Comparison of classifications commonly used as templates for management, scientific and GIS work in the Kruger National Park

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Solomon, M., N. Zambatis, H.C. Biggs and N. Maré. 1999. Comparison of classifications commonly used as templates for management, scientific and GIS work in the Kruger National Park. *Koedoe* 42(2): 131–142. Pretoria. ISSN 0075–6458.

The two major land classification systems used in the Kruger National Park are discussed with respect to their development, sub-classification, scale, as well as current and potential usages. Their relatedness to one another, as well as to six other broad scale vegetation classifications is investigated and major similarities and differences are pointed out.

Key words: land classification, Kruger National Park, landscape, land type, land system, vegetation type, geology, GIS.

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Introduction

During the last decade, two methods of natural classification of land have been commonly used in the Kruger National Park (KNP). Confusion often exists as to which of the classification systems should be used for specific management, decision making and scientific purposes, and at which scale.

New researchers and managers often need a combined and clear explanation of these two systems to be able to carry out their own work. Therefore, the aim of this paper is to give a brief overview of the two different systems, now each developed into scaled hierarchies, and to define all terms used in these hierarchies as well as in other, similar data sets currently in use in the KNP. Furthermore, we aim to clarify the differences between the data sets by dealing with how, and for which purposes, they were developed and to make recommendations on how each one should be applied for particular situations. Figure 1 illustrates the main sub-classifications of the Venter (1990) and Gertenbach (1983) land classification systems in a hierarchical manner.

The "Venter-based land classification hierarchy"

In 1990 Venter proposed a classification of land for management planning in the Kruger National Park, with the main focus of the study being the soils of the KNP. The general objective of his study was to classify, map and quantitatively describe land in the KNP with special reference to morphological properties such as the soil, landform and woody vegetation of the study area.

The role of soil properties in plant and animal ecology decreases in extremely wet and dry climates. However, in areas with moderate climates such as the KNP, it is of vital

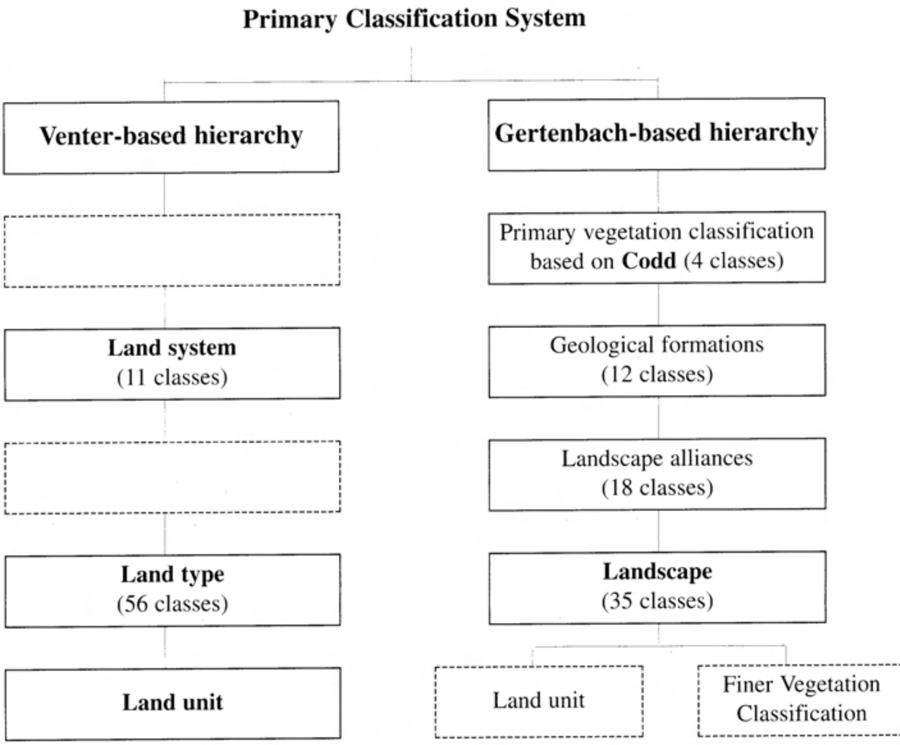

Fig. 1: The main sub-classifications of the Venter (1990) and Gertenbach (1983) land classification systems.

importance (Venter 1986) and soil characteristics, such as soil depth, texture and structure, play a decisive role in determining the availability of water and nutrients to plants. Clearly, abiotic components form an integral and complex part of the ecology in the KNP, and it can thus rightly be assumed that soil and soil properties will determine an area's biotic potential. Any classification system based on abiotic factors, rather than biotic factors, will tend to be more informative at a basic level, since resultant vegetation patterns are likely to be highly correlated with the former.

