertia margaritacea*	
Lessertia miniata	*Lessertia miniata*	*Lessertia miniata*
	Lessertia mossii	
Lessertia pappeana	*Lessertia pappeana*	

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Group 1 **Intermediate MAR, TMax and soil pH; Higher TMin**	**Group 2** **Higher MAR; Lower TMax and soil pH; Lower TMin**	**Group 3** **Lower MAR; Higher TMax and soil pH**
Lessertia pauciflora var. *pauciflora*	*Lessertia pauciflora* var. *pauciflora*	*Lessertia pauciflora* var. *pauciflora*
		Lessertia pauciflora* var. *schlechteri
Lessertia perennans var. *perennans*	*Lessertia perennans* var. *perennans*	*Lessertia perennans* var. *perennans*
	Lessertia perennans* var. *polystachya	
Lessertia perennans var. *sericea*	*Lessertia perennans* var. *sericea*	
	Lessertia phillipsiana	
Lessertia physodes	*Lessertia physodes*	
Lessertia prostata	*Lessertia prostata*	*Lessertia prostata*
Lessertia rigida	*Lessertia rigida*	*Lessertia rigida*
		Lessertia sneeuwbergensis
Lessertia spinescens		*Lessertia spinescens*
Lessertia stenoloba	*Lessertia stenoloba*	*Lessertia stenoloba*
	Lessertia stipulata	
Lessertia stricta	*Lessertia stricta*	
		Lessertia tenuifolia
	Lessertia thodei	
Lessertia tomentosa	*Lessertia tomentosa*	*Lessertia tomentosa*

7.3.3.17 Tribe: Trifolieae

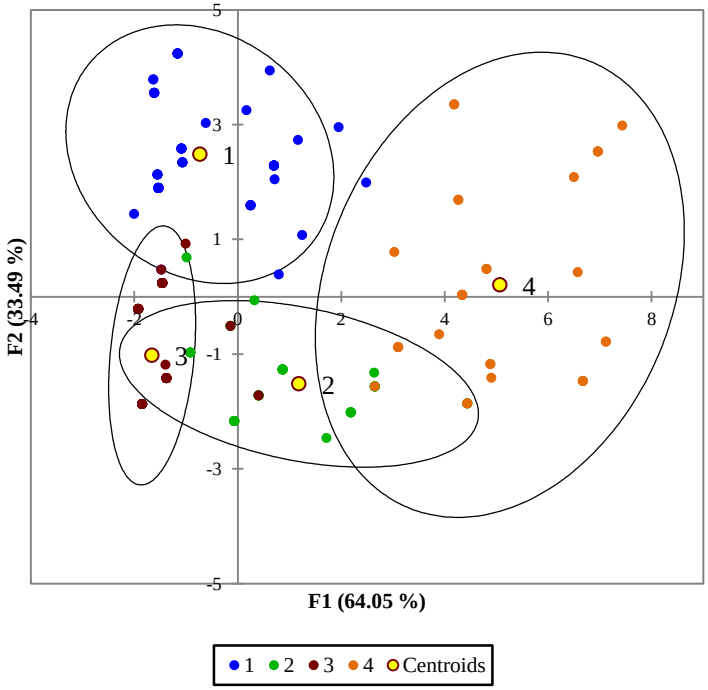

Figure 7.34. Discriminant Analysis for the tribe Trifolieae. Dots represent species; circles represent groups.

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The two genera contained in this tribe are *Trifolium* and *Trigonella*. It is evident from Figure 7.34 that four overlapping groups were formed, where F1 explains 64.05% and F2 33.49% of the independent variables.

Table 7.67. Correlation matrix between climate and soil variables for the tribe Trifolieae.

Variables	F1	F2	F3
F1	1.000	0.000	0.000
F2	0.000	1.000	0.000
F3	0.000	0.000	1.000
AnnRain	**-0.719**	0.138	-0.038
TempMin	-0.051	**0.981**	-0.002
TempMax	**0.645**	0.200	0.587
Phosphorus	0.578	0.487	-0.575
pH	**0.991**	-0.052	-0.034

Values in bold are different from 0 with a significance level alpha=0.05

Mean annual rainfall (negative), mean annual maximum temperature and soil pH are indicated as being correlated with the distribution patterns of species (Table 7.67). Species in Group 4 (Table 7.68) are adapted to low mean annual rainfall, mean annual maximum temperatures as well as high soil pH levels. Additionally, mean annual minimum temperature is also highly correlated with distribution patterns, where species in Groups 2 and 3 are adapted to low mean annual minimum temperatures and those in Group 1 to opposite levels.

Trifolium species are found mainly in the Mesic Highveld Grassland with a mean annual rainfall of 400–800 mm, a mean annual maximum temperature of <27ºC, a mean annual minimum temperature of <2ºC and a soil pH<6.4. *Trigonella anguina* occur mainly in ecotones with a mean annual rainfall of <400 mm, a mean annual maximum temperature of 27–35ºC, a mean annual minimum temperature of <2ºC and a soil pH>7.5.

Table 7.68. Species of the tribe Trifolieae clustered in four groups. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature, TMax=Mean annual maximum temperature, P=Phosphorus.

Group 1 **Higher MAR; Lower TMax and soil pH; Higher TMin**	**Group 2** **Intermediate MAR, TMax and soil pH; Lower TMin**	**Group 3** **Higher MAR; Lower TMax and soil pH; Lower TMin**	**Group 4** **Lower MAR; Higher TMax and soil pH**
Trifolium africanum var. *africanum*	*Trifolium africanum* var. *africanum*	*Trifolium africanum* var. *africanum*	*Trifolium africanum* var. *africanum*
Trifolium africanum var. *lydenburgense*	*Trifolium africanum* var. *lydenburgense*	*Trifolium africanum* var. *lydenburgense*	
Trifolium burchellianum subsp. *burchellianum*	*Trifolium burchellianum* subsp. *burchellianum*	*Trifolium burchellianum* subsp. *burchellianum*	*Trifolium burchellianum* subsp. *burchellianum*
Trifolium burchellianum subsp. *johnstonii*		*Trifolium burchellianum* subsp. *johnstonii*	
	Trigonella anguina	*Trigonella anguina*	*Trigonella anguina*

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7.4 General discussion

It is evident from Table 7.69 that mean annual rainfall is correlated with the distribution patterns of all legume tribes and species. The highest correlation figures (in bold) are also noted for mean annual rainfall for most tribes and genera. Most occurrences fall in the 400–800 mm level, followed by >800 mm (Appendix 6). Soil pH also plays a major role, with overall the second highest correlation figures except for Abreae, *Eriosema* species and Loteae, which have no correlation with soil pH. This could be due to occurrences in regions with generally low soil pH levels. Most occurrences lie in the <6.4 soil pH level, followed by a 5.5–7.4 level, confirming legumes' ultimate range of tolerance to low soil pH levels. Mean annual minimum temperature is a more important factor in the distribution patterns of legume tribes and species than mean annual maximum temperature. The range of tolerance of legume species indigenous to southern Africa to either low (<2ºC) or high (>6ºC) minimum temperatures is a more common phenomenon than species adapted to low (<27ºC) or high (>33ºC) maximum temperatures (Appendix 6). The distribution of legume species is least affected by soil phosphorus content.

The listing of species in the different groups (mostly three) could be useful when selecting species for specific climate and soil conditions (e.g. Table 7.68). The range of tolerance of a species is narrow when recorded in only one group and broad when recorded in all groups. The importance of verifying occurrence data of species (Chapter 5: Inventory) recorded in one group is emphasised, since many species have only one occurrence. A species recorded in all the groups indicates a broad range of tolerance to the given independent variable. Hypocalypteae (3 species), Abreae (2 species) and Loteae (1 species) are the only tribes of which all species were recorded in all the groups. Most species in the remaining tribes and genera are recorded either in one to three or in four groups. It is further evident when recordings between groups are compared that some species are recorded in the low and high levels but not in the intermediate group (e.g. *Aspalathus* species in Table 7.24). This could denote that species are under-collected in regions characterised by the variables in the intermediate group. Also important to note, is the absence of an intermediate group in the case of some tribes (e.g. Abreae, Table 7.46) and genera (e.g. *Eriosema* species, Table 7.52). Since the description of the groups (low, intermediate or high) of correlated variables (mean annual rainfall etc.) was subjective, the DA results that did not distinguish an intermediate group were described only as either low or high.

The results presented in this chapter could be used as a screening tool by plant breeders or pasture scientists to select indigenous legume species with desirable attributes. It should be emphasised that seed of most indigenous legumes is not available from local genebanks or commercial seed companies. The only way to obtain seed is probably through private collection of germplasm in designated grids recorded in Chapter 5: Inventory or through private seed companies specialising in collecting seed in nature.

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Table 7.69. A summary of the climate and soil variables that are correlated with the distribution patterns of legume tribes and species. Figures in bold denote highest correlation. MAR=Mean annual rainfall, TMin=Mean annual minimum temperature; TMax=Mean annual maximum temperature.

Tribe / Genus	**MAR (mm)**	**TMin (ºC)**	**TMax (ºC)**	**Soil P ($mgkg^{-1}$)**	**Soil pH (H_2O)**
Tribe: Cercideae	**0.967**	0.453			-0.830
Tribe: Detarieae	0.870				**-0.955**
Tribe: **Cassieae**	**0.825**	0.745			-0.649
Tribe: Caesalpinieae	**0.925**		-0.643		-0.924
Tribe: Mimoseae	**0.955**	-0.783			-0.743
Tribe: Acacieae	**0.853**		-0.555		-0.886
Tribe: Ingeae	**0.970**			-0.654	-0.862
Tribe: Swartzieae	**0.960**				-0.913
Tribe: Podalyrieae	-0.879				**0.927**
Genus: *Amphithalea*	**0.901**		-0.704	0.640	-0.872
Tribe: Crotalarieae	**0.960**			-0.659	-0.901
Genus: *Aspalathus*	-0.814				**0.930**
Genus: *Crotalaria*	**0.938**				-0.894
Genus: *Lotononis*	-0.836	0.840		0.609	**0.981**
Tribe: Genisteae	-0.871	0.656	0.618	0.738	**0.967**
Genus: *Argyrolobium*	-0.627	0.914			**0.937**
Tribe: Dalbergieae	**0.994**				0.841
Tribe: Hypocalypteae	-0.927			0.612	**0.946**
Tribe: Indigofereae	-0.890			0.659	**0.969**
Genus: *Indigofera*	0.894				**-0.932**
Tribe: Millettieae	**0.958**		-0.633		-0.870
Genus: *Tephrosia*	**0.885**	0.858			-0.833
Tribe: **Abreae**	**0.996**	0.908			
Tribe: Phaseoleae	0.963				0.758
Genus: ***Eriosema***	**0.920**	0.698		0.670	
Genus: *Rhynchosia*	0.837	**0.930**			-0.921
Tribe: Desmodieae	**0.966**				0.837
Tribe: Psoraleeae	-0.803				**0.978**
Genus: *Otholobium*	-0.810				**0.967**
Tribe: Sesbanieae	**0.896**				0.717
Tribe: **Loteae**	**0.973**	0.868	0.725	0.618	
Tribe: Galegeae	-0.824			0.787	**0.977**
Genus: *Lessertia*	-0.930	-0.753	0.728		**0.943**
Tribe: Trifolieae	-0.719	0.981	0.645		**0.991**

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The species recorded in Table 7.70 are adapted to a wide range of soil pH levels as well as to low soil phosphorus levels (<10 $mgkg^{-1}$). Altogether 15 *Acacia* and 13 *Indigofera* species are adapted to these soil conditions. Of the few species that are also adapted to relatively low rainfall, *Indigofera alternans* var. *alternans* is the only herb recorded, occurring in the Central Arid Region Group. *Mundulea sericea* subsp. *sericea*, a shrub/tree, occurs in the Northern and North Eastern Savanna Group. Further investigation to determine biomass production of both species under low soil phosphorus levels is suggested since both species are recorded as having value as livestock feed. However, *Mundulea sericea* subsp. *sericea* contains hydrocyanic acid (Watt & Breyer-Brandwijk 1962). A noteworthy number of diagnostic species are recorded in Table 7.70.

Table 7.70. A list of species adapted to low soil phosphorus (<10 $mgkg^{-1}$) and any given pH level. Species in bold are adapted to relatively low mean annual rainfall (200–600 mm). *Diagnostic species (occurrence of 70% or higher in a given Leguminochorion).

Species	Species
*Acacia ataxacantha**	*Indigofera filipes*
Acacia caffra	*Indigofera heterotricha*
Acacia erioloba	*Indigofera holubii*
Acacia exuvialis	*Indigofera rhytidocarpa* subsp. *rhytidocarpa*
Acacia galpinii	*Indigofera schimperi* var. *schimperi*
Acacia grandicornuta	*Indigofera sessilifolia*
Acacia hebeclada subsp. *hebeclada*	*Indigofera torulosa* var. *torulosa*
Acacia karroo*	*Indigofera vicioides* var. *vicioides*
Acacia luederitzii. var. *retinens*	*Indigofera zeyheri*
Acacia mellifera subsp. *detinens*	*Leobordea divaricata*
Acacia nilotica subsp. *kraussiana*	*Leobordea platycarpa*
Acacia robusta subsp. *clavigera*	*Lessertia depressa*
Acacia senegal var. *leiorhachis*	*Lessertia pauciflora* var. *pauciflora*
Acacia swazica	*Listia heterophylla*
Acacia tortilis subsp. *heteracantha*	*Melolobium calycinum*
Albizia anthelmintica	*Melolobium candicans*
Bauhinia petersiana subsp. *macrantha*	*Melolobium microphyllum*
Bauhinia tomentosa	***Mundulea sericea* subsp. *sericea****
Bolusanthus speciosus	*Neorautanenia mitis*
Chamaecrista biensis	*Otoptera burchellii*
*Chamaecrista mimosoides**	*Peltophorum africanum*
Crotalaria distans subsp. *distans*	*Rhynchosia confusa*
Crotalaria griquensis	*Rhynchosia minima* var. *minima*
Crotalaria lotoides	*Rhynchosia totta* var. *totta**
Crotalaria monteiroi var. *monteiroi*	*Rhynchosia venulosa*
Crotalaria sphaerocarpa subsp. *sphaerocarpa*	*Schotia brachypetala*
Crotalaria virgultalis	*Senna italica* subsp. *arachoides**
Cullen tomentosum	*Sutherlandia frutescens*

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Species	Species
Dichrostachys cinerea subsp. *africana* var. *africana*	*Sutherlandia microphylla*
Elephantorrhiza elephantina	*Tephrosia burchellii**
Indigastrum argyraeum	*Tephrosia multijuga*
Indigofera alternans* var. *alternans	*Tephrosia purpurea* subsp. *leptostachya* var. *pubescens*
Indigofera charlieriana var. *charlieriana*	*Vigna vexillata* var. *vexillata**
Indigofera cryptantha var. *cryptantha*	*Zornia milneana*
Indigofera daleoides var. *daleoides**	

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CHAPTER 8

PASTURE POTENTIAL

8.1 Introduction

8.1.1 Ancient African agriculture

Harlan (1995) states that the most useful tropical forage grasses come from Africa and the most useful legumes from tropical America. Nonetheless, domestication of African legumes such as *Faidherbia albida* (ana tree), *Macrotyloma geocarpum* (Kersting's groundnut), *Sphenostylis stenocarpa* (yam bean), *Vigna subterranea* (bambara groundnut) and *Vigna unguiculata* (cowpea) played a major historical role in developing African agriculture (Shaw 1976; Harlan 1995). Egyptian agriculture was not truly African since crops came for the Near East and the Mediterranean, cultivated in the flooding regimes of the Nile, but by 6000 BC indigenous agriculture was in place in West Africa and by 4000 BC in the central Sudanic zone (Harlan 1995). The pattern of plant domestication in Africa: (i) was essentially noncentric but is accepted as a savanna phenomenon, originating mostly from north of the equator to south of the Sahara (Sahelian, Sudanian, Guineo-Congolian and Ethiopian regions), (ii) can easily be determined, i.e. steps in the evolution of cultivated races wild races, weed races and specialised cultivars (Harlan *et al*. 1976). The above-mentioned legumes used in ancient times are still agriculturally important plants and recent publications on the genetic diversity of these legumes are from Massawe *et al*. (2005) on *Vigna subterranea*, Dangasuk *et al*. (2006) on *Faidherbia albida*, Adu-Gyamfi *et al*. (2012) on *Macrotyloma geocarpum*, Badiane *et al*. (2012) on *Vigna uinguiculata*, and Adewale & Odoh (2013) on *Sphenostylis stenocarpa*.

The north-south axis of Africa hindered development because of ecological barriers such as the Sahara and the severe longitudinal climate changes, according to Diamond (1997). The east-west orientation of plant domestication in Africa (Harlan *et al*. 1976) could be as a result of less variation in climate between these latitudinal lines, permitting easier spread of crops, seeds and agricultural practices. Another theory, as stated by Harris (1967), is that during the Saharan subpluvial period from *ca*. 5000–2350 BC knowledge of agriculture from the core area of the Nile Valley diffused to south of the Sahara. The human migration into southern Africa introduced cultivation to the hunter-gatherer population mainly through the highland spine of eastern Africa (Harris 1967).

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8.1.2 Definition of fodder crops, forages and pastures

Batello *et al*. (undated) defined fodder crops, forages and pastures as follows:

- Fodder crops are grown on arable land and are harvested as a whole crop for livestock feed rather than the animals foraging for themselves. They have a longer history of domestication than pasture species, are very important in smallholder systems, are also used as green manure and cover crop, and are mostly annual.
- Forages are grazed or browsed *in situ*, cut or conserved and fed to housed animals.
- Pastures are improved species or cultivars sown on arable land, and mangement includes the use of fertilisation, irrigation, herbicides and pesticides to ensure optimum production.

It should be added that other important uses of Forage Genetic Resources (FGR) are soil conservation, maintenance of fertility, and restoration of degraded sites (Batello *et al*. undated).

8.1.3 Plant genetic resources

The International Undertaking on Plant Genetic Resources (FAO 1983) defines plant genetic resources (PGR) as the reproductive or vegetative propagating material of the following categories of plants: (i) cultivated varieties (cultivars) in current use and newly developed varieties; (ii) obsolete cultivars; (iii) primitive cultivars (landraces); (iv) wild and weed species, near relatives of cultivated varieties; and (v) special genetic stocks (including elite and current breeder's lines and mutants).

The International Treaty on Plant Genetic Resources (ITPGR) for Food and Agriculture (PGRFA) included 15 genera of legume forages (mainly temperates) in the list of crops (Annex 1) covered under the Multilateral System, none originating from southern Africa (Anon 2009). Two important African legume species are, however, listed as food crops in the treaty, namely *Vigna unguiculata* and *Sphenostylis stenocarpa*. When accessing material listed in Annex 1 under the Multilateral System, it is ‘solely for the purpose of utilization and conservation for research, breeding and training for food and agriculture’ and ‘not to claim intellectual property or other rights that limit facilitated access to PGRFA’ (Moore & Tymowski 2005).

Batello *et al*. (undated) proposed additional forage species from tropical, subtropical, mountain or dryland environments, which include legume species also indigenous to South Africa, namely *Acacia nilotica*, *Faidherbia albida*, *Listia bainesii*, *Macrotyloma axillare*, *Macrotyloma uniflorum*, *Mucuna pruriens*, *Neonotonia wightii*, *Sesbania sesban* and *Stylosanthes fruticosa*. Collection, evaluation and cultivar development of tropical species

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were started in 1950 by the Commonwealth Scientific & Industrial Research Organization (CSIRO, Australia), followed by Centro Internacional de Agricultura Tropical (CIAT, Colombia), Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA, Brazil), International Livestock Research Institute (ILRI, Kenya) and the International Center for Africultural Research in the Dry Areas (ICARDA, Syria) but, owing to a lack of funding, have been abandoned.The authors further state that more research efforts are needed to improve and widen the genetic base of pastures in aforementioned environments and that many countries will benefit from access to additional diversity, including from the species' centres of origin.

Nnadozie *et al*. (2002–3) proposed four PGR programmatic thematic areas for incorporation into the New Partnership for Africa's Development (NEPAD). The first focus area is to conduct a regional PGR assessment and foresight, given that most of Africa's PGR is unknown, unstudied, undervalued and under-utilised. The second is capacity-building to improve participation in international negotiations and an understanding of the ITPGR. The third focus area is to strengthen national and sub-regional PGR programmes, particularly those that address food security and human health. The fourth is to create sustainable financing for PGR activities.

In a recent study that analysed the access to PGR in Africa, it was concluded that the limitation in documentation of indigenous knowledge and the lack of complete inventories of PGR are constraints that limit the access and benefit-sharing of PGR (Elliott 2008). Even though South Africa was not part of this study, actions needed to develop and implement access to PGR and benefit-sharing are also relevant to South Arica, i.e. programmes that maintain *in situ* conservation and *ex situ* facilities as well as the restoration of degraded areas of important biological resources.

Mumba & Marandu (2012) developed guidelines for the mangement and protection of Intellectual Property Rights (IPR), Traditional Knowledge (TK) and Access and Benefit Sharing (ABS) for Southern African Development Community (SADC) countries.

8.2 Statistical procedure and layout of chapter

8.2.1 Statistical procedure

Legume species recorded as being cultivated, grazed or browsed (Chapter 5) were used as dataset. The Agglomerative Hierarchical Clustering (AHC) of the XLSTAT 2010.6.01 Software (Addinsoft) (see Chapter 6, 6.2.1) was used to class latitudes and longitudes in order to select species for further evaluation. The results of the AHC are presented in Table 8.1.

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The latitudinal and longitudinal dataset for cultivated and grazed or browsed species was analysed by Table Curve 2D (Version 5.01) to fit the most appropriate function. All curves were polynomials that fitted a wide range of curvatures and used when the functional relationship was complicated but repeatable and described as:
$y=a+bx^{0.5}+cx+dx^{1.5}+ex^{2}+fx^{2.5}+gx^{3}$.

Table 8.1. Results for the cluster analyses of latitudinal (Lat) and longitudinal (Lon) groups within the cultivated and grazed or browsed dataset. Latitudinal and longitudinal lines in bold were used in further evaluations.

Cultivated species						Grazed or browsed species					
Lat	#spp.	Class	Lon	#spp.	Class	Lat	#spp.	Class	Lon	#spp.	Class
22.125	36	1	16.375	2	1	22.125	17	1	16.875	15	1
22.375	121	2	16.625	1	1	22.375	49	1	17.125	23	1
22.625	104	2	16.875	9	1	22.625	37	1	17.375	24	1
22.875	199	3	17.125	10	1	22.875	64	2	17.625	31	1
23.125	172	3	17.375	8	1	23.125	72	2	17.875	27	1
23.375	58	1	17.625	9	1	23.375	26	1	18.125	15	1
23.625	136	2	17.875	16	1	23.625	46	1	18.375	29	1
23.875	**209**	**3**	18.125	12	1	23.875	70	2	18.625	19	1
24.125	**204**	**3**	18.375	55	1	24.125	79	2	18.875	28	1
24.375	**190**	**3**	18.625	22	1	24.375	78	2	19.125	30	1
24.625	**236**	**3**	18.875	53	1	**24.625**	**102**	**3**	19.375	23	1
24.875	**199**	**3**	19.125	56	1	24.875	85	2	19.625	22	1
25.125	**256**	**3**	19.375	49	1	**25.125**	**99**	**3**	19.875	15	1
25.375	**301**	**3**	19.625	29	1	**25.375**	**122**	**3**	20.125	34	1
25.625	**418**	**3**	19.875	30	1	**25.625**	**130**	**3**	20.375	30	1
25.875	**261**	**3**	20.125	30	1	**25.875**	**106**	**3**	20.625	28	1
26.125	**199**	**3**	20.375	27	1	26.125	90	2	20.875	14	1
26.375	170	3	20.625	37	1	26.375	72	2	21.125	9	1
26.625	131	2	20.875	23	1	26.625	68	2	21.375	11	1
26.875	179	3	21.125	18	1	26.875	91	2	21.625	16	1
27.125	141	2	21.375	33	1	27.125	66	2	21.875	15	1
27.375	190	3	21.625	24	1	27.375	86	2	22.125	23	1
27.625	139	2	21.875	22	1	27.625	78	2	22.375	19	1
27.875	84	1	22.125	32	1	27.875	59	2	22.625	27	1
28.125	149	2	22.375	30	1	28.125	84	2	22.875	26	1
28.375	135	2	22.625	46	1	28.375	90	2	23.125	20	1
28.625	143	2	22.875	33	1	**28.625**	**105**	**3**	23.375	21	1
28.875	185	3	23.125	51	1	**28.875**	**119**	**3**	23.625	24	1
29.125	147	2	23.375	56	1	29.125	82	2	23.875	26	1
29.375	95	2	23.625	24	1	29.375	59	2	24.125	25	1
29.625	153	2	23.875	43	1	29.625	84	2	24.375	27	1
29.875	102	2	24.125	45	1	29.875	70	2	24.625	51	2

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Cultivated species						Grazed or browsed species					
Lat	#spp.	Class	Lon	#spp.	Class	Lat	#spp.	Class	Lon	#spp.	Class
30.125	56	1	24.375	44	1	30.125	50	1	24.875	39	2
30.375	65	1	24.625	52	1	30.375	51	1	25.125	40	2
30.625	109	2	24.875	57	1	30.625	66	2	25.375	33	1
30.875	73	1	25.125	53	1	30.875	29	1	25.625	50	2
31.125	44	1	25.375	46	1	31.125	33	1	25.875	44	2
31.375	63	1	25.625	54	1	31.375	43	1	26.125	52	2
31.625	78	1	25.875	69	1	31.625	36	1	26.375	30	1
31.875	65	1	26.125	83	1	31.875	28	1	26.625	40	2
32.125	55	1	26.375	59	1	32.125	43	1	26.875	54	2
32.375	60	1	26.625	101	1	32.375	50	1	27.125	60	2
32.625	124	2	26.875	105	1	32.625	38	1	27.375	55	2
32.875	50	1	27.125	140	2	32.875	18	1	27.625	67	2
33.125	80	1	27.375	135	2	33.125	28	1	**27.875**	**82**	**3**
33.375	134	2	27.625	149	2	33.375	24	1	**28.125**	**91**	**3**
33.625	159	2	27.875	205	2	33.625	29	1	**28.375**	**120**	**3**
33.875	199	3	28.125	257	2	33.875	42	1	**28.625**	**83**	**3**
34.125	131	2	28.375	275	2	34.125	31	1	28.875	49	2
34.375	67	1	28.625	157	2	34.375	21	1	**29.125**	**101**	**3**
34.625	14	1	28.875	101	1	34.625	8	1	**29.375**	**104**	**3**
			29.125	203	2				29.625	50	2
			29.375	257	2				**29.875**	**111**	**3**
			29.625	136	2				**30.125**	**136**	**3**
			29.875	278	2				**30.375**	**108**	**3**
			30.125	**437**	**3**				**30.625**	**99**	**3**
			30.375	**382**	**3**				**30.875**	**88**	**3**
			30.625	**327**	**3**				**31.125**	**184**	**3**
			30.875	**348**	**3**				**31.375**	**118**	**3**
			31.125	**563**	**3**				**31.625**	**88**	**3**
			31.375	**336**	**3**				**31.875**	**99**	**3**
			31.625	218	2				32.125	70	2
			31.875	198	2				32.375	38	2
			32.125	152	2				32.625	12	1
			32.375	79	1				32.875	11	1
			32.625	59	1						
			32.875	18	1						

In order to score species and separate them into a lower, medium or higher pasture value, known attributes were selected from data presented in Chapter 5. The scores were assigned according to criteria defined in Table 8.2.

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The following shortcomings were identified and are worth mentioning since they affect the order of species proposed for future evaluation:

- Antiqualities of many species are yet unknown and data of physical traits (e.g. hairiness and thorns) are difficult to obtain for all species.
- Distribution patterns are based on plant collection (herbaria) databases (see Chapter 6, 6.1.3).
- Heights are not always defined and creeping or climbing herbs are often described as longer than 5 m.
- Production data are unknown for most species.

Table 8.2. Attributes and numbers assigned to score legumes for pasture value.

Antiqualities
1 = contains antiqualities or poisonous substances
2 = contains minor antiqualities
3 = contains no known antiqualities or is present in root
Distribution
1 = narrow distribution, i.e. present in 1 bioregion
2 = intermediate distribution, i.e. present in 2 or 3 bioregions
3 = wide distribution, i.e. present in more than 3 bioregions
Adapted to low soil phosphorus (P)
1 = not adapted to low soil P
2 = adapted to <10 $mgkg^{-1}$ soil P
Height
1 = mean height >2 m or where a shrub or tree is a climber
2 = mean height ± 1.5 m
3 = mean height 0.5–1.5 m or herbs taller than 1m
4 = mean height < 0.5 m including creepers and climbers
(Where no data were available, the mean of the genus was used.)
Duration
1 = annual
2 = short-lived perennial, occasional perennial or perennial
Cultivated, grazed or browsed
1 = not recorded as being cultivated, grazed or browsed
2 = recorded as cultivated, grazed or browsed

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8.2.2 Layout of chapter

The occurrence of cultivated indigenous legumes is presented first, followed by grazed or browsed legumes. The presence of species in quarter degree grid cells (QDGCs) is shown separately in longitudinal and latitudinal lines with corresponding soil and climatic conditions prevailing in the QDGCs. The final outcome of this chapter is presented in table format, listing promising pasture species that merit further investigation.

8.3 Occurrence of indigenous cultivated legume species

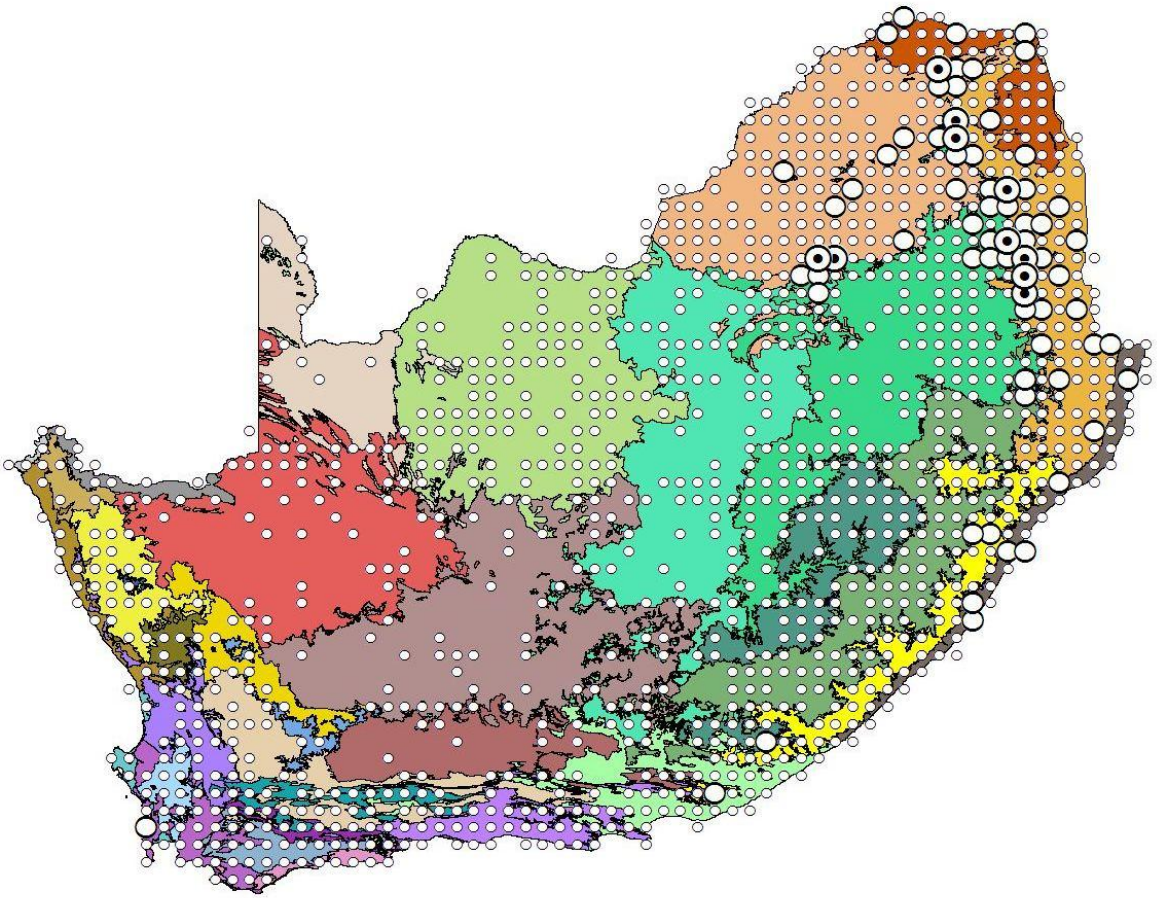

Figure 8.1. Number of indigenous legume species recorded in QDGCs as cultivated species. Small white dots: ≤20 species; larger white dots: 21–40 species; black-white dots: 41–66 species.

The numbers of cultivated (formerly or currently) legume species recorded in QDGCs are shown in Figure 8.1. The highest number of cultivated species occurs mainly in the Central Bushveld, Mopane and Lowveld Bioregions. In order to select QDGCs with high species

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concentrations, species numbers in both latitudes and longitudes were plotted and are shown in Figure 8.2 and Figure 8.3.

The latitudinal lines included in further evaluation of legume species lie between 23,875ºS and 26,125ºS (Figure 8.2) as determined by cluster analyses (Table 8.1, Class 3). Latitudinal lines that were in Class 3 in the cluster analyses, but eliminated from further evaluation, are also listed in Table 8.1. Figure 8.3 shows the longitudinal lines included for further evaluation with all species in Class 3 between 30,125ºS and 31,375ºS included.

The soil and climatic conditions recorded in the selected QDGCs of cultivated species are shown in Table 8.3. The prevailing mean annual rainfall for the selected QDGCs is 400–800 mm, mean annual minimum temperature 2–8ºC, mean annual maximum temperature 25–29ºC, soil phosphorus <10 $mgkg^{-1}$ and soil pH<6.4.

Table 8.3. Soil and climatic conditions recorded in the selected QDGCs of cultivated species.

	Number of QDGCs
Mean annual rainfall (mm)	
200–600	3
400–800	27
600–1000	12
>800	20
Mean annual minimum temperature (ºC)	
<2	1
0–4	10
2–8	31
>6	20
Mean annual maximum temperature (ºC)	
<27	9
25–29	28
27–35	25
Soil P ($mgkg^{-1}$)	
<10	49
5–35	13
Soil pH (H_2O)	
<6.4	34
5.5–7.4	20
6.5–7.4	4
6.5–8.4	3
>7.5	1

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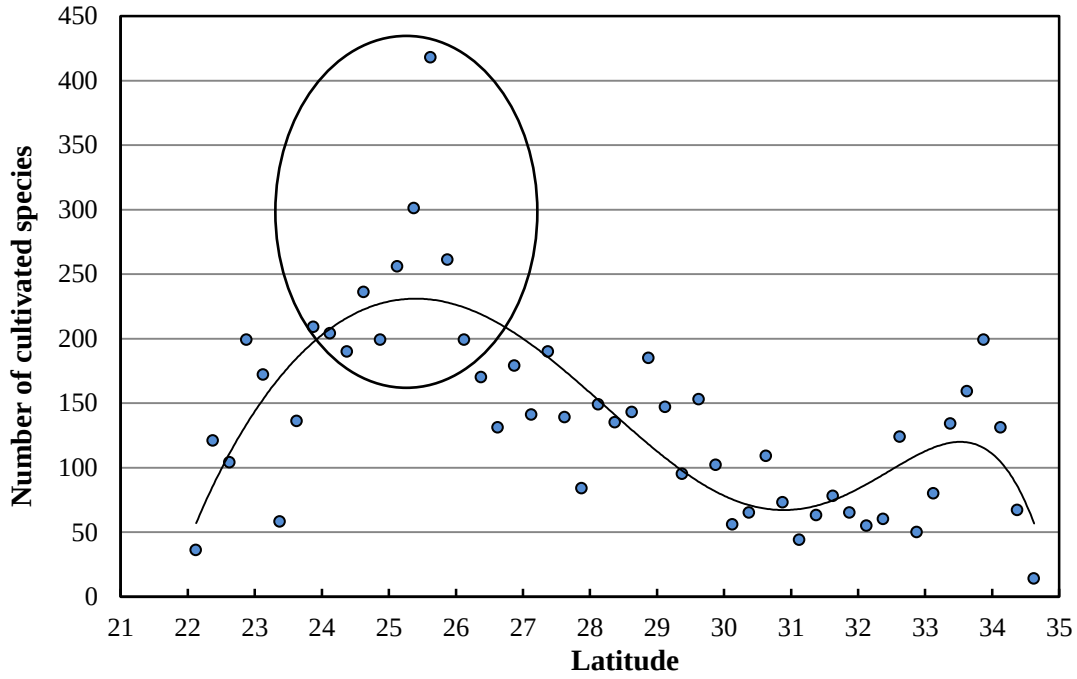

Figure 8.2. The number of cultivated species recorded in the latitudinal lines of the study area. The latitudes enclosed by the ellipsoid were used to generate a species list. $Y=a+bx^{0.5}+cx+dx^{1.5}+ex^{2}+fx^{2.5}+gx^{3}$, $r^2=0.59$.

