A PLANT-ECOLOGICAL STUDY OF THE EASTERN TRANSVAAL ESCARPMENT IN THE SABIE AREA

by

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VOLUME 1: TEXT

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PREFACE

In the beginning, O Lord,
You laid the foundation of the earth,
And the heavens are the work of your hands.
They will perish, but you will remain;
They will all wear out like a garment.
You will roll them up like a robe;
Like a garment they will be changed.
But you remain the same,
And your years will never end.

Hebrews 1:10-12
(New International Version of the Bible)

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ABSTRACT

The indigenous vegetation of the Eastern Transvaal Escarpment in the Sabie area is classified into a number of forest, thicket, woodland, shrubland and grassland syntaxa by means of the Braun-Blanquet table method. Syntaxa are arranged hierarchically in four informal, successively subordinate ranks viz, ecological-formation class (4), vegetation type (14), plant community (53) and variant (18).

Detrended Correspondence Analysis (DCA) ordination of the plant communities confirms the classification and assists in its environmental interpretation.

The practical significance of the phytosociological classification for land-use planning is evaluated in a landscape context, with special reference to vegetation types and land types.

UITTREKSEL

Die inheemse plantegroei van die Oos-Transvaal Eskarpement in die Sabie gebied word in 'n aantal woud, ruigte, boomveld, struikveld en grasveld sintaksons deur middel van die Braun-Blanquet-tabelmetode geklassifiseer. Sintaksons word in 4 informele agtereenvolgens ondergeskikte hierargiese range ingedeel, naamlik ekologiese-formasie klas (4), plantegroeitipe (14), plantgemeenskap (53) en variant (18).

Neigingsverwydering ooreenstemmingsanalise (DCA) ordening van plantgemeenskappe bevestig die klassifikasie en verklaar hulle omgewings interpretasie.

Die praktiese betekenis van die fitososiologiese klassifikasie vir die bodembenuttings beplanning word geëvalueer in 'n landskap verband, met spesiale verwysing na plantegroeitipes en landtipes.

CONTENTS

VOLUME 1 : TEXT

		Page
PREFACE		(ii)
ABSRACT		(iii)
UITTREKSEL		(iii)
1.	INTRODUCTION	1
1.1	PRESENT STATUS	1
1.2	SCOPE	2
1.2.1	Phytosociological Classification	3
1.2.2	Community Ordination	4
1.2.3	Landscape Classification and Mapping	4
2.	STUDY AREA	6
2.1	LOCALITY	6
2.2	ENVIRONMENT	6
2.2.1	Physiography	7
2.2.2	Geology	10
2.2.3	Soils	12
2.2.4	Climate	16
2.2.5	Biotic Factors	32
2.2.6	Summary of Environment	33
2.3	VEGETATION	33
3.	METHODS	38
3.1	PHYTOSOCIOLOGICAL CLASSIFICATION	38
3.1.1	Analysis of Vegetation	39
(A)	Preparation for Sampling	39
	Reconnaissance	39
	Stratification	39
	Randomness	40
	Area delimitation	40
(B)	Implementation of Sampling	41
	Quadrat size	41
	Quadrat number	42

Quadrat data 42
(i) Locality 42
(ii) Floristic composition 42
(iii) Vegetation structure 43
(iv) Habitat 44
3.1.2 Synthesis of Vegetation 48
(A) Floristic Classification 48
Table structuring 49
(i) Raw table 50
(ii) Refined table 50
(iii) Synoptic table 50
Syntaxonomic nomenclature 51
Hierarchical considerations 51
(B) Structural Classification 52
(C) Habitat Correlation 53
3.2 COMMUNITY ORDINATION 54
3.2.1 Detrended Correspondence Analysis 54
(A) Data Processing 55
(B) Environmental Correlation 56
3.3 LANDSCAPE CLASSIFICATION AND MAPPING 57

3.3.1 Integration of Vegetation and Environment 58
(A) The Vegetation-Type Approach 59
(B) The Land-Type Approach 59
Floristic Relationships of Land Types 60
(i) Ordination 61
(ii) Table arrangement 62
Chi-square test 62

4. PHYTOSOCIOLOGICAL CLASSIFICATION 63
4.1 INTRODUCTION 63
4.1.1 Provisional Classification 63
4.1.2 Refined Classification 63
4.1.3 General 65
4.2 CLASSIFICATION AND DESCRIPTION OF THE VEGETATION 67
4.2.1 Forest and Mesic Thicket of the Mistbelt and Low Country 68
(A) General Characteristics 68
(B) Component Vegetation Types 71

4.2.1.1 Tall/Short Forest on soils derived from Upper Dolomite of the Lower Mountains 72

(a) General Characteristics 72

(b) Constituent Syntaxa (Communities 1-2) 72

4.2.1.2 Tall/Short Forest on black soils derived from Black Reef Quartzite of the Plateau Crest 77

(a) General Characteristics 77

(b) Constituent Syntaxa (Community 3) 77

4.2.1.3 Tall Forest associated with Diabase intrusions of the Escarpment Slopes 82

(a) General Characteristics 82

(b) Constituent Syntaxa (Communities 4-6) 83

4.2.1.4 Short Thicket of more xeroclinal slopes with clay soils derived from Nelspruit Granite of the Escarpment Lower Slopes and Upper Foothills 88

(a) General Characteristics 88

(b) Constituent Syntaxa (Communities 7-16) 89

4.2.1.5 High/Tall (riparian) Forest on sandy soils of the Lower Foothills 106

(a) General Characteristics 106

(b) Constituent Syntaxa (Communities 17-19) 106

4.2.2 Woodland and Xeric Thicket of the Low Country 111

(A) General Characteristics 111

(B) Component Vegetation Types 113

4.2.2.1 Partially sheltered Woodland and Thicket (75-95% cover) on fairly shallow soils of the Lower Foothills 114

(a) General Characteristics 114

(b) Constituent Syntaxa (Communities 20-25) 115

4.2.2.2 Less-sheltered Woodland and Thicket (95-100% cover) on fairly deep soils of the Upper Foothills 130

(a) General Characteristics 130

(b) Constituent Syntaxa (Communities 26-35) 131

4.2.2.3 Woodland and Shrubland on exposed granite outcrops 148

(a) General Characteristics 148

(b) Constituent Syntaxa (Communities 36-38) 149

4.2.3 Woodland of the Humid Mistbelt 158

(A) General Characteristics 158

(B) Component Vegetation Types 160

4.2.3.1 Partially sheltered Low Thicket and Woodland on midslope planes of the Escarpment Upper Slopes and the Mountains 161
(a) General Characteristics 161
(b) Constituent Syntaxa (Communities 39-40) 162
4.2.3.2 More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains 166
(a) General Characteristics 166
(b) Constituent Syntaxa (Communities 41-44) 168
4.2.4 Grassland of the Humid Mistbelt 178
(A) General Characteristics 178
(B) Component Vegetation Types 181
4.2.4.1 Grassland and Shrubland on soils derived from Nelspruit Granite of the Escarpment Slopes 181
(a) General Characteristics 181
(b) Constituent Syntaxa (Communities 45-46) 182
4.2.4.2 Low Closed Grassland on soils variously derived from Black Reef Quartzite and Oaktree Dolomite of the Escarpment Plateau 186
(a) General Characteristics 186
(b) Constituent Syntaxa (Communities 47-50) 187
4.2.4.3 Short Closed Grassland on soils derived from Upper Dolomite of the Plateau Interior and Lower Mountains 197
(a) General Characteristics 197
(b) Constituent Syntaxa (Communities 51-52) 198
4.2.4.4 Low Closed Grassland on soils variously derived from Upper Dolomite and Timeball Hill Shale/Mudstone of the Middle Mountains 208
(a) General Characteristics 208
(b) Constituent Syntaxa (Community 53) 208

5. COMMUNITY ORDINATION 214
5.1 FOREST AND MESIC THICKET OF THE MISTBELT AND LOW COUNTRY 214
5.1.1 Environmental Correlation 215
5.2 WOODLAND AND XERIC THICKET OF THE LOW COUNTRY 216
5.2.1 Environmental Correlation 217
5.3 WOODLAND OF THE HUMID MISTBELT 218
5.3.1 Environmental Correlation 218
5.4 GRASSLAND OF THE HUMID MISTBELT 219
5.4.1 Environmental Correlation 220

6. LANDSCAPE CLASSIFICATION AND MAPPING 221
6.1 THE VEGETATION-TYPE APPROACH 221
6.2 THE LAND-TYPE APPROACH 221
6.2.1 Floristic Relationships of Land Types 221
(A) Ordination 221
Species and land-type ordination 221
Species and land-type/vegetation-type combined ordination ... 222
(B) Table Arrangement 224
Chi-square test 224

7. GENERAL DISCUSSION AND CONCLUSIONS 226
7.1 Objectives Reviewed 226
7.2 Objectives Realized 226
7.3 Retrospect 228
7.4 Prospect 231

SUMMARY 235
ACKNOWLEDGEMENTS 237
CURRICULUM VITAE 239
REFERENCES 240

VOLUME 2: APPENDICES

APPENDIX A: PHYTOSOCIOLOGICAL AND ENVIRONMENTAL TABLES

TABLE I Physiognomic - physiographic key to the plant communities in the Sabie area of the Eastern Transvaal Escarpment

TABLE IIA Floristic classification and habitat correlation in Forest and Mesic Thicket of the Mistbelt and Low Country, Sabie area

TABLE IIB Floristic classification and habitat correlation in Woodland and Xeric Thicket of the Low Country, Sabie area

TABLE IIC Floristic classification and habitat correlation in Woodland of the Humid Mistbelt, Sabie area

TABLE IID Floristic classification and habitat correlation in Grassland of the Humid Mistbelt, Sabie area

TABLE III Synoptic classification of the vegetation in the Sabie area of the Eastern Transvaal Escarpment

TABLE IVA Habitat factors recorded in Forest and Mesic Thicket of the Mistbelt and Low Country, Sabie area

TABLE IVB Habitat factors recorded in Woodland and Xeric Thicket of the Low Country, Sabie area

TABLE IVC Habitat factors recorded in Woodland of the Humid Mistbelt, Sabie area

TABLE IVD Habitat factors recorded in Grassland of the Humid Mistbelt, Sabie area

TABLE V Synoptic chart showing major environmental relationships in the Sabie area of the Eastern Transvaal Escarpment

TABLE VI Alphabetical list of species, showing their distribution in the Sabie area of the Eastern Transvaal Escarpment

APPENDIX B: CHECK-LIST

APPENDIX C: MAPS (back pocket)

FIG. 6.1 Vegetation types of the Sabie area, Eastern Transvaal Escarpment

FIG. 6.4 Landscapes of the Sabie area, Eastern Transvaal Escarpment

1. INTRODUCTION

1.1 PRESENT STATUS

The vegetation of South Africa is a natural resource upon which both man and animals depend. Man must therefore protect and nurture what vegetation resources he has if he is to survive. In many areas, conflict often arises as to the optimum utilization of natural resources.There is a conflict between the need to develop resources and the need to conserve them. The Sabie area of the Eastern Transvaal Escarpment, representing Acocks' (1975) Veld Types 8 (North-Eastern Mountain Sourveld) and 9 (Lowveld Sour Bushveld), is an area subject to such land-use conflict. The need to produce food and timber comes into increasing conflict with the need to protect mountain catchments, to conserve natural ecosystems, and to preserve scenic landscapes. Veld Type 9 is ideally suited to the cultivation of citrus and sub-tropical fruit crops, which are assuming increasing importance on both local and overseas food markets. Exotic timber plantations in both veld types supply the needs of expanding timber, mining and paper industries. In the face of such development, mountain catchments must be protected in order to assure a sustained optimum yield of high-quality water for agricultural, domestic and industrial purposes. Similarly, scenic landscapes deserve preservation because of their value for nature conservation, recreation and tourism (Scheepers[1], pers. comm.). There is, therefore, an urgent need for integrated and rational land-use planning in the area. Such planning cannot be arbitrary: it must be based on established scientific principles.

In the Sabie area, land-use planning is required to address the following key questions: How should the land and its vegetation best be utilized? Which areas should be allocated to agriculture and forestry, and which to nature conservation and recreation? Before making such decisions, it is important to know what types of vegetation are represented in the area, their nature conservation status, and where they are located. This information will be conveyed by the inventory and classification of vegetation which this study affords. It should provide a framework towards which the key questions may later be referred, and it should also provide a basis for establishing the practical significance of the different vegetation types.

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The relevance of plant-ecological studies to scientific land-use planning is well known (cf. Pentz, 1938 and 1945; Bayer, 1970; Edwards, 1979; Müller, 1983). Pentz (1938) recognized that vegetation, being the product of environmental factors such as topography, climate and soils, is a reliable natural indicator of the agricultural potential of any region. Land-management systems for an area should therefore comply with the limits imposed by topography, climate, soils and vegetation (Pentz, 1945). A plant-ecological study is invaluable for defining such limits: it "provides assessments of the quality and kinds of vegetation resource upon which agricultural planning can be based" (Edwards, 1979). Moreover, successful management of large areas of natural vegetation depends to a large extent on a knowledge of the composition of the vegetation (Walker, 1976).

Acocks' (1975) veld types provide useful information at the scale of broad landscape types. However, to meet the present needs for regional and subregional planning, attention must be focussed on sections of these landscapes, and the veld-type units prove to be insufficiently detailed to provide a basis (Van der Meulen and Scheepers, 1978). A more detailed classification of vegetation into ecologically interpretable vegetation units is therefore needed.

1.2 SCOPE

The Eastern Transvaal Escarpment comprises a number of floristic regions separated on the basis of topography, climate and latitude (Scheepers[1], pers. comm.). A separate vegetation survey of each region would ultimately be necessary to cover the whole range of Escarpment vegetation. The present study, however, is confined to a broad transect within the floristic region associated with the Sabie area. Ultimately, extrapolation of information out of the transect will have to be attempted by means of air-photo interpretation. For the present, however, attention is restricted to the contents of the transect itself.

A three-tier approach is proposed. First, the vegetation of the transect is classified, at various hierarchical levels, into a number of plant-species assemblages (syntaxa), each with their relevant physiognomic and environmental attributes. Secondly, the syntaxa are ordinated at the community

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level to reveal their ecological relationships. Finally, the syntaxa are correlated, at the vegetation-type level, with existing land-type units in an attempt to identify "vegetation-delineated ecosystems" (cf. Coetzee, 1983). Only scant attention is given to the successional relationships between communities. This is in accordance with Killick (1966) who advocates "straightforward factual description of what the observer sees with less theorizing about possible courses of succession". Successsional theory can, moreover, be an encumberance to the study of vegetation-habitat relationships (Coetzee, 1983).

1.2.1 Phytosociological Classification

According to Mueller-Dombois and Ellenberg (1974), various different sets of criteria may be considered when effecting a vegetation classification. There are structural and functional criteria, floristic criteria, environmental criteria, successional criteria and geographic criteria. For the purpose of " detailed regional ecological studies", they advocate a floristic system of classification. This is substantiated by Westhoff and Van der Maarel (1973) who state that the relationships between plant communities and their environment are best expressed by floristic criteria. Furthermore, the Botanical Research Institute, Pretoria, has adopted the Braun-Blanquet method of vegetation classification (Westhoff and Van der Maarel, 1973; Mueller-Dombois and Ellenberg, 1974; Werger, 1974), which is a floristic classification, as a standard method of vegetation classification in South Africa.

For these reasons, and in consideration of the stated objectives of this study, the Braun-Blanquet method was chosen as the most suitable method of vegetation classification.

In conjunction with, but subordinate to the floristic classification, structural and environmental classifications are also undertaken. Edwards' (1983) structural classification system, derived from combinations of sets of growth form, cover and height attributes, is used to convey the essential physiognomy of the vegetation. It is a multi-purpose, simple, consistent, and broad-scale approach that has recently evolved independently in the three southern hemisphere countries of Australia (Specht *et al*., 1974 and Specht, 1981); Brazil (Eiten, 1968 and 1972); and South Africa (Edwards, 1976 and 1983). It is therefore regarded as the most suitable system available for the present purpose.

Classification of the environment is based on local environmental attributes. Some of the environmental classes are derived from direct observation in the field (Section 3.1.1), whilst others are derived more deductively from existing literature (Section 2.2). The environmental classification provides the basis for subsequent vegetation-habitat correlation.

1.2.2 Community Ordination

A useful adjunct to classification is ordination, defined by Goodall (1954) as "an arrangement of units in a uni- or multidimensional order". In this study, classified vegetation units (plant communities) are ordinated on floristic data using Detrended Correspondence Analysis (Hill & Gauch, 1980). This results in communities being arranged geometrically within several axes of variation, such that similar communities are close together whilst dissimilar ones are far apart. This provides an a posteriori basis for determining whether the Braun-Blanquet communities are real, naturally occurring entities, or whether they are mere artefacts of the data (cf. Westfall, 1981).

Through its ability to portray similarity relations geometrically, ordination is also useful for emphasizing inter-community relationships (Mueller-Dombois & Ellenberg, 1974). Futhermore, by imposing environmental variables upon the axes of ordination, the ecological interpretability of vegetation is enhanced through the perception of overlapping community-habitat distribution patterns (Witkowski, 1983). According to Hill (1979a), Detrended Correspondence Analysis is "the best general purpose" ordination technique currently available.

1.2.3 Landscape Classification and Mapping

A further aspect of this study entails determining the degree of conformity of suites of component vegetation types with MacVicar's (1977) land types. Since his land type is "a class of land over which the macro-climate, the terrain form and the soil pattern each displays a marked degree of uniformity", and since the vegetation is a product of environmental factors such as topography, climate and soils (Pentz, 1938), it is to be expected that land types will to a substantial degree determine the potential vegetation types that can be supported. This is an a priori hypothesis that needs to be tested. Its substantiation would greatly assist the progress of vegetation mapping on the Escarpment because the land-type mapping units could then serve as a reliable basis for the vegetation map.

Correlation of vegetation types with land types could, moreover, assist in classifying landscapes according to Coetzee's (1983) "vegetation-delineated ecosystem" concept. Since, in his words "landscapes are easier to identify than plant communities", such a classification may have considerable practical significance.

"Plant ecology has a basic role to play for the assessment, planned-use, and management of the natural vegetation resources of the country" (Edwards, 1979). This study, in its capacity of assessing vegetation resources, and of eliciting the intrinsic qualities of the land and its cover of vegetation, is intended to provide a scientific basis for land-use planning and management in the Sabie area.

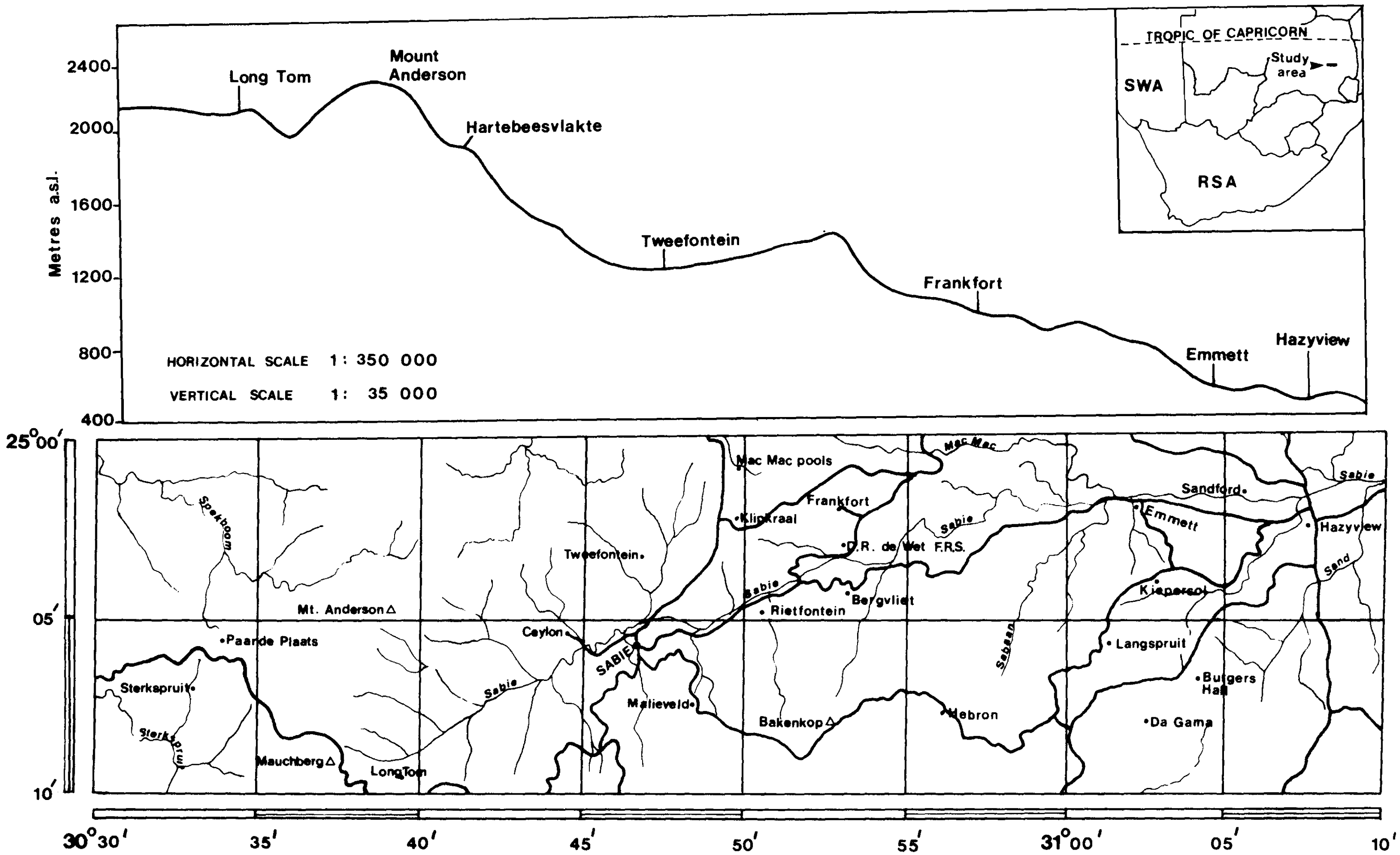

FIG. 2.1 Location of the study area (inset), showing a hypothetical profile (above) and the detailed topography (below).
Based on S.A. 1: 250 000 Topographical Sheet 2530 Barberton.

2. STUDY AREA

2.1 LOCALITY

The study area is situated on the Eastern Transvaal Escarpment between the Olifants River in the north and the Crocodile River in the south. Spanning both the Pilgrims Rest and the Nelspruit Districts, it is bounded by latitude 25°00' and 25°10' south and longitude 30°30' and 31°10' east (Fig. 2.1). Thus its form is that of a broad transect measuring 65 km from west to east and 20 km from north to south, and covering approximately 1 300 km^2 on the map. The transect includes Hazyview (530 m) at its eastern extremity and Mount Anderson (2 300 m) at its western extremity. Its orientation is perpendicular to that of the Escarpment, which has a roughly north-south orientation at this point.

Acocks' (1975) Veld Types 8 (North-Eastern Mountain Sourveld) and 9 (Lowveld Sour Bushveld) are represented within the transect. The transition between these veld types is approximately coincident with the centrally-situated plateau zone formed by the Black Reef Quartzites of the main Drakensberg Escarpment, upon which the town Sabie (1 000 m) is situated (Figs. 2.1 and 2.2).

Owing to limited time, the vegetation of only a portion of the transect could be sampled. This portion, covering an area of approximately 800 km^2, and ranging from 500 to 1 600 m altitude, is indicated on the map by the area east of longitude 30°45' (Fig. 2.1). The following section, nevertheless, deals with the entire transect.

2.2 ENVIRONMENT

The physical and biotic environment of an area imposes certain restrictions on plant growth and is therefore largely responsible for determining its phytosociology. An understanding of the environmental factors operating in any particular area is therefore important background for plant community description and comprehension. According to Watts (1971), the four major divisions of restraint on plant growth are climatic, topographic, edaphic and biotic. The following account of the environment of the study area deals with the broader components of each of these divisions. The more detailed aspects are acquired from direct field observation (Section 3.1.1).

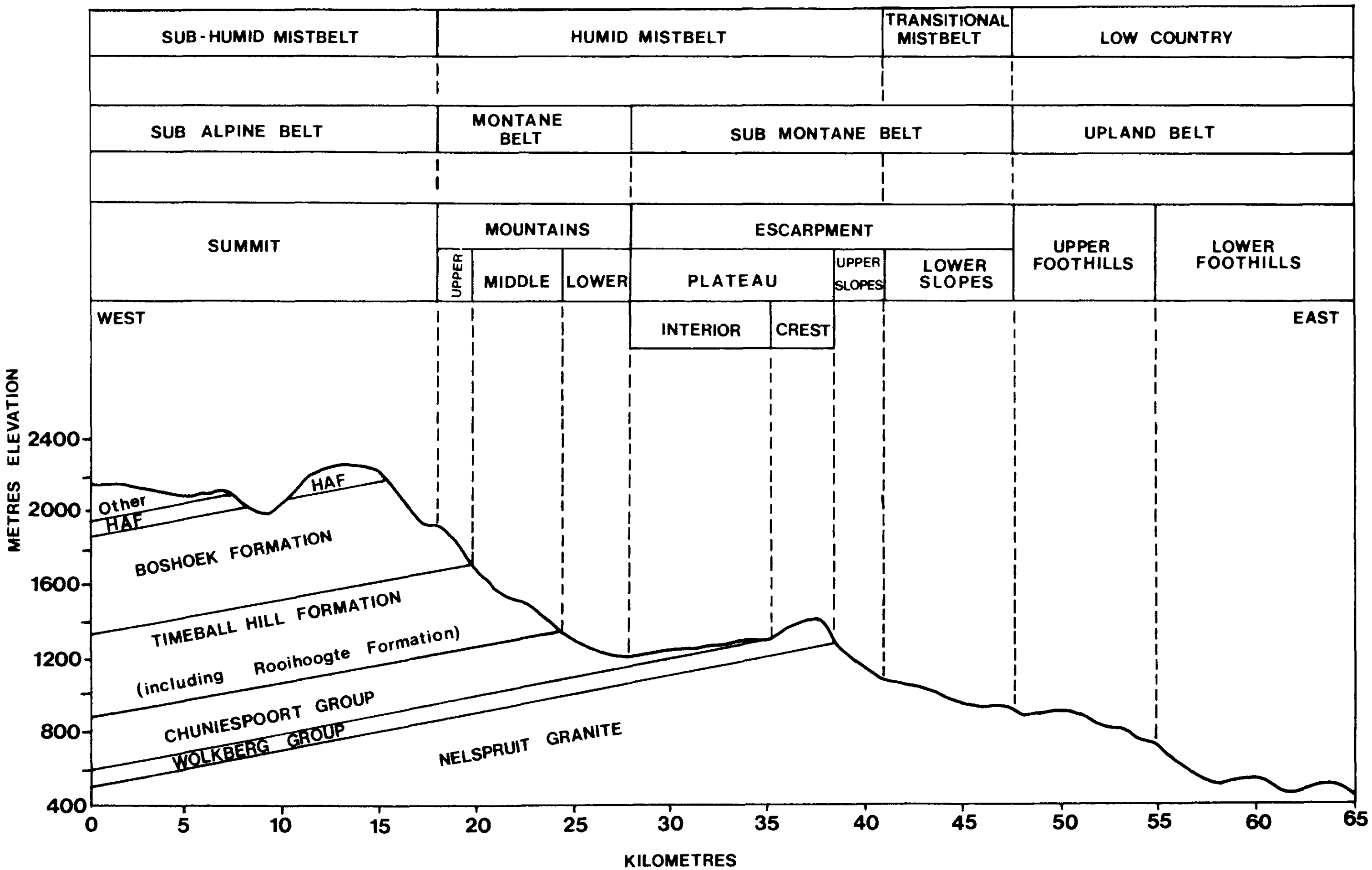

FIG. 2.2 Hypothetical profile of the study area showing physiographic and climatic zonation in relation to geology.
HAF = Hekpoort Andesite Formation

2.2.1 PHYSIOGRAPHY

Fair (1954) described the great Escarpment or Drakensberg as " the mountain wall which forms the eastern edge of the South African plateau or Highveld". Within the confines of the study area this "mountain wall" exhibits varying relief. Such variation is determined largely by the underlying geological structure (Section 2.2.2 and Fig. 2.2). From the high, steeply graded ranges of Mount Anderson (2 300 m) and Mauchberg (2 100 m) in the west, with their many kloofs and waterfalls, the transect descends to the rather narrow west-sloping plateau below (Fig. 2.1). The eastern edge of this plateau forms the crest of the main Escarpment which ranges in elevation from 1 000 m at Sabie to 1 400 m at Mac Mac. Arising along the face of the Escarpment and extending eastwards to about 900 m elevation, are numerous spurs and rivers forming a steeply sloping, dissected terrain with deeply incised valleys and gorges. The most notable of these are associated with the Sabie and Mac Mac Rivers (Fig. 2.1).

Below 900 m elevation the terrain becomes less steeply graded (Fig. 2.1), consisting of elongated low ridges alternating with broad valley-bottoms. The latter observations agree well with those made by Scheepers (1978) at Westfalia Estate, which is situated in a more northerly sector of the Eastern Transvaal Escarpment.

Following the rationale of Scheepers (1978) and with certain modifications, the study area may be divided into the following broad physiographic belts (Fig. 2.2):

(a) The Subalpine Belt consisting of the rolling plains, level terraces and prominent peaks of the mountain summits (above 1 900 m).
(b) The steeply sloping Montane Belt of the mountain ranges to the west of the Escarpment plateau (c. 1 200 - 1 900 m).
(c) The steeply sloping, much-dissected Submontane Belt of the Escarpment slopes to the east of the Escarpment crest, and including the Escarpment plateau (c. 900 - 1 400 m).
(d) The gently sloping, undulating Upland Belt of the foothills (c. 500 - 900 m).

A finer subdivision of these physiographic belts leads to the identification of ten physiographic zones (Fig. 2.2). The main criteria for physiographic zonation are geomorphology and altitude.

Since geomorphology does not always vary consistently with altitude, the altitudinal limits of the physiographic zones are fairly arbitrary.

Knolls and hillocks occurring in a lower zone, for instance, may protrude altitudinally into a higher zone. Conversely, valleys occurring in a higher zone may protrude into a lower zone. Also, because the altitudinal limits of the zones are based largely on a single hypothetical east-west profile, they do not account for the appreciable north-south altitudinal gradient.

The physiographic zones are nevertheless easily discerned in the field and are useful reference points in vegetation description. Running from west to east, and in relation to their inherent geological formations (Section 2.2.2), the zones are as follows (Fig. 2.2):

(a) Summit (above 1 900 m). This zone occurs on the mountain summits formed by the Boshoek and Hekpoort Andesite Formations of the Pretoria Group. It comprises level terraces and rolling plains which rise in places to form prominent peaks.

(b) Mountains (c. 1 200 - 1 900 m). This zone is found between the Escarpment and Summit and is formed mainly by the dolomite formations of the Chuniespoort Group overlain mainly by the Rooihoogte, Timeball Hill and Boshoek Formations of the Pretoria Group. Subdivisions on the basis of altitude facilitate the recognition of Lower (c. 1 200 - 1 350 m), Middle (c. 1 350 - 1 700 m), and Upper (c. 1 700 - 1 900 m) levels. These levels correspond roughly with inherent geological transitions (Fig. 2.2). Generally, this is a zone of steeply east-sloping hills intersected by valleys and rivulets.

(c) Escarpment Plateau (c. 1 200 - 1 400 m). This is a flat, gently west-sloping zone forming a terrace or plateau immediately west of, and including, the main Escarpment crest. The Escarpment Plateau may be divided into the Plateau Interior (c. 1 200 - 1 300 m) and the Plateau Crest (c. 1 300 - 1 400 m) (Fig. 2.2). The geology of the Plateau Crest is predominantly Black Reef Quartzite Formation, Wolkberg Group, whereas that of the Plateau Interior comprises the lower strata of the dolomite formations, Chuniespoort Group before they rise into the Mountain Zone.

(d) Escarpment Upper Slopes (c. 1 100 - 1 300 m). This is a steeply sloping zone immediately below, and to the east of the main Escarpment crest. The underlying geology is Nelspruit Granite, deeply weathered owing to high rainfall. Lower strata of the Wolkberg Group may also be present in the upper parts. The slopes are intersected by numerous deeply-incised gorges, kloofs and valleys.

(e) Escarpment Lower Slopes (c. 900 - 1 100 m). This zone is due east of the Escarpment Upper Slopes on more gently sloping Nelspruit Granite. Valleys are wider and less deeply incised.

(f) Upper Foothills (c. 700 - 900 m). This and the following zone represent a transition from the Escarpment Slopes to the Lowveld. The Upper Foothills are characterized by broken undulating terrain underlain by Nelspruit Granite, which is intruded extensively by Transvaal Diabase.

(g) Lower Foothills (c. 500 - 700 m). This zone lies between the Upper Foothills and the Lowveld. Valleys are wide and flat-bottomed, and slopes are gentle. Nelspruit Granite with Transvaal Diabase intrusions constitutes the underlying geology.

Physiography, moreover, exerts a considerable influence upon the climate and thereby the soil and vegetation of the study area. Both precipitation and the incidence of mist increase with altitude, whilst temperatures tend to decrease (Section 2.2.4). This climatic gradient facilitates the recognition of two major climatic belts based on altitudinal distribution of mist. Following Scheepers (1978), there is the Mistbelt of the high, cooler altitudes as opposed to the Low Country of the low, warmer altitudes (Fig. 2.2). The boundary between these two belts is irregular and poorly defined in the present study area, but judging from personal observation, it appears to fluctuate between 900 and 1 100 m elevation. This zone of fluctuation may constitute a third climatic belt, namely Transitional Mistbelt. Its range conforms to Scheepers' (1978) arbitrary fixing of the lower limit at about 1 050 m elevation. A fourth climatic belt, derived from the subdivision of Mistbelt into "moist" and "dry" sectors, may also be justified (Section 2.2.4.2).

Further climatic differentiation, even in the same altitudinal zone, is apparently caused by the orientation of spurs and river valleys. Their eastward trend results in strongly contrasting north-facing and south-facing aspects. North-facing aspects are more exposed to direct insolation, especially in dry winter months on steep slopes. They therefore tend to be more xeric than south-facing aspects.

Aspect may also influence local climatic conditions by its effect on precipitation. Scheepers (1978) reports that on Westfalia Estate, where the

TABLE 2.1 Chronostratigraphic and lithostratigraphic divisions of the Eastern Transvaal Escarpment *

	SEQUENCE	GROUP		FORMATION	LITHOLOGY AND MEMBER
MOKOLIAN ERATHEM	Transvaal Diabase (intrusive rock)				
VAALIAN ERATHEM	TRANSVAAL	PRETORIA		Hekpoort Andesite	Andesite with pyroclastics, some quartzite and shale
VAALIAN ERATHEM	TRANSVAAL	PRETORIA		Boshoek	Siltstone and shale Quartzite, subgraywacke Conglomerate
VAALIAN ERATHEM	TRANSVAAL	PRETORIA		Timeball Hill	Shale with diamicite Quartzite, siltstone, ironstone Shale and mudstone
VAALIAN ERATHEM	TRANSVAAL	PRETORIA		Rooihoogte	Quartzite Bevet's conglomerate Member
VAALIAN ERATHEM	TRANSVAAL	CHUNIESPOORT		Duitschland	Limestone with quartzite, Conglom. Shale, Dolomite
VAALIAN ERATHEM	TRANSVAAL	CHUNIESPOORT	MALMANI SUBGROUP	Lyttleton	Chert-free dolomite
VAALIAN ERATHEM	TRANSVAAL	CHUNIESPOORT	MALMANI SUBGROUP	Monte Christo	Chert-rich dolomite
VAALIAN ERATHEM	TRANSVAAL	CHUNIESPOORT	MALMANI SUBGROUP	Oaktree	Dark dolomite - incorporates carbonaceous shale and quartzite
VAALIAN ERATHEM	TRANSVAAL	WOLKBERG		Black Reef Quartzite	Quartzite, minor shale Serala Basalt Member Quartzite, Conglomerate
VAALIAN ERATHEM	TRANSVAAL	WOLKBERG		Selati Shale	Shale Argillaceous quartzite, subgray. Shale
VAALIAN ERATHEM	TRANSVAAL	WOLKBERG		Sekororo	Arkose Shale Sericitic quartzite, subgraywacke Conglomerate
SWAZIAN ERATHEM	Nelspruit Granite (intrusive rock)				

* Compiled and adapted from SACS (1980).

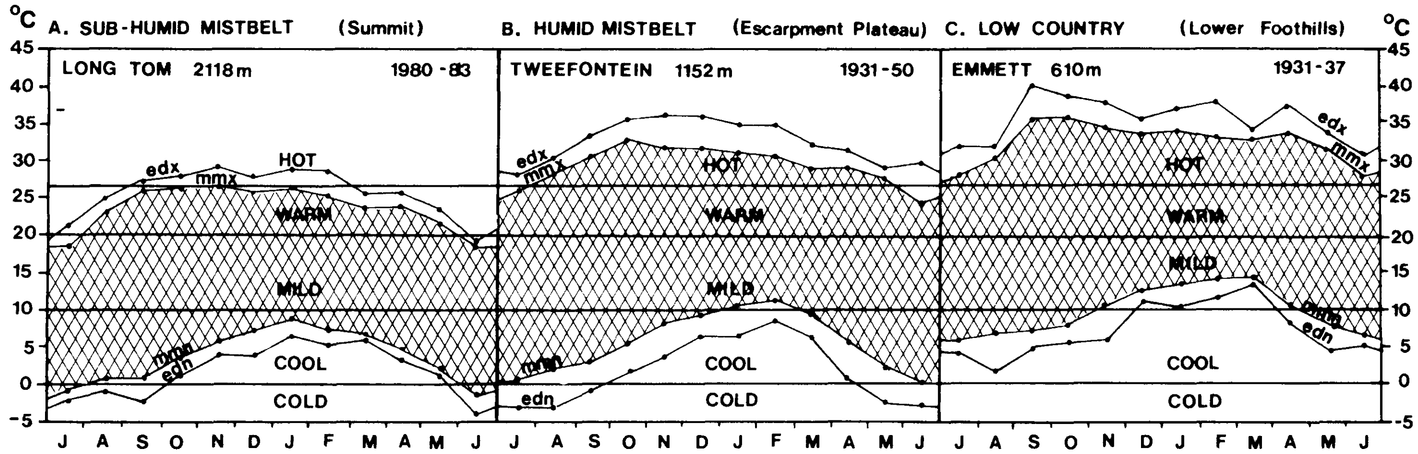

FIG. 2.4 Annual march of extreme daily maximum (edx) and minimum (edn) temperatures and mean monthly maximum (mmx) and minimum (mmn) temperatures for three stations in the Sabie area of the Eastern Transvaal Escarpment.
Compiled from Weather Bureau, S.A. (1954a); and from climatological reports of the Soil and Irrigation Research Institute, Private Bag X79, Pretoria, 0001.

orientation of spurs and river valleys is north-eastward, and where the moisture-bearing winds are north-easterly and easterly to south-easterly, precipitation is heaviest on south to east-facing slopes. There may even be rain-shadow effects to the north-west of the spurs.

Such climatic differences are in turn, sure to affect local edaphic conditions and thus vegetation. The nature and degree of weathering of the substratum and the steepness of the slopes, for instance, is to a large extent controlled by climate. From the foregoing, it is obvious that several physiographic factors interact to influence climate, and thereby soil and vegetation. Altitudinal limits of climatic belts, like physiographic zones, thus become arbitrary. Zonation is therefore purely hypothetical, and imperceptible intergrading across boundaries undoubtedly occurs. Nevertheless, all these hypothetical subdivisions of the abiotic environment serve as convenient terms of reference when dealing with the vegetation.

It is clear that here, as at Westfalia Estate, "the wide range in altitude, the great variations in gradient, the much dissected terrain and the marked differences in aspect result in a great diversity of natural habitats" (Scheepers, 1978).This diversity is largely responsible for eliciting the vegetational response that is reflected in the numerous plant communities to be described in Chapter 4. Regrettably, the vegetation of the Upper Mountains and Summit could not be sampled owing to a lack of time.

2.2.2 GEOLOGY

Rocks provide the basic raw material of the soil, and their constitution is therefore of great significance in vegetation studies. The following account is compiled from Visser and Verwoerd's (1960) description of the geology of the area north of Nelspruit, and from Schutz's (1981), unpublished preliminary report on the geology and pedology of the Sabie forestry area. Nomenclature is updated in accordance with the most recent stratigraphic classification for South Africa as proposed by the South African Committee for Stratigraphy (SACS, 1980) (Table 2.1).

Essentially, four different geological systems are represented. They are traversed by a network of diabase intrusions. Contacts between the systems are roughly parallel and in a north-south direction (Schutz, 1981).

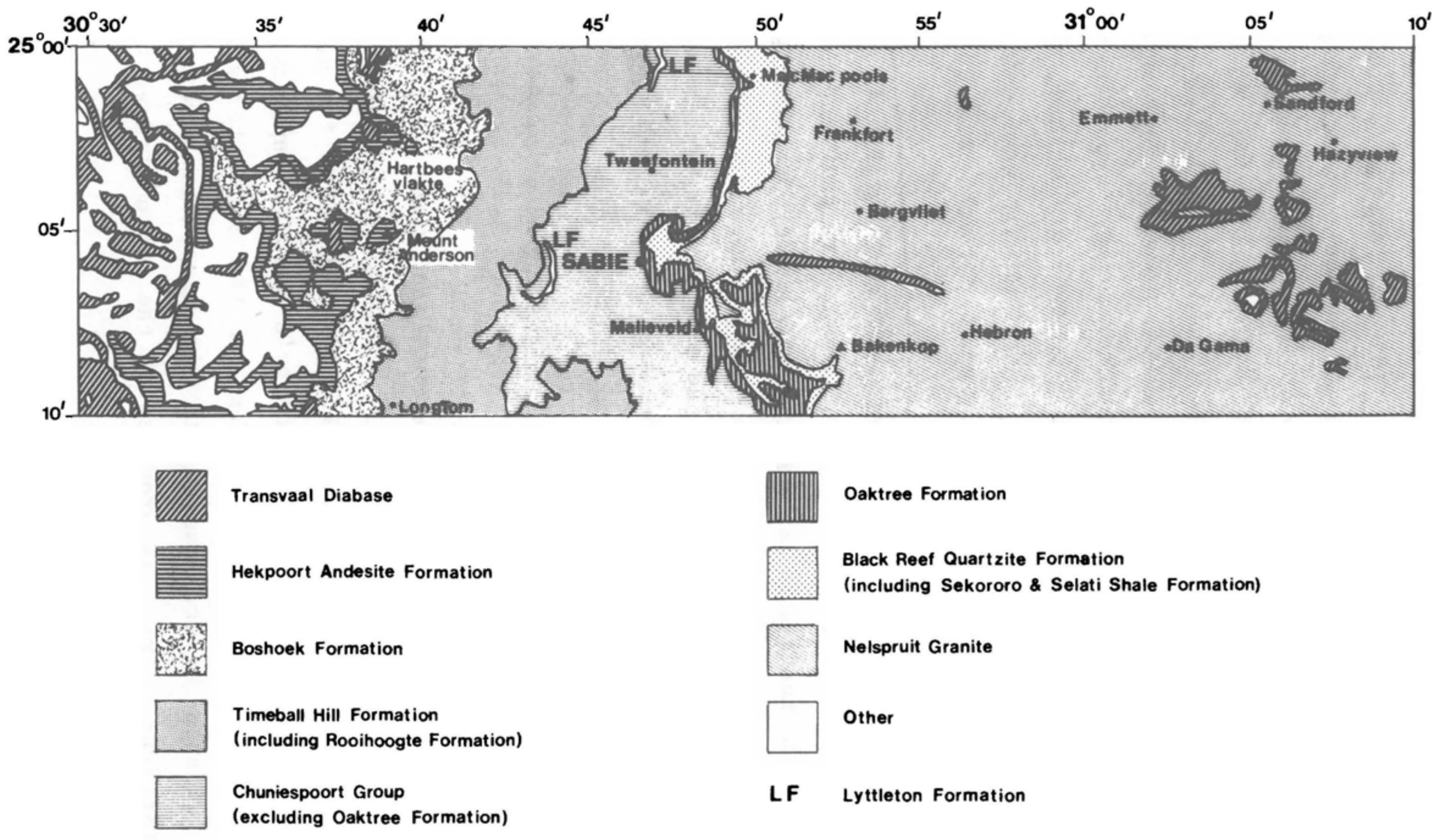

FIG. 2.3 Geological formations in the Sabie area of the Eastern Transvaal Escarpment. Compilation based on Geological Survey Map sheet 22, Geological Survey, Pretoria (1960); and Schutz (pers. comm.*).
Scale approximates 1: 350 000
* Mr. C.J. Schutz, D.R. de Wet F.R.S., Private Bag X520, Sabie, 1260.

Nelspruit Granite, an intrusive of Swazian age, is the oldest rock system (Table 2.1). It comprises the biotite-bearing gneissose granites and migmatites forming the undulating terrain of the Escarpment Slopes and Foothills (Figs. 2.2 and 2.3).

Overlying the granite, and reaching from the Escarpment Plateau to the Summit, are the rock systems of Vaalian age, Transvaal Sequence, represented by the Wolkberg, Chuniespoort and Pretoria Groups (Table 2.1 and Figs. 2.2 and 2.3).

In the study area, the Wolkberg Group is represented by the Sekororo, Selati Shale and Black Reef Quartzite Formations. Whereas the Sekororo and Selati Shale Formations consist of clastic sediments (Wolkberg sediments) resting unconformably on the Nelspruit Granite; the Black Reef Quartzite Formation is a sedimentary-volcanic unit resting conformably on the Wolkberg sediments (SACS,1980) (Table 2.1). The Black Reef Quartzite Formation consists of quartzite with lenses of grit and conglomerate (SACS,1980). Its extreme resistance to weathering is largely responsible for the formation of the Escarpment Plateau with its numerous associated waterfalls, viz Sabie, Mac Mac, Lisbon and Berlin Falls. Shale is always present, particularly near the top, close to the contact with the overlying dolomite (SACS,1980) (Table 2.1). North-south flowing streams often follow the course of this shale, thus forming a natural division between the Black Reef Quartzite and the dolomites (Schutz, 1981).

Overlying the Black Reef Quartzite Formation and rising into the Mountains from the Escarpment Plateau, are the chemical sediments of the Chuniespoort Group, including dolomite, limestone and chert (Table 2.1 and Figs. 2.2 and 2.3). Contact with the underlying Black Reef Quartzite is transitional and conformable (SACS, 1980). Here, the incorporation of carbonaceous shale and quartzite with the overlying dolomite produces the dark dolomite of the Oaktree Formation (Table 2.1). Several waterfalls, e.g. Bridal Veil, Lone Creek and Horseshoe Falls, are caused by a fault line within the Malmani Subgroup (Table 2.1). The predominance of dolomitic limestone in the study area gives the rocks a black weathered surface (due to manganese oxide) and a wrinkled texture (Schutz, 1981).

The dolomites mark the transition to the overlying Pretoria Group, which consists predominantly of quartzite and shale in the Rooihoogte, Timeball Hill and Boshoek Formations, and of prominent volcanic elements in the

Hekpoort Andesite Formation (SACS,1980) (Table 2.1). Bevet's conglomerate is a thin band of felspathic quartzites, shales and chert. Timeball Hill shale is a fairly thick zone of thinly bedded, highly-jointed and fissile, brown shale (Schutz, 1981).

Sills and dykes consisting of Transvaal Diabase, an intrusive of Mokolian age, are prominent throughout the area except in the Black Reef Quartzite Formation (Table 2.1 and Fig. 2.3).

As mentioned previously (Section 2.1), the study area was only sampled up to 1 600 m elevation. Therefore, the Boshoek and Hekpoort Andesite Formations, with their associated vegetation types, are not represented in succeeding chapters.

2.2.3. SOILS

In its capacity both as a plant substrate and as a nutrient reservoir, soil is of considerable significance to vegetation. Different soil types are likely to support different vegetation types, and a study of the soils of the area is therefore essential. Published works on the soils of the Escarpment area include Von Christen's (1964) observations on the forest soils of South Africa, and his earlier account of the soils of Westfalia Estate (Von Christen, 1962). Scheepers' (1978) description is based largely on Von Christen's (1962). The only account that deals specifically with the present study area is Schutz's (1981) unpublished preliminary report on the pedology of the Sabie forestry area. It is based on 450 soil profiles covering the area under pine plantations between Nelspruit in the south and Mariepskop in the north. The following account is compiled from the above-mentioned sources.

The soils are of Tertiary to Recent origin and, regardless of altitude, parent material, or mode of formation, are mostly well-drained, highly leached and ferrallitic. The mature ferrallitic soils are strongly, sometimes excessively weathered, often to a great depth, with the weatherable minerals being virtually absent. They are typically clayey, friable and massive, with poor horizon development, but well-drained, giving rise to a high level of available moisture under normal conditions (Scheepers, 1978).

"Although inherently infertile, the ferrallitic soils have an adequate supply of plant nutrients under a stable plant cover"(Scheepers, 1978). The

TABLE 2.2 Summary of soil forms and series encountered in the Sabie area of the Eastern Transvaal Escarpment*

LITHOLOGY		DOMINANT SOIL FORM	DOMINANT SOIL SERIES	SUB-DOMINANT SOIL FORM	SUB-DOMINANT SOIL SERIES
Granite		Hutton	Farningham Hutton	Oakleaf Inanda Swartland	Leeufontein Highflats Inanda Skilderkrans
Quartzite	Associated with shale	Valsrivier Shortlands Hutton Griffin	Waterval Argent Hutton Cleveland		
	Not associated with shale	Hutton Oakleaf	Farningham Hutton Leeufontein Jozini	Valsrivier Griffin	Waterval Cleveland
Dolomite		Hutton Oakleaf	Hutton Highflats	Griffin	Cleveland
Shale		Hutton Glenrosa Oakleaf	Hutton Williamson Leeufontein	Swartland Hutton	Skilderkrans Farningham
Diabase		Hutton Oakleaf	Hutton Highflats	Valsrivier Shortlands Glenrosa	Waterval Argent Trevanian

* Adapted from Schutz (1981, unpublished)

clay minerals consist mainly of kaolinite, but sesquioxides of iron and aluminium are present as well as some amorphous iron. The clay minerals have a low cation exchange capacity, while the base saturation and pH are also low. The nutrient balance of the soil is therefore very dependent on the amount and quality of organic matter present (Scheepers, 1978).

Notwithstanding their relative uniformity throughout the study area, the soils are affected by the climatic gradients associated with altitude. The soils of the Mistbelt and the Low Country are therefore fairly distinct. Mistbelt soils are subject to higher rainfall and lower temperatures than are Low-Country soils. Evapotranspiration from Mistbelt soils is therefore less and they consequently tend to be more leached and laterized, less structured, and of higher humus content (and therefore more acid), than Low-Country soils. Misbelt soils are generally less fertile than Low-Country soils, having lower cation exchange capacities and fewer exchangeable bases.

Such differences in fertilty, acidity, humus content and structure are sure to be manifested in vegetational differences. However, as expresed by Scheepers (1978), "direct correlation between vegetation and soil conditions" is observed only "in so far as both are influenced by macro-climatic, or microclimatic and other local conditions".

Soil depth varies according to the mode of soil formation. Sedentary soils formed <u>in situ</u> are generally shallow or litholic. Conversely, transported soils are deeper. Also, the presence of hematite in transported soils produces a red colouration. This is less evident in Mistbelt soils, where the lower hematite level and higher humus content tend to produce browner soils.

It is now appropriate to discuss the soils more specifically in relation to the geological formations from which they have in most cases developed. In this context, Schutz's (1981) treatment of the soils of the study area based on the system of soil classification for South Africa developed by MacVicar <u>et al</u>. (1977), is considered relevant. Since soil classification was not attempted in the present study, Schutz's (1981) account is a useful adjunct, providing insight into the range of soil forms and series likely to be encountered in the study area. Table 2.2 summarizes this range according to geological origin. Evidently, the Hutton Form is the dominant soil form in the area.

(a) Granite soils. The soils derived from the granites are deep, well drained, apedal, red, ferrallitic, and highly leached. Well-decomposed granite saprolite is quite frequently encountered within the soil profile below a depth of 80 cm. Quartz grit, often in the form of a broken stone-line, is commonly found in the upper B horizon. Coarse sand is prevalent, mainly towards the surface, whereas the subsoil, or decomposed saprolite is siltier, with less coarse sand. Although the clay content of these soils is usually high (sandy clay loam to sandy clay), their water-holding capacity at the surface is low. This is due to a strong cementation of the clay particles into water-stable micro-aggregates of silt and sand size. This, in combination with the non-swelling properties of kaolinite, results in rapid drainage and low plasticity (Schutz, 1981).

Owing to marked leaching, the granite soils have a low base status and are therefore dystrophic. On the Escarpment Upper Slopes, where a mixture of granite and quartzite soils occur, the organic accumulation appears to be high and the Oakleaf Form is quite common (Schutz, 1981).

(b) Quartzite soils. The characteristically sandy soils derived purely from quartzites are light-textured, coarse sand-grained, apedal or single-grained ferrallitic or gradational soils. Most have been transported. This is evident from the frequency of quartz stones and iron and manganese concretions scattered in the profile, either randomly or as stonelines. The humus content is usually high, forming dark A horizons. Organic O horizons tend to develop in wetter sites (Schutz, 1981).

Quartzite soils are fairly shallow and the bedrock is usually overlain by a layer of hardpan ferricrete. In summer, these factors co-operate in effecting a high water table. In winter, however, slow but efficient drainage is facilitated both by the sandy texture of the soil and by the slight dip of the strata (Fig. 2.2). These soils can thus be particularly dry in winter (Schutz, 1981).

Such fluctuations of the water table together with eluviation are conducive to the formation of bleached E horizons,and although their development is minimal, these E horizons apparently occur frequently in areas covered by virgin grassveld and pines. The resultant soil is light-textured (a loamy sand), single-grained, loose or apedal, containing fairly high humus, and usually grey to dark grey, with a marked absence of faunal activity. Podzolization is apparently taking place in some situations (Schutz, 1981).

Where the solum consists of material from shales as well as quartzites, structure normally develops in the A and upper B horizons. In such instances, moderately well-drained ferrallitic or yellow-brown gradational soils develop. There may be interphases between Valsrivier, Shortlands, and Hutton Forms (Table 2.2). Yellow ferrallitic soils are commonly associated with wetter sites. Where mixing of parent materials is such that quartzite sands overlie weathered shale, and where drainage is impeded, a wet phase of the Griffin Form frequently occurs. Here, roots are confined mainly to the dark A horizon, and marsh-like conditions develop during summer (Schutz, 1981).

(c) Dolomite soils. Soils derived from dolomite are deep, well-drained ferrallitic, apedal, dark reddish brown, sandy to sandy clay loams. The presence of many chert stones and manganese concretions suggests that these soils are transported. Localized particles or bands of dark brown to black manganese earth characterize the upper horizons. Unconsolidated materials consisting of thin bands of soft chert, chalcedony, and thin greyish-blue shales form a C horizon in places where subsurface rocks collapse due to the formation of underground caverns and channels. Often, there is such mixing of unconsolidated rock with the red soil matrix that classification of the soil becomes arbitrary (Schutz, 1981).

(d) Shale soils. These soils are younger than those derived from other parent materials. Because they are developed in the dissected terrain and steep slopes of the Mountain Zones (Fig. 2.2), they tend to be shallow, except on terraces and valley-bottoms. Pockets of silty clay loam 40–50 cm deep are nevertheless prevalent on the slopes, and root penetration is further facilitated by cracks in the shale. Where the shale strata dip (in association with diabase intrusions), weathering is usually deeper than where strata are horizontal (Schutz, 1981).

In general, these soils are moderately well-drained, red, apedal, silty clay loams. Structure is weak to moderate in the surface 20–40 cm. Even where a lithocutanic horizon is found near the surface (i.e. Glenrosa Form, Table 2.2), the soil remains red. This results in the recognition of a red variant of the Glenrosa Form.On the scree slopes, stones and boulders in the profile are abundant, and deep well-drained soils with vigorous faunal activity are thus produced (Schutz, 1981).

(e) Diabase soils. The weathering surface of a diabase dyke is relatively small, and colluvium from surrounding parent materials usually overlies the weathering diabase. This results in soils of binary origin. The diabase soils are dark reddish-brown, moderately deep and on well-weathered parent material. Silt content is high, and there is a fine sand fraction as well as a prevalence of manganese lammellae. Overlying soils are well-drained sandy clay loams having weak to moderate structure in the surface horizons (Schutz, 1981).

2.2.4 CLIMATE

The Eastern Transvaal Escarpment lies in a seasonally arid, sub-tropical region, with hot wet summers and cool dry winters. It forms a transition area between the warmer Lowveld to the east and the climatically more extreme Highveld plateau to the west. Anticyclonic circulation predominates throughout the year (Gamble, 1983).

Within the study area there is a marked climatic gradient in which the most striking climatic transitions are wrought through the influence of physiographic relief and altitude on temperature, moisture, and insolation (Section 2.2.1). The climatic belts, Mistbelt and Low Country (Fig. 2.2) are especially meaningful for identifying gross climatic variability. The latter is sure to play a major role in determining plant-species assemblages. It is therefore important to quantify this variability within the study area. According to Schulze & McGee (1978), light, temperature and moisture are the most significant climatic factors in vegetation development. These operate together to produce "homogeneous environments in which certain plant communities attain importance". The climate will be discussed, accordingly, under the headings insolation (light), temperature, and precipitation (moisture). Short paragraphs on wind, humidity, fire and lightning will also be included. Unless otherwise stated, all data are taken from the South African Weather Bureau's Climate of South Africa publications.

2.2.4.1 Insolation

Radiation from the sun is the most fundamental climatic parameter present in the total environment of plants. Biological processes such as photosynthe-

TABLE 2.3 Annual march of mean daily sunshine (hours) for two stations in the Sabie area of the Eastern Transvaal Escarpment*

	J	F	M	A	M	J	J	A	S	O	N	D
Long Tom (2 118 m) 1980-1983	6,6	7,4	7,2	7,5	8,3	8,7	8,4	8,6	8,2	7,4	6,2	7,0
Hazyview (530 m) 1973-1983	6,0	6,5	6,2	6,6	6,6	7,1	7,5	7,2	7,1	6,2	5,9	6,5

* Based on climatological reports of the Soil and Irrigation Research Institute, Private Bag X79, Pretoria, 0001.

sis, photoperoidism, and phototropism are all dependent on light (Schulze & McGee, 1978). Significant differences in vegetation arising from differences in insolation are therefore to be expected.

Insolation may be measured directly in terms of the quantity of incoming solar radiation, and indirectly by means of sunshine duration. Data for stations occurring within the study area are scant. However, maps of incoming solar radiation patterns based on solar radiation measurements in southern Africa have been compiled by Schulze & McGee (1978). In addition, the Weather Bureau (1950) has compiled maps showing broad, countrywide patterns of sunshine duration and cloud cover based on a number of stations in South Africa. Both sources facilitate some useful generalizations.

Schulze & McGee's (1978) maps show that incoming radiation is subject to seasonal variation. For instance, radiant flux densities for the study area in summer are apparently 80 X 10^5 Jm^{-2} day^{-1} higher than in winter. The magnitude of seasonal variation is supposedly tempered by the interposing effect of cloud cover which, during summer in the study area, reduces the average duration of bright sunshine by 20-30 per cent (Weather Bureau, 1950).

There is also geographic variation of sunshine duration within the study area. For instance, the average annual duration of bright sunshine in the Mistbelt is less than 60 per cent of the possible sunshine, whereas it is 60-70 per cent in the Low Country. Similarly, the Mistbelt experiences less "bright" days (days with 90-100 per cent of possible sunshine) than the Low Country (Weather Bureau, 1950).

This trend of increasing cloudiness is broken in places on the Summit (Sub-humid Mistbelt) however, where, owing to rain-shadow effects, the duration of daily sunshine may be greater than in the Low Country. Thus throughout the year, Long Tom (2 118 m) in the Sub-humid Mistbelt experiences more sunshine than Hazyview (530 m) in the Low Country (Table 2.3).

Besides seasonal and geographic variability, there is also physiographic variability of insolation due to slope and aspect (Section 2.2.1). Daily incoming radiant flux densities on sloping terrain as a function of slope, aspect, and season have been presented for cloudless days in South Africa for the latitudinal range 20°S to 35°S by Schulze (1975). The following general trends for the study area (at 25°S) are derived from these data.

TABLE 2.4 Annual march of temperature extremes, ranges and means for six stations in the Sabie area of the Eastern Transvaal Escarpment *

Temperature parameter (°C)	Climatic Belt$	Station	Altitude (m)	Period	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
(A)	Sub-humid MB	LongTom	2118	1980-83	29,0	28,6	25,5	25,5	23,5	19,0	21,2	25,0	27,2	28,1	29,1	27,9	29,1
EXTREME	Humid MB	Tweefontein	1152	1931-50	35,0	35,0	32,5	31,7	29,4	30,0	28,3	30,6	33,6	35,6	36,1	36,1	36,1
		Sabie	1108	1914-28	34,6	34,8	34,1	32,9	29,0	28,1	28,9	31,6	36,0	37,5	37,2	35,6	37,5
DAILY	TMB	Bergvliet	983	1934-50	35,1	35,0	33,3	31,7	30,6	30,6	29,4	32,8	33,9	38,3	37,8	37,8	38,3
MAXIMUM	LC	Emmett	610	1931-37	37,1	37,8	34,1	37,4	33,4	30,7	32,3	32,2	40,4	39,1	38,2	35,7	40,4
		Hazyview	530	1971-83	42,8	38,5	39,5	38,4	35,2	31,5	34,5	36,4	39,8	41,8	40,0	40,6	42,8
(B)	Sub-humid MB	LongTom	2118	1980-83	6,5	5,2	5,9	3,2	1,2	-4,0	-2,1	-1,0	-2,3	1,3	4,0	4,0	-4,0
EXTREME	Humid MB	Tweefontein	1152	1931-50	6,7	8,9	6,7	1,1	-2,2	-2,5	-2,8	-2,8	-0,6	1,7	3,9	6,7	-2,8
		Sabie	1108	1914-28	7,9	10,1	6,1	2,4	-2,0	-3,1	-4,2	-2,9	-1,5	4,4	7,3	8,8	-4,2
DAILY	TMB	Bergvliet	983	1934-50	10,0	10,6	9,4	7,2	3,9	2,8	0,0	1,7	3,3	5,0	7,8	9,6	0,0
MINIMUM	LC	Emmett	610	1931-37	10,1	11,4	13,3	8,4	4,6	5,0	4,4	1,8	5,0	5,7	5,6	11,2	1,8
		Hazyview	530	1971-83	11,8	12,2	10,4	6,8	4,2	1,7	1,3	1,3	3,2	8,3	10,0	11,6	1,3
(C)	Sub-humid MB	LongTom	2118	1980-83	22,5	23,4	19,6	22,3	22,3	23,0	23,3	26,0	29,5	26,8	25,1	23,9	33,1
EXTREME	Humid MB	Tweefontein	1152	1931-50	28,3	26,1	25,5	30,6	31,6	32,5	31,1	33,4	34,2	33,9	32,2	29,4	38,9
		Sabie	1108	1914-28	26,7	24,7	28,0	30,5	31,0	31,2	33,1	34,5	37,5	33,1	29,9	26,8	41,7
DAILY	TMB	Bergvliet	983	1934-50	25,1	24,4	23,9	24,5	26,7	27,8	29,4	31,1	30,6	33,3	30,0	28,2	38,3
RANGE	LC	Emmett	610	1931-37	27,0	26,4	20,8	29,0	28,8	25,7	27,9	30,4	35,4	33,4	32,6	24,5	38,6
		Hazyview	530	1971-83	31,0	26,3	29,1	31,6	31,0	29,8	33,2	35,1	30,6	33,5	30,0	29,0	41,5
(D)	Sub-humid MB	LongTom	2118	1980-83	8,7	9,1	9,0	9,1	9,4	10,4	10,2	10,4	11,3	10,6	9,4	9,4	9,8
MEAN	Humid MB	Tweefontein	1152	1931-50	10,6	9,9	10,6	12,2	15,0	16,0	15,6	15,7	14,6	13,7	12,1	11,3	13,1
		Sabie	1108	1914-28	10,8	10,6	10,6	13,0	15,9	17,2	17,3	16,4	15,5	13,6	11,9	11,3	13,7
DAILY	TMB	Bergvliet	983	1934-50	10,2	9,2	9,4	9,7	11,0	12,7	12,7	13,0	12,6	12,2	10,8	10,8	11,2
RANGE	LC	Emmett	610	1931-37	10,5	10,7	10,6	11,5	12,5	12,8	13,0	13,3	13,4	13,2	12,1	10,9	12,0
		Hazyview	530	1971-83	11,1	10,8	11,2	13,0	14,9	16,6	17,1	16,4	15,1	13,1	11,9	12,1	13,6
(E)	Sub-humid MB	LongTom	2118	1980-83	16,6	16,1	15,3	13,9	11,4	8,9	9,0	10,4	12,5	13,9	15,2	16,2	13,3
MEAN	Humid MB	Tweefontein	1152	1931-50	20,1	19,9	19,1	17,2	14,8	12,8	12,5	14,2	16,7	18,6	19,1	19,7	17,1
MONTHLY		Sabie	1108	1914-28	21,1	20,6	19,6	17,6	14,4	12,2	12,1	13,8	16,7	18,9	19,7	20,7	17,3
TEMP.	TMB	Bergvliet	983	1934-50	21,5	21,2	20,4	19,2	17,1	14,9	14,4	16,1	18,1	19,7	20,3	21,1	18,7
	LC	Emmett	610	1931-37	22,8	22,8	21,9	20,1	17,9	16,0	15,6	17,2	18,9	20,9	21,5	22,4	19,8
		Hazyview	530	1971-83	24,6	24,2	23,6	21,5	18,5	16,1	16,0	17,8	20,0	21,5	22,9	24,2	20,9

$ MB = Mistbelt TMB = Transitional Mistbelt LC = Low Country

* Compiled and adapted from Weather Bureau, S.A. (1954a) and from climatological reports of the Soil and Irrigation Research Institute, Private Bag X79, Pretoria, 0001.

In midsummer, steep slopes receive less radiation than gentle slopes, regardless of aspect. Steep slopes with a south-facing aspect receive greater radiation than those with a north-facing aspect. Incoming radiation on gentle slopes, however, is apparently unaffected by aspect.

At the equinoxes and in midwinter, north-facing aspects receive greater radiation on steep slopes than they do on gentle slopes. The converse applies to south-facing aspects. Finally, regardless of steepness, slopes experience decreasing radiation as they tend more towards south-facing aspects.

2.2.4.2 Temperature

Although temperature alone may not be a significant factor in determining major regional vegetation formations, it does play a part in determining floristic variations on a meso- and micro-scale (Schulze & McGee, 1978). Such variations result from differential effects of temperature on plant growth rates, seed germination, seedling survival and flowering phenology. According to Scheepers (1978), it is the extremes of a climatic factor that are decisive in limiting the distribution of a species or plant community. For this reason, critical temperature indices like summer maxima, winter minima, and ranges are considered more significant for the present study than temperature means.

Temperature data for six stations in the study area are given in Tables 2.4 and 2.5 and in Figures 2.4 and 2.5. These data will be discussed comparatively with respect to the different climatic belts (Section 2.2.1), and then more generally with respect to the whole area.

(a) Mistbelt. As mentioned previously (Section 2.2.1), further sub-division of the Mistbelt into "moist" and "dry" sectors may be appropriate. It is clear from Fig. 2.4 A-B, for instance, that temperature conditions on the Summit are altogether milder than those lower down in the Mistbelt. Also, rainfall on the Summit is considerably less than at lower altitudes within the Mistbelt (Table 2.8 and Fig. 2.6). Most significant, however, is the fact that on the Summit, evaporation greatly exceeds rainfall; whereas in lower Mistbelt areas, evaporation is approximately equal to rainfall (Table 2.6).

TABLE 2.5 Occurrence of severe frost (less than 0°C in Stevenson screen) at two stations in the Sabie area of the Eastern Transvaal Escarpment*

	Tweefontein (1 152 m)	Bergvliet (983 m)
Earliest date	23 May	-
Latest date	8 September	-
Average first date	23 June	-
Average last date	24 July	-
Average duration	31 days	-
Period of observation	17 years	15 years
Percentage of frost years	59%	0

* Compiled from Weather Bureau, S.A. (1954a).

TABLE 2.6 Differences in the annual water balance for two stations in the Sabie area of the Eastern Transvaal Escarpment*

	Summit	Mountains
	Long Tom (2 118 m)	Grootfonteinberg (1 644 m)
Mean annual evaporation (mm)	1832	1290
Mean annual rainfall (mm)	568	1272
Annual water deficit (mm)	-1264	-18

* Compiled from Weather Bureau, S.A. (1965a); and from climatological reports of the Soil and Irrigation Research Institute, Private Bag X79, Pretoria, 0001.

The Summit thus represents a distinctly cooler and drier sector of the Mistbelt and is therefore designated Sub-humid Mistbelt to distinguish it from the Humid Mistbelt lower down. Owing to a lack of climatic data from areas on the Summit not affected by rain-shadows, it is difficult to ascertain where the boundary between Humid Mistbelt and Sub-humid Misbelt lies. For the present, however, it is assumed to coincide with the transition from the Montane to the Sub-alpine Belt (Fig. 2.2). Since Summit vegetation was not sampled in the present study, the climate of the Sub-humid Mistbelt will not be discussed in great detail. The following paragraphs pertain mainly to the Humid Mistbelt.

Data for the stations Sabie and Tweefontein on the Escarpment Plateau are considered to be representative of the Humid Mistbelt. Mean monthly temperatures in the Humid Mistbelt range from 12,1°C in the coolest month (July) to 21,1°C in the warmest month (January) (Table 2.4 E). Average summer and winter temperatures are thus differentiated by 9,0°C. Extreme daily maxima are greatest in late spring (October: 37,5°C), and extreme daily minima are least in winter (July: -4,2°C) (Table 2.4 A-B and Fig. 2.4 B). Furthermore, just as extreme daily maxima maintain high levels throughout the year , so extreme daily minima maintain low levels (Fig. 2.4 B). The extreme daily range is therefore wide, being greatest in September (37,5°C) and smallest in February (24,7°C) (Table 2.4 C). This is only partly in accordance with the mean daily range, which is least in February (9,9°C) but greatest in July (17,3°C) (Table 2.4). It is consequently apparent that absolute extremes of temperature may be experienced in early spring (August to September). The onset of high daily temperatures prior to the rainy season, together with the persistence of subzero temperatures at night, probably accounts for these extremes.

Severe frost (less than 0°C in Stevenson screen) is prevalent in the winter months (June to July), but has been known to occur as early as May and as late as September (Table 2.5). Its average duration, however, is only 31 days. From the foregoing, it is apparent that late spring may be a critical period for plants growing in the Humid Mistbelt. The prevalence of extremely high day temperatures in the absence of rain could be inhibitory to many species, especially those on exposed, north-facing (xeric) sites. Likewise, frosty conditions would tend to exclude species which inhabit the lower frost-free climatic belts.

(b) Transitional Mistbelt. Temperature conditions at Bergvliet (Escarpment Lower Slopes) are considered representative of the Transitional Mistbelt. Mean monthly temperatures range from 14,4°C in the coolest month (July) to 21,5°C in the warmest month (January) (Table 2.4 E). Seasonal differentiation of mean monthly temperature is thus only 7,1°C.

As in the Humid Mistbelt, extreme daily maxima are greatest in late spring (October: 38,3°C), and extreme daily minima are least in winter (July: 0,0°C) (Table 2.4 A-B). Extreme daily maxima, and especially extreme daily minima, are maintained at higher levels than in the Humid Mistbelt. The nett effect is a narrowing of the extreme daily range, its magnitude being greatest in October (33,0°C) and smallest in March (23,9°C) (Table 2.4 C). The greatest mean daily range, however, occurs in August (13,0°C) and the smallest in February (9,2°C) (Table 2.4 D). Extremes of temperature in late spring, caused by high October maxima in the absence of rainfall, may account for this seasonal deviation from the greatest mean daily range.

Severe frost (less than 0°C in Stevenson screen) has never been recorded in 15 years of observation (Table 2.5). Isolated pockets of frost may occur, however, in areas of poor air drainage such as valley-bottoms.

As in the Humid Mistbelt, the desiccating conditions of late spring would appear to militate against some plants. This is probably enhanced in the Transitional Mistbelt where the dampening effect of mist is less prevalent. Conversely, frost is no longer a factor limiting to plants in the Transitional Mistbelt.

(c) Low Country. Temperature characteristics for this climatic belt are exemplified by the stations Emmett and Hazyview (Lower Foothills). Mean monthly temperatures range from 15,6°C in winter (July) to 24,6°C in summer (January) (Table 2.4 E). Thus, as in the Humid Mistbelt, seasonal temperatures differ by 9,0°C. The greatest extreme daily maximum for Emmett (40,4°C) occurred in September, a month earlier than in the Humid and Transitional Mistbelts and two months earlier than in the Sub-humid Mistbelt. Conversely, the lowest extreme daily minimum for Emmett (1,8°C) occurred in August, a month and two months later respectively (Fig. 2.4 and Table 2.4 A-B). Thus, the Low Country apparently warms up sooner and cools down later than the Mistbelt as a whole. It therefore has a longer warm-hot season than the latter (Fig 2.4).

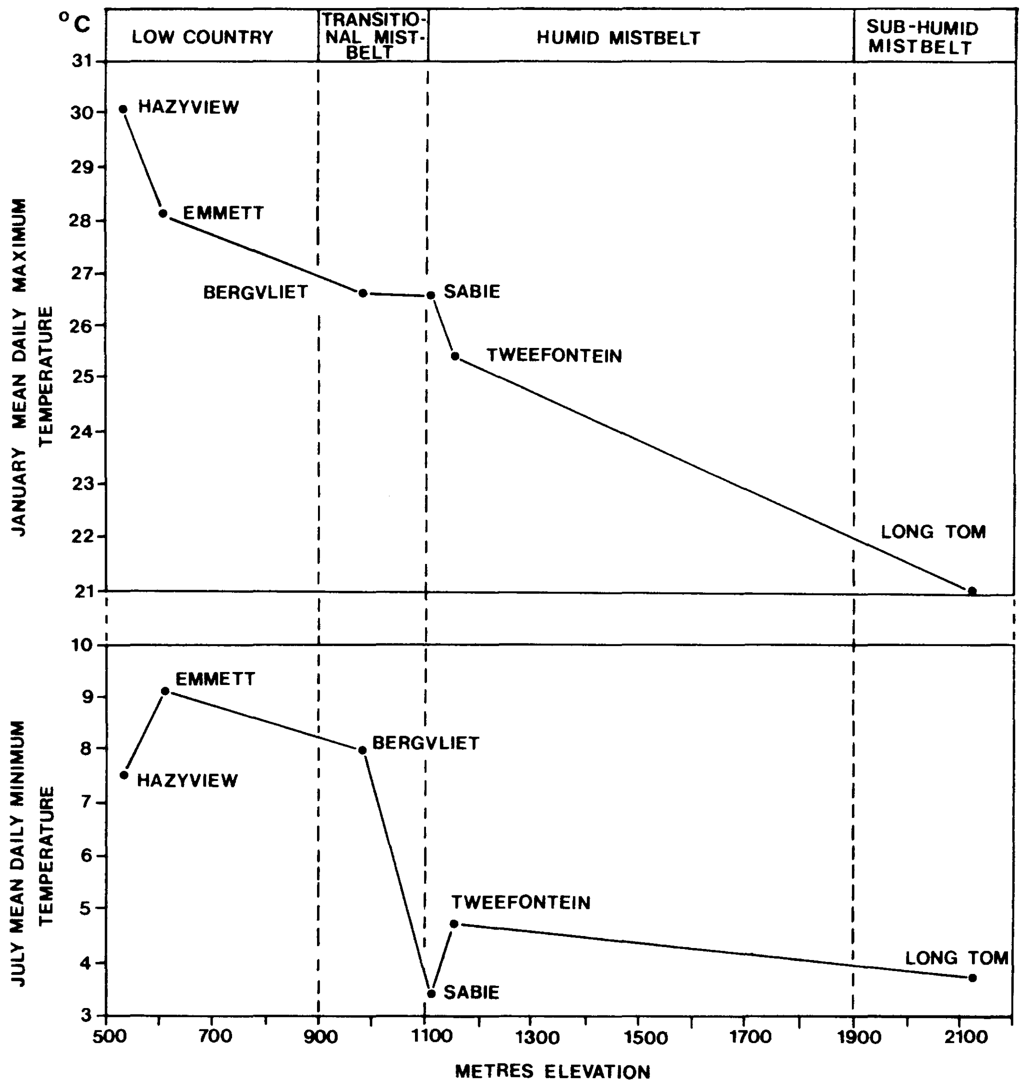

FIG. 2.5 Variation of seasonal temperatures with altitude for six stations in the Sabie area of the Eastern Transvaal Escarpment.
Compiled from Weather Bureau, S.A. (1954a); and from climatological reports of the Soil and Irrigation Research Institute, Private Bag X79, Pretoria, 0001.

As in the Humid Mistbelt, the greatest extreme daily range occurs in September (36,6°C). The smallest extreme daily range, as in the Transitional Mistbelt, occurs in March (20,8°C) (Table 2.4 C). These extreme ranges coincide largely with the mean daily range for Emmett, which is greatest in September (13,4°C) and smallest in January (10,5°C) (Table 2.4 D). This suggests that temperatures in the Low Country are seasonally more consistent than in the Humid and Transitional Mistbelts. Frost (less than 0°C in Stevenson screen) is not an important factor in the Low Country although it may occur in isolated pockets, as in the Transitional Mistbelt.

As for the other climatic belts, the Low Country experiences hot dry conditions in late spring prior to the rainy season, and with the absence of mist, temperatures can be extremely harmful to plants. Also, compared to the Mistbelt, the long warm-hot season of the Low Country means an extended growing season for plants, without the inhibiting effect of frost. Furthermore, the greater predictability of temperature regimes in the Low Country tends to moderate demands on the adaptive capability of plants.

Clearly, the Mistbelt as a whole is consistently cooler than the Low Country (Fig. 2.4 and 2.5). Mean monthly temperatures decrease with increasing altitude, Long Tom being approximately 7,5°C and Sabie 3,5°C cooler than Hazyview throughout the year (Table 2.4 E). Likewise, but with the exception of anomalies caused by local geomorphology, the temperature range generally narrows with increasing altitude. For example, the annual average of the mean daily range is 13,6°C at Hazyview (530 m) and only 9,8°C at Long Tom (2 118 m) (Table 2.4 D).

Of all the stations (besides Long Tom), Bergvliet experiences the smallest seasonal range in mean daily temperature (Fig. 2.5 and Table 2.4 D). This is in accordance with its intermediate position in the transect: not high enough for frost, but just high enough to be cooled by periodic mist. It may therefore represent an area where considerable "mixing" of high and low altitude plant species could take place. The exceptionally small range in mean daily temperature at Long Tom is largely due to the low maxima resulting from its high elevation (Table 2.4 D and Fig. 2.5).

Local geomorphological effects on temperature are evident on the Escarpment Plateau. For example, mean maximum January temperatures for Sabie (1 108 m) are higher than for Tweefontein (1 152 m), but mean minimum July temperatures are lower (Fig. 2.5). In other words, relative to Tweefontein,

TABLE 2.7 Seasonal variation in wind direction for three stations in the vicinity of the study area*

Station	Period	Most significant sector from which wind blows during:	
		January	July
Barberton	1939-1948	NE	NE
Pietersburg	1951-1957	E	SSW
Pilgrim's Rest	1939-1948	SE	SW

* Compiled from Weather Bureau, S.A. (1960).

Sabie's summer maximum is elevated and its winter minimum depressed. This is despite both altitudinal and latitudinal uniformity. Anomalies such as this are usually due to geomorphological variation. In this instance, depression of winter minima may partly be explained by temperature inversion resulting from cold-air drainage into Sabie's shallow, gently sloping river valley. Thus, whereas on calm winter nights cold air would drain freely from the slopes at Tweefontein, leaving them comparatively warm; it would tend to collect in "pockets" at Sabie. Similarly, Sabie's elevated summer maxima may be explained by restricted air flow in a partly enclosed valley. Similar phenomena probably account for the depressed winter temperatures at Hazyview (Fig. 2.5).

As already mentioned, the season most stressful to plants, in terms of temperature, is early spring. Late summer and autumn are the least stressful seasons. This seasonal stress is largely reinforced and complemented by rainfall, which is comparatively low in spring and high in autumn (Fig. 2.6). Therefore, climate is generally most severe in spring and least severe in autumn. Furthermore, the Low-Country climate is more severe than that of the Humid Mistbelt, being hotter and drier throughout the year. The cool, comparatively dry conditions of the Sub-humid Mistbelt, on the other hand, may be even more rigorous for plants than conditions in the Low Country. The seasonal pattern of temperature and rainfall in the Low Country is similar, nevertheless, to that throughout the Mistbelt. This suggests that rainfall throughout the area has a common source and probably takes a common form (Section 2.2.4.4). All these factors contribute towards determining the differential distribution of plant species.

2.2.4.3 Wind

Although wind data for stations in the area are lacking, wind conditions at nearby stations are considered fairly representative and are therefore presented in Table 2.7 . Observations made by Scheepers (1978) augment these data.

South-easterly to easterly to north-easterly winds predominate during summer (January). These winds blow from the Indian Ocean and are often associated with anticyclonic systems, but can also be associated with cyclonic systems. Their persistence is often the harbinger of the steady rains, drizzle and mist so typical of Escarpment weather in summer.

Winds which blow from the southerly to south-westerly sectors during early summer, especially in the afternoon, are often associated with thunderstorms. During winter, these same winds are associated with cold fronts which are sometimes attended by mist and drizzle.

Violent bergwind conditions, such as the 115 kph westerly wind gust recorded in Pietersburg one September, may occasionally occur (Weather Bureau, 1960). These winds become heated by compression as they drop over the Escarpment from the Highveld Plateau and are known to cause considerable physical and economic damage (in the form of breakage, lodging and windthrow) to timber plantations (personal observation). Indigenous vegetation does not apparently suffer much physical damage, but the low humidity of such winds in the presence of high spring temperatures is sure to have adverse physiological effects. Furthermore, the occurrence of such winds in the dry months of early spring constitutes a particularly serious fire hazard.

2.2.4.4 Precipitation

Van Riper (1971) and Walter (1972) consider moisture to be the most important individual climatic parameter influencing the gross features of vegetation. This is in accordance with Scheepers' (1978) conclusion that moisture appears to be the decisive factor in the environment. Moreover, it is the soil-moisture balance rather than the gross precipitation income that determines the major subdivision of vegetation formations (Schulze & McGee, 1978). Whereas the concept of soil- moisture balance takes into account both contributions to the soil by "fog drip" and losses from the soil by interception, evaporation, percolation and run-off; gross precipitation income measured with standard rain gauges does not. Contributions by mist can be quite considerable. Preliminary results from "fog-catchers" in the Eastern Transvaal have yielded precipitation figures that exceed those of standard rain gauges by between 105 and 280 per cent (Fabricius, 1969). Elsewhere, Kittredge (1948) noted that "fog drip" may increase effective precipitation by as much as 200-300 per cent.

"Losses" from interception of rainfall by plant foliage, stems and litter are also substantial. For instance, mature exotic plantations in southern Africa may intercept as much as 8-12 per cent of the mean annual precipitation (Wicht, 1971). Insufficient empirical documentation of such phenomena, however, precludes the use of the moisture-balance concept in the present discussion. Rather, gross precipitation income measured with standard rain gauges will be used as a relative measure of the variability of soil-moisture status within the study area.

Soil moisture is derived from precipitation mainly in the form of rainfall, mist (and fog), dew, hail and snow. As with temperature, extreme values of precipitation , especially minima, are ecologically more important than mean annual values.

(a) Rainfall. The study area falls within the summer rainfall zone where the bulk (85 per cent) of annual rainfall occurs between November and March. During this period, rain is precipitated mainly in the form of afternoon thunderstorms and instability showers caused by convection in, and convergence of, tropical air masses (Weather Bureau, 1965a). Light orographic rainfall (drizzle) without thunder, and associated with advection, is also prevalent in the summer months, especially on the windward sides of the Mountains and Escarpment Slopes. The small proportion of winter rainfall is derived solely from orographic precipitation, since conditions favouring thunderstorms and instability showers do not persist in the winter months (Weather Bureau, 1965a).

On average, the Escarpment region experiences a maximum of over 140 days with measurable rainfall per annum, including 60 to 80 thunderstorms occurring early in the rainy season (Weather Bureau, 1965a). Prolonged periods of rain, usually in the form of drizzle are fairly common. For instance, periods with seven consecutive rainy days are encountered on about two occasions per year, and periods with four consecutive rainy days may be encountered on as many as ten occasions per year(Weather Bureau, 1965a).

Rainfall along the eastern Escarpment is generally reliable. In 58 years of recording, 78 per cent of the annual falls lie within about 20 per cent of the normal rainfall. A further 10 per cent of annual falls may be regarded as "wet" years (120-140 per cent of normal), and the remaining 12 per cent as "dry" years (60-80 per cent of normal) (Weather Bureau,1965a).

The regional climate is of the monsoon type in which three seasons can be recognized (Scheepers,1978) :

1. The rainy season of summer and late summer (i.e. November to March).

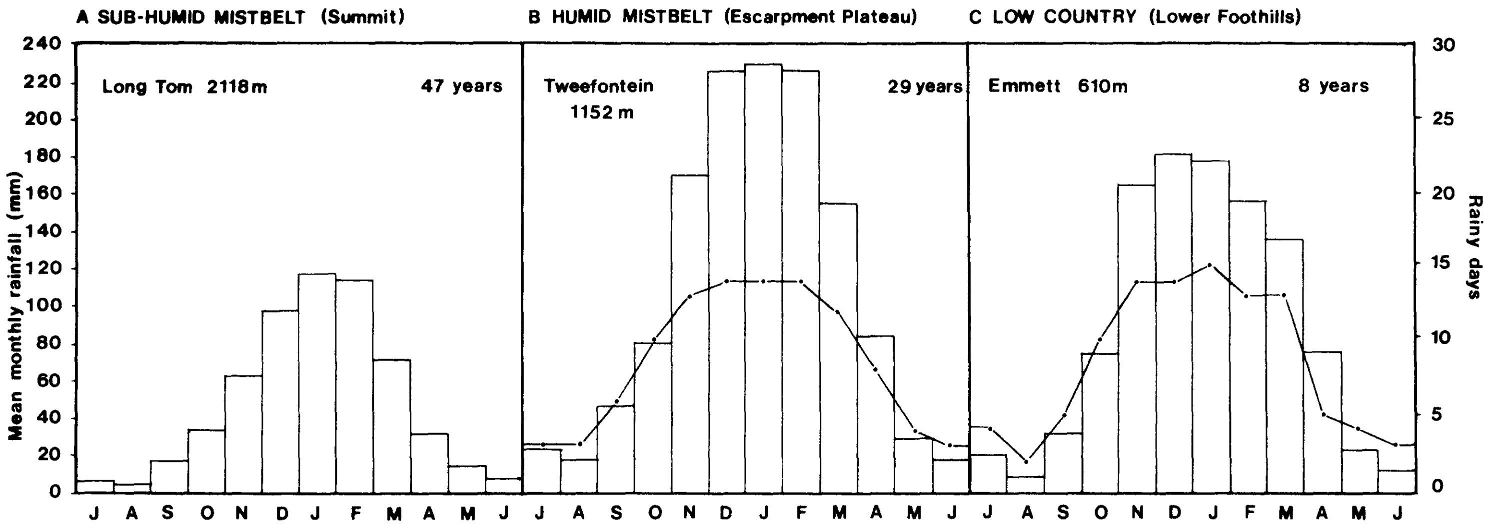

FIG. 2.6 Annual march of mean monthly rainfall (histogram) and mean rainy days per month (graph) for three stations in the Sabie area of the Eastern Transvaal Escarpment. Compiled from Weather Bureau, S.A. (1965b); and from climatological reports of the Soil and Irrigation Research Institute, Private Bag X79, Pretoria, 0001.

2. The cool dry season of "autumn" to early spring (i.e. April to August).
3. The warm dry season of spring and early summer (i.e. September to October).

As mentioned earlier (Section 2.2.4.2), the high temperatures and low rainfall of spring and early summer make the warm dry season a particularly hostile one for plants.

The strongly seasonal nature of the rainfall at three stations in the study area is illustrated in Fig. 2.6. Clearly, maximum rainfall occurs during the warmer months, from November to March. In the Low Country and Humid Mistbelt, there are "superhumid" months in which the monthly rainfall consistently exceeds 100 mm (Fig. 2.8) (Walter,1971). In the Sub-humid Mistbelt, however, the superhumid period is limited largely to January and February (Fig. 2.8). Also, there is a general increase in rainfall with altitude; the mean monthly January rainfall in the Humid Mistbelt being approximately 52 mm more than in the Low Country. This trend is interrupted on the Summit, however, where rainfall is considerably less than in the Low Country (Fig. 2.6A), and where the humid period is considerably shorter (Fig. 2.8). Hence its designation as Sub-humid Mistbelt (Section 2.2.4.2).

The average number of rainy days in both the Mistbelt and Low Country shows much the same type of annual variation as the rainfall amount (Fig. 2.6 B-C). Rainfall is nevertheless consistently heavier in the Humid Mistbelt than in the Low Country. For example, for the same number of rainy days in December, Tweefontein in the Humid Mistbelt experiences 45 mm more rainfall than Emmett in the Low Country (Fig. 2.6 B-C). The heavier rainfall in the Humid Mistbelt may be attributed to the greater influence of orographic rainfall in this climatic belt. Notwithstanding these differences, the number of rainy days per month in the Humid Mistbelt concurs fairly well with that in the Low Country and this suggests, as mentioned previously (Section 2.2.4.2), that the rainfall of both climatic belts has a common source and to some extent takes the same form. Similar conclusions cannot be made for the Sub-humid Mistbelt, however, owing to a lack of readily available data on the number of rainy days.

Rainfall data for specific stations within and around the study area are given in Table 2.8. Stations are grouped according to the physiographic zones they occupy, and this facilitates the computation of a "composite"

TABLE 2.8 Mean annual and absolute maximum and minimum rainfall for 29 stations in the Sabie area of the Eastern Transvaal Escarpment *

PHYSIOGRAPHIC ZONE	STATION	ALTITUDE (m)	PERIOD (Yrs)	ANNUAL RAINFALL (mm)$ mean	max	min	COMPOSITE MEAN (mm)
SUMMIT	Long Tom	2118	47	568	-	-	793
	Paardeplaats	1920	9	831	-	-	
	Elandshoogte	1980	13	981	-	-	
UPPER MOUNTAINS	Hartebeestvlakte	1707	5	1271	-	-	1272
	Grootfonteinberg	1644	6	1272	-	-	
MIDDLE MOUNTAINS	Long Tom-Bos	1525	17	1853	-	-	1853
LOWER MOUNTAINS	Lisbon-Berlyn	1370	15	1382	-	-	1461
	Mac Mac	1250	32	1539	2332	999	
ESCARPMENT PLATEAU INTERIOR	Spitzkop	1463	17	1223	1819	775	1200
	Tweefontein	1152	20	1241	1939	806	
	Sabie	1108	49	1134	1967	708	
	Ceylon	1075"	20	1200	1897	799	
ESCARPMENT PLATEAU CREST	Ophir	1524	23	1469	2317	944	1607
	Lekkerlach	1520	21	1525	-	-	
	Graskop	1478	44	1749	-	-	
	Klipkraal	1372	18	1683	2384	1034	
ESCARPMENT LOWER SLOPES	Hebron	1341	16	1383	1880	927	1465
	Welkom	1065"	8	1611	1914	1250	
	Frankfort	1005	8	1616	-	-	
	Bergvliet	983	17	1263	2124	852	
	Rietspruit	900	7	1454	2080	1212	
UPPER FOOTHILLS	Swartfontein	1067	17	1073	2157	661	1183
	Witwater	1036	21	1113	2065	743	
	Wilgeboom	1000	15	1306	2425	1022	
	Sabie gorge	975	23	1207	1901	801	
	Moddersprui t	914	36	1217	2292	681	
LOWER FOOTHILLS	Emmett	610	8	1042	1433	696	950
	Sandford	579	19	942	1388	614	
	Hazyview	530	13	866	-	-	

* Compiled from miscellaneous records of the Weather Bureau, Pretoria; from Weather Bureau, S.A. (1954b); and from climatological reports of the Soil and Irrigation Resarch Institute, Private Bag X79,Pretoria, 0001.
$ Rainfall figures adjusted to the nearest millimetre.
" Corrected altitude.

mean or index for each zone (except the Escarpment Upper Slopes).This value broadly represents the mean annual rainfall of each zone. Zonal variability can be explained largely in terms of the prevailing physiography. Thus it is clear from Table 2.8 and Fig. 2.7 that rainfall increases steadily from the Lower Foothills (950 mm) up to a first maximum on the Plateau Crest (1 607 mm). This increase is due to the fact that elevations of land force air currents to rise and cool, and hence to precipitate moisture. Furthermore, even in the absence of general atmospheric movements, mountain regions are known to have local ascending currents which would enhance the precipitation process (Killick, 1963). From the Plateau Crest, rainfall decreases into the Plateau Interior (1 200 mm). The effect of the Plateau Crest in creating a local rain-shadow may be responsible for this decrease. From the Plateau Interior, rainfall again increases steadily up to a second maximum on the Middle Mountains (1 853 mm). Above this zone, falling temperatures probably cause significant reductions in the vapour content of the rising air masses, and rainfall consequently decreases to 1 272 mm on the Upper Mountains (Table 2.8 and Fig 2.7). On the Summit, rain-shadow effects together with depleted vapour content of air cause the rainfall to decrease to 793 mm, a minimum for the study area.

With the exception of the Sub-humid Mistbelt and the Plateau Interior Zone, there seems to be a fairly reliable correlation between mean annual rainfall and mist occurrence. Thus, places with a mean annual rainfall of less than about 1 200 mm would probably fall into the Low-Country climatic belt, whilst places with a mean annual rainfall of more than about 1 400 mm would probably fall into the Humid Mistbelt. The Transitional Mistbelt would therefore receive from 1 200 mm to 1 400 mm of rainfall per year (Table 2.8 and Fig. 2.7). This supposition largely confirms that made by Scheepers (1978) for Westfalia Estate.

Extremes of annual rainfall are significant ecologically. Most stations in the study area experience large variations in annual rainfall. There are periodic low minima which tend to be counter-balanced by periodic high maxima (Table 2.8). The Upper Foothills apparently experiences the greatest extreme annual range (e.g. Moddersspruit: 1 611 mm), whereas the Lower Foothills experiences the least (e.g. Emmett: 737 mm). The severity of a drought-year would therefore appear to be greatest in the Upper Foothills, where orographic rainfall may only periodically offset the otherwise relatively low rainfall. The small seasonal range of mean daily temperature

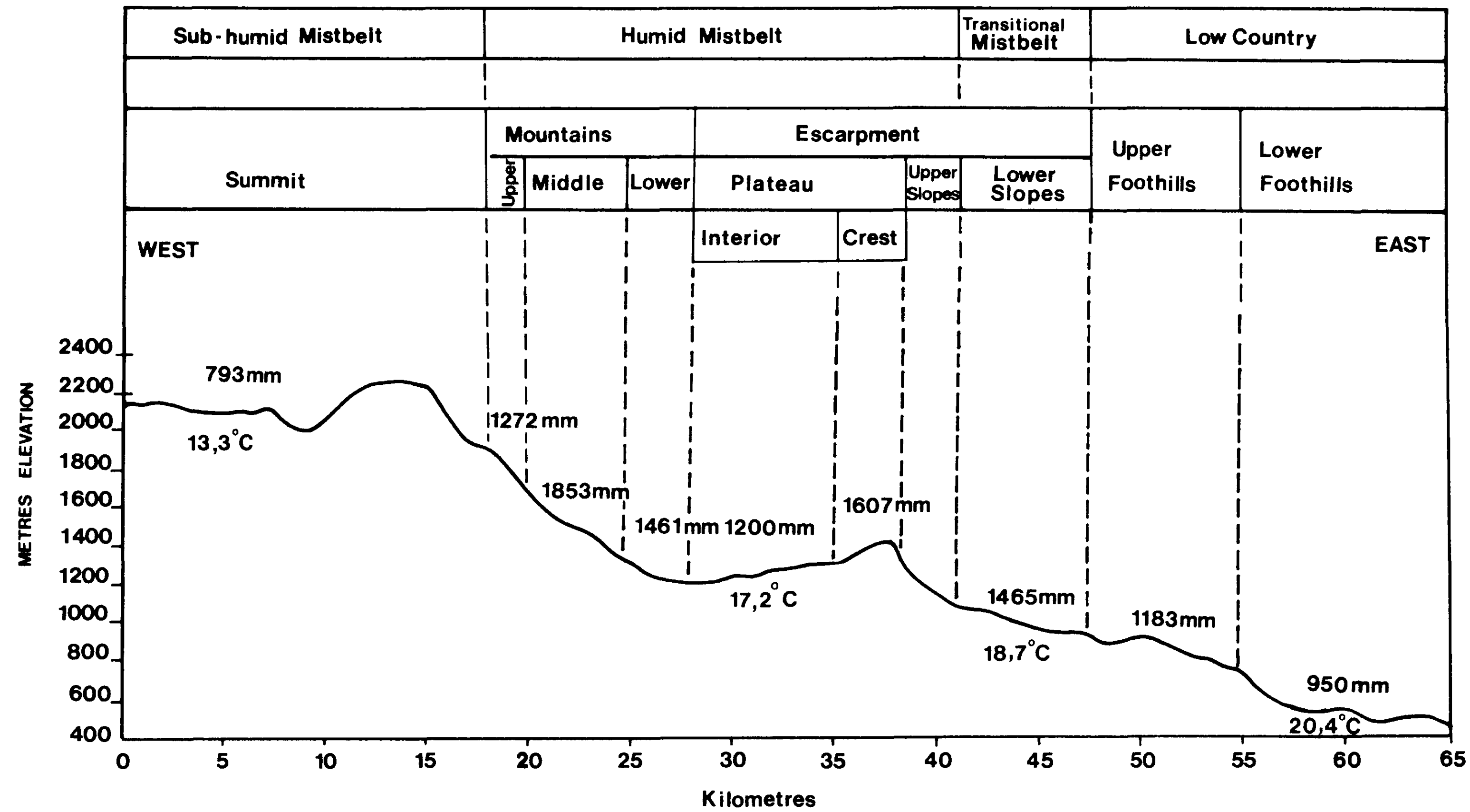

FIG. 2.7 Variation of mean annual rainfall (mm) and mean annual temperature (°C) in the study area with respect to physiography and altitude.
Compiled from Tables 2.4 and 2.8.

in this zone, however, may possibly compensate plants for this unreliable pattern (Section 2.2.4.2).

(b) Mist.[1] As already mentioned, precipitation from mist (and fog) supplements rainfall precipitation quite significantly. Where mist or fog is carried through the crown of trees, fine droplets of water collect on foliage and branches. These droplets coalesce and eventually become large enough to drip to the ground, thus contributing directly to soil moisture. This phenomenon, known as "fog drip", is most significant when mist or fog is moving through tall vegetation. Even when mist or fog is stagnant however, or when it moves through short vegetation, it nevertheless contributes indirectly to soil moisture by reducing evapotranspiration. Conversely, stagnant fogs may actually prevent the precipitation of dew by their inhibiting effect on radiation (Scheepers, 1978).

Clearly, the effects of mist and fog are of great importance in the distribution of plant species and communities. In the Mistbelt, mist is experienced extensively. It also occurs occasionally in the Low Country, on windward, mesic slopes during very wet periods in summer. Cold-air drainage on calm winter nights results in the formation of stagnant valley fogs. In the Low Country, these fogs do not persist beyond early morning, being soon dissipated by the heat of the sun (Scheepers, 1978).

(c) Dew. Radiation of heat at night causes surface temperatures to fall and, under relatively humid conditions, this results in precipitation of moisture in the form of dew. River valleys are especially subject to dew precipitation.

Dew contributes to soil moisture by reducing the rate and duration of evapotranspiration. Such reduction is accomplished when, with the evaporation of dew, rapid temperature-rises are checked and humidities

[1] In this text, the term "mist" is used to indicate suspended moisture droplets condensed by the cooling of saturated air masses rising against sloping ground. In contradistinction, the term "fog" is used to denote such suspended moisture droplets condensed from saturated air cooled at night by radiation and temperature inversion, being restricted mainly to low-lying and level terrain (Scheepers[2], pers. comm.).

[2] Dr J.C. Scheepers, Botanical Research Institute, Private Bag X101, Pretoria, 0001.

raised. Dew precipitation may thus serve to ease, or even positively counteract, drought conditions (Scheepers, 1978).

Observations by Scheepers (1978), of adventitious roots of plants being periodically covered with dew, have interesting ramifications in terms of the capability of such plants to tap these superficial water supplies directly. Plants in the study area possessing adventitious roots include certain grasses, Acanthaceae, and species of *Commelina*, *Bridelia*, *Ficus*, *Cyphostemma*, *Mikania* and *Rhoicissus*. Shrubby plants of ericoid habit such as *Acanthospermum ammanioides*, *Erica woodii*, and *Myrsine africana* are also particularly adept at retaining dew in their foliage for considerable periods. Such a phenomenon may be significant if these plants are able to directly utilize water supplied in this form.

(d) Hail. Precipitation by hail does not contribute very significantly to soil moisture and neither does it appear to cause much damage to indigenous vegetation. This is mainly because it occurs so infrequently, being prevalent during only four or five spring thunderstorms annually (Weather Bureau, 1965a).

(e) Snow. "Apart from increasing soil moisture during winter, snow acts as an insulating blanket protecting plants from excessively cold temperatures and preventing the ground beneath from freezing" (Killick, 1963). Owing to the dryness of the winter, snowfalls in the study area are not particularly frequent. Between 1969 and 1983, only four instances of snow were recorded, usually in early spring (August-September) (Livingstone[1], pers. comm.). The snow is confined to the Summit and Mountains, where slopes as low as 1 600 m elevation may be affected (personal observation). Snow in early spring may therefore be particularly beneficial to high-altitude plants whose soil moisture is largely depleted after the prolonged dry conditions of winter. Snow that precedes the onset of summer rains may thus afford plants the advantage of commencing seasonal growth earlier than usual.

2.2.4.5 Humidity

Thornthwaite (1952) and Mather (1959) have shown that vegetation associations are related to humidity. During the growing season, high humidities assist plant growth by reducing transpiration rates. Low humidities with

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[1] Mrs D. Livingstone, c/o Mondi Timber, P.O. Box 69, Sabie, 1260.

TABLE 2.9 Annual march of mean and extreme maximum and minimum humidity for two stations in the Sabie area of the Eastern Transvaal Escarpment *

STATION & PERIOD	ALTITUDE (m)	PHYSIOGRAPHIC ZONE	HUMIDITY PARAMETER(%)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			Extreme max.	98,0	95,0	96,0	97,0	97,0	98,0	97,0	97,0	95,0	96,0	95,0	97,0
Hazyview	530	Lower	Extreme min.	16,0	20,0	17,0	19,0	17,0	15,0	13,0	12,0	11,0	14,0	16,0	18,0
1978 - 1983		Foothills	Mean max.	85,6	85,7	86,5	88,5	88,0	85,1	83,9	82,0	83,7	84,7	85,1	86,1
			Mean min.	41,9	39,4	38,4	35,5	33,8	28,7	29,3	30,9	32,9	37,0	40,7	37,7
			Extreme max.	100,0	100,0	100,0	98,0	97,0	94,0	96,0	96,0	95,0	90,0	81,0	95,0
Long Tom	2118	Summit	Extreme min.	16,0	12,0	14,0	13,0	9,0	8,0	2,0	3,0	11,0	9,0	10,0	13,0
1980 - 1983			Mean max.	85,7	89,8	88,7	81,9	73,7	65,2	66,7	66,5	69,1	69,0	69,5	73,5
			Mean min.	47,3	50,1	44,6	38,3	33,9	27,7	26,9	30,1	30,5	31,5	36,9	36,2

* Compiled from climatological reports of the Soil and Irrigation Research Institute, Private Bag X79, Pretoria,0001.

high temperatures result in increased transpiration rates which may be limiting or injurious to plant growth. Extreme values of minimum humidity, therefore, are likely to be of greatest significance ecologically.

Data for Hazyview in the Low Country and Long Tom in the Sub-humid Mistbelt are presented in Table 2.9. As expected, humidity levels are correlated with precipitation, temperature, and wind; the highest mean values being recorded in April-May in the Low Country and in February-March in the Sub-humid Mistbelt. These periods are associated with decreasing autumn temperatures (Fig. 2.4 A and C) near the close of the rainy season, when fairly high levels of soil and atmospheric moisture still prevail (Fig. 2.6 A and C). Evapotranspiration is therefore minimal, as is climatic stress for plants. The lowest mean humidity values were recorded in June-July in both the Low Country and the Sub-humid Mistbelt. This is a period of low rainfall and low temperatures (Figs. 2.4 and 2.6). In addition, prevailing winds tend to be dry south-westerly (Table 2.7).

The period July-August in the Sub-humid Mistbelt may be subject to large fluctuations in humidity. For example, the extreme minimum humidity may be as low as 2 per cent, whereas the extreme maximum may be as high as 96 per cent (Table 2.9). The low minima may arise on occasions when hot, dry south-westerly winds blow (cf. bergwinds, Section 2.2.4.3).Such conditions can be particularly devastating for plants. Conditions in the Low Country are not as dry, the lowest extreme minimum humidity being 11 per cent in September. Low humidities in early spring confirm the earlier premises that this is a very difficult season for plants.

Table 2.9 shows the situation at the extremes of the study area only. Humidities for the intermediate Humid and Transitional Mistbelts are obviously expected to be higher than those for either the Sub-humid Mistbelt or the Low Country. Lack of readily available data for the former climatic belts, however, precludes any quantitative conclusions.

2.2.4.6 Lightning and Fire

Fire is an important element of the environment, affecting both biotic and abiotic components. Vegetation variables such as biomass, cover, height and floristic composition are all influenced to some extent by fire (Kruger, 1984). Thus in the humid montane forest/grassland regions of South Africa, for example, fire has played a major role in the development and maintenance of grassland communities. Without fire, grassland is replaced by ecologically more advanced communities, such as forest in moist sites (Tainton & Mentis, 1984).

The majority of fires in South Africa are apparently caused by man (Macdonald et al., 1980; Scotcher, 1980; Horne, 1981). Together with exploitation, such fires have probably been responsible for drastic changes in the distribution of indigenous forest in South Africa (Granger, 1984). Besides anthropogenic causes, there are also natural causes of fire ignition in vegetation. These include falling boulders, earthquake activity, lightning, spontaneous combustion and volcanic action (Edwards, 1984). In South Africa, lightning is believed to be the most significant of these natural causes (Phillips, 1930; West, 1965 and 1971; Scott, 1970; Komarek, 1971). Compared to anthropogenic fires, however, their influence on the present distribution of indigenous forest is thought to be minimal (Granger, 1984). The probability of lightning fires is accentuated by the occurrence of dry lightning storms at the end of the dry season (Komarek, 1971). With the onset of summer rains, many potential lightning fires are probably extinguished by the accompanying rain.

According to Annual Reports of the Department of Forestry 1959/60 to 1977/78 (cited by Edwards, 1984), lightning fires in State Forest land in South Africa account for only 12 per cent, whilst man-made fires account for 65 per cent of the total number of fires. On the Eastern Transvaal Escarpment specifically, the percentage of lightning fires is much greater than this. Between 1975 and 1982, 41 per cent of the plantation fires recorded by Mondi Timber (a 55 000 ha estate centred mainly around Sabie) were initiated by lightning (Kewley[1], pers. comm.). This is in accordance with the fact that thunderstorm activity and ground lightning flash density is highest at altitudes over 1 000 metres in the predominantly grassland and afro-alpine areas of South Africa (Kroninger, 1978). Even in lower-altitude savanna, lightning fires can be significant. In the lowveld of the Kruger National Park, for example, Gertenbach & Potgieter (1979) found that lightning caused 45 per cent of all unscheduled fires during the 1977/78 season. This imples that the potential effect of lightning fires on the vegetation of the study area is considerable. Under the current influence of controlled management, however, such effects are diminishing.

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[1] Mr H.C. Kewley, Mondi Timber, P.O. Box 69, Sabie, 1260.

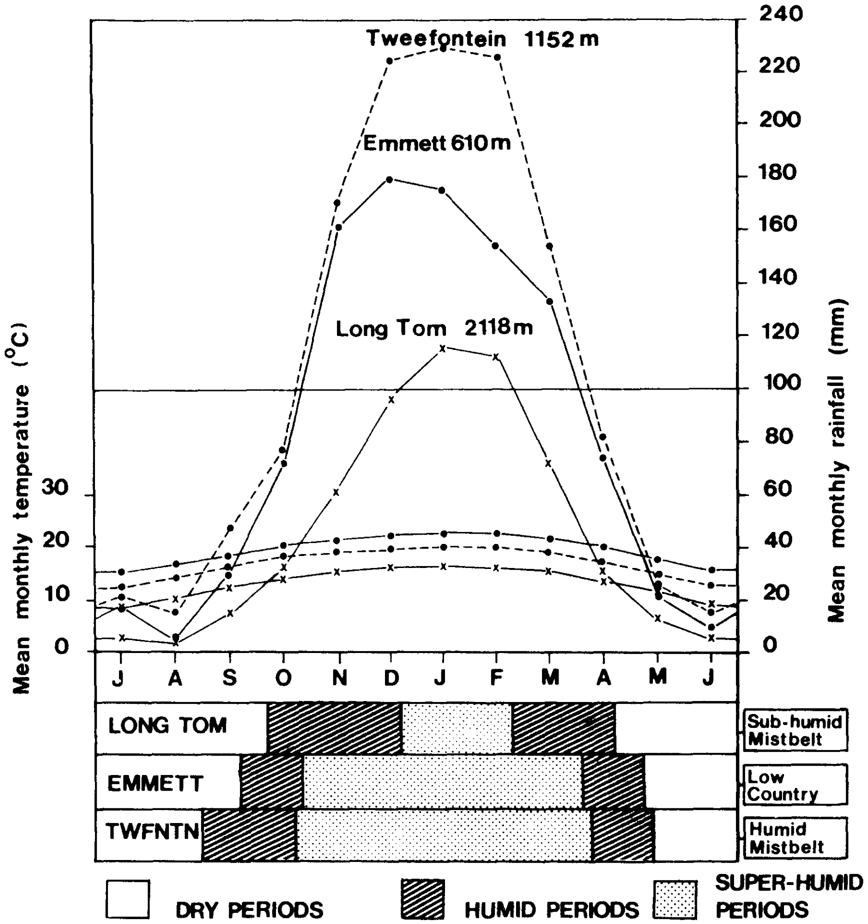


FIG. 2.8 Climatic diagram for three stations in the Sabie area of the Eastern Transvaal Escarpment. Adapted from Walter (1971) using data from Fig. 2.6 and Table 2.4.

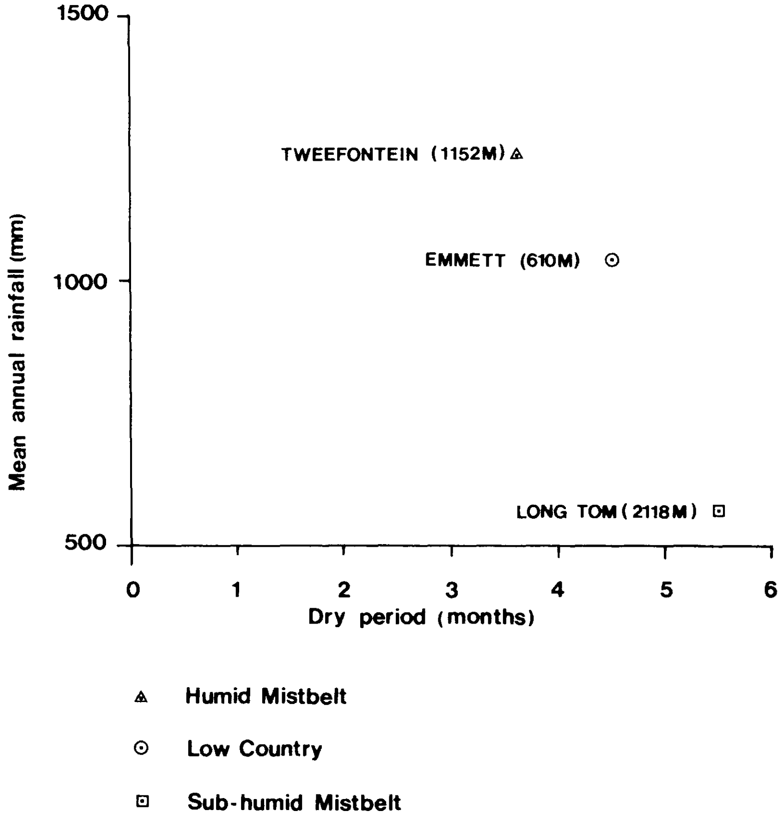


FIG. 2.9 Characterization of climatic types on the basis of annual rainfall and length of dry period.
Based on Walter (1971), using data from Fig. 2.8 and Table 2.8.

2.2.4.7 Climatic Classification

Walter (1971) considers the interaction between annual precipitation and duration of the dry period to be important for characterizing climatic types in relation to vegetation. Dry periods are determined by means of his climatic diagram concept (Fig. 2.8). According to Gaussen (1955), dry periods for plants growing in areas of marked seasonal rainfall occur when the precipitation (N) curve cuts the temperature (T) curve on the scale (T:N = 1:2). Thus for the stations Tweefontein, Emmett and Long Tom, the dry periods are 3,6 , 4,5 and 5,5 months respectively (Fig. 2.8). Fig. 2.9 shows the interaction between precipitation and dry period for these three stations. Clearly, from Walter's (1971) point of view, each station represents a distinct climatic type,and the *a priori* designation of climatic belts in the preceding discussion is thus, to some extent, validated.

Various other systems of climatic classification for the purpose of correlation with vegetation zones for southern Africa have been attempted. According to the Köppen classification (Schulze, 1947), the study area would be divided into two climatic zones, namely Cwa and Cwb (Table 2.10). Whereas Cwb signifies a temperate type of monsoon climate with the mean temperature of the warmest month below 22,1°C, Cwa signifies a warmer type of monsoon climate with the mean temperature of the warmest month above 22,1°C (Scheepers, 1978). Although this classification does distinguish the Low Country from the Mistbelt, it does so purely on the basis of temperature and not precipitation. It consequently fails to distinguish between the Humid and Sub-humid Mistbelts. The insensitivity of the Köppen classification is probably due to the fact that only gross annual rainfall and temperature are used as criteria.

Thornthwaite's (1948) classification is based on other factors besides precipitation and temperature. It is based on the degree to which precipitation exceeds or falls short of the "optimum quantity of water needed for evapotranspiration by a vegetation covered soil, viz the potential evapotranspiration" (Schulze & McGee, 1978). Potential evapotranspiration is regarded as an index of (solar) thermal efficiency, and forms the basis of Thornthwaite's (1948) thermal regions (Table 2.10). Comparison of monthly potential evapotranspiration with monthly precipitation gives a measure of monthly water surpluses and deficits, which in turn facilitates the computation of an overall moisture index for an area. The moisture index then forms the basis of Thornthwaite's (1948) moisture regions (Table 2.10).