Venter recognised, mapped and described 11 land systems, consisting of a total of 56 land types. An individual land system consists of between one and 12 different land types.

A land system can be defined as an area, or group of areas in close proximity, which is associated with a specific geological formation and/or geomorphological phenomenon and/or climatic regime. Each of these land systems is described in detail with regards to its geology, geomorphology and rainfall. Furthermore, the land type(s) comprising each land system are mentioned and a broad overview of the differences between these land types is given. A land type is defined as an area, or group of areas, throughout which a recurring pattern of distinctive land units, each with its own characteristic landform and unique soil and vegetation assemblages can be recognised. Next, each land type is described in detail with respect to its morphometric features, its soils and dominant woody vegetation. Lastly, for each land type

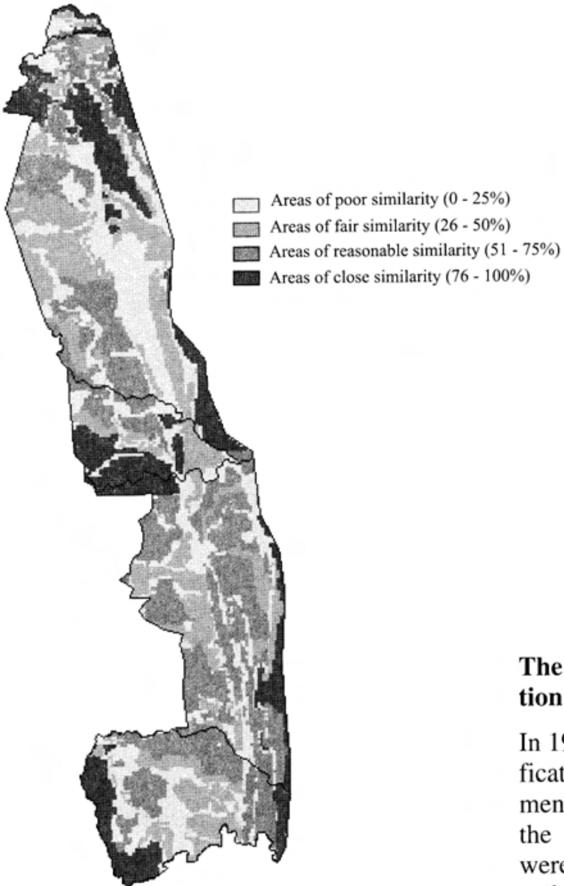

Fig. 2: A spatial comparison of 56 land types (Venter) and 35 landscapes (Gertenbach)

a hillslope profile sketch is presented, dividing land types into land units.

A land unit is a specific section of a hillslope profile with its own distinctive natural attributes, including its morphology (curvature and slope), drainage and position. Each land unit also has a distinct assemblage of soils and plants, which differ from those of other units. These differences are strikingly evident in certain areas, while in other areas they are much more subtle. Land units nest naturally into land types, are primarily based on catenal position and are mapped at a very fine scale.

The polygons formed by the landform classification do not necessarily overlap with those of the previously mentioned three classifications, but landforms were used in conjunction with soil (point data) and vegetation (point data) in classifying land types. A landform is defined as an area with distinctive morphological and physical surface features, including its attributes of local relief, slope classes, drainage pattern and stream frequency. There are five such distinct classes within the KNP, namely plains with low relief, slightly undulating plains, moderately undulating plains, extremely irregular plains and low mountains and hills.

The "Gertenbach - based land classification hierarchy"

In 1983 Gertenbach developed a land classification system on which future management could be based. Because of the fact that the landscapes recognised by Gertenbach were so widely referred to in the last decade and thus acted as a practical starting point, this hierarchy has been developed in a "bottom-up" sense. He attempted to divide the KNP into significant units for the purpose of practical conservation planning and management. As a result 35 landscapes were identified. A landscape can be defined as an area with a specific geomorphology, climate, soil, vegetation pattern and associated fauna. A detailed description of each landscape is given with respect to each of the five components mentioned in the definition, with considerable emphasis on the two biological components, namely vegetation and fauna.

