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A PHYTOSOCIOLOGICAL SYNTHESIS OF *ACACIA TORTILIS*
COMMUNITIES IN THE NORTH-WESTERN SAVANNA OF SOUTH
AFRICA

MSc (Botany)

UP

ABSTRACT

A PHYTOSOCIOLOGICAL SYNTHESIS OF *ACACIA TORTILIS* COMMUNITIES IN THE NORTH-WESTERN SAVANNA OF SOUTH AFRICA

by

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Data from 29 vegetation studies in the Central Savanna of South Africa were combined into a synoptic data set. Reclassification of this data set resulted in the identification of four major vegetation types, representing phytosociological classes: the *Commiphoro mollis-Colophospermetea mopani*, the *Panico maximi-Acacieta tortilis*, the *Terminalio sericeae-Combretetea apiculati* and the *Englerophyto magalismontani-Acacieta caffrae*.

The results indicate that the Mountain Bushveld is a separate, very diverse vegetation type with many different communities. It may be interpreted that the Arid Sweet Bushveld could be divided into two distinct vegetation types. The species composition of the *Panico maximi-Acacieta tortilis* suggests an *Acacia* dominated vegetation on clay soils, as well as on sandy deposits, overlying the clay.

A hierarchical syntaxonomy was derived for the *Panico maximi-Acacieta tortilis*. Two subclasses, four orders, 10 alliances and 36 associations were identified of which two

subclasses, three orders, eight alliances and 15 associations were newly described according to the code for syntaxonomic nomenclature.

UITTREKSEL

‘n FITOSOSIOLOGIESE SINTESE VAN DIE *ACACIA TORTILIS*- GEMEENSKAPPE VAN DIE NOORD-WESTELIKE SAVANNA VAN SUID- AFRIKA

deur

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Data van 29 plantegroei-studies in die Sentrale Savanna van Suid-Afrika is gekombineer in ‘n sinoptiese datastel. Nadat die datastel geherklassifiseer is, is vier hoof plantegroei tipes wat fitososiologiese klasse verteenwoordig, geïdentifiseer naamlik die *Commiphoro mollis-Colophospermetea mopani*, die *Panico maximi-Acacieta tortilis*, die *Terminalio sericeae-Combretetea apiculati* en die *Englerophyto magalismontani-Acacieta caffrae*.

Na aanleiding van die resultate wil dit voorkom of die Bergbosveld ‘n unieke, diverse plantegroei tipe is, wat uit verskeie gemeenskappe bestaan. Die Ariede Soet Bosveld kan moontlik in twee verskillende plantegroei tipes verdeel word. Die *Panico maximi-Acacieta tortilis* word deur *Acacia*-spesies gedomineer en word aangetref op kleigronde, sowel as sanderige neerslae.

‘n Sintaksonomiese hierargie is saamgestel vir die *Panico maximi-Acacieta tortilis* en

twee subklasse, vier ordes, 10 alliansies en 36 assosiasies is geïdentifiseer. Hiervan is twee subklasse, drie ordes, agt alliansies en 15 assosiasies nuut beskryf volgens die kode vir sintaksonomiese nomenklatuur.

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IN THE NORTH-WESTERN SAVANNA OF SOUTH AFRICA**

by

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Submitted in partial fulfilment of the requirements for the degree

MAGISTER SCIENTIAE (BOTANY)

in the Department of Botany
Faculty of Biological and Agricultural Sciences
University of Pretoria
Pretoria

May 1998

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ACKNOWLEDGEMENTS

I would like to thank the following persons and institutions for their assistance:

Prof. George Bredekamp for his enthusiasm and motivation and for always having time to help a student.

Ms. Miranda Deutschländer for her insight and comments and especially for her help with the synoptic tables.

Dr. Ladislav Mucina for his input and valuable comments.

Willem de Frey for his help with GIS.

The Foundation for Research and Development and the University of Pretoria for financial support.

My parents for their love and support for the past 26 years.

My friends, especially Wouter, for their interest and motivation.

Tim for the encouragement to start the study.

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CHAPTER 1

INTRODUCTION

In the past decade conservation management has moved in the direction of environmental management - the influence of human activities as they affect the quality of mankind's physical environment, especially air, water and terrestrial features (Sewell 1975). Emphasis is not on strictly policed, protected areas, primarily for large mammals anymore, but on sustainable resource use, maintenance of ecological processes and genetic diversity (IUCN 1980 in Cunningham 1989).

Savannas can be described as a tropical vegetation type co-dominated by woody plants and grasses. It is the dominant vegetation of Africa, occupying 54% of southern Africa (Scholes 1997). The region is species rich and 43% of the species are endemic to the subcontinent. It is also home to many large mammal species (Cowling & Olivier 1992). According to Rebelo (1997) 9.96% of the Savanna Biome is conserved in South Africa.

Many informal settlements exist in the Central Savanna. These people rely on the savanna to supply grazing, fuelwood and timber. The area is also a main location of livestock and ecotourism industries as well as biological diversity (Scholes 1997), thus making a considerable contribution to the formal economy of the area. Fast growing populations will make increasing demands on the natural resources and will encourage expansion of agricultural use into marginal and often sensitive areas. The manner in which natural resources are used, will have direct relation on their future productive capacity (Aucamp *et al.* 1992). It is thus essential to have the necessary ecological knowledge of an area to assist in planning, development, management and conservation to prevent future environmental disaster.

Existing ecological knowledge of the vegetation types of the Central Savanna of South Africa is scanty. Present knowledge of the broader vegetation of this area is based on the descriptions by Acocks (1988), but he assessed natural resources from a purely

agricultural perspective. Since Acocks' classification in 1953, considerable new information has been collected, that needs to be incorporated in a synthesis of the region's vegetation. A new vegetation map was published in 1996 by Low & Rebelo, but this is not based on a phytosociological analysis of all the existing data, but rather on the present state of knowledge of the co-workers.

Various vegetation studies have been done in the study area (e.g. Coetzee 1975; Van Rooyen 1983; Pauw 1988; Brown *et al.* 1996). These studies were however confined to farms or nature reserves and are of local significance only. The first step to identify broader vegetation types, was taken by Van der Meulen (1979), who published a regional syntaxonomical and synecological study on the vegetation of a part of the North West Province (former Western Transvaal).

The aim of this study is to compile a phytosociological and synecological synthesis of the vegetation of the Central Savanna, including all phytosociological data collected by various researchers in the study area. This is done in order to identify the major zonal vegetation types that possibly represent phytosociological classes. A hierarchical syntaxonomy will be constructed for one of the classes and the plant communities of this class will be described. Formal syntaxon names will be fixed where desirable.

Only one vegetation class is described, since the inclusion of the other three classes has gone beyond the requirements for this dissertation. Chapter 4 was submitted as an article to the *Journal of Vegetation Science*, therefore style irregularities and repetition may occur. Tables and figures are numbered consecutively, except for Chapter 4, which retain the original numbering of the article.

CHAPTER 2

STUDY AREA

2.1. Location and topography

The Central Savanna of South Africa can be defined as the bushveld of the North West Province (north of the Magaliesberg) and the Northern Province. The area is situated between the Kalahari in the west (the Botswana border) and the Lowveld, east of the Escarpment (Figure 1). The southern border runs from Pretoria in a westerly direction to the Botswana border and includes the towns of Rustenburg and Zeerust. The western and northern borders are formed by the Botswana and Zimbabwe borders respectively whereas the eastern border runs from Messina in a southerly direction along the escarpment towards Marble Hall and back to Pretoria.

The central part of this area lies within the Transvaal Plateau Basin. This major physiographic region comprises the Bushveld Basin, surrounded by ridges and valleys called the Bankenveld, and to the north the Waterberg, Soutpansberg and Pietersburg plateaux (Cole 1986).

2.2. Vegetation

Seven of Acocks' Veld Types are present in the study area (Figure 2):

- Springbok Flats Turf Thornveld (Veld Type 12)
- Other Turf Thornveld (Veld Type 13)
- Arid Sweet Bushveld (Veld Type 14)
- Mopani Veld (Veld Type 15)
- Mixed Bushveld (Veld Type 18)
- Sourish Mixed Bushveld (Veld Type 19)
- Sour Bushveld (Veld Type 20)

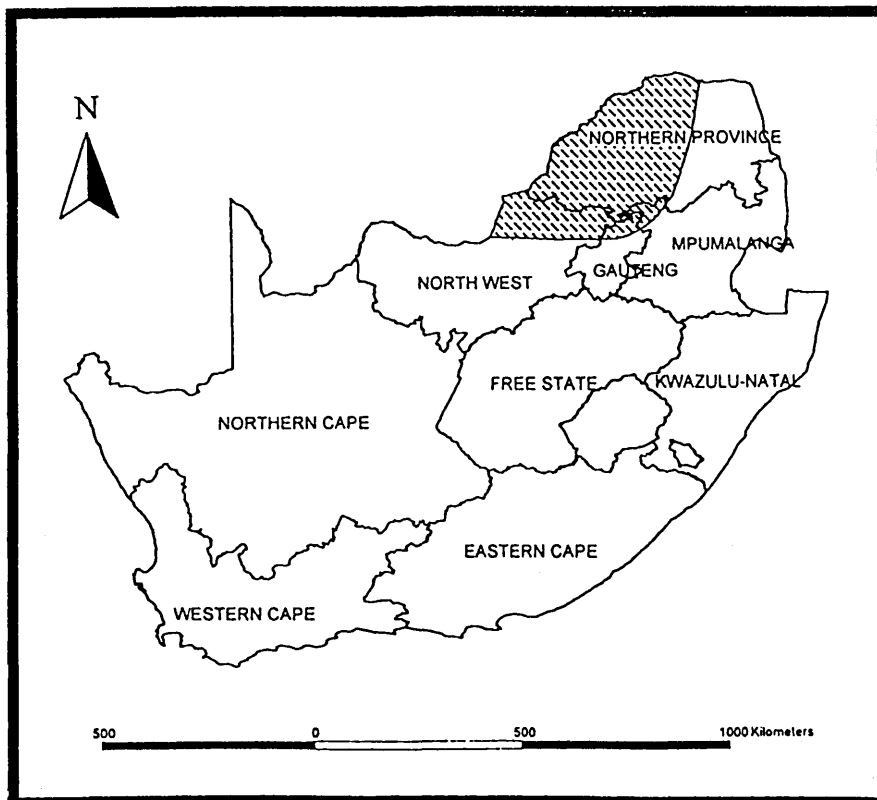
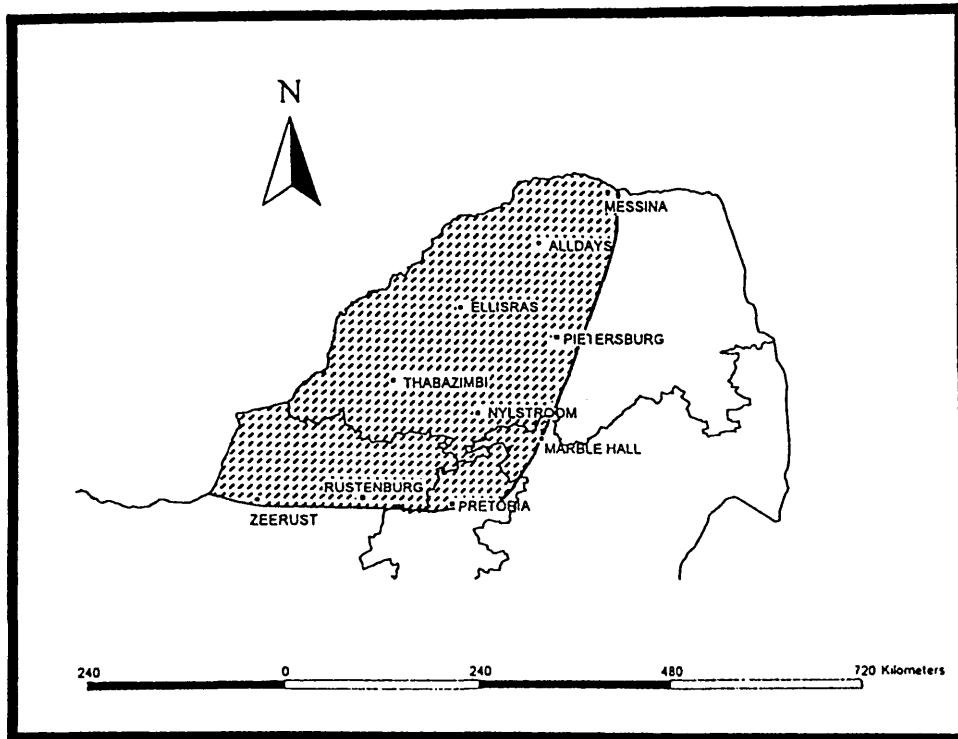


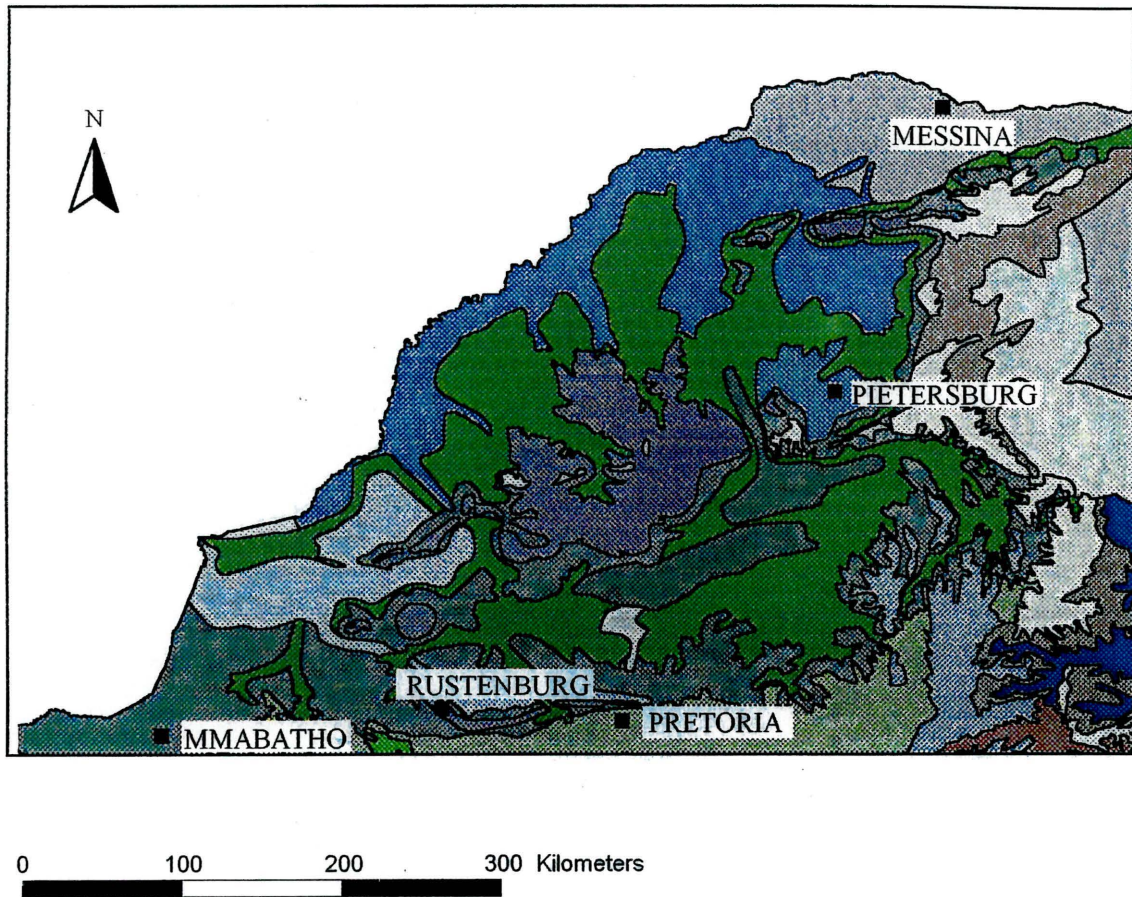
Figure 1. Location of the study area.

22° S
25° E

22° S
31° E

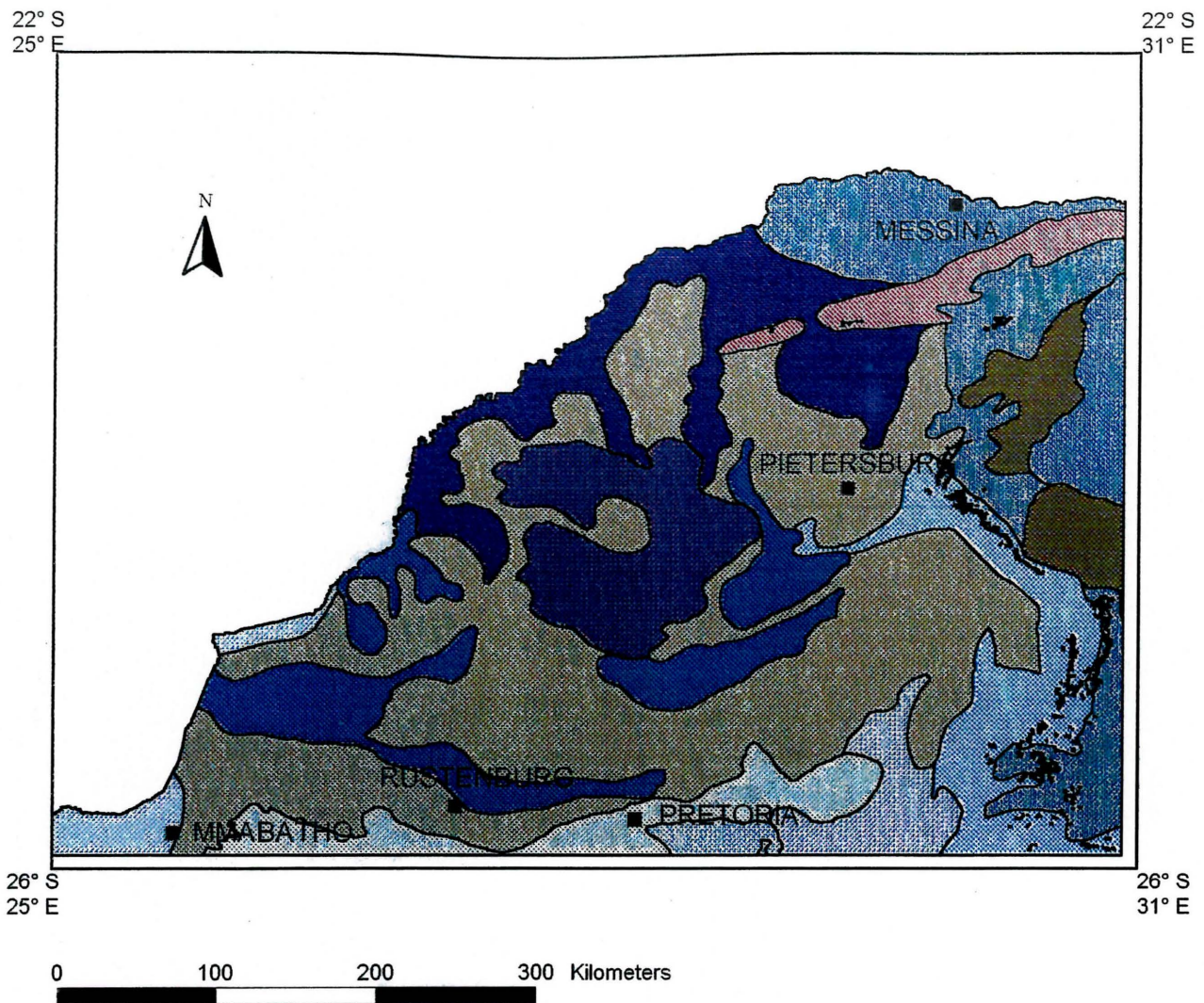
26° S
25° E

26° S
31° E



- Towns
- Acocks Veld Types
- ARID LOWVELD
- ARID SWEET BUSHVELD
- BANKENVELD
- CYBBOGON-THEMEDA VELD(SANDY)
- DRY CYBBOGON-THEMEDA VELD
- KALAHARI THORNVELD AND SHRUB BUSHVELD
- LOWVELD
- LOWVELD SOUR BUSHVELD
- MIXED BUSHVELD
- MOPANI VELD
- NORTH-EASTERN MOUNTAIN SOURVELD
- NORTH-EASTERN SANDY HIGHVELD
- OTHER TURF THORNVELD
- PIET RETIEF SOURVELD
- PIETERSBURG PLATEAU GRASSVELD
- SOUR BUSHVELD
- SOURISH MIXED BUSHVELD
- SPRINGBOK FLATS TURF THORNVELD

Figure 2. Acocks' Veld Types present in the study area (ENPAT 1994).



- Towns
- Vegetation Types of Low & Rebelo
- ▨ Afromontane Forest
- ▨ Mopane Bushveld
- ▨ Soutpansberg Arid Mountain bushveld
- ▨ Waterberg Moist Mountain Bushveld
- ▨ Clay Thorn Bushveld
- ▨ Sweet Bushveld
- ▨ Mixed Bushveld
- ▨ Mixed Lowveld Bushveld
- ▨ Sour Lowveld Bushveld
- ▨ Kalahari Plains Thorn Bushveld
- ▨ Rocky Highveld Grassland
- ▨ Dry Sandy Highveld Grassland
- ▨ Moist Sandy Highveld Grassland
- ▨ Moist Cool Highveld Grassland
- ▨ North-eastern Mountain Grassland

Figure 3. Vegetation Types of Low & Rebelo present in the study area (ENPAT 1994).

Low & Rebelo (1996) described six vegetation types in this area namely Mopane bushveld, Soutpansberg Arid Mountain Bushveld, Waterberg Moist Mountain Bushveld, Clay Thorn Bushveld, Sweet Bushveld and Mixed Bushveld (Figure 3).

2.3. Climate

According to Schultze & McGee (1978) the study area falls within the Cwa climatic zone. It is characterised by warm, temperate climates with temperatures during the coldest month ranging from -3°C (minimum) to 18°C (maximum). The dry season is during the winter months. Average temperatures above 22°C can be expected during the warmest month.

2.3.1. Rainfall

The study area lies within the summer rainfall region. Mean annual precipitation ranges from 305-674 mm (Weather Bureau 1997a). Climatic diagrams (Larcher 1995) for six weather stations in the study area are shown in Figure 4. From this it is clear that precipitation increases from north (Messina 339mm/annum) to south (Pretoria 674mm/annum). In the southern African region mean annual precipitation decreases uniformly westwards from the escarpment across the plateau (Schultze & McGee 1978). However, in the study area, precipitation shows little variation from east to west as illustrated in Figure 5.

2.3.2. Temperature

Mean annual temperatures correlate with rainfall, with the highest rainfall occurring during the warmest months (December and January) and the lowest rainfall during the coldest months (June and July). Mean annual maximum temperatures range from $25-30^{\circ}\text{C}$ and mean annual minimum temperatures from $10-15^{\circ}\text{C}$ (Figure 4).

- Key:
- a -weather station
 - b -altitude(m)
 - c -period with temp.data (years)
 - d -period with rainfall data (years)
 - e -mean annual temp.
 - f -mean annual rainfall
 - g -max. temperature
 - h -mean daily max. of warmest month
 - i -mean daily temp. fluctuation
 - j -mean daily min. of coldest month
 - k -absolute min. temperature
 - l -wet period
 - m -mesic period
 - n -dry period
 - o -mean monthly rainfall
 - p -mean monthly temperature

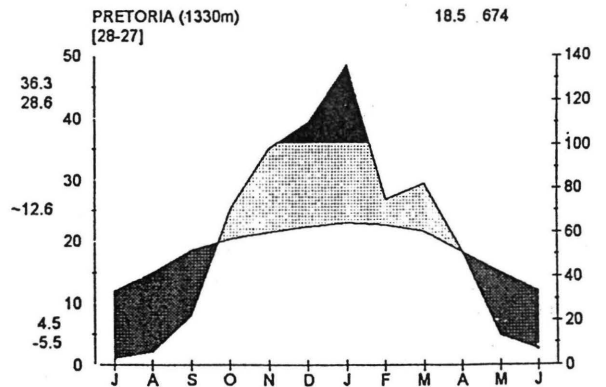
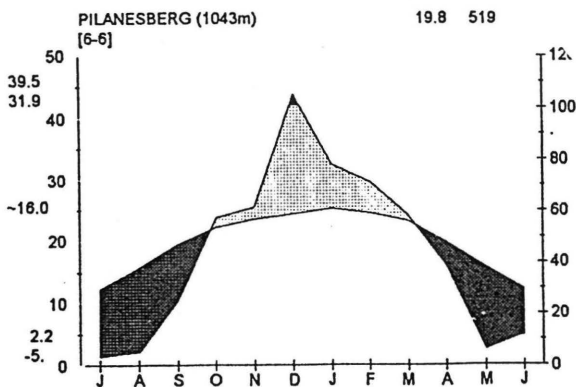
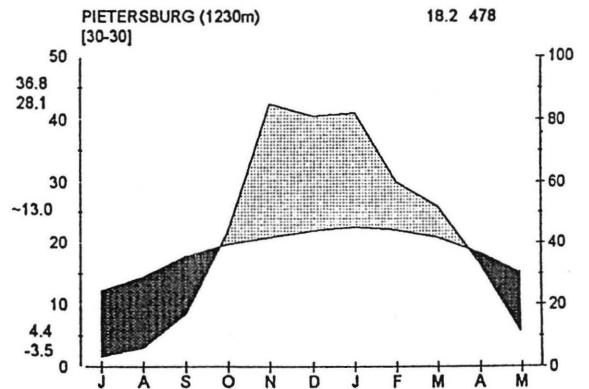
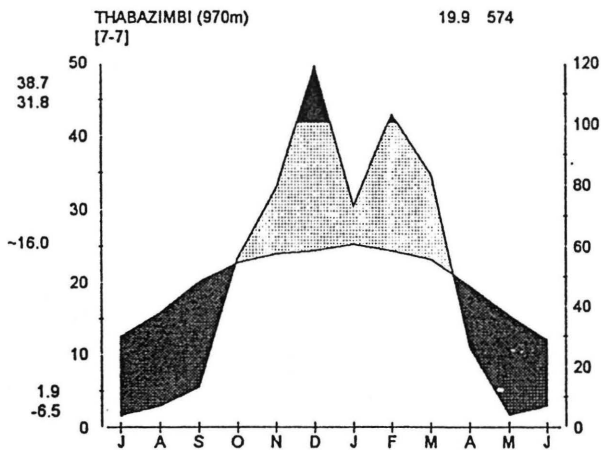
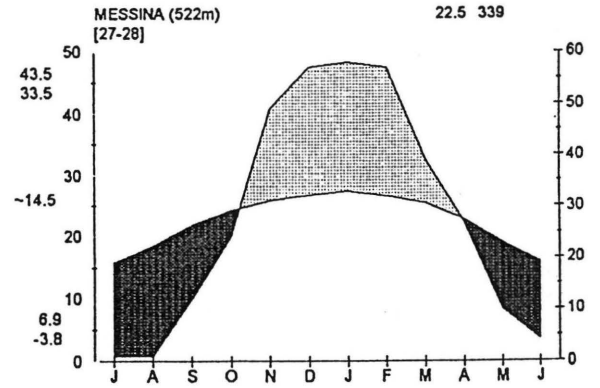
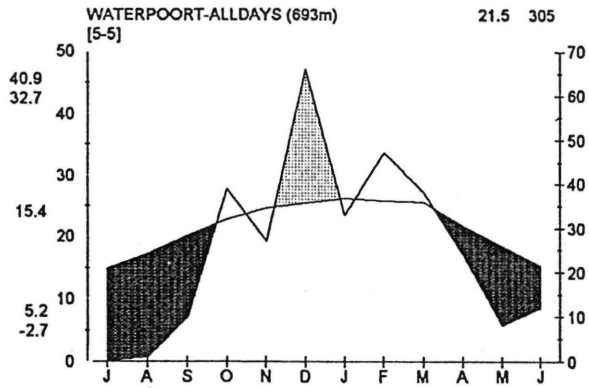
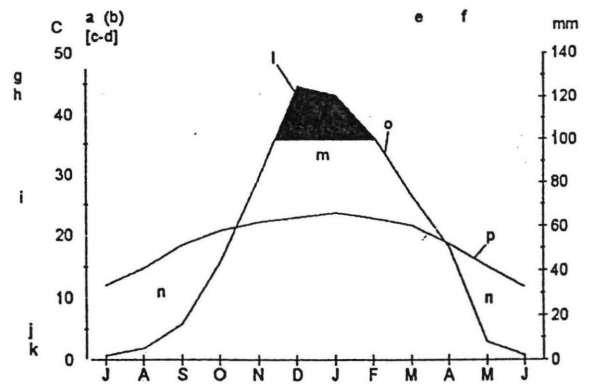


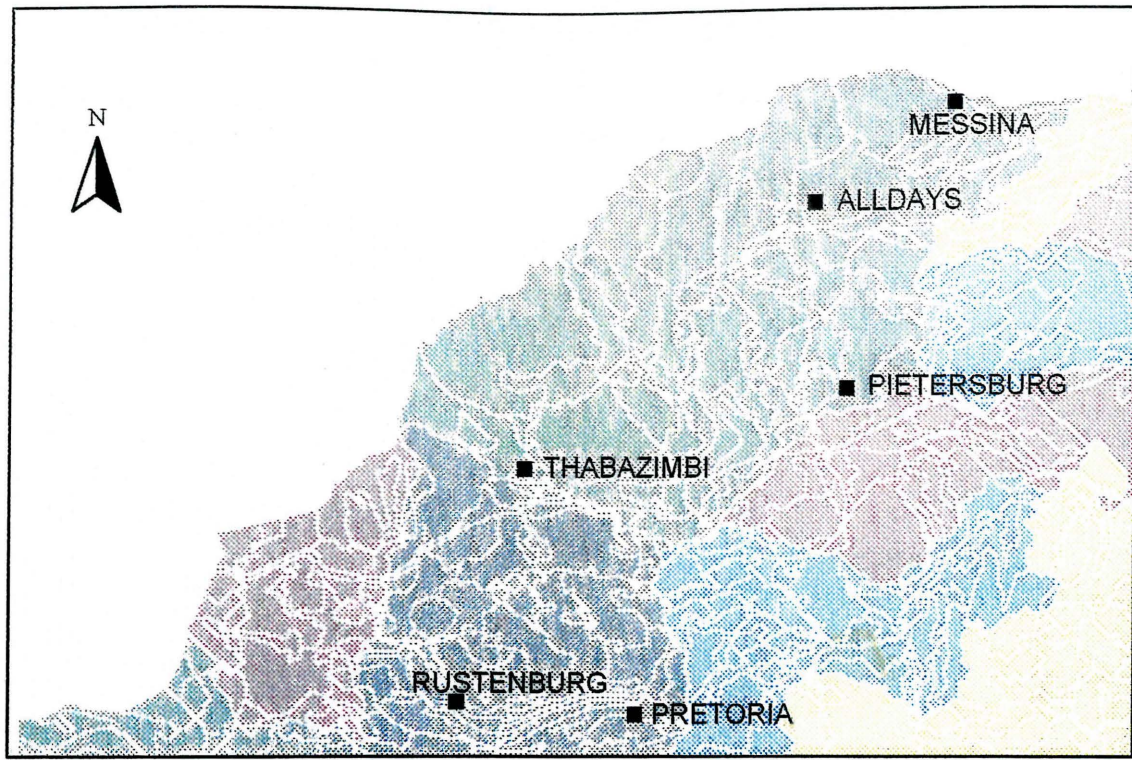
Figure 4. Climate diagrams for six weather stations in the study area.

22° S
25° E

22° S
31° E

26° S
25° E

26° S
31° E



0 100 200 300 Kilometers

- Towns
- Precipitation (mm/annum)
- 376 - 552
- 552 - 606
- 606 - 642
- 642 - 727
- 727 - 893

Figure 5. Precipitation of the study area (ENPAT 1994).

Frost occurs during the coldest months. Mean annual temperatures increase from south (Pretoria 18.5°C) to north (Messina 22.5°)(Weather Bureau 1997b).

2.4. Geology

The Bushveld Basin consists of igneous rocks of the Bushveld Complex and the Transvaal Sequence. Younger rocks include the sediments of the Karoo Sequence, found on the Springbok flats (Geological Survey 1981a). Only the major geological types given on the map (Figure 6) are mentioned in the text.

2.4.1. Bushveld Igneous Complex

The Bushveld Basin is underlain by norite, gabbro and granite of the Bushveld Igneous Complex. This complex consists of three suites:

- the Rustenburg Layered Suite comprises of all the basic layered rocks (mainly norite and gabbro) of the Bushveld Complex.
- the Raseop Granophyre Suite is overlying the Rustenburg Layered Suite and separates the Lebowa Granite Suite from the basic rocks.
- the Lebowa Granite Suite consists primarily of potassium feldspar, quartz, plagioclase and mafic minerals (Geological Survey 1981a).

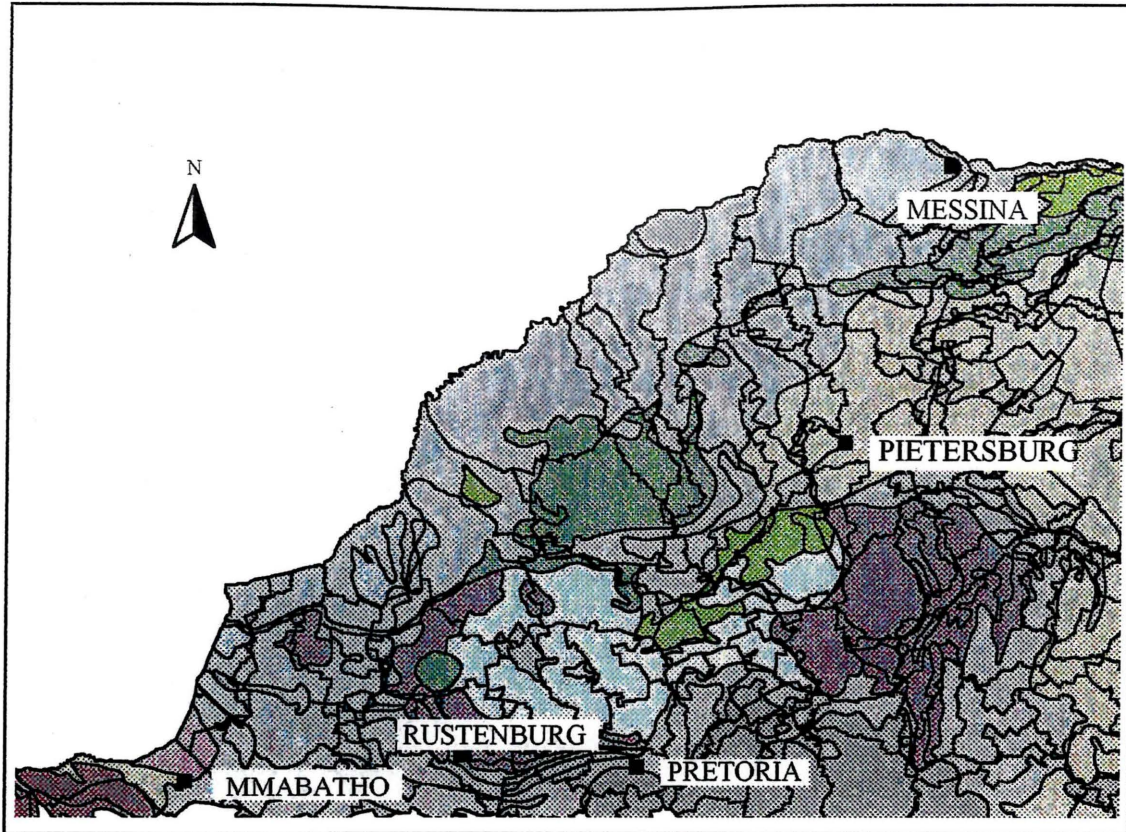
2.4.2. Transvaal Sequence

The Transvaal Sequence is formed by the three groups:

- the Pretoria Group comprises quartzite, hornfels and marble. Quartzites are fine to coarse grained and vary in colour from white through brown to bluish (Geological Survey 1986).

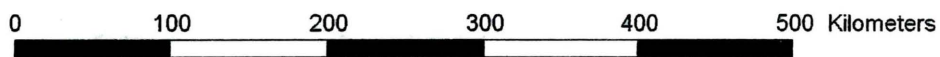
22° S
25° E

22° S
31° E



26° S
25° E

26° S
31° E



- Towns
- Geology
- ALLUVIUM, SAND, CALCRETE
- BARBERTON, MURCHISON, GIYANI, BEIT BRIDGE
- BUSHVELD COMPLEX
- ECCA
- KALAHARI
- MEINHARDSKRAAL GRANITE, SAND RIVER GNEISS, ETC
- RUSTENBURG, LEBOWA, RASHOOP
- SUURBERG, DRAKENSBERG, LEBOMBO
- TRANSVAAL, ROOIBERG, GRIQUALAND-WEST
- VENTERSDORP
- WATERBERG, SOUTPANSBERG, ORANGE RIVER

Figure 6. Geology of the study area (ENPAT 1994)

- the Chuniespoort Group is represented by dolomite, dolomite limestone, chert, shale and quartzite which occurs near the floor contact of the Bushveld Complex (Geological Survey 1986).
- the volcanic rocks of the Rooiberg Group forms a major outcrop south-east of Villa Nora and consists of rhyolite with interbedded agglomerate and tuff (Geological Survey 1986).

The Transvaal sequence is separated from the Karoo Sequence by the Bushveld Complex (Geological Survey 1981a).

2.4.3. Karoo Sequence

This sequence is found on the Springbok flats and north of Ellisras. It forms a shallow basin, overlying the granite of the Bushveld Complex. It consists mainly of siltstone, sandstone, mudstone and shale (Geological Survey 1981a).

2.4.4. Pilanesberg Complex

This complex is represented by a circle of intrusive and extrusive rocks north-west of Rustenburg. It is located on the contact between the Rustenburg Layered Suite and the Lebowa Granite Suite (Geological Survey 1981a).

2.4.5. Waterberg Group

The Waterberg Group forms the central part of the Waterberg Basin. It is formed by the Aasvoëlkop, Mogalakwena and Cleremont Formations. These formations are entirely clastic (Geological Survey 1996).

2.4.6. Soutpansberg Group

The rugged, mountainous country of the Northern Province in the Louis Trichardt area is underlain by this group. The mountains are characterised by

steep-sided, clifted southern slopes and gently dipping northern slopes. Feldspathic quartzite, conglomerate and shale, basalt and quartzite are the rocks and minerals associated with this group (Geological Survey 1981b, 1986).

2.4.7. Beit Bridge Complex and Messina Suite

The Beit Bridge Complex in the most northern part of the study area, is a succession of metasedimentary and metavolcanic rocks. It consists of metaquartzite, leucocratic gneiss, calc-silicate rocks and marble. The ultramafic rocks (metapyroxenite, serpentinite, hornblendite), anthosites and gabbros of the Messina Suite have intruded the complex (Geological Survey 1981b, 1986).

2.4.8. Sand River-, Goudplaats- and Houtrivier Gneiss

A fairly large area south-east of Messina is underlain by Sand River Gneiss. Goudplaats Gneiss, the oldest rocks in the area, are found in the Pietersburg area. Underlying the area from Pietersburg to the Soutpansberg, including a part of the Pietersburg Plateau, is Houtrivier Gneiss. It consists of the following minerals: leucocratic migmatite, gneiss, hornblende-biotite gneiss, biotite gneiss and pegmatitic rocks (Geological Survey 1986).

CHAPTER 3

METHODS

3.1. Approach

The Braun-Blanquet method (Mueller-Dombois & Ellenberg 1974; Werger 1974) was used to classify the data set. Previously it has been used successfully in various areas, for example the Grassland biome (Kooij 1990; Du Preez 1991; Bezuidenhout 1993) as well as the Savanna biome (Bredenkamp 1982; Van Rooyen 1984, Schmidt *et al.* 1993; Brown 1997).

3.2. Method

A large data base of vegetation studies, including relevé data, exists at the University of Pretoria. A total of 34 of these studies were conducted in the Central Savanna area. From these studies, 29 were selected to be used in this study. The phytosociological data from these studies were incorporated into a new data base TURBOVEG (Hennekens 1996a). Four studies were not included, because the data do not include total floristic composition or the data are considered unsuitable for the purposes of this study.

As the study concentrated on broad zonal vegetation types, relevés from azonal and intra-zonal communities were removed from the data set, resulting in 2907 relevés and 1369 species being used. The studies included in this synthesis are listed in Table 1 of Chapter 4.

It is impractical and virtually impossible to handle phytosociological tables of this extent by standard Braun-Blanquet procedures. Van der Maarel *et al.* (1987) suggested a two-step method to classify large phytosociological data sets, which was expanded into a three-step method by Bredenkamp & Bezuidenhout (1995) for the treatment of large phytosociological data sets from South African grasslands. This method was used in the

analysis of the data.