TABLE 2.10 A comparison of three different systems of climate classification in relation to the *a priori* climatic belts of the study area

CLIMATIC BELT	KOPPEN'S CLASSIFICATION		THORNTHWAITE'S CLASSIFICATION*				PAPADAKIS' CLASSIFICATION$	
			Thermal Regions		Moisture Regions			
	Code	Description	Code	Description	Code	Description	Code	Description
Sub-Humid Mistbelt	Cwb	Warm temperate climate with summer rainfall	B1	Cooler-temperate (mesothermal) Moderate frost	C2	Moist Sub-humid	Ci, t-tf, Mo?	Moist Monsoon High Tierra Fria?
Humid Mistbelt	Cwb	Warm temperate climate with summer rainfall	B2	Warmer-temperate (mesothermal) Light frost	B2	Moist Humid	Ci,M-TF,Hu 6-7 Humid months tp,M-tt,Hu	Humid Medium Tierra Fria and Humid Cool Tierra Templada
Transitional Mistbelt	Cwb	Warm temperate climate with summer rainfall	B2	Warmer-temperate (mesothermal) Light frost	B2	Moist Humid	Ct,c-Tf,MO 4 or less Dry months	Moist Monsoon Subtropical Tierra Fria
Low Country	Cwa	Warmer temperate climate with summer rainfall	B3	Warmer-temperate (mesothermal) Very light frost	B1	Moist Humid	Ct,c-TF,MO 5 or more Dry months	Moist/Dry Subtropical Tierra Fria
							Ct,c-TF,Mo	Dry Monsoon Subtropical Tierra Fria

* As modified by Poynton (1971).
$ As applied by Scheepers (1978) and as adopted by Fabricius (MS).

Thornthwaite's (1948) classification, as modified by Poynton (1971), confirms the subjective climatic subdivisions of the study area fairly well. Thus, although the entire study area is classified as mesothermal, three subdivisions corresponding to Sub-humid Mistbelt (B1), Humid and Transitional Mistbelts (B2), and Low Country (B3) are made on the basis of both the mean monthly minimum temperature for the coldest month, and on the degree of frostiness (Table 2.10). Similarly, three subdivisions are made according to moisture regions. The moist sub-humid region (C2) is identified with Sub- humid Mistbelt, whilst the moist humid region encompasses the remaining climatic belts; with the Low Country (B1) being distinguished from the Mistbelt (B2) on the basis of a lower moisture index (20-40 as opposed to more than 40) (Table 2.10).

A third system of classification offering perhaps the greatest degree of sensitivity is that of Papadakis (1961), as applied by Scheepers (1978) and as adopted by Fabricus (MS). Besides recognizing the Sub-humid Mistbelt, Humid Mistbelt and Transitional Mistbelt, it refines the Low Country climatic belt on a moisture basis (moist/dry as opposed to dry monsoon) to give a subdivision possibly corresponding to the Upper Foothills and Lower Foothills respectively (Table 2.10).

The extent to which the plant communities of subsequent chapters correspond to these climatic classes will, to a degree, determine the efficacy of each system.

2.2.5 BIOTIC FACTORS

As opposed to the preceding sections on abiotic factors of the environment, this section is concerned with the biotic factors. Broadly, these include plants, animals, and man.

The plants of the study area are discussed extensively in the syntaxonomic descriptions of Chapter 4. The animals (including invertebrates, fish, birds and mammals) correspond largely with those found at Westfalia Estate (cf. Scheepers, 1978).

Man's main activities, at present, are agriculture and forestry. It is estimated that more than 60 per cent of the study area is cultivated (Fig. 6.1, Appendix C). Citrus and subtropical crops such as bananas, avocados, mangos, ginger and tobacco dominate the landscape on the Foothills (Fig.

2.10). Throughout the Escarpment and Mountains, exotic timber plantations are ubiquitous, with Pinus spp. in higher zones and Eucalyptus spp. lower down (Fig. 2.11). On the Summit, there is a certain amount of pastoral agriculture.

2.2.6 SUMMARY OF ENVIRONMENT

The foregoing discussions have been necessary for establishing a basic environmental context for the syntaxonomic descriptions of subsequent chapters (cf. Chapter 4). Environmental attributes are largely responsible for determining plant-species distributions. Discussion of the environment, therefore, draws attention to the potential determinants of vegetation composition, vegetation structure, and vegetation distribution. Moreover, the consolidation of environmental attributes into abstract classes provides meaningful frames of reference. The classes derived from preceding sections and summarized in Table 2.11, for instance, will be used extensively in subsequent chapters dealing with vegetation.

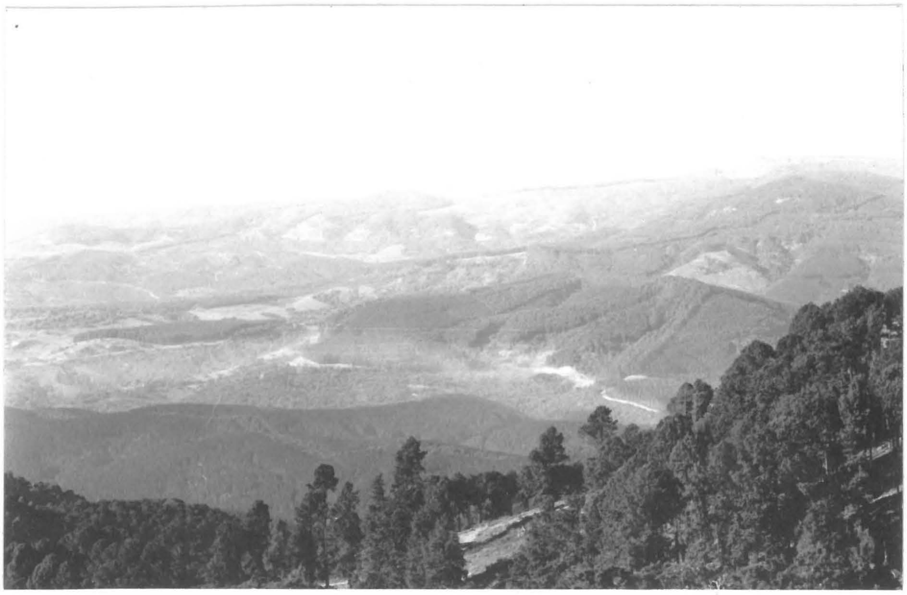
Abiotic factors in Table 2.11 (e.g. climate, soils, geology and physiography) interact with biotic factors to produce a variety of habitats supporting a variety of vegetation types. Land-type units (MacVicar et al., 1974), being a function of soil, climate and physiography, express gross habitat variation, which in turn should express vegetational variation. The land-type unit thus serves as a convenient point of departure in this chapter, forming a theoretical "bridge" between environment and vegetation.

2.3 VEGETATION

Before describing the various syntaxa of the study area, it will be instructive to review the vegetation research previously undertaken in the Eastern Transvaal Escarpment area.

Early attempts to form a general knowledge of the flora of South Africa were based on the observations of botanical explorers and travellers. Rehmann collected plants in the Transvaal between 1879 and 1880. He was the first person to make a substantial collection as far north as the Woodbush area of the Eastern Transvaal Escarpment (Codd & Gunn, 1982). Later, from 1893 to 1894, Schlechter collected in the same area as well as in the neighbouring Lydenburg and Soutpansberg areas (Gunn & Codd, 1981). In addition, Legat (1910) produced a cursory ecological account of the Soutpansberg area.

2.10



2.11

In his Eastern Grassveld region of the Drakensberg, Pole Evans (1920) distinguishes between the upper (above 1 200 m elevation) sourveld region which he terms "Berg Veld", and the lower (below 1 200 m elevation) sweetveld region which he terms "Thornveld". He subsequently describes the eastern slopes of the Drakensberg range between 1 200 and 2 450 m elevation as Eastern Mountain Grassveld. Within this region he refers to Eastern Mountain Forests as occurring in deep ravines and sheltered kloofs on the south-eastern slopes. He deals with the main features of vegetation only, giving short species lists together with salient climatic and topographic features (Pole Evans, 1922). According to his map of the vegetation of South Africa, the Sabie area is one of Temperate Rain Forests surrounded by South African Savanna (Pole Evans, 1929). More explicitly, his map of 1936 shows Temperate Evergreen Forest around Sabie; with "short grass Grassland" on the Mauchberg above, and "tall grass Grassland" below (Pole Evans, 1936).

Phillips (1933) compiled notes on the flora of Barberton from material collected by early collectors such as Galpin, Thorncroft, Liebenberg and Holt. He identifies two distinct floras: a "mountain flora" belonging to the Eastern Mountain Region; and a "plain flora" similar to the Lowveld, and having relationship with the flora of tropical Africa.

Smuts & Hutchinson (1933) give a general account of the vegetation of Schoemanskloof, including Sabie and Mount Anderson. In a prophetic accompanying note, Hutchinson points out that "an intensive survey of the mountains and valleys of the Eastern Transvaal during the flowering and fruiting season would yield much of very great interest, for they seem to carry a flora which is not quite tropical and not typically Cape, but a little of both, with a considerable endemic element. The plant associations therefore must be of very great interest. And whilst we have a fair idea of the latitudinal range of the species in these mountains... we know very little of their altitudinal range".

Burtt Davy (1935) gives general impressions of his Montane Rainforest between 1 550 and 2 450 m elevation on the eastern face of the high escarpment of East Africa. He mentions that on the landward side of the escarpment there is frequently an abrupt change from forest to Savanna-grassland with dwarf scattered trees. On its lower (seaward) side the forest may break abruptly into Savanna country. Broadly, this is an apt description of the vegetation of the study area.

In his preliminary reconnaissance of the vegetation of South Africa, Adamson (1938) classifies the forest vegetation of the North-eastern Transvaal as Montane Forest. He observes that this forest type is to be found in a definite belt at altitudes over 1 400 m where soils are shallow and immature. He recognized three general divisions within the Montane Forest, namely Forest, Scrub and Albizzia Woodland. Each division is described in terms of its ecology, vegetation structure and main species. Causes and effects of disturbance in the form of tree felling and fire are discussed, and successional trends are suggested. An evaluation of the utility of the Montane Forest Belt for agriculture and forestry is made.

Acocks' (1953 and 1975) broad-scale map of the vegetation of South Africa identifies 70 major veld types. The study area spans the two veld types falling under his Inland Tropical Forest Types. They are the North-Eastern Mountain Sourveld (Veld Type 8) of the higher altitudes to the west (including Mount Anderson and Sabie), and the Lowveld Sour Bushveld (Veld Type 9) of the lower altitudes to the east (including Hazyview and Emmett). Within the North-Eastern Mountain Sourveld, Acocks (1975) recognizes three elements, namely a forest component, which he regards as the climax vegetation; a sourveld component, comprising replacement sour grassveld; and a scrubby thornveld component of the mountain slopes. Within the Lowveld Sour Bushveld, which is transitional between the Lowveld and the North-Eastern Mountain Sourveld, he distinguishes between areas of "open parkland with tall well-spaced trees in tall grassveld" and "bushveld dotted with big trees". Acocks' (1975) descriptions of the veld types include lists of the more common associated species.

Despite these early descriptions and broad classifications of the vegetation of the Eastern Transvaal Escarpment, ecological and floristic detail is relatively scant. The Natal Drakensberg has received the attention of Rycroft (1944), West (1951), Taylor (1961), Killick (1963), Moll & Haigh (1966), Edwards (1967) and Moll (1968 and 1972). However, the Transvaal Drakensberg has only been studied in sufficient detail by Van der Schijff (1963), Van der Schijff & Schoonraad (1971) and Scheepers (1978).

On the basis of observations over ten years, Van der Schijff & Schoonraad (1971) divide the vegetation of the Mariepskop Mountain in the Transvaal Drakensberg into several main communities. Their subdivisions are based mainly on physiognomic features, and prominent species are listed with each community description. Communities recognized include the Low Altitude

Woodland Communities, High Mountain Grassland, Mountain Plateau Communities and Montane Forest. Besides describing the plant communities, Van der Schijff & Schoonraad (1971) also discuss their interrelationships with environmental factors such as geology, soils and climate. The threat posed by silviculture to the indigenous vegetation and to the hydrology of the mountain catchments is also briefly alluded to.

Although Mariepskop Mountain is part of the Transvaal Drakensberg, it marks the position where the Escarpment changes direction from north-south to northwest-southeast. Its vegetation, therefore, is probably not typical of the whole Escarpment, and extrapolation of the information from Van der Schijff & Schoonraad's (1971) survey to the rest of the Escarpment would not be feasible.

Scheepers' (1978) survey of Westfalia Estate is a valuable contribution to the ecological survey of the forest areas of the Eastern Transvaal Escarpment. Using diverse methods, data were obtained to describe the various plant communities. The latter are grouped into three broad vegetation belts based on physiognomy of the climax vegetation, viz the Savanna-Woodland Belt (below 900 m elevation), the Scrub-Forest Belt (900 - 1 200 m elevation), and the Montane-Forest Belt (above 1 200 m elevation). The vegetation belts are further subdivided into vegetation zones corresponding largely to climatic zones. Vegetation is also discussed in relation to conservation.

Information from Scheepers' (1978) survey could conceivably be extrapolated to surrounding areas of the Escarpment. The extent of such extrapolation would necessarily be limited, however, by the effect of the changing physiography of the Transvaal Drakensberg range. Such physiographic changes are bound to influence climate and thereby, vegetation. Whereas Westfalia is situated north of Mariepskop Mountain, where the orientation of the Escarpment is northwest-southeast, Sabie is situated to the south, where the orientation is north-south. The indications are that the Sabie study area is floristically different to Westfalia and so warrants separate investigation. Furthermore, the Westfalia area does not include the Subalpine Grassland component of Veld Type 8, and the Upper Montane Forest Zone is only superficially discussed.

Whereas Acocks' (1975) broad-scale map divides the Escarpment into only two vegetation units, Scheepers' (1978) more detailed study identifies at least seven vegetation zones. The basic level of intensity of the latter is more appropriate for present regional planning, and a similar level of detail is envisaged for this study.

As regards the affinities of the North-eastern Transvaal Escarpment flora, there are apparently two mainstreams of Tropical-African elements present. "One is the somewhat impoverished attenuated southward extension of the East-African Montane-Forest Formation, more typical of the higher elevations, and the other is the southerly extension of the East-African Savanna-Woodland Formation". "Southern" or Cape elements are also present, but more sparingly so (Scheepers,1978).

3. METHODS

The Braun-Blanquet method of analysis and synthesis based on floristic composition and canopy cover-abundance (Westhoff & Van der Maarel, 1973; Mueller-Dombois & Ellenberg, 1974; Werger, 1974) was applied in this study with the prime object of effecting a vegetation classification. To complement this classification and effect means of interpreting environmental relations, the resultant syntaxa were ordinated by means of Detrended Correspondence Analysis (Hill & Gauch, 1980). Finally, to determine their practical significance in landscape classification (*sensu* Coetzee, 1983), syntaxa were compared with MacVicar's (1977) land-type units.

3.1 PHYTOSOCIOLOGICAL CLASSIFICATION

Consistent communication about vegetation requires that it be classified into discrete, ecologically meaningful units. The Braun-Blanquet system of vegetation classification has been tested in South Africa for its ability to consistently yield such units (cf. Taylor, 1969; Coetzee, 1972 and 1983; Werger, 1973; Bredenkamp, 1975 and 1982; Boucher, 1978; Weisser, 1978; Van der Meulen, 1979; Westfall, 1981).

The Braun-Blanquet method is biphasic. In the initial analytical phase, species[1] lists are compiled for sample plots (quadrats) placed in floristically homogeneous vegetation. By tabular comparison of these lists in the final synthetic phase, quadrats containing similar sets of defined "character" or "differential" species are amalgamated to form vegetation units. The latter are progressively combined to produce a hierarchical classification of vegetation (Taylor, 1969). The Braun-Blanquet system is a polythetic agglomerative classification technique (Orloci, 1978) whereby classes are formed by the fusion of samples (quadrats) that are based on many attributes (species). A history of the Braun-Blanquet approach is comprehensively reviewed by Coetzee (1983) and will therefore not be repeated here.

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[1] It should be noted that the term species in this text is not always used in its strictest sense. It may include both higher-ranked taxa (cf. "complex", Section 4.1.3) and subordinate taxa (cf. subspecies and variety).

3.1.1 Analysis of Vegetation

This phase of the phytosociological classification involved sampling the vegetation to provide the raw material (data) necessary for documenting the study. Field work was conducted from the centrally-situated D.R. de Wet Forest Research Station (Fig. 2.1).

(A) Preparation for Sampling

Prior to sampling, considerable planning in the form of field reconnaissance, area delimitation, air-photo stratification and sampling design was necessary.

Reconnaissance

During intermittent reconnaissance visits to the study area in 1980 and 1981, species knowledge was progressively augmented and a sampling strategy devised. According to Mueller-Dombois & Ellenberg (1974) such reconnaissance is a prerequisite for effective sampling.

Stratification

Initial attempts at constructing a sampling system based on air-photo stratification of physiognomic-physiographic units were unsuccessful for a number of reasons:

(a) air photos were both outdated (by 10 years) and of poor quality. As a result, the discrepancy between air-photo units and "ground truth" was unacceptably large. A comparative survey of 83 units, for example, revealed a 20,5 per cent error in terms of present "ground truth". Such discrepancy probably results from the continuous accelerated dynamic imposed on the vegetation by development activities. It may also be a result of faulty interpretation. If the sampling system were based on "aberrant" air-photo units such as these, the aberration would be projected into the sampling programme, and some units would be over-sampled whilst others would be omitted.

(b) the resolution of physiognomic-physiographic units proved to be too high. That is, the number of possible combinations was such that to sample every combination in triplicate would require over 600 quadrats.

A revised stratification framework whose units are physiognomic/land-type (sensu MacVicar, 1977) combinations was therefore instituted. Such a framework demonstrates a number of distinct advantages:

(a) Land types are well-defined and readily available.
(b) Reliance on air photos is diminished since the land type is defined not only by topographic criteria but also by climatic and edaphic criteria.
(c) Physiognomic/land-type units have a relatively low resolution because the land type is conceived at the level of macro-criteria. In order to sample every major vegetation formation in the 11 land types of the study area in triplicate, for example, only 195 sample quadrats would be required.
(d) The physiognomic/land-type framework provides a platform for testing the hypothesis that the land-type unit provides a useful basis for vegetation delineation (Chapter 6).
(e) Physiognomic stratification of the area provides a basis for subsequent mapping of the vegetation (Chapter 6).

Randomness

Random distribution of samples within stratified units permits statistical testing of data (Mueller-Dombois & Ellenberg, 1974), and in certain circumstances, is desirable. All potential sample quadrats in this study were consequently identified on air photos according to a random distribution within each land type. Frequently, however, difficult terrain prevented access to some random points, whilst extensive destruction of natural vegetation precluded the use of others. In such instances, sampling became quite subjective, being based on such criteria as proximity to roads, as well as availability and extent of physiognomic classes. Whittaker (1962) has defended the subjective choice of sample plots as being consistent with the aims of the Braun-Blanquet method, provided it is practiced by a skilled worker. Strictly random distribution, moreover, may never reveal "detailed recurring variations of ecological significance" (Mueller-Dombois & Ellenberg, 1974).

Area delimitation

The study area was proportioned (Section 2.1) so as to contain as many different land types as possible. However, limitations on size were imposed by factors such as logistics and time. The paucity of undisturbed natural vegetation was nevertheless a frequent cause for ignoring such constraints, and as a result the study area is broader than would have been necessary in a less disturbed area.

(B) Implementation of Sampling

Between March 1981 and May 1982, random sample points identified on air photos were visited in the field. Many points had to be discarded on the grounds of inaccessibility or disturbance (Section 3.1.1 (A)). In such instances, sample points were selected subjectively from the more accessible sites or from within vestigial stands of natural vegetation respectively. All suitable sample points were analysed by means of quadrats in accordance with Braun-Blanquet methodology (Westhoff & Van der Maarel, 1973).

Quadrat size

According to Werger (1972), the optimum plot size for sampling vegetation in phytosociological studies will be one "giving the most favourable balance between information obtained and effort expended". This optimum apparently varies according to vegetation type. In riverine woodland on the Orange River, for example, a 200 m^2 quadrat yields between 60 and 70 per cent of the species information for that community. A similar size quadrat in *Themeda/Festuca* Alpine Grassland, on the other hand, would yield more than 70 per cent of species information (Werger, 1972). If, as proposed by Scheepers[1] (pers. comm.), a 60 per cent species-information level is acceptable, then 200 m^2 is an adequate quadrat size in both woodland and grassland. This is substantiated for Bushveld vegetation by Cotzee *et al.* (1976), and by Van der Meulen (1979). In forest stands, a quadrat size greater than 200 m^2 is generally advocated (e.g. Mueller-Dombois & Ellenberg, 1974). However, since an optimum quadrat size for forest in the present study area is yet to be determined, 200 m^2 was arbitrarily accepted.

In view of the foregoing, a standard quadrat size of 200 m^2 was adopted for all vegetation types in the study area. Quadrats took the form of rectangular plots measuring 10 x 20 metres and positioned lengthwise downslope. In

[1] Dr J. C. Scheepers, Botanical Research Institute, Private Bag X101, Pretoria, 0001.

TABLE 3.1 Distribution of samples (quadrats) within the physiognomic/ land-type framework of stratification*

LAND TYPE$	FOREST	THICKET	WOODLAND	SHRUBLAND	GRASSLAND	TOTAL
Ab 33b	1	-	-	1	3	5
Ab 34c	2	1	2	2	4	11
Ab 35a	-	-	-	-	6	6
Ab 36a	16	10	18	6	2	52
Ab 37a	2	14	5	1	-	22
Ab 40a	-	2	1	-	-	3
Ab 40b	1	2	-	2	-	5
Ab 41a	6	5	7	-	-	18
Ab 43a	-	-	1	-	-	1
Ac 87a	-	-	4	-	4	8
Ac 88a	6	1	1	-	7	15
Ac 88b	-	-	1	-	3	4
Fa 331a	2	20	24	1	-	47
Fa 331b	-	1	2	-	-	3
TOTAL	36	56	66	13	29	200

* Physiognomy is based on Edwards' (1983) formation classes.
Land types are based on 1:250 000 Land Type Series 2530 Barberton.

$ Postcripts a, b, c, indicate separate occurrences or "islands" of the particular land type (e.g. Ac 88a and Ac 88b are two geographically separate occurrences of the Land Type Ac 88).

retrospect quadrat sizes could have been modified to increase information with little extra effort (Section 7.3).

Quadrat number

Ultimately, 200 sample quadrats were distributed amongst 55 physiognomic/ land-type stratification units as shown in Table 3.1. Where different aspects were represented, each was sampled and replication was attemped where possible. Obviously, not all vegetation formations were represented in every land type. Also, their coverage in each land type varies, so that where the coverage is great (e.g. woodland in Fa 331a), the number of quadrats was correspondingly large, and vice versa (e.g. thicket in Ac 88a). This clearly demonstrates that sample distribution was not weighted by consideration of area, and consequently some stratification units are oversampled whilst others are undersampled. This undesirable but often unavoidable situation is perhaps a reflection of the fragmented nature of the study area, where certain vegetation formations only persist as relics.

Quadrat data

Data in each quadrat were recorded on field data forms (Ec. 2) compiled by the Botanical Research Institute, Private Bag X101, Pretoria, R.S.A. This caters for various categories of data enumerated below. The total set of floristic and environmental observations made at each quadrat is known as a relevé.

(i) Locality

The grid reference (quarter-degree square) as well as the precise latitude and longitude of each quadrat was recorded. Its position on air photos was also marked as accurately as possible.

(ii) Floristic composition

For each quadrat, a comprehensive list of the plant taxa present, together with their cover-abundance values (see (iii) below), was compiled. Species were identified as dominant on the basis of both conspicuousness and cover. Unfamiliar species were collected for identification at the National Herbarium, Pretoria or at the local D.R. de Wet Herbarium. Mosses and lichens were ignored.

42.1

TABLE 3.2 The Domin-Krajina Cover-Abundance Scale*

SCALE	PER CENT COVER (nearest 1%)	DIAMETERS APART
10	91 - 100	Overlapping/Interlocking
9	76 - 90	0 - Almost touching
8	51 - 75	Almost touching - 0,25
7	34 - 50	0,25 - 0,50
6	26 - 33	0,50 - 0,75
5	11 - 25	0,75 - 1,75
4	5 - 10	1,75 - 3,00
3	1 - 4	3,00 - 8,00
2	0,1 - 0,99	8,00 - 27,0
1	0,1	more than 27,0
+	Solitary	Single individual

* Adapted from Krajina (1933) by Westfall (1981).

(iii) Vegetation structure

In vegetation classification and description, the use of floristic information alone is often not sufficient for proper management of the vegetation resource. When floristic composition is combined with structural differentiation, however, many vegetation - site relationships can be clarified (Geldenhuys & Jarman, 1984). The value of incorporating structural features in species-rich forests over large geographical areas, for instance, has been indicated by Webb et al. (1976). Ultimately, structural analysis of vegetation improves the scientific basis of resource planning.

The primary elements of vegetation structure are cover, growth form, and stratification (Dansereau, 1957). Accordingly, the following data were recorded:

Cover-abundance

The canopy cover-abundance of each species was estimated according to the Domin-Krajina scale (Table 3.2). This eleven-point scale is more sensitive than the seven-point Braun-Blanquet scale and errors of estimation are therefore minimised. "It gives an advantage in forest communities where differences in abundance among rarer species are often quite noticeable" (Mueller-Dombois & Ellenberg, 1974). In addition, the Domin-Krajina scale is readily convertible to percentage-cover classes and vice versa. This facilitates comparison results obtained by other workers. Besides the cover-abundance of individual species, the total percentage cover of vegetation in each quadrat was also recorded. This value is equivalent to 100 per cent minus the percentage of bare ground in the quadrat which is directly exposed to the sky.

Growth form

As an aid to structural characterization of different stands of vegetation, eight growth-form categories were devised according to the schedule in Table 3.3. Each species was assigned a code corresponding to its relevant growth form.

The definition of trees and shrubs is based on the criteria of Edwards (1983). Both trees and shrubs are rooted, woody and self-supporting plants. Trees are distinguished from shrubs on the basis of height and branching.

TABLE 3.3 Growth-form categories used in the structural classification of vegetation

CODE	REPRESENTATIVE GROWTH FORMS
TR	Trees
SH	Shrubs (including undershrubs, shrublets and "scrambling" shrubs)
FB	Forbs and Herbs (including suffrutescent, woody, sub-woody, and succulent forms)
GR	Grasses (Poaceae)
CY	Sedges (Cyperaceae)
LN	Lianoid plants (including lianes, climbers, twiners and creepers)
EP	Epiphytes (excluding hemi-epiphytes but including epiphytic ferns)
PT	Ferns (non-epiphytic Pteridophyta)

Trees are always more than 2m high and have one or a few definite trunks branching above ground level. Shrubs, on the other hand, are less than 2m high except when they are multi-stemmed and branching at or near ground level, in which case they can be up to 5m high. Multi-stemmed plants over 5m high and branching at or near ground level, are trees.The definition of grasses, sedges and ferns is mainly taxonomic. Epiphytes are defined by Geldenhuys & Jarman (1984) as plants "not rooted in the ground, but perched on tree trunks and branches to which they are attached by surface roots". To the category of lianoid plants belong all forms of rooted, supported, climbers or creepers, both woody and herbaceous. The "forbs and herbs" category combines Walker & Hopkins' (1980) definition of forb (a herbaceous or slightly woody, annual or sometimes perennial plant which may arise from stolons, tubers, bulbs, rhizomes or seeds), with Edwards' (1983) definition of a herb (a rooted, non-woody, self-supporting, non-grasslike plant).

Vegetation strata

The total canopy cover of each individual stratum of vegetation, as well as its estimated height range (to the nearest 50 cm), was recorded for each quadrat. Transitions between height classes were not precisely defined owing to their being subjectively determined. Strata were identified in accordance with the classification given by Richards, Tansley & Watt (1940), modified by Scheepers (1978), and adapted as follows:

(a) Overstorey — comprising the emergent tree layer (discontinuous).
(b) Canopy — comprising the dominant tree layer (normally continuous).
(c) Understorey — comprising the subordinate tree layer, usually 2,5 metres and taller (continuous or discontinuous).
(d) Shrub layer — comprising shrubs (and giant herbs and ferns) usually shorter than 2,5 metres.
(e) Field layer — comprising herbaceous elements usually shorter than 2 metres.

(iv) Habitat

In order to make vegetation - habitat correlations it was necessary to record and classify prevalent environmental attributes. Certain of these (e.g. climate, physiography, land type) were not measured directly in the field but are recorded as broad class abstractions, derived either by inference (Section 2.2.1) or from existing maps. Others were measured *in situ* at each quadrat and grouped into classes subsequently:

Altitude

In compliance with computer-encoding requirements, the overall altitudinal range of the study area (in metres above sea level) was divided into nine class intervals, each arbitrarily equal:

500 - 622 m
623 - 744 m
745 - 867 m
868 - 989 m
990 - 1111 m
1112 - 1233 m
1234 - 1355 m
1356 - 1478 m
1479 - 1600 m

Quadrats were assigned to the different altitudinal classes on the basis of their position on 1:50 000 topo series maps.

Geomorphology

This refers to the physiographic nature of the site and its position in the landscape. Six geomorphological classes based on Scheepers' (1975) system were recognized:

K — knolls and peaks
A — upland terraces
D — upper-pediment slopes (convex in vertical cross-section)
D/E — midslope planes
E — lower-pediment slopes (concave in vertical cross-section)
H — dry kloofs (steep banks)
L — moist stream banks (levees)

Aspect

Where the slope was greater than 0°, the actual compass bearing (to the nearest degree) of the downslope direction at right angles to the contour

TABLE 3.4 Relationship between stratigraphy of the Eastern Transvaal Escarpment (cf. Table 2.1), and the six informal lithological classes defined under field conditions in the Sabie area

STRATIGRAPHY (after SACS, 1980)			INFORMAL LITHOLOGY
Transvaal Diabase (intrusive rock)			Transvaal Diabase
GROUP	FORMATION	LITHOLOGY AND MEMBER	
PRETORIA	Hekpoort Andesite	Andesite with pyroclastics, some quartzite and shale	—
	Boshoek	Siltstone and shale Quartzite, subgraywacke Conglomerate	
	Timeball Hill	Shale with diamicite Quartzite, siltstone, ironstone Shale and mudstone	Timeball Hill Shale and Mudstone
	Rooihoogte	Quartzite Bevet's conglomerate Member	—
CHUNIESPOORT (MALMANI SUBGROUP)	Duitschland	Limestone with quartzite, Conglom. Shale, Dolomite	Upper Dolomite
	Lyttleton	Chert-free dolomite	
	Monte Christo	Chert-rich dolomite	
	Oaktree	Dark dolomite - incorporates carbonaceous shale and quartzite	Oaktree Dolomite
WOLKBERG	Black Reef Quartzite	Quartzite, minor shale Serala Basalt Member Quartzite, Conglomerate	Black Reef Quartzite
	Selati Shale	Shale Argillaceous quartzite, subgray. Shale	
	Sekororo	Arkose Shale Sericitic quartzite, subgraywacke Conglomerate	
Nelspruit Granite (intrusive rock)			Nelspruit Granite

was recorded. Deviations due to magnetic declination were accounted for. Two broad classes reflecting the degree of insolation and thus, evapotranspiration, were selected:

67 - 247° — mesoclinal
248 - 66° — xeroclinal

Slope

This indicates the inclination or degree of steepness of the site and was measured to the nearest degree by means of an optical clinometer (Phillips, 1959).Four degrees of steepness were recognized in accordance with the system advocated by the Botanical Research Institute, Private Bag X101, Pretoria, 0001:

0,00 - 3,49° — level
3,50 - 17,62° — gentle
17,63 - 36,39° — moderate
more than 36,39° — steep

Exposure

Essentially, this is a function of both the surrounding landscape and the surrounding vegetation. It refers to the extent of exposure to, or shelter from, climatic elements such as sun and wind. Three degrees of exposure were recorded, viz sheltered, partially sheltered, and exposed.

Geology

This was expressed in terms of the prevalent rock outcrop, or lithology. Under field conditions, six informal classes (Table 3.4) were defined on the basis of the most recent stratigraphic classification for South Africa (SACS, 1980):

(a) Timeball Hill Shale and Mudstone
(b) Oaktree Dolomite
(c) Upper Dolomite (mainly dolomitic limestone with chert and shale)
(d) Black Reef Quartzite (including Selati Shale and Sekororo Formations)
(e) Transvaal Diabase
(f) Nelspruit Granite

Rockiness

The degree of surface rockiness was estimated on the basis of the percentage cover (nearest per cent) within the quadrat. Broad cover classes are related to the degree of mechanical utilization, or ploughability as follows (Van der Meulen, 1979):

less than 1% — no limitation on mechanical utilization
1 - 4% — low limitation on mechanical utilization
5 - 34% — moderate limitation on mechanical utilization
35 - 84% — high limitation on mechanical utilization
85 - 100% — no mechanical utilization possible

Biotic influences

Evidence of disturbance in the form of burning, grazing or cultivation was noted.

Soil depth

The average depth (nearest cm) to bedrock of 3 random positions in the quadrat was determined by means of a soil auger. The latter imposed a limit of 1 metre on the measurement of depth, and the maximum recorded depth was therefore 1 metre, even on occassions when bedrock was deeper than this. The following four classes were selected on the basis of their suitability in Bushveld vegetation (cf. Westfall, 1981):

0 - 12 cm — shallow
13 - 48 cm — fairly shallow
49 - 100 cm — fairly deep
more than 100 cm — deep

Soil pH

The pH of soil in each horizon was determined at field capacity (distilled water) by means of selective pH strips. Classes were identified as follows:

5,5 - 6,5 — weakly acid
less than 5,5 — strongly acid

Soil texture

The physical texture of soil in each horizon was determined by testing the pliability of moist, rolled soil (FSSA, 1974). Six different textures were recognized, viz sand, loamy sand, sandy loam, sandy clay loam, sandy clay and clay.

Soil colour

The colour of soil in each horizon was determined at field capacity (distilled water) by means of a soil colour chart (Munsell Soil Color Charts, 1954). Ignoring nuances, four dominant colours were recognized, viz black, grey, brown and red.

3.1.2 Synthesis of Vegetation

This phase of the phytosociological classification involved processing the floristic, structural and habitat data captured during the analytical phase.

(A) Floristic Classification

"In the Braun-Blanquet School, the cover-abundance of plant species in stands of vegetation is presented in two-way tables" (Coetzee, 1983). Each column represents a stand of vegetation (cf. quadrat or relevé), whilst each row represents a species. Thus, entries down a column show cover values of all species occurring in that relevé, and entries along a row show cover values of one species in different relevés (Coetzee, 1983). Rows and columns are re-arranged so as to group relevés having similar species and to group species occupying similar relevés. The former grouping elicits vegetation types, whilst the latter elicits differential species-groups (see below). Thus, "each vegetation type has a characteristic combination of species-groups. Relationships between vegetation types are shown by the species-groups they have in common and closely related vegetation types may be combined to form more general types" (Coetzee, 1983). Species having diagnostic value in this classification were identified as "differential species". They differentiate syntaxa that are within floristically related groups. Differential species characterizing one specific syntaxon alone were identified as "character species" (after Werger, 1974). Species having no diagnostic value were grouped as "general and infrequent species".

Table structuring

Re-arrangement of rows and columns for classification purposes was undertaken with the assistance of PHYTOTAB, a computer package developed jointly by G. Dednam, Computer Services Division, University of Pretoria, and R.H. Westfall, Botanical Research Institute, Private Bag X101, Pretoria (Westfall et al., 1982). The PHYTOTAB package comprises six programs that are code-named "Phyto 10" through to "Phyto 60".

"Phyto 10" prints a raw data matrix with relevés arranged numerically in columns and species arranged alphabetically in rows. "Phyto 20" produces a preliminary classification by re-arranging columns and rows according to relevé and species similarity. The mathematical basis for this clustering procedure is Jaccard's community co-efficient (Mueller-Dombois & Ellenberg, 1974). Species and relevés are arranged in order of decreasing similarity until a predetermined cut-off point is reached. The procedure is then successively repeated for remaining species and relevés until the entire data set has been sorted. The cut-off points chosen for species and relevés were 35 and 45 per cent similarity, respectively. Westfall (1981) considers these to provide the best groupings in Bushveld vegetation.

"Phyto 30" facilitates user-sequencing of species and relevés for the purpose of refining the preliminary classification afforded by "Phyto 20". The semi-intuitive priciples involved in this process of table structuring are very adequately explained by Coetzee (1983).

"Phyto 40" has the capacity of "embellishing" the final classification for tabular presentation. Its facilities include table headings, relevé-linked habitat data, full species names, community names, and footnotes (e.g. Table IIA, Appendix A).

"Phyto 50" determines constancy values[1] for each species in the final classification. As an input to "Phyto 40",it is integral to the production

[1] Constancy value is the frequency with which a species occurs throughout the relevés representing a syntaxon.It is expressed as a percentage for each species of a community thus:

$$\frac{\text{Number of relevés in which the species is present}}{\text{Total number of relevés in the community}} \times 100$$

of a synoptic table (cf.Table III, Appendix A). It is also used as input to DECORANA, a program that ordinates species and syntaxa (or relevés) by means of Detrended Correspondence Analysis (Hill, 1979a) (Section 3.2). "Phyto 60" arranges the raw data from "Phyto 10" in a format that is acceptable to DECORANA (Hill, 1979a).

(i) Raw table

By means of selected programs in PHYTOTAB (Westfall et al., 1982), a provisional classification was made on the basis of the entire data set (200 relevés and 829 species). The resultant table was not only extremely unwieldy but was also limiting in terms of the level of syntaxonomic refinement feasible. For broad-scale surveys, such limitations are acceptable. In semi-detailed surveys such as this, however, finer syntaxonomic detail is necessary.

(ii) Refined table

Following the rationale of Coetzee (1983), the raw table was split into four detailed tables, each representing a different subset of relevés (Tables II A,B,C & D, Appendix A). Species in each subset were then "reclassified agglomeratively, taking into account correlations within the new confines of distribution in the subset, to further endorse existing relevé groupings and to expose new subdivisions of groups hitherto obscured by the general grouping of species" (Coetzee, 1983). In this way, both the number of syntaxa (represented by relevé-groups) and the species defining them (represented by differential species-groups), were increased relative to the raw table.

The criteria for separating relevés into four detailed tables were as follows:

(a) Four major floristic divisions revealed in the raw table.
(b) The vindication of such divisions on a habitat basis by means of ordination (Section 4.1.2).

(iii) Synoptic table

A table summarizing the overall distribution of species within refined syntaxa was constructed by first bringing together the four detailed tables, and then reducing associated syntaxa to single columns by transforming the cover-abundance values of component species to constancy values (see previous footnote). Thus, instead of species being represented by their cover-abundance in each relevé, they are represented by their constancy in each syntaxon (cf.Table III, Appendix A). This transformation was automatically effected by means of "Phyto 50" (see above) wherein constancy values are depicted on a five-point scale, thus:

1 = more than 0 - 20% constancy
2 = more than 20 - 40% constancy
3 = more than 40 - 60% constancy
4 = more than 60 - 80% constancy
5 = more than 80 - 100% constancy

Finally, a certain amount of resequencing was necessary to eliminate those species-groups whose diagnostic value is lost in the broader context.

<u>Syntaxonomic nomenclature</u>

Syntaxa emanating from the floristic classification were named according to the recommendations for a standardized South African syntaxonomic nomenclature system proposed by the Botanical Research Institute, Pretoria (Scheepers <u>et</u> <u>al</u>.,MS): " The nomenclature should be as descriptive as possible and should include:

1. a binomial specific connotation where the first name should be that of a selected differential or character species, and the second that of a dominant or conspicuous species;
2. a physiognomic-structural term".

Edwards' (1983) formation classes (Table 3.5) were used for the latter.

<u>Hierarchical considerations</u>

In large data subsets, many different species-groups have overlapping distributions. This indicates the multidimensional nature of vegetation-habitat relationships. In such cases ,"several classificatory possibilities may exist... A hierarchical arrangement merely draws attention to one such possibility..." (Coetzee, 1974). A traditional phytosociological table, nevertheless, shows both the chosen hierarchy and the alternatives (Coetzee,

TABLE 3.5 Tabular key to the structural groups and formation classes pertaining to the study area (after Edwards, 1983)

Dominant height class	*Total plant cover > 0,1%*			
	Total tree cover >0,1% shrub cover <10% if >1 m high **A. Forest & Woodland** *Total tree cover*			
	100–75% *0–0,1ø*	*75–10%* *0,1–2ø*	*10–1%* *2–8,5ø*	*1–0,1%* *8,5–30ø*
Trees >20 m	1. High forest	5. High closed woodland	9. High open woodland	13. High sparse woodland
Trees 10–20 m	2. Tall forest	6. Tall closed woodland	10. Tall open woodland	14. Tall sparse woodland
Trees 5–10 m	3. Short forest	7. Short closed woodland	11. Short open woodland	15. Short sparse woodland
Trees 2–5 m	4. Low forest	8. Low closed woodland	12. Low open woodland	16. Low sparse woodland
	Total tree cover >1% shrub cover >10% & >1 m high **B. Thicket & Bushland** *Total tree cover*			
	100–10% 0–2ø		*10–1% 2–8,5ø*	
Trees 5–10 m & shrubs 2–5 m	17. Short thicket		19. Short bushland	
Trees 2–5 m & shrubs 1–5 m	18. Low thicket		20. Low bushland	
	Total tree cover <0,1% shrub cover >0,1% *or tree cover up to 1% & shrub cover >10% & >1 m high (closed shrublands)* **C. Shrubland** *Total shrub cover*			
	100–10% 0–2ø	*10–1% 2–8,5ø*	*1–0,1% 8,5–30ø*	
Shrubs 2–5 m	21. High closed shrubland	25. High open shrubland	29. High sparse shrubland	
Shrubs 1–2 m	22. Tall closed shrubland	26. Tall open shrubland	30. Tall sparse shrubland	
Shrubs 0,5–1 m	23. Short closed shrubland	27. Short open shrubland	31. Short sparse shrubland	
Shrubs <0,5 m	24. Low closed shrubland	28. Low open shrubland	32. Low sparse shrubland	
	Total tree cover <0,1% shrub cover <0,1% grass cover dominant and >0,1% **D. Grassland** *Total grass cover*			
	100–10% 0–2ø	*10–1% 2–8,5ø*	*1–0,1% 8,5–30ø*	
Grasses >2 m	33. High closed grassland	37. High open grassland	41. High sparse grassland	
Grasses 1–2 m	34. Tall closed grassland	38. Tall open grassland	42. Tall sparse grassland	
Grasses 0,5–1 m	35. Short closed grassland	39. Short open grassland	43. Short sparse grassland	
Grasses <0,5 m	36. Low closed grassland	40. Low open grassland	44. Low sparse grassland	

Note: (1) % cover refers to projected crown cover as percentage
(2) ø refers to mean crown: gap ratio as mean number of crown diameters apart

1983). For the sake of vegetation description, four different levels (ranks) in the hierarchy were chosen as "orientation points" or "stepping stones across the swamp of variation" (Coetzee, 1983). At the broadest syntaxonomic level, the ecological-formation class, corresponding to the division of the entire data set into four subsets, was chosen. Successively finer syntaxonomic detail was elicited via the levels of vegetation type, plant community, and variant respectively. The basis for their recognition is given in Section 4.1.2.

The assigning of formal ranks such as class, order, alliance and association is avoided at this stage. This is in accordance with Mueller-Dombois & Ellenberg (1974) who state that it is "useful to maintain an unsystematic status for abstract vegetation communities in all cases where the emphasis is on intensive local vegetation studies. A hierachical scheme only becomes desirable where the emphasis lies on developing a vegetation synopsis at a more extensive geographical scale."

(B) Structural Classification

Arising from the analysis of the primary elements of the vegetation structure (namely cover, growth form and stratification), a physiognomic-structural classification of the vegetation of each quadrat was effected by means of Edwards' (1983) formation classes. His system is "based solely on vegetation characters and is independent of, but complementary to floristic, habitat and ecological classification of vegetation". Table 3.5 shows how structural groups such as shrubland and grassland are derived from combinations of growth form and cover. Edwards (1983) utilizes only four primary growth forms, viz trees, shrubs, grasses and herbs. Their correspondence with the growth forms recognized in this study (Section 3.1.1 (B)) is as follows:

trees - TR
shrubs - SH
grasses - GR and CY
herbs - FB, PT and EP

The classification makes no provision for lianoid plants (LN) that are supported by other plants. In the absence of such support they are considered as either shrubs, herbs or grasses (if grass-like).

Subdivision of structural groups on the basis of "the height of the dominant height class" (Edwards 1983) and the total cover of the dominant growth form, results in an array of formation classes such as tall closed woodland and short open grassland (Table 3.5).

These derived formation classes find practical application in both the syntaxonomic nomenclature and the hierarchical arrangement of plant communities obtained from the floristic classification (Section 3.1.2 A).

(C) Habitat Correlation

One of the aims of causal-analytical vegetation research is to analyse the reaction of plants to the combination of all habitat factors. In particular, it is important to recognize the factors that are primarily responsible for floristic differentiation (Mueller-Dombois & Ellenberg, 1974). Tabular portrayal of vegetation-habitat relationships is an effective means of realizing this objective (cf. Westfall, 1981). Accordingly, habitat tables were structured on the same basis as floristic tables using the PHYTOTAB computer package (Westfall et al., 1982). Habitat and structural data, obtained from the environmental and structural classification respectively, were treated as species on a presence/absence basis.

In one set of tables, habitat and structural data were ordered systematically within the framework of the floristic classification (cf. Tables IV A,B,C and D, Appendix A). In this way, floristic units can be compared with associated features such as vegetation cover and physiognomy, or with related factors such as geology and soil depth.

In another set of tables those factors responsible for floristic differentiation of specific syntaxa, or groups of syntaxa, were high-lighted in the same fashion as differential species-groups are high-lighted in floristic tables (Westfall[1], pers. comm.). These habitat tables were then appended to the four detailed floristic tables in order to visually portray causal relationships (cf. Tables II A,B,C and D, Appendix A).

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[1] Mr R. H. Westfall, Botanical Research Institute, Private bag X101, Pretoria, 0001.

3.2 COMMUNITY ORDINATION

Ordination is commonly used for determining discontinuities in vegetation (Whittaker, 1978), in which case it precedes classification and involves the arrangement of stands (relevés) and species by individual values (Mueller-Dombois & Ellenberg, 1974). In this study, however, discontinuities are determined initially by classification (Section 3.1) and confirmed subsequently by ordination. Such ordination involves the arrangement of plant communities (rather than relevés) and species by group values (rather than individual values). This is in accordance with recent approaches by Westfall (1981) and Coetzee (1983), in which communities and species are ordinated "on the basis of their interrelationships". The role of ordination in complementing classification is amplified by Gauch (1982). He observes that most community data sets have two to four gradients, and that in this dimensionality range hierarchical classification is especially weak. Conversely, ordination "is especially strong in this range and may especially complement classification for such data".

3.2.1 Detrended Correspondence Analysis

Having classified the vegetation by means of the Braun-Blanquet system, resultant syntaxa (in this case plant communities) were ordinated on floristic data using Detrended Correspondence Analysis (DCA) (Hill and Gauch, 1980). DCA is an improvement of Reciprocal Averaging (RA) (Hill, 1973) and is far superior to Principal Components Analysis (PCA) (Gauch, 1982). Its advantage lies in its ability to overcome the undesirable "arch effect" (tendency for the second axis to be strongly related to the first) produced by the RA and PCA techniques (Gauch et al., 1977; Greig-Smith, 1980; Hill & Gauch, 1980; Van der Maarel, 1980). It also "scales ordination axes to avoid the contraction of axis ends", a patent shortcoming of other techniques (Hill, 1979a).

The following account, based on those of Coetzee (1983) and Hill (1979a), describes the functioning of DCA for a two-way table showing the occurrence of attributes (e.g. plant species) in a set of sampling units (e.g. plant communities):

In deriving the first axis, the ordination uses an algorithm to assign a set of arbitary scores to species ranging from say 0—100. Scores are then computed for each community, based on a weighted average of the species occurring in them. Community scores are then standardized to range from 0–100, and the algorithm calculates a new set of species scores based on the community scores. The iteration is continued until the scores stabilize to yield a unique first axis ordination of species and communities, independent of initial scores.

The second axis is derived by dividing the first axis into segments. Within each segment, community scores are readjusted to have a zero mean. This results in a detrended set of scores bearing no systematic relation to the first axis. The algorithm then calculates new species scores on the basis of the detrended community scores. The iteration is again continued until scores stabilize to yield a second axis ordination of species and communities, which is independent of the first.

To obtain the third axis, a similar detrending exercise is applied with respect to the second axis, and so on for higher axes. It is this detrending property of DCA which is responsible for reducing the "arch effect" errors associated with axial inter-dependence (cf. Hill, 1979a).

The other problem of axis scale is overcome in DCA by "expanding or contracting small segments along the species ordination axis such that species turnover" along the axis "occurs at a uniform rate ... and consequently that equal distances in the ordination correspond to equal distances in the species composition" (Witkowski, 1983). The outcome of such scaling is that within-community standard deviation of species scores is approximately equal at all points along the axis. This obviates errors due to scale distortion.

(A) Data Processing

Detrended Correspondence Analysis was effected using the DECORANA program (Hill, 1979a), which is dependent on inputs from various programs of the PHYTOTAB computer package (Section 3.1.2 A) (Westfall et al., 1982). These inputs both provide and prepare the raw data for DECORANA as follows:

(a) Relevé groupings (processed via "Phyto 10, 20, 30" succcessively) are reduced to single-column syntaxa via "Phyto 50".
(b) These syntaxa are incorporated with species (unweighted) and arranged in a format acceptable to DECORANA by means of "Phyto 60".

The analysis was undertaken at various syntaxonomic levels (cf. Section 4.1.2) using:

(i) Twenty-four provisional syntaxa from the initial raw table, and 829 species of the entire data set (Table VI, Appendix A). This ordination was used in conjunction with habitat data to endorse the table splitting divisions made in the phytosociological classification (cf. Fig. 4.1).

(ii) Plant communities (including variants) and species of each data subset (Tables II A, B, C, D - Appendix A) ordinated separately. These four ordinations were correlated with environment and used to explain community differentiation in each ecological-formation class (see Chapter 5).

Owing to the magnitude of the species ordinations, only the syntaxon ordinations were considered for evaluation. The latter are portrayed by means of two-dimensional scatter diagrams, in which syntaxonomic relationships are defined by those axes exhibiting maximal vegetational variation (Mueller-Dombois & Ellenberg, 1974).

(B) Environmental Correlation

"Relationships between communities and environmental variables are complex, non-linear and numerous" (Gauch, 1982). As a result, they usually defy analysis by conventional statistical methods and are mostly perceived by informal, visual recognition of common patterns of distribution (Gauch, 1982). One way of portraying such patterns is to superimpose environmental variables on axes of community ordination (cf. Westfall, 1981). This assists in the identification of some of the environmental gradients responsible for floristic, and hence community, differentiation (cf. Orloci, 1978).

Environmental variables recorded during sampling were accordingly superimposed on each ordination diagram. Those variables exhibiting a definite gradient along ordination axes were retained as being important in community differentiation, whilst others were discarded.

Although conventional statistical methods may not be sufficient for defining community-environment relationships, they may nevertheless be useful for validating such relationships _a posteriori_. Baruch (1984), for instance, uses Spearman's rank correlation coefficient (r_s), for validating community-altitude relationships perceived informally. According to Snedecor & Cochran (1967), this coefficient is the ordinary correlation coefficient r, between the ranked values of two variables. Computation is facilitated by the formula:

$$r_s = 1 - \frac{6d^2}{n(n^2-1)} \quad \text{for (n-2) degrees of freedom}$$

where d is the rank difference between variables and n is the sample size.

In this study, Spearman's rank correlation coefficient was used to test the statistical validity of certain of the informally perceived community/soil-depth correlations. This involved a comparison between community rankings based on ordination axes, and community rankings based on soil depth.

3.3 LANDSCAPE CLASSIFICATION AND MAPPING

Experience in the Kruger National Park has shown that the intensity of vegetation surveys has often "surpassed the practical application of the results" (Gertenbach, 1983). Plant communities and associations display such complex distribution patterns and are often so small that it is impossible to indicate them on a map of practically useful scale. Despite intensive research regarding their ecology, moreover, they have so far failed to form the basis of any practical management programme (Gertenbach, 1983). In other words, plant communities do not adequately express the types of production, use and service that can be obtained from the land, and their practical significance in land management cannot be presumed.

The failure of phytosociological classification per se to attain practical significance has given opportunity for more integrated approaches, in which floristic units are converted to land-use, or management units. Vincent & Thomas (1960), for instance, mapped Natural Areas for land-use determination in Zimbabwe (then Southern Rhodesia). Their Natural Areas are based on interactions and relationships between climate, soils and vegetation. Similarly, Stumpel & Kalkhoven (1978) mapped the potential natural vegetation of The Netherlands on the basis of relationships between soil, ground water and vegetation.

Coetzee's (1983) system of landscape classification for the Central District, Kruger National Park is based on an integration of the MacVicar *et al*. (1974) land-type classification, Braun-Blanquet's phytosociological system, Acocks' (1975) veld types, King's (1963) classification of major geomorphological regions, and Thornthwaite's climatological classification (Schulze & McGee, 1978). Each of Coetzee's (1983) landscapes is defined as "an area with a recurrent pattern of plant communities with their associated fauna and abiotic habitat". His landscapes are thus "vegetation-delineated ecosystems" incorporating both abiotic and biotic components. Compared to purely biotic or purely abiotic units the integrated (landscape) units are better defined, more easily recognized in the field, and of greater value as mapping units. Their usefulness as "conservation management units", moreover (cf. Coetzee, 1983), demonstrates their relevance in terms of land-use planning.

Gertenbach (1983), also working in the Kruger National Park, characterizes landscapes as non-negotiable "functional management units". Gertenbach's (1983) and Coetzee's (1983) landscapes differ slightly on the basis of definition. Gertenbach (1983), recognizing "that vegetation and abiotic habitat are not consistently recurrent", refined Coetzee's (1983) definition to read: "A landscape is an area with a specific geomorphology, macro-climate, soil and vegetation pattern and associated fauna". Gertenbach's (1983) landscapes are therefore comparable to MacVicar *et al*. (1974) land types. The integration of vegetation and fauna with land type, moreover, represents significant progress in the formulation of management units.

3.3.1 Integration of Vegetation and Environment

Based on the experience of Coetzee (1983) and Gertenbach (1983) in the Kruger National Park, it seems unlikely that the phytosociological classification of the Sabie area will have practical significance at the plant community level. It is therefore necessary to convert these plant communities into land-use or management units. Coetzee's (1983) and Gertenbach's (1983) landscape concept is considered most suitable for this purpose. It implies the integration of both biotic and abiotic components; in this case, vegetation and environment.

If these components were always consistently recurrent, integration would be simple. Independently derived, *a priori* vegetational and environmental units could be integrated on the basis of perfect correlation. In accordance with

Kuchler (1973), however, mapping boundaries will only coincide if the selected abiotic features happen to be the ones to which the selected biotic features react. Since both types of feature can only be described by a very limited number of criteria, coincidence is unlikely. In short, the integration of two hierarchies is an inherently complex problem (Gauch[1], pers. comm.), necessitating an element of compromise.

Accordingly, two different methods of integration were attempted in this study. One on the basis of vegetation type and another on the basis of land type.

(A) The Vegetation-Type Approach

In this approach, landscapes were derived by the *a posteriori* integration of vegetation and environment. That is, plant communities were grouped on the basis of shared or common environmental attributes, to give vegetation types. (The procedure is more adequately explained in Section 3.1.2). Thus, besides being floristically distinct, each landscape (vegetation type) is characterized by environmental limits or "cut-off points".

Mapping of vegetation types was facilitated by means of 1:30 000 scale aerial photographs of the study area. Photo interpretation was often necessary for interpolative mapping in localities where vegetation was not sampled. The map was reduced to c. 1:50 000 by a photocopy machine. Resultant aerial-photo and topographic distortions were not corrected cartographically, and hence accuracy is limited.

(B) The Land-Type Approach

A major disadvantage of the previous approach (in terms of mapping), is the time and special skill demanded by air-photo interpretation. By capitalizing on an existing system of map units (cf. land types), this disadvantage could be eliminated. Consequently, whilst retaining the vegetation type as a basic landscape unit, the land-type approach attempts to delineate such landscapes on the basis of MacVicar *et al*. (1974) land types rather than by air-photo boundaries. Thus, in this alternative approach, landscapes are derived by the integration of *a priori* vegetation and environmental units, represented

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by vegetation type (present context) and land type (MacVicar *et al.*, 1974) respectively. Good correlation between vegetation and land type would be beneficial in a number of respects:

(i) Vegetation could be mapped on the basis of existing land-type mapping units. Besides reducing mapping time, this approach would enhance the land type's designated function in rational land-use planning.

(ii) The volume of habitat data recorded in vegetation surveys could be considerably reduced since the land type is defined on the basis of major environmental parameters such as climate, topography and soil (MacVicar, 1977).

(iii) The land type could reliably serve as the basic unit of stratification in vegetation sampling.

Although vegetation type and land type are defined by similar criteria (climate, soil, terrain), perfect correlation between them is, for reasons mentioned earlier, highly improbable. It is nevertheless expedient to "express as much significant co-ordinated data structure as possible..." (Gauch,1982). This necessitates an understanding of the degree of correlation between vegetation type and land type. In other words, what are the floristic relationships of land types?

Floristic Relationships of Land Types

Two different methods of analysis were used to define both the floristic nature, and the floristic relationships of land types. The ultimate objective was to find a level at which land types, in conjunction with vegetation types, could feasibly serve as mappable landscape units. According to Gauch (1982) "the intrinsic dimensionality or complexity of data sets affects the suitability of various analyses or presentation options". Whilst ordination is suitable for data sets having two to four important gradients, hierarchical classification expressed by table arrangement "is effective, given data with numerous gradients or one gradient". Since the intrinsic dimensionality of data relating vegetation type with land type was unknown, the data were analysed by both ordination and two-way table arrangement.

A prerequisite for both methods was to ascertain the land type pertaining to each relevé position plotted on 1:50 000 topo maps. (This information is documented in Table IV, Appendix A). The procedure involved enlarging the land type map of the study area (portion of the 1:250 000 Land Type Map 2530 Barberton) to 1:50 000 by means of a Bausch & Lomb Zoom Transfer Scope, and then superimposing it on the topo maps.

(i) Ordination

Theoretically, if land types were treated as samples and ordinated with species, the relevant positions of land types in scatter diagrams would indicate their floristic similarity or dissimilarity. Land types that appeared close together in the diagram would be floristically similar whilst those that appeared far apart would be floristically dissimilar. This provides a basis for determining the extent to which land types are floristic units capable of functioning as landscapes.

Accordingly, the 14 land-type units and the 829 species of the entire data set (Table VI, Appendix A) were ordinated by means of Detrended Correspondence Analysis (DCA) (Hill & Gauch, 1980). The ordination was effected through DECORANA (Hill, 1979a) which is described in Section 3.2.1. Due to the magnitude of the species ordination, only the land-type ordination was considered for evaluation. In the ordination, land types were represented by 14 land-type relevé groupings, each reduced to single-column samples via "Phyto 50" (PHYTOTAB, Westfall _et al_., 1982).

An extension of the argument set forth in the previous paragraphs is that a combined ordination of land types and vegetation types (present context) with species, would indicate floristic correlations between specific land types and specific vegetation types. Good correlations would be indicated for those units appearing in close proximity and conversely. This could provide a basis for defining landscapes.

Therefore, the 14 land-type units together with the 14 vegetation types and the 829 species of the entire data set (Table VI, Appendix A) were ordinated by DCA (Hill & Gauch, 1980). Again the ordination was effected through DECORANA (Hill,1979a), and only the land-type/vegetation-type ordination was considered for evaluation. Reduction of both land-type and vegetation-type relevé groupings to 28 single-column samples was effected via "Phyto 50" (PHYTOTAB, Westfall _et al_, 1982).

(ii) Table arrangement

A two-way table matrix listing land types by rows and vegetation types by columns could potentially facilitate the formulation of landscapes by indicating land-type/vegetation-type correlations. The mapping of such landscapes, moreover, would merely involve simple adaptations to the 1:250 000 Land Type Map 2530 Barberton.

Such a matrix was therefore constructed. Points of coincidence (or integration) between vegetation types and land types were indicated within the matrix by integers, expressing the total of sample relevés involved in each integration. Rows and columns were subsequently re-arranged to produce a matrix diagonal showing clear-cut relationhips between vegetation types and land types, either individually or in groups. Thus, land types or land-type groups which, on the basis of vegetation type, exhibited floristic uniqueness were given landscape status, and were mapped at 1:125 000 scale. Each landscape was further documented by means of an extended legend containing both floristic and environmental information.

<u>Chi-square test</u>

Chi-square is an index of dispersion which may be used to examine certain aspects of the relationship between simultaneous classifications of the same population (Parker, 1973). In the present context, the same "population" of species and samples, has been classified on both a biotic (cf. vegetation type) and an abiotic basis (cf. land type). A chi-square test would therefore be appropriate for determining the significance of each of the vegetation-type/land-type integrations used in defining landscapes. Significant chi-square values would confirm that the landscapes are based on interdependent, well-correlated associations of vegetation type and land type. Thus, the basis of landscape definition would be reinforced.

Where possible, each area of integration in the two-way matrix was accordingly tested for departure from independence by means of the chi-square test.

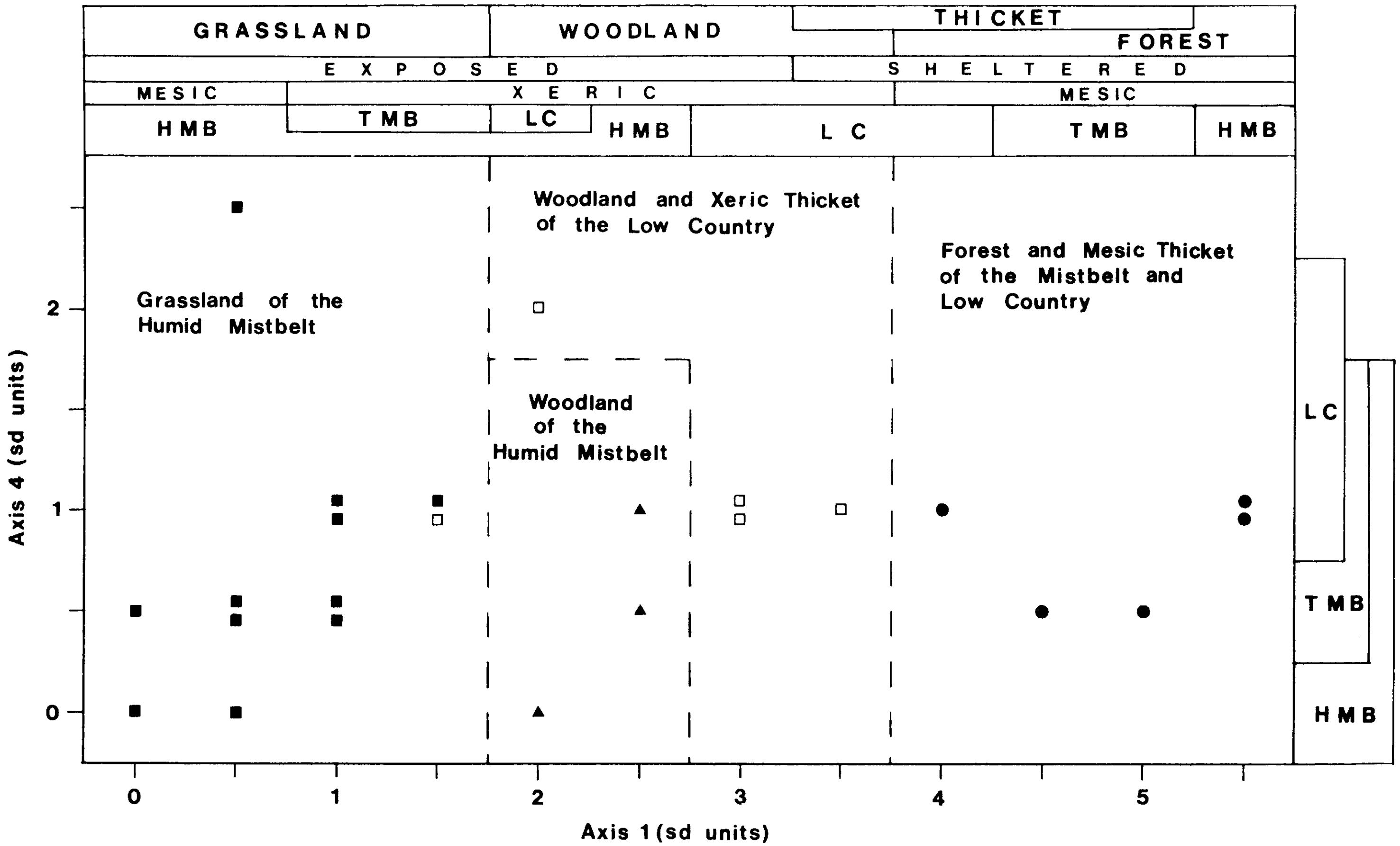

FIG. 4.1 Detrended Correspondence Analysis (DCA) ordination of the 24 provisional syntaxa in relation to four broad floristic-structural groups, namely Grassland(■); Low-altitude Woodland (□); High-altitude Woodland (▲); and Forest and Thicket (●). Axes 1 and 4 represent structural-ecological gradients influencing syntaxon differentiation.
(LC = Low Country; TMB = Transitional Mistbelt; HMB = Humid Mistbelt)

4. PHYTOSOCIOLOGICAL CLASSIFICATION

4.1 INTRODUCTION

4.1.1 Provisional Classification

The provisional Braun-Blanquet classification of vegetation yielded 24 syntaxa which, on the basis of a raw table, appeared to be divided into four broad floristic-structural groups as follows:

(i) Grassland syntaxa (11)
(ii) High-altitude Woodland syntaxa (3)
(iii) Low-altitude Woodland syntaxa (5)
(iv) Forest and Thicket syntaxa (5)

These four groups appear to represent distinct natural entities. They could therefore provide the basis for splitting the raw table into four detailed tables, following the precedent of Coetzee (1983). Further confirmation of the suitability of these groups as the basis for table-splitting is provided by the ordination of their intrinsic syntaxa (Fig. 4.1).

4.1.2 Refined Classification

The Detrended Correspondence Analysis (DCA) ordination of the 24 provisional syntaxa is shown in Figure 4.1. Besides the intrusion of one syntaxon from Low-altitude Woodland into Grassland, the identity of each group is faithfully maintained in the ordination. Each axis, moreover, represents a structural-ecological gradient, whose transitions often correspond to transitions between the groups.

Besides showing the structural and ecological distinctiveness of each group, the ordination diagram also confirms their floristic distinctiveness. The gradient length of axis 1 for each group, for instance, is never more than 4,0 sd, indicating a large degree of species overlap within groups (Fig. 4.1). This is in accordance with the fact that over a distance of 4,0 sd a species appears, rises to its mode, and disappears again (Hill, 1979a). Shorter gradients,moreover, are easier to interpret ecologically than long gradients (Gauch *et al.*, 1977).

TABLE 4.1 The Detrended Correspondence Analysis (DCA) ordination of provisional syntaxa and species, showing eigenvalues for the first four axes, together with the gradient lengths of these axes for provisional syntaxa.

AXIS	EIGENVALUES	GRADIENT LENGTH FOR PROVISIONAL SYNTAXA (sd)
1	0,759	5,68
2	0,352	3,14
3	0,262	3,19
4	0,171	2,50

Examination of eigenvalues and gradient lengths pertaining to the ordination (Table 4.1) provides further justification for dividing the raw table into smaller floristic units. Axis 1 is 5,68 sd long, indicating a high beta diversity (sensu Whittaker, 1970). Syntaxa with a separation of greater than 4,0 sd, moreover, will generally have no species in common (Hill, 1979a). This implies that syntaxa at either extremity of axis 1 do not overlap floristically and can therefore justifiably be placed in separate tables.

Together, axes 1 and 4 account for 93,0 per cent of the variance (Table 4.1). Thus, although axis 4's comparatively low eigenvalue may tend to discredit its validity as an axis (cf. Hill, 1979a), it is felt that the high percentage variance accounted for by the axes in combination would tend to negate any such notion.

Ordination of the provisional syntaxa has clearly endorsed the floristic, structural, and ecological unity of each of the groups derived from the raw table. The treatment of each group as a separate detailed table is thus evidently justified.

Further classification within each detailed table (as described in Section 3.1.2) resulted in the recognition of 62 syntaxa. These syntaxa have been arranged in an informal hierarchy according to floristic and ecological criteria (Fig. 4.2). This hierarchical arrangement provides the basic classificatory framework for vegetation description (Section 4.2). A more elaborate version, with nomenclature included, is presented in the form of an overall synopsis at the beginning of Section 4.2.

The broadest entity, the Ecological-Formation Class (Fig. 4.2), corresponds to the level at which the raw table was split into four detailed tables. For example, Low-altitude Woodland (Section 4.1.1 (iii)) is recognized as an ecological-formation class and is named Woodland and Xeric Thicket of the Low Country in accordance with the prevailing gradients (Fig. 4.1). There are thus four ecological-formation classes distinguished on the basis of floristics, physiognomy and climate (especially the mist factor).

Within each class there are a number of Vegetation Types (Fig. 4.2). The latter are determined largely by environmental criteria (Table V) and to a lesser extent by floristics. A total of fourteen vegetation types are recognized. Each vegetation type encompasses a number of Plant Communities whose basis is primarily floristic and secondarily environmental. Fifty-

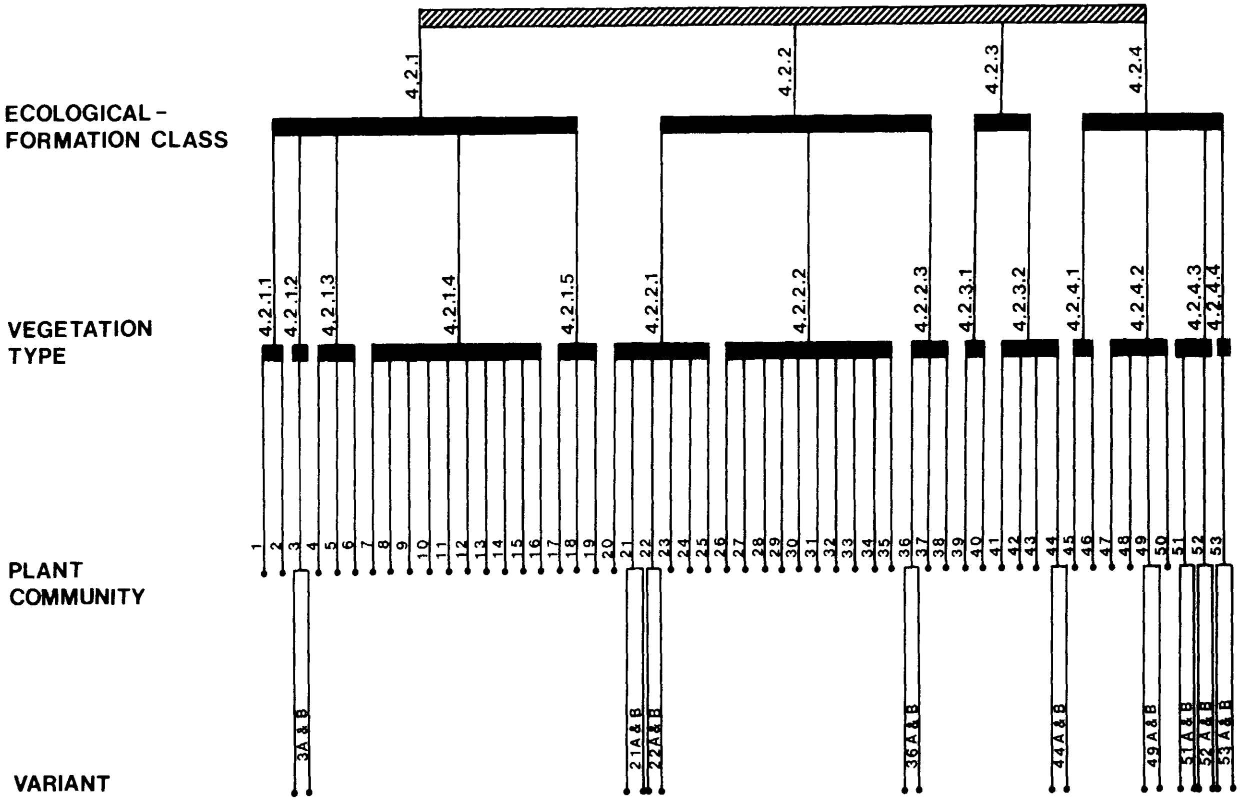

FIG. 4.2 Dendrogram depicting the hierarchical arrangement of syntaxa in the Sabie area of the Eastern Transvaal Escarpment.
4.2.1 = Forest and Mesic Thicket of the Mistbelt and Low Country
4.2.2 = Woodland and Xeric Thicket of the Low Country
4.2.3 = Woodland of the Humid Mistbelt
4.2.4 = Grassland of the Humid Mistbelt
(For remaining nomenclature refer to the overall synopsis, Section 4.2)

three such communities are distinguished (Fig. 4.2). Their nomenclature is based on the proposed recommendations for a South African Code of syntaxonomic nomenclature (Scheepers *et al.*, MS). Entities which exhibit floristic but not discernible environmental variation within communities are recognized as Variants. Eighteen such variants are proposed (Fig. 4.2).

4.1.3 General

The description of the different syntaxonomic levels in terms of their floristic, structural, and environmental attributes is dealt with in Section 4.2. Where certain attributes persist throughout a series of syntaxonomic levels, they are mentioned in connection with the higher level only, and are not mentioned for subordinate levels unless they are particularly characteristic for those lower levels. Thus repetition is avoided.The type relevés quoted in the description of communities and variants are purely tentative at this stage.

A series of phytosociological and other tables, numbered from I to VI and contained in Appendix A, provide the major source of reference. A vegetation map (Fig. 6.1, Appendix C) shows the distribution of major vegetation types in the study area.

Table I is a broad introductory key to the plant communities based on physiognomic and physiographic criteria.It provides simple and rapid access to the classification by indicating the range of syntaxa one may expect to encounter in a particular locality. Further clarification is then obtained by referring to the relevant phytosociological tables. There are four phytosociological tables, each one pertaining to a particular ecological-formation class (Tables II A, B, C and D). The tables have a diagnostic function within the limited context of their relevant classes. Diagnosis is based on differential species-groups whose distribution within the ecological-formation class is confined to a particular syntaxon or particular syntaxa. Further confirmation is provided by the habitat correlations, which are a feature of these tables.

Table III is synoptic in that it present a floristic summary of all 62 syntaxa. It emphasizes affinities across ecological-formation classes. It also reveals the tenacity (or otherwise) of different species in a broader geographical context.

Tables IV A, B, C and D show habitat attributes recorded for each relevé in each ecological-formation class. Table V is a summary of these attributes, revealing broad environmental trends in the study area. It thus proves useful for ecological interpretation of the plant community ordinations discussed in Chapter 5.

Table VI is an alphabetic list showing the distribution within the study area of the 829 plant species, or complexes thereof, encountered in sample releves. It is supplementary to the check-list, which lists full names of taxa by family and includes the collector's specimen numbers (cf. Appendix B).

In instances where plants could not be identified beyond the generic level, the epithet "sp." is appended (e.g. Combretum sp.). It should be noted that such a name may not consistently refer to the same species concept, but may include various species within the genus. Also, species designated as "complex" are those whose identity in the field was not clear. For example, Iboza "complex" is named thus because, although the first specimens collected were identified as Iboza riparia, subsequent specimens, which cursorily appeared to be I. riparia were identified as I. brevispicata. This distinction could not easily be discerned in the field without prior knowledge, and thus the term "complex" is used to indicate that either species could be involved.

In cases where geographical affinities of "complex" members are easily discernible from herbarium records, these affinities are mentioned in textual footnotes. Otherwise, the term "complex" is used without further explanation (besides that already given in the check-list,Appendix B). Full names of taxa, as given in the check-list, are only given in the text when their ommission would result in ambiguity. For example, Apodytes dimidiata is represented by only one subspecies and its full name is unwarranted. Triumfetta pilosa, on the other hand, is represented by two different subspecies whose full names are necessary to avoid ambiguity.

Since many of the aloes were not flowering at the time of sampling, identification was only possible on revisiting the sites. It was not possible, moreover, to revisit every relevé, and so some "identifications" are inferred, being based on the habitats of voucher specimens.

SYNOPSIS OF PHYTOSOCIOLOGICAL CLASSSIFICATION OF THE EASTERN TRANSVAAL ESCARPMENT, SABIE AREA

4.2.1 FOREST AND MESIC THICKET OF THE MISTBELT AND LOW COUNTRY

4.2.1.1 Tall/Short Forest on soils derived from Upper Dolomite of the Lower Mountains

1. Hypoestes phaylopsoides-Dovyalis lucida Tall Forest
2. Streptocarpus cyaneus-Dovyalis lucida Short Forest

4.2.1.2 Tall/Short Forest on black soils derived from Black Reef Quartzite of the Plateau Crest

3. Ekebergia pterophylla-Psychotria zombamontana Short Forest

3A. Bulbophyllum sandersonii-Ekebergia pterophylla-Psychotria zombamontana Variant

3B. Podocarpus latifolius-Ekebergia pterophylla-Psychotria zombamontana Variant

4.2.1.3 Tall Forest associated with Diabase intrusions of the Escarpment Slopes

4. Canthium ciliatum-Syzygium gerrardii Tall Forest
5. Piper capense-Syzygium gerrardii Tall Forest
6. Desmodium repandum-Combretum kraussii Tall Forest

4.2.1.4 Short Thicket of more xeroclinal slopes with clay soils derived from Nelspruit Granite of the Escarpment Lower Slopes and Upper Foothills

7. Dracaena hookerana-Acacia ataxacantha Short Thicket
8. Pleopeltis macrocarpa-Acacia ataxacantha Short Thicket
9. Canthium gueinzii-Acacia ataxacantha Short Thicket
10. Dombeya pulchra-Acacia ataxacantha Short Thicket
11. Iboza riparia-Acacia ataxacantha Short Thicket
12. Rhynchosia komatiensis-Acacia ataxacantha Short Thicket
13. Pittosporum viridiflorum-Acacia ataxacantha Short Thicket
14. Endostemon obtusifolius-Acacia ataxacantha Short Thicket
15. Pycnostachys urticifolia-Acacia ataxacantha Short Thicket
16. Rhynchosia caribaea-Acacia ataxacantha Short Thicket

4.2.1.5 High/Tall (riparian) Forest on sandy soils of the Lower Foothills

17. Schoenoplectus corymbosus-Syzygium cordatum Tall Forest
18. Ochna natalitia-Celtis africana Tall Forest
19. Ceropegia woodii-Celtis africana Tall Forest

4.2.2 WOODLAND AND XERIC THICKET OF THE LOW COUNTRY

4.2.2.1 Partially sheltered Woodland and Thicket (75 - 95% cover) on fairly shallow soils of the Lower Foothills

20. Monanthotaxis caffra-Rhus pentheri Short Thicket
21. Combretum collinum ssp. gazense-Panicum maximum Short Closed Woodland

21A. Setaria sphacelata-Combetum collinum ssp. gazense-Panicum maximum Variant

21B. Sclerocarya birrea ssp. caffra-Combretum collinum ssp. gazense-Panicum maximum Variant

22. Hyparrhenia gazensis-Bauhinia galpinii Short Thicket

22A. Ocimum urticifolium-Hyparrhenia gazensis-Bauhinia galpinii Variant

22B. Sphenostylis marginata ssp. marginata-Hyparrhenia gazensis-Bauhinia galpinii Variant

23. Faurea saligna-Bauhinia galpinii Short Thicket
24. Pterocarpus angolensis-Bauhinia galpinii Short Thicket
25. Rhoicissus tomentosa-Bauhinia galpinii Short Thicket

4.2.2.2 Less-sheltered Woodland and Thicket (95 - 100 % cover) on fairly deep soils of the Upper Foothills

26. Dicoma zeyheri-Parinari curatellifolia Short Thicket
27. Rhynchosia sordida-Parinari curatellifolia Short Closed Woodland
28. Mucuna coriacea ssp. irritans-Antidesma venosum Low Thicket
29. Trachypogon spicatus-Parinari curatellifolia Short Open Woodland
30. Diheteropogon amplectens-Parinari curatellifolia Low Open Woodland
31. Vernonia natalensis-Parinari curatellifolia Short Open Woodland
32. Andropogon schirensis var. angustifolia-Parinari curatellifolia Short Open Woodland
33. Acacia davyi-Hyperthelia dissoluta Low Sparse Woodland
34. Vernonia centaurioides-Hyperthelia dissoluta Low Sparse Woodland
35. Bothriochloa glabra-Hyperthelia dissoluta Short Sparse Woodland

4.2.2.3 Woodland and Shrubland on exposed granite outcrops

36. Ceratotheca triloba-Bequaertiodendron magalismontanum Low Open Woodland

36A. Protorhus longifolia-Ceratotheca triloba-Bequaertiodendron magalismontanum Variant

36B. Ficus burkei-Ceratotheca triloba-Bequaertiodendron magalismontanum Variant

37. Vernonia poskeana var. chlorolepis-Myrothamnus flabellifolia Low Sparse Woodland
38. Coleochloa setifera-Aloe petricola Short Sparse Shrubland

4.2.3 WOODLAND OF THE HUMID MISTBELT

4.2.3.1 Partially sheltered Low Thicket and Woodland on midslope planes of the Escarpment Upper Slopes and the Mountains

39. Galopina aspera-Faurea speciosa Low Open Woodland
40. Artemisia afra-Bowkeria cymosa Low Thicket

4.2.3.2 More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mts

41. Tecomaria capensis ssp. capensis-Bequaertiodendron magalismontanum Low Closed Woodland
42. Diospyros galpinii-Bequaertiodendron magalismontanum Tall Open Shrubland
43. Selago atherstonei-Syzygium cordatum Low Open Woodland
44. Alepidea gracilis var. major-Loudetia simplex Low Open Woodland

44A. Myrica pilulifera-Alepidea gracilis var. major-Loudetia simplex Variant

44B. Athanasia calva-Alepidea gracilis var. major-Loudetia simplex Variant

4.2.4 GRASSLAND OF THE HUMID MISTBELT

4.2.4.1 Grassland and Shrubland on soils derived from Nelspruit Granite of the Escarpment Slopes

45. Gladiolus densiflorus-Loudetia simplex Short Closed Grassland
46. Cliffortia repens-Loudetia simplex Low Closed Shrubland

4.2.4.2 Low Closed Grassland on soils variously derived from Black Reef Quartzite and Oaktree Dolomite of the Escarpment Plateau

47. Tetraselago natalensis-Monocymbium ceresiiforme Low Closed Grassland
48. Rendlia altera-Monocymbium ceresiiforme Low Closed Grassland
49. Lightfootia huttonii-Eragrostis racemosa Low Closed Grassland

49A. Hypoxis multiceps-Lightfootia huttonii-Eragrostis racemosa Variant

49B. Parinari capensis ssp. capensis-Lightfootia huttonii-Eragrostis racemosa Variant

50. Digitaria monodactyla-Loudetia simplex Low Closed Grassland

4.2.4.3 Short Closed Grassland on soils derived from Upper Dolomite of the Plateau Interior and Lower Mountains

51. Asclepias crassinervis-Andropogon schirensis var. angustifolia Short Closed Grassland

51A. Barleria ovata-Asclepias crassinervis-Andropogon schirensis var. angustifolia Variant

51B. Eriosema nutans-Asclepias crassinervis-Andropogon schirensis var. angustifolia Variant

52. Bewsia biflora-Loudetia simplex Short Closed Grassland

52A. Acalypha caperonioides-Bewsia biflora-Loudetia simplex Variant

52B. Helichrysum mixtum-Bewsia biflora-Loudetia simplex Variant

4.2.4.4 Low Closed Grassland on soils variously derived from Upper Dolomite and Timeball Hill Shale and Mudstone of the Middle Mountains

53. Inezia integrifolia-Monocymbium ceresiiforme Low Closed Grassland

53A. Rhynchosia angulosa-Inezia integrifolia-Monocymbium ceresiiforme Variant

53B. Erica drakensbergensis-Inezia integrifolia-Monocymbium ceresiiforme Variant

The primary connotation of the term "dominant", as used in the community descriptions which follow, is that of conspicuousness or prominence of a particular species. This often implies both representativeness and high cover. The latter are nevertheless secondary considerations in defining the term here.

4.2 CLASSIFICATION AND DESCRIPTION OF THE VEGETATION

The vegetation of the study area comprises five major structural classes, viz forest, thicket, woodland, shrubland and grassland (sensu Edwards, 1983). Their distribution in relation to physiography is shown in Tables I and V.

Forest is represented in all zones except the Upper Foothills and Plateau Interior. Conversely, thicket is largely confined to the Foothills and Escarpment Lower Slopes, although it is sparingly represented in the Mountains also. Woodland is featured mainly on the Upper Foothills with small patches also occurring on Escarpment Slopes, Plateau Crest and Mountains. Shrubland is poorly represented on Escarpment Slopes and Plateau Crest. Finally, grassland is the major physiognomic feature of the Plateau and Mountains.

Vegetation cover is generally high (seldom less than 75 per cent), and the slope of the terrain is gentle to moderate (3,5 to 36,5°). Soils are generally fairly shallow and weakly acid, with brown sandy clay loam in the A and brown to red sandy clay in the B horizons (Table V). The most widespread and characteristic species occurring fairly uniformly throughout the area are those of Species-Group 111 (Table III), namely the fern Pellaea viridis, and the small tree Diospyros lycioides. Their absence in certain grassland communities (Section 4.2.4) suggests that fire may be the only inhibiting factor in their otherwise broad ecological amplitude.

An environmental gradient affecting the degree of woodiness of the vegetation is apparent in the study area. This is manifested in the transition from forest, through thicket and woodland, to grassland (Fig. 4.1). Some of the more overt factors influencing the gradient include moisture status as reflected in climatic belt, aspect and altitude, as well as the degree of exposure of vegetation to the abiotic component (Table V and Fig. 4.1). Thus for example, increased exposure, even with concomitant moisture increase, corresponds to decreasing woodiness. It is this environmental gradient, in combination with floristic criteria, that provides the basis for the delineation and nomenclature of four ecological-formation classes (Fig. 4.2):

4.2.1 Forest and Mesic Thicket of the Mistbelt and Low Country.

4.2.2 Woodland and Xeric Thicket of the Low Country.

4.2.3 Woodland of the Humid Mistbelt.

4.2.4 Grassland of the Humid Mistbelt.

4.2.1 FOREST AND MESIC THICKET[1] OF THE MISTBELT AND LOW COUNTRY

(A) General Characteristics

Forest and Mesic Thicket of the Mistbelt and Low Country occurs throughout most of the altitudinal range of the study area, being represented in all physiographic belts and all physiographic zones excepting the Middle Mountains and the Plateau Interior (Table IV A).

Physiognomy

As the name implies, forest and thicket are the major physiognomic classes represented (Table IV A). Above 1 000 metres elevation forest tends to dominate, whilst below 1 000 metres elevation thicket is predominant, especially on the Upper Foothills. All forest vegetation in the study area is confined to the Ecological-Formation Class (Table V).

Habitat

The geomorphology is diverse, although upland terraces are generally devoid of this type of vegetation. Component syntaxa occur on both mesoclinal and xeroclinal sites. The latter tend to support thicket rather than forest (Table IV A). This is probably because the more xeroclinal sites are

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[1] Mesic Thicket refers to a denser, more lush type of thicket which occurs normally in the Mistbelt. Where it occurs in the Low Country it is usually in mesic situations, i.e. riparian or south-facing.

generally fairly steeply sloping and subject to greater exposure to wind and insolation than the more mesoclinal sites (Table IV A).

The predominant lithology is Upper Dolomite, Black Reef Quartzite, and Nelspruit Granite with associated diabase dykes (Table IV A). Soils range in depth from fairly shallow on Upper Dolomite and Black Reef Quartzite, to deep on Nelspruit Granite. The A horizon is generally sandy clay loam in texture, although sandy clays are also prevalent where factors such as erosion are operating (Table IV A).

Floristics

The most widespread species in Forest and Mesic Thicket of the Mistbelt and Low Country are those of Species-Group 46 (Table II A), including the fern *Pellaea viridis*, the forest grass *Oplismenus hirtellus*, the twiner *Dioscorea* "complex"[1], and the small tree *Maytenus mossambicensis*. Of these species, only the latter is differential in the broader context of the study area (Table III (40)). Other such differential species are indicated by Species-Groups 38 and 39 (Table III). Notable species include the lianes *Rhoicissus tomentosa* and *Dalbergia armata*, and the soft twiner *Secamone gerrardii*. The small tree *Tricalysia* "complex"[2] is also diagnostic, although its "intrusion" together with *Maytenus mossambicensis* into Woodland of the Humid Mistbelt should be noted, especially when considering successional relationships. The iridaceous herb *Dietes iridioides* is obviously characteristic, often forming dense stands in the soft light of the field layer.

Inconsistencies, such as poor representation of Species-Groups 38, 39 and 40 in the higher-altitude syntaxa, can perhaps be explained in terms of these syntaxa being ecotonal to a fifth ecological-formation class (not yet defined).

Other species, confined to Forest and Mesic Thicket of the Mistbelt and Low Country and distributed fairly extensively therein, are the following (Table VI) :

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[1] From available herbarium records, it would appear that the two members of this species complex occupy different altitudinal positions, *D. sylvatica* occurring at lower elevations than *D. cotinifolia*.

[2] From herbarium records, it would appear that the components of this complex, viz *T. capensis* and *T. lanceolata* are geographically fairly distinct, preferring higher and lower altitudes respectively.

Anthocleista grandiflora	Canthium gueinzii
Cassinopsis ilicifolia	Asplenium rutifolium
Eugenia natalitia	Peperomia retusa
Oxyanthus gerrardii	Pleopeltis macrocarpa
Peddiea africana	Polypodium polypodioides
Carissa bispinosa	Desmodium repandum
Mikania cordata	Asparagus falcatus

These species are thus fairly typical of the Ecological-Formation Class.

General

Floristic affinities with other ecological-formation classes are manifold. Species-Group 55 (Table III) links Forest and Mesic Thicket of the Mistbelt and the Low Country with the moister elements of Woodland and Xeric Thicket of the Low Country namely, Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1). As such it is an indicator of mesic conditions and is, with minor exceptions, associated solely with forest, thicket, or closed-woodland formations, where the vegetation cover is high (Table V). The more obvious species include the forest grasses Setaria megaphylla and Oplismenus hirtellus, the soft twiners Cissampelos torulosa and Dioscorea "complex", and the canopy tree Zanthoxylum davyi.

Relationships at lower altitudes are expressed by Species-Groups 61, 62, 63, 65 and 66 (Table III). Such relationships reflect the drier conditions of the Transitional Mistbelt and Low Country, where forest formations are confined to riparian sites, and where the surrounding thicket and closed woodland is transitional between Acocks'(1975) North-Eastern Mountain Sourveld and his Lowveld Sour Bushveld (Table V) (cf. Scheepers' (1978) Lowveld Sour Bushveld Transition Zone). Noteworthy species include the shrubby scramblers Bauhinia galpinii and Acacia ataxacantha; the trees Maytenus heterophylla, Ziziphus mucronata, Sterculia murex and Antidesma venosum; and the shrubs Rhoicissus tridentata, Asparagus virgatus and Phaulopsis imbricata.

A relationship with early lithoseral stages of Woodland and Xeric Thicket of the Low Country is indicated by Species-Group 75 (Table III). The persistence, in Forest and Mesic Thicket of the Mistbelt and Low Country, of species that are well represented on exposed granite outcrops of the

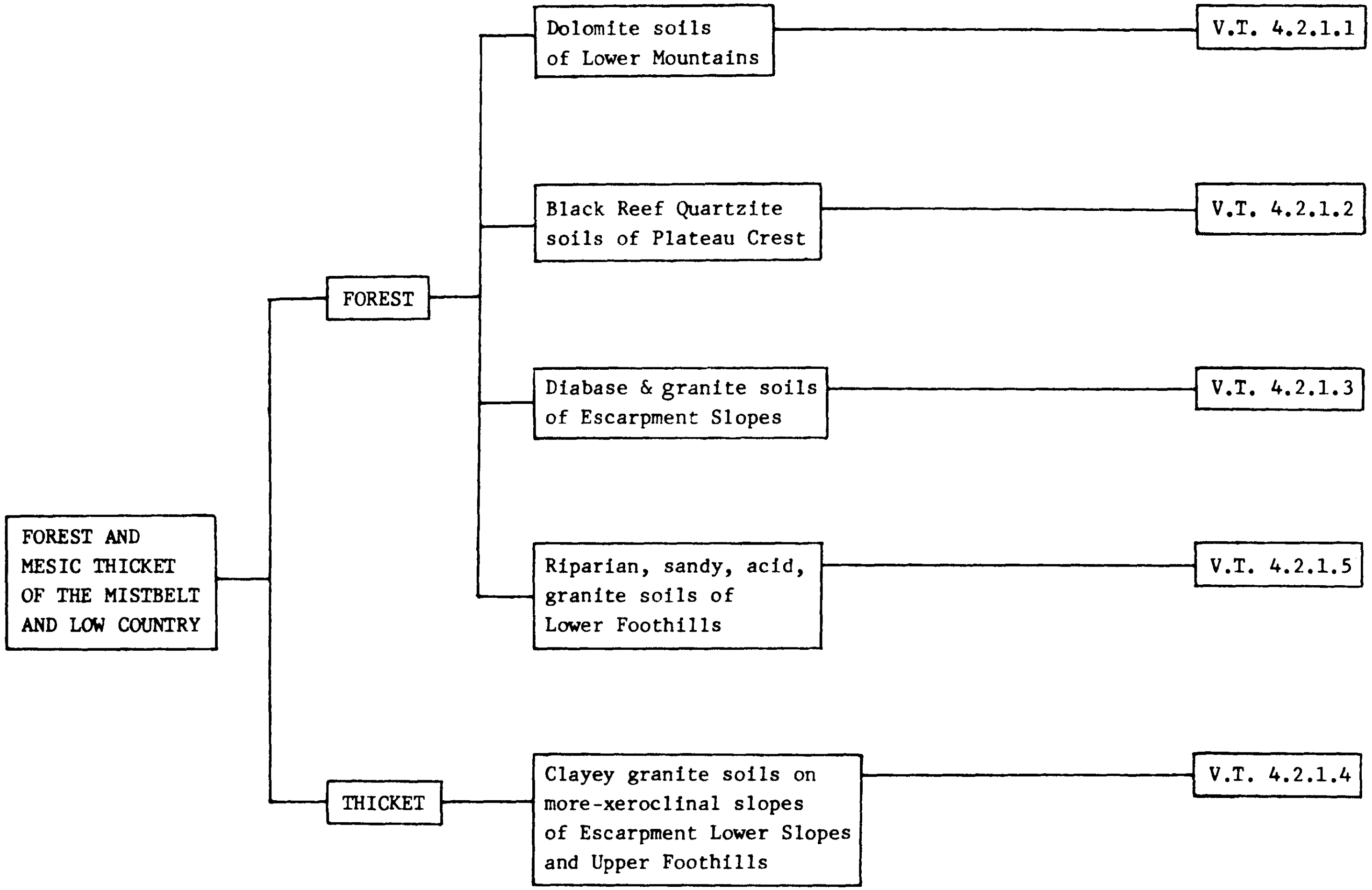


FIG. 4.3 An ecological basis for the recognition of five vegetation types (V.T.) in Forest and Mesic Thicket of the Mistbelt and Low Country, Sabie area.

Escarpment Lower Slopes and Foothills (cf. Community 36, Table V), emphasizes the importance of these species as primary colonizers. Examples include Bridelia micrantha, Combretum molle, Parinari curatellifolia, Heteropyxis natalensis and Pterocarpus angolensis; all trees.

Floristic affinity with Woodland of the Humid Mistbelt is emphasized by understorey trees such as Psychotria capensis, Trimeria grandifolia and Apodytes dimidiata (Table III (100)). Fire-protection and the presence of mist appear to be determinative habitat factors (Table V).

Species-Group 101 (Table III) links Forest and Mesic Thicket of the Mistbelt and Low Country with Woodland and Xeric Thicket of the Low Country, and with Woodland of the Humid Mistbelt. The absence of these species from the less rocky, open, grassy woodland (Communities 32-35) may reflect their susceptibility to fire. Such species include the trees Cussonia spicata and Syzygium cordatum, the shrubs Diospyros whyteana and Grewia occidentalis, and the creeper Smilax kraussiana.

(B) Component Vegetation Types

Forest and Mesic Thicket of the Mistbelt and Low Country comprises five vegetation types (Fig 4.2) that are differentiated and named on the basis of characteristic habitat features (Fig. 4.3 and Tables IV A and V):

4.2.1.1 Tall/Short Forest on soils derived from Upper Dolomite of the Lower Mountains.

4.2.1.2 Tall/Short Forest on black soils derived from Black Reef Quartzite of the Plateau Crest.

4.2.1.3 Tall Forest associated with Diabase intrusions of the Escarpment Slopes.

4.2.1.4 Short Thicket of more xeroclinal slopes with clay soils derived from Nelspruit Granite of the Escarpment Lower Slopes and Upper Foothills.

4.2.1.5 High/Tall (riparian) Forest on sandy soils of the Lower Foothills.

4.2.1.1 Tall/Short Forest on soils derived from Upper Dolomite of the Lower Mountains

(a) General Characteristics

This vegetation type occurs exclusively in the Humid Mistbelt on sheltered, fairly rocky mesoclinal slopes in the 990 - 1 355 m altitudinal range (Table IV A).Species-Group 3 (Table II A) is diagnostic. It is evident from the synoptic table, moreover, that this species-group retains its diagnostic validity in the wider geographic context (Table III (3)). Its members, therefore, may legitimately be regarded as local character species for the Vegetation Type. Among the character species are the conspicuous understorey trees Dovyalis lucida and Clausena anisata. The absence of Mistbelt forest trees such as Combretum kraussii, Cnestis natalensis, Oxyanthus gerrardii and Rapanea melanophloeos, is also fairly diagnostic (Table II A(20)). The dolomite soils may be an inhibiting factor.

Floristic affinities with other vegetation types are evident. Species-Group 13 (Table II A and III), for example, reveals a relationship with Tall Forest associated with Diabase intrusions of the Escarpment Slopes (Vegetation Type 4.2.1.3). Species in common include the tree Cassinopsis ilicifolia, and the moss-like fern ally Selaginella kraussiana. Their joint association with rocky riparian habitats suggests that such habitats may be preferentially selective (Table V).

In the limited context of Forest and Mesic Thicket of the Mistbelt and Low Country, Species-Group 39 (Table II A) reveals affinities between the Vegetation Type and two others of lower altitudes, namely Short Thicket of xeroclinal slopes (Vegetation Type 4.2.1.4) and High/Tall (riparian) Forest (Vegetation Type 4.2.1.5). Associated woody species such as Trimeria grandifolia, Diospyros whyteana and Grewia occidentalis hereby demonstrate their wide ecological amplitude.

(b) Constituent Syntaxa

Tall/Short Forest on soils derived from Upper Dolomite of the Lower Mountains (Vegetation Type 4.2.1.1) is represented by two communities (Fig. 4.2):

1. Hypoestes phaylopsoides - Dovyalis lucida Tall Forest
2. Streptocarpus cyaneus - Dovyalis lucida Short Forest

Community 1.

Hypoestes phaylopsoides - Dovyalis lucida Tall Forest

Type Relevé: 114 (Tables II A and IV A)

This tall (riparian) forest community is represented by two relevés and is found at about 1 300 m elevation in riverine situations within the Vertroosting Nature Reserve, about 6 km south of Sabie (Fig. 4.4).

Habitat

Habitat factors influencing community differentiation are not immediately apparent (Table II A). This is partly because the Community is at the upper limit of the recorded ecological gradient, and further sampling of the surrounding area would be required in order to ascertain pertinent environmental influences. Another likely explanation is that the habitat parameters chosen for recording are not the main controlling factors.

Structure

The structural attributes of the vegetation of the type relevé (114) are as follows:

Overstorey	(10,0-20,0 m)	20% cover
Canopy	(3,0-10,0 m)	70% cover
Shrub layer	(1,0- 3,0 m)	60% cover
Field layer	(0,0- 1,0 m)	75% cover

The other relevé (116) is considered subseral. Its field layer is very sparse (20 per cent cover) compared to the type relevé, and the tree strata are not yet clearly developed.

Floristics

Community 1 is characterized by Species-Group 1 (Table II A), whose members are local character species (Table III (1)). Conspicuous among these is the undershrub Hypoestes phaylopsoides. Also of note, in terms of its scarcity in the area, is the "maidenhair" fern Adiantum capillaris-veneris.

The absence of Species-Group 46 from the Community is significant, especially in view of its consistent presence in all other communities of the Ecological-Formation Class (Table II A). The fern Pellaea viridis, the grass Oplismenus hirtellus, the tree Maytenus mossambicensis, and the twiner Dioscorea "complex" are the elements concerned. Their absence suggests that Community 1 represents vegetation that is transitional to higher-altitude forest (cf. Scheepers' (1978) Montane-Forest).

Other species, whose presence in the Community distinguishes it from Community 2, are the trees Maytenus heterophylla, Psychotria capensis, Ficus capensis and Cussonia spicata; the more herbaceous elements such as Desmodium repandum and Galopina circaeoides; and the twiner Behnia reticulata.

Prunus africana is a conspicuous emergent tree, whilst the dominant canopy tree is Xymalos monospora. The shrub Sclerochiton harveyanus is dominant in the understorey up to about three metres, and Hypoestes phaylopsoides is the dominant undershrub in the field layer.

General

Communities 1-8 are related through the presence of Species-Group 17 (Tables II A and III). These species are indicators of typical Mistbelt forest (Table V). They include the epiphytic creeping ferns Polypodium polypodioides and Pleopeltis macrocarpa, and also the epiphytic succulent herb Peperomia retusa in association with Xymalos monospora in the canopy.

The herbaceous twiner Behnia reticulata and the monocotyledonous shrub Dracaena hookerana both indicate an affinity with forest communities of the Escarpment Slopes (Communities 4-7: Tables II A and III (15)). Similarly, relationship with Communities 3-17 is indicated by Species-Group 34 (Table II A), in which the common tree pioneer Maesa lanceolata is a significant feature.

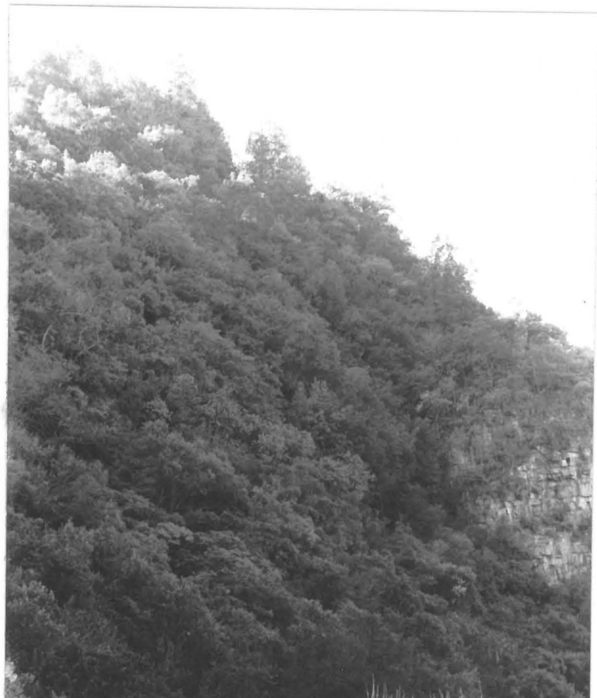
Communities 1, 6, 13 and 16-18 are related through the presence of Ficus capensis and Desmodium repandum (Table II A (36) and III (33)). The riverine habitat of these communities appears to be the unifying element.

Although not clearly defined on phytosociological tables, it is apparent from field observations that Community 1 is related to the Artemisia afra - Bowkeria cymosa Low Thicket (Community 40) and the Acalypha caperonioides -

FIG. 4.4 Community 1: Hypoestes phaylopsoides - Dovyalis lucida Tall Forest in riverine situations within the Vertroosting Nature Reserve (Relevé 114).

FIG. 4.5 Community 2: Streptocarpus cyaneus - Dovyalis lucida Short Forest on dolomite cliffs adjoining the Sabie River (Relevé 94).

4.4



4.5

Bewsia biflora - Loudetia simplex Grassland (Variant 52 A). Besides their contrasting geomorphology, all these syntaxa share a common habitat (Table V). Whereas the grassland and thicket occur on upper-pediment slopes or midslope planes, the forest occurs on lower-pediment slopes or stream banks. It is proposed that with time, and under favourable environmental influences, the grassland would proceed to thicket which in turn would proceed to the climax forest. Floristic elements common to all three syntaxa include Rhoicissus tridentata, Cussonia spicata, and Diospyros lycioides (Table III). With fire-protection, additional woody species such as Greyia radlkoferi, Maesa lanceolata, Smilax kraussiana, Grewia occidentalis and Diospyros whyteana could colonize the grassland to form the Low Thicket community (Table III). Further protection and changing geomorphology could create conditions favouring the establishment of more typical forest species such as Xymalos monospora and Prunus africana, and attendant sciophytes such as Hypoestes phaylopsoides and Dracaena hookerana. The persistence of the pioneer Maesa lanceolata in Relevé 116 of Community 1 suggests that this relevé may represent an intermediate stage between low thicket and climax tall forest.

Community 2.
Streptocarpus cyaneus - Dovyalis lucida Short Forest
Type Relevé: 94 (Tables II A and IV A)

This short (cliff) forest community is represented by three relevés and is found at about 1 100 m elevation on the dolomite cliffs formed by the Sabie River, at a point 2 km west of Sabie (Fig. 4.5).

Habitat

The high percentage rock cover and the sheltered mesoclinal aspect of steep slopes are factors which apparently influence floristic differentiation in the Community (Table II A). Also, its location at the interface of the Plateau Interior and Lower Mountains means that cold-air drainage is impeded and minimum temperatures would be lower than those on the higher slopes of Community 1 (cf. extreme daily minimum temperatures for Sabie and Tweefontein - Section 2.2.4.2).

Structure

The structural attributes of the vegetation of the type relevé (94) are as follows:

Canopy	(4,0-12,0 m)	60% cover
Understorey and shrub layer	(0,5- 4,0 m)	50% cover
Field layer	(0,0- 0,5 m)	60% cover

Floristics

Community 2 is characterized by Species-Group 2 (Table II A), whose members are all local character species (Table III (2)). Notable among these are the understorey tree Canthium huillense and the stemless herb Streptocarpus cyaneus. In the Vegetation Type context, the presence of the following species is diagnostic for the Community: Jasminum streptopus, Maytenus peduncularis, Carissa bispinosa, Dombeya pulchra, Apodytes dimidiata, Asparagus plumosus, Carex spicato-paniculata, Dicliptera clinopodia and Oplismenus hirtellus.

Kiggelaria africana is a dominant canopy element, whilst Diospyros whyteana is dominant in the shrub layer. Streptocarpus cyaneus and the fern Polystichum luctuosum are dominant field-layer species. Although not encountered in relevés, the tree Combretum erythrophyllum is a notable element in the Community.

General

Floristic affinity with forest communities on black quartzite soils of the Plateau Crest is indicated by Species-Group 7 (Table II A and III). These species appear to specifically avoid granite soils (Table V). Typical elements are the rock-associated forest precursors, Greyia radlkoferi, Myrsine africana and Pavetta cooperi.

The soft twiner Jasminum streptopus and the low bushy shrub Asparagus plumosus both indicate an affinity with forest communities of the Escarpment Slopes (Communities 4-7: Tables II A and III (16)). The persistence, in the Community, of lower-altitude species such as the sedge Carex spicato-paniculata and the undershrubs Dicliptera clinopodia and Dombeya pulchra indicates the Community's affinity with forest and thicket vegetation types on granite soils (Table II A (40) and III (35)). The absence of these species from forest Communities 1, 3, 4 and 5 may be due to an altitudinal imposition, whereby the extreme minimum temperature becomes a limiting factor above 1 100 metres elevation (Table V).

4.2.1.2. Tall/Short Forest on black soils derived from Black Reef Quartzite of the Plateau Crest

(a) General Characteristics

This vegetation type occurs exclusively in the Humid Mistbelt on rocky knolls of the Plateau Crest in the 1 356 - 1 478 m altitudinal range (Table IV A). In overall appearance it resembles elfin forest.

Since the Vegetation Type is represented by only one community, its floristic attributes are the same as for that community and will not be repeated here (see Community 3 below).

(b) Constituent Syntaxa

Tall/Short Forest on black soils derived from Black Reef Quartzite of the Plateau Crest (Vegetation Type 4.2.1.2) is represented by one community having two variants (Fig. 4.2):

3. *Ekebergia pterophylla* - *Psychotria zombamontana* Tall/Short Forest
3A. *Bulbophyllum sandersonii* - *Ekebergia pterophylla* - *Psychotria zombamontana* Variant
3B. *Podocarpus latifolius* - *Ekebergia pterophylla* - *Psychotria zombamontana* Variant

Community 3.
Ekebergia pterophylla - *Psychotria zombamontana* Tall/Short Forest

This forest community is represented by four relevés and is found at about 1 400 m elevation in the Mac Mac Nature Reserve, 11 km north-east of Sabie (Tables II A and IV A). It has two variants, 3A and 3B.

Habitat

The combination of fairly shallow, quartzite-derived black soils developed within rocky knolls or "koppies" of the Plateau Crest is unique in the Ecological-Formation Class and is probably influential in community differentiation (Table II A). Compounding factors are the high mean annual rainfall and the propensity for "fog-drip" on the Plateau Crest (Section 2.2.4.4); both of which contribute to the high moisture status of the Community.

The degree of exposure to the abiotic component, as well as the proximity to drainage lines, apparently determines the height of the vegetation (Table IV A). Thus tall forest tends to develop on the more sheltered knolls, especially those near streams (Fig. 4.6). The effect of wind on the more exposed knolls causes localized stunting of vegetation, leading to the development of short forest or even low thicket (Fig. 4.7). These determinants of height appear to have little effect on community differentiation as expressed by floristic composition (Table IV A).

Structure

The structural properties of the vegetation of the Community will be discussed under the variants into which it is divided (see Variants 3A and 3B below).

Floristics

Species-Group 4 (Table II A) is diagnostic. All member-species, except the shrublet Rhus dura, retain their diagnostic validity in the wider geographical context, moreover, and are therefore local character species for both the Community and the Vegetation Type. Aloe arborescens is perhaps the most conspicuous of the character species. Ekebergia pterophylla and Pterocelastrus echinatus are sometimes dominant character species in the canopy. Other character species include the pan-tropical succulent epiphyte Peperomia tetraphylla, the epiphytic orchid Polystachya ottoniana, and the ferns Hypolepis sparsisora and Lycopodium gnidioides. The shrubs Vernonia umbratica and Plectranthus rubropunctatus are also notable.

The absence of widespread woody species such as Trimeria grandifolia, Diospyros whyteana and Grewia occidentalis is a fairly diagnostic feature

FIG. 4.6 Tall forest tends to develop on the more sheltered knolls, especially those near streams (Relevé 79). *Syzygium gerrardii* and *Combretum kraussii* are dominant in the canopy.

FIG 4.7 The effect of wind on the more exposed knolls causes localized stunting of vegetation, leading to the development of low thicket (Relevé 80). Note the conspicuous *Podocarpus latifolius* and *Aloe arborescens*.

4.6

4.7

(Table II A (39)), although not readily interpretable. In forest and thicket generally, the absence of twiners such as Cissampelos torulosa and Dioscorea "complex", as well as the absence of the canopy tree Zanthoxylum davyi, could be diagnostic for the Community (Table III (55) and Table V). The small tree Psychotria zombamontana is a common dominant in the understorey.

General

Floristic affinity with lower-altitude tall forest (Communities 4 and 5) is indicated by Species-Groups 8 and 10 respectively (Tables II A and III). Member-species, including the perennial herb Clivia caulescens and the trees Schefflera umbellifera and Psychotria zombamontana, seem to overtly avoid dolomite soils (Table V).

Not apparent from phytosociological tables, are the relationships with woodland communities of the Humid Mistbelt. The most notable affinities seem to lie with More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2, Table V). Common species include the small trees Pterocelastrus echinatus and Ekebergia pterophylla, the shrub Plectranthus rubropunctatus, the shrublet Rhus dura, and the succulent herb Kalanchoe rotundifolia. From impressions gained in the field, it is doubtful whether these affinities reflect any successional relationship between the communities concerned.

Variant 3A.
Bulbophyllum sandersonii - Ekebergia pterophylla - Pyschotria zombamontana
Tall/Short Forest
Type Relevé: 75 (Tables II A and IV A)

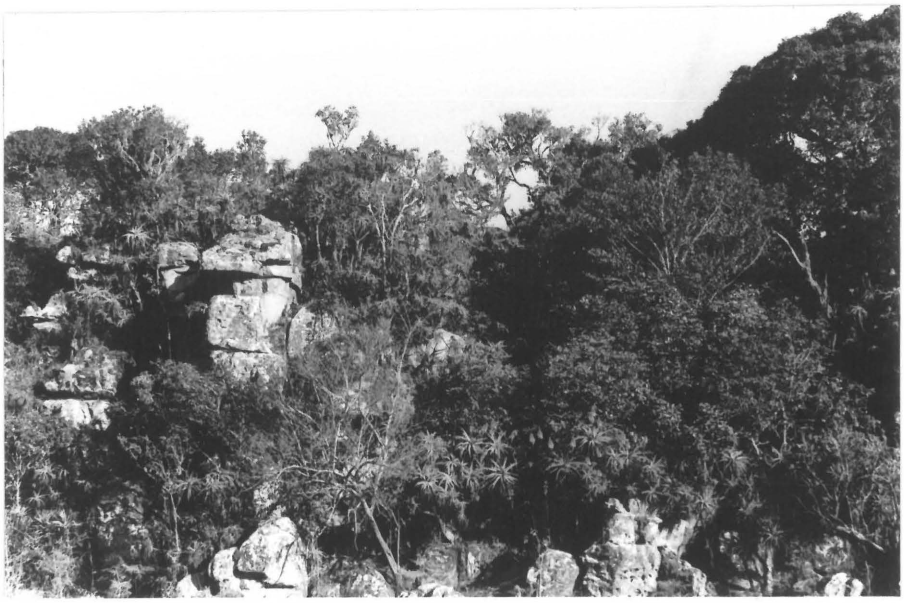
This forest variant is represented by two relevés, the one (Relevé 79) being tall forest situated in a sheltered stream bed(Figs. 4.6 and 4.9), and the other (Relevé 75) being short forest on a more exposed knoll (Fig. 4.8).

Habitat

There is no discernible environmental factor influencing the floristic differentiation between Variants 3A and 3B (Table II A).

FIG. 4.8 Variant 3A: Bulbophyllum sandersonii - Ekebergia pterophylla - Psychotria zombamontana Short Forest on an exposed knoll in the Mac Mac Nature Reserve (Relevé 75). Note the elfin-like appearance.

FIG. 4.9 Interior of Variant 3A: Bulbophyllum sandersonii - Ekebergia pterophylla - Psychotria zombamontana Tall Forest (Relevé 79). Note the dominance of Sclerochiton harveyanus in the shrub layer (Photo P.J. Weisser).


4.8


4.9

Structure

The structural attributes of the type relevé (75) are as follows:

Overstorey	(8,0-20,0 m)	20% cover
Canopy, understorey and shrub layer	(0,5- 8,0 m)	75% cover
Field layer	(0,0- 0,5 m)	65% cover

The other relevé (79) has a taller canopy and a denser shrub layer.