An Environmental Education firm involved in the KNP named Jacana Education, needed a map (simpler than the Gertenbach classification) for tourist use, conveying general information with respect to animal and plant distribution, as well as the underlying abiot-

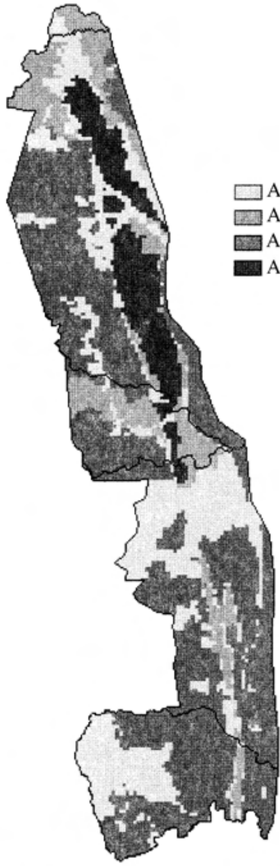

Fig. 3: A spatial comparison of 11 land systems (Venter) and 12 main geological formations (Gertenbach).

ic pattern. At that time no such map was available, and this led to an "ecozones map" being developed by Jacana Education, whereby the KNP was divided into 16 ecozones by combining certain of Gertenbach's landscapes. Although adequate and informative for the tourist, this consolidation needed some refining for technical use. Gertenbach, with the help of Zambatis, slightly modified and refined the Jacana map to come up with 18 landscape alliances (17 plus the riparian communities), which will be hereafter referred to as the landscape alliances map. Because of its ready availability, scientists and managers often use the Jacana Ecozones map, which is often adequate. However, it is important to note the refinements for certain purposes. At a level similar to the Venter land systems, the landscapes of Gertenbach can be grouped into 12 major geological formations (unpublished map).

What was originally done by Codd (1951) produced a "macro" view of vegetation in the KNP. Because so much research work aims at understanding system function, a system that has a small number of divisions—ones which can be construed as the most representative of the major conditions prevalent in the KNP—is useful and in practical terms necessary. Thus the Codd-based consolidation of Gertenbach's original classification took place. This meant that the 35 landscape polygons were aggregated (first into landscape alliances) to such a way as to preserve the general outline of Codd's system and have more accurate boundaries. However, a major functional change was made based on the presumption that macro-level differences between the basalts and granites in the northern mopanieveld of the Park exist.

For future researchers to be able to establish whether or not their study will be affected by the choice of the land classification system used, a map delineating the borders of Venter's 56 land types were compared to a similar map depicting Gertenbach's 35 landscapes to locate areas of potential high similarities and areas of high dissimilarities. Such a comparison is done by aggregating data over units of cartographic space (polygons) that are like individual locations to the extent that they provide all-inclusive, but mutually exclusive study area coverage, i.e. two data layers, conveying different information, but covering the same area in space. Using the Zonal Percentage concept as explained by Tomlin (1990), a new value is computed for each location on a map as a

Table 1
Potential usage of each land classification unit

Level	Attributes used for classification	Potential usages	Comments (strong & weak points)
Land system	Integration of macro geology, geomorphology and climate.	Macro level compartment difference in functional response (e.g. fire return period) where geomorphology/climate are decisive factors. Descriptive backdrop for abiotic classification.	Sourveld is not intuitively delineated.
Land type	Landform, broad vegetation pattern and soil.	Meso-level compartment difference, particularly where soil differences are important (catenal variation included; at this level only spatially implicit, i.e. overall percentage of each land unit within a land type is given). Differences in plant community composition and structure.	Useful because of explicit additional structure at a lower hierarchical detail level.
Land unit	Catenal subdivision of the previous classification.	Where differences within catenal variation are needed. Spatially explicit.	Currently only available for Sabie catchment within Kruger and for Northern Basaltic Plains study area.
Landform	Broad geomorphological structure, edge not contiguous with land system, land type and land unit.	Where macro physical surface structure is needed.	Only at a very broad scale.
Landscape	Geomorphology, climate, soil, vegetation, fauna.	Animal associations. Plant communities implicit.	Wide usage, but certain of these could benefit by also looking at the Venter hierarchy.

function of existing values associated with each polygon containing that location. Figure 2 was generated accordingly to indicate where and how much the two layers of the different classification systems coincide, assigning a similarity index to each region in the Kruger Park. The value assigned to each location on Figure 2 is computed as an average of the percentage of that location's land type that shares its landscape value, and the percentage of the location's landscape that shares its land type value.