- The first step was to stratify the data by using each individual vegetation study as a subset. These individual data sets were classified by the original authors, resulting in the identification of numerous plant communities, represented in 39 phytosociological tables. A synoptic relevé was constructed for each community from each table. Every community, representing zonal vegetation from the 39 phytosociological tables, was thus summarised in a single column in a synoptic table, resulting in 378 synoptic relevés. The matrix of this synoptic table consists of constancy values for each species, between 1 and 5, representing 20% intervals (1 = <20%; 2 = 21-40% ; 3 = 41-60%; 4 = 61-80%; 5 = >80%). Traditional Roman figures were not used, due to the spaces on the computer matrix.
- The 378 synoptic relevés (final plant communities at various levels (communities, subcommunities, variants) in a hierarchical system) were re-entered into a synoptic data set. This synoptic data set was reclassified numerically by using TWINSpan (Hill 1979), and refined by using Braun-Blanquet procedures in the programme MEGATAB (Hennekens 1996b). This effectively brought together all the related synoptic relevés identified in different studies over the study area. From the resulting clusters, four major vegetation types were identified (Chapter 4).
- A separate synoptic table was constructed for each of the four major vegetation types, to include all synoptic relevés (communities). Only synoptic relevés were included and not all original relevés as suggested by Breidenkamp & Bezuidenhout (1995). A hierarchical classification was done for one of these major vegetation types, the *Panico maximi-Acaciea tortilis*. The identified plant communities were described.

In the descriptions of the plant communities, original community names as given by the authors are used. Descriptions of plant communities are from the original authors' phytosociological tables and not from Tables 1 and 2 (Chapter 5). Certain species were affected by name changes. This dissertation follows the nomenclature of Arnold and De Wet (1993).

CHAPTER 4

SUGGESTED SYNTAXONOMIC CLASSES IN THE CENTRAL SAVANNA

(Submitted to the *Journal of Vegetation Science*)

Suggested syntaxonomic classes for zonal vegetation in the Central Savanna of South Africa

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Abstract. Data from 29 vegetation studies that have been done in the Central Savanna area of South Africa were combined into a synoptic data set. The synoptic data set was reclassified by TWINSpan and refined with Braun-Blanquet procedures. This analysis indicates that the Central Savanna consists of four zonal vegetation classes: the *Commiphoro mollis-Colophospermetea mopani*, the *Panico maximi-Acacieta tortilis*, the *Terminalio sericeae-Combretetea apiculati* and the *Englerophyto magalismsontani-Acacieta caffrae*.

Keywords: Braun-Blanquet, phytosociological classes, savanna, synoptic, TWINSpan.

Introduction

The Central Savanna of South Africa can be defined as the bushveld of the North West Province (north of the Magaliesberg) and the Northern Province. The area is situated between the Kalahari in the west (the Botswana border) and the Lowveld, east of the Great Escarpment (Fig.1). Several vegetation studies have been conducted in the Central Savanna. These include published studies (e.g. Brown et al. 1996; Schmidt et al. 1993; Schultz et al. 1994) as well as unpublished reports (e.g. Bredekamp 1978 unpubl.; Nel 1997 unpubl.). These studies were confined to farms or nature reserves, scattered throughout the Central Savanna. A regional study, the syntaxonomy and synecology of the vegetation of a part of the North West Province, was published by Van der Meulen (1979) and is also included in this study.

Present knowledge of the broader vegetation of this area is based on descriptions by Acocks (1988) and Low & Rebelo (1996). Their classifications of broad vegetation types were however not based on phytosociological data.

The aim of this study is to compile a synthesis of all known comparable relevé data from this area, in order to identify the major zonal vegetation types that possibly represent phytosociological classes. Relevés from specialised azonal types were however excluded.

Methods

The 29 phytosociological vegetation studies that have been done in the Central Savanna resulted in 39 phytosociological tables and descriptions of numerous plant

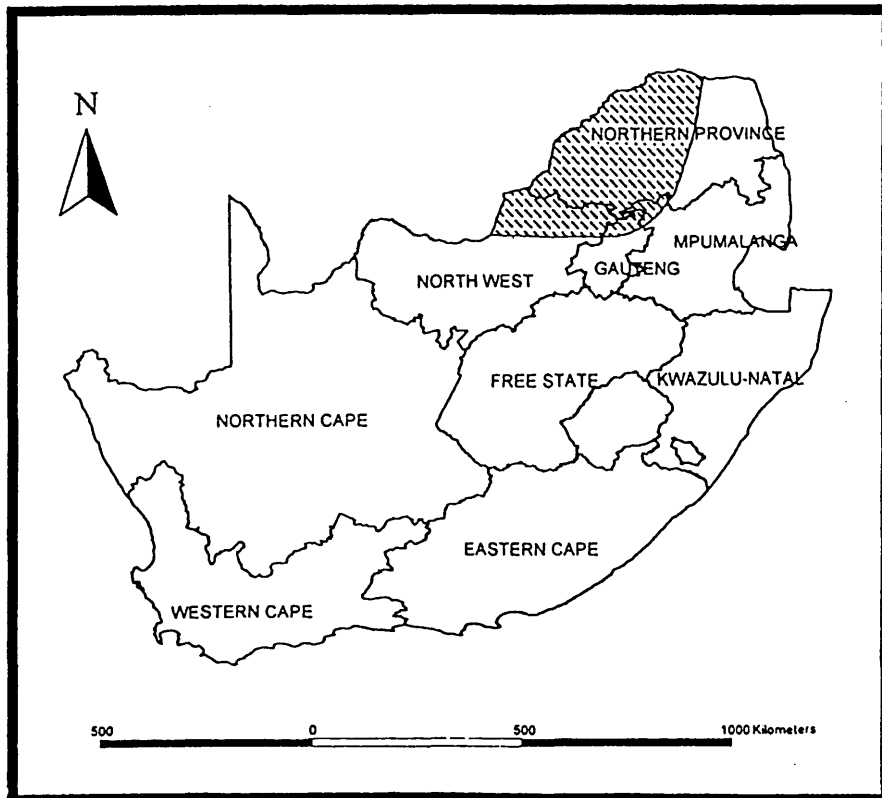
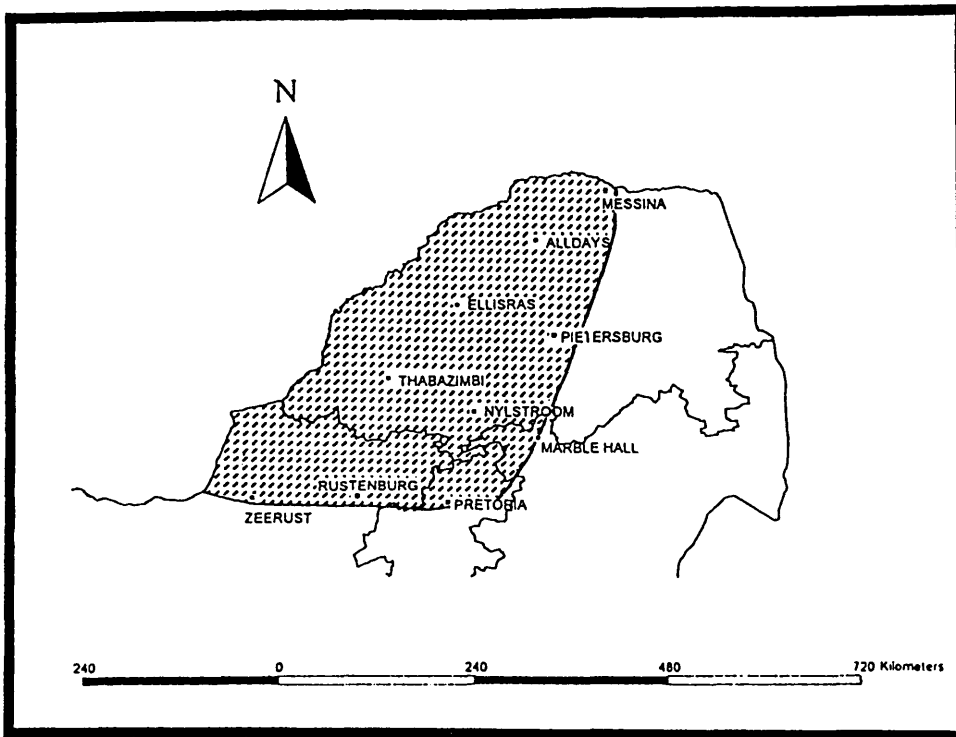


Fig.1. Location of the study area.

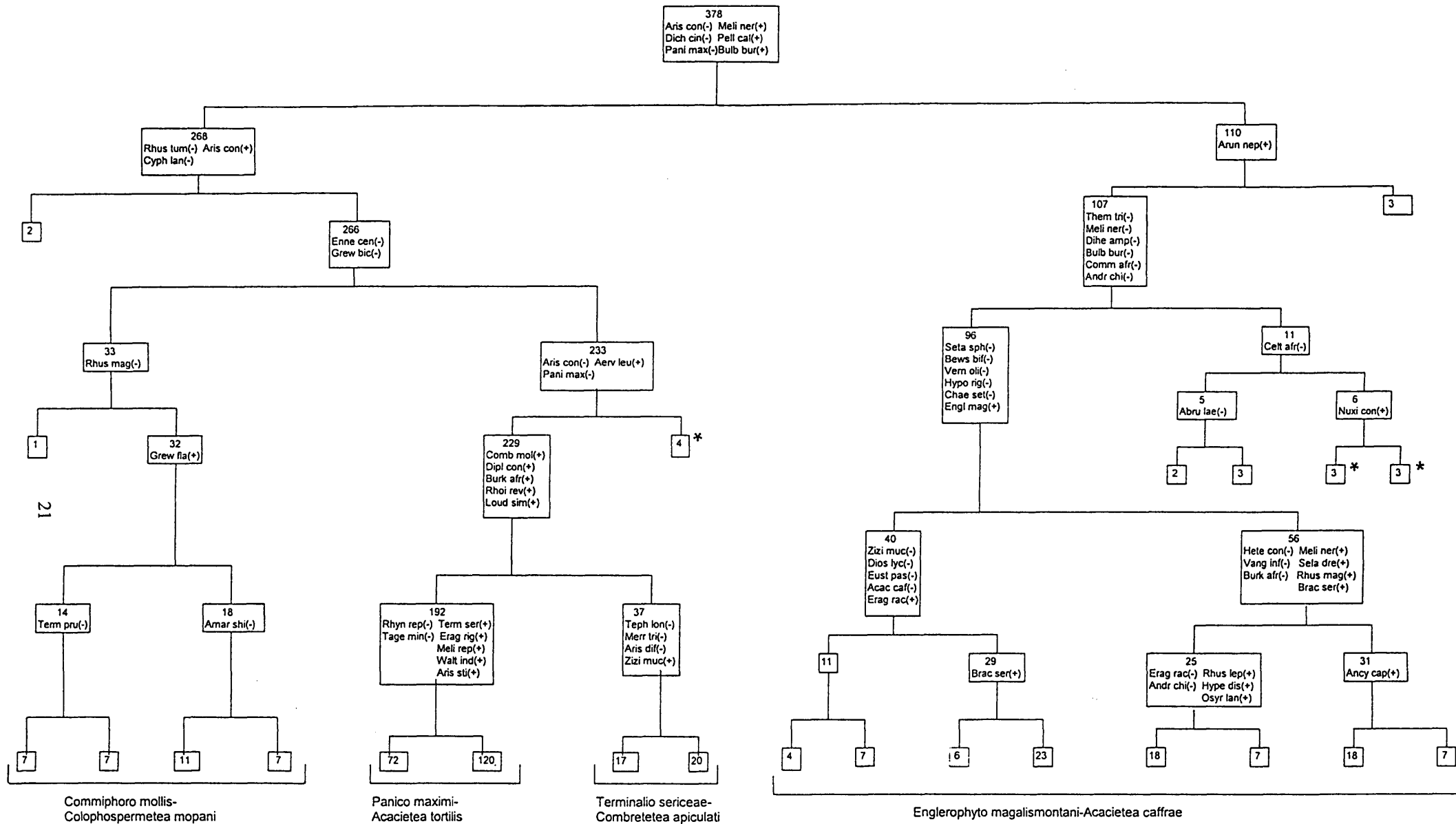
communities. The floristic data of the 39 tables were used. Relevés from azonal and intra-zonal communities were removed from the data set, resulting in 2907 relevés and 1369 species being used. The studies included in this synthesis are listed in Table 1.

The first step was to construct a synoptic relevé for each community from each table. Every community, representing zonal vegetation from the 39 phytosociological tables, was thus summarised in a single column in a single synoptic table. The matrix of this synoptic table is the constancy values of the species, given as 1 to 5, representing 20% intervals. Traditional Roman figures were not used due to practical reasons on the computer, as the constancy values had to occupy a single space.

This resulted in 378 synoptic relevés (plant communities) that were re-entered into a synoptic data set. The synoptic data set was reclassified numerically by using TWINSpan (Hill 1979). A final synoptic table was constructed, showing the four major communities, each representing a zonal vegetation class. Each class was reduced to a single column in the synoptic table (Table 2). In this table species with a constancy value of 1 (<20%) were omitted, except those that were positively identified as indicator species by TWINSpan (Fig.2).

Results

The first TWINSpan division separated the Mountain Bushveld communities from the other communities (Fig.2). The second division separated communities from the Mopane veld and the Arid Sweet Bushveld (Acocks 1988), from the rest of the communities.



*Outlier synoptic relevés (communities) removed from data set.

Fig. 2. Dendrogram of TWINSpan classification, with indicator species ((+) is indicator species for division to the right and (-) is indicator species for division to the left).

A further division of the rest of the communities resulted in two groups, one representing broad leaved bushveld (Werger & Coetzee 1978), dominated by *Combretum* species and the other microphyllous thorny bushveld dominated by *Acacia* species (Cole 1986).

From this it seems that the Central Savanna may be divided into four classes:

1. The *Commiphoro mollis-Colophospermetea mopani*
2. The *Panico maximi-Acacieta tortilis*
3. The *Terminalio sericeae-Combretetea apiculati*
4. The *Englerophyto magalismontani-Acacieta caffrae*

1. *Commiphoro mollis-Colophospermetea mopani*

The *Commiphoro mollis-Colophospermetea mopani* occurs in the far northern part of the study area. The tree *Colophospermum mopane* is usually the sole dominant in this woodland community (Fig.3). It grows on fine grained, usually deep soil that varies from sandy to loamy and clayey (Werger & Coetzee 1978).

Character species of this class are listed in Species Group A (Table 2) and include the woody species *Colophospermum mopane*, *Combretum mossambicense*, *Boscia albitrunca*, *Acacia senegal*, *A.nigrescens*, *A.erubescens*, *Terminalia prunioides*, *Grewia bicolor* and *Kirkia acuminata*. Diagnostic forbs are *Acalypha villicaulis*, *Sida ovata* and *Tribulus terrestris* with prominent grass species being *Stipagrostis uniplumis*, *Eragrostis lehmanniana*, *Aristida adscensionis*, *Cenchrus ciliaris*, *Enneapogon cenchroides* and *Tragus berteronianus*. Constant woody species of this

class are *Acacia tortilis*, *Grewia flava* (Species Group C, Table 2), *G. monticola*, *Dichrostachys cinerea* and *Combretum apiculatum* (Species Group F, Table 2). Prominent herbaceous species include the forbs *Evolvulus alsinoides* (Species Group C, Table 2), *Phyllanthus parvulus* (Species Group F, Table 2), *Solanum panduriforme* and *Rhynchosia totta* (Species Group J, Table 2) and the grasses *Eragrostis lehmanniana* (Species Group C, Table 2), *Schmidtia pappophoroides*, *Aristida congesta* subsp. *congesta*, *Panicum maximum*, *Digitaria eriantha* (Species Group F, Table 2), and *Melinis repens* (Species Group J, Table 2).

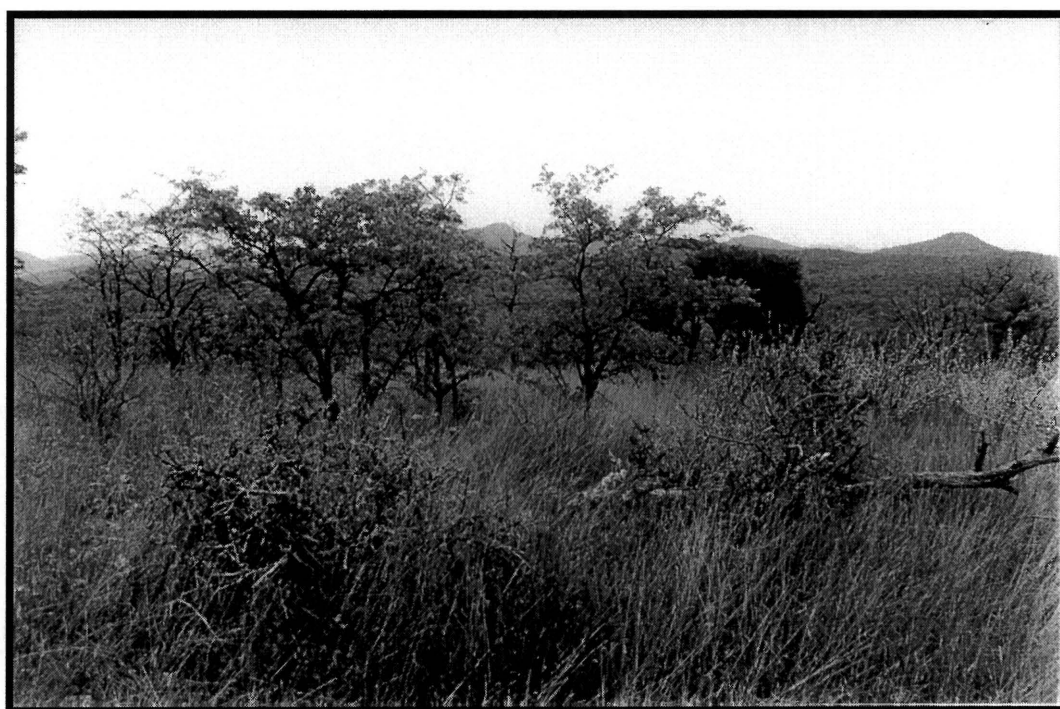


Fig. 3. The vegetation of the Commiphoro mollis-Colophospermetea mopani.

The TWINSpan analysis indicated that the species *Grewia bicolor* and *Enneapogon cenchroides* (Species Group A, Table 2) are the most important indicators of this class, since they are the indicator species at the division where the Commiphoro

mollis-Colophospermetea mopani is separated from the Panico maximi-Acacietaea tortilis and the Terminalio sericeae-Combretetea apiculati (Fig. 2).

2. Panico maximi-Acacietaea tortilis

This microphyllous thorny bushveld is considered as an arid bushveld (Huntley 1982, 1984) and it occurs in the Transvaal Plateau Basin, comprising the flat Bushveld Basin and the Waterberg, Soutpansberg and Pietersburg plateaux to the North (Cole 1986). It is characteristic of the dark, clayey soils often developed over basalt in the low lying areas. A typical example of this vegetation is illustrated by Figure 4. The Panico maximi-Acacietaea tortilis gives way to deciduous broad-leaved savanna in upland areas with sandy soils underlain by granite, thus forming an extensive mosaic with the Terminalio sericeae-Combretetea apiculati.

Diagnostic species for this class include the woody species *Acacia karroo*, *A. robusta*, *A. nilotica*, *A. mellifera*, *Rhus lancea* and *R. pyroides*, as well as the herbaceous species *Eragrostis rigidior*, *E. superba*, *Cymbopogon plurinodis*, *Tagetes minuta* and *Bidens bipinnata* (Species Group B, Table 2). Dominant species are the woody species *Acacia tortilis*, *Grewia flava* (Species Group C, Table 2), *Ziziphus mucronata* (Species Group E, Table 2), *Dichrostachys cinerea* (Species Group F, Table 2) and *Acacia caffra* (Species Group I, Table 2). Prominent species of the herbaceous layer are the forbs *Kyphocarpa angustifolia* (Species Group C, Table 2), *Solanum panduriforme* and *Commelina africana* (Species Group J, Table 2) and the grasses *Aristida congesta* subsp. *barbicollis*, *Urochloa mossambicensis* (Species Group C,

Table 2), *Panicum maximum*, *Digitaria eriantha* and *Aristida congesta* subsp. *congesta* (Species Group F, Table 2).

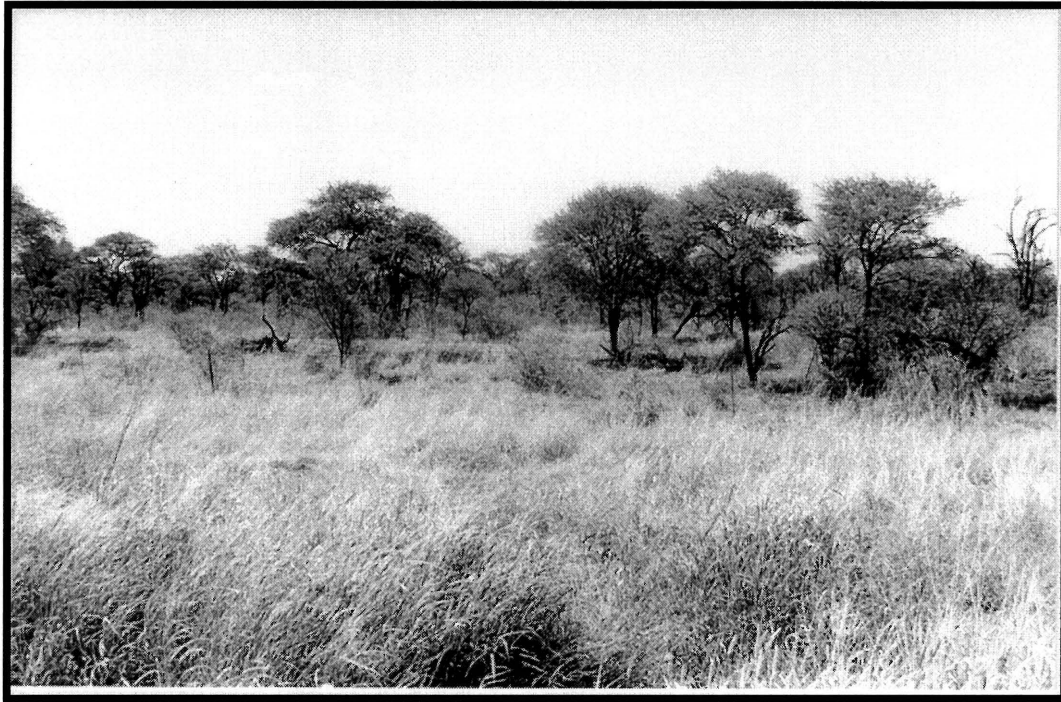


Fig. 4. The vegetation of the *Panico maximi*-*Acacietea tortilis*.

The TWINSpan results indicate that only one woody species is included as an indicator species, namely *Terminalia sericea* (Fig.2), which is usually associated with the sandy soils of the *Terminalio sericeae*-*Combretetea apiculati*. This is possibly an indicator of some of the *Panico maximi*-*Acacietea tortilis* plant communities that occur on the relatively sandy side of a soil texture coenocline within the *Panico maximi*-*Acacietea tortilis* (Winterbach 1998 unpubl.). Other indicator species are *Eragrostis rigidior*, *Tagetes minuta* (Species Group B, Table 2), *Aristida stipitata*, *Waltheria indica* (Species Group E, Table 2) and *Melinis repens* (Species Group J, Table 2).

3. *Terminalio sericeae*-*Combretetea apiculati*

The vegetation of this class occurs on sandy loam soils underlain by granite, quartzite and dolomite. It is considered by Huntley (1982, 1984) to be a moist savanna. This vegetation is illustrated by Figure 5. On the Springbok Flats in the Bushveld Basin, where vertic clay soils are formed from underlying basalt, this vegetation is only found on sandy sediments and on aeolian sands (Werger & Coetzee 1978). In the slightly undulating landscape, this broad-leaved vegetation forms a mosaic with the *Panicum maximi*-*Acacia tortilis*, where the former is found on the upland sandy areas and the latter in the lower lying clayey areas.

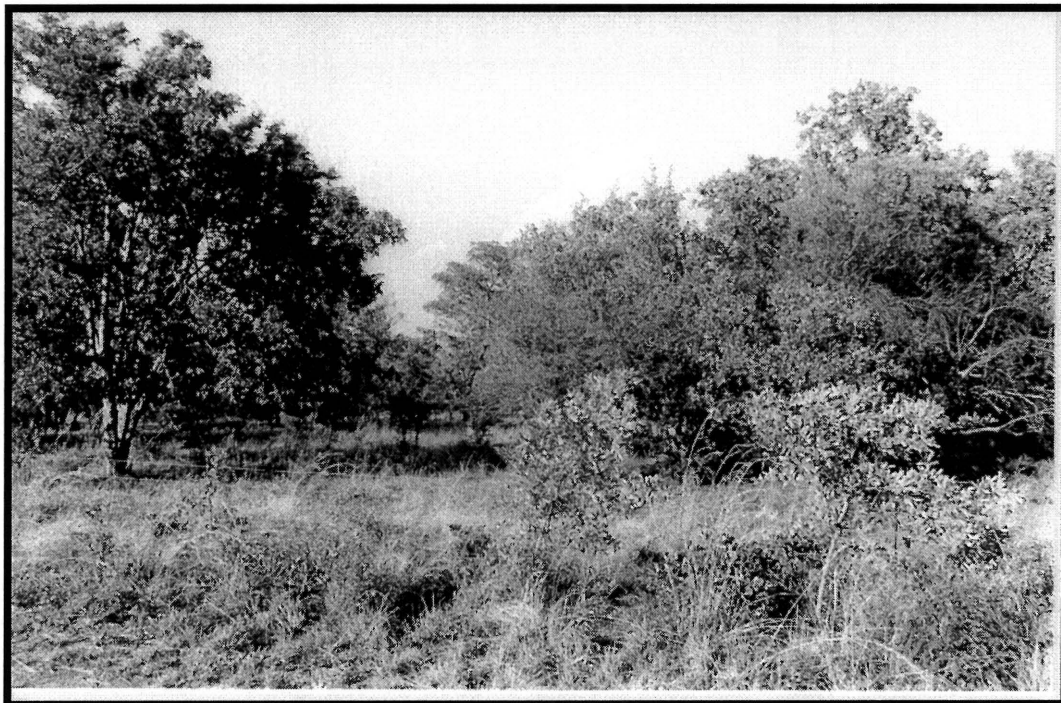


Fig. 5. The vegetation of the *Terminalia sericeae*-*Combretum apiculatum*.

The *Terminalia sericeae*-*Combretum apiculatum* is characterised by Species Group D that includes the woody species *Diplorhynchus condylocarpon*, *Croton*

gratissimus and *Pseudolachnostylis maprouneifolia*. Diagnostic forbs and grasses are *Rhoicissus revoillii*, *Tephrosia longipes*, *Aristida diffusa*, *Eragrostis chloromelas* and *Schizachyrium jeffreysii*. Other prominent species include the trees *Ziziphus mucronata*, *Terminalia sericea*, *Vitex rehmannii*, *Dombeya rotundifolia* (Species Group E, Table 2), *Combretum apiculatum* (Species Group F, Table 2), *Burkea africana*, *Lannea discolor*, *Englerophytum magalismontanum*, *Ochna pulchra* (Species Group H, Table 2), *Combretum molle*, *C.zeyheri* and *Acacia caffra* (Species Group I, Table 2), the forbs *Phyllanthus parvulus* (Species Group F, Table 2), *Commelina africana* and *Solanum panduriforme* (Species Group J, Table 2) and the grass species *Brachiaria nigropedata* (Species Group E, Table 2), *Panicum maximum*, *Digitaria eriantha*, *Aristida congesta* subsp.*congesta* (Species Group F, Table 2), *Loudetia simplex* (Species Group H, Table 2), *Themeda triandra*, *Heteropogon contortus*, *Diheteropogon amplexans*, *Schizachyrium sanguineum* (Species Group I, Table 2) and *Melinis repens* (Species Group J, Table 2).

The indicator species, derived from the TWINSpan analysis, for this class are *Combretum molle*, *Burkea africana*, *Diplorhynchus condilocarpon*, *Rhoicissus revoillii* and *Loudetia simplex* (Fig.2).

4. Englerophyto magalismontani-Acacietaea caffrae

This mountain bushveld is found on the slopes of the Waterberg and the Magaliesberg (Fig.6). It occurs mainly on sandy soils underlain by solid rock.



Fig. 6. Vegetation of the Englerophyto magalismontani-Acacieetea caffrae.

Species Group G (Table 2) represents the diagnostic species of this class and includes the woody species *Protea caffra*, the forbs *Indigophera comosa*, *Selaginella dregei* and *Bulbostylis burchellii* and the grasses *Panicum natalense*, *Bewsia biflora*, *Digitaria diagonalis*, *Cymbopogon validus*, *Brachiaria serrata* and *Trachypogon spicatus*. Woody species constantly present are *Englerophytum magalismontanum*, *Faurea saligna*, *Ozoroa paniculosa* and *Ochna pulcra* (Species Group H, Table 2). Prominent forbs in this class are *Pellaea calomelanos* (Species Group H, Table 2), *Commelina erecta*, *Chamaecrista mimosoides* (Species Group I, Table 2) and *Commelina africana* (Species Group J, Table 2), while dominant grass species include *Loudetia simplex*, *Melinis nerviglumis*, *Eragrostis racemosa* (Species Group H, Table 2), *Themeda triandra*, *Heteropogon contortus* and *Diheteropogon amplexans* (Species Group I, Table 2).

From the TWINSpan results *Melinis nerviglumis*, *Pellaea calomelanos* and *Bulbostylis burchellii* were identified as the indicator species where the Mountain Bushveld is separated from the rest of the relevés (Fig.2). Indicator species for further divisions in the class include *Englerophytum magalismontanum*, *Celtis africana*, *Nuxia congesta* and *Rhus magalismontana*.

Discussion

This is the first attempt to identify zonal phytosociological classes for the South African savanna from phytosociological relevé data. It is realised that these classes are not validly described according to the International Code for syntaxonomic nomenclature (Barkman et al. 1986), as types should be allocated in a hierarchical way, starting with the association, and including all the principal syntaxonomic ranks. This is presently described for the *Panico maximi-Acacieta tortilis* by Winterbach (1998 unpubl.).

The dendrogram (Fig.2) indicates that the Mountain Bushveld is a separate, very diverse vegetation type with many different communities. Further study may reveal that this class might be divided into various different classes. This result may be expected, as many habitat types can be recognised in the complex topography of the rugged Waterberg and Magaliesberg ranges.

TWINSpan grouped the majority of the Arid Sweet Bushveld communities (Acocks 1988) with the communities of the *Commiphora mollis-Colophospermum mopani* even if *Colophospermum mopani* was not present. Some of the communities are however grouped with those of the *Panico maximi-Acacieta tortilis*. From these

results it may be interpreted that the Arid Sweet Bushveld as recognised by Acocks (1988), could be divided into two distinct vegetation types. One type, although without *Colophospermum mopane*, has an affinity with Mopane veld, suggesting a distinct subclass, and the other has an affinity with the Panico maximi-Acacietea tortilis.

The species composition of the Panico maximi-Acacietea tortilis suggests an *Acacia* dominated vegetation on clay soils, as well as on sandy deposits, overlying the clay. The occurrence of species such as *Acacia mellifera*, *Kyphocarpa angustifolia*, *Tribulus terrestris*, *Eragrostis lehmanniana*, *Stipagrostis uniplumis* and *Aristida adscensionis* in these communities may indicate an affinity with the Kalahari savanna (Van Rooyen *et al.* 1988).

Acknowledgements. The Foundation for Research Development is thanked for their financial support.

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Table 1. Data used for TWINSpan analysis

AUTHOR	YEAR	LOCATION	NUMBER OF RELEVES
Botha, K.	1994	Waterberg Wildsentrum	104
Bredenkamp, G.J.	Unpubl.	Pietersburg Nature Reserve	81
Bredenkamp, G.J. & Van Vuuren, D.R.J.	1977	Turfloop, Pietersburg	19
Brown, L.R. & Bredenkamp, G.J.	1994	Borakalalo Nature Reserve, Brits	82
Brown, L.R. <i>et al.</i>	1995	Borakalalo Nature Reserve, Brits	137
Brown, L.R. <i>et al.</i>	1996	Borakalalo Nature Reserve, Brits	132
Coetzee, B.J.	1975	Rustenburg Nature Reserve	191
Coetzee, B.J. <i>et al.</i>	1976	Nylsvley, Nylstroom	161
De Frey, W.H.	1993	Loskopdam, Groblersdal	10
De Kock, C. <i>et al.</i>	1977	Wonderboom, Pretoria	41
Dekker, B. & Van Rooyen, N.	1995	Messina Experimental Farm	148
Fourie, G.	1994	Kwalata Game Ranch, Ellisras	63
Fourie, G.	Unpubl.	De Boveneinde, Vaalwater	27
Hattingh, S.	1994	Aventura Nature Reserve, Warmbaths	33
Kruger, J.W.	1990	Mabalingwe, Warmbaths	107
Nel, P.	Unpubl.	Rustenburg Nature Reserve	283

Pauw, J.C.	1988	Atherstone Nature Reserve, Thabazimbi	43
Purchase, A.L.	1994	Vlakpan, Marblehall	40
Schmidt, A.G. <i>et al.</i>	1993	Rhino Ranch, Ellisras	43
Schultz, E. <i>et al.</i>	1994	Imberbe Game Ranch, Ellisras	39
Smith, D.C.	1992	Doornpoort, Pretoria	58
Turner, J.	1995	Mokolo, Ellisras	85
Van der Meulen, F.	1979	North West Province	514
Van Essen, L.D.	1993	Bosveld Rentmeesters, Roedtan	25
Van Rooyen, N.	1983	Roodeplaat, Pretoria	70
Van Schalkwyk, A.	1993	Mabula Game Reserve, Warmbaths	87
Visser, N. <i>et al.</i>	1996	Honnet Natuurreservaat, Messina	54
Westfall, R.H.	1978	Silkaatsnek, Pretoria	74
Westfall, R.H.	1985	Groothoek, Thabazimbi	156

Table 2. Synoptic table for the vegetation classes of the Central Savanna

Species	Class number			
	1	2	3	4
Species Group A				
<i>Character species of the Commiphora mollis-Colophospermum mopani</i>				
Enneapogon cenchroides	5	.	.	.
Grewia bicolor	5	.	.	.
Aristida adscensionis	4	.	.	.
Terminalia prunioides	4	.	.	.
Stipagrostis uniplumis	4	.	.	.
Acacia nigrescens	3	.	.	.
Acacia senegal	3	.	.	.
Tribulus terrestris	3	.	.	.
Aptosimum lineare	3	.	.	.
Combretum mossambicense	3	.	.	.
Acalypha villicaulis	3	.	.	.
Boscia albitrunca	3	.	.	.
Brachiaria deflexa	3	.	.	.
Achyranthes aspera v. sicula	3	.	.	.
Pavonia burchellii	3	.	.	.
Monechma divaricatum	3	.	.	.
Hibiscus micranthus	3	.	.	.
Hermannia odorata	3	.	.	.
Cenchrus ciliaris	3	.	.	.
Gisekia africana	3	.	.	.
Tephrosia purpurea	2	.	.	.
Eragrostis trichophora	2	.	.	.
Barleria lancifolia	2	.	.	.
Acacia erubescens	2	.	.	.
Abutilon austro-africanum	2	.	.	.
Amaranthus schinzianus	2	.	.	.
Ximenesia americana	2	.	.	.
Solanum coccineum	2	.	.	.
Calostephane divaricata	2	.	.	.
Achyrocline stenoptera	2	.	.	.
Boscia foetida	2	.	.	.
Boerhavia diffusa	2	.	.	.
Commiphora edulis	2	.	.	.
Sida ovata	2	.	.	.
Setaria verticillata	2	.	.	.
Sesamum triphyllum	2	.	.	.
Seddera capensis	2	.	.	.
Sclerocarya birrea s. caffra	2	.	.	.
Rhigozum zambesiaticum	2	.	.	.
Pupalia lappacea	2	.	.	.
Ptychlobium contortum	2	.	.	.
Sterculia rogersii	2	.	.	.
Priva africana	2	.	.	.
Phyllanthus pinnatus	2	.	.	.
Phyllanthus maderaspatensis	2	.	.	.
Panicum coloratum	2	.	.	.
Ocimum americanum	2	.	.	.
Oropetium capense	2	.	.	.
Monechma debile	2	.	.	.
Melhania rehmannii	2	.	.	.
Kohautia cynanchica	2	.	.	.
Lannea schweinfurthii	2	.	.	.
Kirkia acuminata	2	.	.	.
Justicia protracta	2	.	.	.
Jatropha spicata	2	.	.	.
Ipomoea magnusiana	2	.	.	.

Indigofera trita	2	.	.	.
Indigofera heterotricha	2	.	.	.
Limeum sulcatum	2	.	.	.
Leucas glabrata	2	.	.	.
Grewia hexamita	2	.	.	.
Flueggea virosa	2	.	.	.
Hermannia boraginiflora	2	.	.	.
Grewia villosa	2	.	.	.
Eragrostis biflora	2	.	.	.
Corbichonia decumbens	2	.	.	.
Commiphora mollis	2	.	.	.
Commiphora glandulosa	2	.	.	.
Commicarpus fallacissimus	2	.	.	.
Colophospermum mopane	2	.	.	.
Cleome angustifolia	2	.	.	.

Species Group B

Character species of the Panico maximi-Acacieta tortilis

Acacia karroo	3	.	.	.
Eragrostis rigidior	3	.	.	.
Eragrostis superba	2	.	.	.
Acacia robusta	2	.	.	.
Acacia nilotica	2	.	.	.
Acacia mellifera	2	.	.	.
Aristida canescens	2	.	.	.
Achyranthes aspera	2	.	.	.
Bidens bipinnata	2	.	.	.
Combretum hereroense	2	.	.	.
Cymbopogon plurinodis	2	.	.	.
Cynodon dactylon	2	.	.	.
Euclea crispa	2	.	.	.
Euclea undulata	2	.	.	.
Maytenus heterophylla	2	.	.	.
Peltophorum africanum	2	.	.	.
Rhus pyroides	2	.	.	.
Pappea capensis	2	.	.	.
Schkuhria pinnata	2	.	.	.
Rhus lancea	2	.	.	.
Sida cordifolia	2	.	.	.
Tagetes minuta	2	.	.	.

Species Group C

General species for Classes 1 and 2

Eragrostis lehmanniana	4	2	.	.
Grewia flava	3	3	.	.
Acacia tortilis	3	3	.	.
Evolvulus alsinoides	3	2	.	.
Tragus berteronianus	3	2	.	.
Kyphocarpa angustifolia	2	2	.	.
Urochloa mosambicensis	2	2	.	.
Aristida congesta s. barbicollis	2	2	.	.

Species Group D

Character species for the Terminalio sericeae-Combretetea apiculati

Diplorhynchus condylocarpon	4	.	.	.
Rhoicissus revoulii	4	.	.	.
Tylosema fassoglense	3	.	.	.
Croton gratissimus	3	.	.	.
Asparagus africanus	3	.	.	.
Gardenia volkensii	3	.	.	.
Hexalobus monopetalus	3	.	.	.
Euclea natalensis	3	.	.	.