Floristics

Variant 3A is differentiated by two local character species, namely Bulbophyllum sandersonii and Rothmannia capensis (Tables II A (5) and III (5)). The former is an epiphytic orchid, conspicuous against the quartzite rock faces, whilst the latter is a small understorey tree.

Other species, present in the Variant but absent from Variant 3B, include the canopy trees Syzygium gerrardii, Xymalos monospora, Protorhus longifolia and Ficus burkei; the shrub Sclerochiton harveyanus; and the grass Oplismenus hirtellus.

Besides those mentioned for Community 3, there are dominant species that are specific for the Variant. Dominant elements in the field layer include the large perennial herb Clivia caulescens, whilst those of the upper strata include Aloe arborescens and Syzygium gerrardii.

General

There is a definite floristic affinity between the Variant and the forest and thicket communities on granite soils of the Escarpment Slopes and Foothills. It is expressed by Species-Group 39 (Table III), notably Dietes iridioides and Secamone gerrardii.

Variant 3B.
Podocarpus latifolius - Ekebergia pterophylla - Psychotria zombamontana
Tall Forest
Type Relevé: 81 (Tables II A and IV A)

This forest variant is represented by two relevés, the one being tall forest situated in a sheltered stream bed (Relevé 81), and the other (Relevé 80) being low thicket on a more exposed knoll (Fig. 4.7).

Habitat

Habitat factors influencing variant differentiation are not immediately apparent (Table II A).

Structure

The structural attributes of the vegetation of the type relevé (81) are as follows:

Canopy and understorey	(2,0-20,0 m)	70% cover
Shrub layer	(0,5- 2,0 m)	70% cover
Field layer	(0,0- 0,5 m)	30% cover

The lower strata of the other relevé (80) are structurally similar to those of the type relevé, but the upper strata are markedly different, being much lower and not as dense.

Floristics

Variant 3B is differentiated by three local character species (Tables II A (6) and III (6)). These include the valuable yellowood tree *Podocarpus latifolius*, the succulent herb *Cyanotis pachyrrhiza*, and the robust fern *Rumohra adiantiformis*.

Other differential species that occur in the Variant (albeit with a low constancy), but are absent from Variant 3A, include *Smilax kraussiana*, *Ochna natalitia*, *Phylica paniculata*, *Myrica pilulifera*, *Halleria lucida* and *Crassula sarcocaulis*. The comparatively "xerophytic" nature of these species may indicate a more xeric habitat compared with Variant 3A. The absence of more "mesophytic" species such as *Secamone gerrardii* and *Dietes iridioides* is confirmatory in this respect.

Besides those mentioned for Community 3, there are dominant species that are specific to the Variant. *Podocarpus latifolius* is dominant in the canopy, whilst *Plectranthus rubropunctatus* almost forms a pure stand in the shrub layer of the most sheltered sites. Aloe arborescens is dominant on the more exposed sites (Relevé 80). Ekebergia pterophylla is a dominant understorey tree, and Pleopeltis macrocarpa is a conspicuous epiphytic fern.

General

A broad affinity with forest, thicket and woodland occurring between 500 and 1 600 m elevation is expressed by Smilax kraussiana and Syzygium cordatum (Tables III (101) and V).

4.2.1.3 Tall Forest associated with Diabase intrusions of the Escarpment Slopes

(a) General Characteristics

This vegetation type occurs in the Mistbelt on sheltered mesoclinal Escarpment Slopes between 868 and 1 355 m elevation. The soils, which tend to be deep, are generally red in the lower horizon and are derived variously from Nelspruit Granite or Transvaal Diabase (Table IV A).

Species-Group 14 (Table II A) is diagnostic. It is evident from the synoptic table, moreover, that this species-group retains its diagnostic validity in the wider geographical context (Table III (14)). Its members are therefore local character species for the Vegetation Type. They tend to strictly avoid both quartzite and dolomite soils (Table V). Examples include the trees Zanthoxylum capense and Canthium ciliatum, the ferns Dryopteris inaequalis and Thelypteris sp., and the well-known climber Senecio tamoides. Dominant elements in the Vegetation Type are the trees Syzygium gerrardii and Combretum kraussii, in both the canopy and overstorey.

Floristic affinities with other vegetation types are evident. Species- Group 39 (Table III), for example, reveals a relationship with both lower-altitude short thicket of more xeroclinal slopes (Vegetation Type 4.2.1.4), and with riparian forest of the Lower Foothills (Vegetation Type 4.2.1.5). Species include the robust spiny liane Dalbergia armata, the soft twiner Secamone gerrardii, the small tree Tricalysia "complex" (probably T. capensis), and the herb Dietes iridioides; all associated with deep granite soils (Table V). Additional species expressing similar affinities, but with a broader ecological amplitude, are those of Species-Groups 45

(Table II A), and 53 and 55 (Table III). Setaria megaphylla, Zanthoxylum davyi, Oplismenus hirtellus and Monanthotaxis caffra, for instance, have affinities extending to Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1, Table V).

(b) Constituent Syntaxa

Tall Forest associated with Diabase intrusions of the Escarpment Slopes (Vegetation Type 4.2.1.3) is represented by three communities (Fig. 4.2):

4. Canthium ciliatum - Syzygium gerrardii Tall Forest
5. Piper capense - Syzygium gerrardii Tall Forest
6. Desmodium repandum - Combretum kraussii Tall Forest

Community 4.

Canthium ciliatum - Syzygium gerrardii Tall Forest

Type Relevé: 66 (Tables II A and IV A)

This tall forest community of the Humid Mistbelt (Figs. 4.10 and 4.11) is represented by four relevés occurring at about 1 300 m elevation, in a vicinity 2 km west of Frankfort Forest Station on steep, fairly rocky upper-pediment slopes of the Escarpment Upper Slopes (Table IV A).

Habitat

The only observable factors influencing floristic differentiation between the Community and other tall forest communities (5 and 6) of the Vegetation Type are the shallower soils and the more elevated geomorphology (Table IV A).

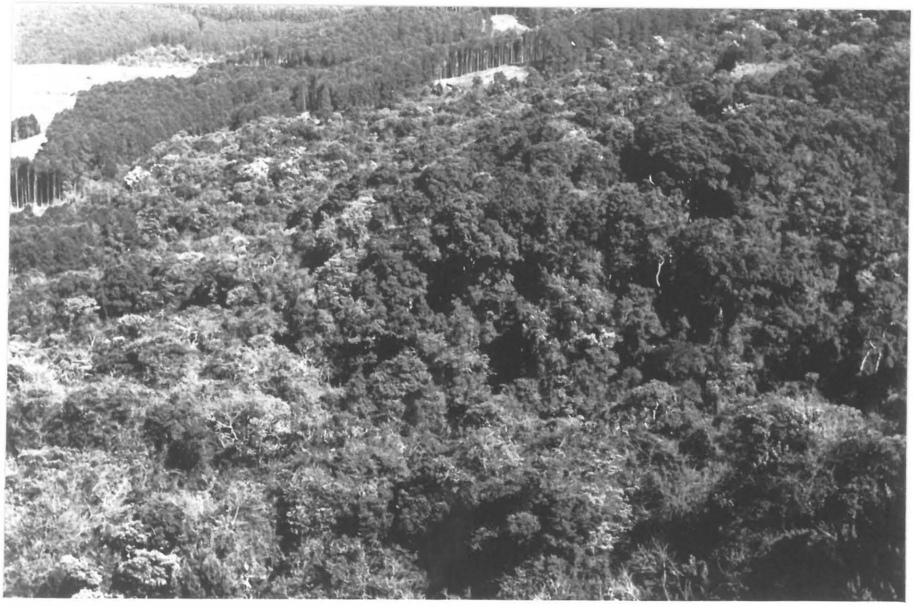
Structure

The structural attributes of the vegetation of the type relevé (66) are as follows:

Overstorey	(15,0-30,0 m)	30% cover
Canopy	(10,0-15,0 m)	60% cover
Understorey	(2,0-10,0 m)	30% cover
Shrub layer	(0,5- 2,0 m)	30% cover
Field layer	(0,0- 0,5 m)	5% cover

FIG. 4.10 Community 4: Canthium ciliatum - Syzygium gerrardii Tall Forest (Relevé 66). Note the rounded crowns of Syzygium gerrardii (mainly centre right).

FIG. 4.11 Interior of Community 4: Canthium ciliatum - Syzygium gerrardii Tall Forest (Relevé 66). Xymalos monospora seedlings are conspicuous in the field layer (foreground), whilst Tricalysia capensis dominates the understorey (Photo P.J. Weisser).



4.10

4.11

Floristics

Community 4 is marked by a lack of differential species and by the absence of more hygrophilous species such as the herbs Impatiens hochstetteri and Sanicula elata, the liane Entada spicata, the ferns Blechnum giganteum and Selaginella kraussiana, and the tree Cassiniopsis ilicifolia (Tables II A (12 and 13) and III (12 and 13)). The presence of species from Tall/Short Forest on black soils derived from Black Reef Quartzite of the Plateau Crest (Vegetation Type 4.2.1.2) is also characteristic. The large herb Clivia caulescens, the epiphytic fern Asplenium anisophyllum, and the tree Schefflera umbellifera are notable examples (Tables II A (8) and III (8)).

Other species, whose absence in the Community distinguishes it from Communities 5 and 6, are Ficus capensis and Desmodium repandum (Table II A (36)). Others, whose presence is distinctive, are the trees Cassipourea gerrardi and Clerodendrum myricoides.

Besides the upper-strata dominants, Combretum kraussii and Syzygium gerrardii, there are also understorey dominants, namely Oxyanthus gerrardii, Psychotria capensis, Psychotria zombamontana and Tricalysia "complex" (probably T. capensis).

General

Besides those already inferred, and those plainly evident from phytosociological tables, Community 4 shows no remarkable floristic affinities with other syntaxa.

It is interesting to note the appearance in one of the relevés (72) of a lianoid form of Acacia ataxacantha, which is normally a "scrambling" shrub or tree in the mesic thicket of lower altitudes (Section 4.2.1.4).

Community 5.
Piper capense - Syzygium gerrardii Tall Forest
Type Relevé: 65 (Tables II A and IV A).

This tall forest community of the Humid Mistbelt, Escarpment Upper Slopes, is represented by three relevés at about 1 200 m elevation in dry rocky kloofs, about 1 km west and north-west of Frankfort Forest Station (Table IV A).

Habitat

The dry, steep rocky kloofs with their attendant deep diabase soils form a distinctive habitat in Forest and Mesic Thicket of the Mistbelt and Low Country (Table II A). Such distinctiveness is probably influential in floristic differentiation.

Structure

The structural attributes of the vegetation of the type relevé (65) are as follows:

Overstorey	(20,0-30,0 m)	30% cover
Canopy and understorey	(4,0-20,0 m)	70% cover
Shrub layer	(0,5- 4,0 m)	50% cover
Field layer	(0,0- 0,5 m)	30% cover

Floristics

Local character species defining Community 5 include the soft shrub Piper capense, which forms almost pure stands in some areas. Another local character species is the fern Asplenium lunulatum (Tables II A (9) and III (9)).

The absence of Species-Group 40 (Table II A) in the Vegetation Type is diagnostic for the Community. Apodytes dimidiata and Dicliptera clinopodia are significant examples. Other species, whose absence in this context is diagnostic, include Bequaertiodendron magalismontanum, Canthium gueinzii and Cissampelos torulosa.

Piper capense is usually dominant in the shrub layer, whilst Oxyanthus gerrardii is dominant in the understorey and Xymalos monospora in the canopy. Cussonia spicata is generally conspicuous in the overstorey.

General

Besides those already inferred, and those plainly evident from phytosociological tables, Community 5 bears no remarkable floristic affinities with other syntaxa in the area. The growth forms of certain understorey species, such as Maytenus mossambicensis, Oxyanthus gerrardii and Psychotria spp., become very variable in some parts of the Community. In Relevé 69, for instance, these common tree species assume a sprawling, more lianoid form. This modification is presumably in response to an increasing demand for light as the canopy becomes more dense.

Community 6.
Desmodium repandum - Combretum kraussii Tall Forest
Type Relevé: 47 (Tables II A and IV A).

This tall (riparian) forest community (Fig. 4.12) occurs at about 950 m elevation in numerous tributaries of the Sabie River, especially in those of the Escarpment Lower Slopes (Table IV A).

Habitat

The Community is the first on the altitudinal gradient of Forest and Mesic Thicket to encounter Transitional Mistbelt conditions. Riparian conditions nevertheless compensate for any decrease in moisture status resulting from a reduction in mist incidence (Table IV A). Its affinities, therefore, lie more with higher-altitude forest than with lower-altitude thicket. The lower altitude, the more gentle slopes, and the less elevated geomorphology are some of the factors influencing floristic differentiation between the Community and others of the same vegetation type (Table IV A).

Structure

The structural attributes of the vegetation of the type relevé (47) are as follows:

Canopy	(4,0-20,0 m)	70% cover
Understorey and shrub layer	(0,5- 4,0 m)	35% cover
Field layer	(0,0- 0,5 m)	60% cover

The generally high vegetation cover in the field layer is noteworthy and may be the result of the high water table in these low-lying areas.

FIG. 4.12 Community 6: Desmodium repandum - Combretum kraussii Tall Forest (Relevé 46). The fern Dryopteris inaequalis and the grass Setaria megaphylla are conspicuous water-side elements (foreground).

4.12

Floristics

Community 6 is marked by a lack of differential species. The absence of Species-Group 9 (Table II A) and the presence of Species-Group 12 (Table II A) is nevertheless fairly diagnostic. Community 6 is indicated where, for example, Impatiens hochstetteri, Sanicula elata and Entada spicata occur unaccompanied by Piper capense, Asplenium lunulatum and Jasminum sp. Similar diagnoses can be made on the basis of the absence of Species-Groups 10, 29 and 37 and the presence of Species-Groups 14, 30 and 38 respectively.

Other species, whose presence in the Community distinguishes it from the higher-altitude forest communities (4 and 5), are the woody elements Protorhus longifolia, Canthium inerme, Toddalia asiatica, Syzygium cordatum and Diospyros whyteana; and the sub-woody elements Desmodium repandum and Smilax kraussiana. Others, whose absence is distinctive, include the small shrub Asparagus plumosus and the tree Psychotria zombamontana.

Combretum kraussii, Xymalos monospora and occasionally Maytenus mossambicensis and Acacia ataxacantha, are dominant in the canopy. Psychotria capensis is often dominant in the understorey, Dicliptera clinopodia in the shrub layer, and Oplismenus hirtellus in the field layer.

General

Relationship with lower-altitude short thicket of more xeroclinal slopes (cf. Vegetation Type 4.2.1.4) is expressed by woody species such as Euclea "complex", Protorhus longifolia, Brachylaena discolor and Canthium inerme (Table II A (30)). Species-Group 44 (Table II A) also expresses this relationship, and extends it to the Lower Foothills (Section 4.2.1.5). Well-known species such as the liane Rhoicissus tomentosa, the tree Acacia ataxacantha, and the small shrub Asparagus virgatus are typical in this respect. Affinities are further extended to Tall/Short Forest on soils derived from Upper Dolomite of the Lower Mountains (Vegetation Type 4.2.1.1) by such widespread species as Trimeria grandifolia, Diospyros whyteana and Grewia occidentalis (Table II A (39)).

Species-Group 74 (Table III) relates Community 6 with mesic thicket and with early stages of lithoseral woodland (cf. Community 36). Indicator species are the lianoid shrub Cephalanthus natalensis and the tree Protorhus longifolia. Both of these species thus demonstrate their adaptability as pioneers, capable of colonizing bare rocky sites and of maintaining their importance even to climax-forest stage.

Litter accumulation in the field layer is another notable feature of the Community. The phenomenon may be due to reduced microbial activity in the soils of sheltered sites, where the diurnal range in temperature is small. It was noted in Relevé 47, for instance, that at midday in October the air temperature was still "cool". This may help to explain the incidence of relatively less acid soils (pH 6,0) in some relevés (cf. Relevés 46 and 49).

4.2.1.4 Short Thicket of more xeroclinal slopes with clay soils derived from Nelspruit Granite of the Escarpment Lower Slopes and Upper Foothills

(a) General Characteristics

This vegetation type occurs variously in the Transitional Mistbelt and the Low Country in the 623-986 m altitudinal range on less rocky sites which, with few exceptions, are upper-pediment slopes. (Table IV A).

Species-Group 29 (Table II A) is diagnostic and, with the exception of the small tree Antidesma venosum, all member species retain their differential status in the broader context (Table III (26)). They therefore qualify as local character species for the Vegetation Type. Such species include the tree Trema orientalis, the small shrub Ochna gamostigmata, the exotic climber Passiflora edulis, and the sedge Cyperus albostriatus. The shrubby (sometimes "scrambling") tree Acacia ataxacantha is a dominant element in the canopy of the Vegetation Type.

Species-Group 66 (Table III) expresses the floristic relationship between the Vegetation Type and certain less exposed woodland and thicket communities of the Low Country (Table V). Representative species include the trees Euclea "complex" and Antidesma venosum, both of which constitute a floristic link between mesic and xeric thicket.

Floristic links with High/Tall (riparian) Forest on sandy soils of the Lower Foothills (Vegetation Type 4.2.1.5) are indicated by Species-Group 37 (Table II A). The tree Bridelia micrantha, the small shrub Rhoicissus tridentata, and the forbs Galopina circaeoides and Flemingia grahamiana provide examples of such links.

(b) Constituent Syntaxa

Short Thicket of more xeroclinal slopes with clay soils derived from Nelspruit Granite of the Escarpment Lower Slopes and Upper Foothills (Vegetation Type 4.2.1.4) is represented by ten communities (Fig. 4.2):

7. Dracaena hookerana - Acacia ataxacantha Short Thicket
8. Pleopeltis macrocarpa - Acacia ataxacantha Short Thicket
9. Canthium gueinzii - Acacia ataxacantha Short Thicket
10. Dombeya pulchra - Acacia ataxacantha Short Thicket
11. Iboza riparia - Acacia ataxacantha Short Thicket
12. Rhynchosia komatiensis - Acacia ataxacantha Short Thicket
13. Pittosporum viridiflorum - Acacia ataxacantha Short Thicket
14. Endostemon obtusifolius - Acacia ataxacantha Short Thicket
15. Pycnostachys urticifolia - Acacia ataxacantha Short Thicket
16. Rhynchosia caribaea - Acacia ataxacantha Short Thicket

Community 7.

Dracaena hookerana - Acacia ataxacantha Short Thicket

Type Relevé: 30 (Tables II A and IV A).

This short (mesic) thicket community of the Transitional Mistbelt is represented by six relevés and is found at about 900 m elevation on the Escarpment Lower Slopes (Table IV A).

Habitat

Communities 6 and 7 occur in the same vicinity, and the only major factor distinguishing them is their geomorphology. Whereas Community 6 is frequently riparian, Community 7 tends to occupy upper-pediment slopes where soils are shallower, less loamy, and more acid (Table IV A). This habitat distinction apparently influences the physiognomy, resulting in the development of thicket rather than forest.

Structure

The structural attributes of the vegetation of the type relevé (30) are as follows:

Canopy and understorey	(2,0-12,0 m)	80% cover
Shrub layer	(0,5- 2,0 m)	50% cover
Field layer	(0,0- 0,5 m)	20% cover

This well-shaded community seems to be transitional between forest and thicket (Figs. 4.13 and 4.14). The presence of numerous lianes throughout the shrub layer, the understorey and the canopy, however, makes the vegetation almost impenetrable and it is classified as thicket rather than forest. Interception of a high proportion of incident light by the upper strata may account for the sparse cover of the field layer.

Floristics

Community 7 is marked by a lack of differential species. The absence of Species-Group 14 and the presence of Species-Group 15 (Table II and III) is nevertheless fairly diagnostic. Community 7 is indicated, for instance, where *Behnia reticulata*, *Dracaena hookerana* and *Ochna holstii* occur unaccompanied by *Dryopteris inaequalis*, *Senecio tamoides* and *Canthium ciliatum*.

Other species, whose presence in the Community distinguishes it from the mesic thicket of lower altitudes (cf. Communities 8-16), are the twiners *Jasminum streptopus* and *Ctenomaria capensis*. Others whose absence is distinctive include those of Species-Group 27 (Table II A), especially *Diospyros lycioides*, *Pteridium aquilinum*, *Ziziphus mucronata* and *Abrus laevigatus*. The absence of *Rhoicissus tridentata* and *Grewia occidentalis* is also significant.

Dominant species in the canopy are *Acacia ataxacantha* and *Zanthoxylum davyi*, as well as *Bridelia micrantha* and *Combretum kraussii* on occasions. *Bequaertiodendron magalismontanum* often dominates the understorey, whilst the small herbaceous shrub *Dracaena hookerana* dominates the shrub layer. The robust spiny liane *Dalbergia armata* is a transgressive element co-dominating all strata.

General

Species-Group 15 (Table II A and III), comprising *Behnia reticulata*, *Dracaena hookerana* and *Ochna holstii*, indicates a relationship with Tall Forest associated with Diabase intrusions of the Escarpment Slopes (Vegetation Type 4.2.1.3). This relationship is further extended to the *Streptocarpus cyaneus* - *Dovyalis lucida* Short Forest (Community 2) by species such as *Jasminum streptopus* and *Asparagus plumosus* (Table II A and III (16)).

FIG. 4.13 Community 7: Dracaena hookerana - Acacia ataxacantha Short Thicket in a kloof near Bergvliet (Relevé 55). Note the large-leaved emergent, Anthocleista grandiflora in the background (left).

FIG. 4.14 Interior of Community 7: Dracaena hookerana - Acacia ataxacantha Short Thicket (Relevé 45). Note the grassy sward of Oplismenus hirtellus in the field layer.

4.13

4.14

Community 8.

Pleopeltis macrocarpa - Acacia ataxacantha Short Thicket

Type Relevé: 61 (Tables II A and IV A)

This community of the Transitional Mistbelt is physiognomically variable, ranging from forest (cf. Relevés 44 and 48) to thicket (cf. Relevé 61). It is represented by three relevés and is found at about 950 m elevation on the Escarpment Lower Slopes (Table IV A).

Habitat

Community 8 is, for the most part, situated on gently sloping, low-lying landforms such as lower-pediment slopes and valleys. Eluviation of clay particles from surrounding upper slopes may contribute to the attendant high clay fraction in the B horizon (Table IV A). The high clay content combined with the gentle slopes are both factors distinguishing Community 8 from other communities in the Vegetation Type.

Structure

The structural attributes of the vegetation of the type relevé (61) are as follows:

Canopy	(4,0-15,0 m)	40% cover
Understorey and shrub layer	(0,5- 4,0 m)	70% cover
Field layer	(0,0- 0,5 m)	50% cover

Considerable variation is seen in Relevé 48 (short forest), where the canopy cover is 70 per cent and the field layer is virtually absent.

Floristics

Community 8 is marked by a lack of differential species. The presence of Species-Group 17 (Tables II A and III) and the absence of Species-Groups 15 and 16 (Table II A and III), in forest and thicket of Escarpment Slopes and Foothills, is nevertheless fairly diagnostic. Community 8 is thus indicated when species such as Xymalos monospora, Polypodium polypodioides and Pleopeltis macrocarpa occur in the absence of such species as Jasminum streptopus, Dracaena hookerana and Behnia reticulata.

Other species, whose presence in the Community distinguishes it from other communities in the Vegetation Type, are Zanthoxylum capense, Rhynchosia thorncroftii, Heteromorpha arborescens and Crassula pellucida. Others, whose absence is distinctive, include the trees Apodytes dimidiata and Antidesma venosum, as well as the forb Flemingia grahamiana.

In the canopy Acacia ataxacantha is dominant, whilst in the understorey Diospyros whyteana, Trimeria grandifolia, Psychotria capensis and Tricalysia "complex" (probably T. capensis) are often dominant. The grass Oplismenus hirtellus dominates the field layer.

General

Affinities with higher-altitude forests are indicated by Species-Group 17 (Table II A and III), including such elements as Xymalos monospora and the epiphytic fern Pleopeltis macrocarpa. Together with Community 7, Community 8 represents the lowest altitudinal range of such species. Their absence from Communities 9-16 may reflect their dependence on cooler, more mesic habitats (Table IV A).Conversely, Species-Groups 62 and 65 (Table III), comprising the trees Maytenus heterophylla, Ziziphus mucronata and Rhus pyroides, and the shrub Rhoicissus tridentata; indicate affinities with more xeric habitats of lower altitudes (Table V).

Community 9.
Canthium gueinzii - Acacia ataxacantha Short Thicket
Type Relevé: 39 (Tables II A and IV A)

Like Community 8, this community of the Transitional Mistbelt is physiognomically variable, sometimes occurring as forest, sometimes as thicket and sometimes as woodland (Table IV A). It is represented by six relevés and is found at about 900 m elevation on the Upper Foothills, between D.R. de Wet Forest Research Station and Bergvliet Forest Station.

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II A. Outstanding features of the habitat are nevertheless evident from Table IV A. These include the diverse geomorphology as well as the fairly steep well-sheltered slopes.

Structure

The structural attributes of the vegetation of the type relevé (39) are as follows:

Canopy	(4,0-10,0 m)	40% cover
Understorey and shrub layer	(1,0- 4,0 m)	50% cover
Field layer	(0,0- 1,0 m)	70% cover

Lianes are evident throughout all strata, even those of the woodland relevés (cf. 38 and 54). This suggests that the woodland portions of the Community are subseral.

Floristics

Community 9 is marked by a lack of differential species. The presence of Species-Group 18 (Tables II A and III) and the absence of Species-Groups 17 and 20 (Tables II A and III) is nevertheless fairly diagnostic. Community 9 is thus indicated when species such as Asparagus falcatus, Rhoicissus rhomboidea, Eugenia natalitia and Carissa bispinosa occur unaccompanied by species such as Cyperus pseudoleptocladus, Xymalos monospora and Oxyanthus gerrardii.

Other species, whose presence in the Community distinguishes it from other communities in the Vegetation Type, are the trees Myrica pilulifera and Rhamnus prinoides, and the climber Clematis brachiata. The absence of the tree Zanthoxylum davyi is also fairly distinctive.

In the canopy, Acacia ataxacantha, Brachylaena discolor, Protorhus longifolia and Apodytes dimidiata are dominant. In the understorey, Maytenus mossambicensis is often dominant; whilst Dietes iridioides is occasionally dominant in the field layer, forming pure stands in some sites (cf. Relevé 39). The climbers Canthium gueinzii and Rhoicissus tomentosa are dominant in all strata.

General

The Community represents the lowermost limit of well-sheltered Mistbelt forest and thicket (Table IV A). Species-Group 18 (Tables II A and III) defines this limit floristically. It comprises species such as Asparagus falcatus, Rhoicissus rhomboidea, Carissa bispinosa and Eugenia natalitia; all of which are ill-adapted to the less sheltered xeric habitats of lower altitudes, but which relate Communities 7, 8 and 9 of the Vegetation Type to Tall Forest associated with Diabase intrusions of the Escarpment Slopes (Vegetation Type 4.2.1.3).

Relationship with the less sheltered xeric habitats of the Vegetation Type (cf. Communities 10-16) is indicated by Species-Group 37 (Table II A), including Bridelia micrantha, Galopina circaeoides, Flemingia grahamiana and Rhoicissus tridentata. In many instances, the density of climbers and lianes makes the community impenetrable and hence its designation as thicket rather than forest.

Community 10.
Dombeya pulchra - Acacia ataxacantha Short Thicket
Type Relevé: 52 (Tables II A and IV A)

This community of the Transitional Mistbelt is physiognomically variable, and shows signs of disturbance. It occurs at about 900 m elevation on the Upper Foothills, on mesoclinal slopes surrounding the Escom substation situated due east of the Gorge cottages. It is represented by two relevés.

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II A. Outstanding features of the habitat are nevertheless evident from Table IV A. These include deep sandy clay soils with little evidence of horizon development and with minimal rock outcrops.

Structure

The structural attributes of the vegetation of the type relevé (52) are as follows:

Canopy	(4,0-10,0 m)	40% cover
Understorey and shrub layer	(0,5- 4,0 m)	60% cover
Field layer	(0,0- 0,5 m)	50% cover

Lianes transgressing all strata contribute to the impenetrability of the vegetation.

Floristics

Community 10 is marked by a lack of differential species. The presence of Species-Group 20 (Table II A and III) and the absence of Species-Groups 17 and 19 (Tables II A and III) is nevertheless fairly diagnostic. The presence of Combretum kraussii, Cnestis natalensis and Cyperus pseudoleptocladus together with the absence of Asplenium splendens, Xymalos monospora and Polypodium polypodioides, for example, is a fairly reliable indication of Community 10.

Other species, present in the Community and only rarely so in other communities of the Vegetation Type, include the shrub Dombeya pulchra. Species whose absence in this context is distinctive include the woody elements Monanthotaxis caffra, Cussonia spicata and Antidesma venosum; and the herbaceous element Dietes iridioides.

Besides Acacia ataxacantha, other canopy dominants include Combretum kraussii, Syzygium cordatum and Protorhus longifolia. Dominant trees in the understorey include Psychotria capensis and Cnestis natalensis, whilst in the shrub layer Ochna gamostigmata is dominant. Dalbergia armata is a dominant liane.

General

Floristic affinity with earlier stages of lithoseral woodland (Communities 36-38) and with higher-altitude woodland, shrubland and grassland (Communities 42-47), is indicated by the fern Mohria caffrorum (Table III (110)).

Community 11.
Iboza riparia - Acacia ataxacantha Short Thicket
Type Relevé: 121 (Tables II A and IV A)

This community of the Transitional Mistbelt is physiognomically variable, sometimes appearing as low woodland (cf.Relevés 57 and 58); sometimes as thicket (cf. Relevés 127, 31 and 121); and sometimes even as shrubland (cf.Relevé 83). It is represented by six relevés and is found mostly at about 950 m elevation on upper-pediment slopes of the Escarpment Lower Slopes (Table IV A).

Habitat

Tables II A and IV A show Community 11 as possessing fairly distinctive habitat features. Slopes are fairly steep, tending to be exposed, and definitely xeroclinal. Surface rock cover is very variable, as is soil texture. Relevé 57, for example, has 85-100 per cent rock cover, with loamy sands in the upper horizon; whilst Relevé 31 has only 1-4 per cent rock cover, with sandy clay loams in the upper horizon. The fairly shallow soils are a more uniform feature of the Community, as is the absence of red hues in the lower horizon.

Structure

The structural attributes of the vegetation of the type relevé (121) are as follows:

Canopy and understorey	(2,0-10,0 m)	75% cover
Shrub layer	(0,5- 2,0 m)	40% cover
Field layer	(0,0- 0,5 m)	50% cover

Lianes tend to be poorly developed. These attributes are not standard for the Community.

Floristics

Aloe longibracteata is the only local character species (Table III (21)). In the Forest and Mesic Thicket of the Mistbelt and Low Country context, however, all of Species-Group 21 (Table II A) is diagnostic. Relevant species include the woody elements Combretum molle, Iboza "complex"[1], Cryptolepis oblongifolia, Indigofera swaziensis and Rhus transvaalensis. Amongst the more herbaceous elements Commelina sp., Aloe longibracteata, Loudetia simplex, Gerbera jamesonii and Pearsonia sessilifolia "complex" are noteworthy.

Another species, whose presence in the Community distinguishes the latter from other communities in the Vegetation Type, is the small herb Polygala hottentotta.

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[1] This species complex comprises I. riparia and I. brevispicata. From herbarium records, I. riparia is apparently more common in this area and is thus the more likely possibility in this context.

Acacia ataxacantha is the only consistently dominant tree in the canopy (Fig. 4.15). Understorey and shrub-layer dominants include Canthium inerme and occasionally, Diospyros whyteana. Smilax kraussiana is dominant in the field layer. Other less consistent dominant species include Combretum molle, Bequaertiodendron magalismontanum and Xerophyta retinervis on the more rocky (lithoseral) sites (cf. Relevé 57); Pteridium aquilinum and Rhoicissus tridentata on the wetter (hydoseral) sites (cf. Relevé 83); and Parinari curatellifolia elsewhere (cf. Releve 31).

General

Species-Groups 73 and 76 (Table III), including the forbs Xerophyta retinervis, Crassula natalensis and Ceratotheca triloba, indicate a weak affinity with low woodland of exposed granite outcrops in the Transitional Mistbelt and Low Country (cf. Community 36).

The low constancy value of these species in Community 11, compared with Community 36, reflects their diminishing importance value in the former. The successional implications are that Community 36 represents an early lithoseral stage, where Xerophyta retinervis, Crassula natalensis and Ceratotheca triloba are important pioneers. As succession proceeds and the vegetation becomes more dense, these species decline in importance to the extent where they become, as in Community 11, mere relics of an earlier stage.

The affinity with Community 36 is further extended to Woodland of the Humid Mistbelt by Species-Groups 89, 94 and 104 (Table III). Species include the forb Helichrysum kraussii, the fern Pellaea calomelanos, and the tree Tarchonanthus trilobus var. galpinii. They relate Communities 11 and 36 to More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2). Like those of Species-Groups 73 and 76, these species appear to be relics in Community 11.

Relationships are further extended to Grassland of the Humid Mistbelt by Species-Group 127 (Table III), notably the low creeper, Rhynchosia monophylla. Still further extension of these affinities to the more densely covered portions of Woodland and Xeric Thicket of the Low Country is expressed by species such as Pearsonia sessilifolia "complex", Cryptolepis oblongifolia, Loudetia simplex and Rhynchelytrum "complex" (Table III (123 and 143)).

FIG 4.15 Community 11: Iboza riparia - Acacia ataxacantha Short Thicket (Relevé 121). Acacia ataxacantha is the only consistently dominant tree in the canopy.

FIG. 4.16 Community 15: Pycnostachys urticifolia - Acacia ataxacantha Short Thicket (Relevé 13). Dense stands of Bauhinia galpinii and Smilax kraussiana in the shrub layer make the vegetation virtually impenetrable.

4.15

4.16

Affinities with woodland and thicket communities of the Foothills, and with Partially sheltered Low Thicket and Woodland on midslope planes of the Escarpment Upper Slopes and the Mountains (Vegetation Type 4.2.3.1), are indicated by Species-Group 83 (Table III), comprising the small tree Rhus transvaalensis and the forb Athrixia phylicoides. Species whose affinities are more or less confined to Grassland of the Humid Mistbelt include the forbs Tetraselago natalensis and Athanasia acerosa (Table III (108 and 115)).

The great variety of species relating Community 11 to numerous other syntaxa implies a great diversity in habitat. This in turn suggests that Community 11 is probably ecotonal.

Community 12.
Rhynchosia komatiensis - Acacia ataxacantha Short Thicket
Type Relevé: 11 (Tables II A and IV A)

This short thicket community on the Upper Foothills of the Low Country is found at about 700 m elevation on sheltered slopes with fairly shallow, strongly acid soils. It is represented by three relevés (Table IV A).

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II A. Nevertheless, the occurrence of mesoclinal slopes outside the Mistbelt is almost unique in the Vegetation Type and may perhaps be significant. Community 12, moreover, is the first in the environmental gradient of the Ecological-Formation Class to encounter Low-Country conditions.

Structure

The structural attributes of the vegetation of the type relevé (11) are as follows:

Canopy and understorey	(2,0-10,0 m)	50% cover
Shrub layer	(0,5- 2,0 m)	80% cover
Field layer	(0,0- 0,5 m)	20% cover

Lianes are present but not abundantly so.

Floristics

Community 12 is marked by a lack of differential species. The presence of Species-Group 22 (Table II A) and the absence of Species-Group 21 (Table II A) is nevertheless fairly diagnostic. Community 12 is indicated when, for example, the small shrub Rhynchosia komatiensis and the forb Athrixia phylicoides occur in Forest and Mesic Thicket of the Mistbelt and Low Country, unaccompanied by Combretum molle and Iboza "complex". Another diagnostic feature is the absence of Species-Group 30 (Table II A) from the Vegetation Type. Examples in this respect include the trees Protorhus longifolia, Brachylaena discolor and Canthium inerme.

Other species in the context of the Vegetation Type, whose presence is restricted to Community 12, include the ground orchid Eulophia streptopetala and the suffrutex Leonotis dysophylla. Others, whose absence in the same context is distinctive, include the prickly liane Toddalia asiatica.

Diospyros whyteana is consistently dominant in the shrub layer whilst Bauhinia galpinii and Gardenia amoena are less consistently so. In the canopy, Acacia ataxacantha is variously co-dominant with Combretum kraussii, Faurea saligna, Parinari curatellifolia, Heteropyxis natalensis and Syzygium cordatum.

General

Relationship with Community 11 is indicated by Species-Group 22 (Table II A), in which Rhynchosia komatiensis and the grass Trichopteryx dregeana are important. Relationship with other Low-Country syntaxa in the Vegetation Type is indicated by species such as the undershrub Phaulopsis imbricata and the tree Catha edulis (Table II A (28)). Extended affinities with riparian forest of the Lower Foothills are indicated by Species-Group 43 (Table II A), in the form of Bauhinia galpinii, Maytenus undata, Celtis africana and Erythrina lysistemon.

These affinities also extend to vegetation types of other ecological-formation classes. Species-Group 51 (Table III), for instance, indicates an affinity with Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1). Representative species include Maytenus undata, Celtis africana, Stylochiton natalense, Osyridicarpos schimperianus, Catha edulis, Tephrosia "complex" and Asparagus "complex". Similarly, Rhynchosia komatiensis and Faurea speciosa indicate affinities that extend to woodland and thicket communities of the Foothills and to Woodland of the Humid Mistbelt (Table III (90)).

Community 12 apparently marks a transition between mesic and xeric vegetation. Its occurrence at the upper limit of the Low Country, just removed from the effects of frequent mist, invites both a proliferation of more xeric species as well as a greater scarcity of lianoid species. Community 12 may represent a lower limit of Scheepers' (1978) submontane Scrub-Forest Belt.

Community 13.
Pittosporum viridiflorum - Acacia ataxacantha Short Thicket
Type Relevé: 191 (Tables II A and IV A)

This fairly sheltered short thicket community on the Upper Foothills of the Low Country is found at about 800 m elevation on gentle xeroclinal slopes with shallow to deep soils. It is represented by five relevés having diverse geomorphology, ranging from knolls and upper-pediment slopes to lower-pediment slopes and stream banks (Table IV A).

Habitat

Habitat factors influencing community differentiation are not immediately apparent from Table II A.

Structure

The structural attributes of the vegetation of the type relevé (191) are as follows:

Canopy	(4,0-10,0 m)	60% cover
Understorey and shrub layer	(0,5- 4,0 m)	75% cover
Field layer	(0,0- 0,5 m)	20% cover

Relevé 168 is structurally anomalous. It is situated on stream banks and develops to high forest (Table IV A). Lianes are consistently present.

Floristics

Community 13 is differentiated by Species-Group 23 (Table II A), comprising the small tree Pittosporum viridiflorum and the shrubs Annona senegalensis and Cassia petersiana. Of these, only the former retains, to some degree, its differential status in the broader context (Table III (22)).

Other species, whose presence in the Vegetation Type is distinctive, include the Aloe sp. concept. Similarly, the absence of the small shrub Ochna gamostigmata in the Vegetation Type is a fairly good indication of Community 13.

Dominant canopy species include Acacia ataxacantha, Syzygium cordatum and Parinari curatellifolia. Those dominant in the shrub layer include Diospyros whyteana and occasionally, Bauhinia galpinii. Asparagus virgatus is often well represented in the field layer.

General

Besides those already mentioned, Community 13 has no other affinities. The large trees Anthocleista grandiflora and Breonadia salicina are conspicuous in the overstorey, especially in riverine sites (cf.Relevés 157 and 168), where they may attain heights of 15 to 40 metres.

Community 14.
Endostemon obtusifolius - Acacia ataxacantha Short Thicket
Type Relevé: 32 (Tables II A and IV A)

This short thicket community of the Upper Foothills occurs on partially sheltered upper-pediment slopes in the Transitional Mistbelt. It is represented by two relevés situated just below 900 m elevation in the vicinity of the Gorge cottages.

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II A. The fairly deep soils with minimal rock outcrops together with the gentle to moderate slopes are noteworthy habitat features, nevertheless (Table IV A).

Structure

The structural attributes of the vegetation of the type relevé (32) are as follows:

Canopy	(4,0-14,0 m)	60% cover
Understorey and shrub layer	(1,0- 4,0 m)	70% cover
Field layer	(0,0- 1,0 m)	20% cover

Lianes are consistently present in all strata.

Floristics

Community 14 is weakly defined by the single shrub Endostemon obtusifolius (Table II A (24) and III (23)). A co-incidental member of this species-group, namely Pinus sp., is an exotic tree and is therefore not suitable for diagnostic purposes. The absence of Species-Group 27 (Table II A) from the Upper Foothills of the Transitional Mistbelt is also fairly diagnostic. Member species such as Diospyros lycioides, Helichyrsum panduratum and Abrus laevigatus are relatively xerophytic, and their absence may thus reflect the mesic nature of Community 14.

Other species, whose presence in the Community distinguishes it from other communities in the Vegetation Type, include the soft tendril-climber Coccinea palmata. Those whose absence is distinctive include the twiner Dioscorea "complex".

In the canopy, Parinari curatellifolia and Bridelia micrantha are dominant whilst Protorhus longifolia and Syzygium cordatum are occasionally so. In the understorey and shrub layer, Diospyros whyteana and Trimeria grandifolia are usually dominant, whilst Carex spicata-paniculata is dominant in the field layer. The larger trees are often well colonized by epiphytic orchids such as Tridactyle tricuspis and Polystacha sp.(Table II A (25)). Also, the spiny liane Dalbergia armata is well represented in all strata.

General

Community 14 is related to Communities 11, 12 and 13 by means of the epiphytic orchids (Table II A (25) and III (24)). Another relationship, not clear from phytosociological tables, is that between Relevés 42 and 31 of

Communities 14 and 11 respectively. Both of these relevés have a canopy dominated by Parinari curatellifolia and an understorey dominated by virtually pure stands of Diospyros whyteana and Trimeria grandifolia. This phenomenon is unusual, and may indicate a fire-induced secondary succession.

Community 15.
Pycnostachys urticifolia - Acacia ataxacantha Short Thicket
Type Relevé: 36 (Tables II A and IV A)

This short thicket community of the Upper Foothills occurs on gentle xeroclinal slopes between 720 and 920 m elevation. It is represented by four relevés which occur variously in the Transitional Mistbelt and Low Country.

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II A. Soils are deepish and developed on partially sheltered upper-pediment slopes and midslope planes (Table IV A).

Structure

The structural attributes of the vegetation of the type relevé (36) are as follows:

Canopy	(4,0-10,0 m)	25% cover
Understorey and shrub layer	(1,0- 4,0 m)	50% cover
Field layer	(0,0- 1,0 m)	50% cover

Relevé 6 differs greatly from the type relevé, having a denser canopy, an overstorey, a sparser field layer, and an abundance of lianes. This departure probably arises out of the Relevé's anomalous position on a sheltered mesoclinal slope (Table IV A).

Floristics

Community 15 is differentiated by Species-Group 26 (Table II A), comprising the exotic tree Jacaranda mimosifolia, the shrub Pycnostachys urticifolia, the forb Triumfetta pilosa var. effusa, and the climber Dalechampia capensis. Of these, only the latter is diagnostic in the context of the whole study area (Table III (25)).

Other species, whose presence in the Vegetation Type is confined to Community 15, include the shrubs Crotalaria recta, Stachys grandifolia, and Vernonia adoensis; the forbs Clutia hirsuta, Vernonia amygdalina and Triumfetta pilosa var. pilosa; the twiner Thunbergia neglecta; and the herbaceous epiphyte Peperomia blanda.

Where there is an overstorey (cf. Relevé 6), Catha edulis is a dominant emergent. In the canopy, Acacia ataxacantha, Euclea "complex", and occasionally Cussonia spicata and Protorhus longifolia are dominant. Diospyros whyteana and Diospyros lycioides are commonly dominant in the understorey and shrub layer. Dense stands of Bauhinia galpinii and Smilax kraussiana in the shrub layer often make the vegetation virtually impenetrable (Fig. 4.16). In the field layer, Smilax kraussiana, Asparagus virgatus and Setaria megaphylla are well represented.

General

Species-Group 27 (Table II A), including such species as Diospyros lycioides Maytenus heterophylla and Pteridium aquilinum, indicates affinities with Communities 8-14. Also, the forb Triumfetta pilosa var. pilosa indicates an affinity with lower-altitude thicket, viz Community 22 (Table III (45)).

Relationship with Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1) is indicated by the small undershrubs Hypoestes aristata and Cassia petersiana (Table III (49 and 57)). The persistence of Species-Groups 74, 75 and 96 (Table III) in the Community, indicates, as with previous communities, its involvement in a lithoseral succession. Species such as Cephalanthus natalensis, Protorhus longifolia, Combretum molle, Parinari curatellifolia, Pterocarpus angolensis, Bequaertiodendron magalismontanum and Canthium inerme are notable examples in this respect.

Community 16.
Rhynchosia caribaea- Acacia ataxacantha Short Thicket
Type Relevé: 33 (Tables II A and IV A)

This short thicket community on the Upper Foothills of the Low Country has riparian affinities. It is represented by five relevés situated mostly at about 800 m elevation.

Habitat

Habitat factors influencing community differentiation are not immediately apparent from Table II A. Generally, soils are deep, with little horizon development. They are developed on gently sloping sheltered slopes, where rock outcrops are minimal (Table IV A).

Structure

The structural attributes of the vegetation of the type relevé (33) are as follows:

Canopy	(4,0-15,0 m)	40% cover
Understorey and shrub layer	(1,0- 4,0 m)	85% cover
Field layer	(0,0- 1,0 m)	20% cover

Relevé 28 is anomalous in that it supports tall forest and is found in the Lower Foothills at 660 m elevation.

Floristics

Community 16 is marked by a lack of differential species. However, there are a number of general and infrequent species which, in the context of the Vegetation Type, are confined to Community 16 and are thus of limited diagnostic value. Relevant trees include *Eugenia natalitia*, *Lannea discolor*, *Ekebergia capensis*, *Myrica serrata*, *Rauvolfia caffra* and *Strychnos spinosa*. Other relevant species are the ferns *Alsophila dregei*, *Dicranopteris linearis* and *Thelypteris bergiana*; the forbs *Plantago major*, *Pearsonia aristata* and *Berkheya echinacea*; and the shrubs *Crotalaria capensis* and *Rubus pinnatus*.

Syzygium cordatum and *Acacia ataxacantha* are usually dominant in the canopy whilst *Bridelia micrantha* is occasionally so. In Relevé 28, *Anthocleista grandiflora* and *Breonadia salicina* are dominant in the canopy, thus indicating an affinity with Community 17 of the Lower Foothills. Dominant elements in the understorey and shrub layers are *Diospyros whyteana* and *Phaulopsis imbricata* respectively. The vigorous prickly liane *Toddalia asiatica* is well represented in all strata.

General

Species-Group 30 (Table III), comprising the large tree Anthocleista grandiflora and the climber Mikania cordata, indicates the riparian nature of Communities 6, 8, 9, 16 and 17. Other such indicators are Ficus capensis and Desmodium repandum (Table III (33)). Their ecological amplitude, moreover, is even broader than that of Species-Group 30.

4.2.1.5 High/Tall (riparian) Forest on sandy soils of the Lower Foothills

(a) General Characteristics

This vegetation type occurs in riparian situations between 500 and 744 m elevation. Slopes are gentle to moderate, mesoclinal, and sheltered. Soils, which are derived from Nelspruit Granite, are deep with minimal rock outcrops (Table IV A).

Local character species for the Vegetation Type include the trees Berchemia zeyheri and Chionanthus foveolata, and the forb Aneilema aequinoctiale (Tables II A (42) and III (37)). Other criteria, such as the coincident presence and absence of respective Species-Groups 44 and 30 (Table II A), are useful as broad indicators of the Vegetation Type. Their value for diagnosis is limited, however.

Dominant elements in the Vegetation Type are the trees Syzygium cordatum and Celtis africana, both of which variously occupy the canopy stratum. Floristic affinities with other vegetation types in Forest and Mesic Thicket of the Mistbelt and Low Country have already been mentioned (cf. Table III (39) and Section 4.2.1.3). An affinity that is confined to Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1) is indicated by Species-Group 50 (Table III). The tree Rhus pentheri and the shrub Pavetta sp. are relevant in this respect. Their preference for low-altitude sites affording some degree of shelter may be significant (Table V).

(b) Constituent Syntaxa

High/Tall (riparian) Forest on sandy soils of the Lower Foothills (Vegetation Type 4.2.1.5) is represented by three communities (Fig. 4.2):

17. Schoenoplectus corymbosus - Syzygium cordatum Tall Forest
18. Ochna natalitia - Celtis africana Tall Forest
19. Ceropegia woodii - Celtis africana Tall Forest

Community 17.

Schoenoplectus corymbosus - Syzygium cordatum Tall Forest

Type Relevé: 188 (Tables II A and IV A)

This tall (riparian) forest community of the Low Country is found between 670 and 870 m elevation on sheltered, gentle slopes with deepish soils. It is situated in the vicinity of Da Gama farm.

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II A.

Structure

The structural attributes of the type relevé (188) are as follows:

Overstorey and canopy	(4,0-20,0 m)	50% cover
Understorey and shrub layer	(0,5- 4,0 m)	70% cover
Field layer	(0,0- 0,5 m)	45% cover

Lianes are prevalent throughout.

Floristics

Community 17 is differentiated by the shrub Lantana camara, the sedge Schoenoplectus corymbosus, and the fern Thelypteris gueinziana (Table II A (32)). The latter two species are local character species (Table III (29)).

Other species, whose presence in the Community distuinguishes it from other communities in the Vegetation Type, include the woody elements Maesa lanceolata, Ficus burkei, Ficus ingens, Halleria lucida and Cephalanthus natalensis. Those whose absence in this respect is distinctive include Monanthotaxis caffra, Zanthoxylum davyi, Celtis africana, Secamone gerrardii and Asparagus virgatus.

Dominant elements in the overstorey and canopy include Anthocleista grandiflora, Syzygium cordatum, with Breonadia salicina and Ficus capensis occasionally. In the shrub and field layers respectively, Diospyros whyteana and Oplismenus hirtellus are dominant, whilst the liane Dalbergia armata dominates all strata.

General

Community 17 is related to most previously mentioned syntaxa by Species-Group 34 (Table II A), comprising the trees Psychotria capensis and Maesa lanceolata. The wide ecological amplitude of these species indicates their adaptability.

Relationship with mesic thicket of the Escarpment Lower Slopes and Upper Foothills, and with Woodland and Xeric Thicket of the Low Country, is expressed by Euclea "complex" and Antidesma venosum (Table III (66)).

Community 18.
Ochna natalitia - Celtis africana Tall Forest
Type Relevé: 176 (Tables II A and IV A)

This tall (riparian) forest community of the Low Country is found between 520 and 720 m elevation and is represented by two relevés situated in the vicinity of Sandford farm, on the Sabie River (Fig. 4.17).

Habitat

Habitat factors influencing floristic differentation are not immediately apparent from Table II A. The clay fraction in the soils of Community 18 is nevertheless greater than that of other constituent syntaxa, namely Communities 17 and 19. Relevé 189 is slightly anomalous in that it is not strictly riparian, being situated on a midslope plane. Furthermore, it occurs at a higher altitude and on steeper slopes than its counterparts (Table IV A).

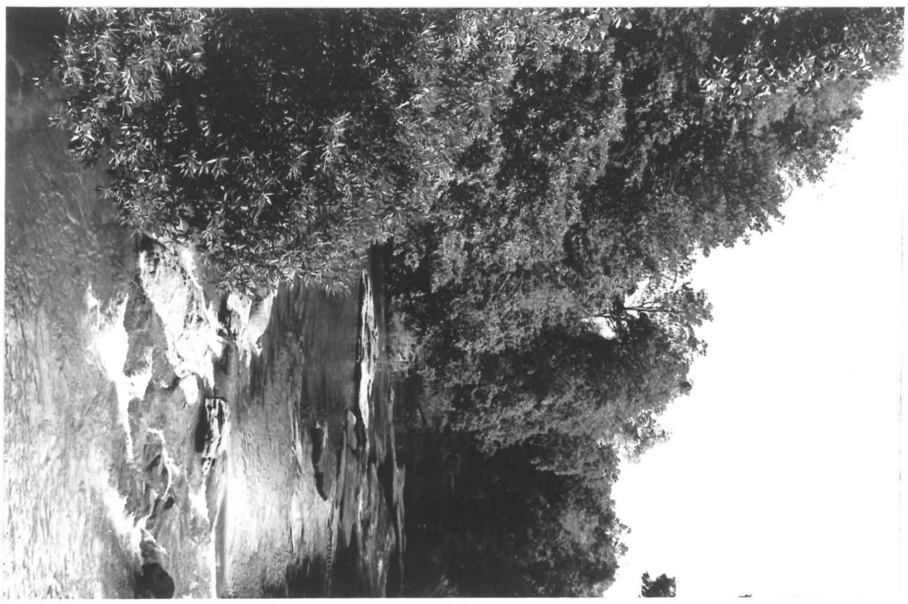
Structure

The structural attributes of the vegetation of the type relevé (176) are as follows:

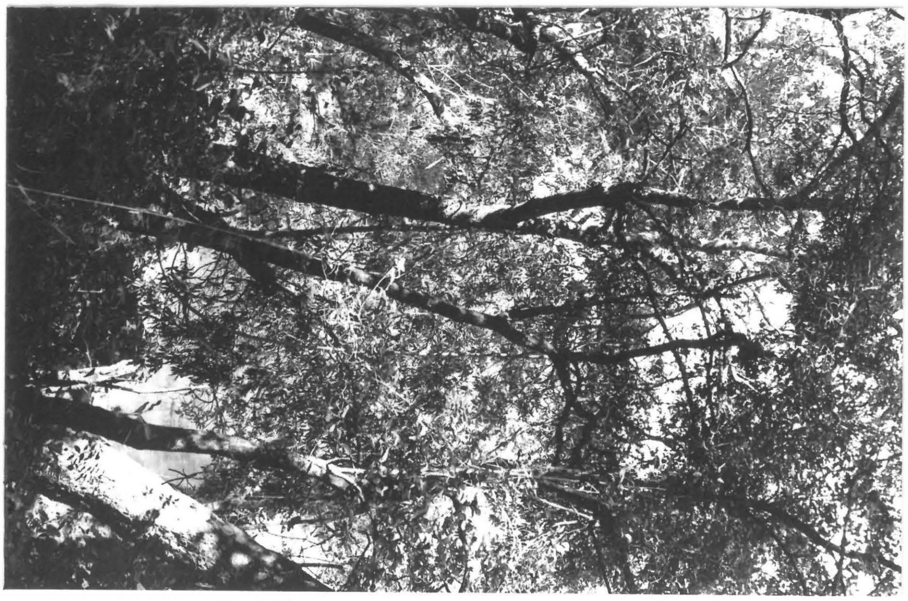
FIG. 4.17 Community 18: *Ochna natalitia* - *Celtis africana* Tall Forest,with *Breonadia salicina* in the foreground and *Anthocleista grandiflora* in the canopy (left).

FIG. 4.18 Community 18: *Ochna natalitia* - *Celtis africana* Tall Forest, sometimes represented by High Forest (Relevé 170), in which specimens of the tree *Breonadia salicina* occasionally attain heights of c. 40 metres.

4.17



4.18



Overstorey and canopy	(5,0-20,0 m)	50% cover
Understorey and shrub layer	(0,5- 5,0 m)	75% cover
Field layer	(0,0- 0,5 m)	60% cover

Relevé 170 is exceptional in that some trees (notably Breonadia salicina) attain heights of c.40 m, resulting in high forest rather than tall forest (Fig. 4.18). The unusually high pH (6,5) of the lower soil horizon indicates a relatively high base status which, together with the abundance of ground-water, may account for this exceptional tree height.

Floristics

Community 18 is marked by a lack of differential species. Nevertheless, the presence of the following species in the Vegetation Type is a fairly good indication of Community 18: Dombeya pulchra, Ochna natalitia, Clausena anisata, Entada spicata, Catha edulis, Stylochiton natalense, Dombeya rotundifolia, Ocotea kenyensis, Cyperus sexangularis and Adiantum capillaris-veneris. The absence of Acacia ataxacantha in this context is also fairly diagnostic.

Celtis africana is consistently dominant in the canopy whilst Breonadia salicina, Ficus capensis, Anthocleista grandiflora, Bridelia micrantha and Catha edulis are less so. In the shrub layer, Diospyros whyteana and Monanthotaxis caffra are notable dominants, whilst those in the field layer are Dietes iridioides and Oplismenus hirtellus. Three robust lianes, noticeable in all strata, are Toddalia asiatica, Rhoicissus tomentosa and Dalbergia armata.

General

Relationship with mesic thicket of the Escarpment Lower Slopes and Upper Foothills is expressed by Species-Groups 37 (Table II A) and 34 (Table III), in which Bridelia micrantha and Toddalia asiatica are the most significant elements. This relationship is extended to Tall/Short Forest on Upper Dolomite of the Lower Mountains (Vegetation Type 4.2.1.1) by Species-Group 39 (Table II A), including Diospyros whyteana and Trimeria grandifolia; and by Species-Group 35 (Table III), including Carex spicato-paniculata and Dombeya pulchra.

Some affinity with the more xeric communities (20 and 21) is indicated by Strychnos madagascariensis, Eulophia streptopetala and Kraussia floribunda (Table III (42 and 43)). Affinities with other more xeric syntaxa are indicated by the trees Maytenus heterophylla, Rhus pyroides, Ziziphus mucronata, Dombeya rotundifolia, Combretum molle and Heteropyxis natalensis (Table III (62, 65, 68 and 75)).

Community 19.
Ceropegia woodii - Celtis africana Tall Forest
Type Relevé: 172 (Tables II A and IV A)

This tall forest community is represented by two relevés situated at about 600 m elevation in the Low Country.

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II A. In fact, the habitat is rather diverse, with variable physiognomy. On rocky upper-pediment slopes underlain by diabase, soils are fairly shallow with well-developed clays in the lower horizons, and the vegetation formation tends to be thicket (cf. Relevé 140). On less rocky midslope planes underlain by granite, soils are deeper but more sandy and gleyed, and forest tends to develop (cf. Relevé 172) (Table IV A).

Structure

The structural attributes of the vegetation of the type relevé (172) are as follows:

Canopy and understorey	(2,0-15,0 m)	80% cover
Shrub layer	(0,5- 2,0 m)	40% cover
Field layer	(0,0- 0,5 m)	25% cover

The field layer in Relevé 140 is more dense (70 per cent cover) owing, perhaps, to the sparser canopy and understorey.

Floristics

Community 19 is differentiated by local character species Kirkia acuminata and Ceropegia woodii; a tree and twiner respectively (Table II A (41) and

III (36)). The absence of Ficus capensis, Desmodium repandum, Toddalia asiatica, Carex spicato-paniculata, Bridelia micrantha, Combretum molle and Heteropyxis natalensis is also diagnostic in the context of the Vegetation Type (Table III (33, 34, 35 and 75)). In the broader context of the Ecological-Formation Class, the absence of Psychotria capensis, Trimeria grandifolia, Apodytes dimidiata and Smilax kraussiana is also fairly diagnostic (Table III (100 and 101)).

In the canopy, Kirkia acuminata is usually dominant together with Acacia ataxacantha in Relevé 140. Shrub layer and understorey dominants are Monanthotaxis caffra and Maytenus undata respectively. In the field layer, Aloe sp. is well represented, as are the lianes Rhoicissus tomentosa and Dalbergia armata in all strata.

General

There is a significant lack of floristic affinity with other syntaxa. This possibly results from Community 19's position at the lower limit of the altitudinal range, where affinities may lie more with Lowveld vegetation.

4.2.2 WOODLAND AND XERIC THICKET[1] OF THE LOW COUNTRY

(A) General Characteristics

Woodland and Xeric Thicket of the Low Country is confined mainly to the Foothills but is also prevalent on some xeroclinal slopes of the Escarpment Lower Slopes (Table IV B).

Physiognomy

As the name implies, woodland and thicket are the major formation classes represented. Factors promoting woodland rather than thicket appear to be the drier conditions on xeroclinal slopes together with the incidence of fire (Table IV B). In addition, shrubland is meagrely represented as a lithoseral precursor to woodland and thicket. The relative scarcity of lianes in the Ecological-Formation Class is a feature which markedly distinguishes it from

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[1] Xeric Thicket refers to the "scrubby" type of thicket normally associated with the Low Country.

Forest and Mesic Thicket of the Mistbelt and Low Country, with its abundance of lianes.

Habitat

The geomorphology results in gentle to moderate gradients, mainly of upper-pediment slopes and occasionally of midslope planes. Riparian sites are conspicuously absent. Component syntaxa are represented on both mesoclinal and xeroclinal slopes. The latter tend to support woodland rather than thicket. Also, as the degree of exposure to the abiotic component increases, so the density of the woody component of the vegetation decreases and the formations become more open (Table IV B).

The predominant lithology is Nelspruit Granite and Transvaal Diabase, with rock outcrops ranging from less than 1 per cent to more than 85 per cent on early lithoseral sites. Soils too, range in depth from being fairly shallow to deep (Table IV B).

Floristics

The most widespread species in Woodland and Xeric Thicket of the Low Country are those of Species-Group 37 (Table II B), including the fern Pellaea viridis and the small tree Diospyros lycioides. Neither are differential for the Ecological-Formation Class, however. Those that are differential include the small tree Dichrostachys cinerea "complex", and the grasses Hyperthelia dissoluta and Heteropogon contortus (Table III (72 and 77)).

Other species that are more or less confined to Woodland and Xeric Thicket of the Low Country and are distributed fairly extensively therein, are the following (Table VI):

Acacia caffra
Acacia davyi
Annona senagalensis
Dombeya rotundifolia
Faurea saligna
Peltophorum africanum
Sclerocarya birrea
Sterculia murex

Acalypha petiolaris
Aloe longibracteata
Gerbera jamesonii
Inula glomerata
Lannea edulis
Bothriochloa glabra
Pavetta schumanniana

These species are thus fairly typical of the Ecological-Formation Class.

General

Floristic affinities with other syntaxa are varied. Species-Group 75 (Table III), for example, links Woodland and Xeric Thicket of the Low Country with more mesic thicket of the previous ecological-formation class (Section 4.2.1). Species such as Bridelia micrantha, Combretum molle, Parinari curatellifolia and Heteropyxis natalensis thus demonstrate their adaptability to the variable moisture regimes of the Foothills Zone (Table V).

Relationships with both Woodland and Grassland of the Humid Misbelt are expressed by species with an even greater ecological amplitude. These include the grasses Loudetia simplex, Rhynchelytrum "complex" and Themeda triandra; and the forbs Clutia monticola, Helichrysum sp., and Senecio oxyriifolius (Table III (143)). It is evident from Table V that these species are well adapted in thicket, woodland and grassland of all the physiographic zones. They are, moreover, well adapted to all climatic belts. Their predominance on upper-pediment slopes is usually independent of aspect, lithology or soil depth, and they are clearly fire-resistant. Their absence from more shaded Forest and Mesic Thicket of the Mistbelt and Low Country is an expression of their heliophytic character.

In contrast to Forest and Mesic Thicket of the Mistbelt and Low Country, the field layer in Woodland and Xeric Thicket of the Low Country is usually dominated by grasses rather than by forbs and herbs. The influence of fire, as well as the generally drier conditions in the latter, may account for this. The most widespread species are Loudetia simplex, Hyperthelia dissoluta, Panicum maximum and Themeda triandra.

(B) Component Vegetation Types

Woodland and Xeric Thicket of the Low Country comprises three vegetation types (Fig. 4.2) that are differentiated and named on the basis of characteristic habitat features (Fig. 4.19 and Tables IV B and V):

4.2.2.1 Partially sheltered Woodland and Thicket (75-95% cover) on fairly shallow soils of the Lower Foothills.

4.2.2.2 Less-sheltered Woodland and Thicket (95-100% cover) on fairly deep soils of the Upper Foothills.

4.2.2.3 Woodland and Shrubland on exposed granite outcrops.

4.2.2.1 Partially sheltered Woodland and Thicket (75-95% cover) on fairly shallow soils of the Lower Foothills

(a) General Characteristics

This vegetation type occurs exclusively in the Low Country, on gently to moderately sloping upper-pediment slopes or midslope planes, between 500 and 867 m elevation. Soils are fairly shallow with up to 34 per cent rock outcrop (Table IV B).

Species-Groups 8 and 9 (Table II B) are diagnostic. Notable members include the trees Rhus pentheri, Maytenus undata, Celtis africana, Pavetta schumanniana and Strychnos spinosa. Of these, only the latter two are local character species for the Vegetation Type (Table III (49)). Amongst the shrubs, only Pappea capensis and Hypoestes aristata qualify as local character species (Table III (49)). Other differential species include Rynchosia caribaea, Stylochiton natalense, Ochna natalitia and Cissampelos torulosa (Table II B (9)). Common dominants in the Vegetation Type are the grass Panicum "complex"[1] (probably P. maximum) and the shrubby tree Bauhinia galpinii.

Floristic affinities with other syntaxa are manifold. Species-Groups 22 and 27 (Table II B), for example, link the Vegetation Type with Less-sheltered Woodland and Thicket on fairly deep soils of the Upper Foothills (Vegetation Type 4.2.2.2). Tree species such as Dombeya rotundifolia, Heteropyxis natalensis, Annona senegalensis, Cussonia spicata, Acacia davyi and Dichrostachys cinerea "complex" are notable in this respect, as is the grass Themeda triandra. This relationship is extended to both Woodland and Grassland of the Humid Mistbelt by Species-Group 134 (Table III), comprising the shrub Indigofera swaziensis; the forbs Helichrysum nudifolium, Gerbera aurantiaca, Pseudarthria hookeri and Aristea woodii; and the grasses Setaria

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[1] Herbarium records indicate that P. maximum is the more commonly occurring species of the complex.

sphacelata and Cymbopogon "complex". These species thus exhibit a wide ecological amplitude. The Vegetation Type is linked to Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3) by the absence of the Eulalia villosa Species-Group (Table III (133)). The xeric conditions associated with shallow sandier soils is probably a factor influencing the exclusion of these more mesic species (Table IV B).

Relationships with syntaxa in Forest and Mesic Thicket of the Mistbelt and Low Country have already been mentioned in Section 4.2.1 (cf. Table III (50, 53 and 55)).

(b) Constituent Syntaxa

Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1) is represented by six communities. Two of these, namely Communities 21 and 22, are further classified to the level of variant (Fig. 4.2):

20. Monanthotaxis caffra - Rhus pentheri Short Thicket
21. Combretum collinum subsp. gazense - Panicum maximum Short Closed Woodland
21A. Setaria sphacelata - Combretum collinum subsp. gazense - Panicum maximum Variant
21B. Sclerocarya birrea susbp. caffra - Combretum collinum subsp. gazense - Panicum maximum Variant
22. Hyparrhenia gazensis - Bauhinia galpinii Short Thicket
22A. Ocimum urticifolium - Hyparrhenia gazensis - Bauhinia galpinii Variant
22B. Sphenostylis marginata subsp. marginata - Hyparrhenia gazensis - Bauhinia galpinii Variant
23. Faurea saligna - Bauhinia galpinii Short Thicket
24. Pterocarpus angolensis - Bauhinia galpinii Short Thicket
25. Rhoicissus tomentosa - Bauhinia galpinii Short Thicket

Community 20.

Monanthotaxis caffra - Rhus pentheri Short Thicket

Type Relevé: 149 (Tables II B and IV B)

This short thicket community is represented by six relevés situated at about 600 m elevation on the farm Sandford (Table IV B).

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II B. Characteristic habitat features are notable, nevertheless. These include the gently sloping upper-pediment slopes and midslope planes formed by diabase ridges, where rock outcrops may cover as much as 34 per cent of the ground surface. Aspect appears not to greatly affect floristic composition on these sites.

Structure

The structural attributes of the vegetation of the type relevé (149) are as follows:

Canopy and understorey	(3,0-12,0 m)	70% cover
Shrub layer	(1,0- 3,0 m)	50% cover
Field layer	(0,0- 1,0 m)	50% cover

Lianes assume minimal importance.

Floristics

Community 20 is differentiated by Species-Group 1 (Table II B). Species include the shrubby climber Monanthotaxis caffra, the tree Mimusops zeyheri, and the herbs Eulophia streptopetala and Scadoxus multiflorus. The epiphytic orchid Ansellia gigantea also features. None of these are local character species for the Community, however (Table III). The absence of Species-Group 8 (Table II B) from the Vegetation Type is also fairly diagnostic. The absence of Acalypha petiolaris and Tephrosia "complex" is especially significant in this respect. The presence of the Abrus laevigatus Species-Group (Table II B (3)) and the absence of the Senecio venosus Species-Group (Table II B (2)) is also fairly diagnostic.

Other general and infrequent species, whose presence in the Community distinguishes it from other communities in the Vegetation Type, include the more mesophytic trees Ochna holstii, Rapanea melanophloeos, Tecomaria capensis and Trichilia emetica; the shrubs Dicliptera clinopodia and Laportea peduncularis; and the herbaceous elements Dietes iridioides, Carex spicato-paniculata and Senecio tamoides.

Dominant canopy trees are Zanthoxylum davyi and Acacia ataxacantha, frequently in association with Catha edulis and Mimusops zeyheri. In the understorey, Maytenus undata and Rhus pentheri are often dominant, whilst in the shrub layer Rhoicissus tridentata is well represented.

General

Affinities with other syntaxa are expressed more through single species than through large species-groups. Affinities with Forest and Mesic Thicket, for example, are indicated by the following species: *Rhoicissus rhomboidea*, *Rapanea melanophloes*, *Ochna holstii*, *Senecio tamoides*, *Carex spicato-paniculata*, *Dicliptera clinopodia*, *Dombeya pulchra*, *Dalbergia armata* and *Dietes iridioides*. *Bequaertiodendron magalismontanum* and *Apodytes dimidiata*, besides indicating this affinity, also indicate an affinity with Woodland of the Humid Mistbelt (Table III (96)).

These affinities with more mesic Mistbelt syntaxa can perhaps be explained in terms of the Community inhabiting sheltered sites in the Low Country (Table V). Thus it enjoys some relief from the surrounding xeric conditions, and the vegetation consequently manifests more mesic characteristics.

Community 21.
Combretum collinum subsp. *gazense* - *Panicum maximum* Short
Closed Woodland

This short closed-woodland community (Fig. 4.20) is represented by twelve relevés situated mainly at about 550 m elevation on the farms Sandford and De Rust (Table IV B). It has two variants, 21A and 21B.

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II B. The short closed-woodland formation, combined with the tendency toward fairly shallow sandy soils, is nevertheless fairly characteristic (Table IV B). Slopes are generally xeroclinal with gentle to moderate gradients. The cover of rocky outcrops ranges from less than 1 per cent to 34 per cent, and there appears to be little colour distinction between soil horizons.

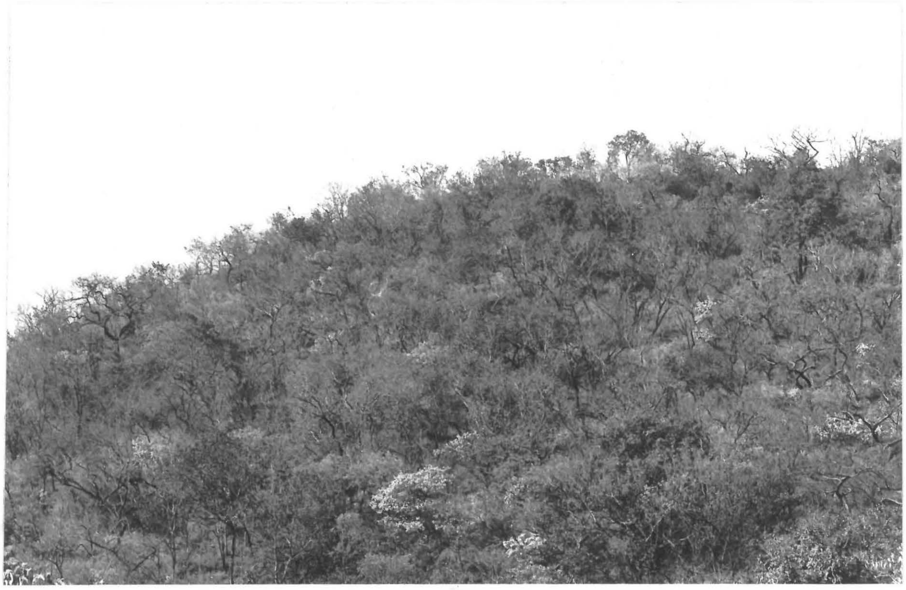
Structure

The structural attributes of the vegetation of the Community will be discussed under the variants into which it is divided (see Variants 21A and 21B below).

FIG. 4.20 Community 21: Combretum collinum subsp. gazense - Panicum maximum Short Closed Woodland (Relevés 138 and 141). Dry conditions discourage the dominance of shrubby scramblers such as Acacia ataxacantha and Bauhinia galpinii (Photo P.J. Weisser).

FIG. 4.21 Variant 21A: Setaria sphacelata - Combretum collinum subsp. gazense - Panicum maximum Short Closed Woodland (Relevé 143). Note Faurea saligna (dark bark, left foreground) and Heteropyxis natalensis (pale bark, background).

FIG. 4.22 Variant 21B: Sclerocarya birrea subsp. caffra - Combretum collinum subsp. gazense - Panicum maximum Short Closed Woodland (Relevé 145). Note the dominance of Pterocarpus angolensis (deciduous trees in foreground) and Terminalia sericea (pale-leaved trees in background). The conspicuous grass is Hyperthelia dissoluta.



4.20

4.21

4.22

Floristics

Community 21 is differentiated by Species-Group 2 (Table II B). All member-species, except the tree Maytenus mossambicensis and the forb Vernonia natalensis, are local character species, moreover (Table III (42)). These include the trees Combretum collinum subsp. gazense, Terminalia sericea, Lannea discolor, Diospyros mespiliformis and Strychnos madagascariensis; the shrub Phyllanthus reticulatus; and the forbs Senecio venosus and Chaetacanthus burchellii.

Other species, whose presence in the Vegetation Type is an indication of Community 21, include the trees Berchemia zeyheri and Grewia monticola, the shrub Vernonia colorata, and the forbs Cryptolepis oblongifolia and Crassula acinaciformis. Those whose absence in this respect is notable include the small tree Grewia occidentalis.

A common dominant in the field layer of the Community is the grass Panicum "complex" (probably P. maximum). The succulent Aloe barbertoniae is sometimes co-dominant. In the canopy, Combretum collinum subsp. suluense and Heteropyxis natalensis are often dominant. The dry conditions in the Community discourage shrubby scramblers such as Acacia ataxacantha and Bauhinia galpinii from attaining dominance, and the vegetation is thus maintained as woodland rather than thicket (Fig. 4.20).

General

Floristic affinity with a more sheltered thicket on less sandy soils (i.e. Community 20) is indicated by Species-Groups 3 (Table II B) and 43 (Table III). Common species include the woody elements Securinega virosa, Kraussia floribunda, Canthium mundianum, Lantana camara, Gardenia amoena, Xeromphis rudis and Asparagus racemosus. The large succulent tree Euphorbia ingens and the twiners Abrus laevigatus and Momordica boivinii are also included.

A weak affinity with Grassland of the Humid Mistbelt, and with Less-sheltered Woodland and Thicket on fairly deep soils of the Upper Foothills (Vegetation Type 4.2.2.2), is expressed by the forb Crabbea hirsuta (Table III (70)). Similarly, Maytenus mossambicensis indicates a relationship with Forest and Mesic Thicket of the Mistbelt and Low Country (Table III (40)).

Variant 21A.
Setaria sphacelata - Combretum collinum subsp. gazense - Panicum maximum
Short Closed Woodland
Type Relevé: 138 (Tables II B and IV B)

This short closed-woodland variant (Fig. 4.21) is represented by five relevés scattered widely on the Lower Foothills between 500 and 867 m elevation (Table IV B).

Habitat

Minor distinctions in habitat between this variant and Variant 21B are apparent. Whereas Variant 21B is subject to disturbance by grazing, this variant is subject to disturbance by burning. Also, whether as a consequence of disturbance factors or not, the vegetation cover of Variant 21A is greater than Variant 21B (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (138) are as follows:

Canopy and understorey	(4,0-10,0 m)	70% cover
Shrub layer	(1,5- 4,0 m)	10% cover
Field layer	(0,0- 1,5 m)	50% cover

Relevé 181 differs markedly from the type relevé, its shrub layer having a cover of 55 per cent. It is therefore a short thicket rather than a closed woodland.

Floristics

Variant 21A is marked by a lack of differential species. The presence of Species-Group 25 (Table II B) in Community 21 is nevertheless fairly diagnostic. Indicator species include the grasses Setaria sphacelata and Cymbopogon "complex", and the forb Helichrysum nudifolium.

Other species, whose presence in the Variant distinguishes it from Variant 21B, include the grass Hyparrhenia filipendula "complex", the trees Parinari curatellifolia and Rhus pyroides, the forb Athrixia phylicoides, and the delicate creeper Rhynchosia totta.

Besides those mentioned for Community 21, there are dominant species that are specific to the Variant. Dominant trees in the canopy include Euclea "complex". Panicum "complex" is dominant in the field layer.

General

Species-Group 25 (Table II B) links Variant 21A with Less-sheltered Woodland and Thicket on fairly deep soils of the Upper Foothills (Vegetation Type 4.2.2.2). Helichrysum nudifolium, Setaria sphacelata and Cymbopogon "complex" are the components expressing this affinity. It is extended to both Woodland and Grassland of the Humid Mistbelt by the grass Hyparrhenia filipendula "complex" and the robust herb Hypoxis "complex" (Table III (133)).

A weak floristic affinity with More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2), and with Community 36, is expressed by the fern Pellaea calomelanos (Table III (104)). The field layer is characteristically dominated by grasses. Whereas Panicum maximum usually dominates shady areas, Hyperthelia dissoluta is associated with sunny, exposed areas. These preferences may reflect differences in nutrient and/or light regime under, and outside, the canopy.

Variant 21B.
Sclerocarya birrea subsp. caffra - Combretum collinum subsp. gazense - Panicum maximum Short Closed Woodland
Type Relevé: 174 (Tables II B and IV B).

This short closed-woodland variant (Fig. 4.22) is represented by seven relevés situated mainly on the farm Sandford between 500 and 650 m elevation (Table IV A).

Habitat

Factors which distinguish the Variant from the former one (21A) are the prevalence of grazing and the greater proportion of diabase rock (Table IV B). Also, the soil in two relevés is exceptionally deep and is probably sometimes alluvial in origin (Relevés 145 and 150, Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (174) are as follows:

Canopy and understorey	(2,0-15,0 m)	75% cover
Shrub layer	(1,0- 2,0 m)	20% cover
Field layer	(0,0- 1,0 m)	55% cover

Relevé 166 represents the only gross departure from this structural pattern. Its understorey and shrub layer (up to 4 m high) together cover 80 per cent of the relevé, and the vegetation is classed as thicket.Its sheltered position may account for the anomaly.

Floristics

Variant 21B is marked by a lack of differential species. The presence of the trees Diospyros whyteana, Gardenia amoena and Sclerocarya birrea, with the grass Heteropogon contortus, is nevertheless a diagnostic feature in the context of Community 21.

Besides those already mentioned for Community 21, there are dominant species that are specific to the Variant. Dominant canopy trees include Pterocarpus rotundifolius, as well as Pterocarpus angolensis, Terminalia sericea, Combretum zeyheri and Acacia ataxacantha on occasions (Fig. 4.22). Panicum "complex" is dominant in the field layer.

General

On sandy lower-pediment slopes, termitaria are common. They support bush clumps whose floristic composition is quite distinct from the surrounding vegetation. Conspicuous trees in these clumps are Olea europaea, Diospyros mespiliformis, Annona senegalensis, Mimusops zeyheri, Maytenus undata, Bridelia micrantha and Cussonia spicata. These more mesophytic species all reflect the enhanced water-holding capacity of the more clayey and humic soils associated with termitaria. Enhanced nitrogen status may also play a rôle (cf. Van der Schijff, 1965).

Community 22.
Hyparrhenia gazensis - Bauhinia galpinii Short Thicket

This short thicket community is found on the Foothills at about 700 m elevation and is represented by five relevés situated mainly on the farms Evert and Emmett (Table IV B). It has two variants, 22A and 22B.

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II B. The Community occurs mainly on moderately sloping upper-pediment slopes. Where it occurs on lower-pediment slopes, the physiognomy tends toward closed woodland rather than thicket (Table III B).

Structure

The structural attributes of the vegetation of the Community will be discussed under the variants into which it is divided (see Variants 22A and 22B below).

Floristics

Community 22 is differentiated by Species-Group 4 (Table II B), whose members are all local character species for the Community (Table III (45)). They include the tree *Euclea natalensis*, the twiner *Glycine wightii*, the forb *Triumfetta pilosa* var. *pilosa*, and the grass *Hyparrhenia gazensis*.

Other species, whose presence in the Vegetation Type is a fairly good indication of Community 22, include the grass *Rhynchelytrum* "complex" and the forb *Blumea alata*. Those whose absence in this context is indicative include the climber *Dioscorea* "complex" and the herb *Stylochiton natalense*.

Dominant elements in the canopy include *Dombeya rotundifolia* and *Acacia ataxacantha*, whilst those in the understorey include *Maytenus heterophylla* and *Bauhinia galpinii*. In the field layer, *Asparagus virgatus* is often dominant.

General

Community 22 is linked to Communities 33, 34, 35, 37 and 38 by the absence of the *Bridelia micrantha* Species-Group (Table III (75)).

Variant 22A.

Ocimum urticifolium - Hyparrhenia gazensis - Bauhinia galpinii Short Thicket

Type Relevé: 24 (Tables II B and IV B)

This variant (Fig. 4.23) tends to be a mosaic of closed woodland and thicket occurring between 623 and 744 m elevation on the Lower Foothills. It is represented by three relevés (Table IV B).

Habitat

Soils in Variant 22A are fairly shallow and derived from Nelspruit Granite. Their A horizon is generally brown, and the degree of rockiness ranges between 5 and 34 per cent.

Structure

The structural attributes of the vegetation of the type relevé (24) are as follows:

Canopy	(6,0-10,0 m)	70% cover
Understorey	(2,0- 6,0 m)	50% cover
Shrub layer	(1,0- 2,0 m)	50% cover
Field layer	(0,0- 1,0 m)	50% cover

Lianes are not well represented.

Floristics

Variant 22A is differentiated by one local character species, namely the small shrub Ocimum urticifolium (Tables II B (5) and III (46)). Another fairly diagnostic feature is the absence of Euclea "complex", Annona senegalensis and Smilax kraussiana from the Vegetation Type. Conversely, the presence of Canthium gilfillanii, Choristylis rhamnoides, Flacourtia indica, Entada spicata, Tragia rupestris and Sida dregei is fairly typical.

Besides those mentioned for Community 22, there are dominant species that are specific to the Variant. Combretum collinum subsp. suluense and Pterocarpus rotundifolius are dominant in the canopy, whilst Indigofera swaziensis is often dominant in the shrub layer.

FIG. 4.23 Variant 22A: _Ocimum urticifolium_ - _Hyparrhenia gazensis_ - _Bauhinia galpinii_ Short Thicket (Relevé 15). The young tree in the foreground is probably _Combretum collinum_ subsp. _suluense_, whilst the grasses are predominantly _Hyparrhenia gazensis_ and _Hyperthelia dissoluta_.

FIG. 4.24 Community 24: _Pterocarpus angolensis_ - _Bauhinia galpinii_ Short Thicket, sometimes represented by Short Closed Woodland (Relevé 14). Note the trees _Cussonia spicata_ and _Euphorbia ingens_, prominent on the right and left, respectively.

4.23

4.24

General

Relationship with the Monanthotaxis caffra - Rhus pentheri Short Thicket (Community 20) is indicated by the epiphytic orchid Ansellia gigantea (Table II B (1)), and by the absence of Faurea speciosa and Rhynchosia komatiensis (Table III (90)). Similarly, Entada spicata and Zanthoxylum capense indicate an affinity with Tall Forest associated with Diabase intrusions of the Escarpment Slopes (Vegetation Type 4.2.1.3).

Variant 22A is linked to Communities 32, 33, 34 and 35 by the absence of the Smilax kraussiana Species-Group (Table III (101)).

Variant 22B.
Sphenostylis marginata subsp. marginata - Hyparrhenia gazensis - Bauhinia galpinii Short Thicket
Type Relevé: 21 (Tables II B and IV B)

This variant is found at about 750 m elevation on the Upper Foothills. It is represented by two relevés varying between Low and Short Thicket (Table IV B).

Habitat

In contrast to the previous variant, soils are fairly deep, less sandy, and derived from Transvaal Diabase. Their A horizons are red as opposed to brown, and the degree of rockiness is greater, ranging from 35 to 84 per cent (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (21) are as follows:

Canopy and understorey	(4,0-8,0 m)	60% cover
Shrub layer	(1,0-4,0 m)	80% cover
Field layer	(0,0-1,0 m)	30% cover

Lianes are not well represented.

Floristics

Variant 22B is differentiated by two local character species, namely the woody hemiparasitic epiphytic bush Erianthemum dregei and the climber Sphenostylis marginata (Tables II B (6) and III (47)).

Other species, whose absence from the Vegetation Type is a fairly good indication of Variant 22B, include the trees Strychnos spinosa, Maytenus undata and Heteropyxis natalensis; the shrub Indigofera swaziensis; and the grass Hyperthelia dissoluta. Conversely, the presence of the tree Combretum kraussii is also indicative of Variant 22B.

Besides those mentioned for Community 22, there are dominant species that are specific to the Variant. In the canopy, Cussonia spicata and Ziziphus mucronata are often dominant, whilst in the understorey Annona senegalensis and Rhus pyroides are dominant. In the field layer, Rhynchosia komatiensis and Athrixia phylicoides are small dominant shrubs and Panicum "complex" and Themeda triandra are dominant grasses.

General

Variant 22B is related to Forest and Mesic Thicket of the Mistbelt and Low Country by the tree Combretum kraussii (Table III (20)). The absence of the grasses Hyperthelia dissoluta and Heteropogon contortus is noteworthy (Table III (77)).

Community 23.
Faurea saligna - Bauhinia galpinii Short Thicket
Type Relevé: 177 (Tables II B and IV B)

This short thicket community occurs in the Foothills on the farms Evert and Abek, between 550 and 800 m elevation. It is represented by five relevés.

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II B. The Community is found on moderately sloping upper-pediment slopes. Physiognomy varies according to various environmental factors. On granite-derived sandy loams of exposed sites influenced by fire, the vegetation tends to be open to closed woodland (cf. Relevés 19 and 20).

Thicket, on the other hand, tends to develop on diabase-derived sandy clays of partially sheltered sites (cf.Relevés 26, 169 and 177) (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (177) are as follows:

Canopy and understorey	(4,0-10,0 m)	15% cover
Shrub layer	(0,5- 4,0 m)	85% cover
Field layer	(0,0- 0,5 m)	60% cover

Twiners and climbers are numerous, but lianes are not well represented. In the more open-woodland formations, the shrub layer is absent.

Floristics

Community 23 is marked by a lack of differential species. It can nevertheless be distinguished from Community 24 and 25 by the absence of the Bequaertiodendron magalismontanum Species-Group (Table III (96)). Another floristic distinction between Community 23 and Community 24 is the relative scarcity of the trees Parinari curatellifolia and Pterocarpus angolensis in the former (Table II B (31)).

General and infrequent species, whose presence in the Vegetation Type may indicate Community 23, are the climbers Secamone gerrardii, Cyphostemma simulans and Sphedamnocarpus pruriens var. pruriens. The absence of the tree Celtis africana in this context may be equally indicative.

In the true thicket, Acacia ataxacantha and Bauhinia galpinii are dominant in the canopy and shrub layer respectively. Faurea saligna is also dominant in the canopy, ocasionally. In the more open-woodland formation, where the shrub layer is absent, Pterocarpus rotundifolius and Combretum collinum subsp. suluense are dominant in the canopy, whilst the grass Hyperthelia dissoluta is dominant in the field layer.

General

Relationship with the Setaria sphacelata - Combretum collinum subsp. gazense - Panicum maximum Variant (21A), and with Less-sheltered Woodland and

Thicket on fairly deep soils of the Upper Foothills (Vegetation Type 4.2.2.2), is indicated by the Setaria sphacelata Species-Group (Table II B (25)).

Fire is apparently responsible for suppressing the development of the shrub layer and for maintaining a predominantly grassy field layer. Thus grasses such as Setaria sphacelata, Loudetia simplex and Hyperthelia dissoluta are found in association with fire-resistant trees such as Faurea saligna, Terminalia sericea, Dichrostachys cinerea "complex" and Combretum zeyheri (cf.Relevés 19 and 20). With fire-protection, other trees and shrubs such as Dombeya rotundifolia, Maytenus heterophylla and Bauhinia galpinii are able to establish themselves together with field-layer species such as Panicum "complex", Rhynchosia komatiensis and Asparagus virgatus. In time, further colonization by trees such as Acacia ataxacantha, Euclea "complex", Combretum molle and Rhus transvaalensis leads to the development of thicket (cf. Relevés 26, 169 and 177).

Community 24.
Pterocarpus angolensis - Bauhinia galpinii Short Thicket
Type Relevé: 175 (Tables II B and IV B)

This community is physiognomically variable, sometimes occurring as short thicket but often also occurring as closed and open woodland (Fig. 4.24). It is represented by eight relevés widely scattered on the Foothills between 520 and 820 m elevation (Table IV B).

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II B. The substrate is usually Nelspruit Granite, and soils of the A horizon range from black loamy sands to brown sandy clay loams. As in Community 23, fire appears to be an important factor in maintaining the vegetation as woodland rather than thicket (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (175) are as follows:

Canopy and understorey	(6,0-15,0 m)	40% cover
Shrub layer	(0,5- 6,0 m)	80% cover
Field layer	(0,0- 0,5 m)	15% cover

In the more open-woodland phase, the shrub layer is absent.

Floristics

Community 24 is marked by a lack of differential species. As mentioned earlier, it can be distinguished from the Faurea saligna - Bauhinia galpinii Short Thicket by the presence of the Bequaertiodendron magalismontanum Species-Group (Table III (96)).

Other species, whose presence in the Vegetation Type is a fairly good indication of Community 24, include the xerophytes Ceratotheca triloba and Vernonia poskeana, and the sedge Coleochloa setifera. The presence of the forb Polygala hottentotta is also fairly significant.

Dominant canopy species include Heteropyxis natalensis, Pterocarpus angolensis, Acacia ataxacantha, and occasionally Faurea saligna. In the shrub layer, Bauhinia galpinii and Annona senegalensis are dominant, whilst Asparagus "complex" and Loudetia simplex are often dominant in the field layer.

General

Relationship with Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3) is indicated by the xerophytes Ceratotheca triloba, Vernonia poskeana and Coleochloa setifera. This relationship applies to only two relevés, however (notably Relevé 179), thus emphasizing the ecotonal nature of the Community.

It is proposed that as soil formation proceeds on early lithoseral sites such as Relevés 179, 14 and 184, tree species such as Faurea saligna, Pterocarpus angolensis and Terminalia sericea begin to assume importance. With fire-protection, these trees form colonization centres for species such as Bauhinia galpinii, Antidesma venosum and Smilax kraussiana. These are the precursors of the thicket formations (Relevés 17, 158, 171 and 175). With burning, however, only fire-resistant trees such as Faurea saligna, Parinari curatellifolia and Acacia davyi survive, and grasses such as Themeda triandra and Loudetia simplex become dominant in the field layer (cf. Relevé 180).

Community 25.
Rhoicissus tomentosa - Bauhinia galpinii Short Thicket
Type Relevé: 190 (Tables II B and IV B)

This short thicket community is widely dispersed on the Upper Foothills between 750 and 850 m elevation. It is represented by two relevés (Table IV B).

Habitat

Factors influencing floristic differentiation are not immediately apparent from Table II B. There is, moreover, considerable diversity between the two relevés. Whereas Relevé 190 is situated on a granite knoll where rock cover is 85 to 100 per cent, and where soils are brown loamy sands; Relevé 27 is situated on a lower-pediment slope where rock outcrop is minimal, and where soils are diabase-influenced sandy clays (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (190) are as follows:

Canopy and understorey	(2,0-10,0 m)	70% cover
Shrub layer	(0,5- 2,0 m)	40% cover
Field layer	(0,0- 0,5 m)	20% cover

On the less rocky lower-pediment slope (Relevé 27), the shrub and field layers are considerably more dense.

Floristics

Community 25 is marked by a lack of differential species. The presence of Species-Groups 8 and 9 (Table II B) and the absence of Species-Group 7 (Table II B) is nevertheless fairly diagnostic. Community 25 may be indicated, for instance, when Rhus pentheri, Maytenus undata and Celtis africana occur unaccompanied by Combretum collinum subsp. suluense.

Other species, whose absence in the Vegetation Type may indicate Community 25, are the trees *Peltophorum africanum*, *Ziziphus mucronata*, *Dombeya rotundifolia* and *Acacia davyi*. Those whose presence in this context may indicate Community 25 are the trees *Clausena anisata* and *Psychotria capensis*, with the climber *Toddalia asiatica*.

In the canopy, dominant species include *Parinari curatellifolia*, *Acacia ataxacantha* and *Rhus pentheri*. *Bauhinia galpinii* dominates the shrub layer, whilst the spiny liane *Dalbergia armata* is occasionally dominant throughout all strata.

General

Community 25 is related to the sheltered *Monanthotaxis caffra* - *Rhus pentheri* Short Thicket (Community 20) by the absence of both the *Dichrostachys cinerea* "complex" Species-Group (Table II B (27)), and the *Loudetia simplex* Species-Group (Table III (143)). This relationship indicates the relatively mesic quality of Community 25. The presence of the shrub *Clausena anisata*, a differential species of Tall/Short Forest on soils derived from Upper Dolomite of the Lower Mountains (Vegetation Type 4.2.1.1), further emphasizes this quality (Table III (3).

Relationship with Forest and Mesic Thicket of the Mistbelt and Low Country, and with More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2), is indicated by the *Psychotria capensis* Species-Group (Table III (100)). This relationship is further extended to the *Ceratotheca triloba* - *Bequaertiodendron magalismontanum* Low Open Woodland (Community 36) by the *Bequaertiodendron magalismontanum* Species-Group (Table III (96)).

4.2.2.2 Less-sheltered Woodland and Thicket (95-100% cover) on fairly deep soils of the Upper Foothills

(a) General Characteristics

Besides one community occurring in the Transitional Mistbelt, the Vegetation Type is confined to the Low Country between 623 and 989 m elevation. Physiognomy is predominantly woodland, which is sometimes disturbed by burning or grazing. The terrain consists mainly of exposed, gently sloping, xeroclinal upper-pediment slopes with comparatively little rock outcrop. Soil depth is highly variable (Table IV B).

The presence of Species-Group 27 (Table II B) and the absence of Species-Group 8 (Table II B) is diagnostic. When Dichrostachys cinerea and Themeda triandra occur unaccompanied by Acalypha petiolaris, Pavetta schumanniana, Strychnos spinosa and Hypoestes aristata, for example, then the Vegetation Type is indicated.

In the Woodland and Xeric Thicket of the Low Country context, Species-Group 133 (Table III) (comprising the grasses Eulalia villosa, Schizachyrium sanguineum and Hyparrhenia filipendula "complex"; and the forb Hypoxis "complex") is also indicative of the Vegetation Type.

Common dominants include the tree Parinari curatellifolia and the grass Hyperthelia dissoluta. Floristic affinity with both Woodland and Grassland of the Humid Mistbelt is indicated by the Eulalia villosa Species-Group (Table III (133)), and this affinity is extended to Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1) by the Indigofera swaziensis Species-Group (Table III (134)). The Loudetia simplex Species-Group (Table III (143)) further extends the affinity to the remainder of the Ecological-Formation Class, whilst the Cryptolepis oblongifolia Species-Group (Table III (123)) indicates a more restricted affinity with the Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland (Community 36).

(b) Constituent Syntaxa

Less-sheltered Woodland and Thicket on fairly deep soils of the Upper Foothills (Vegetation Type 4.2.2.2) is represented by ten communities (Fig. 4.2):

26. Dicoma zeyheri - Parinari curatellifolia Short Thicket
27. Rhynchosia sordida - Parinari curatellifolia Short Closed Woodland
28. Mucuna coriacea subsp. irritans - Antidesma venosum Low Thicket
29. Trachypogon spicatus - Parinari curatellifolia Short Open Woodland
30. Diheteropogon amplectens - Parinari curatellifolia Low Open Woodland
31. Vernonia natalensis - Parinari curatellifolia Short Open Woodland
32. Andropogon schirensis var. angustifolia - Parinari curatellifolia Short Open Woodland
33. Acacia davyi - Hyperthelia dissoluta Low Sparse Woodland
34. Vernonia centaurioides - Hyperthelia dissoluta Low Sparse Woodland
35. Bothriochloa glabra - Hyperthelia dissoluta Short Sparse Woodland

Community 26.

Dicoma zeyheri - Parinari curatellifolia Short Thicket

Type Relevé: 5 (Tables II B and IV B)

This short thicket community of the Upper Foothills is physiognomically variable, sometimes also manifesting as short closed woodland (cf. Relevé 3, Fig. 4.25). It is represented by two relevés situated at about 750 m elevation on the spur extending north-west from Zeederberg.

Habitat

Factors possibly influencing floristic differentiation include the strongly acid soils (Table II B). The unusually low pH may stem from considerable leaching of granite soils on upper-pediment slopes. Such causes may be further compounded by the fairly steep and xeroclinal nature of the slopes. Relevé 3, for example, appears to be in a shallow drainage channel. This may account for the Relevé's fairly deep sandy loams (Table IV B).

Structure

The stuctural attributes of the vegetation of the type relevé (5) are as follows:

Canopy	(4,0-8,0 m)	50% cover
Understorey and shrub layer	(1,5-4,0 m)	60% cover
Field layer	(0,0-1,5 m)	70% cover

In Relevé 3, the shrub layer is less well developed (Fig. 4.25).

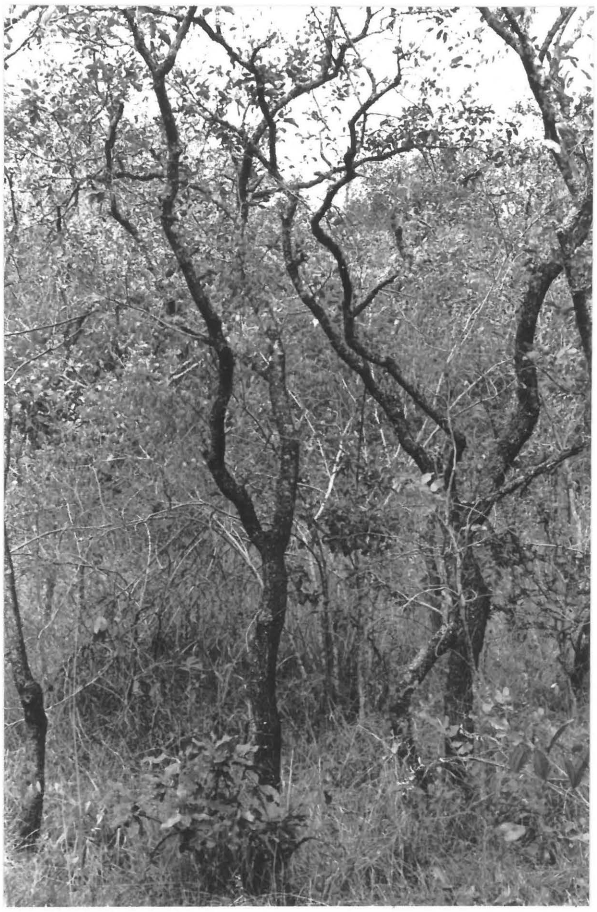
Floristics

Local character species for Community 26 are the forbs Ipomoea crassipes, Aster sp. and Dicoma zeyheri; and the twiner Thunbergia atriplicifolia (Table III (54)). Other species, diagnostic in the Ecological-Formation Class context, include the exotic climber Passiflora edulis, the epiphyte Tridactyle tricuspis, and the small tree Trimeria grandifolia (Table II B (10)).

Other species, whose presence in the Vegetation Type may indicate Community 26, include the trees Zanthoxylum davyi and Catha edulis, the forbs Galopina

FIG. 4.25 Community 26: Dicoma zeyheri - Parinari curatellifolia Short Thicket, sometimes represented by Short Closed Woodland (Relevé 3). Note the predominance of the tree Parinari curatellifolia in the foreground. The grass Loudetia simplex dominates the field layer.

FIG. 4.26 Community 29: Trachypogon spicatus - Parinari curatellifolia Short Open Woodland (Relevé 160), with Faurea saligna and Parinari curatellifolia the dominant trees; and Loudetia simplex and Themeda triandra the dominant grasses.



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circaeoides and Triumfetta rhomboidea, the grass Cleistachne sorghoides, and the climber Sphenostylis marginata.

Dominant canopy species include Parinari curatellifolia and Pterocarpus angolensis. Co-dominant in the canopy are Bridelia micrantha, Combretum molle and Acacia ataxacantha. In the understorey and shrub layer, Catha edulis, Faurea speciosa, Diospyros whyteana, Bauhinia galpinii, Smilax kraussiana and Flemingia grahamiana are dominant. In the closed-woodland formations (cf. Relevé 3), grasses such as Loudetia simplex are dominant in the field layer (Fig. 4.25). With increasing shrubbiness, however,the grasses are replaced by forbs and herbs.

General

Relationship with some syntaxa of Forest and Mesic Thicket of the Mistbelt and Low Country is expressed by species such as Pittosporum viridiflorum, Endostemon obtusifolius, Brachylaena discolor, Carex spicato-paniculata and Dicliptera clinopodia (Table III). The Psychotria capensis Species-Group (Table III (100)) highlights this relationship and indicates another coincident affinity with Woodland of the Humid Mistbelt. Community 26 thus clearly displays an affinity with the more mesic, woody syntaxa of the study area.

Community 27.
Rhynchosia sordida - Parinari curatellifolia Short Closed Woodland
Type Relevé: 163 (Tables II B and IV B)

This short closed-woodland community is represented by two physiognomically variable relevés occurring at about 700 m elevation on the Upper Foothills. In more disturbed situations, especially those related to cultivation, the physiognomy is more like low open woodland (Relevé 10, Table IV B).

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II B. Generally, the Community occurs on gentle mesoclinal slopes with relatively few rock outcrops (Table II B). In short closed woodland of sheltered midslope planes (Relevé 163), the diabase soils are clayey in the lower horizons (Table IV B). These factors may all operate together in improving the moisture status of the site. The granite soils of the low open woodland on exposed upper-pediment slopes (Relevé 10) tend to be more acid and coarse-textured.

Structure

The structural attributes of the vegetation of the type relevé (163) are as follows:

Canopy and understorey	(2,0-15,0 m)	60% cover
Shrub layer	(1,0- 2,0 m)	40% cover
Field layer	(0,0- 1,0 m)	75% cover

In low open woodland (Relevé 10), the field and shrub layers are more dense, whilst the canopy and understorey are less dense.

Floristics

Local character species for the Community are the forbs Rhynchosia sordida and Senecio serratuloides (Tables II B (12) and III (56)). Other more infrequent species, whose presence in the Vegetation Type may be an indication of Community 27, include the shrubs Indigofera tristoides and Rhus intermedia; the forbs Clutia abyssinica, Eriospermum cooperi and Knowltonia transvaalensis; and the sedge Rhynchospora brownii.

Dominant species in the canopy include Parinari curatellifolia and Faurea saligna, whilst those in the field layer include Flemingia grahamiana, Themeda triandra and Cymbopogon "complex".

General

Community 27 is linked to the Bauhinia galpinii short thicket syntaxa (Variant 22B and Community 26), and to the Parinari curatellifolia open woodland syntaxa (Communities 30 and 31), by the absence of the Hyperthelia dissoluta Species-Group (Table III (77)).

Community 28.
Mucuna coriacea subsp. irritans - Antidesma venosum Low Thicket
Type Relevé: 159 (Tables II B and IV B)

This community occurs predominantly as low thicket, but also as short closed woodland in more sheltered sites with deeper soils (Relevé 156, Table IV B). It is represented by three relevés situated between 700 and 800 m elevation on the Upper Foothills (Table IV B).

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II B. However, it does appear as though the sites supporting low thicket are disturbed in some way. Relevé 159, for example, is subject to heavy grazing by cattle. The terrain in general consists of gently sloping, xeroclinal midslope planes. The granite-derived soils are fairly shallow (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (159) are as follows:

Canopy and understorey	(1,5-5,0 m)	15% cover
Shrub and field layer	(0,0-1,5 m)	70% cover

In closed woodland (Relevé 156), the canopy and understorey are better developed.

Floristics

Local character species for the Community are the climbing creeper Mucuna coriacea and the small suffrutex Triumfetta pilosa var. tomentosa (Table II B (14) and III (58)).

Other species, whose presence in the Vegetation Type may indicate Community 28, include the trees Albizia versicolor and Heteromorpha pubescens, and the twiner Rhynchosia caribaea.

Parinari curatellifolia is usually dominant in the canopy, whilst Antidesma venosum and Bauhinia galpinii are dominant in the understorey. In the field layer, Flemingia grahamiana and Hyperthelia dissoluta are usually dominant.

General

Affinities with syntaxa outside the Vegetation Type are few. Nevertheless, the presence of *Secamone gerrardii* indicates an affinity with Forest and Mesic Thicket of the Mistbelt and Low Country (Table III (39)). The Community is probably maintained in its present state by such factors as grazing, and it is therefore regarded as a secondary community.

Community 29.
Trachypogon spicatus - *Parinari curatellifolia* Short Open Woodland
Type Relevé: 160 (Tables II B and IV B).

This community is represented by three relevés, each having a different physiognomy. Besides short open woodland (Fig. 4.26, Relevé 160), there are low thicket (Relevé 182) and short closed woodland (Relevé 161). The Community is situated at about 800 m elevation on the Upper Foothills (Table IV B).

Habitat

The characteristically high clay fraction in the lower soil horizon may effectively limit nutrient and moisture losses due to leaching and percolation, respectively. It may thus be a factor influencing floristic differentiation (Table II B). The diabase soils developed on gently sloping upper-pediment slopes are also characteristic (Table IV B).

Whereas short open woodland develops in response to burning on fairly shallow soils, short closed woodland develops on fairly deep soils where the vegetation is protected from fire. Low thicket, on the other hand, develops in response to burning on exposed spurs with fairly deep soils (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (160) are as follows:

Canopy and understorey	(2,0-12,0 m)	50% cover
Shrub and field layer	(0,0- 2,0 m)	75% cover

In short closed woodland, the canopy and understorey may account for as much as 70 per cent of the cover.

Floristics

Community 29 is marked by a lack of differential species. It is nevertheless differentiated from Community 30 by the presence of the *Acacia ataxacantha* Species-Group (Table II B (15)). Similarly, the absence of the *Mucuna coriacea* Species-Group (Table II B (14)) distinguishes it from the *Mucuna coriacea* subsp. *irritans* - *Antidesma venosum* Low Thicket (Community 28).

The absence of the grass *Rhynchelytrum* "complex" and the presence of *Asparagus racemosus*, *Trachypogon spicatus*, *Rhus rehmanniana* and *Gnidia kraussiana*, in the Vegetation Type, may also indicate Community 29.

Dominant species in the canopy include *Parinari curatellifolia* and *Faurea saligna* (Fig. 4.26), although their dominance in low thicket is largely suppressed by *Acacia davyi*. In the understorey, *Bauhinia galpinii* is dominant, especially in the low thicket.In the field layer, *Cymbopogon* "complex" is the most common dominant. However, as the canopy becomes more open, as in Relevés 160 and 161, *Themeda triandra* and *Loudetia simplex* begin to assume the dominant role in the field layer (Fig. 4.26).

General

Relationship with the *Bothriochloa glabra* - *Hyperthelia dissoluta* Short Sparse Woodland (Community 35) is indicated by the *Hyparrhenia filipendula* "complex" Species-Group (Table II B (26)).

Community 30.
Diheteropogon amplectens - *Parinari curatellifolia* Low Open Woodland
Type Relevé: 1 (Tables II B and IV B)

This low open-woodland community of the Upper Foothills is situated at about 700 m elevation on abandoned crop lands in the vicinity of Zeederberg. It is represented by three relevés (Table IV B).

Habitat

From Table II B it is apparent that some of the factors influencing floristic differentiation are the deep granite soils together with the disturbance effects of past cultivation. The slopes of the Community are mostly characterized by their exposed position on moderately sloping upper-pediment slopes that are relatively free of rock outcrops (Table IV B). Relevé 1 is anomalous in that it is situated on a lower-pediment slope with pure clay in the lower soil horizon (Table IV B). Attendant soil-moisture conditions are therefore distinctly more favourable than those of Relevés 2 and 4.

Structure

The structural attributes of the vegetation of the type relevé (1) are as follows:

Canopy	(2,5-4,0 m)	20% cover
Shrub layer	(1,0-2,5 m)	50% cover
Field layer	(0,0-1,0 m)	80% cover

In Relevé 4, the shrub layer is absent and this may be due to the effect of fire.

Floristics

Community 30 is differentiated by the Conyza floribunda Species-Group (Table II B (16)). All its members, except the forb Hemizygia transvaalensis, are local character species (Table III (59)). They include the forbs Acanthospermum australe and Cassia quarrei, and the grass Diheteropogon amplectens.

Another floristic indicator of Community 30 is the relative scarcity, in the Vegetation Type, of Themeda triandra and Diospyros lycioides. Rhoicissus tridentata is also conspicuously absent. Species whose presence in the Vegetation Type may indicate Community 30 include the small shrub Nidorella auriculata, the tree Trema orientalis, the forbs Richardia brasiliensis and Helichrysum chrysargyrum, the sedge Ficinia sp., and the grasses Hyparrhenia variabilis and Paspalum urvillei.

Dominant species in the canopy are usually Parinari curatellifolia and Trema orientalis. In the shrub layer, Smilax kraussiana is particularly dominant. Bauhinia galpinii is sometimes dominant, especially on lower-pediment slopes (cf. Relevé 1). In the field layer, important dominants include the parasitic weed Cuscuta sp. and the suffrutex Flemingia grahamiana. The most dominant and widespread grass is Schizachyrium sanguineum. Those grasses avoiding the lower-pediment slopes are Loudetia simplex and Eulalia villosa, whilst those confined to such slopes are Setaria megaphylla and Panicum "complex". Those grasses preferring the more shrubby sites are Cymbopogon "complex" and Eragrostis curvula.

General

Community 30 is related to Communities 32, 33, 34 and 35 by the absence of the Rhynchosia komatiensis Species-Group (Table II B (18)). Carex spicato-paniculata and Dombeya pulchra link Community 30 with Forest and Mesic Thicket of the Mistbelt and Low Country (Table III (35)).

Community 30 is clearly a secondary community comparable with Scheepers (1978) "old-land succession on red ferrallitic soils". The abundance of exotic weeds, as well as the dominance of pioneer woody species such as Parinari curatellifolia and Trema orientalis, is typical of this stage of succession. Evidence of the Community's advancement to a more closed and woody physiognomy is given by the presence, often as seedlings, of Diospyros whyteana, Heteropyxis natalensis, Syzygium cordatum, Antidesma venosum and Bridelia micrantha.

Community 31.
Vernonia natalensis - Parinari curatellifolia Short Open Woodland
Type Relevé: 187 (Tables II B and IV B)

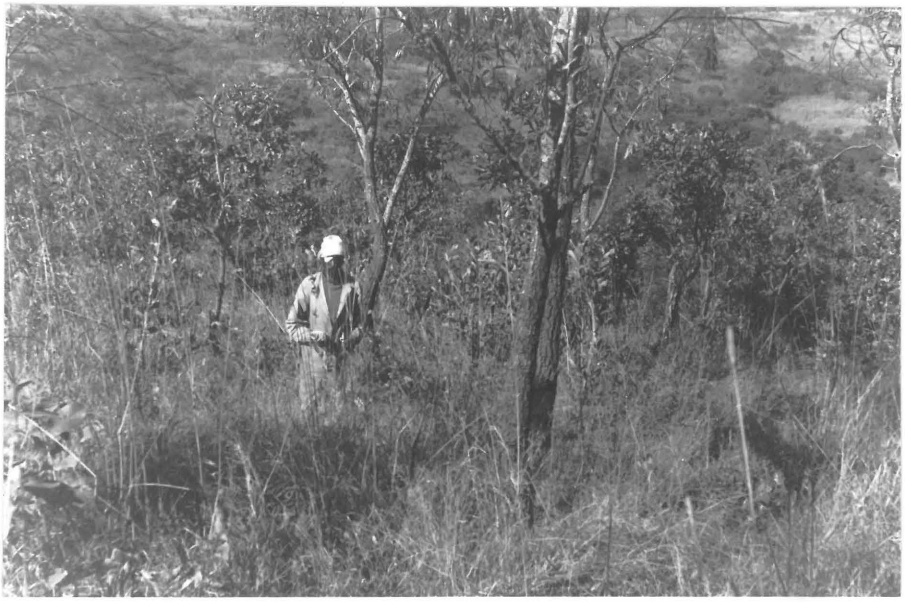
This open-woodland community of the Upper Foothills (Fig. 4.27) is widely distributed at about 750 m elevation. It is represented by three relevés situated mainly on mesoclinal, partially sheltered upper-pediment slopes (Table IV B).

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II B. The exceptionally deep granite soils, developed on

FIG. 4.27 Community 31: Vernonia natalensis - Parinari curatellifolia Short Open Woodland (Relevé 12). Note the tree Faurea saligna in the foreground. Dominant grasses include Loudetia simplex, Themeda triandra and Cymbopogon "complex".

FIG. 4.28 Community 32: Andropogon schirensis var. angustifolia - Parinari curatellifolia Short Open Woodland (Relevé 123). The dominant trees are all Parinari curatellifolia whilst in the field layer, the grass Loudetia simplex is dominant. The solitary forb in the foreground is Eriosema gunniae.



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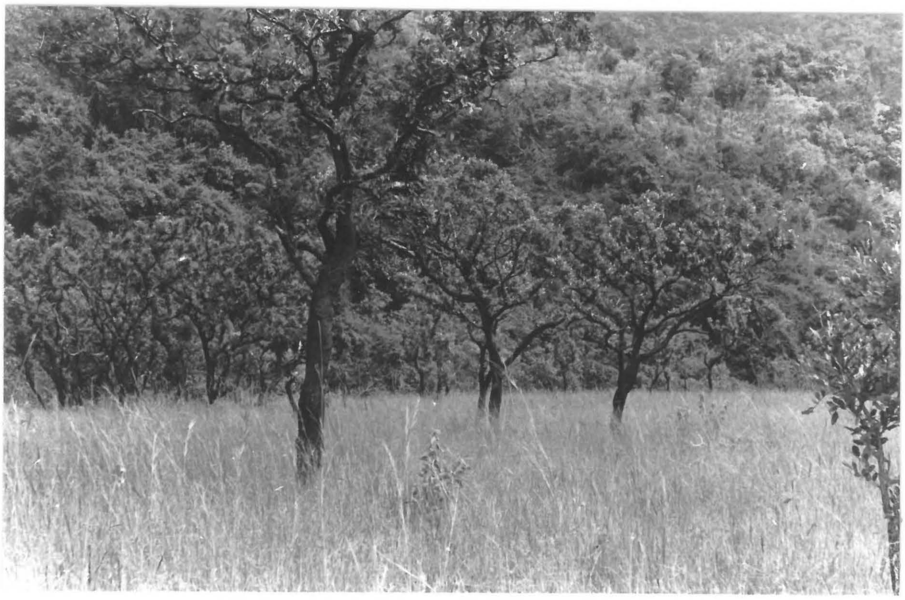

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gently sloping upper-pediment slopes with less than 4 per cent rock cover, are nevertheless distinctive features of the habitat (Table IV B). One relevé (152) is situated on an exposed xeroclinal slope. Excessive depletion of soil moisture in this type of site is apparently inhibited by the high clay fraction in the lower soil horizons (Table IV B). Fire is an important environmental factor serving to maintain the physiognomic character of the vegetation.