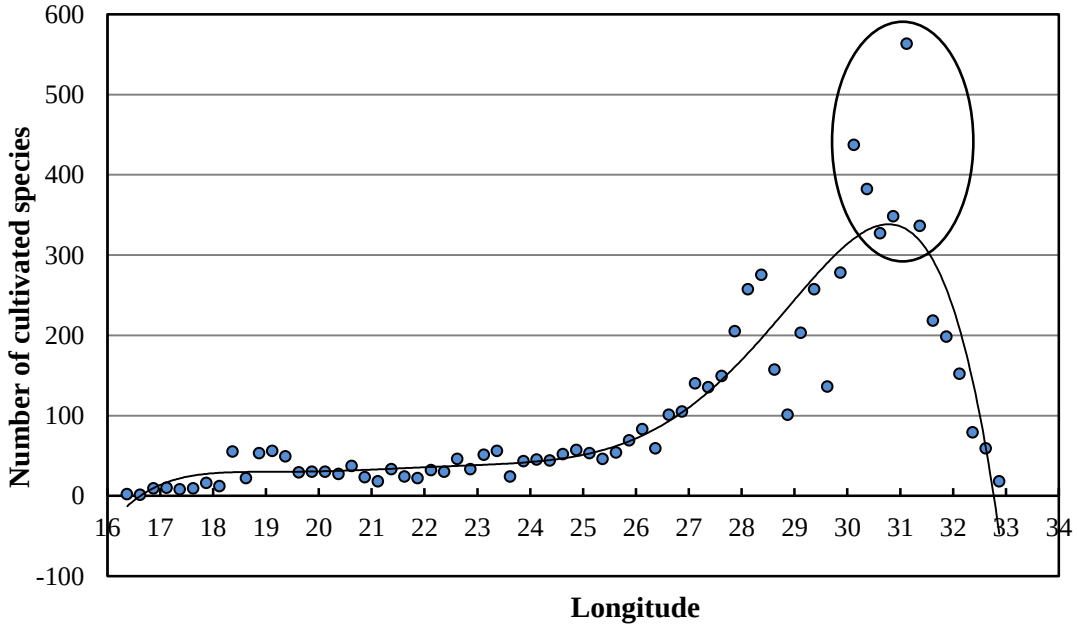

Figure 8.3. The number of cultivated species recorded in the longitudinal lines of the study area. The longitudes enclosed by the ellipsoid were used to generate a species list. $Y=a+bx^{0.5}+cx+dx^{1.5}+ex^{2}+fx^{2.5}+gx^{3}$, $r^2=0.83$.

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8.4 Occurrence of indigenous grazed or browsed legume species

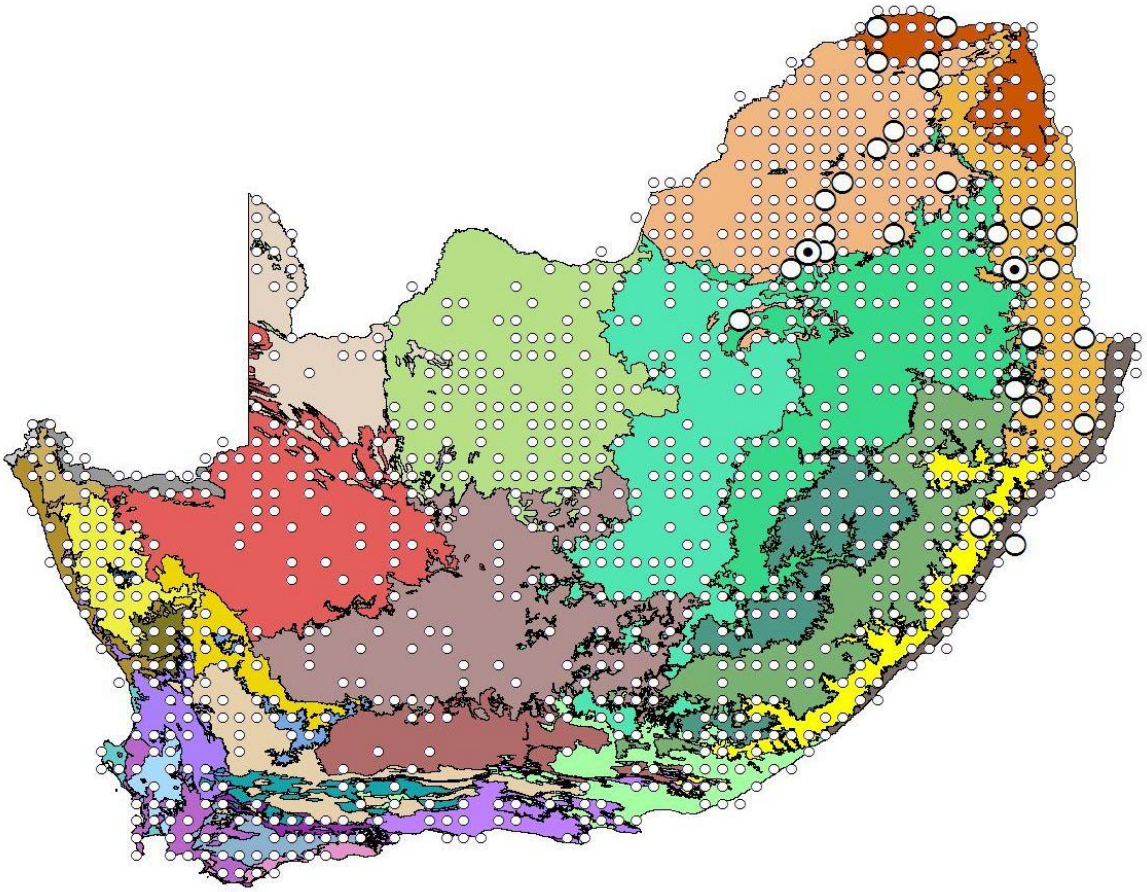

Figure 8.4. Number of indigenous legume species recorded in QDGCs as grazed or browsed species. Small white dots: ≤10 species; large white dots: 11–20 species; black-white dots: 21–27 species.

The numbers of grazed or browsed legume species recorded in QDGCs are shown in Figure 8.4. The highest number of grazed or browsed species has a pattern similar to that of cultivated species in that they also occur mainly in the Central Bushveld, Mopane and Lowveld Bioregions. Species numbers in all latitudes and longitudes were plotted and presented in Figure 8.5 and Figure 8.6 respectively.

Figure 8.5 shows that the latitudinal lines included in further evaluation of legume species lie between 24,625ºS and 25,875ºS, with two added lines 28,625ºS and 28,875ºS containing a high number of grazed or browsed species (Table 8.1, Class 3). Figure 8.6 shows the longitudinal lines grouped in Class 3, namely between 27,875ºS and 31,875ºS.

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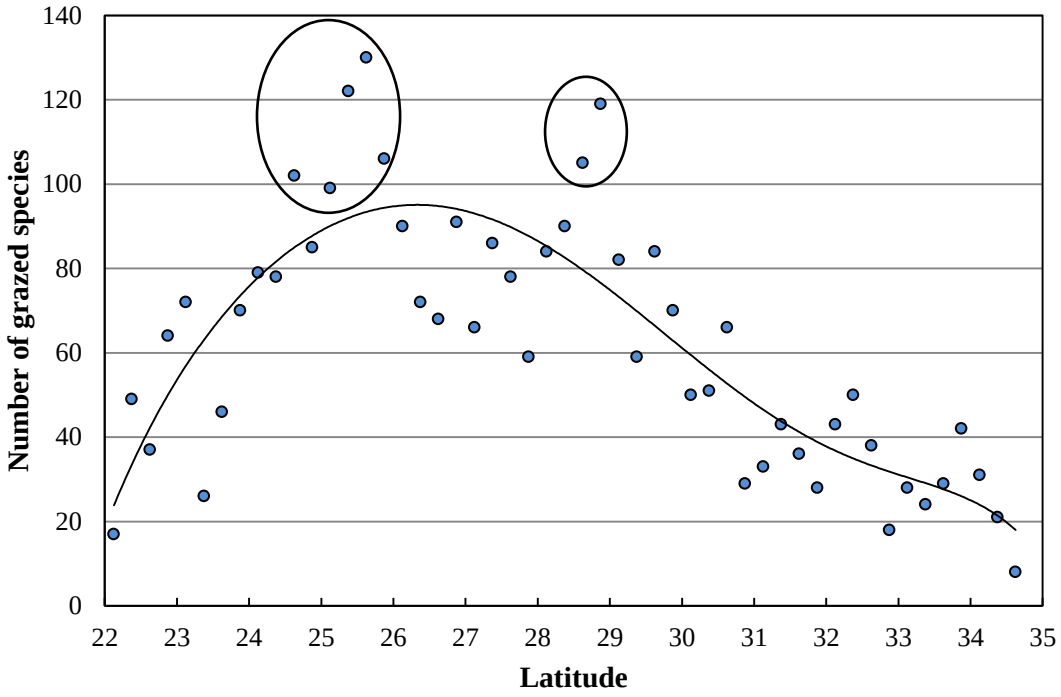

Figure 8.5. The number of grazed or browsed species recorded in the latitudinal lines of the study area. The latitudes enclosed by the ellipsoids were used to generate a species list. $Y=a+bx^{0.5}+cx+dx^{1.5}+ex^{2}+fx^{2.5}+gx^{3}$, $r^2=0.71$.

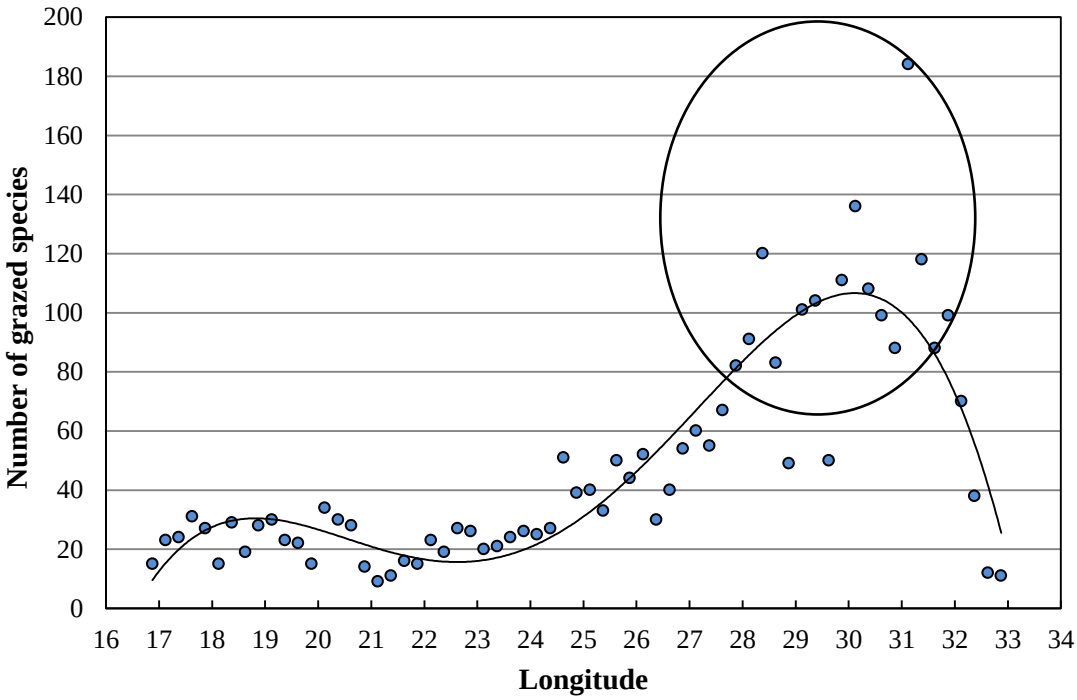

Figure 8.6. The number of grazed or browsed species recorded in the longitudinal lines of the study area. The longitudes enclosed by the ellipsoid were used to generate a species list. $y=a+bx^{0.5}+cx+dx^{1.5}+ex^{2}+fx^{2.5}+gx^{3}$, $r^2=0.81$.

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The soil and climatic conditions recorded in the selected QDGCs of grazed or browsed species are shown in Table 8.4. The prevailing mean annual rainfall for the selected QDGCs is 400–800 mm, mean annual minimum temperature 2–8ºC, mean annual maximum temperature both 25–29ºC and 27–35ºC, soil phosphorus <10 $mgkg^{-1}$ and soil pH<6.4, similar to soil and climatic conditions recorded for QDGCs of cultivated species.

Table 8.4. Soil and climatic conditions recorded in the selected QDGCs of grazed species.

	Number of QDGCs
Mean annual rainfall (mm)	
400–800	67
600–1000	23
>800	36
Mean annual minimum temperature (ºC)	
<2	7
0–4	26
2–8	68
>6	25
Mean annual maximum temperature (ºC)	
<27	17
25–29	55
27–35	54
Soil P ($mgkg^{-1}$)	
<10	119
5–35	7
Soil pH (H_2O)	
<6.4	71
5.5–7.4	35
6.5–7.4	10
6.5–8.4	9
>7.5	1

8.5 Species list with possible pasture value for further evaluation

Legume species recorded in the selected QDGCs of cultivated, grazed or browsed species as discussed under 8.3 and 8.4 were scored according to the criteria outlined in the statistical procedure (8.2.1). The percentage species that scored a total of between nine and 16 are shown in Figure 8.7. Species that scored a total of nine to 11 are labelled as having lower pasture value, 12–14 as having medium pasture value and 15–16 as having higher pasture value. Altogether 584 species are included in the list.

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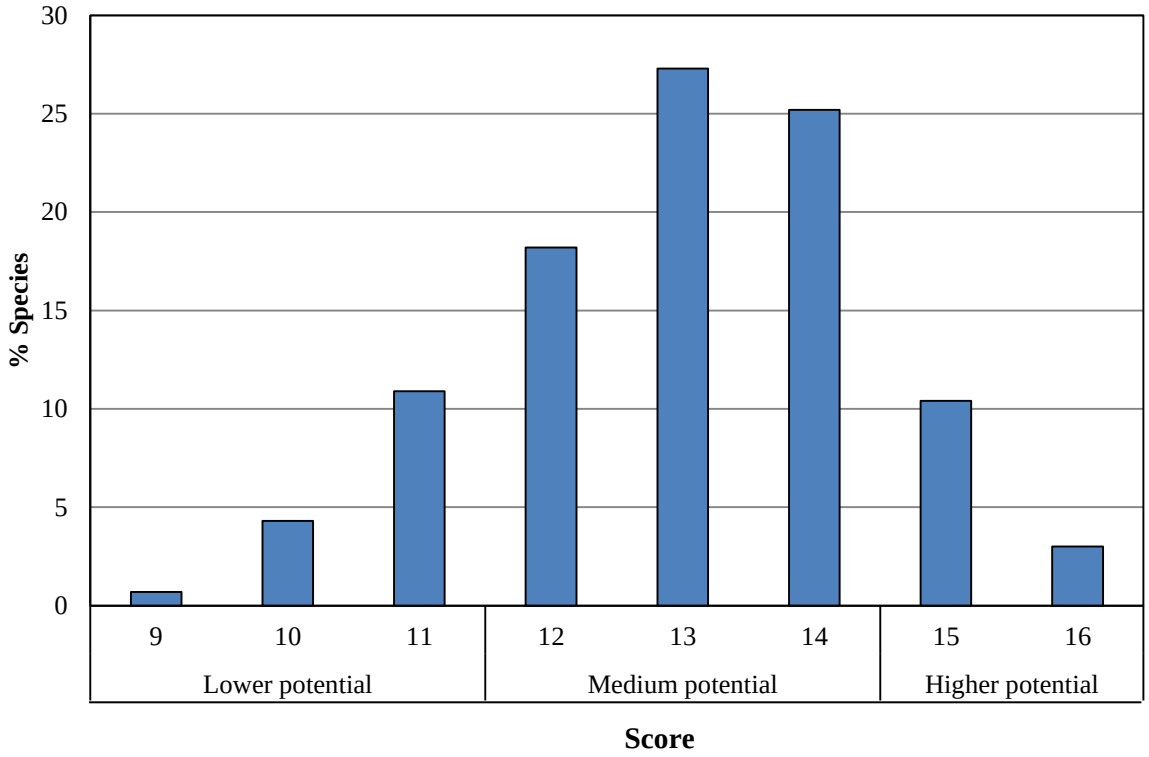

Figure 8.7. The percentage species recorded in groups scored for potential pasture value.

A summary of the percentage legume species, either cultivated or grazed/browsed, is presented in Table 8.5. The tribe Phaseoleae contains the highest percentage cultivated legume species, followed by the Millettieae and Indigofereae. Important grazed or browsed species are mostly contained in the Acacieae, followed by the Crotalarieae and Indigofereae. Since the Phaseoleae contains the second largest group of species (10.8% of total number of indigenous legume species), its importance should also be considered when pasture species are selected.

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Table 8.5. The percentage cultivated or grazed/browsed species present in the various tribes. The percentage of all indigenous legume species present in the various tribes is also shown.

	Cultivated species (%)	Grazed/browsed species (%)	Total legume species (%)
Caesalpinioideae			
Cercideae	4.7	1.0	0.8
Detarieae	4.7	2.1	0.6
Cassieae	1.7	0.0	0.7
Caesalpinieae	2.3	0.0	1.0
Mimosoideae			
Mimoseae	0.0	5.2	1.1
Acacieae	5.2	20.8	3.0
Ingeae	1.2	4.2	0.8
Faboideae			
Swartzieae	0.6	0.0	0.1
Sophoreae	1.7	1.0	0.3
Podalyrieae	5.2	3.1	8.4
Crotalarieae	8.7	15.6	38.0
Genisteae	4.1	3.1	4.6
Dalbergieae	4.1	4.2	1.7
Hypocalypteae	0.0	0.0	0.2
Indigofereae	10.4	12.5	12.7
Millettieae	11.1	2.1	4.6
Abreae	0.0	0.0	0.1
Phaseoleae	20.4	11.5	10.8
Desmodieae	3.5	3.1	0.9
Psoraleeae	3.5	1.0	5.2
Sesbanieae	2.9	1.0	0.6
Loteae	0.0	0.0	0.1
Galegeae	2.9	6.4	3.4
Trifolieae	1.1	2.1	0.3
Total	100.0	100.0	100.0

Finally, the proposed list of pasture species selected for further evaluation is presented in Table 8.6. The three main categories listed, are higher (A1), medium (A2) and lower (A3) pasture value, with short descriptions of each subcategory, followed by the species that fall in the subcategory. A numerical quick guide ('key') is presented in Figure 8.8. In the key, each criterion for selection is numbered, thus allowing for the construction of a seven-figure number reflecting a specific combination of criteria. These numbers appear above the description of the corresponding group of species in Table 8.6.

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Pasture potential		
0 **Higher potential**	**1** **Medium potential**	**2** **Lower potential**
Antiqualities		
0 Contains no known antiqualities or is present in root	**1** Contains some known antiqualities	**2** Contains antiqualities or poisonous substances
Distribution		
0 Wide distribution, i.e. present in more than 3 bioregions	**1** Intermediate distribution, i.e. present in 2 or 3 bioregions	**2** Narrow distribution, i.e. present in 1 bioregion

Adaptation to low soil phosphorus	
0 Adapted to <10 $mgkg^{-1}$ soil P	**1** Not adapted to very low soil P

Height			
0 Mean height < 0.5 m including creepers and climbing	**1** Mean height between 0.5–1.5 m or herbs taller than 1 m	**2** Mean height ± 1.5 m	**3** Mean height >2 m or where a shrub or tree is a climber

Duration	
0 Short-lived perennial, occasional perennial or perennial	**1** Annual

Cultivated, grazed or browsed	
0 Recorded as cultivated, grazed or browsed	**1** Not recorded as being cultivated, grazed or browsed

Figure 8.8. Quick guide (‘key’) to selection criteria for indigenous legume species listed as potential pasture species. For each main character (centred and in bold), select one character state (number), in sequence from top to bottom. The resultant seven-figure numbers selected from this table are recorded for the various pasture value categories in Table 8.6.

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Table 8.6. Species present in QDGCs where high occurrences of cultivated or grazed species were recorded and divided into categories of higher, medium and lower pasture value. The seven-figure number above a group of species reflects the selection criteria as numbered in Figure 8.8. *Diagnostic species (occurrence of 70% or higher in a given Leguminochorion); [P]tribe Phaseoleae.

A1. Higher potential: No known antiqualities

0000000

Wide distribution, adapted to low soil P, height <0.5 m or climber/creeper, perennial, is grazed or cultivated

Argyrolobium collinum
Crotalaria eremicola subsp. *eremicola*
Eriosema parviflorum subsp. *parviflorum*[P]
Indigastrum argyraeum
Indigofera rhytidocarpa subsp. *rhytidocarpa*
Lessertia depressa
Lotononis tenella
Otoptera burchellii[P]
Rhynchosia confusa[P]
Rhynchosia minima var. *minima*[P]
Rhynchosia totta var. *totta**[P]
Rhynchosia venulosa[P]
Vigna vexillata var. *vexillata**[P]
Zornia milneana

0000001

Wide distribution, adapted to low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Argyrolobium humile
Chamaecrista biensis
Eriosema squarrosum[P]
Indigofera angustifolia var. *tenuifolia*
Indigofera ionii
Indigofera torulosa var. *torulosa*
Leobordea divaricata
Lessertia affinis
Lotononis macrosepala
Melolobium calycinum
Melolobium obcordatum
Neptunia oleracea
Pomaria sandersonii
Rhynchosia cooperi[P]
*Tephrosia burchellii**
Tephrosia capensis var. *acutifolia*
Tephrosia capensis var. *hirsuta*
Tephrosia linearis

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Tephrosia marginella
Tephrosia natalensis subsp. *natalensis*
Tephrosia pietersii

0000100

Wide distribution, adapted to low soil P, height 0.5–1.5 m, perennial, is grazed or cultivated

Indigofera alternans var. *alternans*
Indigofera cryptantha var. *cryptantha*
Lessertia pauciflora var. *pauciflora*
Listia heterophylla
Sutherlandia microphylla
Tephrosia multijuga

0001000

Wide distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, is grazed or cultivated

Acacia schweinfurthii var. *schweinfurthii*
*Bauhinia galpinii**
Erythrina zeyheri[P]
Indigofera dimidiata
Indigofera hedyantha
Indigofera longibarbata
Listia bainesii
Lotononis laxa
Macrotyloma axillare var. *axillare*[P]
Neonotonia wightii[P]
Rhynchosia adenodes[P]
Rhynchosia caribaea[P]
Rhynchosia minima var. *prostrata*[P]
*Sphenostylis angustifolia**[P]
Stylosanthes fruticosa
Trifolium africanum var. *africanum*
Trifolium burchellianum subsp. *burchellianum*
Vigna oblongifolia var. *oblongifolia*[P]
Vigna unguiculata subsp. *dekindtiana* var. *huillensis*[P]
Vigna unguiculata subsp. *dekindtiana* var. *dekindtiana*[P]
Vigna unguiculata subsp. *stenophylla*[P]
Vigna vexillata var. *angustifolia*[P]
Vigna vexillata var. *davyi*[P]

0010000

Intermediate distribution, adapted to low soil P, height <0.5 m or climber/creeper, perennial, is grazed or cultivated

Tylosema esculentum

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A2. Higher potential: Some known antiqualities

0100000

Wide distribution, adapted to low soil P, height <0.5 m or climber/creeper, perennial, is grazed or cultivated

Indigofera vicioides var. *vicioides*

B1. Medium potential: No known antiqualities

1000011

Wide distribution, adapted to low soil P, height <0.5 m or climber/creeper, annual, no record of being grazed or cultivated

Crotalaria distans subsp. *distans*
Indigofera charlieriana var. *charlieriana*
Indigofera holubii

1000101

Wide distribution, adapted to low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

Argyrolobium rotundifolium
Aspalathus asparagoides subsp. *rubro-fusca*
Aspalathus gerrardii
Chamaecrista comosa var. *comosa*
Indigofera cuneifolia var. *cuneifolia*
Indigofera daleoides var. *daleoides**
Indigofera filipes
Indigofera foliosa
Indigofera heterotricha
Indigofera poliotes
Leobordea platycarpa
Melolobium alpinum
Melolobium microphyllum
Rhynchosia albissima[P]
Tephrosia glomeruliflora subsp. *glomeruliflora*

1000200

Wide distribution, adapted to low soil P, mean height of 1.5 m, perennial, is grazed or cultivated

Crotalaria lotoides
Crotalaria monteiroi var. *monteiroi*
Sutherlandia frutescens
Sutherlandia montana
Vigna vexillata var. *ovata*[P]

1001001

Wide distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Abrus laevigatus
Acacia kraussiana
Adenopodia spicata

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Aeschynomene micrantha
Alysicarpus zeyheri
Argyrolobium harveyanum
Argyrolobium lotoides
Argyrolobium molle
Argyrolobium pauciflorum
Argyrolobium rupestre subsp. *rupestre*
Argyrolobium stipulaceum
Chamaecrista capensis var. *capensis*
Chamaecrista capensis var. *flavescens*
Chamaecrista comosa var. *capricornia*
Chamaecrista plumosa var. *plumosa*
Crotalaria brachycarpa
Crotalaria virgulata subsp. *grantiana*
Dalbergia armata
Dolichos linearis[P]
Dolichos sericeus subsp. *sericeus*[P]
Dolichos trilobus subsp. *transvaalicus*[P]
Dumasia villosa var. *villosa*[P]
Eriosema burkei var. *burkei*[P]
Eriosema cordatum[P]
Eriosema cordatum x *E. salignum*[P]
Eriosema distinctum[P]
Eriosema ellipticifolium[P]
Eriosema kraussianum[P]
Eriosema pauciflorum var. *pauciflorum*[P]
*Eriosema salignum**[P]
Eriosema simulans[P]
Indigastrum costatum subsp. *macrum*
Indigastrum fastigiatum
Indigofera adenoides
Indigofera inhambanensis
Indigofera laxeracemosa
Indigofera obscura
Indigofera oxytropis
*Indigofera sanguinea**
Indigofera tomentosa
Indigofera torulosa var. *angustiloba*
Leobordea adpressa subsp. *adpressa*
Leobordea hirsuta
Leobordea mucronata
Listia solitudinis
Lotus discolor subsp. *discolor*
Ophrestia oblongifolia var. *oblongifolia*[P]

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Rhynchosia capensis[P]
Rhynchosia crassifolia[P]
Rhynchosia densiflora subsp. *chrysadenia*[P]
Rhynchosia harmsiana var. *harmsiana*[P]
Rhynchosia hirsuta[P]
*Rhynchosia monophylla**[P]
Rhynchosia nervosa var. *nervosa*[P]
Rhynchosia ovata[P]
Rhynchosia pentheri var. *pentheri*[P]
Rhynchosia reptabunda[P]
Sphenostylis marginata subsp. *marginata*[P]
Tephrosia capensis var. *angustifolia*
Tephrosia forbesii subsp. *interior*
Tephrosia semiglabra
Vigna schlechteri[P]
Zornia capensis subsp. *capensis**
Zornia linearis

1001010

Wide distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, annual, is grazed or cultivated

Crotalaria podocarpa
Zornia glochidiata

1001100

Wide distribution, not adapted to very low soil P, height 0.5–1.5 m, perennial, is grazed or cultivated

*Argyrolobium tomentosum**
Crotalaria laburnifolia subsp. *australis*
Cullen tomentosum
Desmodium setigerum
Indigofera melanadenia
Indigofera swaziensis var. *swaziensis*
Vigna luteola var. *luteola*[P]
Vigna unguiculata subsp. *protracta*[P]

1000201

Wide distribution, adapted to low soil P, mean height of 1.5 m, perennial, no record of being grazed or cultivated

Crotalaria natalensis
Lotononis sericophylla
Otholobium caffrum

1000210

Wide distribution, adapted to low soil P, mean height of 1.5 m, annual, is grazed or cultivated

Sesbania transvaalensis

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1000300

Wide distribution, adapted to low soil P, height >2.0 m, perennial, is grazed or cultivated

*Acacia ataxacantha**
Acacia luederitzii var. *luederitzii*
Acacia mellifera subsp. *detinens*
Bauhinia bowkeri
Bauhinia petersiana subsp. *macrantha*
Bauhinia tomentosa
Indigofera frutescens
Lotononis lotononoides
Mundulea sericea subsp. *sericea**

1001011

Wide distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, annual, no record of being grazed or cultivated

Indigastrum parviflorum subsp. *parviflorum* var. *parviflorum*

1001011

Wide distribution, not adapted to very low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

Argyrolobium tuberosum
Aspalathus callosa
Crotalaria lanceolata subsp. *lanceolata*
Desmodium dregeanum
Dichilus lebeckioides
Dichilus reflexus
Dichilus strictus
Dolichos angustifolius[P]
Dolichos falciformis[P]
Eriosema nutans[P]
*Eriosema psoraleoides**[P]
Galactia tenuiflora var. *villosa* [P]
Indigofera bainesii
Indigofera dregeana
Indigofera frondosa
Indigofera mollicoma
Indigofera rostrata
Indigofera sordida
Indigofera tristis
Indigofera tristoides
Indigofera trita subsp. *subulata*
Indigofera velutina
Leobordea carinata
Leobordea corymbosa
Leobordea eriantha

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Leobordea foliosa
Leobordea pulchra
Lessertia perennans var. *perennans**
Lessertia stricta
Neorautanenia ficifolia[P]
Otholobium polyphyllum
Otholobium polystictum
Pearsonia aristata
Pearsonia cajanifolia subsp. *cajanifolia*
Pearsonia sessilifolia subsp. *sessilifolia*
Psoralea glabra
Rhynchosia sordida[P]
Rhynchosia villosa[P]
Rhynchosia woodii[P]
Smithia erubescens
Tephrosia euchroa
Tephrosia glomeruliflora subsp. *meisneri*
Tephrosia kraussiana
Tephrosia longipes subsp. *longipes* var. *longipes**
Tephrosia lupinifolia
Tephrosia polystachya var. *hirta*
Tephrosia rhodesica var. *evansii*
Tephrosia shiluwanensis

1001200

Wide distribution, not adapted to very low soil P, mean height of 1.5 m, perennial, is grazed or cultivated

Aeschynomene indica
Argyrolobium speciosum
Bauhinia natalensis
Crotalaria monteiroi var. *galpinii*
Dipogon lignosus[P]
Indigofera arrecta
Pseudarthria hookeri var. *hookeri**
Psoralea arborea
Tephrosia capensis var. *capensis*
Tephrosia cordata
Tephrosia elongata var. *elongata*
Tephrosia rhodesica var. *rhodesica*
Teramnus labialis subsp. *labialis*[P]

1000301

Wide distribution, adapted to low soil P, height >2.0 m, perennial, no record of being grazed or cultivated

Acacia karroo x *A. tenuispina*
Baphia racemosa

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Indigofera natalensis

1001111

Wide distribution, not adapted to very low soil P, height 0.5–1.5 m, annual, no record of being grazed or cultivated

Chamaecrista stricta

1001201

Wide distribution, not adapted to very low soil P, mean height of 1.5 m, perennial, no record of being grazed or cultivated

Aeschynomene rehmannii var. *leptobotrya*
Calpurnia glabrata
Desmodium repandum
Flemingia grahamiana[P]
Indigofera oxalidea
Indigofera subcorymbosa var. *subcorymbosa*
Indigofera swaziensis var. *perplexa*
Otholobium spicatum
Otholobium wilmsii
Psoralea axillaris

1001300

Wide distribution, not adapted to very low soil P, height >2.0 m, perennial, is grazed or cultivated

Acacia burkei
Acacia senegal var. *rostrata*
Albizia versicolor
Crotalaria capensis
Dalbergia obovata
Dichrostachys cinerea subsp. *africana* var. *setulosa*
Erythrina humeana[P]
Ormocarpum trichocarpum
Schotia latifolia
Sesbania macrantha var. *levis*
Tephrosia polystachya var. *latifolia*

1010001

Intermediate distribution, adapted to low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Argyrolobium nigrescens
Argyrolobium sericosemium
Canavalia bonariensis[P]
Elephantorrhiza obliqua var. *glabra*
Elephantorrhiza woodii var. *woodii*
Eriosema preptum[P]
Eriosema salignum x *E. cordatum*[P]
Eriosema zuluense[P]
Indigofera confusa
Indigofera nebrowniana

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Indigofera neglecta
Indigofera pongolana
Leobordea adpressa subsp. *leptantha*
Leobordea grandis
Leobordea procumbens
Lessertia prostata
Lessertia thodei
Pearsonia grandifolia subsp. *grandifolia*
Pomaria burchellii subsp. *burchellii*
Rhynchosia pentheri var. *hutchinsoniana*[P]
Rhynchosia stenodon[P]
Tephrosia albissima subsp. *zuluensis*
Tephrosia gracilenta

1010100

Intermediate distribution, adapted to low soil P, height 0.5–1.5 m, perennial, is grazed or cultivated

Argyrolobium marginatum
Indigofera schimperi var. *schimperi*
Lotononis galpinii

1011000

Intermediate distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, is grazed or cultivated

Alysicarpus vaginalis var. *vaginalis*
Argyrolobium transvaalense
Desmodium adscendens var. *robustum*
Mucuna pruriens var. *utilis*[P]
Rhynchosia sublobata[P]
Trifolium africanum var. *lydenburgense*

1010011

Intermediate distribution, adapted to low soil P, height <0.5 m or climber/creeper, annual, no record of being grazed or cultivated

Indigofera charlieriana var. *scaberrima*
Indigofera praticola

1010101

Intermediate distribution, adapted to low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

Argyrolobium longifolium
Dolichos pratensis[P]
Indigofera tenuissima
Lessertia dykei
Polhillia connata

1011001

Intermediate distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Argyrolobium ascendens