Mundulea sericea	3
Pterocarpus rotundifolius	3
Pseudolachnostylis maprouneifolia	3
Strychnos pungens	3
Tephrosia longipes	3
Zornia linearis	2
Xerophyta retinervis	2
Vernonia poskeana	2
Aristida rhiniochloa	2
Aristida diffusa	2
Agathisanthemum bojeri	2
Aloe transvaalensis	2
Aloe marlothii	2
Barleria pretoriensis	2
Convolvulus sagittatus	2
Commelina livingstonii	2
Combretum nelsonii	2
Cyperus marginatus	2
Eragrostis chloromelas	2
Elephantorrhiza elephantina	2
Grewia flavescens	2
Bulbostylis hispidula	2
Hibiscus engleri	2
Heteropyxis natalensis	2
Fadogia homblei	2
Ipomoea purpurea	2
Pavonia transvaalensis	2
Polygala uncinata	2
Schizachyrium jeffreysii	2
Rhus discolor	2

Species group E

General species for Classes 2 and 3

Ziziphus mucronata	3	2
Terminalia sericea	2	4
Brachiaria nigropedata	2	4
Vitex rehmannii	2	4
Eragrostis gummiflua	2	3
Dombeya rotundifolia	2	3
Ehretia rigida	2	2
Perotis patens	2	2
Pogonarthria squarrosa	2	2
Monsonia angustifolia	2	2
Merremia tridentata	2	2
Lantana rugosa	2	2
Limeum viscosum	2	2
Enneapogon scoparius	2	2
Cleome maculata	2	2
Aristida stipitata	2	2
Trichoneura grandiglumis	2	2
Waltheria indica	2	2
Aerva leucura	1	1

Species group F

General species for Classes 1,2 and 3

Panicum maximum	3	4	3
Dichrostachys cinerea	3	4	2
Digitaria eriantha	2	4	4
Aristida congesta	2	4	4
Phyllanthus parvulus	2	2	4
Combretum apiculatum	2	2	4
Schmidtia pappophoroides	2	2	2
Grewia monticola	3	.	2

Species Group G

Character species for the Englerophyto magalimontani-Acacieatea caffrae

Senecio venosus	3
Indigofera comosa	3
Bulbostylis burchellii	3
Trachypogon spicatus	3
Tephrosia elongata	2
Thesium transvaalense	2
Sphenostylis angustifolia	2
Selaginella dregei	2
Protea caffra	2
Pentanisia angustifolia	2
Parinari capensis	2
Panicum natalense	2
Nidorella hottentotica	2
Oxalis obliquifolia	2
Hyppoxis rigidula	2
Digitaria diagonalis	2
Dicoma anomala	2
Dichapetalum cymosum	2
Cymbopogon validus	2
Cymbopogon excavatus	2
Cyanotis speciosa	2
Cryptolepis oblongifolia	2
Bewsia biflora	2
Becium obovatum s. obovatum var. galpinii	2
Athrixia elata	2
Brachylaena rotundata	2
Brachiaria serrata	2
Ancylobotrys capensis	2
Albica setosa	2
Aristida aequiglumis	2
Antherothamnus pearsonii	2
Urelytrum agropyroides	2
Tristachya biseriata	2
Vernonia oligocephala	2
Vernonia galpinii	2
Abrus laevigatus	1
Arundinella nepalensis	1

Species Group H

General species for Classes 3 and 4

Burkea africana	5	2
Loudetia simplex	4	3
Lansea discolor	4	2
Ozoroa paniculosa	4	2
Pellaea calomelanos	3	4
Englerophytum magalimontanum	3	3
Andropogon schirensis	3	3
Tapiphyllum parvifolium	3	2
Maytenus tenuispina	3	2
Oldenlandia herbacea	3	2
Asparagus suaveolens	3	2
Ochna pulchra	3	2
Melinis nerviglumis	2	4
Vangueria infausta	2	3
Faurea saligna	2	2
Setaria lindenberiana	2	2
Eragrostis racemosa	2	3

Species Group I

General species for Classes 2,3 and 4

Themeda triandra	3	3	4
Heteropogon contortus	3	3	3
Diheteropogon amplexans	2	3	4
Combretum molle	2	5	2
Combretum zeyheri	2	4	2
Bracharia serrata	2	3	3
Schizachyrium sanguineum	2	3	3
Setaria sphacelata	2	2	3
Lippia javanica	2	3	2
Elyonurus muticus	2	2	2
Commelina erecta	2	2	2
Acacia caffra	2	2	2
Osyris lanceolata	1	1	1
Eustachys paspaloides	1	1	1
Chamaecrista mimosoides	2	.	2
Diospyros lycioides	2	.	2
Eragrostis curvula	2	.	2
Rhus leptodictya	2	.	2
Celtis africana	1	.	1
Hyperthelia dissoluta	1	.	1
Nuxia congesta	1	.	1

Species Group J

General species for Classes 1,2,3 and 4

Melinis repens	3	3	4	2
Commelina africana	2	3	3	3
Solanum panduriforme	2	3	2	2
Rhynchosia totta	2	.	2	2
Chaetacanthus costatus	1	1	1	1
Rhus magalismontana	1	.	1	1

CHAPTER 5

RESULTS AND DISCUSSION

As indicated by Winterbach *et al.* (submitted)(Chapter 4), the classification procedure resulted in the identification of the following four classes:

- *Commiphoro mollis-Colophospermetea mopani*
- *Panico maximi-Acacietaea tortilis*
- *Terminalio sericeae-Combretetea apiculati*
- *Englerophyto magalismontani-Acacietaea caffrae*

One of the classes is described formally according to the code of syntaxonomic nomenclature (Barkman *et al.* 1986).

I. *Panico maximi-Acacietaea tortilis* Class Nova hoc loco

Nomenclatural type: *Acacienea nilotico-tortilis*

The *Panico maximi-Acacietaea tortilis* is characterised by the species *Aristida canescens*, *Tagetes minuta*, *Rhus lancea*, *Acacia karroo*, *A. robusta* and *A. nilotica*. Other prominent species include the woody species *Euclea crispa*, *E. undulata*, *Acacia mellifera*, *A. tortilis*, *A. caffra*, *Ziziphus mucronata*, *Grewia flava* and *Dichrostachys cinerea*. Prominent species of the herbaceous layer are the forbs *Achyranthes aspera*, *Kyphocarpa angustifolia*, *Sida cordifolia*, *Solanum panduriforme* and *Commelina africana* and the grasses *Cymbopogon plurinodis*, *Cynodon dactylon*, *Aristida congesta* subsp. *congesta*, *A. congesta* subsp. *barbicollis*, *Urochloa mossambicensis*, *Panicum maximum*, *Eragrostis rigidior* and *Digitaria eriantha*.

This microphyllous thorny bushveld occurs in the Transvaal Plateau Basin, comprising the flat Bushveld Basin including the Waterberg, Soutpansberg and Pietersburg plateaux to the North (Cole 1986). It is characteristic of the dark, clayey

soils which developed over basalt in the low lying areas. The *Panico maximi-Acacieta tortilis* gives way to deciduous broad-leaved savanna in upland areas with sandy soils underlain by granite, thus forming an extensive mosaic with the *Terminalio sericeae-Combretetea apiculati*.

Further analysis of the *Panico maximi-Acacieta tortilis* resulted in two synoptic tables, representing two subclasses:

- A. the *Acacienea nilotico-tortilis*, a savanna on more clayey soils (Table 1), and
- B. the *Terminalio sericeae-Acacienea tortilis*, a savanna on relatively sandy soils over clayey subsoils (Table 2).

Tables 1 and 2 are synoptic tables, where each column represents a plant community.

A. *Acacienea nilotico-tortilis* Subclass Nova hoc loco

Nomenclatural type: *Sporobolo nitentis-Acaciatalia tortilis*

The 43 plant communities represented in Table 1 are grouped into 18 noda. These noda represent communities and subcommunities of different hierarchical levels in the *Acacienea nilotico-tortilis*. From this hierarchy three orders, seven alliances and 20 associations are described formally (some newly) according to the code of syntaxonomic nomenclature (Barkman *et al.* 1986). Only community names that were described in publications of various authors were fixed. Those community names that were described in unpublished reports or theses, are not fixed, as the original authors should publish these descriptions first.

The following is a complete classification of all plant communities and presently recognised syntaxa, at various hierarchical levels, of the *Acacienea nilotico-tortilis*:

I. *Panico maximi-Acacieta tortilis* Class Nova

1. *Acaciatalia rehmannianae-tortilis* Order Nova

- 1.1. *Crabbea hirsuta*-*Acacia rehmannaiana*-bushveld
- 1.1.1 *Crabbea hirsuta*-*Acacia rehmannaiana*-*Crotolaria lotoides* bushveld
- *Digitaria eriantha*-*Aloe marlothii* Bush
 - *Rhus pentheri*-*Acacia karroo* Microphyllous Forest
- 1.1.2. *Crabbea hirsuta*-*Acacia rehmannaiana*-*Tephrosia capensis* bushveld
- *Elionurus muticus*-*Themeda triandra* Grassland
 - *Asparagus africanus*-*Acacia tortilis* Savanna
 - *Setaria incrassata*-*Hyparrhenia hirta* Grassland and Bushveld
- 1.1.3. *Crabbea hirsuta*-*Acacia rehmannaiana*-*Setaria nigrirostris* grassland
- *Aristida canescens*-*Aloe ammophila* Grassland
- 1.1.4. *Crabbea hirsuta*-*Acacia rehmannaiana*-*Aristida diffusa* bushveld
- *Aristida diffusa*-*Ormocarpum trichocarpum* Savanna
- 1.1.5. *Crabbea hirsuta*-*Acacia rehmannaiana*-*Ziziphus zeyheriana* bushveld
- *Combretum hereroense*-*Acacia nilotica* Bushveld

1.2. *Acacia hebeclada*-*Acacia rehmannaiana* bushveld

1.2.1. *Acacion permixtae-rehmannaiana* Alliance Nova

- *Spirostacho africanae*-*Acacietum tortilis* Association Nova
- *Eucleo crispae*-*Acacietum tortilis* Association Nova
- *Pogonarthrio squarrosae*-*Acacietum tortilis* Association Nova

1.2.2. *Acacion hebecladae-rehmannaiana* Alliance Nova

- *Zizipho mucronatae*-*Acacietum karroo* (Brown *et al.* 1998, submitted)
- *Sporoboli africanae*-*Acacietum karroo* Association Nova

2. *Acacia tenuispina*-*Acacia tortilis* bushveld

- *Acacia gerrardii*-*Digitaria argyrograpta* community
- *Acacia tenuispina*-*Acacia luederitzii* variation

3. *Rhus leptodictya*-*Acacia tortilis* bushveld

- 3.1. *Rhus leptodictya*-*Olea europaea* subsp. *africana* bushveld

- *Olea europaea-Spirostachys africana* community
- *Olea europaea-Fingerhuthia africana* community

3.2. *Rhus zeyheri-Rhus leptodictya* bushveld

- *Eragrostis curvula* short open savanna
- *Eragrostis barbinodis-Acacia caffra* short open savanna
- *Cymbopogon plurinodis-Acacia karroo* short open savanna
- *Aristida bipartita-Acacia karroo* sparse open savanna

4. *Acacia caffra-Acacia nilotica* bushveld

4.1. *Eragrostis lehmanniana-Acacia caffra* bushveld

- *Carissa bispinosa-Eragrostis gummiflua* variation
- *Carissa bispinosa-Kalanchoe rotundifolia* variation
- *Acacia luederitzii-Acacia karroo* variation
- *Eragrostis chloromelas-Panicum maximum* community
- *Maytenus heterophylla-Chloris virgata* community
- *Stipagrostis uniplumis-Mariscus congestus* community

4.2. *Albizia petersiana-Acacia caffra* bushveld

- *Cymbopogon excavatus-Tagetes minuta* community

5. *Sporobolo nitentis-Acaciatalia tortilis* Order Nova

5.1. *Acacia mellifera-Acacia tortilis* bushveld

5.1.1. *Rhoo ciliatae-Acacion tortilis* Alliance Nova

- *Acacietum melliferae-hereroensis* Association Nova
- *Trago racemosi-Acacietum tortilis* Association Nova
- *Combreto mollis-Rhoetum lanceae* Association Nova

5.1.2. *Acacion erubescens-tortilis* Alliance Nova

- *Combreto hereroensis-Acacietum erubescens*
- *Eucleo undulatae-Acacietum tortilis*
- *Boscio albitruncae-Acacietum luederitzii* Association Nova
- *Acacietum eriolobae-fleckii* Association Nova

5.1.3. *Ischaemo afri-Acacion tortilis* Alliance Nova

- *Aristido bipartitae-Acacietum tortilis* Association Nova

5.1.4. *Spirostacho africanae-Acacion tortilis* Alliance Nova

- *Carisso bispinosae-Acacietum tortilis* Association Nova
- *Sporobolo iocladi-Spirostachetum africanae* Association Nova

5.2. *Eucleo undulatae-Acacion tortilis* Alliance Nova

- *Sporobolo iocladi-Acacietum tortilis* Association Nova
- *Pappeo capensis-Acacietum tortilis* Association Nova
- *Acacietum nilotico-tortilis* Association Nova

6. *Falckio oblongae-Acaciatalia niloticae* Order Nova

6.1. *Falckio oblongi-Acacion nilotica* Alliance Nova

- *Falckio oblongi-Acacietum nilotica* Association Nova

The *Acacienea nilotico-tortilis* is characterised by the absence of the species *Terminalia sericea*, *Peltophorum africanum* and *Combretum apiculatum*, which are diagnostic species of the *Terminalio sericeae-Acacienea tortilis*. The *Acacienea nilotico-tortilis* which is the more typical of the *Panico maximi-Acacienea tortilis*, occurs on clayey soil. This is furthermore confirmed by the presence of woody *Acacia* species e.g. *Acacia permixta*, *A. hebeclada*, *A. rehmanniana*, *A. gerrardii*, *A. tenuispina*, *A. caffra*, *A. erubescens*, *A. luederitzii*, *A. fleckii*, *A. hereroensis*, *A. mellifera*, *A. erioloba*, *A. robusta*, *A. nilotica*, *A. tortilis* and *A. karroo*, normally indicative of xeric clayey soils and typical of microphyllous thorny bushveld (Huntley 1982, 1984).

The species *Panicum maximum*, *Acacia tortilis* (53)¹, *Acacia nilotica* (55) and *A. karroo* (56) will not be repeatedly mentioned in the description of the plant communities.

¹ Figures in brackets up to p.87 refer to the number of the Species Group in Table 1.

Table 1. Synoptic table of the *Acacienea nilotico-tortilis*

Community number	1					2	3		4		5				6			
	1.1.		1.2.				3.1.	3.2.	4.1.	4.2.	5.1.			5.2.				
	1.1.1.	1.1.2.	1.1.3.	1.1.4.	1.1.5.	1.2.1.	1.2.2.				5.1.1.	5.1.2.	5.1.3.	5.1.4.				
Releve number	6 6	6 6 6	6	6	6	0 0 0	9 0	7 7	3 4	1 1 1 2	7 7 8 8 8 8	8	1 1			5 5 6	5	
	3 6	4 5 7	8	1	2	1 2 3	9 0	0 1	9 0	7 8 9 0	5 6 0 1 2 6	5	9 0 1	4 5 7 8	1	2 3 6	8 9 0	5
Species Group 1																		
Crotalaria lotoides	5 2												2 1	2 1 2				
Commicarpus pentandrus	3 1																	
Clematis brachiata	5				3 2													
Portulaca pilosa	5																	
Chloris gayana	5																	
Oxalis corniculata	4	1																
Pupalia lappacea	4																	
Dipcadi viride	4																	
Pseudognaphalium luteo-album	3	1 1																
Hypoestes forskoolii	3	1																
Rhus pentheri	3	1																
Cyperus sexangularis	3	2																
Cuscuta campestris	3	1											1					
Oxygonum dregeanum	2	2																
Grewia retinervis	1	1																
Dyschoriste transvaalensis	2																	
Species Group 2																		
Tephrosia capensis	3 2 1																	
Acanthosperm hispidum	2 1 2																	
Chascanum adenostachyum	2 2 2																	
Helichrysum kraussii	2 1 1																	
Crotalaria burkeana	2 1 1																	
Agathisanthemum bojeri	1 1 1															2		
Helichrysum splendidum	1 1 1																	
Litogyne gariepina	1 1 1															2		1
Brachiaria nigropedata	3 2																	
Bonatea speciosa v. antennifera	2 1																1	
Anthospermum hispidulum	1 2																	
Microchloa caffra	1 2																	
Athrixia elata	2 1																	
Solanum supinum	1 1																	
Vernonia oligocephala	1 1																	
Hypoxis rigidula	1 1																	
Alysicarpus zeyheri	1 1																	
Mariscus rehmannianus	1 1																	
Species Group 3																		
Aerva leucura	5 2	2 2 1																
Cyphostemma cirrhosum	5 1	2 2 1															5 1	
Conyza bonariensis	1 5	1 1 3					2				3						2 1	

Blepharis subvolubilis 2 . 2
 Cyperus textilis 2 . 2

Species Group 15

Asparagus africanus 5 2 3 5 5 2 5 5 2 5 2
 Leucas martinicensis 1 1 3 4 2 2 3 4

Species Group 16

Maytenus senegalensis 3 5 | 1 4 1 | . 3 | 3 | 4 5 5 | 2 2
 Aloe ammophila 1 1 | 2 3 1 | 2 | 2 5 | 2 . 4 | 2 .
 Diospyros lycioides s. guerkei 4 5 | 1 2 1 | . 3 | 3 | 3 5 3 | 4 3 4 2
 Senecio burchellii 4 4 | 1 1 | 2 | 5 5 5 | 3 2
 Lippia javanica 4 5 | 2 4 2 | 3 | . 4 5 | 3 2 2 1 5 2
 Pollichia campestris 5 . | 1 3 | 4 2 5 | . 2
 Aloe marlothii 5 . | 1 . | 2 | 3 2 | 5 2 1
 Acacia rehmanniana . 4 | 1 2 3 | 3 | . 2 4

Species Group 17

Aristida meridionalis 5 2
 Acacia tenuispina 3 4
 Acacia gerrardii 5 3 1
 Setaria verticillata 2 2
 Brachiaria eruciformis 4
 Aristida adscensionis 3 5
 Pennisetum sphacelatum 3
 Tragus berteronianus 2 1 1

Species Group 18

Olea europaea 2 5 5
 Eragrostis heteromera 3 2 2 1
 Cymbopogon plurinodis 4 2 4
 Aristida congesta s. barbicollis 2 2
 Aristida canescens 2 2 3 3
 Setaria pallide-fusca 2 2
 Monsonia burkeana 2 2 1
 Briza minor 2 4

Species Group 19

Alloteropsis semialata 2 . 2 4
 Walafrida tenuifolia 1 . 1 1
 Zinnia peruviana 2 . 2 3 1 2 . 5
 Rhus zeyheri 2 . 2 2 . 2
 Convolvulus sagittatus 1 2
 Ximenia caffra 1 1
 Clerodendrum glabrum 2 2

Species Group 20

Aloe transvaalensis 4 5 | 3 2 1 | . 4
 Vitex rehmannii 2 . 1

Species Group 21

Euclea crispa 5 . 5 2 2 2 | 3 2
 Rhus leptodictya 3 5 . 2 1 5 3

Species Group 22

Eragrostis curvula	. . .	1 1 | 2	3 5 5 | 2 2 . . . . .	. . . . .	5 5 4 | 1 3 . . . . .	. . . . .	2 | . . . . .
Setaria sphacelata	. . .	2 1 1 | . . . . .	3 5 . . . . .	. . . . .	3 2 3 | 2 . . . . .	. . . . .	5
Digitaria argyrograpt	. . .	2 2 . | 2	3 . . . . .	. . . . .	5 1 . . . . .	. . . . .	1

Species Group 23

Melinis repens s. repens	4 3 | 3 3 2 | . . . . .	5 5 | 2 3 3 | . . . . .	. . . . .	4 5 3 | . . . . .	. . . . .	. . . . .	. . . . .
Lantana rugosa	2 5 | 2 2 1 | 2 . . . . .	. . . . .	5 2 4 | 5 4 . . . . .	. . . . .	1 1 | . . . . .	. . . . .	2
Urochloa mosambicensis	4 . | 1 1 1 | 2 . . . . .	. . . . .	. . . . .	5 2 | 3 2 | 1 1 | . . . . .	. . . . .	. . . . .	. . . . .
Elionurus muticus	1 . | 5 4 3 | . . . . .	3 . . . . .	. . . . .	. . . . .	2 2 | 1 3 4 | . . . . .	. . . . .	. . . . .

Species Group 24

Eragrostis lehmanniana	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	3 2 5 3 | 5 . . . . .	. . . . .	4 1 3 | . . . . .
Asparagus larinus	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	5 5 . 3 5 | . . . . .	. . . . .	. . . . .
Grewia monticola	4 2 	2 5 3 4 	5 1

Species Group 25

Maytenus heterophylla	3 	2 1 3 2 1 1 1 	2	5	4 3 1
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Species Group 26

Eragrostis chloromelas	1 1 1 	5	4 5 3 3 	2	5
Kyphocarpa angustifolia	2 2	4 3 	2	3 3	4 5
Eragrostis rigidior	. . . . .	1 1 1 | . . . . .	. . . . .	5	3 2 | . . . . .	5 3 2 | . . . . .	. . . . .	2 2 4 | . . . . .

Species Group 27

Themeda triandra	1 5 | 5 5 3 | 3 5 | 5 4 4 2 | 2	2 5 | 4 4 | 5 5 4 2 | 2 5 . 5 . . . . .	. . . . .	2	2 . 2 | 5 | . . . . .
Digitaria eriantha	4 . | 4 4 1 | . . . . .	2 3 | 4 4 5 | . . . . .	. . . . .	2	3 2 5 3 4 | . . . . .

Species Group 28

Albizia petersiana	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	2	5 | . . . . .
Datura stramonium	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	2
Digitaria sanguinalis	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	5 | . . . . .
Flaveria bidentis	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	5 | . . . . .
Hyperthelia dissoluta	. . . . .	. . . . .	. . . . .	. . . . .	2 | . . . . .	. . . . .	5 | . . . . .
Melinis repens	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	5 | . . . . .
Tribulus terrestris	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	5 | . . . . .
Monocymbium cerasiiformis	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	5 | . . . . .

Species Group 29

Acacia caffra	1	3	1 4 1 	3 5 3 2 5
Paspalum dilatatum	1 3 4 5 3

Species Group 30

Rhus lancea	5 	1 1 	3 4 2 2	5 2	2 3 5
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Species Group 31

Sporobolus africanus	5 	2 	5
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Species Group 32

Tagetes minuta	4 2 2 3 4 	2	1 2 	3	3 5
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Species Group 33

Eustachys paspaloides	3 3 3 2 	2	3	5 5
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Schkuhria pinnata	4	1	1	2	1	3	.	2	5	3	2	.	2	3	5	2	3	1	3	3	1	1	2	.	.	1	2	1	1	.	.			
Lycium cinereum	4	3	.	1	1	2	.	3	2	2	2	1	2	1	1	2	1	1	1	2	1	2	2	2	3	.	.		
Kalanchoe rotundifolia	2	.	2	.	.	.	3	2	2	4	2	4	1	2	1	2	2	1	1	3	2	3	2	5	3	.	.			
Ocimum americanum v. americanum	1	5	.	1	4	.	.	3	3	3	.	3	4	.	.	3	2	2	1	1	1	.	1	1	3	5	1	2	.	.		
Carissa bispinosa	.	2	.	1	.	.	.	5	2	4	2	.	.	5	3	5	5	.	3	.	.	2	1	.	1	.	1	5	5	3	2	5	5	.	.				
Aristida congesta s. congesta	5	.	4	5	1	2	2	3	5	5	5	2	.	2	2	3	3	5	.	4	2	4	2	.	.	
Dichrostachys cinerea	.	1	.	1	.	.	.	4	.	5	2	.	2	.	2	2	4	4	2	3	4	5	5	4	3	3	.	.
Achyranthes aspera	5	5	1	3	2	.	.	3	5	2	.	3	4	2	1	1	.	1	.	2	5	4	.	.	

Species Group 54

Falckia oblonga	5
Salvia repens	5	
Berkheya radula	5	
Senecio apiifolius	4	
Senecio inornatus	3	
Nesaea schinzii	3	

Species Group 55

Acacia nilotica	.	.	.	1	1	.	.	5	4	3	5	4	.	3	5	.	2	.	.	3	2	.	.	4	3	1	3	2	1	3	2	4	4	.	1	4	3	.	.
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Species Group 56

Ziziphus mucronata	4	5	.	3	1	5	.	1	3	.	5	3	.	2	.	5	5	2	5	4	3
Acacia karroo	.	5	.	1	.	.	3	2	3	2	5	5	.	4	3	5	5	4	3	2	5	3	4	.	.	4	4	3	1	3	1	2	2	1	.	3	.	1	4	3	.	.		

1. *Acacietalia rehmanniana-tortilis* Order Nova hoc loco

Nomenclatural type: *Acacion permixtae-rehmanniana*

This bushveld is situated on the Pietersburg Plateau as represented in the Pietersburg Nature Reserve (Bredenkamp *in prep.*) and below the Turfloop Dam, near the University of the North (Bredenkamp & Van Vuuren 1977). The area is underlain by granite. Erosion of the rocks led to the formation of gentle undulating plains, with granite inselbergs.

Acocks (1988) described this vegetation as the Pietersburg Plateau False Grassveld (Veld Type 67). Grass species associated with this veld type include *Themeda triandra*, *Heteropogon contortus*, *Aristida canescens*, *Elionurus muticus*, *Brachiaria serrata* and *Cymbopogon plurinodis*. The woody species *Acacia rehmanniana*, *A. tortilis*, *A. hebeclada*, *A. permixta* and *Maytenus senegalensis* are scattered throughout the grassland. Species Group 16 (Table 1) is characteristic of this bushveld, which consists of two major communities, the first being the *Crabbea hirsuta-Acacia rehmanniana* bushveld from the Pietersburg Nature Reserve and the second the *Acacia hebeclada-Acacia rehmanniana* bushveld below Turfloop Dam.

1.1. *Crabbea hirsuta-Acacia rehmanniana*-bushveld

The individual communities that represent this bushveld were identified and described in the Pietersburg Nature Reserve (Bredenkamp *in prep.*).

Species Group 9 (Table 1) is diagnostic of this community and consists of the species *Crabbea hirsuta* and *Pentarrhinum insipidum*. Five subcommunities were recognised.

1.1.1 *Crabbea hirsuta-Acacia rehmanniana-Crotalaria lotoides* bushveld

This community is found in the Pietersburg Nature Reserve (Bredenkamp *in prep.*). It occurs in disturbed areas and on vertic soils along riverbanks.

Diagnostic species for this community are represented in Species Group 1 (Table 1). Constantly present species of the woody layer include *Maytenus senegalensis*, *Diospyros lycioides* subsp. *guerkei* (16), *Lantana rugosa* (23) and *Ziziphus mucronata* (56). Prominent forbs are *Aerva leucura*, *Cyphostemma cirrhosum*, *Conyza bonariensis*, *Corchorus asplenifolius* (3), *Pentarrhinum insipidum* (9), *Senecio burchellii*, *Lippia javanica* (16) and *Achyranthes aspera* (35). Grasses that occur frequently include *Hyparrhenia hirta* (7), *Melinis repens* subsp. *repens* (23), *Themeda triandra* (27), *Cynodon dactylon* (40) and *Bothriochloa insculpta* (53).

The two communities that represent this community, were recognised by Bredenkamp (*in prep.*) in the Pietersburg Nature Reserve:

- The *Digitaria eriantha-Aloe marlothii* Bush is associated with stone walls and ash deposits of Ndebele ruins (Figure 7). *Aloe marlothii* is characteristic for this community, while *Acacia tortilis* is a prominent tree and the grasses *Digitaria eriantha*, *Urochloa mossambicense* and *Cynodon dactylon* are dominant in the herbaceous layer. The grazing is of high nutritional value, probably due to the ashy deposits, which results in the concentration of game and subsequent overgrazing.
- The is found on vertic soils along the river banks. It is dominated by 8-15m tall individuals of *Acacia karroo*. Constant woody species are *Asparagus suaveolens*, *Rhus lancea* and *R. pentheri*. In the sparse herbaceous layer *Teucrium trifidum*, *Setaria sphacelata*, *Hyparrhenia hirta* and *Chloris gayana* are prominent.

1.1.2. *Crabbea hirsuta-Acacia rehmanniana-Tephrosia capensis* bushveld

Communities described in the Pietersburg Nature Reserve (Bredenkamp *in prep.*) are included in this community. They occur on the upland crests and the concave bottomland areas of the undulating landscape, often on sodic soils.

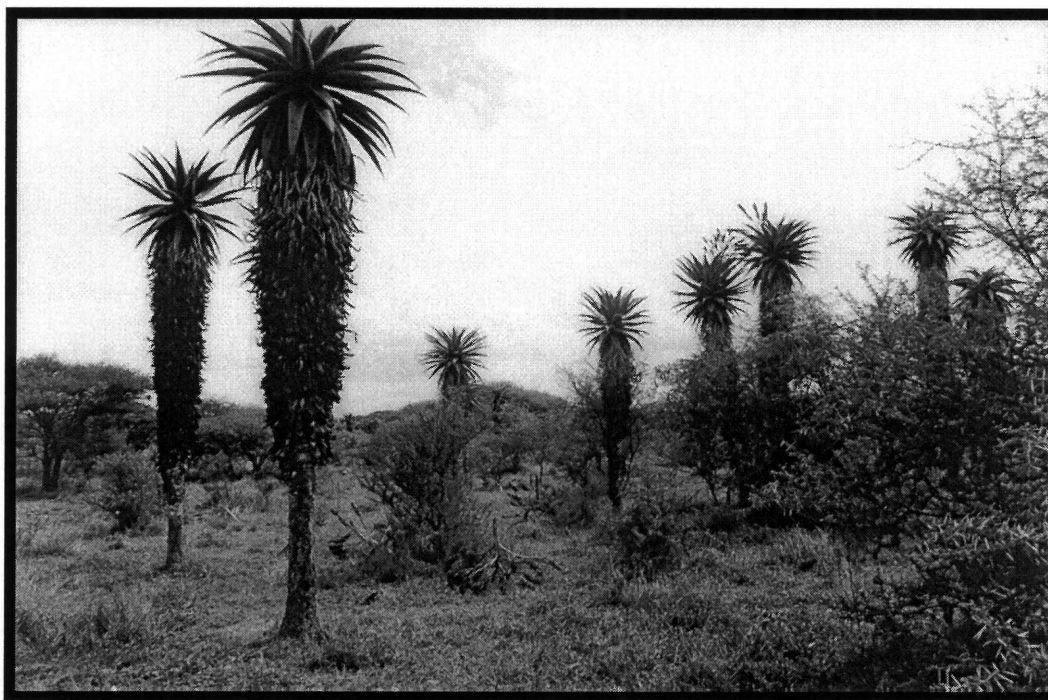


Figure 7. The vegetation of the *Digitaria eriantha*-*Aloe marlothii* Bush

This community is characterised by Species Group 2 (Table 1), which consists of only herbaceous species. However, prominent woody species present in this community include *Maytenus senegalensis* (16) and *Acacia tortilis* (53). Constantly present species of the herbaceous layer are *Aloe ammophila* (16) and the forbs *Rhynchosia confusa* (6), *Crabbea hirsuta* (9), *Commiphora africana* (12), *Lippia javanica* (16), *Achyranthes aspera* (53) and the grass species *Trichoneura grandiglumis* (6), *Hyparrhenia hirta* (7), *Eragrostis trichophora* (8), *Melinis repens* subsp. *repens*, *Elionurus muticus* (23), *Themeda triandra*, *Digitaria eriantha* (27), *Heteropogon contortus* (34), *Cynodon dactylon* (40), *Eragrostis superba*, *Cymbopogon excavatus* (45) and *Aristida congesta* subsp. *congesta* (53).

The following three communities were described by Bredenkamp (*in prep.*):

- The *Elionurus muticus-Themeda triandra* Grassland (Figure 8) occurs on fairly deep soil of the Glenrosa Form on upland crests of undulations. Diagnostic forb species are *Cyphostemma humile* and *Jatropha zeyheri*, while diagnostic grasses include *Eragrostis gummiflua*, *Pogonarthria squarrosa* and *Diheteropogon amplexans*. Other prominent grasses are *Brachiaria nigropedata*, *Aristida diffusa*, *Elionurus muticus*, *Cymbopogon excavatus*, *Eragrostis trichophora* and *Themeda triandra*. This is a sour grassland community which becomes unpalatable during winter.



Figure 8. The vegetation of the *Elionurus muticus-Themeda triandra* Grassland (in the foreground).

- The *Asparagus africanus-Acacia tortilis* Savanna is found on shallow, rocky soils along shallow drainage lines in the concave areas of the undulations. This community is characterised by *Asparagus africanus* and the prominence of *Acacia tortilis*.
- The *Setaria incrassata-Hyparrhenia hirta* Grassland and Bushveld on marshy bottomlands are often waterlogged during the wet season.

Diagnostic species are *Aristida bipartita* and *Setaria incrassata*, while *Hyparrhenia hirta* is dominant in the herbaceous layer. The woody layer is mostly represented by *Acacia rehmanniana*.

1.1.3. *Crabbea hirsuta*-*Acacia rehmanniana*-*Setaria nigrirostris* grassland

This vegetation was described by Bredenkamp (*in prep.*) in the Pietersburg Nature Reserve. The community is identified by the presence of Species Group 4 (Table 1), while Species Group 1 and 2 are absent. The community is species poor. Constantly present grass species include *Eragrostis trichophora* (8), *Themeda triandra* (27), *Cynodon dactylon* (40) and *Bothriochloa insculpta* (53). Forbs are prominent in this community. The most conspicuous species are *Hibiscus trionum*, *Hypoxis hemerocallidea*, *Talinum caffrum* (7), *Menodora africana* (8) and *Commiphora africana* (12).

Bredenkamp (*in prep.*) described this community as follows:

- The *Aristida canescens*-*Aloe ammophila* Grassland occurs on poorly drained sodic duplex soils. The community has a poor species composition. *Aloe ammophila* and the grasses *Aristida canescens* and *Cynodon dactylon* are the most prominent species.

This community is floristically different from the other sub-communities of the *Crabbea hirsuta*-*Acacia rehmanniana* bushveld, since species such as *Maytenus senegalensis*, *Diospyros lycioides*, *Acacia rehmanniana*, *A. nilotica*, *A. tortilis* and *A. karroo* are absent. The absence of these woody species also reflects a structural difference. The species composition of the community however is typically of the Pietersburg Plateau False Grassveld (Acocks 1988) that is surrounded by savanna vegetation and therefore the community is considered as part of the *Crabbea hirsuta*-*Acacia rehmanniana* bushveld.

1.1.4. *Crabbea hirsuta*-*Acacia rehmanniana*-*Aristida diffusa* bushveld

This community is found in the Pietersburg Nature Reserve on slightly rocky slopes (Bredenkamp *in prep.*).

The presence of Species Group 6 (Table 1), with the simultaneous absence of Species Groups 1, 2 and 4 are diagnostic. The herbaceous species *Aristida diffusa*, *Chaetacanthus burchellii*, *Chamaecrista mimosoides*, *Eragrostis racemosa*, *Diheteropogon amplexans*, *Dicoma anomala* are present. Woody species present in this community are *Ormocarpum trichocarpum* (8), *Maytenus senegalensis*, *Diospyros lycioides* subsp. *guerkei* (16), and *Acacia caffra* (29). Conspicuous forbs include *Indigofera torulosa*, *Boophane disticha* (7), *Commiphora africana* (12), *Kyphocarpa angustifolia* (26), *Gnidia capitata* and *Senecio venosus* (35). Prominently present grasses are *Hyparrhenia hirta* (7), *Brachiaria serrata* (11), *Setaria sphacelata* (22), *Melinis repens* subsp. *repens*, *Elionurus muticus* (23), *Eustachys paspaloides* (33), *Heteropogon contortus* (34) and *Themeda triandra* (27).

- This community was originally described by Bredenkamp (*in prep.*) as the *Aristida diffusa*-*Ormocarpum trichocarpum* Savanna which is an open savanna with 2-3m tall trees and a fairly dense grass layer. Characteristic woody species are *Ormocarpum trichocarpum*, *Maytenus heterophylla* and *Acacia caffra*. The grass layer is dominated by *Aristida diffusa*, while *Eragrostis racemosa*, *Themeda triandra* and *Eustachys paspaloides* are also prominent.

1.1.5. *Crabbea hirsuta*-*Acacia rehmanniana*-*Ziziphus zeyheriana* bushveld

This community is found in the Pietersburg Nature Reserve, on the lower slopes of granite inselbergs (Bredenkamp *in prep.*). An example of this bushveld is shown in Figure 9.

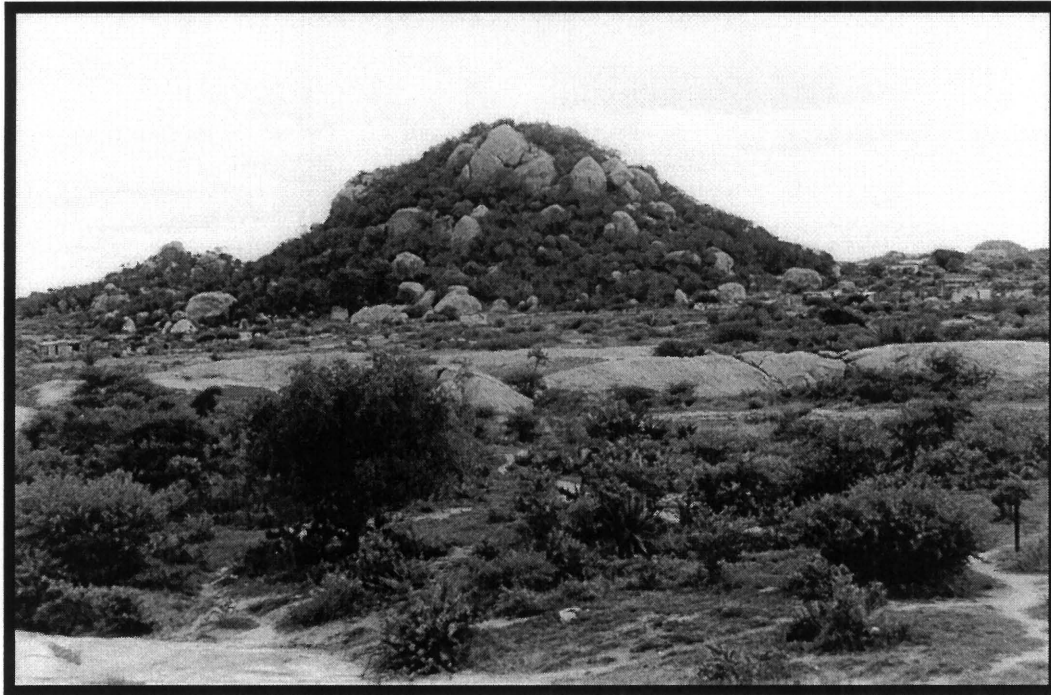


Figure 9. The vegetation of the *Crabbea hirsuta*-*Acacia rehmanniana*-*Ziziphus zeyheriana* bushveld.

The presence of Species Group 8 (Table 1) and absence of Species Groups 1,2,4 and 6 is diagnostic. Species Group 8 consists of the woody species *Ormocarpum trichocarpum* and *Ziziphus zeyheriana* and the herbaceous species *Eragrostis trichophora* and *Menodora africana*. The most constant woody species are *Acacia gerrardii* (17), *Euclea crispa* (21), *Combretum hereroense* (46), *Carissa bispinosa* (53) and *Acacia nilotica* (55). Prominent forbs include *Crabbea hirsuta*, *Pentarrhinum insipidum* (9), *Commiphora africana* (12), *Lippia javanica* (16) and *Kyphocarpa angustifolia* (26). Grasses frequently found are *Brachiaria serrata* (11), *Setaria sphacelata*, *Digitaria argyrograpta* (22), *Melinis repens* subsp. *repens* (23), *Eragrostis chloromelas* (26), *Themeda triandra* (27), *Eustachys paspaloides* (33), *Heteropogon contortus* (34), *Eragrostis gummiflua* (44) and *Bothriochloa insculpta* (53). *Aloe ammophylla* (16) is prominently present.

- This community was described in the Pietersburg Nature reserve by Bredenkamp (*in prep.*) as the *Combretum hereroense*-*Acacia nilotica*

Bushveld, an open savanna of trees and shrubs, with *Combretum hereroense*, *Acacia nilotica* and *A. gerrardii* as the diagnostic species. Other prominent species are *Euclea crispa*, *Carissa bispinosa* and *Acacia tortilis*, as well as the grasses *Themeda triandra*, *Hyparrhenia hirta* and *Eragrostis gummiflua*.

1.2. *Acacia hebeclada*-*Acacia rehmanniana* bushveld

This bushveld is typically found on the Pietersburg plateau, close to Turfloop Dam (Bredenkamp & Van Vuuren 1977).

Diagnostic species of the community are listed in Species Group 14 (Table 1). The community can be divided into two Alliances: the *Acacion permixtae-rehmanniana* on the slopes of the undulating terrain and the *Acacion hebecladae-rehmanniana* along stream bank and on the plains adjacent to the streams.

1.2.1. *Acacion permixtae-rehmanniana* Alliance Nova hoc loco

(Synonym: *Acacia tortilis* Savanna (Bredenkamp & Van Vuuren 1977))

Nomenclatural type: *Euclea crispae*-*Acacietum tortilis*

This community is found on sandy loam soils below Turfloop Dam (Figure 10). The vegetation occurs on the slopes of the slightly undulating landscape (Bredenkamp & Van Vuuren 1977).