From Fig. 2 areas of close similarity (75 % – 100 % similarity) between the two classification systems can be seen near Malelane, along the eastern boundary of the Park, as well as around Phalaborwa, Shingwedzi, Punda Maria, Pafuri and Nwambiya respectively. Because of the fact that there is seldom a definite and visible border between classification types (be it geology, soil or vegetation), but rather a gradual change (gradient), the boundaries of each classification unit are drawn subjectively out of necessity

Table 2

Similarities and differences between vegetation type classifications used in the Kruger National Park

	Increasing Heterogeneity								Increasing Homogeneity		
	Similarities										
	Codd (1951)	Acocks (1953)	Van der Schijff (1957)	Pienaar (1963)	Van Wyk (1972)	Coetzee (1983)	Gertenbach (1983)	Gertenbach (1998, Unpubl.) Landscapes	Gertenbach (1983, Unpubl.) Geology	Gertenbach (1983, Unpubl.) Dominant vegetation	Low & Rebelo (1998)
Number & Type of Unit	5 Vegetation Regions	5 Veld Types	6 Communi-ties	19 Game Habitats	19 Vegetation Units	20 Major Veg. Zones	35 Landscapes	18 Landscape Alliances	12 Major Geol. Form.	8 Dominant Woody spp.	7 Veg. Types
Differences											
Codd (1951)	**± 2 025 932**	FNa; NUb	Bpa	OBa; BPa	OBa; FNb; BPa	None	None	None	FNb	None	BPa
Acocks (1953)	OBa; FNb; BPd	**1 500 000**	OBb; FNc; BPa	BPa	BPa	None	None	None	None	FNc	BPa
V.d. Schijff (1957)	OBp; FNc; BPd	BPd; NUa	**500 000**	OBa; BPa	OBa; BPa	None	None	None	None	FNc	BPa
Pienaar (1963)	FNf; BPd; NUa	OBa; FNf	FNf; BPd; NUa	**± 1 450 537**	OBa; BPa; NUb	None	None	None	None	None	BPa
Van Wyk (1972)	BPd; NUa	OBa; FNb; BPd; NUa	FNb; BPd; NUa	FNb; BPd	**250 000**	None	None	None	None	None	FNb
Coetzee (1983)	OBc; FNe; NUa	OBc; FNe; NUa	OBc; FNe; NUa	OBc; FNe; NUa	OBc; FNe; NUa	**Unmapped**	OBc	OBc	None	OBc	OBc
Gertenbach (1983) Landscapes	OBc;FNd; BPb,d; NUa	OBc; FNd; BPb,d; NUa	OBc;FNd; BPb,d; Nua	OBc; FNd; BPb,d; NUa	OBc; BPb,d; NUa	FNd; NUc	**250 000**	OBc; FNd; BPb,c	OBc; BPb,c	OBc; BPb,c	OBc; FNb
Gertenbach (1998) Alliances	OBc; FNd; BPb,d; NUa	OBc; FNd; BPb,d; NUa	OBc; FNd; BPb,d; Nua	OBc; FNd; BPb,d: NUa	OBc; FNd; BPb,d; NUc	FNd; NUc	NUc	**250 000**	OBc; BPb,c	OBc; BPb,c	OBc; FNb
Gertenbach (1983) Geology	OBc; FNa; BPb,d; NUa	OBc; FNa; BPb,d; NUa	OBc; FNb; BPb,c; Nuc	OBc; FNa; BPb,d; NUc	OBc; FNa; BPb,d; FNc	FNa; NUa	FNa; NUa	FNa; NUc	**250 000**	OBc; BPb,c	OBc; FNb
Gertenbach (1983) Dominant woody species	OBc; FNc; BPb,d; NUa	OBc; BPb,d; NUa	OBc; BPb,d; NUa	OBc; BPb,d; NUc	OBc; BPb,d; NUc	FNc; NUc	FNc; NUa	FNc; NUc	FNc; NUc	**250 000**	OBc
Low & Rebelo (1998)	OBc; FNb; BPd; NUa	OBc; FNb; BPd; NUc	OBc; FNb; BPd; NUc	OBc; FNb; BPd; NUc	OBc; BPd; NUc	FNb;NUa	BPd; NUc	BPd; NUc	BPd; NUc	FNb; BPd	**3880 000**