Structure

The structural attributes of the vegetation of the type relevé (187) are as follows:

Canopy and understorey	(1,5-10,0 m)	35% cover
Field layer	(0,0- 1,5 m)	90% cover

The canopy in Relevé 12 reaches only 6 m in height and the physiognomy is therefore low open woodland. It appears that some sort of historical disturbance is responsible for stunting vegetation in this relevé (Fig. 4.27).

Floristics

Community 31 is marked by a lack of differential species. The presence of Species-Group 18 (Table II B) and the absence of Species-Group 17 (Table II B) is nevertheless fairly diagnostic. For example, when Rhynchosia komatiensis, Athrixia phylicoides and Faurea saligna occur unaccompanied by Bauhinia galpinii, Maytenus heterophylla and Panicum "complex", then Community 31 may be indicated.

Other infrequent species, whose presence in the Vegetation Type may indicate Community 31, include Halleria lucida, Indigofera hilaris, Pearsonia aristata and Senecio coronatus.

Parinari curatellifolia and Faurea saligna are common dominants in the canopy (Fig. 4.27). Less common, are Faurea speciosa, Syzygium cordatum and Pterocarpus angolensis. In the field layer, Loudetia simplex and Themeda triandra are dominant grasses. In the low open woodland (Relevé 12), which had not been burned for a while, Cymbopogon "complex" and Eulalia villosa feature as co-dominant grasses (Fig. 4.27).

General

Community 31 is linked to the Combretum collinum subsp. gazense - Panicum maximum Short Closed Woodland (Community 21) by the forb Vernonia natalensis (Table II B (21)). Similarly, the trees Faurea saligna and Acacia caffra link Communities 31, 29, 24, 23 and 21 (Table III (64)).

Communities 22B, 26, 27, 30 and 31 are linked by the absence of the Hyperthelia dissoluta Species-Group (Table III (77)).

It is inferred that with fire-protection, the Community could develop into an Acacia ataxacantha short thicket resembling Communities 13 and 16. Parinari curatellifolia, Faurea saligna and Syzygium cordatum form "species-enrichment nuclei" in Loudetia simplex-dominated grassland. These nuclei develop into bushy clumps, as colonization by species like Heteropyxis natalensis, Dombeya rotundifolia, Combretum molle, Cussonia spicata, Rhus transvaalensis and Smilax kraussiana takes place.

Community 32.
Andropogon schirensis var. angustifolia - Parinari curatellifolia Short Open Woodland
Type Relevé: 123 (Tables II B and IV B)

This short open-woodland community of the Transitional Mistbelt is situated on the Escarpment Lower Slopes at about 950 m elevation, in Bergvliet Forest Reserve (Fig. 4.28). It is represented by two relevés (Table IV B).

Habitat

Altitudinally and climatically, this community is related to Vegetation Type 4.2.2.3, Woodland and Shrubland on exposed granite outcrops (Table II B). It occurs on gently sloping xeroclines of exposed upper-pediment slopes. The underlying lithology consists of Nelspruit Granite, although rock outcrop is minimal. The soils are fairly deep, and fire is a significant component of the habitat (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (123) are as follows:

Canopy	(1,5-10,0 m)	15% cover
Field layer	(0,0- 1,5 m)	80% cover

The understorey and shrub layer are conspicuously absent.

Floristics

Community 32 is differentiated by Species-Group 20 (Table II B). Members include the geophytic herb Gladiolus exiguus, the forb Eriosema gunniae, and the grass Andropogon schirensis. None of these are local character species for the Community (Table III).

Other species, whose presence in the Vegetation Type may indicate Community 32, are some higher-altitude grassland elements. Examples include Anthospermum ammanioides, Fadogia tetraquetra, Inezia integrifolia and Eragrostis racemosa.

In the canopy, Parinari curatellifolia and (ocasionally) Pterocarpus angolensis are dominant. The field layer is dominated by the grass Loudetia simplex (Fig. 4.28). Schizachyrium sanguineum is co-dominant. Non-graminoid elements in the field layer include Diospyros galpinii, Flemingia grahamiana, Rhynea phylicifolia and Pteridium aquilinum.

General

The absence of the Dombeya rotundifolia Species-Group (Table II B (22)) links Community 32 with Communities 30, 34 and 35. Similarly, the absence of the Smilax kraussiana Species-Group (Table III (101)) links Community 32 with Communities 33, 34 and 35 . Fire appears to be the common factor excluding these species (Table IV B).

A definite affinity with Grassland of the Humid Mistbelt is indicated by the following outliers: Eriosema gunniae, Oxalis depressa Fadogia tetraquetra, Helichrysum mixtum, Diospyros galpinii, Inezia integrifolia and Gladiolus exiguus. The Monocymbium ceresiiforme Species-Group (Table II (141)) and the Andropogon schirensis Species-Group (Table III (142)) further amplify this affinity.

It is inferred that in the absence of fire, the Community would proceed to Acacia ataxacantha thicket. Precusor species found in the shade of large fire-resistant trees such as *Parinari curatellifolia* include the following: *Apodytes dimidiata*, *Trimeria grandifolia*, *Smilax kraussiana*, *Diospyros lycioides* and *Trichopteryx dregeana*.

Community 33.
Acacia davyi - *Hyperthelia dissoluta* Low Sparse Woodland
Type Relevé: 139 (Tables II B and IV B)

This low sparse-woodland community of the Foothills (Fig. 4.29) is situated on upper-pediment slopes between 760 and 800 m elevation and is represented by three relevés (Table IV B).

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II B. Like the previous community, Community 33 is situated on gently sloping xeroclines of exposed upper-pediment slopes. Soils are shallower, however, and derived mainly from Transvaal Diabase, which outcrops more extensively here (5-34 per cent) than in Community 32. Fire is also an important element in the total habitat. One relevé (186) is found on deeper granite soils where the lower horizon consists of black sandy clays (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (139) are as follows:

Canopy	(1,0-2,5 m)	2,5% cover
Field layer	(0,0-1,0 m)	85% cover

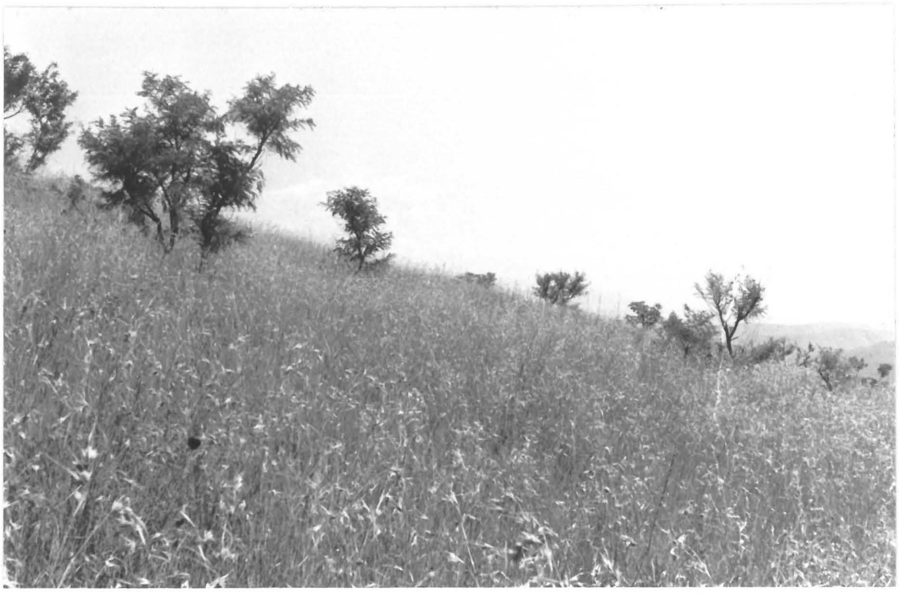
In other relevés, the canopy reaches as high as 5 metres.

Floristics

Community 33 is marked by a lack of differential species. In the Vegetation Type, Community 33 may nevertheless be indicated by the presence of Species-Group 22 (Table II B) and the absence of Species-Group 21 (Table II B): for example, when *Dombeya rotundifolia*, *Heteropyxis natalensis*, *Annona*

FIG. 4.29 A Lower Foothills representative of Community 33: *Acacia davyi* - *Hyperthelia dissoluta* Low Sparse Woodland (Relevé 139). *Themeda triandra* can be seen dominating the field layer. The trees are mainly *Acacia davyi*.

FIG. 4.30 Community 35: *Bothriochloa glabra* - *Hyperthelia dissoluta* Short Sparse Woodland (Relevé 164), showing a solitary shrub *Annona senegalensis* in the foreground, and a solitary tree *Sclerocarya birrea* subsp. *caffra* in the background.



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senegalensis and Acacia davyi occur unaccompanied by Flemingia grahamiana and Inula glomerulata.

Other species, whose presence in the Vegetation Type may indicate Community 33, are the trees Terminalia sericea and Combretum collinum subsp. suluense. The creeper Tylosema fassoglensis and the forbs Hemizygia canescens, Plectranthus spicatus and Sutera grandiflora are other examples. Species whose absence in this context is significant include Athrixia phylicoides, Parinari curatellifolia and Flemingia grahamiana.

Acacia davyi is often dominant in the canopy (Fig. 4.29) whilst Faurea speciosa is occasionally so. In the field layer, the grasses Themeda triandra and Loudetia simplex are usually co-dominant. They are often accompanied by seedlings of Dombeya rotundifolia and Annona senegalensis, and by the forb Pearsonia sessilifolia "complex".

General

An affinity with the Combretum collinum subsp. gazense - Panicum maximum Short Closed Woodland (Community 21) is expressed by Terminalia sericea and Senecio venosus (Table III (42)). Combretum collinum subsp. suluense, Aloe barbertoniae and Tylosema fassoglensis link Community 33 with Vegetation Type 4.2.2.1, Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Table III (48)). The absence of the Bridelia micrantha Species-Group (Table III (75)) links Community 33 with Communities 22, 34 and 35.

Fire is observed to eliminate the following species potentially suited to this habitat: Annona senegalensis, Dichrostachys cinerea "complex", Peltophorum africanum and Dombeya rotundifolia. On fire-protected adjacent slopes, the vegetation is able to develop toward closed woodland resembling Community 21.

Community 34.
Vernonia centaurioides - Hyperthelia dissoluta Low Sparse Woodland
Type Relevé: 194 (Tables II B and IV B)

This community is physiognomically variable, occurring as both low sparse woodland (Relevé 194) and tall sparse shrubland (Relevé 8). The representative relevés are widely dispersed on the Upper Foothills between 730 and 930 m elevation (Table IV B).

Habitat

The sandy clay texture of the upper soil horizons is distinctive (Table II B). It suggests that the development of an organic upper horizon is either somehow inhibited or that it has been removed in the past. Relevé 8 shows definite signs of surface erosion that could be associated with past cultivation. Regular, untimely burning could produce similar effects in Relevé 194.

Community 34 is situated on gently sloping, exposed upper-pediment slopes underlain by Nelspruit Granite. Rock outcrop is minimal, and soils are fairly shallow and sometimes strongly acid in the lower horizons (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (194) are as follows:

Canopy	(1,5-4,0 m)	2% cover
Field layer	(0,0-1,5 m)	90% cover

In Relevé 8, a canopy has not yet developed.

Floristics

Local character species for Community 34 are Vernonia centaurioides, a forb; and Indigofera oxalidea, a trailing forb (Tables II B (23) and III (69)).

Other infrequent species, whose presence in the Vegetation Type may indicate Community 34, are the soft tendril-climber Trochomeria sagittata; the forbs Helichrysum kraussii, H. mimetes, H. orodatissimum, Conostomium natalense and Senecio latifolius; and the grass Brachiaria brizantha.

In the canopy, Parinari curatellifolia is dominant, whilst in the field layer Hyperthelia dissoluta is dominant. Other species, sometimes dominant in the field layer, include the forbs *Flemingia grahamiana* and *Helichrysum mimetes*, and the grass *Loudetia simplex*.

General

Community 34 is respectively linked to Communities 22 and 30 by the presence of *Triumfetta pilosa* var. *pilosa* (Table III (45)) and *Acanthospermum australe* (Table III (59)). Its affinities with Community 36, and with Humid Mistbelt woodland (Communities 41 and 42), are indicated by *Helichrysum kraussii* (Table III (89)). Affinities extending to Grassland of the Humid Mistbelt are expressed by the *Monocymbium ceresiiforme* Species-Group (Table III (141)), and by *Cephalaria pungens* (Table III (138)).

Community 34 is a secondary community which, if left undisturbed, would probably develop towards thicket. Disturbances have facilitated the establishment of higher-altitude grassland species. These would apparently be eliminated as succession, by way of such woody species as *Parinari curatellifolia*, *Diospyros whyteana*, *Syzygium cordatum*, *Bridelia micrantha*, *Trimeria grandifolia* and *Euclea* "complex", takes place.

Community 35.
Bothriochloa glabra - *Hyperthelia dissoluta* Short Sparse Woodland
Type Relevé: 164 (Tables II B and IV B)

This short sparse-woodland community of the Upper Foothills (Fig. 4.30) is situated at about 700 m elevation on the farm Sandford. It is represented by two relevés located on abandoned lands (Table IV B).

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II B. The Community occurs on gentle, exposed slopes underlain by Transvaal Diabase. Soils are very deep, and rock outcrop is minimal. Total vegetation cover is relatively sparse (50-75 per cent) (Table IV B).

The effects of disturbance are greater on xeroclinal midslope planes where erosion is presumably more devastating (cf. Relevé 162). The lack of organic material in the upper horizon testifies to this (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (164) are as follows:

Canopy	(2,0-15,0 m)	2% cover
Field layer	(0,0- 2,0 m)	60% cover

In Relevé 162, the canopy is lower (not more than 5 m high).

Floristics

Community 35 is marked by a lack of differential species. The presence of Species-Group 26 (Table II B) and the absence of Species-Group 25 (Table II B), in the context of the Vegetation Type, is nevertheless quite distinctive. Thus, for example, when the grasses *Hyparrhenia filipendula* "complex" and *Bothriochloa glabra* occur unaccompanied by the grasses *Setaria sphacelata* and *Cymbopogon* "complex", and by the forb *Helichyrsum nudifolium*; then Community 35 may be indicated. The absence of the *Indigofera swaziensis* Species-Group (Table III (134)) and the *Pearsonia sessilfolia* "complex" Species-Group (Table III (123)), in this context, may be indicative.

Other indicators of Community 35 are the absence and presence, in the Vegetation Type, of *Loudetia simplex* and *Eriosema psoraleoides* respectively.

The canopy is floristically variable. Whilst *Terminalia sericea* is the conspicuous dominant on the xeroclinal midslope planes (Relevé 162), *Sclerocarya birrea* is dominant on the mesoclinal upper-pediment slopes (Relevé 164, Fig. 4.30). In the field layer, the grasses *Hyperthelia dissoluta*, *Themeda triandra* and *Hyparrhenia filipendula* "complex" are consistently dominant. More erratically dominant elements include the suffrutex *Pseudarthria hookeri* and the grass *Hyparrhenia hirta*.

General

Community 35 is linked to the *Trachypogon spicatus* - *Parinari curatellifolia* Short Open Woodland (Community 29) by the presence of the *Hyparrhenia filipendula* "complex" Species-Group (Table II B (26)). The Transvaal Diabase lithology appears to be a floristically unifying factor (Table IV B).

Pioneer trees in this old-land succession are the following: Peltophorum africanum, Parinari curatellifolia, Diospyros lycioides and Combretum molle. Pioneer grasses include Bothriochloa glabra, Sporobolus "complex", Themeda triandra, Paspalum urvillei, Hyparrhenia filipendula "complex", Hyperthelia dissoluta and Rhynchelytrum "complex". Amongst the pioneer suffrutices, Pseudarthria hookeri, Flemingia grahamiana and Rhoicissus tridentata are noteworthy.

4.2.2.3 Woodland and Shrubland on exposed granite outcrops

(a) General Characteristics

The most distinctive features of the Vegetation Type are the low vegetal cover (less than 50 per cent); the high rock cover (more than 85 per cent); and the immature soils, deficient in clay and without stratal development (Table II B). The Vegetation Type occurs on upper-pediment slopes between 500 and 1 355 m elevation, on the Foothills and Escarpment Lower Slopes. As such, it is subject to both Low-Country and Transitional-Mistbelt climates. Soils are generally shallow and often black (Table IV B).

Diffferential species for the Vegetation Type include the small mat-forming fern ally Selaginella dregei and the succulent forb Crassula alba "complex" (Table II B (36)). The former is a local character species for the Vegetation Type (Table III (79)). Other species, whose presence in Woodland and Xeric Thicket of the Low Country may indicate the Vegetation Type, include the fern Mohria caffrorum.

Common dominants include the small shrubby tree Bequaertiodendron magalismontanum, the shrublet Myrothamnus flabellifolia, and the large succulent herb Aloe petricola. The Diospyros lycioides Species-Group (Table II B (37)) expresses the affinity between Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3) and all other vegetation types in Woodland and Xeric Thicket of the Low Country.

Relationship with Community-Groups 6-30, 8-31, and 20-33 is indicated by Acacia ataxacantha (Table III (63)), Rhus pyroides (Table III (65)), and Lannea edulis (Table III (68)) respectively.

Vernonia poskeana links the Vegetation Type with Woodland of the Humid Mistbelt (Table III (96)). This relationship is extended both to Forest and Mesic Thicket of the Mistbelt and Low Country, and to Woodland and Xeric Thicket of the Low Country, by the Smilax kraussiana Species-Group (Table III (101)). It is extended to Grassland of the Humid Mistbelt by the Crassula alba "complex" Species-Group (Table III (110)).

An interesting phenomenon is the absence of the Indigofera swaziensis Species-Group (Table III (134)) from Forest and Mesic Thicket of the Mistbelt and Low Country, and from Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3). These syntaxa are apparently at the opposite extremes of the soil-moisture gradient, and the Indigofera swaziensis Species-Group is evidently unable to tolerate either extreme.

(b) Constituent Syntaxa

Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3) is represented by three communities. One of these, namely Community 36, is further classified to the level of variant (Fig 4.2):

36. Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland
36A. Protorhus longifolia - Ceratotheca triloba - Bequaertiodendron magalismontanum Variant
36B. Ficus burkei - Ceratotheca triloba - Bequaertiodendron magalismontanum Variant
37. Vernonia poskeana var. chlorolepis - Myrothamnus flabellifolia Low Sparse Woodland
38. Coleochloa setifera - Aloe petricola Short Sparse Shrubland

Community 36.
Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland

This community is represented by five relevés and is physiognomically variable; ranging from closed woodland, through open and sparse woodland, to shrubland. It is situated mainly in Bergvliet Forest Reserve in the 868 to 1 111 m elevation range (Table IV B). It has two variants, 36A and 36B.

Habitat

The black loamy sand in the upper soil horizon is a distinctive feature, shared only with the Pterocarpus angolensis - Bauhinia galpinii Short Thicket (Community 24) (Table II B). Slopes are consistently xeroclinal, with gentle to moderate gradients. Other habitat factors correspond to those for the Vegetation Type as a whole (Table IV B).

Structure

The structural attributes of the vegetation of the Community will be discussed under the variants into which it is divided (see Variants 36A and 36B below).

Floristics

Community 36 is differentiated by Species-Group 28 (Table II B), comprising the suffrutex Ceratotheca triloba, the succulent forb Crassula natalensis, and the xerophytic fern Pellaea calomelanos. Except for the latter, all are local character species for Community 36 (Table III (73)).

The presence of the Parinari curatellifolia Species-Group (Table II B (31)) and the absence of the Aloe petricola Species-Group (Table II B (35)), in the context of the Vegetation Type, may also indicate Community 36.

Other individual species, whose presence in the Vegetation Type may indicate Community 36, include the woody elements Parinari curatellifolia, Bequaertiodendron magalismontanum, Bridelia micrantha, Cryptolepis oblongifolia and Vangueria infausta. Amongst the more herbaceous elements, Rhynchosia monophylla, Kalanchoe rotundifolia, Pearsonia sessilifolia "complex" and Pteridium aquilinum are indicative.

The most common dominants in the Community are the trees Combretum molle and Bequaertiodendron magalismontanum in the canopy, and the grass Loudetia simplex in the field layer.

General

The Bridelia micrantha Species-Group (Table III (75)) links Community 36 with mesic thicket, xeric thicket, and the more woody components of Low-Country woodland.

Relationship with Forest and Mesic Thicket of the Mistbelt and Low Country, and with More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2), and with xeric thicket

Communities 24 and 25, is expressed by the Bequaertiodendron magalismontanum Species-Group (Table III (96)). The xerophytic fern Pellaea calomelanos is strongly associated with More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2) (Table III (104)).

Variant 36A.
Protorhus longifolia - Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland
Type Relevé: 53 (Tables II B and IV B)

This woodland variant is represented by three relevés whose canopy cover ranges from closed, to open, to sparse. It is situated between 900 and 1 000 m elevation on Upper Foothills and Lower Escarpment Slopes, where it is favourably influenced by the intermittent mist (Table IV B).

Habitat

Habitat factors involved in differentiating floristically between this variant and the next (Variant 36B) are not immediately apparent from Table II B.

Structure

The structural attributes of the vegetation of the type relevé (53) are as follows:

Canopy and shrub layer	(0,5-5,0 m)	20% cover
Field layer	(0,0-0,5 m)	40% cover

This structure denotes a low sparse woodland (Fig. 4.31). In low open woodland (Relevé 59), the canopy and shrub layer provide 35 per cent cover; whilst in low closed woodland (Relevé 41), these strata may provide as much as 50 per cent cover.

Floristics

Variant 36A is differentiated by Species-Group 29 (Table II B), comprising the tree Protorhus longifolia, the shrubby climber Cephalanthus natalensis,

FIG. 4.31 Variant 36A: Protorhus longifolia - Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland, sometimes represented by Low Sparse Woodland (Relevé 53).In the middle distance, Xerophyta retinervis and Ceratotheca triloba are notable. The tree Combretum molle can be seen in the background (middle).

FIG. 4.32 Community 37: Vernonia poskeana var. chlorolepis - Myrothamnus flabellifolia Low Sparse Woodland (Relevé 16). The deciduous tree in the foreground is Lannea discolor. The xerophytic shrublet, Myrothamnus flabellifolia occupies shallow soil pockets and crevices in the middle distance.

FIG. 4.33 Community 38: Coleochloa setifera - Aloe petricola Short Sparse Shrubland on a granite dome near Sabie (Relevé 120). The tussock sedge Coleochloa setifera, and the succulent Aloe petricola, are clearly dominant in the field layer.

4.31

4.32

4.33

the forb Helichrysum kraussii, and the grass Brachiaria serrata. None of these are local character species (Table III).

Other species, whose presence in the Vegetation Type may indicate Variant 36A, include Setaria megaphylla, Abrus laevigatus, Syzygium cordatum, Rhus transvaalensis, Ficus ingens, Grewia occidentalis, Psychotria capensis, Dalbergia armata and Toddalia asiatica. Those whose absence in this context may be indicative include the grass Rhynchelytrum "complex".

Besides those mentioned for Community 36, there are dominant species that are specific to the Variant. In the canopy, Protorhus longifolia and Syzygium cordatum are dominant; whilst in the shrub layer, Psychotria capensis, Dalbergia armata, Iboza "complex", and Xerophyta retinervis are dominant.

General

The small shrub Ochna natalitia indicates the Variant's affinity with Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1). Other such xeric affinities are indicated by Senecio oxyriifolius, Abrus laevigatus, Cymbopogon "complex" and Rhus transvaalensis. More mesic affinities are indicated by species such as Asplenium splendens, Setaria megaphylla, Syzygium cordatum, Psychotria capensis, Dalbergia armata, Toddalia asiatica and Carex spicato-paniculata.

Relationship with the Tecomaria capensis subsp. capensis - Bequaertiodendron magalismontanum Low Closed Woodland (Community 41) is indicated by the chasmophyte, Ficus ingens (Table III (84)).

An extremely rocky substrate in a relatively mesic environment such as this, creates a particularly exacting habitat for plants. Thus, although the potential "seed pool" is mesophytic, the substrate is mostly too xeric for seedling establishment. Consequently, only specialized plants, or plants of wide ecological amplitude, are able to establish themselves on these sites. Plants in the latter category include Psychotria capensis, Dalbergia armata and Cephalanthus natalensis. These not only change their growth form but also their morphology. They develop thick hairy leaves as a means of overcoming the water deficit in the substrate and, in the case of the latter two species, their normally lianoid habit is modified as they adopt a creeping and shrubby habit, respectively. Of the specialized plants able to utilize this type of habitat because they are specifically adapted to it, Xerophyta retinervis, Ficus ingens, Selaginella dregei, Rhynchosia monophylla, Senecio oxyriifolius, Kalanchoe rotundifolia and Crassula spp. are noteworthy.

Variant 36B.
Ficus burkei - Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland
Type Relevé: 125 (Tables II B and IV B)

This low open-woodland variant is represented by two relevés at about 900 m elevation. Relevé 125 is successionally more advanced than Relevé 192, which is situated virtually on sheet-rock, and whose physiognomy is tall open shrubland (Table IV B).

Habitat

Habitat factors involved in differentiating floristically between this variant and the previous one (Variant 36A) are not immediately apparent from Table II B.

Structure

The structural attributes of the vegetation of the type relevé (125) are as follows:

Canopy and shrub layer	(1,0-5,0 m)	25% cover
Field layer	(0,0-1,0 m)	70% cover

In Relevé 192, the canopy is absent, whilst the shrub layer accounts for about 10 per cent of the cover and the field layer about 20 per cent.

Floristics

Variant 36B is marked by a lack of differential species. The presence of Species-Group 28 (Table II B) and the absence of Species-Group 29 (Table II B) is nevertheless fairly diagnostic. Thus, for example, when Ceratotheca triloba, Crassula natalensis and Pellaea calomelanos occur unaccompanied by Helichrysum kraussii, Protorhus longifolia, Cephalanthus natalensis and Brachiaria serrata, then Variant 36B may be indicated.

Other species, whose presence in the Vegetation Type may indicate Variant 36B, are the trees Ficus burkei, Antidesma venosum, Pavetta gardeniifolia var. gardeniifolia, Tarchonanthus trilobus and Trema orientalis; the grasses Andropogon schirensis and Schizachyrium sanguineum; and the forb Fadogia tetraquetra.

Besides those mentioned for Community 36, there are dominant species that are specific to the Variant. Pterocarpus angolensis and Psidium guajava are variously dominant in the canopy, whilst the grass Rhynchelytrum "complex" is consistently so in the field layer.

General

An affinity with the Vernonia poskeana var. chlorolepis - Myrothamnus flabellifolia Low Sparse Woodland (Community 37) is indicated by the Xerophyta retinervis Species-Group (Table III (76)). Similarly, the Tarchonanthus trilobus Species-Group (Table III (94)) indicates an affinity with More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2).

Other relationships with both Woodland and Grassland of the Humid Mistbelt are evident. The filiform grass Microchloa caffra indicates this variant's affinity with the Tetraselago natalensis - Monocymbium ceresiiforme Low Closed Grassland (Community 47) (Table III (107)). The forb Fadogia tetraquetra (Table III (127)) and the grass Andropogon schirensis (Table III (142)) both show broader affinities in this context.

Relevé 125 is already fairly advanced in the lithoseral succession, and the presence of Acacia ataxacantha seedlings suggests that the Variant is developing toward Acacia ataxacantha thicket.

Community 37.
Vernonia poskeana var. chlorolepis - Myrothamnus flabellifolia Low Sparse Woodland
Type Relevé: 16 (Tables II B and IV B)

This low, sparse to open, woodland community is represented by three relevés widely distributed throughout the Low Country and Transitional Mistbelt, between 530 and 920 m elevation.

Habitat

The brown upper soil horizon is restricted to the Vegetation Type and indicates older soils (Table II B). The latter are mostly fairly shallow. On moderately sloping mesoclines on the Escarpment Lower Slopes, a low open woodland develops (cf. Relevé 124). On more gentle xeroclines on the Foothills, low sparse woodland is more typical (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (16) are as follows:

Canopy and shrub layer	(1,0-4,0 m)	15% cover
Field layer	(0,0-1,0 m)	50% cover

In low open woodland (Relevé 124), the canopy alone accounts for about 10 per cent of the cover.

Floristics

Community 37 is marked by a lack of differential species. The presence of Species-Group 35 (Table II B) and the absence of Species-Group 36 (Table II B) is nevertheless fairly diagnostic. Likewise is the presence of Species-Group 33 (Table II B) and the absence of Species-Group 31 (Table II B). Thus, for example, when Aloe petricola and Myrothamnus flabellifolia occur unaccompanied by Selaginella dregei and Crassula alba "complex" Community 37 may be indicated. It may also be indicated when Vernonia poskeana and Xerophyta retinervis occur independently of Parinari curatellifolia, Pterocarpus angolensis and Gerbera jamesonii.

The presence in the Vegetation Type of other species such as Lannea discolor, Securinega virosa, Euphorbia ingens, Sclerocarya birrea and Tylosema fassoglensis, may also indicate Community 37.

In the shrub layer, Iboza "complex" is often dominant. In the field layer, Myrothamnus flabellifolia and Xerophyta retinervis are dominant shrublets (Fig. 4.32); Vernonia poskeana is a dominant forb; and Loudetia simplex is a dominant grass.

General

The Vernonia poskeana Species-Group (Table II B (33)) indicates an affinity with the Ficus burkei - Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland (Variant 36B). Likewise the Aloe petricola Species-Group (Table II B (35)) indicates the affinity of Community 37 with the Coleochloa setifera - Aloe petricola Short Sparse Shrubland (Community 38).

Relationship with the Combretum collinum subsp. gazense - Panicum maximum Short Closed Woodland (Community 21) is indicated by the tree Lannea discolor (Table III (42)). Similarly, an affinity with both mesic and xeric thicket is indicated by the trees Maytenus heterophylla (Table III (62)) and Acacia ataxacantha (Table III (63)). The tree Dichrostachys cinerea "complex" expresses the affinity of Community 37 with woodland and thicket of the Foothills (Table III (72)).

The grass Eragrostis sclerantha links Community 37 with some communities of More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2) (Table III (93)).

The creeper Tylosema fassoglensis and the tussock-sedge Coleochloa setifera are some of the earliest pioneers of sheet-rock in this area. The latter species forms densely fibrous mats that function as soil "traps", facilitating the establishment of species such as Xerophyta retinervis, Combretum molle, Pellaea viridis, Iboza "complex", Myrothamnus flabellifolia, Aloe spp., Selaginella dregei and Aristida congesta. Mosses play an important role in binding soil particles together and in preventing excessive dehydration of the substrate. Soil also accumulates in the rock crevices, thereby enabling deeper-rooting species such as Loudetia simplex, Cussonia spicata, Maytenus heterophylla, Annona senegalensis and Heteropyxis natalensis to become established.It is possible that in time, the Community could develop to closed woodland similar to the Combretum collinum subsp. gazense - Panicum maximum Short Closed Woodland (Community 21).

Community 38.
Coleochloa setifera - Aloe petricola Short Sparse Shrubland
Type Relevé: 120 (Tables II B and IV B)

This short sparse-shrubland community (Fig. 4.33) is represented by three relevés widely dispersed in both the Low Country and the Transitional Mistbelt, between 700 and 1 340 m elevation.

Habitat

The short sparse (succulent) shrubland on exposed granite sheet-rock is unique in the Vegetation Type (Table II B). It may occur on the Foothills and Escarpment Lower Slopes; on gently sloping xeroclines, or moderately sloping mesoclines (Table II B).

Structure

The structural attributes of the vegetation of the type relevé (120) are as follows:

Field layer	(0,0-0,5 m)	50% cover

In some relevés, a poorly developed shrub layer (0,5-1,0 m) covering about 2 per cent of the area is apparent.

Floristics

Community 38 is marked by a lack of differential species. The presence of Species-Group 35 (Table II B) and the absence of Species-Group 34 (Table II B) is nevertheless diagnostic. Thus, for example, when the succulent *Aloe petricola*, the shrublet *Myrothamnus flabellifolius*, and the matted tussock-sedge *Coleochloa setifera* occur independently of the grasses *Hyperthelia dissoluta*, *Loudetia simplex* and *Heteropogon contortus*, then Community 38 is probably indicated (Fig. 4.33).

Other species, whose presence in the Vegetation Type may indicate Community 38, include the woody elements *Greyia radlkoferi* and *Indigofera comosa*; and the herbaceous elements *Crassula sarcocaulis*, *Cyanotis speciosa* and *Plectranthus spicatus*. Those woody elements whose absence in this context may be indicative of Community 38 are *Combretum molle* , *Diospyros whyteana* and *Xerophyta retinervis*.

In the shrub layer, *Greyia radlkoferi* may sometimes be dominant. *Coleochloa setifera* and *Aloe petricola* are clearly dominant in the field layer (Fig.

4.33), whilst Pellaea viridis, Selaginella dregei and Myrothamnus flabellifolia are less so.

General

Greyia radlkoferi links Community 38 with three tall/short forest communities of Lower Mountains and Plateau Crest (Communities 1-3), and with the Alepidea gracilis var. major - Loudetia simplex Low Open Woodland (Community 44). Ceratotheca triloba links Community 38 with the Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland (Community 36). This relationship is extended to both Woodland and Grassland of the Humid Mistbelt by the Crassula alba "complex" Species-Group (Table III (110)).

The high proportion of succulent and semi-succulent plants is a characteristic feature of the Community. It reflects the extremely xeric conditions resulting from the substrate's limited capacity to provide greater moisture resources for vegetation.

4.2.3 WOODLAND OF THE HUMID MISTBELT

(A) General Characteristics

Woodland of the Humid Mistbelt occurs predominantly on the Plateau Crest but is also scantily present on the Escarpment Upper Slopes and the Mountains (Table IV C).

Physiognomy

As the name implies, woodland is the major formation class represented. Canopy cover varies between closed, open, and sparse; the latter corresponding to more exposed, and the former to more sheltered, sites. The canopy is usually stunted (less than 5 m high), and the woodland is therefore designated "low". The effects of wind on exposed ridges is probably responsible for such stunting. In addition, thicket, shrubland, and grassland are meagrely represented. Total vegetal cover is usually 50-75 per cent (Table IV C).

Habitat

The terrain is characterized mainly by exposed (sometimes partially sheltered) Black Reef Quartzite outcrops on xeroclinal, moderately steep upper-pediment slopes. Upper Dolomite is also sporadically represented, as are midslope planes and upland terraces. Soils are fairly shallow, varying in texture from loamy sands to sandy clay loams in the upper horizon (Table IV C). The trend with increasing altitude is towards colder, more xeric conditions. The latter conditions are reflected in the decreasing canopy cover of higher altitudes.

Floristics

The most widespread species in Woodland of the Humid Mistbelt are those of Species-Group 22 (Table II C), including the creeper Smilax kraussiana, the grasses Loudetia simplex and Rhynchelytrum "complex", and the fern Pellaea viridis. None of these are differential for the Ecological-Formation Class, however.

Other species, that are more or less confined to Woodland of the Humid Mistbelt and are distributed fairly extensively therein, are the following (Table VI):

Bowkeria cymosa
Cyanotis lapidosa
Erythrina latissima
Helichrysum cooperi
Helichrysum pallidum
Hyparrhenia cymbaria
Nuxia congesta
Plectranthus zatarhendi
Rhus macowanii

These species are thus fairly typical of the Ecological-Formation Class.

General

Woodland of the Humid Mistbelt is linked to Forest and Mesic Thicket of the Mistbelt and Low Country, and to Woodland and Xeric Thicket of the Low Country, by the Smilax kraussiana Species-Group (Table III (101)). The Pellaea viridis Species-Group (Table III (111)) extends this affinity to Grassland of the Humid Mistbelt. These species thus display their broad ecological amplitude.

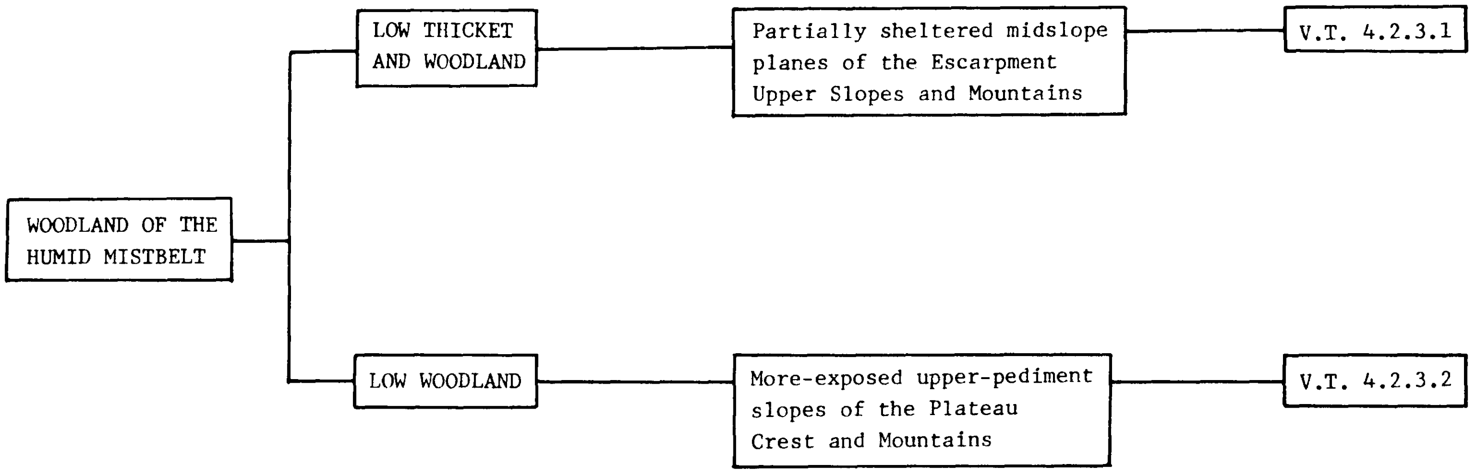


FIG. 4.34 An ecological basis for the recognition of two vegetation types (V.T.) in Woodland of the Humid Mistbelt, Sabie area.

Other species have more restricted affinities. The Acalypha wilmsii Species-Group (Table III (127)), for example, links Woodland of the Humid Mistbelt with Grassland of the Humid Mistbelt. These species thus demonstrate their heliophytic character by their avoidance of Forest and Mesic Thicket of the Mistbelt and Low Country, and their mesophytic character by their avoidance of Woodland and Xeric Thicket of the Low Country.

This relationship with Grassland of the Humid Mistbelt is extended to Less-sheltered Woodland and Thicket on fairly deep soils of the Upper Foothills (Vegetation Type 4.2.2.2) by the Eulalia villosa Species-Group (Table III (133)); and to Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1) by the Indigofera swaziensis Species-Group (Table III (134)). The Loudetia simplex Species-Group (Table III (143)) represents a final extension of the relationship, embracing in addition, almost the whole of Woodland and Xeric Thicket of the Low Country. In contrast to the Acalypha wilmsii Species-Group (Table III (127)), these species thus demonstrate not only their heliophytic character, but also their relatively xerophytic character.

In the Humid Mistbelt, woodland tends to develop (rather than grassland and forest) on exposed rocky xeroclines with shallow sandy soils (Table V). Such sites are too rocky to fuel the hot fires that sustain grassland, and they are too exposed to provide the sheltered mesic habitats that sustain forest.

(B) Component Vegetation Types

Woodland of the Humid Mistbelt comprises two vegetation types (Fig. 4.2) that are differentiated and named on the basis of characteristic habitat features (Fig. 4.34 and Tables IV C and V):

4.2.3.1 Partially sheltered Low Thicket and Woodland on midslope planes of the Escarpment Upper Slopes and the Mountains.

4.2.3.2 More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains.

4.2.3.1 Partially sheltered Low Thicket and Woodland on midslope planes of the Escarpment Upper Slopes and the Mountains

(a) General Characteristics

This vegetation type occurs on moderately sloping xeroclines between 1 112 and 1 478 m elevation. The underlying lithology varies between Black Reef Quartzite and Upper Dolomite (Table IV C). It is distinguished from the other vegetation type (4.2.3.2) in Woodland of the Humid Mistbelt by the red hue of the lower soil horizon, and by its location in partially sheltered, rockless midslope planes as opposed to rocky, exposed upper-pediment slopes. The development of dense thicket rather than open woodland is also characteristic (Table II C).

Local character species for the Vegetation Type include the forbs Vernonia oligocephela and Helichrysum umbraculigerum (Table III (82)). Other species, that are differential in the Woodland of the Humid Mistbelt context, include Rhus transvaalensis, Hemizygia transvaalensis, Athrixia phylicoides and Ziziphus mucronata (Table II C (3)). Those whose absence in this context may indicate the Vegetation Type include the fern Pellaea calomelanos and the prostrate grass Trichopteryx dregeana (Table II C (21)).

The tree Faurea speciosa is often dominant in the more open formations, whilst Bowkeria cymosa tends to dominate the more closed formations.

Floristic affinity with the Tecomaria capensis subsp. capensis - Bequaertiodendron magalismontanum Low Closed Woodland (Community 41) is expressed by the presence of the Rhoicissus tridentata Species-Group (Table II C (6)). Conversely, the absence of the Bequaertiodendron magalismontanum Species-Group (Table II C (12)) indicates an affinity with the Alepidea gracilis var. major - Loudetia simplex Low Open Woodland (Community 44).

The sciophytic forb Galopina circaeoides indicates an affinity with mesic thicket and with Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1) (Table III (52)). Ziziphus mucronata shows a broader affinity with thicket formations of the Mistbelt and the Low Country (Table III (62)). The affinities of the Rhus transvaalensis Species-Group (Table III (93)), on the other hand, are more confined to the Low Country.

(b) Constituent Syntaxa

Partially sheltered Low Thicket and Woodland on midslope planes of the Escarpment Upper Slopes and the Mountains (Vegetation Type 4.2.3.1) is represented by two communities (Fig. 4.2):

39. Galopina aspera - Faurea speciosa Low Open Woodland
40. Artemisia afra - Bowkeria cymosa Low Thicket

Community 39.
Galopina aspera - Faurea speciosa Low Open Woodland
Type Relevé: 130 (Tables II C And IV C)

This community of the Escarpment Upper Slopes is physiognomically variable, being maintained as low open woodland only through the influence of fire (Fig. 4.35). With fire-protection, low thicket tends to develop (Relevé 135). The Community is represented by two relevés at about 1 160 m elevation in the Spitskopspruit valley, 3,5 km south-east of Sabie (Table IV C).

Habitat

Habitat factors possibly influencing floristic differentiation are the red hues of the presumably well-drained upper soil horizon, as well as the underlying Black Reef Quartzite lithology (Table II C). Burning appears to affect soil texture indirectly by reducing organic input in the form of litter, and by enhancing surface erosion. This is suggested by the lack of loam in the upper horizon of the burned relevé (130) (Table IV C).

Structure

The structural attributes of the vegetation of the type relevé (130) are as follows:

Canopy	(1,0-5,0 m)	35% cover
Field layer	(0,0-1,0 m)	80% cover

In low thicket (Relevé 135) there is, in addition, a shrub layer up to 3 m high covering 40 per cent of the quadrat area.

4.35

4.36

Floristics

Local character species for the Community are the geophytic herbs Boophane disticha and Eriospermum sp., and the forb Galopina aspera (Table III (80)). Other species, that are differential for Community 39 in the Woodland of the Humid Mistbelt context, include the forbs Inula glomerulata, Helichrysum nudifolium, Berkheya insignis, Gerbera aurantiaca and Pseudarthria hookeri; the grass Hyperthelia dissoluta; and the tree Combretum molle (Table II C (1)).

Other species, whose presence in the Vegetation Type may indicate Community 39, include those of the Hyparrhenia hirta Species-Group (Table II C (10)), as well as the grass Schizachyrium sanguineum, the tree Faurea speciosa, the small shrub Rhynchosia komatiensis, and the forbs Acalypha wilmsii and Fadogia tetraquetra. Species whose absence in this context is indicative include those of the Nidorella auriculata Species-Group (Table II C (21)), as well as the shrub Grewia occidentalis, and the suffrutex Alepidea gracilis.

Faurea speciosa is dominant in the canopy, whilst Rhynchosia komatiensis, Acalypha wilmsii and Eulalia villosa are dominant in the field layer (Fig. 4.35). Where there is a shrub layer, Smilax kraussiana and Flemingia grahamiana are dominant.

General

Community 39 is linked to the Selago atherstonei - Syzygium cordatum Low Open Woodland (Community 43) by the presence of the Hyparrhenia hirta Species-Group (Table II C (10)). This relationship is extended to the Diospyros galpinii - Bequaertiodendron magalismontanum Tall Open Shrubland (Community 42) by the Schizachyrium sanguineum Species-Group (Table II C (11)).

The forb Senecio venosus indicates an affinity with the Combretum collinum subsp. gazense - Panicum maximum Short Closed Woodland (Community 21) (Table III (42)). In addition, Acacia ataxacantha, Euclea "complex" and Dioscorea "complex" all indicate a broad affinity with mesic and xeric thicket. Affinity with Woodland and Xeric Thicket of the Low Country is indicated by the grass Hyperthelia dissoluta (Table III (77)). The absence of the Psychotria capensis Species-Group (Table III (100)) links Community 39 with

FIG. 4.35 Community 39: Galopina aspera - Faurea speciosa Low Open Woodland maintained by fire (Relevé 130). The canopy is virtually a monostand of Faurea speciosa, whilst the field layer is dominated by numerous forbs and grasses.

FIG. 4.36 Community 40: Artemisia afra - Bowkeria cymosa Low Thicket (Relevé 117), showing the dominant shrub Vernonia stipulacea and the bracken fern Pteridium aquilinum (foreground).

the Athanasia calva - Alepidea gracilis var. major - Loudetia simplex Low Open Woodland (Variant 44B).

Affinities with grassland syntaxa include that with the Lightfootia huttonii - Eragrostis racemosa Low Closed Grassland (Community 49) by the forb Triumfetta welwitschii (Table III (116)). Another affinity is that expressed toward the Asclepias crassinervis - Andropogon schirensis var. angustifolia Short Closed Grassland (Community 51) by the semi-succulent forb Asclepias crassinervis (Table III (124)).

Community 40.
Artemisia afra - Bowkeria cymosa Low Thicket
Type Relevé: 117 (Tables II C and IV C)

This community of the Mountains is physiognomically variable, occurring also as low open woodland (Relevé 113). It is represented by two relevés situated between 1 280 and 1 400 m elevation in the Vertroosting Nature Reserve, about 6 km south of Sabie.

Habitat

A unique feature of the habitat is the sandy clay loam of the upper soil horizon found in conjunction with the underlying Upper Dolomite (Table II C). This feature is shared in common only with the Alepidea gracilis var. major - Loudetia simplex Low Open Woodland (Community 44).

Whereas low thicket develops on moderately sloping, mesoclinal midslope planes with minimal rock outcrop; low open woodland develops on moderately sloping, xeroclinal upper-pediment slopes with substantial rock outcrop. Soils of the former are deeper, more acid, and more clayey than those of the latter.

Structure

The structural attributes of the vegetation of the type relevé (117) are as follows:

Canopy and shrub layer	(1,5-5,0 m)	50% cover
Field layer	(0,0-1,5 m)	90% cover

The field-layer cover in low open woodland (Relevé 113) is reduced to 50 per cent.

Floristics

Local character species for Community 40 are the small shrub Nidorella auriculata and the forb Artemisia afra (Table III (81)). Other species that are differential for Community 40, in the Woodland of the Humid Mistbelt context, include the shrub Lippia javanica and the forb Acalypha caperonioides (Table II C (2)). The absence of the creeper Rhynchosia monophylla from the Ecological-Formation Class may indicate Community 40 (Table III (127)).

Dominant species that are common to both relevés include Cussonia spicata and Bowkeria cymosa in the canopy; Rhus transvaalensis, Indigofera swaziensis and Diospyros lycioides in the shrub layer; and Rhoicissus tridentata, Pteridium aquilinum and Cymbopogon "complex" in the field layer. Aloe arborescens and Greyia radlkoferi are more specifically dominant in the low open woodland, whilst Rhus macowanii, Maesa lanceolata and Vernonia stipulacea are specifically dominant in the low thicket (Fig. 4.36).

General

Community 40 is linked to the Tecomaria capensis subsp. capensis - Bequaertiodendron magalismontanum Low Closed Woodland (Community 41) by the presence of the Grewia occidentalis Species-Group (Table II C (5)).

Affinities with Mistbelt forest are evident. The presence of the liane Cyphostemma anatomicum in both Community 40 and the Streptocarpus cyaneus - Dovyalis lucida Short Forest (Community 2), for example, indicates their floristic affinity (Table III (2)).

Aloe arborescens similarly shows the Community's affinity with the Ekebergia pterophylla - Psychotria zombamontana Short Forest (Community 3) (Table III (4)), as does Greyia radlkoferi with Communities 2 and 3 (Table III (7)). Affinity with Tall Forest associated with diabase intrusions of the Escarpment Slopes (Vegetation Type 4.2.1.3) is indicated by the climber Senecio tamoides (Table III (14)).

Affinities with grassland syntaxa are also apparent. Lippia javanica, Rhus discolor, Acalypha caperonioides and Heteromorpha pubescens, for example, link the Community with the Bewsia biflora - Loudetia simplex Short Closed Grassland (Community 52) (Table III (129-130)).

The low open woodland of Relevé 113 is clearly derived from Community 52 , notably Relevé 112. The succcession appears to be lithoseral. As the underlying dolomite begins to crop out, Aloe arborescens and Xerophyta retinervis become dominant. Another pioneer exploiting crevices in the exposed dolomite, is the bulbous herb Haemanthus carneus. With increasing fire-protection, woody encroachment by species such as Heteromorpha pubescens, Rhoicissus tridentata, Ziziphus mucronata, Bowkeria cymosa and Diospyros whyteana takes place. In time, this low open woodland may develop to the Hypoestes phaylopsoides - Dovyalis lucida Tall Forest (Community 1).

The low thicket of Relevé 117, however, appears to have a more hydroseral origin. On mesoclinal midslope planes, seepage areas are sometimes prevalent and they support virtually pure stands of the bracken fern Pteridium aquilinum (Fig. 4.36). As conditions become drier, shrubs such as Vernonia stipulacea, Rhus macowanii, Lippia javanica, Buddleia salviifolia and Bowkeria cymosa become established in place of Pteridium aquilinum.

In the field layer, dense mats, formed by species such as Helichrysum spp., Senecio tamoides and Triumfetta pilosa var. effusa, develop. Taller trees, such as Maesa lanceolata and Cussonia spicata, then form "species-enrichment nuclei", which develop into bush-clumps supporting species such as Alsophila dregei, Psychotria capensis, Diospyros whyteana and Clausena anisata. These bush-clumps shade out the dense Helichrysum spp. mats, and eventually tall forest trees such as Ficus capensis begin to dominate the canopy, resulting in the Hypoestes phaylopsoides - Dovyalis lucida Tall Forest (Community 1).

4.2.3.2 More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains

(a) General Characteristics

This vegetation type consists mainly of low woodland on moderately sloping xeroclines between 990 and 1 600 m elevation (Table IV C). It is associated mainly with the Black Reef Quartzite cliffs forming the Plateau Crest. It is distinguishable from Partially sheltered Low Thicket and Woodland on midslope planes of the Escarpment Upper Slopes and the Mountains (Vegetation Type 4.2.3.1) by such features as the sandier soils, the sparser vegetal cover, the rockier substrate, and the more exposed upper-pediment slopes (Table II C).

Species which differentiate the Vegetation Type are the xerophytic fern Pellaea calomelanos and the grass Trichopteryx dregeana (Table II C (21)). The former is a local character species, also embracing Community 36 (Table III (104)). The absence of Helichrysum nudifolium and Ziziphus mucronata from Woodland of the Humid Mistbelt may equally well indicate the Vegetation Type.

In the canopy, Bequaertiodendron magalismontanum and Syzygium cordatum are variously dominant, whilst Loudetia simplex is a common dominant in the field layer. Affinities with Mistbelt forest, and with Short Thicket of more xeroclinal slopes with clay soils derived from Nelspruit Granite of the Escarpment Lower Slopes and Upper Foothills (Vegetation Type 4.2.1.4), are indicated by the tree Rapanea melanophloes (Table III C (20)) and the sedge Cyperus albostriatus (Table III (26)), respectively.

The Bequaertiodendron magalismontanum Species-Group (Table III (96)) indicates the Vegetation Type's affinity with Forest and Mesic Thicket of the Mistbelt and Low Country; with the Bauhinia galpinii Short Thicket (as represented by Communities 24 and 25); and with the early stages of Low Country lithoseral woodland, namely the Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland (Community 30).

The grass Trichopteryx dregeana (Table III (109)) indicates an affinity with ecotonal Acacia ataxacantha short thicket (as represented by Communities 11 and 12), and with grassland of Escarpment Slopes and Plateau (Communities 45-47). Crassula alba "complex" (Table III (110)) links this same type of grassland with both the Vegetation Type, and Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3).

The Andropogon schirensis Species-Group (Table III (143)) links the Vegetation Type with both the Andropogon schirensis var. angustifolia - Parinari curatellifolia Short Open Woodland (Community 32), and Grassland of the Humid Mistbelt.

(b) Constituent Syntaxa

More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2) is represented by four communities. One of these, namely Community 44, is further classified to the level of variant (Fig 4.2):

41. Tecomaria capensis susbp. capensis - Bequaertiodendron magalismontanum Low Closed Woodland
42. Diospyros galpinii - Bequaertiodendron magalismontanum Tall Open Shrub-land
43. Selago atherstonei - Syzygium cordatum Low Open Woodland
44. Alepidea gracilis var. major - Loudetia simplex Low Open Woodland

44A. Myrica pilulifera - Alepidea gracilis var major - Loudetia simplex Variant

44B. Athanasia calva - Alepidea gracilis var. major - Loudetia simplex Variant

Community 41.

Tecomaria capensis subsp. capensis - Bequaertiodendron magalismontanum Low Closed Woodland

Type Relevé: 99 (Tables II C and IV C)

This low closed woodland community of the Plateau Crest (Fig. 4.37) is situated 1,5 km east of Sabie, on Black Reef Quartzite cliffs. It is represented by three relevés located at about 1 050 m elevation (Table II C).

Habitat

Factors apparently influencing floristic differentiation are the sandy loams of the upper soil horizon and the partially sheltered nature of the sites (Table II C). Other habitat factors correspond largely to those for the Vegetation Type (Table IV C).

Structure

The structural attributes of the vegetation of the type relevé (99) are as follows:

Canopy and shrub layer	(1,0-5,0 m)	70% cover
Field layer	(0,0-1,0 m)	40% cover

In low sparse woodland (Relevé 96), the canopy and shrub layer together cover only 35 per cent of the quadrat area.

Floristics

Community 41 is differentiated by the *Ochna holstii* Species-Group (Table II C (4)), including *Ficus ingens*, *Setaria megaphylla* and *Canthium mundianum*. The only local character species amongst these are the trees *Tecomaria capensis* and *Solanum mauritianum*, and the fern *Arthropteris macrocarpa* (Table III (84)).

The absence from the Vegetation Type of the *Crassula alba* "complex" Species-Group (Table II C (20)), including *Andropogon schirensis* and *Panicum natalense*, may also indicate Community 41. The grass *Eulalia villosa* is also notably absent. Those species, whose presence in this context may be indicative, include *Combretum molle*, *Bersama transvaalensis*, *Dombeya pulchra* and *Triumfetta rhomboidea*.

In the canopy, *Bequaertiodendron magalismontanum*, *Ficus ingens* and *Tecomaria capensis* are often dominant. *Psychotria capensis* is dominant in the shrub layer, whilst *Helichrysum kraussii* and *Cyperus leptocladus* may occasionally dominate the field layer (Fig. 4.37).

General

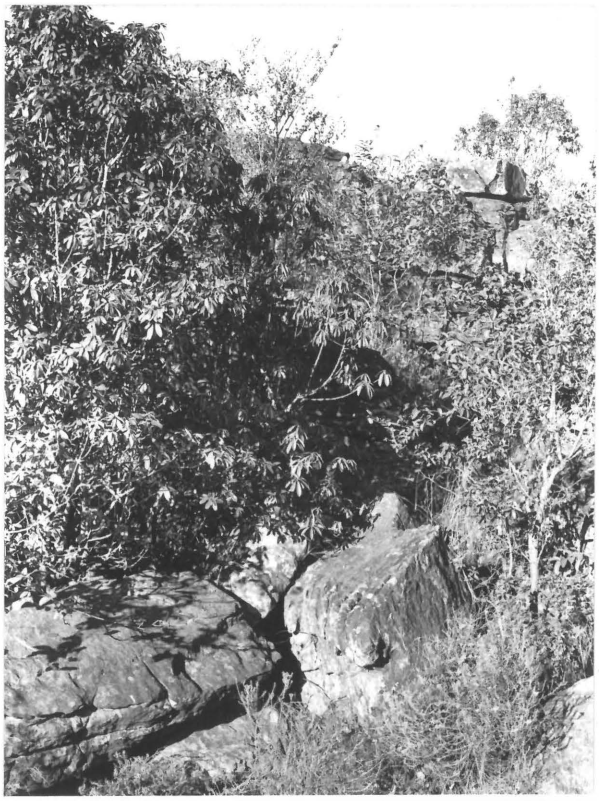
Relationship with Partially sheltered Low Thicket and Woodland on midslope planes of the Escarpment Upper Slopes and the Mountains (Vegetation Type 4.2.3.1) is expressed by the *Rhoicissus tridentata* Species-Group (Table II C (6)). Similarly, affinity with the *Diospyros galpinii* - *Bequaertiodendron magalismontanum* Tall Open Shrubland (Community 42) is expressed by the *Hyparrhenia filipendula* "complex" Species-Group (Table II C (8)). This last affinity is extended to the *Selago atherstonei* - *Syzygium cordatum* Low Open Woodland (Community 43) by the *Bequaertiodendron magalismontanum* Species-Group (Table II C (12)); and to the *Myrica pilulifera* - *Alepidea gracilis* var *major* - *Loudetia simplex* Low Open Woodland (Variant 44A) by the *Psychotria capensis* Species-Group (Table II C (17)).

Community 42.
Diospyros galpinii - *Bequaertiodendron magalismontanum* Tall Open Shrubland
Type Relevé: 98 (Tables II C and IV C)

FIG. 4.37 Community 41: Tecomaria capensis subsp. capensis - Bequaertiodendron magalismontanum Low Closed Woodland (Relevé 96). In the foreground, the shrub Bequaertiodendron magalismontanum and the forb Helichrysum kraussii are visible.

FIG. 4.38 Community 43: Selago atherstonei - Syzygium cordatum Low Open Woodland near Malieveld (Relevé 126). Note the stunted form of Syzygium cordatum on the right. Bequaertiodendron magalismontanum can be seen on the extreme left, whilst Aloe petricola is conspicuous in the foreground (right).

FIG. 4.39 Variant 44A: Myrica pilulifera - Alepidea gracilis var. major - Loudetia simplex Low Open Woodland in Mac Mac Nature Reserve (Relevé 74). Rocky outcrops in grassland provide a niche for woody species such as Syzygium cordatum, Myrsine africana and Rhus dura.



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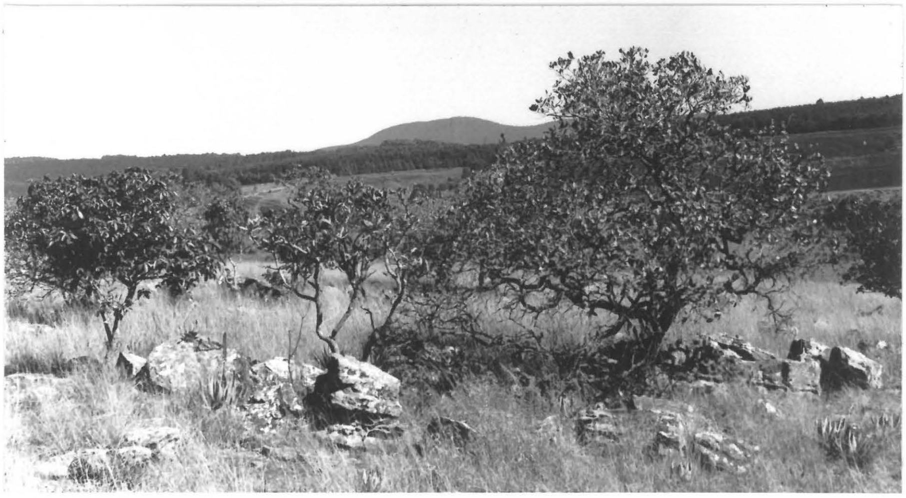

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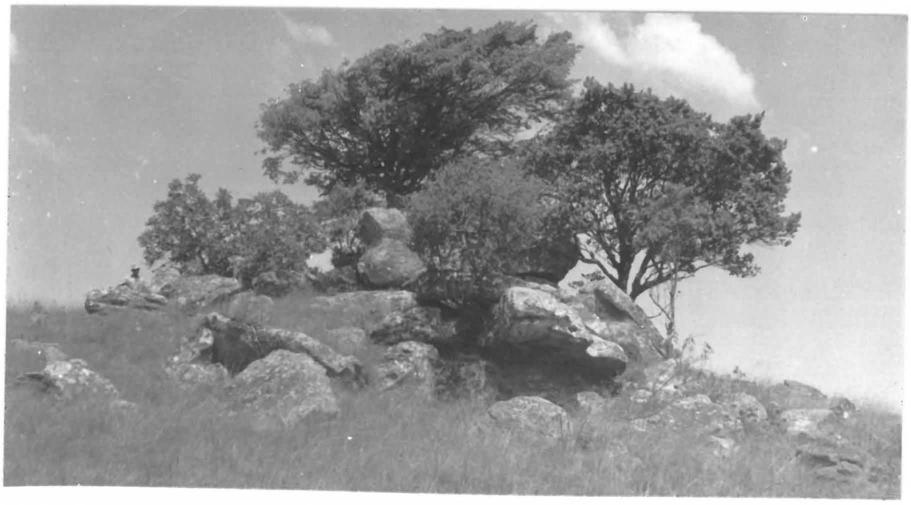


4.39

This community of the Plateau Crest is physiognomically variable occurring as grassland (Relevé 97), shrubland (Relevé 98), and woodland (Relevé 100). It is situated on the slopes immediately subjacent to the Black Reef Quartzite cliffs 1,5 km east of Sabie. It is represented by three relevés at about 1 050 m elevation (Table IV C).

Habitat

The very shallow soils with sandy brown loams in the upper horizon are distinctive (Table II C). Other habitat features correspond well to those for the Vegetation Type as a whole (cf. Section 4.2.3.2).

Structure

The structural attributes of the vegetation of the type relevé (98) are as follows:

Shrub layer	(1,0-2,0 m)	5% cover
Field layer	(0,0-1,0 m)	60% cover

By contrast, short closed grassland (Relevé 97) lacks a shrub layer, whilst the low open woodland (Relevé 100) has a canopy.

Floristics

Community 42 is differentiated by the *Gladiolus densiflorus* Species-Group (Table II C (7)), including the shrublets *Diospyros galpinii*, *Parinari capensis* and *Lannea edulis*; and the grass *Tristachya leucothrix*. Among these are the local character species, *Selago hyssopifolia* and *Aeschynomene rehmanii* var. *leptobotrya*; a forb and shrublet respectively (Table III (87)).

The absence of the shrublet *Rhus dura* from the Vegetation Type may indicate Community 42. The presence of *Pterocelastrus echinatus* and *Polygala hottentotta*, in this context, may be similarly indicative.

Where there is a canopy, *Bequaertiodendron magalismontanum* is usually dominant. Even in short closed grassland, it is present in the field layer as a seedling. More consistent components dominating the field layer include the grasses Loudetia simplex and Panicum natalense, the creeper Rhynchosia monophylla, and the shrublet Parinari capensis.

General

Relationship with the Selago atherstonei - Syzygium cordatum Low Open Woodland (Community 43) and with the Galopina aspera - Faurea speciosa Low Open Woodland (Community 39) is expressed by the Schizachyrium sanguineum Species-Group (Table II C (11)). These affinities are extended to the Alepidea gracilis var. major - Loudetia simplex Low Open Woodland (Community 44) by the Crassula alba "complex" Species-Group (Table II C (20)). They are also extended to the ecotonal Acacia ataxacantha short thicket (Community 11); to Less-sheltered Woodland and Thicket on fairly deep soils of the Upper Foothills (Vegetation Type 4.2.2.2); and to low closed grassland (Communities 49B-50) by the Pearsonia sessilifolia "complex" Species-Group (Table III (123)). The shrublet Lannea edulis links Community 42 with Woodland and Xeric Thicket of the Low Country (Table III (68)). Similarly, Parinari capensis links Community 42 with the low closed grassland Communities 49B and 50 (Table III (121)).

There appears to be a successional gradient from short closed grassland (Relevé 97), to tall open shrubland (relevé 98), to low open woodland (Relevé 100). In grassland, rock outcrops that are protected from fire are colonized by such pioneers as the creeper Rhynchosia monophylla, the shrublet Parinari capensis (which may have subterranean buds), and the grass Rhynchelytrum "complex" (probably R. rhodesianum in this instance). Colonization by shrubs such as Plectranthus zatarhendi then takes place. These plants have large, fire-resistant woody rootstocks, which apparently serve to break up rock. In time, Parinari capensis and Rhynchosia monophylla form dense mats which cover the rock and which act as "traps", collecting the soil and debris necessary for future colonization by other woody species such as Vernonia poskeana, Bequaertiodendron magalismontanum, Faurea speciosa and Tarchonanthus trilobus. Subsequent development towards closed or open woodland is apparently determined by the degree of exposure. Whereas the more sheltered sites support closed woodland (cf. Community 41), the more exposed sites tend to support open woodland (cf. Relevé 100).

Community 43.
Selago atherstonei - Syzygium cordatum Low Open Woodland
Type Relevé: 126 (Tables II C and IV C)

This low open-woodland community of the Plateau Crest (Fig. 4.38) is situated 3,5 km south-east of Sabie, on the Malieveld plateau. It is represented by four relevés at about 1 200 m elevation (Table IV C).

Habitat

The Community's major location on a gently sloping, xeroclinal upland terrace, together with the effect of burning and the incidence of black loamy sands in the upper soil horizons, are all factors which seem to influence floristic differentiation (Table II C). Other habitat factors correspond well to those for the Vegetation Type as a whole (cf. Section 4.2.3.2).

Structure

The structural attributes of the vegetation of the type relevé (126) are as follows:

Canopy	(1,0-4,0 m)	30% cover
Field layer	(0,0-1,0 m)	60% cover

Low closed woodland (Relevé 128) has a canopy cover of 60 per cent.

Floristics

Community 43 is differentiated by Species-Group 9 (Table II C), comprising Aloe petricola, Gladiolus exiguus, Selago atherstonei and Burchellia bubalina. Only the latter two species, a forb and a tree respectively, show any potential as local character species (Table III (91)).

The presence of the Hyparrhenia hirta Species-Group in the Vegetation Type may also indicate Community 43 (Table II C (10)). Likewise may the presence of frost-sensitive species, such as Parinari curatellifolia, Pterocarpus angolensis and Trachypogon spicatus, be indicative. Their presence may be explained in terms of the Plateau Crest being an area from which cold air drains away.

In the canopy, Syzygium cordatum and Bequaertiodendron magalismontanum are invariably dominant (Fig. 4.38). In closed woodland, Pterocarpus angolensis also becomes dominant. In the field layer, Loudetia simplex and Aloe petricola are most often dominant (Fig. 4.38).

General

Community 43 is related to the Galopina aspera - Faurea speciosa Low Open Woodland (Community 39) by the presence of the Hyparrhenia hirta Species-Group (Table II C (10)). Community 43 is also related to the Alepidea gracilis var. major - Loudetia simplex Low Open Woodland (Community 44) by the presence of the Aeschynomene nyassana Species-Group (Table II C (19)). The latter relationship is extended to the Humid Mistbelt by the Loudetia densispica Species-Group (Table III (140)).

The presence of species such as Ekebergia pterophylla, Myrsine africana and Cyanotis pachyrrhiza seems to indicate an affinity with the elfin-like Ekebergia pterophylla - Psychotria zombamontana Short Forest (Community 3). Similarly do Crassula natalensis and Xerophyta retinervis indicate an affinity with the Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland (Community 36); and Aloe petricola and Coleochloa setifera, an affinity with Communities 37 and 38.

The Selago atherstonei Species-Group (Table III (91)) indicates an affinity with the Erica drakensbergensis - Inezia integrifolia - Monocymbium ceresiiforme Low Closed Woodland (Variant 53B). As the surrounding Andropogon schirensis grassland (cf. Community 51) of upland terraces approaches the ridge of the Plateau Crest, soils become shallower and the underlying Black Reef Quartzite begins to crop out. Aloe petricola is one of the first species to colonize these areas of exposed rock. The latter afford some protection from fire and so become species-enrichment centres, Bequaertiodendron magalismontanum and Syzygium cordatum being the first woody inhabitants. These are followed by other woody species, such as Pterocarpus angolensis, Rhus rehmanniana and Psychotria capensis, all of which contribute towards a denser canopy which in turn results in the Loudetia simplex-dominated field layer (cf. Relevé 126) being replaced by a Cyperus leptocladus- and Trichopteryx dregeana-dominated field layer (cf. Relevé 128).

Whether the vegetation subsequently develops to short (elfin-like) forest (cf. Community 3), or to Acacia ataxacantha short thicket (cf. Community 11), is largely dependent on how the habitat is modified. Whereas thicket is more likely to develop on steeper, exposed, xeroclinal, upper-pediment slopes; forest is more likely to develop on gently sloping, sheltered knolls outcropping on upland terraces. (Table IV A).

Copmmunity 44.
Alepidea gracilis var. major - Loudetia simplex Low Open Woodland

This community is represented by four relevés in the 1 234 - 1 600 m elevation range. Their physiognomy is mainly low open woodland (Fig. 4.39), and they are widely distributed on the Plateau Crest (at Mac Mac and Bakenkop) and on the Mountains (Vertroosting Nature Reserve) (Table IV C). The Community has two variants, 44A and 44B.

Habitat

The factors that are distinctive, and shared only with the Artemisia afra - Bowkeria cymosa Low Thicket (Community 40), are the sandy clay loams in the upper soil horizon and the underlying dolomite lithology (Table II C). Other habitat factors largely correspond to those for the Vegetation Type as a whole (cf. Section 4.2.3.2).

Structure

The structural attributes of the vegetation of the Community will be discussed under the variants into which it is divided (see Variants 44A and 44B below).

Floristics

Community 44 is differentiated by the Mohria caffrorum Species-Group (Table II C (13)), including the tree Greyia radlkoferi, the shrub Plectranthus rubropunctatus, the suffrutex Alepidea gracilis, the forb Clutia monticola, and the grass Eragrostis curvula. Some species are particularly selective. They include Helichrysum mimetes, Erica drakensbergensis, Pearsonia aristata and Senecio coronatus (Table III (97)).

The absence, from the Vegetation Type, of the Bequaertiodendron magalismontanum Species-Group (Table II C (12)) may indicate Community 44.

Likewise, in this context, may the presence of the tree Bowkeria cymosa. The most common dominant of the Community is the field-layer grass, Loudetia simplex.

General

The shrub Plectranthus rubropunctatus links Community 44 with Tall/Short Forest on black soils derived from Black Reef Quartzite of the Plateau Crest (Vegetation Type 4.2.1.2) (Table III (4)). This relationship is extended to Tall/Short Forest on soils derived from Upper Dolomite of the Lower Mountains (Vegetation Type 4.2.1.1), and to the Artemisia afra - Bowkeria cymosa Low Thicket (Community 40), by the tree Greyia radlkoferi (Table III (7)). Affinity with the Inezia integrifolia - Monocymbium ceresiiforme Low Closed Grassland (Community 53) is indicated by the Protea caffra Species-Group (Table III (139)).

It is proposed that Community 44 is intermediate in the succession from grassland (cf. Community 53) to forest (cf.Communities 1,2 and 3). The appearance of rocky outcrops in the grassland appears to initiate the succession by providing a niche for woody species such as Syzygium cordatum, Myrsine africana, Plectranthus rubropunctatus and Rhus dura (Fig. 4.39).

Variant 44A.
Myrica pilulifera - Alepidea gracilis var major - Loudetia simplex Low Open Woodland
Type Relevé: 107 (Tables II C and IV C)

This low open-woodland variant (Fig. 4.39) is represented by two relevés situated at 1 400 and 1 580 m elevation, on the Plateau Crest and Middle Mountains, respectively (Table IV C).

Habitat

The Variant is notable for its low open-woodland physiognomy on gently sloping, very rocky xeroclines (Table II C). The Black Reef Quartzite and Upper Dolomite variations (Relevés 74 and 107 respectively) are apparently not the main controlling factors (Table IV B).

Structure

The structural attributes of the vegetation of the type relevé (107) are as follows:

Canopy and shrub layer	(0,5-5,0 m)	10% cover
Field layer	(0,0-0,5 m)	45% cover

The canopy and shrub layer may account for as much as 30 per cent of the cover in the other representative relevé (74).

Floristics

Variant 44A is differentiated by Species-Group 14 (Table II C) including the forbs Cephalaria pungens and Eriosema ellipticifolium. Other member-species include the shrub Pachystigma macrocalyx, the tree Myrica pilulifera, and the forb Conostomium natalense. Of these, only the former is a local character species for the Variant, the latter two being particularly selective species.

Other species, whose presence in the Vegetation Type may indicate Variant 44A, include the trees Ochna arborea and Syzygium gerrardii; the shrub Asparagus rigidus; and the forbs Gerbera aurantiaca, Acalypha angustata, Selago muddii, Hermannia montana and Wahlenbergia virgata. Those whose absence in this context may be indicative, include the grass Trichopteryx dregeana.

Besides those already mentioned for Community 44, there are dominant species that are specific to the Variant. Syzygium cordatum and Myrica pilulifera are variously dominant in the canopy and shrub layer, whilst Smilax kraussiana is co-dominant with Loudetia simplex in the field layer.

General

Affinities with Mistbelt forest are indicated by Schefflera umbellifera (Table III (8)) and Syzygium gerrardii (Table III (11)). Those with Grassland of the Humid Mistbelt are indicated by the Cephalaria pungens Species-Group (Table III (138)). Individual species having an affinity with various grassland communities include Tephrosia elongata, Tetraselago natalensis, Selago muddii and Acalypha angustata (Table III (107, 108, 114 and 136 respectively)).

Variant 44B.
Athanasia calva - Alepidea gracilis var major - Loudetia simplex Low Open Woodland
Type Relevé: 118 (Tables II C and IV C)

This woodland variant is physiognomically variable, occurring both as low open woodland (Relevé 118) and as low sparse woodland (Relevé 200). It is represented by two relevés situated at 1 240 and 1 600 m elevation, on the Lower Mountains and Plateau Crest, respectively (Table IV C).

Habitat

The Variant is notable for its moderately sloping mesoclines. Also, it is not so rocky as the previous variant (44A) (Table II C). The varying Black Reef Quartzite and Upper Dolomite lithology does not appear to be the main controlling factor, even though the former produces blacker, more acid soils (cf. Relevé 200) (Table IV C).

Structure

The structural attributes of the vegetation of the type relevé (118) are as follows:

Canopy and shrub layer	(1,5-4,0 m)	10% cover
Field layer	(0,0-1,5 m)	90% cover

Low sparse woodland (Relevé 200) has a canopy cover of only 2 per cent.

Floristics

Variant 44B is differentiated by Species-Group 18 (Table II C), comprising the forb Athanasia calva and the fern Blechnum tabulare which, although not local character species, are fairly selective for the Variant (Table III (102)).

The absence of the Psychotria capensis Species-Group (Table II C (17)) from the Vegetation Type is a good indication of Variant 44B. Other species, whose absence in this context may be indicative, include Setaria sphacelata and Diospyros lycioides (Table II C (22)). Those species, whose presence in the Vegetation Type may indicate Variant 44B, include Nidorella auriculata, Flemingia grahamiana, Athanasia acerosa and Berkheya latifolia.

Besides those already mentioned for Community 44, there are dominant species that are specific to the Variant. Faurea speciosa and Greyia radlkoferi are variously dominant in the canopy, whilst Erica drakensbergensis and Cliffortia nitidula are dominant in the shrub layer. In the field layer, Monocymbium ceresiiforme and Helichrysum mimetes are co-dominant with Loudetia simplex.

General

Affinities lie mainly with Woodland and Grassland of the Humid Mistbelt. They are expressed by individual species rather than by species-groups. Flemingia grahamiana, for example, links Variant 44B with Partially sheltered Low Thicket and Woodland on midslope planes of the Escarpment Upper Slopes and the Mountains (Vegetation Type 4.2.3.1) (Table II C (3)).

The presence of the forb Aster comptonii links Variant 44B with both the Artemisia afra - Bowkeria cymosa Low Thicket (Community 40), and the Gladiolus densiflorus - Loudetia simplex Short Closed Grassland (Community 45) (Table III (105)). Similarly, the shrub Athanasia acerosa links the Variant with Monocymbium ceresiiforme and Loudetia simplex grasslands (Communities 45-48) (Table III (115)). Affinity with the Asclepias crassinervis - Andropogon schirensis var. angustifolia Short Closed Grassland (Community 51) is indicated by the forb Lopholaena segmentata (Table III (124)).

4.2.4 GRASSLAND OF THE HUMID MISTBELT

(A) General Characteristics

Grassland of the Humid Mistbelt is represented in all physiographic zones except the Foothills. Its altitudinal range lies between 990 and 1 600 m elevation (Table IV D).

Physiognomy

Closed grassland is the predominant physiognomy. It is further differentiated on the basis of height and cover, which attributes are apparently determined by the slope and aspect of the habitat. Whereas low closed grassland (50–75 per cent cover) predominates on gently sloping xeroclines, short closed grassland (75–100 per cent cover) predominates on moderately sloping mesoclines (Table IV D). In addition, open and sparse woodland and shrubland is meagrely represented (Table IV D).

Habitat

The fire-maintained Grassland of the Humid Mistbelt occurs on exposed sites and covers all geomorphological classes except knolls, kloofs and streambanks (Table IV D). This is in accordance with the fire-protective properties of such sites.

All types of lithology except Transvaal Diabase are represented, although even this may be represented in localities not covered by relevés. Soils are mainly fairly shallow but may also be very deep on the less rocky sites, where colluviation may be a factor. Sandy clay loams are predominant in the upper soil horizon, whilst sandy clays predominate in the lower horizons. Soil colour ranges from black to red (Table IV D).

Characteristic habitat features that pertain only to Grassland of the Humid Mistbelt include the relatively low percentage of rocky outcrops (less than 34 per cent); the absence of strongly acid soils; and the presence of Timeball Hill Shale and Mudstone, as well as Oaktree Dolomite (Table V).

Floristics

The most widespread species in Grassland of the Humid Mistbelt are those of Species-Group 38 (Table II D), including the grasses *Loudetia simplex*, *Andropogon schirensis* and *Panicum natalense*; and the shrublet *Aeschynomene nyassana*. None of these are differential for the Ecological-Formation Class, however. The *Cephalaria pungens* Species-Group (Table III (138)) is perhaps the most diagnostic in this context.

Other species, that are more or less confined to Grassland of the Humid Mistbelt and are distributed fairly extensively therein, are the following (Table VI):

Acrotome hispida	Eriosema gunniae
Becium obovatum	Helichrysum aureo-nitens
Bewsia biflora	Hemizygia subvelutina
Bulbostylis schoenoides	Indigofera sanguinea
Cyanotis speciosa	Pentanisia angustifolia
Eragrostis capensis	Raphionacme hirsuta
Eriosema angustifolium	Selago muddii
Eriosema ellipticifolium	Vernonia hirsuta

These species are thus fairly typical of the Ecological-Formation Class.

General

Relationship with Less-sheltered Woodland and Thicket on fairly deep soils of the Upper Foothills (Vegetation Type 4.2.2.2) is indicated by the Pentanisia prunelloides Species-Group (Table III (128)). This relationship is extended to Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1), and to Woodland of the Humid Mistbelt, by the Indigofera swaziensis Species-Group (Table III (134)). Other affinities have already been mentioned in other sections.

On the basis of observations made of grassland Communities 46—50, there are phenological differences amongst the associated grasses. There are early-flowering species, late-flowering species, and species with extended flowering seasons. Amongst the early-flowering grasses (October to December) are Eragrostis capensis, E. curvula, E. hierniana, Panicum ecklonii, Koeleria capensis, Harpochloa falx, Rendlia altera, Digitaria monodactyla, Sporobolus "complex" and Setaria sphacelata. The late-flowering grasses (February to March) include Loudetia simplex, Monocymbium ceresiiforme, Andropogon schirensis, Panicum natalense, Eulalia villosa, Stiburus alopecuroides, Schizachyrium sanguineum, Hyparrhenia hirta, H. filipendula and Eragrostis gummiflua. Finally those grasses whose flowering season extends from October to March include Themeda triandra, Eragrostis racemosa and Loudetia densispica.

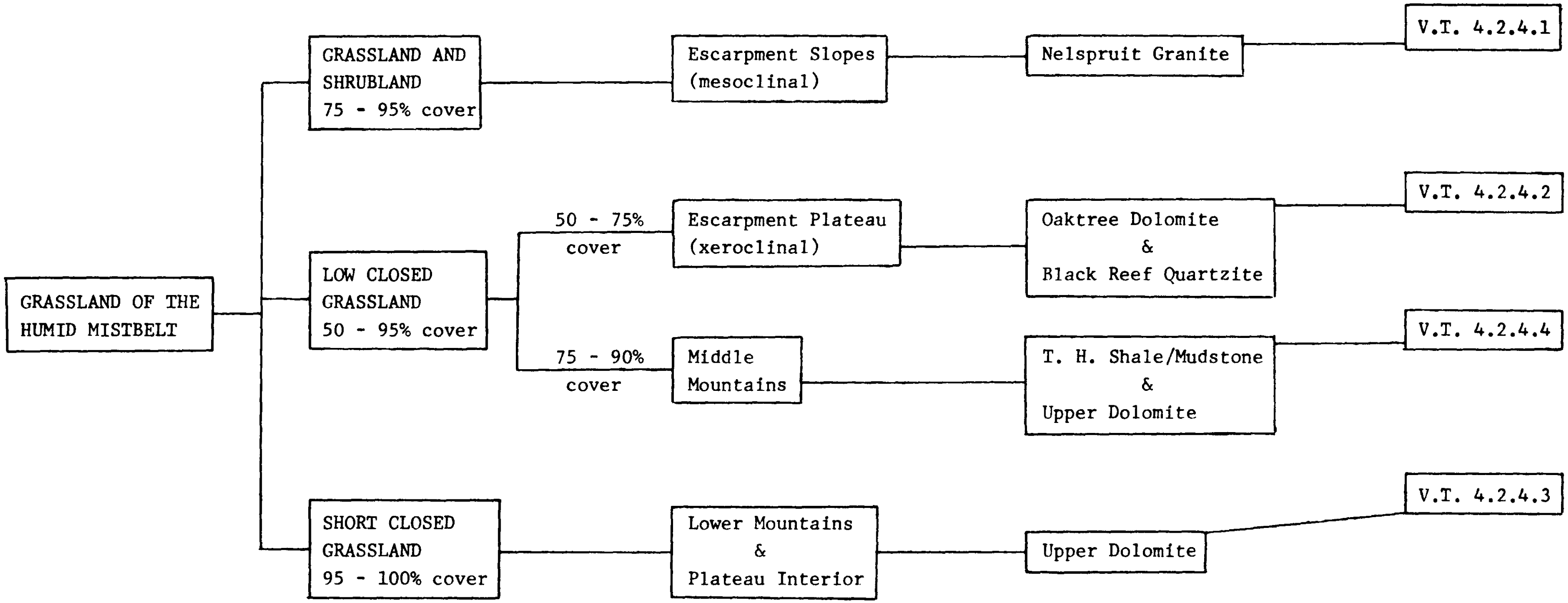


FIG. 4.40 An ecological basis for the recognition of four vegetation types (V.T.) in Grassland of the Humid Mistbelt, Sabie area.

The Humid Mistbelt is an area of high moisture status, supporting the physiognomic extremes of forest and grassland. Fire is traditionally held responsible for the subjugation of forest and woodland by grassland. Recent findings by Rutherford and Westfall (MS), however, suggest that frost, especially in conjuction with high rainfall, may also be a factor responsible for the elimination of woody species. The absence of grassland in burnt, frosted parts of the Low Country, would then presumably be due to the low moisture status of the latter.

(B) Component Vegetation Types

Grassland of the Humid Mistbelt comprises four vegetation types (Fig. 4.2) that are differentiated and named on the basis of characteristic habitat features (Fig. 4.40 and Tables IV D and V):

4.2.4.1 Grassland and Shrubland on soils derived from Nelspruit Granite of the Escarpment Slopes.

4.2.4.2 Low Closed Grassland on soils variously derived from Black Reef Quartzite and Oaktree Dolomite of the Escarpment Plateau.

4.2.4.3 Short Closed Grassland on soils derived from Upper Dolomite of the Plateau Interior and Lower Mountains.

4.2.4.4 Low Closed Grassland on soils variously derived from Upper Upper Dolomite and Timeball Hill Shale and Mudstone of the Middle Mountains.

4.2.4.1 Grassland and Shrubland on soils derived from Nelspruit Granite of the Escarpment Slopes

(a) General Characteristics

This vegetation type occurs on level to moderately sloping mesoclines between 1 112 and 1 355 m elevation. Geomorphology varies between upper-pediment slopes, midslope planes and lower-pediment slopes. The vegetal cover is usually 75–95 per cent.

There is a characteristic lack of differential species. Perhaps the most diagnostic floristic feature is the absence of Species-Group 34 (Table II D), comprising the forb Helichrysum pilosellum and the grass Eragrostis racemosa. The presence of Trichopteryx dregeana (Table III (109)) is also fairly diagnostic. The most common dominant is the grass Loudetia simplex.

Besides those already mentioned under previous sections, floristic affinities are largely confined to Grassland of the Humid Mistbelt.
The Eulalia villosa Species-Group (Table II D (28)) links the Vegetation Type with the Lightfootia huttonii - Eragrostis racemosa Low Closed Grassland (Community 49), the Asclepias crassinervis - Andropogon schirensis var. angustifolia Short Closed Grassland (Community 51), and the Bewsia biflora - Loudetia simplex Short Closed Grassland (Community 52).

The Loudetia densispica Species-Group (Table II D (33)) links the Vegetation Type with the Monocymbium ceresiiforme low closed grassland (Communities 47, 48 and 53). This relationship is extended to both the Hypoxis multiceps - Lightfootia huttonii - Eragrostis racemosa Low Closed Grassland (Variant 49A), and the Asclepias crassinervis - Andropogon schirenis var. angustifolia Short Closed Woodland (Community 51), by the Monocymbium ceresiiforme Species-Group (Table II D (35)). It is further extended to the Bewsia biflora - Loudetia simplex Short Closed Grassland (Community 52) by the Cephalaria pungens Species-Group (Table II D (36)).

(b) Constituent Syntaxa

Grassland and Shrubland on soils derived from Nelspruit Granite of the Escarpment Slopes (Vegetation Type 4.2.4.1) is represented by two communities (Fig 4.2):

45. Gladiolus densiflorus - Loudetia simplex Short Closed Grassland
46. Cliffortia repens - Loudetia simplex Low Closed Shrubland

Community 45.
Gladiolus densiflorus - Loudetia simplex Short Closed Grassland
Type Relevé: 198 (Tables II D and IV D)

This short closed grassland community of the Escarpment Lower Slopes is represented by four relevés situated mainly at about 1 200 m elevation on Hebron plantation, about 5 km east of Bakenkop.

Habitat

Community 45 is unique in Grassland of the Humid Mistbelt. It is the only constituent syntaxon to occur in the Transitional Mistbelt, on the Escarpment Lower Slopes (Table II D). The Community is mostly found on lower-pediment slopes that are exposed, mesoclinal and gently sloping. Soils tend to be deep, with minimal rock outcrop. In some places (cf. Relevé 199), a high clay fraction in the lower horizons results in a perched water table, with resultant swampy conditions and gleyed soils (Table IV D).

Structure

The structural attributes of the vegetation of the type relevé (198) are as follows:

Field layer	(0,0-1,0 m)	90% cover

One relevé (136), having advanced to the stage of low open woodland, has a 3 m high canopy with a cover of 15 per cent.

Floristics

Community 45 is differentiated by Species-Group 1 (Table II D), including the geophytic herb Gladiolus densiflorus and the forb Selago atherstonei. Other members of the Species-Group, namely the forbs Indigofera sp. and Lopholaena disticha, are local character species for Community 45 (Table III (105)). The forb Aster comptonii is fairly selective (Table III (105)).

The absence from the Vegetation Type of the Tetraselago natalensis Species-Group (Table II D (4)), the Selago muddii Species-Group (Table II D (8)), and the Bulbostylis schoenoides Species-Group (Table II D(17)) is also diagnostic for Community 45. Likewise, in this context, is the absence of individual species such as Becium obovatum, Helichrysum aureo-nitens, and Pearsonia sessilifolia "complex".

The presence in the Vegetation Type of such species as Knowltonia transvaalensis, Diospyros galpinii, Barleria ovata, Helichrysum nudifolium, Aeschynomene nyassana, Rhynchosia monophylla and Pteridium aquilinum, may also indicate Community 45.

Dominant members in the field layer include the grasses _Loudetia simplex_ and _Monocymbium ceresiiforme_, the large geophytic herb _Gladiolus densiflorus_, and the small shrub _Athanasia acerosa_. In low open woodland (Relevé 136), _Protea caffra_ and _Faurea speciosa_ assume dominance in the canopy.

General

Gladiolus densiflorus shows affinity with _Parinari curatellifolia_ woodland (Communities 29-34); the _Diospyros galpinii_ - _Bequaertiodendron magalismontanum_ Tall Open Shrubland (Community 42); and the _Parinari capensis_ subsp. _capensis_ - _Lightfootia huttonii_ - _Eragrostis racemosa_ Low Closed Grassland (Variant 49B) (Table III (70)). The _Hemizygia subvelutina_ Species-Group (Table III (115)) links Community 45 with other grassland syntaxa, viz Communities 46, 47 and 48.

The _Barleria ovata_ Species-Group (Table III (132)) links Community 45 with Partially sheltered Low Thicket and Woodland on midslope planes of the Escarpment Upper Slopes and the Mountains (Vegetation Type 4.2.3.1), and with grassland Communities 49–52.

As the Community becomes moisture-saturated, more hygrophilous species such as the grasses _Trichopteryx dregeana_, _Setaria sphacelata_, _Stiburus alopecuroides_ and _Ischaemum arcuatum_ become prominent. Other hygrophilous species attaining importance are the tree fern _Alsophila dregei_ and the shrublet _Smithia erubescens_.

Community 46.
Cliffortia repens - _Loudetia simplex_ Short Open Shrubland
Type Relevé: 62 (Tables II D and IV D)

This is the only shrubland community occurring in Grassland of the Humid Mistbelt (Fig. 4.41). It is represented by two relevés situated on the Escarpment Upper Slopes at about 1 250 m elevation, and approximately 1 km west of Frankfort Forest Station (Table IV D).

Habitat

The shrubland physiognomy on relatively rocky sites of the Escarpment Upper Slopes is characteristic (Table II D). The exposed upper-pediment slopes of Community 46 are moderately sloping and mesoclinal. Soils are fairly shallow, with black loams in the upper horizon, and red sandy clays lower down (Table IV D).

Structure

The structural attributes of the vegetation of the type relevé (62) are as follows:

Shrub layer	(0,5-1,0 m)	5% cover
Field layer	(0,0-0,5 m)	80% cover

Floristics

Community 46 is differentiated by Species-Group 2 (Table II D), including the forbs Senecio oxyriifolius and Helichrysum mimetes. Other members of this group are local character species for the Community. They comprise the small shrub Cliffortia repens, the herb Lobelia decipiens, the grass Styppeiochloa gynoglossa, and the sedge Pycreus muricatus (Table III (106)).

Other diagnostic features in the Vegetation Type context are the inverse of those mentioned for the previous community (45).

In the shrub layer, Cliffortia repens is the most common dominant (Fig. 4.41). Dominant grasses in the field layer are Loudetia simplex and Eragrostis capensis. Dominant forbs include Helichrysum mimetes, Pearsonia sessilifolia "complex" and Hemizygia subvelutina.

General

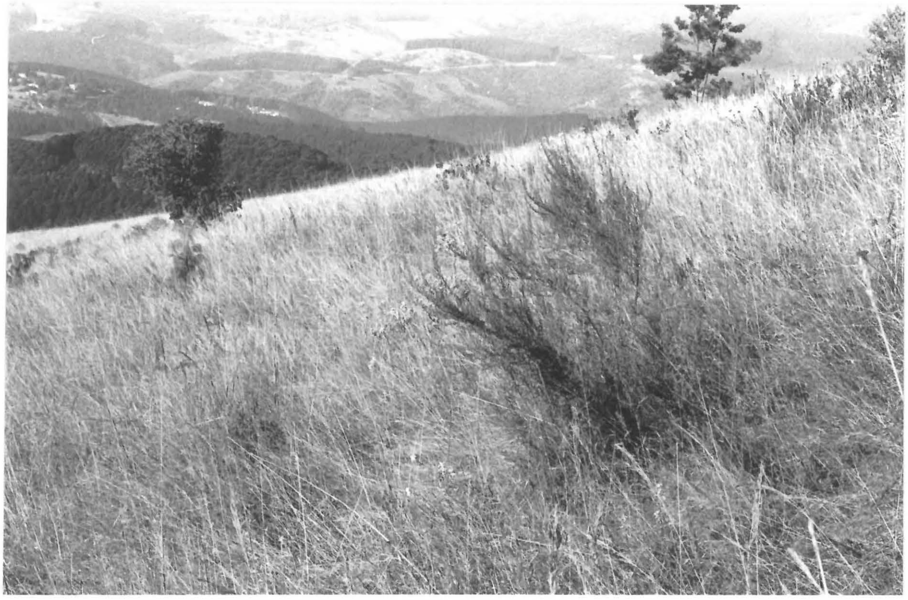
The absence of the Themeda triandra Species-Group (Table II D (37)) links Community 46 with the Digitaria monodactyla - Loudetia simplex Low Closed Grassland (Community 50).

Relationship with the Tetraselago natalensis - Monocymbium ceresiiforme Low Closed Grassland (Community 47) is expressed by the Tetraselago natalensis Species-Group (Table II D (4)). This relationship is extended to the Rendlia altera - Monocymbium ceresiiforme Low Closed Grassland (Community 48) by the Selago muddii Species-Group (Table II D (81)).

FIG. 4.41 Community 46: *Cliffortia repens* - *Loudetia simplex* Short Open Shrubland (Relevé 62), showing the diagnostic shrub *Cliffortia repens* (centre).

FIG. 4.42 Community 47: *Tetraselago natalensis* - *Monocymbium ceresiiforme* Low Closed Grassland (Relevé 84), showing an alluvial site where the grass *Stiburus alopecuroides* attains dominance. The dark corymbose inflorescences of *Tetraselago natalensis* are visible in the centre of the photograph.

FIG. 4.43 Community 48: *Rendlia altera* - *Monocymbium ceresiiforme* Low Closed Grassland in Mac Mac Nature Reserve (Relevé 78). Note the dominance of the bracken fern *Pteridium aquilinum*.


4.41


4.42


4.43

The Bulbostylis schoenoides Species-Group (Table II D (17)) links Community 46 with Low Closed Grassland on soils variously derived from Black Reef Quartzite and Oaktree Dolomite of the Escarpment Plateau (Vegetation Type 4.2.4.2). Relationship with Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3) is indicated by the forb Xerophyta retinervis (Table III (76)). Likewise, the forb Helichrysum mimetes (Table III (97)) indicates an affinity with the Alepidea gracilis var major - Loudetia simplex Low Open Woodland (Community 44).

The small shrub Rhynchosia komatiensis (Table III (90)) indicates an affinity with disturbed Acacia ataxacantha thicket (Communities 11 and 12); witn Bauhinia galpinii thicket and Parinari curatellifolia woodland; and with woodland syntaxa of the Humid Mistbelt.

4.2.4.2 Low Closed Grassland on soils variously derived from Black Reef Quartzite and Oaktree Dolomite of the Escarpment Plateau

(a) General Characteristics

This vegetation type consists mainly of low closed grassland (50–75 per cent cover) between 990 and 1 478 m elevation. Geomorphology is diverse, though mostly exposed, gently sloping and xeroclinal. Underlying lithology varies between Black Reef Quartzite and Oaktree Dolomite. Rocky outcrops also vary from less than 1 per cent to 34 per cent cover. Soils range in depth, from fairly shallow to deep; and in texture, from loamy sand to sandy clay in the lower horizons.Soil colour also varies from black to red (Table IV D).

Local character species for the Vegetation Type are the forbs Becium obovatum and Indigofera sanguinea (Table II (119)). The presence of Species-Group 17 (Table II D) and the absence of Species-Group 2 (Table II D) is also fairly diagnostic. Thus, for example, when Bulbostylis schoenoides, Eragrostis curvula and Eragrostis capensis occur unaccompanied by Lobelia decipiens, Cliffortia repens, Senecio oxyriifolius and Helichrysum mimetes, then the Vegetation Type is indicated.

Another infrequent species, whose presence in Grassland of the Humid Mistbelt may indicate the Vegetation Type, is the herb Commelina africana var. krebsiana.

The most common dominants in this single-stratum vegetation type are the grasses *Monocymbium ceresiiforme*, *Eragrostis racemosa* and *Loudetia simplex*. Floristic affinities are not apparent from Table II D and III.

(b) Constituent Syntaxa

Low Closed Grassland on soils variously derived from Black Reef Quartzite and Oaktree Dolomite of the Escarpment Plateau (Vegetation Type 4.2.4.2) is represented by four communities. One of these, namely Community 49, is further classified to the level of variant (Fig 4.2):

47. *Tetraselago natalensis* - *Monocymbium ceresiiforme* Low Closed Grassland
48. *Rendlia altera* - *Monocymbium ceresiiforme* Low Closed Grassland
49. *Lightfootia huttonii* - *Eragrostis racemosa* Low Closed Grassland
49A. *Hypoxis multiceps* - *Lightfootia huttonii* - *Eragrostis racemosa* Variant
49B. *Parinari capensis* subsp. *capensis* - *Lightfootia huttonii* - *Eragrostis racemosa* Variant
50. *Digitaria monodactyla* - *Loudetia simplex* Low Closed Grassland

Community 47.
Tetraselago natalensis - *Monocymbium ceresiiforme* Low Closed Grassland
Type Relevé: 73 (Tables II D and IV D)

This low closed-grassland community of the Plateau Crest (Fig. 4.42) is centred mainly in the Mac Mac Nature Reserve, 12 km north-east of Sabie. It is represented by three relevés at about 1 530 m elevation (Table IV D).

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II D. The low closed-grassland physiognomy occurs on gently sloping xeroclinal upland terraces formed by Black Reef Quartzite. Soils are fairly shallow, sandy and rocky, except on alluvial sites (cf. Relevé 84); where they may be fairly deep, with a considerable clay fraction (Table IV D). One relevé (71) occurs on granite soils of upper-pediment slopes, where a tall open shrubland has developed.

Structure

The structural attributes of the vegetation of the type relevé (73) are as follows:

Field layer (0,0-0,5 m) 65% cover

The vegetal cover in the field layer increases to 95 per cent on the alluvial sites (Relevé 84, Fig. 4.42). Where the vegetation is allowed to proceed to shrubland (Relevé 71), a 2 m high shrub layer with 5 per cent cover is prevalent.

Floristics

Community 47 is differentiated by Species-Group 3 (Table II D), comprising the filiform grass Microchloa caffra and the subwoody shrub Tephrosia elongata. Neither of these are local character species, although they are fairly selective for Community 47 (Table III (101)).

Other species, whose presence in the Vegetation Type may indicate Community 47, include the forbs Tetraselago natalensis (Fig. 4.42) and Eriospermum burchellii (Table II D (4)). More infrequent species in this context are Protea gaguedi, Aristea woodii and Trichopteryx dregeana.

The sedge Bulbostylis schoenoides, and the grasses Monocymbium ceresiiforme and Loudetia simplex, are the most common dominants. On the alluvial sites, more hygrophilous species (such as the grass Stiburus alopecuroides) attain dominance (Fig. 4.42).

General

Relationship with the Rendlia altera - Monocymbium ceresiiforme Low Closed Grassland (Community 48) is indicated by the Kyllinga alba Species-Group (Tables IID (7) and III (113)).

The absence of the Eulalia villosa Species-Group from grassland Communities 47, 48, 50 and 53 indicates their affinity (Table II D (28)). This affinity may reflect the avoidance of Black Reef Quartzite by these species (Table IV D).

Affinity with grassland Communities 48, 49, 52B and 53 is indicated by the Helichrysum pilosellum Species-Group (Table II D (34)), whilst affinities with Community 53 alone, are expressed by the forbs Vernonia hirsuta and Crassula vaginata (Table III (136)).

The Crassula alba "complex" Species-Group (Table III (110)) indicates an affinity with Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3); with More-exposed Low Woodland on upper pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2); and with Grassland and Shrubland on soils derived from Nelspruit Granite of the Escarpment Slopes (Vegetation Type 4.2.4.1).

With the fire-protection afforded by rock outcrops, it is evident that woody precursors such as Syzygium cordatum, Myrica pilulifera, Protea gaguedi and Cephalanthus natalensis are advantaged. Under continued protection, and with appropriate modifications to the habitat, it is conceivable that Community 47 would be succeeded by low woodland resembling that of the Plateau Crest and the Mountains (Communities 41—44).

Community 48.
Rendlia altera - Monocymbium ceresiiforme Low Closed Grassland
Type Relevé: 78 (Tables II D and IV D)

This low closed-grassland community of the Plateau Crest at about 1 400 m elevation (Fig. 4.43) is situated in the Mac Mac Nature Reserve, about 12 km north-east of Sabie. It is represented by five relevés (Table IV D).

Habitat

Habitat factors influencing floristic differentiation are not immediately apparent from Table II D. It is clear, however, that the Community has deeper soils, with fewer rock outcrops, than Community 47. The consistently black colour of the upper soil horizon is also characteristic (Table IV D). Otherwise, the habitat is very similar to that of Community 47.

Structure

The structural attributes of the vegetation of the type relevé (78) are as follows:

Field layer	(0,0-0,5 m)	70% cover

On alluvial sites (cf. Relevé 85), the vegetal cover in the field layer may be as high as 100 per cent.

Floristics

Community 48 is differentiated by the Alloteropsis semialata Species-Group (Table II D (6)). Local character species among these include the forbs Senecio erubescens var. crepidifolius, Senecio gerrardii and Helichrysum cephaloideum; and the herb Euphorbia striata (Table III (112)).

Other infrequent species, whose presence in the Vegetation Type may indicate Community 48, include the grasses, Eragrostis caesia and Festuca costata, and the herb Moraea muddii. Those whose absence in this context may be similarly indicative include the creeper Rhynchosia monophylla.

Common dominants are the grasses Rendlia altera, Monocymbium ceresiiforme and Loudetia simplex. The forb Becium obovatum is also commonly dominant. Less common dominants are Athanasia acerosa, Koeleria capensis, Pteridium aquilinum, Eragrostis curvula, Bulbostylis schoenoides and Harpochloa falx.

General

The Hemizygia subvelutina Species-Group (Table II D (9)) links Community 48 with other grassland syntaxa, viz Communities 45, 46 and 47. Similarly, the Becium obovatum Species-Group (Table II D (13)) links Community 48 with the Lightfootia huttonii - Eragrostis racemosa Low Closed Grassland (Community 49).

Relationships expressed by individual species include that with the Artemisia afra - Bowkeria cymosa Low Thicket (Community 40) by the shrub Nidorella auriculata (Table III (81)), as well as that with the Athanasia calva - Alepidea gracilis var. major - Loudetia simplex Low Open Woodland (Variant 44B) by the shrub Athanasia calva.

It is conceivable that as rocks begin to crop out and soils become shallower and sandier, the Microchloa caffra and Tetraselago natalensis Species-Groups (Table II D (3-4)) would become opportunistic, and the Community could develop toward grassland resembling the Tetraselago natalensis - Monocymbium ceresiiforme Low Closed Grassland (Community 47).

Community 49.
Lightfootia huttonii - Eragrostis racemosa Low Closed Grassland

This low closed-grassland community of the Plateau Interior is represented by five relevés situated at about 1 100 m elevation on the slopes immediately south of Harmony Hill Township, Sabie (Table IV D). The Community has two variants, 49A and 49B.

Habitat

The red clay soils derived from Oaktree Dolomite are characteristic (Table II D). Other distinctive habitat features, shared only with the *Asclepias crassinervis* - *Andropogon schirensis* var. *angustifolia* Short Closed Grassland (Community 51), are the deep soils devoid of rocky outcrops and situated on the Plateau Interior (Table II D). Other habitat factors largely correspond to those for the Vegetation Type as a whole (cf. Section 4.2.4.2).

Structure

The structural attributes of the vegetation of the Community will be discussed under the variants into which it is divided (see Variants 49A and 49B below).

Floristics

Community 49 is differentiated by the *Acrotome hispida* Species-Group (Table II D (10)). Local character species among these include the grasses *Brachiaria subulifolia* and *Digitaria apiculata*; and the forbs *Eriosema cordatum*, *Sonchus integrifolius*, *Helichrysum subulifolium* and *Triumfetta welwitschii* (Table III (116)).

Other species, whose presence in the Vegetation Type may indicate Community 49, include *Diospyros galpinii* and *Hypoxis* "complex" (Table II D (24)), as well as those of the *Eulalia villosa* Species-Group (Table II D (28)). A less frequent subwoody forb, whose presence may be indicative in this context, is *Fadogia tetraquetra*.

Dominant grasses include *Eragrostis racemosa*, *Loudetia simplex*, and *Themeda triandra*. The sedge *Bulbostylis schoenoides* and the forb *Helichrysum pilosellum* are sub-dominant.

General

The forb Pearsonia aristata links Community 49 with the Alepidea gracilis var. major - Loudetia simplex Low Open Woodland (Table III (97)).

Relationship with Short Closed Grassland on soils derived from Upper Dolomite of the Plateau Interior and Lower Mountains (Vegetation Type 4.2.4.3) is expressed by the Cymbopogon "complex" Species-Group (Table II D (26)). This relationship is extended to the Gladiolus densiflorus - Loudetia simplex Short Closed Grassland (Community 45) by the Diospyros galpinii Species-Group (Table II D (24)).

Finally, the forbs Acrotome hispida and Lightfootia huttonii (Table III (116)) appear to link Community 49 with the Eriosema nutans - Asclepias crassinervis - Andropogon schirensis var. angustifolia Short Closed Grassland (Variant 51B).

The red colouration in the soils arises from the presence of hematite — an ingredient of transported soils. The effects of hematite appear to be enhanced by the minimum of organic accumulations in the topsoil. Historical cultivation of this area may have been responsible for such humic deficits in the soil. The transported nature of the soil also explains its great depth.

Potential succession to more woody communities is suggested by the presence of seedlings of Diospyros lycioides, Ziziphus mucronata and Acacia spp.

Variant 49A.
Hypoxis multiceps - Lightfootia huttonii - Eragrostis racemosa Low Closed Grassland
Type Relevé: 88 (Tables II D and IV D)

This low closed-grassland variant is represented by two relevés at 1 120 m elevation (Table IV D).

Habitat

The only discernible habitat factor distinguishing the Variant from its partner (Variant 49B) is its situation on midslope planes rather than lower-pediment slopes (Table IV D). Its moisture status may therefore be less favourable than that of Variant 49B.

Structure

The structural attributes of the vegetation of the type relevé (88) are as follows:

Field layer	(0,0-0,5 m)	70% cover

In less eroded sites (cf. Relevé 89), cover may be as high as 85 per cent.

Floristics

The small shrub Hypoxis multiceps (Table III (117)) is the only local character species for Variant 49A. The forb Scabiosa columbaria and the creeper Rhynchosia totta are selectively differential (Table III (117)), whilst those that are differential in the Grassland of the Humid Mistbelt context only, include the large geophytic herb Gladiolus sp. (Table II D (11)). The absence of the Loudetia densispica Species-Group (Table III (140)) from Grassland of the Humid Mistbelt may indicate the Variant.

Other species, whose presence in the Vegetation Type may indicate Variant 49A, include the forbs Knowltonia transvaalensis and Helichrysum aureo-nitens; and the grass Brachiaria serrata. Those whose absence may be indicative in this context include the grass Panicum natalense and the shrublet Aeschynomene nyassana.

Besides those mentioned for Community 49, there are species that are specifically dominant in the Variant. The large herb Hypoxis "complex" (probably H. rigidula in this instance), and the grass Andropogon schirensis are typical.

General

The forb Knowltonia transvaalensis (Table II D (20)) links Variant 49A with both the Gladious densiflorus - Loudetia simplex Short Closed Grassland (Community 45), and the Eriosema nutans - Asclepias crassinervis - Andropogon schirensis var. angustifolia Short Closed Grassland (Variant 51B).

Variant 49B.

Parinari capensis subsp. capensis - Lightfootia huttonii - Eragrostis racemosa Low Closed Grassland

Type Relevé: 93 (Tables II D and IV D)

This low closed-grassland variant is represented by three relevés between 980 and 1 110 m elevation (Table IV D).

Habitat

The only discernible habitat factor distinguishing the Variant from its partner (Variant 49A) is its situation on lower-pediment slopes rather than midslope planes (Table IV D). Its moisture status may therefore be more favourable than that of Variant 49A.

Structure

The structural attributes of the vegetation of the type relevé (93) are as follows:

Field layer	(0,0-0,5 m)	85% cover

In more eroded sites (cf. Relevé 91), cover may be reduced to 75 per cent.

Floristics

The delicate creeper Sphenostylis angustifolia (Table III (118)) is the only local character species for Variant 49B. The forbs Piloselloides hirsuta and Raphionacme elata are selectively differential (Table II D (12)).

Variant 49B is differentiated from the Hypoxis multiceps - Lightfootia huttonii - Eragrostis racemosa Low Closed Grassland (Variant 49A) by the presence of the Parinari capensis Species-Group (Table II D (16)), and the absence of the Monocymbium ceresiiforme Species-Group (Table II D (35)).

Other species, whose presence in the Vegetation Type may indicate Variant 49B, include the large geophytic herb Gladiolus densiflorus and the grass Brachiaria filifolia.

Besides those mentioned for Community 49, there are no species that are specifically dominant in the Variant.

General

Just as the presence of the Parinari capensis Species-Group (Table II D (16)) links Variant 49B with the Digitaria monodactyla - Loudetia simplex Low Closed Grassland (Community 50), so too does the absence of the Monocymbium ceresiiforme Species-Group (Table II D (35)). Habitat factors influencing this floristic affinity are not discernible from Table IV D.

This relationship is extended to the Diospyros galpinii - Bequaertiodendron magalismontanum Tall Open Shrubland (Community 42) by the shrublet Parinari capensis (Table III (121)). It is also extended to disturbed Acacia ataxacantha thicket (Community 11); to Less-sheltered Woodland and Thicket on fairly deep soils of the Upper Foothills (Vegetation Type 4.2.2.2); to the Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland (Community 36); and to elements of the Humid Mistbelt by the Pearsonia sessilifolia "complex" Species-Group (Table III C (123)).

Community 50.
Digitaria monodactyla - Loudetia simplex Low Closed Grassland
Type Relevé: 87 (Tables II D and IV D)

This low closed-grassland community of the Plateau Crest is represented by two relevés situated about 400 m north-east of the Sabie Falls, at an elevation of 1 000 m (Table IV D).

Habitat

The Community's location on Black Reef Quartzite of the Plateau Crest is distinctive, being shared only with Monocymbium ceresiiforme low closed grassland (Communities 47—48), and with Bequaertiodendron magalismontanum woodland (Communities 41—43) (Tables II C and II D). Soils are fairly shallow and sandy, with litle horizon development. There is considerable rock outcrop in places, notably on midslope planes where erosion is evident (Tables IV D). Otherwise, habitat factors largely correspond to those for the Vegetation Type as a whole (cf. Section 4.2.4.2).

Structure

The structural attributes of the vegetation of the type relevé (87) are as follows:

Field layer	(0,0-0,5 m)	70% cover

On more eroded sites (cf. Relevé 86), the cover may be as low as 60 per cent.

Floristics

Local character species for Community 50 are the small herbs Anthericum galpinii var. galpinii and Linum thunbergii, and the sedge Cyperus semitrifidus (Table III (120)). Other species, that are differential in the Grassland of the Humid Mistbelt context only, are those of the Digitaria monodactyla Species-Group (Table II D (15)), including the creeper Desmodium hirtum and the suffrutex Ceratotheca triloba.

The absence of the following species-groups from the Vegetation Type is also strongly diagnostic for Community 50:

Becium obovatum	(Table II D (13))
Haplocarpha scaposa	(Table II D (14))
Acalypha wilmsii	(Table II D (20))
Gerbera aurantiaca	(Table II D (27))
Helichrysum pilosellum	(Table II D (34))
Themeda triandra	(Table II D (37))

The presence of the following less frequent species, in the Vegetation Type may also indicate Community 50: Ochna natalitia, Rhus dura, Eragrostis gummiflua, E. hierniana and Pellaea calomelanos.

Grasses are dominant in the field layer and commonly include Eragrostis capensis and Digitaria monodactyla.

General

The suffrutex Ceratotheca triloba (Table III (73)), links Community 50 with the Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open

Woodland (Community 36). This affinity is extended to Partially sheltered Woodland and Thicket on fairly shallow soils of the Lower Foothills (Vegetation Type 4.2.2.1), and to More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2), by the small shrub Ochna natalitia (Table III (52)) and the xerophytic fern Pellaea calomelanos (Table III (104)), respectively.

The absence (in grassland, woodland, and xeric thicket) of the Indigofera swaziensis Species-Group (Table III (134)) links Community 50 with Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3), and with grassland Communities 46 and 53. Also, the presence in Community 50 of the sedge Cyperus leptocladus (Table III (94)) is indicative of an affinity with More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2).

An affinity with Tall/Short Forest on black soils derived from Black Reef Quartzite of the Plateau Crest (Vegetation Type 4.2.1.2); with the Rhynchosia tomentosa - Bauhinia galpinii Short Thicket (Community 25); and with Humid Mistbelt low open woodland (Communities 43—44), is expressed by the shrublet Rhus dura (Table III (103)).

Finally, the Schizachyrium sanguineum Species-Group (Table II D (23)) indicates an affinity with the Acalypha caperonioides - Bewsia biflora - Loudetia simplex Short Closed Grassland (Variant 52A).

Horizon development in Community 50 is poor, possibly indicating erosion. As underlying rocks are exposed and become fire-protective, woody species such as Ceratotheca triloba and Ochna natalitia are advantaged. They may thus be the precursors of Plateau Crest woodland (Communities 41—44) and, ultimately, of elfin-like Plateau Crest forest (Community 3).

4.2.4.3 Short Closed Grassland on soils derived from Upper Dolomite of the Plateau Interior and Lower Mountains

(a) General Characteristics

This vegetation type consists mainly of short closed grassland on upper-pediment slopes between 1 234 and 1 355 m elevation. Underlying lithology is Upper Dolomite, situated variously in the Plateau Interior and Lower

Mountains. Soils vary from deep to fairly shallow, and rock cover on the varied aspects is minimal (Table IV D). Soil colour and texture is in accordance with the overall trend for the study area (cf. Section 4.2).

The Vegetation Type is marked by a lack of differential species. The presence of Species-Groups 24 and 28 (Table II D) and the absence of Species-Group 14 (Table II D) is nevertheless fairly diagnostic. The Vegetation Type may thus be indicated when, for example, Diospryros galpinii, Barleria ovata, Eulalia villosa and Setaria sphacelata occur unaccompanied by the forb Haplocarpha scaposa.