Diagnostic of this community is Species Group 10 (Table 1). Constantly present species of the woody layer are *Acacia hebeclada* (14), *Asparagus africanus* (15), *Maytenus senegalensis*, *Diospyros lycioides* subsp. *guerkei* (16), *Lantana rugosa* (23) and *Acacia nilotica* (55). Prominent forbs include *Ehrharta melicoides* (10), *Solanum panduriforme* (14), *Senecio burchellii*, *Pollichia campestris* (16). Grass species common to this community are

Eragrostis curvula (22), *Melinis repens* subsp. *repens* (23), *Themeda triandra*,
Digitaria eriantha (27), *Cynodon dactylon* (40) and *Eragrostis superba* (45).

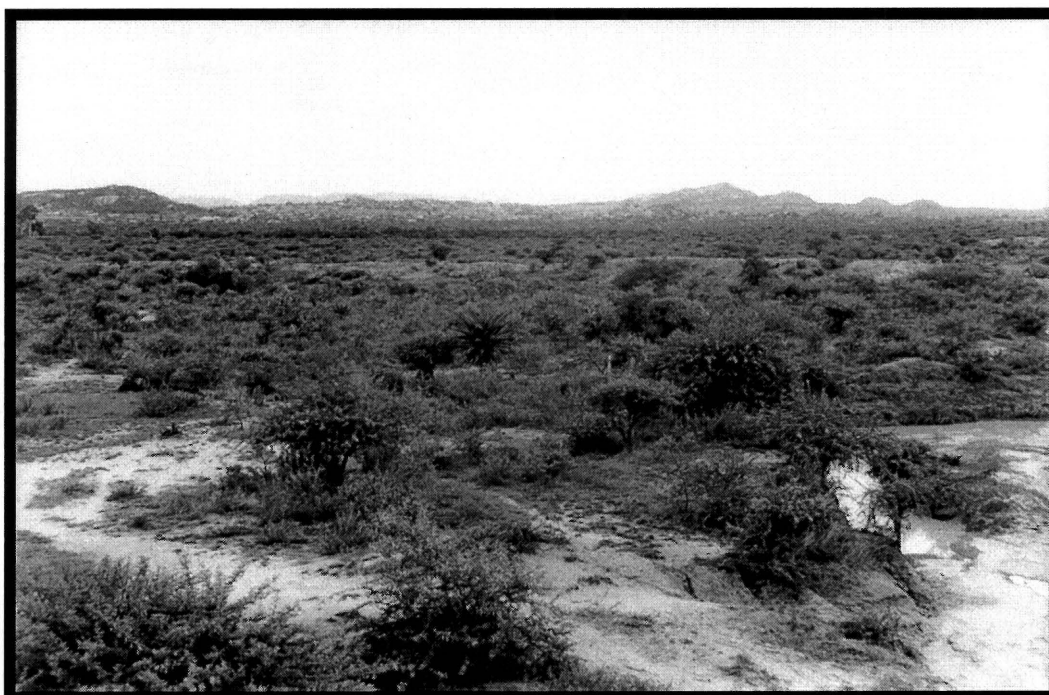


Figure 10. The vegetation of the *Acacion permixtae-rehmanniana*.

This vegetation was described on the north-eastern part of the Pietersburg plateau, close to Turfloop Dam, as the *Acacia tortilis* Savanna (Bredenkamp & Van Vuuren 1977). It is represented by three associations:

- *Spirostacho africanae-Acacietum tortilis* Association Nova hoc loco (Synonym: *Acacia tortilis-Spirostachys africana* Savanna (Bredenkamp & Van Vuuren 1977)).

Nomenclatural type: Relevé 16, Table 1 (Bredenkamp & Van Vuuren 1977).

The description of the *Acacia tortilis-Spirostachys africana* Savanna by Bredenkamp & Van Vuuren (1977 - p.17) is considered as the diagnosis for this association.

This vegetation is situated on south facing slopes on deep, reddish-brown sandy loam to sandy clay loam soils. This community is characterised by the woody species *Spirostachys africana*, *Ehretia rigida* and *Rhus leptodictya* and the herbs *Brachiaria serrata* and *Oxalis* species. Conspicuous of this community is the variation in floristic composition and vegetation structure.

- *Eucleo crispae-Acacietum tortilis* Association Nova hoc loco
(Synonym: *Acacia tortilis-Euclea crispa* Savanna (Bredenkamp & Van Vuuren 1977)).

Nomenclatural type: Relevé 26, Table 1 (Bredenkamp & Van Vuuren 1977).

The description of the *Acacia tortilis-Euclea crispa* Savanna by Bredenkamp & Van Vuuren (1977) is considered as the diagnosis for this association.

This savanna occurs on dark brown acid soils. *Maytenus senegalensis* and *Acacia tortilis* are the dominant trees, while *Diospyros lycioides* subsp. *guerkei*, *Acacia hebeclada*, *A. nilotica* and *A. karroo* are also present. The prominent grasses are *Cynodon dactylon* and *Aristida congesta* subsp. *congesta*.

- *Pogonarthrio squarrosae-Acacietum tortilis* Association Nova hoc loco
(Synonym: *Acacia tortilis-Pogonarthria squarrosa* Savanna (Bredenkamp & Van Vuuren 1977)).

Nomenclatural type: Relevé 28, Table 1 (Bredenkamp & Van Vuuren 1977).

The description of the *Acacia tortilis-Pogonarthria squarrosa* Savanna by Bredenkamp & Van Vuuren (1977) is considered as the diagnosis for this association.

This savanna is characterised by *Pogonarthria squarrosa*, *Withania somnifera*, *Kalanchoe rotundifolia*, *Commelina africana*, *Carissa bispinosa* and *Aloe ammophila*. The tree stratum is dominated by *Maytenus senegalensis*, *Acacia nilotica* and *A. tortilis*, with *Aristida congesta* subsp. *congesta* and *Cynodon dactylon* being the most prominent grasses. This community is found on north facing slopes on dark reddish brown soils.

1.2.2. *Acacion hebecladae-rehmannianae* Alliance Nova hoc loco

(Synonym: *Acacia karroo* Riverine Communities (Bredenkamp & Van Vuuren 1977)).

Nomenclatural type: *Zizipho mucronatae-Acacietum karroo*

This vegetation is typically found in the vicinity of the Turfloop Dam. It occurs mainly along streams and adjacent areas of clayey soils.

The only character species of this community is *Xanthium spinosum* (Species Group 13, Table 1). The species *Aloe greatheadii*, *A. cryptopoda* (14) and *A. marlothii* (16) are constantly present in this community. Prominent woody species are *Asparagus africanus* (15), *Acacia rehmanniana* (16), *Lantana rugosa* (23), *Rhus pyroides* (46) and *Acacia karroo* (56). Forbs prominently present include *Solanum panduriforme*, *Bidens bipinnata* (14), *Leucas martinicensis* (15), *Tagetes minuta* (32), *Schkuhria pinnata* and *Achyranthes aspera* (53). The most constantly present grasses are *Setaria incrassata* (14) and *Cynodon dactylon* (40).

This alliance is represented by two associations as described close to Turfloop Dam (Bredenkamp & Van Vuuren 1977):

- *Zizipho mucronatae-Acacietum karroo* Association (Brown *et al.* 1998, submitted)

(Synonym: *Acacia karroo-Ziziphus mucronata* Thickets (Bredenkamp & Van Vuuren 1977)).

Thicket along stream banks has a very dense tree stratum and is dominated by *Acacia karroo*. Characteristic of this community are the species *Ziziphus mucronata*, *Aloe marlothii* and *Rubia petiolaris*. Young plants of *Acacia karroo* are prominent in the shrub layer. In the herb layer *Cynodon dactylon* is the most abundant species, while *Panicum maximum*, *Setaria incrassata* and *Achyranthes aspera* are prominent under the trees.

- *Sporoboli africani-Acacietum karroo* Association Nova hoc loco (Synonym: *Acacia karroo-Sporobolus africana* Savanna (Bredenkamp & Van Vuuren 1977)).

Nomenclatural type: Relevé 21, Table 1 (Bredenkamp & Van Vuuren 1977).

The description of the *Acacia karroo-Sporobolus africana* Savanna by Bredenkamp & Van Vuuren (1977) is considered as the diagnosis for this association. This savanna occurs on clay soils, usually adjacent to the *Acacia karroo-Ziziphus mucronata* Thicket. The herbaceous species *Sporobolus africanus*, *Schkuhria pinnata* and *Sida rhombifolia* characterise this variation. The prominent trees are *Acacia karroo*, *Rhus pyroides* and *Acacia rehmanniana*. Constantly present herbaceous species are the grasses *Cynodon dactylon*, *Sporobolus africanus*, *Setaria incrassata* and the forbs *Achyranthes aspera*, *Schkuhria pinnata*, *Sida rhombifolia* and *Solanum panduriforme*.

2. *Acacia tenuispina-Acacia tortilis* bushveld

This community was originally described by Van Essen (1993) on the farm Bosveld Rentmeesters, situated on the Springbok Flats near the town Roedtan. This area is part of the Springbok Flats Turf Thornveld (Veld Type 12, Acocks 1988), which is characterised by the presence of various *Acacia* species.

Diagnostic species of this community are listed in Species Group 17 (Table 1) and includes the woody species *Acacia gerrardii* and *A. tenuispina*. Other conspicuous woody species are *Grewia flava* (52) and *Acacia nilotica* (55). Prominently present grasses are *Digitaria argyrograpta* (22), *Urochloa mosambicensis* (23), *Eragrostis chloromelas* (26) and *Panicum maximum* (44).

Van Essen (1993) described the following two communities on the farm Bosveld Rentmeesters:

- The *Acacia gerrardii*-*Digitaria argyrograpta* community. The trees *Acacia gerrardii* and *Grewia flava* are prominent. Grasses frequently found in this community are *Digitaria argyrograpta*, *Eragrostis rigidior* and *Urochloa mosambicense*.
- The *Acacia tenuispina*-*Acacia luederitzii* variation. Constantly present species of the woody layer are *Acacia tenuispina*, *A. luederitzii*, *A. tortilis*, *A. nilotica* and *Grewia flava*. The herbaceous layer includes *Fingerhuthia africana*, *Cenchrus ciliaris*, *Themeda triandra* and *Panicum maximum*.

3. *Rhus leptodictya*-*Acacia tortilis* bushveld

The particular species composition of this bushveld community is found in Mabula Game Reserve, close to Warmbaths (Van Schalkwyk 1993) and on the Doornpoort Experimental Farm, north of Pretoria (Smith 1992).

Species Group 20 (Table 1) represents the diagnostic species of this community. Two sub-communities were identified: the *Rhus leptodictya*-*Olea europaea* subsp. *africana* bushveld and the *Rhus leyheri*-*Rhus leptodictya* bushveld, characterised by clayey soils.

3.1. *Rhus leptodictya* subsp. *africana*-*Olea europaea* bushveld

This community consists of vegetation found in the Mabula Game Reserve (Van Schalkwyk 1993). Acocks (1988) described this vegetation as Sourish Mixed Bushveld (Veld Type 19), which is dominated by *Acacia caffra* in a tall, dense grassveld with *Cymbopogon plurinodis*, *Themeda triandra*, *Elionurus muticus* and *Hyparrhenia* species being the most prominent.

Species Group 18 (Table 1) is diagnostic for this community, with *Olea europaea* as the most prominent species. Other prominent trees and shrubs include *Aloe transvaalensis* (20), *Maytenus heterophylla* (25), *Rhus lancea* (30), *Maytenus polyacantha* (35), *Euclea undulata* (46), *Grewia flava* (52), *Carissa bispinosa* (53) and *Acacia karroo* (56). Grasses prominently present are *Urochloa mosambicensis* (23), *Eragrostis chloromelas* (26), *Themeda triandra* (27), *Heteropogon contortus* (34) and *Eragrostis gummiflua* (44).

Van Schalkwyk (1993) recognised the two communities representing this vegetation in Mabula Game Reserve:

- The *Olea europaea-Spirostachys africana* community is dominated by the woody species *Spirostachys africana*, *Maytenus polyacantha*, *Carissa bispinosa*, *Olea europaea* subsp. *africana* and *Euclea undulata* and the grasses *Eragrostis gummiflua* and *Panicum maximum*.
- The *Olea europaea-Fingerhuthia africana* community is characterised by the species *Fingerhuthia africana*, *Acacia luederitzii* and *Acacia mellifera*. Other species constantly present are *Maytenus polyacantha*, *Olea europaea* subsp. *africana*, *Themeda triandra* and *Panicum maximum*.

3.2. *Rhus zeyheri-Rhus leptodictya* bushveld

This bushveld occurs on the Doornpoort Experimental farm north of Pretoria (Smith 1992). The vegetation is part of the Other Turf Thornveld (Veld Type 13), as described by Acocks (1988). Clayey soils of the Arcadia (vertic A

horizon), Rensburg (vertic A horizon over a G horizon) and Shortlands (orthic A horizon over a red structured B horizon) Forms (Soil Classification Workgroup 1991) are features of this community.

The diagnostic species of this community are represented in Species Group 19 (Table 1). Constantly present woody species include *Dichrostachys cinerea* (53), *Acacia nilotica* (55) and *A. karroo* (56). The herbaceous layer consists of the grass species *Eragrostis curvula*, *Setaria sphacelata* (22), *Melinis repens* subsp. *repens* (23), *Themeda triandra* (27), *Cynodon dactylon* (40) and *Bothriochloa insculpta* (53).

Four communities were originally described by Smith (1992) at Doornpoort:

- The *Eragrostis curvula* short open savanna is associated with very fertile soils of the Arcadia and Rensburg Forms. Conspicuous woody species are *Acacia karroo*, *A. nilotica*, *Dichrostachys cinerea* and *Ziziphus mucronata*. The most prominent grass species is *Eragrostis curvula*, while *Themeda triandra*, *Heteropogon contortus*, *Bothriochloa insculpta* and *Melinis repens* subsp. *repens* are also constantly present. Forbs encountered in the community are *Solanum panduriforme* and *Felicia muricata*.
- The *Eragrostis barbinodis*-*Acacia caffra* short open savanna occurs on red, non-swelling clay soils of the Shortlands Form. Diagnostic species are *Acacia caffra*, *Clerodendrum glabrum* and the grass *Eragrostis barbinodis*. *Acacia nilotica* and *A. karroo* constantly occur in the woody layer. Grass species that are widely distributed in this community include *Heteropogon contortus*, *Bothriochloa insculpta* and *Aristida congesta* subsp. *congesta*.
- The *Cymbopogon plurinodis*-*Acacia karroo* short open savanna. The grass species *Cymbopogon plurinodis*, *Elionurus muticus* and *Hyparrhenia filipendula* are diagnostic for this community. *Acacia karroo* is the most prominent woody species. Other prominent grass species include *Themeda*

triandra, *Eragrostis curvula*, *Melinis repens* subsp. *repens* and *Aristida congesta* subsp. *congesta*. The community is found on red Shortlands and Hutton Forms (orthic A horizon over a red apedal B horizon), soils with a clay percentage of 20.1%-55.0%.

- The *Aristida bipartita*-*Acacia karroo* sparse open savanna is restricted to old lands on clay soils of the Rensburg, Arcadia and Shortlands soil forms. Diagnostic species are *Aristida bipartita*, *Dichantium aristatum* and *Hibiscus trionum*. *Acacia karroo*, *Aristida bipartita*, *Ischaemum afrum* and *Cynodon dactylon* are species that are frequently found in this community. The highest density of individuals (2308 ind/ha) is found in the 0.5m height class and indicates the area is in an early phase of recovery.

4. *Acacia caffra*-*Acacia nilotica* bushveld

This species composition is typical of the vegetation in the Aventura Nature Reserve, Warmbaths (Hattingh 1994). It is characterised by sandy loam and sandy clay loam soils. The vegetation occurs on the transitional area between the Sourish Mixed Bushveld and Turf Thornveld (Acocks 1988).

Diagnostic species for this community are *Acacia caffra* and *Paspalum dilatatum* (Species Group 29, Table 1). This bushveld is divided into two major communities, namely the *Eragrostis lehmanniana*-*Acacia caffra* bushveld and the *Albizia petersiana*-*Acacia caffra* bushveld.

4.1. *Eragrostis lehmanniana*-*Acacia caffra* bushveld

Species Group 24 (Table 1) is diagnostic for this community, which is found in the Aventura Nature Reserve at Warmbaths (Hattingh 1994). Conspicuous woody species are *Acacia caffra* (29), *Acacia luederitzii* (36) and *Acacia karroo* (56). In the herbaceous layer the forbs *Kyphocarpa angustifolia* (26), *Ocimum americanum* var. *americanum* (53) and the grasses *Digitaria eriantha*

(27), *Paspalum dilatatum* (29), *Heteropogon contortus* (34) and *Cynodon dactylon* (40) are prominent.

Hattingh (1994) described the communities that constitute this bushveld community:

- The *Carissa bispinosa-Eragrostis gummiflua* variation is an overgrazed community. The diagnostic species is *Eragrostis gummiflua*, while *Panicum maximum*, *Cynodon dactylon* and *Paspalum dilatatum* occur frequently. Dense stands of *Acacia mellifera* and *Dichrostachys cinerea* are present in this community. The forb *Asparagus larycinus* is prominent.
- The *Carissa bispinosa-Kalanchoe rotundifolia* variation is characterised by dark sandy loam soils with patches of white brackish soil in between. The grass species *Aristida canescens*, *A. junciformis* and *A. stipitata* are diagnostic together with a variety of forbs, of which *Kalanchoe rotundifolia* is the most abundant. *Acacia mellifera* and *Dichrostachys cinerea* are the most prominent woody species. The community is overgrazed and as a result of that sheet erosion is present in an advanced state.
- The *Acacia luederitzii-Acacia karroo* variation. Species constantly present in this community are the forb *Cleome rubella* and the grasses *Themeda triandra*, *Aristida congesta* subsp. *congesta*, *Heteropogon contortus*, *Panicum maximum* and *Eragrostis lehmanniana*. The most prominent woody species are *Acacia karroo* and *Grewia monticola*.
- The *Eragrostis chloromelas-Panicum maximum* community lies adjacent to an refuse-dump and to a vlei area. Diagnostic species are *Eragrostis chloromelas*, *Festuca scabra* and the forb *Chaetacanthus burchellii*. The trees *Dichrostachys cinerea*, *Acacia karroo* and *Ziziphus mucronata* occur constantly. The community has a high percentage surface rocks.

- The *Maytenus heterophylla-Chloris virgata* community is found on sandy clay loam soil. Diagnostic species are the woody species *Maytenus heterophylla*, the forb *Datura stramonium* and the grasses *Chloris virgata* and *Briza minor*. In the woody layer *Acacia karroo*, *Rhus pyroides*, *Ziziphus mucronata* and *Dichrostachys cinerea* are conspicuous. Prominent herbaceous species include the forbs *Kyphocarpa angustifolia* and *Schkuhria pinnata*, as well as the grasses *Themeda triandra*, *Heteropogon contortus* and *Eragrostis trichophora*. The community has a high Ecological Index, indicating a good veld condition.
- The *Stipagrostis uniplumis-Mariscus congestus* community is a vlei area that is flooded during the rain season. The soil is a black clay and poorly drained, leading to marshy condition during the wet summer months. The sedges *Mariscus congestus* and *Schoenoplectus corymbosus* and the grass *Stipagrostis uniplumis* are diagnostic for this community. Constantly present woody species are *Acacia tortilis* and *Rhus lancea*. In the herbaceous layer *Kyphocarpus angustifolia* is prominent.

4.2. *Albizia petersiana-Acacia caffra* bushveld

This community occurs in the Aventura Nature Reserve, Warmbaths (Hattingh 1994).

Diagnostic species of this community are listed in Species Group 28 (Table 1). The woody species *Acacia caffra* (29) and *Rhus lancea* (30) are prominently present. Herbaceous species occurring frequently in the community include the forbs *Tagetes minuta* (32) and *Schkuhria pinnata* (53), as well as the grass species *Paspalum dilatatum* (29), *Sporobolus africanus* (31), *Eustachys paspaloides* (33), *Heteropogon contortus* (34), *Cynodon dactylon* (40), *Tragus racemosus* (43) and *Cymbopogon excavatus* (45).

- This community was described by Hattingh (1994) in the Aventura Nature Reserve (Warmbaths) as the *Cymbopogon excavatus-Tagetes minuta* community, a severely degraded area as indicated by the grass species *Cymbopogon excavatus*, *Tragus racemosus*, *Aristida adscensionis*, *Hyparrhenia dissoluta*, *Paspalum dilatatum* and *Digitaria sanguinalis*. Diagnostic forbs include *Tagetes minuta*, *Tribulus terrestris* and *Datura stramonium*, all pioneer species. The only diagnostic woody species is *Albizia petersiana*, but *Acacia caffra* and *Rhus lancea* are also prominent. Extensive damage to the vegetation is caused by vehicles.

5. *Sporobolo nitentis-Acaciatalia tortilis* Order Nova hoc loco

(Synonym: *Acacia tortilis-Panicum maximum* Woodland Order (Van der Meulen 1979))

Nomenclatural type: *Acacion erubescens-tortilis*

This bushveld is situated in parts of the Northern and North West provinces (Van der Meulen 1979), as well as the Nylsvley Nature Reserve (Coetzee *et al.* 1976). A feature of these areas is the presence of clumps of vegetation on termite mounds.

Species Group 49 (Table 1) is characteristic of this bushveld. Two major communities were identified, namely the *Acacia mellifera-Acacia tortilis* bushveld and the *Euclea undulata-Acacia tortilis* bushveld.

5.1. *Acacia mellifera-Acacia tortilis* bushveld

This bushveld vegetation was described as part of a phytosociological study done by Van der Meulen (1979) in a part of the Northern and North West provinces (formerly known as the western Transvaal).

The diagnostic species for this community are listed in Species Group 43 (Table 1). Woody species associated with this vegetation are *Acacia mellifera* (43), *A. robusta* (51), *Grewia flava* (52), *Ehretia rigida* (53), *Acacia nilotica*

(55) and *Acacia karroo* (56). Prominently present herbaceous species include the grasses *Eragrostis superba* (45), *Sporobolus nitens* (49) and *Panicum maximum* (53). Four alliances were identified in this vegetation type.

5.1.1. *Rhoo ciliatae*-*Acacion tortilis* Alliance Nova hoc loco

Nomenclatural type: *Combretum mollis*-*Rhoetum lanceae*

This alliance includes the Transitional Woodland as described by Van der Meulen (1979). This particular vegetation is found on the Mafekeng plateau on shallow sandy or stony soils.

Species Group 35 (Table 1) is diagnostic for the community. Other constantly present species include the woody species *Acacia robusta* (51), *Grewia flava* (52), *Ehretia rigida* (53), *Acacia nilotica* (55) and *A. karroo* (56). Conspicuous species of the herbaceous layer are the forbs *Aptosimum procumbens* (37), *Monsonia angustifolia* (43), *Teucrium trifidum* (49) and *Schkuhria pinnata* (53), as well as the grasses *Cynodon dactylon* (40), *Eragrostis superba* (45) and *Sporobolus nitens* (49).

Several communities representing this bushveld vegetation were described by Van der Meulen (1979):

- *Acacietum melliferae-hereroensis* Association Nova hoc loco
(Synonym: *Acacia hereroense* Variant (Van der Meulen 1979))
Nomenclatural type: Relevé 405, Table 3 (Van der Meulen 1979)

The description of the *Acacia hereroense* Variant by Van der Meulen (1979 - p.75) is considered the diagnosis for this association.

This variant is a degraded community occurring as scattered fragments in ploughed land on the Mafekeng plateau. *Acacia hereroense*, *Rhus ciliata*, *Chrysocoma polygalifolia* and *Helichrysum cerastioides* are diagnostic

species in the community. Prominently present species include *Acacia karroo*, *Grewia flava* and *Tarchonanthus camphoratus*. The most constantly occurring shrub is *Vitex zeyheri*.

- *Trago racemosi-Acacieta tortilis* Association Nova hoc loco
(Synonym: *Acacia tortilis-Tragus racemosus* Woodland Association (Van der Meulen 1979))
Nomenclatural type: Relevé 36, Table 4 (Van der Meulen 1979)
(Relevé 27 designated by Van der Meulen as nomenclatural type cannot be considered as valid since it does not contain the species *Acacia tortilis*.)

Van der Meulen (1979) described the *Acacia tortilis-Tragus racemosus* Woodland (Table 4, p.101) as an association. Although the association name was not validly published, the description on p.101 is considered as the diagnosis for this association.

The association is found on structured, sometimes colluvial and stony soils of bottomlands. Diagnostic species for this community include the forbs *Schkuhria pinnata*, *Achyroopsis avicularis* and *Lycium cinereum* and the grasses *Tragus racemosus*, *Bothriochloa insculpta* and *Cynodon dactylon*. The most constant trees found are *Rhus lancea* and species of *Acacia*. A feature of the community is bare, usually eroded ground, alternating with patches of grass. Common pioneer grass species in this community are *Tragus racemosus*, *Aristida congesta* subsp. *congesta*, *Chloris virgata* and *Sporobolus nitens*.

- *Combreto mollis-Rhoetum lanceae* Association Nova hoc loco
(Synonym: *Rhus lancea-Brachiaria serrata* woodland (Van der Meulen 1979))
Nomenclatural type: Relevé 11, Table 4 (Van der Meulen 1979)

The description of the *Rhus lancea-Brachiaria serrata* Woodland by Van der Meulen (1979 - p.101) is considered as the diagnosis for this association, although this association name was not validly published.

This vegetation occurs on the lower slopes of hillsides. Diagnostic woody species are *Combretum molle*, *Maytenus polyacantha*, *Buddleja saligna*, *Jasminum breviflorum*, *Grewia occidentalis* and *Cassine burkeana*. In the herbaceous layer *Phyllanthus parvulus*, *Anthospermum rigidum*, *Gnidia capitata*, *Brachiaria serrata*, *Diheteropogon filifolius* and *Cymbopogon excavatus* are diagnostic. Other common species include *Rhus lancea*, *Euclea undulata* and *Olea africana*, as well as *Eragrostis lehmanniana*, *Heteropogon contortus*, *Hibiscus pusillis*, *Lippia javanica* and *Themeda triandra* of the herbaceous layer.

5.1.2. *Acacion erubescens-tortilis* Alliance Nova hoc loco

Nomenclatural type: *Euclea undulatae-Acacietum tortilis*

This bushveld is situated around Pilanesberg, between Rustenburg and Pretoria, in the Skuinsdrif-Lindleyspoort area and around Pienaarsrivier, to the north of Pretoria (Figure 11). It occurs on soils of the Hutton, Mispah (orthic A horizon over rock), Shortlands and Oakleaf (orthic A horizon over a neocutanic B horizon)(Soil Classification Workgroup 1991) Forms.

Diagnostic species of the community are represented in Species Group 36 (Table 1) and includes *Acacia erubescens* and *A. fleckii*. Prominent woody species are *Boscia albitrunca*, *Acacia mellifera* (43), *A. robusta* (51), *Grewia flava* (52), *Ehretia rigida* (53), *Acacia nilotica* (55) and *A. karroo* (56). Forbs constantly present include *Aptosimum procumbens* (37), *Heliotropium ciliatum* (39), *Abutilon austro-africanum*, *Pavonia burchellii* and *Hirpicium bechuanense* (43). Grass species frequently found in this community are *Eragrostis superba* (45) and *Urochloa brachyura* (49).

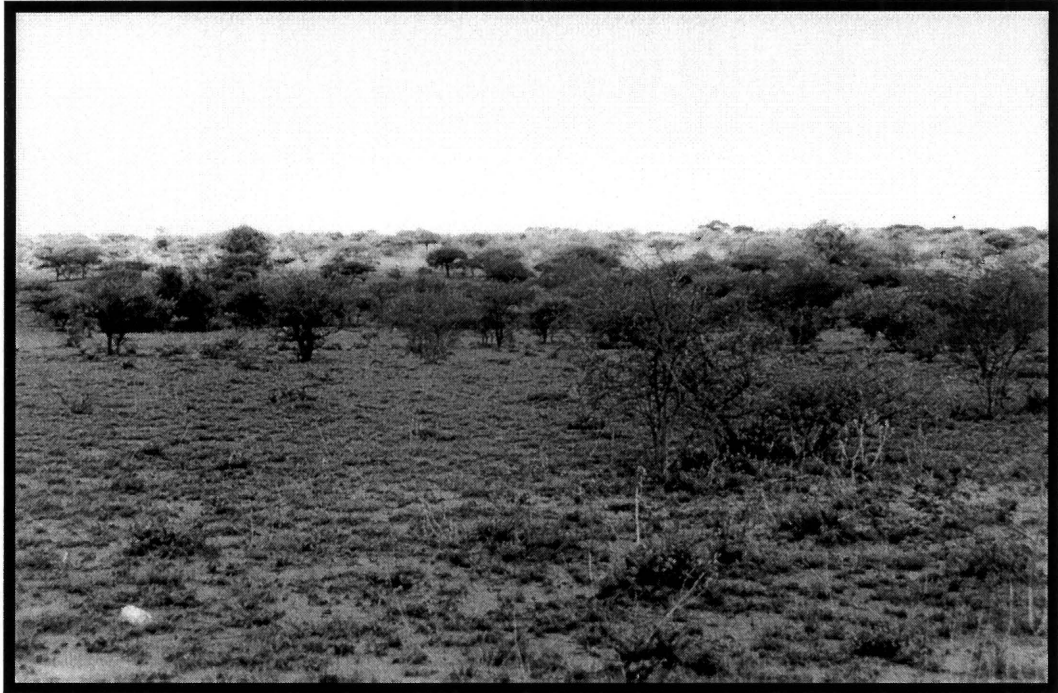


Figure 11. The vegetation of the *Acacion erubescens-tortilis*.

The associations representing this bushveld were originally described (though not validly and some of these syntaxa were validated by Brown *et al.* 1998, submitted) by Van der Meulen (1979) in parts of the North West and Northern Provinces:

- *Combreto hereroensis-Acacieta erubescens* (Brown *et al.* 1998, submitted)
(Synonym: *Acacia erubescens* Association (Van der Meulen 1979))

This vegetation type is found on ferro-gabbro. It occurs north-east of Pilanesburg and between Rustenburg and Pretoria. The characteristic tree of this vegetation is *Acacia erubescens*. The other character species are *Boerhavia erecta*, *Phyllanthus parvulus* and *Oropetium capense*. Prominent woody species include *Grewia flava*, *Acacia tortilis* and *Ziziphus mucronata*. *Acacia nilotica*, *A. karroo*, *A. mellifera*, *A. robusta* and *Dichrostachys cinerea* are present, but with a low constancy. Typical grasses of this vegetation are *Panicum maximum*, *Urochloa brachyura*,

Aristida congesta subsp. *congesta* and *Eragrostis lehmanniana*. On shallow and gravelly soil, dense stands of *Acacia erubescens* are found, but on the deeper, more structured soils the vegetation is less dense.

- *Eucleo undulatae-Acacieta tortilis* (Brown *et al.* 1998, submitted)
(Synonym: *Acacia tortilis* Association (Van der Meulen 1979))

This association found mainly in the Skuinsdrif-Lindleyspoort area. Prominent trees and shrubs are *Acacia tortilis*, *A. nilotica*, *A. mellifera* and *Grewia flava* (Figure 12). The most important species in the grass layer includes *Panicum maximum*, *Aristida congesta* subsp. *congesta*, *Eragrostis lehmanniana* and *Cymbopogon plurinodis*. Serious bush encroachment is taking place in parts of this vegetation type, where almost pure stands of *Acacia mellifera* shrubs can be found. Low thickets of *Acacia nilotica* and *A. tortilis* are also common in this area. An interesting vegetation pattern is observed, where stripes of bush alternate with narrow lanes of grassland (Van der Meulen & Morris 1979). This phenomenon can be attributed to differences in soil drainage. The stripes of bush are found on deeper, better-drained, red soils of the Hutton and Shortlands Form. The grassland lanes occur on poorly-drained, yellow-brown soils of the Avalon Form (orthic A horizon over a yellow-brown apedal B horizon over a soft plinthic B horizon) or Glencoe (orthic A horizon over a yellow-brown apedal B horizon over a hard plinthic B horizon)(Soil Classification Workgroup 1991) Form.

- *Boscio albitruncae-Acacieta luederitzii* Association Nova hoc loco
(Synonym: *Acacia luederitzii-Boscia albitrunca* Association (Van der Meulen 1979))
Nomenclatural type: Relevé 271, Table 3 (Van der Meulen 1979)

The description of the *Acacia luederitzii*-*Boscia albitrunca* Association by Van der Meulen (1979 - p.71) is considered the diagnosis for this association, although his association name was not validly published.

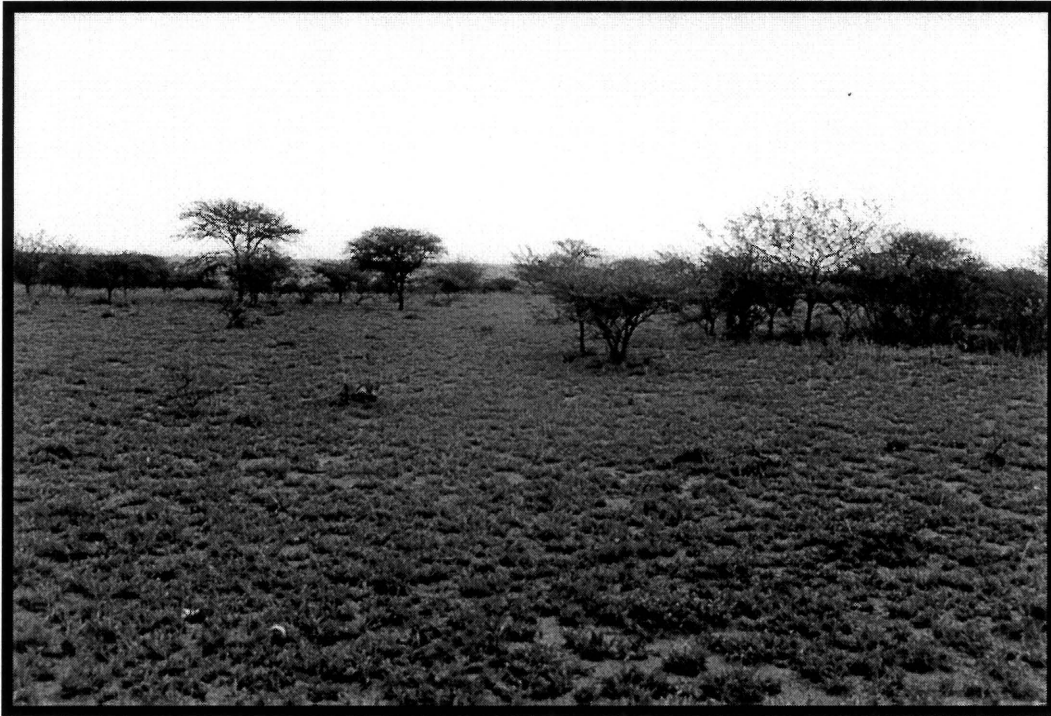


Figure 12. The vegetation of the *Eucleo undulatae*-*Acacietum tortilis*.

This vegetation is a low, semi-closed thorny woodland, found at low altitudes (900-1080m) on sandy deposits. The diagnostic species for this association is *Acacia luederitzii*, while *A. tortilis*, *A. mellifera*, *Boscia albitrunca*, *Dichrostachys cinerea* and *Tarchonanthus camphoratus* are constantly present. Prominent species of the herbaceous layer are *Panicum maximum*, *Aristida congesta* subsp. *congesta*, *Eragrostis lehmanniana* and *Aloe transvaalensis*. Soils are usually of the Hutton Form (red sands), but darker, calcareous soils of the Oakleaf Form are found in depressions.

- *Acacietum eriolobae-fleckii* Association Nova hoc loco
(Synonym: *Acacia erioloba*-*Acacia fleckii* Association (Van der Meulen 1979))

Nomenclatural type: Relevé 473, Table 3 (Van der Meulen 1979)

(Relevé 213 designated by Van der Meulen as nomenclatural type cannot be considered as valid since it does not contain the species *Acacia fleckii*.)

The description of the *Acacia erioloba*-*Acacia fleckii* Association (Van der Meulen 1979 - p.73) is considered as the diagnosis of this association, although this association name was not validly published.

This association occurs west of the Pilanesberg on deep, red, sandy Hutton soils. This vegetation merges gradually into the *Eucleo undulatae*-*Acacietum tortilis* as the soil becomes more clayey. The vegetation type is characterised by the presence of *Acacia erioloba* and *A. fleckii*. Other prominent woody species include *Acacia tortilis*, *A. nilotica* and *A. mellifera*. Important shrubs are *Grewia flava* and *Dichrostachys cinerea*. The most abundant grass species are *Eragrostis lehmanniana*, *Panicum maximum*, *Aristida congesta* subsp. *congesta* and *Cymbopogon plurinodis*.

5.1.3. *Ischaemo afri*-*Acacien tortilis* Alliance Nova hoc loco

Nomenclatural type: *Aristido bipartitae*-*Acacietum tortilis*

This vegetation is found on vertic black clays in the warm, low-lying areas of the Bushveld Basin (Van der Meulen 1979). Acocks (1988) described this vegetation as the Other Turf Thornveld (Veld Type 13).

Species Group 38 (Table 1) represents the diagnostic species of this alliance. Woody species constantly present are *Acacia mellifera* (43), *Grewia flava* (52) and *Acacia nilotica* (55). Prominent species of the herbaceous layer include the grasses *Panicum maximum* and *Bothriochloa insculpta* (53).

- *Aristido bipartitae*-*Acacietum tortilis* Association Nova hoc loco
(Synonym: *Acacia tortilis*-*Aristida bipartita* Association (Van der Meulen 1979))

Nomenclatural type: Relevé 456, Table 1 (Van der Meulen 1979)

Van der Meulen (1979) described this *Acacia tortilis-Aristida bipartita* Woodland as an association, but the name was not published validly. His description on p.54 is however considered to be the diagnosis for this association.

The association is described as an open to semi-open, low, thorny woodland and sometimes even a grassland with sparse trees. The vertic soils are of the Arcadia Form. The dominant woody plants include *Acacia tortilis*, *A. nilotica* and *A. mellifera*. A continuous grass stratum dominates the field. The most prominent grasses are *Eragrostis curvula*, *Aristida bipartita* and *Cymbopogon plurinodis*. Species occurring only in this association are the grasses *Setaria incrassata*, *Ischaemum afrum*, *Sehema galpinii* and *Aristida bipartita*.

5.1.4. *Spirostacho africanae-Acacion tortilis* Alliance Nova hoc loco

(Synonym: *Acacia tortilis-Carissa bispinosa* Woodland Alliance (Van de Meulen 1979))

Nomenclatural type: *Sporobolo iocladi-Spirostachetum africanae*

This vegetation was described by Van der Meulen (1979) on the undulating Bushveld Granite terrain north of Rustenburg, between the Pilanesberg and the Crocodile River.

The diagnostic species of this alliance are listed in Species Group 41 (Table 1). Conspicuous woody species include *Boscia albitrunca* (43), *Grewia flava* (52), *Ehretia rigida*, *Carissa bispinosa* (53) and *Acacia nilotica* (55). Constantly present forbs are *Abutilon austro-africanum*, *Cassine burkeana*, *Delosperma* species, *Opuntia* species (43), *Justicia flava* (48), *Achyroopsis avicularis* and *Jasminum breviflorum* (49). Prominent grasses include *Schmidtia pappophoroides* (42) and *Panicum maximum* (53).

Van der Meulen (1979) described the communities of this bushveld as the *Acacia tortilis-Carissa bispinosa* Woodland Alliance (not validly published) and the *Spirostachys africana-Sporobolus ioclados* Woodland Association (not validly published) on granite. The first can be divided into two groups, namely vegetation on diabase dykes and vegetation on termitaria, but because the vegetation is floristically very similar, it is described as one community.

- *Carisso bispinosae-Acacietum tortilis* Association Nova hoc loco
Nomenclatural type: Relevé 360, Table 2 (Van der Meulen 1979)

This community is considered to be an association and not an alliance as described by Van der Meulen (1979)(not validly published). His description of the *Acacia tortilis-Carissa bispinosa* Woodland on p.58 is however considered to be the diagnosis of this association.

This vegetation is a closed, often thicket-like, woodland with a sparse ground-layer. *Spirostachys africana* and *Sclerocarya birrea* subsp. *caffra* are the diagnostic trees, while *Pappea capensis*, *Acacia tortilis*, *A. nilotica*, *Rhus leptodictya*, *R. pyroides* and *Ziziphus mucronata* are constantly present. Common shrubs include *Carissa bispinosa*, *Jasminum breviflorum*, *Euclea undulata*, *Grewia flava*, *Ehretia rigida* and *Dichrostachys cinerea*. Grasses and forbs are few with *Panicum maximum*, *Achyroopsis avicularis*, *Asparagus suaveolens*, *Solanum delagoense*, *Pollichia campestris* and *Senecio breviflorum* being the most prominent species. The vegetation is a mosaic of grassland with scattered bush-clumps on termite mounds and fairly dense strips of thornveld on diabase dykes.