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Argyrolobium campicola
Argyrolobium muddii
Argyrolobium pseudotuberosum
Crotalaria pearsonii
Crotalaria pisicarpa
Crotalaria schinzii
Decorsea galpinii[P]
Decorsea schlechteri[P]
Dolichos peglerae[P]
Eriosema angustifolium[P]
Eriosema buchananii var. *buchananii*[P]
Eriosema gunniae[P]
Eriosema transvaalense[P]
Indigastrum burkeanum
Indigofera angustata
Indigofera atrata
Indigofera circinnata
Indigofera densa
Indigofera enormis
Indigofera hendecaphylla
Indigofera ingrata
Indigofera inyangana
Indigofera lydenbergensis
Indigofera reducta
Indigofera ripae
Indigofera schinzii
Indigofera setosa
Leobordea decumbens subsp. *rehmannii*
Lotononis acuminata
Melolobium wilmsii
Pearsonia bracteata
Pearsonia sessilifolia subsp. *filifolia*
Pearsonia uniflora
Ptycholobium contortum
Ptycholobium plicatum subsp. *plicatum*
Rhynchosia angulosa[P]
Rhynchosia atropurpurea[P]
Rhynchosia hirta[P]
Rhynchosia pauciflora[P]
Tephrosia brummittii
Tephrosia natalensis subsp. *pseudocapitata*
Tephrosia radicans
Vigna frutescens subsp. *frutescens* var. *frutescens*[P]
Vigna mudenia[P]

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1011100

Intermediate distribution, not adapted to very low soil P, height 0.5–1.5 m, perennial, is grazed or cultivated

Crotalaria natalitia var. *natalitia*
Desmodium barbatum var. *dimorphum*
Dichilus pilosus
Indigofera homblei subsp. *homblei*
Indigofera micrantha
Macrotyloma uniflorum var. *stenocarpum*[P]
Tephrosia villosa subsp. *ehrenbergiana* var. *daviesii*
Tephrosia villosa subsp. *ehrenbergiana* var. *ehrenbergiana*

1010111

Intermediate distribution, adapted to low soil P, height 0.5–1.5 m, annual, no record of being grazed or cultivated

Sesbania brevipedunculata

1010201

Intermediate distribution, adapted to low soil P, mean height of 1.5 m, perennial, no record of being grazed or cultivated

Calpurnia reflexa
Crotalaria macrocarpa subsp. *macrocarpa*
Lessertia perennans var. *polystachya*
Otholobium fumeum

1010300

Intermediate distribution, adapted to low soil P, height >2.0 m, perennial, is grazed or cultivated

Acacia galpinii
Acacia grandicornuta
Acacia senegal var. *leiorhachis*
Bolusanthus speciosus
Craibia zimmermannii
Philenoptera sutherlandii

1011011

Intermediate distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, annual, no record of being grazed or cultivated

Crotalaria distans subsp. *mediocris*
Microcharis galpinii

1011101

Intermediate distribution, not adapted to very low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

Aeschynomene rehmannii var. *rehmannii*
Argyrolobium frutescens
Argyrolobium wilmsii
Astragalus atropilosulus subsp. *burkeanus* var. *burkeanus*
Dolichos junodii[P]
Indigofera astragalina

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Indigofera egens
Indigofera galpinii
Indigofera setiflora
Indigofera trita subsp. *scabra*
Kotschya parvifolia
Kotschya thymodora subsp. *thymodora*
Leobordea arida
Leobordea lanceolata
Otholobium nigricans
Pearsonia cajanifolia subsp. *cryptantha*
Pearsonia grandifolia subsp. *latibracteolata*
Pearsonia obovata
Pearsonia sessilifolia subsp. *marginata**
Pearsonia sessilifolia subsp. *swaziensis*
Rhynchosia galpinii[P]
Rhynchosia komatiensis[P]
Rhynchosia thorncroftii[P]
Tephrosia acaciifolia
Tephrosia elongata var. *tzaneenensis*
Tephrosia noctiflora
Tephrosia retusa
Tephrosia subulata

1011201

Intermediate distribution, not adapted to very low soil P, mean height of 1.5 m, perennial, no record of being grazed or cultivated

Crotalaria recta
Desmodium salicifolium var. *salicifolium*
Desmodium velutinum
Rhynchosia nitens[P]

1020000

Narrow distribution, adapted to low soil P, height <0.5 m or climber/creeper, perennial, is grazed or cultivated

Melolobium subspicatum

1020001

Narrow distribution, adapted to low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Argyrolobium nanum
Crotalaria schlechteri
Eriosema durnfordensis[P]
Lessertia glabricaulis
Lessertia macroflora
Macrotyloma coddii[P]
Rhynchosia dieterlenae[P]
Rhynchosia peglerae[P]

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1020100

Narrow distribution, adapted to low soil P, height 0.5–1.5 m, perennial, is grazed or cultivated

Indigofera tinctoria var. *arcuata*

1021000

Narrow distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, is grazed or cultivated

Vigna unguiculata subsp. *tenuis* var. *ovata*[P]

1020011

Narrow distribution, adapted to low soil P, height <0.5 m or climber/creeper, annual, no record of being grazed or cultivated

Microcharis latifolia

1020101

Narrow distribution, adapted to low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

Lessertia stipulata

1021001

Narrow distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Crotalaria monophylla
Cullen holubii
Eriosema fasciculatum[P]
Eriosema rufescens[P]
Indigofera crebra
Indigofera floribunda
Indigofera leendertziae
Indigofera lepida
Leobordea pariflora
Leobordea spicata
Macrotyloma maranguense[P]
Pearsonia hirsuta
Polhillia brevicalyx
Rhynchosia rogersii[P]
Vigna kokii[P]

1021100

Narrow distribution, not adapted to very low soil P, height 0.5–1.5 m, perennial, is grazed or cultivated

Crotalaria laburnifolia subsp. *laburnifolia*

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B2. Medium potential: Some known antiqualities

1100001

Wide distribution, adapted to low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Neorautanenia mitis[P]

1100100

Wide distribution, adapted to low soil P, height 0.5–1.5 m, perennial, is grazed or cultivated

Senna italica subsp. *arachoides**

1101000

Wide distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, is grazed or cultivated

Tylosema fassoglensis

1100101

Wide distribution, adapted to low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

*Chamaecrista mimosoides**

1100200

Wide distribution, adapted to low soil P, mean height of 1.5 m, perennial, is grazed or cultivated

Tephrosia purpurea subsp. *leptostachya* var. *pubescens*

1101001

Wide distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Desmodium gangeticum

1101010

Wide distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, annual, is grazed or cultivated

Vigna unguiculata subsp. *unguiculata* var. *unguiculata*[P]

1101100

Wide distribution, not adapted to very low soil P, height 0.5–1.5 m, perennial, is grazed or cultivated

Alysicarpus rugosus subsp. *perennirufus*
Indigofera spicata var. *spicata*

1100300

Wide distribution, adapted to low soil P, height >2.0 m, perennial, is grazed or cultivated

Acacia brevispica subsp. *dregeana*
*Acacia karroo**
Acacia luederitzii var. *retinens*
Acacia nilotica subsp. *kraussiana*
Albizia anthelmintica.
Dichrostachys cinerea subsp. *africana* var. *africana*
Peltophorum africanum
Schotia brachypetala
Virgilia divaricata

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1101200

Wide distribution, not adapted to very low soil P, mean height of 1.5 m, perennial, is grazed or cultivated

Tephrosia purpurea subsp. *leptostachya* var. *leptostachya*

1110100

Intermediate distribution, adapted to low soil P, height 0.5–1.5 m, perennial, is grazed or cultivated

Indigofera cryptantha var. *occidentalis*

Tephrosia purpurea subsp. *canescens*

1111000

Intermediate distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, is grazed or cultivated

Crotalaria damarensis

1111001

Intermediate distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Pterolobium stellatum

B3. Medium potential: Toxic qualities

1200001

Wide distribution, adapted to low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Crotalaria dura subsp. *dura*

1200100

Wide distribution, adapted to low soil P, height 0.5–1.5 m, perennial, is grazed or cultivated

Indigofera sessilifolia

Lessertia brachystachya

1201000

Wide distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, is grazed or cultivated

Canavalia virosa[P]

Lablab purpureus subsp. *uncinatus*[P]

Mucuna coriacea subsp. *irritans*[P]

1200101

Wide distribution, adapted to low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

Indigofera zeyheri

Lotononis carnosa subsp. *carnosa*

1200200

Wide distribution, adapted to low soil P, mean height of 1.5 m, perennial, is grazed or cultivated

Elephantorrhiza elephantina

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1201001

Wide distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Crotalaria burkeana
Indigofera hilaris var. *hilaris*
Tephrosia macropoda var. *diffusa*

1201100

Wide distribution, not adapted to very low soil P, height 0.5–1.5 m, perennial, is grazed or cultivated

Crotalaria globifera
Crotalaria pallida var. *pallida*
Dichilus gracilis

1210001

Intermediate distribution, adapted to low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Entada rheedii

1211000

Intermediate distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, is grazed or cultivated

Canavalia rosea[P]
Crotalaria barkae subsp. *barkae*
Crotalaria rhodesiae

C1. Lower potential: No known antiqualities

2001301

Wide distribution, not adapted to very low soil P, height >2.0 m, perennial, no record of being grazed or cultivated

Acacia hereroensis
Albizia forbesii
Calpurnia sericea
Dalbergia nitidula
Indigofera comosa
Indigofera eriocarpa
Indigofera jucunda
Indigofera ormocarpoides
Tephrosia polystachya var. *polystachya*
Wiborgia obcordata

2010301

Intermediate distribution, adapted to low soil P, height >2.0 m, perennial, no record of being grazed or cultivated

Acacia exuvialis
Acacia swazica
Acacia welwitschii subsp. *delagoensis*
Aeschynomene uniflora var. *uniflora*
Dialium schlechteri

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Sophora inhambanensis

2011101

Intermediate distribution, not adapted to very low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

Indigofera delagoaensis
Indigofera lupatana

2011111

Intermediate distribution, not adapted to very low soil P, height 0.5–1.5 m, annual, no record of being grazed or cultivated

Alysicarpus glumaceus subsp. *glumaceus* var. *glumaceus*

2011201

Intermediate distribution, not adapted to very low soil P, mean height of 1.5 m, perennial, no record of being grazed or cultivated

Aeschynomene nodulosa var. *nodulosa*
Aeschynomene nyassana
Argyrolobium megarrhizum
Chamaecrista plumosa var. *erecta*
Crotalaria longidens
Indigofera placida
Rhynchosia clivorum var. *clivorum*[P]
Rhynchosia spectabilis[P]
Tephrosia aequilata subsp. *australis*
Tephrosia reptans var. *reptans*

2011300

Intermediate distribution, not adapted to very low soil P, height >2.0 m, perennial, is grazed or cultivated

Acacia erubescens
Acacia nebrownii
Acacia xanthophloea
Afzelia quanzensis
Albizia harveyi
Cordyla africana
Dalbergia melanoxylon
Dichrostachys cinerea subsp. *africana* var. *pubescens*
Faidherbia albida
Ormocarpum kirkii
Psoralea pinnata var. *pinnata*
Pterocarpus rotundifolius subsp. *rotundifolius*
Schotia capitata
Xanthocercis zambesiaca

2011201

Intermediate distribution, not adapted to very low soil P, mean height of 1.5 m, perennial, no record of being grazed or cultivated

Indigofera lyalli subsp. *lyalli*

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2011301

Intermediate distribution, not adapted to very low soil P, height >2.0 m, perennial, no record of being grazed or cultivated

Acacia borleae
Acacia davyi
Acacia natalitia
Acacia polyacantha subsp. *campylacantha*
Acacia rehmanniana
Acacia tenuispina
Acacia theronii
Albizia brevifolia
Albizia petersiana subsp. *evansii*
Crotalaria doidgeae
Elephantorrhiza goetzei subsp. *goetzei*
Newtonia hildebrandtii var. *hildebrandtii*

2020111

Narrow distribution, adapted to low soil P, height 0.5–1.5 m, annual, no record of being grazed or cultivated

Sesbania rogersii

2020201

Narrow distribution, adapted to low soil P, mean height of 1.5 m, perennial, no record of being grazed or cultivated

Erythrina x *hennessyae*[P]

2021001

Narrow distribution, not adapted to very low soil P, height <0.5 m or climber/creeper, perennial, no record of being grazed or cultivated

Indigofera colutea var. *colutea*

2021101

Narrow distribution, not adapted to very low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

Eriosema naviculare[P]
Indigofera masonae
Indigofera rehmannii
Otholobium foliosum subsp. *gazense*

2021110

Narrow distribution, not adapted to very low soil P, height 0.5–1.5 m, annual, is grazed or cultivated

Crotalaria ochroleuca
Crotalaria spartea

2020301

Narrow distribution, adapted to low soil P, height >2.0 m, perennial, no record of being grazed or cultivated

Acacia ormocarpoides
Caesalpinia rostrata
Calpurnia capensis

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2021201

Narrow distribution, not adapted to very low soil P, mean height of 1.5 m, perennial, no record of being grazed or cultivated

Elephantorrhiza praetermissa
Indigofera amitina

2021300

Narrow distribution, not adapted to very low soil P, height >2.0 m, perennial, is grazed or cultivated

Pterocarpus lucens subsp. *antunesii*

2021301

Narrow distribution, not adapted to very low soil P, height >2.0 m, perennial, no record of being grazed or cultivated

Acacia sekhukhuniensis
Philenoptera bussei

C2. Lower potential: Some known antiqualities

2101300

Wide distribution, not adapted to very low soil P, height >2.0 m, perennial, is grazed or cultivated

Acacia gerrardii subsp. *gerrardii* var. *gerrardii*
Acacia nigrescens
Calpurnia aurea subsp. *aurea*
Erythrina caffra[P]
Erythrina latissima[P]
Erythrina lysistemon[P]
*Pterocarpus angolensis**
Senna petersiana
Sesbania sesban subsp. *sesban* var. *nubica*

2101301

Wide distribution, not adapted to very low soil P, height >2.0 m, perennial, no record of being grazed or cultivated

Elephantorrhiza burkei

2110300

Intermediate distribution, adapted to low soil P, height >2.0 m, perennial, is grazed or cultivated

Sesbania sesban subsp. *sesban* var. *zambesiaca*

2111110

Intermediate distribution, not adapted to very low soil P, height 0.5–1.5 m, annual, is grazed or cultivated

Alysicarpus rugosus subsp. *rugosus*

2111200

Intermediate distribution, not adapted to very low soil P, mean height of 1.5 m, perennial, is grazed or cultivated

Calpurnia villosa var. *intrusa*

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2111111

Intermediate distribution, not adapted to very low soil P, height 0.5–1.5 m, annual, no record of being grazed or cultivated

Chamaecrista absus

2111300

Intermediate distribution, not adapted to very low soil P, height >2.0 m, perennial, is grazed or cultivated

Cassia abbreviata subsp. *beareana*
Colophospermum mopane
Piliostigma thonningii
Sesbania sesban subsp. *sesban* var. *sesban*

2120101

Narrow distribution, adapted to low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

Crotalaria orientalis subsp. *allenii*

2120200

Narrow distribution, adapted to low soil P, mean height of 1.5 m, perennial, is grazed or cultivated

Mucuna pruriens var. *pruriens*[P]

C3. Lower potential: Toxic qualities

2200111

Wide distribution, adapted to low soil P, height 0.5–1.5 m, annual, no record of being grazed or cultivated

Crotalaria sphaerocarpa subsp. *sphaerocarpa*

2200300

Wide distribution, adapted to low soil P, height >2.0 m, perennial, is grazed or cultivated

Acacia caffra
Acacia erioloba
Acacia hebeclada subsp. *hebeclada*
Acacia robusta subsp. *clavigera*
Acacia tortilis subsp. *heteracantha*
Millettia grandis

2201101

Wide distribution, not adapted to very low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

Tephrosia macropoda var. *macropoda*

2201300

Wide distribution, not adapted to very low soil P, height>2.0 m, perennial, is grazed or cultivated

Acacia robusta subsp. *robusta*
Acacia sieberiana var. *woodii*
Albizia adianthifolia var. *adianthifolia*
Dichrostachys cinerea subsp. *nyassana*
Tephrosia grandiflora

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2201301

Wide distribution, not adapted to very low soil P, height>2.0 m, perennial, no record of being grazed or cultivated

Abrus precatorius subsp. *africanus*

2210300

Intermediate distribution, adapted to low soil P, height >2.0 m, perennial, is grazed or cultivated

Albizia tanganyicensis subsp. *tanganyicensis*

Burkea africana

2210301

Intermediate distribution, adapted to low soil P, height >2.0 m, perennial, no record of being grazed or cultivated

Erythrophleum lasianthum

2211300

Intermediate distribution, not adapted to very low soil P, height >2.0 m, perennial, is grazed or cultivated

Philenoptera violacea

2221101

Narrow distribution, not adapted to very low soil P, height 0.5–1.5 m, perennial, no record of being grazed or cultivated

Indigofera buchananii

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CHAPTER 9

GENERAL DISCUSSION AND CONCLUSIONS

9.1 General discussion

Legume species indigenous to South Africa, Lesotho and Swaziland were recorded using the PRECIS database. The presence or absence status of each legume species in a QDGC was recorded and the resulting dataset formed the basis of all statistical analyses. The error index for the PRECIS database of 15% was assumed small considering the large number of records (27 322 records) and legume species (1 654 species) that comprised the final dataset. Scientific species names were verified with SANBI's online Plants of southern Africa (posa.sanbi.org), taking into consideration the recent taxonomic revisions of *Lebeckia* and *Lotononis*. No PRECIS records were available for 75 species (4.6%), possibly because they were recorded in herbaria other than those mentioned in Chapter 4, or they were alien species as disclosed by Dr B. Schrire (Legume Systematist, Kew, UK; pers. comm.) or because of an inherent error in the Fabaceae records of PRECIS. Additionally, for many of these 'missing' species, no descriptive data could be found in the literature.

The use of the program XLSTAT to determine functional clusters enabled the successful analysis of relatively large ecological datasets (regional scale). The legume distribution dataset was similarly analysed with PC-ORD (McCune & Mefford 2006), specifically developed for ecological data. Comparable clusters were formed but differently arranged on the y-axis (unpublished data). Access to qualified biometricians specialising in using programs designed to analyse ecological data, was limited while access to qualified biometricians within the ARC posed no problems. The training of ecological biometricians within the ARC is proposed.

The QDGC map (± 675 km^2) used in this study to define climate and soil values is too large an area to define all the transitional zones and therefore the number of classes were limited to five for mean annual rainfall, four for both mean annual minimum and maximum temperature, three for soil phosphorus and five for soil pH. The QDGCs in especially the Cape Floristic Region were difficult to define in terms of bioregions and resulted in many QDGCs defined as ecotones, but less so for biomes. The 397 species that are present in ecotones only, are listed in Appendix 8 and have therefore not been incorporated in the bioregions dataset. The QDGCs containing small numbers of species were not eliminated from the dataset. The overall error level of data supplied by SANBI is estimated at ± 15%.

A poor distinction between annual, occasionally perennial and perennial legume species was made, whereas reseeders and resprouters were not distinguished at all.

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Autecological (referring to the relationship between an individual species and its environment) research on potential pasture species and diagnostic species is proposed because limited data regarding migration, phenology, pollination etc. are available. The effect of climate change on the reproduction and production of proposed species could also be monitored in forthcoming studies.

The distribution probability based on climatic similarities predicted for Africa and the world is proposed as one of the next phases of this study, using programs such as DIVA-GIS or Maxent.

The grouping of legume species indigenous to South Africa, Lesotho and Swaziland into well-defined Leguminochoria is ecologically described. Both the Generalist group (Cluster B4) and the Summer Rainfall Region (Cluster B5) contain many other Leguminochoria, while the Higher Rainfall Cape Floristic Region (Cluster C) and the Northern Mistbelt Forest (Cluster E), for example, formed distinct Leguminochoria. The Northern and Northeastern Savanna Region's (Cluster B6) distinction from the Savanna Group (Cluster D) is unfounded as they have similar climate and soil properties as well as many key species shared between the Northern and Northeastern Savanna Region and the Subtropical Lowveld & Mopane Region (Cluster D2).

The highest legume species richness is found in the Northern Mistbelt Forest (Cluster E), a fraction higher than in the Albany Centre (Cluster A2), the Higher Rainfall Cape Floristic Region (Cluster C) and the Central Bushveld Region (Cluster D1). The high rainfall level (>800 mm) noted within most parts of the Northern Mistbelt Forest clearly resulted in higher species richness compared to lower rainfall levels noted for the other clusters. Most diagnostic species are herbs, with the majority present in the Northern Mistbelt Forest (Cluster E). Many of the diagnostic species were or are currently cultivated (Chapter 5: Inventory).

The six communities identified by PHYTOTAB-PC are geographically sound. The separation of the Albany Centre is unexpected and merits further investigation, especially since some key species were noted as common to other clusters and in the light of Van Wyk & Smith's (2001) observation that floristic elements of many other regions converge in this centre.

Information on the range of tolerance of all indigenous legume species to rainfall, temperature, soil pH and phosphorus is presented. This should be useful for selecting species for future breeding programmes. Where species distribution patterns were narrow, the range of tolerance could not be clearly defined, whereas for species with a wide distribution pattern, useful information regarding the range of tolerance could be described.

Existing data on the cultivation and grazing or browsing status of indigenous legumes were used to select 584 species found mainly in the Central Bushveld, Mopane and Lowveld Bioregions to be further evaluated for their pasture potential. Known characteristics were used to divide species into three categories (lower, medium and higher) based on recorded antiqualities, distribution pattern, adaptation to soil phosphorus levels, height and duration.

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Chemical but not physical antiqualities are documented in this study. This is seen as a shortcoming, especially where attributes such as hairiness, stickiness or thorns limit intake and therefore animal production. The listing and description of individual species (Chapter 5: Inventory) should, however, be seen as a functional database to be updated with available data on physical antiqualities. The selected legume species proposed for further evaluation could have been reduced if physical antiqualities were available for use as a selection tool. It is, however, foreseen that plant breeding and selection techniques will be applied to select against physical and chemical antiqualities to improve the acceptability of legume plants as pasture.

The selected list of potential pasture species excludes the Cape Floristic Region. This region is one of three well-represented areas, probably because of extensive collecting by herbaria in the Western Cape. *Aspalathus* is a prominent genus in this region, with none of the species recognised as having pasture potential at present.

Diagnostic species were not investigated further in terms of conspicuousness that could lead to high collection intensities, habitat similarities or any other attribute that could relate to the high occurrence of the 23 species identified. Noteworthy though, is the fact that all diagnostic species are listed as potential pasture species for further evaluation.

Investigations into the identification, occurrence and resistance of legume species to pests and diseases are foreseen, notably when further selection and breeding programmes follow. This is particularly relevant when pastures are established in a region where a particular legume species is indigenous and where all its natural enemies may be present. In a monoculture, the opportunities for pests and diseases to develop increase remarkably compared to a diverse natural environment. Monitoring known pests and diseases assists farmers to control them either by using management tools such as cutting or grazing regimes when the first signs of a pest or disease appear or by using more environmentally friendly pesticides.

The Directorate Plant Health and Quality of the South African National Department of Agriculture is responsible for regulating the export of seed (e.g. material transfer agreements and phytosanitary certificates). Other countries interested in importing legume seeds are encouraged to use the online information available at: http://www.nda.agric.za/docs/npposa/default.htm.

A review of the literature on legume species used as pastures indicates that only a few indigenous species such as *Lablab purpureus*, *Listia bainesii*, *Neonotonia wightii* and *Vigna unguiculata* have been utilised extensively. According to Dr A. Kruger (pers. comm.), farmers in South Africa have lost interest in tropical/subtropical legume pasture owing to the long establishment phase (around three years for some species), a lack of persistence, its disappearance for years and unexpected return, and the difficulty to obtain seed. Furthermore, most of the pasture species cultivated in South Africa are developed in and imported from foreign countries, mainly Australia. The lack of interest and funding from agricultural agencies and the shortage of pasture breeders are believed to be the main stumbling blocks in

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developing legume pastures for local requirements in South Africa (Dr A. Smith, pers. comm.). Seed companies registered as forage legume seed suppliers are listed on the website of the South African National Seed Organization (http://sansor.org/members-listing/).

9.2 Conclusions

9.2.1 Leguminochoria

- The Southern Afromontane includes legume species confined mainly to the Mesic Highveld Grassland, Sub-Escarpment Grassland and Sub-Escarpment Savanna Bioregions with a high rainfall (>600 mm), moderate minimum (0–8°C) and maximum (25–29°C) temperatures, low soil phosphorus content (<10 $mgkg^{-1}$), low pH (<6.4) and non-sodic soils.

- The fact that eight of the species in the Southern Afromontane are not key species in any other cluster suggests that they are unique species, and the relatively high occurrence of *Eriosema distinctum* and *Argyrolobium speciosum* makes these species especially important.

- In terms of bioregions, the Albany Centre is shared equally between the Albany Thicket and Sub-Escarpment Grassland Bioregions with medium annual rainfall (400–800 mm), minimum temperatures of mainly 2–8°C and moderate maximum temperatures of 25–29°C and phosphorus content of soils mainly 5–35 $mgkg^{-1}$, non-sodic soils and a wide range of pH levels.

- The Albany Centre has relatively high species richness even though only 1.3% of QDGCs are included in this cluster compared to the other clusters in the Sour and Mixed Veld Group. This is significant in terms of the available genetic resources in a relatively small cluster.

- The Mesic Highveld Grassland is the major bioregion present in the Northern Highveld Region with an annual rainfall of 400–800 mm, low minimum temperatures (mainly <4°C), low phosphorus soil values (<10 $mgkg^{-1}$), low pH (<6.4) and non-sodic soils.

- *Eriosema burkei* var. *burkei*, *Indigofera oxytropis*, *Pearsonia cajanifolia* subsp. *cajanifolia* and *Pearsonia sessilifolia* subsp. *sessilifolia* are not present as key species in other clusters and are therefore critical species in the Northern Highveld Region.

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- Mesic Highveld, Drakensberg Grassland and Sub-Escarpment form the major bioregions for the Drakensberg Alpine Centre that falls in a high-rainfall area (mostly >800 mm) with relatively low minimum (<2°C) and maximum (<27°C) temperatures, with low soil phosphorus content of <10 $mgkg^{-1}$ and pH<6.4.

- *Lessertia perennans* var. *perennans* is a diagnostic species present in the Drakensberg Alpine Centre and the fact that it does not appear as a key species in any other cluster indicates its uniqueness in the Drakensberg Alpine Centre, similarly for *Lotononis sericophylla* and *Lotononis galpinii*.

- The Indian Ocean Coastal Belt Bioregion contains the most QDGCs found in the Drakensberg Foothill & Coastal Region with a high annual rainfall (>800 mm/year), high minimum temperatures (>6°C), moderate to high maximum temperatures, relatively low soil phosphorus and pH levels as well as non-sodic soils.

- The occurrence of several climbers in the Drakensberg Foothill & Coastal Region is noteworthy, with many of the key species also found in the Southern Afromontane probably owing to the closeness of these two clusters.

- The Namaqualand Hardeveld and the Bushmanland Bioregions are well represented in the Arid Western Region with low annual rainfall (<400 mm), high minimum and maximum temperatures, high soil pH (>7.5) and medium soil phosphorus, medium to highly sodic soils.

- Most key species in the Arid Western Region are noted as not being present in other clusters, indicating that most of them are uniquely associated with this cluster.

- The Albany Thicket and Eastern Fynbos Renosterveld are well represented in the Lower Rainfall Cape Floristic Region. The annual rainfall lies between 200–600 mm but <400 mm is also a probability. Relatively high minimum (2–8°C) and moderate maximum (25–28°C) temperatures are noted, with predominantly acidic and some sodic soils.

- *Aspalathus* species are listed as having the highest occurrence, where five species are also key species in the Higher Rainfall Cape Floristic Region.

- The Central Arid Region forms mainly in the dry Eastern Kalahari Bushveld, Bushmanland, Dry Highveld Grassland and Upper Karoo Bioregions. The low annual rainfall of <400 mm and relatively low minimum and high maximum temperatures are expected for this semi-arid to arid region with high soil phosphorus content (>20 $mgkg^{-1}$) and pH (>7.5) and mainly non-sodic soils.

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- Most of the key species in the Central Arid Region are also present as key species in the Generalist Group and the Kalahari Bushveld Region. *Lessertia annularis*, *L. pauciflora* var. *pauciflora* and *L. macrostachya* var. *macrostachya* are key species uniquely found in this region.

- The highest percentage bioregions present in the Generalist Group are the Central Bushveld, Eastern Kalahari Bushveld and Dry Highveld Grassland Bioregions, but the wide distribution pattern makes it difficult to describe the climatic and soil properties.

- *Acacia karroo* is the species with the highest occurrence and is a diagnostic species in the Central Bushveld and Northern Mistbelt Region.

- The major bioregions that comprise the Summer Rainfall Region are the Mesic Highveld Grassland and the Central Bushveld. An annual rainfall of 400–800 mm and also regions with an annual rainfall higher than 600 mm, very low minimum temperatures (<4°C) and moderate to high maximum temperatures, low soil phosphorus content, acidic and non-sodic soils, are mostly noted.

- *Rhynchosia totta* var. *totta* has the highest occurrence, listed as key species in most other clusters, except the Seasonal Rainfall Group.

- The Northern and Northeastern Savanna Group is represented mainly by the Central Bushveld and Lowveld bioregions. Medium annual rainfall (400–800 mm), relatively high minimum (>6°C) and maximum (27–35°C) temperatures, soils low in phosphorus, acidic and non-sodic soils, characterise this cluster.

- The Northern and Northeastern Savanna Group has the highest occurrence of tree forms that are listed as key species compared to other clusters, with *Faidherbia albida*, *Xanthocercis zambesiaca* and *Colophospermum mopane* uniquely associated with this cluster.

- The Eastern Kalahari Bushveld Bioregion nearly uniquely represents the Kalahari Bushveld Region. A relatively medium annual rainfall of 400–800 mm to very low annual rainfall of <400 mm, low minimum temperatures (<2°C), high maximum (>27°C) temperatures, relatively low soil phosphorus content, slightly acidic and non-sodic soils, describe this region.

- Many of the key species in the Kalahari Bushveld Region are also present in the Arid Central Region and the Generalist Group. This is expected since all these clusters are well represented in the Eastern Kalahari Bushveld Bioregion.

- The major bioregion present in the Higher Rainfall Cape Floristic Region is the Eastern Fynbos Renosterveld, with the Southwest Fynbos second highest. The annual

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rainfall is mostly 200–600 mm, with minimum temperatures of 2–8°C, maximum temperatures of 25–29°C, a wide range of soil phosphorus contents, mostly acidic soils and a large percentage of medium sodic soils.

- Many *Aspalathus* species are listed as key species in the Higher Rainfall Cape Floristic Region and notably not present in any other cluster, with species such as *A. ciliaris* and *A. hispida* subsp. *hispida* uniquely associated with this cluster.

- The Central Bushveld Region is uniquely formed in the Central Bushveld Bioregion with an annual rainfall of 400–800 mm, relatively high minimum (2–8°C) and maximum (27–35°C) temperatures, low soil phosphorus levels, moderately acidic to neutral and non-sodic soils.

- The Central Bushveld Region contains six diagnostic species, a noteworthy number compared to the previously mentioned clusters. *Burkea africana* and *Sphenostylis angustifolia* are diagnostic species that are not present in any other cluster, indicating their uniqueness.

- The main bioregion found in the Subtropical Lowveld & Mopane Region is the Lowveld, followed by the Central Bushveld and Mopane Bioregions. An annual rainfall of 400–800 mm, relatively high minimum (>6°C) and high maximum (27–35°C) temperatures, low soil phosphorus, a pH range that varies widely and non-sodic soils predominate in this region.

- Most key species in the Subtropical Lowveld & Mopane Region are also present in the Northern and Northeastern Savanna Group.

- The Mesic Highveld Grassland, Lowveld and Central Bushveld are the major bioregions found in the Northern Mistbelt Forest with a high annual rainfall of >800 mm, moderate minimum and maximum temperatures, acidic, low in soil phosphorus and non-sodic soils.

- A large number of diagnostic species are present in the Northern Mistbelt Forest, evidently more compared to all other clusters. Seven of the diagnostic species are not found in other clusters, indicating that these species are especially unique to the Northern Mistbelt Forest.

- The smaller clusters, namely the Higher Rainfall Cape Floristic Region, the Savanna Group and the Northern Mistbelt Forest, have very high species richness and are present in the higher-rainfall regions (both temperate and subtropical).

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- *Acacia karroo* was the highest recorded key species, followed by *Rhynchosia totta* var. *totta*, *Eriosema salignum*, *Senna italica* subsp. *arachoides*, *Sutherlandia frutescens* and *Vigna vexillata* var. *vexillata*.

- Six legume communities were identified, with Group 1 containing the southern and western Cape Region, Group 2 containing two relatively low-rainfall clusters and the Generalist Group, Group 3 the Albany Centre as a single entity, Group 4 the Savanna, Lowveld, Mopane and Bushveld Regions, Group 5 containing the Northern Highveld Region, Drakensberg Alpine Centre and Summer Rainfall Region, and finally Group 6 a well-defined Afromontane Region with the inclusion of the foothills and coastal areas of the Drakensberg. Soil pH and mean annual minimum temperatures are the main drivers for distinguishing between these legume communities.

9.2.2 Abiotic factors

- Mean annual rainfall and soil pH (in order of importance) are the main drivers for the distribution patterns of the Cercideae (*Adenolobus*, *Bauhinia*, *Piliostigma* and *Tylosema*).

- Soil pH and mean annual rainfall are the main drivers for the distribution patterns of the Detarieae (*Afzelia*, *Brachystegia*, *Colophospermum*, *Guibourtia* and *Schotia*).

- Mean annual rainfall, mean annual minimum temperature and soil pH are the main drivers for the distribution patterns of the Cassieae (*Cassia*, *Chamaecrista*, *Dialium* and *Senna*).

- Mean annual rainfall, soil pH and mean annual maximum temperature are the main drivers for the distribution patterns of the Caesalpinieae (*Burkea*, *Caesalpinia*, *Erythrophleum*, *Parkinsonia*, *Peltophorum*, *Pomaria*, *Pterolobium* and *Umtiza*).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of the Mimoseae (*Adenopodia*, *Dichrostachys*, *Elephantorrhiza*, *Entada*, *Neptunia*, *Newtonia*, *Xerocladia* and *Xylia*).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of the Acacieae (*Acacia*).

- Mean annual rainfall, soil phosphorus and pH are the main drivers for the distribution patterns of the Ingeae (*Albizia*, *Calliandra* and *Faidherbia*).

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- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of the Swartzieae (*Cordyla*).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of the Podalyrieae (*Calpurnia*, *Cyclopia*, *Liparia*, *Podalyria*, *Stirtonanthus*, *Virgilia* and *Xiphotheca*).

- Mean annual rainfall, mean annual maximum temperature and soil pH are the main drivers for the distribution patterns of *Amphithalea* (Podalyrieae).

- Mean annual rainfall, phosphorus and soil pH are the main drivers for the distribution patterns of the Crotalarieae (*Bolusia*, *Calobota*, *Euchlora*, *Ezoloba*, *Lebeckia*, *Leobordea*, *Listia*, *Pearsonia*, *Rafnia*, *Rothia*, *Wiborgia* and *Wiborgiella*).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of *Aspalathus* (Crotalarieae).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of *Crotalaria* (Crotalarieae).

- Soil pH, mean annual rainfall and soil phosphorus are the main drivers for the distribution patterns of *Lotononis* (Crotalarieae).

- Soil pH, mean annual rainfall, mean annual minimum and maximum temperatures as well as soil phosphorus are the main drivers for the distribution patterns of the Genisteae (*Dichilus*, *Melolobium* and *Polhillia*).

- Mean annual rainfall, mean annual minimum temperature and soil pH are the main drivers for the distribution patterns of *Argyrolobium* (Genisteae).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of the Dalbergieae (*Aeschynomene*, *Dalbergia*, *Kotschya*, *Ormocarpum*, *Pterocarpus*, *Smithia*, *Stylosanthes* and *Zornia*).