The presence of the infrequent forb Crabbea hirsuta in Grassland of the Humid Mistbelt may also indicate the Vegetation Type. The grasses Loudetia simplex and Andropogon schirensis are commonly dominant in the field layer.

Besides the affinities already mentioned under previous sections, the only significant affinity pertaining to the Vegetation Type is that with Less-sheltered Woodland and Thicket on fairly deep soils of the Upper Foothills (Vegetation Type 4.2.2.2). It is expressed by the forb Crabbea hirsuta (Table III (70)).

(b) Constituent Syntaxa

Short closed grassland on soils derived from Upper Dolomite of the Plateau Interior and Lower Mountains (Vegetation Type 4.2.4.3) is represented by two communities, viz 51 and 52. Each of these is further classified to the level of variant (Fig. 4.2):

51. Asclepias crassinervis - Andropogon schirensis var. angustifolia Short Closed Grassland
51A. Barleria ovata - Asclepias crassinervis - Andropogon schirensis var. angustifolia Variant
51B. Eriosema nutans - Asclepias crassinervis - Andropogon schirensis var. angustifolia Variant
52. Bewsia biflora - Loudetia simplex Short Closed Grassland
52A. Acalypha caperonioides - Bewsia biflora - Loudetia simplex Variant
52B. Helichrysum mixtum - Bewsia biflora - Loudetia simplex Variant

Community 51.
Asclepias crassinervis - Andropogon schirensis var. angustifolia Short Closed Grassland

This short closed-grassland community of the Plateau Interior is represented by four relevés. Each is situated on the Malieveld Plateau at about 1 250 m elevation (Table IV D). The Community has two variants, 51A and 51B.

Habitat

The factors that are distinctive in the Grassland of the Humid Mistbelt context, and shared only with the Lightfootia huttonii - Eragrostis racemosa Low Closed Grassland (Community 49), are the deep, rock-free soils occurring on the Plateau Interior (Table II D). In the Vegetation Type context, deeper soils, sparser vegetal cover, gentler slopes and greater fire susceptibility are all factors which distinguish Community 51 from Community 52. Other habitat factors largely correspond to those for the Vegetation Type as a whole (cf. Section 4.2.4.3).

Structure

The structural attributes of the vegetation of the Community will be discussed under the variants into which it is divided (see Variants 51A and 51B below).

Floristics

Community 51 is differentiated by the Asclepias crassinervis Species-Group (Table II D (18)), including the forbs Lopholaena segmentata and Eriosema gunniae. None are local character species (Table III (124)).

Other species, whose presence in the Vegetation Type may indicate Community 51, include the forbs Eriosema angustifolium, Vernonia natalensis, Pentanisia prunelloides and Helichrysum aureo-nitens. Those whose absence in this context may be similarly indicative include the forbs Pentanisia angustifolia and Helichrysum nudifolium.

The grasses Themeda triandra and Andropogon schirensis are commonly dominant in the field layer.

General

Most affinities have already been covered in previous sections.

Variant 51A.
Barleria ovata - Asclepias crassinervis - Andropogon schirensis var. angustifolia Short Closed Grassland
Type Relevé: 129 (Tables II D and IV D)

This variant is represented by two relevés and is physiognomically variable, sometimes occurring as low open woodland (Relevé 134, Fig. 4.44). Whereas the latter is found at 1 320 m elevation on the Plateau Interior, the type relevé is found at 1 220 m elevation on the Plateau Crest (Table IV D).

Habitat

Variant 51A is not discernibly different from Variant 51B (Table IID). Variability within Variant 51A is nevertheless evident. Whereas short closed grassland (Relevé 129) occurs on xeroclinal upland terraces overlying Black Reef Quartzite, low open woodland (Relevé 134) occurs on mesoclinal upper-pediment slopes overlying Upper Dolomite (Table IV D).

Structure

The structural attributes of the vegetation of the type relevé (129) are as follows:

Field layer	(0,0-1,0 m)	80% cover

In low open woodland (Relevé 134) there is, in addition, a 3 m high canopy with a cover of 25 per cent (Fig. 4.44).

Floristics

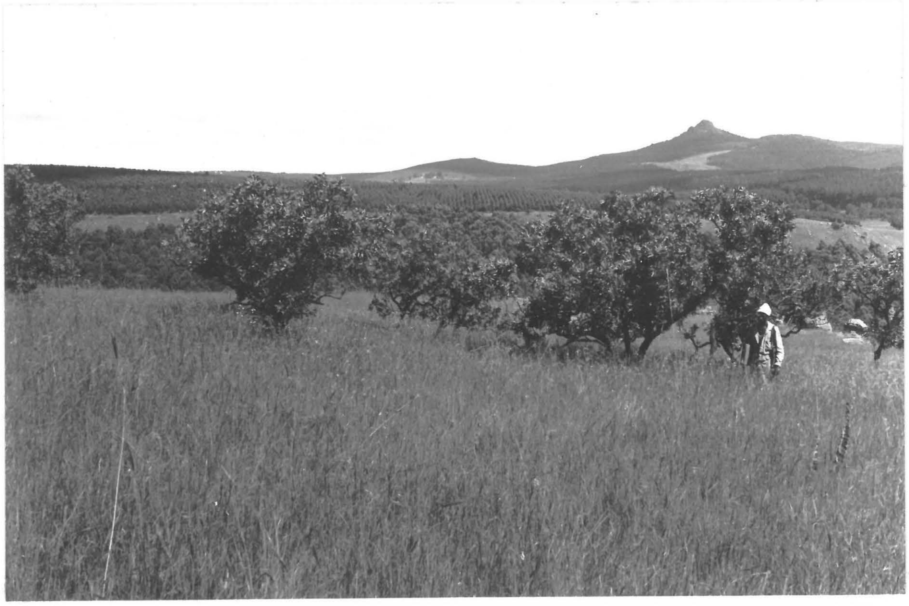
Variant 51A is marked by a lack of differential species. The presence of Species-Group 18 (Table II D) and the absence of Species-Group 19 (Table II D) is nevertheless fairly diagnostic. Thus, for example, when Asclepias crassinervis, Lopholaena segmentata and Eriosema gunniae occur unaccompanied by the herb Oxalis depressa and the forb Eriosema nutans, then Variant 51A may be indicated.

Other species, whose presence in the Vegetation Type may indicate Variant 51A, include the small tree Protea welwitschii, the grass Hyperthelia dissoluta, and the forb Senecio glaberrimus. Those whose absence is

FIG. 4.44 Variant 51A: *Barleria ovata* - *Asclepias crassinervis* - *Andropogon schirensis* var. *angustifolia* Short Closed Grassland, sometimes represented by Low Open Woodland (Relevé 134). The dominant tree is *Protea welwitschii*.

FIG. 4.45 Variant 52A: *Acalypha caperonioides* - *Bewsia biflora* - *Loudetia simplex* Short Closed Grassland, sometimes represented by Tall Closed Grassland (Relevé 119). The light-leaved trailing forb is *Pearsonia sessilifolia* subsp. *marginata* (foreground). The rare herb *Kniphofia splendida* is indicated in the background.

FIG. 4.46 Variant 53B: *Erica drakensbergensis* - *Inezia integrifolia* - *Monocymbium ceresiiforme* Low Closed Grassland, represented by Low Open Woodland on rocky sites where woody species, such as *Protea caffra* (right) and *Myrica pilulifera* (left), are protected from fire (Relevé 105).



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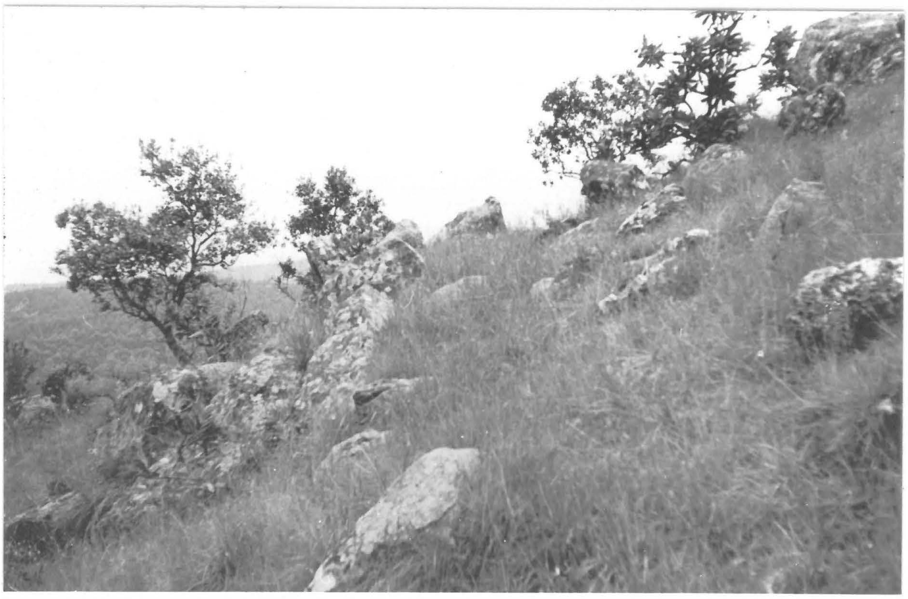

4.46

similarly indicative in this context, include the grasses Cymbopogon "complex" and Bewsia biflora, the shrub Rhus discolor, and the suffrutex Flemingia grahamiana.

Besides those mentioned for Community 51, there are dominant species that are specific to the Variant. The grasses Schizachyrium sanguineum and Hyperthelia dissoluta are field-layer dominants, whilst the tree Protea welwitschii is a canopy dominant, where a canopy exists (Fig. 4.44).

General

The presence of Hyperthelia dissoluta in such abundance (Table II D) is surprising, since its affinities are mainly with Woodland and Xeric Thicket of the Low Country (Table III (77)). Other affinities have already been covered under previous sections.

The ability of Protea welwitschii to regenerate vegetatively after fire (Frost, 1984) probably accounts for the maintenance, in spite of regular burning, of Protea welwitschii open woodland (Relevé 134, Fig. 4.44). Moreover, the scarcity of seedlings may indicate a burning regime that is either too frequent or else ill-timed. Burning before seed is ripe can destroy potential populations (Jordaan, 1965). Since Protea welwitschii flowers in summer and scatters its seed three months later (Vogts, 1982), summer burning would presumably be detrimental to seedling establishment. Similarly, if burning frequency is greater than the primary juvenile period (time from germination to first seed production) of Protea welwitschii, its persistence at the site would be threatened (cf. Frost, 1984). These factors may explain the absence of Protea welwitschii woodland elsewhere in the Community.

Variant 51B.
Eriosema nutans - Asclepias crassinervis - Andropogon schirensis var. angustifolia Short Closed Grassland
Type Relevé: 132 (Tables II D and IV D)

This short closed-grassland variant is represented by two relevés situated at about 1 250 m elevation on the Plateau Interior (Table IV D).

Habitat

Variant 51B is not discernibly different from Variant 51A (Table II D). Variability within Variant 51B is nevertheless evident. Vegetal cover on upper-pediment slopes with shallow soils (Relevé 133) is less than on xeroclinal lower-pediment slopes (Relevé 132) (Table IV D).

Structure

The structural attributes of the vegetation of the type relevé (132) are as follows:

Field layer	(0,0-1,0 m)	95% cover

The field-layer cover in the other relevé (133) is only marginally less, at 90 per cent.

Floristics

Variant 51B is differentiated by the herb Oxalis depressa and the forb Eriosema nutans (Table II D (19)). The latter is a local character species (Table III (125)).

Other species, whose presence in the Vegetation Type may indicate Variant 51B, include Knowltonia transvaalensis, Hemizygia subvelutina, Pearsonia aristata and Gnidia microcephala. Those whose absence in this context may be similarly indicative include Barleria ovata, Hemizygia transvaalensis, Indigofera swaziensis and Berkheya insignis (Table II D).

Besides those mentioned for Community 51, there are dominant species that are particularly specific to the Variant. The grasses Loudetia simplex and Monocymbium ceresiiforme are typical.

General

An affinity with the Rhynchosia angulosa - Inezia integrifolia - Monocymbium ceresiiforme Low Closed Grassland (Variant 53A) is indicated by the Gladiolus exiguus Species-Group (Table II D (32)). Similarly, Bewsia biflora, Helichrysum platypterum and Rhus discolor (Table III (129)) all express an affinity with the Bewsia biflora - Loudetia simplex Short Closed Grassland (Community 52) (Table III (129)).

Acrotome hispida and Lightfootia huttonii (Table III (116)) link Variant 51B with the Lightfootia huttonii - Eragrostis racemosa Low Closed Grassland (Community 49). This relationship is extended to the Alepidea gracilis var. major - Loudetia simplex Low Open Woodland (Community 44) by the forb Pearsonia aristata (Table III (97)).

Finally, the small shrub Vernonia poskeana links Variant 51B with parts of Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3), and with parts of Woodland of the Humid Mistbelt (Table III (95)).

Community 52.
Bewsia biflora - Loudetia simplex Short Closed Grassland

This predominantly short closed-grassland community of the Lower Mountains is represented by six relevés in the 1 234 to 1 355 m altitudinal range. Each relevé is located in the Vertroosting Nature Reserve, about 6 km south of Sabie (Table IV D). The Community has two variants, 52A and 52B.

Habitat

In the Grassland of the Humid Mistbelt context, the Community's location on the Lower Mountains is distinctive (Table II D). It is differentiated from Community 51 by the denser vegetation cover (possibly a reflection of less frequent burning), and the slightly rockier, shallower soils (Table IV D). Other habitat factors largely correspond to those for the Vegetation Type as a whole (cf. Section 4.2.4.3).

Structure

The structural attributes of the vegetation of the Community will be discussed under the variants into which it is divided (see Variants 52A and 52B below).

Floristics

Community 52 is differentiated by the Bewsia biflora Species-Group (Table II D (21)), including the shrubs Lippia javanica and Rhus discolor; and the forbs Flemingia grahamiana, Aristea woodii and Helichrysum platypterum. None are local character species (Table III (129)).

Other species, whose presence in the Vegetation Type may indicate Community 52, include the forbs Helichrysum nudifolium and Pentanisia angustifolia. Those forbs, whose absence in this context may be similarly indicative, include Eriosema angustifolium, Vernonia natalensis and Helichrysum aureonitens (Table II D).

Dominant grasses in the field layer are Themeda triandra and Loudetia simplex. Hemizygia transvaalensis is a dominant forb.

General

Affinities with other syntaxa have already been covered in previous sections. The presence of subwoody precursors such as Flemingia grahamiana, Pearsonia sessilifolia "complex", Pseudarthria hookeri and Rhoicissus tridentata is an indication of the Community's dynamic state. With continued fire-protection, other woody species such as Heteromorpha arborescens, Lippia javanica and Bowkeria cymosa are advantaged, and a woodland similar to the Artemisia afra - Bowkeria cymosa Low Open Woodland (Community 40) may develop.

Where the Community verges on drainage lines, Cymbopogon "complex" and Pteridium aquilinum become the dominant species. In time, these drainage lines become Maesa lanceolata - dominated thickets, providing niches for forest species such as Cussonia spicata, Psychotria capensis, Diospyros whyteana, Schistostephium heptalobum, Cassinopsis ilicifolia, Clausena anisata and Kiggelaria africana. The eventual climax of such succession is presumed to be the Hypoestes phaylopsoides - Dovyalis lucida Tall (riparian) Forest (Community 1).

Variant 52A.
Acalypha caperonioides - Bewsia biflora - Loudetia simplex Short Closed Grassland
Type Relevé: 111 (Tables II D and IV D)

This variant is represented by three physiognomically diverse relevés. Besides short closed grassland, there is tall closed grassland (Fig. 4.45) and tall sparse shrubland (Table IV D).

Habitat

Distinctions between this variant and the next (Variant 52B) are varied. Whereas Variant 52A is situated mainly on fairly steep, xeroclinal midslope planes; Variant 52B is situated mainly on fairly level, mesoclinal upper-pediment slopes (Table IV D). Variant 52A may thus be slightly moister than Variant 52B. Variability within Variant 52A is also evident. The vegetal cover in tall sparse shrubland (Relevé 112) with considerable rock outcrop, for example, does not exceed 75 per cent (Table IV D).

Structure

The structural attributes of the vegetation of the type relevé (111) are as follows:

Field layer	(0,0-1,0 m)	95% cover

Where there is a shrub layer attaining a height of 2 m (cf. Relevé 112), its cover is about 1 per cent.

Floristics

Variant 52A is differentiated by the Acalypha caperonioides Species-Group (Table II D (22)), including the shrub Heteromorpha pubescens; and the forbs Indigofera hilaris, Cyphia elata, Crassula natalensis and Leonotis dysophylla. None are local character species, although some are fairly selective (Table III (130)).

Other species, whose presence in the Vegetation Type may indicate Variant 52A, include Aloe arborescens, Xerophyta retinervis, Kniphofia splendida and Sporobolus "complex". Those whose absence in this context may indicate the Variant include Monocymbium ceresiiforme, Helichrysum pilosellum and Alepidea gracilis (Table II D).

Besides those mentioned for Community 52, there are dominant species that are specific to the Variant. Aloe arborescens, Pearsonia sessilifolia "complex" and Xerophyta retinervis are typical.

General

Floristic affinities are manifold. Xerophyta retinervis links Variant 52A with Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3), and with woodland and shrubland Communities 43 and 46 (Table III (76)). Crassula natalensis similarly links the Variant with the Ceratotheca triloba - Bequaertiodendron magalismontanum Low Open Woodland (Community 36), and with low open woodland Communities 43 and 44 (Table II (73)).

Relationship with the Galopina aspera - Faurea speciosa Low Open Woodland (Community 39) is expressed by the forb Galopina aspera (Table III (80)). This relationship is extended to the Combretum collinum subsp. gazense - Panicum maximum Short Closed Woodland (Community 21), and to parts of the Humid Mistbelt woodland (Communities 42–43), by Senecio venosus (Table III (42)) and Cyphia elata (Table III (43)), respectively.

An affinity with the Artemisia afra - Bowkeria cymosa Low Thicket (Community 40) is indicated by the Acalypha caperonioides Species-Group (Table III (130)). This relationship is extended to elfin-like Forest on black soils derived from Black Reef Quartzite of the Plateau Crest (Vegetation Type 4.2.1.2) by Aloe arborescens (Table III (4)).

The presence of species such as Diospyros lycioides, Cussonia spicata and Rhoicissus tridentata (Table III) demonstrates the Variant's broad affinity with forest, thicket and woodland, generally.

Variant 52B.
Helichrysum mixtum - Bewsia biflora - Loudetia simplex Short Closed Grassland
Type Relevé: 110 (Tables II D and IV D)

This variant is represented by three relevés. It is physiognomically diverse, comprising short closed grassland as well as tall open shrubland in places (Table IV D).

Habitat

Distinctions between this variant and the previous one (Variant 52A) are varied. Whereas Variant 52B is situated mainly on fairly level, mesoclinal upper-pediment slopes; Variant 52A is situated on mainly fairly steep, xeroclinal midslope planes (Table IV D). Variant 52B may thus be slightly drier than Variant 52A.

Structure

The structural attributes of the vegetation of the type relevé (110) are as follows:

Field layer	(0,0-1,0 m)	95% cover

In tall open shrubland (Relevé 115), the shrub layer is 2 m high and covers 35 per cent of the quadrat area.

Floristics

Variant 52B is differentiated by the *Helichrysum mixtum* Species-Group (Table II D (25)). There are no local character species (Table III (131)). The presence of the grass *Monocymbium ceresiiforme* in the drier variant (52B), differentiates the latter from the moister variant (52A), where it is absent (Table II D (35)). This avoidance of moister sites by *Monocymbium ceresiiforme* is reminiscent of its behaviour in the *Lightfootia huttonii* - *Eragrostis racemosa* Low Closed Grassland (Community 49).

Other species, whose presence in the Vegetation Type may indicate Variant 52B, include *Helichrysum mimetes*, *Athanasia calva*, *Vernonia hirsuta*, *Crassula vaginata* and *Erica drakensbergensis*. Those whose absence in this context may indicate Variant 52B include *Asclepias crassinervis*, *Hypoxis* "complex", *Acalypha wilmsii* and *Pseudarthria hookeri* (Table III).

Besides those mentioned for Community 52, there are dominant species that are specific to the Variant. In the field layer, *Cymbopogon* "complex", *Monocymbium ceresiiforme* and *Cephalaria pungens* are typical. In the shrub layer, where it exists, *Erica drakensbergensis* is dominant.

General

Variant 52B has broad floristic affinities. The *Pentanisia angustifolia* Species-Group (Table II D (31)) links the Variant with the *Rhynchosia angulosa* - *Inezia integrifolia* - *Monocymbium ceresiiforme* Low Closed Grassland (Variant 53A).

Affinities with the Andropogon schirensis var. angustifolia - Parinari curatellifolia Short Open Woodland (Community 32) are indicated by the forb Helichrysum mixtum (Table III (131)).

Variant 52B is linked to Partially sheltered Low Thicket and Woodland on midslope planes of the Escarpment Upper Slopes and the Mountains (Vegetation Type 4.2.3.1) by the forb Helichrysum umbraculigerum (Table II (82)). This relationship is extended to Woodland and Xeric Thicket of the Low Country by the small shrub Athrixia phylicoides (Table III (83)). It is also extended to More-exposed Low Woodland on upper-pediment slopes of the Plateau Crest and the Mountains (Vegetation Type 4.2.3.2), and to Mistbelt grassland of Escarpment Slopes and Plateau, by the creeper Rhynchosia monophylla (Table III (127)).

Helichrysum mimetes, Athanasia calva and Erica drakensbergensis (Table III (97 and 102)) link Variant 52B with the Alepidea gracilis var. major - Loudetia simplex Low Open Woodland (Community 44). Similarly, do Hibiscus aethiopicus and Piloselloides hirsuta (Table III (116 and 118)) link the Variant with the Lightfootia huttonii - Eragrostis racemosa Low Closed Grassland (Community 49).

4.2.4.4 Low Closed Grassland on soils variously derived from Upper Dolomite and Timeball Hill Shale and Mudstone of the Middle Mountains

(a) General Characteristics

This vegetation type occurs on upper-pediment slopes of the Middle Mountains in the 1 356 to 1 478 m altitudinal range. Besides low closed grassland, open to sparse woodland is also sometimes manifested (Table IV D and Fig. 4.46). Since the Vegetation Type is represented by only one community, its floristic and environmental attributes are the same as for that community and will not be repeated here (see Community 53 below).

(b) Constituent Syntaxa

Low Closed Grassland on soils variously derived from Upper Dolomite and Timeball Hill Shale and Mudstone of the Middle Mountains (Vegetation Type 4.2.4.4) is represented by one community having two variants (Fig. 4.2):

53. Inezia integrifolia - Monocymbium ceresiiforme Low Closed Grassland
53A. Rhynchosia angulosa - Inezia integrifolia - Monocymbium ceresiiforme Variant
53B. Erica drakensbergensis - Inezia integrifolia - Monocymbium ceresiiforme Variant

Community 53.

Inezia integrifolia - Monocymbium ceresiiforme Low Closed Grassland

This low closed-grassland community of the Middle Mountains is represented by six relevés situated on upper-pediment slopes in the Vertroosting Nature Reserve, 6 km south of Sabie. Besides low closed grassland, open and sparse woodland is also prevalent in places (Table IV D). It has two variants, 53A and 53B.

Habitat

The low closed-grassland physiognomy occurring on the Middle Mountains is unique in Grassland of the Humid Mistbelt. Soils are fairly shallow, and vegetal cover is usually between 75 and 95 per cent (Table IV D). Other habitat factors correspond largely to those for Grassland of the Humid Mistbelt as a whole (cf. Section 4.2.4).

Structure

The structural properties of the vegetation of the Community will be discussed under the variants into which it is divided (see Variants 53A and 53B below).

Floristics

Community 53 is differentiated by the Inezia integrifolia Species-Group (Table II D (29)), including Protea caffra. Of these species, only the forb Dicoma anomala is a local character species (Table III (135)). Other particularly selective species include the forbs Indigofera sp. 1 and Gnidia sp.

In the field layer, Themeda triandra, Loudetia simplex and Monocymbium ceresiiforme are the commonly dominant grasses, whilst Eriosema ellipticifolium is a fairly dominant forb. Where there is a canopy (cf. Relevé 105), Protea caffra is the dominant element (Fig. 4.46).

General

The Protea caffra Species-Group (Table III (139)) links Community 53 with the Alepidea gracilis var. major - Loudetia simplex Low Open Woodland (Community 44). Their common association with Land Type Ac 87a is perhaps significant in terms of their floristic affinity (Table V) (see also Chapter 6).

The absence of the Diospyros galpinii Species-Group (Table II D (24)) links Community 53 with the predominantly Plateau Crest grassland (Communities 46, 47, 48 and 50). Likewise, Community 53 is related to Grassland and Shrubland on soils derived from Nelspruit Granite of the Escarpment Slopes (Vegetation Type 4.2.4.1) by the absence of the forb Gerbera aurantiaca (Table II D (27)).

Drainage courses in this type of grassland support such forest precursors as Alsophila dregei, Maesa lanceolata and Syzygium cordatum. Other evidence of the Community's seral successional state is the encroachment, with fire-protection, of such woody elements as Protea caffra, Faurea speciosa, Myrica pilulifera and Apodytes dimidiata.

Variant 53A.
Rhynchosia angulosa - Inezia integrifolia - Monocymbium ceresiiforme Low Closed Grassland
Type Relevé: 104 (Tables II D and IV D)

This low closed-grassland variant is represented by three relevés situated at about 1 450 m elevation on upper-pediment slopes (Table IV D). It sometimes appears as low sparse woodland in places where isolated woody elements have become established (cf. Relevé 103).

Habitat

Whereas Variant 53A occurs mainly on gently sloping mesoclines, whose underlying lithology is Timeball Hill Shale and Mudstone; Variant 53B is found mainly on steeper sloping xeroclines underlain by Upper Dolomite. Rock outcrops in the latter, moreover, are more prolific (Table IV D). Variant 53A may therefore experience slightly moister conditions than Variant 53B.

Structure

The structural attributes of the vegetation of the type relevé (104) are as follows:

Field layer	(0,0-0,5 m)	90% cover

Where a canopy exists (cf. Relevé 103), it reaches up to 3 m in height and covers less than 5 per cent of the quadrat area.

Floristics

Variant 53A is differentiated by the Vernonia hirsuta Species-Group (Table II D (30)), including the tree Faurea speciosa, the forbs Crassula vaginata and Rhynchosia angulosa, and the sedge Cyperus obtusiflorus. Only the latter is a local character species for the Variant (Table III (136)).

Other infrequent species, whose presence in Grassland of the Humid Mistbelt may indicate Variant 53A, include Erica woodii, Buchnera dura, Lotononis pulchra, Sopubia cana and Ficinia bergiana.

Besides those already mentioned for Community 53, an occasional dominant in the canopy, where present, is the tree Faurea speciosa.

General

The tree Faurea speciosa indicates an affinity with woodland and thicket of both Mistbelt and Low Country (Table III (90)). Similarly, the Pentanisia angustifolia Species-Group (Table III (137)) indicates an affinity with the Helichrysum mixtum - Bewsia biflora- Loudetia simplex Short Closed Grassland (Variant 52B).

Variant 53B.
Erica drakensbergensis - Inezia integrifolia - Monocymbium ceresiiforme Low Closed Grassland
Type Relevé: 108 (Tables II D and IV D)

This low closed-grassland variant is represented by three relevés at about 1 500 m elevation on upper-pediment slopes (Table IV D). It sometimes appears as low open woodland, especially on rocky sites where woody elements are protected from fire (cf.Relevé 105, Fig. 4.46).

Habitat

Whereas this variant occurs mainly on steep xeroclines underlain by Upper Dolomite, the previous one (Variant 53A) is found mainly on gently sloping mesoclines underlain by Timeball Hill Shale and Mudstone (Table IV D). Variant 53B may therefore experience drier conditions than Variant 53A.

Structure

The structural attributes of the vegetation of the type relevé (108) are as follows:

Field layer	(0,0-0,5 m)	90% cover

Where a canopy exists (cf. Relevé 105), it reaches up to 3 m in height and covers about 20 per cent of the quadrat area. In such situations, the cover of the field layer is reduced to 50 per cent (Fig. 4.46).

Floristics

Variant 53B is marked by a lack of differential species. The absence of Species-Groups 30, 31 and 32 (Table II D) from the Vegetation Type is nevertheless fairly diagnostic. Thus, for example, when *Vernonia hirsuta*, *Gladiolus exiguus* and *Indigofera* sp. 2 are absent from the Vegetation Type, then Variant 53B may be indicated. Similarly may the presence of *Erica drakensbergensis* in the Vegetation Type, indicate Variant 53B.

Other infrequent species, whose presence in Grassland of the Humid Mistbelt may indicate Variant 53B, include the grass *Ctenium concinnum*, the herb *Streptocarpus dunnii*, the forb *Helichrysum reflexum*, and the trees *Apodytes dimidiata* and *Burchellia bubalina*.

Besides those mentioned for Community 53, an occasional dominant in the canopy, where present, is the shrub *Erica drakensbergensis*.

General

Floristic affinities are manifold. The presence of the tree Apodytes dimidiata indicates a relationship with Mistbelt woodland, and with Forest and Mesic Thicket of the Mistbelt and Low Country (Table III (100)). The Crassula alba "complex" Species-Group (Table III (110)) indicates an affinity with Woodland and Shrubland on exposed granite outcrops (Vegetation Type 4.2.2.3), and with elements of both Woodland and Grassland of the Humid Mistbelt. Relationship with elements of the Mistbelt woodland alone, is further demonstrated by the Selago atherstonei Species-Group (Table III (91)); by Myrica pilulifera (Table III (98)); and by Streptocarpus dunnii (Table III (99)). Relationship with elements of the Mistbelt grassland alone, is demonstrated by Digitaria monodactyla (Table III (120)) and Bewsia biflora (Table II D (21)). Erica drakensbergensis indicates an affinity with elements of both Woodland and Grassland of the Humid Mistbelt (Table III (97)).

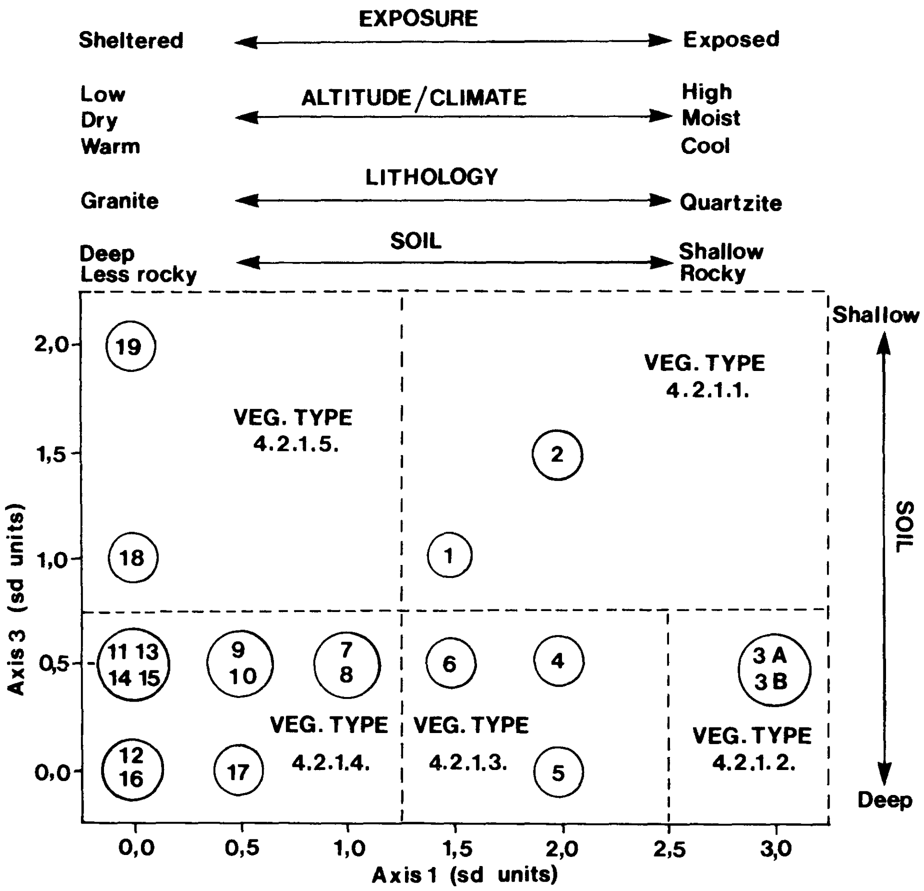

FIG. 5.1 Detrended Correspondence Analysis (DCA) ordination of the 19 plant communities comprising Forest and Mesic Thicket of the Mistbelt and Low Country, Sabie area. Axes 1 and 3 represent the main environmental gradients as shown.

5. COMMUNITY ORDINATION

Before discussing the Detrended Correspondence Analysis (DCA) community ordinations, it is necessary to explain certain aspects of DECORANA's (Hill, 1979a) outputs. First, the eigenvalue for each ordination axis corresponds to the variance that that axis accounts for. An axis whose eigenvalue is 0,652, for example, would account for 65,2 per cent of the variance. Such an axis would thus reflect a sufficient amount of the inherent data structure to be significant. Axes whose eigenvalues are considerably less than the highest eigenvalue are probably not significant in terms of revealing data structure (Hill, 1979a).

Secondly, the gradient length of each axis in standard deviations (sd) is a direct reflection of beta or habitat diversity (sensu Whittaker, 1970). "To a good approximation, 4,0 sd corresponds to the distance over which a species appears, rises to its mode, and disappears again" (Hill, 1979a). This means that samples with a separation of greater than 4,0 sd will generally have no species in common.

The ordination of plant communities (and variants) is discussed in the context of their respective ecological-formation classes, or data subsets. It must be noted that the terms used for indicating environmental gradients in the ordination diagrams (Figs. 5.1—4) are not absolute, but relative. Their function is merely for indicating trends.

5.1 FOREST AND MESIC THICKET OF THE MISTBELT AND LOW COUNTRY

Table 5.1 gives results of the DCA ordination of the 19 communities and the species comprising the Forest and Mesic Thicket of the Mistbelt and Low Country subset. Axes 1 and 3 form the ordination axes of the scatter diagram (Fig. 5.1) depicting the floristic and environmental relationships of the communities.

Axes 1 and 3 together account for 69,4 per cent of the variance (Table 5,1) and are therefore considered to adequately represent the inherent data structure. Gradient lengths of the first three axes are slightly less than 4,0 sd (Table 5.1), indicating a moderately high beta diversity for Forest and Mesic Thicket of the Mistbelt and Low Country.

TABLE 5.1 Forest and Mesic Thicket of the Mistbelt and Low Country: Detrended Correspondence Analysis (DCA) ordination of communities and species, showing eigenvalues and gradient lengths (community) for the first four axes

AXIS	EIGENVALUE	GRADIENT LENGTH FOR COMMUNITIES (sd)*
1	0,523	3,29
2	0,317	2,95
3	0,171	2,36
4	0,093	1,50

* sd = standard deviation

TABLE 5.2 Forest and Mesic Thicket of the Mistbelt and Low Country: community rankings and rank correlation coefficients (r_s) based on soil depth and ordination axes 1 and 3 (d.f. = degrees of freedom)

COMMUNITY	RANK		
	AXIS 1	AXIS 3	SOIL DEPTH
1	6	4	11
2	4	2	2
3A	2	6	5
3B	1	8	1
4	5	7	12
5	3	19	13
6	7	13	9
7	8	9	10
8	9	12	14
9	11	11	15
10	10	10	16
11	13	5	6
12	19	20	4
13	17	14	3
14	15	15	17
15	18	16	8
16	14	17	18
17	12	18	19
18	16	3	20
19	20	1	7

r_s (soil depth/axis 1) $= 1-\frac{6(1096)}{20(400-1)} = 0{,}176$ for 18 d.f. (Not significant)

r_s (soil depth/axis 3) $= 1-\frac{6(1006)}{20(400-1)} = 0{,}244$ for 18 d.f. (Not significant)

Community separation on the basis of vegetation type is indicated in the ordination diagram by means of the broken lines (Fig. 5.1). Apart from the "intrusion" of Community 17 into Vegetation Type 4.2.1.4, the identity of the five vegetation types associated with Forest and Mesic Thicket of the Mistbelt and Low Country is faithfully maintained by the ordination. Thus the classificatory basis of the vegetation-type category is, for the most part, vindicated.

The merging of Communities 3A and 3B in the ordination diagram suggests that the ordination is not as sensitive in detecting floristic nuances as is the phytosociological classification. This is further illustrated by the merging of up to four syntaxa (Communities 11, 13, 14, 15) in the lower left portion of the diagram (Fig. 5.1). Conversely, the merging of communities may, in some cases (cf. Community 14), be a result of such communities being differentiated by species absence rather than presence (Section 4.2.1.4).

5.1.1. Environmental Correlation

Some of the environmental gradients possibly influencing community differentiation in Forest and Mesic Thicket of the Mistbelt and Low Country are indicated in relation to axes 1 and 3 of the ordination diagram (Fig. 5.1). Axis 1 corresponds predominantly to a temperature/moisture/lithology gradient, whilst axis 3 appears to reflect a soil-depth gradient.

Spearman's rank correlation coefficient (r_s) indicates that the soil-depth gradients along axes 1 and 3 are not significantly correlated with community ordinations along those axes (Table 5.2). Hence, soil depth per se is unlikely to be a significant factor in the differentiation of Forest and Mesic Thicket communities. In combination with other environmental variables, however, soil depth may well be significant. Soil depth and soil texture together for instance, may, as indicated below, account more significantly for community differentiation along axis 3 than does soil depth on its own.

Forest vegetation is uniformly represented along both axes (Fig. 5.1). Whereas forest Communities 1 to 6 are associated with the moist, cool conditions of higher altitudes; forest Communities 17 to 19 are associated with the dry, warm conditions of lower altitudes (axis 1, Fig. 5.1). Forest thus appears to exhibit a wide moisture tolerance. In reality, however,

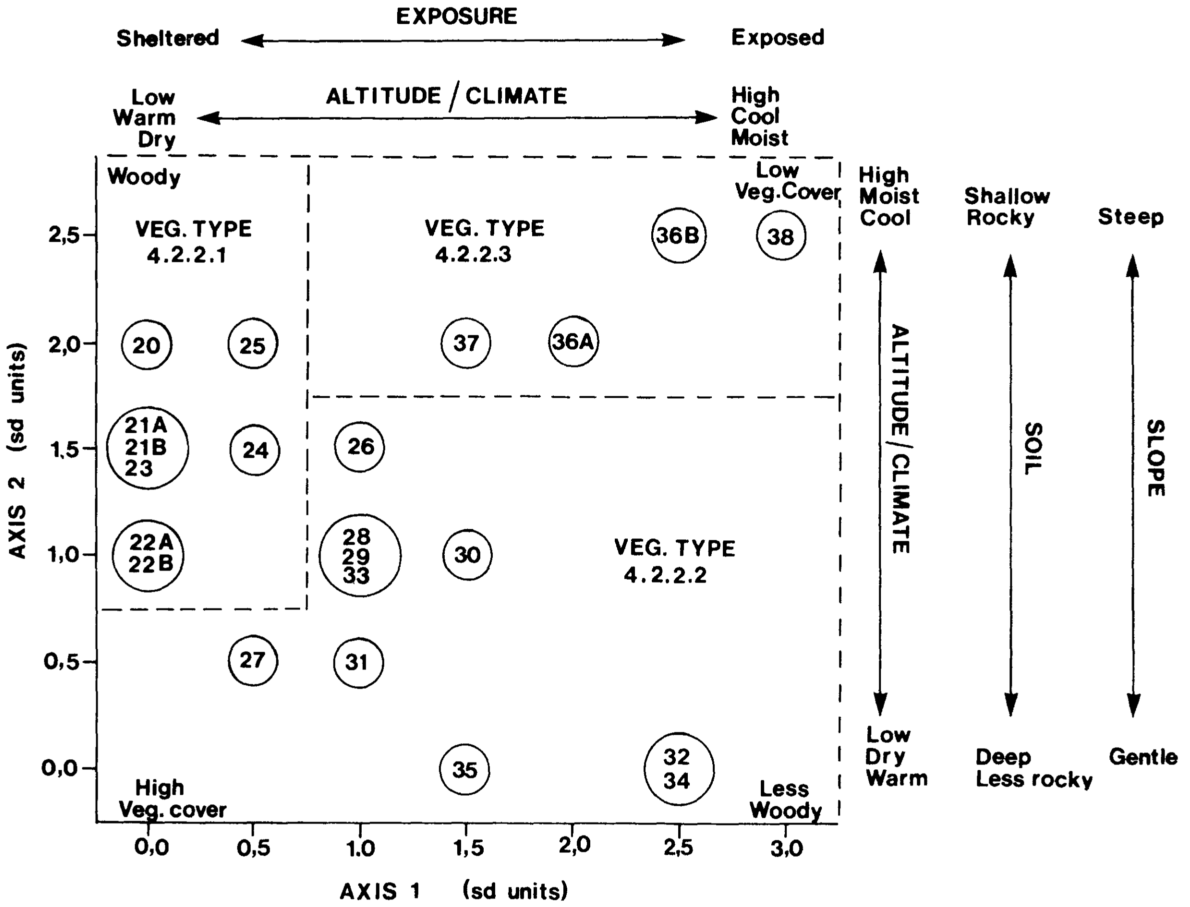

FIG. 5.2 Detrended Correspondence Analysis (DCA) ordination of the 19 plant communities comprising Woodland and Xeric Thicket of the Low Country, Sabie area. Axes 1 and 2 represent the main environmental gradients as shown.

Communities 17 to 19 are confined to sheltered riparian sites where, despite surrounding aridity, moisture is non-limiting.

The isolation on axis 1 of forest Community 3 is probably due to both the shallow, rocky quartzite-derived soil, and the exposed sites to which the Community is confined (Fig. 5.1). By contrast, forest Communities 1 and 2 occur on deeper dolomit-derived soils in more sheltered sites, whilst Communities 4 to 6 occur on deeper granite-derived soils, also in more sheltered sites.

Mesic thicket (Vegetation Type 4.2.1.4) is confined to the portion near the origin of each axis (Fig. 5.1). Constituent syntaxa (Communities 7 to 16) are consequently grouped in the lower left sector of the ordination diagram, corresponding to conditions that are not sufficiently moist to sustain forest. The anomalous occurrence of forest Community 17 in the "drier" sector of the diagram may reflect a moisture deficit relative to Communities 18 and 19. Whereas the soils of the two latter communities have a high clay fraction in the lower horizon, those of Community 17 consist mainly of sand (Table IV A, Appendix A). The water-holding capacity of soils in Community 17, therefore, is likely to be less than in Communities 18 and 19.

5.2 WOODLAND AND XERIC THICKET OF THE LOW COUNTRY

Table 5.3 gives results of the DCA ordination of the 19 communities and the species comprising the Woodland and Xeric Thicket of the Low Country subset. Axes 1 and 2 form the ordination axes of the scatter diagram (Fig. 5.2) depicting the floristic and environmental relationships of the communities.

Axes 1 and 2 together account for 74,3 per cent of the variance (Table 5.3) and are therefore considered to adequately represent the inherent data structure. Gradient lengths of the first three axes range from 2,35 to 3,08 sd (Table 5.3), indicating a moderately low beta diversity for Woodland and Xeric Thicket of the Low Country.

Community separation on the basis of vegetation type is indicated in the ordination diagram by means of the broken lines (Fig. 5.2). Clearly, the identity of the three vegetation types asssociated with Woodland and Xeric Thicket of the Low Country is faithfully maintained by the ordination. Thus the classificatory basis of the vegetation-type category is confirmed.

TABLE 5.3 Woodland and Xeric Thicket of the Low Country: Detrended Correspondence Analysis (DCA) ordination of communities and species, showing eigenvalues and gradient lengths (community) for the first four axes

AXIS	EIGENVALUE	GRADIENT LENGTH FOR COMMUNITIES (sd)*
1	0,447	3,08
2	0,296	2,83
3	0,188	2,35
4	0,095	1,56

* sd = standard deviation

TABLE 5.4 Woodland and Xeric Thicket of the Low Country: community rankings and rank correlation coefficient (r_s) based on soil depth and ordination axis 2 (d.f. = degrees of freedom)

COMMUNITY	RANK	
	AXIS 2	SOIL DEPTH
20	6	6
21A	11	5
21B	9	10
22A	13	17
22B	14	11
23	10	7
24	8	9
25	5	14
26	7	16
27	19	18
28	16	13
29	17	12
30	12	19
31	18	20
32	22	21
33	15	8
34	21	15
35	20	22
36A	4	4
36B	1	3
37	3	2
38	2	1

r_s (soil depth/axis 2) $= 1 - \frac{6(418)}{22(484-1)} = 0{,}764$ for 20 d.f. (Significant at P less than 0,01)

The merging of the variants of Communities 21 and 22 in the ordination diagram suggests that the ordination is not as sensitive in detecting floristic nuances as is the phytosociological classification. This is further illustrated by the merging of three separate syntaxa (Communities 28, 29, 33) (Fig. 5.2). Conversely, the merging of some communities may be a result of such communities being differentiated by species absence rather than presence (cf. Section 4.2.2).

5.2.1 Environmental Correlation

Some of the environmental gradients possibly influencing community differentiation in Woodland and Xeric Thicket of the Low Country are indicated in relation to axes 1 and 2 of the ordination diagram (Fig. 5.2). Axis 1 corresponds to a temperature/moisture/exposure gradient, whilst axis 2 reflects a similar gradient compounded with soil depth and slope. The net effect of these gradients is a gradient corresponding to the positive diagonal and operating from cool moist conditions, with shallow rocky soils on exposed steep slopes (upper right); to warm dry conditions, with deep, less rocky soils on sheltered gentle slopes (lower left).

Spearman's rank correlation coefficient (r_s) shows that the soil-depth gradient operating along axis 2 is significantly correlated with the ordination of communities along that axis (Table 5.4). Thus the importance of soil depth in community differentiation on axis 2 is highlighted. Since every possible environmental factor has not been accounted for in the correlation, however, one cannot conclude that soil depth *per se* necessarily has a prime influence. The correlation may actually reflect some of the causes or effects associated with variable soil depth, such as geomorphology, soil moisture, or perhaps, as explained below, disturbance.

The low open/sparse woodland and the short sparse shrubland communities of Vegetation Type 4.2.2.3 are clearly correlated with the shallow rocky soils on exposed steep slopes (Fig. 5.2). Vegetal cover in this part of the gradient is accordingly low. As these habitats become warmer, drier, and more sheltered, the vegetation becomes more woody, resulting in the woodland and thicket communities of Vegetation Type 4.2.2.1. On the more gentle slopes with deepish, less rocky soils (lower left and right, Fig.5.2), land is more arable, more inviting for human settlement, and more susceptible to fire. Attendant vegetation is therefore likely to be disturbed. This may explain the sparsely woody nature of Vegetation Type 4.2.2.2.

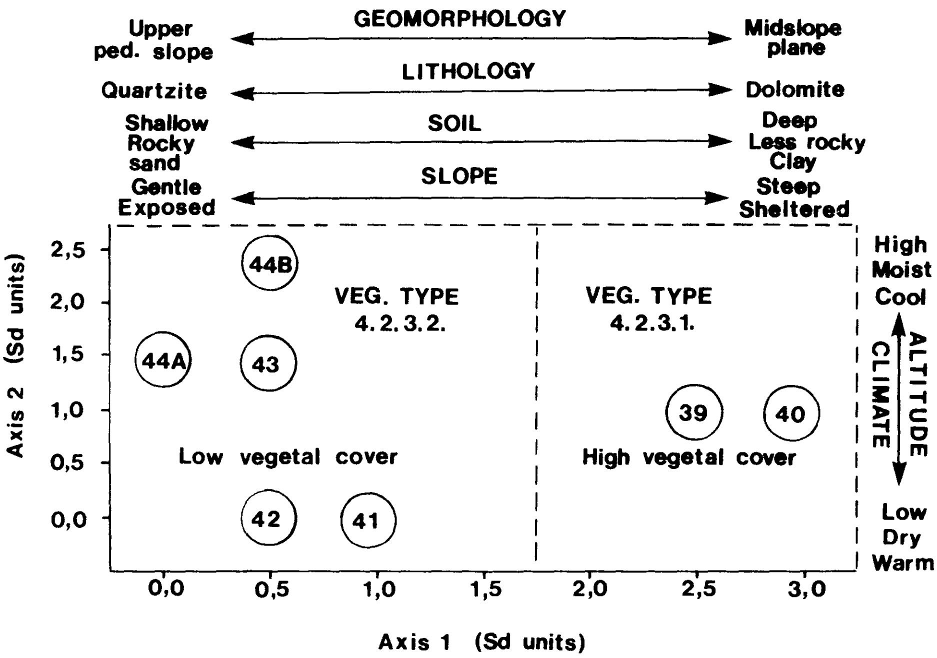

FIG. 5.3 Detrended Correspondence Analysis (DCA) ordination of the six plant communities comprising Woodland of the Humid Mistbelt, Sabie area. Axes 1 and 2 represent the main environmental gradients as shown.

5.3 WOODLAND OF THE HUMID MISTBELT

Table 5.5 gives results of the DCA ordination of the six communities and the species comprising the Woodland of the Humid Mistbelt subset. Axes 1 and 2 form the ordination axes of the scatter diagram (Fig. 5.3) depicting the floristic and environmental relationships of the communities.

Axes 1 and 2 together account for 89,2 per cent of the variance (Table 5.5) and are therefore effective in representing the inherent data structure. Gradient lengths of the first two axes are slightly higher than those for Woodland and Xeric Thicket of the Low Country, but less than those for Forest and Mesic Thicket of the Mistbelt and Low Country (Table 5.5). Beta diversity in Woodland of the Humid Mistbelt is therefore relatively intermediate between the mesic and the more xeric ecological-formation class.

Community separation on the basis of vegetation type is indicated in the ordination diagram by means of the broken lines (Fig. 5.3). Clearly, the identity of the three vegetation types associated with Woodland of the Humid Mistbelt is faithfully maintained by the ordination. Thus the classificatory basis of the vegetation-type category is confirmed.

The slight separation between the variants of Community 44 (Fig. 5.3) is in accordance with the definition of variant, viz floristic differentiation without any discernible environmental variation.

5.3.1 Evironmental Correlation

Some of the environmental gradients possibly influencing community differentiation in Woodland of the Humid Mistbelt are indicated in relation to axes 1 and 2 of the ordination diagram (Fig. 5.3). Axis 1 corresponds to a geomorphology/geology/exposure gradient, whilst axis 2 reflects a temperature/moisture gradient.

The soil-depth gradient along axis 1 is, according to Spearman's rank correlation coefficient (r_s) (Table 5.6), significantly correlated with the ordination of communities along Axis 1. This does not necessarily imply however, that soil depth *per se* is determining community differentiation. There are numerous other factors related to soil depth which, singly or in

TABLE 5.5 Woodland of the Humid Mistbelt: Detrended Correspondence Analysis (DCA) ordination of communities and species, showing eigenvalues and gradient lengths (community) for the first four axes

AXIS	EIGENVALUE	GRADIENT LENGTH FOR COMMUNITIES (sd)*
1	0,529	3,13
2	0,363	2,94
3	0,080	1,82
4	0,001	1,82

* sd = standard deviation

TABLE 5.6 Woodland of the Humid Mistbelt: community rankings and rank correlation coefficient (r_s) based on soil depth and ordination axes 1 (d.f. = degrees of freedom)

COMMUNITY	RANK	
	AXIS 1	SOIL DEPTH
39	2	3
40	1	1
41	3	2
42	6	7
43	5	5
44A	7	6
44B	4	4

r_s (soil depth/axis 1) = $1 - \frac{6(4)}{7(49-1)}$ = 0,928 for 5 d.f.
(Significant at P less than 0,01)

combination, could be influencing community differentiation (see also Section 5.2.1).

The low open woodland and low thicket associated with Communities 39 and 40 apparently develops in response to a high soil-moisture status occasioned by the deep clay soils of sheltered midslope planes (Fig. 5.3). Their association with dolomite, moreover, is reminiscent of the tall/short forest represented by Communities 1 and 2, and it is therefore possible that Communities 39 and 40 are seral to these forest communities.

On the shallow and sandy quartzite-derived soils of exposed and rocky upper-pediment slopes, soil-moisture is more limiting. Vegetation response is accordingly towards a closed/open woodland with low vegetal cover (Communities 41 to 44, Fig. 5.3). Supplementary moisture in the form of "fog-drip" (cf. Section 2.2.4), especially at the higher altitudes of Communities 43 and 44, may provide some stimulus for the succession to develop towards the elfin-like forests represented by Community 3.

5.4 GRASSLAND OF THE HUMID MISTBELT

Table 5.7 gives results of the DCA ordination of the nine communities and the species comprising the Grassland of the Humid Mistbelt subset. Axes 1 and 2 form the ordination axes of the scatter diagram (Fig. 5.4) depicting the floristic and environmental relationships of the communities.

Axes 1 and 2 together account for 89,7 per cent of the variance (Table 5.7) and are therefore sufficient for revealing the inherent data structure. Gradient lengths of the first two axes range from 2,76 to 3,78 sd (Table 5.7), indicating a slightly higher beta diversity than other ecological-formation classes.

Community separation on the basis of vegetation type is indicated in the ordination diagram by means of the broken lines (Fig. 5.4). Vegetation Type 4.2.4.1 (Communities 45 and 46) is the only one in Grassland of Humid Mist-belt, whose identity is not maintained by the ordination. Rather, it tends to merge with two others, namely Vegetation Types 4.2.4.2 and 4.2.4.3 (Fig. 5.4). This suggests that Vegetation Type 4.2.4.1 may be a classificatory artefact, with lithology and physiography playing a much less significant role in community differentiation than is indicated by the phytosociological classification.

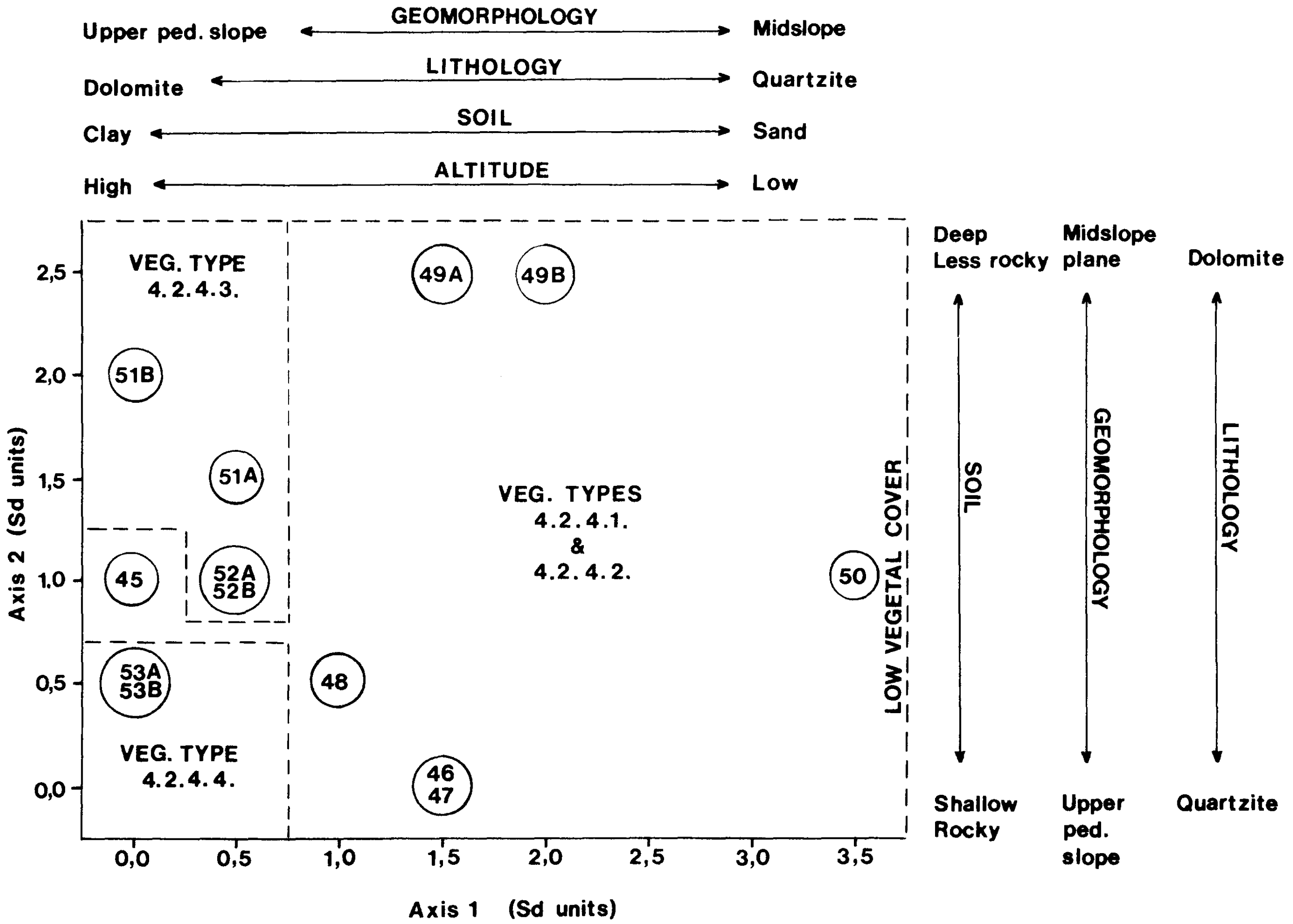

FIG. 5.4 Detrended Correspondence Analysis (DCA) ordination of the nine plant communities comprising Grassland of the Humid Mistbelt, Sabie area. Axes 1 and 2 represent the main environmental gradients as shown.

Floristic nuances (in the form of variants) brought out by the phytosociological classification are in some cases (e.g. Communities 49 and 51) corroborated by the ordination, but in others (e.g. Communities 52 and 53) they are not (Fig. 5.4). On the whole, the phytosociological classification of communities is confirmed by the ordination, the joint occurrence of Communities 46 and 47 (Fig. 5.4) being the only exception.

5.4.1 Environmental Correlation

Some of the environmental gradients influencing community differentiation in Grassland of the Humid Mistbelt are indicated in relation to axes 1 and 2 of the ordination diagram (Fig. 5.4). Axis 1 apparently corresponds to a soil-texture/lithology/geomorpholgy gradient, whilst axis 2 appears to reflect a soil-depth/lithology/geomorphology gradient. The net effect of these gradients is a geomorphology gradient corresponding to the positive diagonal, and operating from upper-pediment slopes (lower left) to midslope planes (upper right); and also a lithology gradient corresponding to the negative diagonal, and operating from dolomite (upper left) to quartzite (lower right).

Spearman's rank correlation coefficient (r_s) shows that the soil-depth gradient indicated on axis 2 is not significantly correlated with the ordination of communities along that axis (Table 5.8). This merely suggests that soil depth *per se* is not sufficiently influencing community differentiation along axis 2. In combination with other variables, however, soil depth may well be significant. On the positive diagonal (Fig. 5.4), Communities 49 and 50 are possibly separated from the other communities on the basis of an improved soil-moisture status, reflecting their lower position in the landscape. On the negative diagonal (Fig. 5.4), Communities 46 to 48 and 50 appear to be separated from the other communities by virtue of their sandy quartzite-derived shallow soils, which soils are in contrast with the deeper, dolomite-derived clay soils of their counterparts (Communities 45, 49 and 51 to 53).

Community 50 appears on the diagram as an outlier (Fig. 5.4). This may reflect its disturbed character, being situated in a municipal area where human influences are manifold.

TABLE 5.7 Grassland of the Humid Mistbelt: Detrended Correspondence Analysis (DCA) ordination of communities and species, showing eigenvalues and gradient lengths (community) for the first four axes

AXIS	EIGENVALUE	GRADIENT LENGTH FOR COMMUNITIES (sd)*
1	0,514	3,78
2	0,383	2,76
3	0,169	2,22
4	0,032	2,20

* sd = standard deviation

TABLE 5.8 Grassland of the Humid Mistbelt: community rankings and rank correlation coefficient (r_s) based on soil depth and ordination axis 2 (d.f. = degree of freedom)

COMMUNITY	RANK	
	AXIS 2	SOIL DEPTH
45	8	6
46	13	8
47	12	7
48	11	5
49A	1	3
49B	2	2
50	6	13
51A	4	1
51B	3	4
52A	5	9
52B	5	11
53A	9	10
53B	10	12

r_s (soil depth/axis 2) $= 1 - \frac{6(190)}{13(169-1)} = 0{,}478$ for 11 d.f.
(Not significant)

TABLE 6.1 Detrended Correspondence Analysis (DCA) ordination of land types and species in the Sabie area of the Eastern Transvaal Escarpment, showing eigenvalues and gradient lengths (land type) for the first four axes

AXIS	EIGENVALUE	GRADIENT LENGTH FOR LAND TYPES (sd)*
1	0,583	3,64
2	0,320	2,57
3	0,129	1,78
4	0,071	1,64

* sd = standard deviation

TABLE 6.2 Detrended Correspondence Analysis (DCA) ordination of land types (LT), vegetation types (VT), and species in the Sabie area of the Eastern Transvaal Escarpment, showing eigenvalues and gradient lengths (VT and LT) for the first four axes

AXIS	EIGENVALUE	GRADIENT LENGTH FOR COMBINED VT AND LT (sd)*
1	0,585	4,18
2	0,389	3,80
3	0,207	2,47
4	0,121	2,12

* sd = standard deviation

6. LANDSCAPE CLASSIFICATION AND MAPPING

6.1 THE VEGETATION-TYPE APPROACH

The 14 vegetation types derived from the phytosociological classification have already been described in Chapter 4, and their potential as landscapes has been discussed in Section 3.3.1. The spatial relations of vegetation types in the study area are depicted on the map (Fig. 6.1, Appendix C).

The descriptive type of legend facilitates simple diagnosis of vegetation types in the field. Coincidence between short closed grassland, Upper Dolomite, and Lower Mountains, for example, is likely to be indicative of Vegetation Type 4.2.4.3.

6.2 THE LAND-TYPE APPROACH

6.2.1 Floristic Relationship of Land Types

(A) Ordination

The interpretation of DECORANA's ordination output has already been explained in Chapter 5 and will therefore not be repeated here.

Species and land-type ordination

Table 6.1 gives results of the DCA ordination of 14 land-type units and 829 species. The low eigenvalues of the third and fourth axes render the latter insignificant (cf. Hill, 1979a). The first two axes, on the other hand, account for as much as 90,3 per cent of the variance and are therefore valid. They form the ordination axes of the scatter diagram (Fig. 6.2) depicting the floristic relationships of land-type units.

The gradient lengths of the first two axes for land types, being slightly less than 4.0 sd, indicate a moderately high beta diversity (Table 6.1). This implies that land types situated at either extremity of these axes do not overlap widely and are therefore floristically distinct. Land Types Ac87a and Fa331 on axis 1, for example, represent floristic extremes of grassland and woodland respectively (Fig. 6.2). On axis 2, floristic extremes of forest and grassland are depicted by Land-Type units Ac88a and Ac88b respectively.

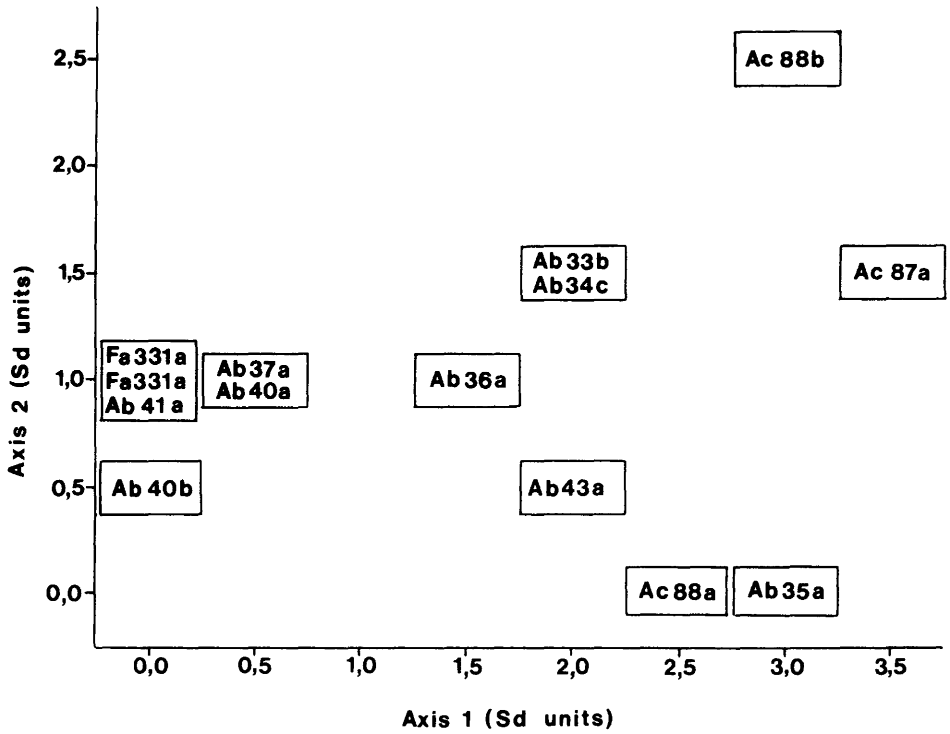

FIG. 6.2 Detrended Correspondence Analysis (DCA) ordination of the 14 land types in the study area. The ordination is based on species presence and absence.

Besides illustrating the floristic distinctiveness of land types at gradient extremities, Figure 6.2 also indicates other interesting facts:

(i) There can be floristic diversity within a land type. The separation on axis 2, for example, of Ac88a and Ac88b (the same land type in two different localities) indicates their floristic dissimilarity.

(ii) There can be floristic conformity across land types. The merging on both axes of Land Types Ab37a and Ab40a, for example, indicates their floristic similarity.

(iii) There can be floristic specificity within a land type. Land Type Ac87a, for example, being separate from all other land types, probably possesses a degree of floristic uniqueness.

So although some land types may be floristically homogeneous, others are clearly floristically heterogeneous. This should not detract from their potential as landscape units, however: "It cannot be expected that the classification of ... landscapes should be a demarcation of homogeneous units. On the contrary heterogeneity occurs within a landscape..." (Gertenbach, 1983). It only remains to discern how land types may be integrated with vegetation to provide the necessary landscape units.

Species and land-type/vegetation-type combined ordination

Table 6.2 gives results of the combined DCA ordination of 14 land-type units, 14 vegetation types and 829 species. The comparatively low eigenvalues of the third and fourth axes render the latter insignificant (cf. Hill, 1979a). The first two axes, on the other hand, account for 97,4 per cent of the variance and are therefore valid. They form the ordination axes of the scatter diagram (Fig. 6.3) depicting floristic correlations between vegetation types and land types.

The gradient lengths of the first two axes for vegetation-type/land-type combinations indicate a high beta diversity (Table 6.2). Moreover, most of the vegetation types are floristically distinct, being separate from each other on the ordination diagram (Fig. 6.3). This tends to vindicate the rather subjective vegetation-type divisions made in the phytosociological classification (Chapter 4). Vegetation Types 4.2.1.1 and 4.2.1.3 are the only exceptions in this regard.

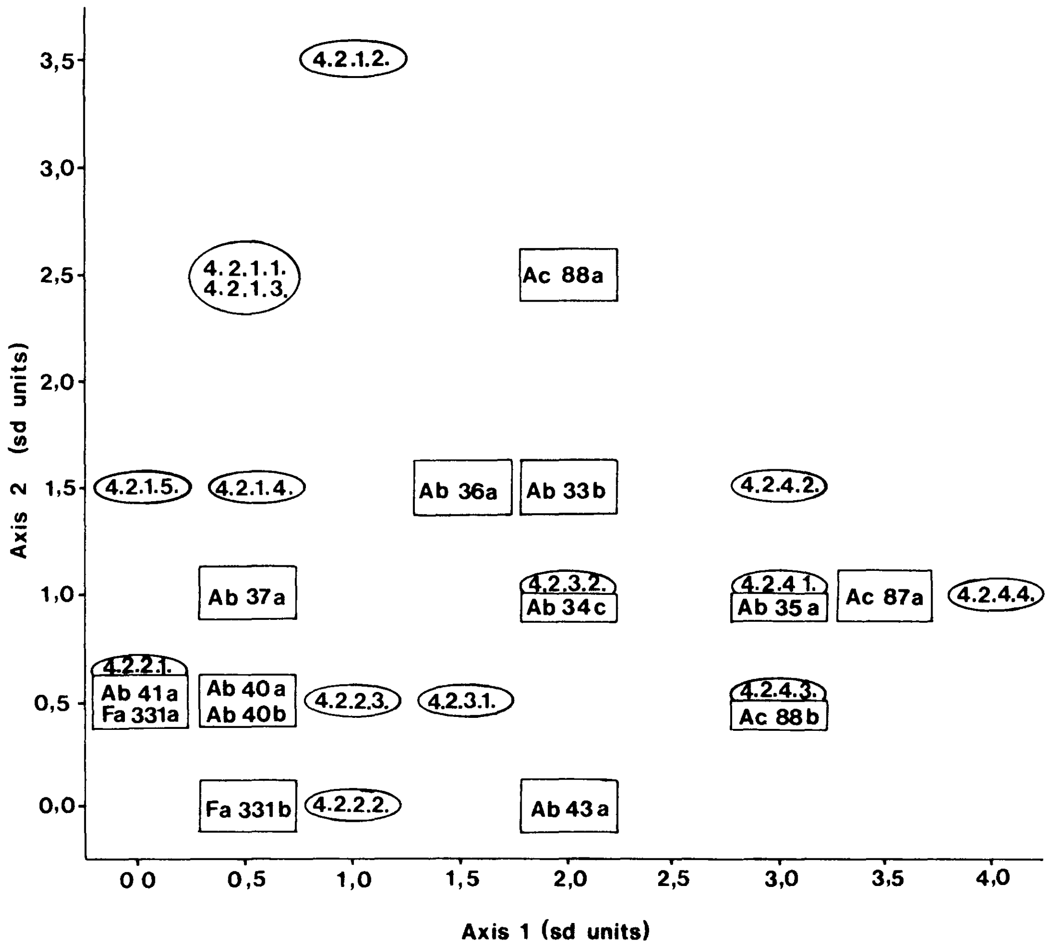

FIG. 6.3 Detrended Correspondence Analysis (DCA) ordination of the 14 land types (rectangles) and the 14 vegetation types (ovals) in the study area. The ordination is based on species presence and absence.

Good floristic correlation between vegetation type and land type is indicated for the following combinations (Fig. 6.3):

(i) Vegetation Type 4.2.2.1 and Land Types Ab41a and Fa331a
(ii) Vegetation Type 4.2.3.2 and Land Type Ab34c
(iii) Vegetation Type 4.2.4.1 and Land Type Ab35a
(iv) Vegetation Type 4.2.4.3 and Land Type Ac88b

Many vegetation types and land types are poorly correlated, however (e.g. Vegetation Types 4.2.1.1 and 4.2.1.3 with Land Types Ac88a and Ab36a).

Whether or not vegetation types and land types correlate floristically is probably a matter of scale. By altering the scale of either entity, their positions in the ordination diagram would change to reveal new correlations and to cancel old ones. For each land type to faithfully accommodate *a priori* vegetation types would therefore be highly fortuitous. It is thus probable that attempts at deriving landscapes on the basis of land-type/ vegetation-type correlations are based on faulty premises. Whereas vegetation is a function of climate, topography, soil, biota, and time (Major, 1951); land type is merely a function of climate, soil (as related to time), and topography (MacVicar *et al*., 1974). Hence the land type fails to account for important vegetation-determining factors such as time, biota and, although not mentioned by Major (1951), fire. The selected abiotic features of land type, moreover, are not necessarily always those to which the selected biotic features of vegetation type react (Kuchler, 1973). *A priori* vegetation types and land types cannot therefore be expected to correlate well.

There may nevertheless be combinations of both vegetation type and land type, which would correlate well enough with each other to form landscapes. This implies broadening the scale of both entities. One way of realizing such combinations would be to delineate them on the ordination diagram (Fig. 6.3). Since no clear-cut polarization of combinations is evident in the diagram, however, any attempt at delineation would be too subjective.

Another way of revealing compatible combinations of vegetation type and land type would be to reduce the dimensionality of data projection. Whereas the ordination diagram (Fig. 6.3) portrays relationships two-dimensionally, a simple two-way matrix would portray them in only one dimension. Although

TABLE 6.3 Derivation of landscapes on the basis of land type/vegetation type sample distribution *

LAND TYPE	VEGETATION TYPE														LANDSCAPE
	4.2.4.4	4.2.4.2	4.2.1.2	4.2.1.1	4.2.4.3	4.2.3.2	4.2.2.1	4.2.1.5	4.2.2.3	4.2.2.2	4.2.1.4	4.2.1.3	4.2.3.1	4.2.4.1	
Ac87	6					2									I
Ab35		6													II
Ac88		7	4	3	4	1									III
Ab34				2	6	1							2		
Ab41							12	5	1						IV
Fa331							25	1	2	16	6				
Ab40							1	1	1	2	3				V
Ab37									2	4	16				
Ab36		2				10			4	2	16	13	2	3	VI
Ab33									1		1			3	VII

* Integers within the matrix refer to the number of sample relevés represented at each point of integration.

such reduction involves some loss of fidelity to the data structure, it enhances workability for contemplation and communication (Gauch, 1982).

(B) Table Arrangement

Table 6.3 shows a two-way matrix in which floristically similar land types are brought close together, as are distributionally similar vegetation types. Thus natural groupings of land type can be distinguished on the basis of vegetation type. These groupings form the basis of several proposed landscape units (Landscapes I to VII). It is obvious that these landscapes are not derived on the basis of strict, clear-cut divisions of vegetation type. On the contrary, they often share the same vegetation types (e.g. Landscapes IV and V). It is the combination of inherent vegetation types that makes them unique, and which forms the basis of their definition.

Note that geographically separate land-type units, such as Ac88a and Ac88b, have been amalgamated in the matrix to represent a single unit (Land Type Ac88). In addition, Land Type Ab43 is not included in the matrix since it is only represented by a single relevé. Hence the number of land types is reduced to ten.

Each landscape is represented on the map (Fig. 6.4, Appendix C) and is described in the form of an expanded legend as shown. This type of legend may be used as a diagnostic key for the identification of landscapes (and communities) in the field. Landscape II, for example, is recognized on the following basis: Loudetia simplex - and Eragrostis racemosa - dominated low closed grassland on exposed slopes of the Escarpment Plateau, where soils are deep and red when underlain by Oaktree Dolomite (Community 49), but shallow and brown when underlain by Black Reef Quartzite (Community 50).

Chi-square test

Table 6.4 shows the completed chi-square (X^2) values for the vegetation-type/land-type integrations defining Landscapes III, IV and V. According to these figures, Landscape IV (Table 6.4 b) is the only one that is based on interdependent, well-correlated associations of vegetation type and land type. Landscapes III and V both have X^2 values reflecting insignificant correlations between vegetation type and land type (Table 6.4 a and c).

TABLE 6.4 Computation of chi-square (X^2)* for the vegetation -type/land-type integrations defining Landscapes III, IV and V (d.f. = degrees of freedom)

(a) Landscape III

	4.2. 4.2	4.2. 1.2	4.2. 1.1	4.2. 4.3	4.2. 3.2	Total
Ac88	7	4	3	4	1	19
Ab34	0	0	2	6	1	9
Total	7	4	5	10	2	28

X^2 = 9,32 for 4 d.f. (Not significant at P = 0,05)

(b) Landscape IV

	4.2. 2.1	4.2. 1.5	4.2. 2.3	4.2. 2.2	4.2. 1.4	Total
Ab41	12	5	1	0	0	18
Fa331	25	1	2	16	6	50
Total	37	6	3	16	6	68

X^2 = 18,5 for 4 d.f. (Significant at P = 0,001)

(c) Landscape V

	4.2. 2.3	4.2. 2.2	4.2 1.4	Total
Ab40	1	2	3	6
Ab37	2	4	16	22
Total	3	6	19	28

X^2 = 1,19 for 2 d.f. (Not significant at P = 0,5)

* $X^2 = \frac{(f - F)^2}{F}$

where f = observed frequency

F = expected frequency = $\frac{\text{(row total)(column total)}}{n}$

Caution needs to be exercised in interpreting these chi-square values, however. According to Parker (1973) conclusions drawn from a chi- square analysis are likely to be unreliable if a large proportion of the expected frequencies (F) are less than 5. In Landscapes III, IV and V, the proportion of F values below 5 is 90, 70, and 83 per cent respectively. Corresponding X^2 values are therefore not necessarily reliable. In order to increase their reliability, further sampling, to increase expected frequencies (F), would be necessary.

7. GENERAL DISCUSSION AND CONCLUSIONS

The research objectives enumerated in Chapter 1 have, to a degree, been realized by this study. Certain redundancies in the research process have nevertheless been identified, and their exclusion from future studies should improve efficiency. The research process has also generated fresh ideas for further research.

7.1 Objectives Reviewed

The prime objective in studying the plant ecology of the Eastern Transvaal Escarpment (apart from providing an inventory of the vegetation) is to provide a scientific basis for land-use planning. This precludes the formulation of land-use policy, which must remain the responsibility of land managers. Their task is to objectively apportion limited resources amongst diverse developmental and conservational needs. The vegetation resource, being an index or measure of all other resources (Weaver & Clements, 1938), provides a potentially viable basis for such apportionment.

Basic vegetation research *per se*, however, would only partially fulfil the prime objective. Such basic research must have applicational value to a non-specialist (Jahn, 1982). In other words, site/vegetation relationships must be so expressed as to be useful to those responsible for managing the vegetation resource (Geldenhuys & Jarman, 1984). In the Sabie context, the ultimate research product, therefore, should be both intelligible and useful to the "grass-roots" custodians of the land, namely farmers, foresters, and conservators. Consequently, objectives extend beyond a purely academic phytosociological classification of vegetation, to include a more practical classification of landscapes.

7.2 Objectives Realized

The phytosociological classification of vegetation (Chapter 4) yielded four informal syntaxomonic levels. The broadest of these, the ecological-formation class, is considered to be inadequate as a practical management unit because, despite its physiognomic and climatic distinctiveness, it is probably too broadly defined to be consistent with local management criteria. Conversely, the two most refined levels, viz plant community and variant, are too detailed to map. The intermediate level of vegetation type, however, provides units that are floristically, physiognomically, and environmentally distinct, and which are readily mappable at a practically useful scale. The vegetation type is therefore considered to be suitable as a land-management unit, or landscape. In its capacity as a "vegetation-delineated ecosystem", it is comparable to Coetzee's (1983) landscape.

At a broader scale, the classification of landscapes on the basis of land type is also considered valid for practical management purposes. The fact that the primary determinants of land type, namely topography, climate and soil (MacVicar et al., 1974) are, in most cases, identical to those of vegetation type, both confirms the significance of these factors in determining vegetation response, and enhances the status of land types as vegetation units.

Both of the landscape classification schemes presented in Chapter 6 combine phytosociological information with environmental information. According to Mueller-Dombois & Ellenberg (1974), this type of approach is best for forest/site classification and mapping for practical forestry purposes.

The expanded legends of both landscape classifications are useful tools for translating basic research into practical-application format. Their function as diagnostic keys should prove especially valuable to non-specialist managers, whose expertise may be limited to the identification of main physiographic zones, basic lithology, vegetation formations, and a limited number of plant species.

Whereas Gertenbach's (1983) landscapes for the Kruger National Park average 557 km^2 each, the landscapes for the Sabie area average 114 km^2 and 57 km^2 each (land-type and vegetation-type basis, respectively). The smaller units in the Sabie area probably reflect the greater beta diversity asssociated with steep environmental gradients. Their size appears to be suitable for management purposes, although this criterion should ultimately be assessed by the managers themselves. The degree of overlap between landscape units will determine the efficacy of each landscape classification. Valid landscape units would be those having mimimal overlap.

The choice of classification scheme is dictated by planning requirements. If the primary determinants of land type, namely soil, climate, and topography, are adequate for defining planning strategy, then the land-type basis will probably suffice. Conversely, if planning strategy is dependent on finer floristic responses, then the vegetation-type basis would be preferable.

According to Walker (1985), management objectives in terms of mapping are essentially scale-related. For regional orientation and policy-making, small-scale (1:250 000) maps, permitting generalized representation of floristically defined vegetation units, are needed (cf. Fig. 6.4, Appendix C). For reconnaissance, planning and management at a more localized level, intermediate-scale (1:50 000) maps are necessary (cf. Fig. 6.1, Appendix C). Ultimately, the efficacy of either classification scheme must be determined in the field. "The crucial test of a technique is essentially an empirical one. Does it prove practical in use?" (Grieg-Smith, 1971).

The validity of a landscape classification scheme within the confines of a broad transect, such as the Sabie transect, does not automatically indicate its validity outside the transect. The extrapolatability of the classification scheme, therefore, is another aspect requiring research in the future.

The plant species check-list contained in Appendix B, together with environmental data, should serve to augment the resource inventory being compiled by the Department of Agriculture and Water Supply, R.S.A.

7.3 Retrospect

Although the phytosociological classification at the community and variant levels is ostensibly too intensive and refined, it is doubtful whether the landscapes of Chapter 6 could have been characterized without this degree of detail as a basis (cf. Gertenbach, 1983). The importance of habitat information is especially pertinent in this regard. The use of "diagnostic" habitat-groups (Table II, Appendix A) was often helpful in the environmental interpretation of communities. In some instances, however (cf. Table II B), the paucity of habitat data precluded meaningful community-environmental correlations being made. Another reason for poor correlation could be that the habitat parameters are not ecologically significant, and cannot always be meaningfully used to characterize communities. More comprehensive habitat data, especially soil chemistry, may have assisted in interpretation, although the increased interpretability may not justify the added cost of procuring such data.

Although the standard quadrat size of 200 m^2 was probably sufficient for achieving a 60 per cent species-information level in woodland, it could probably have been reduced to 50 m^2 in grassland (cf. Werger, 1972). An *ad hoc* investigation of a forest stand (Relevé 64) in the present study area, moreover, revealed that an increase in quadrat size from 200 to 400 m^2, registered a 27 per cent increase in the total number of species. Whether this increase in information is worth the extra effort needed to sample a 400 m^2 quadrat, however, is uncertain. In this respect, Werger's (1972) method of determining optimum plot size may prove useful in future studies.

Both the phytosociological classification (Table II D, Appendix A) and the ordination of communities (Fig. 5.4) show that the vegetation types of Grassland of the Humid Mistbelt are rather poorly differentiated, floristically. This suggests that the divisions may be too arbitrary, and that adjustments may be necessary in the future. Conversely, the vegetation types are very well differentiated environmentally and are therefore easily recognizable in their present form.

Edwards' (1983) structural classification scheme is, with some provisos, compatible with Escarpment vegetation. One proviso relates to his bushland and thicket structural group. The tree height of thickets described in this study often exceeds 10 metres, in which case the classification is inadequate. Two soloutions are suggested. Either incorporate an additional formation class, viz tall thicket; or retain the short thicket class and append "with emergents" when tree height exceeds 10 metres. Another proviso is that Edwards' (1983) primary growth form set does not account for supported lianes, a common feature of Escarpment vegetation. One solution would be to ulitize a qualifying term such as "lianoid" whenever supported lianes are well represented.

A major advantage of Edwards' (1983) classification is that it is versatile and extensible. Raw data pertaining to growth form, height, and cover of different strata in diverse structural types can be "plugged" into the classification, and formation classes can be readily abstracted without necessarily having to visit the site oneself.

The community ordinations appear to have been minimally instructive, their only role being to confirm the classification. In classification, there is always the possibility that groupings are controlled by the ecologist rather than by structure internal to the data (Gauch & Whittaker, 1981). By ordinating derived classes (e.g. plant communities) on floristic data, the relative continuity among them is exposed, and their realness is thus substantiable (Mueller-Dombois & Ellenberg, 1974). With few exceptions, plant communities in this study have been substantiated.

The fact that some of the communities derived from the phytosociological classification lose their floristic distinctiveness in the Detrended Correspondence Analysis (DCA) ordination suggests that the classification may be too refined in places. Whereas a Braun-Blanquet table matrix portrays communities uni-dimensionally, a DCA ordination portrays them in at least two dimensions (Gauch[1], pers. comm.). Thus it is apparent that the ordination probably represents reality better than does the classification. Communities that lose floristic distinctiveness in the ordination, therefore, should rather perhaps be ranked as variants on the basis of their joint occurrence in the ordination diagram. Examples include Communities 4 and 5 in Forest and Mesic Thicket of the Mistbelt and Low Country (Fig.5.1), and Communities 46 and 47 in Grassland of the Humid Mistbelt (Fig. 5.4).

The correlations of environmental variables with community ordinations likewise proved rather superfluous, since they merely confirmed the habitat correlations made in the Braun-Blanquet tables (Table II A-D, Appendix A). They were, of necessity, less comprehensive.

The use of Spearman's rank correlation coefficient to test the significance of community/environment correlations is basically unrealistic, unless all environmental factors are considered together. The "significance" of one factor cannot be substantiated without testing the significance of all other factors as well. Conversely, the "non-significance" of one factor merely indicates the irrelevance of that factor *per se*, without indicating its possible relevance in combination with other factors.

The landscape classification derived on the basis of vegetation type (Fig. 6.1, Appendix C) is similar to that derived on the basis of land type (Fig. 6.4, Appendix C), in that both are partly or wholly defined in terms of climate, soil and topography. The difference lies in the floristic restraints inherent in the vegetation-type landscapes. Such restraints may, or may not, be necessary for a particular planning requirement; only trial will tell.

The ordination of land types and species showed that land types are not necessarily floristic units, and that land types *per se* are therefore not automatically suitable as landscape units. Nevertheless, they do appear to

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be sufficiently distinct, floristically, for use as stratification units in vegetation sampling.

The ordination of land types, vegetation types and species confirmed that land types are not always well correlated with vegetation types, and that landscape formulation attemped on the basis of common delineation is therefore unrealistic, being based on faulty premises. First, whereas land type is based on a purely abiotic habitat, vegetation responds both to a biotic and an abiotic habitat. Secondly, the selected abiotic features of land type are not necessarily always those to which the selected biotic features of vegetation type react. Thirdly, their boundaries denote only one of many possible transitions in the continuum of variation, and coincidence would therefore be highly fortuitous. According to Gauch[1] (pers. comm.), moreover, the vegetation-type/land-type combined ordination may not be statistically valid, since both the vegetation-type and land-type entities are based on the same samples.

There are nevertheless combinations of land type and vegetation type which, although not always significantly correlated by chi-square analysis, are floristically and environmentally fairly distinct, and which are readily mappable. Hence the landscapes derived on the basis of land type (Fig. 6.4, Appendix C). Again, their applicability to a particular planning requirement remains to be tested.

Different, improved approaches to landscape derivation could have been employed, and these will be discussed below (Section 7.4).

7.4 Prospect

The Braun-Blanquet method of classification proved useful in effecting a vegetation classification of the Sabie area. PHYTOTAB (Westfall *et al.*, 1982) was singularly influential in this respect. The time spent on "Phyto 30" was excessive, however, and future streamlining of matrix rearrangment would therefore be very beneficial. One suggestion would be to ordinate relevés and species (via DECORANA - Hill, 1979a) and to use resultant rankings as the basis for initial species and relevé sequences in the raw table. This may result in a more "advanced" matrix than that procured by

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"Phyto 20". Consequently, less time need be expended by "Phyto 30" on shuffling columns and rows to produce the final table. Another suggestion is to compare "Phyto 20" with Two-way Indicator Species Analysis (TWINSPAN), a polythetic divisive method of classification (Hill, 1979b). Alternatively, recent developments in PHYTOTAB (Westfall et al., 1982) appear to be yielding exceptionally well-defined final classifications (Westfall[1], pers. comm.).

Although the practice of table-splitting both enhanced the diagnostic capacity of most communities and revealed new communities, it also created problems in constructing the synoptic table. Some species-groups lost their diagnostic value in the broad context of a composite table, and member-species had to be resequenced, therefore, for the synoptic table to be meaningful. In addition, duplicated species had to be eliminated. This proved to be a very time-consuming operation. It may be expedient in the future, therefore, to exclude non-differential species-groups from the synoptic table and to retain duplicated species. Construction of the synoptic table would thus involve simple juxtaposition of the detailed tables.

Geldenhuys & Jarman (1984) contend that most of the current systems of structural classification (e.g. Edwards, 1983) "have been designed to cover the entire range of vegetation types possible and consequently do not proceed to classify any particular vegetation type down to a fine level of detail". Their efforts to derive a structural-functional classification of forest at a more detailed level may therefore be significant in the future.

Growth-form definitions in the literature are often imprecise and non-standardized. A review of this aspect of vegetation structure is therefore warranted. Geldenhuys & Jarman's (1984) scheme is constructed from various sources (e.g. Walker & Hopkins, 1980; Edwards, 1983; Kruger, 1978; Webb et al., 1976; Scheepers, 1978; Walter, 1979) and may therefore be appropriate for future studies.

With regard to landscape classification, it is clear that MacVicar's (1977) land types, in conjunction with vegetation types, would provide a convenient basis for landscapes. The integration of two a priori resource units such as

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these, however, cannot be approached on the basis of joint delineation. It should rather be approached on the basis of independent delineation. Hence the landscapes could either be delineated by vegetation type and documented by land type (as in Fig. 6.1, Appendix C) or vice versa (as in Fig. 6.4, Appendix C).

In the vegetation-delineated landscapes (Fig. 6.1), the land type merely supplements the floristic and environmental information pertaining to each vegetation type. Landscape boundaries have been drawn from air photographs, and the advantages of extant land-type boundaries are lost.

In the environment-delineated landscapes (Fig. 6.4), habitat-factor analysis could be minimised, since the land type provides the broad-scale habitat information. In addition, the existing land-type map boundaries can be fully exploited, without recourse to air-photo interpretation.

Both of these alternatives are inherently awkward, however. Gauch[1] (pers. comm.) suggested a unique alternative approach whereby vegetation types are refined or adjusted to conform with land types. This approach involves constructing a model in which 150 relevés (randomly selected, and labelled according to land type) are ordinated on species data. For the model to work, resultant relevé clusters should correspond with land-type differentiation patterns. These relevé clusters then constitute the vegetation types which are to be regarded as landscapes. If no such clusters are apparent, then the model does not work, the floristic unity of land types is repudiated, and the land types per se are too poorly qualified to characterize landscapes. If such relevé clusters do emerge, however, then the model works and must be validated by the use of reserve data comprising the remaining 50 relevés. The percentage of reserve relevés whose position in the ordination is true to the model determines the validity, or otherwise, of the model. At least 84 per cent of the reserve relevés should be correctly positioned, with respect to vegetation-type/land-type relevé clusters, for the model to be valid (Gauch[1], pers. comm.).

The potential advantages of this approach, in terms of landscape derivation and mapping, are numerous:

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1) It obviates the prolonged manipulation of Braun-Blanquet tables.
2) It is objectively extensible. In other words, new relevés can simply simply be "slotted" into the ordination diagram by vector multiplication, without being subjectively inserted into Braun-Blanquet tables.
3) It is self-critical in that its validity is subject to certain objective constraints.
4) It is clearer and less ambiguous than more subjective approaches.

In conclusion, methodologies, accomplishments, and limitations of community ecology are often consequent on the human factor (Gauch, 1982). Whereas communities are integrated, our minds can only perceive them by means of a series of individual thoughts. Communities are, furthermore, too rich to be observed or described entirely (Grieg-Smith, 1971). Computers have assisted immensely in saving time and labour, but the necessary elements of creativity and insight must remain a human perogative. In his finitude, moreover, man's creativity is fraught with the risk of error and is therefore always subject to successive refinement. For this reason, community ecology is imbued with subjectivity and is partly art — the joint product of the observer and the observed (Gauch, 1982).

SUMMARY

A preliminary Braun-Blanquet phytosociological classification of vegetation in the Sabie area of the Eastern Transvaal Escarpment revealed 24 syntaxa representing forest, thicket, woodland, shrubland and grassland formations. Subsequent subdivision of the preliminary table on the basis of floristics, physiognomy and climate, resulted in four separate tables, each recognized as an ecological-formation class as follows:

(A) Forest and Mesic Thicket of the Mistbelt and Low Country (Table IIA, Appendix A).
(B) Woodland and Xeric Thicket of the Low Country (Table IIB, Appendix A).
(C) Woodland of the Humid Mistbelt (Table IIC, Appendix A).
(D) Grassland of the Humid Mistbelt (Table IID, Appendix A).

Further refinement within each ecological-formation class generated an informal hierachy in which vegetation types, plant communities, and variants are successively subordinate in rank (Fig. 4.2).

A total of 14 vegetation types, defined by floristic and environmental criteria, were recognized. They are distributed amongst the ecological-formation classes as follows:

(A) 5 vegetation types (Section 4.2.1).
(B) 3 vegetation types (Section 4.2.2).
(C) 2 vegetation types (Section 4.2.3).
(D) 4 vegetation types (Section 4.2.4).

These vegetation types are indicated as potentially useful bases for landscapes and were mapped as such (Fig. 6.1, Appendix C).

Floristic differentiation within each vegetation type formed the basis of plant communities and variants. A total of 53 plant communities and 18 variants are distributed amongst the ecological-formation classes thus (see synopsis of phytosociological classification, Section 4.2):

(A) 19 communities with 2 variants.
(B) 19 communities with 6 variants.
(C) 6 communities with 2 variants.
(D) 9 communities with 8 variants.

Plant communities and variants were named according to the latest code for the standardization of syntaxonomic nomenclature, where the first name of the binomial is that of a diagnostic species, and the second is that of a dominant or conspicuous species. The binomial is followed by a structural term denoting the general physiognomy of the community or variant.

Affinities between communities in the different ecological-formation classes are revealed in a synoptic table (Table III, Appendix A), which is a floristic summary of all syntaxa pertaining to the study area.

An environmental review of the physiography, geology, soils and climate of the study area (Chapter 2) was greatly beneficial in terms of providing a broad framework within which the phytosociological classification could be expressed (Table 2.12 and Table V, Appendix A). This applies especially to the derivation of ecological-formation classes and vegetation types. Habitat factors recorded in situ (Table IV A–D, Appendix A) were especially useful for interpreting finer floristic responses at the plant-community level.

Specific correlations between communities and habitat were identified by means of habitat tables juxtaposed on floristic tables (Table II A–D, Appendix A). Habitat factors were treated as species in the habitat tables and ordered into groups that characterize specific communities. Thus the factors influencing community differentiation are immediately apparent.

Detrended Correspondence Analysis of the plant communities and species of each ecological-formation class confirmed both the classification and the major environmental gradients operating in community differentiation (Chapter 5). In most ecological-formation classes, a temperature/moisture gradient is predominant.

The practical significance of the phytosociological classification in terms of land-use planning was evaluated on the basis of its contribution to landscape classification (Chapter 6). The vegetation type is a tentatively useful landscape concept (Fig. 6.1, Appendix C). The land type is also a useful landscape concept, when integrated with vegetation type (Fig. 6.4, Appendix C). Future research, however, may show that phytosociological classification is not an essential precedent for landscape classification.

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CURRICULUM VITAE

Graham Basil Deall was born on the 14th June 1950 in Harare, Zimbabwe (formerly Salisbury, Southern Rhodesia). He grew up in the Sipolilo district of Zimbabwe and attended the Umvukwes Junior School in Mvurwi and the Ellis Robins High School in Harare. He matriculated from the latter in 1967.

Thereafter, he studied at the University of Natal, Pietermaritzburg where, in 1971, he obtained a B.Sc. degree with Botany and Chemistry as major subjects.

His career, which began in the chemical industry, was interrupted with a period of extended national service in Rhodesia's British South Africa Police. In 1977 his career was directed towards agricultural research through his appointment as Horticultural Research Technician at the Chiredzi Research Station in the south-eastern Lowveld of Zimbabwe.

After marriage in 1978, he continued his studies in the botanical field, obtaining a B.Sc. (Hons) degree from Natal University, Pietermaritzburg in 1979. He was subsequently appointed on contract as a Professional Officer in the Ecology Section of the Botanical Research Institute, Pretoria in 1980. His work at the Institute culminated in the submission of an M. Sc. thesis at the University of Pretoria in 1985, on the plant ecology of the Eastern Transvaal Escarpment in the Sabie area.

REFERENCES

ACOCKS, J.P.H., 1953. Veld Types of South Africa. Mem. bot. Surv. S. Afr. 28: 1–192.

ACOCKS, J.P.H., 1975. Veld Types of South Africa. 2nd edition. Killick, D.J.B. (ed.) Mem. bot. Surv. S. Afr. 40: 1–128.

ADAMSON, R.S., 1938. The vegetation of South Africa. London: Whitefriars.

BARUCH, Z., 1984. Ordination and classification of vegetation along an altitudinal gradient in the Venezuelan paramos. Vegetatio 55: 115–126.

BAYER, A.W., 1970. Plant ecology in the service of man in Southern Africa. S. Afr. J. Sci. 66: 71–77.

BOUCHER, C., 1978. Cape Hangklip area II. The vegetation. Bothalia 12: 455–497.

BREDENKAMP, G.J., 1975. 'n Plantsosiologiese studie van die Suikerbosrand-natuurreservaat. M. Sc. thesis, University of Pretoria.

BREDENKAMP, G.J., 1982. 'n Plantekologiese studie van die Manyeleti-wildtuin. D.Sc. thesis, University of Pretoria.

BURTT DAVY, J., 1935. A sketch of the forest vegetation and flora of tropical Africa. Emp. For. J. 14: 191–201.

CODD, L.E. & GUNN, M., 1982. The collecting activities of Anton Rehmann (1840-1917) in South Africa. Bothalia 14: 1–14.

COETZEE, B.J., 1972. 'n Plantsosiologiese studie van die Jack Scott-natuurreservaat. M.Sc. thesis, University of Pretoria.

COETZEE, B.J., 1974. Improvement of association-analysis classification technique. Bothalia 11: 365–367.

COETZEE, B.J.,1983. Phytosociology, vegetation structure and landscapes of the Central District, Kruger National Park, South Africa. Vaduz: Cramer.

COETZEE, B.J., VAN DER MEULEN, F., ZWANIGER, S., GONSALVES, P. & WEISSER, P.J., 1976. A phytosociological classification of the Nylsvley Nature Reserve. Bothalia 12: 137–160.

DANSEREAU, P., 1957. Biogeography: an ecological perspective. New York: Ronald.

DYER, R.A., 1975. The genera of southern African flowering plants. Vol. 1. Dicotyledons. Pretoria: Government Printer.

DYER, R.A., 1976. The genera of southern African flowering plants. Vol. 2. Gymnosperms and monocotyledons. Pretoria: Government Printer.

EDWARDS, D., 1967. A plant ecology survey of the Tugela Basin. Mem. bot. Surv. S. Afr. 36: 1–285.

EDWARDS, D., 1976. Formation Classes. Unpublished MS.

EDWARDS, D., 1979. The role of plant ecology in the development of South Africa. Bothalia 12: 748–751.

EDWARDS, D., 1983. A broad-scale structural classification of vegetation for practical purposes. Bothalia 14: 705–712.

EDWARDS, D., 1984. Fire regimes in the biomes of South Africa. In: Booysen, P. de V. & Tainton, N.M. (eds.), Ecological effects of fire in South African ecosystems. Ecol. Studies 48. New York: Springer-Verlag.

EITEN, G., 1968. Vegetation forms. Institute de Botânica. Bol. 4.

EITEN, G., 1972. The cerrado vegetation of Brazil. Bot. Rev. 38: 201–341.

FABRICIUS, A.F., 1969, cited in Schutte, J.M., 1971. Die onttrekking van water uit die newellaag en lae wolke by Mariepskop. S.A. Dept. Water Affairs, Div. Hydr. Res., Techn. Note, 20: 1–21.

FABRICIUS, A.F., MS. Climatic types of tropical and subtropical south-eastern Africa. (In prep.)

FAIR, T.J.D., 1954. The natural landscape. In Lowveld Regional Development Association (ed.), The South-Eastern Transvaal Lowveld. pp. 3–12. Parow: Cape Times.

FROST, P.G.H., 1984. The responses and survival of organisms in fire-prone environments. In: Booysen, P. de V. & Tainton, N.M. (eds.), Ecological effects of fire in South African ecosystems. Ecol. Studies 48. New York: Springer-Verlag.

F.S.S.A., 1974. Manual of soil analysis methods. The Fertilizer Society of South Africa 37: 1–65.

GAMBLE, F.C., 1983. Climate of the Transvaal Escarpment. Unpublished notes. Department of Geography, University of the Witwatersrand, Johannesburg.

GAUCH, H.G. Jr., 1982. Multivariate analysis in community ecology. Cambridge: Cambridge University Press.

GAUCH, H.G. Jr. & WHITTAKER, R.H., 1981. Hierarchical classification of community data. J. Ecol. 69: 537–557.

GAUCH, H.G. Jr., WHITTAKER, R.H. & WENTWORTH, T.R., 1977. A comparative study of reciprocal averaging and other ordination techniques. J. Ecol. 65: 157–174.

GAUSSEN, H., 1955. Expression des mileux par des formules écologiques; leur represéntation cartographique. Coll. Int. Cent. Nat. Rech. Sci. 59: 257–269.

GELDENHUYS, C.J. & JARMAN, M.L., 1984. Structural analysis, classification and description of South African indigenous evergreen forest vegetation: A workshop report. Draft copy for: South African National Scientific Programmes.

GERTENBACH, W.P.D., 1983. Landscapes of the Kruger National Park. Koedoe 26: 9–121.

GERTENBACH, W.P.D. & POTGIETER, A.L.F., 1979. Veldbrandnavorsing in die struikmopanieveld van die Krugerwildtuin. Koedoe 22: 1–28.

GOODALL, D.W., 1954. Vegetational classification and vegetational continua. Agnew. Pflanzensoziologie (Vienna). Feitschrift Aichinger 1: 168–182.

GRANGER, J.E., 1984. Fire in forest. In: Booysen, P. de V. & Tainton, N.M. (eds.), Ecological effects of fire in South African ecosystems. Ecol. Studies 48. New York: Springer-Verlag.

GREIG-SMITH, P., 1971. Analysis of vegetation data: The user viewpoint. In Statistical ecology, G.P. Patil, E.C. Pielou & W.E. Waters (eds.), Vol. 3. pp. 149–166. University Park, P.A.: Pennsylvannia State University Press.

GREIG-SMITH, P., 1980. The development of numerical classification and ordination. Vegetatio 42: 1–9.

GUNN, M. & CODD, L.E., 1981. Botanical exploration of southern Africa. Cape Town: Balkema.

HILL, M.O., 1973. Reciprocal averaging: an eigenvector method of ordination. J. Ecol. 61: 237–249

HILL, M.O., 1979a. DECORANA - A FORTRAN program for detrended correspondence analysis and reciprocal averaging. Unpublished report. Ecology and Systematics, Cornell University, Ithaca, New York.

HILL, M.O., 1979b. TWINSPAN — A FORTRAN program for arranging multivariate data in an ordered two-way table by classification of the individuals and attributes. Unpublished report. Ecology and Systematics, Cornell University, Ithaca, New York.

HILL, M.O. & GAUCH, H.G. Jr., 1980. Detrended Correspondence Analysis: an improved ordination technique. Vegetatio 42: 47–58.

HORNE, I.P., 1981. The frequency of fires in the Groot Swartberg mountain catchment area, Cape Province. S. Afr. For. J. 118: 56–60.

JAHN, G. (ed.), 1982. Appplication of vegetation science to forestry. Handbook of vegetation science. Part 12. The Hague: Junk.

JORDAAN, P.G., 1965. Die invloed van ŉ winterbrand op die voortplanting van vier soorte van die Proteaceae. Tydskrif vir Natuurwetenskappe 5: 27–31.

KILLICK, D.J.B., 1963. An account of the plant ecology of the Cathedral Peak Area of the Natal Drakensberg. Mem. bot. Surv. S. Afr. 34: 1–178.

KILLICK, D.J.B., 1966. Fifty years of plant ecology in South Africa. J. S. Afr. Biol. Soc. 7: 11–28.

KING, L.C., 1963. South African scenery. Edinburgh: Oliver & Boyd.

KITTREDGE, J., 1948. Forest influences. New York: McGraw-Hill.

KOMEREK, E.V., 1971. Lightning and fire ecology in Africa. Proc. Ann. Tall Timbers Fire Ecol. Conf. 11: 473–511.

KRAJINA, V.J., 1933. Die pflazengesellschaften des Mylnica — Tales in den Vysoke Tatry (Hohe Tatra). Mit besonderer Berücksichtigung der ökologischen Verhältnisse. Botan. Centralbl., Beih., Abt. II, 50: 774–957; 51: 1–224.

KRONINGER, H., 1978. Newsletter, National Lightning Recording Scheme, No. 2, November 1978. CSIR, Pretoria, National Electrical Engineering Research Institute, Special Report Elek 161: 1–18.

KRUGER, F.J., 1978. Structural/physiognomic/functional classification and description of fynbos vegetation: a workshop report. Unpublished manuscript. Department of Environment Affairs, Forestry Branch, Pretoria.

KRUGER, F.J., 1984. Effects of fire on vegetation structure and dynamics. In: Booysen, P. de V. & Tainton, N.M. (eds.), Ecological effects of fire in South African ecosystems. Ecol. Studies 48. New York: Springer-Verlag.

KUCHLER, A.W., 1973. Problems in classifying and mapping vegetation for ecological regionalization. Ecology 54: 512–523.

LEGAT, C.E., 1910. Trees of the North-Eastern Transvaal. Kew Bull. pp. 49–55.

MACDONALD, I.A.W., FURNISS, P.R., SCHOLES, R.J. & BERRY, A., 1980. Fire regime characteristics in the Hluhluwe–Corridor–Umfolozi Game Reserve Complex in Zululand. 2. Analysis of the areas burned in the period 1955–1978. Mimeo report to National Programme for Environmental Sciences, CSIR, Pretoria, 1–6.

MACVICAR, C.N., 1977. Resource data collection at regional scales. I. Land type mapping. Unpublished report. Soil and Irrigation Research Institute, Department of Agricultural Technical Services, Pretoria.

MACVICAR, C.N., SCOTNEY, D.M., SKINNER, T.E., NIEHAUS, H.S. & LOUBSER, J.H., 1974. A classification of land (climate, terrain form,soil) primarily for rainfed agriculture. S. Afr. J. Agric. Extn 3: 21–24.

MACVICAR, C.N., DE VILLIERS, J.M., LOXTON, R.F., VERSTER, E., LAMBRECHTS, J.J.N., MERRYWEATHER, F.R., LE ROUX, J., VAN ROOYEN, T.H. & HARMSE H.J. VON M., 1977. Soil classification. A binomial system for South Africa. Pretoria: Department of Agricultural Technical Services.

MAJOR, J., 1951. A functional, factorial approach to plant ecology. Ecology 32: 392–412.

MATHER, J.R., 1959. The moisture balance in grassland climatology. In: Sprague, H.B. (ed.), Grasslands. pp. 251–261. Am. Assoc. Adv. Sci., Washington.

MOLL, E,J., 1968. A quantitative ecological investigation of the Krantzkloof forest, Natal. Jl S. Afr. Bot. 34: 15–25.

MOLL, E.J., 1972. The current status of the Mistbelt Mixed Podocarpus Forest in Natal. Bothalia 10: 595–598.

MOLL, E.J. & HAIGH, H., 1966. A report on the Xumeni Forest. For. S. Afr. 7: 99–108.

MUELLER-DOMBOIS, D. & ELLENBERG, H., 1974. Aims and methods of vegetation ecology. New York: John Wiley & Sons.

MüLLER, T., 1983. A case for a vegetation survey in a developing country based on Zimbabwe. Bothalia 14: 721–723.

MUNSELL SOIL COLOR CHARTS, 1954. Baltimore: Munsell Color Company Inc.

ORLOCI, L., 1978. Multivariate analysis in vegetation research. 2nd edn. The Hague: Junk.

PAPADAKIS, J., 1961. Climate tables for the world. Beunos Aires: Talleres Graficos "Optimus".

PARKER, R.E., 1973. Introductory statistics for biology. Studies in Biology No. 43. London: Edward Arnold.

PENTZ, J.A., 1938. The value of botanical survey and the mapping of vegetation as applied to farming systems in South Africa. Mem. bot. Surv. S. Afr. 19: 1–15.

PENTZ, J.A., 1945. An agro-ecological survey of Natal. Dept. Agric. and For. Bull. No. 250, Govt. Printer, Pretoria.

PHILLIPS, E.A., 1959. Methods of vegetation study. New York: Holt, Rhinehart & Winston.

PHILLIPS, E.P., 1933. The flora of Barberton. S. Afr. J. Sci. 30: 234– 236.

PHILLIPS, J.F.V., 1930 Fire: its influence on biotic communities and physical factors in South and East Africa. S. Afr. J. Sci. 27: 352–367.

POLE EVANS, I.B., 1920. The veld, its resources and dangers. S. Afr. J. Sci. 17: 1–34.

POLE EVANS, I.B., 1922. The main botanical regions of South Africa. Mem. bot. Surv. S. Afr. 4: 49–53.

POLE EVANS, I.B., 1929. Vegetation of South Africa. In: Crocker, H.J. & McCrae, J. (eds.), South Africa and science. pp. 192–214. Johannesburg: Hortons Ltd.

POLE EVANS, I.B., 1936. A vegetation map of South Africa. Mem. bot. Surv. S. Afr. 15–23.

POYNTON, R.J., 1971. A silvicultural map of southern Africa. S. Afr. J. Sci. 67: 58–60.

RICHARDS, P.W., TANSLEY, A.G. & WATT, A.S., 1940. The recording of structure, life form and flora of tropical forest communities as a basis for their classification. J. Ecol. 28: 224–239.

RUTHERFORD, M.C. & WESTFALL, R.H., MS. An objective categorization of the biomes of southern Africa. Mem. bot. Surv. S. Afr. (In press).

RYCROFT, H.B., 1944. The Karkloof Forest, Natal. Jl S. Afr. For. Ass. 11: 14–25.

SACS, 1980. South African committee for stratigraphy. Stratigraphy of South Africa. Part 1 (Comp. L.E. Kent). Lithostratigraphy of the Republic of South Africa, South West Africa/Namibia and the Republics of Bophuthatswana, Transkei and Venda. Handb. geol. Surv. S. Afr. 8: 1–690.

SCHEEPERS, J.C., 1975. Procedure for using field-data sheets (Form Ec. 2). Unpublished technical note. Botanical Research Institute, P. Bag X101, Pretoria, 0001.

SCHEEPERS, J.C., 1978. Vegetation of Westfalia Estate on the North-Eastern Transvaal Escarpment. Mem. bot. Surv. S. Afr. 42: 1–230.

SCHEEPERS, J.C., BOUCHER, C. & WESTFALL, R.H., MS. The standardization of South African syntaxonomic nomenclature. S. Afr. J. Bot. (In press).

SCHELPE, E.A.C.L.E., 1969. Revised check-list of the Pteridophyta of southern Africa. Jl S. Afr. Bot. 35: 127–140.

SCHULZE, B.R., 1947. The climate of South Africa according to the classifications of Köppen and Thornthwaite. S. Afr. geog. J. 29: 32–42.

SCHULZE, R.E., 1975. Incoming radiation on sloping terrain: A general model for use in southern Africa. Agrochemophysika 7: 55–61.

SCHULZE, R.E. & McGEE, O.S., 1978. Climatic indices and classification in relation to the biogeography of southern Africa. In: Werger, M.J.A. (ed.), Biogeography and ecology of southern Africa. pp. 19–52. The Hague: Junk.

SCHUTZ, C.J., 1981. A reconnaissance of the geology and pedology of the Sabie forestry area. Unpublished report. Natal Forestry Research Centre, P. Bag X9029, Pietermaritzburg, 3200.

SCOTCHER, J.S.B., 1980. Fire ecology in the Natal Drakensberg game and nature reserves. Mimeo report to National Programme for Environmental Sciences, CSIR, Pretoria, 1–49.

SCOTT, J.D., 1970. Pros and cons of eliminating veld burning. Proc. Grassld Soc. S. Afr. 5: 23–26.

SMUTS, J.C. & HUTCHINSON, J., 1933. The vegetation of Schoemanskloof, eastern Transvaal. Kew Bull. pp. 417—427.

SNEDECOR, G.W. & COCHRAN, W.G., 1967. Statistical methods (sixth edition). Iowa: The Iowa State University Press.

SPECHT, R.L., 1981. Foliage projective cover and standing biomass. In: Gillison, A.N. & Anderson, D.J. (eds.), Vegetation classification in Australia. pp. 10—21. Canberra: CSIRO & Australian University Press.

SPECHT, R.L., ROE, E.M. & BOUGHTON, V.H. (eds.), 1974. Conservation of major plant communities in Australia and Papua New Guinea. Aust. J. Bot. Suppl. No. 7.

STUMPEL, A.H.P. & KALKHOVEN, J.T.R., 1978. A vegetation map of The Netherlands, based on the relationship between ecotopes and types of potential natural vegetation. In: Van der Maarel, E. & Werger, M.J.A. (eds.), Plant species and plant communities. The Hague: Junk.

TAINTON, N.M. & MENTIS, M.T., 1984. Fire in grassland. In: Booysen, P. de V. & Tainton, N.M. (eds.), Ecological effects of fire in South African ecosystems. Ecol. Studies 48. New York: Springer-Verlag.

TAYLOR, H.C., 1961. The Karkloof Forest: a plea for its protection. For. S. Afr. 1: 123—134.

TAYLOR, H.C., 1969. A vegetation survey of the Cape of Good Hope Nature Reserve. M. Sc. thesis, University of Cape Town.

THORNTHWAITE, C.W., 1948. An approach towards a rational classification of climate. Geog. Rev. 38: 55—94.

THORNTHWAITE, C.W., 1952. Grassland climates. Laboratory of Climatology. Public. Climatol. 5: 1—14.

VAN DER MAAREL, E., 1980. On the interpretability of ordination diagrams. Vegetatio 42: 43—45.

VAN DER MEULEN, F., 1979. Plant sociology of the western Transvaal Bushveld. A syntaxonomic and synecological study. Vaduz: Cramer.

VAN DER MEULEN, F. & SCHEEPERS, J.C., 1978. On vegetation studies and land evaluation in South Africa. In: Tuxen, R. (ed.),Assoziations komplexe und ihre praktische Anwendung. Ber. int. Symp. Int. Ver. Vegetationskunde, Rinteln, 1977. pp. 481—489. Lehre: Cramer.

VAN DER SCHIJFF, H.P., 1963. A preliminary account of the Mariepskop Complex. Fauna Flora Transv. 14: 42—53.

VAN DER SCHIJFF, H.P., 1965. Die invloed van termitaria op the plantegroei van die Nasionale Krugerwildtuin. Tydsk. Natuurwet. 5: 48—54.

VAN DER SCHIJFF, H.P. & SCHOONRAAD, ELZABE, 1971. The flora of the Mariepskop Complex. Bothalia 10: 461—500.

VAN RIPER, J., 1971. Man's physical world. London: McGraw-Hill.

VINCENT, V. & THOMAS, R.G., 1960. An agricultural survey of Southern Rhodesia. Part I: Agro-ecological survey. Salisbury: Government Printer.

VISSER, H.N. & VERWOERD, W.J., 1960. The geology of the country north of Nelspruit. Dept. of Mines, Geological Survey. Govt. Printer, Pretoria.

VOGTS, M., 1982. South Africa's proteaceae : know them and grow them. Cape Town: Struik.

VON CHRISTEN, H.C., 1962. Reconnaissance survey of the soils of the Westfalia Estate, northern Transvaal. Unpublished report No. 1196/62, Soils Research Institute, Dept. Agric. Tech, Serv., Pretoria.