- *Sporobolo iocladi-Spirostachetum africanae* Association Nova hoc loco
(Synonym: *Spirostachys africana-Sporobolus ioclados* Woodland (Van der Meulen 1979))
Nomenclatural type: Relevé 354, Table 3 (Van der Meulen 1979)

The description of the *Spirostachys africana-Sporobolus ioclados* Woodland by Van der Meulen (1979 - p.70) is considered to be the diagnosis for this association.

This association occurs in bottomlands and dry riverbeds on granite. It is a semi-open to closed woodland. Soils are sandy and may be brackish in some areas. The woody plants tend to occur in bush-clumps, slightly raised above the open space, probably by the action of termites. Constantly present trees and shrubs are *Spirostachys africana*, *Acacia tortilis*, *A. nilotica*, *Carissa bispinosa* and *Euclea undulata*. Grass species frequently found in this community are *Sporobolus ioclados*, *Eragrostis gummiflua*, *Trichoneura grandiglumis*, *Perotis patens*, *Panicum maximum* and *Digitaria eriantha*. The most prominent forbs are *Xerophyta humilis*, *Agathisanthemum bojeri* and *Stylosanthes fruticosa*.

5.2. *Euclea undulatae-Acacia tortilis* Alliance Nova hoc loco

Nomenclatural type: *Pappo capensis-Acacieta tortilis*

The species composition of this bushveld is typical of the Nylsvley Nature Reserve, south of Naboomspruit (Coetzee *et al.* 1976). It is found on alluvium and a variety of calcareous clay soils.

Species Group 46 (Table 1) is diagnostic for this alliance. Woody species with a high constancy are *Acacia tortilis*, *Ehretia rigida*, *Carissa bispinosa* (53) and *Ziziphus mucronata* (56). Prominently present forbs include *Justicia flava* (48), *Achyrocline avicularis*, *Kalanchoe lanceolata* (49) and *K. rotundifolia* (53), while the grasses *Urochloa brachyura*, *Sporobolus ioclados* (49) and *Chloris virgata* (50) are frequently found in this alliance.

Coetzee *et al.* (1976) described the following three communities (though not validly) from the Nylsvley Nature Reserve:

- *Sporobolo iocladi-Acacietum tortilis* Association Nova hoc loco
(Synonym: *Sporobolus ioclados-Acacia tortilis* Tree Savanna (Coetzee *et al.* 1976))
Nomenclatural type: Relevé 196, Table 4 (Coetzee *et al.* 1976)

The description of the *Sporobolus ioclados-Acacia tortilis* Tree Savanna by Coetzee *et al.* (1976 - p.153) is considered to be the diagnosis for this association.

This savanna occurs on very heavy and brackish soils of the Arcadia Form. The diagnostic species for the association are *Sporobolus ioclados* and *Ocimum americanum* var. *americanum*. The tree *Boscia foetida* is also diagnostic, but occurs sporadically. The area is heavily grazed and poor in species.

- *Pappeo capensis-Acacietum tortilis* Association Nova hoc loco
(Synonym: *Pappea capensis-Acacia tortilis* variation (Coetzee *et al.* 1976))
Nomenclatural type: Relevé 131, Table 4 (Coetzee *et al.* 1976)

The description of the *Pappea capensis-Acacia tortilis* variation (Coetzee *et al.* 1976 - p.155) is considered as the diagnosis for this association.

This vegetation occurs on termitaria and is characterised by the woody species *Euclea undulata*, *Ziziphus mucronata*, *Carissa bispinosa* and *Pappea capensis*. Diagnostic species of the herbaceous layer include *Kalanchoe lanceolata*, *Plectranthus cylindraceus* and *P. neochilus*. The trees and shrubs form dense, impenetrable thickets.

- *Acacietum nilotico-tortilis* Association Nova hoc loco
(Synonym: *Acacia nilotica-Acacia tortilis* Variation (Coetzee *et al.* 1976))
Nomenclatural type: Relevé 205, Table 4 (Coetzee *et al.* 1976)

The description of the *Acacia nilotica*-*Acacia tortilis* Variation (Coetzee *et al.* 1976 - p.155) is considered to be the diagnosis for this association.

This vegetation type is found on river banks on sandy soils of the Oakleaf Form, and on heavier soils of the Valsrivier (orthic A horizon over a pedocutane B horizon, while the subsoil is unconsolidated material without signs of wetness)(Soil Classification Workgroup 1991) and Arcadia Forms. *Acacia nilotica*, *A. karroo* and *Blepharis transvaalensis* are diagnostic for this association. The dominant tree is *Acacia tortilis*, the shrub layer is dominated by *Carissa bispinosa* and *Panicum maximum* and *Eragrostis lehmanniana* are the prominent grass species.

6. *Falckio oblongae*-*Acaciatalia niloticae* Order Nova hoc loco

Nomenclatural type: *Falckio oblongi*-*Acacion nilotica*

This bushveld vegetation occurs on vertic soils of the Arcadia Form and is inundated for prolonged periods during heavy rainfall. During dry periods considerable cracking of the soil surface takes place.

Diagnostic species for this order are *Falckia oblonga*, *Nesaea schinzii*, *Salvia repens*, *Berkheya radula* and *Senecio apiifolius* (Species Group 54, Table 1).

6.1. *Falckio oblongi*-*Acacietum nilotica* Alliance Nova hoc loco

Nomenclatural type: *Falckio oblongi*-*Acacietum nilotica*

- *Falckio oblongi*-*Acacietum nilotica* Association Nova hoc loco
(Synonym: *Aristida bipartita*-*Setaria woodii* Tree Savanna and Grassland (Coetzee *et al.* 1976))

Nomenclatural type: Relevé 199, Table 5 (Coetzee *et al.* 1976)

The description of the *Aristida bipartita*-*Setaria woodii* Tree Savanna and Grassland by Coetzee *et al.* (1976 - p.156-157) is considered as the diagnosis for this association. This vegetation occurs on vertic soils of the

Arcadia Form and is inundated for prolonged periods during heavy rainfall. During dry periods considerable cracking of the soil surface takes place.

Diagnostic species for this association are *Falckia oblonga*, *Salvia repens*, *Berkheya radula*, *Senecio apiifolius*, *Senecio inornatus* and *Nesaea schinzii* (Species group 54, Table 1). Prominent woody species are *Acacia nilotica* (55), *Ziziphus mucronata* and *Acacia karroo* (56). Constantly present herbaceous species are *Aristida bipartita* (6), *Setaria incrassata* (14) and *Themeda triandra* (27).

- Coetzee *et al.* (1976) described this community as the *Aristida bipartita*-*Setaria incrassata* Tree Savanna and Grassland. Tree cover in this savanna is only 1-5%, with *Acacia karroo* and *Ziziphus mucronata* (56) being the dominant species. In the herbaceous layer *Setaria incrassata*, *Aristida bipartita*, *Dichanthium annulatum* var. *pappilosum* and *Scirpus dregeanus* are prominent.

B. *Terminalio sericeae*-*Acacienea tortilis* Subclass Nova hoc loco

Nomenclatural type: *Acaciatalia erubescens-luederitzii*

The 58 plant communities represented in Table 2 are grouped into 20 *noda*. These *noda* represent 20 plant communities and subcommunities of different hierarchical levels in the *Terminalio sericeae*-*Acacienea tortilis*. One order, three alliances and 16 associations are described formally (some newly) and classified according to the code of syntaxonomic nomenclature (Barkman *et al.* 1986).

The following is a complete classification of all plant communities and presently recognised syntaxa, at various hierarchical levels, of the *Terminalio sericeae*-*Acacienea tortilis*:

1. *Grewia monticola*-*Acacia tortilis* bushveld

- *Terminalia sericea-Vernonia poskeana* variation
- *Terminalia sericea-Dichrostachys cinerea* variation
- *Acacia luederitzii-Acacia sieberiana* variation
- *Acacia karroo-Eragrostis rigidior* community

2. *Acacia grandicornuta-Acacia tortilis* bushveld

2.1. *Acacia grandicornuta-Acacia tortilis-Dichantium annulatum* var. *papillosum* bushveld

- *Cymbopogon validus-Acacia nilotica* community
- *Ischaemum afrum-Acacia tenuispina* community

2.2. *Acacia grandicornuta-Acacia tortilis-Cucumis africanus* bushveld

- *Stipagrostis uniplumis-Terminalia sericea* short open savanna
- *Grewia bicolor-Combretum apiculatum* short open savanna
- *Grewia flava-Acacia erubescens* short open savanna

3. *Acaciatalia erubescens-luederitzii* (Brown *et al.* 1998, submitted)

3.1. *Aristida canescens-Acacia tortilis* bushveld

3.1.1. *Celtido africanae-Combretion erythrophyllii* (Brown *et al.* 1998, submitted)

- *Zizipho mucronatae-Acacietaum karroo* (Brown *et al.* 1998, submitted)
- *Combreto erythrophyllum-Acacietaum karroo* (Brown *et al.* 1998, submitted)

3.1.2. *Aristida canescens-Acacia tortilis-Dactyloctenium aegyptium* bushveld

- *Eragrostio rigidioris-Acacietaum luederitzii* (Brown *et al.* 1998, submitted)
- *Schoenoplecto corymbosi-Cynodetum dactyli* (Brown *et al.* 1998, submitted)

3.1.3. *Aristida canescens-Acacia tortilis-Indigophora comosa* bushveld

- *Eucleo undulatae-Acacietum tortilis* (Brown *et al.* 1998, submitted)
- *Combreto hereroensis-Acacietum erubescens* (Brown *et al.* 1998, submitted)
- *Combreto hereroensis-Acacietum luederitzii* (Brown *et al.* 1998, submitted)
- *Eragrostio rigidioris-Dichrostachyetum cinereae* (Brown *et al.* 1998, submitted)
- *Eragrostio rigidioris-Acacietum luederitzii* (Brown *et al.* 1998, submitted)

3.1.4. *Acacion luederitzii-tortilis* (Brown *et al.* 1998, submitted)

- *Sporobolo iocladi-Acacietum luederitzii* (Brown *et al.* 1998, submitted)
- *Portulaco quadrifidae-Acacietum tortilis* (Brown *et al.* 1998, submitted)
- *Clerodendro ternati-Combretum apiculati* (Brown *et al.* 1998, submitted)
- *Combreto hereroensis-Acacietum luederitzii* (Brown *et al.* 1998, submitted)

3.1.5. *Aristida canescens-Acacia tortilis- Schizachyrium jeffreysii* bushveld

- *Eragrostis gummiflua-Terminalia sericea* mixed woodland
- *Combreto hereroensis-Acacietum luederitzii-Burkeetosum africanae* (Brown *et al.* 1998, submitted).
- *Eragrostis pallens-Terminalia sericea-Cleome maculata* mixed woodland variant
- *Schizachyrium jeffreysii-Terminalia sericea* woodland

3.2. *Hyperthelia dissoluta-Acacia tortilis* bushveld

- ##### 3.2.1. *Eragrostio pallentis-Terminalion sericeae* (Brown *et al.* 1998, submitted)

- *Agathisanthemo bojeri-Terminalietum sericeae* (Brown *et al.* 1998, submitted)
- *Terminalio sericeae-Proteetum welwitschii* (Brown *et al.* 1998, submitted)

3.2.2. *Hyperthelia dissoluta-Acacia tortilis-Faurea saligna* bushveld

- *Hyparrhenia hirta-Hyperthelia dissoluta* tall grassland

3.2.3 *Hyperthelia dissoluta-Acacia tortilis-Asparagus africanus* bushveld

- *Olea europaea-Combretum hereroense* community

4. *Acacia burkei-Acacia tortilis* bushveld

4.1. *Panicum natalense-Acacia tortilis* bushveld

4.1.1. *Panicum natalense-Acacia tortilis-Acacia robusta* bushveld

- *Combretum apiculatum-Themeda triandra* variation
- *Combretum apiculatum-Sporobolus fimbriatus* variation

4.1.2. *Panicum natalense-Acacia tortilis-Strychnos madagascariensis* bushveld

- *Combretum apiculatum-Sclerocarya birrea* variation
- *Combretum apiculatum-Schizachyrium jeffreysii* variation
- *Combretum apiculatum-Peltophorum africanum* variation

4.1.3. *Panicum natalense-Acacia tortilis-Eragrostis biflora* bushveld

- *Boscia albitrunca-Eragrostis rigidior* low thicket
- *Dichrostachys cinerea-Pollichia campestris* low thicket
- *Acacia nilotica-Eragrostis rigidior* low thicket

4.1.4. *Solano delagoensis-Acacietaum tortilis* Association Nova

4.2. *Acacia caffra-Acacia tortilis* bushveld

4.2.1. *Acacia caffra-Acacia tortilis-Aloe daveyana* bushveld

- *Stylosanthus fruticosa-Themeda triandra* community
- *Enneapogon scoparius-Dichrostachys cinerea* community

4.2.2. *Acacia caffra-Acacia tortilis-Cenchrus ciliaris* bushveld

- *Tricholaena monachne-Cenchrus ciliaris* community
- *Combretum apiculatum-Pennisetum sphacelatum* variation

5. *Tephrosia longipes-Acacia erubescens* bushveld

5.1. *Euclea divinorum-Acacia erubescens* bushveld

- *Pterocarpus rotundifolius-Combretum apiculatum* tall open woodland
- *Acacia burkei-Peltophorum africanum* tall open woodland
- *Acacia mellifera-Euclea divinorum* short closed woodland

5.2. *Ipomoea obscura-Acacia erubescens* bushveld

- *Combretum molle-Tephrosia longipes* short open woodland
- *Brachiaria serrata-Waltheria indica* low open grassland
- *Aristida congesta* subsp. *barbicollis-Schmidtia pappophoroides* short closed grassland
- *Acacia erubescens-Tephrosia longipes* low sparse grassland

5.3. *Terminalia brachystemma-Acacia erubescens* bushveld

- *Burkea africana-Bidens pilosa* Variant
- *Burkea africana-Ozoroa paniculosa* Variant
- *Terminalia sericea-Eragrostis pallens* low sparse woodland

The vegetation of the *Terminalia sericeae-Acacienea tortilis* is characterised by the presence of the woody species *Terminalia sericea*, *Peltophorum africanum* and *Combretum apiculatum*, all absent from the *Acacienea nilotico-tortilis* of the more clayey soils. Within the generally clay soil habitat of the *Panico maximi-Acacienea tortilis*, the presence of these three woody species, normally indicative of sandy soils, indicates that the *Terminalia sericeae-Acacienea tortilis* represents vegetation on the relatively sandy side within the clayey soil gradient. The higher percentage sand in these clayey soils may be due to leaching of the slightly raised upland sites found in the slightly undulating landscape or due to a sandy deposit over a more clayey subsoil.

Species Group 66

Aristida stipitata	3	2 2 2	2 2 4 1 3	1	2 4	4 5 5 4	4	3	1	5 5	5 5 5	3 5 5	4	2 1	1	2 2 2
Eragrostis gummiflua	2	1 2	1 2 2	1	4 2 2 5	1 3 4	2	4	2	1	2	1	2	1	1	2 1 1

Species Group 67

Waltheria indica	1	1 3 2 2	2 3 5 5 4	2	2 3	5 5 5 5	4 5 4	5	3 5 4	3 5 5	4 4	3	2 5 3	3 5 4 2	3 3 2
Aristida congesta s. barbicollis	2 1	4 4 3 2	4 2 4 5 4	4 5 5 4 5	5 2 4	2 4	1	5 5	3 4 4	5 5 5	5 4 3	5 1 5	2 5 4		
Melinis repens	2	2 1	2 5 3 4	1 2	4 5 2 2	5 5 4	5 3	4 3	1 3 5	4 1	3 5	4 2 2	4 1 3	3 3 3	
Acacia karroo	3	5 5	1 1	1 2	1 1 3	5 2 2 2	3 4	4 3	1 1	1 5 2	2	1 2 1	1 1	2	
Commelina erecta	2 3	3 2 2 3	1 3 2	1	1 1 3	5 3	4 4 2	4	1 1 1	1 1	1 1	3	1		
Commiphora africana	1	3 1	3 1 1	2 3 1	2	1	3	5 5 5	4	2 1	1 1 1	1	1		

Species Group 68

Grewia flava	4 1	5 5 5	3 3	4 3 3	4 4 3 3 4	5 5 4 5 5	5 2	3	5 5	3 4 3	3 2	5	2	2 3 4	1 1 1 1	2 2
Pogonarthria squarrosa	2	1	4	2 1	1 2 3 3	1 2 3	5 2 5 2	5 3 5	5 5	3 5 5	4 5	4	2	2 1	2 3 1	
Peltophorum africanum	1	3 4 1	1	2	2 4 3 4 1	1 3 3	3 5 4	1 4	2 2	1 2	3	1 1 3	2	1		
Acacia erubescens	3 2	5 4	1 2 1	1 5	1 3 3 2 2 2	3 2 2	2	3 4 4	2 1 2 2	4 1 2						
Urochloa mosambicensis	1	2	1	3 5	5 4 3	3 2 2 3 4	4 3 3 3 4	3 1 2	1	4 4	1 1	1	1			

Species Group 69

Dichrostachys cinerea	3 5 3 4	4 3	5 4 5	1 1	3 3 2	3 5 5 5 5	5 4 4 5 5	5 5 5 4	5 5	3 3	5 5	5 5 5	5 5 3	4 5	5 5	2 4	4 4 3	2 1 3 3	3 2 3
Digitaria eriantha	5 5 5 4	5 5	5 3 5	3 2	3 4 1	4 3 5 5 4	5 1 2 3 5	5 4 5 5	5 3 5	2	5 5	5 5 4	5 5 5	4 2	3	2 2 1	4 1 4	4 2 2	
Aristida congesta s. congesta	3 3 5 5	4	4 4 4	3 2 1	5 2 3 3 3	3 3 2 3 2	4 4 5 4	5 3 5	2 3	5 5 5	5 4 5	5 5	3 5	2 3	2 1	2 2 3	4 2 4		
Panicum maximum	5 5 5 5	1	5 4 5	3 5	4 3 3	2 3 2 4 4	4 2 3 3 3	2 4 4	1 2	2 4	5	3 5 5	5 5 2	3 3	5 2	4 2	1 1 1	3 1	1
Terminalia sericea	5 3 1	5	1	1 2 5 1 4	1 3	5 5 5 4	5 5 5	3	3	5 5 4	1 1	4	1	3 5 3	5 5	5 5 5			
Solanum panduriforme	3 5 3	1	2 1	3 3 2	4 3 1 2 2	3 4 5 4 1	2 1	1	2	2 3 2	2 1 3 3	3 2 1							

Common species for this subclass are the woody species *Dichrostachys cinerea*, the grasses *Digitaria eriantha*, *Aristida congesta* subsp. *congesta* and *Panicum maximum* (69)². These species will not be repeatedly mentioned in the description of the various communities and syntaxa.

1. *Grewia monticola*-*Acacia tortilis* bushveld

This community is found on sandy loam soils in the Warmbaths area. It occurs in the transitional area between the Sourish Mixed Bushveld and Turf Thornveld as classified by Acocks (1988).

This community is characterised by Species Group 1 (Table 2) which includes the prominent shrub *Grewia monticola*. Generally this vegetation is dominated by thorny, microphyllous species such as *Ziziphus mucronata*, *Acacia mellifera*, *A. luederitzii* (22), *A. robusta* (33), *A. tortilis*, *A. nilotica* (58) and *Dichrostachys cinerea* (69). Dominant herbaceous species are the forb *Kyphocarpa angustifolia* (44) and the grass *Cynodon dactylon* (51), indicating over utilization, and *Schmidtia pappophoroides* (51), indicative of the relatively sandy nature of the area.

Four communities identified by Hattingh (1994) at the Aventura Nature Reserve at Warmbaths are included in this community.

- The *Terminalia sericea*-*Vernonia poskeana* variation on deep loamy sand lies in close approximation to wetlands and is consequently often flooded. This frequent flooding may be the reason for sandy deposits as well as the presence of pioneer forbs such as *Solanum panduriforme*, *Kyphocarpa angustifolia* and *Verbena brasiliensis*. Hattingh (1994) identified the grass *Stipagrostis uniplumis*, the forb *Vernonia poskeana* and the tree *Terminalia sericea* as diagnostic species.
- The *Terminalia sericea*-*Dichrostachys cinerea* variation, with the grasses *Triraphis andropogonoides*, *Eragrostis rigidior*, *Digitaria eriantha*, *Panicum maximum* and

² Figures in brackets up to the end of Chapter 5 refer to the number of the Species Group in Table 2.

Chloris virgata, the forbs *Kyphocarpa angustifolia*, *Melica decumbens* and the woody species *Terminalia sericea*, *Dichrostachys cinerea* and *Acacia mellifera* as prominent species. Donga erosion is a prominent feature in this community.

- The *Acacia luederitzii*-*Acacia sieberiana* variation is characterised by the large tree *Acacia sieberiana*. Dominant grass species are *Panicum maximum* and *Schmidtia pappophoroides*. *Cleome rubella* is a constantly present forb and *Acacia luederitzii* and *Dichrostachys cinerea* are the dominant trees. This area has been severely utilised and trampled by game, due to the good grazing quality and palatability of the grass component.
- The *Acacia karroo*-*Eragrostis rigidior* community, restricted to well drained loamy sand. Although Hattingh (1994) did not recognise diagnostic species for this community, it can be identified by the dominance of the grass species *Eragrostis rigidior*, *Panicum maximum* and *Digitaria eriantha*. *Ceratotheca triloba* is a prominent forb, while the tree layer is dominated by *Acacia karroo*, *A. tortilis*, *A. robusta* and *Dichrostachys cinerea*.

2. *Acacia grandicornuta*-*Acacia tortilis* bushveld

This particular species composition is found in the Atherstone Nature Reserve, west of Thabazimbi. The diagnostic species of this community are listed in Species Group 4 (Table 2). Two groups of plant communities were recognised, one being on more clayey soils, the *Acacia grandicornuta*-*Acacia tortilis*-*Dichantium annulatum* var. *papillosum* bushveld and the other on more sandy soils, the *Acacia grandicornuta*-*Acacia tortilis*-*Cucumis africanus* bushveld (Pauw 1988).

2.1. *Acacia grandicornuta*-*Acacia tortilis*-*Dichantium annulatum* var. *papillosum* bushveld

The presence of the species *Ischaemum afrum* (2), *Panicum coloratum* (4), *Ziziphus mucronata* (22), *Acacia nilotica* (58) and *Grewia flava* (68) in this

community, indicates a strong resemblance to the Black Turfveld (Veld Type 12b), a variation of the Springbok Flats Turf Thornveld, as described by Acocks (1988).

Diagnostic species for this community are Species Group 2 (Table 2), including the grasses *Dichanthium anulatum*, *Dinebra retroflexa* and *Ischaemum afrum*, normally associated with black, vertic montmorillonitic clay. A variety of *Acacia* species commonly occur in this community, namely *Acacia grandicornuta* (4), *A. mellifera* (22), *A. nilotica*, *A. tortilis* (58) and *A. erubescens* (68). These *Acacia* species are associated with the dark clay soils that are present in the Atherstone Nature Reserve (Pauw 1988). Other constantly present species include the woody species *Achyrocline stenoptera* (4), *Ziziphus mucronata* (22) and *Grewia flava* (68), as well as the grasses *Panicum coloratum* (4), *Chloris virgata* (14), *Eragrostis rigidior* (51) and *Tragus berteronianus* (57). It is a short open savanna community, comprising of the two communities described by Pauw (1988) in the Atherstone Nature Reserve.

- The *Cymbopogon validus-Acacia nilotica* community occurs in a mosaic distribution pattern, usually associated with clay soils of the Valsrivier Form. Diagnostic species include the trees *Acacia robusta*, *A. senegal* var. *rostrata* and the herbaceous species *Cymbopogon validus*, *Dichanthium annulatum* var. *papillosum* and *Enneapogon cenchroides*. Other prominently present species are *Evolvulus alsinoides*, *Heliotropium steudneri*, *Tragus berteronianus*, *Aristida congesta* and *Panicum coloratum*.
- The *Ischaemum afrum-Acacia tenuispina* community is associated with the vertic Arcadia soil form, with a high clay content (>55%). Variable moisture content causes the soil to swell and shrink leading to the forming of cracks. This soil form is the cause of the stunted growth form (<0.75m) of the woody species in this community (Pauw 1988). In the woody

stratum *Acacia tenuispina* is diagnostic, while *A. nilotica*, *A. tortilis* and *Dichrostachys cinerea* are dominant species. Other diagnostic species are *Ischaemum afrum*, *Hibiscus trionum*, *Eragrostis curvula* and *Setaria incrassata*. Prominent herbaceous species include *Digitaria eriantha*, *Indigophera schimperi* and *Commelina bengalensis*.

Although the *Acacia grandicornuta*-*Acacia tortilis*-*Dichanthium annulatum* var. *papillosum* bushveld occurs on clayey soils and has a high constancy of *Acacia* species, it was classified under the *Terminalio sericeae*-*Acacienea tortilis* because of the presence of associated species with a preference for sandy soil.

2.2. *Acacia grandicornuta*-*Acacia tortilis*-*Cucumis africanus* bushveld

This bushveld occurs on the more sandy soils of the Atherstone Nature Reserve. Diagnostic species for this community are *Limeum pterocarpum*, *Cucumis africanus*, *Urochloa brachyura*, *Talinum caffrum*, *Sida ovata*, *Acacia erioloba*, *Acacia fleckii* and *Clerodendrum myricoides* (Species Group 3, Table 2). Constant species include the trees *Boscia albitrunca* (14), *Grewia flavescens* (21), *Acacia tortilis* (58), *Peltophorum africanum* and *Grewia flava* (68), the forbs *Indigophera schimperi* (4), *Commiphora pyracanthoides* (38), *Kyphocarpa angustifolia* (44) and the grasses *Eragrostis rigidior*, *Schmidtia pappophoroides* (51) and *Tragus berteronianus* (57). Most of these species indicate the Kalahari affinity of this bushveld (Van Rooyen & Bezuidenhout 1997) and explains why TWINSPAN classified this community under the *Terminalio sericeae*-*Acacienea tortilis* and not under the *Acacienea nilotico-tortilis*.

Three communities in the Atherstone Nature Reserve originally described by Pauw (1988) represent this community:

- The *Stipagrostis uniplumis-Terminalia sericea* short open savanna on sandy soil. The diagnostic species are *Terminalia sericea* and the grasses *Stipagrostis uniplumis*, *Eragrostis pallens* and *E. lehmanniana*. The tree layer is dominated by *Grewia flava*, *Dichrostachys cinerea* and *Acacia tortilis*. Prominent herbaceous species include *Schmidtia pappophoroides*, *Panicum maximum* and *Digitaria eriantha*.
- The *Grewia bicolor-Combretum apiculatum* short open savanna occurs mainly on sandy clay loam soils of the Hutton Form (Soil Classification Workgroup 1991). Species diagnostic for this community are *Combretum apiculatum*, *Grewia bicolor*, *Euclea undulata*, *Acacia burkei* and *Combretum hereroense*. Other dominant woody species are *Grewia flava*, *Acacia erubescens*, *A. tortilis* and *Peltophorum africanum*. The grass layer is dominated by *Eragrostis rigidior*, *Schmidtia pappophoroides*, *Panicum maximum* and *Aristida congesta*.
- The *Grewia flava-Acacia erubescens* short open savanna occurs characteristically on the Hutton soil form with a clay subsoil (>55% clay). No diagnostic species were identified by Pauw (1988) for this community, but *Acacia erubescens* is the most prominent woody species. It is however completely absent on the Clovelly soils of this area. Other conspicuous woody species are *Boscia albitrunca*, *Commiphora pyracanthoides*, *Acacia fleckii*, *Ehretia rigida*, *Acacia tortilis* and *Ziziphus mucronata*. Prominent forbs and grasses are respectively *Limeum pterocarpum*, *Evolvulus alsinoides*, *Kyphocarpa angustifolia* and *Eragrostis rigidior*, *Schmidtia pappophoroides*, *Panicum maximum*, *Aristida congesta* and *Digitaria eriantha*.

3. *Acacietalia erubescens-luederitzii* (Brown *et al.* 1998, submitted)

The communities that represent this order were identified and described from the Borakalalo Nature Reserve, north of the town Brits (Brown *et al.* 1995, 1996, 1997)

and in the Mabula Game Reserve near Warmbaths (Van Schalkwyk 1993). Most of the communities are situated along riverbanks, around dry riverbeds and close to the edge of a dam. Many of the grasses and forbs are pioneer species, indicating the general degraded state of the area. Acocks (1988) described the area as Mixed and Sourish Mixed Bushveld (Veld Types 18 and 19).

Diagnostic species for this order are recorded in Species Group 31 (Table 2). This bushveld can be divided into two major communities, each represented by a number of associations. The two major communities are the *Aristida canescens-Acacia tortilis* bushveld from the Borakalalo Nature Reserve and the *Hyperthelia dissoluta-Acacia tortilis* bushveld from Borakalalo and Mabula Game Reserve.

3.1. *Aristida canescens-Acacia tortilis* bushveld

The community is situated in the Borakalalo Nature Reserve along riverbanks and around old or dry riverbeds, close to the edge of the Klipvoor Dam as well as on sandy or coarse-grained granite soil (Brown *et al.* 1995). This community is characterised by Species Group 19 (Table 2), which consists of the woody species *Grewia subspathulata* and the grass *Aristida canescens*.

This community is represented by five alliances.

3.1.1. *Celtido africanae-Combretion erythrophyllii* (Brown *et al.* 1998, submitted)

(Synonyms: *Combretum erythrophyllum-Celtis africana* Forest Alliance (Van der Meulen 1979); *Ziziphus mucronata-Acacia karroo* riverine woodland (Brown *et al.* 1997))

Although the relevés of this alliance are included into the analysis of the *Panico maximi-Acacieta tortilis*, it seems that *Acacia karroo*-dominated vegetation along river banks should be classified under a separate class. The *Acacia karroo* Riparian Thicket Class (Du Preez & Bredenkamp 1991) and the

Grewia flavae-Acacieta karroo (Bezuidenhout *et al.* 1994) were not validly published as a class name. It is recommended that the class name should rather be formally validated by the original authors. *Acacia karroo* communities are commonly found as riparian vegetation along rivers in the Grassland and Savanna Biomes. Diagnostic species include *Acacia karroo*, *Asparagus suaveolens*, *A. laricinus*, *Rhus pyroides*, *R. lancea*, *Ziziphus mucronata*, *Salix mucronata*, *Diospyros lycioides* subsp. *guerkei* and *Celtis africana* (Du Preez & Bredenkamp 1991; Bezuidenhout *et al.* 1994).

This alliance can be found along river banks in the Borakalalo Nature Reserve and is grazed and trampled to a great extent (Brown *et al.* 1995). The alluvial soil is loamy to clayey.

The vegetation is characterised by the forb *Aerva leucura*, the grass *Bothriochloa insculpta* and the tree *Combretum erythrophyllum* (Species Group 5, Table 2). Species that occur constantly are the woody species *Ziziphus mucronata*, *Rhus pyroides* (22), *Maytenus heterophylla* (25), *Rhus lancea* (31), *Acacia karroo* (67), the forbs *Bidens bipinnata* (9), *Portulaca quadrifida* (13), *Commelina erecta*, *Commiphora africana* (67) and the grasses *Cynodon dactylon* (51), *Tragus berteronianus* (57) and *Urochloa mosambicensis* (68).

Two associations are recognised:

- *Ziziphomucronatae-Acacieta karroo* (Brown *et al.* 1998, submitted)
(Synonyms: *Ziziphus mucronata-Acacia karroo* riverine woodland; *Urochloa mosambicensis-Eragrostis rigidior-Acacia karroo* riverine woodland (Brown *et al.* 1995))

The dominant species of this association are the trees *Acacia karroo*, *Acacia tortilis*, *Maytenus heterophylla* and *Rhus lancea*. The shrub *Grewia flava*, the grasses *Eragrostis rigidior*, *Digitaria eriantha*, *Tragus*

berteronianus, *Chloris virgata*, *Aristida congesta* subsp. *congesta* and *A. congesta* subsp. *barbicollis* are prominently present. Forbs that are present include *Aerva leucura*, *Schkuhria pinnata*, *Commelina africana*, *Justicia flava* and *Phyllanthus incurvus*.

- *Combretum erythrophyllum*-*Acacietum karroo* (Brown *et al.* 1998, submitted)

(Synonyms: *Panicum maximum*-*Combretum erythrophyllum*-*Acacia karroo* riverine woodland (Brown *et al.* 1995); *Panicum maximum*-*Acacia karroo* woodland (Brown *et al.* 1996))

This vegetation is a riverine woodland, with diagnostic species *Combretum erythrophyllum*, *Phragmites australis* and *Asparagus* species. Other prominent species include the trees *Acacia karroo*, *Maytenus heterophylla*, *Rhus lancea*, *Ziziphus mucronata*, the forbs *Commelina erecta*, *Bidens bipinnata* and the grasses *Urochloa mosambicensis*, *Cynodon dactylon* and *Panicum maximum*.

3.1.2. *Aristida canescens*-*Acacia tortilis*-*Dactyloctenium aegyptium* bushveld

This community is found in and around old and seasonal riverbeds. It is composed from communities identified by Brown *et al.* (1995, 1996) in the Borakalalo Nature Reserve in the North West Province.

Diagnostic species for this community are included in Species Group 6 (Table 2). Constant species are the trees *Acacia mellifera*, *A. luederitzii* (22), *Acacia tortilis* (58), the shrubs *Euclea undulata* (32) and *Grewia flava* (68) as well as the forbs *Zornia glochidiata* (8), *Portulaca quadrifida* (13), *Tephrosia capensis*, *Gomphrena celosioides* (25), *Kyphocarpa angustifolia* (44), *Schkuhria pinnata* (50), *Waltheria indica* and *Commelina erecta* (67).

Prominent grass species are *Eragrotis rigidior*, *Cynodon dactylon* (51), *Tragus berteronianus* (57) and *Aristida congesta* subsp. *barbicollis* (67).

Brown *et al.* (1998, submitted) recognised three associations that were described under three different alliances. The results of this study indicate however that these three alliances are closely related and could be combined under a single alliance. This is however not done formally here.

The following syntaxa and/or plant communities (variants) are presently classified under the *Aristida canescens*-*Acacia tortilis*-*Dactyloctenium aegyptium* bushveld:

- *Eragrostio rigidioris*-*Acacietum luederitzii* (Brown *et al.* 1998, submitted) (Synonyms: *Eragrostis rigidior*-*Acacia luederitzii* dry riverine woodland (Brown *et al.* 1995); *Eragrostis trichophora*-*Acacia luederitzii* woodland (Brown *et al.* 1996))

This association was classified under the *Portulaco quadrifidae*-*Acacia luederitzii* by Brown *et al.* (1998, submitted).

The vegetation is dry riverine woodland on sandy though sodic soils. Up to 70% of this association has been severely grazed and trampled. This association is characterised by *Acacia luederitzii*, *A. mellifera*, *Diospyros lycioides* subsp. *guerkei*, *Eragrostis trichophora*, *Sporobolus ioclados*, *Chloris virgata*, *Abutilon austro-africanum* and *Plectranthus madagascariensis*. Dominant species in the woody and shrub layer are *Acacia tortilis*, *A. mellifera*, *Dichrostachys cinerea*, *Grewia flava* and *Euclea undulata*. The most dominant grasses are *Eragrostis rigidior*, *Urochloa mosambicensis*, *Digitaria eriantha*, *Tragus berteronianus*, *Aristida congesta* subsp. *congesta* and *A. congesta* subsp. *barbicollis*. Dominant forbs include *Portulaca quadrifida* and *Schkuhria pinnata*. It is mainly found in low-lying areas around old or dry riverbeds.

The following two communities are variants of the *Eragrostis trichophora-Acacia luederitzii* woodland and therefore also classified under the *Eragrostio rigidioris-Acacieta luederitzii*.

- *Sporobolus ioclados-Acacia luederitzii-Euclea undulata* variant is found on brackish soil. Dominant woody species include *Acacia luederitzii*, *A. mellifera*, *Grewia flava* and *Euclea undulata*. The herbaceous layer is dominated by *Eragrostis trichophora*, *Digitaria eriantha*, *Tragus berteronianus*, *Urochloa mosambicensis*, *Justicia flava* and *Abutilon austro-africanum*. This community is present in seasonally dry riverbeds. It is preferred by grazing animals. An estimated 85% of the area has been overgrazed.
- The *Sporobolus ioclados-Acacia luederitzii-Xerophyta humilis* variant is found in old and seasonal riverbeds. Diagnostic species are the forbs *Xerophyta humilis*, *Delosperma* species, *Justicia anagalloides*, *Corchorus asplenifolius* and *Asparagus suaveolens*. The woody layer is dominated by *Acacia luederitzii* and *A. mellifera*. Characteristic of this community is the near absence of *Dichrostachys cinerea*. Dominant herbaceous species are the forbs *Xerophyta humilis*, *Justicia flava*, *Abutilon austro-africanum* and the grasses *Eragrostis trichophora*, *Sporobolus ioclados*, *Chloris virgata*, *Panicum maximum* and *Tragus berteronianus*.
- *Schoenoplecto corymbosi-Cynodetum dactyli* (Brown *et al.* 1998, submitted)
(Synonyms: *Schoenoplectus corymbosus-Cynodon dactylon* grassland (Brown & Bredenkamp 1994); *Cynodon dactylon* grassland (Brown *et al.* 1996))

The alliance to which this association belongs is according to Brown *et al.* (1998, submitted) uncertain.

This vegetation type is a grassland of clayey and marshy soils on the edge of the Klipvoor Dam. The only grass species present is *Cynodon dactylon*. This species, together with the weedy forbs *Schkuhria pinnata* and *Portulaca quadrifida*, dominate the vegetation and covers 80-95% of the area. This area is disturbed, because of periodic flooding and game flocking to the water edge during droughts.

3.1.3. *Aristida canescens*-*Acacia tortilis*-*Indigophora comosa* bushveld

This community can be found in disturbed areas such as old lands and dry riverbeds of the Borakalalo Nature Reserve. The soils of this community are primarily sandy, but loamy soils are also present.

This community is characterised by *Indigophora comosa* and *Hermannia tomentosa* (Species Group 7, Table 2). Constant species of the woody layer include *Acacia luederitzii*, *Ziziphus mucronata* (22), *Euclea undulata*, *Combretum hereroense* (32), *Acacia tortilis* (58), *Peltophorum africanum* and *Grewia flava* (68). Herbaceous species that are constantly present are *Portulaca quadrifida* (13), *Felicia muricata* (24), *Tricholaena monachne* (25), *Lophiocarpus tenuissimus* (36), *Portulaca kermesina* (42), *Kyphocarpa angustifolia* (44), *Evolvulus alsinoides* (49), *Eragrostis rigidior*, *Schmidtia pappophoroides* (51), *Heteropogon contortus* (58), *Aristida stipitata* (66), *A. congesta* subsp. *barbicollis* (67) and *Urochloa mosambicensis* (68).

Brown *et al.* (1998, submitted) described the five associations representing this bushveld community. The associations were described under different alliances of the *Acacietalia erubescens-luederitzii*.

- *Euclea undulatae*-*Acacietum tortilis* (Brown *et al.* 1998, submitted)
(Synonyms: *Acacia tortilis* Association (Van der Meulen 1979); *Euclea undulata*-*Acacia tortilis* plains woodland (Brown *et al.* 1995))

Brown *et al.* (1998, submitted) considered this association to be part of the *Portulaco quadrifidae-Acacion luederitzii*.

This woodland association has a mosaic distribution pattern and is situated in or close to dry riverbeds. Diagnostic species include the forbs *Anthericum transvaalense*, *Portulaca kermesina* and *Ruellia patula*. *Acacia tortilis* dominates the woody layer and appears to have become invasive. Grasses that are present are *Aristida congesta* subsp. *congesta* and *Cynodon dactylon*.

- *Combretum hereroensis-Acacia erubescens* (Brown *et al.* 1998, submitted)
(Synonyms: *Acacia erubescens* Association (Van der Meulen 1979); *Acacia erubescens* disturbed woodland (Brown *et al.* 1995))

This association is classified under the *Portulaco quadrifidae-Acacion luederitzii* (Brown *et al.* 1998, submitted).

This vegetation type is a disturbed woodland, where *Acacia erubescens* is the only characteristic species. *Dichrostachys cinerea*, *Peltophorum africanum*, *Combretum hereroense*, *Grewia flava* and *Euclea undulata* are also prominent. Dominant grasses are *Eragrostis trichophora*, *Schmidtia pappophoroides*, *Digitaria eriantha* and *Eragrostis rigidior*. Forbs that can be found are *Anthericum transvaalense* and *Portulaca kermesina*. The sandy soil is subjected to a high degree of trampling.