- Soil pH and mean annual rainfall are the main drivers for the distribution patterns of the Hypocalypteae (*Hypocalyptus*).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of the Indigofereae (*Cyamopsis*, *Indigastrum* and *Microcharis*).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of *Indigofera* (Indigofereae).

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- Mean annual rainfall, mean annual maximum temperature and soil pH are the main drivers for the distribution patterns of the Millettieae (*Craibia*, *Millettia*, *Mundulea*, *Philenoptera*, *Ptycholobium*, *Requienia* and *Xeroderris*).

- Mean annual rainfall, mean annual minimum temperature and soil pH are the main drivers for the distribution patterns of *Tephrosia* (Millettieae).

- Mean annual rainfall and mean annual minimum temperature are the main drivers for the distribution patterns of the Abreae (*Abrus*).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of the Phaseoleae (*Alistilus*, *Bolusafra*, *Canavalia*, *Decorsea*, *Dipogon*, *Dolichos*, *Dumasia*, *Erythrina*, *Flemingia*, *Galactia*, *Lablab*, *Macrotyloma*, *Mucuna*, *Neonotonia*, *Neorautanenia*, *Ophrestia*, *Otoptera*, *Sphenostylis*, *Teramnus* and *Vigna*).

- Mean annual rainfall, mean annual minimum temperature and soil phosphorus are the main drivers for the distribution patterns of *Eriosema* (Phaseoleae).

- Mean annual rainfall, soil pH and mean annual minimum temperature are the main drivers for the distribution patterns of *Rhynchosia* (Phaseoleae).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of the Desmodieae (*Alysicarpus*, *Desmodium* and *Pseudarthria*).

- Soil pH level and mean annual rainfall are the main drivers for the distribution patterns of the Psoraleeae (*Cullen* and *Psoralea*).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of *Otholobium* (Psoraleeae).

- Mean annual rainfall and soil pH are the main drivers for the distribution patterns of Sesbanieae (*Sesbania*).

- Mean annual rainfall, minimum and mean annual maximum temperatures and soil phosphorus are the main drivers for the distribution patterns of the Loteae (*Lotus*).

- Mean annual rainfall as well as phosphorus and soil pH are the main drivers for the distribution patterns of the Galegeae (*Astragalus* and *Sutherlandia*).

- Soil pH, mean annual rainfall, mean annual maximum and minimum temperatures are the main drivers for the distribution patterns of *Lessertia* (Galegeae).

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- Mean annual rainfall, mean annual maximum and minimum temperatures and soil pH are the main drivers for the distribution patterns of the Trifolieae (*Trifolium* and *Trigonella*).

9.2.3 Pasture potential

- The highest number of cultivated legume species occurs mainly in the Central Bushveld, Mopane and Lowveld Bioregions with a mean annual rainfall of 400–800 mm, mean annual minimum temperature 2–8ºC, mean annual maximum temperature 25–29ºC, soil phosphorous <10 $mgkg^{-1}$ and soil pH<6.4.

- The highest number of grazed and browsed species has a similar pattern as cultivated species, occurring mainly in the Central Bushveld, Mopane and Lowveld Bioregions, with similar climate and soil conditions.

- The tribe Phaseoleae contains the highest percentage cultivated legume species, followed by the Millettieae and Indigofereae. Important grazed or browsed species are contained mostly in the Acacieae, followed by the Crotalarieae and Indigofereae.

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SUMMARY

The principal objective of this study was to record all known legume species indigenous to South Africa, Lesotho and Swaziland and to propose a list of species for further evaluation of their pasture potential. Taxonomic and distribution data for legumes were obtained from the PRECIS database to establish distribution patterns based on the bioregions vegetation map. A cluster analysis was performed to obtain meaningful distribution patterns of indigenous legume species recorded in quarter degree grid cells and to establish and describe functional legume clusters. Five main clusters were recognised. The Sour and Mixed Veld Group (Cluster A) was subdivided into five smaller clusters with distinct vegetational patterns mainly in the grassland and savanna regions. The Seasonal Rainfall Group (Cluster B) has the largest weight and was subdivided into seven distinct smaller clusters. The Higher Rainfall Cape Floristic Region (Cluster C) is a main cluster and was not subdivided. The two clusters in the Savanna Group (Cluster D) are located in the savanna region and the Northern Mistbelt Forest (Cluster E), the smallest cluster, represents a forest area. The subdivision of the five main clusters resulted in 16 Leguminochoria. The highest species richness was recorded in the Northern Mistbelt Forest. For each Leguminochorion the key species were listed and, if present, the diagnostic species (occurrence 70% or higher) were also noted. Leguminochoria were classified in six communities, with the Albany Centre noted as a single entity, indicating no floristic links with any of the other clusters. Soil pH and mean annual minimum temperature are the main drivers for distinguishing between legume communities.

Mean annual rainfall is correlated with the distribution patterns of all legume tribes and species. Most occurrences fall in the 400–800 mm level, followed by >800 mm. Soil pH also plays a major role with most occurrences lying in the <6.4 soil pH level, followed by a 5.5–7.4 level. Mean annual minimum temperature is a more important factor in the distribution patterns of legume tribes and species than mean annual maximum temperature. The distribution of legume species is least affected by soil phosphorus content. The listing of species in the different groups, as determined by cluster analysis, is useful when selecting species for specific climate and soil conditions. Species adapted to a wide range of soil pH levels as well as to low soil phosphorus levels are recorded, with 15 *Acacia* and 13 *Indigofera* species adapted to these soil conditions.

Legume species recorded as being cultivated, grazed or browsed were used as dataset. The highest number of cultivated species occurs mainly in the Central Bushveld, Mopane and Lowveld Bioregions. The prevailing mean annual rainfall for these regions is 400–800 mm, mean annual minimum temperature 2–8ºC, mean annual maximum temperature 25–29ºC, soil phosphorus <10 $mgkg^{-1}$ and soil pH<6.4. The highest number of grazed and browsed species has a pattern similar to that of cultivated species. A total of 584 legume species are included in a list for further evaluation of their pasture potential.

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CURRICULUM VITAE

MARIKE TRYTSMAN

Marike Trytsman (neè M van den Berg) was born in 1959 in Johannesburg, South Africa and matriculated in 1976 at Edenvale Hoërskool. In 1987 she completed an MSc Agric (Planted Pastures) and in 1989 a B Inst Agrar (Hons) at the University of Pretoria.

She joined the Department of Agricultural Development in 1983. The focus of her research was the agronomic evaluation of temperate planted pastures as well as research support for the evaluation of tropical planted pastures and cover crops. Between 1987 and 1999, the emphasis was placed on the production of annual legume pastures intercropped with annual temperate grasses along with measuring biological nitrogen fixation of legumes using the ^{15}N and natural abundance techniques. A visit to the USA to review methods to determine biological nitrogen fixation was undertaken in 1992.

The position of manager for the National Forage Genebank of the ARC-Range and Forage Institute was accepted in 2000 focusing on updating the Genebank documentation systems to improve accessibility, seed regeneration of important accessions and screening and descriptive studies of genebank accession. In 2001, she visited Western Australian farmers to access legumes adapted to saline soils. During the visit, the possibility of evaluating South African legumes was discussed.

As co-ordinator for the Rangeland Monitoring Project, training of the Department of Agriculture interns for the period 2005–2006 demanded much of her attention. The ARC-Professional Development Programme appointed het as mentor for an MSc student and they received awards for the best mentor, student and mentor/student relationship for the 2005 group.

She managed the Range & Forage Unit group at Roodeplaat between 2006–2008 involving three research and six facility projects. In 2009, the indigenous legume project formally commenced and she was in a position to spend her full time on this project.

Other positions held include the advisory scientific editor for the Grassland Society of Southern Africa (1993, 1995 and 1998), the program co-ordinator for the Grassland Society of Southern Africa 34th Congress (1999) and the Gauteng representative for the Grassland Society of Southern Africa (2002) assistant editor for *African Journal of Range & Forage Science* (2006–2007).

Marike Trytsman developed and wrote Pasture Science course for Technikon SA (1997), developed three agricultural courses for Vista University (2001) and was external examiner for Technikon SA, Medunsa and the University of Pretoria (1987–2002).

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List of Publications: M. Trytsman (neè M. van den Berg)

VAN DEN BERG, M., KRUGER, A.J. & WASSERMANN, V.D. 1988. Effect of N application, seeding rate and defoliation height on mixtures of *T. vesiculosum* and *L. multiflorum*. I. DM production, CP content and CP production. *Journal of the Grassland Society of Southern Africa* 5: 154–157.

VAN DEN BERG, M., KRUGER, A.J. & WASSERMANN, V.D. 1988. Effect of N application, seeding rate and defoliation height on mixtures of *T. vesiculosum* and *L. multiflorum*. II. Yield advantage as reflected in the LER. *Journal of the Grassland Society of Southern Africa* 5: 158–160.

VAN DEN BERG, M. & KRUGER, A.J. 1989. Plant relations in mixtures of *T. subterraneum* and *L. multiflorum*. I. DM production, CP content and CP production. *Journal of the Grassland Society of Southern Africa* 6: 23–28.

WASSERMANN, V.D. & VAN DEN BERG, M. 1990. Comparitive response of lucerne and sainfoin to applications of P, K and lime. *South African Journal of Plant and Soil* 7: 76–80.

VAN DEN BERG, M. & KRUGER, A.J. 1991. Plant relations in mixtures of *T. subterraneum* and *L. multiflorum*. II. Yield advantage as reflected in the LER. *Journal of the Grassland Society of Southern Africa* 8: 9–12.

VAN DEN BERG, M., KRUGER, A.J. & WASSERMANN, V.D. 1991. Die invloed van N toediening, saaidigtheid en metode van vermenging van komponente op mengsels van *T. vesiculosum* en *L. multiflorum*. *Journal of the Grassland Society of Southern Africa* 7: 213–216.

VAN DEN BERG, M. 1992. Assegaaiklawer. Weidingsvereniging van SA. Weidingsboerdery Forum, Kruger Nationale Park.

VAN DEN BERG, M., KRUGER, A.J. & LELLO, J.V. 1992. The compatibility of *T. resupinatum* and *L. multiflorum* in mixtures as affected by N application and different seeding rates. *South African Journal of Plant and Soil* 9: 52–57.

VAN DEN BERG, M., MEYER, J.H.F. & GEERTHSEN, J.M.P. 1992. Nitrogen fixation of annual temperate clover species determined by the N difference method. *Journal of the Grassland Society of Southern Africa* 9: 165–169.

WASSERMANN, V.D., KRUGER, A.J. & VAN DEN BERG, M. 1992. Herbage yield and stand persistence of lucerne cultivars of varying winter dormancy under irrigation in the Transvaal Middleveld. *South African Journal of Plant and Soil* 9: 129–135.

VAN DEN BERG, M. & SMITH, M.F. 1993. N fertilization and seeding rate of annual temperate grass/clover pastures under cutting in SA. Proceedings of the XVII International Grassland Congress, New Zealand/Australia.

TRYTSMAN, M., STOCK, W.D. & OTTO, C.J. 1995. The use of *L. multiflorum* and uninoculated *T. subterraneum* as reference crops in N_2 fixation studies. *African Journal Range & Forage Science* 12: 46–48.

TRYTSMAN, M. 1996. Preliminary results on the assessment of reference crops for the quantification of N fixation using the ^{15}N dilution method. Proceedings of the All Africa Conference On Animal Agriculture, University of Pretoria, Pretoria.

TRYTSMAN, M. & VAN DEN BERGH, L. 1997. The evaluation of existing pastures cultivated on rehabilitated mine land for economical animal production. Report on the Research Projects of High Extraction Coal Mining Areas (Project 2(a)).

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TRYTSMAN, M. KRUGER, A.J., WASSERMANN, V.D. & STOLTZ, M. 1998. Production of irrigated *T. repens* under a cutting regime in the subtropical region of Gauteng, SA. *African Journal of Range and Forage Science* 14: 81–86.

TRYTSMAN, M., MEYER J.H.F. & VAN DEN BERGH, L. 1998. ^{15}N uptake by annual and perennial temperate pastures. 8th African Association for Biological Nitrogen Fixation Conference, University of Cape Town, Cape Town.

TRYTSMAN, M. & SMITH, M.F. 1998. Comparison of methods used for determining N fixation in annual clovers. *Applied Plant Science* 12: 20–23.

WASSERMANN, V.D., KRUGER, A.J. & TRYTSMAN, M. 1998. Regrowth potential of *T. resupinatum* in comparison to other temperate pasture legumes. *Applied Plant Science* 12: 24–27.

TRYTSMAN, M. 1999. Pasture I Study Guide. Department of Animal Health, Technikon SA.

TRYTSMAN, M., VAN DEN BERGH, L., TERBLANCHE, H., STOLTZ, M.A., LAW, I. & BLOEM, J.F. 1999. Interaction between *M. sativa* cultivars and *Sinorhizobium meliloti* strains. Proceedings of the 34th Congress of the Grassland Society of Southern Africa, Warmbath, South Africa.

TRYTSMAN, M. & MAPPLEDORAM, B. 2000. Preliminary results on the evaluation of white clover in association with perennial ryegrass. Proceedings of the 35th Congress of the Grassland Society of Southern Africa, Harare, Zimbabwe.

TRYTSMAN, M. 2001. Animal Production Study Guide, Department of Animal Science, Vista University.

TRYTSMAN, M. 2001. Pasture Management Study Guide. Department of Animal Science, Vista University.

BRITS, G., TRYTSMAN, M., SMITH, A., NDLOVU, S., MOGALE, E., MAKHAFULA, M. & MOLIFI, R.N. 2003. Screenings of subtropical grass species for drought tolerance. Proceedings of the VII International Rangeland Congress, Durban.

TRYTSMAN, M., BRITS, G., DEARLOVE, K., DREYER, C. & IMMELMAN, K. 2003. The ARC-RFI Fodder Crop Genebank. Proceedings of the VII International Rangeland Congress, Durban.

DEARLOVE, K., TRYTSMAN, M. & BREYTENBACH, P.J.J. 2004. Integrating biotechnology into the polyfarm concept. *South African Journal of Botany* 70: 83–88.

TRYTSMAN, M. 2005. Pasture & Nutrition: Animal Health Study guide. Department of Animal & Veterinary Public Health, UNISA.

SMITH, A. & TRYTSMAN, M. 2007. Sand, the movement and containment thereof: Not a simple problem. Report for the Impact Compaction Technology Development, Peoples Republic of China.

TRYTSMAN, M., VAN WYK, A.E. & MASEMOLA, E.L. 2011. Systematics, diversity and forage value of indigenous legumes of South Africa, Lesotho and Swaziland. *African Journal of Biotechnology* 10: 13773–13779.

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REFERENCES

ABBERTON, M.T. 2010. *Enhancing the role of legumes: potential and obstacles. Integrated Crop Management*, volume 11. www.fao.org/docrep/013/i1880e/i1880e08.pdf.

ABBERTON, M.T., MACDUFF, J.H., MARSHALL, A.H. & HUMPHREYS, M.W. 2008. *The genetic improvement of forage grasses and legumes to enhance adaptation of grasslands to climate change.* Food and Agriculture Organization of the United Nations, Rome. ftp://ftp.fao.org/docrep/fao/010/ai779e/ai779e00.pdf.

ACOCKS, J.P.H. 1953. Veld types of South Africa. *Memoirs of the Botanical Survey of South Africa* 28:1–192.

ACOCKS, J.P.H. 1988. Veld types of South Africa, 3rd edition. *Memoirs of the Botanical Survey of South Africa* 57: 1–146.

ADEDAPO, A.A., OMOLOYE, O.A. & OHORE, O.G. 2007. Studies on the toxicity of an aqueous extract of the leaves of *Abrus precatorius* in rats. *Onderstepoort Journal of Veterinary Research* 74: 31–36.

ADEWALE, B.D. & ODOH, N.C. 2013. Review on genetic resources, diversity and agronomy of African Yam bean (*Sphenostylis stenocarpa* (Hochst. ex A.Rich.) Harms): A Potential Future Food Crop. *Sustainable Agriculture Research* 2: 32–43.

ADJOLOHOUN, S., BINDELLE, J., ADANDÉDJAN, C. & BULDGEN, A. 2008. Some suitable grasses and legumes for ley pastures in Sudanian Africa: the case of the Borgou region in Benin. *Biotechnology, Agronomy, Society and Environment* 12: 405–419.

ADU-GYAMFI, R., DZOMEKU, I.K. & LARDI, J. 2012. Evaluation of growth and yield potential of genotypes of kersting's groundnut (*Macrotyloma geocarpum* Harms) in Northern Ghana. *International Research Journal of Agricultural Science and Soil Science* 2: 509–515.

AGANGA, A.A. & TSHWENYANE, S.O. 2003. Feeding value and anti-nutritive factors of forage tree legumes. *Pakistan Journal of Nutrition* 2: 170–177.

AGBEDE, J.O. 2006. Characterisation of the leaf meals, protein concentrates and residues from some tropical leguminous plants. *Journal of the Science of Food and Agriculture* 86: 1292–1297.

AKYEAMPONG, E. 1985. Some responses of cowpea to drought stress. Potentials of forage legumes in farming systems of sub-Saharan Africa. *Proceedings of a workshop held at ILCA, Addis Ababa, Ethiopia.* http://www.fao.org/wairdocs/ilri/x5488e /x5488e00.htm #Contents.

ANELE, U.Y. 2011. *Evaluation of dual purpose cowpea varieties for dry season feeding of ruminant animals*. PhD thesis, Rheinischen Friedrich-Wilhelms-Universität, Bonn, Germany. http://hss.ulb.uni-bonn.de/2011/2481/2481.pdf.

© University of Pretoria

ANON 1999. Cover legumes increase productivity of upland rice under intensified land use. *West Africa Rice Research Brief* No. 2 October. http://www.warda.cgiar.org/publications/RBrief2.pdf.

ANON 2009. *International treaty on plant genetic resources for food and agriculture*. Food and Agriculture Organization of the United Nations, Rome, Italy.

ANON 2012. *ARC National Public Goods Assets Annual Report 2011/12*. Agricultural Research Council, Hatfield, South Africa.

ARAYA, M.R., NGUGI, R.K., MUSIMBA, N.K.R. & NYARIKI, D.M. 2003. Effect of *Acacia tortilis* pods on intake, digestibility and nutritive quality of goat diets in southwestern Eritrea. *African Journal of Range & Forage Science* 20: 59–62.

ARDLEY, J.K., O'HARA, G.W., REEVE, W.G., YATES, R.J., DILWORTH, M.J., TIWARI, R.P. & HOWIESON, J.G. 2009. Root nodule bacteria isolated from South African *Lotononis bainesii*, *L. listii* and *L. solitudinis* are species of *Methylobacterium* that are unable to utilize methanol. *Archives of Microbiology* 191: 311–318.

ASSEFA, G., KIJORA, C., KEHALIEW, A., SONDER, K. & PETERS, K.J. 2012. Effect of pre-feeding forage treatments, harvesting stage, and animal type on preference of tagasaste (*Chamaecytisus palmensis*). *Agroforestry Systems* 84: 25–34.

AYISI, K.K., BOPAPE, M.P. & PENGELLY, B.C. 2004. Assessment of the variation in growth and yield of diverse Lablab (*Lablab purpureus*) germplasm in Limpopo Province, South Africa. In A. Whitbread & B.C. Pengelly (eds), Tropical legumes for sustainable farming systems in southern Africa and Australia. *Australian Centre for International Research (ACIAR) Proceedings* 115: 44–50.

AYISI, K.K., NKGAPELE, R.J. & DAKORA, F.D. 2000. Nodule formation and function in six varieties of Cowpea (*Vigna unguiculata* (L.) Walp.) grown in a nitrogen rich field soil in South Africa. *Symbiosis* 28: 17–31.

BADIANE, F.A., GOWDA, B.S., CISSÉ, N., DIOUF, D., SADIO, O. & TIMKO, M.P. 2012. Genetic relationship of cowpea (*Vigna unguiculata*) varieties from Senegal based on SSR markers. *Genetics and Molecular Research* 11: 292–304.

BALA, A., MURPHY P. & GILLER, K.E. 2002. Occurrence and genetic diversity of rhizobia nodulating *Sesbania sesban* in African soils. *Soil Biology & Biochemistry* 34: 1759–1768.

BALOYI, J.J., HAMUDIKUWANDA, H. & NGONGONI, N.T. 2009. Estimation of true intestinal digestibility of dry matter, nitrogen and amino acids of cowpea and silverleaf desmodium forage legumes and *Brachystegia spiciformis* (musasa) browse legume. *African Journal of Range & Forage Science* 26: 51–57.

BARNARD, S.A. 1987. Influence of sowing depth on the germination of Karoo shrubs and grasses. *Journal of the Grassland Society of Southern Africa* 4: 123–126.

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BARNES, D.L., RETHMAN, N.F.G., DE WITT, C.C. & KOTZE, G.D. 1986. Exploratory trials on reinforcement of veld with legumes in the south-eastern Transvaal Highveld. *Journal of the Grassland Society of Southern Africa* 3: 90–95.

BATELLO, C., BRINKMAN, R., 't MANNETJE, L., MARTINEZ, A. & SUTTIE, J. Undated. *Plant Genetic Resources of Forage Crops, Pasture and Rangelands*. Food & Agricultural Organization. http://typo3.fao.org/fileadmin/templates/agphome/documents/PGR/SoW2/thematicstudy_forage.pdf.

BLOEM, J., TRYTSMAN, G. & SMITH, H.J. 2009. Biological nitrogen fixation in resource-poor agriculture in South Africa. *Symbiosis* 48: 18–24.

BOATWRIGHT, J.S., TILNEY, P.M. & VAN WYK, B-E. 2009. The generic concept of *Lebeckia* (Crotalarieae, Fabaceae): Reinstatement of the genus *Calobota* and the new genus *Wiborgiella*. *South African Journal of Botany* 75: 546–556.

BOATWRIGHT, J.S., WINK, M. & VAN WYK, B-E. 2011. The generic concept of *Lotononis* (Crotalarieae, Fabaceae): Reinstatement of the genera *Euchlora*, *Leobordea* and *Listia* and the new genus *Ezoloba*. *Taxon* 60: 161–177.

BOND, W.J., MIDGLEY, G.F. & WOODWARD, F.I. 2003. What controls South African vegetation – climate or fire? *South African Journal of Botany* 69: 79–91.

BOONE, C.M., OLSTHOORN, M.M.A., DAKORA, F.D., SPAINK, H.P. & THOMAS-OATES, J.E. 1999. Structural characterisation of lipo-chitin oligosaccharides isolated from *Bradyrhizobium aspalati*, microsymbionts of commercially important South African legumes. *Carbohydrate Research* 317: 155–163.

BOSCH, C.H. & BORUS, D.J. 2006. *Dyes and tannins of Tropical Africa. Conclusions and recommendations based on PROTA 3: 'Dyes and tannins'*. PROTA Foundation, Wageningen, Netherlands.

BOTHA, P.R. 2003. *Die produksiepotensiaal van oorgesaaide kikoejoeweiding in die gematigde kusgebied van die Suid Kaap*. PhD thesis, University of the Free State, Bloemfontein, South Africa.

BOWER, N., HERTEL, K., OH, J. & STOREY, R. 1988. Nutritional evaluation of Marama Bean (*Tylosema esculentum*, Fabaceae): Analysis of the seed. *Economic Botany* 42: 533–540.

BREDENKAMP, G.J., SPADA, F. & KAZMIERCZAK, E. 2002. On the origin of northern and southern hemisphere grasslands. *Plant Ecology* 163: 209–229.

BREEBAART, L. 2003. *Feeding selection in three grazing systems in the Nama Karoo*. National Botanical Institute, Claremont, South Africa.

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BREEBAART, L., BHIKRAJ, R. & O'CONNOR, T.G. 2002. Dietary overlap between Boer goats and indigenous browsers in a South African savanna. *African Journal of Range & Forage Science* 19: 13–20.

BRITTEN, E.J. 1962. Evaluation for pasture purposes of some African clovers in a plant introduction program. *Journal of Range Management* 15: 329–333.

BROMILOW, C. 2001. *Problem plants of South Africa*. Briza Publications, Pretoria, South Africa.

BURTT-DAVY, J. 1921. III. New or noteworthy South African Plants (I). *Bulletin of Miscellaneous Information (Royal Gardens, Kew)* 2: 49–52.

CHIANU, J.N., NKONYA, E.M., MAIRURA, F.S., CHIANU, J.N. & AKINNIFESI, F.K. 2011. Biological nitrogen fixation and socioeconomic factors for legume production in sub-Saharan Africa: a review. *Agronomy for Sustainable Development* 31: 139–154.

CHIKOWO, R., MAPFUMO, P., LEFFELAAR, P.A. & GILLER, K.E. 2006. Integrating legumes to improve N cycling on smallholder farms in sub-humid Zimbabwe: resource quality, biosphysical and environmental limitations. *Nutrient cycling in Agroecosystems* 76: 219–231.

CHINGWARU, W., DUODU, G., VAN ZYL, Y., SCHOEMAN, C.J., MAJINDA, R., YEBOAH, S., JACKSON, J., KAPEWANGOLO, P., KANDAWA-SCHULZ, M., MINNAAR, A. & CENCIC, A. 2011. Antibacterial and anticandidal activity of *Tylosema esculentum* (marama) extracts. *South African Journal of Science*. http://www.sajs.co.za/ issue/2011/107/3-4/march-april-2011.

CHINUWO, T., GANDIWA, E., MUGABE, P.H., MPOFU, I.D.T. & TIMPONG-JONES, E. 2010. Effects of previous cultivation on regeneration of *Julbernardia globiflora* and *Brachystegia spiciformis* in grazing areas of Mupfurudzi Resettlement Scheme, Zimbabwe. *African Journal of Range & Forage Science* 27: 45–49.

CLATWORTHY J.N. & MADAKADZE, C. 1988. Some thoughts on the collection, introduction and evaluation of pasture legumes in Zimbabwe. In: Pasture Network for Eastern and Southern Africa (PANESA), African forage plant genetic resources, evaluation of forage germplasm and extensive livestock production systems. *Proceedings of the Third Workshop held at the International Conference Centre, Arusha, Tanzania, 27–30 April 1987*. International Livestock Centre for Africa, Addis Ababa, Ethiopia.

CLATWORTHY, J.N. 1980. Screening of legumes for veld reinforcement. *Proceedings of the Annual Congresses of the Grassland Society of Southern Africa* 15: 111–116.

CLATWORTHY, J.N. 1984. Pasture research in Zimbabwe: 1964–84. In J.A. Kategile, Pasture improvement research in Eastern and Southern Africa. *Proceedings of a workshop held in Harare, Zimbabwe, 17–21 Sept. 1984*. http://idl-bnc. idrc.ca /dspace/ bitstream/10625 /20557/1/63011_p25-58.pdf.

© University of Pretoria

COOK, B.G., PENGELLY, B.C., BROWN, S.D., DONNELLY, J.L., EAGLES, D.A., FRANCO, M.A., HANSON, J., MULLEN, B.F., PARTRIDGE, I.J., PETERS, M. & SCHULTZE-KRAFT, R. 2005. *Tropical forages: an interactive selection tool*. [CD-ROM], CSIRO, DPI&F(Qld), CIAT and ILRI, Brisbane, Australia.

COWLING, R.M., RUNDEL, P.W., DESMET, P.G. & ESLER, K.J. 1998. Extraordinary high regional-scale plant diversity in southern African arid lands: subcontinental and global comparisons. *Diversity and Distributions* 4: 27–36.

DAKORA, F.D. & KEYA, S.O. 1997. Contribution of legume nitrogen fixation to sustainable agriculture in sub-Saharan Africa. *Soil Biology and Biochemistry* 29: 809–817.

DAKORA, F.D. 2000. Commonality of root nodulation signals and nitrogen assimilation in tropical grain legumes belonging to the tribe Phaseoleae. *Australian Journal of Plant Physiology* 27: 885–892.

DAKORA, F.D. 2003. Defining new roles for plant and rhizobial molecules in sole and mixed plant cultures involving symbiotic legumes. *New Phytologist* 158: 39–49.

DAKORA, F.D., LAWLOR, D.W. & SIBUGA K.P. 1999. Assessment of symbiotic nitrogen nutrition in Marama bean (*Tylosema esculentum* L.), a tuber-producing, underutilized African legume. *Symbiosis* 27: 269–277.

DAMAYANTI, F., LAWN, R. J. & BIELIG, L.M. 2010. Genotypic variation in domesticated and wild accessions of the tropical tuberous legume *Vigna vexillata* (L.) A. Rich. *Crop and Pasture Science* 61: 771–784.

DANGASUK, G.O., ODAGO, P.O., WERE, B.A. & GUDU, S. 2006. Geographic characterisation of African provenances of *Faidherbia albida*. *African Crop Science Journal* 14: 263–273.

DAVIS, C.L. 2011. *Climate risk and vulnerability: a handbook for southern Africa*. Council for Scientific and Industrial Research, Pretoria, South Africa. pp 92.

DEBELA, E., TOLERA, A., EIK, L.O. & SALTE, R. 2011. Nutritive value of morphological fractions of *Sesbania sesban* and *Desmodium intortum*. *Tropical and Subtropical Agroecosystems* 14.

DEWHURST, R.J., DELABY, L., MOLONEY, A., BOLAND, T. & LEWIS, E. 2009. Nutritive value of forage legumes used for grazing and silage. *Irish Journal of Agricultural and Food Research* 48: 167–187.

DIAMOND, J. 1997. *Guns, germs, and steel: the fates of human societies*. W.W. Norton & Company, New York.

DICKO, M.S. & SIKENA, L.K. 1992. Fodder trees and shrubs in range and farming systems in dry tropical Africa. In A. Speedy & P-L. Pugliese, *Legume trees and other fodder trees as*

© University of Pretoria

protein sources for livestock. Food and Agriculture Organization of the United Nations, Rome.

DOIGNON-BOURCIER, F., SY, A., WILLEMS, A., TORCK, U., DREYFUS, B., GILLIS, M. & DE LAJUDIE, P. 1999. Diversity of Bradyrhizobia from 27 tropical leguminosae species native of Senegal. *Systematic and Applied Microbiology* 22: 647–661. <Is jy seker van Willems se voorletter? Is dit dalk dieselfde persoon?>

DOIGNON-BOURCIER, F., WILLEMS, A., COOPMAN, R., LAGUERRE, G., GILLIS, M. & DE LAJUDIE, P. 2000. Genotypic characterization of *Bradyrhizobium* strains nodulating small Senegalese legumes by 16S-23S rRNA Intergenic Gene Spacers and Amplified Fragment Length Polymorphism Fingerprint Analyses. *Applied and Environmental Microbiology* 66: 3987–3997.

ECKARD, R.J. 1994. *The nitrogen economy of three irrigated temperate grass pastures with and without white clover in Natal*. PhD thesis, University of Natal, South Africa.

EKANAYAKE, S., SKOG, K. & ASP, N.-G. 2007. Canavanine content in sword beans (*Canavalia gladiata*): analysis and effect of processing. *Food and Chemical Toxicology* 45: 797–803.

EKELEME, F., AKOBUNDU, I.O., FADAYOMI, R.O., CHIKOYE, D. & ABAYOMI, Y.A. 2003. Characterization of legume cover crop for weed suppression in the moist Savanna of Nigeria. *Weed Technology* 17: 1–13.

ELLIOTT, W.S. 2008. *Access to genetic resources in Africa: Analysing development of ABS policies in four African countries*. United Nations Environment Programme, Nairobi, Kenya.

ERASMUS, D. 2012. *Tree lucerne: marvellous, but not miraculous!* http://www.farmersweekly.co.za/article.aspx?id=32701&h=Tree-lucerne:-marvellous,-but-not-miraculous!

ERNST, W.H.O., TOLSMA, D.J. & DECELLE, J.E. 1989. Predation of seeds of *Acacia tortilis* by insects. *Oikos* 54: 294–300.

FANG, J., CHAO, C-C.T., ROBERTS, P.A. & EHLERS, J.D. 2007. Genetic diversity of cowpea (*Vigna unguiculata* (L.) Walp.) in four West African and USA breeding programs as determined by AFLP analysis. *Genetic Resources and Crop Evolution* 54: 1197–1209.

FAO 1983. *Report of the Conference of FAO - Twenty-Second Session*. http://www.fao.org/docrep/x5563E/X5563e00.htm#Contents

FAO 1989. *Plant genetic resources: their conservation* in situ *for human use*. FAO, Rome, Italy.

FAO 1996. Potential for forage legumes on land in west Africa. *World Soil Resources Report* 82. Food and Agriculture Organization of the United Nations, Rome, Italy.

© University of Pretoria

FORNARA, D.A. & DU TOIT, J.T. 2007. Browsing lawns? Responses of *Acacia nigrescens* to ungulate browsing in an African Savanna. *Ecology* 88: 200–209.

GARDENER, C.J., MCIVOR, J.G. & JANSEN, A. 1993. Passage of legume and grass seeds through the digestive tract of cattle and their survival in faeces. *Journal of Applied Ecology* 30: 63–74.

GERDING, M., O'HARA, G.W., BRÄU, L., NANDASENA, K. & HOWIESON, J.G. 2012. Diverse *Mesorhizobium* spp. with unique *nodA* nodulating the South African legume species of the genus *Lessertia*. *Plant and Soil* 358: 385–401.

GERMISHUIZEN, G. & CLARKE, B. 2003. *Illustrated guide to the wild flowers of northern South Africa*. Briza Publications, Pretoria, South Africa.

GERMISHUIZEN, G. & MEYER, N.L. 2003. Plants of southern Africa: an annotated checklist. *Strelitzia* 14. South African National Biodiversity Institute, Pretoria, South Africa.

GIBBS RUSSELL, G.E. & ARNOLD, T.H. 1989. Fifteen years with the computer: Assessment of the "Precis" taxonomic system. *Taxon* 38: 178–195.

GILLETT, J.B. 1952. The genus *Trifolium* in southern Arabia and in Africa south of the Sahara. *Kew Bulletin* 7: 367–404.

GILLETT, J.B. 1963. *Sesbania* in Africa (excluding Madagascar) and southern Arabia. *Kew Bulletin* 17: 91–159.

GLEN, H.F. 2002. *Cultivated plants of southern Africa*. National Botanical Institute and Jacana Publishers, Johannesburg, South Africa.

GOLDBLATT, P. 1978. An analysis of the flora of southern Africa: its characteristics, relationships and origins. *Annals of the Missouri Botanical Gardens* 65: 369–436.

GOLDBLATT, P. & MANNING, J.C. 2002. Plant diversity of the Cape region of southern Africa. *Annals of the Missouri Botanical Garden* 89: 281–302.

GOLDSCHMIDT, W.B. & ORCHARD, E.R. 1940. The inoculation of clover. The effect of different strains of nodule bacteria on the growth and composition of *Trifolium repens*. *Farming in South Africa* 15: 411–419.

GRAHAM, P.H. & VANCE, C.P. 2003. Legumes: importance and constraints to greater use. *Plant Physiology* 131: 872–877.

GREENWAY, P.J. 1936. *Mundulea* fish poison. *Bulletin of Miscellaneous Information* 4: 245–250.

GROBBELAAR, N. & CLARKE, B. 1972. A qualitative study of the nodulation ability of legume species. List 2. *Journal of South African Botany* 38: 241–247.

© University of Pretoria

GROBBELAAR, N. & CLARKE, B. 1974. A qualitative study of the nodulating ability of legume species: List 4. *Agroplantae* 6: 59–64.

GROBBELAAR, N. & CLARKE, B. 1975. A qualitative study of the nodulating ability of legume species: List 3. *Journal of South African Botany* 41: 29–36.

GROBBELAAR, N., VAN BEYMA, M.C. & TODD, C.M. 1967. A qualitative study of the nodulating ability of legume species: List 1. Publications of the University of Pretoria, New Series no 38.

GROBBELAAR, N. & VAN ROOYEN, M.W. 1979. A qualitative study of the nodulating ability of legume species: List 5. *Journal of South African Botany* 45: 267–272.