ISSN 0075-6458

Key to the abbreviations used in Table 2

1. Objectivity (OB)
   - Subjective, little or no quantitative data used — a
   - Semi-objective, some quantitative data used — b
   - Objective, scientifically based — c

2. Foundation (FN)
   - Geological formations, regardless of vegetation dominants — a
   - Geological formation and vegetation dominants — b
   - Climate, geology and vegetation dominants — c
   - Climate and geology — d
   - Game habitats — e

3. Boundary position (BP)
   - Approximately placed — a
   - Semi-accurately to accurately placed — b
   - Largely or completely correspond — c
   - Largely or completely differ — d

4. Number of units (NU)
   - More than — a
   - Same as — b
   - Less than — c

to delineate a boundary. These indistinct boundaries occur both on the ground and on aerial photographs, where at a scale of 1:250 000 a one-millimetre error or shift in boundary position, represents 250 m on the ground. In these areas, a very low similarity between the two systems can thus be expected.

The same comparison was done for the 11 land systems as identified by Venter and the agglomoration of Gertenbach's landscapes into 12 main geological formations. These areas of similarity and dissimilarity are depicted in Fig. 3. Intuitively, one might expect the boundaries of these geological areas to coincide closely with the boundaries of Venter's land systems, since these two classification systems are essentially based upon the same criteria. As can be seen form Figure 3, this is however, not the case. The only areas of extremely close similarity is where Gertenbach's classification corresponds to Venter's Letaba land system. Differences between Venter (1990) and Gertenbach (1983) are primarily due to greater emphasis being placed on geology, terrain morphology and soils by Venter, whereas Gertenbach places greater emphasis on dominant woody vegetation. A further reason for differences concerns the indistinct boundaries on the ground or aerial photographs, as discussed previously.

The attributes used in developing each classification as well as potential usages and strong and weak points are given in Table 1. Only levels specifically used by Venter (1990) and Gertenbach (1983) in their respective publications are explained in this table.

Comparison of the most widely used broad-scale vegetation classifications in South Africa yield a correspondence shown in Table 2. Six vegetation classifications and the Gertenbach landscapes (because of its high dependence on vegetation) are used in the first half of the table in an increasing scale of heterogeneity, i.e. from the smallest number of classes per system to the largest number of classes per classification system. In the second half of the table, three unpublished classifications identified by Gertenbach as well as the vegetation map by Low and Rebelo are compared to one another in levels of increasing homogeneity. In this table the original scale at which each system was developed is given and major similarities and differences between these systems are pointed out. In Table 3, these vegetation classifications, developed from 1951 to 1998, are explained with respect to the units used as a strategic framework for describing land in the KNP by various authors. Furthermore, the Gertenbach landscape numbers, corresponding to every individual unit in each classification system are provided for comparative purposes.