- *Combretum hereroensis-Acacia luederitzii* (Brown *et al.* 1998, submitted)
(Synonym: *Perotis patens-Terminalia sericea* woodland (Brown & Bredenkamp 1994)).

This vegetation is described as a subcommunity by Brown *et al.* (1996) and is placed under this association by (Brown *et al.* 1998, submitted). It is

considered to fall under the *Acacia luederitzii-tortilis* (Brown *et al.* 1998, submitted).

The association is a woodland, with diagnostic species the shrub *Grewia flava*, the forb *Portulaca kermesina* and the grasses *Urochloa mosambicensis* and *Panicum maximum*. Dominant trees are *Terminalia sericea*, *Burkea africana* and *Dichrostachys cinerea*. The grasses *Digitaria eriantha*, *Melinis repens* subsp. *repens*, *Schmidtia pappophoroides*, *Tricholaena monachne* and the forb *Lophiocarpus tenuissimus* are also prominent in the community. Soils of this area are sandy and coarsely-grained.

- *Eragrostio rigidioris-Dichrostachyetum cinereae* (Brown *et al.* 1998, submitted).

(Synonyms: *Digitaria eriantha-Terminalia sericea* woodland (Brown *et al.* 1996); *Eragrostis rigidior-Dichrostachys cinerea* woodland (Brown *et al.* 1997))

This association is classified under the *Eragrostio pallentis-Terminalion sericeae* (Brown *et al.* 1998, submitted).

The association is found on old cultivated fields. The soils are coarsely-grained and loamy. Dominant trees are *Acacia tortilis* and *Dichrostachys cinerea*, which seem to be invading the old fields. *Terminalia sericea* is absent from this association. Other dominant species include the grasses *Eragrostis rigidior* and *Digitaria eriantha*. *Melinis repens* subsp. *repens*, *Trichoneura grandiglumis*, *Tricholaena monachne*, *Heteropogon contortus*, *Panicum maximum* and *Aristida congesta* subsp. *barbicollis* may also be present. Dominant forbs are *Evolvulus alsinoides* and *Waltheria indica*. Little trampling and erosion is present.

- *Eragrostio rigidioris-Acacieta luederitzii* (Brown *et al.* 1998, submitted).

(Synonyms: *Eragrostis rigidior*-*Acacia luederitzii* dry riverine woodland (Brown *et al.* 1995); *Eragrostis trichophora*-*Acacia luederitzii* woodland (Brown *et al.* 1996))

This association forms part of the *Portulaco quadrifidae*-*Acacion luederitzii* (Brown *et al.* 1998, submitted).

This vegetation type occurs in old and seasonal riverbeds. The woody layer is dominated by *Acacia luederitzii*, *Dichrostachys cinerea* and *Grewia flava*. *Acacia mellifera*, *Terminalia sericea* and *Combretum hereroense* are also prominent. Conspicuous grass species are *Eragrostis trichophora*, *Digitaria eriantha*, *Tricholaena monachne*, *Eragrostis rigidior*, *Aristida congesta* subsp. *barbicollis*, *A. congesta* subsp. *congesta*, *Pogonarthria squarrosa* and *Panicum maximum*. Prominent forbs include *Evolvulus alsinoides*, *Cleome rubella*, *Lophiocarpus tenuissimus* and *Cleome maculata*.

3.1.4. *Acacion luederitzii-tortilis* (Brown *et al.* 1998, submitted)

(Synonym: *Acacia erubescens*-*Acacia luederitzii*-*Portulaca oleraceae* thornveld (Brown *et al.* 1997))

The alliance can be found in and around old riverbeds, close to the edges of the Klipvoor Dam and on slight slopes. The soil of this alliance has a sandy to clayish texture. In certain parts of the area the soil is coarsely-grained and derived from granite.

Characteristic of this vegetation is Species Group 11 (Table 2) which consists of the forbs *Ruellia cordata*, *Hibiscus pusillus* and the tree *Combretum imberbe*. Constant woody species are *Boscia albitrunca* (14), *Grewia subspathulata* (19), *A. luederitzii*, *Ziziphus mucronata* (22), *Euclea undulata*, *Combretum hereroense* (32), *Acacia tortilis*, *A. nilotica* (58), *A. erubescens* and *Grewia flava* (68). Forbs that are constantly present are *Kalanchoe*

rotundifolia (12), *Portulaca oleracea* (17), *Tricholaena monachne* (25), *Kyphocarpa angustifolia* (44), *Schkuhria pinnata*, *Justicia flava*, *Abutilon austro-africanum* (50) and *Monsonia angustifolia* (51). Prominent grasses include *Aristida canescens* (19), *Eragrostis rigidior* (51), *Tragus berteronianus* (57), *Heteropogon contortus*, *Enneapogon scoparius* (58), *Aristida congesta* subsp. *barbicollis* and *Urochloa mosambicensis* (68).

Brown *et al.* (1998, submitted) described the following associations and/or plant communities:

- *Sporobolus iocladi-Acacieta luederitzii* (Brown *et al.* 1998, submitted) (Synonym: *Sporobolus ioclados-Acacia luederitzii* woodland (Brown & Bredenkamp 1994))

The following two subcommunities of the *Sporobolus ioclados-Acacia luederitzii* woodland are described, but are treated as one community and is therefore considered to represent only one association.

- The *Tarchonanthus camphoratus-Acacia luederitzii* mixed woodland. This community is characterised by the shrubs *Tarchonanthus camphoratus*, *Ehretia rigida*, the grasses *Dactyloctenium aegyptium*, *Eragrostis trichophora* and the forbs *Justicia flava*, *Hibiscus pusillus* and *Ruellia cordata*. The woody layer is dominated by *Acacia luederitzii* and *A. tortilis*. Highly palatable grasses namely *Sporobolus ioclados* and *S. nitens* dominate the grass layer. This explains the high degree of grazing that takes place and consequently also the presence of the following pioneer grasses: *Dactyloctenium aegyptium*, *Eragrostis trichophora*, *Tragus berteronianus*, *Chloris virgata*, *Aristida canescens* subsp. *canescens* and *Urochloa mosambicensis*. Dominant forbs are *Kalanchoe rotundifolia* and *Plectranthus madagascariensis*.

- The *Sporobolus nitens*-*Acacia luederitzii* woodland is also situated in old and dry riverbeds. The soils of this community are sandy to clayish. Only the forb *Pavonia burchellii* is diagnostic. *Acacia luederitzii* dominates the woody layer with an average canopy cover of up to 40%. As mentioned in the previous community, the grass layer is dominated by *Sporobolus nitens* and *S. ioclados*, while *Tragus berteronianus*, *Aristida congesta* subsp. *barbicollis* and *Enneapogon scoparius* are present. Dominant forbs are *Kalanchoe rotundifolia*, *Plectranthus madagascariensis*, *Lycium* species, *Pavonia burchellii*, *Abutilon austro-africanum* and *Solanum panduriforme*.

- *Portulaco quadrifidae*-*Acacietum tortilis* (Brown *et al.* 1998, submitted)
(Synonym: *Portulaca quadrifida*-*Acacia tortilis* woodland (Brown & Bredenkamp 1994))

This disturbed woodland occurs on coarse-grained soil derived from granite. The following diagnostic species have been identified (Brown *et al.* 1995): *Acacia tortilis*, *Portulaca quadrifida*, *Limeum viscosum*, *Achyranthes aspera*, *Talinum caffrum* and *Tribulus terrestris*. Dominant grasses are *Eragrostis rigidior*, *Tragus berteronianus*, *Aristida congesta* subsp. *barbicollis* and *Chloris virgata*. All these grasses are increaser II species, indicating the deteriorated condition of the herbaceous layer, caused by a high degree of grazing. The forbs that occur in the association are all weedy pioneers, namely *Portulaca quadrifida*, *Solanum panduriforme*, *Portulaca oleracea*, *Achyranthes aspera*, *Limeum viscosum* and *Tribulus terrestris*.

- *Clerodendro ternati*-*Combretetum apiculati* (Brown *et al.* 1998, submitted)
(Synonym: *Clerodendrum ternatum*-*Combretum apiculatum* woodland (Brown & Bredenkamp 1994))

This woodland is associated with coarse-grained granite soil. Species characteristic for this association include the trees *Combretum apiculatum*, *Acacia robusta*, *Vitex rehmannii*, the forbs *Clerodendrum ternatum*, *Hermannia glanduligera*, *Ceratotheca triloba* and the grass *Brachiaria nigropedata*. The shrub layer is dominated by *Grewia flava*. Increaser II species such as *Eragrostis rigidior*, *Tragus berteronianus* and *Enneapogon scoparius* dominate the grass layer, while *Schmidtia pappophoroides* and *Panicum maximum* also occur. The most prominent forbs are *Clerodendrum ternatum*, *Kyphocarpa angustifolia*, *Monsonia angustifolia*, *Portulaca quadrifida* and *Schkuhria pinnata*. Most of these are pioneer species.

- *Combretum hereroensis*-*Acacietum luederitzii* (Brown *et al.* 1998, submitted).

(Synonym: *Perotis patens*-*Terminalia sericea* woodland (Brown & Bredenkamp 1994))

This vegetation represents only the *Typicum* Subassociation of the *Combretum hereroensis*-*Acacietum luederitzii* (Brown *et al.* 1998, submitted). The other subassociation (*Combretum hereroensis*-*Acacietum luederitzii*-*Burkeetosum africanae*) of this association is classified under the *Aristida canescens*-*Acacia tortilis*-*Schizachyrium jeffreysii* bushveld. Diagnostic species are *Acacia luederitzii*, *Ehretia rigida*, *Justicia flava* and *Tarchonanthus camphoratus*. Dominant woody species include *Acacia tortilis*, *Terminalia sericea*, *Combretum hereroense*, *Dichrostachys cinerea* and the shrub *Grewia flava*. Prominent grass species are *Eragrostis rigidior*, *Tragus berteronianus*, *Aristida congesta* subsp. *barbicollis*, *Tricholaena monachne* and *Perotis patens*. These grasses occur on sandy soils. Forbs that are present include *Justicia flava*, *Waltheria indica*, *Lophiocarpus tenuissimus* and *Chamaecrista absus*. Erosion occurs in this subassociation.

3.1.5. *Aristida canescens*-*Acacia tortilis*-*Schizachyrium jeffreysii* bushveld

Characteristic of this community is the sandy soil that occurs throughout this bushveld in the Borakalalo Nature Reserve. It was classified by TWINSPAN (Hill 1979) under the *Panico maximi*-*Acacietea tortilis* instead of the *Terminalia sericeae*-*Combretetea apiculati*, possibly because of the presence of *Acacia* species and other associated species such as *Ziziphus mucronata*.

The diagnostic species for this community are represented in Species Group 15 (Table 2). Constant woody species are *Rhus pyroides*, *Ziziphus mucronata* (22), *Combretum hereroense* (32) and *Acacia karroo* (67). Constantly present species of the herbaceous layer include the grasses *Perotis patens* (35), *Trichoneura grandiglumis* (41), *Aristida adscensionis*, *Eragrostis rigidior* (51), *Heteropogon contortus* (58), *Aristida stipitata*, *Eragrostis gummiflua* (66), *Melinis repens* subsp. *repens* (67), *Pogonarthria squarrosa* (68) and the forbs *Felicia muricata* (24), *Agathisanthemum bojeri* (25), *Perotis patens* (35), *Chamaecrista absus* (42), *Kyphocarpa angustifolia* (44), *Vernonia poskeana* (48), *Evolvulus alsinoides* (49), *Monsonia angustifolia* (51) and *Waltheria indica* (67).

Brown & Bredenkamp (1994) and Brown *et al.* (1998, submitted) recognised the three communities and one association that represent this community in the Borakalalo Nature Reserve:

- The *Eragrostis gummiflua*-*Terminalia sericea* mixed woodland is described as a subcommunity of the *Perotis patens*-*Terminalia sericea* woodland (Brown & Bredenkamp 1994), and placed under the *Combretum hereroensis*-*Acacietum luederitzii* Association by Brown *et al.* (1998, submitted). It occurs on sandy soil, with diagnostic species the grasses *Eragrostis gummiflua*, *Schizachyrium jeffreysii*, *Aristida adscensionis*, the forbs *Agathisanthemum bojeri*, *Jatropha zeyheri*, *Crabbea angustifolia*, *Chamaecrista mimosoides* and the woody species *Acacia tenuispina*.

Dominant grasses are *Eragrostis rigidior*, *Aristida congesta* subsp. *barbicollis*, *Perotis patens*, *Melinis repens* subsp. *repens* and *Pogonarthria squarrosa*. Prominent forbs include *Limeum fenestratum*, *Waltheria indica* and *Chamaecrista absus*. The woody layer is dominated by *Terminalia sericea* and *Dichrostachys cinerea*, while *Boscia albitrunca*, *Acacia karroo*, *Rhus pyroides*, *Combretum hereroense*, *Peltophorum africanum*, *Ziziphus mucronata* and occasionally *Acacia tortilis*, *A. erubescens*, *A. caffra* and *Rhus lancea* are also present.

- *Combretum hereroense-Acacieta luederitzii-Burkeetosum africanae* (Brown *et al.* 1998, submitted).
(Synonym: *Eragrostis pallens-Terminalia sericea* woodland (Brown & Bredenkamp 1994)).

This vegetation is completely dominated by *Terminalia sericea* and *Burkea africana*, while *Dichrostachys cinerea* is also prominent. Dominant grass species are *Triraphis andropogonoides*, *Schizachyrium sanguineum*, *Perotis patens*, *Melinis repens* subsp. *repens*, *Eragrostis lehmanniana*, *Aristida stipitata*, *Digitaria eriantha* and *Panicum maximum*. The forb layer consists of *Chamaecrista absus*, *Limeum fenestratum*, *Vernonia poskeana*, *Waltheria indica* and *Bidens pilosa*. This variant is represented by the *Combretum hereroense-Acacieta luederitzii-Burkeetosum africanae* (Brown *et al.* 1998, submitted).

- The *Eragrostis pallens-Terminalia sericea-Cleome maculata* mixed woodland variant forms a mosaic distribution pattern with the previous variant. The most dominant grasses are *Eragrostis pallens*, *Perotis patens*, *Schizachyrium jeffreysii*, *Eragrostis curvula*, *Aristida stipitata* and *Pogonarthria squarrosa*. Dominant forbs include *Blepharis integrifolia*, *Indigophera filipes*, *Leonotis ocyimifolia*, *Justicia anagalloides*, *Dicoma anomala*, *Vernonia poskeana* and *Waltheria indica*. *Terminalia sericea*

dominates the woody layer and *Dichrostachys cinerea* is also prominent. The soil varies from sandy to slightly clayish. Slight erosion occurs.

- The *Schizachyrium jeffreysii*-*Terminalia sericea* woodland is described by Brown & Bredenkamp (1994) and placed under the *Combretum hereroensis*-*Acacietum luederitzii* by Brown *et al.* (1998, submitted). This vegetation is associated with coarse-grained granite soil and granite boulders. Characteristic of this vegetation are *Acacia tenuispina*, *Eragrostis gummiflua*, *Schizachyrium jeffreysii*, *Aristida adscensionis* subsp. *adscensionis* and *Chamaecrista mimosoides*. The woody layer is dominated by *Terminalia sericea*. *Perotis patens*, *Themeda triandra*, *Aristida stipitata* subsp. *graciflora* and *Digitaria eriantha* can be found in the grass layer. Forbs that are present include *Agathisanthemum bojeri* and *Waltheria indica*.

3.2. *Hyperthelia dissoluta*-*Acacia tortilis* bushveld

Associations and communities described from the Borakalalo Nature Reserve (Brown *et al.* 1996) near Brits and Mabula Game Reserve (Van Schalkwyk 1993) near Warmbaths, are included in this community. Character species of this community are found in Species Group 30 (Table 2). This includes the tall grass *Hyperthelia dissoluta*, often encountered in Sour or Sourish Mixed Bushveld (Acocks 1988).

3.2.1. *Eragrostio pallentis*-*Terminalia sericeae* (Brown *et al.* 1998, submitted)

Synonym: *Eragrostis pallens*-*Terminalia sericea* woodland (Brown *et al.* 1997))

The alliance can be found close to the edge of the Klipvoor Dam (Borakalalo Nature Reserve) and on sandy, coarse-grained soil.

Species Group 23 (Table 2) represents the diagnostic species of this community. No diagnostic woody species were identified, but *Dichrostachys cinerea* and *Terminalia sericea* (69) are present. Forbs are prominent and include *Cleome rubella* (24), *Tricholaena monachne*, *Agathisanthemum bojeri* (25), *Trichoneura grandiglumis* (41), *Cleome maculata* (42), *Kyphocarpa angustifolia* (44), *Chamaecrista mimosoides* (48) and *Waltheria indica* (67). Constant grass species are *Diheteropogon amplexans* (27), *Perotis patens* (35), *Schmidtia pappophoroides* (51), *Melinis repens* subsp. *repens* (67) and *Pogonarthria squarrosa* (68).

The three communities of which this community comprises, were originally described by Brown *et al.* (1996) as three variants of the *Agathisanthemum bojeri-Terminalia sericea* woodland. Brown *et al.* (1998, submitted) described it as two associations under this alliance.

- *Agathisanthemum bojeri-Terminalietum sericeae* (Brown *et al.* 1998, submitted)
(Synonyms: *Perotis patens-Terminalia sericea* plains woodland (Brown *et al.* 1995); *Agathisanthemum bojeri-Terminalia sericea* woodland, excluding the *Protea welwitschii* variant (Brown *et al.* 1996))

The *Eragrostis pallens* variant occurs along the edge of the Klipvoor Dam on sandy soil. The grass *Eragrostis pallens* and the forbs *Convolvulus sagittatus* and *Rhyncosia totta* are diagnostic species for this community. The woody layer is dominated by *Terminalia sericea*. Dominant grass species include *Melinis repens* subsp. *repens*, *Trichoneura grandiglumis*, *Schmidtia pappophoroides*, *Digitaria eriantha*, *Pogonarthria squarrosa* and *Aristida congesta* subsp. *congesta*. Prominent forbs are *Chamaecrista mimosoides*,

Phyllanthus incurvus, *Lophiocarpus tenuissimus* and *Cleome rubella*.

- *Terminalia sericeae-Proteetum welwitschii* (Brown *et al.* 1998, submitted)
(Synonym: *Protea welwitschii* variant (Brown *et al.* 1996))

Diagnostic species of the *Protea welwitschii* variant include the shrub *Protea welwitschii* and the forb *Triumfetta sonderi*. *Protea welwitschii* (0.5-2m tall) dominates the woody layer. *Terminalia sericea* trees are scattered and it seems as if they are encroaching into this area. Most of the trees are classified within the 0.1-3.0m height class, which indicates that they are still young. The older *Terminalia sericea* trees found in the community are taller than five meters. Dominant herbaceous species are the grasses *Melinis repens* subsp. *repens*, *Trichoneura grandiglumis*, *Perotis patens*, *Tricholaena monachne* and the forbs *Merremia tridentata* and *Dicoma anomala*. The soil is sandy and medium-sized granite rocks cover approximately 20% of the soil surface.

- The *Agathisanthemum bojeri-Terminalia sericea-Pogonarthria squarrosa* is a variant of the *Perotis patens-Terminalia sericea* plains woodland (Brown *et al.* 1995) and is therefore considered as part of the *Agathisanthemo bojeri-Terminalietum sericeae* Association (Brown *et al.* 1998, submitted).

The woody layer of this community is dominated by *Terminalia sericea*, while *Peltophorum africanum* and *Dichrostachys cinerea* are also present. Dominant herbaceous species are the grasses *Melinis repens* subsp. *repens*, *Trichoneura grandiglumis*, *Perotis patens*, *Tricholaena monachne* and the forbs *Merremia tridentata*

and *Dicoma anomala*. The community is found on sandy, coarse-grained soil.

3.2.2. *Hyperthelia dissoluta*-*Acacia tortilis*-*Faurea saligna* bushveld

Van Schalkwyk (1993) recognised this community on the slopes of hills at Mabula Game Reserve. It is characterised by Species Group 26 (Table 2). Woody species frequently found in this community are *Faurea saligna* (26), *Acacia karroo* (67), *Dichrostachys cinerea* and *Terminalia sericea* (69). *Aloe transvaalensis* (29) is constantly present. The only forbs found are *Kyphocarpa angustifolia* (44) and *Commelina erecta* (67). Prominently present grasses include *Hyperthelia dissoluta*, *Elionurus muticus* (30) and *Eragrostis rigidior* (51). This species composition indicates Sour Bushveld.

The community described by Van Schalkwyk (1993) is:

- The *Hyparrhenia hirta*-*Hyperthelia dissoluta* tall grassland has only one diagnostic species, namely *Hyparrhenia hirta*. Other conspicuous species are *Aloe transvaalensis*, *Acacia karroo*, the forb *Lippia javanica* and the grass *Hyperthelia dissoluta*. This is a bushveld with a 2-3m tall open grassy layer.

3.2.3. *Hyperthelia dissoluta*-*Acacia tortilis*-*Asparagus africanus* bushveld

This community is represented by the *Olea europaea*-*Combretum hereroense* community found in Mabula Game Reserve (Van Schalkwyk 1993). Diagnostic species for this community are represented by Species Group 28 (Table 2) and include *Asparagus africanus*, *Euclea crispa*, *Maytenus polyacantha*, *Pappea capensis* and *Eragrostis chloromelas*. Species that are constantly present in the woody layer are *Olea europaea* subsp. *africana* (29), *Rhus lancea* (31), *Euclea undulata*, *Combretum hereroense* (32) and *Acacia karroo* (67). Prominent species in the herbaceous layer include the grasses

Eragrostis rigidior (51), *Heteropogon contortus* (58), *Eragrostis gummiflua* (65), and *Panicum maximum* (69). Only a few forbs are present, such as *Dicerocaryum eriocarpum* (40), *Kyphocarpa angustifolia* (44) and *Schkuhria pinnata* (50), but with very low constancy values. *Aloe transvaalensis* (29) is constantly present.

Character species identified for the *Olea europaea-Combretum hereroense* community by Van Schalkwyk (1993) are *Combretum hereroense*, *Acacia erubescens*, *A. tortilis* var. *heteracantha*, *Ehretia rigida* and *Sutera burkeana*. Other constantly present species include *Olea europaea* subsp. *africana*, *Euclea undulata*, *Eragrostis gummiflua* and *Maytenus polycantha*.

4. *Acacia burkei-Acacia tortilis* bushveld

Communities on sandy soils from Nylsvley Nature Reserve and the Loskop Dam and Marble Hall areas represent this community. These communities occur in the Mixed Bushveld (Veld Type 18) and Turf Thornveld (Veld Type 12, Acocks 1988). Species characteristic for this community are listed in Species Group 56 (Table 2). Two communities were recognised, namely the *Panicum natalense-Acacia tortilis* bushveld and the *Acacia caffra-Acacia tortilis* bushveld.

4.1. *Panicum natalense-Acacia tortilis* bushveld

This bushveld community consists of four communities found on sandy Hutton soils at Vlakpan Game Ranch in the Marble Hall district and in the Nylsvley Nature Reserve close to Nylstroom. The diagnostic species of this community appear in Species Group 47 (Table 2).

4.1.1. *Panicum natalense-Acacia tortilis-Acacia robusta* bushveld

This community is typically found at Vlakpan Game Ranch near Marble Hall. It is characterised by the presence of Species Group 33 and the absence of

Species Group 34 (Table 2). Constantly present woody species include *Acacia robusta* (33), *A. burkei* (56), *A. tortilis* (58), *Combretum apiculatum* (65) and *Grewia flava* (68). Prominent forbs are *Clerodendrum ternatum* (35), *Solanum kwebense* (39), *Chaemaecrista absus* (42), *Kyphocarpa angustifolia* (44), *Sida alba* (47), *Vernonia poskeana* (48), *Blepharis integrifolia* (49), *Monsonia angustifolia* (51), *Merremia palmata* (62) and *Commelina erecta* (67). Constant species of the grass layer include *Hyparrhenia tamba* (33), *Trichoneura grandiglumis* (41), *Panicum natalense* (47), *Aristida adscensionis*, *Eragrostis rigidior*, *Schmidtia pappophoroides* (51), *Tragus berteronianus* (57), *Heteropogon contortus*, *Enneapogon scoparius*, *Themeda triandra* (58), *Aristida stipitata* (66), *A. congesta* subsp. *barbicollis*, *Melinis repens* subsp. *repens* (67) and *Pogonarthria squarrosa* (68).

Two variations of the *Combretum apiculatum-Terminalia sericea* short thicket, occurring mainly on sandy Hutton soils, as described by Purchase (1994) from the Vlakpan Game Ranch are classified under this community:

- The *Combretum apiculatum-Themeda triandra* variation has no diagnostic species, but it is distinguished from the other variations by a high cover value of *Themeda triandra*.
- The *Combretum apiculatum-Sporobolus fimbriatus* variation with diagnostic species *Sporobolus fimbriatus*, *Andropogon chinensis*, *Hibiscus trionum* and *Ceratotherium cimum*.

4.1.2. *Panicum natalense-Acacia tortilis-Strychnos madagascariensis* bushveld

This community is characterised by Species Group 34 (Table 2) which consists of only woody species. Other constant woody species include *Acacia robusta* (33), *Acacia burkei* (56), *A. tortilis* (58), *Combretum apiculatum* (65) and *Commiphora africana* (67). Prominent forbs are *Lophiocarpus tenuissimus*,

Clerodendrum ternatum (35), *Commiphora pyracanthoides* (38), *Chamaesyce prostrata* (39), *Dicerocaryum eriocarpum* (40), *Chamaecrista absus*, *Bulbostylis hispidula* (42), *Indigophera filipes* (43), *Kyphocarpa angustifolia* (44), *Hibiscus engleri* (47), *Vernonia poskeana* (48), *Evolvulus alsinoides*, *Blepharis integrifolia* (49). The grass layer is represented by the following species among others: *Panicum natalense* (47), *Stipagrostis uniplumis* (48), *Eragrostis rigidior*, *Schmidtia pappophoroides* (51), *Tragus berteronianus* (57), *Heteropogon contortus*, *Enneapogon scoparius*, *Eragrostis lehmanniana*, *Themeda triandra* (58) and *Aristida stipitata* (66).

Three variations of the *Combretum apiculatum-Terminalia sericea* short thicket from the Vlakpan Game Ranch (Purchase 1994) constitute this community:

- The *Combretum apiculatum-Sclerocarya birrea* variation with the diagnostic woody species *Sclerocarya birrea* subsp. *caffra*, *Ozoroa paniculosa*, *Lansea discolor*, *Acacia caffra* and *Combretum zeyheri*. Prominent herbaceous species include the forbs *Vernonia poskeana*, *Justicia protracta*, *Commelina africana*, *Kyphocarpa angustifolia*, *Evolvulus alsinoides* and the grasses *Eragrostis rigidior*, *Digitaria eriantha*, *Schmidtia pappophoroides*, *Themeda triandra*, *Aristida congesta* subsp. *congesta*, *A. congesta* subsp. *barbicollis*, *Panicum maximum* and *Heteropogon contortus*. The large percentage of increaser IIB species indicate an excessive degree of over-utilization (Purchase 1994).
- The *Combretum apiculatum-Schizachyrium jeffreysii* variation is characterised by the species *Achyranthes sicula*, *Sphedamnocarpus pruriens*, *Cucumis* species and *Schizachyrium jeffreysii*. Over-utilization is taking place as indicated by the large percentage of increaser species present (Purchase 1994).

- The *Combretum apiculatum*-*Peltophorum africanum* variation of bottomland situations. The species *Peltophorum africanum*, *Striga asiatica*, *Tragia rupestris* and *Sporobolus africanus* are diagnostic for this variation.

4.1.3. *Panicum natalense*-*Acacia tortilis*-*Eragrostis biflora* bushveld

Species Group 37 (Table 2) represents the diagnostic species of this community. Constant species of the woody layer are *Acacia tortilis* (58) and *Dichrostachys cinerea* (69). Constantly present forbs and grasses include *Urochloa panicoides* (38), *Solanum kwebense* (39), *Chaemaecrista absus* (42), *Kyphocarpa angustifolia* (44), *Limeum viscosum*, *Evolvulus alsinoides* (49), *Eragrostis rigidior*, *Schmidtia pappophoroides* (51), *Tragus berteronianus* (57), *Aristida stipitata* (66) and *Aristida congesta* subsp. *barbicollis* (67).

The soils of this community are of the Clovelly Form and the only other soil form present is a sandy Hutton. The community is represented by three communities described in the Vlakpan Game Ranch by Purchase (1994):

- The *Boscia albitrunca*-*Eragrostis rigidior* low thicket has only one diagnostic woody species, namely *Boscia albitrunca*. The herbaceous layer is characterised by *Geigeria burkei*, *Panicum coloratum*, *Ruellia* cf. *patula*, *Pupalia lappacea*, *Dicoma zeyheri* and *Blepharis subvolubilis*. Dominant woody species include *Acacia tortilis* var. *heteracantha*, *A. luederitzii* var. *retinens*, *A. nilotica* and *Terminalia sericea* and the shrubs *Grewia flava*, *G. bicolor*, *Commiphora pyracanthoides* and *Dichrostachys cinerea*. Prominent grasses are *Eragrostis rigidior*, *Aristida congesta* subsp. *barbicollis*, *Digitaria eriantha*, *Schmidtia pappophoroides*, *Urochloa panicoides* and *Enneapogon scoparius*. The following forbs are constantly present in the community: *Commelina africana*, *Kyphocarpa angustifolia*, *Limeum viscosum*, *Evolvulus alsinoidis*, *Commelina erecta*, *Monsonia angustifolia* and *Leucas glabrata*. The area is over-grazed and large bare

patches are visible where the grass has been grazed down to root level (Purchase 1994).

- The *Dichrostachys cinerea*-*Pollichia campestris* low thicket. This area comprises of two old lands and natural vegetation. No diagnostic woody species are present, but the community is dominated by dense thickets of *Dichrostachys cinerea* and *Acacia tortilis*. The only diagnostic grass species is *Aristida canescens*, while *Eragrostis rigidior*, *Aristida congesta* subsp. *barbicollis*, *Tragus berteronianus*, *Digitaria eriantha* and *Panicum maximum* are dominant. Prominently present forbs include *Pollichia campestris*, *Hermbstaedia odorata*, *Zornia milniana*, *Kyphocarpa angustifolia*, *Solanum kwebense* and *Waltheria indica*. The veld is over-utilized and this is made worse by the presence of a dam which results in over-grazing and trampling.
- The *Acacia nilotica*-*Eragrostis rigidior* low thicket is found on old cultivated lands. No diagnostic species have been identified but *Acacia tortilis*, *A. nilotica* and *Dichrostachys cinerea* are dominant in the woody layer. The grass layer is dominated by *Digitaria eriantha*, *Eragrostis rigidior*, *Aristida congesta* subsp. *barbicollis*, *Pogonarthria squarrosa*, *Melinis repens* subsp. *repens*, *Heteropogon contortus* and *Schmidtia pappophoroides*. Forbs that are prominent are *Chaemaecrista absus*, *C. mimosoides*, *Blepharis integrifolia* and *Kyphocarpa angustifolia*.

4.1.4. *Solano delagoensis*-*Acacietum tortilis* Association Nova hoc loco

Nomenclatural type: Relevé 58, Table 6 (Coetzee *et al.* 1976)

The description of the *Communities of abandoned settlements* by Coetzee *et al.* (1976 - p.158) is considered the diagnosis for this association.

This bushveld occurs in the Nylsvley Nature Reserve (Coetzee *et al.* 1976) and is characterised by Species Group 45 (Table 2) which includes *Solanum*

delagoense, *Crotolaria pisicarpa*, *Tephrosia burchellii* and *Spermacoce senensis*. The constant species present in this community are the trees *Acacia tortilis* (58) and *Dichrostachys cinerea* (69) and the forbs *Vernonia poskeana* (48), *Evolvulus alsinoides* (49) and *Waltheria indica* (67). Prominent grass species include *Eragrostis rigidior*, *Cynodon dactylon* (51), *Heteropogon contortus*, *Eragrostis lehmanniana* (58) and *Melinis repens* subsp. *repens* (67).

Two communities originally described in the Nylsvley Nature Reserve (Coetzee *et al.* 1976) represent this community.

Coetzee *et al.* (1976) described two communities that are found on disturbed areas where native settlements were. The woody layer is dominated by *Acacia tortilis* while *Sclerocarya birrea* subsp. *caffra*, *Burkea africana* and *Terminalia sericea* are occasionally found. Prominent species of the herbaceous layer include the grasses *Eragrostis lehmanniana*, *E. rigidior*, *Aristida stipitata* and *Eragrostis superba*, as well as the forbs *Solanum delagoense*, *Crotolaria pisocarpa*, *Schkuhria pinnata* and *Leucas neuflyzeana*. The community is found on Hutton soils.

4.2. *Acacia caffra*-*Acacia tortilis* bushveld

This particular community is found on a farm to the north of Loskop Dam, in the Aventura Nature Reserve at Warmbaths and in the Marble Hall area. The only species characteristic of this community is *Acacia caffra* (Species Group 55, Table 2). The community can be divided into two groups, being the *Acacia caffra*-*Acacia tortilis*-*Aloe davyana* bushveld and the *Acacia caffra*-*Acacia tortilis*-*Cenchrus ciliaris* bushveld on disturbed areas.

4.2.1. *Acacia caffra*-*Acacia tortilis*-*Aloe daveyana* bushveld

This Bushveld occurs north of Loskop Dam on soil that varies from sandy to clayey. The community is characterised by the species *Aloe daveyana*, *Felicia*

filifolia, *Asparagus setaceus* and *Brachiaria eruciformis* (Species Group 52, Table 2). Constantly present woody species are *Acacia caffra* (55), *Lantana rugosa*, *Acacia burkei* (56), *A. tortilis* (58), *Combretum apiculatum* (65) and *Acacia karroo* (67). Forbs are sparse in this community with *Felicia filifolia*, *Asparagus setaceus* and *A. suaveolens* (53) being the only constant species. Prominently present grasses are *Eragrostis lehmanniana* (57), *Enneapogon scoparius*, *Themeda triandra* (58), *Aristida congesta* subsp. *congesta* and *Panicum maximum* (68).

The community comprises of two communities originally described by De Frey (1993) north of Loskop Dam:

- The *Stylosanthus fruticosus*-*Themeda triandra* community is characterised by the forbs *Stylosanthus fruticosus*, *Waltheria indica*, *Hermannia depressa* and *Hypoxis obtusa*. The woody layer is dominated by *Acacia* species, such as *Acacia nilotica*, *A. caffra*, *A. tortilis* and *A. karroo* as well as *Dichrostachys cinerea*. The most prominent grasses are *Themeda triandra*, *Eragrostis lehmanniana* and *Aristida congesta*.
- The *Enneapogon scoparius*-*Dichrostachys cinerea* community with the diagnostic species *Enneapogon scoparius*, *Maytenus heterophylla*, *Lantana rugosa* and *Acacia burkei*. Constantly present species include the woody species *Combretum apiculatum*, *Dichrostachys cinerea*, the herbaceous species *Aloe daveyana*, the forbs *Asparagus suaveolens*, *Felicia filifolia* and the grasses *Aristida congesta*, *Eragrostis lehmanniana* and *Themeda triandra*.

4.2.2. *Acacia caffra*-*Acacia tortilis*-*Cenchrus ciliaris* bushveld

This community consists of two communities originally described in the Aventura Nature Reserve, Warmbaths (Hattingh 1994) and in the Marble Hall (Van Essen 1993) area. The vegetation of these communities shows signs of

degradation. The diagnostic species of this community are included in Species Group 54 (Table 2) and consists of the grass species *Cenchrus ciliaris* and *Aristida meridionalis*. Constant species of the woody stratum are *Acacia tortilis* (58) and *Dichrostachys cinerea* (69). Forbs are sparse and the most prominent grasses are *Eragrostis lehmanniana* (58), *Urochloa mossambicensis* (68), *Aristida congesta* subsp. *congesta* and *Panicum maximum* (69).

Hattingh (1994) described the first community in the Aventura Nature Reserve at Warmbaths:

- The *Tricholaena monachne*-*Cenchrus ciliaris* community occurs on loamy sand. There are no diagnostic woody species, but the forbs *Felicia mossamedensis*, *Solanum mauritianum* and *Crassula alba* as well as the grasses *Cenchrus ciliaris*, *Aristida rhiniochloa*, *Urochloa mosambicensis* and *Tricholaena monachne* are characteristic for this community. An amount of trampling takes place, since the riding horses of the reserve are kept in this area (Hattingh 1994).

The second community was described from the farm Bosveld Rentmeesters close to Marble Hall by Van Essen (1993):

- The *Combretum apiculatum*-*Pennisetum sphacelatum* variation has a sparse grass layer. The vegetation is dominated by the trees *Combretum apiculatum* and *Dichrostachys cinerea*.

5. *Tephrosia longipes*-*Acacia erubescens* bushveld

The community occurs mainly in overgrazed and degraded areas, as indicated by the high occurrence of the woody species *Dichrostachys cinerea* (69) and the grass *Aristida congesta* subs. *barbicollis* (67). It is found in the Ellisras region of the Waterberg on old lands, plains around pans and waterholes, as well as drainage areas

and floodplains. Soils of these areas are sandy and derived from underlying sandstone and shale of the Waterberg Group (Turner 1995).

According to Acocks (1988) this community lies in the Mixed Bushveld (Veld type 18). Two main variations are recognised within this veld type: *Combretum apiculatum* Veld and Mixed *Terminalia* and *Dichapetalum* Veld. Both are represented in this community (Turner 1995). Although it seems that this community should rather be classified under the *Terminalia sericeae-Combretum apiculatum*, it was classified under the *Panicum maximi-Acacia tortilis*, possibly because of the presence of species associates with the latter class.

This community is characterised by Species Group 62 (Table 2) which includes the woody species *Mundulea sericea* and *Grewia bicolor*. Constant species are *Combretum apiculatum* (65) and *Acacia erubescens* (68). The forbs *Merremia tridentata* (63), *Ceratotheca triloba* (65), *Solanum panduriforme* (69) and the grass species *Aristida congesta* subsp. *barbicollis* and *Melinis repens* subsp. *repens* (67) are also present.

5.1. *Euclea divinorum-Acacia erubescens* bushveld

Diagnostic species for this community are the woody species *Pterocarpus rotundifolius*, *Euclea divinorum*, the forb *Convolvulus sagittatus* and the grasses, *Brachiaria serrata* and *Cymbopogon excavatus* (Species Group 59, Table 2). The constant woody species are *Mundulea sericea* (62), *Combretum apiculatum* (65), *Acacia erubescens* and *Grewia flava* (68). Constant herbaceous species are the forbs *Chaetecanthus costatus* (62), *Merremia tridentata* (63), *Waltheria indica* and the grass *Melinis repens* subsp. *repens* (67).

The community occurs in overgrazed areas and on old lands. It is characterised by an open to moderate tree canopy, with a sparse grass layer and an abundance of forbs.

This community comprises of three communities originally described by Turner (1995) in the Mokolo Nature Reserve (Waterberg) as:

- The *Pterocarpus rotundifolius-Combretum apiculatum* tall open woodland associated with rocky ridges and hillsides. Diagnostic species are *Pterocarpus rotundifolius* and *Diplorhynchus condylocarpon*, with *Combretum apiculatum* and *Acacia erubescens* as dominant species. The high occurrence of *Aristida congesta* subsp. *barbicollis* and *Dichrostachys cinerea* indicates overgrazing and disturbance. The soil of this community is sandy and derived from feldspathic sandstone and shale.
- The *Acacia burkei-Peltophorum africanum* tall open woodland which occurs on north-facing slopes. Diagnostic species are *Acacia burkei* and *Peltophorum africanum*. *Combretum apiculatum*, *Terminalia sericea*, *Dichrostachys cinerea* and the grass *Aristida congesta* subsp. *barbicollis* are the dominant species. This community occurs on sandy soils of the Constantia Form (orthic A horizon over an E horizon over a yellow-brown apedal B horizon)(Soil Classification Workgroup 1991) and is severely overgrazed.
- The *Acacia mellifera-Euclea divinorum* short closed woodland situated on floodplains, dry river beds and plains around pans and waterholes. The diagnostic species for this community are *Acacia mellifera* and *Euclea divinorum*. Other dominant tree species are *Acacia erubescens*, *Grewia flava*, *Terminalia sericea* and *Dichrostachys cinerea*. Only a few grass and forb species are present. The soils are hard and clayey. The poor ground cover, caused by overgrazing, leads to an increased runoff of water, causing gulleys and dongas.