GROBBELAAR, N., VAN ROOYEN, M.W. & VAN ROOYEN, N. 1983. A qualitative study of the nodulating ability of legume species: List 6. *South African Journal of Botany* 2: 329–332.

GUTTERIDGE, R.C. 1998. The perennial *Sesbania* species. In R.C. Gutteridge & H.M. Shelton, *Forage tree legumes in tropical agriculture*. Tropical Grassland Society of Australia Inc., St Lucia, Queensland, Australia.

HAKIZA, J.J., LAZIER, J.R. & SAYERS, A.R. 1988a. Characterisation and preliminary evaluation of accessions of *Zornia* species from the ILCA collection. In Pasture Network for Eastern and Southern Africa (PANESA), African forage plant genetic resources, evaluation of forage germplasm and extensive livestock production systems. *Proceedings of the Third Workshop held at the International Conference Centre, Arusha, Tanzania, 27–30 April 1987*. International Livestock Centre for Africa, Addis Ababa, Ethiopia.

HAKIZA, J.J., LAZIER, J.R. & SAYERS, A.R. 1988b. Characterisation and evaluation of forage legumes in Ethiopia: preliminary examination of variation between accessions of *Stylosanthes fruticosa* (Retz.) Alston. In Pasture Network for Eastern and Southern Africa (PANESA), African forage plant genetic resources, evaluation of forage germplasm and extensive livestock production systems. *Proceedings of the Third Workshop held at the International Conference Centre, Arusha, Tanzania, 27–30 April 1987*. International Livestock Centre for Africa, Addis Ababa, Ethiopia.

HALLENSLEBEN, M., POLREICH, S., HELLER, J. & MAASS, B.L. 2009. Assessment of the importance and utilization of cowpea (*Vigna unguiculata* (L.) Walp.) as leafy vegetable in small-scale farm households in Tanzania – East Africa. *Conference on International Research on Food Security*. Natural Resource Management and Rural Development, Hamburg, Germany. http://www.tropentag.de/2009/abstracts/full/426.pdf.

HAQUE, I., JUTZI, S. & NEATE, P.J.H. 1985. Potentials of forage legumes in farming systems of sub-Saharan Africa. *Proceedings of a workshop held at ILCA, Addis Ababa, Ethiopia, 16–19 September 1985*. ILCA, Addis Ababa.

© University of Pretoria

HARLAN, J.R. 1995. *The living fields: our agricultural heritage*. The Press Syndicate of the University of Cambridge, Cambridge, United Kingdom.

HARLAN, J.R., DE WET, J.M.J. & STEMLER, A. 1976. Plant domestication and indigenous African agriculture. In J.R. Harlan, J.M.J. de Wet & A.B.L. Stemler, *Origins of African Plant Domestication*. Mouton Publishers, The Hague, The Netherlands.

HARRIS, D.R., 1967. New light on plant domestication and the origins of agriculture: a review. *Geographical Review* 57: 90–107.

HASSEN, A., GIZACHEW, L., RETHMAN, N.F.G. & VAN NIEKERK, W.A. 2007. Influence of undersowing perennial forages in maize on grain, fodder yield and soil properties in the sub-humid region of western Ethiopia. *African Journal of Range & Forage Science* 24: 35–41.

HASSEN, A., RETHMAN, N.F.G. & APOSTOLIDES, Z. 2006. Morphological and agronomic characterisation of *Indigofera* species using multivariate analysis. *Tropical Grasslands* 40: 45–59.

HASSEN, A., RETHMAN, N.F.G., APOSTOLIDES, Z. & VAN NIEKERK, W.A. 2007. Influence of moisture stress on growth, dry matter yield and allocation, water use and water-use efficiency of four *Indigofera* species. *African Journal of Range & Forage Science* 24: 25–34.

HASSEN, A., RETHMAN, N.F.G., APOSTOLIDES, Z. & VAN NIEKERK, W.A. 2008. Forage production and potential nutritive value of 24 shrubby *Indigofera* accessions under field conditions in South Africa. *Tropical Grasslands* 42: 96–103.

HENDRICKS, H.H., NOVELLIE, P.A., BOND, W.J. & MIDGLEY, J.J. 2002. Diet selection of goats in the communally grazed Richtersveld National Park. *African Journal of Range & Forage Science* 19: 1–11.

HERRIDGE, D.F., PEOPLES, M.B. & BODDEY, R.M. 2008. Global inputs of biological nitrogen fixation in agricultural systems. *Plant and Soil* 311: 1–18.

HÖGBERG, P. & NYLUND, J.E. 1981. Ectomycorrhizae in coastal miombo woodland of Tanzania. *Plant and Soil* 63: 283–289.

HUTCHINGS, A., SCOTT, A.H., LEWIS, G. & CUNNINGHAM, A. 1996. *Zulu medicinal plants: an inventory*. University of Natal Press, Pietermaritzburg.

HUTTON, E.M. & GUERASSIMOFF, J. 1966. Problems in breeding the legume *Indigofera spicata* for tropical pastures. *Euphytica* 15: 353–361.

ISELY, D. 1982. Leguminosae and *Homo sapiens*. *Economic Botany* 36: 46–70.

© University of Pretoria

JAFTHA, J.B., STRIJDOM, B.W. & STEYN, P.L. 2000. Characterization of pigmented methylotrophic bacteria which nodulate *Lotononis bainesii*. *Systematic and Applied Microbiology* 25: 440–449.

JOFFE, P. 2003. *Easy guide to indigenous shrubs*. Briza Publications, Pretoria, South Africa.

JOMBART, T., DEVILLARD, S. & BALLOUX, F. 2010. Discriminant analysis of principal components: a new method for the analysis of genetically structured populations. *BMC Genetics* 11: 94.

JONES, R.M. 2009. A listing of forage accessions sown in evaluation studies carried out by CSIRO in southern and central Queensland, Australia (1950–2000). *Tropical Grasslands* 43: 125–128.

JONES, R.M., BISHOP, H.G., CLEM, R.L., CONWAY, M.J., COOK, B.G., MOORE, K. & PENGELLY, B.C. 2000. Measurements of nutritive value of a range of tropical legumes and their use in legume evaluation. *Tropical Grasslands* 34: 78–90.

JONES, R.M., STRIJDOM, B.W. & THERON, E.P. 1974. The indigenous South African clovers (*T. africanum* and *T. burchellianum*) and their potential as pasture legumes. *Tropical Grasslands* 8: 7–16.

JORDAAN, A., DU PLESSIS, H.J. & WESSELS, D.C.J. 2000. Roots of *Colophospermum mopane*: are they infected by rhizobia? *South African Journal of Botany* 66: 128–130.

KADMON, R. & DANIN, A. 1999. Distribution of plant species in Israel in relation to spatial variation in rainfall. *Journal of Vegetation Science* 10: 421–432.

KAHURANANGA, J. 1988. The screening of perennial *Trifolium* species mainly from the Ethiopian highlands and their potential for use in pasture. In Pasture Network for Eastern and Southern Africa (PANESA), African forage plant genetic resources, evaluation of forage germplasm and extensive livestock production systems. *Proceedings of the Third Workshop held at the International Conference Centre, Arusha, Tanzania, 27–30 April 1987*. International Livestock Centre for Africa, Addis Ababa, Ethiopia.

KARWASARA, V.S., TOMAR, P. & DIXIT, V.K. 2011. Oxytocin influences the production of glycyrrhizin from cell cultures of *Abrus precatorius* Linn. *Plant Growth Regulation* 65: 401–405.

KATEGILE, J.A. 1985. Pasture improvement research in eastern and southern Africa. *Proceedings of a workshop held in Harare, Zimbabwe, 17–21 September 1984*. International Development Research Centre, Ottawa, Canada.

KELLERMAN, T.S., COETZER, J.A.W., NAUDE, T.W. & BOTHA, C.J. 2005. *Plant poisonings and mycotoxicoses of livestock in southern Africa*, edn 2. Oxford University Press, Cape Town, South Africa.

© University of Pretoria

KIDD, M.M. 2002. *Cape Peninsula*. South African Wild Flower Guide 3. Botanical Society of South Africa, Kirstenbosch, South Africa.

KING, F.E., KING, T.J. & WARWICK, A.J. 1952. The chemistry of extractives from hardwoods. Part VI. Constituents of huninga, the heartwood of *Pterocarpus angolensis*, A. : 6 : GDihydroxy-5 : 7-dimethoxyisojavone (Muningin). *Journal of the Chemical Society* 96–100.

KISINYO, P.O., GUDU, S.O., OTHIENO, C.O., OKALEBO, J.R., OPALA, P.A., MAGHANGA, J.K., AGALO, J.J., NG'ETICH, W.K., KISINYO, J.A., OSIYO, R.J., NEKESA, A.O., MAKATIANI, E.T., ODEE, D.W. & OGOLA, B.O. 2012. Effects of lime, phosphorus and rhizobia on *Sesbania sesban* performance in a western Kenyan acid soil. *African Journal of Agricultural Research* 7: 2800–2809.

KRISTJANSON, P., TARAWALI, S., OKIKE, I., SINGH, B.B., THORNTON, P.K., MANYONG, V.M., KRUSKA, R.L. & HOOGENBOOM, G. 2002. Genetically improved dual-purpose cowpea: assessment of adoption and impact in the dry savannah region of west Africa. *ILRI Impact Assessment Series* No. 9. Addis Ababa, Ethiopia.

KRUGER, A.J. 1999. *Role of plant genetic resources in sustainable land use systems*. PhD thesis, University of Pretoria, Pretoria, South Africa.

KUMAR, R. 1992. Anti-nutritional factors, the potential risks of toxicity and methods to alleviate them. *FAO Animal Production and Health Paper* 102. http://www.fao.org/ag/aga/agap/frg/ahpp102/102-145.pdf.

KUNENE, N., WILSON, R.A.C. & MYENI, N.P. 2003. The use of trees, shrubs and herbs in livestock production by communal farmers in northern KwaZulu-Natal, South Africa. *African Journal of Range & Forage Science* 20: 271–274.

LAMBERS, H., SHANE, M.W., CRAMER, M.D., PEARSE, S.J. & VENEKLAAS, E.J. 2006. Root structure and functioning for efficient acquisition of phosphorus: matching morphological and physiological traits. *Annals of Botany* (London) 98: 693–713.

LAW, I.J. & STRIJDOM, B.W. 1984. Role of lectins in the specific recognition of *Rhizobium* by *Lotononis bainesii*. *Plant Physiology* 74: 779–785.

LE HOUÉROU, H.N. 1980. The role of browse in the Sahelian and Sudanian zones. In H.N. Le Houérou, *Browse in Africa: the current state of knowledge*. International Livestock Centre for Africa, Ethiopia. http://www.ilri.org/InfoServ/Webpub/fulldocs/BROWSE_IN_AFRICA/toc.htm.

LE ROUX, A. & SCHELPE, T. 1997. *Namaqualand*. South African Wild Flower Guide 1. Botanical Society of South Africa, Kirstenbosch, South Africa.

LE ROUX, C.J.G., HOWE, L.G. & DU TOIT, L.P. 1988. A comparison of the dry matter yields of perennial legumes in the Dohne sourveld. *African Journal of Range & Forage Science* 5: 146–149.

© University of Pretoria

LE ROUX, P.M., KOTZÉ, C.D. & NEL, G.P. 1994. *Bossieveld. Grazing plants of the Karoo and karoo-like areas*. Bulletin 428, Department of Agriculture, Pretoria, South Africa.

LEISTNER, O.A. 1967. The plant ecology of the southern Kalahari. *Memoirs of the Botanical Society of South Africa* 38: 1–172.

LENNE, J.M. & WOOD, D. 2004. Is there a 'logic of fodder legumes' in Africa? *Food Policy* 29: 565–585.

LETSELA, T., WITKOWSKI, E.T.F. & BALKWILL, K. 2003. Plant resources used for subsistence in Tsehlanyane and Bokong in Lesotho. *Economic Botany* 57: 619–639.

LEWIS, G., SCHRIRE, B., MACKINDER, B. & LOCK, M. 2005. *Legumes of the world*. Royal Botanic Gardens, Kew, UK.

LINDER, H.P., LOVETT, J., MUTKE, J.M., BARTHLOTT, W., JÜRGENS, N., REBELO, T. & KÜPER, W. 2005. A numerical re-evaluation of the sub-Saharan phytochoria of mainland Africa. *Biologiske Skrifter* 55: 229–252.

LOW, A.B. & REBELO, A.G. 1996. *Vegetation of South Africa, Lesotho and Swaziland*. Department of Environmental Affairs & Tourism, Pretoria, South Africa.

LUKHELE, M.S. & VAN RYSSEN, J.B.J. 2000. *The chemical composition of leaves from indigenous fodder trees in South Africa*. Short paper and poster abstracts: 38th Congress of the South African Society of Animal Science. http://www.sasas.co.za/Sajas.html.

LUPWAYI, N.Z., KENNEDY, A.C. & CHIRWA, R.M. 2011. Grain legume impacts on soil biological processes in sub-Saharan Africa. *African Journal of Plant Science* 5: 1–7.

LUSEMBO, P., MOHAMED-SALEEM, M.A., ABATE, T. & SABIITI, E.N. 1995. Agronomic evaluation of herbaceous legumes in a subhumid zone of Uganda. *African Journal of Range & Forage Science* 12: 68–71.

LUSIGI, W.J., NKURUNZIZA E.R. & MESHETI, S. 1984. Forage preferences of livestock in the arid lands of northern Kenya. *Journal of Range Management* 37: 542–548.

MAASS, B.L., KNOX, M.R. & VENKATESHA, S.C. 2010. *Lablab purpureus* – a crop lost for Africa? *Tropical Plant Biology* 3: 123–135.

MACHARIA, P.N., GACHENE, C.K.K., MUREITHI, J.G., KINYAMARIO, J.I., EKAYA, W.N. & THURANIRA, E.G. 2011. The effect of introduced forage legumes on improvement of soil fertility in natural pastures of semi-arid rangelands of Kajiado district, Kenya. *Tropical and Subtropical Agroecosystems* 14: 221–227.

MAKOI, J.H.J.R., CHIMPHANGO, S.B.M. & DAKORA, F.D. 2009. Effect of legume plant density and mixed culture on symbiotic N_2 fixation in five cowpea (*Vigna unguiculata* (L.) Walp.) genotypes in South Africa. *Symbiosis* 48: 57–67.

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MAKOI, J.H.J.R., CHIMPHANGO, S.B.M. & DAKORA, F.D. 2010. Elevated levels of acid and alkaline phosphatase activity in roots and rhizosphere of cowpea (*Vigna unguiculata* (L.) Walp.) genotypes grown in mixed culture and at different densities with sorghum (*Sorghum bicolor* L.). *Crop and Pasture Science* 61: 279–286.

MANNING, J. 2001. *Eastern Cape*. South African Wild Flower Guide 11. Botanical Society of South Africa, Kirstenbosch, South Africa.

MANNING, J. 2003. *Photographic guide to the wild flowers of South Africa*. Briza Publications, Pretoria, South Africa.

MANNING, J. & GOLDBLATT, P. 2000. *West Coast*. South African Wild Flower Guide 7. Botanical Society of South Africa, Kirstenbosch, South Africa.

MANNING, J. & GOLDBLATT, P. 2002. *Nieuwoudtville, Bokkeveld Plateau & Hantam*. South African Wild Flower Guide 9. Botanical Society of South Africa, Kirstenbosch, South Africa.

MAPFUMO, P., MTAMBANENGWE, F., GILLER, K.E. & MPEPEREKI, S. 2005. Tapping indigenous herbaceous legumes for soil fertility management by resource-poor farmers in Zimbabwe. *Agriculture, Ecosystems and Environment* 109: 221–223.

MAPIYE, C., CHIMONYO, M., MARUFU, M.C. & DZAMA, K. 2011. Utility of *Acacia karroo* for beef production in southern African smallholder farming systems: a review. *Animal Feed Science and Technology* 164: 135–146.

MAPIYE, C., MUPANGWA, J.F., MUGABE, P.H., CHIKUMBA, N., POSHIWA, X. & FOTI, R. 2006. A review of forage legume research for rangeland improvement in Zimbabwe. *Tropical Grasslands* 40: 145–149.

MAPOSSE, I.C., MUIR, J.P. & ALAGE, A.A. 2003. Status of range and forage research in Mozambique. *African Journal of Range & Forage Science* 20: 63–68.

MASSAWE, F.J., MWALE, S.S., AZAM-ALI, S.N. & ROBERTS, J.A. 2005. Breeding in bambara groundnut (*Vigna subterranea* (L.) Verdc.): strategic considerations. *African Journal of Biotechnology* 4: 463–471.

MASUTHA, T.H., MUOFHE, M.L. & DAKORA, F.D. 1997. Evaluation of N_2 fixation and agroforestry potential in selected tree legumes for sustainable use in South Africa. *Soil Biology and Biochemistry* 29: 993–998.

McCLEAN, C.J., LOVETT, J.C., KÜPER, W., HANNAH, L., SOMMER, J.H., BARTHLOTT, W., TERMANSEN, M., SMITH, G.F., TOKUMINE, S. & TAPLIN, J.R.D. 2005. African plant diversity and climate change. *Annals of the Missouri Botanical Garden* 92: 139–152.

McCUNE, B. & MEFFORD, M.J. 2006. *PC-ORD. Multivariate Analysis of Ecological Data*. Version 5. MjM Software, Gleneden Beach, Oregon, USA.

© University of Pretoria

MIDGLEY, G.F., CHOWN, S.L. & KGOPE, B.S. 2007. Monitoring effects of anthropogenic climate change on ecosystems: a role for systematic ecological observation? *South African Journal of Science* 103: 282–286.

MINTSA MI NZUE, A.P. 2009. *Use and conservation status of medicinal plants in the Cape Peninsula, Western Cape Province of South Africa*. MSc thesis, Conservation Ecology and Entomology, University of Stellenbosch, Stellenbosch, South Africa.

MLAMBO, V., MOULD, F., MUELLER-HARVEY, I., OWEN, E., NDLOVU, L., MUGABE, P., SIKOSANA, J. & SMITH, T. 2001. Chemical composition and *in vitro* fermentation characteristics of *Acacia* and other tree pods (R7351). In T. Smith & S.H. Godfrey, Sustaining livestock in challenging dry season environments. Strategies for smallscale livestock farmers. *Proceedings of the 3rd Workshop on Livestock Production Programme Projects*, Ingwe Lodge and ICRISAT, Matopos, Zimbabwe.

MOHAMMADI, S.A. & PRASANNA, B.M. 2003. Analysis of genetic diversity in crop plants – salient statistical tools and considerations. *Crop Science* 43: 1235–1248.

MOORE, G. & TYMOWSKI, W. 2005. *Explanatory guide to the International Treaty on Plant Genetic Resources for Food and Agriculture*. IUCN, Gland, Switzerland, and Cambridge, UK.

MORGAN, W.T.W. 1981. Ethnobotany of the Turkana: use of plants by pastoral people and their livestock in Kenya. *Economic Botany* 35: 96–130.

MORIARTY, A. 1982. *Outeniekwa, Tsitsikamma & Oostelike Klein-Karoo*. Veldblomgids van Suid-Afrika 2. Botanical Society of South Africa, Kirstenbosch, South Africa.

MORIARTY, A. 1997. *Outeniqua, Tsitsikamma & Eastern Little Karoo*. South African Wild Flower Guide 2. Botanical Society of South Africa, Kirstenbosch, South Africa.

MORRIS, J.B. 1997. Special-purpose legume genetic resources conserved for agricultural, industrial and pharmaceutical use. *Economic Botany* 51: 251–263.

MORRIS, J.B. & WALKER, J.T. 2002. Non-traditional legumes as potential soil amendments for nematode control. *Journal of Nematology* 34: 358–361.

MOTT, C.L. 2010. Environmental constraints to the geographic expansion of plant and animal species. *Nature Education Knowledge* 3: 72.

MUCINA, L. & GELDENHUYS, C.J. 2006. Afrotemperate, subtropical and azonal forests. In L. Mucina & M.C. Rutherford, The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria, South Africa.

MUCINA, L. & RUTHERFORD, M.C. 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African Biodiversity Institute, Pretoria, South Africa.

© University of Pretoria

MUIR, J. 1906. The cancer cure in South Africa. *The British Medical Journal* March 31: 758–759.

MUIR, J.P. & MAPOSSE, I.C. 2002. Collection of herbaceous range legumes in Mozambique with potential for range reseeding and cultivated pasture. *Proceedings of the GSSA Congress* 37, Christiana, South Africa.

MUIR, J.P. & PITMAN, W.D. 1991. Grazing tolerance of warm-season legumes in peninsular Florida. *Agronomy Journal* 83: 297–302.

MUMBA, L.E. & MARANDU, W. 2012. *Traditional knowledge and plant genetic resources guidelines*. Southern Africa Network for Biosciences / NEPAD Planning and Coordinating Agency, Lynnwood, Pretoria, South Africa.

MUOFHE, M.L. & DAKORA, F.D. 1999. Nitrogen nutrition in nodulated field plants of the shrub tea legume *Aspalathus linearis* assessed using ^{15}N natural abundance. *Plant and Soil* 209: 181–186.

MURPHY, A.M. & COLUCCI, P.E. 1999. A tropical forage solution to poor quality ruminant diets: a review of *Lablab purpureus*. *Livestock Research for Rural Development* 11. http://www.cipav.org.co/lrrd11/2/colui.htp.

MURPHY, A.M., COLUCCI, P.E. & PADILLA, M.R. 1999. Analysis of the growth and nutritional characteristics of *Lablab purpureus*. *Livestock Research for Rural Development* 11. http://www.lrrd.org/lrrd11/3/colu113.htm.

MUSIL, C.F., KGOPE, B.S., CHIMPHANGO, S.B.M. & DAKORA, F.D. 2003. Nitrate additions enhance the photosynthetic sensitivity of a nodulated South African Mediterranean-climate legume (*Podalyria calyptrata*) to elevated UV-B. *Environmental and Experimental Botany* 50: 197–210.

MUSTART, P., COWLING, R. & ALBERTYN, J. 2003. *Southern Overberg*. South African Wild Flower Guide 8. Botanical Society of South Africa, Kirstenbosch, South Africa.

MUTAKELA, P.S. 2009. *Biomass prediction models for* Colophospermum mopane *(Mopane) in Botswana*. MSc thesis, University of Stellenbosch, Stellenbosch, South Africa.

NAUDIN, K. & BALARABÉ, O. 2008. *How to produce more biomass for direct seeding mulched-based cropping system in Sub-saharian Africa? Example in North Cameroon*. Regional Workshop on Conservation Agriculture, Laos. http://agroecologie.cirad.fr.

NELL, P. 2010. *The primary salinity, sodicity and alkalinity status of South African soils*. PhD thesis, University of the Free State, Bloemfontein, South Africa.

NEZOMBA, H., TAURO, T.P., MTAMBANENGWE, F. & MAPFUMO, P. 2007. Biomass productivity of N_2-fixing indigenous legumes on sandy soils under smallholder rain-fed conditions of Zimbabwe. *African Crop Science Conference Proceedings* 8: 1505–1512.

© University of Pretoria

NEZOMBA, H., TAURO, T.P., MTAMBANENGWE, F. & MAPFUMO, P. 2009. Indigenous legumes biomass quality and influence on C and N mineralization under indigenous legume fallow systems. *Symbiosis* 48: 78–91.

NGWA, A.T., NSAHLAI, I.V. & BONSI, M.L.K. 2003. Feed intake and dietary preferences of sheep and goats offered hay and legume-tree pods in South Africa. *Agroforestry Systems* 57: 29–37.

NIANG, A., STYGER, E., GAHAMANYI, A., HOEKSTRA, D. & COE, R. 1998. Fodder-quality improvement through contour planting of legume-shrub/grass mixtures in croplands of Rwanda highlands. *Agroforestry Systems* 39: 263–274.

NNADOZIE, K.C., KIAMBI, D., KAMERI-MBOTE, P., ATTA-KRAH, K. & MUGABE, J. 2002–3. *Plant Genetic Resources in Africa's renewal. Policy, legal and programmatic issues under the New Partnership for Africa's Development*. International Environmental Law Research Centre, Geneva, Switzerland.

NORTON, B.W. 1998. Anti-nutritive and toxic factors in forage tree legumes. In R.C. Gutteridge & H.M. Shelton, *Forage tree legumes in tropical agriculture*. Tropical Grassland Society of Australia Inc., St Lucia, Queensland, Australia.

NORTON, B.W., WHITFORD, C. & STAPLES, I.B. 1989. Digestion of seed from hard-seeded selections of *Macrotyloma uniflorum* (Horse gram) by cattle. *Tropical Grasslands* 23: 219–224.

NYOKA, R., CHIKUMBA, N., CHAKOMA, I., MAZAIWANA, P., MUKOMBE, N. & MAGWENZI, N. 2004. Evaluation and screening of forage legumes for sustainable integration into Crop-Livestock farming systems of Wedza District. In A. Whitbread & B.C. Pengelly (eds), Tropical legumes for sustainable farming systems in southern Africa and Australia. *Australian Centre for International Research (ACIAR) Proceedings* 115: 58–64.

O'CONNOR, T.G., DE RIDDER, C.H. & HOBSON, F.O. 2010. Aspects of the seed ecology of *Acacia karroo* in the Eastern Cape, South Africa. *African Journal of Range & Forage Science* 27: 77–87.

OBERSON, A., BÜNEMANN, E.K., FRIESEN, D.K., RAO, I.M., SMITHSON, P.C., TURNER, B.L. & FROSSARD, E. 2006. Improving phosphorus fertility in tropical soils through biological interventions, pp. 531–546. In N. Uphoff, A.S. Ball, E. Fernandes, H. Herren, O. Husson, M. Laing, C. Palm, J. Pretty, P. Sanchez, N. Sanginga & J. Thies, *Biological approaches to sustainable soil systems*. CRC Press, Boca Raton FL. http://ciat-library.ciat.cgiar.org/ Articulos_Ciat/DK3724_C037.pdf.

ODHIAMBO, J.J.O. 2004. *Biomass production and nitrogen accumulation of some dual-purpose legumes in Limpopo province, South Africa*. Australian Agronomy Conference. http://www.regional.org.au/au/asa/2004/poster/2/5/6/590_odhiambojo.htm.

© University of Pretoria

ODHIAMBO, J.J.O. 2011. Potential use of green manure legume cover crops in smallholder maize production systems in Limpopo province. *African Journal of Agricultural Research* 6: 107–112.

ODUNSI, A.A. 2003. Assessment of lablab (*Lablab purpureus*) leaf meal as a feed ingredient and yolk colouring agent in the diet of layers. *International Journal of Poultry Science* 2: 71–74.

OGWANG, B.H. 1985. Research on forage legumes in Swaziland. Potentials of forage legumes in farming systems of sub-Saharan Africa. *Proceedings of a workshop held at ILCA, Addis Ababa, Ethiopia*. http://www.fao.org/wairdocs/ilri/x5488e/x5488e00.htm#Contents.

OLOGHOBO, A. D 1989. Mineral and antinutritional contents of forage legumes consumed by goats in Nigeria. *Proceedings of a conference held at Bamenda, Cameroon 18–25 January 1989*. African Small Ruminant Research Network, International Livestock Centre for Africa, Addis Ababa, Ethiopia.

ONIM, J.F.M. & DZOWELA B.H. 1988. The distribution of *Sesbania* species in the PANESA region. In B.H. Dzowela (ed.), African forage plant genetic resources, evaluation of forage germplasm and extensive livestock production systems. *Proceedings of the third workshop held at the international conference centre Arusha, Tanzania, 27–30 April 1987*. International Livestock Centre for Africa, Addis Ababa, Ethiopia.

ONYANGO, R.M.A., MWANGI, T.K. & N'GENY, J.M. 2002. Effect of relaying green manure legumes on yields of intercropped maize in smallholder farms of Trans Nzoia district, Kenya. *Seventh Eastern and Southern Africa Regional Maize Conference 5–11 February 2002*: 330–334.

OSONUBI, O. 1985. Responses of cowpeas (*Vigna unguiculata* (L.) Walp.) to progressive soil drought. *Oecologia* 66: 554–557.

OWEN-SMITH, N. & COOPER, S.M. 1987. Palatability of woody plants to browsing ruminants in a South African savanna. *Ecology* 68: 319–331.

PANELLA, L., KAMI, J. & GEPTS, P. 1993. Vignin diversity in wild and cultivated taxa of *Vigna unguiculata* (L.) Walp. (Fabaceae). *Economic Botany* 47: 371–386.

PANG, J., TIBBETT, M., DENTON, M.D., LAMBERS, H., SIDDIQUE, K.H.M., BOLLAND, M.D.A., REVELL, C.K. & RYAN, M.H. 2010. Variation in seeding growth of 11 perennial legumes in response to phosphorus supply. *Plant and Soil* 328: 133–143.

PAUSAS, J.G. & AUSTIN, M.P. 2001. Patterns of plant species richness in relation to different environments: an appraisal. *Journal of Vegetation Science* 12: 153–166.

PELLEW, R.A. 1980. The production and consumption of acacia browse and its potential for animal protein production. In H.N. Le Houérou, *Browse in Africa: the current state of knowledge*. International Livestock Centre for Africa, Ethiopia. http://www.ilri.org/InfoServ/Webpub/fulldocs/BROWSE_IN_AFRICA/toc.htm.

© University of Pretoria

PENGELLY, B.C. & MAASS, B.L. 2001. *Lablab purpureus* (L.) Sweet – diversity, potential use and determination of a core collection of this multi-purpose tropical legume. *Genetic Resources and Crop Evaluation* 48: 261–272.

PEOPLES, M.B., HAUGGAARD-NIELSEN, H. & JENSEN, E.S. 2009. The potential environmental benefits and risks derived from legumes in rotations. In D.W. Emerich & H.B. Krishnan (eds), *Nitrogen fixation in crop production*. pp. 349–385. Madison, WI (US): American Society of Agronomy, Agronomy Monograph No. 52.

PIETROSEMOLI, S., ARENAS, F., BERMUDEZ, D., PELEY, O. & CASANOVA, A. 2005. Goat preference of five tropical legumes. *Journal of Animal Science* 83, Supplement 1: 277.

POOLEY, E. 1998. *A field guide to wild flowers of KwaZulu-Natal and the eastern region*. Natal Flora Publications Trust, Durban, South Africa.

POOLEY, E. 2003. *Mountain flowers. A field guide to the flora of the Drakensberg and Lesotho*. Flora Publications Trust, Durban, South Africa.

POWELL, A.M. 1987. Marama bean (*Tylosema esculentum*, Fabaceae) seed crop in Texas. *Economic Botany* 41: 216–220.

PRECIS, 2008. South African National Biodiversity Institute, Pretoria, South Africa.

PULE-MEUELENBERG, F. & DAKORA, F.D. 2007. Assessing the biological potential of N_2-fixing Leguminosae in Botswana for increased crop yields and commercial exploitation. *African Journal of Biotechnology* 6: 325–334.

QADIR, M. & OSTER, J.D. 2004. Crop and irrigation management strategies for saline-sodic soils and waters aimed at environmentally sustainable agriculture. *Science of the Total Environment* 323: 1–19.

REAL, D. & ALTIER, N. 2005. Breeding for disease resistance, forage and seed production in *Lotononis bainesii* Baker. *New Zealand Journal of Agricultural Research* 48: 93–100.

ROBERTSON, M.P. & BARKER, N.P. 2006. A technique for evaluating species richness maps generated from collection data. *South African Journal of Science* 102: 77–84.

RODRIGUEZ, F.M. & TECSON-MENDOZA, E.M. 1998. Alkaloids of several Philippine indigenous food legumes: determination and removal. *Philippine Journal of Crop Science* 23: 121–125.

ROOTMAN, G., MABISTELA, M. & PENGELLY, B. 2004. Selecting potential fodder bank legumes in semi-arid northern South Africa. In A. Whitbread & B.C. Pengelly (eds), Tropical legumes for sustainable farming systems in southern Africa and Australia. *Australian Centre for International Research (ACIAR) Proceedings* No. 115.

© University of Pretoria

RUIZ-VEGA, J. 1994. *Agrometeorology of grass and grasslands in tropical and sub-tropical regions*. CAgM Report 57, World Meteorological Organization, Geneva, Switzerland.

RUTHERFORD, M.C. & WESTFALL, R.H. 1986. Biomes of southern Africa – an objective categorisation. *Memoirs of the Botanical Survey of South Africa* 54: 1–98. Botanical Research Institute, Department of Agricultural and Water Supply, Pretoria, South Africa.

RUTHERFORD, M.C., MUCINA, L. & POWRIE, L.W. 2006. Biomes and bioregions of Southern Africa. In L. Mucina & M.C. Rutherford (eds), The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria, South Africa.

SAMANTA, A., DAS, G. & DAS, S.K. 2011. Roles of flavonoids in plants. *International Journal of Pharmaceutical Science and Technology* 6: 12–35.

SAMBA, R.T., SYLLA, S.N., NEYRA, M., GUEYE, M., DREYFUS, B. & NDOYE, I. 2002. Biological nitrogen fixation in *Crotalaria* species estimated using the ^{15}N isotope dilution method. *African Journal of Biotechnology* 1: 17–22.

SAMPSON, H.C. 1928. Cover crops in tropical plantations. *Bulletin of Miscellaneous Information (Royal Gardens Kew)* 5: 161–183.

SANGINGA, N. 2003. Role of biological nitrogen fixation in legume based cropping systems; a case study of West Africa farming systems. *Plant and Soil* 252: 25–39.

SARWATT, S.V. & MKIWA, F.E.J. 1988. The current status of knowledge on the feed value of *Crotalaria* species. In Pasture Network for Eastern and Southern Africa (PANESA), African forage plant genetic resources, evaluation of forage germplasm and extensive livestock production systems. *Proceedings of the Third Workshop held at the International Conference Centre, Arusha, Tanzania, 27–30 April 1987*, International Livestock Centre for Africa, Addis Ababa, Ethiopia.

SCHULTZE-KRAFT, R., PETERS, M., VIVAS, N., PARRA, F. & FRANCO, D.L.H. 2005. *Desmodium velutinum* – a high-quality shrub legume for acid soils in the tropics. In F.P. O'Mara, R.J. Wilkins, L. 't Mannetje, D.K. Lovett, P.A.M. Rogers & T.M. Boland, *Proceedings of the XX International Grassland Congress, Dublin, Ireland*: Offered papers, p. 338. Wageningen Academic Publishers, Wageningen, The Netherlands.

SCHULZE, R.E. (ed) 2007. *South African Atlas of Climatology and Agrohydrology*. Water Research Commission, Pretoria, SA, WRC Report 1489/1/06.

SHAW, T. 1976. Early crops in Africa: a review of the evidence. In J.R. Harlan, J.M.J. de Wet & A.B.L. Stemler, *Origins of African plant domestication*. Mouton Publishers, The Hague, The Netherlands.

SHEARING, D. & VAN HEERDEN, K. 1997. *Karoo*. South African Wild Flower Guide 6. Botanical Society of South Africa, Kirstenbosch, South Africa.

© University of Pretoria

SHELTON, H.M. 2001. Advances in forage legumes: shrub legumes. *Proceedings of the XIX International Grassland Congress 2001*. Grassland Ecosystems: an Outlook into the 21st Century, Sao Pedro, Brazil.

SHELTON, H.M., FRANZE, S. & PETERS, M. 2005. Adoption of tropical forage legume technology around the world: analysis of success. In D.A. McGilloway (ed.), *Grassland: a global resource*. Wageningen Academic Publishers, Wageningen, The Netherlands. pp. 149–166.

SIDDHURAJU, P., VIJAYAKUMARI, K. & JANARDHANAN, K. 1992. The biochemical composition and nutritional potential of the tribal pulse, *Alysicarpus rugosus* (Willd.) DC. *Food Chemistry* 45: 251–255.