Table 3

Rationalisation of the vegetation classifications of the KNP : 1951 - 1998

	GERTENBACH (1983) Braun-Blanquet 35 LANDSCAPES
1	Moderately undulating granitic plains with *Terminalia sericea* tree savanna
2	Low granitic mountains with *Combretum apiculatum* bush savanna
3	Moderately undulating granitic plains with *Combretum zeyheri* bush savanna
4	Granitic plains with *Acacia grandicornuta* tree savanna
5	Moderately undulating granitic plains with *C. apiculatum* bush savanna
6	Slightly undulating metalava plains with *Colophospermum mopane* bush savanna
7	Irregular granitic hills with *C. mopane* tree savanna
8	Moderately undulating granitic plains with *C. mopane* bush savanna
9	Slightly undulating metalava plains with *C. mopane* tree savanna
10	Very irregular granitic plains with *C. mopane* tree savanna
11	Slightly undulating granitic plains with *C. mopane* bush savanna
12	Metalava plains with *C. mopane* tree savanna
13	Karoo sediment plains with *Acacia welwitschii* tree savanna
14	Karoo sediment plains with *T. sericea* bush savanna
15	Karoo sediment plains with *C. mopane* tree savanna
16	Very irregular Clarens sandstone hills with *T. sericea* bush savanna
17	Basaltic plains with *Sclerocarya birrea* tree savanna
18	Slightly undulating basaltic plains with *Acacia nigrescens* shrub savanna
19	Moderately undulating gabbroic plains with *A. nigrescens* bush savanna
20	Moderately undulating basaltic plains with *A. nigrescens* bush savanna
21	Irregular basaltic plains with *A. nigrescens* bush savanna
22	Irregular basaltic plains with *C. mopane* bush savanna
23	Basaltic plains with *C. mopane* shrub savanna
24	Slightly undulating gabbroic plains with *C. mopane* shrub savanna
25	Moderately undulating basaltic plains with *C. mopane* shrub savanna
26	Irregular calcitic plains with *C. mopane* shrub savanna
27	Slightly undulating basaltic plains with *C. apiculatum* bush savanna
28	Alluvial plains with *Faidherbia albida* tree savanna
29	Low rhyolitic mountains with *C. apiculatum* bush savanna
30	Recent sand plains with *T. sericea* bush savanna
31	Low rhyolitic mountains with *C. mopane* bush savanna
32	Recent sand plains with *Baphia massaiensis* bush savanna
33	Andesitic plains with *Combretum collinum* shrub savanna
34	Low Soutpansberg group mountains with *Burkea africana* tree savanna
35	Alluvial plains with *Salvadora angustifolia* tree savanna

These landscape numbers are provided for comparative purposes in each classification system that follows.

Table 3 (continued)

CODD (1951) Subjective, coarse classification 5 VEGETATION REGIONS		ACOCKS (1953) Species abundance ranking 5 VELD TYPES		VAN DER SCHIJFF (1957) Belt transects 6 COMMUNITIES	
1. Large deciduous-leaved bush	1	9. Lowveld sour bushveld	1	1. *Dichrostachys-Terminalia Hyparrhenia* communities	1
	2		15		
	3		16	2. *Combretum* communities	2
	19		25		3
2. *Combretum* communities	4		34		4
	5	10. Lowveld	1		5
	6		2		6
	7		3		7
	8		4		11
	19		5		12
3. Knobthorn-Marula open parkland	13		17		19
	14		19		24
	15		29		29
	17	11. Arid Lowveld	6		31
	18		7		33
	20		13	3. *Acacia nigriscens-Sclerocarya birrea* associations	4
	21		14		12
	29		17		13
	30		18		14
4. Mopanieveld	9		19		17
	10		20		18
	11		21		20
	12		29		21
	15		30	5. *Colophospermum mopane* communities	6
	22	15. Mopani Veld	8		7
	23		9		8
	24		10		9
	25		11		10
	26		12		11
	27		13		12
	28		14		15
	31		15		16
	32		22		22-28
	33		23		35
	35		24	6. Mixed communities of Punda Maria Sandveld	16
5. Punda Maria Sandveld	16		25		34
	36		26	7. *Baphia massaiensis* communities of the Nwambiya sandveld	30
			27		32
			28		
			31	Unmapped communities	
			32	4. Communities of doleritic intrusions	
			33		
			35	8. Hygrophilic communities	
		18. Mixed Bushveld	16	9. Communities of rock sheets, koppies & ridges	
			18		
			25	10. Communities of termitaria	