5.2. *Ipomoea obscura-Acacia erubescens* bushveld

This community can be distinguished from the *Euclea divinorum*-*Acacia erubescens* bushveld by the presence of Species Group 60 (Table 2) and the absence of Species Group 59 (Table 2). Constant species include the forbs *Tephrosia longipes*, *Oldenlandia herbacea*, *Chaetecanthus costatus* (62), *Merremia tridentata* (63), *Waltheria indica* (67), *Solanum panduriforme* (69) and the grasses *Aristida congesta* subsp. *barbicollis* (67) and *Digitaria eriantha* (69). The community can be found on disturbed undulating plains and old lands. Yellow sandy soils are characteristic of this community.

Turner (1995) originally described the four communities that constitute this bushveld community:

- The *Combretum molle*-*Tephrosia longipes* short open woodland associated with undulating, sandy plains. The dominant species include the tree *Terminalia sericea*, the forbs *Tephrosia longipes*, *Oldenlandia herbacea* and the grasses *Aristida congesta* subsp. *barbicollis* and *Schmidtia pappophoroides*. The community occurs on deep, yellow sandy soil of the Clovelly Form.
- The *Brachiaria serrata*-*Waltheria indica* low open grassland on old lands. This area is very disturbed as indicated by the diagnostic species *Brachiaria serrata*, *Cynodon dactylon* and dominant species *Waltheria indica* and *Tephrosia longipes*. Areas brush-packed with tree material have a high occurrence of favourable grasses such as *Brachiaria serrata*, *Melinis repens* subsp. *repens* and *Sporobolus ioclados*, indicating an improvement of veld condition.
- The *Aristida congesta* subsp. *barbicollis*-*Schmidtia pappophoroides* short closed grassland on plains near waterholes. The herbaceous layer dominates the vegetation, with *Aristida congesta* subsp. *barbicollis*, *Digitaria eriantha* and *Schmidtia pappophoroides* being the most prominent grasses.

- The *Acacia erubescens-Tephrosia longipes* low sparse grassland on old lands. The vegetation is dominated by the forbs *Tephrosia longipes*, *Chaemaecrista comosa* and the encroaching trees *Acacia erubescens* and *Dichrostachys cinerea*. This community has a sparse grass layer due to game overgrazing the recovery growth. The soil varies from sandy to slightly clayey.

5.3. *Terminalia brachystemma-Acacia erubescens* bushveld

This community is characterised by the presence of *Terminalia brachystemma* (Species Group 61) and the absence of Species Groups 59 and 60 (Table 2). Trees constantly present are *Combretum apiculatum* (65), *Acacia erubescens* (68) and *Terminalia sericea* (69). Forbs such as *Tephrosia longipes*, *Oldenlandia herbacea*, *Chaetecanthus costatus*, *Thesium utile*, *Kalanchoe paniculata* (62), *Merremia tridentata* (63), *Ceratotheca triloba* (65) and *Waltheria indica* (67) are abundant in this community. The grass layer is sparse with only a few constant species, namely *Eragrostis pallens* (64), *Aristida stipitata* (65), *Eragrostis gummiflua* (66), *Melinis repens* subsp. *repens* (67) and *Digitaria eriantha* (69). The high constancy of *Aristida congesta* subsp. *barbicollis* (67) and *Dichrostachys cinerea* (69) indicates overgrazing and bush encroachment (Turner 1995). The soils are of the Constantia Form.

Three communities were described by Turner (1995):

- The *Burkea africana-Bidens pilosa* Variant situated along dry river beds. Diagnostic species are *Bidens pilosa* and *Solanum sisymbriifolium*. This variant is dominated by *Terminalia sericea* and the grass *Schmidtia pappophoroides*. This area is subjected to overgrazing and erosion.

- The *Burkea africana*-*Ozoroa paniculosa* Variant on the floodplain of the Mogol River. This variant is dominated by *Terminalia sericea* and *Tephrosia longipes*. As in the previous variant, this area is also overgrazed.
- The *Terminalia sericea*-*Eragrostis pallens* low sparse woodland. This community is associated with midslopes of flat plains. Dominant species are the trees *Terminalia sericea*, *Dichrostachys cinerea*, *Acacia erubescens*, the forb *Chaemaecrista comosa* and the grasses *Aristida congesta* subsp. *barbicollis* and *Schmidtia pappophoroides*. Bush encroachment is taking place in this community.

CHAPTER 6

CONCLUDING REMARKS

The aims for this study were successfully achieved, namely:

a) Related relevés from different studies in the study area were brought together effectively. From this, four major vegetation types representing phytosociological classes were identified for the Central Savanna of South Africa.

b) For the *Panico maximi-Acacieta tortilis* a hierarchical syntaxonomy was derived and two subclasses, four orders, 10 alliances and 36 associations were identified of which two subclasses, three orders, eight alliances and 15 associations are newly described according to the International Code for Syntaxonomic Nomenclature (Barkman *et al.* 1986).

The three-step method (Bredenkamp & Bezuidenhout 1995) for treating large phytosociological data sets (originally developed for data from South African grasslands) proved to be effective for classification and synthesis of data from the savannas as well. The combination of a numerical classification technique (TWINSPAN)(Hill 1979) and the following refinement by Braun-Blanquet procedures was very successful, in that an ecologically sound classification of the vegetation could be derived.

The results of the study indicate that the *Panico maximi-Acacieta tortilis* is an *Acacia*-dominated vegetation, characteristic of dark clayey soils, but also occurring on the relatively sandy side of a soil texture coenocline within the class. The main criteria for distinguishing between communities are floristical differences as well as soil texture and drainage pattern.

The vegetation classes can easily be distinguished in the veld, but it is not possible to compile a vegetation map of the area at an appropriate scale, since the *Panico maximi-*

Acacietea tortilis forms an extensive mosaic with the *Terminalio sericeae-Combretetea apiculati*. In the slightly undulating landscape the microphyllous thorny bushveld is found in the low lying clayey areas, with the broad-leaved savanna found on the upland sandy areas.

The following is a complete classification of all plant communities and presently recognised syntaxa, at various hierarchical levels, of the *Panico maximi-Acacietea tortilis*:

A. Acacienea nilotico-tortilis Subclass Nova

1. *Acacietalia rehmanniana-tortilis* Order Nova

1.1. *Crabbea hirsuta-Acacia rehmanniana*-bushveld

1.1.1 *Crabbea hirsuta-Acacia rehmanniana-Crotolaria lotoides* bushveld

- *Digitaria eriantha-Aloe marlothii* Bush
- *Rhus pentheri-Acacia karroo* Microphyllous Forest

1.1.2. *Crabbea hirsuta-Acacia rehmanniana-Tephrosia capensis* bushveld

- *Elionurus muticus-Themeda triandra* Grassland
- *Asparagus africanus-Acacia tortilis* Savanna
- *Setaria incrassata-Hyparrhenia hirta* Grassland and Bushveld

1.1.3. *Crabbea hirsuta-Acacia rehmanniana-Setaria nigrirostris* grassland

- *Aristida canescens-Aloe ammophila* Grassland

1.1.4. *Crabbea hirsuta-Acacia rehmanniana-Aristida diffusa* bushveld

- *Aristida diffusa-Ormocarpum trichocarpum* Savanna

1.1.5. *Crabbea hirsuta-Acacia rehmanniana-Ziziphus zeyheriana* bushveld

- *Combretum hereroense-Acacia nilotica* Bushveld

1.2. *Acacia hebeclada-Acacia rehmanniana* bushveld

1.2.1. *Acacion permixtae-rehmanniana* Alliance Nova

- *Spirostacho africanae-Acacietum tortilis* Association Nova
- *Eucleo crispae-Acacietum tortilis* Association Nova
- *Pogonarthrio squarrosae-Acacietum tortilis* Association Nova

1.2.2. *Acacion hebecladae-rehmanniana* Alliance Nova

- *Zizipho mucronatae-Acacetum karroo* (Brown *et al.* 1998, submitted)
- *Sporoboli africani-Acacetum karroo* Association Nova

2. *Acacia tenuispina-Acacia tortilis* bushveld

- *Acacia gerrardii-Digitaria argyrograpta* community
- *Acacia tenuispina-Acacia luederitzii* variation

3. *Rhus leptodictya-Acacia tortilis* bushveld

3.1. *Rhus leptodictya-Olea europaea* subsp. *africana* bushveld

- *Olea europaea-Spirostachys africana* community
- *Olea europaea-Fingerhuthia africana* community

3.2. *Rhus zeyheri-Rhus leptodictya* bushveld

- *Eragrostis curvula* short open savanna
- *Eragrostis barbinodis-Acacia caffra* short open savanna
- *Cymbopogon plurinodis-Acacia karroo* short open savanna
- *Aristida bipartita-Acacia karroo* sparse open savanna

4. *Acacia caffra-Acacia nilotica* bushveld

4.1. *Eragrostis lehmanniana-Acacia caffra* bushveld

- *Carissa bispinosa-Eragrostis gummiflua* variation
- *Carissa bispinosa-Kalanchoe rotundifolia* variation
- *Acacia luederitzii-Acacia karroo* variation
- *Eragrostis chloromelas-Panicum maximum* community
- *Maytenus heterophylla-Chloris virgata* community
- *Stipagrostis uniplumis-Mariscus congestus* community

4.2. *Albizia petersiana-Acacia caffra* bushveld

- *Cymbopogon excavatus-Tagetes minuta* community

5. *Sporobolo nitentis-Acaciatalia tortilis* Order Nova

5.1. *Acacia mellifera*-*Acacia tortilis* bushveld

5.1.1. *Rhoo ciliatae*-*Acacion tortilis* Alliance Nova

- *Acacietum melliferae-hereroensis* Association Nova
- *Trago racemosi-Acacietum tortilis* Association Nova
- *Combreto mollis-Rhoetum lanceae* Association Nova

5.1.2. *Acacion erubescens-tortilis* Alliance Nova

- *Combreto hereroensis-Acacietum erubescens*
- *Eucleo undulatae-Acacietum tortilis*
- *Boscio albitruncae-Acacietum luederitzii* Association Nova
- *Acacietum eriolobae-fleckii* Association Nova

5.1.3. *Ischaemo afri-Acacion tortilis* Alliance Nova

- *Aristido bipartitae-Acacietum tortilis* Association Nova

5.1.4. *Spirostacho africanae-Acacion tortilis* Alliance Nova

- *Carisso bispinosae-Acacietum tortilis* Association Nova
- *Sporobolo iocladi-Spirostachetum africanae* Association Nova

5.2. *Eucleo undulatae-Acacion tortilis* Alliance Nova

- *Sporobolo iocladi-Acacietum tortilis* Association Nova
- *Pappeo capensis-Acacietum tortilis* Association Nova
- *Acacietum nilotico-tortilis* Association Nova

6. *Falckio oblongae-Acaciatalia niloticae* Order Nova

6.1. *Falckio oblongi-Acacion nilotica* Alliance Nova

- *Falckio oblongi-Acacietum nilotica* Association Nova

B. *Terminalio sericeae-Acacienea tortilis* Subclass Nova

1. *Grewia monticola-Acacia tortilis* bushveld

- *Terminalia sericea-Vernonia poskeana* variation

- *Terminalia sericea-Dichrostachys cinerea* variation
- *Acacia luederitzii-Acacia sieberiana* variation
- *Acacia karroo-Eragrostis rigidior* community

2. *Acacia grandicornuta-Acacia tortilis* bushveld

2.1. *Acacia grandicornuta-Acacia tortilis-Dichantium annulatum* var. *papillosum* bushveld

- *Cymbopogon validus-Acacia nilotica* community
- *Ischaemum afrum-Acacia tenuispina* community

2.2. *Acacia grandicornuta-Acacia tortilis-Cucumis africanus* bushveld

- *Stipagrostis uniplumis-Terminalia sericea* short open savanna
- *Grewia bicolor-Combretum apiculatum* short open savanna
- *Grewia flava-Acacia erubescens* short open savanna

3. *Acaciatalia erubescens-luederitzii* (Brown *et al.* 1998, submitted)

3.1. *Aristida canescens-Acacia tortilis* bushveld

3.1.1. *Celtido africanae-Combretion erythrophyllii* (Brown *et al.* 1998, submitted)

- *Zizipho mucronatae-Acacietum karroo* (Brown *et al.* 1998, submitted)
- *Combreto erythrophyllum-Acacietum karroo* (Brown *et al.* 1998, submitted)

3.1.2. *Aristida canescens-Acacia tortilis-Dactyloctenium aegyptium* bushveld

- *Eragrostio rigidioris-Acacietum luederitzii* (Brown *et al.* 1998, submitted)
- *Schoenoplecto corymbosi-Cynodetum dactyli* (Brown *et al.* 1998, submitted)

3.1.3. *Aristida canescens-Acacia tortilis-Indigophora comosa* bushveld

- *Eucleo undulatae-Acacietum tortilis* (Brown *et al.* 1998, submitted)

- *Combretum hereroensis-Acacia erubescens* (Brown *et al.* 1998, submitted)
- *Combretum hereroensis-Acacia luederitzii* (Brown *et al.* 1998, submitted)
- *Eragrostis rigidioris-Dichrostachyetum cinereae* (Brown *et al.* 1998, submitted)
- *Eragrostis rigidioris-Acacia luederitzii* (Brown *et al.* 1998, submitted)

3.1.4. *Acacia luederitzii-tortilis* (Brown *et al.* 1998, submitted)

- *Sporobolus iocladi-Acacia luederitzii* (Brown *et al.* 1998, submitted)
- *Portulaca quadrifida-Acacia tortilis* (Brown *et al.* 1998, submitted)
- *Clerodendron ternati-Combretum apiculatum* (Brown *et al.* 1998, submitted)
- *Combretum hereroensis-Acacia luederitzii* (Brown *et al.* 1998, submitted)

3.1.5. *Aristida canescens-Acacia tortilis-Schizachyrium jeffreysii* bushveld

- *Eragrostis gummiflora-Terminalia sericea* mixed woodland
- *Combretum hereroensis-Acacia luederitzii-Burkeetosum africanae* (Brown *et al.* 1998, submitted).
- *Eragrostis pallens-Terminalia sericea-Cleome maculata* mixed woodland variant
- *Schizachyrium jeffreysii-Terminalia sericea* woodland

3.2. *Hyperthelia dissoluta-Acacia tortilis* bushveld

3.2.1. *Eragrostis pallentis-Terminalia sericeae* (Brown *et al.* 1998, submitted)

- *Agathisanthemo bojeri-Terminalietum sericeae* (Brown *et al.* 1998, submitted)
- *Terminalio sericeae-Proteetum welwitschii* (Brown *et al.* 1998, submitted)

3.2.2. *Hyperthelia dissoluta-Acacia tortilis-Faurea saligna* bushveld

- *Hyparrhenia hirta-Hyperthelia dissoluta* tall grassland

3.2.3 *Hyperthelia dissoluta-Acacia tortilis-Asparagus africanus* bushveld

- *Olea europaea-Combretum hereroense* community

4. *Acacia burkei-Acacia tortilis* bushveld

4.1. *Panicum natalense-Acacia tortilis* bushveld

4.1.1. *Panicum natalense-Acacia tortilis-Acacia robusta* bushveld

- *Combretum apiculatum-Themeda triandra* variation
- *Combretum apiculatum-Sporobolus fimbriatus* variation

4.1.2. *Panicum natalense-Acacia tortilis-Strychnos madagascariensis* bushveld

- *Combretum apiculatum-Sclerocarya birrea* variation
- *Combretum apiculatum-Schizachyrium jeffreysii* variation
- *Combretum apiculatum-Peltophorum africanum* variation

4.1.3. *Panicum natalense-Acacia tortilis-Eragrostis biflora* bushveld

- *Boscia albitrunca-Eragrostis rigidior* low thicket
- *Dichrostachys cinerea-Pollichia campestris* low thicket
- *Acacia nilotica-Eragrostis rigidior* low thicket

4.1.4. *Solano delagoensis-Acacietum tortilis* Association Nova

4.2. *Acacia caffra-Acacia tortilis* bushveld

4.2.1. *Acacia caffra-Acacia tortilis-Aloe daveyana* bushveld

- *Stylosanthus fruticosus-Themeda triandra* community
- *Enneapogon scoparius-Dichrostachys cinerea* community

4.2.2. *Acacia caffra-Acacia tortilis-Cenchrus ciliaris* bushveld

- *Tricholaena monachne-Cenchrus ciliaris* community
- *Combretum apiculatum-Pennisetum sphacelatum* variation

5. *Tephrosia longipes-Acacia erubescens* bushveld

5.1. *Euclea divinorum-Acacia erubescens* bushveld

- *Pterocarpus rotundifolius-Combretum apiculatum* tall open woodland
- *Acacia burkei-Peltophorum africanum* tall open woodland
- *Acacia mellifera-Euclea divinorum* short closed woodland

5.2. *Ipomoea obscura-Acacia erubescens* bushveld

- *Combretum molle-Tephrosia longipes* short open woodland
- *Brachiaria serrata-Waltheria indica* low open grassland
- *Aristida congesta* subsp. *barbicollis-Schmidtia pappophoroides* short closed grassland
- *Acacia erubescens-Tephrosia longipes* low sparse grassland

5.3. *Terminalia brachystemma-Acacia erubescens* bushveld

- *Burkea africana-Bidens pilosa* Variant
- *Burkea africana-Ozoroa paniculosa* Variant
- *Terminalia sericea-Eragrostis pallens* low sparse woodland

This is the first syntaxonomical account of savanna vegetation in the Central Savanna. The study yielded very valuable information on the broader vegetation types of the area. The knowledge gained from this study will contribute to a better understanding of the ecology of the Central Savanna and should be applied in management and conservational planning.

ALPHABETICAL SPECIES LIST

- Abildgaardia ovata* (Burm.f.) Kral
Abrus laevigatus E.Mey.
Abutilon angulatum (Guill. & Perr.) Mast.
Abutilon austro-africanum Hochr.
Abutilon grandiflorum G.Don
Abutilon piloso-cinereum A.Meeuse
Abutilon sonneratianum (Cav.) Sweet
Acacia ataxacantha DC.
Acacia borleae Burt Davy
Acacia burkei Benth.
Acacia caffra (Thunb.) Willd.
Acacia erioloba E.Mey.
Acacia erubescens Welw. ex Oliv.
Acacia fleckii Schinz
Acacia gerrardii Benth.
Acacia grandicornuta Gerstner
Acacia hebeclada DC.
Acacia hereroensis Engl.
Acacia karroo Hayne
Acacia luederitzii Engl.
Acacia mellifera (Vahl) Benth.
Acacia nigrescens Oliv.
Acacia nilotica (L.) Delile
Acacia permixta Burt Davy
Acacia rehmanniana Schinz
Acacia robusta Burch.
Acacia senegal (L.) Willd.
Acacia sieberiana DC.
Acacia tenuispina I.Verd.
Acacia tortilis (Forssk.) Hayne
Acacia xanthophloea Benth.
Acalypha angustata Sond.
Acalypha caperonioides Baill.
Acalypha glabrata
Acalypha glandulifolia Buchinger ex Meisn.
Acalypha indica L.
Acalypha segetalis Müll.Arg.
Acalypha species
Acalypha villicaulis Hochst. ex A.Rich.
Acanthosicyos naudinianus (Sond.) C.Jeffrey
Acanthospermum glabratum (DC.) Wild
Acanthospermum hispidum DC.
Achyranthes aspera L.
Achyranthes aspera L. var. *sicula* L.
Achyrocline stenoptera (DC.) Hilliard & B.L.Burt
Achyropsis avicularis (E.Mey. ex Moq.) T.Cooke & C.H.Wright
Achyropsis leptostachya (E.Mey. ex Meisn.) Baker & C.B.Clarke
Acokanthera oppositifolia (Lam.) Codd
Acrotome angustifolia G.Taylor
Acrotome hispida Benth.
Acrotome inflata Benth.
Actiniopteris radiata (J.König ex Sw.) Link
Adansonia digitata L.
Adenostemma caffrum DC.
Adhatoda densiflora (Hochst.) Manning
Adiantum poiretii Wikstr.
Adromischus umbraticola C.A.Sm.
Aerva leucura Moq.
Aeschynomene rehmannii
Agathisanthemum bojeri
Agrimonia procera Wallr.
Albizia anthelmintica (A.Rich.) Brongn.
Albizia harveyi E.Fourn.
Albizia petersiana
Albizia tanganyicensis
Albuca glauca Baker
Albuca setosa Jacq.
Alectra orobanchoides Benth.
Alectra vogelii Benth.
Alepidea setifera N.E.Br.
Alloteropsis semialata
Aloe aculeata Pole-Evans
Aloe ammophila Reynolds
Aloe cryptopoda Baker
Aloe dabenorisana Van Jaarsv.
Aloe greatheadii
Aloe greatheadii Schönland var. *davyana* (Schönland) Glen & D.S.Hardy
Aloe littoralis Baker
Aloe marlothii
Aloe mutabilis Pillans
Aloe peglerae Schönland
Aloe species
Aloe transvaalensis Kuntze
Alternanthera pungens Humb.
Alysicarpus glumaceus
Alysicarpus zeyheri Harv.
Amaranthus schinzianus Thell.
Amaranthus thunbergii
Ammocharis coranica (Ker Gawl.) Herb.
Anacampseros arachnoides (Haw.) Sims
Anacampseros subnuda
Ancylobotrys capensis (Oliv.) Pichon
Androcymbium longipes Baker
Andropogon appendiculatus Nees
Andropogon chinensis (Nees) Merr.
Andropogon huillensis Rendle
Andropogon schirensis A.Rich.
Androstachys johnsonii Prain
Anthephora pubescens Nees
Antherothamnus pearsonii N.E.Br.
Anthospermum hispidulum E.Mey. ex Sond.
Anthospermum rigidum
Antizoma angustifolia (Burch.) Miers ex Harv.
Apium species
Apodytes dimidiata
Aptosimum albomarginatum Marloth & Engl.

Aptosimum decumbens Schinz
Aptosimum lineare Marloth & Engl.
Aptosimum procumbens (Lehm.) Steud.
Argyrolobium pauciflorum
Argyrolobium transvaalense Schinz
Aristea woodii N.E.Br.
Aristida adscensionis L.
Aristida aequiglumis Hack.
Aristida bipartita (Nees) Trin. & Rupr.
Aristida canescens
Aristida congesta Roem. & Schult. ssp.
barbicollis (Trin. & Rupr.) De Winter
Aristida congesta Roem. & Schult. ssp.
congesta
Aristida diffusa
Aristida junciformis
Aristida meridionalis Henrard
Aristida mollissima
Aristida rhiniochloa Hochst.
Aristida scabrivalvis
Aristida sciurus Stapf
Aristida spectabilis Hack.
Aristida stipitata
Aristida stipitata Hack. ssp. *stipitata*
Aristida transvaalensis Henrard
Aristida vestita Thunb.
Artemisia afra Jacq. ex Willd.
Artemisiopsis villosa (O.Hoffm.) Schweick.
Arundinella nepalensis Trin.
Asclepias adscendens (Schltr.) Schltr.
Asclepias aurea (Schltr.) Schltr.
Asclepias brevipes (Schltr.) Schltr.
Asclepias decipiens N.E.Br.
Asclepias stellifera Schltr.
Ascolepis capensis (Kunth) Ridl.
Asparagus aethiopicus L.
Asparagus africanus Lam.
Asparagus aspergillus Jessop
Asparagus buchananii Baker
Asparagus cooperi Baker
Asparagus exuvialis Burch. fo. *ecklonii*
 (Baker) Fellingham & N.L.Mey.
Asparagus krebsianus (Kunth) Jessop
Asparagus laricinus Burch.
Asparagus nelsii Schinz
Asparagus setaceus (Kunth) Jessop
Asparagus suaveolens Burch.
Asparagus transvaalensis (Oberm.) Fellingham
 & N.L.Mey.
Asparagus virgatus Baker
Aspilia mossambicensis (Oliv.) Wild
Asplenium splendens Kunze
Aster harveyanus Kuntze
Aster peglerae Bolus
Athrixia elata Sond.
Babiana hypogea
Balanites pedicellaris Mildbr. & Schltr.
Barleria affinis C.B.Clarke
Barleria bolusii Oberm.
Barleria bremekampii Oberm.
Barleria crossandriformis C.B.Clarke
Barleria lanceolata (Schinz) Oberm.
Barleria macrostegia Nees
Barleria pretoriensis C.B.Clarke
Barleria senensis Klotzsch
Barleria splendens E.A.Bruce
Barleria virgula C.B.Clarke
Bauhinia galpinii N.E.Br.
Bauhinia petersiana Bolle ssp. *macrantha*
 (Oliv.) Brummitt & J.H.Ross
Becium angustifolium (Benth.) N.E.Br.
Becium obovatum (E.Mey. ex Benth.) N.E.Br.
 ssp. *obovatum* var. *galpinii* (Gürke) N.E.Br.
Berchemia discolor (Klotzsch) Hemsl.
Berchemia zeyheri (Sond.) Grubov
Bergia decumbens Planch. ex Harv.
Berkheya carlinopsis
Berkheya onopordifolia (DC.) O.Hoffm. ex
 Burt Davy var. *onopordifolia*
Berkheya radula (Harv.) De Wild.
Berkheya seminivea Harv. & Sond.
Berkheya speciosa
Berkheya zeyheri
Bewsia biflora (Hack.) Gooss.
Bidens bipinnata L.
Bidens pilosa L.
Blechnum attenuatum
Blepharis breyeri Oberm.
Blepharis diversispina (Nees) C.B.Clarke
Blepharis integrifolia
Blepharis maderaspatensis
Blepharis subvolubilis
Blepharis transvaalensis Schinz
Blumea mollis (D.Don) Merr.
Boerhavia diffusa L.
Boerhavia erecta L.
Bonatea speciosa
Bonatea speciosa (L.f.) Willd. var. *antennifera*
 (Rolfe) Somerv.
Boophane disticha (L.f.) Herb.
Boscia albitrunca
Boscia foetida
Bothriochloa bladhii (Retz.) S.T.Blake
Bothriochloa insculpta (A.Rich.) A.Camus
Bothriochloa radicans (Lehm.) A.Camus
Brachiaria brizantha (A.Rich.) Stapf
Brachiaria deflexa (Schumach.) C.E.Hubb. ex
 Robyns
Brachiaria eruciformis (Sm.) Griseb.
Brachiaria nigropedata (Ficalho & Hiern) Stapf
Brachiaria serrata (Thunb.) Stapf
Brachylaena discolor DC.
Brachylaena rotundata S.Moore
Brachypodium bolusii Stapf
Bridelia mollis Hutch.
Briza minor L.

Brunsvigia natalensis Baker
Brunsvigia radulosa Herb.
Buchnera glabrata Benth.
Buddleja saligna Willd.
Buddleja salviifolia (L.) Lam.
Bulbine angustifolia Poelln.
Bulbine capitata Poelln.
Bulbine sedifolia Schltr. ex Poelln.
Bulbine species
Bulbostylis boeckeleriana (Schweinf.) Beetle
Bulbostylis burchellii (Ficalho & Hiern)
C.B. Clarke
Bulbostylis contexta (Nees) M. Bodard
Bulbostylis hispidula (Vahl) R. W. Haines
Bulbostylis humilis (Kunth) C. B. Clarke
Bulbostylis oritrephes (Ridl.) C. B. Clarke
Burkea africana Hook.
Buxus macowanii Oliv.
Cadaba aphylla (Thunb.) Wild
Calodendrum capense (L.f.) Thunb.
Calostephane divaricata Benth.
Calpurnia aurea
Canthium gilfillanii (N.E.Br.) O.B. Mill.
Canthium kuntzeanum Bridson
Canthium spinosum (Klotzsch) Kuntze
Canthium suberosum Codd
Cardiospermum halicacabum
Carex spicato-paniculata C. B. Clarke
Carissa bispinosa
Cassia abbreviata Oliv. ssp. *beareana* (Holmes)
Brenan
Cassine aethiopica Thunb.
Cassine burkeana (Sond.) Kuntze
Cassine species
Cassine transvaalensis (Burt Davy) Codd
Cassinopsis ilicifolia (Hochst.) Kuntze
Catophractes alexandri D. Don
Celtis africana Burm.f.
Cenchrus ciliaris L.
Cephalaria zeyheriana Szabó
Ceratotheca triloba (Bernh.) Hook.f.
Ceterach cordatum (Thunb.) Desv.
Chaetacanthus burchellii Nees
Chaetacanthus costatus Nees
Chaetacanthus setiger (Pers.) Lindl.
Chaetachme aristata Planch.
Chamaecrista absus (L.) Irwin & Barneby
Chamaecrista biensis (Steyaert) Lock
Chamaecrista comosa
Chamaecrista comosa E. Mey. var. *comosa*
Chamaecrista mimosoides (L.) Greene
Chamaesyce inaequilatera (Sond.) Soják
Chamaesyce neopolycnemoides (Pax & K. Hoffm.) Koutnik
Chamaesyce prostrata (Aiton) Small
Chascanum adenostachyum (Schauer)
Moldenke
Chascanum hederaceum
Chascanum hederaceum (Sond.) Moldenke var. *hederaceum*
Chascanum pinnatifidum (L.f.) E. Mey. var. *pinnatifidum*
Chascanum pinnatifidum
Cheilanthes hirta
Cheilanthes marlothii (Hieron.) Schelpe
Cheilanthes viridis
Cheilanthes viridis (Forssk.) Sw. var. *viridis*
Chenopodium album L.
Chenopodium ambrosioides L.
Chenopodium carinatum R.Br.
Chenopodium schraderianum Roem. & Schult.
Chironia palustris
Chironia purpurascens
Chloris gayana Kunth
Chloris mossambicensis K. Schum.
Chloris virgata Sw.
Chlorophytum bowkeri Baker
Chlorophytum cooperi (Baker) Nordal
Chlorophytum fasciculatum (Baker) Kativu
Chlorophytum galpinii (Baker) Kativu var. *galpinii*
Chlorophytum polyphyllum (Baker) Kativu
Chlorophytum transvaalense (Baker) Kativu
Chlorophytum trichophlebium (Baker) Nordal
Chortolirion angolense (Baker) A. Berger
Chrysocoma obtusata (Thunb.) Ehr. Bayer
Chrysopogon serrulatus Trin.
Cineraria canescens J.C. Wendl. ex Link
Cineraria lobata L'H,r.
Cirsium vulgare (Savi) Ten.
Cissus fragilis E. Mey. ex Kunth
Cissus quadrangularis L.
Clematis brachiata Thunb.
Clematis oweniae Harv.
Cleome angustifolia
Cleome hirta (Klotzsch) Oliv.
Cleome maculata (Sond.) Szyszyl.
Cleome monophylla L.
Cleome rubella Burch.
Clerodendrum glabrum
Clerodendrum myricoides (Hochst.) Vatke
Clerodendrum ternatum
Clerodendrum triphyllum
Clutia pulchella
Coccinia adoensis (A. Rich.) Cogn.
Coleochloa setifera (Ridl.) Gilly
Colophospermum mopane (J. Kirk ex Benth.)
J. Kirk ex J. L. Onard
Combretum apiculatum
Combretum collinum
Combretum erythrophyllum (Burch.) Sond.
Combretum hereroense Schinz
Combretum imberbe Wawra
Combretum kraussii Hochst.
Combretum moggii Exell
Combretum molle R.Br. ex G. Don

Combretum mossambicense (Klotzsch) Engl.
 Combretum nelsonii Dummer
 Combretum woodii Dummer
 Combretum zeyheri Sond.
 Commelina africana
 Commelina benghalensis L.
 Commelina diffusa
 Commelina eckloniana Kunth
 Commelina erecta L.
 Commelina livingstonii C.B. Clarke
 Commelina subulata Roth
 Commicarpus fallacissimus (Heimerl) Heimerl
 ex Oberm.
 Commicarpus pentandrus (Burch.) Heimerl
 Commiphora africana (A. Rich.) Engl.
 Commiphora crenato-serrata Engl.
 Commiphora edulis (Klotzsch) Engl.
 Commiphora glandulosa Schinz
 Commiphora marlothii Engl.
 Commiphora merkeri Engl.
 Commiphora mollis (Oliv.) Engl.
 Commiphora neglecta I. Verd.
 Commiphora pyracanthoides Engl.
 Commiphora schimperi (O. Berg) Engl.
 Commiphora tenuipetiolata Engl.
 Convolvulus natalensis Bernh. apud C. Krauss
 var. transvaalensis (Schltr.) A. Meeuse
 Convolvulus ocellatus Hook. f. var. ocellatus
 Convolvulus sagittatus
 Conyza aegyptiaca (L.) Aiton
 Conyza albida Spreng.
 Conyza bonariensis (L.) Cronquist
 Conyza podocephala DC.
 Conyza scabrida DC.
 Conyza ulmifolia (Burm. f.) Kuntze
 Corbichonia decumbens (Forssk.) Exell
 Corchorus asplenifolius Burch.
 Corchorus confusus Wild
 Corchorus kirkii N.E. Br.
 Corchorus trilocularis L.
 Cordia monoica Roxb.
 Cotyledon orbiculata
 Cotyledon species
 Crabbea angustifolia Nees
 Crabbea hirsuta Harv.
 Crassula alba
 Crassula campestris (Eckl. & Zeyh.) Endl. ex
 Walp.
 Crassula capitella
 Crassula exilis Harv. ssp. sedifolia (N.E. Br.)
 Toelken
 Crassula lanceolata
 Crassula sarcocaulis
 Crassula setulosa
 Crassula species
 Crassula swaziensis Schönland
 Craterostigma wilmsii Engl. ex Diels
 Crossandra greenstockii S. Moore
 Crotalaria brachycarpa (Benth.) Burt Davy ex
 I. Verd.
 Crotalaria burkeana Benth.
 Crotalaria damarensis Engl.
 Crotalaria laburnifolia
 Crotalaria lotoides Benth.
 Crotalaria meyeriana Steud.
 Crotalaria pisicarpa Welw. ex Baker
 Crotalaria spartea Baker
 Crotalaria sphaerocarpa
 Croton gratissimus
 Croton menyhartii Pax
 Croton species
 Cryptocarya angustifolia E. Mey. ex Meisn.
 Cryptolepis oblongifolia (Meisn.) Schltr.
 Cryptolepis transvaalensis Schltr.
 Cucumella species
 Cucumis africanus L. f.
 Cucumis hirsutus Sond.
 Cucumis myriocarpus
 Cucumis zeyheri Sond.
 Cullen holubii (Burt Davy) C. H. Stirt.
 Cuscuta campestris Yunck.
 Cussonia paniculata
 Cussonia spicata Thunb.
 Cussonia transvaalensis Reyneke
 Cyanotis speciosa (L. f.) Hassk.
 Cyathea dregei Kunze
 Cyathula cylindrica Moq.
 Cyathula lanceolata Schinz
 Cycnium adonense
 Cymbopogon excavatus (Hochst.) Stapf ex
 Burt Davy
 Cymbopogon marginatus (Steud.) Stapf ex
 Burt Davy
 Cymbopogon plurinodis (Stapf) Stapf ex Burt
 Davy
 Cymbopogon validus (Stapf) Stapf ex Burt
 Davy
 Cynanchum schistoglossum Schltr.
 Cynodon dactylon (L.) Pers.
 Cynodon hirsutus Stent
 Cynodon nlemfuensis Vanderyst
 Cynoglossum lanceolatum Forssk.
 Cyperus albostrigatus Schrad.
 Cyperus amabilis Vahl
 Cyperus bellus Kunth
 Cyperus compressus L.
 Cyperus denudatus L. f.
 Cyperus esculentus
 Cyperus laevigatus L.
 Cyperus leptocladus Kunth
 Cyperus margaritaceus Vahl
 Cyperus marginatus Thunb.
 Cyperus obtusiflorus
 Cyperus rupestris
 Cyperus sexangularis Nees
 Cyperus species

Cyperus sphaerospermus Schrad.
Cyperus textilis Thunb.
Cyperus usitatus
Cyphia angustifolia Eckl. & Zeyh.
Cyphia stenopetala Diels
Cyphostemma cirrhosum
Cyphostemma humile
Cyphostemma lanigerum (Harv.) Desc. ex Wild & R.B.Drumm.
Cyphostemma sandersonii (Harv.) Desc.
Dactyloctenium aegyptium (L.) Willd.
Dalechampia capensis A.Spreng.
Danthoniopsis dinteri (Pilg.) C.E.Hubb.
Datura ferox L.
Datura stramonium L.
Delosperma herbeum (N.E.Br.) N.E.Br.
Delosperma leendertziae N.E.Br.
Delosperma species
Denekia capensis Thunb.
Deverra burchellii (DC.) Eckl. & Zeyh.
Dianthus mooiensis
Dianthus transvaalensis Burt Davy
Dicerocaryum eriocarpum (Decne.) Abels
Dichanthium annulatum (Forssk.) Stapf var. *papillosum* (A.Rich.) de Wet & Harlan
Dichapetalum cymosum (Hook.) Engl.
Dichondra repens J.R. & G.Forst.
Dichrostachys cinerea
Dicliptera clinopodia Nees
Dicliptera fruticosa K.Balkwill
Dicliptera micranthes Nees
Dicoma anomala Sond.
Dicoma capensis Less.
Dicoma macrocephala DC.
Dicoma tomentosa Cass.
Dicoma zeyheri
Digitaria argyrograpta (Nees) Stapf
Digitaria brazzae (Franch.) Stapf
Digitaria diagonalis
Digitaria eriantha Steud.
Digitaria monodactyla (Nees) Stapf
Digitaria polyphylla Henrard
Digitaria sanguinalis (L.) Scop.
Digitaria ternata (A.Rich.) Stapf
Digitaria tricholaenoides Stapf
Digitaria velutina (Forssk.) P.Beauv.
Diheteropogon amplexans (Nees) Clayton
Diheteropogon filifolius (Nees) Clayton
Dimorphotheca spectabilis Schltr.
Dinebra retroflexa
Diospyros austro-africana
Diospyros lycioides Desf. ssp. *guerkei* (Kuntze) De Winter
Diospyros rotundifolia Hiern
Diospyros whyteana (Hiern) F.White
Dipcadi ciliare (Zeyh. ex Harv.) Baker
Dipcadi glaucum (Ker Gawl.) Baker
Dipcadi longifolium (Lindl.) Baker
Dipcadi marlothii Engl.
Dipcadi viride (L.) Moench
Diplorhynchus condylocarpon (Müll.Arg.) Pichon
Dissotis debilis
Dodonaea angustifolia L.f.
Dolichos angustifolius Eckl. & Zeyh.
Dombeya rotundifolia
Doryopteris concolor (Langsd. & Fisch.) Kuhn
Dovyalis zeyheri (Sond.) Warb.
Drimia elata Jacq.
Drimiopsis burkei Baker
Droguetia iners
Drosera madagascariensis DC.
Duranta erecta L.
Dyschoriste transvaalensis C.B.Clarke
Echinochloa colona (L.) Link
Echinochloa holubii (Stapf) Stapf
Ehretia amoena Klotzsch
Ehretia rigida (Thunb.) Druce
Ehrharta erecta
Ehrharta melicoides Thunb.
Elephantorrhiza burkei Benth.
Elephantorrhiza elephantina (Burch.) Skeels
Elephantorrhiza obliqua
Eleusine coracana
Elionurus muticus (Spreng.) Kunth
Emilia transvaalensis (Bolus) C.Jeffrey
Endostemon tereticaulis (Poir.) M.Ashby
Englerophytum magalismontanum (Sond.) T.D.Penn.
Enneapogon cenchroides (Roem. & Schult.) C.E.Hubb.
Enneapogon desvauxii P.Beauv.
Enneapogon pretoriensis Stent
Enneapogon scoparius Stapf
Enteropogon macrostachyus (A.Rich.) Benth.
Epilobium tetragonum
Equisetum ramosissimum Desf.
Eragrostis acraea De Winter
Eragrostis aspera (Jacq.) Nees
Eragrostis biflora Hack. ex Schinz
Eragrostis capensis (Thunb.) Trin.
Eragrostis chloromelas Steud.
Eragrostis ciliaris (L.) R.Br.
Eragrostis curvula (Schrad.) Nees
Eragrostis dinteri Stapf
Eragrostis echinochloidea Stapf
Eragrostis gummiflua Nees
Eragrostis heteromera Stapf
Eragrostis lappula Nees
Eragrostis lehmanniana
Eragrostis micrantha Hack.
Eragrostis nindensis Ficalho & Hiern
Eragrostis obtusa Munro ex Ficalho & Hiern
Eragrostis pallens Hack.
Eragrostis plana Nees
Eragrostis pseudosclerantha Chiov.