VON CHRISTEN, H.C., 1964. Some observations on the forest soils of South Africa. For. S. Afr. No. 5: 1—21.

WALKER, B.H., 1976. An approach to the monitoring of changes in the composition and utilization of woodland and savanna vegetation. S. Afr. J. Wildl. Res. 6: 1—32.

WALKER, J. & HOPKINS, M.S., 1980. Description and classification of Australian vegetation. Draft copy for: Land and soil survey handbook.

WALKER, R.S., 1985. User needs : Vegetation classification and mapping. Unpublished notes. Department of Environment Affairs, Forestry Branch, Pietermaritzburg.

WALTER, H., 1971. Ecology of tropical and subtropical vegetation. Edinburgh: Oliver and Boyd.

WALTER, H., 1972. Der Wassserhaushalt der Pflanzen in kausaler und kybernetischer Betrachtung. Ber. Dtsch. Bot. Ges. 85: 301—313.

WALTER, H., 1979. Vegetation of the earth, and ecological systems of the geo-biosphere. New York: Springer-Verlag.

WATTS, D., 1971. Principles in biogeography. London: McGraw-Hill.

WEATHER BUREAU, S.A., 1950. Sunshine and cloudiness in South Africa Clim.S. Afr. Publ. WB 14 S. Afr. Weath. Bur.

WEATHER BUREAU, S.A., 1954a. Climate statistics. Clim.S. Afr. Publ. WB 19 S. Afr. Weath. Bur.

WEATHER BUREAU, S.A., 1954b. Rainfall statistics. Clim.S. Afr. Publ. WB 20 S. Afr. Weath. Bur.

WEATHER BUREAU, S.A., 1960. Surface winds. Clim.S. Afr. Publ. WB 26 S. Afr. Weath. Bur.

WEATHER BUREAU, S.A., 1965a. General survey. Clim.S. Afr. Publ. WB 28 S. Afr. Weath. Bur.

WEATHER BUREAU, S.A., 1965b. Average monthly rainfall. Clim.S. Afr. Publ. WB 29 S. Afr. Weath. Bur.

WEAVER, J.E. & CLEMENTS, F.E., 1938. Plant ecology. London: McGraw-Hill.

WEBB, L.J., TRACEY,J.G. & WILLIAMS, W.T., 1976. The value of structural features in tropical forest topology. Australian Journal of Ecology 1: 3–28.

WEISSER, P.J., 1978. A vegetation study of the Zululand dune areas. (Natal Town & Regional Plannning Report 38). Pietermaritzburg: Natal Town and Regional Planning Commission.

WERGER, M.J.A., 1972. Species area relationship and plot size: with some examples from South African vegetation. Bothalia 10: 583–594.

WERGER, M.J.A., 1973. An account of the plant communities of Tussen die Riviere Game Farm, Orange Free State. Bothalia 11: 165–176.

WERGER, M.J.A., 1974. On concepts and techniques applied in the Zürich-Montpellier method of vegetation survey. Bothalia 11: 309–323.

WEST, O., 1951. The vegetation of Weenen county, Natal. Mem. bot. Surv. S. Afr. 23: 1–183.

WEST, O., 1965. Fire in vegetation and its use in pasture management with special reference to tropical and subtropical Africa. Mimeographed publication No. 1. Commonwealth Bureau of Pastures and Field Crops, Hurley, Berkshire, 1–53.

WEST, O., 1971. Fire, man and wildlife as interacting factors limiting the development of climax vegetation in Rhodesia. Proc. Ann. Tall Timbers Fire Ecol. Conf. 11: 121–145.

WESTFALL, R.H., 1981. The plant ecology of the farm Groothoek, Thabazimbi district. M.Sc. thesis, University of Pretoria.

WESTFALL, R.H., DEDNAM, G., VAN ROOYEN, N. & THERON, G.K., 1982. PHYTOTAB – A program package for Braun-Blanquet tables. Vegetatio 49: 35–37.

WESTHOFF, V. & VAN DER MAAREL, E., 1973. The Braun-Blanquet approach. In: Whittaker, R.H. (ed.). Handbook of vegetation science. The Hague: Junk.

WHITTAKER, R.H., 1962. Classification of natural communities. Bot. Rev. 28: 1–239.

WHITTAKER, R.H., 1970. Communities and ecosystems. New York: Macmillan Publ. Co.

WHITTAKER, R.H., 1978. Direct gradient analysis. In: Whittaker, R.H. (ed.). Ordination of plant communities. pp. 7–51. The Hague: Junk.

WICHT, C.L., 1971. The influence of vegetation in South African mountain catchments on water supplies. S. Afr. J. Sci. 67: 201– 209.

WITKOWSKI, E.T.F., 1983. Ecology of the Klaserie Private Nature Reserve. M.Sc. thesis, University of the Witwatersrand.

APPENDIX A

PHYTOSOCIOLOGICAL AND ENVIRONMENTAL TABLES

TABLE I PHYSIOGNOMIC-PHYSIOGRAPHIC KEY TO THE PLANT COMMUNITIES IN THE SABIE AREA OF THE EASTERN TRANSVAAL ESCARPMENT

FORMATION CLASS (EDWARDS '83)	PHYSIOGRAPHIC ZONE	COMMUNITY NO.	TABLE NUMBER	ECOLOGICAL-FORMATION CLASS #
FOREST	LOWER MOUNTAINS	1	IIA	(A)
		2	IIA	
	PLATEAU CREST	3	IIA	
	ESCARPMENT UPPER SLOPES	4	IIA	
		5	IIA	
	ESCARPMENT LOWER SLOPES	6	IIA	
	LOWER FOOTHILLS	17	IIA	
		18	IIA	
		19	IIA	
THICKET	MOUNTAINS	40	IIC	(C)
	ESCARPMENT LOWER SLOPES	7	IIA	(A)
		8	IIA	
		11	IIA	
	UPPER FOOTHILLS	9	IIA	
		10	IIA	
		12	IIA	
		13	IIA	
		14	IIA	
		15	IIA	
		16	IIA	
		25	IIB	(B)
		28	IIB	
	LOWER FOOTHILLS	20	IIB	
		22	IIB	
		23	IIB	
		24	IIB	
WOODLAND	MOUNTAINS & PLAT. CREST	44	IIC	(C)
	PLATEAU CREST	41	IIC	
		43	IIC	
	ESCARPMENT UPPER SLOPES	39	IIC	
	ESCARPMENT LOWER SLOPES	32	IIB	(B)
	UPPER FOOTHILLS	26	IIB	
		27	IIB	
		29	IIB	
		30	IIB	
		31	IIB	
		33	IIB	
		34	IIB	
		35	IIB	
		36	IIB	
		37	IIB	
	LOWER FOOTHILLS	21	IIB	
SHRUBLAND	PLATEAU CREST	42	IIC	(C)
	ESCARPMENT UPPER SLOPES	46	IID	(D)
	ESCARPMENT LOWER SLOPES	38	IIB	(B)
GRASSLAND	LOWER MOUNTAINS	52	IID	(D)
	MIDDLE MOUNTAINS	53	IID	
	PLATEAU CREST	47	IID	
		48	IID	
		50	IID	
	PLATEAU INTERIOR	49	IID	
		51	IID	
	ESCARPMENT LOWER SLOPES	45	IID	

(A) = FOREST AND MESIC THICKET OF THE MISTBELT AND LOW COUNTRY
(B) = WOODLAND AND XERIC THICKET OF THE LOW COUNTRY
(C) = WOODLAND OF THE HUMID MISTBELT
(D) = GRASSLAND OF THE HUMID MISTBELT

TABLE IIA FLORISTIC CLASSIFICATION AND HABITAT CORRELATION IN FOREST AND MESIC THICKET OF THE MISTBELT AND LOW COUNTRY, SABIE AREA

HABITAT FACTORS		1	2	3. A .B	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	COMMUNITY NUMBER:	1	2	3. A .B	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	RELEVE NUMBER:	11		.				1				1 1		1111			111	11	111	11
		11	999	77.88	6767	666	444566	945435	644	343335	55	258325	21	25659	34	331	32555	89	787	47
		64	542	95.01	0062	759	769684	755000	148	934874	21	783117	791	52871	22	6563	38415	83	096	02
	TOTAL SPECIES PER RELEVE:	24	333	34.42	4333	443	554444	444332	445	343344	43	452343	243	44444	32	5444	33444	54	442	23
		88	593	70.27	0968	117	005616	232499	350	818352	47	576939	984	38410	56	7871	19663	01	088	54
LAND TYPE AB 34C		++		.																
SHORT FOREST		+	+++	+.			+		+											
990-1111 METRES ELEVATION			+++	.			+		+											
35-84 PERCENT ROCK COVER		+	+++	.		++	+ +					+		+						+
UPPER DOLOMITE		++	+++	.																
LOWER MOUNTAINS		++	+++	.																
BLACK REEF QUARTZITE				++.++								+								
PLATEAU CREST				++.++								+								
BLACK A HORIZON				++.++			+	+ +	+			+ +						+		
85-100 PERCENT ROCK COVER				++.++								+								
1356-1478 METRES ELEVATION				++.++																
KNOLL				++.+										+						
LAND TYPE AC 88A			+++	++.++																
FAIRLY SHALLOW SOIL (13-48 CM)		+	+++	+.++			+	+	+			++ ++	+ +	+ + +		+				+
8:NORTH EASTERN MOUNTAIN SOURVELD		++	+++	++.++																
1234-1355 METRES ELEVATION		++		.	+ ++			+				+								
ESCARPMENT UPPER SLOPES				.	++++	+++	+					+								
1112-1233 METRES ELEVATION				.	+	+++	+					+								
KLOOF (DRY)				.	+	+++			+	+							+			
TRANSVAAL DIABASE				.	+	+ +	+		+					+		+				+
HUMID MISTBELT		++	+++	++.++	++++	+++	+					+ +								
PARTIALLY SHELTERED SITE		+		.+							+	++ ++		++	++	++				
TRANSITIONAL MISTBELT				.			+++ +	+++ ++	+++	++++++	++	+ +++			++	++	+			
LAND TYPE AB 37A				.				+++		++++	+	+	+++	+	+	+	+			
868-989 METRES ELEVATION				.			+++	++ ++	++	+ +++	++	+ +++			+	++		+		
SANDY CLAY A HORIZON				.			++	+ + +	+ +	++++ +	++	+	++		+	+ +	+			
LAND TYPE AB 36A				.	++++	+++	++++++	++	+++	++	+	+++ ++			+	++				
FAIRLY DEEP SOIL (49-100 CM)		+		+ .	++++	+	++	+++ +		+ + ++		+	+		++	++	+	+		
5-34 PERCENT ROCK COVER				.	++ +	+	+ +	+ +	+	+++ +		+ +	+++	+		+ +		+		
UPPER PEDIMENT SLOPE			+++	.	+++			+ ++	+	+ +	+	++ +++	+ +	+	++	+ +				+
745-867 METRES ELEVATION				.			+	+		+ +				++ ++	+		+ +++			
LAND TYPE FA 331A				.										++		+	++ +			+

2

UPPER FOOTHILLS			.			+	+		+++++	++	+	+++	++ ++	++	++++	+ +++	+		
XEROCLINAL ASPECT (248-66 DEG.)	+		+. +			+ +	+++	+	+ + +		++ +++		++ ++	++	++	++ +	+	+	
1-4 PERCENT ROCK COVER	+		.	+		+ +	++ ++	+ +	+ +	++	++			++	++	++		+	
LOWER PEDIMENT SLOPE	+		.			+	++	+	+	+	+	+	+			++			
95-100 PERCENT VEGETAL COVER	+	+++	+ .	+	++	+ +	+ + +				+ +	+++	+ +		+	++++			
RED B HORIZON		+	.	+++	+ +	+ +	+ +	+	+++++	+		+++	+	+	+ +	+ +			
LOWER FOOTHILLS			.										+			+	+	+++	++
LAND TYPE AB 41A			.														+	+++	+
TALL FOREST	+		+ . +	++++	+++	++ +++	+ +		+							+	++	++	+
STRONGLY ACID B HORIZON			.			+	+								+		+	++	+
SANDY B HORIZON			.			+											++	+	+
500-622 METRES ELEVATION			.										+					+ +	+
<1 PERCENT ROCK COVER			.										+ +			+++	+	+ +	+
LOW COUNTRY			.			+	+					+++	+++++		+ +	++++	++	+++	++
623-744 METRES ELEVATION			.									+++			+ +	+	+	+	+
SHELTERED SITE	+	+++	++. +	++++	+++	++++++	++++++	+++	++++++	+		+++	++		+	+++++	++	+++	++
SANDY CLAY LOAM A HORIZON	++	++	++. +	++++	+++	+ ++	+		+		++	+	+++++	+	+ +	++++	++	+++	+
STREAM BANK (WET)	+		. +			+ + +			+				+			++	++	+ +	
9: LOWVELD SOUR BUSHVELD			.	++++	+++	++++++	++++++	+++	++++++	++	++++++	+++	+++++	++	++++	+++++	++	+++	++
NELSPRUIT GRANITE			.	+ ++	+	++++ +	++++++	++	++++++	++	+++++	+++	++++	++	+++	+++++	++	+++	+
DEEP SOIL (>100 CM)			.		++	+ ++	+	+ +	+ +	++	+		+ +		+	+ +++	+	+++	+
75-95 PERCENT VEGETAL COVER	+		+.++	+++	+	+ + ++	+ ++	+++	++++++	++	++ +		+ + +	++	++	+	++	+++	++
GENTLE SLOPE (3,5-17,62 DEG.)	+		+.++	+	+	++ ++	+	++	+	+	+		++++	+	++	+ ++	++	+ +	
WEAKLY ACID A HORIZON	++	++	+.++	++++	+++	++++++	++ + +	+++	++ +++	++	+++++	+	+++++	++	+++	+ +++	+	++	++
BROWN A HORIZON	++	+	.	++++	+++	+++++	++ +	+ +	++++++	++	+ ++	+++	+ +	++	+++	++++	+	+++	++
WEAKLY ACID B HORIZON	++	++	+ .	++++	+++	++ ++	+ ++++	+ +	++++++	++	+ ++	+++	++ ++	++	++ +	+++++	+	+	+
MESOCLINAL ASPECT (67-247 DEG.)	+	+++	+ .+	++++	+++	+ + ++	+ ++	++	++ +	++	+	+++	+		+	++	+	++	++
SANDY CLAY B HORIZON	++	++	+ .	++	+++	+ ++++	++ +++		++	++	+ +	+	++ +	++	++++	+++		++	
BROWN B HORIZON	++	+	+ .	+	+	++	++ + +	+	+	+	++ ++		+ ++	+	+ +	++	++	+++	+
MODERATE SLOPE (17,63-36,39 DEG.)	+	+ +	.	++	++	++	+ ++++	+	+++++	+	+ +++	+++	+	+	+	+		+	++
<1> DIFFERENTIAL SPECIES OF THE HYPOESTES PHAYLOPSOIDES - DOVYALIS LUCIDA TALL FOREST (COMMUNITY 1)																			
HYPOESTES PHAYLOPSOIDES (SH)	26		.																
DUMASIA VILLOSA VAR.VILLOSA (LN)	22		.																
ADIANTUM CAPILLARIS-VENERIS (PT)	21		.													1		2	
CLERODENDRUM GLABRUM #(TR)	12		.												3				
<2> DIFFERENTIAL SPECIES OF THE STREPTOCARPUS CYANEUS - DOVYALIS LUCIDA SHORT FOREST (COMMUNITY 2)																			
STREPTOCARPUS CYANEUS (FB)		252	.																
CANTHIUM HUILLENSE (TR)		352	.																
CYPHOSTEMMA ANATOMICUM (LN)		22	.				2												
BUDDLEIA AURICULATA (SH)		22	.																
<3> DIFFERENTIAL SPECIES OF COMMUNITIES 1-2																			
DOVYALIS LUCIDA (TR)	22	322	.				2												
CLAUSENA ANISATA (TR)	22	333	.										3					2	
POLYSTICHUM LUCTUOSUM (PT)	2	251	.																
CALPURNIA AUREA (TR)	2	1 2	.																
THALICTRUM RHYNCHOCARPUM (FB)	1	11	.																
PHANEROPHLEBIA CARYOTIDEA #(PT)	2	1	.																

<4> DIFFERENTIAL SPECIES OF THE EKEBERGIA PTEROPHYLLA - PSYCHOTRIA ZOMBAMONTANA SHORT FOREST (COMMUNITY 3)

PEPEROMIA TETRAPHYLLA (EP)		3	23.22																
EKEBERGIA PTEROPHYLLA (TR)			23.53																3
HYPOLEPIS SPARSISORA (PT)			12.2			3													
LYCOPODIUM GNIDIOIDES (PT)			22.2																
VERNONIA UMBRATICA (SH)			23. 2																
PLECTRANTHUS RUBROPUNCTATUS (SH)			4 .28																
ALOE ARBORESCENS (SH)			5.72																
POLYSTACHYA OTTONIANA (EP)			2.11																
PTEROCELASTRUS ECHINATUS (TR)			2. 4																
RHUS DURA (SH)			3.4																

<5> DIFFERENTIAL SPECIES OF THE BULBOPHYLLUM SANDERSONNII - EKEBERGIA PTEROPHYLLA - PSYCHOTRIA ZOMBAMONTANA VARIANT (3A)

BULBOPHYLLUM SANDERSONII (EP)			22.																
ROTHMANNIA CAPENSIS (TR)			23.																

<6> DIFFERENTIAL SPECIES OF THE PODOCARPUS LATIFOLIUS - EKEBERGIA PTEROPHYLLA - PSYCHOTRIA ZOMBAMONTANA VARIANT (3B)

CYANOTIS PACHYRRHIZA (FB)			.22																
PODOCARPUS LATIFOLIUS (TR)			.47																
RUMOHRA ADIANTIFORMIS (PT)			.32																

<7> DIFFERENTIAL SPECIES OF COMMUNITIES 2-3

GREYIA RADLKOFERI (TR)	2	342	3.4																
MYRSINE AFRICANA (SH)		23	3.2				2												
PAVETTA COOPERI (TR)		3	2.3				2												

<8> DIFFERENTIAL SPECIES OF COMMUNITIES 3-4

CLIVIA CAULESCENS (FB)			44. 4	3 2															
SCHEFFLERA UMBELLIFERA (TR)			2 .2	33		3		4											
ASPLENIUM ANISOPHYLLUM (EP)			2 . 2	2															

<9> DIFFERENTIAL SPECIES OF THE PIPER CAPENSE - SYZYGIUM GERRARDII TALL FOREST (COMMUNITY 5)

PIPER CAPENSE (SH)			.		273														
ASPLENIUM LUNULATUM (PT)			. 1		332														
JASMINUM SP. (LN)			.		23		1												

<10> DIFFERENTIAL SPECIES OF COMMUNITIES 3-5

PSYCHOTRIA ZOMBAMONTANA (TR)			43.34	2333	433														
ASPLENIUM RUTIFOLIUM (EP)			2.1	3332	332	2	2	3					2						

<11> DIFFERENTIAL SPECIES OF COMMUNITIES 1-3A & 4-5

SYZYGIUM GERRARDII (TR)	1		63.	5364	532	44	3		2										
SCLEROCHITON HARVEYANUS (SH)	6	5 3	8 .	4	3														

<12> DIFFERENTIAL SPECIES OF COMMUNITIES 5-6

IMPATIENS HOCHSTETTERI #(FB)			.		43	3 3 3													
SANICULA ELATA (FB)			.		3	3 2													
ENTADA SPICATA (LN)			.		3	3 2												3	
BLECHNUM GIGANTEUM (PT)			.		2	2													

CASSINOPSIS ILICIFOLIA (TR)	32	323	.		3	32 2										2	2		
SELAGINELLA KRAUSSIANA (PT)	2	1	.		33	3223 3													

<14> DIFFERENTIAL SPECIES OF COMMUNITIES 4-6

DRYOPTERIS INAEQUALIS (PT)			.	2 2	233	342223		2											
SENECIO TAMOIDES (LN)			. 2	3 2	232	32333	2	23											2
CANTHIUM CILIATUM (TR)	1		.	2232	2	22													
ZANTHOXYLUM CAPENSE (TR)			.	3	2	3 2		2											
THELYPTERIS SP. (PT)			.	3	3	3													

<15> DIFFERENTIAL SPECIES OF COMMUNITIES 4-7

BEHNIA RETICULATA (LN)	22		.	2322	32	33 33	22 233	3	3										
DRACAENA HOOKERANA (SH)	3		.	3122	33	2 3	222 45				2								
OCHNA HOLSTII (TR)			3.2	3323	3	2	333				3 3		2			2			

<16> DIFFERENTIAL SPECIES OF COMMUNITIES 2 & 4-7

JASMINUM STREPTOPUS (LN)		232	.	2	2 2	2 222	1 223												
ASPARAGUS PLUMOSUS (SH)		332	.	3 32	32		1												

<17> DIFFERENTIAL SPECIES OF COMMUNITIES 1-8

PEPEROMIA RETUSA (EP)	2	322	22. 2	2	232	333 3	3 2	3							1				
XYMALOS MONOSPORA (TR)	6		43.	5534	464	753446	4 3	3 3											
POLYPODIUM POLYPODIOIDES (EP)	2		2 . 2	2 32	3 2	3	32	2 2			2 2				2				
PLEOPELTIS MACROCARPA (EP)		2	22.33	2	1	3		22							1				
RAWSONIA LUCIDA (TR)		3	.	33		2	2 2	3											

<18> DIFFERENTIAL SPECIES OF COMMUNITIES 4-9

ASPARAGUS FALCATUS (LN)			.	32	322	332332	32233	133	233222							2			
RHOICISSUS RHOMBOIDEA (LN)			.	23 3	333	332333	343233	332	33332		2 2			2					
CARISSA BISPINOSA (SH)		32	.	2232	33	33333	23333		32			3	2			22			
EUGENIA NATALITIA (TR)			.	5		43 3	334 3		23 2					3		2			

<19> DIFFERENTIAL SPECIES OF COMMUNITIES 3-9

ASPLENIUM SPLENDENS (PT)			32.33	3322	323	333 2	3 32	332	3 2										
STREPTOCARPUS SP. (FB)	2		22.22		32	3 3			23										

<20> DIFFERENTIAL SPECIES OF COMMUNITIES 3-10

COMBRETUM KRAUSSII (TR)			5 . 2	4 56	5 3	44255	6 544	32	23	63	3	4	2						
CYPERUS PSEUDOLEPTOCLADUS (CY)			3 .33	33 2	323	22333	32 3	32		23	2		2					2	2
CNESTIS NATALENSIS (TR)			2.	2		223 3	3333	3	3	34	2								
OXYANTHUS GERRARDII (TR)			2 .	5452	336	22	23	5	3	2						2			
RAPANEA MELANOPHLOEOS (TR)			13.2			3	2 2	3	3	4							2		

<21> DIFFERENTIAL SPECIES OF THE IBOZA RIPARIA - ACACIA ATAXACANTHA SHORT THICKET (COMMUNITY 11)

COMMELINA SP. (FB)			.2								222 22						2		2
COMBRETUM MOLLE (TR)			.							2	32 35			3	1		1	1	
IBOZA "COMPLEX" (SH)			.								22 23						1		
ALOE LONGIBRACTEATA (FB)			.								23 22								
CRYPTOLEPIS OBLONGIFOLIA (FB)			.								2 2								
LOUDETIA SIMPLEX (GR)			.								2 3								
GERBERA JAMESONII (FB)			.								2 2		1						
INDIGOFERA SWAZIENSIS (SH)			.								322							2	

```
PEARSONIA SESSILIFOLIA "COMPLEX" (FB)  |  |    |  .  |     |   |       |       |   |       |  |22 2   |   |      |  |    |      |  |   |   |
RHUS TRANSVAALENSIS (TR)               |  |    |  .  |     |   |       |       |   |       |  |1 32   |   |      |  |    |     1|  | 1 |   |
------------------------------------------------------------------------------------------------------------------------------------------
<22> DIFFERENTIAL SPECIES OF COMMUNITIES 11-12
------------------------------------------------------------------------------------------------------------------------------------------
RHYNCHOSIA KOMATIENSIS (SH)            |  |    |  .  |     |   |       |       |   |      3|  |22 2   |223|      |  |    |      |  |   |   |
ATHRIXIA PHYLICOIDES (FB)              |  |    |  .  |     |   |       |       |   |      2|  |1     2|3 3|     2| 2|    |      |  |   |   |
TRICHOPTERYX DREGEANA (GR)             |  |    |  .  |     |   |       |       |   |      •|  |2 4    |  5|      |  |    |  2   |  |   |   |
FAUREA SPECIOSA (TR)                   |  |    |  .  |     |   |       |       |   |       |  |44     |2  |      |  |   5|      |  |   |   |
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<23> DIFFERENTIAL SPECIES OF THE PITTOSPORUM VIRIDIFLORUM - ACACIA ATAXACANTHA SHORT THICKET (COMMUNITY 13)
------------------------------------------------------------------------------------------------------------------------------------------
PITTOSPORUM VIRIDIFLORUM (TR)          |  |    |  .  |     |   |       |       |   |       |  |       |   |32232 |  |    |  2   |  |   |   |
ANNONA SENEGALENSIS (TR)               |  |    |  .  |     |   |       |       |   |       |  |       |   |2    2|  |    |      |  |   |   |
CASSIA PETERSIANA (SH)                 |  |    |  .  |     |   |       |       |   |       |  |       |   |    12|  |   2|      |  |   |   |
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<24> DIFFERENTIAL SPECIES OF THE ENDOSTEMON OBTUSIFOLIUS - ACACIA ATAXACANTHA SHORT THICKET (COMMUNITY 14)
------------------------------------------------------------------------------------------------------------------------------------------
ENDOSTEMON OBTUSIFOLIUS (SH)           |  |    |  .  |     |   |       |       |   |       |  | 2     |   |      |32|  2 |      |  |   |   |
PINUS SP. (TR)                         |  |    |  .  |     |   |       |       |   |      2|  |       |   |      |32|    |      |  |   |   |
------------------------------------------------------------------------------------------------------------------------------------------
<25> DIFFERENTIAL SPECIES OF COMMUNITIES 11-14
------------------------------------------------------------------------------------------------------------------------------------------
PARINARI CURATELLIFOLIA (TR)           |  |    |  .  |     |   |       |       |   |    4 4|  | 3 7   | 35|23 35|58|    |   44|  |   |   |
TRIDACTYLE TRICUSPIS (EP)              |  |    |  .2 |     |   |       |       |   |    2  |  | 2 2   | 2 |32 22|33|    |    2|  |   |   |
POLYSTACHYA SP. (EP)                   |  |    |  .  |     |   |       |       |   |      2|  | 2    1|   |3 23 |32|  2 |      |  |   |   |
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<26> DIFFERENTIAL SPECIES OF THE PYCNOSTACHYS URTICIFOLIA - ACACIA ATAXACANTHA SHORT THICKET (COMMUNITY 15)
------------------------------------------------------------------------------------------------------------------------------------------
PYCNOSTACHYS URTICIFOLIA (SH)          |  |    |  .  |     |   |       |       |   |    2  |  |       |   |      |  |12 1|      |  |   |   |
JACARANDA MIMOSIFOLIA (TR)             |  |    |  .  |     |   |       |       |   |       |  |       |   |      |  | 32 |  3   |  |   |   |
TRIUMFETTA PILOSA VAR.EFFUSA (FB)      |  |    |  .  |     |   |       |       |   |       |  |       |  3|      |  | 3 3|      |  |   |   |
DALECHAMPIA CAPENSIS (LN)              |  |    |  .  |     |   |       |       |   |       |  |       |   |3     |  |2  2|      |  |   |   |
------------------------------------------------------------------------------------------------------------------------------------------
<27> DIFFERENTIAL SPECIES OF COMMUNITIES 8-15
------------------------------------------------------------------------------------------------------------------------------------------
DIOSPYROS LYCIOIDES #(TR)              |2 |242|  .  |     |   |       |       |23 |    2 3|3 |23 21  |3  |22 12|  |4233|   12|1 |   |   |
PTERIDIUM AQUILINUM (PT)               |  |    |  .  |     |   |   2   |       |22 |    2 2|2 |2292   |2 4|     1|32|1422|3  2 |  |   |   |
HELICHRYSUM PANDURATUM #(FB)           |  |    |  .  |     |   |       |       | 2 |    2 2|2 |     1 |  3|      |  |232 |      |  |   |   |
MAYTENUS HETEROPHYLLA (TR)             |32|    |  .  |     |   |       |       | 2 |      2|  | 2 22  |  2|     1| 2|  2 |      |  | 1 |   |
ZIZIPHUS MUCRONATA #(TR)               |  |    |  .  |     |   |       | 1     | 2 | 3     |  |       |2  | 2    |  |3   |3     |  | 1 |   |
ABRUS LAEVIGATUS (LN)                  |  |    |  .  |    2|   | 2     |       | 2 | 2     |3 | 3     |23 | 2    |  |1   | 2    |  |  2| 2|
RHUS PYROIDES (TR)                     |  | 3  |  .  |     |   |       |       | 2 |      2|  |2     2|  3|2     |  |  31|      |  | 2 |   |
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<28> DIFFERENTIAL SPECIES OF COMMUNITIES 12-16
------------------------------------------------------------------------------------------------------------------------------------------
PHAULOPSIS IMBRICATA (SH)              |  |    |  .  |     |   |       |       |   |       |  |       |32 |33 4  |  |3  5|32631|  |3  |   |
CATHA EDULIS (TR)                      |  |    |  .  |     |   |       |       |   |       |  |       |43 |    22|  |6   | 2 2 |  | 5 |   |
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<29> DIFFERENTIAL SPECIES OF COMMUNITIES 7-16
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OCHNA GAMOSTIGMATA (SH)                |  |    |  .  |     |   |  3    | 22    |22 |2 2   1|43| 32 2  | 23| 1    |2 |2 22| 11   |  |   |   |
ANTIDESMA VENOSUM (TR)                 |  |    |  .  |     |   |       | 23    |   |  4    |  |3  32  |3 3| 3 22 |4 | 224|3  23|1 |   |   |
PASSIFLORA EDULIS (LN)                 |  |    |  .  |     |   |   2   |2      |2  | 2     |  |       | 2 |  22  |3 |   2|3 1   |  |   |   |
TREMA ORIENTALIS (TR)                  |  |    |  .  |     |   |       |     2 |2  | 23 3  |  |       |  3|      |  |  3 |4 3   |  |   |   |
CYPERUS ALBOSTRIATUS (CY)              |  |    |  .  |   3 |   |       |     2 |   |2 3 2  |  |3      | 2 |      |  |  2 |      |  |   |   |
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<30> DIFFERENTIAL SPECIES OF COMMUNITIES 6-16
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EUCLEA "COMPLEX" (TR)                  |3 |    |  .  |     |   | 22    | 23    | 4 |    332|33|33 331 |  2|   222| 3|2343|4  22| 2|   |   |
PROTORHUS LONGIFOLIA (TR)              |  |    |23   |     |   |332 [illegible]
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BRACHYLAENA DISCOLOR #(TR)			.	3		2 3	24 43	3	344322	43	3		2	4	3	12			
CANTHIUM INERME (TR)			2.			223	2	3	233	3	23 333		2	2	332	2			
<31> DIFFERENTIAL SPECIES OF COMMUNITIES 4-10 & 15-16																			
PEDDIEA AFRICANA (TR)			.	3 22	3 2	333 32	23 333	2 3	232	3			3 3		1	2211			
CANTHIUM GUEINZII (LN)			.	2 3		2 3 2	34 43		225323	2	33			3	43	42	3		
RUBUS SP. (SH)			.2		3	2 2	2	3	2		2 2				2		2		
<32> DIFFERENTIAL SPECIES OF THE SCHOENOPLECTUS CORYMBOSUS - SYZYGIUM CORDATUM TALL FOREST (COMMUNITY 17)																			
LANTANA CAMARA (SH)			.												2		33		
SCHOENOPLECTUS CORYMBOSUS (CY)			.														11		
THELYPTERIS GUEINZIANA (PT)			.														12		
<33> DIFFERENTIAL SPECIES OF COMMUNITIES 6 & 8-9 & 16-17																			
ANTHOCLEISTA GRANDIFLORA (TR)			.			4		5	3				33			332	23	3	
MIKANIA CORDATA (LN)			.		3	2 3		3	33							32	22		
<34> DIFFERENTIAL SPECIES OF COMMUNITIES 1 & 3-17																			
PSYCHOTRIA CAPENSIS (TR)	43		35.3	3335	223	336342	3 3	34	333 3	64	1 2 2	23	343	2	5 22	2532	1	2	
MAESA LANCEOLATA (TR)	2		3.4			2	3	32	223	2	3 2					3 1	2		
<35> DIFFERENTIAL SPECIES OF COMMUNITIES 13-18																			
RHUS DENTATA (TR)			.		2		2				2		2 2		22	2	2		
VERNONIA STIPULACEA (SH)			.										2 2		2 2	2	12	1	
RHYNCHOSIA HIRTA (LN)			.				2						2 2		3	1 1		3	
TEPHROSIA "COMPLEX" (FB)			.									2	2	2	2	2	1	2	
HETEROPYXIS NATALENSIS (TR)			.									3	2		2	2	1	3	
BREONADIA SALICINA (TR)			.									3	5			3	5	5	
STYLOCHITON NATALENSE (FB)			.										2		1			2	
<36> DIFFERENTIAL SPECIES OF COMMUNITIES 1 & 6 & 13 & 16-18																			
FICUS CAPENSIS (TR)	52		.		5	34 3		3					22 2	3		2 3	34	32	
DESMODIUM REPANDUM (SH)	23		.		1	2223 3	2	2	1				2		2	2	2	2	
<37> DIFFERENTIAL SPECIES OF COMMUNITIES 7-18																			
BRIDELIA MICRANTHA (TR)			.				62 4	4	334323	22	5 3 3	2 3	32	53	3532	42334	32	34	
GALOPINA CIRCAEOIDES (FB)	22		.			2	2	21	22 3	22	22 22	23	2 2	2	232	222	1	2	
FLEMINGIA GRAHAMIANA (FB)			.				2		223 2	2	32	2 3	211	32	332	3 14	2	2	
RHOICISSUS TRIDENTATA (SH)	2		.					2	2 2		224 1	3 3	2 2	2	1 2	12	1	1	
<38> DIFFERENTIAL SPECIES OF COMMUNITIES 6-18																			
SMILAX KRAUSSIANA (LN)	1		.3			2222	222 22	332	222223	23	32432	326	3222	43	4334	22133	12	21	
TODDALIA ASIATICA (LN)			.			233	3 3	22	234223	23	3 32		2 22	32	1332	52322	22	222	
SYZYGIUM CORDATUM (TR)			.3			34 2	7	4	23 4	63	32 33	223	354	43	432	43 52	44	3	
<39> DIFFERENTIAL SPECIES OF COMMUNITIES 1-2 & 6-18																			
TRIMERIA GRANDIFOLIA (TR)	32	443	.	2		233 2	333 3	44	233 23	43	23 32	3 2	2 3	6	32 3	2 22	3	21	
DIOSPYROS WHYTEANA (SH)	22	34	.1			322	143	35	22 325	33	5 8 2	743	44335	44	4543	32252	34	333	2
CISSAMPELOS TORULOSA (LN)	22	222	.	2 2		32	2222	2	22221	2	2	3	422	2	3 2	2 22	11	2	2
GREWIA OCCIDENTALIS (SH)	22	2	.			32		1	232		3 2		22	2		3	12	11	

<40> DIFFERENTIAL SPECIES OF COMMUNITIES 2 & 6-18

APODYTES DIMIDIATA #(TR)		442	2 .4	3 33		4 3	2		233422	2	3	3	32232	2	332	5 221	2	2	
CAREX SPICATO-PANICULATA (CY)		222	.			22	223	32	3224	33	23363	33	2322	33	343	22232	11	2	
DICLIPTERA CLINOPODIA (SH)		62	.	23		5334	4		3		3	3	2				1	2 3	
DOMBEYA PULCHRA (SH)		23	.			2				22			3		2 2	2		2 3	

<41> DIFFERENTIAL SPECIES OF THE CEROPEGIA WOODII - CELTIS AFRICANA TALL FOREST (COMMUNITY 19)

CEROPEGIA WOODII (LN)			.																22
KIRKIA ACUMINATA (TR)			.																44

<42> DIFFERENTIAL SPECIES OF COMMUNITIES 18-19

BERCHEMIA ZEYHERI (TR)			.															1	4
ANEILEMA AEQUINOCTIALE (FB)			.										2					2	2
CHIONANTHUS FOVEOLATA #(TR)			.															2	6

<43> DIFFERENTIAL SPECIES OF COMMUNITIES 12-13 & 15-19

BAUHINIA GALPINII (SH)			.									326	5 222		4 3	22	2	22	2
MAYTENUS UNDATA (TR)			.						2		3	3	42 3		323		1	23	33
CELTIS AFRICANA (TR)			.			3							333			3 2		336	23
ERYTHRINA LYSISTEMON (TR)			.					1				3	523		32				3
GARDENIA AMOENA (TR)			.				3					6	2			2		23	23

<44> DIFFERENTIAL SPECIES OF COMMUNITIES 6-19

RHOICISSUS TOMENTOSA (LN)			.		2	33 3	3322	2	333221	23	22	2	22	2	3 2	422 1	22	222	33
ACACIA ATAXACANTHA (TR)			.	4 2		34443	35345	464	435324	14	342 63	4 5	43234	3	4323	5 522	4		6
ASPARAGUS VIRGATUS (SH)	32		.			333	22222	32	3 321	33	12222	32	42212	4	3233	32121		12	2

<45> DIFFERENTIAL SPECIES OF COMMUNITIES 4-19

DALBERGIA ARMATA (LN)			.	333	32	23333	233443	3	334 32	25	2 232	33	3223	43	5 3	32 32	32	223	33
CUSSONIA SPICATA (TR)	32		.	22	35	33 433	33 43	2	3432		3	3	22 2	23	3 5	3 2	2	2	12
MONANTHOTAXIS CAFFRA (SH)			.	2	22	2 2	2334	3	3 2		3 2	3	322		1	21		232	33
SETARIA MEGAPHYLLA (GR)	1		1 .	2 2	1	32 3 2	2	222	222	32	22 22	2	22222	23	2333	311	2	22	21
ZANTHOXYLUM DAVYI (TR)		2	.	433	522	2 3	23 455	3 2		2	3 32		42 2		2 3	2		2 2	2
BEQUAERTIODENDRON M'MONTANUM #(SH)			.	3 42		3323	34636	6	62 22	3	22 333	3	5222	3	1	2322	3	3 3	2
TRICALYSIA "COMPLEX" (TR)			32.	5347	323	332 7	3 354	326	432 2	22	2					22	2	12	2
DIETES IRIDIOIDES (FB)			2 .	33	2	3	23 44		85 2		2		333		333	2 2	2	2 5	3
SECAMONE GERRARDII (LN)			2.	22	2 2	2 3 2	22 3	2 2	2	3	3		1 2		2			1 2	2

<46> DIFFERENTIAL SPECIES OF COMMUNITIES 2-19

PELLAEA VIRIDIS (PT)	1	2	22.22	2222	1	22232	22222	232	23313	33	22 333	233	222 2	32	2221	22122	22	12	2
OPLISMENUS HIRTELLUS (GR)		432	53.	3322	322	553344	36222	472	25333	32	333	32	222	22	6223	22323	34	432	3
MAYTENUS MOSSAMBICENSIS #(TR)		32	.	252	334	555442	23353	443	434323	32	23 21	4	31222	2	1331	31			2
DIOSCOREA "COMPLEX" (LN)		22	.		1	2	2	2	2 2	22	22 21	2	2 2		1	22	2	122	22

GENERAL AND INFREQUENT SPECIES

TREES AND SHRUBS

ACACIA SP. (TR)			.									4							
ALLOPHYLLUS "COMPLEX"(TR)	3		.			2 2							4		1			21	2
ASPARAGUS ANGUSTICLADUS (SH)			.																3
ASPARAGUS "COMPLEX" (SH)			.								2 2		2	22	22	2		1	
ASPARAGUS RACEMOSUS (SH)			.										1						1
BERSAMA TRANSVAALENSIS (TR)	3		1 .																
BERSAMA TYSONIANA (TR)			.				2												

CANTHIUM LOCUPLES (TR)			2 .																
CANTHIUM OBOVATUM (TR)			.	3															
CASSIA FLORIBUNDA (SH)			.						2							3			
CASSIPOUREA GERRARDII (TR)	2		.	3 4															
CHORISTYLIS RHAMNOIDES (TR)			.						2 2						4				
CITRUS SP. (TR)			.										2			2 2			
CLERODENDRUM MYRICOIDES (TR)			.	33														1	
CLERODENDRUM SUFFRUTICOSUM #(SH)			.								2								
COMBRETUM COLLINUM SSP.SULUE.#(TR)			.										3						
COMBRETUM SP. (TR)			.													2			
CROTALARIA CAPENSIS (SH)			.													2			
CROTALARIA RECTA (SH)			.												3				
CYATHULA CYLINDRICA (SH)			.				1						2					2	
DOMBEYA ROTUNDIFOLIA #(TR)			.										3					2	
DOVYALIS ZEYHERI (TR)		2	.																
DRYPETES GERRARDII (TR)	2		.																
EKEBERGIA CAPENSIS (TR)			.													1			
EUCLEA NATALENSIS (TR)			.													2			
FAUREA SALIGNA (TR)			.									4				3			
FICUS BURKEI (TR)			33.	33		3	3				3	3	5				12		
FICUS INGENS (TR)			.								3						2		
HALLERIA LUCIDA (TR)			.2			3			3	2						3	2		
HETEROMORPHA ARBORESCENS (TR)			.					3											
HYPOESTES ARISTATA (SH)			.									3			3				
ILEX MITIS (TR)		2	.																
KIGGELARIA AFRICANA (TR)	3	45	.			3	4	3											
KRAUSSIA FLORIBUNDA (SH)			.															2	
LANNEA DISCOLOR (TR)			.													2			
LANTANA MEARNSII #(SH)			.					2											
LEUCOSIDEA SERICEA (TR)		2	.																
LIPPIA JAVANICA (SH)			.								2								
MAYTENUS PEDUNCULARIS (TR)		42	.				33		3						3	2			
MIMUSOPS ZEYHERI (TR)			.										2				2		3
MYRICA PILULIFERA (TR)			.2						23										
MYRICA SERRATA (TR)			.													2			
NIDORELLA SP. (SH)			.								4								
OCHNA ARBOREA (TR)			5 .																
OCHNA NATALITIA (SH)			.2				33				2 3		3 2	2	2			31	
OCOTEA KENYENSIS (TR)		3	.															2	
OLEA CAPENSIS SSP.MACROCARPA (TR)		2	.																
OLEA EUROPAEA SSP.AFRICANA (TR)		2	.																
PAVETTA GALPINII (SH)			.				2												
PAVETTA SP. (SH)			.										2					122	2
PHOENIX RECLINATA (TR)			.										1						
PHYLICA PANICULATA (SH)			.3																
PLECTRANTHUS FRUTICOSIS (SH)			2.														2		
PLECTRANTHUS GRANDIDENTATUS (SH)	3		.								3								
PLECTRANTHUS LAXIFLORUS (SH)			.				3												
PLECTRANTHUS SP. (SH)		342	.		3	3		33			3								
PLECTRANTHUS VERTICILLATUS (SH)			.										2			2			5
POLYGALA VIRGATA (SH)			.					2		1					2				
PRUNUS AFRICANA (TR)	3		.				3												
PSIDIUM GUAJAVA (TR)			.												3	2 2 4		2	
PTEROCARPUS ANGOLENSIS (TR)			.						3		2				7				
RAUVOLFIA CAFFRA (TR)			.	2		6										3			
RHAMNUS PRINOIDES (TR)		2	.						2										
RHUS CHIRINDENSIS (TR)			.	3		2			3						3				
RHUS INTERMEDIA (SH)			.								3								
RHUS PENTHERI (TR)			.															1	3
RHUS SP. (TR)	3		.								2								
RHYNCHOSIA THORNCROFTII (SH)			.					2											

ALLOPHYLLUS "COMPLEX"(TR)	2		2																			
ANTHOSPERMUM AMMANIOIDES (SH)															3							
APODYTES DIMIDIATA #(TR)	2 2	2						3	22		2			2								
BEQUAERTIODENDRON M'MONTANUM #(SH)	1 3 2						22	3											323	32		
BERCHEMIA ZEYHERI (TR)		2	2																			
BRACHYLAENA DISCOLOR #(TR)									2				1									
BRIDELIA MICRANTHA (TR)	2					2 3	2 2 2	3	33		3	2	32						2	21		
CANTHIUM CILIATUM (TR)			1																			
CANTHIUM GILFILLANII (TR)				3																		
CANTHIUM INERME (TR)	2						3	2	1				1 1						22		2	
CANTHIUM SP. (TR)				2																		
CASSIA FLORIBUNDA (SH)							2															
CATHA EDULIS (TR)	45		2	3			5		15													
CHORISTYLIS RHAMNOIDES (TR)				2																		
CLAUSENA ANISATA (TR)								2														
CLERODENDRUM GLABRUM #(TR)			2																			
CLERODENDRUM MYRICOIDES (TR)							2	1						1								
CLERODENDRUM SP. (TR)	1											2										
COMBRETUM APICULATUM #(TR)			3			4	2															
COMBRETUM KRAUSSII (TR)					5																	
CROTALARIA RECTA (SH)															1							
DESMODIUM DREGEANUM (SH)																	1					
DICLIPTERA CLINOPODIA (SH)	2								2													
DOMBEYA PULCHRA (SH)	2		1										1									
EHRETIA AMOENA (SH)			3	3.																		
ENDOSTEMON OBTUSIFOLIUS (SH)									1													
ERYTHRINA LYSISTEMON (TR)	3							2											3			
FICUS BURKEI (TR)		2					3	3												21		
FICUS CAPENSIS (TR)						2	2	2				2	11			2						
FICUS INGENS (TR)																			3			
FLACOURTIA INDICA (TR)				2																		
GREWIA MONTICOLA (TR)		2	2																			
GREWIA OCCIDENTALIS (SH)	2 22				3	1 2	1 2	2	1		1			2					2			
GREYIA RADLKOFERI (TR)																						2
HALLERIA LUCIDA (TR)														2								
HETEROMORPHA PUBESCENS (SH)											2											
HETEROMORPHA SP. (SH)												2										
IBOZA "COMPLEX" (SH)		3					3 32	3				1							352	3	322	2
INDIGOFERA COMOSA (SH)																						2
INDIGOFERA TRISTOIDES (SH)										3												
JACARANDA MIMOSIFOLIA (TR)	1					2																
KIRKIA ACUMINATA (TR)			2																			
LAPORTEA PEDUNCULARIS (SH)	3																					
LIPPIA JAVANICA (SH)											3						1		2			
NIDORELLA AURICULATA (SH)													4									
OCHNA GAMOSTIGMATA (SH)	1												1									
OCHNA HOLSTII (TR)	2																					
PACHYSTIGMA SP.(SH)							2															
PAVETTA GARDENIIFOLIA VAR.GA.#(SH)																				2		
PAVETTA GARDENIIFOLIA VAR.SU.#(SH)																					2	
PAVETTA SP. (SH)	2					2	2	2														
PHAULOPSIS IMBRICATA (SH)	22 2		3	3			3 3	2	23		3		43									
PHYLLANTHUS NUMMULARIIFOLIUS (SH)			1																			
PITTOSPORUM VIRIDIFLORUM (TR)									2					2								
PLECTRANTHUS RUBROPUNCTATUS (SH)																						2
PROTEA SP. (TR)													1									
PSIDIUM GUAJAVA (TR)						2	1	2			3		51		1		22		2	2		
PSYCHOTRIA CAPENSIS (TR)								2	11					1					32			
PYCNOSTACHYS URTICIFOLIA (SH)								2	12	2			1						2		2	
RAPANEA MELANOPHLOEOS (TR)	2																					
RHUS DENTATA (TR)	2					2 3	12		2			2										

RHUS DURA (SH)								2														
RHUS INTERMEDIA (SH)										2												
RHUS REHMANNIANA (TR)												2										
RHUS SP. (TR)											2											
RUBUS SP. (SH)						2																
SCLEROCARYA BIRREA SSP.CAFFRA (TR)			22 13	4								2						2			2	
SCOLOPIA ZEYHERI (TR)	2	2																				
SOLANUM SP. (SH)																				2		
STACHYS GRANDIFOLIA (SH)					3																	
STERCULIA MUREX (TR)	63					53	1 2			2		22									2	
TARCHONANTHUS TRILOBUS #(TR)																				2		
TECOMARIA CAPENSIS #(TR)	2																					
TERMINALIA PHANEROPHLEBIA (TR)				3																		
TREMA ORIENTALIS (TR)	2			2 2							2		65							2		
TRICHILIA EMETICA (TR)	2																					
VANGUERIA INFAUSTA (TR)	2 2 2	222 2	223 1	4		3	2 22												23	22		
VERNONIA COLORATA (SH)		2	2																			
VERNONIA STIPULACEA (SH)										2	2	2										
XIMENIA CAFFRA (TR)			2							2	2											
ZANTHOXYLUM CAPENSE (TR)				2																		

LIANOID PLANTS

ADENIA DIGITATA (LN)							1					1	1									
ADENIA GUMMIFERA #(LN)	1																			2		
CEROPEGIA SP. (LN)						1																
COCCULUS HIRSUTUS (LN)			1																			
CUCUMIS SP. (LN)					2																	
CYNANCHUM ELLIPTICUM (LN)		2																				
CYPHOSTEMMA ANATOMICUM (LN)																						1
CYPHOSTEMMA SIMULANS (LN)						1																
CYPHOSTEMMA WOODII (LN)																					1	
DALBERGIA ARMATA (LN)	232	2						4											4 2			
ENTADA SPICATA (LN)				3																		
MOMORDICA BALSAMINA (LN)				2																		
OSYRIDICARPOS SCHIMPERIANUS (LN)	1	1						1														
PENTARRHINUM INSIPIDUM (LN)				3																		
ANTHERICUM COOPERI (FB)																						
PUPALIA ATROPURPUREA (LN)	2	2																				
PYRENACANTHA GRANDIFLORA (LN)	2																					
RHOICISSUS RHOMBOIDEA (LN)	1																					
RHOICISSUS TOMENTOSA (LN)	2						2	22														
RHYNCHOSIA MONOPHYLLA (LN)																			3	3		
RHYNCHOSIA TOTTA (LN)	1 1	2 1		2																		1
RUBIA CORDIFOLIA (LN)					2	1	1															
RUBIA PETIOLARIS (LN)											1											
SECAMONE GERRARDII (LN)						2					1											
SENECIO TAMOIDES (LN)	2																					
SPHEDAMNOCARPUS GAL. SSP.REH.#(LN)							2															
SPHEDAMNOCARPUS PRU. VAR.PRU.#(LN)						2																
TODDALIA ASIATICA (LN)								2			2			2					2			
TRAGIA OKANYUA (LN)													2									
TRAGIA RUPESTRIS (LN)				2																		
TRAGIA SP. (LN)		2										12										
TROCHOMERIA SAGITTATA (LN)																	1					
TYLOPHORA ANOMALA (LN)				3	2		2 2 1	1	2												2	
VIGNA OBLONGIFOLIA #(LN)		2																				

FORBS AND HERBS

ABUTILON SONNERATIANUM (FB)				3																		

ACALYPHA PUNCTATA (FB)									2				3									
ACHYRANTHES SICULA (FB)		1															1					
AEOLLANTHUS REHMANNII (FB)																				.2		
AGATHISANTHEMUM BOJERI #(FB)				2													2					
AGERATUM CONYZOIDES (FB)				2																		
ALOE SP. (FB)													1	3								
ANTHERICUM GALPINII (FB)																					2	
ARGYROLOBIUM SPECIOSUM (FB)									2			1										
ARGYROLOBIUM TRANSVAALENSE (FB)		3				2																
ARISTEA WOODII (FB)					.2								1	1		3						
ASCLEPIAS CRASSINERVIS (FB)												1									1	
ASTER HARVEYANUS (FB)														1								
BERKHEYA ECHINACEA #(FB)														1								
BERKHEYA INSIGNIS (FB)									2			2		2 1			1					
BERKHEYA SETIFERA (FB)												1										
BERKHEYA SP. (FB)															2							
BIDENS PILOSA (FB)				3																		
BLUMEA ALATA (FB)				3	.3	2							122	21			3					
BROWNLEEA CAERULEA (FB)				3																		
BUCHNERA LONGESPICATA (FB)			.1																			
CEPHALARIA PUNGENS (FB)										3							3					
CLUTIA ABYSSINICA #(FB)										2												
CLUTIA MONTICOLA (FB)				2			2					12		2			1					
COMMELINA AFRICANA VAR.LANCI.#(FB)	1	1																				
COMMELINA LIVINGSTONII (FB)																			2			
COMMELINA SP. (FB)							2	2											3.	2		
CONOSTOMIUM NATALENSE #(FB)																	2					
CORCHORUS CONFUSUS (FB)											2											
CORCHORUS SP. (FB)														1								
CRASSULA ACINACIFORMIS (FB)		2	.1																			
CRASSULA SARCOCAULIS #(FB)																						3
CRINUM SP. (FB)																			3			
CRYPTOLEPIS OBLONGIFOLIA (FB)		22	. 2				1		22		2	1	2	2 3	2	2	1		3.	2		
CYANOTIS LANATA (FB)							2															
CYANOTIS SPECIOSA (FB)																						2
CYPHIA ELATA "COMPLEX" (FB)									2													
DESMODIUM HIRTUM (FB)															1							
DESMODIUM NATALITIUM (FB)			1	2.																		
DIETES IRIDIOIDES (FB)	2																					
DISSOTIS PHAEOTRICHA #(FB)																	1					
DYSCHORISTE DEPRESSA (FB)																	2					
ERIOSEMA PSORALEOIDES (FB)			.2															3				
ERIOSPERMUM BURCHELLII (FB)																			3.			
ERIOSPERMUM COOPERI (FB)										2												
ERIOSPERMUM SP. (FB)																					2	
FADOGIA SP. (FB)																2						
FADOGIA TETRAQUETRA (FB)															1					.2		
GALOPINA CIRCAEOIDES (FB)	1			2	.3	1 1		1	2													
GEIGERIA BURKEI VAR.ELATA #(FB)			.2			2								2		2						
GERBERA SPECIOSA (FB)		2																				
GLADIOLUS ECKLONII #(FB)														1								
GLADIOLUS SP. (FB)				2		3	3												3.		32	
GNIDIA CAFFRA (FB)									2	2			1	3								
GNIDIA KRAUSSIANA (FB)												22										
GNIDIA SP. (FB)																			3			
HAPLOCARPHA SCAPOSA (FB)												1	2		1		3		2.			
HELICHRYSUM CHRYSARGYRUM (FB)													3									
HELICHRYSUM MIMETES (FB)																	3					
HELICHRYSUM MIXTUM (FB)															2							
HELICHRYSUM ODORATISSIMUM (FB)																	2		2			
HELICHRYSUM PANDURATUM #(FB)						2	1				2						21					

HELICHRYSUM PILOSELLUM (FB)															2		2					
HELICHRYSUM SP. (FB)					3	3	3		1			2	2						2			
HERMANNIA GRANDIFLORA (FB)											1		3					2				
HIBISCUS SURATTENSIS (FB)													1									
HOSLUNDIA OPPOSITA (FB)			1																			
HYPOXIS "COMPLEX" (FB)		1								22		12	2	2							1	
ILYSANTHES WILMSII (FB)																				1		
INDIGOFERA HILARIS (FB)														1								
INEZIA INTEGRIFOLIA (FB)															2							
IPOMOEA SP. (FB)		1												2								
KALANCHOE ROTUNDIFOLIA (FB)			2				2 1												2	2		
KNOWLTONIA TRANSVAALENSIS #(FB)										3												
LANNEA EDULIS (FB)		22	2 2				122	2				1		1		2				2	2	
LEDEBOURIA SP. (FB)														1								
LEONOTIS DYSOPHYLLA (FB)				2	3	3	3				3											
LIPPIA WILMSII (FB)										2	2											
MORAEA SP. (FB)															1							
OXALIS DEPRESSA (FB)															2						1	
PEARSONIA ARISTATA (FB)														1								
PEARSONIA SESSILIFOLIA #(FB)							2		2	3			2		12	43	12		4	2		
PEARSONIA SP. (FB)							2				2											
PEARSONIA UNIFLORA (FB)							3															
PENTANISIA PRUNELLOIDES (FB)			2				1			2	2		1			3	1					
PENTAS SP. (FB)										2												
PEUCEDANUM MAGALISMONTANUM (FB)														1								
PLECTRANTHUS SPICATUS (FB)																2						2
POLYGALA HOTTENTOTTA (FB)							2 2		2		2		22						3			
POLYGALA UNCINATA (FB)		1					3												2		2	
RAPHIONACME ELATA (FB)										1												
RHYNEA PHYLICIFOLIA (FB)														3	22		2		2			
RICHARDIA BRASILIENSIS (FB)													2									
RUELLIA SP. (FB)		1																				
SCABIOSA COLUMBARIA (FB)										3		2										
SENECIO CORONATUS (FB)														2								
SENECIO LATIFOLIUS (FB)																	2					
SENECIO OXYRIIFOLIUS (FB)							1		1			1	1						2			
SIDA DREGEI (FB)				2																		
STYLOSANTHES FRUTICOSA (FB)													1									
SUTERA GRANDIFLORA (FB)							2									4						
TEPHROSIA ELONGATA (FB)	2	1																				
TRIUMFETTA PILOSA VAR.EFFUSA (FB)		1		2			2		2				2									
TRIUMFETTA RHOMBOIDEA (FB)									3										2			
TRIUMFETTA SP. (FB)						2																
VERNONIA NEOCORYMBOSA (FB)											1	22		2 3	2							
WALTHERIA INDICA (FB)				2			2														2	
SEDGES																						
BULBOSTYLIS BURCHELLII (CY)							2															
BULBINE SP. (FB)		2					2															
CAREX SPICATO-PANICULATA (CY)	22								22		2		4						3			
CYPERUS SP. (CY)	2		2																			
FICINIA SP. (CY)													6									
MARISCUS SP. (CY)															1							
RHYNCHOSPORA BROWNII (CY)										2												
GRASSES																						
ANDROPOGON SCHINZII (GR)														1		1	3			1		
ARISTIDA CONGESTA #(GR)			2																		2	
BRACHIARIA BRIZANTHA (GR)																	2					

CLEISTACHNE SORGHOIDES (GR)		.	.				2										.		
ERAGROSTIS CAPENSIS (GR)		.	.									1					.		
ERAGROSTIS CURVULA (GR)		.	3 .		3						31			2	3		.		
ERAGROSTIS HIERNIANA (GR)		.	.														. 1		
ERAGROSTIS RACEMOSA (GR)		.	.										4				3.		
ERAGROSTIS SCLERANTHA #(GR)		.	.														.	2	
ERAGROSTIS SP. (GR)		.2	.														.		
HYPARRHENIA HIRTA (GR)		.	.										2			4	.	1	
HYPARRHENIA SP. (GR)		.	.														2 .		
HYPARRHENIA VARIABILIS (GR)		.	.		3						3						.		
MELINIS TENUINERVIS (GR)		2.	.														.		
MICROCHLOA CAFFRA (GR)		.	.														. 1		
MONOCYMBIUM CERESIIFORME (GR)		.	.									3	4		2		.		
OPLISMENUS HIRTELLUS (GR)	2 2	.	3 .		1	2	2										.		
PANICUM NATALENSE (GR)		.	.										1				.		
PASPALUM SCROBICULATUM (GR)		.	.								1				1		.		
PASPALUM URVILLEI (GR)		.	.								4						.		
PEROTIS PATENS (GR)		.2	.														.		
POGONARTHRIA SQUARROSA (GR)		.2	.														.		
RHYNCHELYTRUM "COMPLEX" (GR)		1 .	2 3. 3		3		1		2		11	2	2	1	12	2	.22	22	1
SPOROBOLUS "COMPLEX" (GR)		.	.		3				3			1			41	23	2 . 1		
SPOROBOLUS STAPFIANUS (GR)		.	.											1			.		
STIBURUS ALOPECUROIDES (GR)		.	.								3						.		
TRACHYPOGON SPICATUS (GR)		.	.							22					2		.		
TRICHONEURA GRANDIGLUMIS (GR)		.2	.														.		
TRISTACHYA LEUCOTHRIX (GR)		.	.							1					2		.		
FERNS																			
ASPLENIUM SPLENDENS (PT)		.	.														2 .		
CHEILANTHES HIRTA (PT)	1	.	.														.		
MOHRIA CAFFRORUM (PT)		.	.														2 .		1
PTERIDIUM AQUILINUM (PT)		.	.					2				3	22				2 .2		

+ DENOTES PRESENCE

REFER TO APPENDIX B FOR FULL SPECIES NAME

FOR EXPLANATION OF "COMPLEX" SEE TEXT, SECTION 4.1.3

FOR EXPLANATION OF HABITAT FACTORS SEE TEXT, CHAPTERS 2 & 3

DIGITS 1-9 IN MATRIX DENOTE DOMIN-KRAJINA COVER-ABUNDANCE VALUES (CF. TEXT, SECTION 3.1.1.B)

GROWTH FORMS: TR=TREE; SH=SHRUB; LN=LIANOID; EP=EPIPHYTE; FB=FORB OR HERB; CY=SEDGE; GR=GRASS; PT=FERN (CF. TEXT, SECTION 3.1.1.B)

20

TABLE IIC   FLORISTIC CLASSIFICATION AND HABITAT CORRELATION
            IN WOODLAND OF THE HUMID MISTBELT, SABIE AREA

```
                                             |--|--|---|---|----|--.--|
                                   COMMUNITY |39|40|41 |42 | 43 | 4.4 |
                                     NUMBER: |  |  |   |   |    |A . B|
                                             |--|--|---|---|----|--.--|
                                             |11|11|  1| 1 |1111| 1.12|
                                     RELEVE  |33|11|990|909|2323|70.10|
                                     NUMBER: |05|73|691|807|8167|47.80|
                                             |--|--|---|---|----|--.--|
                                             |  |  |   |   |    |  .  |
                               TOTAL SPECIES |55|44|443|444|3545|45.43|
  HABITAT FACTORS                PER RELEVE: |54|93|946|900|7011|71.51|
                                             -------------------------
RED  A  HORIZON                              |++|  |   |+  |    |  .  |
MIDSLOPE PLANE                               |++|+ |   |   | +  |  .  |
1-4 PERCENT ROCK COVER                       |++|+ |   |   |    |  .  |
75-95 PERCENT VEGETAL COVER                  |++|  |  +|  +|    |  .+ |
ESCARPMENT UPPER SLOPES                      |++|  |  +|  +| +  |  .  |
                                             -------------------------
8:NORTH EASTERN MOUNTAIN SOURVELD            |  |++|   |   |    |++.++|
SANDY CLAY LOAM  A  HORIZON                  | +|++|   |   |    |+ .++|
UPPER DOLOMITE                               |  |++|   |   |    | +.+ |
LAND TYPE AB 34C                             |  |++|   |   |    |  .+ |
                                             -------------------------
RED  B  HORIZON                              |+ |+ |   |   |    |  .  |
LOW THICKET                                  | +|+ |   |   |    |  .  |
                                             -------------------------
LOW CLOSED WOODLAND                          |  |  | ++|   |+   |  .  |
                                             -------------------------
PARTIALLY SHELTERED SITE                     |++|++| ++|   |   +|  .  |
                                             -------------------------
SHALLOW SOIL (0-12 CM)                       |  |  |   |+ +|    | +.  |
                                             -------------------------
990-1111 METRES ELEVATION                    |  |  |+++|+++|    |  .  |
SANDY LOAM  A  HORIZON                       |  |  |+++|++ | +  | +.  |
                                             -------------------------
1112-1233 METRES ELEVATION                   |++|  |   |   |++++|  .  |
WEAKLY ACID  B  HORIZON                      |+ |+ |   |   |++ +|  .+ |
FIRE DISTURBANCE                             |+ |  |   |   |+++ |  .  |
LOAMY SAND  A  HORIZON                       |  |  |   |  +|+ ++|  .  |
BLACK  A  HORIZON                            |  |  |   |   | + +|  . +|
UPLAND TERRACE                               |  |  |   |   |+ + |  .  |
                                             -------------------------
9: LOWVELD SOUR BUSHVELD                     |++|  |+++|+++|++++|  .  |
LAND TYPE AB 36A                             |++|  |+++|+++|++++|  .  |
                                             -------------------------
LOW OPEN WOODLAND                            |+ | +|   | + | +++|++.+ |
GENTLE SLOPE (3,5-17,62 DEG.)                |  |  |+  |   |+ + |++.  |
                                             -------------------------
BLACK REEF QUARTZITE                         |++|  |+++|+++|++++|+ . +|
50-75 PERCENT VEGETAL COVER                  |  | +|++ |++ |++++|+ . +|
PLATEAU CREST                                |  |  |++ |++ |+ ++|+ . +|
85-100 PERCENT ROCK COVER                    |  |  |++ |+  |  + |++.  |
                                             -------------------------
XEROCLINAL ASPECT (248-66 DEG.)              |++| +|+++|+++|+ + |++   |
```

```
35-84 PERCENT ROCK COVER                   |  | +|  +| ++|+  +|  .++|
MESOCLINAL ASPECT (67-247 DEG.)            |  |+ |   |   | + +|  .++|
                                           --------------------------
HUMID MISTBELT                             |++|++|+++|+++|++++|++.++|
WEAKLY ACID  A  HORIZON                    |++| +|+++|+++|+++ |++.+ |
FAIRLY SHALLOW SOIL (13-48 CM)             |++| +|+++| + |++++|+ .++|
MODERATE SLOPE (17,63-36,39 DEG.)          |++|++| ++|+++| + +|  .++|
                                           --------------------------
<1> DIFFERENTIAL SPECIES OF THE GALOPINA ASPERA - FAUREA SPECIOSA LOW OPEN WOODLAND (COMMUNITY 39)
                                           --------------------------
GALOPINA ASPERA (FB)                       |22|  |   |   |    |  .  |
INULA GLOMERATA (FB)                       |32|  |   |   |    |  .  |
HYPERTHELIA DISSOLUTA (GR)                 |22|  |   |   |    |  .  |
COMBRETUM MOLLE (TR)                       |22|  |  3|   |    |  .  |
HELICHRYSUM NUDIFOLIUM #(FB)               |23| 2|   |   |    |  .  |
BERKHEYA INSIGNIS (FB)                     |22|  |   |   |    |  .  |
GERBERA AURANTIACA (FB)                    |21| 2|   |   |    |2 .  |
BOOPHANE DISTICHA (FB)                     |21|  |   |   | 1  |  .  |
VERNONIA NEOCORYMBOSA (FB)                 |12|  |   |   |    |  .  |
ERIOSPERMUM SP. (FB)                       |21|  |   |   |    |  .  |
SENECIO VENOSUS (FB)                       |11|  |   |   |    |  .  |
PSEUDARTHRIA HOOKERI (FB)                  |22|  | 2 |  1|    |  .  |
                                           --------------------------
<2> DIFFERENTIAL SPECIES OF THE ARTEMISIA AFRA - BOWKERIA CYMOSA LOW THICKET (COMMUNITY 40)
                                           --------------------------
NIDORELLA AURICULATA (SH)                  |  |12|   |   |    |  .2 |
LIPPIA JAVANICA (SH)                       |  |22|   |   |    |  .1 |
ACALYPHA CAPERONIOIDES (FB)                |  |12|   |   |    |  .  |
ARTEMISIA AFRA (FB)                        |  |22|   |   |    |  .  |
                                           --------------------------
<3> DIFFERENTIAL SPECIES OF COMMUNITIES 39-40
                                           --------------------------
RHUS TRANSVAALENSIS (TR)                   |22|32|   |   | 1  |  .  |
HEMIZYGIA TRANSVAALENSIS (FB)              |22|12|   |   | 2  |  .  |
FLEMINGIA GRAHAMIANA (FB)                  |23|21|   |   |    |  .2 |
VERNONIA OLIGOCEPHALA (FB)                 |22|22|   |   |    |  .  |
ATHRIXIA PHYLICOIDES (FB)                  |22|2 |   |   |    |  .  |
VERNONIA STIPULACEA (SH)                   | 2|3 |2  |   |    |  .  |
GALOPINA CIRCAEOIDES (FB)                  | 2|2 |   |   |    |  .  |
HELICHRYSUM UMBRACULIGERUM (FB)            | 2|4 |   |   |    |  .  |
ZIZIPHUS MUCRONATA #(TR)                   | 2| 2|   |   |    |  .  |
                                           --------------------------
<4> DIFFERENTIAL SPECIES OF THE TECOMARIA CAPENSIS SSP.CAPENSIS - BEQUAERTIODENDRON MAGALISMONTANUM LOW CLOSED WOODLAND (COMM 41)
                                           --------------------------
OCHNA HOLSTII (TR)                         |  |  |322| 2 |    |  .  |
TECOMARIA CAPENSIS #(TR)                   |  |  |244|   |    |  .  |
FICUS INGENS (TR)                          |  |  |243|   | 2  |  .  |
SETARIA MEGAPHYLLA (GR)                    |  |  |212|   |    |  .  |
IBOZA "COMPLEX" (SH)                       |  |  |33 |   |3   |  .  |
ARTHROPTERIS MONOCARPA (PT)                |  |  |32 |   |    |  .  |
SOLANUM MAURITIANUM (TR)                   |  |  |32 |   |    |  .  |
CANTHIUM MUNDIANUM (TR)                    |  |  |42 |   |    |  .  |
BIDENS PILOSA (FB)                         |  |  |11 |   |    |  .  |
PLECTRANTHUS FRUTICOSIS (SH)               |  |  | 22|   |    |  .  |
HETEROPYXIS NATALENSIS (TR)                |  |  | 33|   |    |  .  |
MAYTENUS UNDATA (TR)                       |  |  | 33|   |    |  .  |
EULOPHIA STREPTOPETALA (FB)                |  |  | 12|   |    |  .  |
```

22

<5> DIFFERENTIAL SPECIES OF COMMUNITIES 40-41

GREWIA OCCIDENTALIS (SH)		31	32		1	.
EHRHARTA ERECTA (GR)		2	2			.
MAYTENUS MOSSAMBICENSIS #(TR)		2	2			.
HALLERIA LUCIDA (TR)		1	1			.

<6> DIFFERENTIAL SPECIES OF COMMUNITIES 39-41

RHOICISSUS TRIDENTATA (SH)	22	33	12		1	.
TRIUMFETTA PILOSA VAR.EFFUSA (FB)	1	31	22	2		.
CUSSONIA SPICATA (TR)	3	23	2		2	.
RHYNCHOSIA KOMATIENSIS (SH)	32		23	2		.

<7> DIFFERENTIAL SPECIES OF THE DIOSPYROS GALPINII - BEQUAERTIODENDRON MAGALISMONTANUM TALL OPEN SHRUBLAND (COMMUNITY 42)

GLADIOLUS DENSIFLORUS (FB)				222		.
DIOSPYROS GALPINII (FB)	2			322		.
SELAGO HYSSOPIFOLIA (FB)				12		.
LANNEA EDULIS (FB)				1 2		.
TRISTACHYA LEUCOTHRIX (GR)				1 1		.
PEARSONIA SP. (FB)				2 3		.
PARINARI CAPENSIS SSP.CAPENSIS (FB)				4 3	2	.
AESCHYNOMENE REHMANNII VAR.L.#(FB)				22		.

<8> DIFFERENTIAL SPECIES OF COMMUNITIES 41-42

HYPARRHENIA FILIPENDULA "COMPLEX" (GR)		1	222	2 2		.
HELICHRYSUM KRAUSSII (FB)			3 2	232		.
RAPANEA MELANOPHLOEOS (TR)			2	23		4 .
PLECTRANTHUS ZATARHENDI #(FB)			3	32		.
FICUS BURKEI (TR)			4	2		.
HELICHRYSUM COOPERI (FB)			1	22		.
HEMIZYGIA CANESCENS (FB)			3	2		.
CYPERUS ALBOSTRIATUS (CY)			2	2 2		2.
TRICALYSIA "COMPLEX" (TR)			2	2		.
CYANOTIS LAPIDOSA (FB)			1 2	2		.

<9> DIFFERENTIAL SPECIES OF THE SELAGO ATHERSTONEI - SYZYGIUM CORDATUM LOW OPEN WOODLAND (COMMUNITY 43)

ALOE PETRICOLA (FB)				2	3232	.
SELAGO ATHERSTONEI (FB)					2232	.2
BURCHELLIA BUBALINA (TR)					2 2	.
GLADIOLUS EXIGUUS (FB)					111	.1

<10> DIFFERENTIAL SPECIES OF COMMUNITIES 39 & 43

HYPARRHENIA HIRTA (GR)	22			3	32 2	.
ANTHOSPERMUM AMMANIOIDES (SH)	22				12 2	.
RHYNEA PHYLICIFOLIA (FB)	22				2 1	.1
HELICHRYSUM PANDURATUM #(FB)	3				1 2	.

<11> DIFFERENTIAL SPECIES OF COMMUNITIES 39 & 42-43

SCHIZACHYRIUM SANGUINEUM (GR)	22			222	332	.2
CRYPTOLEPIS OBLONGIFOLIA (FB)	2			222	213	.
VERNONIA POSKEANA #(FB)	2			122	122	

CYPERUS LEPTOCLADUS (CY)			4 2	2 2	3 2	.
CANTHIUM INERME (TR)			22	2	2 2	.
TARCHONANTHUS TRILOBUS #(TR)			35	2	3	.

<13> DIFFERENTIAL SPECIES OF THE ALEPIDEA GRACILIS VAR.MAJOR - LOUDETIA SIMPLEX LOW OPEN WOODLAND (COMMUNITY 44)

MOHRIA CAFFRORUM (PT)	2			2		22.12
ALEPIDEA GRACILIS VAR.MAJOR (FB)		12			1	22.12
CLUTIA MONTICOLA (FB)	1					21.2
HELICHRYSUM "COMPLEX" (FB)				1		2 .2
HELICHRYSUM MIMETES (FB)					2	2.32
INEZIA INTEGRIFOLIA (FB)						1.1
ERICA DRAKENSBERGENSIS (SH)						1.3
PEARSONIA ARISTATA (FB)						2.1
PLECTRANTHUS RUBROPUNCTATUS (SH)						2. 3
SENECIO CORONATUS (FB)						2. 2
ERAGROSTIS CURVULA (GR)			1			3 . 2
GREYIA RADLKOFERI (TR)		1				3 . 3

<14> DIFFERENTIAL SPECIES OF THE MYRICA PILULIFERA - ALEPIDEA GRACILIS VAR.MAJOR - LOUDETIA SIMPLEX VARIANT (44A)

CONOSTOMIUM NATALENSE #(FB)						32.
PACHYSTIGMA MACROCALYX (SH)						32.
CEPHALARIA PUNGENS (FB)						31.
ERIOSEMA ELLIPTICIFOLIUM (FB)						22.
MYRICA PILULIFERA (TR)						44.

<15> DIFFERENTIAL SPECIES OF COMMUNITIES 43-44A

CYANOTIS PACHYRRHIZA (FB)					1	3 .
EKEBERGIA PTEROPHYLLA (TR)					2	3 .
MYRSINE AFRICANA (SH)					2	2.
ERAGROSTIS RACEMOSA (GR)					2	1.
STREPTOCARPUS DUNNII (FB)				1	2	2.
CRASSULA NATALENSIS (FB)					1	2.

<16> DIFFERENTIAL SPECIES OF COMMUNITIES 42-44A

PEARSONIA SESSILIFOLIA "COMPLEX" (FB)	2			2	2322	2 .
SENECIO GLABERRIMUS (FB)				2	1 22	2.

<17> DIFFERENTIAL SPECIES OF COMMUNITIES 41-44A

PSYCHOTRIA CAPENSIS (TR)		2	224	2	2222	2 .
COMMELINA SP. (FB)			2	2 2	2 22	31.
SYZYGIUM CORDATUM (TR)			3	2	3233	43.
APODYTES DIMIDIATA #(TR)			3		3 2	2 .
VANGUERIA INFAUSTA (TR)			2		2 2	2.

<18> DIFFERENTIAL SPECIES OF THE ATHANASIA CALVA - ALEPIDEA GRACILIS VAR.MAJOR - LOUDETIA SIMPLEX VARIANT (44B)

ATHANASIA CALVA (FB)						.22
BLECHNUM TABULARE (PT)					2	.22

<19> DIFFERENTIAL SPECIES OF COMMUNITIES 43-44

AESCHYNOMENE NYASSANA (FB)					1122	21.2

RHUS DURA (SH)			2		12	32. 2
LOUDETIA DENSISPICA (GR)					4 2	2 .4
PROTEA CAFFRA (TR)					1 2	2.2
MONOCYMBIUM CERESIIFORME (GR)					1 2	.32
HYPOXIS "COMPLEX" (FB)					22	2.2
CLIFFORTIA NITIDULA SSP.PILOSA (SH)					2	. 6

<20> DIFFERENTIAL SPECIES OF COMMUNITIES 42-44

CRASSULA ALBA "COMPLEX" (FB)				222	2222	22.12
RHYNCHOSIA MONOPHYLLA (LN)	2		3	434	3233	21.2
ANDROPOGON SCHIRENSIS #(GR)	2			222	2232	2.3
PANICUM NATALENSE (GR)				343	3232	2.1

<21> DIFFERENTIAL SPECIES OF COMMUNITIES 41-44

PELLAEA CALOMELANOS (PT)			1 2	22	2222	32.2
TRICHOPTERYX DREGEANA (GR)			2	2	22 2	.22

<22> DIFFERENTIAL SPECIES OF COMMUNITIES 39-44

SMILAX KRAUSSIANA (LN)	23	21	232	223	2222	32.1
LOUDETIA SIMPLEX (GR)	22	3	2	444	2455	33.44
RHYNCHELYTRUM "COMPLEX" (GR)	2	1	22	221	212	2. 2
PELLAEA VIRIDIS (PT)	12	2	2 1	2	2 22	2 . 2
INDIGOFERA SWAZIENSIS (SH)	22	23	24	32	1	.2
CYMBOPOGON "COMPLEX" (GR)	22	13	2	1 2	2	.22
RHUS DENTATA (TR)	2	1	2 2	2	2	.2
THEMEDA TRIANDRA (GR)	3	2	1		2	.2
SETARIA SPHACELATA (GR)	11	1	2	222	1	2 .
DIOSPYROS LYCIOIDES #(TR)	23	23	34	2	1	2 .

GENERAL AND INFREQUENT SPECIES

TREES AND SHRUBS

ACACIA ATAXACANTHA (TR)	2					.
ACACIA MEARNSII (TR)						. 2
ALLOPHYLLUS "COMPLEX"(TR)		2				.
ALOE ARBORESCENS (SH)		5				.
ASPARAGUS "COMPLEX" (SH)	1					.
ASPARAGUS LARICINUS (SH)		2				.
ASPARAGUS RIGIDUS (SH)						2 .
ASPARAGUS VIRGATUS (SH)			2			.
BERSAMA TRANSVAALENSIS (TR)			3			.
BOWKERIA CYMOSA (TR)	1	23				2.2
BUDDLEIA SALVIIFOLIA (SH)		2				.
CLERODENDRUM GLABRUM #(TR)			1			.
CLERODENDRUM SP. (TR)	1					.
CNESTIS NATALENSIS (TR)			1			.
CYATHULA CYLINDRICA (SH)			1			.
DIOSPYROS WHYTEANA (SH)		2	3			1 .
DOMBEYA PULCHRA (SH)			3			.
ERYTHRINA LATISSIMA (TR)	2		3			.
ERYTHRINA LYSISTEMON (TR)			2			.
EUCLEA "COMPLEX" (TR)	5					.
FAUREA SPECIOSA (TR)	54			1	3	.4
HETEROMORPHA ARBORESCENS (TR)			2			

PLECTRANTHUS GRANDIDENTATUS (SH)		2					
PROTEA SP. (TR)						3	
PSIDIUM GUAJAVA (TR)			4				
PTEROCARPUS ANGOLENSIS (TR)					3		
PTEROCELASTRUS ECHINATUS (TR)				2			
RHUS DISCOLOR (SH)		2					
RHUS MACOWANII (TR)		3					2
RHUS REHMANNIANA (TR)			2		1		
RUBUS SP. (SH)			1				2
RUMEX SAGITTATUS (SH)			2				
SCHEFFLERA UMBELLIFERA (TR)						3	
SPARRMANNIA RICINOCARPA (SH)		1					
STRYCHNOS SPINOSA (TR)			1				
SYZYGIUM GERRARDII (TR)						2	
TRIMERIA GRANDIFOLIA (TR)		3	3		1		
LIANOID PLANTS							
ADENIA GUMMIFERA #(LN)		2					
ASPARAGUS ASPARAGOIDES (LN)		1					
CEPHALANTHUS NATALENSIS (LN)			4			2	
CEROPEGIA MEYERI (LN)			1				
CEROPEGIA WOODII (LN)			1				
CLEMATIS BRACHIATA (LN)		2					
CYPHOSTEMMA ANATOMICUM (LN)		2					
DIOSCOREA "COMPLEX" (LN)	1						
DIOSCOREA DREGEANA VAR.HUTCHINSONII (LN)			2				
IPOMOEA BATHYCOLPOS VAR.BATHYCOLPOS (LN)					1		
RHYNCHOSIA CARIBAEA (LN)		2			2		
SENECIO TAMOIDES (LN)		2					
SPHEDAMNOCARPUS PRU. VAR.LAN.#(LN)	2						
FORBS AND HERBS							
ACALYPHA ANGUSTATA VAR.GLABRA (FB)						2	
ACALYPHA WILMSII (FB)	32			1 2	2	2	
ACANTHOSPERMUM AUSTRALE (FB)	2			1			
ACHYRANTHES SICULA (FB)		1					
AGRIMONIA ODORATA (FB)		2					
ALOE SP. (FB)	1						
ARGYROLOBIUM SPECIOSUM (FB)	2						
ARISTEA WOODII (FB)				2		1	
ASCLEPIAS CRASSINERVIS (FB)	2						
ATHANASIA ACEROSA (FB)							2
BARLERIA OVATA (FB)	2	11		21	12		
BECIUM OBOVATUM (FB)						1	
BEGONIA SP. (FB)			1				
BERKHEYA LATIFOLIA (FB)							2
BIDENS KIRKII (FB)					1		
BLUMEA ALATA (FB)	2						
BORRERIA NATALENSIS (FB)				1			
CHLOROPHYTUM SP. (FB)						2	
CONYZA FLORIBUNDA (FB)		1			1		
CRASSULA GLOBULAROIDES (FB)						2	
CRASSULA SARCOCAULIS #(FB)							2
DICOMA ZEYHERI (FB)				1			
EURYOPS PEDUNCULATUS (FB)					1		

FADO"TA MONTICOLA (FB)				2		.
FADOGIA TETRAQUETRA (FB)	22			1	1 12	2.
GLADIOLUS ECKLONII #(FB)					2	.
GLADIOLUS SP. (FB)	1					. 1
HAEMANTHUS CARNEUS (FB)		3				.
HELICHRYSUM ADENOCARPUM #(FB)						. 3
HELICHRYSUM CHRYSARGYRUM (FB)						. 2
HELICHRYSUM PALLIDUM (FB)		2				. 2
HELICHRYSUM PILOSELLUM (FB)						2.
HELICHRYSUM REFLEXUM (FB)						3.
HELICHRYSUM SP.NOV.2 (FB)		3				.
HELICHRYSUM SP. (FB)		2	1	12		2.2
HELICHRYSUM WILMSII (FB)						.2
HERMANNIA GRANDIFLORA (FB)	2					.
HERMANNIA MONTANA (FB)						2.
HETEROMORPHA TRANSVAALENSIS (FB)	1					.
HYPOXIS GALPINII (FB)					2	.
INDIGOFERA OXALIDEA (FB)					1	.
INDIGOFERA SP.1 (FB)						2.
KALANCHOE ROTUNDIFOLIA (FB)			12		2 2	.
LEONOTIS DYSOPHYLLA (FB)		1		1		.1
LOPHOLAENA SEGMENTATA (FB)						.2
MORAEA MUDDII (FB)				2		.
PENTANISIA PRUNELLOIDES (FB)						1.
PEUCEDANUM CAPENSE VAR.CAPENSE (FB)		2				.
PIMPINELLA TRANSVAALENSIS (FB)						1.
POLYGALA HOTTENTOTTA (FB)				2		.
SCHISTOSTEPHIUM HEPTALOBUM (FB)			2			.
SELAGO MUDDII (FB)						2 .
SENECIO OXYRIIFOLIUS (FB)		1				2 .
SENECIO PTEROPHORUS (FB)						.2
STACHYS NATALENSIS VAR.GALPINII (FB)						2.
STOMATANTHES AFRICANUS (FB)	1					.
TEPHROSIA "COMPLEX" (FB)		2				.
TEPHROSIA ELONGATA (FB)						1.
TETRASELAGO NATALENSIS (FB)						2 .
TRIUMFETTA RHOMBOIDEA (FB)			2			.
TRIUMFETTA WELWITSCHII VAR.HIRSUTA (FB)	2					.
WAHLENBERGIA LYCOPODIOIDES (FB)					1	.
WAHLENBERGIA UNDULATA (FB)					1	.
WAHLENBERGIA VIRGATA (FB)						2 .
XEROPHYTA RETINERVIS (FB)					1	.
SEDGES						
BULBOSTYLIS BURCHELLII (CY)				2	1	.
BULBOSTYLIS ORITREPHES (CY)					2	.
COLEOCHLOA SETIFERA (CY)					1	.
KYLLINGA CYLINDRICA (CY)				1		.
GRASSES						
ARISTIDA JUNCIFORMIS #(GR)				1		.
BEWSIA BIFLORA (GR)				1		.
CTENIUM CONCINNUM (GR)						1.
DIGITARIA DIAGONALIS (GR)		2				.
DIHETEROPOGON FILIFOLIUS (GR)					2	.
EULALIA VILLOSA (GR)	32	1		2	2	22

FERNS

CHEILANTHES VIRIDIS VAR.GLAUCA (PT)					3		.
PELLAEA PECTINIFORMIS (PT)							.1
PTERIDIUM AQUILINUM (PT)	22	23	1			1 21	2.

+ DENOTES PRESENCE

REFER TO APPENDIX B FOR FULL SPECIES NAME

FOR EXPLANATION OF "COMPLEX" SEE TEXT, SECTION 4.1.3

FOR EXPLANATION OF HABITAT FACTORS SEE TEXT, CHAPTERS 2 & 3

DIGITS 1-9 IN MATRIX DENOTE DOMIN-KRAJINA COVER-ABUNDANCE VALUES (CF. TEXT, SECTION 3.1.1.B)

GROWTH FORMS: TR=TREE; SH=SHRUB; LN=LIANOID; EP=EPIPHYTE; FB=FORB OR HERB; CY=SEDGE; GR=GRASS; PT=FERN (CF. TEXT, SECTION 3.1.1.B)

TABLE IID FLORISTIC CLASSIFICATION AND HABITAT CORRELATION IN GRASSLAND OF THE HUMID MISTBELT, SABIE AREA

HABITAT FACTORS	45	46	47	48	4.9	50	5.1	5.2	5.3
COMMUNITY NUMBER:					A . B		A . B	A . B	A . B
RELEVE NUMBER:	1111 9993 5896	66 32	877 413	87778 27865	. 88.999 89.301	88 67	11.11 23.33 94.32	111.111 111.011 129.905	111.111 000.000 346.285
TOTAL SPECIES PER RELEVE:	3224 2720	44 60	353 118	43323 49980	. 44.434 10.451	32 68	. 22.33 86.17	. 433.332 597.945	. 332.223 738.130
TRANSITIONAL MISTBELT	++++				.		.	.	.
ESCARPMENT LOWER SLOPES	++++				.		.	.	.
1112-1233 METRES ELEVATION	++++				++.		+ . +	.	.
LAND TYPE AB 33B	+++				.		.	.	.
LEVEL SLOPE (0-3,49 DEG.)	++		+	+	.		.	.	.
LAND TYPE AB 36A	+	++	+		. +		.	.	.
SHORT OPEN SHRUBLAND		++			.		.	.	.
5-34 PERCENT ROCK COVER		++	++		.	+	.	+ .	+.++
ESCARPMENT UPPER SLOPES		++	+		. +		.	.	.
NELSPRUIT GRANITE	+++	++	+		.		.	.	.
9: LOWVELD SOUR BUSHVELD	++++	++	+		++.+++	++	++.++	.	.
1356-1478 METRES ELEVATION			+	+++++	.		.	.	+++.+ +
FAIRLY DEEP SOIL (49-100 CM)			+	+ ++	.		.	.	.
LAND TYPE AC 88A			+ +	+++++	.		.	.	.
UPLAND TERRACE			+ +	++++	.		+ .	.	.
BLACK B HORIZON	+		+	+	.		.	.	.
BLACK A HORIZON	+	++	+	++++	.		.	.	.
LOAMY SAND A HORIZON		+	+	+	.	+	.	.	.
OAKTREE DOLOMITE					++.++		.	.	.
CLAY B HORIZON	+				++. +		.	+ .	.
RED A HORIZON					++. ++		.	+ .	.
LAND TYPE AB 35A					++.++	++	.	.	.
990-1111 METRES ELEVATION					.++	++	.	.	.
PLATEAU CREST			+ +	+++++	.	++	+ .	.	.
BLACK REEF QUARTZITE	+		+ +	+++++	. +	++	+ .	.	.
LOW CLOSED GRASSLAND			+ +	+++++	++.+++	++	.	.	++.++
50-75 PERCENT VEGETAL COVER			++	++++	+ . ++	++	.	+ .	+. +
LAND TYPE AC 88B					.		++.++	.	.
DEEP SOIL (>100 CM)	+ +				++.++		++. +	.	.
<1 PERCENT ROCK COVER	+			++	++.++		+. +	.	.
PLATEAU INTERIOR					++.++		+.++	.	.
LAND TYPE AB 34C					.		.	+++.+++	.
LOWER MOUNTAINS					.		.	+ +.+++	.