SINCLAIR, T.R. & VADEZ, V. 2012. The future of grain legumes in cropping systems. *Crop and Pasture Science* 63: 501–512.

SINGH, B.B., AJEIGBE, H.A., TARAWALI, S.A., FERNANDEZ-RIVERA, S. & ABUBAKAR, M. 2003. Improving the production and utilization of cowpea as food and fodder. *Field Crops Research*. 84: 169–177.

SKARPE, C. 1986. Plant community structure in relation to grazing and environmental changes along a north-south transect in the western Kalahari. *Vegetation* 68: 3–18.

SMARTT, J. 1985. Evolution of grain legumes. II. Old and New World pulses of lesser economic importance. *Experimental Agriculture* 21: 1–18.

SMIT, G.N. 2003. The coppicing ability of *Acacia erubescens* and *Combretum apiculatum* subsp. *apiculatum* in response to cutting. *African Journal of Range & Forage Science* 20: 21–27.

SMITH, A. 1974. *Genetiese en sitologiese studies van die genus* Lotononis *Eckl. & Zeyh., met die oog op moontlike teling*. MSc (Agric) thesis, University of Pretoria, Pretoria, South Africa.

SMITH, A. 1977. The evaluation of tropical pasture species in the Transvaal. *Proceedings of the Grassland Society of South Africa* 12: 29–31.

SMITH, A. & RHIND, J.M.L.C. 1984. Eight decades of pasture plant improvement in South Africa. *Journal of the Grassland Society of South Africa* 1: 25–28.

SMITH, O.B. 1992. Fodder trees and shrubs in range and farming systems in tropical humid Africa. In A. Speedy & P-L. Pugliese, *Legume trees and other fodder trees as protein sources for livestock*. Food and Agriculture Organization of the United Nations, Rome, Italy.

SMITH, T., MLAMBO, V., SIKOSANA, J.L.N., MAPHOSA, V., MUELLER-HARVEY, I. & OWEN, E. 2005. *Dichrostachys cinerea* and *Acacia nilotica* fruits as dry season feed supplements for goats in a semi-arid environment: summary of a DFID funded project in Zimbabwe. *Animal Feed Science and Technology* 122: 149–157.

© University of Pretoria

SOBERÓN, J. & PETERSON, T. 2004. Biodiversity informatics: managing and applying primary biodiversity data. *Philosophical Transactions of the Royal Society, London* B 359: 689–698.

SPEEDY, A. & PUGLIESE, P-L. 1991. Legume trees and other fodder trees as protein sources for livestock. *Proceedings of the FAO Expert Consultation held at the Malaysian Agricultural Research and Development Institute (MARDI) in Kuala Lumpur, Malaysia*. FAO, Rome, Italy.

SPRENT, J.I. 2001. *Nodulation in legumes*. Royal Botanic Gardens, Kew, UK.

SPRENT, J.I. & GEHLOT, H.S. 2011. Nodulated legumes in arid and semi-arid environments: are they important? *Plant Ecology and Diversity* 12 January 2011 iFirst: 1–9.

SPRENT, J.I., ODEE, D.W. & DAKORA, F.D. 2010. African legumes: a vital but under-utilized resource. *Journal of Experimental Botany* 61: 1257–1265.

SPRIGGS, A.C. & DAKORA, F.D. 2007. Competitive ability of selected *Cyclopia* Vent. rhizobia under glasshouse and field conditions. *Soil Biology & Biochemistry* 39: 58–67.

STEENKAMP, Y., VAN WYK, A.E., SMITH, G.F. & STEYN, H. 2005. Floristic endemism in southern Africa: a numerical classification at generic level. *Biologiske Skrifter* 55: 253–271.

STEINKE, T.D. & NEL, L.O. 1990. A preliminary account of growth characteristics and seed germination of *Cassia mimosoides* L. in Dohne Sourveld. *African Journal of Range & Forage Science* 7: 166–173.

STEWART, W.D.P. 1977. Present-day nitrogen fixing plants. *Ambio* 6: 166–173.

STEYN, D.G. 1934. *The toxicology of plants in South Africa together with a consideration of poisonous foodstuffs and fungi*. William Clowes & Sons, London, UK.

STEYN, M. 1994. *SA Acacias identification guide*. Promedia Press, Pretoria, South Africa.

STODDARD, F.L., BALKO, C., ERSKINE, W., KHAN, H.R., LINK, W. & SARKER, A. 2006. Screening techniques and source of resistance to abiotic stresses in cool-season food legumes. *Euphytica* 147: 167–186.

STRIJDOM, B.W. 1998. South African studies on biological nitrogen-fixing systems and the exploitation of the nodule bacterium-legume symbiosis. *South African Journal of Science* 94: 11–23.

SUMBERG, J. 2002. The logic of fodder legumes in Africa. *Food policy* 27: 285–300.

SYLLA, S.N., NDOYE, I., GUEYE, M., BA, A.T. & DREYFUS, B. 2002. Estimates of biological nitrogen fixation by *Pterocarpus lucens* in a semi-arid natural forest park in Senegal using ^{15}N natural abundance method. *African Journal of Biotechnology* 1: 50–56.

© University of Pretoria

TAN, P-N., STEINBACH, M. & KUMAR, V. 2006. Introduction to data mining. Chapter 8, *Cluster analysis: basic concepts and algorithms*. http://www-users. cs.umn.edu/~ kumar/ dmbook/index.php.

TARAWALI, G., MANYONG, V.M., CARSKY, R.J., VISSOH, P.V., OSEI-BONSU, P. & GALIBA, M. 1999. Adoption of improved fallows in West Africa: lessons from mucuna and stylo studies. *Agroforestry Systems* 47: 93–122.

TAURO, T.P., NEZOMBA, H., MTAMBANENGWE, F. & MAPFUMO, P. 2007. Field emergence and establishment of indigenous N_2-fixing legumes for soil fertility restoration. *African Crop Science Conference Proceedings* 8: 1929–1935.

THOMAS, D. & SUMBERG, J.E. 1995. A review of the evaluation and use of tropical forage legumes in sub-Saharan Africa. *Agricultural Ecosystems and the Environment* 54: 151–163.

THRO, A.M., WIER, A.T., TORRES, K.C., FLORES, H.E. & PILLAY, M. 1987. Production of plantlets from tissue cultures of *Lotononis*, a southern African veld legume. *Journal of the Grassland Society of Southern Africa* 4: 151–153.

TJELELE, T.J. 2006. *Dry matter production, intake and nutritive value of certain* Indigofera *species*. M. Inst. Agrar thesis (Animal Production), University of Pretoria, Pretoria, South Africa.

'T MANNETJE, L. & PRITCHARD, A.J. 1968. The effects of photoperiod and night temperature on flowering and growth in some African *Trifolium* species. *New Phytologist* 67: 257–263.

TRYTSMAN, G. 2008. *Intensification to promote sustainable farming systems in rural development applying conservation agricultural principles.* Master's thesis, Sustainable Agriculture, University of the Free State, Bloemfontein, South Africa.

TRYTSMAN, M., VAN WYK, A.E. & MASEMOLA, E.L. 2011. Systematics, diversity and forage value of indigenous legumes of South Africa, Lesotho and Swaziland. *African Journal of Biotechnology* 10: 13773–13779.

VAN HEERDEN, J.M. 2007. *Development and demonstration of legume-based fodder production systems for mutton production*. http://www.overbergagri.co.za/images/stories/ LandbouOntw/Peulgewasweidings%20Verslag%202007.pdf.

VAN HEERDEN, J.M. 2012. The persistence of grazed lucerne cultivars under dryland in the Overberg. *Grassroots* 12: 12–15.

VAN ROOYEN, G. & STEYN, H. 1999. *Cederberg, Clanwilliam and Biedouw Valley*. South African Wild Flower Guide 10. Botanical Society of South Africa, Kirstenbosch, South Africa.

© University of Pretoria

VAN ROOYEN, N. 2001. *Flowering plants of the Kalahari dunes*. Ecotrust cc, Pretoria, South Africa.

VAN WYK, A.E. & MALAN S.J. 1998. *Field guide to the wild flowers of the Highveld*. Struik Publishers, Cape Town, South Africa.

VAN WYK, A.E. & SMITH, G. 2001. *Regions of floristic endemism in southern Africa. A review with emphasis on succulents*. Umdaus Press, Hatfield, Pretoria, South Africa.

VAN WYK, A.E., VAN WYK, P. & VAN WYK, B-E. 2000. *Photographic guide to trees of southern Africa*. Briza Publications, Pretoria, South Africa.

VAN WYK, P. & VAN WYK, A.E. 1997. *Field guide to the trees of southern Africa*. Struik Publishers, Cape Town, South Africa.

VANCE, C.P. 2001. Symbiotic nitrogen fixation and phosphorus acquisition. Plant nutrition in a world of declining renewable resources. *Plant Physiology* 127: 390–397.

VENTER, F. & VENTER, J-A. 1996. *Making the most of indigenous trees*. Briza Publications, Pretoria, South Africa.

VIETMEYER, N.D. 1986. Lesser known plants of potential use in agriculture and forestry. *Science, New Series* 232: 1379–1384.

WADDINGTON, S., SAKALA, W.D. & MEKURIA, M. 2004. Progress in lifting soil fertility in southern Africa. *Proceedings of the 4th International Crop Science Congress, 26 Sept–1 Oct 2004*. Brisbane, Australia.

WALKER, B.H. 1980. A review of browse and its role in livestock production in southern Africa. In H.N. Le Houérou, *Browse in Africa: the current state of knowledge*. International Symposium on Browse in Africa, International Livestock Centre for Africa, Addis Ababa, Ethiopia.

WANG, Y., MAJAK, W. & McALLISTER, T.A. 2012. Frothy bloat in ruminants: cause, occurrence and mitigation strategies. *Animal Feed Science and Technology* 172: 103–114.

WATT, J.M. & BREYER-BRANDWIJK, M.G. 1962. *The medicinal and poisonous plants of southern and eastern Africa*, edn 2. Livingstone, London.

WESSELS, D.C.J., VAN DER WAAL, C. & DE BOER, W.F. 2007. Induced chemical defences in *Colophospermum mopane* trees. *African Journal of Range & Forage Science* 24: 141–147.

WESTFALL, R.H. 1992. *Objectivity in stratification, sampling and classification of vegetation*. PhD thesis, University of Pretoria, Pretoria, South Africa.

WHITBREAD, A.M. & PENGELLY, B.C. 2004. Tropical legumes for sustainable farming systems in southern Africa and Australia. *ACIAR Proceedings* No. 115. Canberra, Australia.

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WHITBREAD, A.M., AYISI, K., MABAPA, P., ODHIAMBO, J.J.O., MALULEKE, N. & PENGELLY, B.C. 2011. Evaluating *Lablab purpureus* (L.) Sweet germplasm to identify short-season accessions suitable for crop and livestock farming systems in southern Africa. *African Journal of Range & Forage Science* 28: 21–28.

WILCOCK, T.E., VAN NIEKERK, W.A., RETHMAN, N.F.G. & COERTZE, R.J. 2004. A comparison of *Cassia sturtii*, *Tripteris sinuatum* and *Sutherlandia microphylla*: three fodder shrubs applicable to revegetation of degraded rangeland in the Northern Cape Province. *South African Journal of Animal Science* 34, Supplement 1: 114–116.

WILLIAMS, M.C. & MOLYNEUX, R.J. 1987. Occurrence, concentration and toxicity of pyrrolizidine alkaloids in *Crotalaria* seeds. *Weed Science* 35: 476–481.

WOODFIELD, D.R. & CLARK, D.A. 2009. Do forage legumes have a role in modern dairy farming systems? *Irish Journal of Agricultural and Food Research* 48: 137–147.

WOODWARD, F.I. 1987. *Climate and plant distribution*. University Press, Cambridge, UK.

YATES, R.J., HOWIESON, J.G., REEVE, W.G., NANDASENA, K.G., LAW, I.L., BRÄU, L., ARDLEY, J.K., NISTELBERGER, H.M., REAL, D. & O'HARA, G.W. 2007. *Lotononis angolensis* forms nitrogen fixing, lupinoid nodules with phylogenetically unique, fast-growing, pink-pigmented bacteria, which do not nodulate *L. bainesii* or *L. listii*. *Soil Biology & Biochemistry* 39: 1680–1688.

ZINN, A.D., WARD, D. & KIRKMAN, K. 2007. Inducible defences in *Acacia sieberiana* in response to giraffe browsing. *African Journal of Range & Forage Science* 24: 123–129.

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APPENDICES

Appendix 1. PC-Ord dendogram of Leguminochoria indigenous to SA, Lesotho and Swaziland.

Appendix 2. A comparison between XLStats and PC-Ord cluster analysis describing the Leguminochoria of South Africa, Lesotho and Swaziland.

Appendix 3. The number of legume species per QDGC for Cluster B3, B4 and B5.

Appendix 4. A summary of key species and total count recorded in clusters

Appendix 5. A summary of the occurrences of legume genera recorded in Bioregions as defined by Rutherford *et al*. (2006).

Appendix 6. A summary of the occurrence of legume genera within the mean annual rainfall, minimum and maximum temperatures zones as defined by ARC-ISCW (2006).

Appendix 7. A summary of the occurrence of legume genera within the soil pH and phosphorus levels as defined by ARC-ISCW (2006).

Appendix 8. List of indigenous legume species recorded in ecotones only (397 species).

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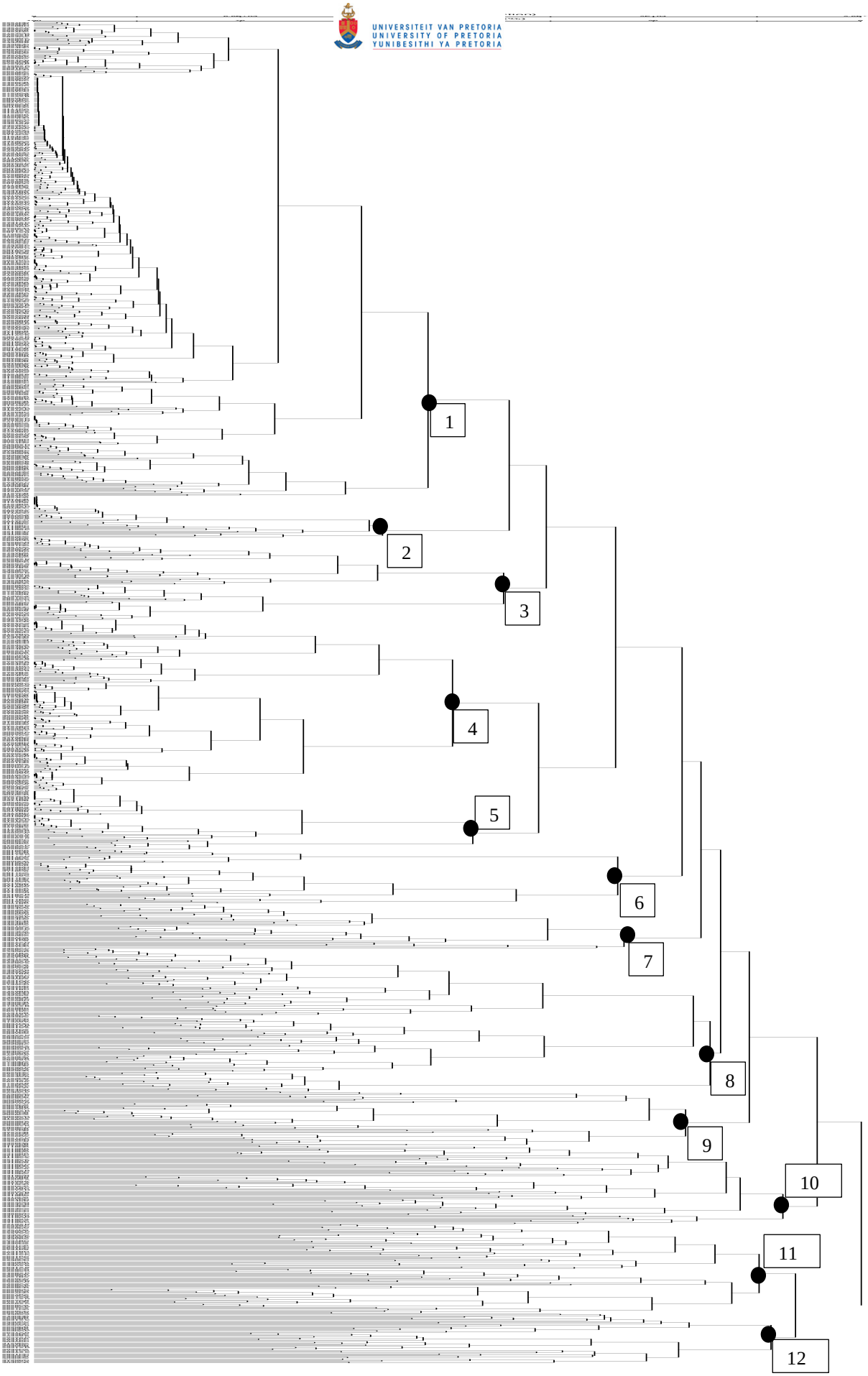

Appendix 1. PC-Ord dendogram of Leguminochoria indigenous to SA, Lesotho and Swaziland.

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Appendix 2. A comparison between XLStats and PC-Ord cluster analysis describing the Leguminochoria of South Africa, Lesotho and Swaziland.

XLStats Cluster nr.	Cluster name	PC-Ord Cluster nr.
A Sour and Mixed Veld Group (Medium to High Rainfall Areas)		
A1	Southern Afromontane	7
A2	Albany Centre	8
A3	Northern Highveld Region	7
A4	Drakensberg Alpine Centre	8
A5	Drakensberg Foothill & Coastal Region	12
B Seasonal Rainfall Group (All year, winter and summer)		
B1	Arid Western Region	5
B2	Lower Rainfall Cape Floristic Region	6
B3	Central Arid Region	3,4
B4	Generalist Group	1
B5	Summer Rainfall Region	2
B6	Northern and North-eastern Savanna Region	7
B7	Kalahari Bushveld Region	7
C	**Higher Rainfall Cape Floristic Region**	9
D	**Savanna Group**	
D1	Central Bushveld Region	10
D2	Subtropical Lowveld & Mopane Region	10
E	**Northern Mistbelt Forest**	11

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Appendix 3. The number of legume species per QDGC for Cluster B3, B4 and B5.

Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
3320CC	31	2.1	2231CB	21	1.1	2327DD	25	1.4
3219CB	29	2.0	3220AA	19	1.0	3127DB	25	1.4
3319DA	23	1.6	3026DA	17	0.9	3130AC	21	1.2
3219DC	21	1.5	2826CD	16	0.8	3227DA	21	1.2
3219CD	20	1.4	2826CC	15	0.8	2427DC	20	1.1
2925CB	19	1.3	2929DC	14	0.7	2430CD	20	1.1
3322DA	19	1.3	3127AD	13	0.7	2528BB	20	1.1
3119AA	18	1.2	3127CA	13	0.7	2832CA	19	1.1
3222BC	17	1.2	3128CC	13	0.7	2627DC	18	1.0
3320AB	17	1.2	3219BC	13	0.7	2732BB	18	1.0
3225BA	16	1.1	3228CC	13	0.7	2830DB	18	1.0
3125AC	15	1.0	2230DD	12	0.6	2831AD	18	1.0
3219AD	15	1.0	3126AD	12	0.6	2930BD	18	1.0
2723CA	14	1.0	3325AD	12	0.6	2427BB	17	0.9
3319DB	14	1.0	2822DA	11	0.6	2527DA	17	0.9
3320CA	14	1.0	2827CD	11	0.6	2530CD	17	0.9
2626CD	13	0.9	3027DC	11	0.6	2629AD	17	0.9
3026AC	13	0.9	3027DD	11	0.6	2629CD	17	0.9
3221BB	13	0.9	3225AD	11	0.6	2731DC	17	0.9
3224BC	13	0.9	3226BD	11	0.6	2832CB	17	0.9
2626DC	12	0.8	2327BB	10	0.5	2527CD	16	0.9
2922DA	12	0.8	2730CC	10	0.5	2530DC	16	0.9
3026CA	12	0.8	2817CC	10	0.5	2631DC	16	0.9
3119BD	12	0.8	2821BC	10	0.5	2729DD	16	0.9
3319BA	12	0.8	3028CD	10	0.5	2831AB	16	0.9
2620BC	11	0.8	3226BB	10	0.5	3128CA	16	0.9
2626BD	11	0.8	2427AD	9	0.5	3129CB	16	0.9
2824BB	11	0.8	2529BD	9	0.5	3228BD	16	0.9
2824CA	11	0.8	2827AD	9	0.5	2230BC	15	0.8
3025CA	11	0.8	3029CC	9	0.5	2230DB	15	0.8
3025DA	11	0.8	3124DA	9	0.5	2427BD	15	0.8
3119CD	11	0.8	3126BC	9	0.5	2629BD	15	0.8
3225AB	11	0.8	3129CC	9	0.5	2830DD	15	0.8
3321BC	11	0.8	3226DC	9	0.5	2931AA	15	0.8
2520AA	10	0.7	3326AA	9	0.5	2428AA	14	0.8
2722DC	10	0.7	2328DD	8	0.4	2428BA	14	0.8
2822CD	10	0.7	2329BC	8	0.4	2428BD	14	0.8
3119CB	10	0.7	2429AD	8	0.4	2528AA	14	0.8
2520CB	9	0.6	2430AC	8	0.4	2528AC	14	0.8
2622CD	9	0.6	2431BA	8	0.4	2530CC	14	0.8
2623DA	9	0.6	2526CB	8	0.4	2730CB	14	0.8
2726BC	9	0.6	2529CA	8	0.4	2730DD	14	0.8
2728BB	9	0.6	2723BC	8	0.4	2732BD	14	0.8

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
2822AB	9	0.6	2732AD	8	0.4	2830DC	14	0.8
2824DD	9	0.6	2823AC	8	0.4	3029DB	14	0.8
3119DA	9	0.6	2827BC	8	0.4	3228AD	14	0.8
3219BD	9	0.6	2830BA	8	0.4	3228CA	14	0.8
3325DB	9	0.6	2831BC	8	0.4	2327DC	13	0.7
2520BC	8	0.6	2917AA	8	0.4	2429AB	13	0.7
2524CD	8	0.6	3119AD	8	0.4	2526AB	13	0.7
2622CC	8	0.6	3120CA	8	0.4	2527AD	13	0.7
2625AC	8	0.6	3127CD	8	0.4	2627CB	13	0.7
2625CB	8	0.6	3128BB	8	0.4	2629DD	13	0.7
2722BB	8	0.6	3129BA	8	0.4	2729DB	13	0.7
2725AC	8	0.6	3229AA	8	0.4	2827AC	13	0.7
2725CA	8	0.6	3320AC	8	0.4	2829CA	13	0.7
2820CA	8	0.6	3320BD	8	0.4	2831DA	13	0.7
2822AA	8	0.6	3327AA	8	0.4	2931AC	13	0.7
2822DD	8	0.6	3425BA	8	0.4	3227DD	13	0.7
2823AD	8	0.6	2229BD	7	0.4	3228BC	13	0.7
2823CC	8	0.6	2330BA	7	0.4	3327BA	13	0.7
2824AA	8	0.6	2330DB	7	0.4	3422AB	13	0.7
2920AD	8	0.6	2426BB	7	0.4	2429DB	12	0.7
2922CA	8	0.6	2428CC	7	0.4	2723AB	12	0.7
2923BB	8	0.6	2429BA	7	0.4	2731BA	12	0.7
3119DB	8	0.6	2431AB	7	0.4	3128AD	12	0.7
3120CC	8	0.6	2626DD	7	0.4	3128DB	12	0.7
3222AA	8	0.6	2627BC	7	0.4	2330AC	11	0.6
3222AD	8	0.6	2817DC	7	0.4	2527BC	11	0.6
3225AA	8	0.6	2824CB	7	0.4	2731CC	11	0.6
3320AA	8	0.6	2917CA	7	0.4	2829CB	11	0.6
3320CB	8	0.6	2917CC	7	0.4	2832BA	11	0.6
3321AC	8	0.6	2918CA	7	0.4	2929DD	11	0.6
2524CA	7	0.5	2927AB	7	0.4	2525CA	10	0.6
2622AB	7	0.5	3025CB	7	0.4	2526DD	10	0.6
2624BD	7	0.5	3029CD	7	0.4	2527BD	10	0.6
2722BA	7	0.5	3119BC	7	0.4	2529DC	10	0.6
2724DA	7	0.5	3122BD	7	0.4	2627BD	10	0.6
2824BC	7	0.5	3126BB	7	0.4	2631BA	10	0.6
2918BB	7	0.5	3127CC	7	0.4	2723AA	10	0.6
2920AA	7	0.5	3218CD	7	0.4	2729DC	10	0.6
3021BB	7	0.5	3227CC	7	0.4	2730AA	10	0.6
3123CC	7	0.5	3227DC	7	0.4	2827CC	10	0.6
3219DD	7	0.5	3327AC	7	0.4	2428CA	9	0.5
3224AD	7	0.5	3327CA	7	0.4	2529BA	9	0.5
2525CD	6	0.4	2227DD	6	0.3	2531DA	9	0.5
2624CC	6	0.4	2328AD	6	0.3	2626BA	9	0.5
2721BA	6	0.4	2328CC	6	0.3	2632DC	9	0.5

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
2722BC	6	0.4	2330BB	6	0.3	2727CB	9	0.5
2725DD	6	0.4	2428DD	6	0.3	2729BB	9	0.5
2821DC	6	0.4	2520AC	6	0.3	2729CB	9	0.5
2920AB	6	0.4	2527BB	6	0.3	2827BD	9	0.5
2920AC	6	0.4	2622CA	6	0.3	2827DC	9	0.5
2921BB	6	0.4	2724DD	6	0.3	2929BD	9	0.5
3024BB	6	0.4	2816DA	6	0.3	3029CA	9	0.5
3219BA	6	0.4	2823BA	6	0.3	3228DA	9	0.5
3219BB	6	0.4	2830CB	6	0.3	2229BA	8	0.4
3220AC	6	0.4	2831BA	6	0.3	2330AD	8	0.4
3322AB	6	0.4	2917BD	6	0.3	2427DD	8	0.4
2520CC	5	0.3	2924DB	6	0.3	2429CA	8	0.4
2524DD	5	0.3	2925CD	6	0.3	2528DD	8	0.4
2723DB	5	0.3	2927CD	6	0.3	2626AC	8	0.4
2817DA	5	0.3	2929AA	6	0.3	2630CC	8	0.4
2820CC	5	0.3	3018AB	6	0.3	2630DB	8	0.4
2821DD	5	0.3	3027CC	6	0.3	2723AC	8	0.4
2920CA	5	0.3	3028BB	6	0.3	2723CB	8	0.4
2922BD	5	0.3	3028BD	6	0.3	2724BB	8	0.4
2922CC	5	0.3	3124DD	6	0.3	2727BD	8	0.4
2925BA	5	0.3	3126DA	6	0.3	2728CA	8	0.4
3022AA	5	0.3	3127DD	6	0.3	2728CD	8	0.4
3026DB	5	0.3	3129CA	6	0.3	2729CA	8	0.4
3119DD	5	0.3	3318AC	6	0.3	2730CA	8	0.4
3219AB	5	0.3	3325BB	6	0.3	2830AC	8	0.4
3222AB	5	0.3	2228DB	5	0.3	2929DA	8	0.4
3222BA	5	0.3	2327AD	5	0.3	2929DB	8	0.4
3225AC	5	0.3	2327CC	5	0.3	3027AC	8	0.4
3319BB	5	0.3	2328AB	5	0.3	3128DD	8	0.4
2523DB	4	0.3	2328CB	5	0.3	2329DA	7	0.4
2723BA	4	0.3	2328DC	5	0.3	2427DA	7	0.4
2724CD	4	0.3	2329AC	5	0.3	2429CB	7	0.4
2819CD	4	0.3	2331DD	5	0.3	2527CC	7	0.4
2819DB	4	0.3	2427AC	5	0.3	2627CC	7	0.4
2820BC	4	0.3	2427CD	5	0.3	2628DA	7	0.4
2821AD	4	0.3	2427DB	5	0.3	2629AB	7	0.4
2822BA	4	0.3	2520AB	5	0.3	2727DD	7	0.4
2822CB	4	0.3	2523CB	5	0.3	2728BC	7	0.4
2919BD	4	0.3	2525DA	5	0.3	2728DA	7	0.4
2920BB	4	0.3	2526BC	5	0.3	2729DA	7	0.4
2921AC	4	0.3	2629AC	5	0.3	2730AB	7	0.4
2921DC	4	0.3	2632AC	5	0.3	3128AB	7	0.4
2922AC	4	0.3	2722AB	5	0.3	3227BA	7	0.4
2922BA	4	0.3	2724BC	5	0.3	2327BC	6	0.3
2922DB	4	0.3	2726CD	5	0.3	2525BA	6	0.3

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
2923BA	4	0.3	2727AD	5	0.3	2824AB	6	0.3
2924CA	4	0.3	2729CD	5	0.3	2927BA	6	0.3
2926AB	4	0.3	2731AD	5	0.3	2930AB	6	0.3
3017AA	4	0.3	2732DC	5	0.3	3029DC	6	0.3
3019CD	4	0.3	2816BC	5	0.3	3128DA	6	0.3
3022CA	4	0.3	2820BA	5	0.3	3228AC	6	0.3
3119AB	4	0.3	2821AC	5	0.3	2529DA	5	0.3
3120AA	4	0.3	2828DC	5	0.3	2628BA	5	0.3
3122BC	4	0.3	2916BD	5	0.3	2631DB	5	0.3
3123AC	4	0.3	2927CA	5	0.3	2827CA	5	0.3
3123DD	4	0.3	2928AC	5	0.3	2827DB	5	0.3
3125AB	4	0.3	2928CC	5	0.3	2829BD	5	0.3
3125BA	4	0.3	3018CB	5	0.3	2926CD	5	0.3
3125DC	4	0.3	3024AD	5	0.3	2927AA	5	0.3
3217DB	4	0.3	3027DA	5	0.3	2928BA	5	0.3
3219DB	4	0.3	3028BA	5	0.3	3025BB	5	0.3
3220AB	4	0.3	3124DC	5	0.3	3029AC	5	0.3
3220DA	4	0.3	3125BD	5	0.3	3128BC	5	0.3
2328DA	3	0.2	3127AC	5	0.3	2228CB	4	0.2
2520CA	3	0.2	3127BB	5	0.3	2426CC	4	0.2
2520CD	3	0.2	3127CB	5	0.3	2626AB	4	0.2
2620AB	3	0.2	3128BD	5	0.3	2630BC	4	0.2
2620BA	3	0.2	3128CB	5	0.3	2826CB	4	0.2
2620DC	3	0.2	3219DA	5	0.3	2828BD	4	0.2
2623DC	3	0.2	3220BC	5	0.3	2829AB	4	0.2
2720BA	3	0.2	3228AB	5	0.3	2829BA	4	0.2
2726CA	3	0.2	3228BB	5	0.3	3028BC	4	0.2
2819BC	3	0.2	3320AD	5	0.3	3029BB	4	0.2
2820AB	3	0.2	3323AB	5	0.3	3029BC	4	0.2
2820DB	3	0.2	2228BD	4	0.2	3030BD	4	0.2
2821BD	3	0.2	2231CD	4	0.2	2228DD	3	0.2
2822CC	3	0.2	2327AC	4	0.2	2331DA	3	0.2
2919AC	3	0.2	2327CB	4	0.2	2426CD	3	0.2
2920DA	3	0.2	2331AA	4	0.2	2526DC	3	0.2
2922BC	3	0.2	2331BA	4	0.2	2624CD	3	0.2
2922CD	3	0.2	2420CC	4	0.2	2630DD	3	0.2
2924BB	3	0.2	2429DA	4	0.2	2829DC	3	0.2
2924CB	3	0.2	2429DC	4	0.2	2927AD	3	0.2
2924DD	3	0.2	2431BB	4	0.2	3029BA	3	0.2
2926BC	3	0.2	2520DC	4	0.2	2328AC	2	0.1
3023BA	3	0.2	2525BC	4	0.2	2426BC	2	0.1
3024CA	3	0.2	2526AD	4	0.2	2525BB	2	0.1
3025AA	3	0.2	2526BA	4	0.2	2628BB	2	0.1
3125AD	3	0.2	2627AC	4	0.2	2628DB	2	0.1
3220CB	3	0.2	2629DC	4	0.2	2629BB	2	0.1

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
3220DB	3	0.2	2721BB	4	0.2	2830AD	2	0.1
2327CA	2	0.1	2723BB	4	0.2	2924BA	2	0.1
2620AA	2	0.1	2723CD	4	0.2	2927DC	2	0.1
2621DB	2	0.1	2817DD	4	0.2	3226CA	2	0.1
2621DD	2	0.1	2823DD	4	0.2	2228CA	1	0.1
2624AA	2	0.1	2828AD	4	0.2	2523CD	1	0.1
2624DA	2	0.1	2830BD	4	0.2	2625AA	1	0.1
2720AB	2	0.1	2917CB	4	0.2	2627DA	1	0.1
2722AC	2	0.1	2919DB	4	0.2	2628BD	1	0.1
2722DB	2	0.1	2921DA	4	0.2	2629BA	1	0.1
2723CC	2	0.1	3018DB	4	0.2	2629CC	1	0.1
2822AD	2	0.1	3021AA	4	0.2	2726BB	1	0.1
2822DB	2	0.1	3021DD	4	0.2	2728DC	1	0.1
2825BD	2	0.1	3022CD	4	0.2	2823AA	1	0.1
2918DB	2	0.1	3027BC	4	0.2	2828AA	1	0.1
2923DC	2	0.1	3030BA	4	0.2	2925CC	1	0.1
2926DC	2	0.1	3119BB	4	0.2	3028DA	1	0.1
3019DC	2	0.1	3122BA	4	0.2	3124AB	1	0.1
3020BC	2	0.1	3125BC	4	0.2	3326CD	1	0.1
3020CC	2	0.1	3125CB	4	0.2			
3020DA	2	0.1	3127DC	4	0.2			
3021BA	2	0.1	3128AC	4	0.2			
3022CC	2	0.1	3128DC	4	0.2			
3023BC	2	0.1	3129AB	4	0.2			
3025AB	2	0.1	3220AD	4	0.2			
3025BA	2	0.1	3221BA	4	0.2			
3026AA	2	0.1	3223AA	4	0.2			
3026AB	2	0.1	3227AA	4	0.2			
3026BC	2	0.1	3320BB	4	0.2			
3121DC	2	0.1	3321DB	4	0.2			
3123CA	2	0.1	3322BD	4	0.2			
3222BD	2	0.1	3324BD	4	0.2			
3224AC	2	0.1	2231CC	3	0.2			
3224DC	2	0.1	2328DB	3	0.2			
3225DB	2	0.1	2329AD	3	0.2			
2621CD	1	0.1	2331AD	3	0.2			
2622CB	1	0.1	2331CD	3	0.2			
2624CA	1	0.1	2426CA	3	0.2			
2626BB	1	0.1	2426DA	3	0.2			
2721AB	1	0.1	2428DC	3	0.2			
2722BD	1	0.1	2429CC	3	0.2			
2724CA	1	0.1	2431DB	3	0.2			
2725AB	1	0.1	2520AD	3	0.2			
2725DB	1	0.1	2520DA	3	0.2			
2817AB	1	0.1	2526AC	3	0.2			