Eragrostis racemosa (Thunb.) Steud.
Eragrostis rigidior Pilg.
Eragrostis rotifer Rendle
Eragrostis sclerantha
Eragrostis stapfii De Winter
Eragrostis superba Peyr.
Eragrostis trichophora Coss. & Durieu
Erica woodii Bolus
Eriosema burkei Benth.
Eriosema cordatum E.Mey.
Eriosema salignum E.Mey.
Erythrina caffra Thunb.
Erythrina lysistemon Hutch.
Erythrina mendesii Torre
Euclea crispa
Euclea divinorum Hiern
Euclea linearis Zeyh. ex Hiern
Euclea natalensis
Euclea undulata
Eulalia villosa (Thunb.) Nees
Eulophia ovalis
Euphorbia clavarioides
Euphorbia cooperi
Euphorbia ingens E.Mey. ex Boiss.
Euphorbia quadrata Nel
Euphorbia schinzii Pax
Euphorbia striata
Euphorbia tirucalli L.
Euphorbia trichadenia Pax
Eustachys paspaloides (Vahl) Lanza & Mattei
Evolvulus alsinoides
Fadogia homblei De Wild.
Falckia oblonga Bernh. ex C.Krauss
Faurea saligna Harv.
Felicia clavipilosa
Felicia fascicularis DC.
Felicia filifolia
Felicia mossamedensis (Hiern) Mendonça
Felicia muricata
Felicia scabrida (DC.) Range
Festuca scabra Vahl
Ficinia filiformis (Lam.) Schrad.
Ficus abutilifolia (Miq.) Miq.
Ficus capreifolia Delile
Ficus cordata Thunb. ssp. *salicifolia* (Vahl) C.C.Berg
Ficus glumosa (Miq.) Delile
Ficus ingens
Ficus tettensis Hutch.
Ficus thonningii Blume
Fimbristylis ferruginea (L.) Vahl
Fingerhuthia africana Lehm.
Flacourtia indica (Burm.f.) Merr.
Flaveria bidentis (L.) Kuntze
Floscopa glomerata (Willd. ex Schult. & Schult.f.) Hassk.
Flueggea virosa
Freesia grandiflora (Baker) Klatt
Freesia laxa (Thunb.) Goldblatt & J.C.Manning
ssp. *laxa*
Frithia pulchra
Fuirena pubescens (Poir.) Kunth
Galopina circaeoides Thunb.
Gardenia resiniflua
Gardenia volkensii
Garuleum woodii Schinz
Gazania krebsiana
Geigeria burkei
Geigeria elongata Alston
Geigeria ornativa O.Hoffm.
Gerbera ambigua (Cass.) Sch.Bip.
Gerbera piloselloides (L.) Cass.
Gerbera viridifolia
Gisekia africana
Gisekia pharnacioides
Gladiolus calcaratus G.J.Lewis
Gladiolus permeabilis
Gladiolus permeabilis D.Delaroche ssp. *edulis* (Burch. ex Ker Gawl.) Oberm.
Gnaphalium filagopsis Hilliard & B.L.Burt
Gnidia capitata L.f.
Gnidia microcephala Meisn.
Gnidia sericocephala (Meisn.) Gilg ex Engl.
Gomphocarpus fruticosus (L.) Aiton f.
Gomphocarpus physocarpus E.Mey.
Gomphocarpus tomentosus Burch.
Gomphrena celosioides Mart.
Graderia subintegra Mast.
Grewia bicolor Juss.
Grewia caffra Meisn.
Grewia flava DC.
Grewia flavescens
Grewia hexamita Burret
Grewia monticola Sond.
Grewia occidentalis L.
Grewia retinervis Burret
Grewia subspathulata N.E.Br.
Grewia tenax (Forssk.) Fiori
Grewia villosa Willd.
Guilleminea densa (Willd.) Moq.
Gunnera perpensa L.
Haemanthus carneus Ker Gawl.
Halleria lucida L.
Haplocarpha scaposa Harv.
Harpagophytum procumbens
Harpagophytum zeyheri
Harpagophytum zeyheri Decne. ssp. *zeyheri*
Hebenstretia dentata L.
Helichrysum acrophilum Bolus
Helichrysum acutatum DC.
Helichrysum athrxiifolium (Kuntze) Moeser
Helichrysum aureum
Helichrysum caespitium (DC.) Harv.
Helichrysum cephaloideum DC.
Helichrysum cerastioides
Helichrysum coriaceum Harv.

Helichrysum dasymallum Hilliard
Helichrysum galpinii N.E.Br.
Helichrysum glomeratum Klatt
Helichrysum harveyanum Wild
Helichrysum interjacens Hilliard
Helichrysum kraussii Sch.Bip.
Helichrysum lepidissimum S.Moore
Helichrysum melanacme DC.
Helichrysum mimetes S.Moore
Helichrysum mundtii Harv.
Helichrysum nudifolium (L.) Less.
Helichrysum oxyphyllum DC.
Helichrysum setosum Harv.
Helichrysum splendidum (Thunb.) Less.
Helichrysum subglomeratum Less.
Helichrysum uninervium Burttt Davy
Helichrysum zeyheri Less.
Helinus integrifolius (Lam.) Kuntze
Heliotropium ciliatum Kaplan
Hemizygia canescens (Gürke) M.Ashby
Hermannia boraginiflora Hook.
Hermannia coccocarpa (Eckl. & Zeyh.) Kuntze
Hermannia depressa N.E.Br.
Hermannia floribunda Harv.
Hermannia glabrata L.f.
Hermannia glanduligera K.Schum.
Hermannia grandifolia N.E.Br.
Hermannia grisea Schinz
Hermannia linnaeoides (Burch.) K.Schum.
Hermannia modesta (Ehrenb.) Mast.
Hermannia parvula Burttt Davy
Hermannia quartiniana
Hermannia rigida Harv.
Hermannia tomentosa (Turcz.) Schinz ex Engl.
Hermannia umbratica I.Verd.
Hermbstaedtia linearis Schinz
Hermbstaedtia odorata
Heteromorpha arborescens (Thunb.) Cham. & Schltldl.
Heteropogon contortus (L.) Roem. & Schult.
Heteropyxis natalensis Harv.
Hexalobus monopetalus
Hibiscus aethiopicus
Hibiscus calyphyllus Cav.
Hibiscus cannabinus L.
Hibiscus engleri K.Schum.
Hibiscus lunarifolius Willd.
Hibiscus microcarpus Garcke
Hibiscus pedunculatus L.f.
Hibiscus platycalyx Mast.
Hibiscus praeteritus R.A.Dyer
Hibiscus pusillus Thunb.
Hibiscus schinzii Gürke
Hibiscus subreniformis Burttt Davy
Hibiscus trionum L.
Hirpicium bechuanense (S.Moore) Roessler
Holubia saccata Oliv.
Homeria pallida Baker
Hybanthus enneaspermus (L.) F.Muell.
Hypparrhenia anamesa Clayton
Hypparrhenia dregeana (Nees) Stapf
Hypparrhenia filipendula
Hypparrhenia hirta (L.) Stapf
Hypparrhenia tamba (Steud.) Stapf
Hypericum aethiopicum
Hypericum lalandii Choisy
Hyperthelia dissoluta (Nees ex Steud.) Clayton
Hyphaene coriacea Gaertn.
Hypoestes aristata (Vahl) Sol. ex Roem. & Schult. var. *aristata*
Hypoestes forskaolii (Vahl) R.Br.
Hypoxis acuminata Baker
Hypoxis angustifolia
Hypoxis argentea
Hypoxis filiformis Baker
Hypoxis hemerocallidea Fisch. & C.A.Mey.
Hypoxis iridifolia Baker
Hypoxis rigidula
Ilex mitis
Imperata cylindrica (L.) Raeusch.
Indigastrum burkeanum (Benth. ex Harv.) Schrire
Indigofera adenoides Baker f.
Indigofera alternans
Indigofera charlieriana
Indigofera circinnata Benth. ex Harv.
Indigofera comosa N.E.Br.
Indigofera cryptantha
Indigofera daleoides
Indigofera egens N.E.Br.
Indigofera filipes Benth. ex Harv.
Indigofera frondosa N.E.Br.
Indigofera hedyantha Eckl. & Zeyh.
Indigofera heterotricha DC.
Indigofera hilaris Eckl. & Zeyh.
Indigofera hirsuta
Indigofera longebarbata Engl.
Indigofera melanadenia Benth. ex Harv.
Indigofera nebrowiana J.B.Gillett
Indigofera oxalidea Welw. ex Baker
Indigofera rhytidocarpa
Indigofera sanguinea N.E.Br.
Indigofera schimperi
Indigofera sessilifolia DC.
Indigofera setiflora Baker
Indigofera spicata Forssk.
Indigofera torulosa
Indigofera trita
Indigofera vicioides
Indigofera zeyheri Spreng. ex Eckl. & Zeyh.
Ipomoea bathycolpos
Ipomoea bolusiana
Ipomoea cairica (L.) Sweet
Ipomoea crassipes Hook.
Ipomoea gracilisejala Rendle
Ipomoea hochstetteri House

Ipomoea magnusiana
Ipomoea obscura
Ipomoea oenotherae (Vatke) Hallier f.
Ipomoea ommaneyi Rendle
Ipomoea papilio Hallier f.
Ipomoea purpurea (L.) Roth
Ipomoea simplex Thunb.
Ipomoea sinensis
Ipomoea transvaalensis A.Meeuse
Ischaemum afrum (J.F.Gmel.) Dandy
Isolepis fluitans (L.) R.Br.
Isolepis hystrix (Thunb.) Nees
Jacaranda mimosifolia D.Don
Jamesbrittenia atropurpurea (Benth.) Hilliard
ssp. atropurpurea
Jamesbrittenia montana (Diels) Hilliard
Jasminum breviflorum Harv. ex C.H. Wright
Jasminum multipartitum Hochst.
Jatropha capensis (L.f.) Sond.
Jatropha latifolia
Jatropha spicata Pax
Jatropha zeyheri
Justicia anagaloides (Nees) T.Anderson
Justicia betonica L.
Justicia flava (Vahl) Vahl
Justicia petiolaris
Justicia protracta
Kalanchoe lanceolata (Forssk.) Pers.
Kalanchoe paniculata Harv.
Kalanchoe rotundifolia (Haw.) Haw.
Kalanchoe species
Kalanchoe thyrsoiflora Harv.
Kedrostis africana (L.) Cogn.
Kedrostis crassirostrata Bremek.
Kedrostis foetidissima (Jacq.) Cogn.
Khadia acutipetala (N.E.Br.) N.E.Br.
Kirkia acuminata Oliv.
Kirkia wilmsii Engl.
Koeleria capensis (Steud.) Nees
Kohautia amatymbica Eckl. & Zeyh.
Kohautia caespitosa
Kohautia cynanchica DC.
Kohautia virgata (Willd.) Bremek.
Kyllinga alba Nees
Kyphocarpa angustifolia (Moq.) Lopr.
Lactuca inermis Forssk.
Laggera crispata (Vahl) Hepper & J.R.I. Wood
Lannea discolor (Sond.) Engl.
Lannea edulis
Lannea schimperi (A.Rich.) Engl.
Lantana camara L.
Lantana rugosa Thunb.
Lapeirousia sandersonii Baker
Ledebouria cooperi (Hook.f.) Jessop
Ledebouria floribunda (Baker) Jessop
Ledebouria graminifolia (Baker) Jessop
Ledebouria marginata (Baker) Jessop
Ledebouria ovatifolia (Baker) Jessop
Ledebouria revoluta (L.f.) Jessop
Leersia hexandra Sw.
Leonotis leonurus (L.) R.Br.
Leonotis ocymifolia
Lepidium africanum
Leucas capensis (Benth.) Engl.
Leucas glabrata
Leucas martinicensis (Jacq.) R.Br.
Leucas neuflizeana Courbon
Leucas sexdentata Skan
Limeum aethiopicum
Limeum fenestratum
Limeum pterocarpum
Limeum sulcatum
Limeum viscosum
Linum thunbergii Eckl. & Zeyh.
Lippia javanica (Burm.f.) Spreng.
Lippia rehmannii H.Pearson
Lippia scaberrima Sond.
Litanthus pusillus Harv.
Litogyne gariepina (DC.) Anderb.
Littonia modesta Hook.
Littonia rigidifolia Bredell
Littonia species
Lobelia aquaemontis E.Wimm.
Lolium perenne L.
Lonchocarpus capassa Rolfe
Lophiocarpus tenuissimus Hook.f.
Lopholaena coriifolia (Sond.) E.Phillips & C.A.Sm.
Lotononis bainesii Baker
Lotononis calycina (E.Mey.) Benth.
Lotononis laxa Eckl. & Zeyh.
Loudetia flavida (Stapf) C.E.Hubb.
Loudetia simplex (Nees) C.E.Hubb.
Lupinus species
Lycium cinereum Thunb. sensu lato
Lycium hirsutum Dunal
Lycium schizocalyx C.H. Wright
Lycium species
Macrotyloma axillare
Maerua angolensis DC.
Maerua cafra (DC.) Pax
Maerua parvifolia Pax
Mariscus capensis (Steud.) Schrad.
Mariscus congestus (Vahl) C.B. Clarke
Mariscus indecorus
Mariscus rehmannianus C.B. Clarke
Mariscus uitenhagensis Steud.
Markhamia zanzibarica (Bojer ex DC.) K.Schum.
Maytenus heterophylla (Eckl. & Zeyh.) N.Robson
Maytenus polyacantha (Sond.) Marais
Maytenus senegalensis (Lam.) Exell
Maytenus tenuispina (Sond.) Marais
Maytenus undata (Thunb.) Blakelock
Melhania acuminata

Melhania forbesii Planch. ex Mast.
Melhania prostrata DC.
Melhania rehmannii Szyszyl.
Melia azedarach L.
Melica decumbens Thunb.
Melinis nerviglumis (Franch.) Zizka
Melinis repens
Melinis repens (Willd.) Zizka ssp. *repens*
Menodora africana Hook.
Merremia palmata Hallier f.
Merremia tridentata
Microchloa caffra Nees
Mimusops zeyheri Sond.
Miscanthus junceus (Stapf) Pilg.
Mohria caffrorum
Momordica balsamina L.
Momordica repens Bremek.
Monechma debile (Forssk.) Nees
Monechma divaricatum (Nees) C.B. Clarke
Monocymbium cerasiiforme (Nees) Stapf
Monopsis decipiens (Sond.) Thulin
Monsonia angustifolia E.Mey. ex A. Rich.
Monsonia burkeana Planch. ex Harv.
Mosdenia leptostachys (Ficalho & Hiern) Clayton
Mundulea sericea (Willd.) A. Chev.
Myrica pilulifera Rendle
Myrica serrata Lam.
Myrothamnus flabellifolius Welw.
Myrsine africana L.
Nemesia fruticans (Thunb.) Benth.
Neonotonia wightii (Arn.) J.A. Lackey
Neorautanenia ficifolius (Benth.) C.A. Sm.
Nesaea schinzii Koehne
Nicolasia stenoptera
Nidorella auriculata DC.
Nidorella hottentotica DC.
Nidorella resedifolia
Nolletia ciliaris (DC.) Steetz
Nolletia rarifolia (Turcz.) Steetz
Nuxia congesta R.Br. ex Fresen.
Nuxia glomerulata (C.A. Sm.) I. Verd.
Obetia tenax (N.E. Br.) Friis
Ochna holstii Engl.
Ochna inermis (Forssk.) Schweinf.
Ochna pretoriensis E. Phillips
Ochna pulchra Hook.
Ocimum americanum L. var. *americanum*
Oenothera rosea L'H,r. ex Aiton
Oldenlandia herbacea
Olea europaea
Olea europaea L. ssp. *africana* (Mill.) P.S. Green
Ophrestia oblongifolia
Oplismenus hirtellus (L.) P. Beauv.
Opuntia imbricata (Haw.) DC.
Opuntia species
Ormocarpum trichocarpum (Taub.) Engl.
Oropetium capense Stapf
Osteospermum muricatum
Osyris lanceolata Hochst. & Steud.
Otoptera burchellii DC.
Oxalis corniculata L.
Oxalis depressa Eckl. & Zeyh.
Oxalis latifolia Humb.
Oxalis obliquifolia Steud. ex Rich.
Oxalis species
Oxygonum dregeanum
Oxygonum sinuatum (Hochst. & Steud. ex Meisn.) Dammer
Ozoroa insignis Delile ssp. *reticulata* (Baker f.) J.B. Gillett
Ozoroa paniculosa
Pachycarpus schinzianus (Schltr.) N.E. Br.
Pachystigma macrocalyx (Sond.) Robyns
Pachystigma pygmaeum (Schltr.) Robyns
Pachystigma triflorum Robyns
Panicum coloratum
Panicum deustum Thunb.
Panicum dregeanum Nees
Panicum maximum Jacq.
Panicum natalense Hochst.
Panicum schinzii Hack.
Panicum volutans J.G. Anderson
Pappea capensis Eckl. & Zeyh.
Parinari capensis
Paspalum dilatatum Poir.
Paspalum distichum L.
Paspalum scrobiculatum L.
Paspalum urvillei Steud.
Passerina montana Thoday
Pavetta edentula Sond.
Pavetta eylesii S. Moore
Pavetta gardeniifolia
Pavonia burchellii (DC.) R.A. Dyer
Pavonia columella Cav.
Pavonia senegalensis (Cav.) Leistner
Pavonia transvaalensis (Ulbr.) A. Meeuse
Pearsonia aristata (Schinz) Dummer
Pearsonia cajanifolia
Pearsonia sessilifolia
Pelargonium luridum (Andrews) Sweet
Pellaea calomelanos
Pellaea pectiniformis Baker
Peltophorum africanum Sond.
Pennisetum sphacelatum (Nees) T. Durand & Schinz
Pentansia angustifolia (Hochst.) Hochst.
Pentarrhinum insipidum E. Mey.
Pentzia calcarea Kies
Perotis patens Gand.
Persicaria attenuata
Phragmites australis (Cav.) Steud.
Phragmites mauritianus Kunth
Phyla species
Phyllanthus burchellii Müll. Arg.

Phyllanthus glaucophyllus Sond.
Phyllanthus incurvus Thunb.
Phyllanthus maderaspatensis L.
Phyllanthus parvulus Sond.
Phyllanthus pentandrus Schumach. & Thonn.
Phyllanthus pinnatus (Wight) G.L. Webster
Phymaspermum athanasioides (S. Moore)
 Källersjö
Piliostigma thonningii (Schumach.) Milne-Redh.
Pittosporum viridiflorum Sims
Plectranthus cylindraceus Hochst. ex Benth.
Plectranthus fruticosus L'Hér.
Plectranthus grandidentatus Gürke
Plectranthus hadiensis
Plectranthus madagascariensis
Plectranthus neochilus Schltr.
Plectranthus verticillatus (L.f.) Druce
Plumbago zeylanica L.
Podocarpus latifolius (Thunb.) R.Br. ex Mirb.
Pogonarthria squarrosa (Roem. & Schult.) Pilg.
Pollichia campestris Aiton
Polycarpaea corymbosa (L.) Lam.
Polygala albida
Polygala amatymbica Eckl. & Zeyh.
Polygala hottentotta C. Presl
Polygala ohlendorffiana Eckl. & Zeyh.
Polygala producta N.E.Br.
Polygala rehmannii Chodat
Polygala sphenoptera Fresen.
Polygala uncinata E.Mey. ex Meisn.
Polygala wilmsii Chodat
Polygonum hystriculum J. Schust.
Polygonum meisnerianum Cham. & Schltld.
Populus alba L.
Portulaca kermesina N.E.Br.
Portulaca oleracea L.
Portulaca pilosa L.
Portulaca quadrifida L.
Pouzolzia mixta Solms
Priva africana Moldenke
Priva cordifolia
Protea caffra
Protea gagedi
Protea roupelliae
Protea species
Protea welwitschii Engl.
Prunus africana (Hook.f.) Kalkman
Psammotropha mucronata
Pseudognaphalium luteo-album (L.) Hilliard & B.L. Burtt
Pseudognaphalium oligandrum (DC.) Hilliard & B.L. Burtt
Pseudognaphalium undulatum (L.) Hilliard & B.L. Burtt
Pseudolachnostylis maprouneifolia
Psydrax livida (Hiern) Bridson
Pteridium aquilinum (L.) Kuhn
Pterocarpus angolensis DC.
Pterocarpus rotundifolius
Pterocelastrus echinatus N.E.Br.
Pterocelastrus rostratus Walp.
Pterodiscus speciosus Hook.
Ptychobium contortum (N.E.Br.) Brummitt
Ptychobium plicatum (Oliv.) Harms
Pupalia lappacea
Putterlickia pyracantha (L.) Szyszyl.
Pycnostachys reticulata (E.Mey.) Benth.
Pygmaeothamnus zeyheri
Ranunculus multifidus Forssk.
Raphionacme burkei N.E.Br.
Raphionacme galpinii Schltr.
Raphionacme hirsuta (E.Mey.) R.A. Dyer ex E. Phillips
Requienia sphaerosperma DC.
Rhamnus prinoides L'Hér.
Rhigozum brevispinosum Kuntze
Rhigozum obovatum Burch.
Rhigozum zambesiicum Baker
Rhoicissus digitata (L.f.) Gilg & M. Brandt
Rhoicissus revoilii Planch.
Rhoicissus tridentata
Rhus ciliata Licht. ex Schult.
Rhus dentata Thunb.
Rhus discolor E.Mey. ex Sond.
Rhus engleri Britten
Rhus gracillima
Rhus gueinzii Sond.
Rhus lancea L.f.
Rhus leptodictya Diels
Rhus magalismsontana
Rhus pentheri Zahlbr.
Rhus pyroides
Rhus rigida
Rhus rigida Mill. var. *rigida*
Rhus tenuinervis Engl.
Rhus tumulicola
Rhus zeyheri Sond.
Rhynchosia caribaea (Jacq.) DC.
Rhynchosia ciliata (Thunb.) Schinz
Rhynchosia confusa Burt & Davy
Rhynchosia longiflora Schinz
Rhynchosia minima
Rhynchosia monophylla Schltr.
Rhynchosia nervosa
Rhynchosia nitens Benth.
Rhynchosia spectabilis Schinz
Rhynchosia totta
Rhynchosia vendae C.H. Stirt.
Rhynchospora brownii Roem. & Schult.
Richardia brasiliensis Gomes
Rothmannia capensis Thunb.
Rubia petiolaris DC.
Rubus rigidus Sm.
Ruellia cordata Thunb.
Ruellia malacophylla C.B. Clarke

Ruellia patula Jacq.
Ruelliopsis species
Salacia rehmannii Schinz
Salix mucronata Thunb. ssp. *woodii* (Seemen) Immelman
Salvadora australis Schweick.
Salvia radula Benth.
Salvia repens
Salvia runcinata L.f.
Salvia species
Sansevieria aethiopica Thunb.
Sansevieria hyacinthoides (L.) Druce
Sansevieria species
Sarcostemma viminale (L.) R.Br.
Satureja biflora (Buch.-Ham. ex D.Don) Briq.
Scabiosa columbaria L.
Scadoxus multiflorus
Scadoxus puniceus (L.) Friis & Nordal
Schistostephium crataegifolium (DC.) Fenzl ex Harv.
Schistostephium griseum (Harv.) Hutch.
Schistostephium heptalobum (DC.) Oliv. & Hiern
Schizachyrium jeffreysii (Hack.) Stapf
Schizachyrium sanguineum (Retz.) Alston
Schizachyrium ursulus Stapf
Schizobasis intricata (Baker) Baker
Schkuhria pinnata (Lam.) Cabrera
Schmidtia pappophoroides Steud.
Schoenoplectus corymbosus (Roth ex Roem. & Schult.) J.Raynal
Schoenoplectus leucanthus (Boeck.) J.Raynal
Schoenoplectus triquetus (L.) Palla
Schoenoxiphium lehmannii (Nees) Steud.
Schoenoxiphium sparteum (Wahlenb.) C.B.Clarke
Schotia brachypetala Sond.
Schrebera alata (Hochst.) Welw.
Scilla nervosa (Burch.) Jessop
Scirpoides species
Scirpus burkei C.B.Clarke
Scirpus ficinioides Kunth
Scleria bulbifera Hochst. ex A.Rich.
Sclerocarya birrea (A.Rich.) Hochst. ssp. *caffra* (Sond.) Kokwaro
Scolopia zeyheri (Nees) Harv.
Sebaea junodii Schinz
Secamone alpini Schult.
Secamone filiformis (L.f.) J.H.Ross
Secamone parvifolia (Oliv.) Bullock
Securidaca longepedunculata Fresen.
Seddera capensis (E.Mey. ex Choisy) Hallier f.
Selaginella dregei (C.Presl) Hieron.
Selago capitellata Schltr.
Senecio achilleifolius DC.
Senecio affinis DC.
Senecio albanensis
Senecio apiifolius (DC.) Benth. & Hook.f. ex O.Hoffm.
Senecio barbatus DC.
Senecio burchellii DC.
Senecio conrathii N.E.Br.
Senecio coronatus (Thunb.) Harv.
Senecio erubescens
Senecio inaequidens DC.
Senecio inornatus DC.
Senecio isatideus DC.
Senecio linifolius L.
Senecio microglossus DC.
Senecio oxyriifolius DC.
Senecio pleistocephalus S.Moore
Senecio ruwenzoriensis S.Moore
Senecio serratuloides
Senecio venosus Harv.
Senna italica
Senna italica Mill. ssp. *micrantha* (Brenan) Lock
Senna septemtrionalis (Viv.) Irwin & Barneby
Sesamothamnus lugardii N.E.Br. ex Stapf
Sesamum alatum Thonn.
Sesamum triphyllum
Setaria incrassata (Hochst.) Hack.
Setaria lindenbergiana (Nees) Stapf
Setaria megaphylla (Steud.) T.Durand & Schinz
Setaria nigrirostris (Nees) T.Durand & Schinz
Setaria pallide-fusca (Schumach.) Stapf & C.E.Hubb.
Setaria sagittifolia (A.Rich.) Walp.
Setaria sphacelata
Setaria ustilata de Wit
Setaria verticillata (L.) P.Beauv.
Sida alba L.
Sida chrysantha Ulbr.
Sida cordifolia L.
Sida dregei Burttt Davy
Sida ovata Forssk.
Sida rhombifolia L.
Silene burchellii
Solanum capense L.
Solanum coccineum Jacq.
Solanum delagoense Dunal
Solanum giganteum Jacq.
Solanum incanum L.
Solanum kwebense N.E.Br.
Solanum mauritanum Scop.
Solanum nigrum L.
Solanum nodiflorum Jacq.
Solanum panduriforme E.Mey.
Solanum retroflexum Dunal
Solanum rigescens Jacq.
Solanum sisymbriifolium Lam.
Solanum species
Solanum supinum Dunal
Sonchus dregeanus DC.
Sonchus wilmsii R.E.Fr.

Sorghum bicolor
Sorghum versicolor Andersson
Spermacoce natalensis Hochst.
Spermacoce senensis (Klotzsch) Hiern
Sphegamnocarpus pruriens
Sphenostylis angustifolia Sond.
Spirostachys africana Sond.
Sporobolus africanus (Poir.) Robyns & Tournay
Sporobolus fimbriatus (Trin.) Nees
Sporobolus ioclados (Trin.) Nees
Sporobolus nitens Stent
Sporobolus panicoides A.Rich.
Sporobolus pectinatus Hack.
Sporobolus stapfianus Gand.
Stachys aethiopica L.
Stachys natalensis
Stachys spathulata Burch. ex Benth.
Stapelia gigantea N.E.Br.
Steganotaenia araliacea Hochst.
Sterculia rogersii N.E.Br.
Stiburus alopecuroides (Hack.) Stapf
Stipagrostis uniplumis
Stipagrostis zeyheri
Stoebe vulgaris Levyns
Streptocarpus vandeleurii Baker f. & S.Moore
Striga asiatica (L.) Kuntze
Striga bilabiata (Thunb.) Kuntze
Striga elegans Benth.
Striga gesnerioides (Willd.) Vatke ex Engl.
Strychnos cocculoides Baker
Strychnos madagascariensis Poir.
Strychnos pungens Soler.
Stylochiton natalensis Schott
Stylosanthes fruticosa (Retz.) Alston
Stylosanthes species
Sutera arcuata Hiern
Sutera caerulea (L.f.) Hiern
Sutera campanulata (Benth.) Kuntze
Sutera floribunda (Benth.) Kuntze
Sutera palustris Hiern
Syzygium cordatum Hochst.
Syzygium guineense (Willd.) DC.
Tagetes minuta L.
Talinum caffrum (Thunb.) Eckl. & Zeyh.
Tapinanthus natalitius
Tapiphyllum parvifolium (Sond.) Robyns
Tarchonanthus camphoratus L.
Tarenna supra-axillaris
Tephrosia purpurea (L.) Pers. ssp. *leptostachya* (DC.) Brummitt var. *pubescens* Baker
Tephrosia burchellii Burt Davy
Tephrosia capensis
Tephrosia elongata
Tephrosia forbesii
Tephrosia longipes
Tephrosia lupinifolia DC.
Tephrosia multijuga R.G.N. Young
Tephrosia polystachya
Tephrosia purpurea
Tephrosia rhodesica
Tephrosia semiglabra Sond.
Terminalia brachystemma Welw. ex Hiern
Terminalia phanerophlebia Engl. & Diels
Terminalia prunioides M.A.Lawson
Terminalia sericea Burch. ex DC.
Tetradenia brevispicata (N.E.Br.) Codd
Tetradenia riparia (Hochst.) Codd
Teucrium trifidum Retz.
Thelypteris confluens (Thunb.) Morton
Themeda triandra Forssk.
Thesium costatum
Thesium cytisoides A.W.Hill
Thesium junceum
Thesium magalismsontanum Sond.
Thesium racemosum Bernh.
Thesium transvaalense Schltr.
Thesium utile A.W.Hill
Thunbergia atriplicifolia E.Mey. ex Nees
Thunbergia neglecta Sond.
Tinnea rhodesiana S.Moore
Tithonia rotundifolia (Mill.) S.F.Blake
Trachyandra saltii
Trachypogon spicatus (L.f.) Kuntze
Tragia rupestris Sond.
Tragopogon dubius Scop.
Tragus berteronianus Schult.
Tragus racemosus (L.) All.
Tribulus terrestris L.
Tribulus zeyheri
Tricalysia lanceolata (Sond.) Burt Davy
Tricholaena monachne (Trin.) Stapf & C.E.Hubb.
Trichoneura grandiglumis
Tricliceras laceratum (Oberm.) Oberm.
Triraphis andropogonoides (Steud.) E.Phillips
Tristachya biseriata Stapf
Tristachya leucothrix Nees
Tristachya rehmannii Hack.
Tritonia nelsonii Baker
Triumfetta rhomboidea Jacq.
Triumfetta sonderi Ficalho & Hiern
Trochomeria macrocarpa
Tulbaghia species
Turbina oblongata (E.Mey. ex Choisy) A.Meeuse
Turraea obtusifolia Hochst.
Tylosema fassoglense (Schweinf.) Torre & Hillc.
Urelytrum agropyroides (Hack.) Hack.
Urochloa brachyura (Hack.) Stapf
Urochloa mosambicensis (Hack.) Dandy
Urochloa oligotricha (Fig. & De Not.) Henrard
Urochloa panicoides P.Beauv.
Ursinia nana
Urtica urens L.

Vahlia capensis
Vangueria cyanescens Robyns
Vangueria esculenta S.Moore
Vangueria infausta
Vepris lanceolata (Lam.) G.Don
Verbena bonariensis L.
Verbena brasiliensis Vell.
Verbena officinalis L.
Verbena tenuisecta Briq.
Vernonia fastigiata Oliv. & Hiern
Vernonia galpinii Klatt
Vernonia gerberiformis
Vernonia hirsuta (DC.) Sch.Bip. ex Walp.
Vernonia natalensis Sch.Bip. ex Walp.
Vernonia oligocephala (DC.) Sch.Bip. ex Walp.
Vernonia poskeana
Vernonia staehelinoides Harv.
Vernonia steetziana Oliv. & Hiern
Vernonia sutherlandii Harv.
Vigna unguiculata
Viscum combreticola Engl.
Viscum menyharthii Engl. & Schinz
Viscum rotundifolium L.f.
Vitex ferruginea Schumach. & Thonn. ssp.
amboniensis (Gürke) Verdc. var. *amboniensis*
Vitex mombassae Vatke
Vitex pooara Corbishley
Vitex rehmannii Gürke
Vitex zeyheri Sond.
Vittaria isoetifolia Bory
Wahlenbergia denticulata (Burch.) A.DC. var. *denticulata*
Wahlenbergia banksiana A.DC.
Wahlenbergia lycopodioides Schltr. & Brehmer
Wahlenbergia magaliesbergensis Lammers
Wahlenbergia undulata (L.f.) A.DC.
Walafrida densiflora (Rolfe) Rolfe
Walafrida tenuifolia Rolfe
Waltheria indica L.
Widdringtonia nodiflora (L.) Powrie
Withania somnifera (L.) Dunal
Xanthium spinosum L.
Xanthium strumarium L.
Xanthocercis zambesiaca (Baker) Dumaz-le-Grand
Xerophyta humilis (Baker) T.Durand & Schinz
Xerophyta retinervis Baker
Xerophyta viscosa Baker
Ximenia americana
Ximenia caffra
Xyris capensis Thunb.
Zanthoxylum capense (Thunb.) Harv.
Zinnia peruviana (L.) L.
Ziziphus mucronata
Ziziphus zeyheriana Sond.
Zornia capensis Pers.

Zornia glochidiata DC.
Zornia linearis E.Mey.
Zornia milneana Mohlenbr.

SUMMARY

A PHYTOSOCIOLOGICAL SYNTHESIS OF *ACACIA TORTILIS* COMMUNITIES IN THE NORTH-WESTERN SAVANNA OF SOUTH AFRICA

by

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MAGISTER SCIENTIAE (BOTANY)

Existing ecological knowledge of the vegetation types of the Central Savanna of South Africa is scanty. Present knowledge of the broader vegetation of this area is based on the descriptions by Acocks (1988) and Low & Rebelo (1996), but this is not based on a phytosociological analysis of all the existing data.

The aim of this study is to compile a phytosociological and synecological synthesis of the vegetation of the Central Savanna, including all phytosociological data collected by various researchers in the study area. This is done in order to identify the major zonal vegetation types that represent phytosociological classes. A hierarchical syntaxonomy was constructed for one of the classes and the plant communities of this class were formally described according to the code for syntaxonomic nomenclature (Barkman *et al.* 1986).

The Central Savanna of South Africa can be defined as the bushveld of the North West Province (north of the Magaliesberg) and the Northern Province. The area is situated

between the Kalahari in the west (the Botswana border) and the Lowveld, east of the Escarpment. The central part of this area lies within the Transvaal Plateau Basin. This major physiographic region comprises the Bushveld Basin, surrounded by ridges and valleys called the Bankenveld, and to the north the Waterberg, Soutpansberg and Pietersburg plateaux (Cole 1986).

The various vegetation studies that have been done in the Central Savanna resulted in many phytosociological tables and descriptions of numerous plant communities. Data of 39 tables were included in this study. Relevés from azonal and intra-zonal communities were removed from the data set, resulting in 2907 relevés and 1369 species being used. A three-step method for the treatment of large phytosociological data sets, developed by Breidenkamp & Bezuidenhout (1995), was used in the analysis of the data.

From the results it seems that the Central Savanna may be divided into four major vegetation types, representing phytosociological classes: the *Commiphoro mollis-Colophospermetea mopani*, the *Panico maximi-Acacietaea tortilis*, the *Terminalio sericeae-Combretetea apiculati* and the *Englerophyto magalismontani-Acacietaea caffrae*.

The results of the TWINSpan classification (Hill 1979) indicate that the Mountain Bushveld is a separate, very diverse vegetation type with many different communities. Further study may reveal that this class might be subdivided into various different classes. It may be interpreted that the Arid Sweet Bushveld, as recognised by Acocks (1988), could be divided into two distinct vegetation types. One type has an affinity with Mopane veld, suggesting a distinct sub-class, and the other has an affinity with the *Panico maximi-Acacietaea tortilis*. The species composition of the *Panico maximi-Acacietaea tortilis* suggests an *Acacia* dominated vegetation on clay soils, as well as on sandy deposits, overlying the clay.

A hierarchical syntaxonomy was derived for the *Panico maximi-Acacietaea tortilis*. Two subclasses, four orders, 10 alliances and 36 associations were identified of which two subclasses, three orders, eight alliances and 15 associations were newly described

according to the code for syntaxonomic nomenclature (Barkman *et al.* 1986).

This is the first attempt to identify phytosociological classes for the South African savanna from phytosociological relevé data. The study yielded valuable information on the broader vegetation types of the study area. This will contribute to a better understanding of the ecology of the Central Savanna.

OPSOMMING

‘n FITOSOSIOLOGIESE SINTESE VAN DIE *ACACIA TORTILIS*-
GEMEENSKAPPE VAN DIE NOORD-WESTELIKE SAVANNA VAN
SUID-AFRIKA

deur

RONEL WINTERBACH

Leier: Prof. G.J. BREDEKAMP

Medeleier: Me. M.S. DEUTSCHLÄNDER

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MAGISTER SCIENTIAE (PLANTKUNDE)

Huidige ekologiese kennis van die plantegroei van die Sentrale Savanna van Suid-Afrika is nie meer voldoende vir die beplanning, bestuur en bewaring van die gebied nie. Die bestaande kennis van die breër plantegroei tipes van die area is gebaseer op die beskrywings van Acocks (1988) en Low & Rebelo (1996), wat nie op 'n fitososiologiese analise van al die beskikbare data gebaseer is nie.

Die doel van die studie is om 'n fitososiologiese en sinekologiese sintese te maak van die plantegroei van die Sentrale Savanna. Dit sluit alle bestaande fitososiologiese data in, soos deur ander navorsers versamel. Dit word gedoen om die hoof plantegroei tipes van die gebied, wat fitososiologiese klasse verteenwoordig, te identifiseer. 'n Sintaksonomiese hierargie is vir een van die klasse saamgestel en die plantgemeenskappe van die klas is beskryf volgens die kode vir sintaksonomiese nomenklatuur (Barkman *et al.* 1986).

Die Sentral Savanna kan gedefiniër word as die bosveld van die Noord-Westelike Provinsie (noord van die Magaliesberge) en die Noordelike Provinsie. Die gebied word begrens deur die Kalahari in die weste (die Botswana grens) en die Lavel, oos van die eskarpement. Die grootste gedeelte van hierdie gebied bestaan uit die Bosveldkom, wat omring is deur die Bankenveld en die Waterberge, Soutpansberg en Pietersburgplato (Cole 1986).

Verskeie plantegroei-studies is gedoen in die studiegebied. Dit het gelei tot 'n groot hoeveelheid fitososiologiese tabelle en beskrywings van verskeie plantgemeenskappe. Data van 39 tabelle is gebruik vir die studie. Nadat asonale en intra-sonale gemeenskappe verwyder is, het die datastel bestaan uit 'n totaal van 2907 relevés en 1369 spesies. 'n Metode wat deur Bredenkamp & Bezuidenhout (1995) ontwikkel is vir die hantering van groot fitososiologiese datastelle is gebruik in die verwerking van die data.

Die resultate dui daarop dat die Sentrale Savanna in vier hoof plantegroei tipes, wat moontlik klasse verteenwoordig, verdeel kan word, naamlik die *Commiphoro mollis-Colophospermetea mopani*, die *Panico maximi-Acacieta tortilis*, die *Terminalio sericeae-Combretetea apiculati* en die *Englerophyto magalismontani-Acacieta caffrae*.

Die resultate van die TWINSPAN-klassifikasie (Hill 1979) dui daarop dat die Bergbosveld 'n unieke, diverse plantegroei tipe is, wat uit verskeie gemeenskappe bestaan. Verdere studie mag toon dat die klas onderverdeel kan word in verskeie klasse. Die Ariëde Soet Bosveld (Acocks 1988) kan moontlik in twee verskillende plantegroei tipes verdeel word. Die een tipe toon affiniteit met die Mopanieveld, terwyl die ander affiniteit met die *Panico maximi-Acacieta tortilis* toon. Die *Panico maximi-Acacieta tortilis* word deur *Acacia*-spesies gedomineer en word aangetref op kleigronde, sowel as op sanderige neerslae.

'n Sintaksonomiese hierargie is saamgestel vir die *Panico maximi-Acacieta tortilis* en twee subklasse, vier ordes, 10 alliansies en 36 assosiasies is geïdentifiseer. Hiervan is

twee subklasse, drie ordes, agt alliansies en 15 assosiasies nuut beskryf volgens die kode vir sintaksonomiese nomenklatuur (Barkman *et al.* 1986).

Dit is die eerste poging om fitososiologiese klasse vir die Suid-Afrikaanse Savanna te identifiseer vanaf fitososiologiese data. Die studie lewer 'n belangrike bydrae tot die kennis van die breër plantegroei tipes en die ekologie van die area.

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