```
                                            ---------------------------------------------------
1234-1355 METRES ELEVATION                  |    |++|++ |     |  .   |  | +.+ |+++.+++|   .   |
95-100 PERCENT VEGETAL COVER                |  ++|  |+  |    +|  .   |  |  . +|+ +.++ |+  .   |
SHORT CLOSED GRASSLAND                      |+++ |  |   |     |  .   |  |+ .++|+  .++ |   .   |
                                            ---------------------------------------------------
MESOCLINAL ASPECT (67-247 DEG.)             |++++|++| + |   + |  .   |  | +.+ |  +. ++|++ .  +|
1-4 PERCENT ROCK COVER                      |++ +|  |+  |+  ++|  .  +| +|+ .+ |+ +.+++|++ .   |
BROWN  B  HORIZON                           | +  |  | + |  +++|  .   | +|  .+ |   . + |+  . + |
                                            ---------------------------------------------------
MIDDLE MOUNTAINS                            |    |  |   |     |  .   |  |  .  | + .   |+++.+++|
LAND TYPE AC 87A                            |    |  |   |     |  .   |  |  .  |   .   |+++.+++|
TIMEBALL HILL SHALE & MUDSTONE              |    |  |   |     |  .   |  |  .  |   .   |++ .  +|
                                            ---------------------------------------------------
8:NORTH EASTERN MOUNTAIN SOURVELD           |    |  |+ +|+++++|  .   |  |  .  |+++.+++|+++.+++|
MODERATE SLOPE (17,63-36,39 DEG.)           |   +|++|   |     |  .  +|  |  .  |+++.  +|+  .+ +|
                                            ---------------------------------------------------
RED  B  HORIZON                             |+   | +|   |     |++.++ |  |++. +|+ +.+ +| ++.  +|
BROWN  A  HORIZON                           |+ ++|  |+ +|     |  .+  |++|++.++|+ +.+++|+++.+++|
UPPER PEDIMENT SLOPE                        |    |++| + |     |  .  +| +| +.+ | + .++ |+++.+++|
UPPER DOLOMITE                              |    |  |   |     |  .   |  | +.++|+++.+++|  +.++ |
                                            ---------------------------------------------------
HUMID MISTBELT                              |    |++|+++|+++++|++.+++|++|++.++|+++.+++|+++.+++|
XEROCLINAL ASPECT (248-66 DEG.)             |    |  |+ +|+++ +|++.+++|++|+ . +|++ .+  |  +.++ |
GENTLE SLOPE (3,5-17,62 DEG.)               |+   |  |++ |+++ +|++.++ |++|++.++|   .++ | ++. + |
                                            ---------------------------------------------------
EXPOSED SITE                                |+++ |++|+++|+++++|++.+++|++|++.++| ++.+++|+++.+++|
WEAKLY ACID  A  HORIZON                     |+++ |++| ++| +++ |++.+++|++| +.++|+++.+++|+++.+++|
WEAKLY ACID  B  HORIZON                     |+++ | +| + | +++ |++.++ | +| +.++|+ +.++ |+++. ++|
SANDY CLAY LOAM  A  HORIZON                 |++++|+ |+  | ++  |++.++ |  | +. +|+ +.+++|+++.+++|
FIRE DISTURBANCE                            |+   |++|+++|++++ |++.++ |++|++.++|  +.  +|++ .  +|
75-95 PERCENT VEGETAL COVER                 |++  |++|   |     | +.+  |  |++.+ |   .  +| + .++ |
FAIRLY SHALLOW SOIL (13-48 CM)              | +  |++| ++| ++  |  .  +|++|  .+ |+++.+++|+++.+++|
SANDY CLAY  B  HORIZON                      |++  | +|++ |  +++|  .+  |  |++.++|  +.+++|+++. ++|
                                            ---------------------------------------------------
<1> DIFFERENTIAL SPECIES OF THE GLADIOLUS DENSIFLORUS - LOUDETIA SIMPLEX SHORT CLOSED GRASSLAND (COMMUNITY 45)
                                            ---------------------------------------------------
INDIGOFERA SP. (FB)                         |1332|  |   |     |  .   |  |  .  |   .   |   .   |
GLADIOLUS DENSIFLORUS (FB)                  |412 |  |   |     | .22  |  |  .  |   .   |   .   |
LOPHOLAENA DISTICHA (FB)                    |122 |  |   |     |  .  1|  |  .  |   .   |   .   |
ASTER COMPTONII (FB)                        |22  |  |   |     |  .   |  |  .  |  2.   |   .   |
SELAGO ATHERSTONEI (FB)                     |  22|  |   |     |  .   |  |  .  |   .   |   .  2|
                                            ---------------------------------------------------
<2> DIFFERENTIAL SPECIES OF THE CLIFFORTIA REPENS - LOUDETIA SIMPLEX SHORT OPEN SHRUBLAND (COMMUNITY 46)
                                            ---------------------------------------------------
LOBELIA DECIPIENS (FB)                      |    |33|   |    3|  .   |  |  .  |   .   |   .   |
CLIFFORTIA REPENS (SH)                      |    |33|   |     |  .   |  |  .  |   .   |   .   |
STYPPEIOCHLOA GYNOGLOSSA (GR)               |    |33|   |     |  .   |  |  .  |   .   |   .   |
SENECIO OXYRIIFOLIUS (FB)                   |    |32|   |     |  .   |  |  .  | 1 .   |  1.   |
HELICHRYSUM MIMETES (FB)                    |    |33|   |     |  .   |  |  .  |   .  2|   .   |
PYCREUS MURICATUS (CY)                      |    |33|   |     |  .   |  |  .  |   .   |   .   |
                                            ---------------------------------------------------
<3> DIFFERENTIAL SPECIES OF THE TETRASELAGO NATALENSIS - MONOCYMBIUM CERESIIFORME LOW CLOSED GRASSLAND (COMMUNITY 47)
                                            ---------------------------------------------------
MICROCHLOA CAFFRA (GR)                      |    |  | 22|2    |  .   | 2|  .  |   .   |   .   |
TEPHROSIA ELONGATA (FB)                     |    |  | 13|     |  .   |  |  .  |   .   |   .   |
                                            ---------------------------------------------------
<4> DIFFERENTIAL SPECIES OF COMMUNITIES 46-47
                                            ---------------------------------------------------
TETRASELAGO NATALENSIS (FB)                 |    |4 |232|     |  .   |  |  .  |   .   |   .   |
MOHRIA CAFFRORUM (PT)                       |   2|22| 2 |     |  .   |  |  .  |   .   |   .  2|
ERIOSPERMUM BURCHELLII (FB)                 |    | 3|2 3|     |  .   |  |  .  |   .   |   .   |
```

RHYNCHELYTRUM "COMPLEX" (GR)		2	3		.	1	.	1 .	.
PELLAEA VIRIDIS (PT)		2	2		.	3	.	.	.

<5> DIFFERENTIAL SPECIES OF COMMUNITIES 45-47

DIOSPYROS LYCIOIDES #(TR)	2 2	2	1		.2		.	1 .	.
TRICHOPTERYX DREGEANA (GR)	2	2	2		.		.	.	.
HELICHRYSUM PANDURATUM #(FB)	2		2	1	.		.	1 .	.

<6> DIFFERENTIAL SPECIES OF THE RENDLIA ALTERA - MONOCYMBIUM CERESIIFORME LOW CLOSED GRASSLAND (COMMUNITY 48)

ALLOTEROPSIS SEMIALATA (GR)		2		3322	.		.	.	.
COMMELINA SP. (FB)				2322	.		.	.	.
SENECIO ERUBESCENS VAR.CREP.#(FB)				132	.		.	.	.
SENECIO GERRARDII (FB)				221	.		.	.	.
NIDORELLA AURICULATA (SH)				2 1	.		.	.	.
ATHANASIA CALVA (FB)				2 2	.		.	. 2	.
HELICHRYSUM SP. (FB)				34	.		.	. 2	. 2
DROSERA SP. (FB)				3 2	.		.	.	.
HELICHRYSUM CEPHALOIDEUM (FB)				2 33	.		.	.	.
EUPHORBIA STRIATA (FB)				31	.		.	.	.
POLYGALA HOTTENTOTTA (FB)			2	1 2	.		.	.	.

<7> DIFFERENTIAL SPECIES OF COMMUNITIES 47-48

KYLLINGA ALBA (CY)			232	3332	.2		.	.	.
RENDLIA ALTERA (GR)			5	3692	.		.	.	.
TOLPIS CAPENSIS (FB)			21	32 1	.		.	.	.

<8> DIFFERENTIAL SPECIES OF COMMUNITIES 46-48

SELAGO MUDDII (FB)		2	2	24 23	.		.	.	. 1
HARPOCHLOA FALX (GR)		2	2 1	1 26	.		.	.	.
KOELERIA CAPENSIS (GR)		2	4	47 8	.		.	.	.
TRACHYANDRA SALTII (FB)		2	3	1 22	.		.	.	.
HYPOXIS FILIFORMIS (FB)		2	2	334	.		.	.	.
STIBURUS ALOPECUROIDES (GR)		2	6	1 22	.		.	.	.
PANICUM ECKLONII (GR)		2	42	3 3	.		.	.	.
STACHYS NIGRICANS (FB)		3	2	2	.		.	.	.

<9> DIFFERENTIAL SPECIES OF COMMUNITIES 45-48

HEMIZYGIA SUBVELUTINA (FB)	23 3	43	3	223	.		.2	.	.
ATHANASIA ACEROSA (FB)	1331		21	554	.		.	.	.

<10> DIFFERENTIAL SPECIES OF THE LIGHTFOOTIA HUTTONII - ERAGROSTIS RACEMOSA LOW CLOSED GRASSLAND (COMMUNITY 49)

ACROTOME HISPIDA (FB)					32.32		.1	.	2.
HYPARRHENIA HIRTA (GR)					43.43	2	.	1.	.
LIGHTFOOTIA HUTTONII (FB)					33.22		.1	.	.
SPOROBOLUS "COMPLEX" (GR)			3		43.24		.	2 1.	.
BRACHIARIA SUBULIFOLIA (GR)					23.3		.	.	.
DIGITARIA APICULATA (GR)					3 .22		.	.	.
ERIOSEMA CORDATUM (FB)					2 .22		.	.	.
HIBISCUS AETHIOPICUS VAR.OVATUS (FB)					2.22		.	. 1	.
PEARSONIA ARISTATA (FB)					3.2		.2	.	.
SONCHUS INTEGRIFOLIUS (FB)					1. 3		.	.	.
HELICHRYSUM SUBULIFOLIUM (FB)					2 . 2		.	.	.
TRISTACHYA LEUCOTHRIX (GR)	2				1.3 2		2.	1 .	.
SENECIO LATIFOLIUS (FB)			3		1 .322		.	.	.
TRIUMFETTA WELWITSCHII VAR.HIRSUTA (FB)					3. 23		.	.	.

HERMANNIA LANCIFOLIA (FB)					3 . 32		.	.	.
<11> DIFFERENTIAL SPECIES OF THE HYPOXIS MULTICEPS - LIGHTFOOTIA HUTTONII - ERAGROSTIS RACEMOSA VARIANT (49A)									
SCABIOSA COLUMBARIA (FB)					42.		.	.	.
HYPOXIS MULTICEPS (FB)					33.		.	.	.
GLADIOLUS SP. (FB)	1				22.		.	.	.
RHYNCHOSIA TOTTA (LN)					22.		.	.	.
<12> DIFFERENTIAL SPECIES OF THE PARINARI CAPENSIS SSP.CAPENSIS - LIGHTFOOTIA HUTTONII - ERAGROSTIS RACEMOSA VARIANT (49B)									
RAPHIONACME ELATA (FB)					.2 3		.	.	.
SPHENOSTYLIS ANGUSTIFOLIA (LN)					.3 3		.	.	.
PILOSELLOIDES HIRSUTA (FB)			2		.12		.	.1	.
<13> DIFFERENTIAL SPECIES OF COMMUNITIES 46-49									
BECIUM OBOVATUM (FB)		22	2	3524	3 . 3		.	.	.
INDIGOFERA SANGUINEA (FB)			4	22	33.2		.	.	.
<14> DIFFERENTIAL SPECIES OF COMMUNITIES 45-49									
HAPLOCARPHA SCAPOSA (FB)	22	34	23	323	32.34		. 1	.2	. 2
<15> DIFFERENTIAL SPECIES OF THE DIGITARIA MONODACTYLA - LOUDETIA SIMPLEX LOW CLOSED GRASSLAND (COMMUNITY 50)									
DIGITARIA MONODACTYLA (GR)					.	65	.	.	. 1
CYPERUS SEMITRIFIDUS (CY)					.	33	.	.	.
ANTHERICUM GALPINII VAR.GALPINII (FB)					.	22	.	.	.
LINUM THUNBERGII (FB)					.	22	.	.	.
DESMODIUM HIRTUM (FB)					.	23	.	.	.
CERATOTHECA TRILOBA (FB)					.	31	.	.	.
<16> DIFFERENTIAL SPECIES OF COMMUNITIES 49B-50									
DIPCADI MARLOTHII (FB)					.11	32	.	.	.
PARINARI CAPENSIS SSP.CAPENSIS (FB)					.232	3	.	.	.
<17> DIFFERENTIAL SPECIES OF COMMUNITIES 46-50									
BULBOSTYLIS SCHOENOIDES (CY)		3	743	22226	33.535	32	.	.	.
ERAGROSTIS CAPENSIS (GR)		55		3 2	2 .222	66	.	.	.
ERAGROSTIS CURVULA (GR)		33	23	64 2	2 .22	4	.	.	.
CYANOTIS SPECIOSA (FB)		21	3		.32	2	.	.	.
DIERAMA SP. (FB)		3			3.	3	.	.	.
<18> DIFFERENTIAL SPECIES OF THE ASCLEPIAS CRASSINERVIS - ANDROPOGON SCHIRENSIS VAR.ANGUSTIFOLIA SHORT CLOSED GRASSLAND (COMM 51)									
ASCLEPIAS CRASSINERVIS (FB)					. 2		11.21	2.	.
LOPHOLAENA SEGMENTATA (FB)					.		2.22	. 2	.
ERIOSEMA GUNNIAE (FB)	2				.		2 .2	1 .	.
PSEUDARTHRIA HOOKERI (FB)					.		2 . 2	2 .	.
<19> DIFFERENTIAL SPECIES OF THE ERIOSEMA NUTANS - ASCLEPIAS CRASSINERVIS - ANDROPOGON SCHIRENSIS VAR.ANGUSTIFOLIA VARIANT (51B)									
OXALIS DEPRESSA (FB)					.		.11	1 .	1.
ERIOSEMA NUTANS (FB)					.		.22	.	.
<20> DIFFERENTIAL SPECIES OF COMMUNITIES 45-49A & 51									
ACALYPHA WILMSII (FB)	2232	22	4 2	443	2 . 3		2.23	2 .	.

KNOWLTONIA TRANSVAALENSIS #(FB)	32 2			22.			.23	.	.
ERIOSEMA ANGUSTIFOLIUM (FB)	2	2	1 3	.		21.21	.	1 .	

<21> DIFFERENTIAL SPECIES OF THE BEWSIA BIFLORA - LOUDETIA SIMPLEX SHORT CLOSED GRASSLAND (COMMUNITY 52)

BEWSIA BIFLORA (GR)					. 2		. 2	212.222	.2
LIPPIA JAVANICA (SH)					.		.	212.2 2	.
FLEMINGIA GRAHAMIANA (FB)					.		. 2	322.2 1	.
RHUS DISCOLOR (SH)					.		. 2	322. 2	.
BERKHEYA SP. (FB)					.		.	3 1.12	2.
ARISTEA WOODII (FB)			21		.		.	2 .11	.
HELICHRYSUM PLATYPTERUM (FB)	2				.		.1	2. 3	.
RHUS DENTATA (TR)					.	1	.	1.2	.

<22> DIFFERENTIAL SPECIES OF THE ACALYPHA CAPERONOIDES - BEWSIA BIFLORA - LOUDETIA SIMPLEX VARIANT (52A)

ACALYPHA CAPERONIOIDES (FB)					.		.	232.	.
INDIGOFERA HILARIS (FB)					.		.	222.	.
CYPHIA ELATA "COMPLEX" (FB)					.		.	11 .	.
CRASSULA NATALENSIS (FB)					.		.	12 .	.
HETEROMORPHA PUBESCENS (SH)					.		.	13 .	.
LEONOTIS DYSOPHYLLA (FB)					.		.	2 2.	.

<23> DIFFERENTIAL SPECIES OF COMMUNITIES 50-52A

SCHIZACHYRIUM SANGUINEUM (GR)					4 .	2	4 . 2	332.2	.2
HYPARRHENIA FILIPENDULA "COMPLEX" (GR)					. 3	33	. 2	23 .	.

<24> DIFFERENTIAL SPECIES OF COMMUNITIES 45 & 49 & 51-52

DIOSPYROS GALPINII (FB)	33 2				32.231		22.33	322.4	.
HYPOXIS "COMPLEX" (FB)					55. 3		21.33	2 1.	.
BARLERIA OVATA (FB)	22				.		21.	21 .12	.

<25> DIFFERENTIAL SPECIES OF THE HELICHRYSUM MIXTUM - BEWSIA BIFLORA -LOUDETIA SIMPLEX VARIANT (52B)

HELICHRYSUM MIXTUM (FB)					.		.	. 32	.

<26> DIFFERENTIAL SPECIES OF COMMUNITIES 49-52

CYMBOPOGON "COMPLEX" (GR)	1		2		22. 2		.13	332.331	.
HEMIZYGIA TRANSVAALENSIS (FB)				2	. 3	12	2 .	224.22	.
INDIGOFERA SWAZIENSIS (SH)	2		3		2.		2 .	1 3. 4	.
ALEPIDEA GRACILIS VAR.MAJOR (FB)			4		.231		2.2	.2 2	. 3
BERKHEYA INSIGNIS (FB)	2				. 3		2.	2 . 3	.

<27> DIFFERENTIAL SPECIES OF COMMUNITIES 47-49 & 51-52

GERBERA AURANTIACA (FB)			32	3 3	33.33		2. 2	1 . 2	.

<28> DIFFERENTIAL SPECIES OF COMMUNITIES 45-46 & 49 & 51-52

EULALIA VILLOSA (GR)	22 2	32			12.1 1		2.12	222.321	.
SETARIA SPHACELATA (GR)	3221	1			3.22		1 . 2	112.11	.

<29> DIFFERENTIAL SPECIES OF THE INEZIA INTEGRIFOLIA - MONOCYMBIUM CERESIIFORME LOW CLOSED GRASSLAND (COMMUNITY 53)

INEZIA INTEGRIFOLIA (FB)					.		.	.	221.222
INDIGOFERA SP.1 (FB)					.		.	.	322.21
PROTEA CAFFRA (TR)	2				.		.	.	41 . 23
GNIDIA SP. (FB)					.		.2	.	22 .22

DICOMA ANOMALA SSP.CIRSIOIDES (FB)					.		.	.	2 .1

<30> DIFFERENTIAL SPECIES OF THE RHYNCHOSIA ANGULOSA - INEZIA INTEGRIFOLIA - MONOCYMBIUM CERESIIFORME VARIANT (53A)

VERNONIA HIRSUTA VAR.HIRSUTA (FB)			2	1	.1		.	. 2	221.
RHYNCHOSIA ANGULOSA (FB)					.		.	.	221. 3
ACALYPHA ANGUSTATA VAR.GLABRA (FB)					.		.	2.	222.3
CRASSULA VAGINATA (FB)				2	.		.	. 2	33 . 2
CYPERUS OBTUSIFLORUS #(CY)					.		.	.	22 .
FAUREA SPECIOSA (TR)	2				.		.	.	42 .

<31> DIFFERENTIAL SPECIES OF COMMUNITIES 52B & 53A

INDIGOFERA SP.2 (FB)					.		.	.12	212.
PENTANISIA ANGUSTIFOLIA (FB)					. 3		.	3 .12	21 .

<32> DIFFERENTIAL SPECIES OF COMMUNITIES 51B & 53A

GLADIOLUS EXIGUUS (FB)					.		.22	1 .3	213.
VERNONIA NATALENSIS (FB)					.		2.21	.	41 . 1

<33> DIFFERENTIAL SPECIES OF COMMUNITIES 45-48 & 53

LOUDETIA DENSISPICA (GR)	43	42	3 3	12224	.		2.	. 22	223.432
ERIOSEMA ELLIPTICIFOLIUM (FB)		1	22	2	.	1	.	.1	333.322
CLUTIA MONTICOLA (FB)	1222	22	2 2	232	1. 3		1.	.2	23 .2

<34> DIFFERENTIAL SPECIES OF COMMUNITIES 47-49 & 52B-53

HELICHRYSUM PILOSELLUM (FB)			22	123	33.332		2.3	.22	234.222
ERAGROSTIS RACEMOSA (GR)		3	213	2	64.532	1	2 .	1 .32	222.322

<35> DIFFERENTIAL SPECIES OF COMMUNITIES 45-49A & 51 & 53A

MONOCYMBIUM CERESIIFORME (GR)	5551	33	213	33243	22.		22.13	.322	552.213
PENTANISIA PRUNELLOIDES (FB)	2221	22	332	333 2	23.		2.22	1.	121.

<36> DIFFERENTIAL SPECIES OF COMMUNITIES 45-48 & 51-53

CEPHALARIA PUNGENS (FB)	2 2	4	3	33 34	.		2.22	22 .43	3 . 2
HELICHRYSUM "COMPLEX" (FB)	3232	3	23	33	.		3.	222.13	223.212

<37> DIFFERENTIAL SPECIES OF COMMUNITIES 45-49 & 51-53

THEMEDA TRIANDRA (GR)	333	3	4 2	33324	54.767		4.56	232.433	654.433
HELICHRYSUM NUDIFOLIUM #(FB)	332		23	23	2 .2		.	22.232	2 .

<38> DIFFERENTIAL SPECIES OF COMMUNITIES 45-53

LOUDETIA SIMPLEX (GR)	5433	88	423	33346	86.624	72	3 .35	546.542	343.431
ANDROPOGON SCHIRENSIS #(GR)	2	23	3 2	32332	43.241	2	34.33	322.332	342.222
PANICUM NATALENSE (GR)	1	2	2	1	. 4	1	3 . 1	22.23	222.232
AESCHYNOMENE NYASSANA (FB)	2 2		3 3	33 2	. 2	3	.	2 . 2	222.2

GENERAL AND INFREQUENT SPECIES

TREES AND SHRUBS

APODYTES DIMIDIATA #(TR)					.		.	.	. 2
BURCHELLIA BUBALINA (TR)					.		.	.	. 2
CUSSONIA SPICATA (TR)					.		.	1 .	.

ERICA DRAKENSBERGENSIS (SH)	3							24	23
ERICA WOODII (SH)									2
INDIGOFERA TRISTOIDES (SH)	2								
MYRICA PILULIFERA (TR)			3	2					4
OCHNA NATALITIA (SH)						2			
PLECTRANTHUS SP. (SH)						2		1	
PROTEA GAGUEDI (TR)			2						
PROTEA SP. (TR)				1					
PROTEA WELWITSCHII (TR)							5		
RHOICISSUS TRIDENTATA (SH)								2	
RHUS DURA (SH)						3			2
RHUS PYROIDES (TR)				1					
RHYNCHOSIA KOMATIENSIS (SH)		3							
SYZYGIUM CORDATUM (TR)			2						
VERNONIA ADOENSIS (SH)								2	
ALOE ARBORESCENS (SH)								5	
LIANOID PLANTS									
CEPHALANTHUS NATALENSIS (LN)			2			2			
CUCUMIS PROPHETARUM (LN)					1				
IPOMOEA BATHYCOLPOS VAR.BATHYCOLPOS (LN)			1			3			
PEARSONIA OBOVATA (LN)								2	
RHYNCHOSIA MONOPHYLLA (LN)	1 2		3		33 3	3	3	2	
TRAGIA RUPESTRIS (LN)					1				
VIGNA NERVOSA (LN)			2						2
ZORNIA MILNEANA (LN)						1			
EPIPHYTES									
POLYSTACHYA CONCRETA (EP)		2							
FORBS AND HERBS									
ACALYPHA SP. (FB)							2		
AESCHYNOMENE REHMANNII (FB)				2					
ALBUCA SETOSA (FB)			2						
ALECTRA SESSILIFLORA #(FB)									1
ALEPIDEA BASINUDA VAR.BASINUDA (FB)				2					
ALOE SP. (FB)	2							1	
ANTHERICUM ANGULICAULE (FB)				1					
ANTHERICUM COOPERI (FB)					2				
ARGYROLOBIUM SPECIOSUM (FB)			3						
ASCLEPIAS DREGEANA (FB)					2				
ASTER LYDENBURGENSIS (FB)					2				
ATHRIXIA PHYLICOIDES (FB)								2	
BERKHEYA ECHINACEA #(FB)	2								
BOOPHANE DISTICHA (FB)					1				
BUCHNERA DURA (FB)									2
CASSIA MIMOSOIDES (FB)							1		
CASSIA PLUMOSA VAR.ERECTA (FB)								1	
COMMELINA AFRICANA VAR.KREBSIANA (FB)			3	2		2			
COMMELINA ECKLONIANA (FB)				6					
CRABBEA HIRSUTA (FB)							2	1	
CRASSULA ALBA "COMPLEX" (FB)	21		4	2					1
CRASSULA SARCOCAULIS #(FB)			2						
CRASSULA SP. (FB)	2	1							
CRYPTOLEPIS OBLONGIFOLIA (FB)					4	2			
CYRTANTHUS BICOLOR (FB)			2						
DICOMA ZEYHERI (FB)					3			2	
DISSOTIS PHAEOTRICHA #(FB)	1								

34

ERIOSEMA BURKEI (FB)					. 2		.	.	.
ERIOSPERMUM COOPERI (FB)				1	.		.	.	.
EURYOPS PEDUNCULATUS (FB)					.	2	.	.	.
EURYOPS TRANSVAALENSIS #(FB)				3	.		.	.	3.
FADOGIA TETRAQUETRA (FB)	1				42. 3		2 . 3	.	.
GALOPINA ASPERA (FB)					.		.	1 .	.
GEIGERIA BURKEI VAR.HIRTELLA #(FB)					.		.	.2	.
GERBERA AMBIGUA (FB)				2	.		.	.	.
GLADIOLUS ECKLONII #(FB)	2				.		2.	.	.
GNIDIA MICROCEPHALA (FB)					.		. 2	.	.
HAEMANTHUS SP. (FB)					.		.	.	2 .
HELICHRYSUM ADENOCARPUM #(FB)			2		.		.	.	.
HELICHRYSUM AUREO-NITENS (FB)		23			3 .		22. 2	.	. 2
HELICHRYSUM AUREUM VAR.MONOCEPHALUM (FB)				3	.		.	.	.
HELICHRYSUM CORIACEUM (FB)					.		. 2	.	.
HELICHRYSUM ODORATISSIMUM (FB)			3		.		.	.	.
HELICHRYSUM REFLEXUM (FB)					.		.	.	. 2
HELICHRYSUM SP.NOV.1 (FB)	2				.		.	.	. 22
HELICHRYSUM SP.NOV.3 (FB)				5	.		.	.	.
HELICHRYSUM UMBRACULIGERUM (FB)			3		.		.	. 2	.
HELICHRYSUM WILMSII (FB)		2			.		.	.	.
HERMANNIA MONTANA (FB)					.		.	.1	2 .
HYPERICUM AETHIOPICUM SSP.SONDERI (FB)					.		1 .	.	.
HYPOCHOERIS MICROCEPHALA #(FB)					.3		.	.	.
HYPOXIS GALPINII (FB)		3			.		.	.	.
HYPOXIS GERRARDII (FB)					.		.	.	1.
INDIGOFERA OXALIDEA (FB)				1	.2		.	.	.
KALANCHOE ROTUNDIFOLIA (FB)			2		.		.	.	.
KNIPHOFIA SP. (FB)			3		.		.	.	.
KNIPHOFIA SPLENDIDA (FB)					.		.	3.	.
KOHAUTIA AMATYMBICA (FB)				2	.		.	.	.
LEDEBOURIA COOPERI (FB)					.1		.	.	.
LEDEBOURIA REVOLUTA (FB)		1			.		.1	1 .	.
LEDEBOURIA SP. (FB)				3	3. 2	22	1 .	.	1 .
LOTONONIS PULCHRA (FB)					.		.	.	3 .
LOTUS DISCOLOR (FB)	2				.		.	.	.
MONSONIA ATTENUATA (FB)	1				.		.	.	.
MORAEA ELLIOTII (FB)		2			.		.	.	.
MORAEA MUDDII (FB)				3	.		.	.	.
MORAEA SP. (FB)					.		. 2	.	.
PEARSONIA SESSILIFOLIA "COMPLEX" (FB)		33	2		. 2	3	.2	3 5.	.
PEUCEDANUM MAGALISMONTANUM (FB)		3		3	1.		.	.	.
RAPHIONACME HIRSUTA (FB)			3	121	.		.	1 .1	121.
RHAMPHICARPA TUBULOSA (FB)					.	1	.	.	.
RHYNCHOSIA VILLOSA (FB)			2		.		.	.	.
RHYNEA PHYLICIFOLIA (FB)	2				.		.	. 3	.
SCHISTOSTEPHIUM CRATAEGIFOLIUM (FB)	1 2				.		.	. 11	.
SCILLA NERVOSA (FB)					.	2	.	.	.
SEBAEA LEIOSTYLA (FB)					.		.	. 1	2 .
SELAGO ELATA (FB)	1				.		.	.	.
SENECIO AFFINIS (FB)	2				.		.	2 .	.
SENECIO CONRATHII (FB)					.		.	2.	.
SENECIO CORONATUS (FB)			3		.		.	.	.
SENECIO ERUBESCENS VAR.DICHOTOMUS (FB)			2		.		.	.	.
SENECIO GLABERRIMUS (FB)					.	3	2 .	.	.
SENECIO LYDENBURGENSIS (FB)					1 .		.	.	.
SENECIO MACROCEPHALUS (FB)			3		.		.	.	.
SENECIO POLYODON VAR.POLYODON (FB)		2			.		.	.	.
SENECIO PTEROPHORUS (FB)		2			.		.	. 2	.
SENECIO VENOSUS (FB)					.		.	1 .	.
SONCHUS SP. (FB)					.		.	1 .	.

SONCHUS WILMSII (FB)							1			1			
SOPUBIA CANA VAR.CANA (FB)												3	
STACHYS NATALENSIS VAR.GALPINII (FB)													1
STOMATANTHES AFRICANUS (FB)	1					2							
STREPTOCARPUS DUNNII (FB)													2
STRIGA BILABIATA (FB)						1							
TEPHROSIA MACROPODA (FB)		1											
TEPHROSIA SEMIGLABRA (FB)										1			
THESIUM COSTATUM (FB)				2		2							
THESIUM CYTISOIDES (FB)				2									
THESIUM SP. (FB)												3	
VERNONIA POSKEANA #(FB)									1				2
WAHLENBERGIA LYCOPODIOIDES (FB)								2					
WAHLENBERGIA UNDULATA (FB)							1			2			
WAHLENBERGIA VIRGATA (FB)			2	2									
XEROPHYTA RETINERVIS (FB)		4								3			
XYSMALOBIUM CONFUSUM (FB)													1

SEDGES

BULBOSTYLIS ORITREPHES (CY)									1				
COLEOCHLOA SETIFERA (CY)	5												
CYPERUS LEPTOCLADUS (CY)							2						
CYPERUS PSEUDOLEPTOCLADUS (CY)			2										
FICINIA BERGIANA (CY)												2	
KYLLINGA CYLINDRICA (CY)											2		
MARISCUS SOLIDUS SSP.SOLIDUS (CY)	2												
RHYNCHOSPORA BROWNII (CY)		3											
SCIRPUS FICINIOIDES (CY)				2									
SCLERIA BULBIFERA (CY)						3							
SCLERIA MELANOMPHALA (CY)	1												

GRASSES

AGROSTIS LACHNANTHA (GR)		2											
ANDROPOGON HUILLENSIS (GR)		2					2						
BRACHIARIA FILIFOLIA (GR)						4							
BRACHIARIA SERRATA #(GR)					2								
CTENIUM CONCINNUM (GR)													2
DIGITARIA DIAGONALIS (GR)										2			
DIGITARIA TRICHOLAENOIDES (GR)				2									
ERAGROSTIS CAESIA (GR)				4									
ERAGROSTIS GUMMIFLUA (GR)							2						
ERAGROSTIS HIERNIANA (GR)							3						
ERAGROSTIS SCLERANTHA #(GR)	2												
FESTUCA COSTATA (GR)				3									
HETEROPOGON CONTORTUS (GR)						1	2						
HYPARRHENIA ANAMESA (GR)									2				
HYPARRHENIA NEWTONII VAR.MACRA (GR)		2											
HYPERTHELIA DISSOLUTA (GR)								4					
ISCHAEMUM ARCUATUM (GR)	2												
PASPALUM SCROBICULATUM (GR)					2								
SPOROBOLUS STAPFIANUS (GR)							3						
TRACHYPOGON SPICATUS (GR)	2										2		

FERNS

BLECHNUM TABULARE (PT)			3										2
DRYOPTERIS ATHAMANTICA (PT)	2								2				
PELLAEA CALOMELANOS (PT)							2						
PTERIDIUM AQUILINUM (PT)	22		3	2 8				11			2		2

+ DENOTES PRESENCE

REFER TO APPENDIX B FOR FULL SPECIES NAME

FOR EXPLANATION OF "COMPLEX" SEE TEXT, SECTION 4.1.3

FOR EXPLANATION OF HABITAT FACTORS SEE TEXT, CHAPTERS 2 & 3

DIGITS 1-9 IN MATRIX DENOTE DOMIN-KRAJINA COVER-ABUNDANCE VALUES (CF. TEXT, SECTION 3.1.1.B)

GROWTH FORMS: TR=TREE; SH=SHRUB; LN=LIANOID; EP=EPIPHYTE; FB=FORB OR HERB; CY=SEDGE; GR=GRASS; PT=FERN (CF. TEXT, SECTION 3.1.1.B)

TABLE III SYNOPTIC CLASSIFICATION OF THE VEGETATION IN THE SABIE AREA OF THE EASTERN TRANSVAAL ESCARPMENT (DIFFERENTIAL SPECIES ONLY)

COMMUNITY NUMBER:	1	2	3A	3B	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21A	21B	22A	22B	23	24	25	26	27	28	29	30	31	32	33	34	35	36A	36B	37	38	39	40	41	42	43	44A	44B	45	46	47	48	49A	49B	50	51A	51B	52A	52B	53A	53B
	(TABLE IIA)																				(TABLE IIB)																						TBL IIC							(TABLE IID)												
ECOLOGICAL -FORMATION CLASS:	FOREST AND MESIC THICKET OF THE MISTBELT AND LOW COUNTRY																				WOODLAND AND XERIC THICKET OF THE LOW COUNTRY																						WOODLND OF THE HUMID MISTBLT							GRASSLAND OF THE HUMID MISTBELT												
TOTAL RELEVES PER COMMUNITY:	2	3	2	2	4	3	6	6	3	6	2	6	3	5	2	4	5	2	3	2	6	5	7	3	2	5	8	2	2	2	3	3	3	3	2	3	2	2	3	2	3	3	2	2	3	3	4	2	2	4	2	3	5	2	3	2	2	2	3	3	3	3
<1> DIFFERENTIAL SPECIES OF COMMUNITY 1																																																														
HYPOESTES PHAYLOPSOIDES (SH)	5																																																													
DUMASIA VILLOSA VAR.VILLOSA (LN)	5																																																													
ADIANTUM CAPILLARIS-VENERIS (PT)	5																1		2																																											
CLERODENDRUM GLABRUM #(TR)	5															2							1																						2																	
<2> DIFFERENTIAL SPECIES OF COMMUNITY 2																																																														
STREPTOCARPUS CYANEUS (FB)		5																																																												
CANTHIUM HUILLENSE (TR)		5																																																												
CYPHOSTEMMA ANATOMICUM (LN)		4						1																																		2		3																		
BUDDLEIA AURICULATA (SH)		4																																																												
<3> DIFFERENTIAL SPECIES OF COMMUNITIES 1-2																																																														
DOVYALIS LUCIDA (TR)	5	5						1																																																						
CLAUSENA ANISATA (TR)	5	5												1					2									3																																		
POLYSTICHUM LUCTUOSUM (PT)	3	5																																																												
CALPURNIA AUREA (TR)	3	4																																																												
THALICTRUM RHYNCHOCARPUM (FB)	3	4																																																												
PHANEROPHLEBIA CARYOTIDEA #(PT)	3	2																																																												
<4> DIFFERENTIAL SPECIES OF COMMUNITY 3																																																														
PEPEROMIA TETRAPHYLLA (EP)		2	5	5																																																										
EKEBERGIA PTEROPHYLLA (TR)			5	5																3																											2	3															
HYPOLEPIS SPARSISORA (PT)			5	3			1																																																							
LYCOPODIUM GNIDIOIDES (PT)			5	3																																																										
VERNONIA UMBRATICA (SH)			5	3																																																										
PLECTRANTHUS RUBROPUNCTATUS (SH)			3	5																																						2						3	3														
ALOE ARBORESCENS (SH)			3	5																																								3															2				
POLYSTACHYA OTTONIANA (EP)			3	5																																																										
PTEROCELASTRUS ECHINATUS (TR)			3	3																																										2																
<5> DIFFERENTIAL SPECIES OF VARIANT 3A																																																														
BULBOPHYLLUM SANDERSONII (EP)			5																																																											
ROTHMANNIA CAPENSIS (TR)			5																																																											
<6> DIFFERENTIAL SPECIES OF VARIANT 3B																																																															

CYANOTIS PACHYRRHIZA (FB)	5		23	
PODOCARPUS LATIFOLIUS (TR)	5			
RUMOHRA ADIANTIFORMIS (PT)	5			

<7> DIFFERENTIAL SPECIES OF COMMUNITIES 2-3

GREYIA RADLKOFERI (TR)	3533	2	3 33	
MYRSINE AFRICANA (SH)	433 1		23	
PAVETTA COOPERI (TR)	233 1			

<8> DIFFERENTIAL SPECIES OF COMMUNITIES 3-4

CLIVIA CAULESCENS (FB)	533			
SCHEFFLERA UMBELLIFERA (TR)	333 1 2		3	
ASPLENIUM ANISOPHYLLUM (EP)	332			

<9> DIFFERENTIAL SPECIES OF COMMUNITY 5

PIPER CAPENSE (SH)	5			
ASPLENIUM LUNULATUM (PT)	3 5			
JASMINUM SP. (LN)	4 1			

<10> DIFFERENTIAL SPECIES OF COMMUNITIES 3-5

PSYCHOTRIA ZOMBAMONTANA (TR)	5555			
ASPLENIUM RUTIFOLIUM (EP)	3355112 1			

<11> DIFFERENTIAL SPECIES OF COMMUNITIES 1-3A & 4-5

SYZYGIUM GERRARDII (TR)	3 5 5521 1		3	
SCLEROCHITON HARVEYANUS (SH)	343 22			

<12> DIFFERENTIAL SPECIES OF COMMUNITIES 5-6

IMPATIENS HOCHSTETTERI #(FB)	43			
SANICULA ELATA (FB)	22			
ENTADA SPICATA (LN)	22 2	2		
BLECHNUM GIGANTEUM (PT)	21			

<13> DIFFERENTIAL SPECIES OF COMMUNITIES 1-2 & 5-6

CASSINOPSIS ILICIFOLIA (TR)	55 23 13			
SELAGINELLA KRAUSSIANA (PT)	32 45			

<14> DIFFERENTIAL SPECIES OF COMMUNITIES 4-6

DRYOPTERIS INAEQUALIS (PT)	355 2			
SENECIO TAMOIDES (LN)	335514 3	1	3	
CANTHIUM CILIATUM (TR)	3 522	1		
THELYPTERIS SP. (PT)	221			
ZANTHOXYLUM CAPENSE (TR)	222 2	2		

<15> DIFFERENTIAL SPECIES OF COMMUNITIES 4-7

BEHNIA RETICULATA (LN)	5 544521			
DRACAENA HOOKERANA (SH)	3 5425 1			
OCHNA HOLSTII (TR)	335213 2 1 1	1	52	

<16> DIFFERENTIAL SPECIES OF COMMUNITIES 2 & 4-7

JASMINUM STREPTOPUS (LN)	5 2444			

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ASPARAGUS PLUMOSUS (SH)                 | 5  44 1            |                     |       |             |
                                        ------------------------------------------------------------------
<17> DIFFERENTIAL SPECIES OF COMMUNITIES 1-8
                                        ------------------------------------------------------------------
PEPEROMIA RETUSA (EP)                   |355325422      2    |                     |       |             |
XYMALOS MONOSPORA (TR)                  |3 5 55524           |                     |       |             |
POLYPODIUM POLYPODIOIDES (EP)           |3 3344124  2   2    |                     |       |             |
PLEOPELTIS MACROCARPA (EP)              | 255221 4      2    |                     |       |             |
RAWSONIA LUCIDA (TR)                    | 2  3 122           |                     |       |             |
                                        ------------------------------------------------------------------
<18> DIFFERENTIAL SPECIES OF COMMUNITIES 4-9
                                        ------------------------------------------------------------------
ASPARAGUS FALCATUS (LN)                 |    355555      1   |                     |       |             |
RHOICISSUS RHOMBOIDEA (LN)              |    455555 2  3     |1                    |       |             |
CARISSA BISPINOSA (SH)                  | 4  5455 2  21  2   |                     |       |             |
EUGENIA NATALITIA (TR)                  |    2 34 3    3 1   |                     |       |             |
                                        ------------------------------------------------------------------
<19> DIFFERENTIAL SPECIES OF COMMUNITIES 3-9
                                        ------------------------------------------------------------------
ASPLENIUM SPLENDENS (PT)                |  55554352          |                 2   |       |             |
STREPTOCARPUS SP. (FB)                  |3 55 42  2          |                     |       |             |
                                        ------------------------------------------------------------------
<20> DIFFERENTIAL SPECIES OF COMMUNITIES 3-10
                                        ------------------------------------------------------------------
COMBRETUM KRAUSSII (TR)                 |  334454425121      |    3                |       |             |
CYPERUS PSEUDOLEPTOCLADUS (CY)          |  3545534 51 1    23|                     |       |  2          |
CNESTIS NATALENSIS (TR)                 |  3 2 442151        |                     |  2    |             |
OXYANTHUS GERRARDII (TR)                |  3 5522213     1   |                     |       |             |
RAPANEA MELANOPHLOEOS (TR)              |  53  12213      3  |1                    |  24 3 |             |
                                        ------------------------------------------------------------------
<21> DIFFERENTIAL SPECIES OF COMMUNITY 11
                                        ------------------------------------------------------------------
ALOE LONGIBRACTEATA (FB)                |           4        |                     |       |             |
                                        ------------------------------------------------------------------
<22> DIFFERENTIAL SPECIES OF COMMUNITY 13
                                        ------------------------------------------------------------------
PITTOSPORUM VIRIDIFLORUM (TR)           |             5  1   |        3    2       |       |             |
                                        ------------------------------------------------------------------
<23> DIFFERENTIAL SPECIES OF COMMUNITY 14
                                        ------------------------------------------------------------------
ENDOSTEMON OBTUSIFOLIUS (SH)            |           1  52    |        3            |       |             |
PINUS SP. (TR)                          |         1    5     |                     |     3 |             |
                                        ------------------------------------------------------------------
<24> DIFFERENTIAL SPECIES OF COMMUNITIES 11-14
                                        ------------------------------------------------------------------
POLYSTACHYA SP. (EP)                    |         1 2 352    |                     |       |             |
TRIDACTYLE TRICUSPIS (EP)               |   3     1 2245 1   |        5         3  |       |             |
                                        ------------------------------------------------------------------
<25> DIFFERENTIAL SPECIES OF COMMUNITY 15
                                        ------------------------------------------------------------------
JACARANDA MIMOSIFOLIA (TR)              |               31   |1    1               |       |             |
DALECHAMPIA CAPENSIS (LN)               |             1 3    |                     |       |             |
                                        ------------------------------------------------------------------
<26> DIFFERENTIAL SPECIES OF COMMUNITIES 7-16
                                        ------------------------------------------------------------------
OCHNA GAMOSTIGMATA (SH)                 |      12435341342   |1           2        |       |             |
PASSIFLORA EDULIS (LN)                  |      1121  22322   |       35 2          |       |             |
TREMA ORIENTALIS (TR)                   |       123  2  22   |1  4      2 4     3  |       |             |
CYPERUS ALBOSTRIATUS (CY)               |    2  1 3 12  2    |                     |  24 3 |             |
                                        ------------------------------------------------------------------
<27> DIFFERENTIAL SPECIES OF COMMUNITIES 6-16
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BRACHYLAENA DISCOLOR #(TR)	2 242551 1322	3 2			
<28> DIFFERENTIAL SPECIES OF COMMUNITIES 4-10 & 15-16					
PEDDIEA AFRICANA (TR)	4455433 2 24				
CANTHIUM GUEINZII (LN)	3 34 532 3323				
RUBUS SP. (SH)	3 22121 2 2 3	1	2 3		
<29> DIFFERENTIAL SPECIES OF COMMUNITY 17					
SCHOENOPLECTUS CORYMBOSUS (CY)	5				
THELYPTERIS GUEINZIANA (PT)	5				
<30> DIFFERENTIAL SPECIES OF COMMUNITIES 6 & 8-9 & 16-17					
ANTHOCLEISTA GRANDIFLORA (TR)	1 21 2 352				
MIKANIA CORDATA (LN)	22 22 25				
<31> DIFFERENTIAL SPECIES OF COMMUNITIES 1 & 3-17					
MAESA LANCEOLATA (TR)	3 33 114332 23		3 2		
<32> DIFFERENTIAL SPECIES OF COMMUNITIES 13-18					
RHYNCHOSIA HIRTA (LN)	1 2 22 2				
BREONADIA SALICINA (TR)	21 132				
<33> DIFFERENTIAL SPECIES OF COMMUNITIES 1 & 6 & 13 & 16-18					
FICUS CAPENSIS (TR)	5 23 2 33 254	113 24 2			
DESMODIUM REPANDUM (SH)	5 25121 1 2132				
<34> DIFFERENTIAL SPECIES OF COMMUNITIES 6-18					
TODDALIA ASIATICA (LN)	324553 355555	3 2 2 2			
<35> DIFFERENTIAL SPECIES OF COMMUNITIES 2 & 6-18					
CAREX SPICATO-PANICULATA (CY)	5 2344554454552	2 5 2 2 2			
DICLIPTERA CLINOPODIA (SH)	4 3 41 1 121 34	1 3			
DOMBEYA PULCHRA (SH)	4 1 5 1 31 4	1 1 2	2		
<36> DIFFERENTIAL SPECIES OF COMMUNITY 19					
CEROPEGIA WOODII (LN)	5		2		
KIRKIA ACUMINATA (TR)	5	1			
<37> DIFFERENTIAL SPECIES OF COMMUNITIES 18-19					
BERCHEMIA ZEYHERI (TR)	23	11			
ANEILEMA AEQUINOCTIALE (FB)	1 23				
CHIONANTHUS FOVEOLATA #(TR)	23				
<38> DIFFERENTIAL SPECIES OF COMMUNITIES 6-19					
RHOICISSUS TOMENTOSA (LN)	234255222334555	1 15			
<39> DIFFERENTIAL SPECIES OF COMMUNITIES 4-19					
DALBERGIA ARMATA (LN)	4455255444534555	31 3 4			

42

TRICALYSIA "COMPLEX" (TR)	5 55445451 2343		22	
DIETES IRIDIOIDES (FB)	3 3214 3 1 3 42343	1		
SECAMONE GERRARDII (LN)	3 34334131 2 2 43	1 2		
<40> DIFFERENTIAL SPECIES OF COMMUNITIES 2-19				
MAYTENUS MOSSAMBICENSIS #(TR)	4 4555555425352 3	12	32	
<41> DIFFERENTIAL SPECIES OF COMMUNITIES 17-20 *				
MIMUSOPS ZEYHERI (TR)	1 3 3	4 1		
<42> DIFFERENTIAL SPECIES OF COMMUNITY 21				
SENECIO VENOSUS (FB)		33 2 2	5	2
TERMINALIA SERICEA (TR)		23 21 2		
COMBRETUM COLLINUM SSP.GAZEN.#(TR)		32 1		
LANNEA DISCOLOR (TR)	1	132 1 2		
CHAETACANTHUS BURCHELLII (FB)		312 1 2		
DIOSPYROS MESPILIFORMIS (TR)		13		
STRYCHNOS MADAGASCARIENSIS (TR)	2	1122		
PHYLLANTHUS RETICULATUS (SH)		12		
<43> DIFFERENTIAL SPECIES OF COMMUNITIES 20-21				
SECURINEGA VIROSA (SH)	1	2242 1 2		
CANTHIUM MUNDIANUM (TR)		222 3	4	
EULOPHIA STREPTOPETALA (FB)	2 2	411	4	
KRAUSSIA FLORIBUNDA (SH)	2	521		
LANTANA CAMARA (SH)	2 5	232 2 2		
XEROMPHIS RUDIS (SH)		211		
ASPARAGUS RACEMOSUS (SH)	1 3	111 2		
EUPHORBIA INGENS (TR)		211 1 2		
MOMORDICA BOIVINII (LN)		111		
<44> DIFFERENTIAL SPECIES OF COMMUNITIES 12-21 *				
GARDENIA AMOENA (TR)	1 21 1 45	3 3		
<45> DIFFERENTIAL SPECIES OF COMMUNITY 22				
GLYCINE WIGHTII (LN)	1	531 3		
HYPARRHENIA GAZENSIS (GR)		53		
TRIUMFETTA PILOSA VAR.PILOSA (FB)	2	43 2 3		
EUCLEA NATALENSIS (TR)	1	1 23		
<46> DIFFERENTIAL SPECIES OF VARIANT 22A				
OCIMUM URTICIFOLIUM (SH)		4		
<47> DIFFERENTIAL SPECIES OF VARIANT 22B				
ERIANTHEMUM DREGEI (EP)	1	5		
SPHENOSTYLIS MARGINATA #(LN)	12	5 3		
<48> DIFFERENTIAL SPECIES OF COMMUNITIES 20-24				
COMBRETUM COLLINUM SSP.SULUE.#(TR)	1	2545333 2		
ALOE BARBETONIAE (FB)		4454312 4 2 4		
COMBRETUM ZEYHERI (TR)		1232 23		
PTEROCARPUS ROTUNDIFOLIUS (TR)		1234312		

TYLOSEMA FASSOGLENSIS (LN)		2222 11 4 2		
<49> DIFFERENTIAL SPECIES OF COMMUNITIES 21-25				
PAVETTA SCHUMANNIANA (TR)		12343323 2		
STRYCHNOS SPINOSA (TR)	1	1222 323	2	
HYPOESTES ARISTATA (SH)	2 2	12 23343 22		
ACALYPHA PETIOLARIS (FB)		4345323 3		
PAPPEA CAPENSIS (SH)		113 13		
<50> DIFFERENTIAL SPECIES OF COMMUNITIES 18-25 *				
RHUS PENTHERI (TR)	23	53353215 5 2		
PAVETTA SP. (SH)	1 53	1 113		
<51> DIFFERENTIAL SPECIES OF COMMUNITIES 12-25 *				
ASPARAGUS "COMPLEX" (SH)	2 1531 2	53355343 3 4 3	3	
MAYTENUS UNDATA (TR)	1 123 4 345	5342 215 22	4	
TEPHROSIA "COMPLEX" (FB)	2132132	1323223	3	
CATHA EDULIS (TR)	42 22 2	2 12 1 5		
CELTIS AFRICANA (TR)	1 3 2 55	41343 15		
STYLOCHITON NATALENSE (FB)	1 2 2	531 113		
OSYRIDICARPOS SCHIMPERIANUS (LN)	1321	11 3		
<52> DIFFERENTIAL SPECIES OF COMMUNITIES 10-18 & 20-25 *				
GALOPINA CIRCAEOIDES (FB)	5 1143544234332	1 232 33	33	
RHYNCHOSIA CARIBAEA (LN)	2 2 31 1 44	41323323 2	3 2	
OCHNA NATALITIA (SH)	3 2 2 232 4	52123243 4 2		3
TYLOPHORA ANOMALA (LN)	1 3 2 1	23 233 2		
<53> DIFFERENTIAL SPECIES OF COMMUNITIES 4-25 *				
MONANTHOTAXIS CAFFRA (SH)	242422 223 22 55	5 113		
ABRUS LAEVIGATUS (LN)	2 1 213141 21 23	4332 1 2		
<54> DIFFERENTIAL SPECIES OF COMMUNITY 26				
IPOMOEA CRASSIPES (FB)		5		
THUNBERGIA ATRIPLICIFOLIA (LN)		5		
ASTER SP. (FB)		53		
DICOMA ZEYHERI (FB)		5 22	2	2 2
<55> DIFFERENTIAL SPECIES OF COMMUNITIES 4-26 *				
SETARIA MEGAPHYLLA (GR)	3 3 3241535425553345	4112 1235 2 2	5	
OPLISMENUS HIRTELLUS (GR)	55 5555555343555553	2 2 133		
CISSAMPELOS TORULOSA (LN)	55 3 24253123333523	511452353 2		
ZANTHOXYLUM DAVYI (TR)	2 45254 33 3 31 43	512 1 33		
DIOSCOREA "COMPLEX" (LN)	4 211225422 22355	514 22 53 4 4	3	
<56> DIFFERENTIAL SPECIES OF COMMUNITY 27				
RHYNCHOSIA SORDIDA (FB)		5		
SENECIO SERRATULOIDES #(FB)		5		
<57> DIFFERENTIAL SPECIES OF COMMUNITIES 20-27				
PELTOPHORUM AFRICANUM (TR)		5125334 322 2		
CASSIA PETERSIANA (SH)	2 2	23345143 3 2 3 3		

<58> DIFFERENTIAL SPECIES OF COMMUNITY 28

MUCUNA CORIACEA SSP.IRRITANS (LN)	1	1 5 23			
TRIUMFETTA PILOSA VAR.TOM. #(FB)		34			

<59> DIFFERENTIAL SPECIES OF COMMUNITY 30

CONYZA FLORIBUNDA (FB)		3 4	3 2		
ACANTHOSPERMUM AUSTRALE (FB)		4 5	3 2		
CASSIA QUARREI (FB)		4			
DIHETEROPOGON AMPLECTENS (GR)		4			

<60> DIFFERENTIAL SPECIES OF COMMUNITIES 20-30

PANICUM "COMPLEX" (GR)	1 3	35545433 224	2		
CUSCUTA SP. (FB)		21 5 3 2 4			

<61> DIFFERENTIAL SPECIES OF COMMUNITIES 12-30 *

BAUHINIA GALPINII (SH)	54 32343	5535545555544			
PHAULOPSIS IMBRICATA (SH)	43 35 2	3 12 235 2 4			
STERCULIA MUREX (TR)	1 2	2 22 3 4 2			

<62> DIFFERENTIAL SPECIES OF COMMUNITIES 8-30 *

MAYTENUS HETEROPHYLLA (TR)	5 21 32132 2	4455544355222 4			
ZIZIPHUS MUCRONATA #(TR)	121 21 21 2	4354522 3442	33		

<63> DIFFERENTIAL SPECIES OF COMMUNITIES 6-30 *

ACACIA ATAXACANTHA (TR)	3 555555453543 3	5345534355442 2 2	3		
ASPARAGUS VIRGATUS (SH)	5 35445545355 43	5135543353 22	2		

<64> DIFFERENTIAL SPECIES OF COMMUNITIES 21-31

FAUREA SALIGNA (TR)	2 1	12 32 5 4 5			
ACACIA CAFFRA (TR)		21 3223 2 2 2			

<65> DIFFERENTIAL SPECIES OF COMMUNITIES 8-31 *

RHOICISSUS TRIDENTATA (SH)	3 22 44233232	545233455555 53	554 2	2	
RHUS PYROIDES (TR)	2 21 221 3 2	2 252233322 2 2 2 2		1	

<66> DIFFERENTIAL SPECIES OF COMMUNITIES 6-17 & 20-31 *

EUCLEA "COMPLEX" (TR)	3 222355233533	443 33353545 2 2	3		
ANTIDESMA VENOSUM (TR)	2 1 3433433	33323235335442 3			

<67> DIFFERENTIAL SPECIES OF COMMUNITIES 26-32

INULA GLOMERATA (FB)		3 2 534442	5		

<68> DIFFERENTIAL SPECIES OF COMMUNITIES 20-33

DOMBEYA ROTUNDIFOLIA #(TR)	1 2	5555544 324 2 5			
ACACIA DAVYI (TR)		1234312 4 2 4			
ANNONA SENEGALENSIS (TR)	2	242 53535545 4 3 2			
LANNEA EDULIS (FB)		22 23 2 2 2 32	4		

<69> DIFFERENTIAL SPECIES OF COMMUNITY 34

VERNONIA CENTAURIOIDES (FB)		5		
INDIGOFERA OXALIDEA (FB)		2 5	2	1 2
<70> DIFFERENTIAL SPECIES OF COMMUNITIES 29-34				
CRABBEA HIRSUTA (FB)		11 3 4 25 3		3 2
GLADIOLUS DENSIFLORUS (FB)		1 1 4 2 233	5	4 4
<71> DIFFERENTIAL SPECIES OF COMMUNITIES 29 & 35				
BOTHRIOCHLOA GLABRA (GR)		3 1 42 35		
<72> DIFFERENTIAL SPECIES OF COMMUNITIES 21-35				
DICHROSTACHYS CINEREA "COMP" #(TR)		1444333 4 24 235 2		
<73> DIFFERENTIAL SPECIES OF COMMUNITY 36				
CERATOTHECA TRILOBA (FB)	1	1 55 2		5
CRASSULA NATALENSIS (FB)	1	43	23	4
<74> DIFFERENTIAL SPECIES OF COMMUNITIES 5-11 & 14-16 & 36A *				
CEPHALANTHUS NATALENSIS (LN)	3 25232252 213	4	2 3	2 3
PROTORHUS LONGIFOLIA (TR)	5 332553 531	5		
<75> DIFFERENTIAL SPECIES OF COMMUNITIES 9-18 & 20-32 & 36 *				
BRIDELIA MICRANTHA (TR)	325534255554	1 2235 224 25		
COMBRETUM MOLLE (TR)	34 32 32	231433335345443 3452	5 2	
PARINARI CURATELLIFOLIA (TR)	2 2445 2	12 1335354555 5 43	2	
HETEROPYXIS NATALENSIS (TR)	21 2132	4334 453534252 4 2 2	4	
PTEROCARPUS ANGOLENSIS (TR)	1 1 2	133 24 5 2 23 23	2	
GERBERA JAMESONII (FB)	2 1	21 113 4 3 25		
PSIDIUM GUAJAVA (TR)	23 2	113 2 4 3 5 23	2	
PYCNOSTACHYS URTICIFOLIA (SH)	1 4	353 2 2 2		
<76> DIFFERENTIAL SPECIES OF COMMUNITIES 36B-37				
XEROPHYTA RETINERVIS (FB)	1	234	2	3 2
HEMIZYGIA CANESCENS (FB)		1 2 32	22	
<77> DIFFERENTIAL SPECIES OF COMMUNITIES 21 & 23-37				
HYPERTHELIA DISSOLUTA (GR)		1432 233 54 3555454	5	3
HETEROPOGON CONTORTUS (GR)		22 11 2 235 34		23
<78> DIFFERENTIAL SPECIES OF COMMUNITIES 37-38				
ALOE PETRICOLA (FB)		45	25	
MYROTHAMNUS FLABELLIFOLIA (FB)		44		
COLEOCHLOA SETIFERA (CY)		1 25	2	2
<79> DIFFERENTIAL SPECIES OF COMMUNITIES 36-38				
SELAGINELLA DREGEI (PT)		4324		
<80> DIFFERENTIAL SPECIES OF COMMUNITY 39				
GALOPINA ASPERA (FB)			5	2

BOOPHANE DISTICHA (FB)			5 2	2
ERIOSPERMUM SP. (FB)		2	5	
<81> DIFFERENTIAL SPECIES OF COMMUNITY 40				
NIDORELLA AURICULATA (SH)		2	5 3	2
ARTEMISIA AFRA (FB)			5	
<82> DIFFERENTIAL SPECIES OF COMMUNITIES 39-40				
VERNONIA OLIGOCEPHALA (FB)		3 23	55	
HELICHRYSUM UMBRACULIGERUM (FB)			33	2 2
<83> DIFFERENTIAL SPECIES OF COMMUNITIES 11 & 20-32 & 39-40 *				
RHUS TRANSVAALENSIS (TR)	3 1 2	2422332335552532 4	55 2	
ATHRIXIA PHYLICOIDES (FB)	1 2413	13 523 5545253 5	53	2
<84> DIFFERENTIAL SPECIES OF COMMUNITY 41				
TECOMARIA CAPENSIS #(TR)	2	1	5	
FICUS INGENS (TR)	1 3	2	5 2	
ARTHROPTERIS MONOCARPA (PT)			4	
SOLANUM MAURITIANUM (TR)	1		4	
BIDENS PILOSA (FB)	1 2	2	4	
PLECTRANTHUS FRUTICOSIS (SH)	3 3		4	
<85> DIFFERENTIAL SPECIES OF COMMUNITIES 40-41				
EHRHARTA ERECTA (GR)	2 1		32	
HALLERIA LUCIDA (TR)	3 1 13 13	2	32	
<86> DIFFERENTIAL SPP. OF COMMUNITIES 13-18 & 27-29 & 39-41 *				
VERNONIA STIPULACEA (SH)	2 3152	322	332	
<87> DIFFERENTIAL SPECIES OF COMMUNITY 42				
SELAGO HYSSOPIFOLIA (FB)			4	
PEARSONIA SP. (FB)		1 2	4	
AESCHYNOMENE REHMANNII VAR.L.#(FB)			4	
<88> DIFFERENTIAL SPECIES OF COMMUNITIES 41-42				
CYANOTIS LAPIDOSA (FB)			42	
PLECTRANTHUS ZATARHENDI #(FB)			24	
HELICHRYSUM COOPERI (FB)			24	
<89> DIFFERENTIAL SPECIES OF COMMUNITIES 36 & 41-42 *				
HELICHRYSUM KRAUSSII (FB)	1	3 53	45	
<90> DIFFERENTIAL SPP. OF COMMUNITIES 11-12 & 21-31 & 39-42 *				
FAUREA SPECIOSA (TR)	22 2	21 312 53242 2	5 22 3	2 4
RHYNCHOSIA KOMATIENSIS (SH)	1 35	32 5445554224 2	5 42	3
TRIUMFETTA PILOSA VAR.EFFUSA (FB)	2 3	1 2 1 3 2	3542	
<91> DIFFERENTIAL SPECIES OF COMMUNITY 43				
SELAGO ATHERSTONEI (FB)			5 3	3 2

BURCHELLIA BUBALINA (TR)			3	2

<92> DIFFERENTIAL SPECIES OF COMMUNITIES 39 & 43

ANTHOSPERMUM AMMANIOIDES (SH)		3	5 4	

<93> DIFFERENTIAL SPECIES OF COMMUNITIES 39 & 42-43

ERAGROSTIS SCLERANTHA #(GR)		2	43	2
CYPHIA ELATA "COMPLEX" (FB)		3	5 42	4

<94> DIFFERENTIAL SPECIES OF COMMUNITIES 41-43

TARCHONANTHUS TRILOBUS #(TR)	1	3	422	
AEOLLANTHUS REHMANNII (FB)		3	424	
CYPERUS LEPTOCLADUS (CY)	3		443	3

<95> DIFFERENTIAL SPP. OF COMMUNITIES 36B-37 & 39 & 42-43 *

VERNONIA POSKEANA #(FB)		2 35	3 54	3 2

<96> DIFF. SPP. OF COMMUNITIES 3-19 & 24-25 & 36 & 41-43 *

BEQUAERTIODENDRON M'MONTANUM #(SH)	4 452435243243 43	3 23 55	554	
CANTHIUM INERME (TR)	3 312335 1341	1 133 4 4 2	423	
COMMELINA SP. (FB)	3 5 3 3	13 23	2445	4
FICUS BURKEI (TR)	5 3 11 121 5	1 13 5	22	
KALANCHOE ROTUNDIFOLIA (FB)	53 22 3	1 2 23	4 3	2

<97> DIFFERENTIAL SPECIES OF COMMUNITY 44

HELICHRYSUM MIMETES (FB)		3	235	5 2
ERICA DRAKENSBERGENSIS (SH)			33	2 4 4
SENECIO CORONATUS (FB)		2	33	2
PEARSONIA ARISTATA (FB)	1	2	33	32 3

<98> DIFFERENTIAL SPECIES OF VARIANT 44A

CONOSTOMIUM NATALENSE #(FB)		3	5	
PACHYSTIGMA MACROCALYX (SH)			5	
MYRICA PILULIFERA (TR)	3 2		5	21 2

<99> DIFFERENTIAL SPECIES OF COMMUNITIES 43-44A

STREPTOCARPUS DUNNII (FB)			223	2

<100> DIFFERENTIAL SPP. OF COMMUNITIES 1-18 & 26 & 40-44A *

PSYCHOTRIA CAPENSIS (TR)	5 535552445343 34432	35 2 4	35253	
TRIMERIA GRANDIFOLIA (TR)	55 2 4445544234334	5	32 2	
APODYTES DIMIDIATA #(TR)	5334 21 5312534432	21 35 2 2	2 33	2

<101> DIFF. SPP. OF COMMUNITIES 1-31 & 36-37 & 39-44A *

SMILAX KRAUSSIANA (LN)	3 3 4555555455554	332 5235555555 4 22	5555553	
CUSSONIA SPICATA (TR)	5 345424 123532325	55325123 32 4 2 2 2	352 2	2
DIOSPYROS WHYTEANA (SH)	54 3 33455355555553	5 2 33255 4 52 232	32 3	
GREWIA OCCIDENTALIS (SH)	52 2 23 2 23 154	3 32233 2 2 2	54 2	
SYZYGIUM CORDATUM (TR)	3 3123545354452	1 3 52244 4	2255	2

<102> DIFFERENTIAL SPECIES OF VARIANT 44B

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                                        ------------------------------------------------------------------
ATHANASIA CALVA (FB)                    |   3                |                      |      5|   2      2 |
BLECHNUM TABULARE (PT)                  |           1        |                      |    2 5|  2        2|
                                        ------------------------------------------------------------------
<103> DIFFERENTIAL SPECIES OF COMMUNITIES 43-44
                                        ------------------------------------------------------------------
RHUS DURA (SH)                          |  33                |       3              |  2 353|      3    2|
CLIFFORTIA NITIDULA SSP.PILOSA (SH)     |                    |                      |    2 3|            |
                                        ------------------------------------------------------------------
<104> DIFFERENTIAL SPECIES OF COMMUNITIES 41-44
                                        ------------------------------------------------------------------
PELLAEA CALOMELANOS (PT)                |           1        | 1                 25 |  44553|      3     |
                                        ------------------------------------------------------------------
<105> DIFFERENTIAL SPECIES OF COMMUNITY 45
                                        ------------------------------------------------------------------
INDIGOFERA SP. (FB)                     |                    |                      |       |5           |
LOPHOLAENA DISTICHA (FB)                |                    |                      |       |4    2      |
ASTER COMPTONII (FB)                    |                    |                      | 3    3|3        2  |
                                        ------------------------------------------------------------------
<106> DIFFERENTIAL SPECIES OF COMMUNITY 46
                                        ------------------------------------------------------------------
LOBELIA DECIPIENS (FB)                  |                    |                      |       | 5 1        |
CLIFFORTIA REPENS (SH)                  |                    |                      |       | 5          |
STYPPEIOCHLOA GYNOGLOSSA (GR)           |                    |                      |       | 5          |
PYCREUS MURICATUS (CY)                  |                    |                      |       | 5          |
                                        ------------------------------------------------------------------
<107> DIFFERENTIAL SPECIES OF COMMUNITY 47
                                        ------------------------------------------------------------------
MICROCHLOA CAFFRA (GR)                  |                    |                   3  |    2  |  41  3     |
TEPHROSIA ELONGATA (FB)                 |                    |11                    |     3 |  4         |
                                        ------------------------------------------------------------------
<108> DIFFERENTIAL SPECIES OF COMMUNITIES 46-47
                                        ------------------------------------------------------------------
TETRASELAGO NATALENSIS (FB)             |           1        |                      |     3 | 35         |
ERIOSPERMUM BURCHELLII (FB)             |                    |                  2   |       | 34         |
                                        ------------------------------------------------------------------
<109> DIFFERENTIAL SPECIES OF COMMUNITIES 41-47 *
                                        ------------------------------------------------------------------
TRICHOPTERYX DREGEANA (GR)              |           22   1   |                      |  224 5|232         |
                                        ------------------------------------------------------------------
<110> DIFFERENTIAL SPECIES OF COMMUNITIES 36-38 & 42-47 *
                                        ------------------------------------------------------------------
CRASSULA ALBA "COMPLEX" (FB)            |                    |                  23 2|   5555|3 21       2|
MOHRIA CAFFRORUM (PT)                   |          3         |                  2  2|3  2 55|252        2|
                                        ------------------------------------------------------------------
<111> DIFFERENTIAL SPECIES OF COMMUNITIES 1-47 *
                                        ------------------------------------------------------------------
PELLAEA VIRIDIS (PT)                    |32555255555554555543|554453455  42  2  5555|5342433| 32   3     |
DIOSPYROS LYCIOIDES #(TR)               |35      423424 523  |5535544535552432334522|554223 |332  2   2  |
                                        ------------------------------------------------------------------
<112> DIFFERENTIAL SPECIES OF COMMUNITY 48
                                        ------------------------------------------------------------------
ALLOTEROPSIS SEMIALATA (GR)             |                    |                      |       | 3 4        |
SENECIO ERUBESCENS VAR.CREP.#(FB)       |                    |                      |       |   3        |
SENECIO GERRARDII (FB)                  |                    |                      |       |   3        |
DROSERA SP. (FB)                        |                    |                      |       |   2        |
HELICHRYSUM CEPHALOIDEUM (FB)           |                    |                      |       |   3        |
EUPHORBIA STRIATA (FB)                  |                    |                      |       |   2        |
                                        ------------------------------------------------------------------
<113> DIFFERENTIAL SPECIES OF COMMUNITIES 47-48
                                        ------------------------------------------------------------------
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KYLLINGA ALBA (CY)				54 2
TOLPIS CAPENSIS (FB)				43
RENDLIA ALTERA (GR)				24

<114> DIFFERENTIAL SPECIES OF COMMUNITIES 46-48

SELAGO MUDDII (FB)			3	324 2
HARPOCHLOA FALX (GR)				343
KOELERIA CAPENSIS (GR)				323
TRACHYANDRA SALTII (FB)				323
HYPOXIS FILIFORMIS (FB)				323
STIBURUS ALOPECUROIDES (GR)		2		323
PANICUM ECKLONII (GR)				342
STACHYS NIGRICANS (FB)				321

<115> DIFFERENTIAL SPECIES OF COMMUNITIES 45-48

HEMIZYGIA SUBVELUTINA (FB)				4523 3
ATHANASIA ACEROSA (FB)	1		3	5 43

<116> DIFFERENTIAL SPECIES OF COMMUNITY 49

ACROTOME HISPIDA (FB)				54 3 2
LIGHTFOOTIA HUTTONII (FB)				54 3
BRACHIARIA SUBULIFOLIA (GR)				52
DIGITARIA APICULATA (GR)				34
ERIOSEMA CORDATUM (FB)				34
HIBISCUS AETHIOPICUS VAR.OVATUS (FB)				34 2
SONCHUS INTEGRIFOLIUS (FB)				32
HELICHRYSUM SUBULIFOLIUM (FB)				32
SENECIO LATIFOLIUS (FB)		3		2 35
TRIUMFETTA WELWITSCHII VAR.HIRSUTA (FB)			3	34
HERMANNIA LANCIFOLIA (FB)				34

<117> DIFFERENTIAL SPECIES OF VARIANT 49A

SCABIOSA COLUMBARIA (FB)		3 2		5
HYPOXIS MULTICEPS (FB)				5
RHYNCHOSIA TOTTA (LN)		22 2 2		5

<118> DIFFERENTIAL SPECIES OF VARIANT 49B

RAPHIONACME ELATA (FB)		3		4
SPHENOSTYLIS ANGUSTIFOLIA (LN)				4
PILOSELLOIDES HIRSUTA (FB)				2 4 2

<119> DIFFERENTIAL SPECIES OF COMMUNITIES 46-49

BECIUM OBOVATUM (FB)			3	52432
INDIGOFERA SANGUINEA (FB)				2252

<120> DIFFERENTIAL SPECIES OF COMMUNITY 50

DIGITARIA MONODACTYLA (GR)				5 2
CYPERUS SEMITRIFIDUS (CY)				5
ANTHERICUM GALPINII VAR.GALPINII (FB)				5
LINUM THUNBERGII (FB)				5
DESMODIUM HIRTUM (FB)		3		5

<121> DIFFERENTIAL SPECIES OF COMMUNITIES 49B-50

DIPCADI MARLOTHII (FB)				45
PARINARI CAPENSIS SSP.CAPENSIS (FB)			42	53

<122> DIFFERENTIAL SPECIES OF COMMUNITIES 46-50

ERAGROSTIS CURVULA (GR)		2 1 4 23	2 33	543343
BULBOSTYLIS SCHOENOIDES (CY)				355555
ERAGROSTIS CAPENSIS (GR)		2		5 2355
CYANOTIS SPECIOSA (FB)		2		52 43
DIERAMA SP. (FB)				3 3 3

<123>DIFF.SPP. OF COMMS.11 & 26-34 & 36,39 & 42-43 & 49B-50 *

PEARSONIA SESSILIFOLIA #(FB)	3	1 33 2 545 23	3 253	52 23 34
CRYPTOLEPIS OBLONGIFOLIA (FB)	2	21 1 5 2224323 23	3 54	23

<124> DIFFERENTIAL SPECIES OF COMMUNITY 51

ASCLEPIAS CRASSINERVIS (FB)		2 2	3	2 552
LOPHOLAENA SEGMENTATA (FB)			3	35 2
ERIOSEMA GUNNIAE (FB)		5		2 332

<125> DIFFERENTIAL SPECIES OF VARIANT 51B

ERIOSEMA NUTANS (FB)				5
OXALIS DEPRESSA (FB)		3 2		52 2

<126> DIFFERENTIAL SPECIES OF COMMUNITIES 45-49A & 51

ERIOSEMA ANGUSTIFOLIUM (FB)				2 22 55 2

<127> DIFFERENTIAL SPECIES OF COMMUNITIES 39-51 *

ACALYPHA WILMSII (FB)			5 423	554332 352
FADOGIA TETRAQUETRA (FB)		3 3	5 243	2 52 33
RHYNCHOSIA MONOPHYLLA (LN)	1	23	3 25553	3 2 5233 2

<128> DIFFERENTIAL SPP. OF COMMUNITIES 30 & 34 & 45-49 & 51 *

PENTANISIA PRUNELLOIDES (FB)		1 1 32 2 23	3	55545 352 5
HAPLOCARPHA SCAPOSA (FB)		22 3 3 2		354354 3 2 2

<129> DIFFERENTIAL SPECIES OF COMMUNITY 52

LIPPIA JAVANICA (SH)	1	2 3 2	5 3	54
BEWSIA BIFLORA (GR)			2	2 355 2
HELICHRYSUM PLATYPTERUM (FB)				2 322
RHUS DISCOLOR (SH)			3	352
BERKHEYA SP. (FB)	2	3		442

<130> DIFFERENTIAL SPECIES OF VARIANT 52A

ACALYPHA CAPERONIOIDES (FB)			5	5
INDIGOFERA HILARIS (FB)		2		5
HETEROMORPHA PUBESCENS (SH)		2	3	4

<131> DIFFERENTIAL SPECIES OF VARIANT 52B

HELICHRYSUM MIXTUM (FB)		3		4

<132> DIFFERENTIAL SPECIES OF COMMUNITIES 39-52 *

BARLERIA OVATA (FB)			35 43	3 5 44
HEMIZYGIA TRANSVAALENSIS (FB)		4	55 2	1 253 54
DIOSPYROS GALPINII (FB)		5	3 5	4 55 5552

<133> DIFFERENTIAL SPP.OF COMMUNITIES 26-35 & 39-44 & 49-52 *

EULALIA VILLOSA (GR)	1	33 425 3	53 22 5	45 54 3555
SCHIZACHYRIUM SANGUINEUM (GR)		1 3 2252523 3	5 54 3	3 33352 2
HYPOXIS "COMPLEX" (FB)		1 5 422 2	333	52 554
HYPARRHENIA FILIPENDULA #(GR)	2	2 1 242 32 5	354	25 34

<134> DIFFERENTIAL SPP.OF COMMUNITIES 21-34 & 39-45 & 51-52 *

INDIGOFERA SWAZIENSIS (SH)	3 2	2324 3235 42 32	55442 3	2 2 3 3 42
HELICHRYSUM NUDIFOLIUM #(FB)	1 13	41 3223552444323	53	4 4232 452
GERBERA AURANTIACA (FB)	1	1 3 1 5 5 2	53 3	4254 3322
SETARIA SPHACELATA (GR)	1	5 2323 334544543	532523	53 34 3354
CYMBOPOGON "COMPLEX" (GR)	2	2 12 352544345 2	55242 5	2 2 52 555
PSEUDARTHRIA HOOKERI (FB)	1	224321 352243 3	5 22	332
ARISTEA WOODII (FB)		3 22 2	2 3	4 24

<135> DIFFERENTIAL SPECIES OF COMMUNITY 53

INDIGOFERA SP.1 (FB)			3	54
GNIDIA SP. (FB)		2		3 44
DICOMA ANOMALA SSP.CIRSIOIDES (FB)				22

<136> DIFFERENTIAL SPECIES OF VARIANT 53A

VERNONIA HIRSUTA VAR.HIRSUTA (FB)				21 2 25
RHYNCHOSIA ANGULOSA (FB)				52
ACALYPHA ANGUSTATA VAR.GLABRA (FB)			3	2 52
CRASSULA VAGINATA (FB)				2 242
CYPERUS OBTUSIFLORUS #(CY)				4

<137> DIFFERENTIAL SPECIES OF COMMUNITIES 52B & 53A

INDIGOFERA SP.2 (FB)				45
PENTANISIA ANGUSTIFOLIA (FB)				2 244

<138> DIFFERENTIAL SPP. OF COMMUNITIES 44A & 45-48 & 50-53 *

CEPHALARIA PUNGENS (FB)		3 3	5	3324 354422
ERIOSEMA ELLIPTICIFOLIUM (FB)			5	341 3 255

<139> DIFFERENTIAL SPECIES OF COMMUNITIES 44 & 53 *

PROTEA CAFFRA (TR)			333	2 44
INEZIA INTEGRIFOLIA (FB)		3	33	55

<140> DIFFERENTIAL SPECIES OF COMMUNITIES 43-48 & 52-53 *

HELICHRYSUM "COMPLEX" (FB)			2 33	5342 3 5455
LOUDETIA DENSISPICA (GR)			333	3545 3 455
AESCHYNOMENE NYASSANA (FB)			553	3 43 23 2252
ALEPIDEA GRACILIS VAR.MAJOR (FB)			5 255	2 5 33 4 2
GLADIOLUS EXIGUUS (FB)		5	4 3	5225

<141> DIFFERENTIAL SPECIES OF COMMUNITIES 32 & 43-53 *

MONOCYMBIUM CERESIIFORME (GR)		23 3	3 5	55555 55 555
HELICHRYSUM PILOSELLUM (FB)		3 3	3	4355 33 455
ERAGROSTIS RACEMOSA (GR)		3 2	23	3515533 2455

<142> DIFFERENTIAL SPECIES OF COMMUNITIES 32 & 42-53 *

ANDROPOGON SCHIRENSIS #(GR)		5 3	3 5533	2545553555555
PANICUM NATALENSE (GR)		3	5533	2321 23334455

<143> DIFFERENTIAL SPECIES OF COMMUNITIES 21-24 & 26-53 *

LOUDETIA SIMPLEX (GR)	2	31 23 332245543 555	5325555	5555555355555
RHYNCHELYTRUM "COMPLEX" (GR)	1	1 43 1 3 2 423253 542	3345433	32 3 2
THEMEDA TRIANDRA (GR)		542523 3525253535	332 2 3	434555 355555
CLUTIA MONTICOLA (FB)		2 1 4 2 3	3 53	554332 3 242
HELICHRYSUM SP. (FB)	1	311 3 22 2	324 33	2 2 2
SENECIO OXYRIIFOLIUS (FB)		1 3 22 2	3 3	5 2 2

REFER TO APPENDIX B FOR FULL SPECIES NAME

FOR EXPLANATION OF "COMPLEX" SEE TEXT, SECTION 4.1.3

* SPECIES-GROUPS HAVING AFFINITY ACROSS ECOLOGICAL-FORMATIONS

DIGITS 1-5 IN MATRIX DENOTE CONSTANCY VALUES (CF. TEXT, SECTION 3.1.2.A)

GROWTH FORMS: TR=TREE; SH=SHRUB; LN=LIANOID; EP=EPIPHYTE; FB=FORB OR HERB; CY=SEDGE; GR=GRASS; PT=FERN (CF. TEXT, SECTION 3.1.1.B)

TABLE IVA HABITAT FACTORS RECORDED IN FOREST AND MESIC THICKET OF THE MISTBELT AND LOW COUNTRY, SABIE AREA

COMMUNITY NUMBER:	1	2	3.A	3.B	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	11							1				1 1		1111			111	11	111	11
RELEVE	11	999	77	88	6767	666	444566	945435	644	343335	55	258325	21	25659	34	331	32555	89	787	47
NUMBER:	64	542	95	01	0062	759	769684	755000	148	934874	21	783117	791	52871	22	6563	38415	83	096	02
V E G E T A T I O N																				
FORMATION																				
HIGH FOREST														+					+	
TALL FOREST	+		+	+	++++	+++	++ +++	+ +		+							+	++	++	+
SHORT FOREST	+	+++	+				+		+											
LOW FOREST									+		+									
SHORT THICKET								++ ++	+	+ + +	+	+ ++	+++	++ ++	++	++++	+ +++			+
LOW THICKET				+																
TALL CLOSED WOODLAND																				
SHORT CLOSED WOODLAND										+ +										
LOW CLOSED WOODLAND												+								
SHORT OPEN WOODLAND																				
LOW OPEN WOODLAND												+								
SHORT SPARSE WOODLAND																				
LOW SPARSE WOODLAND																				
SHORT CLOSED SHRUBLAND												+								
TALL OPEN SHRUBLAND																				
SHORT OPEN SHRUBLAND																				
TALL SPARSE SHRUBLAND																				
SHORT SPARSE SHRUBLAND																				
TALL CLOSED GRASSLAND																				
SHORT CLOSED GRASSLAND																				
LOW CLOSED GRASSLAND																				
COVER																				
95 - 100 PERCENT	+	+++	+		+	++	+ +	+ + +				+ +	+++	+ +		+	++++			
75 - 95 PERCENT	+		+	++	+++	+	+ + ++	+ ++	+++	++++++	++	++ +		+ + +	++	++	+	++	+++	++
50 - 75 PERCENT																+				
33 - 50 PERCENT												+								
DISTURBANCE																				
FIRE												+								
GRAZING																				
OLD LAND																				
P H Y S I O G R A P H Y																				
ZONE																				
MIDDLE MOUNTAINS																				
LOWER MOUNTAINS	++	+++																		

```
    PLATEAU INTERIOR                |  |   |  .  |    |   |      |      |   |      |  |      |   |     |  |    |     |  |   |  |
    PLATEAU CREST                   |  |   |++.++|    |   |      |      |   |      |  |+     |   |     |  |    |     |  |   |  |
    ESCARPMENT UPPER SLOPES         |  |   |  .  |++++|+++|    + |      |   |      |  |  +   |   |     |  |    |     |  |   |  |
    ESCARPMENT LOWER SLOPES         |  |   |  .  |    |   |+++  +|+++ ++|+++|     +|  | +  ++|   |     |  |    |     |  |   |  |
    UPPER FOOTHILLS                 |  |   |  .  |    |   |   +  |   +  |   |+++++ |++|   +  |+++|++ ++|++|++++|+ +++| +|   |  |
    LOWER FOOTHILLS                 |  |   |  .  |    |   |      |      |   |      |  |      |   |  +  |  |    | +   |+ |+++|++|
                                    --------------------------------------------------------------------------------------------
ALTITUDE
                                    --------------------------------------------------------------------------------------------
    1479 - 1600 METRES              |  |   |  .  |    |   |      |      |   |      |  |      |   |     |  |    |     |  |   |  |
    1356 - 1478 METRES              |  |   |++.++|    |   |      |      |   |      |  |      |   |     |  |    |     |  |   |  |
    1234 - 1355 METRES              |++|   |  .  |+ ++|   |      |+     |   |      |  |  +   |   |     |  |    |     |  |   |  |
    1112 - 1233 METRES              |  |   |  .  | +  |+++|    + |      |   |      |  |+     |   |     |  |    |     |  |   |  |
    990  - 1111  METRES            |  |+++|  .  |    |   |     +|      |+  |      |  |      |   |     |  |    |     |  |   |  |
    868  - 989   METRES            |  |   |  .  |    |   |+++   | ++ ++| ++| + +++|++| + +++|   |     | +| ++ |     | +|   |  |
    745  - 867   METRES            |  |   |  .  |    |   |   +  |   +  |   |+ +   |  |      |   |++ ++|+ |    |+ +++|  |   |  |
    623  - 744   METRES            |  |   |  .  |    |   |      |      |   |      |  |      |+++|     |  |+  +| +   |+ | + |+ |
    500  - 622   METRES            |  |   |  .  |    |   |      |      |   |      |  |      |   |  +  |  |    |     |  |+ +| +|
                                    --------------------------------------------------------------------------------------------
GEOMORPHOLOGY
                                    --------------------------------------------------------------------------------------------
    KNOLL                           |  |   |++.+ |    |   |      |      |   |      |  |      |   |+    |  |    |     |  |   |  |
    UPLAND TERRACE                  |  |   |  .  |    |   |      |      |   |      |  |      |   |     |  |    |     |  |   |  |
    UPPER PEDIMENT SLOPE            |  |+++|  .  | +++|   |      | +  ++|  +|  +  +|+ |++ +++|+ +|    +|++|+  +|     |  |   |+ |
    MIDSLOPE PLANE                  |  |   |  .  |    |   |  + + |+     |   |   +  |  |      |   | +   |  | ++ |     |  | + | +|
    LOWER PEDIMENT SLOPE            |+ |   |  .  |    |   | +    |  ++  |+  |+     | +|  +   | + |   + |  |    |   ++|  |   |  |
    KLOOF (DRY)                     |  |   |  .  |+   |+++|      |      | + |    + |  |      |   |     |  |    |  +  |  |   |  |
    STREAM BANK (WET)               | +|   |  . +|    |   |+  + +|      |   | +    |  |      |   |  +  |  |    |++   |++|+ +|  |
                                    --------------------------------------------------------------------------------------------
ASPECT
                                    --------------------------------------------------------------------------------------------
    MESOCLINAL (67 - 247 DEG)       | +|+++|+ .+ |++++|+++|+ + ++|+   ++| ++| ++ + |++|  +   |+++|  +  |  |+   |  ++ |+ | ++|++|
    XEROCLINAL (248 - 66 DEG)       |+ |   | +. +|    |   | + +  | +++  |+  |+  + +|  |++ +++|   |++ ++|++| ++ |++  +| +|+  |  |
                                    --------------------------------------------------------------------------------------------
SLOPE
                                    --------------------------------------------------------------------------------------------
    LEVEL (0,0 - 3,5 DEG)           |  |   |+ .  |    |   |      |      |   |      |  |      |   |     |  |   +|  +  |  |   |  |
    GENTLE (3,5 - 17,5 DEG)         |+ |   | +.++| +  |  +|++  ++| +    |++ |+     |+ |  +   |   | ++++| +| ++ | + ++|++|+ +|  |
    MODERATE (17,5 - 36,5 DEG)      | +|+ +|  .  |  ++|++ |  ++  |+ ++++|  +| +++++| +| + +++|+++|+    |+ |+   |+    |  | + |++|
    STEEP (> 36,5 DEG)              |  | + |  .  |+   |   |      |      |   |      |  |+     |   |     |  |    |     |  |   |  |
                                    --------------------------------------------------------------------------------------------
EXPOSURE
                                    --------------------------------------------------------------------------------------------
    SHELTERED                       | +|+++|++. +|++++|+++|++++++|++++++|+++|++++++| +|      |+++| ++  |  |+   |+++++|++|+++|++|
    PARTIALLY SHELTERED             |+ |   |  .+ |    |   |      |      |   |      |+ |++ ++ |   |   ++|++|  ++|     |  |   |  |
    EXPOSED                         |  |   |  .  |    |   |      |      |   |      |  |  +  +|   |+    |  | +  |     |  |   |  |
                                    ============================================================================================
         G E O L O G Y
         -------------
LITHOLOGY
                                    --------------------------------------------------------------------------------------------
    TIMEBALL HILL SHALE & MUDSTONE  |  |   |  .  |    |   |      |      |   |      |  |      |   |     |  |    |     |  |   |  |
    OAKTREE DOLOMITE                |  |   |  .  |    |   |      |      |   |      |  |      |   |     |  |    |     |  |   |  |
    UPPER DOLOMITE                  |++|+++|  .  |    |   |      |      |   |      |  |      |   |     |  |    |     |  |   |  |
    BLACK REEF QUARTZITE            |  |   |++.++|    |   |      |      |   |      |  |+     |   |     |  |    |     |  |   |  |
    TRANSVAAL DIABASE               |  |   |  .  | +  |+ +|    + |      |+  |      |  |      |   |    +|  |   +|     |  |   |+ |
    NELSPRUIT GRANITE               |  |   |  .  |+ ++| + |++++ +|++++++| ++|++++++|++| +++++|+++|++++ |++|+++ |+++++|++|+++| +|
                                    --------------------------------------------------------------------------------------------
ROCK COVER
                                    --------------------------------------------------------------------------------------------
    < 1 PERCENT                     |  |   |     |    |   |      |      |   |      |  |      |   | + + |  |    |  +++| +|+ +| +|
```

```
   1 - 4 PERCENT                   |+ |   |  .  |  + |   |  +  +| ++ ++|+ +|   + +|++|  ++  |   |     |++| ++ |++   |  | + |  |
   5 - 34 PERCENT                  |  |   |  .  |++ +|  +| +  + |+  +  | + |+++ + |  |+   + |+++|  +  |  |+  +|     |+ |   |  |
   35 - 84 PERCENT                 | +|+++|  .  |    |++ |+  +  |      |   |      |  | +    |   |+    |  |    |     |  |   |+ |
   85 - 100 PERCENT                |  |   |++.++|    |   |      |      |   |      |  |     +|   |     |  |    |     |  |   |  |
                                   ============================================================================================

          S O I L
          -------
DEPTH
                                   --------------------------------------------------------------------------------------------
   SHALLOW (0 - 12 CM)             |  |   |  .  |    |   |      |      |   |      |  |      |   |     |  |    |     |  |   |  |
   FAIRLY SHALLOW (13 - 48 CM)     | +|+++| +.++|    |   |   +  |+     | + |      |  |++  ++|+ +|+ + +|  |   +|     |  |   |+ |
   FAIRLY DEEP (49 - 100 CM)       |+ |   |+ .  |++++|  +|++    | +++ +|   |+ + ++|  |   +  | + |     |++|++  | +   |+ |   |  |
   DEEP (> 100 CM)                 |  |   |  .  |    |++ |  + ++|    + |+ +| + +  |++|  +   |   | + + |  |  + |+ +++| +|+++| +|
                                   --------------------------------------------------------------------------------------------
PH
                                   --------------------------------------------------------------------------------------------
   WEAKLY ACID  A  HORIZON         |++|++ | +.++|++++|+++|++++++|++ + +|+++|++ +++|++|+++++ | + |+++++|++| +++|+ +++|+ | ++|++|
   STRONGLY ACID  A  HORIZON       |  |  +|+ .  |    |   |      |  + + |   |  +   |  |     +|+ +|     |  |+   | +   | +|+  |  |
                                   --------------------------------------------------------------------------------------------
   WEAKLY ACID  B  HORIZON         |++| ++|+ .  |++++|+++|++  ++|+ ++++|+ +|++++++|++| + ++ |+++|++ ++|++|++ +|+++++|+ |+  |+ |
   STRONGLY ACID  B  HORIZON       |  |   |  .  |    |   |  +   | +    |   |      |  |      |   |     |  |  + |     | +| ++| +|
                                   --------------------------------------------------------------------------------------------
TEXTURE
                                   --------------------------------------------------------------------------------------------
   SANDY  A  HORIZON               |  |   |  .  |    |   |      |      |   |      |  |      |   |     |  |    |     |  |   |  |
   LOAMY SAND  A  HORIZON          |  |   |  .  |    |   |      |      | + |      |  |+    +|   |     |  |    |     |  |   | +|
   SANDY LOAM  A  HORIZON          |  |  +|  .+ |    |   |      |    + |   |      |  |    + |   |     |  |    |     |  |   |  |
   SANDY CLAY LOAM  A  HORIZON     |++|++ |++. +|++++|+++|  + ++|+     |   |    + |  |  ++  |+  |+++++|+ |+ + | ++++|++|+++|+ |
   SANDY CLAY  A  HORIZON          |  |   |  .  |    |   |++    | + + +|+ +|++++ +|++| +    | ++|     | +| + +|+    |  |   |  |
   CLAY  A  HORIZON                |  |   |  .  |    |   |      |  +   |   |      |  |      |   |     |  |    |     |  |   |  |
                                   --------------------------------------------------------------------------------------------
   SANDY  B  HORIZON               |  |   |  .  |    |   |   +  |      |   |      |  |      |   |     |  |    |     |++|+  | +|
   LOAMY SAND  B  HORIZON          |  |   |  .  |    |   |      |      |   |      |  |      |   |     |  |    |     |  |   |  |
   SANDY LOAM  B  HORIZON          |  |   |  .  |    |   |      |      |   |      |  |    + |   |     |  |    |     |  |   |  |
   SANDY CLAY LOAM  B  HORIZON     |  |   |  .  |    |   | +    |  +   |   |   +++|  | +    | ++|     |  |    | +   |  |   |  |
   SANDY CLAY  B  HORIZON          |++| ++|+ .  |++  |+++|+ ++++|++ +++|   |++    |++|+  +  |+  |++ + |++|++++|  +++|  | ++|  |
   CLAY  B  HORIZON                |  |   |  .  |  ++|   |      |      |+ +|  +   |  |      |   |    +|  |    |+    |  |   |+ |
                                   --------------------------------------------------------------------------------------------
COLOUR
                                   --------------------------------------------------------------------------------------------
   BLACK  A  HORIZON               |  |   |++.++|    |   |     +|+    +| + |      |  |  +  +|   |     |  |    |     | +|   |  |
   GREY  A  HORIZON                |  |   |  .  |    |   |      |      |   |      |  | +    |   |+ +  |  |+   |     |  |   |  |
   BROWN  A  HORIZON               |++| + |  .  |++++|+++|+++++ | ++ + |+ +|++++++|++|+  ++ |+++| + + |++| +++| ++++|+ |+++|++|
   RED  A  HORIZON                 |  |+ +|  .  |    |   |      |   +  |   |      |  |      |   |    +|  |    |+   +|  |   |  |
                                   --------------------------------------------------------------------------------------------
   BLACK  B  HORIZON               |  |   |  .  |    |   |      |      |   |      |  |      |   |     |  |    |     |  |   |  |
   GREY  B  HORIZON                |  |   |  .  |    |   |     +|      |   |      |  |      |   |     |  |    |     |  |   | +|
   BROWN  B  HORIZON               |++| + |+ .  |   +| + |++    |++ + +|+  |+     |+ |++ ++ |   |+  ++| +|+ + | ++  |++|+++|+ |
   RED  B  HORIZON                 |  |  +|  .  |+++ |+ +|  + + |  + + |  +| +++++| +|      |+++| +   |+ | + +|+  + |  |   |  |
                                   ============================================================================================
        C L I M A T E
        -------------
BELT
                                   --------------------------------------------------------------------------------------------
   LOW COUNTRY                     |  |   |  .  |    |   |   +  |   +  |   |      |  |      |+++|+++++|  |+  +| ++++|++|+++|++|
   TRANSITIONAL MISTBELT           |  |   |  .  |    |   |+++  +|+++ ++|+++|++++++|++| + +++|   |     |++| ++ |+    |  |   |  |
   HUMID MISTBELT                  |++|+++|++.++|++++|+++|    + |      |   |      |  |+ +   |   |     |  |    |     |  |   |  |
                                   ============================================================================================
      L A N D   T Y P E
      -----------------
                                   --------------------------------------------------------------------------------------------
```

LAND TYPE AB 33B			.				+												
LAND TYPE AB 34C	++		.																
LAND TYPE AB 35A			.																
LAND TYPE AB 36A			.	++++	+++	++++++	++	+++	++	+	+++ ++			+	++				
LAND TYPE AB 37A			.				+++		++++	+	+	+++	+	+	+	+			
LAND TYPE AB 40A			.										+			+			
LAND TYPE AB 40B			.										+				+		
LAND TYPE AB 41A			.														+	+++	+
LAND TYPE AB 43A			.																
LAND TYPE AC 87A			.																
LAND TYPE AC 88A		+++	++.++																
LAND TYPE AC 88B			.																
LAND TYPE FA 331A			.										++		+	++ +			+
LAND TYPE FA 331B			.																

V E L D   T Y P E

8: N.E. MOUNTAIN SOURVELD	++	+++	++.++																
9: LOWVELD SOUR BUSHVELD			.	++++	+++	++++++	++++++	+++	++++++	++	++++++	+++	+++++	++	++++	+++++	++	+++	++

+ DENOTES PRESENCE

FOR EXPLANATION OF HABITAT FACTORS SEE TEXT, CHAPTERS 2 & 3

TABLE IVB HABITAT FACTORS RECORDED IN WOODLAND AND XERIC THICKET OF THE LOW COUNTRY, SABIE AREA

COMMUNITY NUMBER:	20	2.1	2.2	23	24	25	26	27	28	29	30	31	32	33	34	35	3.6	37	38
		A . B	A . B														A . B		
RELEVE NUMBER:	111111	11111.1111111	.	1 1	11 1111	1		1	1 1	111		11	11	11	1	11	.11	11	111
	444686	44883.4547446	121.22	62217	15718787	92		61	5 5	866		581	22	238	9	66	455.29	172	792
	294537	83518.5014766	845.13	90697	48574901	07	35	30	996	201	124	372	23	296	84	24	193.52	634	860
V E G E T A T I O N																			
FORMATION																			
HIGH FOREST																			
TALL FOREST																			
SHORT FOREST	+																		
LOW FOREST																			
SHORT THICKET	++ +++	+ . +	++.+	+ + +	+ +	++	+												
LOW THICKET			. +		+				++	+									
TALL CLOSED WOODLAND					+														
SHORT CLOSED WOODLAND		+++ +.++++++	+	+	+		+	+	+	+									
LOW CLOSED WOODLAND					+												+		
SHORT OPEN WOODLAND					++					+		++	++						
LOW OPEN WOODLAND				+				+			+++	+					+ .+	+	
SHORT SPARSE WOODLAND																+			
LOW SPARSE WOODLAND														++	+	+	+.	++	
SHORT CLOSED SHRUBLAND																			
TALL OPEN SHRUBLAND																	. +		
SHORT OPEN SHRUBLAND																			
TALL SPARSE SHRUBLAND														+	+				
SHORT SPARSE SHRUBLAND																			+++
TALL CLOSED GRASSLAND																			
SHORT CLOSED GRASSLAND																			
LOW CLOSED GRASSLAND																			
COVER																			
95 - 100 PERCENT			+ .	++		+	+	+	+	+	++	++	+	+	+				
75 - 95 PERCENT	++++++	++++ .+ + +	++.++	+ ++	++++ ++	+	+	+	+	+	+	+	+	++	+				
50 - 75 PERCENT		+. + +++			++				+	+						++	.+	+	
33 - 50 PERCENT																	+++. +	++	+++
DISTURBANCE																			
FIRE		++ +.		+ +	+ +	+				++		++	++	+++	+	+	+.+	+	
GRAZING		.++ ++							+										
OLD LAND											++				+	+			
P H Y S I O G R A P H Y																			
ZONE																			
MIDDLE MOUNTAINS																			
LOWER MOUNTAINS																			

```
    PLATEAU INTERIOR                  |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    PLATEAU CREST                     |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    ESCARPMENT UPPER SLOPES           |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    ESCARPMENT LOWER SLOPES           |      |     .       |   .  |     |        |  |  |  |   |   |   |   |++|   |  |  | + .+ |  +| ++|
    UPPER FOOTHILLS                   |    + |  ++ .       |  +.++| ++  |++ ++   |++|++|++|+++|+++| ++|+++|  |+ +|++|++|+ +. +|+  |   |
    LOWER FOOTHILLS                   |++++ +|++  +.+++++++|++ .  |+  ++|  +  +++|  |  |  |   |   |+  |   |  | + |  |  |   .  | + |+  |
                                      -------------------------------------------------------------------------------------------------
ALTITUDE
                                      -------------------------------------------------------------------------------------------------
    1479 - 1600 METRES                |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    1356 - 1478 METRES                |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    1234 - 1355 METRES                |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   | + |
    1112 - 1233 METRES                |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    990 - 1111  METRES                |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  | + .  |   |  +|
    868 - 989   METRES                |      |     .       |   .  |     |        |  |  |  |   |   |   |   |++|   | +|  |+ +.++|  +|   |
    745 - 867   METRES                |    + |   + .       |   .+ |  +  |   +    |++| +|  | ++|+++|   |++ |  |  +|  |  |   .  |   |   |
    623 - 744   METRES                |      |  + +.      +|+ +. +| + ++|++  +++ |  |+ |++|+  |   |+++|  +|  |++ |+ |++|   .  |+  |+  |
    500 - 622   METRES                |++++ +|++   .++++++ | + .  |+    |  +    +|  |  |  |   |   |   |   |  |   |  |  |   .  | + |   |
                                      -------------------------------------------------------------------------------------------------
GEOMORPHOLOGY
                                      -------------------------------------------------------------------------------------------------
    KNOLL                             |      |     .       |   .  |     |        |+ |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    UPLAND TERRACE                    |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    UPPER PEDIMENT SLOPE              |+   ++|+ +++.   + ++| ++.++|+++++|++ + +  |  |++| +| + |+++| ++| ++|++|+++|++| +|+++.++|+++|+++|
    MIDSLOPE PLANE                    | +++  | +   . ++ +  |   .  |     |  + + ++|  |  |+ |+ +|   |   |+  |  |   |  |+ |   .  |   |   |
    LOWER PEDIMENT SLOPE              |      |     .+      |+  .  |     |        | +|  |  |   |   |+  |   |  |   |  |  |   .  |   |   |
    KLOOF (DRY)                       |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    STREAM BANK (WET)                 |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
                                      -------------------------------------------------------------------------------------------------
ASPECT
                                      -------------------------------------------------------------------------------------------------
    MESOCLINAL (67 - 247 DEG)         |+++   | +   .+   + +|+  .+ |+   +|+ +  + +| +|  |++|   |++ |   | ++|  |   | +| +|   .  |  +|++ |
    XEROCLINAL (248 - 66 DEG)         |   +++|+ +++. +++ + | ++. +| +++ | + ++ + |+ |++|  |+++|  +|+++|+  |++|+++|+ |+ |+++.++|++ |  +|
                                      -------------------------------------------------------------------------------------------------
SLOPE
                                      -------------------------------------------------------------------------------------------------
    LEVEL (0,0 - 3,5 DEG)             |      |  +  .+      |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    GENTLE (3,5 - 17,5 DEG)           | +++ +| +   . + ++ +|+  .  |   + |  + ++++| +|  |++|+ +|+++|+  |+++|++|+++|++|++|+  . +| + |  +|
    MODERATE (17,5 - 36,5 DEG)        |+     |+  ++.  +  + | ++.++|+++ +|++ +    |+ |++|  | + |   | ++|   |  |   |  |  | ++.+ |+ +|++ |
    STEEP (> 36,5 DEG)                |    + |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
                                      -------------------------------------------------------------------------------------------------
EXPOSURE
                                      -------------------------------------------------------------------------------------------------
    SHELTERED                         | +++ +|+    .      +|+  .  |     |        | +|  |+ |   |   |   |   |  |   |  |  |   .  |   |   |
    PARTIALLY SHELTERED               |+   + | ++++.++++++ | ++.++|+ + +|  ++++++|+ |++|  |  +| ++|   | ++|  |   |  |  |   .  |   |   |
    EXPOSED                           |      |     .       |   .  | + + |++      |  |  | +|++ |+  |+++|+  |++|+++|++|++|+++.++|+++|+++|
                                      =================================================================================================
         G E O L O G Y
         -------------
LITHOLOGY
                                      -------------------------------------------------------------------------------------------------
    TIMEBALL HILL SHALE & MUDSTONE    |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    OAKTREE DOLOMITE                  |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    UPPER DOLOMITE                    |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    BLACK REEF QUARTZITE              |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
    TRANSVAAL DIABASE                 |++ +++|++ ++.  + +++|   .++|+ + +|  +   + | +|  |+ |   |+++|   |   |++|   |  |++|   .  |   |   |
    NELSPRUIT GRANITE                 |  +   |  +  .++ +   |+++.  | + + |++ +++ +|+ |++| +|+++|   |+++|+++|++|  +|++|  |+++.++|+++|+++|
                                      -------------------------------------------------------------------------------------------------
ROCK COVER
                                      -------------------------------------------------------------------------------------------------
    < 1 PERCENT                       |      |     .++     |   .  |     |       +|  |  |  |  +|   |+  |+  |++|   |+ |+ |   .  |   |   |
```

```
   1 - 4 PERCENT                   |  +   |++   .   +   |+  .  |   + |      + | +|  | +|+  |   | ++| ++|  |   | +| +|   .  |   |   |
   5 - 34 PERCENT                  |++ +++|  +++.  + +++| ++.  |+ + +| +++    |  |++|+ | + |+ +|   |   |  |+++|  |  |   .  |   |   |
   35 - 84 PERCENT                 |      |     .       |   .++| +   |+   ++  |  |  |  |   | + |   |   |  |   |  |  |   .+ |   |   |
   85 - 100 PERCENT                |      |     .       |   .  |     |        |+ |  |  |   |   |   |   |  |   |  |  |+++. +|+++|+++|
                                   =================================================================================================

           S O I L
           -------

DEPTH
                                   -------------------------------------------------------------------------------------------------
   SHALLOW (0 - 12 CM)             |      |     .  +    |   .  |+    |        |  |  |  |   |   |   |   |  |   |  |  |   . +|+  |   |
   FAIRLY SHALLOW (13 - 48 CM)     |++ +++|+++++.   ++++| + .++|+ +++|+++++++ | +| +|  |++ | + |   |   |  |++ | +|  |+ +.+ | ++|+  |
   FAIRLY DEEP (49 - 100 CM)       |  +   |     .       |+ +.  |     |        |  |  | +|   |+ +|   |   |++|  +|+ |  |   .  |   |   |
   DEEP (> 100 CM)                 |      |     .++     |   .  |     |       +|  |+ |  |  +|   |+++|+++|  |   |  |++|   .  |   |   |
                                   -------------------------------------------------------------------------------------------------
PH
                                   -------------------------------------------------------------------------------------------------
   WEAKLY ACID  A  HORIZON         | +++++|+++++. ++++++|+++.++|+++++| +++++++|++|  |+ |+ +|+++|  +|+++|++|+++|++|++|+ +.+ | + |+  |
   STRONGLY ACID  A  HORIZON       |+     |     .+      |   .  |     |+       |  |++| +| + |   |++ |   |  |   |  |  |   . +|   |   |
                                   -------------------------------------------------------------------------------------------------
   WEAKLY ACID  B  HORIZON         |  +   |     .+ +    |+++.+ |  + +|+     ++|  | +|++|+ +| ++| + |+++|+ |+  | +|++|   .  |   |   |
   STRONGLY ACID  B  HORIZON       |    + |     .       |   .  |     |   +    | +|+ |  |   |+  |+ +|   |  |   |+ |  |   .  |   |   |
                                   -------------------------------------------------------------------------------------------------
TEXTURE
                                   -------------------------------------------------------------------------------------------------
   SANDY  A  HORIZON               |      |   + .+      |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
   LOAMY SAND  A  HORIZON          |  +   |+    . + +   |  +.  |     |+    + +|+ |  |  |   |   |   |   |  |   |  |  |+ +.+ | + |   |
   SANDY LOAM  A  HORIZON          |      | +   .       |   .  | + + | +      |  |+ |  |   |   |   |   |+ |   |  |  |   . +|   |+  |
   SANDY CLAY LOAM  A  HORIZON     |++ +++|  + +.  + +++| + .  |+    |  + + + |  | +|++|+ +|+++|+++|+++| +|+++|  | +|   .  |  +|   |
   SANDY CLAY  A  HORIZON          |      |     .       |+  .++|  + +|   +    | +|  |  | + |   |   |   |  |   |++|  |   .  |   |   |
   CLAY  A  HORIZON                |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |+ |   .  |   |   |
                                   -------------------------------------------------------------------------------------------------
   SANDY  B  HORIZON               |      |     .+      |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
   LOAMY SAND  B  HORIZON          |      | +   .       |  +.  |     |+       |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
   SANDY LOAM  B  HORIZON          |      |     .       |   .  |     |        |  |  |  |   |   | + |   |  |   |  |  |   .  |   |   |
   SANDY CLAY LOAM  B  HORIZON     |      |  +  .       |   .  |     |        |  |++| +|   |   |   |   |  |+  |+ |  |   .  |   |   |
   SANDY CLAY  B  HORIZON          |  + + |     . +  +  |++ .+ |  + +|    +  +|++|  |  |+ +|   |  +| ++|++|  +| +| +|   .  |   |   |
   CLAY  B  HORIZON                |      |     .       |   .  |     |   +  + |  |  |+ |   |+++|+  |+  |  |   |  |+ |   .  |   |   |
                                   -------------------------------------------------------------------------------------------------
COLOUR
                                   -------------------------------------------------------------------------------------------------
   BLACK  A  HORIZON               |      |     .       |   .  |     | ++  +  |  |  |  |   |   |   |   |  |   |  |  |+ +.++|   |+  |
   GREY  A  HORIZON                |+     |     .  +    |+  .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
   BROWN  A  HORIZON               | +++  |+++++.++ ++++| ++.  |++ ++|+  ++ ++|++|+ |+ |+++|+ +|  +|+++|++| ++|+ |++|   .  | ++|   |
   RED  A  HORIZON                 |    ++|     .       |   .++|  +  |        |  | +| +|   | + |++ |   |  |+  | +|  |   .  |   |   |
                                   -------------------------------------------------------------------------------------------------
   BLACK  B  HORIZON               |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |  +|  |  |   .  |   |   |
   GREY  B  HORIZON                |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
   BROWN  B  HORIZON               |  + + | ++  .++  +  | ++.  |  + +|+   + ++|++| +|+ |+  |+  | + | + |  |   |  |+ |   .  |   |   |
   RED  B  HORIZON                 |      |     .       |+  .+ |     |   +    |  |+ | +|  +| ++|+ +|+ +|++|+  |++| +|   .  |   |   |
                                   =================================================================================================

        C L I M A T E
        -------------

BELT
                                   -------------------------------------------------------------------------------------------------
   LOW COUNTRY                     |++++++|+++++.+++++++|+++.++|+++++|++++++++|++|++|++|+++|+++|+++|+++|  |+++|++|++|+ +. +|++ |+  |
   TRANSITIONAL MISTBELT           |      |     .       |   .  |     |        |  |  |  |   |   |   |   |++|   |  |  | + .+ |  +| ++|
   HUMID MISTBELT                  |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
                                   =================================================================================================

      L A N D   T Y P E
      -----------------

                                   -------------------------------------------------------------------------------------------------
```

```
LAND TYPE AB 33B                 |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   | + |
LAND TYPE AB 34C                 |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
LAND TYPE AB 35A                 |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
LAND TYPE AB 36A                 |      |     .       |   .  |     |        |  |  |  |   |   |   |   |++|   |  |  |+  .+ |  +|  +|
LAND TYPE AB 37A                 |      |     .       |   .  |     |        |  |  | +|   | + |   |  +|  |   |+ |  | ++.  |   |   |
LAND TYPE AB 40A                 |      |     .       |   .  |     |        |  |  |  |   |   |   |+  |  |   |  |  |   .  |   |   |
LAND TYPE AB 40B                 |      |   + .       |   .  |     |        |  |  |  |   |   |   |   |  |+  |  |  |   . +|   |   |
LAND TYPE AB 41A                 |+ +   | ++  .+  ++  |   .  |+   +|  + +  +|  |  |  |   |   |   |   |  |   |  |  |   .  | + |   |
LAND TYPE AB 43A                 |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   | +|  |   .  |   |   |
LAND TYPE AC 87A                 |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
LAND TYPE AC 88A                 |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
LAND TYPE AC 88B                 |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
LAND TYPE FA 331A                | + +++|+   +. ++  ++|+++.++| +++ |++ + ++ | +|++|+ |+ +|+++|+++|   |  | + |  |++|   .  |+  |+  |
LAND TYPE FA 331B                |      |     .       |   .  |     |        |+ |  |  |   |   |   | + |  |  +|  |  |   .  |   |   |
                                 =================================================================================================

   V E L D   T Y P E
   -----------------

                                 -------------------------------------------------------------------------------------------------
8: N.E. MOUNTAIN SOURVELD        |      |     .       |   .  |     |        |  |  |  |   |   |   |   |  |   |  |  |   .  |   |   |
9: LOWVELD SOUR BUSHVELD         |++++++|+++++.+++++++|+++.++|+++++|++++++++|++|++|++|+++|+++|+++|+++|++|+++|++|++|+++.++|+++|+++|
                                 =================================================================================================
```

\+ DENOTES PRESENCE

FOR EXPLANATION OF HABITAT FACTORS SEE TEXT, CHAPTERS 2 & 3

TABLE IVC HABITAT FACTORS RECORDED IN WOODLAND
OF THE HUMID MISTBELT, SABIE AREA

COMMUNITY NUMBER:	39	40	41	42	43	4.4 A	. B
RELEVE NUMBER:	11	11	1	1	1111	1.	12
	33	11	990	909	2323	70.	10
	05	73	691	807	8167	47.	80
V E G E T A T I O N							
FORMATION							
HIGH FOREST							
TALL FOREST							
SHORT FOREST							
LOW FOREST							
SHORT THICKET							
LOW THICKET	+	+					
TALL CLOSED WOODLAND							
SHORT CLOSED WOODLAND							
LOW CLOSED WOODLAND			++		+		
SHORT OPEN WOODLAND							
LOW OPEN WOODLAND	+	+		+	+++	++	+
SHORT SPARSE WOODLAND							
LOW SPARSE WOODLAND			+				+
SHORT CLOSED SHRUBLAND							
TALL OPEN SHRUBLAND				+			
SHORT OPEN SHRUBLAND							
TALL SPARSE SHRUBLAND							
SHORT SPARSE SHRUBLAND							
TALL CLOSED GRASSLAND							
SHORT CLOSED GRASSLAND				+			
LOW CLOSED GRASSLAND							
COVER							
95 - 100 PERCENT		+					
75 - 95 PERCENT	++		+	+			+
50 - 75 PERCENT		+	++	++	++++	+	+
33 - 50 PERCENT						+	
DISTURBANCE							
FIRE	+				+++		
GRAZING							
OLD LAND							
P H Y S I O G R A P H Y							
ZONE							
MIDDLE MOUNTAINS		+				+	
LOWER MOUNTAINS		+					+

8

```
   PLATEAU INTERIOR                |  |  |   |   |    |  .  |
   PLATEAU CREST                   |  |  |++ |++ |+ ++|+ . +|
   ESCARPMENT UPPER SLOPES         |++|  |  +|  +| +  |  .  |
   ESCARPMENT LOWER SLOPES         |  |  |   |   |    |  .  |
   UPPER FOOTHILLS                 |  |  |   |   |    |  .  |
   LOWER FOOTHILLS                 |  |  |   |   |    |  .  |
                                   --------------------------
ALTITUDE
                                   --------------------------
   1479 - 1600 METRES              |  |  |   |   |    | +. +|
   1356 - 1478 METRES              |  | +|   |   |    |+ .  |
   1234 - 1355 METRES              |  |+ |   |   |    |  .+ |
   1112 - 1233 METRES              |++|  |   |   |++++|  .  |
   990 - 1111  METRES              |  |  |+++|+++|    |  .  |
   868 - 989   METRES              |  |  |   |   |    |  .  |
   745 - 867   METRES              |  |  |   |   |    |  .  |
   623 - 744   METRES              |  |  |   |   |    |  .  |
   500 - 622   METRES              |  |  |   |   |    |  .  |
                                   --------------------------
GEOMORPHOLOGY
                                   --------------------------
   KNOLL                           |  |  |   |   |    |  .  |
   UPLAND TERRACE                  |  |  |   |   |+ + |  .  |
   UPPER PEDIMENT SLOPE            |  | +|+++|+++|   +|++.++|
   MIDSLOPE PLANE                  |++|+ |   |   | +  |  .  |
   LOWER PEDIMENT SLOPE            |  |  |   |   |    |  .  |
   KLOOF (DRY)                     |  |  |   |   |    |  .  |
   STREAM BANK (WET)               |  |  |   |   |    |  .  |
                                   --------------------------
ASPECT
                                   --------------------------
   MESOCLINAL (67 - 247 DEG)       |  |+ |   |   | + +|  .++|
   XEROCLINAL (248 - 66 DEG)       |++| +|+++|+++|+ + |++.  |
                                   --------------------------
SLOPE
                                   --------------------------
   LEVEL (0,0 - 3,5 DEG)           |  |  |   |   |    |  .  |
   GENTLE (3,5 - 17,5 DEG)         |  |  |+  |   |+ + |++.  |
   MODERATE (17,5 - 36,5 DEG)      |++|++| ++|+++| + +|  .++|
   STEEP (> 36,5 DEG)              |  |  |   |   |    |  .  |
                                   --------------------------
EXPOSURE
                                   --------------------------
   SHELTERED                       |  |  |   |   |    |  .  |
   PARTIALLY SHELTERED             |++|++| ++|   |   +|  .  |
   EXPOSED                         |  |  |+  |+++|+++ |++.++|
                                   ==========================
        G E O L O G Y
        -------------
LITHOLOGY
                                   --------------------------
   TIMEBALL HILL SHALE & MUDSTONE  |  |  |   |   |    |  .  |
   OAKTREE DOLOMITE                |  |  |   |   |    |  .  |
   UPPER DOLOMITE                  |  |++|   |   |    | +.+ |
   BLACK REEF QUARTZITE            |++|  |+++|+++|++++|+ . +|
   TRANSVAAL DIABASE               |  |  |   |   |    |  .  |
   NELSPRUIT GRANITE               |  |  |   |   |    |  .  |
                                   --------------------------
ROCK COVER
                                   --------------------------
   < 1 PERCENT                     |  |  |   |   |    |  .  |
```

LAND TYPE AB 33B	+++				.		.	.	.
LAND TYPE AB 34C					.		.	+++.+++	.
LAND TYPE AB 35A					++.++	++	.	.	.
LAND TYPE AB 36A	+	++	+		. +		.	.	.
LAND TYPE AB 37A					.		.	.	.
LAND TYPE AB 40A					.		.	.	.
LAND TYPE AB 40B					.		.	.	.
LAND TYPE AB 41A					.		.	.	.
LAND TYPE AB 43A					.		.	.	.
LAND TYPE AC 87A					.		.	.	+++.+++
LAND TYPE AC 88A			+ +	+++++	.		.	.	.
LAND TYPE AC 88B					.		++.++	.	.
LAND TYPE FA 331A					.		.	.	.
LAND TYPE FA 331B					.		.	.	.

V E L D   T Y P E

8: N.E. MOUNTAIN SOURVELD			+ +	+++++	.		.	+++.+++	+++.+++
9: LOWVELD SOUR BUSHVELD	++++	++	+		++.+++	++	++.++	.	.

+ DENOTES PRESENCE

FOR EXPLANATION OF HABITAT FACTORS SEE TEXT, CHAPTERS 2 & 3

```
    1 - 4 PERCENT                       |++ +|  |+  |+  ++|  .  +| +|+ .+ |+ +.+++|++ .   |
    5 - 34 PERCENT                      |    |++| ++|     |  .   |+ |  .  | + .   |  +.++ |
    35 - 84 PERCENT                     |    |  |   |     |  .   |  |  .  |   .   |   .   |
    85 - 100 PERCENT                    |    |  |   |     |  .   |  |  .  |   .   |   .  +|
                                        ===================================================
            S O I L
            -------
DEPTH
                                        ---------------------------------------------------
    SHALLOW (0 - 12 CM)                 |   +|  |   |     |  .   |  |  .  |   .   |   .   |
    FAIRLY SHALLOW (13 - 48 CM)         | +  |++| ++| ++  |  .  +|++|  .+ |+++.+++|+++.+++|
    FAIRLY DEEP (49 - 100 CM)           |    |  |+  |+  ++|  .   |  |  .  |   .   |   .   |
    DEEP (> 100 CM)                     |+ + |  |   |     |++.++ |  |++. +|   .   |   .   |
                                        ---------------------------------------------------
PH
                                        ---------------------------------------------------
    WEAKLY ACID  A  HORIZON             |+++ |++| ++| +++ |++.+++|++| +.++|+++.+++|+++.+++|
    STRONGLY ACID  A  HORIZON           |    |  |   |     |  .   |  |  .  |   .   |   .   |
                                        ---------------------------------------------------
    WEAKLY ACID  B  HORIZON             |+++ | +| + | +++ |++.++ | +| +.++|+ +.++ |+++. ++|
    STRONGLY ACID  B  HORIZON           |    |  |   |     |  .   |  |  .  |   .   |   .   |
                                        ---------------------------------------------------
TEXTURE
                                        ---------------------------------------------------
    SANDY  A  HORIZON                   |    |  |   |     |  .   |  |  .  |   .   |   .   |
    LOAMY SAND  A  HORIZON              |    | +| + |   + |  .   |+ |  .  |   .   |   .   |
    SANDY LOAM  A  HORIZON              |    |  |  +|    +|  .   | +|+ .  | + .   |   .   |
    SANDY CLAY LOAM  A  HORIZON         |++++|+ |+  | ++  |++.++ |  | +. +|+ +.+++|+++.+++|
    SANDY CLAY  A  HORIZON              |    |  |   |     |  .  +|  |  .+ |   .   |   .   |
    CLAY  A  HORIZON                    |    |  |   |     |  .   |  |  .  |   .   |   .   |
                                        ---------------------------------------------------
    SANDY  B  HORIZON                   |    |  |   |     |  .   |  |  .  |   .   |   .   |
    LOAMY SAND  B  HORIZON              |    |  |   |     |  .   |  |  .  |   .   |   .   |
    SANDY LOAM  B  HORIZON              |    |  |   |     |  .   |  |  .  |   .   |   .   |
    SANDY CLAY LOAM  B  HORIZON         |    |  |   | +   |  .   | +|  .  |   .   |   .   |
    SANDY CLAY  B  HORIZON              |++  | +|++ |  +++|  .+  |  |++.++|  +.+++|+++. ++|
    CLAY  B  HORIZON                    |  + |  |   |     |++. + |  |  .  |+  .   |   .   |
                                        ---------------------------------------------------
COLOUR
                                        ---------------------------------------------------
    BLACK  A  HORIZON                   | +  |++| + | ++++|  .   |  |  .  |   .   |   .   |
    GREY  A  HORIZON                    |    |  |   |     |  .   |  |  .  |   .   |   .   |
    BROWN  A  HORIZON                   |+ ++|  |+ +|     |  .+  |++|++.++|+ +.+++|+++.+++|
    RED  A  HORIZON                     |    |  |   |     |++. ++|  |  .  | + .   |   .   |
                                        ---------------------------------------------------
    BLACK  B  HORIZON                   | +  |  |+  | +   |  .   |  |  .  |   .   |   .   |
    GREY  B  HORIZON                    |    |  |   |     |  .   |  |  .  |   .   |   .   |
    BROWN  B  HORIZON                   |  + |  | + |  +++|  .   | +|  .+ |   . + |+  . + |
    RED  B  HORIZON                     |+   | +|   |     |++.++ |  |++. +|+ +.+ +| ++.  +|
                                        ===================================================
          C L I M A T E
          -------------
BELT
                                        ---------------------------------------------------
    LOW COUNTRY                         |    |  |   |     |  .   |  |  .  |   .   |   .   |
    TRANSITIONAL MISTBELT               |++++|  |   |     |  .   |  |  .  |   .   |   .   |
    HUMID MISTBELT                      |    |++|+++|+++++|++.+++|++|++.++|+++.+++|+++.+++|
                                        ===================================================
        L A N D   T Y P E
        -----------------
```

TABLE IVD HABITAT FACTORS RECORDED IN GRASSLAND OF THE HUMID MISTBELT, SABIE AREA

```
                          |----|--|---|-----|--.---|--|--.--|---.---|---.---|
              COMMUNITY   | 45 |46|47 | 48  | 4.9   |50| 5.1 |  5.2  |  5.3  |
                 NUMBER:  |    |  |   |     |A . B  |  |A . B| A . B | A . B |
                          |----|--|---|-----|--.---|--|--.--|---.---|---.---|
                          |1111|  |   |     |  .   |  |11.11|111.111|111.111|
                 RELEVE   |9993|66|877|87778|88.999|88|23.33|111.011|000.000|
                 NUMBER:  |5896|32|413|27865|89.301|67|94.32|129.905|346.285|
                          ---------------------------------------------------
   V E G E T A T I O N
   -------------------
FORMATION
                          ---------------------------------------------------
   HIGH FOREST            |    |  |   |     |  .   |  |  .  |   .   |   .   |
   TALL FOREST            |    |  |   |     |  .   |  |  .  |   .   |   .   |
   SHORT FOREST           |    |  |   |     |  .   |  |  .  |   .   |   .   |
   LOW FOREST             |    |  |   |     |  .   |  |  .  |   .   |   .   |
                          ---------------------------------------------------
   SHORT THICKET          |    |  |   |     |  .   |  |  .  |   .   |   .   |
   LOW THICKET            |    |  |   |     |  .   |  |  .  |   .   |   .   |
                          ---------------------------------------------------
   TALL CLOSED WOODLAND   |    |  |   |     |  .   |  |  .  |   .   |   .   |
   SHORT CLOSED WOODLAND  |    |  |   |     |  .   |  |  .  |   .   |   .   |
   LOW CLOSED WOODLAND    |    |  |   |     |  .   |  |  .  |   .   |   .   |
   SHORT OPEN WOODLAND    |    |  |   |     |  .   |  |  .  |   .   |   .   |
   LOW OPEN WOODLAND      |   +|  |   |     |  .   |  | +.  |   .   |   .  +|
   SHORT SPARSE WOODLAND  |    |  |   |     |  .   |  |  .  |   .   |   .   |
   LOW SPARSE WOODLAND    |    |  |   |     |  .   |  |  .  |   .   |+  .   |
                          ---------------------------------------------------
   SHORT CLOSED SHRUBLAND |    |  |   |     |  .   |  |  .  |   .   |   .   |
   TALL OPEN SHRUBLAND    |    |  | + |     |  .   |  |  .  |   .  +|   .   |
   SHORT OPEN SHRUBLAND   |    |++|   |     |  .   |  |  .  |   .   |   .   |
   TALL SPARSE SHRUBLAND  |    |  |   |     |  .   |  |  .  | + .   |   .   |
   SHORT SPARSE SHRUBLAND |    |  |   |     |  .   |  |  .  |   .   |   .   |
                          ---------------------------------------------------
   TALL CLOSED GRASSLAND  |    |  |   |     |  .   |  |  .  |  +.   |   .   |
   SHORT CLOSED GRASSLAND |+++ |  |   |     |  .   |  |+ .++|+  .++ |   .   |
   LOW CLOSED GRASSLAND   |    |  |+ +|+++++|++.+++|++|  .  |   .   | ++.++ |
                          ---------------------------------------------------
COVER
                          ---------------------------------------------------
   95 - 100 PERCENT       |  ++|  |+  |    +|  .   |  |  . +|+ +.++ |+  .   |
   75 - 95  PERCENT       |++  |++|   |     | +.+  |  |++.+ |   .  +| + .++ |
   50 - 75  PERCENT       |    |  | ++|++++ |+ . ++|++|  .  | + .   |  +.  +|
   33 - 50  PERCENT       |    |  |   |     |  .   |  |  .  |   .   |   .   |
                          ---------------------------------------------------
DISTURBANCE
                          ---------------------------------------------------
   FIRE                   |+   |++|+++|++++ |++.++ |++|++.++|  +.  +|++ .  +|
   GRAZING                |    |  |   |     |  .   |  |  .  |   .   |   .   |
   OLD LAND               |    |  |   |     |  .  +|  |  .  |   .   |   .   |
                          ===================================================
   P H Y S I O G R A P H Y
   -----------------------
ZONE
                          ---------------------------------------------------
   MIDDLE MOUNTAINS       |    |  |   |     |  .   |  |  .  | + .   |+++.+++|
   LOWER MOUNTAINS        |    |  |   |     |  .   |  |  .  |+ +.+++|   .   |
```

```
    PLATEAU INTERIOR                 |    |  |   |     |++.++ |  | +.++|   .   |   .   |
    PLATEAU CREST                    |    |  |+ +|+++++|  .   |++|+ .  |   .   |   .   |
    ESCARPMENT UPPER SLOPES          |    |++| + |     |  .  +|  |  .  |   .   |   .   |
    ESCARPMENT LOWER SLOPES          |++++|  |   |     |  .   |  |  .  |   .   |   .   |
    UPPER FOOTHILLS                  |    |  |   |     |  .   |  |  .  |   .   |   .   |
    LOWER FOOTHILLS                  |    |  |   |     |  .   |  |  .  |   .   |   .   |
                                     ---------------------------------------------------
 ALTITUDE
                                     ---------------------------------------------------
    1479 - 1600 METRES               |    |  |   |     |  .   |  |  .  |   .   |   . + |
    1356 - 1478 METRES               |    |  |  +|+++++|  .   |  |  .  |   .   |+++.+ +|
    1234 - 1355 METRES               |    |++|++ |     |  .   |  | +.+ |+++.+++|   .   |
    1112 - 1233 METRES               |++++|  |   |     |++.   |  |+ . +|   .   |   .   |
    990 - 1111  METRES               |    |  |   |     |  .++ |++|  .  |   .   |   .   |
    868 - 989   METRES               |    |  |   |     |  .  +|  |  .  |   .   |   .   |
    745 - 867   METRES               |    |  |   |     |  .   |  |  .  |   .   |   .   |
    623 - 744   METRES               |    |  |   |     |  .   |  |  .  |   .   |   .   |
    500 - 622   METRES               |    |  |   |     |  .   |  |  .  |   .   |   .   |
                                     ---------------------------------------------------
 GEOMORPHOLOGY
                                     ---------------------------------------------------
    KNOLL                            |    |  |   |     |  .   |  |  .  |   .   |   .   |
    UPLAND TERRACE                   |    |  |+ +|++++ |  .   |  |+ .  |   .   |   .   |
    UPPER PEDIMENT SLOPE             |    |++| + |     |  .  +| +| +.+ | + .++ |+++.+++|
    MIDSLOPE PLANE                   |+  +|  |   |     |++.   |+ |  .  |+ +.  +|   .   |
    LOWER PEDIMENT SLOPE             | ++ |  |   |    +|  .++ |  |  . +|   .   |   .   |
    KLOOF (DRY)                      |    |  |   |     |  .   |  |  .  |   .   |   .   |
    STREAM BANK (WET)                |    |  |   |     |  .   |  |  .  |   .   |   .   |
                                     ---------------------------------------------------
 ASPECT
                                     ---------------------------------------------------
    MESOCLINAL (67 - 247 DEG)        |++++|++| + |   + |  .   |  | +.+ |  +. ++|++ .  +|
    XEROCLINAL (248 - 66 DEG)        |    |  |+ +|+++ +|++.+++|++|+ . +|++ .+  |  +.++ |
                                     ---------------------------------------------------
 SLOPE
                                     ---------------------------------------------------
    LEVEL (0,0 - 3,5 DEG)            | ++ |  |  +|   + |  .   |  |  .  |   .   |   .   |
    GENTLE (3,5 - 17,5 DEG)          |+   |  |++ |+++ +|++.++ |++|++.++|   .++ | ++. + |
    MODERATE (17,5 - 36,5 DEG)       |   +|++|   |     |  .  +|  |  .  |+++.  +|+  .+ +|
    STEEP (> 36,5 DEG)               |    |  |   |     |  .   |  |  .  |   .   |   .   |
                                     ---------------------------------------------------
 EXPOSURE
                                     ---------------------------------------------------
    SHELTERED                        |    |  |   |     |  .   |  |  .  |   .   |   .   |
    PARTIALLY SHELTERED              |   +|  |   |     |  .   |  |  .  |+  .   |   .   |
    EXPOSED                          |+++ |++|+++|+++++|++.+++|++|++.++| ++.+++|+++.+++|
                                     ===================================================
         G E O L O G Y
         -------------
 LITHOLOGY
                                     ---------------------------------------------------
    TIMEBALL HILL SHALE & MUDSTONE   |    |  |   |     |  .   |  |  .  |   .   |++ .  +|
    OAKTREE DOLOMITE                 |    |  |   |     |++.++ |  |  .  |   .   |   .   |
    UPPER DOLOMITE                   |    |  |   |     |  .   |  | +.++|+++.+++|  +.++ |
    BLACK REEF QUARTZITE             |   +|  |+ +|+++++|  .  +|++|+ .  |   .   |   .   |
    TRANSVAAL DIABASE                |    |  |   |     |  .   |  |  .  |   .   |   .   |
    NELSPRUIT GRANITE                |+++ |++| + |     |  .   |  |  .  |   .   |   .   |
                                     ---------------------------------------------------
 ROCK COVER
                                     ---------------------------------------------------
    < 1 PERCENT                      | +  |  |   | ++  |++.++ |  | +. +|   .   |   .   |
```

TABLE V SYNOPTIC CHART SHOWING MAJOR ENVIRONMENTAL RELATIONSHIPS IN THE SABIE AREA OF THE EASTERN TRANSVAAL ESCARPMENT

```
                          |--------------------|----------------------|-------|-------------|
                          |     (TABLE IIA)    |      (TABLE IIB)     |TBL IIC| (TABLE IID) |
                          |--------------------|----------------------|-------|-------------|
            ECOLOGICAL    |  FOREST AND MESIC  |        WOODLAND      |WOODLND|  GRASSLAND  |
            -FORMATION    |   THICKET OF THE   |   AND XERIC THICKET  |OF THE |   OF THE    |
                CLASS:    |   MISTBELT AND     |        OF THE        | HUMID |    HUMID    |
                          |    LOW COUNTRY     |      LOW COUNTRY     |MISTBLT|  MISTBELT   |
                          |--------------------|----------------------|-------|-------------|
             COMMUNITY    |          1111111111|2222222222223333333333|3444444|4444445555555|
               NUMBER:    |12334567890123456789|0112234567890123456678|9012344|5678990112233|
                          |  AB                | ABAB             AB  |     AB|    AB ABABAB|
                          |--------------------|----------------------|-------|-------------|
        TOTAL RELEVES     |                    |                      |       |             |
      PER COMMUNITY:      |23224366362635245232|6573258222333323223233|2233422|4235232223333|
                          -----------------------------------------------------------------

 V E G E T A T I O N
 -------------------
FORMATION
                          -----------------------------------------------------------------
   HIGH FOREST            |             1    2 |                      |       |             |
   TALL FOREST            |3 335552 1      1543|                      |       |             |
   SHORT FOREST           |353   1 2           |1                     |       |             |
   LOW FOREST             |        2 3         |                      |       |             |
                          -----------------------------------------------------------------
   SHORT THICKET          |       4233354554  3|511433253             |       |             |
   LOW THICKET            |   3                |    3 1   42          |33     |             |
                          -----------------------------------------------------------------
   TALL CLOSED WOODLAND   |                    |      1               |       |             |
   SHORT CLOSED WOODLAND  |         2          | 452 11 3322          |       |             |
   LOW CLOSED WOODLAND    |           1        |      1           2   |  4 2  |             |
   SHORT OPEN WOODLAND    |                    |      2    2 45       |       |             |
   LOW OPEN WOODLAND      |           1        |     1   3  52    232 |33 2453|2      3    2|
   SHORT SPARSE WOODLAND  |                    |                 3    |       |             |
   LOW SPARSE WOODLAND    |                    |               4332 4 |  2   3|           2 |
                          -----------------------------------------------------------------
   SHORT CLOSED SHRUBLAND |           1        |                      |       |             |
   TALL OPEN SHRUBLAND    |                    |                   3  |   2   |  2       2  |
   SHORT OPEN SHRUBLAND   |                    |                      |       | 5           |
   TALL SPARSE SHRUBLAND  |                    |               23     |       |         2   |
   SHORT SPARSE SHRUBLAND |                    |                     5|       |             |
                          -----------------------------------------------------------------
   TALL CLOSED GRASSLAND  |                    |                      |       |         2   |
   SHORT CLOSED GRASSLAND |                    |                      |   2   |4      3524  |
   LOW CLOSED GRASSLAND   |                    |                      |       |  45555    44|
                          -----------------------------------------------------------------
COVER
                          -----------------------------------------------------------------
   95 - 100 PERCENT       |353 2423   252 24   |   2 2 3332244323     | 3     |3 21    3442 |
   75 - 95  PERCENT       |3 3542435553 3531555|5434534333222343      |5 22  3|35  32 53 224|
   50 - 75  PERCENT       |               2    | 13   2   22     5 32 | 344533|  44345  2 22|
   33 - 50  PERCENT       |           1        |                  5345|     3 |             |
                          -----------------------------------------------------------------
DISTURBANCE
                          -----------------------------------------------------------------
   FIRE                   |           1        | 3   223   4 45533232 |3   4  |2554545552242|
   GRAZING                |                    |  3       2           |       |             |
   OLD LAND               |                    |            4   33    |       |     2       |
```

63

P H Y S I O G R A P H Y

ZONE

MIDDLE MOUNTAINS			3 3	2 55
LOWER MOUNTAINS	55		3 3	45
PLATEAU INTERIOR				54 35
PLATEAU CREST	55 1		44433	45 53
ESCARPMENT UPPER SLOPES	551 1		5 222	52 2
ESCARPMENT LOWER SLOPES	4551 3	5 2324		5
UPPER FOOTHILLS	11 551545543	12 25235555545 455432		
LOWER FOOTHILLS	1 1355	5354 33 2 2 22		

ALTITUDE

1479 - 1600 METRES			33	2
1356 - 1478 METRES	55		3 3	25 54
1234 - 1355 METRES	5 4 1 1	2	3 3	54 3355
1112 - 1233 METRES	251 1		5 5	5 5 33
990 - 1111 METRES	5 1 2	2 2	55	45
868 - 989 METRES	344454 33 3	5 3 452		2
745 - 867 METRES	11 2 43 4	11 31153 45 4 2		
623 - 744 METRES	5 31323	214334 352 52 435 22		
500 - 622 METRES	1 43	5252 12 2		

GEOMORPHOLOGY

KNOLL	53 1	3		
UPLAND TERRACE			3	44 3
UPPER PEDIMENT SLOPE	5 4 322354153 3	3434553 53254455535555	355255	52 23332455
MIDSLOPE PLANE	21 1 1 3 23	313 3 34 2 3	53 2	3 5 3 42
LOWER PEDIMENT SLOPE	3 12213121 2	12 3 2		3 1 4 3
KLOOF (DRY)	25 21 1			
STREAM BANK (WET)	3 3 3 1 1 254			

ASPECT

MESOCLINAL (67 - 247 DEG)	35335543435151 22345	31323233 5 4 4 33 24	3 3 5	5521 332442
XEROCLINAL (248 - 66 DEG)	3 33 2323 5 453332	343433335 525255335542	535535	44555334224

SLOPE

LEVEL (0,0 - 3,5 DEG)	3 21	11		3 21
GENTLE (3,5 - 17,5 DEG)	3 3522414131 433354	4132 143 5452555552322	2 35	2 4454555 442
MODERATE (17,5 - 36,5 DEG)	34 3425253451321 25	132454235 2 4 4344	55453 5	25 2 5224
STEEP (> 36,5 DEG)	2 2 1	1		

EXPOSURE

SHELTERED	35535555553 52 25555	4112 3 3		
PARTIALLY SHELTERED	3 3 34 253	245453435 24 4	554 2	2 2
EXPOSED	2 1 2	22 3425255555555	25455	4555555554555

G E O L O G Y

LITHOLOGY

TIMEBALL HILL SHALE & MUDSTONE				42
OAKTREE DOLOMITE				54
UPPER DOLOMITE	55		5 33	355524

64