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
2820CD	1	0.1	2526BB	3	0.2			
2822CA	1	0.1	2527AB	3	0.2			
2823BB	1	0.1	2620BB	3	0.2			
2823DB	1	0.1	2620CC	3	0.2			
2824BD	1	0.1	2620CD	3	0.2			
2824CC	1	0.1	2629BC	3	0.2			
2824CD	1	0.1	2720AC	3	0.2			
2826BC	1	0.1	2720BD	3	0.2			
2826CA	1	0.1	2720CD	3	0.2			
2826DB	1	0.1	2724CC	3	0.2			
2918DD	1	0.1	2726AA	3	0.2			
2919AD	1	0.1	2727AC	3	0.2			
2919BB	1	0.1	2728BD	3	0.2			
2921CB	1	0.1	2730DA	3	0.2			
2922AB	1	0.1	2816CB	3	0.2			
2923CA	1	0.1	2818CC	3	0.2			
2926BA	1	0.1	2819CB	3	0.2			
2926BD	1	0.1	2822AC	3	0.2			
3019BD	1	0.1	2823DA	3	0.2			
3019CB	1	0.1	2823DC	3	0.2			
3019DB	1	0.1	2826AC	3	0.2			
3019DD	1	0.1	2827DA	3	0.2			
3020CD	1	0.1	2829AA	3	0.2			
3021BC	1	0.1	2830BC	3	0.2			
3022DD	1	0.1	2830CA	3	0.2			
3023AD	1	0.1	2917AB	3	0.2			
3023CB	1	0.1	2923AC	3	0.2			
3027BD	1	0.1	2924BD	3	0.2			
3120BB	1	0.1	2925AB	3	0.2			
3120BC	1	0.1	2925AC	3	0.2			
3120BD	1	0.1	2926DB	3	0.2			
3120DB	1	0.1	2927AC	3	0.2			
3121AB	1	0.1	2928BC	3	0.2			
3121BA	1	0.1	2928CA	3	0.2			
3121BC	1	0.1	2928DD	3	0.2			
3122DB	1	0.1	2929CA	3	0.2			
3123BB	1	0.1	3018AD	3	0.2			
3123DA	1	0.1	3019CA	3	0.2			
3125BB	1	0.1	3019CC	3	0.2			
3221BD	1	0.1	3021BD	3	0.2			
3222CD	1	0.1	3022AD	3	0.2			
3222DC	1	0.1	3025BC	3	0.2			
3222DD	1	0.1	3025BD	3	0.2			
3223BA	1	0.1	3026CD	3	0.2			
3223CA	1	0.1	3027CA	3	0.2			

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
3224AB	1	0.1	3028CB	3	0.2			
3225BB	1	0.1	3117BB	3	0.2			
3321BA	1	0.1	3119BA	3	0.2			
			3123BD	3	0.2			
			3126AA	3	0.2			
			3225CB	3	0.2			
			3226CB	3	0.2			
			3227AB	3	0.2			
			3228BA	3	0.2			
			3325AC	3	0.2			
			3325BA	3	0.2			
			3422BA	3	0.2			
			2228DC	2	0.1			
			2229DA	2	0.1			
			2230AD	2	0.1			
			2331AC	2	0.1			
			2427AB	2	0.1			
			2525CC	2	0.1			
			2525DD	2	0.1			
			2526CD	2	0.1			
			2526DB	2	0.1			
			2529AA	2	0.1			
			2529BC	2	0.1			
			2622DA	2	0.1			
			2623AC	2	0.1			
			2624CB	2	0.1			
			2624DB	2	0.1			
			2625AB	2	0.1			
			2625CC	2	0.1			
			2626BC	2	0.1			
			2626CA	2	0.1			
			2626CC	2	0.1			
			2627AB	2	0.1			
			2628DC	2	0.1			
			2629DA	2	0.1			
			2723DA	2	0.1			
			2725CD	2	0.1			
			2726AD	2	0.1			
			2727AA	2	0.1			
			2728AD	2	0.1			
			2729AC	2	0.1			
			2729AD	2	0.1			
			2731DB	2	0.1			
			2731DD	2	0.1			
			2818DD	2	0.1			

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
			2819BB	2	0.1			
			2819DD	2	0.1			
			2820AD	2	0.1			
			2820BB	2	0.1			
			2821CA	2	0.1			
			2821CD	2	0.1			
			2822BB	2	0.1			
			2822BD	2	0.1			
			2823CD	2	0.1			
			2825AA	2	0.1			
			2825AC	2	0.1			
			2825DD	2	0.1			
			2826DA	2	0.1			
			2826DC	2	0.1			
			2827AA	2	0.1			
			2830AB	2	0.1			
			2916BB	2	0.1			
			2917AC	2	0.1			
			2918BC	2	0.1			
			2918BD	2	0.1			
			2918CC	2	0.1			
			2918CD	2	0.1			
			2918DC	2	0.1			
			2919BA	2	0.1			
			2921AA	2	0.1			
			2922AD	2	0.1			
			2923BD	2	0.1			
			2924DC	2	0.1			
			2925BB	2	0.1			
			2926DA	2	0.1			
			2927DA	2	0.1			
			2928AA	2	0.1			
			2928BB	2	0.1			
			3020BD	2	0.1			
			3021AC	2	0.1			
			3023DA	2	0.1			
			3023DB	2	0.1			
			3024AC	2	0.1			
			3026BB	2	0.1			
			3026DC	2	0.1			
			3027AA	2	0.1			
			3027AB	2	0.1			
			3027CB	2	0.1			
			3027CD	2	0.1			
			3028DB	2	0.1			

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
			3028DC	2	0.1			
			3029AA	2	0.1			
			3118AC	2	0.1			
			3118CA	2	0.1			
			3120CD	2	0.1			
			3121AA	2	0.1			
			3121BB	2	0.1			
			3122AC	2	0.1			
			3122AD	2	0.1			
			3122BB	2	0.1			
			3124CB	2	0.1			
			3124CC	2	0.1			
			3125CA	2	0.1			
			3125DD	2	0.1			
			3126BA	2	0.1			
			3126DC	2	0.1			
			3127BC	2	0.1			
			3127BD	2	0.1			
			3128BA	2	0.1			
			3128CD	2	0.1			
			3129AC	2	0.1			
			3218CA	2	0.1			
			3220DC	2	0.1			
			3221DD	2	0.1			
			3222BB	2	0.1			
			3222DB	2	0.1			
			3224AA	2	0.1			
			3224DA	2	0.1			
			3226AB	2	0.1			
			3227BB	2	0.1			
			3321BB	2	0.1			
			3322BA	2	0.1			
			3323AA	2	0.1			
			3323BA	2	0.1			
			3324AD	2	0.1			
			3324BA	2	0.1			
			3327AB	2	0.1			
			3419DC	2	0.1			
			2228CD	1	0.1			
			2229CB	1	0.1			
			2326DB	1	0.1			
			2327CD	1	0.1			
			2328BD	1	0.1			
			2329CA	1	0.1			
			2329CC	1	0.1			

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
			2331BC	1	0.1			
			2426CB	1	0.1			
			2426DB	1	0.1			
			2426DD	1	0.1			
			2427AA	1	0.1			
			2427CA	1	0.1			
			2427CC	1	0.1			
			2522DD	1	0.1			
			2523DD	1	0.1			
			2524CC	1	0.1			
			2524DC	1	0.1			
			2525CA	1	0.1			
			2525CB	1	0.1			
			2526BD	1	0.1			
			2532AC	1	0.1			
			2532CA	1	0.1			
			2622BC	1	0.1			
			2622BD	1	0.1			
			2623BB	1	0.1			
			2623DD	1	0.1			
			2624BA	1	0.1			
			2625BB	1	0.1			
			2625DB	1	0.1			
			2625DD	1	0.1			
			2626DA	1	0.1			
			2628CD	1	0.1			
			2629AA	1	0.1			
			2631CC	1	0.1			
			2720AA	1	0.1			
			2720AD	1	0.1			
			2720CB	1	0.1			
			2720CC	1	0.1			
			2721AA	1	0.1			
			2721AD	1	0.1			
			2722CC	1	0.1			
			2722CD	1	0.1			
			2724DB	1	0.1			
			2724DC	1	0.1			
			2726AB	1	0.1			
			2726BA	1	0.1			
			2726DA	1	0.1			
			2726DD	1	0.1			
			2727AB	1	0.1			
			2727BB	1	0.1			
			2727CD	1	0.1			

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
			2727DC	1	0.1			
			2728DD	1	0.1			
			2729AA	1	0.1			
			2729AB	1	0.1			
			2817DB	1	0.1			
			2819DC	1	0.1			
			2820DA	1	0.1			
			2820DD	1	0.1			
			2821AA	1	0.1			
			2821CC	1	0.1			
			2821DA	1	0.1			
			2822BC	1	0.1			
			2822DC	1	0.1			
			2823CB	1	0.1			
			2824AC	1	0.1			
			2825AD	1	0.1			
			2825CC	1	0.1			
			2825CD	1	0.1			
			2826AA	1	0.1			
			2826AB	1	0.1			
			2826AD	1	0.1			
			2826BD	1	0.1			
			2827BA	1	0.1			
			2828AC	1	0.1			
			2828BA	1	0.1			
			2829BC	1	0.1			
			2830DA	1	0.1			
			2918AA	1	0.1			
			2918AB	1	0.1			
			2918AC	1	0.1			
			2918CB	1	0.1			
			2919BC	1	0.1			
			2919DD	1	0.1			
			2921AB	1	0.1			
			2921CC	1	0.1			
			2922BB	1	0.1			
			2923DA	1	0.1			
			2924DA	1	0.1			
			2925BC	1	0.1			
			2925BD	1	0.1			
			2925CA	1	0.1			
			2926CA	1	0.1			
			2926DD	1	0.1			
			2927DD	1	0.1			
			2928BD	1	0.1			

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
			2928DB	1	0.1			
			3018BC	1	0.1			
			3018CD	1	0.1			
			3019AC	1	0.1			
			3019DA	1	0.1			
			3020BA	1	0.1			
			3021AD	1	0.1			
			3021CD	1	0.1			
			3023AB	1	0.1			
			3023CA	1	0.1			
			3024BA	1	0.1			
			3024DC	1	0.1			
			3024DD	1	0.1			
			3025AD	1	0.1			
			3025CC	1	0.1			
			3026DD	1	0.1			
			3028AC	1	0.1			
			3028DD	1	0.1			
			3117BA	1	0.1			
			3118AA	1	0.1			
			3120AB	1	0.1			
			3121AC	1	0.1			
			3121CD	1	0.1			
			3121DD	1	0.1			
			3122CC	1	0.1			
			3122DC	1	0.1			
			3123CD	1	0.1			
			3124AA	1	0.1			
			3124BD	1	0.1			
			3124CA	1	0.1			
			3125AA	1	0.1			
			3126AC	1	0.1			
			3126BD	1	0.1			
			3126CA	1	0.1			
			3127AA	1	0.1			
			3127BA	1	0.1			
			3129AA	1	0.1			
			3129AD	1	0.1			
			3129BB	1	0.1			
			3129CD	1	0.1			
			3220BA	1	0.1			
			3220BD	1	0.1			
			3220CA	1	0.1			
			3220DD	1	0.1			
			3221AC	1	0.1			

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Cluster B3	#Spp.	%	Cluster B4	#Spp.	%	Cluster B5	#Spp	%
			3221AD	1	0.1			
			3223CC	1	0.1			
			3224BA	1	0.1			
			3224CA	1	0.1			
			3224DD	1	0.1			
			3225BC	1	0.1			
			3225CD	1	0.1			
			3226AC	1	0.1			
			3226AD	1	0.1			
			3226BA	1	0.1			
			3226CC	1	0.1			
			3227BC	1	0.1			
			3321AA	1	0.1			
			3321AB	1	0.1			
			3323BB	1	0.1			
			3323BC	1	0.1			
			3324AA	1	0.1			
			3324AB	1	0.1			
			3325AA	1	0.1			
			3326DC	1	0.1			

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Appendix 4. A summary of key species and total count recorded in clusters. Diagnostic species in bold.

Legume species	**Count**	***Legume species***	**Count**
Abrus laevigatus E.Mey.	1	*Indigofera oxytropis Benth. ex Harv.*	1
Acacia ataxacantha DC.	1	*Indigofera pungens E.Mey.*	1
Acacia burkei Benth.	2	*Indigofera rhytidocarpa Benth. ex Harv. subsp. rhytidocarpa*	1
Acacia caffra (Thunb.) Willd.	3	*Indigofera sanguinea N.E.Br.*	1
Acacia davyi N.E.Br.	1	*Indigofera sessilifolia DC.*	3
Acacia erioloba E.Mey.	2	*Indigofera tristoides N.E.Br.*	1
Acacia gerrardii Benth. subsp. gerrardii var. gerrardii	2	*Indigofera zeyheri Spreng. ex Eckl. & Zeyh.*	2
Acacia haematoxylon Willd.	1	*Leobordea divaricata Eckl. & Zeyh.*	1
Acacia hebeclada DC. subsp. hebeclada	1	*Leobordea eriantha (Benth.) B.-E van Wyk & Boatwr.*	2
Acacia karroo Hayne	**9**	*Leobordea foliosa (Bolus) B.-E van Wyk & Boatwr.*	1
Acacia nigrescens Oliv.	2	*Leobordea platycarpa (Viv.) B.-E van Wyk & Boatwr.*	2
Acacia nilotica (L.) Willd. ex Delile subsp. kraussiana (Benth.) Brenan	2	*Lessertia annularis Burch.*	1
Acacia robusta Burch. subsp. robusta	1	*Lessertia brachystachya DC.*	1
Acacia senegal (L.) Willd. var. rostrata Brenan	1	*Lessertia depressa Harv.*	1
Acacia tortilis (Forssk.) Hayne subsp. heteracantha (Burch.) Brenan	3	*Lessertia diffusa R.Br.*	1
Adenolobus garipensis (E.Mey.) Torre & Hillc.	1	*Lessertia excisa DC.*	1
Aeschynomene micrantha DC.	1	*Lessertia herbacea (L.) Druce*	1
Aeschynomene rehmannii Schinz var. leptobotrya (Harms ex Baker f.) J.B.Gillett	1	*Lessertia macrostachya DC. var. macrostachya*	1
Albizia adianthifolia (Schumach.) W.Wight var. adianthifolia	1	*Lessertia pauciflora Harv. var. pauciflora*	1
Albizia anthelmintica (A.Rich.) Brongn.	1	*Lessertia perennans (Jacq.) DC. var. perennans*	1
Alysicarpus rugosus (Willd.) DC. subsp. perennirufus J.Léonard	1	*Listia heterophylla E. Mey*	3
Argyrolobium harveyanum Oliv.	1	*Lotononis divaricata (Eckl. & Zeyh.) Benth.*	1
Argyrolobium lotoides Harv.	1	*Lotononis falcata (E.Mey.) Benth.*	2
Argyrolobium rupestre (E.Mey.) Walp. subsp. rupestre	1	*Lotononis galpinii Dummer*	1
Argyrolobium speciosum Eckl. & Zeyh.	1	*Lotononis laxa Eckl. & Zeyh.*	2
Argyrolobium tomentosum (Andrews) Druce	3	*Lotononis lotononoides (Scott-Elliot) B.-E.van Wyk*	1
Argyrolobium tuberosum Eckl. & Zeyh.	1	*Lotononis parviflora (P.J.Bergius) D.Dietr.*	1
Aspalathus acuminata Lam. subsp. acuminata	2	*Lotononis pulchella (E.Mey.) B.-E.van Wyk*	1
Aspalathus angustifolia (Lam.) R.Dahlgren subsp. angustifolia	1	*Lotononis pungens Eckl. & Zeyh.*	2
Aspalathus chortophila Eckl. & Zeyh.	1	*Lotononis rabenaviana Dinter & Harms*	1
Aspalathus ciliaris L.	1	*Lotononis sericophylla Benth.*	1
Aspalathus collina Eckl. & Zeyh. subsp. collina	1	*Lotus discolor E.Mey. subsp. discolor*	1

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Legume species	Count	*Legume species*	Count
Aspalathus divaricata Thunb. subsp. divaricata	1	*Melolobium aethiopicum (L.) Druce*	1
Aspalathus hirta E.Mey. subsp. hirta	1	*Melolobium calycinum Benth.*	1
Aspalathus hispida Thunb. subsp. hispida	1	*Melolobium candicans (E.Mey.) Eckl. & Zeyh.*	3
Aspalathus hystrix L.f.	1	*Melolobium canescens Benth.*	2
Aspalathus juniperina Thunb. subsp. juniperina	1	*Melolobium humile Eckl. & Zeyh.*	1
Aspalathus kougaensis (Garab. ex R.Dahlgren) R.Dahlgren	1	*Melolobium microphyllum (L.f.) Eckl. & Zeyh.*	3
Aspalathus nigra L.	2	*Melolobium obcordatum Harv.*	1
Aspalathus pinguis Thunb. subsp. pinguis	1	*Mundulea sericea (Willd.) A.Chev. subsp. sericea*	4
Aspalathus quinquefolia L. subsp. virgata (Thunb.) R.Dahlgren	1	*Neonotonia wightii (Wight. ex Arn.) J.A.Lackey*	1
Aspalathus rubens Thunb.	1	*Ormocarpum trichocarpum (Taub.) Engl.*	2
Aspalathus setacea Eckl. & Zeyh.	1	*Otholobium caffrum (Eckl. & Zeyh.) C.H.Stirt.*	1
Aspalathus shawii L.Bolus subsp. shawii	1	*Otholobium fruticans (L.) C.H.Stirt.*	1
Aspalathus spicata Thunb.	1	*Otholobium polyphyllum (Eckl. & Zeyh.) C.H.Stirt.*	1
Aspalathus spinescens Thunb. subsp. lepida (E.Mey.) R.Dahlgren	1	*Otholobium polystictum (Benth. ex Harv.) C.H.Stirt.*	2
Aspalathus spinosa L. subsp. spinosa	3	*Otholobium virgatum (Burm.f.) C.H.Stirt.*	1
Aspalathus steudeliana Brongn.	1	*Parkinsonia africana Sond.*	1
Aspalathus subtingens Eckl. & Zeyh.	1	*Pearsonia cajanifolia (Harv.) Polhill subsp. cajanifolia*	1
Bauhinia galpinii N.E.Br.	1	*Pearsonia sessilifolia (Harv.) Dummer subsp. marginata (Schinz) Polhill*	1
Burkea africana Hook.	1	*Pearsonia sessilifolia (Harv.) Dummer subsp. sessilifolia*	1
Calobota angustifolia (E.Mey.) Boatwr. & B.-E.van Wyk	1	*Peltophorum africanum Sond.*	3
Calobota sericea (Thunb.) Boatwr. & B.-E.van Wyk	1	*Philenoptera violacea (Klotzsch) Schrire*	2
Calobota spinescens (Harv.) Boatwr. & B.-E.van Wyk	1	*Podalyria burchellii DC.*	1
Calpurnia aurea (Aiton) Benth. subsp. aurea	1	*Podalyria myrtillifolia (Retz.) Willd.*	1
Chamaecrista biensis (Steyaert) Lock	1	*Pomaria sandersonii (Harv.) B.B.Simpson & G.P.Lewis*	1
Chamaecrista mimosoides (L.) Greene	3	*Pseudarthria hookeri Wight & Arn. var. hookeri*	1
Colophospermum mopane (J.Kirk ex Benth.) J.Kirk ex J.Léonard	1	*Psoralea affinis Eckl. & Zeyh.*	2
Crotalaria capensis Jacq.	1	*Psoralea aphylla L.*	1
Crotalaria effusa E.Mey.	1	*Psoralea arborea Sims*	1
Crotalaria excisa (Thunb.) Baker f. subsp. excisa	1	*Psoralea oligophylla Eckl. & Zeyh.*	2
Crotalaria globifera E.Mey.	2	*Pterocarpus angolensis DC.*	1
Crotalaria griquensis L.Bolus	1	*Pterocarpus rotundifolius (Sond.) Druce subsp. rotundifolius*	1
Crotalaria laburnifolia L. subsp. australis (Baker f.) Polhill	1	*Rafnia capensis (L.) Schinz subsp. capensis*	1
Crotalaria lanceolata E.Mey. subsp. lanceolata	1	*Requienia sphaerosperma DC.*	1
Crotalaria lotoides Benth.	2	*Rhynchosia adenodes Eckl. & Zeyh.*	3

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Legume species	Count	*Legume species*	Count
Crotalaria monteiroi Taub. ex Baker f. var. monteiroi	1	*Rhynchosia capensis (Burm.f.) Schinz*	1
Crotalaria obscura DC.	1	*Rhynchosia caribaea (Jacq.) DC.*	4
Crotalaria sphaerocarpa Perr. ex DC. subsp. sphaerocarpa	3	*Rhynchosia ciliata (Thunb.) Schinz*	1
Cullen tomentosum (Thunb.) J.W.Grimes	2	*Rhynchosia confusa Burtt Davy*	1
Dalbergia armata E.Mey.	1	*Rhynchosia cooperi (Harv. ex Baker f.) Burtt Davy*	1
Dalbergia obovata E.Mey.	2	*Rhynchosia minima (L.) DC. var. minima*	2
Desmodium dregeanum Benth.	1	*Rhynchosia minima (L.) DC. var. prostrata (Harv.) Meikle*	1
Desmodium repandum (Vahl) DC.	1	*Rhynchosia monophylla Schltr.*	1
Dichilus strictus E.Mey.	1	*Rhynchosia nervosa Benth. ex Harv. var. nervosa*	2
Dichrostachys cinerea (L.) Wight & Arn. subsp. africana Brenan & Brummitt var. africana	3	*Rhynchosia sordida (E.Mey.) Schinz*	1
Dipogon lignosus (L.) Verdc.	1	***Rhynchosia totta (Thunb.) DC. var. totta***	**8**
Dolichos angustifolius Eckl. & Zeyh.	1	*Schotia afra (L.) Thunb. var. afra*	1
Elephantorrhiza elephantina (Burch.) Skeels	4	*Schotia brachypetala Sond.*	2
Eriosema burkei Benth. ex Harv. var. burkei	1	*Schotia latifolia Jacq.*	1
Eriosema cordatum E.Mey.	4	***Senna italica Mill. subsp. arachoides (Burch.) Lock***	**5**
Eriosema distinctum N.E.Br.	1	*Sphenostylis angustifolia Sond.*	1
Eriosema kraussianum Meisn.	2	*Stylosanthes fruticosa (Retz.) Alston*	3
Eriosema parviflorum E.Mey. subsp. parviflorum	1	***Sutherlandia frutescens (L.) R.Br.***	**5**
Eriosema psoraleoides (Lam.) G.Don	3	*Sutherlandia humilis E.Phillips & R.A.Dyer*	1
Eriosema salignum E.Mey.	**5**	*Sutherlandia microphylla Burch. ex DC.*	1
Eriosema squarrosum (Thunb.) Walp.	1	*Tephrosia burchellii Burtt Davy*	1
Erythrina zeyheri Harv.	1	*Tephrosia capensis (Jacq.) Pers. var. capensis*	4
Faidherbia albida (Delile) A.Chev.	1	*Tephrosia elongata E.Mey. var. elongata*	1
Hypocalyptus sophoroides (P.J.Bergius) Baill.	1	*Tephrosia grandiflora (Aiton) Pers.*	1
Indigastrum argyraeum (Eckl. & Zeyh.) Schrire	3	*Tephrosia longipes Meisn. subsp. longipes var. longipes*	4
Indigastrum argyroides (E.Mey.) Schrire	1	*Tephrosia lupinifolia DC.*	1
Indigastrum costatum (Guill. & Perr.) Schrire subsp. macrum (E.Mey.) Schrire	1	*Tephrosia macropoda (E.Mey.) Harv. var. macropoda*	2
Indigofera alternans DC. var. alternans	3	*Tephrosia purpurea (L.) Pers. subsp. leptostachya (DC.) Brummitt var. leptostachya*	3
Indigofera amoena Aiton	1	*Tephrosia semiglabra Sond.*	1
Indigofera cryptantha Benth. ex Harv. var. cryptantha	1	*Trifolium africanum Ser. var. africanum*	4
Indigofera daleoides Benth. ex Harv. var. daleoides	2	*Trifolium burchellianum Ser. subsp. burchellianum*	3
Indigofera denudata L.f.	1	*Vigna unguiculata (L.) Walp. subsp. unguiculata var. unguiculata*	1
Indigofera exigua Eckl. & Zeyh.	1	***Vigna vexillata (L.) A.Rich. var. vexillata***	**5**
Indigofera filipes Benth. ex Harv.	2	*Wiborgia fusca Thunb. subsp. fusca*	1

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Legume species	**Count**	***Legume species***	**Count**
Indigofera hedyantha Eckl. & Zeyh.	3	*Wiborgia monoptera E.Mey.*	1
Indigofera heterophylla Thunb.	3	*Wiborgia obcordata (P.J.Bergius) Thunb.*	1
Indigofera heterotricha DC.	3	*Xanthocercis zambesiaca (Baker) Dumaz-le-Grand*	1
Indigofera hilaris Eckl. & Zeyh. var. hilaris	3	*Zornia capensis Pers. subsp. capensis*	4
Indigofera melanadenia Benth. ex Harv.	1	*Zornia linearis E.Mey.*	2
Indigofera meyeriana Eckl. & Zeyh.	1	*Zornia milneana Mohlenbr.*	2

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Appendix 5. A summary of the occurrences of legume genera recorded in Bioregions as defined by Rutherford *et al*. (2006).

Bioregion	***Abrus***	***Acacia***	***Adenolobus***	***Adenopodia***	***Aeschynomene***	***Afzelia***	***Albizia***	***Alistilus***	***Alysicarpus***	***Amphithalea***	***Argyrolobium***	***Aspalathus***
Albany Thicket		5		2					1		4	22
Bushmanland		18	3									1
Central Bushveld	13	391		3	10		42	12	15		34	4
Drakensberg Grassland		1									23	1
Dry Highveld Grassland		36									10	2
Eastern Fynbos-Renosterveld										8	12	132
Eastern Kalahari Bushveld		104									3	1
Ecoregion	63	735	10	27	81	12	117	3	58	229	546	2555
Gariep Desert		3	3									
Indian Ocean Coastal Belt	15	39		4	13		13		4		19	13
Kalahari Duneveld		12					2					
Knersvlakte												1
Lower Karoo		1										4
Lowveld	16	260		2	18	5	60		13		11	1
Mesic Highveld Grassland		24			18		1		5		67	2
Mopane		61			4	3	21		1			
Namaqualand Hardeveld		1									2	6
Namaqualand Sandveld		1									1	1
Northwest Fynbos										1	1	43
Rainshadow Valley Karoo		3										13
Richtersveld		1	1									
South Coast Fynbos										2	1	35
South Strandveld										1		
Southern Namib Desert												
Southwest Fynbos					1					14	8	117
Sub-Escarpment Grassland		10		1	1				7		40	6
Sub-Escarpment Savanna	1	7		1	1		1				9	
Trans-Escarpment Succulent Karoo												1
Upper Karoo		6									1	7
West Coast Renosterveld												13
West Strandveld											2	10
Grand Total	108	1719	17	40	147	20	257	15	104	255	794	2991

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Bioregion	*Astragalus*	*Baphia*	*Bauhinia*	*Bolusafra*	*Bolusanthus*	*Bolusafra*	*Bolusanthus*	*Bolusia*	*Brachystegia*	*Burkea*	*Caesalpinia*	*Calliandra*
Albany Thicket			1									
Bushmanland											1	
Central Bushveld	6		36		7		7			27		
Drakensberg Grassland												
Dry Highveld Grassland												
Eastern Fynbos-Renosterveld												
Eastern Kalahari Bushveld			5					2				
Ecoregion	14	9	78	9	16	9	16	1	1	17		5
Gariep Desert			1									1
Indian Ocean Coastal Belt		6	7								6	
Kalahari Duneveld												
Knersvlakte												
Lower Karoo												
Lowveld			13		10		10				3	
Mesic Highveld Grassland	1		2									
Mopane		1	1		1		1					
Namaqualand Hardeveld												
Namaqualand Sandveld												
Northwest Fynbos												
Rainshadow Valley Karoo												
Richtersveld												
South Coast Fynbos												
South Strandveld												
Southern Namib Desert												
Southwest Fynbos			1	3		3						
Sub-Escarpment Grassland			5									
Sub-Escarpment Savanna		1	2									
Trans-Escarpment Succulent Karoo												
Upper Karoo												
West Coast Renosterveld												
West Strandveld												
Grand Total	21	17	152	12	34	12	34	3	1	44	10	6

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Bioregion	***Calobota***	***Calpurnia***	***Canavalia***	***Cassia***	***Chamaecrista***	***Colophospermum***	***Cordyla***	***Craibia***	***Crotalaria***	***Cullen***	***Cyamopsis***	***Cyclopia***
Albany Thicket	1	5	1		5				8			
Bushmanland	9								5	9	4	
Central Bushveld		8	2	6	90	3		1	177	7		
Drakensberg Grassland					1				1			
Dry Highveld Grassland					10				20	6		
Eastern Fynbos-Renosterveld		1							4	1		13
Eastern Kalahari Bushveld	14	1			26				71	18	4	
Ecoregion	164	108	34	20	217	18	3	3	518	23	4	90
Gariep Desert	5								1	1		
Indian Ocean Coastal Belt		6	18		31		2	3	59			
Kalahari Duneveld	5								11	1	1	
Knersvlakte	2									1		
Lower Karoo												2
Lowveld		6	4	4	28	2	3	3	100			
Mesic Highveld Grassland		24			26				30			
Mopane				5	8	13			40	2	1	
Namaqualand Hardeveld	11								6			
Namaqualand Sandveld	12								2			
Northwest Fynbos	1											
Rainshadow Valley Karoo										1		
Richtersveld	2								1			
South Coast Fynbos												1
South Strandveld												
Southern Namib Desert	4								1	1		
Southwest Fynbos	1								1			9
Sub-Escarpment Grassland		14			9				11			
Sub-Escarpment Savanna		2	2		3				3			
Trans-Escarpment Succulent Karoo									1			
Upper Karoo	3									3		
West Coast Renosterveld												
West Strandveld	5											
Grand Total	239	175	61	35	454	36	8	10	1071	74	14	115

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Bioregion	***Dalbergia***	***Decorsea***	***Desmodium***	***Dialium***	***Dichilus***	***Dichrostachys***	***Dipogon***	***Dolichos***	***Dumasia***	***Elephantorrhiza***	***Entada***	***Eriosema***
Albany Thicket	1						1	7	1			6
Bushmanland												
Central Bushveld	4	5	6		11	51	1	31	2	53		73
Drakensberg Grassland					6		1	3				6
Dry Highveld Grassland					1			5		4		4
Eastern Fynbos-Renosterveld			2				7		1			1
Eastern Kalahari Bushveld					4	8	1			16		
Ecoregion	117	16	105	12	72	77	44	135	11	80	2	564
Gariep Desert												
Indian Ocean Coastal Belt	24		29	3	6	10	2	7	2	2	4	68
Kalahari Duneveld												
Knersvlakte												
Lower Karoo												
Lowveld	38	3	18	4	5	37	2	9		6	3	47
Mesic Highveld Grassland	1		5		15	3		21	1	15	1	98
Mopane	5	4	1		1	8		5		1		
Namaqualand Hardeveld										1		
Namaqualand Sandveld												
Northwest Fynbos							1					
Rainshadow Valley Karoo												
Richtersveld												
South Coast Fynbos							1					
South Strandveld												
Southern Namib Desert												
Southwest Fynbos							2	1				1
Sub-Escarpment Grassland	3		2		3			9	1	4		42
Sub-Escarpment Savanna	1					1		1				11
Trans-Escarpment Succulent Karoo												
Upper Karoo												
West Coast Renosterveld												
West Strandveld												
Grand Total	194	28	168	19	124	195	63	234	19	182	10	921

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Bioregion	***Erythrina***	***Erythrophleum***	***Euchlora***	***Ezoloba***	***Faidherbia***	***Flemingia***	***Galactia***	***Guibourtia***	***Hypocalyptus***	***Indigastrum***	***Indigofera***
Albany Thicket	7									2	18
Bushmanland										16	33
Central Bushveld	23				9	1				36	355
Drakensberg Grassland	2										18
Dry Highveld Grassland	5									6	51
Eastern Fynbos-Renosterveld									19	1	66
Eastern Kalahari Bushveld	1		1							20	157
Ecoregion	151	9	12	4	14	19	15	2	47	134	1841
Gariep Desert										3	9
Indian Ocean Coastal Belt	20	1					4			1	75
Kalahari Duneveld										3	23
Knersvlakte			1								
Lower Karoo											2
Lowveld	27	5			9	4	10			9	139
Mesic Highveld Grassland	23					2				13	185
Mopane	1				5	1	1			9	58
Namaqualand Hardeveld											12
Namaqualand Sandveld											6
Northwest Fynbos			1						1		7
Rainshadow Valley Karoo										1	2
Richtersveld											
South Coast Fynbos											5
South Strandveld											
Southern Namib Desert											
Southwest Fynbos			1						3	1	39
Sub-Escarpment Grassland	8									3	61
Sub-Escarpment Savanna	3										7
Trans-Escarpment Succulent Karoo			1	1							2
Upper Karoo											11
West Coast Renosterveld											1
West Strandveld			1	1							2
Grand Total	271	15	18	6	37	27	30	2	70	258	3185

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Bioregion	***Kotschya***	***Lablab***	***Lebeckia***	***Leobordea***	***Lessertia***	***Liparia***	***Listia***	***Lotononis***	***Lotus***	***Macrotyloma***	***Melolobium***	***Microcharis***	***Millettia***
Albany Thicket		1		1	8			7	1		3		
Bushmanland				23	16		2	20			15		
Central Bushveld	2	6		31	5		30	10	4	5	4		1
Drakensberg Grassland				3	22			27			5		
Dry Highveld Grassland				8	20		8	17			28		
Eastern Fynbos-Renosterveld		2	4	1	6	10		4					1
Eastern Kalahari Bushveld				11	27		18	19			54		
Ecoregion	12	40	91	306	477	103	62	581	35	34	295	8	16
Gariep Desert				2	1			4			3	1	
Indian Ocean Coastal Belt		3		8	4		1	2	7	8			7
Kalahari Duneveld				2	5						4		
Knersvlakte				1	1			2			1		
Lower Karoo			1	1	3						3		
Lowveld		4		13	2		2	2	1	15		6	
Mesic Highveld Grassland	1	6		88	16		12	31	14	1	27	2	
Mopane		1		2			1	3					
Namaqualand Hardeveld				16	17			9			7		
Namaqualand Sandveld					4			3			5		
Northwest Fynbos			3		3	1		2					
Rainshadow Valley Karoo			2	4	9			11			8		
Richtersveld				1	1			1					
South Coast Fynbos			1		2			4			1		
South Strandveld						1							
Southern Namib Desert								1					
Southwest Fynbos			5		8	11	1	10			1		
Sub-Escarpment Grassland		2		26	17		4	28	1	1	7		2
Sub-Escarpment Savanna		1		2				1	2	2			1
Trans-Escarpment Succulent Karoo					2			4			4		
Upper Karoo				3	15			4			18		
West Coast Renosterveld			1		1			3					
West Strandveld					4						3		
Grand Total	15	66	108	553	696	126	141	810	65	66	496	17	28

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Bioregion	***Mucuna***	***Mundulea***	***Neonotonia***	***Neorautanenia***	***Neptunia***	***Newtonia***	***Ophrestia***	***Ormocarpum***	***Otholobium***	***Otoptera***	***Parkinsonia***
Albany Thicket									3		
Bushmanland											7
Central Bushveld	2	42	12	17	1		10	13	17	13	1
Drakensberg Grassland									6		
Dry Highveld Grassland		3		1			5				
Eastern Fynbos-Renosterveld									45		
Eastern Kalahari Bushveld		3		4						6	5
Ecoregion	21	57	46	24	2	7	19	43	490	12	14
Gariep Desert											1
Indian Ocean Coastal Belt	2		8		1	1	3	1			
Kalahari Duneveld										1	1
Knersvlakte											
Lower Karoo									1		
Lowveld	7	17	10	6	1	4		28	5		
Mesic Highveld Grassland	2	6	5	3					21		
Mopane	1	5		4				2	2	1	
Namaqualand Hardeveld									7		
Namaqualand Sandveld											
Northwest Fynbos									4		
Rainshadow Valley Karoo											
Richtersveld											
South Coast Fynbos									6		
South Strandveld											
Southern Namib Desert											
Southwest Fynbos									22		
Sub-Escarpment Grassland									14		
Sub-Escarpment Savanna			1								
Trans-Escarpment Succulent Karoo											
Upper Karoo											
West Coast Renosterveld									1		
West Strandveld									4		
Grand Total	35	133	82	59	5	12	37	87	648	33	29