Table 3 *(continued)*

PIENAAR (1963) Subjective 19 GAME HABITATS	
1. Pumbe Sandveld	30
2. Deciduous shrub thickets (Nyandu bush)	32
3. Bush or forest-clad mountainous or rocky outcrops	2, 16
4. Lebombo mountain range	25, 26, 29, 31
5. Light montane forest and overgrown valleys	2, 34
6. Riparian forest	28, 35
7. Mopani shrub savanna of Lebombo flats	11, 23, 24, 27
8. Mopani tree savanna of Lebombo flats	23
9. Grassland plains and dambos	23
10. Mixed Mopani - *Combretum* savanna woodland	6-12, 22, 24, 26, 33
11. Mixed Mopani - *Combretum* tree savanna	7, 8, 11, 12
12. Mopani woodland	15
13. Dense thorn thickets	4
14. Mixed *Combretum* savanna woodland	3, 4, 5, 19
15. Mixed *Combretum Acacia* tree savanna	5, 13, 14, 19
16. Long grass savanna woodland and tree savanna	1
17. Dry deciduous forest	16, 31, 34
18. *Acacia nigriscens Sclerocarya birrea* tree savanna	17, 18, 20, 21
19. *Acacia nigriscens Sclerocarya birrea* savanna woodland	17, 18, 21

VAN WYK (1972) Subjective 19 VEGETATION ZONES	
AREA A	
A_1 Red bush-willow veld (granite undulations)	3, 5
A_2 Thorny thickets (brackish flats of granite origin)	4
AREA B	
Red bush-willow/ mopani veld (granite undulation)	24, 33
AREA C	
C_1 Shrub mopani veld (basalt plains)	22, 23
C_2 Tree mopani veld (sandstone plains & alluvial soils)	15
C_3 Mixed mopani veld (basalt ridges)	25, 26, 27
AREA D	
D_1 Knobthorn/marula veld (basalt plains and dolerite intrusions)	17, 18, 19, 20
D_2 Leadwood/marula/*Albizia* veld (basalt plains)	17
AREA E	
Terminalia/sicklebush veld (granite undulations)	1
AREA F	
F_1 Mixed red bush-willow and mopani veld (rhyolite ridges)	29, 31
F_2 Lebombo ironwood forest (rhyolite ridges)	29
AREA G	
Punda Maria Sandveld (Sandstone ridges)	34
AREA H	
H_1 Wambija sandveld(sandy flats)	32
H_2 Pumbe sandveld(sandy flats)	30
AREA I	
Mixed montane vegetation (granite mountains)	2
AREA J	
Delagoa thorn thickets (brackish flats of granite origin)	13, 14
AREA K	
Karoo sandveld (karoo sediments)	16
AREA L	
Terminalia/*Commiphora*/knobthorn veld (basalt undulations)	21
AREA M	
Riverine forest (Alluvial soils)	28, 35

COETZEE (1983) Braun-Blanquet 20 VEGETATION ZONES	
A. AZONAL REGION	
1. Riparian	28, 35
B. SUBHUMID REGIONS	
2. Subhumid plains	1
3. Southern subhumid hills and mountains	2
4. Northern subhumid hills and mountains	34
C. SEMI-ARID REGIONS	
5. Semi-arid grainitic plains	3, 5
6. Semi-arid amphibolitic and andesitic plains	33
7. Semi-arid dolerite plains	17, 18, 19
8. Semi-arid basaltic plains	17, 20
9. Semi-arid Karoo sediment plains	13, 14
10. Semi-arid sand plateau	30
11. Semi-arid hills and inselberge	31
D. ARID REGIONS	
12. Arid granitic plains	6, 7, 8, 9, 10, 11, 12, 24, 33
13. Arid dolerite plains	22, 23
14. Arid basaltic pains	22, 23
15. Arid karoo sediment plains	15
16. Southern spiny arid bushveld	4, 21
17. Northern spiny arid bushveld	25, 26, 27
18. Arid sand plateau	32
19. Arid sandstone hills	16
20. Arid inselberge, ridges and rhyolite range	29, 31