```
    BLACK REEF QUARTZITE            |  55       1        |                      |5 55533|2 45 253     |
    TRANSVAAL DIABASE               |    241 2    1 2   3|543 5323 3 5   4 5    |       |             |
    NELSPRUIT GRANITE               |    4255455554545553|1135 243535 55525 5555|       |452          |
                                    -------------------------------------------------------------------
ROCK COVER
                                    -------------------------------------------------------------------
    < 1 PERCENT                     |             2  3343|  2   1   2 225 33    |       |2  254 33    |
    1 - 4 PERCENT                   |3   2 244252  532 2 |1212 113 32 44  33    |53     |4 23 2333454 |
    5 - 34 PERCENT                  |    422224 251 3 3  |5334 32 5324   5      |    2  | 54   3  2 24|
    35 - 84 PERCENT                 |35   42    1 1     3|    512    2       3  | 3243 5|             |
    85 - 100 PERCENT                |  55       1        |       3          5355| 4225  |            2|
                                    ===================================================================
            S O I L
            -------
DEPTH
                                    -------------------------------------------------------------------
    SHALLOW (0 - 12 CM)             |                    |  1  1             32 |   4 3 |2            |
    FAIRLY SHALLOW (13 - 48 CM)     |3535  112  443 2   3|553254533 42   43 4342|5352535|2542 25 35555|
    FAIRLY DEEP (49 - 100 CM)       |3 3 5224 4 12 5313  |1  4     3 4  523     | 3     |  23         |
    DEEP (> 100 CM)                 |     4314251 2 24353|  2   1 3 2 55   5    |       |3   54 53    |
                                    -------------------------------------------------------------------
PH
                                    -------------------------------------------------------------------
    WEAKLY ACID  A  HORIZON         |54355554555525544345|55555555 3452555554322|5355453|4543555355555|
    STRONGLY ACID  A  HORIZON       | 23    2 1 14  2132 |1 1   1 532 4       3 | 3    3|             |
                                    -------------------------------------------------------------------
    WEAKLY ACID  B  HORIZON         |543 5545455354545323|1 25322 3544253235    |33  4 3|4323543354454|
    STRONGLY ACID  B  HORIZON       |      11       2 343|1     133  24   3     |       |             |
                                    -------------------------------------------------------------------
TEXTURE
                                    -------------------------------------------------------------------
    SANDY  A  HORIZON               |                    | 11                   |       |             |
    LOAMY SAND  A  HORIZON          |        2  2       3|1122  23          432 |   24  | 321  3      |
    SANDY LOAM  A  HORIZON          | 2 3   1   1        | 1   21 3     3    3 2| 5423  | 21  33 2    |
    SANDY CLAY LOAM  A  HORIZON     |54535531 1 225334553|5232 12 35455535 3  2 |35   35|532254 334555|
    SANDY CLAY  A  HORIZON          |      2345514 331   |   25213  2     5     |3      |     2  3    |
    CLAY  A  HORIZON                |       1            |                 3    |       |             |
                                    -------------------------------------------------------------------
    SANDY  B  HORIZON               |      1          523|  1                   |       |             |
    LOAMY SAND  B  HORIZON          |                    | 1 2  1               |    2  |             |
    SANDY LOAM  B  HORIZON          |           1        |            2         |       |             |
    SANDY CLAY LOAM  B  HORIZON     |      11 3 14   1   | 1     53     23      |      3|   1  3      |
    SANDY CLAY  B  HORIZON          |543 3555 25223553 4 |2 243225  4 245233    |3      |3343 2 552554|
    CLAY  B  HORIZON                |    3   41   1  1  3|      2 3 522    3    | 3     |2   52   2   |
                                    -------------------------------------------------------------------
COLOUR
                                    -------------------------------------------------------------------
    BLACK  A  HORIZON               |  55  122  2    3   |      2           45 2|    3 3|2524         |
    GREY  A  HORIZON                |           1 2 2    |1 12                  |    2  |             |
    BROWN  A  HORIZON               |52  5553455352544355|3554 4453354255435  4 | 554253|4 4  25554555|
    RED  A  HORIZON                 | 4     1     1  2   |2   51  33 24  23     |5  2   |    54   2   |
                                    -------------------------------------------------------------------
    BLACK  B  HORIZON               |                    |               2      |       |2 21         |
    GREY  B  HORIZON                |      1            3|                      |       |             |
    BROWN  B  HORIZON               |523 22242134 3332553|2234 235332222   3    |    2 3|2 23  3 3 222|
    RED  B  HORIZON                 | 2  4422253 51332   |   23 1 3324445253    |33     |23  54 534442|
                                    ===================================================================
         C L I M A T E
         -------------
BELT
```

```
   LOW COUNTRY                     |      11    55 34555|55555555555555 5554342|       |             |
   TRANSITIONAL MISTBELT           |      455554  531   |              5   2324|       |5            |
   HUMID MISTBELT                  |5555551    2        |                      |5555555| 555555555555|
                                   ===================================================================
      L A N D   T Y P E
      -----------------
                                   -------------------------------------------------------------------
   LAND TYPE AB 33B                |       1            |                     2|       |4            |
   LAND TYPE AB 34C                |5                   |                      | 5    3|         55  |
   LAND TYPE AB 35A                |                    |                      |       |    545      |
   LAND TYPE AB 36A                |    55525235  33    |              5   2322|5 555  |252  2       |
   LAND TYPE AB 37A                |       3 43151321   |         32  2  3 4   |       |             |
   LAND TYPE AB 40A                |             1  1   |             2        |       |             |
   LAND TYPE AB 40B                |             1   3  | 1             2   3  |       |             |
   LAND TYPE AB 41A                |                 353|223  22             2 |       |             |
   LAND TYPE AB 43A                |                    |                3     |       |             |
   LAND TYPE AC 87A                |                    |                      |     33|           55|
   LAND TYPE AC 88A                | 555                |                      |     3 |  45         |
   LAND TYPE AC 88B                |                    |                      |       |       55    |
   LAND TYPE FA 331A               |             2 23  3|4235534353455  2 5  22|       |             |
   LAND TYPE FA 331B               |                    |       3     2 2      |       |             |
                                   ===================================================================
      V E L D   T Y P E
      -----------------
                                   -------------------------------------------------------------------
   8: N.E. MOUNTAIN SOURVELD       |5555                |                      | 5   55|  45     5555|
   9: LOWVELD SOUR BUSHVELD        |    5555555555555555|5555555555555555555555|5 555  |552 55555    |
                                   ===================================================================

FOR EXPLANATION OF HABITAT FACTORS SEE TEXT, CHAPTERS 2 & 3

DIGITS 1-5 IN MATRIX DENOTE CONSTANCY VALUES (CF. TEXT, SECTION 3.1.2.A)
```

TABLE VI ALPHABETICAL LIST OF SPECIES, SHOWING THEIR DISTRIBUTION IN THE SABIE AREA OF THE EASTERN TRANSVAAL ESCARPMENT

	(TABLE IIA)	(TABLE IIB)	TBL IIC	(TABLE IID)
ECOLOGICAL -FORMATION CLASS:	FOREST AND MESIC THICKET OF THE MISTBELT AND LOW COUNTRY	WOODLAND AND XERIC THICKET OF THE LOW COUNTRY	WOODLND OF THE HUMID MISTBLT	GRASSLAND OF THE HUMID MISTBELT
COMMUNITY	1111111111	2222222222223333333333	3444444	4444445555555
NUMBER:	12334567890123456789	0112234567890123456678	9012344	5678990112233
	AB	ABAB AB	AB	AB ABABAB
ABRUS LAEVIGATUS (LN)	2 1 213141 21 23	4332 1 2		
ABUTILON SONNERATIANUM (FB)		2		
ACACIA ATAXACANTHA (TR)	3 555555453543 3	5345534355442 2 2	3	
ACACIA CAFFRA (TR)		21 3223 2 2 2		
ACACIA DAVYI (TR)		1234312 4 2 4		
ACACIA MEARNSII (TR)			3	
ACACIA SP. (TR)	2	2 3		
ACALYPHA ANGUSTATA VAR.GLABRA (FB)			3	2 52
ACALYPHA CAPERONIOIDES (FB)			5	5
ACALYPHA PETIOLARIS (FB)		4345323 3		
ACALYPHA PUNCTATA (FB)		3 2		
ACALYPHA SP. (FB)				3
ACALYPHA WILMSII (FB)			5 423	554332 352
ACANTHOSPERMUM AUSTRALE (FB)		4 5	3 2	
ACHYRANTHES SICULA (FB)	13	1 3	3	
ACROTOME HISPIDA (FB)				54 3 2
ADENIA DIGITATA (LN)	1 3	1 22		
ADENIA GUMMIFERA #(LN)		1 3	3	
ADIANTUM CAPILLARIS-VENERIS (PT)	5 1 2			
AEOLLANTHUS REHMANNII (FB)		3	424	
AESCHYNOMENE NYASSANA (FB)			553	3 43 23 2252
AESCHYNOMENE REHMANNII (FB)				1
AESCHYNOMENE REHMANNII VAR.L.#(FB)			4	
AGATHISANTHEMUM BOJERI #(FB)		2 3		
AGERATUM CONYZOIDES (FB)		2		
AGRIMONIA ODORATA (FB)			3	
AGROSTIS LACHNANTHA (GR)				3
ALBIZIA VERSICOLOR (TR)		2		
ALBUCA SETOSA (FB)				2
ALECTRA SESSILIFLORA #(FB)				2
ALEPIDEA BASINUDA VAR.BASINUDA (FB)				1
ALEPIDEA GRACILIS VAR.MAJOR (FB)			5 255	2 5 33 4 2
ALLOPHYLLUS "COMPLEX"(TR)	3 2 1 2 43	1 1	3	
ALLOTEROPSIS SEMIALATA (GR)				3 4
ALOE ARBORESCENS (SH)	35		3	2
ALOE BARBETONIAE (FB)		4454312 4 2 4		
ALOE LONGIBRACTEATA (FB)	4			
ALOE PETRICOLA (FB)		45	25	
ALOE SP. (FB)	2 25	22	3	2 2
ALSOPHILA DREGEI (PT)	1 13			
ANDRACHNE OVALIS (GR)	1			
ANDROPOGON HUILLENSIS (GR)				3 3
ANDROPOGON SCHINZII (GR)		2 23 3		
ANDROPOGON SCHIRENSIS #(GR)		5 3	3 5533	2545553555555
ANEILEMA AEQUINOCTIALE (FB)	1 23			

67

ANNONA SENEGALENSIS (TR)	2	242 53535545 4 3 2		
ANSELLIA GIGANTEA (EP)		3 4		
ANTHERICUM ANGULICAULE (FB)				1
ANTHERICUM COOPERI (FB)				2
ANTHERICUM GALPINII (FB)		2		
ANTHERICUM GALPINII VAR.GALPINII (FB)				5
ANTHOCLEISTA GRANDIFLORA (TR)	1 21 2 352			
ANTHOSPERMUM AMMANIOIDES (SH)		3	5 4	
ANTIDESMA VENOSUM (TR)	2 1 3433433	33323235335442 3		
APODYTES DIMIDIATA #(TR)	5334 21 5312534432	21 35 2 2	2 33	2
ARGYROLOBIUM SPECIOSUM (FB)	1 2	3 2	3	2
ARGYROLOBIUM TRANSVAALENSE (FB)		1 1		
ARISTEA WOODII (FB)		3 22 2	2 3	4 24
ARISTIDA CONGESTA #(GR)		1 2		
ARISTIDA JUNCIFORMIS #(GR)			2	
ARTEMISIA AFRA (FB)			5	
ARTHROPTERIS MONOCARPA (PT)			4	
ASCLEPIAS CRASSINERVIS (FB)		2 2	3	2 552
ASCLEPIAS DREGEANA (FB)				2
ASPARAGUS ANGUSTICLADUS (SH)	3			
ASPARAGUS ASPARAGOIDES (LN)			3	
ASPARAGUS "COMPLEX" (SH)	2 1531 2	53355343 3 4 3	3	
ASPARAGUS FALCATUS (LN)	355555 1			
ASPARAGUS LARICINUS (SH)			3	
ASPARAGUS PLUMOSUS (SH)	5 44 1			
ASPARAGUS RACEMOSUS (SH)	1 3	111 2		
ASPARAGUS RIGIDUS (SH)			3	
ASPARAGUS VIRGATUS (SH)	5 35445545355 43	5135543353 22	2	
ASPLENIUM ANISOPHYLLUM (EP)	332			
ASPLENIUM INAEQUILATERALE (PT)	2			
ASPLENIUM LOBATUM (PT)	2			
ASPLENIUM LUNULATUM (PT)	3 5			
ASPLENIUM RUTIFOLIUM (EP)	3355112 1			
ASPLENIUM SPLENDENS (PT)	55554352	2		
ASPLENIUM VARIANS SSP.FIMBRIATUM (PT)	2			
ASTER COMPTONII (FB)			3 3	3 2
ASTER HARVEYANUS (FB)		2		
ASTER LYDENBURGENSIS (FB)				2
ASTER SP. (FB)		53		
ATHANASIA ACEROSA (FB)	1		3	5 43
ATHANASIA CALVA (FB)	3		5	2 2
ATHRIXIA PHYLICOIDES (FB)	1 2413	13 523 5545253 5	53	2
ATHYRIUM SCANDICINUM (PT)	2			
BARLERIA GUEINZII (FB)	3			
BARLERIA OVATA (FB)			35 43	3 5 44
BAUHINIA GALPINII (SH)	54 32343	5535545555544		
BECIUM OBOVATUM (FB)			3	52432
BEGONIA SP. (FB)	3		2	
BEHNIA RETICULATA (LN)	5 544521			
BEQUAERTIODENDRON M'MONTANUM #(SH)	4 45243524324343	3 23 55	554	
BERCHEMIA ZEYHERI (TR)	23	11		
BERKHEYA ECHINACEA #(FB)	1	2		2
BERKHEYA INSIGNIS (FB)		3 2 4 3	5	2 2 3 22
BERKHEYA LATIFOLIA (FB)			3	
BERKHEYA SETIFERA (FB)		2		
BERKHEYA SP. (FB)	2	3		442
BERSAMA TRANSVAALENSIS (TR)	3 3		2	
BERSAMA TYSONIANA (TR)	1			
BEWSIA BIFLORA (GR)			2	2 355 2
BIDENS KIRKII (FB)			2	

BIDENS PILOSA (FB)	1 2	2	4	
BLECHNUM GIGANTEUM (PT)	21			
BLECHNUM TABULARE (PT)	1		2 5	2 2
BLOTIELLA GLABRA (PT)	1			
BLUMEA ALATA (FB)		231 54 3	3	
BOOPHANE DISTICHA (FB)			5 2	2
BORRERIA NATALENSIS (FB)			2	
BOTHRIOCHLOA GLABRA (GR)		3 1 42 35		
BOWKERIA CYMOSA (TR)			35 33	
BRACHIARIA BRIZANTHA (GR)		3		
BRACHIARIA FILIFOLIA (GR)				2
BRACHIARIA SERRATA #(GR)		4		3
BRACHIARIA SUBULIFOLIA (GR)				52
BRACHYLAENA DISCOLOR #(TR)	2 242551 1322	3 2		
BREONADIA SALICINA (TR)	21 132			
BRIDELIA MICRANTHA (TR)	325534255554	1 2235 224 25		
BROWNLEEA CAERULEA (FB)		2		
BUCHNERA DURA (FB)				2
BUCHNERA LONGESPICATA (FB)		1		
BUDDLEIA AURICULATA (SH)	4			
BUDDLEIA SALVIIFOLIA (SH)			3	
BULBOPHYLLUM SANDERSONII (EP)	5			
BULBOSTYLIS BURCHELLII (CY)		1	22	
BULBOSTYLIS ORITREPHES (CY)			2	3
BULBOSTYLIS SCHOENOIDES (CY)				355555
BULBINE SP. (FB)		1 1		
BURCHELLIA BUBALINA (TR)			3	2
CALPURNIA AUREA (TR)	34			
CANTHIUM CILIATUM (TR)	3 522	1		
CANTHIUM GILFILLANII (TR)		2		
CANTHIUM GUEINZII (LN)	3 34 532 3323			
CANTHIUM HUILLENSE (TR)	5			
CANTHIUM INERME (TR)	3 312335 1341	1 133 4 4 2	423	
CANTHIUM LOCUPLES (TR)	3			
CANTHIUM MUNDIANUM (TR)		222 3	4	
CANTHIUM OBOVATUM (TR)	2			
CANTHIUM SP. (TR)		2		
CAPPARIS BRASSII (FB)	1			
CAPPARIS SEPIARIA VAR.SUBGLABRA (LN)	2			
CAREX SPICATO-PANICULATA (CY)	5 2344554454552	2 5 2 2 2		
CARISSA BISPINOSA (SH)	4 5455 2 21 2			
CASSIA BICAPSULARIS (LN)	1			
CASSIA FLORIBUNDA (SH)	1 1	1		
CASSIA MIMOSOIDES (FB)				3
CASSIA PETERSIANA (SH)	2 2	23345143 3 2 3 3		
CASSIA PLUMOSA VAR.ERECTA (FB)				2
CASSIA QUARREI (FB)		4		
CASSINOPSIS ILICIFOLIA (TR)	55 23 13			
CASSIPOUREA GERRARDII (TR)	3 3			
CATHA EDULIS (TR)	42 22 2	2 12 1 5		
CELTIS AFRICANA (TR)	1 3 2 55	41343 15		
CEPHALANTHUS NATALENSIS (LN)	3 25232252 213	4	2 3	2 3
CEPHALARIA PUNGENS (FB)		3 3	5	3324 354422
CERATOTHECA TRILOBA (FB)	1	1 55 2		5
CEROPEGIA MEYERI (LN)			2	
CEROPEGIA RACEMOSA SSP.SETIFERA (LN)	1			
CEROPEGIA SP. (LN)		1		
CEROPEGIA WOODII (LN)	5		2	
CHAETACANTHUS BURCHELLII (FB)		312 1 2		
CHEILANTHES CONCOLOR (PT)	3			

CHEILANTHES HIRTA (PT)	3	1		
CHEILANTHES VIRIDIS VAR.GLAUCA (PT)	1		2	
CHIONANTHUS FOVEOLATA #(TR)	23			
CHLOROPHYTUM SP. (FB)			3	
CHORISTYLIS RHAMNOIDES (TR)	2 2	2		
CISSAMPELOS TORULOSA (LN)	55 3 24253123333523	511452353 2		
CITRUS SP. (TR)	1 2			
CLAUSENA ANISATA (TR)	55 1 2	3		
CLEISTACHNE SORGHOIDES (GR)		3		
CLEMATIS BRACHIATA (LN)	2 3 1		3	
CLERODENDRUM GLABRUM #(TR)	5 2	1	2	
CLERODENDRUM MYRICOIDES (TR)	3 2	13 2		
CLERODENDRUM SP. (TR)		1 2	3	
CLERODENDRUM SUFFRUTICOSUM #(SH)	1			
CLIFFORTIA NITIDULA SSP.PILOSA (SH)			2 3	
CLIFFORTIA REPENS (SH)				5
CLIVIA CAULESCENS (FB)	533			
CLUTIA ABYSSINICA #(FB)		3		
CLUTIA HIRSUTA (FB)	2			
CLUTIA MONTICOLA (FB)		2 1 4 2 3	3 53	554332 3 242
CNESTIS NATALENSIS (TR)	3 2 442151		2	
COCCINIA PALMATA (LN)	32			
COCCULUS HIRSUTUS (LN)		1		
COLEOCHLOA SETIFERA (CY)		1 25	2	2
COMBRETUM APICULATUM #(TR)		1 11		
COMBRETUM COLLINUM SSP.GAZEN.#(TR)		32 1		
COMBRETUM COLLINUM SSP.SULUE.#(TR)	1	2545333 2		
COMBRETUM KRAUSSII (TR)	334454425121	3		
COMBRETUM MOLLE (TR)	34 32 32	231433335345443 3452	5 2	
COMBRETUM SP. (TR)	1			
COMBRETUM ZEYHERI (TR)		1232 23		
COMMELINA AFRICANA VAR.KREBSIANA (FB)				21 3
COMMELINA AFRICANA VAR.LANCI.#(FB)		11		
COMMELINA ECKLONIANA (FB)				1
COMMELINA LIVINGSTONII (FB)	21 2	2		
COMMELINA SP. (FB)	3 5 3 3	13 23	2445	4
CONOSTOMIUM NATALENSE #(FB)		3	5	
CONYZA FLORIBUNDA (FB)		3 4	3 2	
CORCHORUS CONFUSUS (FB)		2		
CORCHORUS SP. (FB)		2		
CRABBEA HIRSUTA (FB)		11 3 4 25 3		3 2
CRASSULA ACINACIFORMIS (FB)		11		
CRASSULA ALBA "COMPLEX" (FB)		23 2	5555	3 21 2
CRASSULA GLOBULAROIDES (FB)	3		3	
CRASSULA NATALENSIS (FB)	1	43	23	4
CRASSULA PELLUCIDA #(FB)	1 2			
CRASSULA SARCOCAULIS #(FB)	3	2	3	2
CRASSULA SP. (FB)				23
CRASSULA VAGINATA (FB)				2 242
CRINUM SP. (FB)		2		
CROCOSMIA AUREA (FB)	3			
CROTALARIA CAPENSIS (SH)	1			
CROTALARIA RECTA (SH)	2	3		
CRYPTOLEPIS OBLONGIFOLIA (FB)	2	21 1 5 2224323 23	3 54	23
CTENIUM CONCINNUM (GR)			3	2
CTENOMERIA CAPENSIS (LN)	2			
CUCUMIS PROPHETARUM (LN)				2
CUCUMIS SP. (LN)		3		
CUSCUTA SP. (FB)		21 5 3 2 4		
CUSSONIA SPICATA (TR)	5 345424 123532325	55325123 32 4 2 2 2	352 2	2
CYANOTIS LANATA (FB)		1		

CYANOTIS LAPIDOSA (FB)			42	
CYANOTIS PACHYRRHIZA (FB)	5		23	
CYANOTIS SPECIOSA (FB)		2		52 43
CYATHULA CYLINDRICA (SH)	1 1 2		2	
CYMBOPOGON "COMPLEX" (GR)	2	2 12 352544345 2	55242 5	2 2 52 555
CYNANCHUM ELLIPTICUM (LN)		1		
CYPERUS ALBOSTRIATUS (CY)	2 1 3 12 2		24 3	
CYPERUS IMMENSUS (CY)	3			
CYPERUS LEPTOCLADUS (CY)	3		443	3
CYPERUS OBTUSIFLORUS #(CY)				4
CYPERUS PSEUDOLEPTOCLADUS (CY)	3545534 51 1 23			2
CYPERUS SEMITRIFIDUS (CY)				5
CYPERUS SEXANGULARIS (CY)	2			
CYPERUS SP. (CY)	5 1 23	1 1		
CYPHIA ELATA "COMPLEX" (FB)		3	5 42	4
CYPHOSTEMMA ANATOMICUM (LN)	4 1	2	3	
CYPHOSTEMMA SIMULANS (LN)		1		
CYPHOSTEMMA WOODII (LN)	1	2		
CYRTANTHUS BICOLOR (FB)				2
DALBERGIA ARMATA (LN)	4455255444534555	31 3 4		
DALECHAMPIA CAPENSIS (LN)	1 3			
DESMODIUM DREGEANUM (SH)		3		
DESMODIUM HIRTUM (FB)		3		5
DESMODIUM NATALITIUM (FB)		12		
DESMODIUM REPANDUM (SH)	5 25121 1 2132			
DICHROSTACHYS CINEREA "COMP" #(TR)		1444333 4 24 235 2		
DICLIPTERA CLINOPODIA (SH)	4 3 41 1 121 34	1 3		
DICOMA ANOMALA SSP.CIRSIOIDES (FB)				22
DICOMA ZEYHERI (FB)		5 22	2	2 2
DICRANOPTERIS LINEARIS (PT)	2			
DIERAMA SP. (FB)				3 3 3
DIETES IRIDIOIDES (FB)	3 3214 3 1 3 42343	1		
DIGITARIA APICULATA (GR)				34
DIGITARIA DIAGONALIS (GR)			3	2
DIGITARIA MONODACTYLA (GR)				5 2
DIGITARIA TRICHOLAENOIDES (GR)				1
DIHETEROPOGON AMPLECTENS (GR)		4		
DIHETEROPOGON FILIFOLIUS (GR)			2	
DIOSCOREA "COMPLEX" (LN)	4 211225422 22355	514 22 53 4 4	3	
DIOSCOREA DREGEANA VAR.HUTCHINSONII (LN)			2	
DIOSPYROS GALPINII (FB)		5	3 5	4 55 5552
DIOSPYROS LYCIOIDES #(TR)	35 423424 523	5535544535552432334522	554223	332 2 2
DIOSPYROS MESPILIFORMIS (TR)		13		
DIOSPYROS WHYTEANA (SH)	54 3 33455355555553	5 2 33255 4 52 232	32 3	
DIPCADI MARLOTHII (FB)				45
DISPERIS FANNINIAE (FB)	3			
DISSOTIS PHAEOTRICHA #(FB)		3		2
DOMBEYA PULCHRA (SH)	4 1 5 1 31 4	1 1 2	2	
DOMBEYA ROTUNDIFOLIA #(TR)	1 2	5555544 324 2 5		
DOVYALIS LUCIDA (TR)	55 1			
DOVYALIS ZEYHERI (TR)	2			
DRACAENA HOOKERANA (SH)	3 5425 1			
DROSERA SP. (FB)				2
DRYOPTERIS ATHAMANTICA (PT)				2 3
DRYOPTERIS INAEQUALIS (PT)	355 2			
DRYOPTERIS SP. (PT)	2			
DRYPETES GERRARDII (TR)	3			
DUMASIA VILLOSA VAR.VILLOSA (LN)	5			
DYSCHORISTE DEPRESSA (FB)		3		

EHRETIA AMOENA (SH)		12		
EHRHARTA ERECTA (GR)	2 1		32	
EKEBERGIA CAPENSIS (TR)	1			
EKEBERGIA PTEROPHYLLA (TR)	55 3		23	
ENDOSTEMON OBTUSIFOLIUS (SH)	1 52	3		
ENTADA SPICATA (LN)	22 2	2		
ERAGROSTIS CAESIA (GR)				1
ERAGROSTIS CAPENSIS (GR)		2		5 2355
ERAGROSTIS CURVULA (GR)		2 1 4 23	2 33	543343
ERAGROSTIS GUMMIFLUA (GR)				3
ERAGROSTIS HIERNIANA (GR)		3		3
ERAGROSTIS RACEMOSA (GR)		3 2	23	3515533 2455
ERAGROSTIS SCLERANTHA #(GR)		2	43	2
ERAGROSTIS SP. (GR)		1		
ERIANTHEMUM DREGEI (EP)	1	5		
ERICA DRAKENSBERGENSIS (SH)			33	2 4 4
ERICA WOODII (SH)				2
ERIOSEMA ANGUSTIFOLIUM (FB)				2 22 55 2
ERIOSEMA BURKEI (FB)				2
ERIOSEMA CORDATUM (FB)				34
ERIOSEMA ELLIPTICIFOLIUM (FB)			5	341 3 255
ERIOSEMA GUNNIAE (FB)		5		2 332
ERIOSEMA NUTANS (FB)				5
ERIOSEMA PSORALEOIDES (FB)		1 3		
ERIOSPERMUM BURCHELLII (FB)		2		34
ERIOSPERMUM COOPERI (FB)		3		1
ERIOSPERMUM SP. (FB)		2	5	
ERYTHRINA LATISSIMA (TR)			3 2	
ERYTHRINA LYSISTEMON (TR)	2 23 3 3	1 3 2	2	
EUCLEA "COMPLEX" (TR)	3 222355233533	443 33353545 2 2	3	
EUCLEA NATALENSIS (TR)	1	1 23		
EUGENIA NATALITIA (TR)	2 34 3 3 1			
EULALIA VILLOSA (GR)	1	33 425 3	53 22 5	45 54 3555
EULOPHIA STREPTOPETALA (FB)	2 2	411	4	
EUPHORBIA INGENS (TR)		211 1 2		
EUPHORBIA KRAUSSIANA (FB)	1			
EUPHORBIA STRIATA (FB)				2
EURYOPS PEDUNCULATUS (FB)			2	3
EURYOPS TRANSVAALENSIS #(FB)				1 2
FADOGIA MONTICOLA (FB)			2	
FADOGIA SP. (FB)		2		
FADOGIA TETRAQUETRA (FB)		3 3	5 243	2 52 33
FAUREA SALIGNA (TR)	2 1	12 32 5 4 5		
FAUREA SPECIOSA (TR)	22 2	21 312 53242 2	5 22 3	2 4
FESTUCA COSTATA (GR)				1
FICINIA BERGIANA (CY)				2
FICINIA SP. (CY)		2		
FICUS BURKEI (TR)	5 3 11 121 5	1 13 5	22	
FICUS CAPENSIS (TR)	5 23 2 33 254	113 24 2		
FICUS INGENS (TR)	1 3	2	5 2	
FLACOURTIA INDICA (TR)		2		
FLEMINGIA GRAHAMIANA (FB)	1 4324354332	5554445 33	55 3	354
FLOSCOPA GLOMERATA (FB)	3			
GALOPINA ASPERA (FB)			5	2
GALOPINA CIRCAEOIDES (FB)	5 1143544234332	1 232 33	33	
GARDENIA AMOENA (TR)	1 21 1 45	3 3		
GEIGERIA BURKEI VAR.ELATA #(FB)		1 1 2 2		
GEIGERIA BURKEI VAR.HIRTELLA #(FB)				2
GERBERA AMBIGUA (FB)				1

GERBERA AURANTIACA (FB)	1	1 3 1 5 5 2	53 3	4254 3322
GERBERA JAMESONII (FB)	2 1	21 113 4 3 25		
GERBERA SPECIOSA (FB)		1		
GLADIOLUS DENSIFLORUS (FB)		1 1 4 2 233	5	4 4
GLADIOLUS ECKLONII #(FB)		2	2	2 3
GLADIOLUS EXIGUUS (FB)		5	4 3	5225
GLADIOLUS SP. (FB)		2 11 2 4	3 3	2 5
GLYCINE WIGHTII (LN)	1	531 3		
GNIDIA CAFFRA (FB)		33 22		
GNIDIA KRAUSSIANA (FB)		4		
GNIDIA MICROCEPHALA (FB)				3
GNIDIA SP. (FB)		2		3 44
GREWIA MONTICOLA (TR)		11		
GREWIA OCCIDENTALIS (SH)	52 2 23 2 23 154	3 32233 2 2 2	54 2	
GREYIA RADLKOFERI (TR)	3533	2	3 33	
HAEMANTHUS CARNEUS (FB)			3	
HAEMANTHUS SP. (FB)				2
HALLERIA LUCIDA (TR)	3 1 13 13	2	32	
HAPLOCARPHA SCAPOSA (FB)		22 3 3 2		354354 3 2 2
HARPOCHLOA FALX (GR)				343
HELICHRYSUM ADENOCARPUM #(FB)			3	2
HELICHRYSUM AUREO-NITENS (FB)				5 3 53 2
HELICHRYSUM AUREUM VAR.MONOCEPHALUM (FB)				1
HELICHRYSUM CEPHALOIDEUM (FB)				3
HELICHRYSUM CHRYSARGYRUM (FB)		2	3	
HELICHRYSUM "COMPLEX" (FB)			2 33	5342 3 5455
HELICHRYSUM COOPERI (FB)			24	
HELICHRYSUM CORIACEUM (FB)				3
HELICHRYSUM KRAUSSII (FB)	1	3 53	45	
HELICHRYSUM MIMETES (FB)		3	235	5 2
HELICHRYSUM MIXTUM (FB)		3		4
HELICHRYSUM NUDIFOLIUM #(FB)	1 13	41 3223552444323	53	4 4232 452
HELICHRYSUM ODORATISSIMUM (FB)	1 2	3 2		2
HELICHRYSUM PALLIDUM (FB)			3 3	
HELICHRYSUM PANDURATUM #(FB)	22312 4	11 2 5	3 3	2 21 2
HELICHRYSUM PILOSELLUM (FB)		3 3	3	4355 33 455
HELICHRYSUM PLATYPTERUM (FB)				2 322
HELICHRYSUM REFLEXUM (FB)			3	2
HELICHRYSUM SP.NOV.1 (FB)				2 4
HELICHRYSUM SP.NOV.2 (FB)			3	
HELICHRYSUM SP.NOV.3 (FB)				1
HELICHRYSUM SP. (FB)	1	311 3 22 2	324 33	2 2 2
HELICHRYSUM SUBULIFOLIUM (FB)				32
HELICHRYSUM UMBRACULIGERUM (FB)			33	2 2
HELICHRYSUM WILMSII (FB)			3	3
HEMIZYGIA CANESCENS (FB)		1 2 32	22	
HEMIZYGIA SUBVELUTINA (FB)				4523 3
HEMIZYGIA TRANSVAALENSIS (FB)		4	55 2	1 253 54
HERMANNIA GRANDIFLORA (FB)		2 2 3	3	
HERMANNIA LANCIFOLIA (FB)				34
HERMANNIA MONTANA (FB)			3	22
HETEROMORPHA ARBORESCENS (TR)	2		2	
HETEROMORPHA PUBESCENS (SH)		2	3	4
HETEROMORPHA SP. (SH)		2		
HETEROMORPHA TRANSVAALENSIS (FB)			3	
HETEROPOGON CONTORTUS (GR)		22 11 2 235 34		23
HETEROPYXIS NATALENSIS (TR)	21 2132	4334 453534252 4 2 2	4	
HIBISCUS AETHIOPICUS VAR.OVATUS (FB)				34 2
HIBISCUS SURATTENSIS (FB)		2		
HOSLUNDIA OPPOSITA (FB)		1		

HYPARRHENIA ANAMESA (GR)			3	3
HYPARRHENIA CYMBARIA (GR)			3 3	
HYPARRHENIA DREGEANA (GR)			3	
HYPARRHENIA FILIPENDULA #(GR)	2	2 1 242 32 5	354	25 34
HYPARRHENIA GAZENSIS (GR)		53		
HYPARRHENIA HIRTA (GR)		3 3 2	5 24	543 2
HYPARRHENIA NEWTONII VAR.MACRA (GR)				3
HYPARRHENIA SP. (GR)	2	2		
HYPARRHENIA VARIABILIS (GR)		1 2		
HYPERICUM AETHIOPICUM SSP.SONDERI (FB)				3
HYPERTHELIA DISSOLUTA (GR)		1432 233 54 3555454	5	3
HYPOCHOERIS MICROCEPHALA #(FB)				2
HYPOESTES ARISTATA (SH)	2 2	12 23343 22		
HYPOESTES PHAYLOPSOIDES (SH)	5			
HYPOLEPIS SPARSISORA (PT)	53 1			
HYPOXIS "COMPLEX" (FB)		1 5 422 2	333	52 554
HYPOXIS FILIFORMIS (FB)				323
HYPOXIS GALPINII (FB)			2	3
HYPOXIS GERRARDII (FB)				2
HYPOXIS MULTICEPS (FB)				5
IBOZA "COMPLEX" (SH)	4 3	1 23 2 5352	4 2	
ILEX MITIS (TR)	2			
ILYSANTHES WILMSII (FB)		3		
IMPATIENS HOCHSTETTERI #(FB)	43			
INDIGOFERA COMOSA (SH)		2		
INDIGOFERA HILARIS (FB)		2		5
INDIGOFERA OXALIDEA (FB)		2 5	2	1 2
INDIGOFERA SANGUINEA (FB)				2252
INDIGOFERA SP. (FB)				5
INDIGOFERA SP.1 (FB)			3	54
INDIGOFERA SP.2 (FB)				45
INDIGOFERA SWAZIENSIS (SH)	3 2	2324 3235 42 32	55442 3	2 2 3 3 42
INDIGOFERA TRISTOIDES (SH)		3		2
INEZIA INTEGRIFOLIA (FB)		3	33	55
INULA GLOMERATA (FB)		3 2 534442	5	
IPOMOEA BATHYCOLPOS VAR.BATHYCOLPOS (LN)			2	2 3
IPOMOEA CRASSIPES (FB)		5		
IPOMOEA SP. (FB)		1 2		
ISCHAEMUM ARCUATUM (GR)	3			2
ISOGLOSSA ECKLONIANA (FB)	1			
JACARANDA MIMOSIFOLIA (TR)	31	1 1		
JASMINUM SP. (LN)	4 1			
JASMINUM STREPTOPUS (LN)	5 2444			
KALANCHOE ROTUNDIFOLIA (FB)	53 22 3	1 2 23	4 3	2
KIGGELARIA AFRICANA (TR)	34 112			
KIRKIA ACUMINATA (TR)	5	1		
KNIPHOFIA SP. (FB)				2
KNIPHOFIA SPLENDIDA (FB)				2
KNOWLTONIA TRANSVAALENSIS #(FB)		3		4 5 5
KOELERIA CAPENSIS (GR)				323
KOHAUTIA AMATYMBICA (FB)				1
KRAUSSIA FLORIBUNDA (SH)	2	521		
KYLLINGA ALBA (CY)				54 2
KYLLINGA CYLINDRICA (CY)			2	2
LANNEA DISCOLOR (TR)	1	132 1 2		
LANNEA EDULIS (FB)		22 23 2 2 2 32	4	
LANTANA CAMARA (SH)	2 5	232 2 2		

LANTANA MEARNSII *(SH)	2			
LAPORTEA PEDUNCULARIS (SH)		1		
LEDEBOURIA COOPERI (FB)				2
LEDEBOURIA REVOLUTA (FB)				3 32
LEDEBOURIA SP. (FB)		2		13253 2
LEONOTIS DYSOPHYLLA (FB)	2	2311 2	3 2 3	4
LEONOTIS SP. (FB)	1			
LEUCOSIDEA SERICEA (TR)	2			
LIGHTFOOTIA HUTTONII (FB)				54 3
LINUM THUNBERGII (FB)				5
LIPPIA JAVANICA (SH)	1	2 3 2	5 3	54
LIPPIA WILMSII (FB)		32		
LOBELIA DECIPIENS (FB)				5 1
LOPHOLAENA DISTICHA (FB)				4 2
LOPHOLAENA SEGMENTATA (FB)			3	35 2
LOTONONIS PULCHRA (FB)				2
LOTUS DISCOLOR (FB)				2
LOUDETIA DENSISPICA (GR)			333	3545 3 455
LOUDETIA SIMPLEX (GR)	2	31 23 332245543 555	5325555	5555555355555
LYCOPODIUM GNIDIOIDES (PT)	53			
MAESA LANCEOLATA (TR)	3 33 114332 23		3 2	
MARATTIA FRAXINEA VAR.SALICIFOLIA (PT)	1			
MARISCUS SOLIDUS SSP.SOLIDUS (CY)				2
MARISCUS SP. (CY)		3		
MAYTENUS HETEROPHYLLA (TR)	5 21 32132 2	4455544355222 4		
MAYTENUS MOSSAMBICENSIS *(TR)	4 4555555425352 3	12	32	
MAYTENUS PEDUNCULARIS (TR)	4 2 1 21			
MAYTENUS UNDATA (TR)	1 123 4 345	5342 215 22	4	
MELINIS TENUINERVIS (GR)		1		
MICROCHLOA CAFFRA (GR)		3	2	41 3
MIKANIA CORDATA (LN)	22 22 25			
MIMUSOPS ZEYHERI (TR)	1 3 3	4 1		
MOHRIA CAFFRORUM (PT)	3	2 2	3 2 55	252 2
MOMORDICA BALSAMINA (LN)		2		
MOMORDICA BOIVINII (LN)		111		
MONANTHOTAXIS CAFFRA (SH)	242422 223 22 55	5 113		
MONOCYMBIUM CERESIIFORME (GR)		23 3	3 5	55555 55 555
MONSONIA ATTENUATA (FB)				2
MORAEA ELLIOTII (FB)				3
MORAEA MUDDII (FB)			2	1
MORAEA SP. (FB)		3		3
MUCUNA CORIACEA SSP.IRRITANS (LN)	1	1 5 23		
MYRICA PILULIFERA (TR)	3 2		5	21 2
MYRICA SERRATA (TR)	1			
MYROTHAMNUS FLABELLIFOLIA (FB)		44		
MYRSINE AFRICANA (SH)	433 1		23	
NIDORELLA AURICULATA (SH)		2	5 3	2
NIDORELLA SP. (SH)	1			
NUXIA CONGESTA (TR)			2 3	
OCHNA ARBOREA (TR)	3		3	
OCHNA GAMOSTIGMATA (SH)	12435341342	1 2		
OCHNA HOLSTII (TR)	335213 2 1 1	1	52	
OCHNA NATALITIA (SH)	3 2 2 232 4	52123243 4 2		3
OCHNA SP. (SH)			2	
OCIMUM URTICIFOLIUM (SH)		4		
OCOTEA KENYENSIS (TR)	2 2			
OLEA CAPENSIS SSP.MACROCARPA (TR)	2			
OLEA EUROPAEA SSP.AFRICANA (TR)	2			

OPLISMENUS HIRTELLUS (GR)	55 5555555343555553	2 2 133		
OSYRIDICARPOS SCHIMPERIANUS (LN)	1321	11 3		
OXALIS DEPRESSA (FB)		3 2		52 2
OXYANTHUS GERRARDII (TR)	3 5522213 1			
PACHYSTIGMA MACROCALYX (SH)			5	
PACHYSTIGMA SP.(SH)		1		
PANICUM "COMPLEX" (GR)	1 3	35545433 224	2	
PANICUM ECKLONII (GR)				342
PANICUM NATALENSE (GR)		3	5533	2321 23334455
PAPPEA CAPENSIS (SH)		113 13		
PARINARI CAPENSIS SSP.CAPENSIS (FB)			42	53
PARINARI CURATELLIFOLIA (TR)	2 2445 2	12 1335354555 5 43	2	
PASPALUM SCROBICULATUM (GR)		2 3		3
PASPALUM URVILLEI (GR)		2		
PASSIFLORA EDULIS (LN)	1121 22322	35 2		
PAVETTA COOPERI (TR)	233 1			
PAVETTA GALPINII (SH)	1			
PAVETTA GARDENIIFOLIA VAR.GA.#(SH)		3		
PAVETTA GARDENIIFOLIA VAR.SU.#(SH)		2		
PAVETTA SCHUMANNIANA (TR)		12343323 2		
PAVETTA SP. (SH)	1 53	1 113		
PAVONIA COLUMELLA (FB)	3			
PEARSONIA ARISTATA (FB)	1	2	33	32 3
PEARSONIA OBOVATA (LN)				2
PEARSONIA SESSILIFOLIA #(FB)	3	1 33 2 545 23	3 253	52 23 34
PEARSONIA SP. (FB)		1 2	4	
PEARSONIA UNIFLORA (FB)		1		
PEDDIEA AFRICANA (TR)	4455433 2 24			
PELLAEA CALOMELANOS (PT)	1	1 25	44553	3
PELLAEA PECTINIFORMIS (PT)	2 3		3	
PELLAEA VIRIDIS (PT)	32555255555554555543	554453455 42 2 5555	5342433	32 3
PELTOPHORUM AFRICANUM (TR)		5125334 322 2		
PENTANISIA ANGUSTIFOLIA (FB)				2 244
PENTANISIA PRUNELLOIDES (FB)		1 1 32 2 23	3	55545 352 5
PENTARRHINUM INSIPIDUM (LN)		2		
PENTAS SP. (FB)		3		
PEPEROMIA BLANDA VAR.LEPTOSTACHYA (EP)	2			
PEPEROMIA RETUSA (EP)	355325422 2			
PEPEROMIA TETRAPHYLLA (EP)	255			
PERGULARIA DAEMIA VAR.DAEMIA (LN)		2		
PEROTIS PATENS (GR)		1		
PEUCEDANUM CAPENSE VAR.CAPENSE (FB)			3	
PEUCEDANUM MAGALISMONTANUM (FB)		2		3 13
PHANEROPHLEBIA CARYOTIDEA #(PT)	32			
PHAULOPSIS IMBRICATA (SH)	43 35 2	3 12 235 2 4		
PHOENIX RECLINATA (TR)	1			
PHRAGMITES MAURITIANUS (GR)	3			
PHYLICA PANICULATA (SH)	3			
PHYLLANTHUS NUMMULARIIFOLIUS (SH)		1		
PHYLLANTHUS RETICULATUS (SH)		12		
PILOSELLOIDES HIRSUTA (FB)				2 4 2
PIMPINELLA TRANSVAALENSIS (FB)			3	
PINUS SP. (TR)	1 5		3	
PIPER CAPENSE (SH)	5			
PITTOSPORUM VIRIDIFLORUM (TR)	5 1	3 2		
PLANTAGO MAJOR (FB)	1			
PLECTRANTHUS FRUTICOSIS (SH)	3 3		4	
PLECTRANTHUS GRANDIDENTATUS (SH)	3 1		3	
PLECTRANTHUS LAXIFLORUS (SH)	1			
PLECTRANTHUS RUBROPUNCTATUS (SH)	35	2	33	

PLECTRANTHUS SP. (SH)	5 21 4 1	2 2		3 2
PLECTRANTHUS SPICATUS (FB)		2 2		
PLECTRANTHUS VERTICILLATUS (SH)	1 1 3			
PLECTRANTHUS ZATARHENDI #(FB)			24	
PLEOPELTIS MACROCARPA (EP)	255221 4 2			
PODOCARPUS LATIFOLIUS (TR)	5			
POGONARTHRIA SQUARROSA (GR)		1		
POLYGALA HOTTENTOTTA (FB)	2	2 3 2 4 2	2	22
POLYGALA UNCINATA (FB)		1 1 2 2		
POLYGALA VIRGATA (SH)	2 3 2			
POLYGONUM SALICIFOLIUM (FB)	3			
POLYPODIUM POLYPODIOIDES (EP)	3 3344124 2 2			
POLYSTACHYA CONCRETA (EP)	1			3
POLYSTACHYA OTTONIANA (EP)	35			
POLYSTACHYA SP. (EP)	1 2 352			
POLYSTICHUM LUCTUOSUM (PT)	35			
PROTEA CAFFRA (TR)			333	2 44
PROTEA GAGUEDI (TR)				2
PROTEA SP. (TR)		2	3	1
PROTEA WELWITSCHII (TR)				3
PROTORHUS LONGIFOLIA (TR)	5 332553 531	5		
PRUNUS AFRICANA (TR)	3 1			
PSEUDARTHRIA HOOKERI (FB)	1	224321 352243 3	5 22	332
PSIDIUM GUAJAVA (TR)	23 2	113 2 4 3 5 23	2	
PSYCHOTRIA CAPENSIS (TR)	5 53555244534334432	35 2 4	35253	
PSYCHOTRIA ZOMBAMONTANA (TR)	5555			
PTERIDIUM AQUILINUM (PT)	1 423441552	3 25 23	552 43	3 22 5 2 2
PTERIS CATOPTERA (PT)	3 2 1			
PTERIS CRETICA (PT)	3			
PTEROCARPUS ANGOLENSIS (TR)	1 1 2	133 24 5 2 23 23	2	
PTEROCARPUS ROTUNDIFOLIUS (TR)		1234312		
PTEROCELASTRUS ECHINATUS (TR)	33		2	
PUPALIA ATROPURPUREA (LN)	3	11		
PYCNOSTACHYS URTICIFOLIA (SH)	1 4	353 2 2 2		
PYCREUS MURICATUS (CY)				5
PYRENACANTHA GRANDIFLORA (LN)		1		
RAPANEA MELANOPHLOEOS (TR)	53 12213 3	1	24 3	
RAPHIONACME ELATA (FB)		3		4
RAPHIONACME HIRSUTA (FB)				23 225
RAUVOLFIA CAFFRA (TR)	2 1 1			
RAWSONIA LUCIDA (TR)	2 3 122			
RENDLIA ALTERA (GR)				24
RHAMNUS PRINOIDES (TR)	2 1			
RHAMPHICARPA TUBULOSA (FB)				3
RHOICISSUS RHOMBOIDEA (LN)	455555 2 3	1		
RHOICISSUS TOMENTOSA (LN)	234255222334555	1 15		
RHOICISSUS TRIDENTATA (SH)	3 22 44233232	545233455555 53	554 2	2
RHUS CHIRINDENSIS (TR)	2 1 1 2			
RHUS DENTATA (TR)	2 1 1 2 313	1 22 3 2	33422 3	3 22
RHUS DISCOLOR (SH)			3	352
RHUS DURA (SH)	33	3	2 353	3 2
RHUS INTERMEDIA (SH)	1	3		
RHUS MACOWANII (TR)			3 3	
RHUS PENTHERI (TR)	23	53353215 5 2		
RHUS PYROIDES (TR)	2 21 221 3 2	2 252233322 2 2 2 2		1
RHUS REHMANNIANA (TR)		2	2 2	
RHUS SP. (TR)	3 1	2		
RHUS TRANSVAALENSIS (TR)	3 1 2	2422332335552532 4	55 2	
RHYNCHELYTRUM "COMPLEX" (GR)	1	1 43 1 3 2 423253 542	3345433	32 3 2
RHYNCHOSIA ANGULOSA (FB)				52

SENECIO MIKANIOIDES (LN)	2			
SENECIO OXYRIIFOLIUS (FB)		1 3 22 2	3 3	5 2 2
SENECIO PANDURIFORMIS (FB)	31			
SENECIO POLYODON VAR.POLYODON (FB)				3
SENECIO PTEROPHORUS (FB)			3	3 2
SENECIO SERRATULOIDES #(FB)		5		
SENECIO TAMOIDES (LN)	335514 3	1	3	
SENECIO VENOSUS (FB)		33 2 2	5	2
SETARIA MEGAPHYLLA (GR)	3 3 3241535425553345	4112 1235 2 2	5	
SETARIA SPHACELATA (GR)	1	5 2323 334544543	532523	53 34 3354
SIDA DREGEI (FB)		2		
SMILAX KRAUSSIANA (LN)	3 3 4555555455554	332 5235555555 4 22	5555553	
SOLANUM MAURITIANUM (TR)	1		4	
SOLANUM SP. (SH)	3	3		
SONCHUS INTEGRIFOLIUS (FB)				32
SONCHUS SP. (FB)				2
SONCHUS WILMSII (FB)				3 2
SOPUBIA CANA VAR.CANA (FB)				2
SPARRMANNIA RICINOCARPA (SH)			3	
SPHEDAMNOCARPUS GAL. SSP.GAL.#(LN)	1			
SPHEDAMNOCARPUS GAL. SSP.REH.#(LN)		1		
SPHEDAMNOCARPUS PRU. VAR.LAN.#(LN)			3	
SPHEDAMNOCARPUS PRU. VAR.PRU.#(LN)		1		
SPHENOSTYLIS ANGUSTIFOLIA (LN)				4
SPHENOSTYLIS MARGINATA #(LN)	12	5 3		
SPOROBOLUS "COMPLEX" (GR)		1 2 2 5523		2 54 4
SPOROBOLUS STAPFIANUS (GR)		2		3
STACHYS GRANDIFOLIA (SH)	2	3		
STACHYS NATALENSIS VAR.GALPINII (FB)			3	2
STACHYS NIGRICANS (FB)				321
STENOGLOTTIS FIMBRIATA (FB)	3			
STEPHANIA ABYSSINICA (LN)	2			
STERCULIA MUREX (TR)	1 2	2 22 3 4 2		
STIBURUS ALOPECUROIDES (GR)		2		323
STOMATANTHES AFRICANUS (FB)			3	2 2
STRELITZIA CAUDATA (TR)	1			
STREPTOCARPUS CYANEUS (FB)	5			
STREPTOCARPUS DUNNII (FB)			223	2
STREPTOCARPUS POLYANTHUS #(FB)	2			
STREPTOCARPUS SP. (FB)	3 55 42 2			
STRIGA BILABIATA (FB)				2
STRYCHNOS MADAGASCARIENSIS (TR)	2	1122		
STRYCHNOS SPINOSA (TR)	1	1222 323	2	
STYLOCHITON NATALENSE (FB)	1 2 2	531 113		
STYLOSANTHES FRUTICOSA (FB)		2		
STYPPEIOCHLOA GYNOGLOSSA (GR)				5
SUTERA GRANDIFLORA (FB)		1 2		
SYZYGIUM CORDATUM (TR)	3 3123545354452	1 3 52244 4	2255	2
SYZYGIUM GERRARDII (TR)	3 5 5521 1		3	
TARCHONANTHUS TRILOBUS #(TR)	1	3	422	
TECOMARIA CAPENSIS #(TR)	2	1	5	
TECTARIA GEMMIFERA (PT)	2			
TEPHROSIA "COMPLEX" (FB)	2132132	1323223	3	
TEPHROSIA ELONGATA (FB)		11	3	4
TEPHROSIA MACROPODA (FB)				3
TEPHROSIA SEMIGLABRA (FB)				2
TERMINALIA PHANEROPHLEBIA (TR)		2		
TERMINALIA SERICEA (TR)		23 21 2		
TETRASELAGO NATALENSIS (FB)	1		3	35
THALICTRUM RHYNCHOCARPUM (FB)	34			

THELYPTERIS BERGIANA (PT)	1 1			
THELYPTERIS GUEINZIANA (PT)	5			
THELYPTERIS MADAGASCARIENSIS (PT)	21			
THELYPTERIS SP. (PT)	221			
THELYPTERIS TOTTA (PT)	3			
THEMEDA TRIANDRA (GR)		542523 3525253535	332 2 3	434555 355555
THESIUM COSTATUM (FB)				1 2
THESIUM CYTISOIDES (FB)				1
THESIUM SP. (FB)				2
THUNBERGIA ATRIPLICIFOLIA (LN)		5		
THUNBERGIA NEGLECTA SSP.NEGLECTA (LN)	2			
THUNBERGIA SP. (FB)	1 2			
TODDALIA ASIATICA (LN)	324553 355555	3 2 2 2		
TODEA BARBARA (PT)	1			
TOLPIS CAPENSIS (FB)				43
TRACHYANDRA SALTII (FB)				323
TRACHYPOGON SPICATUS (GR)		4 3	2	2 2
TRAGIA OKANYUA (LN)		2		
TRAGIA RUPESTRIS (LN)		2		2
TRAGIA SP. (LN)		1 4		
TREMA ORIENTALIS (TR)	123 2 22	1 4 2 4 3		
TRICALYSIA "COMPLEX" (TR)	5 55445451 2343		22	
TRICHILIA EMETICA (TR)		1		
TRICHOCLADUS GRANDIFLORUS (TR)	32			
TRICHOMANES PYXIDIFERUM (PT)	3 21			
TRICHONEURA GRANDIGLUMIS (GR)		1		
TRICHOPTERYX DREGEANA (GR)	22 1		224 5	232
TRIDACTYLE TRICUSPIS (EP)	3 1 2245 1	5 3		
TRIMERIA GRANDIFOLIA (TR)	55 2 4445544234334	5	32 2	
TRISTACHYA LEUCOTHRIX (GR)		2 3	4	2 34 3 2
TRIUMFETTA PILOSA VAR.EFFUSA (FB)	2 3	1 2 1 3 2	3542	
TRIUMFETTA PILOSA VAR.PILOSA (FB)	2	43 2 3		
TRIUMFETTA PILOSA VAR.TOM. #(FB)		34		
TRIUMFETTA RHOMBOIDEA (FB)	1 23	3 2	2	
TRIUMFETTA SP. (FB)		1		
TRIUMFETTA WELWITSCHII VAR.HIRSUTA (FB)			3	34
TROCHOMERIA SAGITTATA (LN)		3		
TYLOPHORA ANOMALA (LN)	1 3 2 1	23 233 2		
TYLOPHORA FLANAGANII (LN)	3			
TYLOSEMA FASSOGLENSIS (LN)		2222 11 4 2		
TYPHA CAPENSIS (FB)	3			
VANGUERIA INFAUSTA (TR)	1	3432 12 45	2 33	
VERNONIA ADOENSIS (SH)	2			2
VERNONIA AMYGDALINA (FB)	2			
VERNONIA CENTAURIOIDES (FB)		5		
VERNONIA COLORATA (SH)		11		
VERNONIA HIRSUTA VAR.HIRSUTA (FB)				21 2 25
VERNONIA NATALENSIS (FB)		23 2 4 2		35 42
VERNONIA NEOCORYMBOSA (FB)	2 1	24 43	5	
VERNONIA OLIGOCEPHALA (FB)		3 23	55	
VERNONIA POSKEANA #(FB)		2 35	3 54	3 2
VERNONIA STIPULACEA (SH)	2 3152	322	332	
VERNONIA UMBRATICA (SH)	53			
VIGNA NERVOSA (LN)				2 2
VIGNA OBLONGIFOLIA #(LN)		1		
WAHLENBERGIA LYCOPODIOIDES (FB)			2	3
WAHLENBERGIA UNDULATA (FB)			2	3 2
WAHLENBERGIA VIRGATA (FB)			3	21
WALTHERIA INDICA (FB)		2 1 2		

XEROMPHIS RUDIS (SH)		211		
XEROPHYTA RETINERVIS (FB)	1	234	2	3 2
XIMENIA CAFFRA (TR)		1 32		
XYMALOS MONOSPORA (TR)	3 5 55524			
XYSMALOBIUM CONFUSUM (FB)				2
ZANTHOXYLUM CAPENSE (TR)	222 2	2		
ZANTHOXYLUM DAVYI (TR)	2 45254 33 3 31 43	512 1 33		
ZANTHOXYLUM THORNCROFTII (TR)	3			
ZIZIPHUS MUCRONATA #(TR)	121 21 21 2	4354522 3442	33	
ZORNIA MILNEANA (LN)				3

REFER TO APPENDIX B FOR FULL SPECIES NAME

FOR EXPLANATION OF "COMPLEX" SEE TEXT, SECTION 4.1.3

DIGITS 1-5 IN MATRIX DENOTE CONSTANCY VALUES (CF. TEXT, SECTION 3.1.2.A)

GROWTH FORMS: TR=TREE; SH=SHRUB; LN=LIANOID; EP=EPIPHYTE; FB=FORB OR HERB; CY=SEDGE; GR=GRASS; PT=FERN (CF. TEXT, SECTION 3.1.1.B)

```
   1 - 4 PERCENT                      |++|+ |   |   |    |  .  |
   5 - 34 PERCENT                     |  |  |   |   | +  |  .  |
   35 - 84 PERCENT                    |  | +|  +| ++|+  +|  .++|
   85 - 100 PERCENT                   |  |  |++ |+  |  + |++.  |
                                      ==========================
           S O I L
           -------
DEPTH
                                      --------------------------
   SHALLOW (0 - 12 CM)                |  |  |   |+ +|    | +.  |
   FAIRLY SHALLOW (13 - 48 CM)        |++| +|+++| + |++++|+ .++|
   FAIRLY DEEP (49 - 100 CM)          |  |+ |   |   |    |  .  |
   DEEP (> 100 CM)                    |  |  |   |   |    |  .  |
                                      --------------------------
PH
                                      --------------------------
   WEAKLY ACID  A  HORIZON            |++| +|+++|+++|+++ |++.+ |
   STRONGLY ACID  A  HORIZON          |  |+ |   |   |    |  . +|
                                      --------------------------
   WEAKLY ACID  B  HORIZON            |+ |+ |   |   |++ +|  .+ |
   STRONGLY ACID  B  HORIZON          |  |  |   |   |    |  .  |
                                      --------------------------
TEXTURE
                                      --------------------------
   SANDY  A  HORIZON                  |  |  |   |   |    |  .  |
   LOAMY SAND  A  HORIZON             |  |  |   |  +|+ ++|  .  |
   SANDY LOAM  A  HORIZON             |  |  |+++|++ | +  | +.  |
   SANDY CLAY LOAM  A  HORIZON        | +|++|   |   |    |+ .++|
   SANDY CLAY  A  HORIZON             |+ |  |   |   |    |  .  |
   CLAY  A  HORIZON                   |  |  |   |   |    |  .  |
                                      --------------------------
   SANDY  B  HORIZON                  |  |  |   |   |    |  .  |
   LOAMY SAND  B  HORIZON             |  |  |   |   |+   |  .  |
   SANDY LOAM  B  HORIZON             |  |  |   |   |    |  .  |
   SANDY CLAY LOAM "B" HORIZON        |  |  |   |   |    |  .+ |
   SANDY CLAY  B  HORIZON             |+ |  |   |   |    |  .  |
   CLAY "B" HORIZON                   |  |+ |   |   |    |  .  |
                                      --------------------------
COLOUR
                                      --------------------------
   BLACK  A  HORIZON                  |  |  |   |   | + +|  . +|
   GREY  A  HORIZON                   |  |  |   |   |+   |  .  |
   BROWN  A  HORIZON                  |  |++|+++| ++|  + |++.+ |
   RED  A  HORIZON                    |++|  |   |+  |    |  .  |
                                      --------------------------
   BLACK  B  HORIZON                  |  |  |   |   |    |  .  |
   GREY  B  HORIZON                   |  |  |   |   |    |  .  |
   BROWN  B  HORIZON                  |  |  |   |   |+   |  .+ |
   RED  B  HORIZON                    |+ |+ |   |   |    |  .  |
                                      ==========================
        C L I M A T E
        -------------
BELT
                                      --------------------------
   LOW COUNTRY                        |  |  |   |   |    |  .  |
   TRANSITIONAL MISTBELT              |  |  |   |   |    |  .  |
   HUMID MISTBELT                     |++|++|+++|+++|++++|++.++|
                                      ==========================
      L A N D   T Y P E
      -----------------
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LAND TYPE AB 33B						.
LAND TYPE AB 34C		++				.+
LAND TYPE AB 35A						.
LAND TYPE AB 36A	++		+++	+++	++++	.
LAND TYPE AB 37A						.
LAND TYPE AB 40A						.
LAND TYPE AB 40B						.
LAND TYPE AB 41A						.
LAND TYPE AB 43A						.
LAND TYPE AC 87A						+. +
LAND TYPE AC 88A						+ .
LAND TYPE AC 88B						.
LAND TYPE FA 331A						.
LAND TYPE FA 331B						.

V E L D   T Y P E

8: N.E. MOUNTAIN SOURVELD		++				++.++
9: LOWVELD SOUR BUSHVELD	++		+++	+++	++++	.

+ DENOTES PRESENCE

FOR EXPLANATION OF HABITAT FACTORS SEE TEXT, CHAPTERS 2 & 3

APPENDIX B

CHECK-LIST

This check-list contains the 848 plant taxa (excluding mosses and lichens) recorded in the 200 sample quadrats of the study area. All except the most common and familiar taxa are represented by voucher specimens which are housed in either the National Herbarium, Pretoria; the D.R. de Wet Forest Research Station Herbarium, Sabie; or in the author's field herbarium, Botanical Research Institute, Pretoria. Voucher specimen numbers are quoted in parentheses and,unless otherwise stated, pertain to G.B. Deall. Some taxa can, if necessary, be verified by more than the single voucher specimen quoted. Additional numbers are available from the author's collection register kept at the National Herbarium, Pretoria.

Classification of the Pteridophyta is according to Schelpe (1969), whilst that of the Spermatophyta is according to Dyer (1975, 1976). Taxonomic nomenclature is generally not updated beyond 1982 which is when sampling was terminated. The use of the specific epithets "complex" and sp. is explained in Section 4.1.3 of the text. All exotic species are marked with an asterisk.

A floristic analysis of the taxa contained in the check-list is summarized in Table A. The study revealed a total of 848 species (including subspecies and varieties) distributed amongst 436 genera and 120 families. As with Scheepers' (1978) study, the Asteraceae constitute the largest family. The Fabaceae and Poaceae are next, followed by the Rubiaceae and Liliaceae.

Table A Floristic analysis of taxa collected in the Sabie area of the Eastern Transvaal Escarpment

Major families and groups	No. of families	No. of genera	No. of species*
Monocotyledonae	13	100	195
Poaceae		43	80
Liliaceae		14	34
Dicotyledonae	87	306	603
Asteraceae		33	104
Fabaceae		34	82
Rubiaceae		25	46
Angiospermae	100	406	798
Gymnospermae	2	2	2
Pteridophyta	18	28	48
	120	436	848

* including subspecies and varieties

LYCOPODIACEAE

Lycopodium gnidioides L.f.(1194)

SELAGINELLACEAE

Selaginella dregei (Presl) Hieron (1618)
Selaginella kraussiana (Kunze) A. Braun (326)

MARATTIACEAE

Marattia fraxinea J.E. Sm. ex J.F. Gmel. var. *salicifolia* (Schrad.) C. Chr. (1043)

OSMUNDACEAE

Todea barbara (L.) T. Moore (1120)

SCHIZAEACEAE

Mohria caffrorum (L.) Desv. (1023)

HYMENOPHYLLACEAE

Trichomanes pyxidiferum L. (1017)

DENNSTAEDTIACEAE

Blotiella glabra (Bory) Tyron. (1126)
Hypolepis sparsisora (Schrad.) Kuhn (1123)
Pteridium aquilinum (L.) Kuhn (29)

ADIANTACEAE

Adiantum capillaris-veneris L. (894)
Cheilanthes concolor (Langsd. & Fisch) Schelpe & N.C. Anthony (1846)
Cheilanthes hirta Swartz (1717)
Cheilanthes viridis (Forsk.) Swartz var. *glauca* (Sim) Schelpe & N.C. Anthony (1414)
Pellaea calomelanos (Swartz) Link (87)
Pellaea pectiniformis Bak. (1391)
Pellaea viridis Forsk. (2077)
Pteris catoptera Kunze (1063)
Pteris cretica L.(1572)

POLYPODIACEAE

Pleopeltis macrocarpa (Bory ex Willd.) Kaulf. (717)
Polypodium polypodioides (L.) Hitchc. (704)

DAVALLIACEAE

Arthropteris monocarpa (Cordem) C. Chr. (1400)

ASPLENIACEAE

Asplenium anisophyllum Kunze (1065)
Asplenium inaequilaterale Willd. (1130 A)
Asplenium lobatum Pappe & Rawson (1046 A)
Asplenium lunulatum Swartz (1130)

Asplenium rutifolium (Berg.) Kunze (335)
Asplenium splendens Kunze (321)
Asplenium varians Wall. ex Hook & Grev. subsp. fimbriatum (Schelpe) Kunze (1380)

THELYPTERIDACEAE

Thelypteris bergiana (Schlechtd.) Ching (895)
Thelypteris gueinziana (Mett.) Schelpe (1909)
Thelypteris madagascariensis (Fee) Schelpe (1122)
Thelypteris sp. (including 1045)
Thelypteris totta (Thunb.) Schelpe (1923)

ATHYRIACEAE

Athyrium scandicinum (Willd.) C. Presl. (1125)

ASPIDIACEAE

Dryopteris athamantica (Kunze) Kuntze (1655)
Dryopteris inaequalis (Schlechtd.) Kuntze (1001)
Dryopteris sp.
Phanerophlebia caryotidea (Wall. ex Hook. & Grev.) Copel var. micropteris (Kunze) Tardieu (1575)
Polystichum luctuosum (Kunze) T. Moore (1381)
Rumohra adiantiformis (G. Forst.) Ching (1226)
Tectaria gemmifera (Fee) Alston (1139)

BLECHNACEAE

Blechnum giganteum (Kaulf.) Schlechtd. (1121)
Blechnum tabulare (Thunb.) Kuhn. (1146)

GLEICHENIACEAE

Dicranopteris linearis (Burm. f) Underw. (571)

CYCATHACEAE

Alsophila dregei (Kunze) R. Tyron (109)

PODOCARPACEAE

Podocarpus latifolius (Thunb.) R. Br. ex Mirb. (2050)

PINACEAE

* Pinus sp.

TYPHACEAE

Typha capensis (P. Rohrb.) N.E. Br.

POACEAE

Ischaemum arcuatum (Nees) Stapf (1905)
Cleistachne sorghoides Benth. (684)
Eulalia villosa (Thunb.) Nees (633)
Bothriochloa glabra (Roxb.) A. Camus (598)
Schizachyrium sanguineum (Retz.) Alston (603)

Andropogon huillensis Rendle (1300)
Andropogon schinzii Hack. (1919)
Andropogon schirensis Hochst. ex A. Rich. var. angustifolia Stapf (1321 B)
Cymbopogon "complex"
a) Cymbopogon excavatus (Hochst.) Stapf ex Burtt Davy (1518)
b) Cymbopogon validus (Stapf) Stapf ex Burtt Davy (1321 C)
Hyparrhenia anamesa Clayton (1658)
Hyparrhenia cymbaria (L.) Stapf (1601)
Hyparrhenia dregeana (Nees) Stapf ex Stent. (1977)
Hyparrhenia filipendula "complex"
a) Hyparrhenia filipendula (Hochst.) Stapf var. filipendula (1321 F)
b) Hyparrhenia filipendula (Hochst.) Stapf var. pilosa (Hochst.) Stapf (1624 A)
Hyparrhenia gazensis (Rendle) Stapf (848)
Hyparrhenia hirta (L.) Stapf (1321 D)
Hyparrhenia newtonii (Hack.) Stapf var. macra Stapf (164)
Hyparrhenia sp.
Hyparrhenia variabilis Stapf (3)
Hyperthelia dissoluta (Nees ex Steud.) Clayton (2018)
Monocymbium ceresiiforme (Nees) Stapf (1119)
Trachypogon spicatus (L.f.) Kuntze (1513)
Heteropogon contortus (L.) Beauv. ex Roem. & Schult. (730)
Diheteropogon amplectens (Nees) Clayton (623)
Diheteropogon filifolius (Nees) Clayton (1694)
Themeda triandra Forsk. (745)
Digitaria apiculata Stent (1312)
Digitaria diagonalis (Nees) Stapf (1533)
Digitaria monodactyla (Nees) Stapf (1276)
Digitaria tricholaenoides Stapf (1244 A)
Alloteropsis semialata (R. Br.) Hitchc. (1113)
Brachiaria brizantha (Hochst. ex A. Rich.) Stapf (721)
Brachiaria filifolia Stapf (= B. bovonei) (1320)
Brachiaria serrata (Thunb.) Stapf var. serrata (1320 A)
Brachiaria subulifolia (Mez) Clayton (1320)
Paspalum scrobiculatum L. (678)
* Paspalum urvillei Steud.(114)
Oplismenus hirtellus (L.) Beauv. (682)
Panicum "complex"
a) Panicum deustum Thunb. (1695 A)
b) Panicum maximum Jacq. (847)
Panicum ecklonii Nees (1096)
Panicum natalense Hochst. (1321 H)
Setaria megaphylla (Steud.) Dur. & Schinz (602)
Setaria sphacelata (Schumach.) M.B. Moss (817)
Rhynchelytrum "complex"
a) Rhynchelytrum repens (Willd.) C.E. Hubb. (1401)
b) Rhynchelytrum rhodesianum (Rendle) Stapf & C.E. Hubb. (1623)
c) Rhynchelytrum setifolium (Stapf) Chiov. (1292 B)
d) Rhynchelytrum sp.
Melinis tenuinervis (Stapf) Stapf (1704)
Ehrharta erecta Lam. (243)
Tristachya leucothrix Nees (1321 J)
Trichopteryx dregeana Nees (1108)
Loudetia densispica (Rendle) C.E. Hubb. (1094)
Loudetia simplex (Nees) C.E. Hubb. (616)
Phragmites mauritianus Kunth (1965)
Agrostis lachnantha Nees (1078)
Aristida congesta Roem. & Schult. subsp. barbicollis (Trin. & Rupr.) De Wint. (1767)
Aristida junciformis Trin. & Rupr. subsp. junciformis (1428)

Perotis patens Gand. (1760)
Sporobolus "complex" (972)
a) Sporobolus africanus (Poir.) Robyns & Tournay (1541)
b) Sporobolus centrifugus (Trin.) Nees (2088)
c) Sporobolus pyramidalis (Beauv.) (555)
Sporobolus stapfianus Gand. (1898)
Eragrostis caesia Stapf (54)
Eragrostis capensis (Thunb.) Trin. (1097)
Eragrostis curvula (Schrad.) Nees (1294 B)
Eragrostis gummiflua Nees (1299 A)
Eragrostis hieriana Rendle (1920)
Eragrostis racemosa (Thunb.) Steud. (1028)
Eragrostis sclerantha Nees subsp. sclerantha (1424 A)
Eragrostis sp.
Microchloa caffra Nees (1143)
Rendlia altera (Rendle) Chiov. (1171)
Harpochloa falx (1208)
Ctenium concinnum Nees (1511)
Pogonarthria squarrosa (Licht. ex Roem. & Schult.) Pilg. (1769)
Bewsia biflora (Hack.) Goossens (1312 G)
Styppeiochloa gynoglossa (Goossens) De Wint. (1102)
Trichoneura grandiglumis (Nees) Ekman (1759)
Koeleria capensis (Steud.) Nees (1079)
Stiburus alopecuroides (Hack.) Stapf (1109)
Festuca costata Nees (1215)

CYPERACEAE

Cyperus albostriatus Schrad. (1418)
Cyperus immensus C.B. Cl. (1908)
Cyperus leptocladus Kunth (1289)
Cyperus obtusiflorus Vahl var. flavissimus Boeck. (1478)
Cyperus pseudoleptocladus Kukenth. (1056)
Cyperus semitrifidus Schrad. (1278)
Cyperus sexangularis Nees (1841)
Cyperus sp.
Pycreus muricatus (Kukenth.) Napper (1077)
Mariscus solidus (Kunth) P.J. Vorster ms. subsp. solidus (1969)
Mariscus sp.
Kyllinga alba Nees (161)
Kyllinga cylindrica Nees
Ficinia bergiana Kunth (1501)
Ficinia sp. (680)
Schoenoplectus corymbosus (Roth. ex Roem. & Schult.) J. Raynal (1910)
Scirpus ficinioides Kunth (1262 A)
Bulbostylis burchellii (Fical. & Hiern) C.B. Cl. (1449)
Bulbostylis oritrephes (Ridley) C.B. Cl. (1663)
Bulbostylis schoenoides (Kunth) C.B. Cl. (1088)
Rhynchospora brownii Roem. & Schult. (749)
Coleochloa setifera (Ridley) Gilly (1882)
Scleria bulbifera Hochst. ex A. Rich. (1335)
Scleria melanomphala Kunth (1944)
Schoenoxiphium lehmannii (Nees) Steud. (1582)
Carex spicato-paniculata C.B. Cl. (595)

ARECACEAE

Phoenix reclinata Jacq. (1838)

ARACEAE

Stylochiton _natalense_ Schott (702)

COMMELINACEAE

Commelina _africana_ L. var. _krebsiana_ (Kunth) C.B. Cl. (1285)
Commelina _africana_ L. var. _lancispatha_ C.B. Cl. (1724)
Commelina _eckloniana_ Kunth (1265)
Commelina _livingstonii_ C.B. Cl. (720)
Commelina sp. (including 1188 and 1406)
Aneilema _aequinoctiale_ (P. Beauv.) Kunth (1837)
Cyanotis _lanata_ Benth. (1894)
Cyanotis _lapidosa_ Phill. (1409)
Cyanotis _pachyrrhiza_ Oberm. (1241)
Cyanotis _speciosa_ (L.f.) Hassk. (= _C_. _nodiflora_) (1149 A)
Floscopa _glomerata_ (Willd. ex Schult. & Schult. f.) Hassk. (1924)

LILIACEAE

Bulbine sp.
Trachyandra _saltii_ (Bak.) Oberm. (1090)
Anthericum _angulicaule_ Bak. (1270)
Anthericum _cooperi_ Bak. (1364)
Anthericum _galpinii_ Bak. var. _galpinii_ (1280)
Anthericum sp. cf. _A_. _galpinii_ Bak. (1860)
Chlorophytum sp. (1191 A)
Eriospermum _burchellii_ Bak.(= _E_. _luteo-rubrum_) (1030)
Eriospermum _cooperi_ Bak. (756)
Eriospermum sp. (including 1858)
Kniphofia _sp_. (1160)
Kniphofia _splendida_ E. A. Bruce (E.A. Bruce: 315)
Aloe _arborescens_ Mill.
Aloe _barbertoniae_ Pole Evans (1998)
Aloe _longibracteata_ Pole Evans (1992)
Aloe _petricola_ Pole Evans (1995)
Aloe sp. (including 1993 and 1994)
Albuca _setosa_ Jacq. (1176)
Dipcadi _marlothii_ Engl. (1279)
Scilla _nervosa_ (Burch.) Jessop (1296)
Ledebouria _cooperi_ (Hook. f.) Jessop (1369)
Ledebouria _revoluta_ (L.f) Jessop (1554)
Ledebouria sp. (1212)
Dracaena _hookerana_ K.Koch (907)
Asparagus _angusticladus_ (Jessop) Oberm. (1850)
Asparagus _asparagoides_ (L.) Wight
Asparagus "complex" (786)
a) _Asparagus_ _africanus_ Lam.(516)
b) _Asparagus_ _setaceus_ (Kunth) Jessop (1385)
Asparagus _falcatus_ L. (93)
Asparagus _laricinus_ Burch. (1567)
Asparagus _plumosus_ Bak. (1062)
Asparagus _racemosus_ Willd. (1706 A)
Asparagus _rigidus_ Jessop (1186)
Asparagus _virgatus_ Bak. (43)
Behnia _reticulata_ (Thunb.) Didr. (282)
Smilax _kraussiana_ Meisn. (122)

AMARYLLIDACEAE

Haemanthus carneus Ker-Gawl. complex (1561)
Haemanthus sp. (1489)
Scadoxus multiflorus (Martyn) Raf. subsp. multiflorus (1728)
Boophane disticha (L.f.) Herb.
Clivia caulescens R.A. Dyer
Crinum sp.(974)
Cyrtanthus bicolor R.A.Dyer (1161)

HYPOXIDACEAE

Hypoxis "complex"
a) Hypoxis rigidula Bak. (1302)
b) Hypoxis rooperi S.Moore (667)
Hypoxis filiformis Bak. (1093)
Hypoxis galpinii Bak. (1112)
Hypoxis gerrardii Bak. (1502)
Hypoxis multiceps Buchinger ex Bak. (1317)

VELLOZIACEAE

Xerophyta retinervis Bak. (2003)

DIOSCOREACEAE

Dioscorea "complex"
a) Dioscorea cotinifolia Kunth (655)
b) Dioscorea sylvatica (Kunth) Eckl. var. sylvatica (377)
Dioscorea dregeana Bak. var. hutchinsonii Burkhill ms. (1443 A)

IRIDACEAE

Moraea elliotii Bak. (1118)
Moraea muddii N.E. Br. (1426)
Moraea sp. (1628 B)
Dietes iridioides (L.) Sweet (362)
Aristea woodii N.E. Br. (681)
Dierama sp. cf. D. galpinii N.E. Br. (1282 A)
Crocosmia aurea Planch. (366)
Gladiolus densiflorus Bak. (1708)
Gladiolus ecklonii Lehmm. subsp. ecklonii (1688)
Gladiolus exiguus G.J. Lewis (1482)
Gladiolus sp. (including 782 and 1318)

STRELITZIACEAE

Strelitzia caudata R.A. Dyer

ORCHIDACEAE

Stenoglottis fimbriata Lindl. (1237)
Brownleea caerulea Harv. ex Lindl. (830)
Disperis fanniniae Harv. (1239)
Polystachya concreta (Jacq.) Garay & Sweet (1622)
Polystachya ottoniana Reichb. f. (1201)
Polystachya sp. (including 1049 and 926)
Ansellia gigantea Reichb. f.(var. not identified) (803)
Eulophia streptopetala Lindl. (1446)
Bulbophyllum sandersonii Reichb. f. (1198)
Tridactyle tricuspis (Bol.) Schltr. (658 A)

PIPERACEAE

Piper capense L. (2055)
Peperomia blanda Jacq. H.B.K. var. *leptostachya* Hook. & Arn. (708)
Peperomia retusa (L.f.) A. Dietr.(715)
Peperomia tetraphylla (G. Forst.) Hook. & Arn. (1192)

MYRICACEAE

Myrica pilulifera Rendle (960)
Myrica serrata Lam. (897)

ULMACEAE

Celtis africana Burm.f. (256)
Trema orientalis (L.) Blume (794)

MORACEAE

Ficus burkei (Miq.) Miq. (= *F. petersii*) (872)
Ficus capensis Thunb. (858)
Ficus ingens (Miq.) Miq. (811)

URTICACEAE

Laportea peduncularis (Wedd.) Chew (1756)

PROTEACEAE

Faurea saligna Harv. (1788)
Faurea speciosa (Welw.) Welw. (644)
Protea caffra Meisn. (1488)
Protea gaguedi Gmel. (1145 A)
Protea sp.
Protea welwitschii Engl. (1666)

LORANTHACEAE

Erianthemum dregei (Eckl. & Zeyh.) v. Tieghem (846)

SANTALACEAE

Osyridicarpos schimperanus (Hochst. ex A. Rich.) A. DC.(701)
Thesium costatum A.W. Hill (1216)
Thesium cytisoides A.W. Hill (1268)
Thesium sp. (1500)

OLACACEAE

Ximenia caffra Sond. (1772)

POLYGONACEAE

Rumex sagittatus Thunb. (1411)
Polygonum salicifolium Willd. (1911)

AMARANTHACEAE

Cyathula cylindrica Moq.(1410)
Pupalia atropurpurea Moq. (1757)
Achyranthes sicula (L.) All. (1599)

RANUNCULACEAE

Knowltonia transvaalensis Szyszyl. var. *transvaalensis* (744)
Clematis brachiata Thunb. (1383)
Thalictrum rhynchocarpum Dill. & Rich. (1353A)

MENISPERMACEAE

Cocculus hirsutus (L.) Diels (2027)
Stephania abyssinica Dill. & Rich. (216)
Cissampelos torulosa E. Mey. ex Harv. (200)

ANNONACEAE

Monanthotaxis caffra (Sond.) Verdc. (707)
Annona senegalensis Pers. (738)

TRIMENIACEAE

Xymalos monospora (Harv.) Baill. (1002)

LAURACEAE

Ocotea kenyensis (Chiov.) Robyns (1388)

CAPPARACEAE

Capparis brassii DC. (896)
Capparis sepiaria L. var. *subglabra* (Oliv.) De Wolf (1874)

DROSERACEAE

Drosera sp.

CRASSULACEAE

Kalanchoe rotundifolia Haw. (779)
Crassula acinaciformis Schinz
Crassula alba "complex"
a) *Crassula alba* Forsk. var. *alba* (1416A)
b) *Crassula alba* Forsk. var. *parvisepala* (Schonl.) Toelken (R71)
Crassula globularoides Britt. (1232)
Crassula natalensis Schonl. (1521)
Crassula pellucida L. subsp. *brachypetala* (1125)
Crassula sarcocaulis Eckl. & Zeyh. subsp. *sarcocaulis* (= *C. parvisepala*) (1228)
Crassula sp. (including 1115)
Crassula vaginata Eckl. & Zeyh. (1483)

ESCALLONIACEAE

Choristylis rhamnoides Harv. (831)

PITTOSPORACEAE

Pittosporum viridiflorum Sims (1793)

MYROTHAMNACEAE

Myrothamnus flabellifolia Welw. (1853)

HAMAMELIDACEAE

Trichocladus grandiflorus Oliv. (1059)

ROSACEAE

Rubus pinnatus Willd. (2023)
Rubus sp. (including 480)
* Agrimonia odorata Mill. (1596)
Leucosidea sericea Eckl. & Zeyh. (56)
Cliffortia nitidula (Engl.) R.E. & Th. Fries JR. subsp. pilosa Weim. (1693)
Cliffortia repens Schltr. (1082)
Prunus africana (Hook. f.) Kalkm. (966)
Parinari capensis Harv. subsp. capensis (1295)
Parinari curatellifolia Planch. ex Benth. (7)

CONNARACEAE

Cnestis natalensis (Hochst.) Planch. & Sond. (908)

FABACEAE

Albizia versicolor Welw. ex Oliv. (2039)
Acacia ataxacantha DC. (650)
Acacia caffra (Thunb.) Willd. (818)
Acacia davyi N.E. Br. (767)
* Acacia mearnsii De Wild.
Acacia sp. (including 868)
Dichrostachys cinerea "complex"
a) Dichrostachys cinerea (L.) Wight & Arn. subsp. africana Brenan & Brummitt var. africana (628)
b) Dichrostachys cinerea (L.) Wight & Arn. subsp. nyassana (Taub.) Brenan (723)
Entada spicata (E. Mey.)Druce (1008)
Bauhinia galpinii N.E. Br. (2030)
Tylosema fassoglensis (Schweinf.) Torre & Hillc. (519)
Cassia bicapsularis L. (1800)
* Cassia floribunda Cav. (257)
Cassia mimosoides L. (1643)
Cassia petersiana Bolle (738)
Cassia plumosa (E. Mey.) Vogel var. erecta Schorn & Gordon-Gray (1552)
Cassia quarrei (Ghesq.) Steyaert (599)
Peltophorum africanum Sond. (803 A)
Calpurnia aurea (Ait.) Benth. (295)
Lotononis pulchra Duemmer (1476)
Pearsonia aristata (Schinz) Duemmer (1518 A)
Pearsonia obovata (Schinz) Polhill (1522)
Pearsonia sessilifolia "complex"
a) Pearsonia sessilifolia Duemmer subsp. marginata (Schinz) Polhill (1452)
b) Pearsonia sessilifolia (Harv.) Duemmer subsp. sessilifolia (1707)
Pearsonia sp.
Pearsonia uniflora (Kensit) Polhill (821)
Crotalaria capensis Jacq. (888)
Crotalaria recta Steud. (1624)
Argyrolobium speciosum Eckl. & Zeyh. (709)
Argyrolobium transvaalense Schinz (1840)
Lotus discolor E. Mey. (1946)
Indigofera comosa N.E. Br. (1883)
Indigofera hilaris Eckl. & Zeyh. (1535)
Indigofera oxalidea Welw. ex Bak. (731)

Indigofera _sanguinea_ N.E. Br. (2073)
Indigofera sp.(including 1945)
Indigofera sp. 1 (1460)
Indigofera sp. 2 (1475)
Indigofera _swaziensis_ H. Bol.(665)
Indigofera _tristoides_ N.E. Br.(1939)
Tephrosia "complex"
a) _Tephrosia_ _polystachya_ E. Mey. var. _latifolia_ Harv. (765 A)
b) _Tephrosia_ _shiluwanensis_ Schinz. (765)
Tephrosia _elongata_ E. Mey. var. _elongata_ (1153)
Tephrosia _macropoda_ (E. Mey.) Harv. (1117)
Tephrosia _semiglabra_ Sond. (1553)
Aeschynomene _nyassana_ Taub. (1182)
Aeschynomene _rehmannii_ Schinz (1246)
Aeschynomene _rehmannii_ Schinz var. _leptobotrya_ (Harms ex Bak. f.) J.B. Gillett (1420)
Stylosanthes _fruticosa_ (Retz.) Alston (604)
Zornia _milneana_ Mohl. (1298)
Desmodium _dregeanum_ Benth. (737)
Desmodium _hirtum_ Guill. & Perr. (1288)
Desmodium _natalitium_ Sond. (793)
Desmodium _repandum_ (Vahl) DC. (1002 A)
Pseudarthria _hookeri_ Wight & Arn. (610)
Dalbergia _armata_ E. Mey. (21)
Pterocarpus _angolensis_ DC. (248)
Pterocarpus _rotundifolius_ (Sond.) Druce subsp. _rotundifolius_ (2040)
Abrus _laevigatus_ E. Mey. (= _A._ _fruticulosis_) (713)
Dumasia _villosa_ DC. var. _villosa_ (1573)
Glycine _wightii_ (Wight & Arn.) Verdc. subsp. _wightii_ var. _longicauda_ (Schweinf.) Verdc. (802)
Erythrina _latissima_ E. Mey. (1437)
Erythrina _lysistemon_ Hutch. (874)
Mucuna _coriacea_ Bak. subsp. _irritans_ (Burtt Davy) Verdc. (1626)
Rhynchosia _angulosa_ Schinz (1485)
Rhynchosia _caribaea_ (Jacq.) DC. (696)
Rhynchosia _hirta_ (Andrews) Meikle & Verdc. (= _R._ _albiflora_ (Sims) Alston) (= _R._ _cyanosperma_ Benth ex Bak.) (42)
Rhynchosia _komatiensis_ Harms (620)
Rhynchosia _monophylla_ Schltr. (1413 A)
Rhynchosia _sordida_ (E. Mey.) Schinz (1829)
Rhynchosia _thorncroftii_ (Bak. f.) Burtt Davy (988)
Rhynchosia _totta_ (Thunb.) DC. (1327)
Rhynchosia _villosa_ (Meisn.) Druce (1261)
Eriosema _angustifolium_ Burtt Davy (1244)
Eriosema _burkei_ Benth. (1345)
Eriosema _cordatum_ E. Mey. (1362)
Eriosema _ellipticifolium_ Schinz (1116)
Eriosema _gunniae_ Stirton M/S (1544)
Eriosema _nutans_ Schinz (1657)
Eriosema _psoraleoides_ (Lam.) G.Don (1768)
Flemingia _grahamiana_ Wight & Arn. (2034)
Vigna _oblongifolia_ Rich. var. _oblongifolia_ (1780)
Vigna _nervosa_ Markoetter (1481)
Sphenostylis _angustifolia_ Sond. (1334)
Sphenostylis _marginata_ E. Mey. subsp. _marginata_ (692)

GERANIACEAE

Monsonia _attenuata_ Harv. (1688)

OXALIDACEAE

Oxalis _depressa_ Eckl. & Zeyh. (1507)

LINACEAE

Linum _thunbergii_ Eckl. & Zeyh. (1284)

RUTACEAE

Zanthoxylum _capense_ (Thunb.) Harv. (334)
Zanthoxylum _davyi_ (Verdoorn) Waterm. (694)
Zanthoxylum _thorncroftii_ (Verdoorn) Waterm.
Toddalia _asiatica_ (L.) Lam. (2025)
Clausena _anisata_ (Willd.) Hook. f. ex Benth. (875)
* _Citrus_ sp.

SIMAROUBACEAE

Kirkia _acuminata_ Oliv. (1718)

MELIACEAE

Ekebergia _capensis_ Sparrm. (892)
Ekebergia _pterophylla_ (C. DC.) Hofmeyr (1689)
Trichilia _emetica_ Vahl (1753)

MALPHIGIACEAE

Sphedamnocarpus _galphimiifolius_ (A. Juss.) Szyszyl. subsp. _galphimiifolius_ (1959)
Sphedamnocarpus _galphimiifolius_ (A. Juss.) Szyszyl. subsp. _rehmannii_ Launert (819)
Sphedamnocarpus _pruriens_ (A. Juss.) Szyszyl. var. _lanceolatus_ Launert (1674)
Sphedamnocarpus _pruriens_ (A. Juss.) Szyszyl. var. _pruriens_ (500)

POLYGALACEAE

Polygala _hottentotta_ Presl (625)
Polygala _uncinata_ E. Mey. ex Meisn. (978)
Polygala _virgata_ Thunb. (943)

EUPHORBIACEAE

Andrachne _ovalis_ Müll. Arg. (1044)
Securinega _virosa_ (Roxb. ex Willd.) Pax & K. Hoffm. (792)
Phyllanthus _nummulariifolius_ Poir. (1774)
Phyllanthus _reticulatus_ Poir. (1698)
Drypetes _gerrardii_ Hutch. (900)
Antidesma _venosum_ E. Mey. ex. Tul. (637)
Bridelia _micrantha_ (Hochst.) Baill. (652)
Acalypha _angustata_ Sond. var. _glabra_ Sond. (1458)
Acalypha _caperonioides_ Baill. (1534)
Acalypha _petiolaris_ Hochst. (758)
Acalypha _punctata_ Meisn. (622)
Acalypha sp.
Acalypha _wilmsii_ Pax ex Prain & Hutch.(1422)
Ctenomeria _capensis_ (Thunb.) Harv. ex Sond. (1401)
Tragia _okanyua_ Pax (672)
Tragia _rupestris_ Sond. (799)

Tragia sp. (including 1820)
Dalechampia capensis Spreng. f. (712 A)
Clutia abyssinica Jaub. & Spach var. *abyssinica* (752)
Clutia hirsuta E.Mey. ex Sond. (940)
Clutia monticola S. Moore (869)
Euphorbia ingens E. Mey. ex Boiss.
Euphorbia kraussiana Bernh. (932)
Euphorbia striata Thunb. (1202)

ANACARDIACEAE

Sclerocarya birrea (A.Rich.) Hochst. subsp. *caffra* (Sond.) Kokwaro (= *S. caffra*) (1844)
Lannea discolor (Sond.) Engl. (814)
Lannea edulis (Sond.) Engl. (1421)
Protorhus longifolia (Bernh.) Engl. (914)
Rhus chirindensis Bak. f. forma *legatii* (Schonl.) R. & A. Fernandes (939)
Rhus dentata Thunb. (675)
Rhus discolor E. Mey.(1529)
Rhus dura Schonl. (1185)
Rhus intermedia Schonl. (755)
Rhus macowanii Schonl. (1591)
Rhus pentheri Zahlbr. (757)
Rhus pyroides Burch. (760)
Rhus rehmanniana Engl. (1436)
Rhus sp.
Rhus transvaalensis Engl. (675 A)

AQUIFOLIACEAE

Ilex mitis (L.) Radlk. (1354)

CELASTRACEAE

Maytenus heterophylla (Eckl. & Zeyh.) N.K.B. Robson (601)
Maytenus mossambicensis (Klotzch) Blakelock subsp. *mossambicensis* (269)
Maytenus peduncularis (Sond.) Loes. (900)
Maytenus undata (Thunb.) Blakelock (837)
Catha edulis (Vahl) Forsk. ex Endl. (644 A)
Pterocelastrus echinatus N.E. Br. (1067)

ICACINACEAE

Cassinopsis ilicifolia (Hochst.) Kuntze (275)
Apodytes dimidiata E. Mey. ex Arn. subsp. *dimidiata* (666)
Pyrenacantha grandiflora Baill. (1892)

SAPINDACEAE

Allophyllus "complex"
a) *Allophyllus melanocarpus* (Sond.) Radlk. (1576)
b) *Allophyllus transvaalensis* Burtt Davy (1129)
Pappea capensis Eckl. & Zeyh. (1705)

MELIANTHACEAE

Bersama transvaalensis Turrill (1455)
Bersama tysoniana Oliv. (1957)

GREYIACEAE

Greyia radlkoferi Szyszyl. (1563)

BALSAMINACEAE

Impatiens hochstetteri Warb. subsp. hochstetteri (1013)

RHAMNACEAE

Ziziphus mucronata Willd. subsp. mucronata (700)
Berchemia zeyheri (Sond.) Grubov (1713)
Rhamnus prinoides L' Herit. (959)
Phylica paniculata Willd. (1227)

VITACEAE

Rhoicissus rhomboidea (E. Mey. ex Harv.) Planch. (2048)
Rhoicissus tomentosa (Lam.) Wild & Drumm. (705)
Rhoicissus tridentata (L. f.) Wild & Drumm. (128)
Cyphostemma anatomicum (C.A. Sm.) Wild & Drumm. (1392)
Cyphostemma simulans (C.A. Sm.) Wild & Drumm. (1878)
Cyphostemma woodii (Gilg & Brandt) Desc. (810)

TILIACEAE

Corchorus confusus H. Wild (741)
Corchorus sp. (1903)
Sparrmannia ricinocarpa (Eckl. & Zeyh.) Kuntze (1592)
Grewia monticola Sond. (1697)
Grewia occidentalis L. (657)
Triumfetta pilosa Roth. var. effusa (E. Mey. ex Harv.) Wild (627)
Triumfetta pilosa Roth. var. pilosa (733)
Triumfetta pilosa Roth. var. tomentosa Szyszyl. ex Sprague & Hutch. (1803)
Triumfetta rhomboidea Jacq. (685)
Triumfetta sp.
Triumfetta welwitschii Mast. var. hirsuta (Sprague & Hutch.) Wild (1323)

MALVACEAE

Abutilon sonneratianum (Cav.) Sweet (835)
Sida dregei Burtt Davy (871)
Pavonia columella Cav. (1925)
Hibiscus aethiopicus L. var. ovatus Harv. (1531)
Hibiscus surattensis L. (607)

STERCULIACEAE

Dombeya rotundifolia (Hochst.) Planch. var. rotundifolia (424)
Dombeya pulchra N.E. Br. (611)
Hermannia grandiflora N.E. Br. (617)
Hermannia lancifolia Szyszyl. (1315)
Hermannia montana N.E. Br. (1490)
Waltheria indica L. (785)
Sterculia murex Hemsl. (2033)

OCHNACEAE

Ochna arborea Burch.
Ochna gamostigmata Du Toit (632)
Ochna holstii Engl. (915)
Ochna natalitia (Meisn.) Walp. (778)
Ochna sp.

CLUSIACEAE

Hypericum aethiopicum Thunb. subsp. *sonderi* (Bred.) N.K.B. Robson (1642)

FLACOURTIACEAE

Rawsonia lucida Harv. & Sond. (970)
Kiggelaria africana L. (989)
Scolopia mundii (Eckl. & Zeyh.) Warb. (993)
Scolopia zeyheri (Nees) Harv. (1720)
Trimeria grandifolia (Hochst.) Warb. (664)
Flacourtia indica (Burm. f.) Merr. (813)
Dovyalis lucida Sim (1360)
Dovyalis zeyheri (Sond.) Warb. (1386)

PASSIFLORACEAE

Adenia digitata (Harv.) Engl. (382)
Adenia gummifera (Harv.) Harms var. *gummifera* (1917)
* *Passiflora edulis* Sims (654)

BEGONIACEAE

Begonia sp.

THYMELAEACEAE

Peddiea africana Harv. (includes *P. fischeri*) (719)
Gnidia caffra Meisn. (634)
Gnidia kraussiana Meisn. (1815)
Gnidia microcephala Meisn. (1653)
Gnidia sp. (including 976 and 1461)

RHIZOPHORACEAE

Cassipourea gerrardii (Schinz) Alston (1060)

COMBRETACEAE

Combretum apiculatum Sond. subsp. *apiculatum* (845)
Combretum collinum Fresen. subsp. *gazense* (Swynn. & Bak. f.) Okafor
Combretum collinum Fresen. subsp. *suluense* (Engl. & Diels) Okafor (829 A)
Combretum kraussii Hochst. (861)
Combretum molle R. Br. ex G. Don (631)
Combretum sp. (887)
Combretum zeyheri Sond. (843)
Terminalia phanerophlebia Engl. & Diels (862)
Terminalia sericea Burch. ex DC. (1758)

MYRTACEAE

Heteropyxis natalensis Harv. (608)
* Psidium guajava L.
Eugenia natalitia Sond. (884)
Syzygium cordatum Hochst. (883)
Syzygium gerrardii (Harv. ex Hook f.) Burtt Davy (909)

MELASTOMATACEAE

Dissotis phaeotricha (Hochst.) Hook. f. var. phaeotricha (1967)

ARALIACEAE

Schefflera umbellifera (Sond.) Baill. (1009)
Cussonia spicata Thunb.

APIACEAE

Sanicula elata Buch.- Ham. (1101)
Alepidea basinuda Pott var. basinuda (1203)
Alepidea gracilis Duemmer var. major Weim. (1492)
Heteromorpha arborescens (Spreng.) Cham. & Schlechtd. (991)
Heteromorpha pubescens Burtt Davy (1808)
Heteromorpha sp.
Heteromorpha transvaalensis Schltr. & Wolff (1645)
Pimpinella transvaalensis Wolff (1514 A)
Peucedanum capense Sond. var. capense (1604)
Peucedanum magalismontanum Sond. (1087)

ERICACEAE

Erica drakensbergensis Guth. & Bol. (1584)
Erica woodii H. Bol. (1480)

MYRSINACEAE

Maesa lanceolata Forsk. (923)
Myrsine africana L. (1193)
Rapanea melanophloes (L.) Mez (965)

SAPOTACEAE

Bequaertiodendron magalismontanum (Sond.) Heine & J.H. Hemsl. (2015)
Mimusops zeyheri Sond. (1712)

EBENACEAE

Euclea "complex"
a) Euclea crispa (Thunb.) Guerke subsp. crispa (918)
b) Euclea divinorum Hiern (28)
c) Euclea schimperi (A. DC.) Dandy var. schimperi (633)
Euclea natalensis A. DC. (833)
Diospyros galpinii (Hiern) De Wint. (1415)
Diospyros lycioides Desf. subsp. sericea (Bernh.) De Wint. (624)
Diospyros mespiliformis Hochst. ex A. DC. (1980 C)
Diospyros whyteana (Hiern) F. White (612)

OLEACEAE

Schrebera alata (Hochst.) Welw. (1068)
Chionanthus foveolata (E. Mey.) Stearn subsp. foveolata (= Linoceira foveolata) (1848)
Olea capensis L. subsp. macrocarpa (C.H. WR.) Verdoorn (1357)
Olea europaea L. subsp. africana (Mill.) P.S. Green (1393)
Jasminum sp. (including 962 A)
Jasminum streptopus E. Mey. (916)

LOGANIACEAE

Strychnos madagascariensis Poir. (1750)
Strychnos spinosa Lam. (1751)
Anthocleista grandiflora Gilg
Nuxia congesta R. Br. ex Fresen. (1071)
Buddleia auriculata Benth. (1373)
Buddleia salviifolia (L.) Lam. (2067)

GENTIANACEAE

Sebaea leiostyla Gilg (1472)

APOCYNACEAE

Carissa bispinosa (L.) Desf. ex Brenan var. acuminata (E. Mey.) Codd (92)
Rauvolfia caffra Sond. (211)

PERIPLOCACEAE

Cryptolepis oblongifolia Schltr. (1032)
Raphionacme elata N.E. Br. (1343)
Raphionacme hirsuta (E. Mey.) R.A. Dyer ex Phill. (1169)

ASCLEPIADACEAE

Xysmalobium confusum Scott Elliott (1464)
Asclepias crassinervis N.E. Br. (1351)
Asclepias dregeana Schltr. (1352)
Pentarrhinum insipidum E. Mey. (863)
Cynanchum ellipticum (Harv.) R.A. Dyer (1890)
Secamone alpinii Schultes (917)
Secamone gerrardii Harv. ex Benth. (697)
Secamone parvifolia (Oliv.) Bullock (931)
Ceropegia meyeri Decne. (1444)
Ceropegia racemosa N.E. Br. subsp. setifera (Schltr.) Huber (995)
Ceropegia sp. (1875)
Ceropegia woodii Schltr. (1457)
Tylophora anomala N.E. Br. (648)
Tylophora flanaganii Schltr. (1569)
Pergularia daemia (Forsk.) Chiov. var. daemia (1810)

CONVOLVULACEAE

Cuscuta sp.
Ipomoea bathycolpos Hallier F. var. bathycolpos (1178)
Ipomoea crassipes Hook. (640)
Ipomoea sp. (including 1745)

BORAGINACEAE

Ehretia amoena Klotzsch (748 A)

VERBENACEAE

* Lantana camara L. (949)
Lantana mearnsii Moldenke var. latibracteolata Moldenke (1072)
Lippia javanica (Burm. f.) Spreng. (734)
Lippia wilmsii H.H.W. Pearson (742)
Clerodendrum glabrum E. Mey. var. glabrum (1442)
Clerodendrum myricoides (Hochst.) Vatke (1137)
Clerodendrum sp. (1819)
Clerodendrum suffruticosum Guerke var. suffruticosum (1050)

LABIATAE

Acrotome hispida Benth. (1307)
Leonotis dysophylla Benth. (including L. brevipes Skan) (739)
Leonotis sp. (1053)
Stachys grandifolia E. Mey. ex Benth. (699)
Stachys natalensis Hochst. var. galpinii (Briq.) Codd (1498)
Stachys nigricans Benth. (1259)
Aeollanthus rehmannii Guerke (1408)
Endostemon obtusifolius (E. Mey. ex Benth.) N.E. Br. (929)
Pycnostachys urticifolia Hook. (614 B)
Plectranthus fruticosus L' Hérit. (1439)
Plectranthus grandidentatus Guerke (1560)
Plectranthus laxiflorus Benth. (1958)
Plectranthus rubropunctatus Codd (1508)
Plectranthus sp. (including 834 and 1379)
Plectranthus spicatus E. Mey. ex Benth. (1880)
Plectranthus verticillatus (L. f.) Druce (1714)
Plectranthus zatarhendi (Forsk.) E.A. Bruce var. zatarhendi (1452)
Hoslundia opposita Vahl (1869)
Iboza "complex"
a) Iboza brevispicata N.E. Br. (777)
b) Iboza riparia (Hochst.) N.E. Br. (397)
Hemizygia canescens (Guerke) Ashby (1764)
Hemizygia subvelutina (Guerke) Ashby (533)
Hemizygia transvaalensis (Schltr.) Ashby (1290)
Ocimum urticifolium Roth. (791)
Becium obovatum (E. Mey. ex Benth.) N.E. Br. var. obovatum (1083)

SOLANACEAE

* Solanum mauritianum Scop.
Solanum sp.

SCROPHULARIACEAE

Halleria lucida L. (1404 B)
Bowkeria cymosa Macowan (1513 A)
Sutera grandiflora (Galpin) Hiern. (855)
Ilysanthes wilmsii Engl. (1916)
Selago atherstonei Rolfe (536)
Selago elata Choisy & Rolfe (1964)
Selago hyssopifolia E. Mey. (1424)
Selago muddii Rolfe (1098)
Tetraselago natalensis (Rolfe) Junell (1111)

Alectra sessiliflora (Vahl) Kuntze var. *sessiliflora* (1486)
Sopubia cana Harv. var. *cana* (1470)
Buchnera dura Benth. (1491)
Buchnera longispicata Schinz (1763)
Rhamphicarpa tubulosa (L. f.) Benth. (1293)
Striga bilabiata (Thunb.) Kuntze (1346)

BIGNONIACEAE

Tecomaria capensis (Thunb.) Spach subsp. *capensis* (1404)
* *Jacaranda mimosifolia* D. Don (937)

PEDALIACEAE

Ceratotheca triloba (Bernh.) Hook. f. (1282)

GESNERIACEAE

Streptocarpus cyaneus S. Moore (1384)
Streptocarpus dunnii Hook. f. (1423 A)
Streptocarpus polyanthus Hook. subsp. *dracomontanus* Hilliard (1062 B)
Streptocarpus sp.

ACANTHACEAE

Thunbergia atriplicifolia Nees (643)
Thunbergia neglecta Sond. subsp. *neglecta* (695)
Thunbergia sp. (including 986)
Phaulopsis imbricata (Forsk.) Sweet (600)
Dyschoriste depressa Nees (725)
Chaetacanthus burchellii Nees (1737)
Ruellia sp. (1742)
Crabbea hirsuta Harv. (748)
Barleria gueinzii Sond. (1711)
Barleria ovata E. Mey. ex Nees (1523)
Sclerochiton harveyanus Nees (1062 A)
Dicliptera clinopodia Nees (686)
Hypoestes aristata R. Br. (740)
Hypoestes phaylopsoides S. Moore (1570)
Isoglossa eckloniana (Nees) Lindau (876)

PLANTAGINACEAE

Plantago major L. (901)

RUBIACEAE

Kohautia amatymbica Eckl. & Zeyh. (1209)
Agathisanthemum bojeri Klotzsch subsp. *australe* Brem. var *australe* (726)
Conostomium natalense (Hochst.) Brem. var. *glabrum* Brem. (1516)
Pentas sp. (743)
Breonadia salicina (Vahl) Hepper & Wood
Cephalanthus natalensis Oliv. (706)
Burchellia bubalina (L. f.) Sims (1494)
Xeromphis rudis (E. Mey. ex Harv.) Codd (1783 A)
Gardenia amoena Sims (885)
Rothmannia capensis Thunb. (1199)
Rothmannia globosa (Hochst.) Keay (886)
Oxyanthus gerrardii Sond. (1014)

Tricalysia "complex"
a) Tricalysia capensis (Meisn.) Sim (1136)
b) Tricalysia lanceolata (Sond.) Burtt Davy (1397)
Kraussia floribunda Harv. (1721)
Pentanisia angustifolia (Hochst.) Hochst. (1473)
Pentanisia prunelloides (Klotzsch ex Eckl. & Zeyh.) Walp. (676)
Vangueria infausta Burch. (790)
Canthium ciliatum (Klotzsch) Kuntze (1057)
Canthium gilfillanii (N.E. Br.) O.B. Miller (829)
Canthium gueinzii Sond. (889)
Canthium huillense Hiern. (1371)
Canthium inerme (L. f.) Kuntze (613)
Canthium locuples (K. Schum.) Codd (1224)
Canthium mundianum Cham. & Schlechtd. (1407)
Canthium obovatum Klotzsch (1168)
Canthium sp. (841)
Pachystigma macrocalyx (Sond.) Robyns (1190)
Pachystigma sp. (1884)
Fadogia monticola Robyns (1419)
Fadogia sp.
Fadogia tetraquetra Krause (1448)
Pavetta cooperi Harv. & Sond. (1956)
Pavetta galpinii Brem. (997)
Pavetta gardeniifolia A. Rich var. gardeniifolia (1632)
Pavetta gardeniifolia A. Rich var. subtomentosa K. Schum. (806)
Pavetta schumanniana F. Hoffm. ex K. Schum. (784)
Pavetta sp. (including 1847)
Psychotria capensis (Eckl.) Vatke (971)
Psychotria zombamontana (Kuntze) Petit (2053)
Galopina aspera (Eckl. & Zeyh.) Walp. (1540)
Galopina circaeoides Thunb. (691)
Anthospermum ammanioides S. Moore (1627)
* Richardia brasiliensis (Moq.) Gomez (626)
Borreria natalensis (Hochst.) K. Schum. ex S. Moore (1454)
Rubia cordifolia L. (851)
Rubia petiolaris DC. (1805)

DIPSACACEAE

Cephalaria pungens Szabo (1471)
Scabiosa columbaria L. (747)

CUCURBITACEAE

Momordica balsamina L. (865)
Momordica boivinii Baill. (1697 A)
Cucumis prophetarum L. (1368)
Cucumis sp. (1368)
Trochomeria sagittata (Harv. ex Sond.) Cogn. (1935)
Coccinia palmata (Sond.) Cogn. (892)

CAMPANULACEAE

Wahlenbergia lycopodioides Schltr. & V. Brehm. (1636)
Wahlenbergia undulata A. DC. (1550)
Wahlenbergia virgata Engl. (1175)
Lightfootia huttonii Sond. (1308)

LOBELIACEAE

Cyphia elata "complex"
a) Cyphia elata Harv. var. elata Harv. (441)
b) Cyphia elata Harv. var. glabra Harv. (1416)
Lobelia decipiens Sond. (1092)

ASTERACEAE

Vernonia adoensis Sch. Bip. ex Walp. (942)
Vernonia amygdalina Del. (703)
Vernonia centaurioides Klatt (1930)
Vernonia colorata (Willd.) Drake (1700)
Vernonia hirsuta (DC.) Sch. Bip. var. hirsuta (1477)
Vernonia natalensis Sch. Bip. (1474)
Vernonia neocorymbosa Hilliard (1624 B)
Vernonia oligocephala (DC.) Sch. Bip. ex Walp. (815)
Vernonia poskeana Vatke & Hildebr. var. chlorolepis (Steetz) O. Hoffm. (804)
Vernonia stipulacea Klatt (1405)
Vernonia umbratica Oberm. (1195)
* Ageratum conyzoides L. (864)
Stomatanthes africanus (Oliv. & Hiern) R.M. King & H. Robinson (1647)
Mikania cordata (Burm. f.) B.L. Robinson (898)
Aster comptonii Lippert (1594)
Aster harveyanus Kuntze (768)
Aster lydenburgensis Lippert (1338)
Aster sp. (including 750)
Nidorella auriculata DC. (605)
Nidorella sp. (1249)
* Conyza floribunda H.B.K. (609)
Brachylaena discolor DC. subsp. transvaalensis (Phill. & Schweick.) J. Paiva (679)
Tarchonanthus trilobus DC. var. galpinii (Hutch. & Phill.) J. Paiva (1433)
Blumea alata (D. Don) DC. (606)
Rhynea phylicifolia DC. (766)
Helichrysum adenocarpum DC. (1179)
Helichrysum aureo-nitens Sch. Bip. (1100)
Helichrysum aureum (Houtt.) Merr. var. monocephalum (DC.) Hilliard (1242)
Helichrysum cephaloideum DC. (1205)
Helichrysum chrysargyrum Moeser (673)
Helichrysum "complex"
a) Helichrysum acutatum DC. (1099)
b) Helichrysum thapsus (Kuntze) Moeser (1520)
Helichrysum cooperi Harv. (1413)
Helichrysum coriaceum Harv. (1656)
Helichrysum kraussii Sch. Bip.(975)
Helichrysum mimetes S. Moore (1607)
Helichrysum mixtum (Kuntze) Moeser (1525)
Helichrysum nudifolium (L.) Less. var. nudifolium (618)
Helichrysum odoratissimum (L.) Sweet (1932)
Helichrysum pallidum DC. (1558)
Helichrysum panduratum O. Hoffm. var. transvaalense Moeser (712)
Helichrysum pilosellum (L. f.) Less. (1164)
Helichrysum platypterum DC. (1585)
Helichrysum reflexum N.E. Br. (1497)
Helichrysum sp. (including 1157 and 1253)
Helichrysum sp. nov. 1 (= Weidermann & Oberdieck 2179) (1493)
Helichrysum sp. nov. 2 (= Scheepers s.n) (1590)
Helichrysum sp. nov. 3 (= Van der Schijff 4335 A) (1263)
Helichrysum subulifolium Harv. (1303)

Helichrysum umbraculigerum Less. (1154)
Helichrysum wilmsii Moeser (1106)
Athrixia phylicoides DC. (645)
Inula glomerata Oliv. & Hiern (635)
Geigeria burkei Harv. subsp. burkei var. elata Merxm. (842)
Geigeria burkei Harv. subsp. burkei var. hirtella Merxm.(1515)
* Acanthospermum australe (Loefl.) Kuntze (596)
Bidens kirkii (Oliv. & Hiern) Sherff (1640)
* Bidens pilosa L.
Athanasia acerosa (DC.) Harv. (1111)
Athanasia calva Hutch. (1976)
Inezia integrifolia (Klatt) Phill. (1462)
Schistostephium crataegifolium (DC.) Fenzl ex Harv. (1530)
Schistostephium heptalobum (DC.) Oliv. & Hiern (928)
Artemisia afra Jacq. ex Willd. (1559)
Lopholaena disticha (N.E. Br.) S. Moore (1947)
Lopholaena segmentata (Oliv.) S. Moore (1532)
Senecio affinis DC. (1546)
Senecio conrathii N.E. Br. (1616)
Senecio coronatus (Thunb.) Harv. (1511)
Senecio deltoideus Less. (920)
Senecio erubescens Ait. var. crepidifolius DC. (1121)
Senecio erubescens Ait. var. dichotomus DC. (1180)
Senecio gerrardii Harv. (1214)
Senecio glaberrimus DC. (1274)
Senecio latifolius DC. (= S. sceleratus) (26)
Senecio lydenburgensis Hutch. & Burtt Davy (1314)
Senecio macrocephalus DC. (1145)
Senecio mikanioides Otto ex Harv. (1142)
Senecio oxyriifolius DC. (1038)
Senecio panduriformis Hilliard (1250)
Senecio polyodon DC. var. polyodon (1105)
Senecio pterophorus DC. (111)
Senecio serratuloides DC. var. serratuloides (1828)
Senecio tamoides DC. (2059)
Senecio venosus Harv. (1545)
Euryops pedunculatus N.E. Br. (1637)
Euryops transvaalensis Klatt subsp. setilobus (N.E. Br.) B. Nordenstam (1499)
Haplocarpha scaposa Harv. (669)
Berkheya echinacea (Harv.) O. Hoffm. ex Burtt Davy subsp. echinacea (769)
Berkheya insignis (Harv.) Thell. (641)
Berkheya latifolia Wood & Evans (1980)
Berkheya setifera DC. (1823)
Berkheya sp. (including 1075)
Dicoma anomala Sond. subsp. cirsioides (Harv.) Wild (1459)
Dicoma zeyheri Sond. (636)
Gerbera ambigua (Cass.) Sch. Bip.
Gerbera aurantiaca Sch. Bip. (656)
Gerbera jamesonii H. Bol. ex Hook. f. (84)
Gerbera speciosa S. Moore (1743)
Piloselloides hirsuta (Forsk.) C. Jeffrey (1333)
Tolpis capensis (L.) Sch. Bip. (1210)
Hypochoeris microcephala (Sch. Bip.) Cabr. var. albiflora (Kuntze) Cabr. (1367)
Sonchus integrifolius Harv. (1325)
Sonchus sp. (1543)
Sonchus wilmsii R.E. Fries (1537)