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Bioregion	***Pearsonia***	***Peltophorum***	***Philenoptera***	***Piliostigma***	***Podalyria***	***Polhillia***	***Pomaria***	***Pseudarthria***	***Psoralea***	***Pterocarpus***	***Pterolobium***
Albany Thicket					1				2		
Bushmanland							2				
Central Bushveld	31	39	8				8	4	6	31	6
Drakensberg Grassland							1				
Dry Highveld Grassland	2						1				
Eastern Fynbos-Renosterveld					32				60		
Eastern Kalahari Bushveld		1					7				
Ecoregion	208	50	35	15	263	14	27	45	491	66	13
Gariep Desert											
Indian Ocean Coastal Belt			1		1			3	4		
Kalahari Duneveld											
Knersvlakte											
Lower Karoo									2		
Lowveld	17	19	15	6				13	2	27	4
Mesic Highveld Grassland	47					1		5	6	2	
Mopane		2	9	2					1	4	
Namaqualand Hardeveld									2		
Namaqualand Sandveld											
Northwest Fynbos					1				2		
Rainshadow Valley Karoo									2		
Richtersveld											
South Coast Fynbos					1				6		
South Strandveld											
Southern Namib Desert											
Southwest Fynbos					18				30		
Sub-Escarpment Grassland	1		1				6	1	4		
Sub-Escarpment Savanna								1			
Trans-Escarpment Succulent Karoo					1	1					
Upper Karoo											
West Coast Renosterveld									1		
West Strandveld					2				2		
Grand Total	306	111	69	23	320	16	52	72	623	130	23

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Bioregion	***Ptycholobium***	***Rafnia***	***Requienia***	***Rhynchosia***	***Rothia***	***Schotia***	***Senna***	***Sesbania***	***Smithia***	***Sophora***	***Sphenostylis***	***Stirtonanthus***
Albany Thicket				19		15						
Bushmanland	3		4	1		3						
Central Bushveld	22		1	239		14	35	24	2	1	18	
Drakensberg Grassland				5								
Dry Highveld Grassland				22			6	5			1	
Eastern Fynbos-Renosterveld		4		31		3						
Eastern Kalahari Bushveld	7		10	57			31	8				
Ecoregion	21	232	13	935	1	139	76	47	30	1	66	7
Gariep Desert	1					1						
Indian Ocean Coastal Belt		1	1	33		3	1	4	1	4	6	
Kalahari Duneveld	2		6	1			3					
Knersvlakte												
Lower Karoo		2				1						
Lowveld	3			130		29	28	15	1	1	9	
Mesic Highveld Grassland				118		1	1	1	9		2	
Mopane	8			22	2	8	6	6			1	
Namaqualand Hardeveld				2			1					
Namaqualand Sandveld												
Northwest Fynbos		9										
Rainshadow Valley Karoo		1		1								
Richtersveld				2								
South Coast Fynbos				3		1						
South Strandveld												
Southern Namib Desert												
Southwest Fynbos		15		8								
Sub-Escarpment Grassland				58		5			1		2	
Sub-Escarpment Savanna			1	13				2			2	
Trans-Escarpment Succulent Karoo												
Upper Karoo				1		1	2					
West Coast Renosterveld												
West Strandveld				1								
Grand Total	67	264	36	1702	3	224	190	112	44	7	107	7

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Bioregion	***Stylosanthes***	***Sutherlandia***	***Tephrosia***	***Teramnus***	***Trifolium***	***Trigonella***	***Tylosema***	***Umtiza***	***Vigna***	***Virgilia***	***Wiborgia***	***Wiborgiella***
Albany Thicket			9		3			1	11			
Bushmanland		10	4								1	
Central Bushveld	32	8	195	6	5		22		46		1	
Drakensberg Grassland		8	1		13							
Dry Highveld Grassland		14	19		10	1	2		2			1
Eastern Fynbos-Renosterveld		6	14		5				3	13		1
Eastern Kalahari Bushveld		15	47			2	3		4			
Ecoregion	48	220	739	32	130	8	35	1	249	28	144	28
Gariep Desert		1	3									
Indian Ocean Coastal Belt	7		68	4	1				44			
Kalahari Duneveld			1						1			
Knersvlakte		1										
Lower Karoo												
Lowveld	12		104	9			12		32			
Mesic Highveld Grassland	2	5	89	3	48		1		33			
Mopane	5		44	1					5			
Namaqualand Hardeveld		6									10	1
Namaqualand Sandveld		4									1	1
Northwest Fynbos		1									5	
Rainshadow Valley Karoo		5	1			1					2	
Richtersveld												
South Coast Fynbos		1	2								1	1
South Strandveld												
Southern Namib Desert		1										
Southwest Fynbos		2	2							2	1	1
Sub-Escarpment Grassland			33	2	16			1	19			
Sub-Escarpment Savanna			7	1	1			1	6			
Trans-Escarpment Succulent Karoo		1									1	
Upper Karoo		8			2							
West Coast Renosterveld											1	
West Strandveld											2	
Grand Total	106	317	1382	58	234	12	75	4	455	43	170	34

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Bioregion	***Xanthocercis***	***Xerocladia***	***Xeroderris***	***Xiphotheca***	***Xylia***	***Zornia***
Albany Thicket						4
Bushmanland		6				
Central Bushveld	10	1				53
Drakensberg Grassland						
Dry Highveld Grassland						5
Eastern Fynbos-Renosterveld						
Eastern Kalahari Bushveld						12
Ecoregion	13	1	3	52	2	169
Gariep Desert						
Indian Ocean Coastal Belt						21
Kalahari Duneveld						
Knersvlakte						
Lower Karoo						
Lowveld	1					20
Mesic Highveld Grassland						33
Mopane	13		2			4
Namaqualand Hardeveld						
Namaqualand Sandveld						
Northwest Fynbos				2		
Rainshadow Valley Karoo						
Richtersveld						
South Coast Fynbos						
South Strandveld						
Southern Namib Desert						
Southwest Fynbos				4		
Sub-Escarpment Grassland						8
Sub-Escarpment Savanna						2
Trans-Escarpment Succulent Karoo						
Upper Karoo						
West Coast Renosterveld						
West Strandveld						
Grand Total	37	8	5	58	2	331

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Appendix 6. A summary of the occurrence of legume genera within the mean annual rainfall, minimum and maximum temperatures zones as defined by ARC-ISCW (2006).

Genera	**Mean Annual Rainfall (mm)**					**Mean Annual Minimum Temperature (ºC)**				**Mean Annual Maximum Temperature (ºC)**			
	<400	**200–600**	**400–800**	**600–1000**	**>800**	**<2**	**0–4**	**2–8**	**>6**	**<27**	**25–29**	**27–35**	**>33**
Abrus		3	40	17	48		6	53	49		64	44	
Acacia	231	125	871	218	274	193	183	855	488	27	560	1029	103
Adenolobus	17						2	8	7		2	4	11
Adenopodia		2	7	8	23		1	22	17		34	6	
Aeschynomene	3	8	46	33	57	5	12	83	47	15	78	53	1
Afzelia	1	5	6	4	4			6	14		5	15	
Albizia	22	38	111	36	50		3	117	137	1	77	173	6
Alistilus	1	6	8				1	14			5	10	
Alysicarpus		2	34	28	40		15	60	29	6	61	37	
Amphithalea	46	99	63	19	28	1	33	165	56	12	201	41	1
Argyrolobium	37	55	225	183	294	162	162	344	126	182	491	119	2
Aspalathus	509	1245	647	291	299	24	428	1851	688	209	2250	528	4
Astragalus			15	5	1		5	16		1	11	9	
Baphia		2		2	13			3	14		11	6	
Bauhinia	6	7	71	22	46	7	8	91	46	7	73	66	6
Bolusafra		3	3	3	3		3	6	3	1	11		
Bolusanthus		2	21	5	6			20	14		12	22	
Bolusia	1		2			3						2	1
Brachystegia		1							1			1	
Burkea	1	6	37				5	37	2		18	26	
Caesalpinia	1		4	1	4			1	9		2	7	1
Calliandra	6							1	5		3	3	
Calobota	200	31	8			28	20	72	119	5	97	105	32
Calpurnia	6	3	54	52	60	30	41	67	37	41	101	32	1
Canavalia		5	11	9	36			16	45		34	26	1

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Genera	Mean Annual Rainfall (mm)					Mean Annual Minimum Temperature (ºC)				Mean Annual Maximum Temperature (ºC)			
	<400	**200–600**	**400–800**	**600–1000**	**>800**	**<2**	**0–4**	**2–8**	**>6**	**<27**	**25–29**	**27–35**	**>33**
Cassia	6	9	15	3	2			18	17		8	27	
Chamaecrista	19	18	241	57	119	57	54	223	120	19	217	209	9
Colophospermum	10	10	15	1				17	19		5	30	1
Cordyla			4	1	3			1	7		1	7	
Craibia			7		3			1	9		2	8	
Crotalaria	165	85	470	128	223	126	86	509	350	38	412	550	71
Cullen	47	2	23	1	1	38	11	18	7	2	3	46	23
Cyamopsis	14					7	3	4				5	9
Cyclopia	21	34	16	27	17		17	81	17	15	78	22	
Dalbergia		7	64	31	92		6	76	112	5	100	89	
Decorsea	2	5	14	5	2		1	15	12		11	16	1
Desmodium	1	3	30	27	107	1	13	78	76	8	104	56	
Dialium			14	1	4			5	14		4	15	
Dichilus	12	4	53	21	34	44	34	34	12	29	53	40	2
Dichrostachys	11	16	96	26	46	6	16	95	78	3	62	124	6
Dipogon	6	17	17	12	11	3	8	38	14	10	41	11	1
Dolichos	7	18	131	28	50	49	41	101	43	38	120	76	
Dumasia			5	3	11		5	11	3	3	10	6	
Elephantorrhiza	10	11	128	18	15	42	38	86	16	8	81	85	8
Entada			1	3	6		1	1	8		3	7	
Eriosema		15	298	205	403	73	201	403	244	111	575	235	
Erythrina	2	7	115	68	79	30	36	112	93	23	156	92	
Erythrophleum			6	3	6			5	10		5	10	
Euchlora	16	1	1			2	2	10	4		6	11	1
Ezoloba	4	2					1	1	4		2	4	
Faidherbia	7	11	16	2	1			19	18		10	26	1
Flemingia		1	6	6	14		1	19	7	2	18	7	
Galactia		1	6	12	11		1	12	17		13	17	

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Genera	Mean Annual Rainfall (mm)					Mean Annual Minimum Temperature (ºC)				Mean Annual Maximum Temperature (ºC)			
	<400	**200–600**	**400–800**	**600–1000**	**>800**	**<2**	**0–4**	**2–8**	**>6**	**<27**	**25–29**	**27–35**	**>33**
Guibourtia		2							2			2	
Hypocalyptus	14	15	14	17	10		9	53	8	18	40	12	
Indigastrum	72	18	109	29	30	61	37	118	42	18	81	124	35
Indigofera	493	409	1272	417	594	477	529	1536	643	308	1537	1170	170
Kotschya		2	2	3	8		1	14		1	13	1	
Lablab	1	5	20	23	17	3	16	32	15	9	35	21	1
Lebeckia	22	49	17	14	6	1	12	61	34	4	86	18	
Leobordea	112	9	182	109	141	132	162	189	70	125	238	147	43
Lessertia	308	94	145	68	81	188	117	237	154	96	299	251	50
Liparia	21	26	33	24	22		9	86	31	11	95	20	
Listia	13	9	102	8	9	48	27	55	11	7	47	78	9
Lotononis	257	129	199	98	127	225	154	292	139	132	388	244	46
Lotus			18	12	35	5	15	25	20	11	42	12	
Macrotyloma	1	2	25	10	28	2	3	26	35	2	31	33	
Melolobium	251	54	131	25	35	238	91	105	62	61	141	235	59
Microcharis	2		2	5	8	1	1	10	5	1	8	6	2
Millettia			1	6	21			10	18	1	22	5	
Mucuna		3	11	7	14		1	23	11	2	17	16	
Mundulea	7	10	89	15	12	11	27	68	27	5	39	86	3
Neonotonia		3	35	14	30	1	7	44	30	3	42	37	
Neorautanenia	7	10	38		4	6	9	30	14	1	14	42	2
Neptunia		1	4					1	4			5	
Newtonia			7	2	3			5	7		5	7	
Ophrestia			19	1	17	6	6	11	14		21	16	
Ormocarpum	1	7	50	18	11		1	45	41		33	53	1
Otholobium	79	165	155	125	124	27	120	381	120	107	454	87	
Otoptera	8	7	18			5	6	20	2		6	23	4
Parkinsonia	27		2			5	9	15			1	8	20

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Genera	Mean Annual Rainfall (mm)					Mean Annual Minimum Temperature (ºC)				Mean Annual Maximum Temperature (ºC)			
	<400	**200–600**	**400–800**	**600–1000**	**>800**	**<2**	**0–4**	**2–8**	**>6**	**<27**	**25–29**	**27–35**	**>33**
Pearsonia			146	53	107	18	80	195	13	38	181	87	
Peltophorum	3	10	69	13	16	1	7	72	31		39	70	2
Philenoptera	12	10	23	8	16			33	36		23	46	
Piliostigma		4	9	7	3			6	17		5	18	
Podalyria	32	108	76	54	50		33	218	69	32	255	33	
Polhillia	5	9			2	2	4	7	3	1	8	7	
Pomaria	14	3	10	10	15	10	23	19		9	17	15	11
Pseudarthria		1	19	14	38	1	5	43	23	6	46	20	
Psoralea	61	169	155	109	129	3	73	406	141	85	466	71	1
Pterocarpus		11	71	23	25		2	84	44	2	53	75	
Pterolobium		4	9	5	5			17	6		14	9	
Ptycholobium	26	12	24	2	3	6	8	45	8		16	37	14
Rafnia	58	97	55	22	32		42	176	46	3	207	54	
Requienia	25	1	7		3	14	10	9	3		3	11	22
Rhynchosia	90	112	788	305	407	198	303	855	346	195	870	606	31
Rothia	1	1	1						3			3	
Schotia	25	38	96	36	29	2	9	132	81	7	117	91	9
Senna	38	25	96	19	12	46	20	74	50	1	41	124	24
Sesbania	10	7	52	15	28	11	11	44	46	1	31	73	7
Smithia			6	11	27		11	29	4	10	30	4	
Sophora			6	1				2	5			7	
Sphenostylis	1		45	19	42	3	18	57	29		64	43	
Stirtonanthus	5	2					1	6			3	4	
Stylosanthes	5	6	63	12	20		7	68	31	1	39	66	
Sutherlandia	158	64	59	14	22	95	74	112	36	34	119	144	20
Tephrosia	98	103	612	200	369	156	199	661	366	107	658	562	55
Teramnus	1		18	16	23		11	29	18	3	29	26	
Trifolium	10	11	109	43	61	107	57	51	19	80	111	43	

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Genera	Mean Annual Rainfall (mm)					Mean Annual Minimum Temperature (ºC)				Mean Annual Maximum Temperature (ºC)			
	<400	**200–600**	**400–800**	**600–1000**	**>800**	**<2**	**0–4**	**2–8**	**>6**	**<27**	**25–29**	**27–35**	**>33**
Trigonella	8		3		1	9		3		1		9	2
Tylosema	1	6	45	13	10	5	7	46	17	1	27	45	2
Umtiza			2	1	1			1	3		4		
Vigna	9	7	175	86	178	33	70	204	148	51	248	153	3
Virgilia	3	10	12	15	3		1	34	8	14	26	3	
Wiborgia	92	66	7	4	1	1	14	103	52	5	88	75	2
Wiborgiella	12	9	7	4	2	2	1	24	7	2	27	5	
Xanthocercis	8	14	13	1	1			22	15		6	29	2
Xerocladia	7		1			6	1	1				6	2
Xeroderris	1	4							5			5	
Xiphotheca	9	15	15	9	10		6	33	19	1	49	8	
Xylia		2							2			2	
Zornia	7	12	163	55	94	43	62	148	78	24	166	137	4
Grand Total	3979	3907	9843	3874	5718	3145	4043	13462	6671	2458	14122	9780	961

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Appendix 7. A summary of the occurrence of legume genera within the soil pH and phosphorus levels as defined by ARC-ISCW (2006).

Genera	**Soil Phosphorus (ppm)**			**Soil pH (H_2O)**				
	<10	**5–35**	**>20**	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
Abrus	79	29		71	29	5	2	1
Acacia	1185	486	48	639	5360000	206	210	128
Adenolobus		1	16				1	16
Adenopodia	22	18		27	11	1	1	
Aeschynomene	108	39		99	32	9	7	
Afzelia	10	10		8	4	7	1	
Albizia	141	116		85	85	45	34	8
Alistilus	7	8		6	5		4	
Alysicarpus	83	21		75	21	7	1	
Amphithalea	13	222	20	83	84	36	30	22
Argyrolobium	505	278	11	522	179	23	55	15
Aspalathus	184	2596	211	1150	911	303	438	189
Astragalus	14	7		15	6			
Baphia	12	5		14	1	2		
Bauhinia	107	43	2	81	49	8	10	4
Bolusafra	1	11		8	4			
Bolusanthus	27	7		14	12	4	3	1
Bolusia	3				2	1		
Brachystegia		1				1		
Burkea	30	14		21	16	3	4	
Caesalpinia	5	4	1	5	2	2		1
Calliandra			6					6
Calobota	21	130	88	5	26	48	59	101
Calpurnia	116	56	3	113	39	10	9	4
	41	20		32	22	6	1	

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Genera	Soil Phosphorus (ppm)			Soil pH (H_2O)				
	<10	**5–35**	**>20**	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
Cassia	13	22		8	9	8	9	1
Chamaecrista	339	115		263	125	37	24	5
Colophospermum	9	27		3	6	11	15	1
Cordyla	6	2		1	3	4		
Craibia	6	4		2	6	2		
Crotalaria	657	373	41	444	299	128	116	84
Cullen	36	20	18	5	9	12	16	32
Cyamopsis	6	3	5			5	3	6
Cyclopia	4	97	14	56	26	5	16	12
Dalbergia	132	62		112	60	19	3	
Decorsea	12	16		5	11	6	4	2
Desmodium	122	46		129	31	6	2	
Dialium	15	4		7	10	2		
Dichilus	108	12	4	90	15	8	5	6
Dichrostachys	139	56		90	64	22	16	3
Dipogon	15	46	2	33	15	6	4	5
Dolichos	150	82	2	131	55	15	26	7
Dumasia	14	5		15	4			
Elephantorrhiza	147	34	1	85	57	18	15	7
Entada	10			6	4			
Eriosema	727	194		690	194	20	15	2
Erythrina	187	83	1	165	78	16	10	2
Erythrophleum	12	3		8	5	2		
Euchlora	1	6	11	1	2	2	3	10
Ezoloba		5	1	2	1		2	1
Faidherbia	11	26		5	9	12	10	1
Flemingia	18	9		19	5	2	1	
Galactia	26	4		20	9	1		

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Genera	Soil Phosphorus (ppm)			Soil pH (H_2O)				
	<10	5–35	>20	<6.4	5.5–7.4	6.5–7.4	6.5–8.4	>7.5
Guibourtia		2				2		
Hypocalyptus		63	7	34	14	7	9	6
Indigastrum	147	75	36	93	59	30	28	48
Indigofera	1698	1309	178	1480	747	312	380	266
Kotschya	9	6		12	2		1	
Lablab	46	20		48	12	3	3	
Lebeckia	3	94	11	42	34	8	18	6
Leobordea	388	100	65	345	72	24	39	73
Lessertia	214	319	163	210	100	82	128	176
Liparia	5	109	12	71	26	5	14	10
Listia	115	23	3	68	30	14	17	12
Lotononis	280	369	161	312	127	89	124	158
Lotus	52	13		54	11			
Macrotyloma	50	16		43	18	4	1	
Melolobium	217	171	108	99	70	95	92	140
Microcharis	14	1	2	13		1	1	2
Millettia	19	9		18	10			
Mucuna	22	13		27	5	2	1	
Mundulea	99	34		68	41	12	10	2
Neonotonia	66	16		50	27	3	2	
Neorautanenia	38	21		18	17	15	7	2
Neptunia	3	2		1	3	1		
Newtonia	10	2		5	6	1		
Ophrestia	27	10		30	7			
Ormocarpum	58	29		31	35	12	8	1
Otholobium	160	446	42	346	148	50	73	31
Otoptera	15	18		4	8	10	8	3
Parkinsonia	6	10	13		1	4	2	22

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Genera	Soil Phosphorus (ppm)			Soil pH (H_2O)				
	<10	**5–35**	**>20**	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
Pearsonia	266	40		231	63	4	6	2
Peltophorum	78	33		46	40	12	10	3
Philenoptera	32	37		24	18	14	12	1
Piliostigma	12	11		11	5	7		
Podalyria	14	299	7	153	100	24	38	5
Polhillia	2	10	4	2	2	5	4	3
Pomaria	34	12	6	21	11	4	6	10
Pseudarthria	54	18		54	16		2	
Psoralea	80	506	37	303	183	34	77	26
Pterocarpus	87	43		76	32	12	9	1
Pterolobium	8	15		12	7	1	3	
Ptycholobium	31	32	4	10	19	10	17	11
Rafnia	5	221	38	100	83	13	37	31
Requienia	20	11	5	3	6	8	3	16
Rhynchosia	1155	526	21	959	452	125	126	40
Rothia		3				2	1	
Schotia	84	122	18	66	79	25	39	15
Senna	126	62	2	50	44	47	32	17
Sesbania	84	28		44	36	20	10	2
Smithia	42	2		40	4			
Sophora	4	3		4	3			
Sphenostylis	95	12		79	23	2	3	
Stirtonanthus		3	4		1	2		4
Stylosanthes	76	30		52	35	9	9	1
Sutherlandia	87	143	87	64	59	44	60	90
Tephrosia	960	407	15	760	339	130	113	40
Teramnus	46	12		40	16	1	1	
Trifolium	175	56	3	149	45	18	16	6

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Genera	Soil Phosphorus (ppm)			Soil pH (H_2O)				
	<10	**5–35**	**>20**	**<6.4**	**5.5–7.4**	**6.5–7.4**	**6.5–8.4**	**>7.5**
Trigonella	7		5	1		3	3	5
Tylosema	54	21		50	16	5	4	
Umtiza	1	3		2	2			
Vigna	347	108		304	98	31	18	4
Virgilia	1	41	1	27	8	2	5	1
Wiborgia	3	133	34	28	42	34	41	25
Wiborgiella	2	24	8	9	7	1	11	6
Xanthocercis	8	29		3	8	10	15	1
Xerocladia	1	2	5	1				7
Xeroderris		5				4	1	
Xiphotheca	2	52	4	30	15	4	5	4
Xylia		2				2		
Zornia	264	67		216	78	19	15	3
Grand Total	13744	11962	1615	13014	6813	2570	2903	2021

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Appendix 8. List of indigenous legume species recorded in ecotones only (397 species).

Acacia natalitia
Aeschynomene nodulosa var. *glabrescens*
Aeschynomene rhodesiaca
Amphithalea axillaris
Amphithalea bodkinii
Amphithalea bowiei
Amphithalea cedarbergensis
Amphithalea cuneifolia
Amphithalea cymbifolia
Amphithalea dahlgrenii
Amphithalea ericifolia subsp. *erecta*
Amphithalea esterhuyseniae
Amphithalea micrantha
Amphithalea minima
Amphithalea monticola
Amphithalea muirii
Amphithalea obtusiloba
Amphithalea perplexa
Amphithalea rostrata
Amphithalea sericea
Amphithalea speciosa
Amphithalea spinosa
Amphithalea tortilis
Amphithalea villosa
Amphithalea violacea
Amphithalea williamsonii
Argyrolobium crassifolium
Argyrolobium frutescens
Argyrolobium harmsianum
Argyrolobium lunare subsp. *lunare*
Argyrolobium nanum
Argyrolobium parviflorum
Argyrolobium polyphyllum E
Argyrolobium pumilum
Argyrolobium rarum
Argyrolobium sericosemium
Argyrolobium splendens
Argyrolobium trifoliatum
Aspalathus acanthiloba
Aspalathus acanthoclada
Aspalathus acanthophylla
Aspalathus acicularis subsp. *planifolia*
Aspalathus acidota
Aspalathus acifera
Aspalathus aculeata
Aspalathus amoena
Aspalathus arida subsp. *erecta*
Aspalathus arida subsp. *procumbens*
Aspalathus attenuata
Aspalathus aurantiaca
Aspalathus barbata
Aspalathus barbigera
Aspalathus batodes subsp. *batodes*
Aspalathus bidouwensis
Aspalathus borboniifolia
Aspalathus burchelliana
Aspalathus caespitosa
Aspalathus calcarata
Aspalathus caledonensis
Aspalathus campestris
Aspalathus candicans
Aspalathus capitata
Aspalathus chenopoda subsp. *gracilis*
Aspalathus chrysantha
Aspalathus citrina
Aspalathus cliffortiifolia
Aspalathus collina subsp. *luculenta*
Aspalathus compacta
Aspalathus comptonii
Aspalathus concava
Aspalathus condensata
Aspalathus confusa
Aspalathus congesta
Aspalathus corniculata
Aspalathus corrudifolia
Aspalathus cuspidata
Aspalathus densifolia
Aspalathus dianthopora
Aspalathus diffusa
Aspalathus digitifolia
Aspalathus elliptica
Aspalathus empetrifolia
Aspalathus ericifolia subsp. *pusilla*
Aspalathus esterhuyseniae
Aspalathus ferox
Aspalathus glabrescens
Aspalathus glossoides
Aspalathus grandiflora

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Aspalathus granulata
Aspalathus grobleri
Aspalathus humilis
Aspalathus hypnoides
Aspalathus incana
Aspalathus incompta
Aspalathus incurva
Aspalathus incurvifolia
Aspalathus inops
Aspalathus intricata subsp. *anthospermoides*
Aspalathus intricata subsp. *oxyclada*
Aspalathus isolata
Aspalathus joubertiana
Aspalathus juniperina subsp. *gracilifolia*
Aspalathus juniperina subsp. *grandis*
Aspalathus juniperina subsp. *monticola*
Aspalathus karrooensis
Aspalathus lamarckiana
Aspalathus lanata
Aspalathus lanceicarpa
Aspalathus lanceifolia
Aspalathus lebeckioides
Aspalathus lenticula
Aspalathus leptoptera
Aspalathus linearifolia
Aspalathus longifolia
Aspalathus longipes
Aspalathus lotiflora
Aspalathus macrocarpa
Aspalathus marginalis
Aspalathus marginata
Aspalathus millefolia
Aspalathus mundiana
Aspalathus myrtillifolia
Aspalathus nudiflora
Aspalathus obliqua
Aspalathus obtusata
Aspalathus odontoloba
Aspalathus oliveri
Aspalathus opaca subsp. *pappeana*
Aspalathus orbiculata
Aspalathus pachyloba subsp. *macroclada*
Aspalathus pallidiflora
Aspalathus parviflora
Aspalathus patens
Aspalathus pedicellata
Aspalathus pedunculata
Aspalathus pendula
Aspalathus perfoliata subsp. *perfoliata*
Aspalathus pigmentosa
Aspalathus pilantha
Aspalathus pinguis subsp. *australis*
Aspalathus pinguis subsp. *longissima*
Aspalathus polycephala subsp. *lanatifolia*
Aspalathus polycephala subsp. *polycephala*
Aspalathus polycephala subsp. *rigida*
Aspalathus potbergensis
Aspalathus proboscidea
Aspalathus prostrata
Aspalathus pycnantha
Aspalathus quinquefolia subsp. *compacta*
Aspalathus quinquefolia subsp. *hispida*
Aspalathus ramosissima
Aspalathus rectistyla
Aspalathus recurva
Aspalathus recurvispina
Aspalathus repens
Aspalathus rigidifolia
Aspalathus rosea
Aspalathus rostrata
Aspalathus rostripetala
Aspalathus rycroftii
Aspalathus salicifolia
Aspalathus sceptrum-aureum
Aspalathus secunda
Aspalathus securifolia
Aspalathus shawii subsp. *glabripetala*
Aspalathus shawii subsp. *longispica*
Aspalathus simii
Aspalathus singuliflora
Aspalathus smithii
Aspalathus spectabilis
Aspalathus spiculata
Aspalathus spinosa subsp. *Glauca*
Aspalathus spinosissima subsp. *spinosissima*
Aspalathus spinosissima subsp. *tenuiflora*
Aspalathus suaveolens
Aspalathus subulata
Aspalathus sulphurea
Aspalathus taylorii
Aspalathus teres subsp. *thodei*
Aspalathus theresae

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Aspalathus tridentata subsp. *fragilis*
Aspalathus tridentata subsp. *rotunda*
Aspalathus truncata
Aspalathus tuberculata
Aspalathus tulbaghensis
Aspalathus variegata
Aspalathus venosa
Aspalathus verbasciformis
Aspalathus vulpina
Aspalathus wittebergensis
Aspalathus zeyheri
Brachystegia spiciformis
Calobota elongata
Calobota pungens
Calpurnia capensis
Calpurnia floribunda
Calpurnia villosa var. *villosa*
Calpurnia woodii
Crotalaria argyraea
Crotalaria humilis
Crotalaria lebeckioides
Crotalaria pearsonii
Crotalaria spartea
Cyclopia alopecuroides
Cyclopia aurescens var. *aurescens*
Cyclopia falcata
Cyclopia glabra
Cyclopia latifolia
Cyclopia maculata
Cyclopia plicata
Cyclopia sessiliflora
Dolichos decumbens
Elephantorrhiza woodii var. *woodii*
Eriosema angustifolium
Eriosema cordatum x *E. preptum*
Eriosema cordatum x *E. squarrosum*
Eriosema fasciculatum
Eriosema kraussianum x *E. squarrosum*
Eriosema latifolium
Eriosema pauciflorum x *E. salignum*
Eriosema rufescens
Eriosema salignum x *E. kraussianum*
Eriosema squarrosum x *E. cordatum*
Eriosema streyi
Eriosema umtamvunense
Guibourtia conjugata
Indigofera candicans
Indigofera complicata
Indigofera concava
Indigofera crebra
Indigofera cuneifolia var. cuneifolia
Indigofera disticha
Indigofera elandsbergensis
Indigofera enormis
Indigofera floribunda
Indigofera gifbergensis
Indigofera grisophylla
Indigofera guthriei
Indigofera hantamensis
Indigofera hendecaphylla
Indigofera hirsuta var. hirsuta
Indigofera homblei subsp. *homblei*
Indigofera langebergensis
Indigofera lepida
Indigofera leptocarpa
Indigofera pauciflora
Indigofera platypoda
Indigofera podophylla
Indigofera quinquefolia
Indigofera racemosa
Indigofera rehmannii
Indigofera superba
Indigofera thesioides
Indigofera triquetra
Indigofera woodii var. *laxa*
Lebeckia ambigua
Lebeckia brevicarpa
Lebeckia gracilis
Leobordea esterhuyseniana
Leobordea furcata
Leobordea globulosa
Leobordea longicephala
Leobordea oligocephala
Leobordea spicata
Leobordea stipulosa
Lessertia candida
Lessertia contracta
Lessertia globosa
Lessertia kensitii
Lessertia mossii
Lessertia sneeuwbergensis
Lessertia stipulata

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Lessertia tenuifolia
Liparia bonaespei
Liparia boucheri
Liparia capitata
Liparia confusa
Liparia congesta
Liparia genistoides
Liparia myrtifolia
Liparia racemosa
Liparia rafnioides
Liparia striata
Lotononis acocksii
Lotononis acuminata
Lotononis argentea
Lotononis azurea
Lotononis azureoides
Lotononis bachmanniana
Lotononis brevicaulis
Lotononis carnea
Lotononis carnosa subsp. *condensata*
Lotononis complanata
Lotononis comptonii
Lotononis dahlgrenii
Lotononis dichiloides
Lotononis elongata
Lotononis exstipulata
Lotononis fastigiata
Lotononis filiformis
Lotononis gracilifolia
Lotononis holosericea
Lotononis involucrata subsp. *bracteata*
Lotononis involucrata subsp. *digitata*
Lotononis lamprifolia
Lotononis linearifolia
Lotononis monophylla
Lotononis nutans
Lotononis pallens
Lotononis perplexa
Lotononis pumila
Lotononis purpurescens
Lotononis rigida
Lotononis rostrata subsp. *Brachybotrys*
Lotononis rostrata subsp. *rostrata*
Lotononis sabulosa
Lotononis trichodes
Lotononis venosa
Lotononis viborgioides
Lotononis virgata
Macrotyloma axillare var. *glabrum*
Macrotyloma coddii
Melolobium lampolobum
Melolobium stipulatum
Neorautanenia brachypus
Otholobium bowieanum
Otholobium hamatum
Otholobium incanum
Otholobium macradenium
Otholobium pictum
Otholobium pungens
Otholobium rubicundum
Otholobium saxosum
Otholobium swartbergense
Otholobium thomii
Otholobium uncinatum
Podalyria amoena
Podalyria hamata
Podalyria microphylla
Podalyria oleaefolia
Podalyria orbicularis
Podalyria pearsonii
Podalyria pulcherrima
Podalyria racemulosa
Podalyria reticulata
Polhillia brevicalyx
Polhillia canescens
Polhillia obsoleta
Polhillia pallens
Psoralea aphylla x *pinnata*
Psoralea glaucina
Psoralea gueinzii
Psoralea odoratissima
Psoralea peratica
Pterocarpus lucens subsp. *antunesii*
Rafnia alata
Rafnia angulata subsp. *angulata*
Rafnia angulata subsp. *Ericifolia*
Rafnia angulata subsp. *thunbergii*
Rafnia capensis subsp. *calycina*
Rafnia capensis subsp. *elsieae*
Rafnia crispa
Rafnia globosa
Rafnia inaequalis

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Rafnia ovata	*Tephrosia polystachya* var. *longidens*
Rafnia rostrata subsp. *pluriflora*	*Tephrosia vogelii*
Rafnia rostrata subsp. *rostrata*	*Vigna kokii*
Rafnia schlechteriana	*Vigna mudenia*
Rafnia vlokii	*Vigna unguiculata* subsp. *tenuis* var. *ovata*
Rhynchosia angustifolia	*Wiborgia tenuifolia*
Rhynchosia arida	*Wiborgiella bowieana*
Rhynchosia peglerae	*Wiborgiella fasciculata*
Rhynchosia rogersii	*Wiborgiella humilis*
Rhynchosia vendae	*Wiborgiella inflata*
Schotia latifolia x *S. afra form A*	*Xiphotheca canescens*
Sesbania macowaniana	*Xiphotheca cordifolia*
Stirtonanthus chrysanthus	*Xiphotheca guthriei*
Stirtonanthus insignis	*Xiphotheca lanceolata*
Stirtonanthus taylorianus	*Xiphotheca phylicoides*
Tephrosia inandensis	*Xylia torreana*
Wiborgia leptoptera subsp. *cedarbergensis*	

Brachystegia, *Guibourtia*, *Stirtonanthus* and *Xylia* are genera with a 100% occurrence in ecotones.

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