Table 3 *(continued)*

GERTENBACH (1998) Synthesis of allied landscapes 17 LANDSCAPE ALLIANCES	
1. Granitic plains with *Terminalia sericea* tree savanna	1
2. Granitic mountains with *Combretum apiculatum* bush savanna	2
3. Granitic lowlands with *Acacia grandicornuta* tree savanna	4
4. Granite plains with *Combretum zeyheri* or *C. apiculatum* bush savanna	3 5
5. Granite plains with *Colophospermum mopane* bush or tree savanna	6 7
6. Metalava with *C. mopane* tree savanna	9 10
7. Granitic plains with *C. mopane* bush savanna	8 11
8. Metalava plains with *C. mopane* tree savanna; or Andesitic plains with *Combretum collinum* shrub savanna	12 33
9. Karoo sediment plains with *Acacia welwitchii* tree savanna; or with *T. sericea* bush savanna	13 14
10. Karoo sediment plains with *C. mopane* tree savanna	15
11. Clarens sandstone hills with *T. sericea* bush savanna; or Soutpansberg group mountains with *Burkea africana* tree savanna	16 37
12. Basaltic or gabbroic plains with *S. birrea tree* savanna; or *Acacia nigriscens* bush or shrub savanna	17 18 19 20
13. Basaltic or gabbroic plains with *A. nigriscens* bush savanna; or *C. mopane* bush or shrub savanna	21 22 23 24
14. Basaltic plains or rhyolite mountains with *C. apiculatum* or *C. mopane* bush savanna	27 29 31
15. Basaltic or calcitic plains with *C. mopane* shrub savanna	25 26
16. Alluvial plains with *Faidherbia albida* or *Salvadora angustifolia* tree savanna	28 35
17. Recent sand plains with *T. sericea* bush savanna; or with *Baphia massaiensis* bush savanna	30 32

GERTENBACH (1998) Grouped according to predominant woody vegetation 8 DOMINANT WOODY SPECIES GROUPINGS	
MOPANI Tree, bush or shrub savanna on: i) Lightly, moderately, irregular or very irregular granitic plains ii) Basaltic plains, moderately undulating or irregular basaltic plains iii) Slightly undulating gabbroic plains iv) Undulating metalava plains v) Karoo sediment plains vi) Irregular calcitic plains	6 7 8 9 10 11 12 15 22 23 24 25 26 31
COMBRETUM spp. *C. apiculatum* or *C. zeyheri* bush savanna; or *C. collinum* shrub savanna on: i) Moderately undulating granitic plains or low granitic mountains ii) Slightly undulating basaltic plains iii) Andesetic plains iv) Low rhyolitic mountains	2 3 5 27 29 33
ACACIA spp. *A. nigriscens* bush or shrub savanna or *A. grandicornuta* or *A. welwitchii* tree savanna on: i) Granitic lowlands ii) Karoo sediment plains iii) Slightly, moderately or irregular basaltic plains	4 13 18 19 20 21
SCLEROCARYA BIRREA Tree savanna on basaltic plains	17
TERMINALIA SERICEA Tree or bush savanna on: i) Moderately undulating granitic plains ii) Karoo sediment iii) Recent sand plains	1 14 16 30
BURKEA AFRICANA Tree savanna on low Soutpansberg group mountains	34
ALLUVIUM *Faidherba albida* or *Salvadora angustifolia* tree savanna on alluvial plains	28 35
BAPHIA MASSAIENSIS Bush savanna on recent sand plains	32

LOW & REBELO (1998) Published classifications 7 VEGETATION TYPES	
SAVANNA BIOME	
9. Mopane shrubveld	9 22 23 27 35
10. Mopane bushveld	7 8 10 11 12 15 24 25 26 28 32 33
11. Soutpansberg arid mountain bushveld	16
13. Lebombo arid mountain bushveld	29 30 31
19. Mixed lowveld bushveld	3 4 5 13 14 19
20. Sweet lowveld bushveld	6 17 18 20 21
21. Sour lowveld bushveld	1 2 34

The question arose whether there is not a necessity for a finer vegetation based subclassification of the 35 landscapes. Raw data on the plant communities occurring in the KNP (collected by Van Rooyen (1978), Gertenbach (1978) and Coetzee (1983)) are available, and modern techniques can be implemented to reclassify these into a viable small scaled classification corresponding to the land units in the Venter-based classification. Indeed, a project on the phytosociological and syntaxonomical synthesis of the vegetation of the Kruger National Park and adjacent lowveld is currently under way. The wealth of phytosociological data that have been collected in the KNP and surroundings over the years by individual researchers for various studies (among others those mentioned above) can now be used. The objective is to prepare a comprehensive phytosociological synthesis of all available data, resulting in plant communities being identified and described at a smaller scale than was previously available. For more details on this study contact Prof. G. Bredenkamp at *gbredenk@scientia.up.ac.za*.

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