



## **APPENDIX 1**

### **A description of the four land classification systems**



## Appendix 1

The area (ha) occupied by each of the land systems and land types in the Kruger National Park. Because these two classifications nest naturally within each other, their areas are given in one table to indicate the specific land types comprising each land system.

LAND SYSTEM	LAND TYPE ID	LAND TYPE	AREA (ha)	% of KNP
<b>Malelane</b>			41 326	7.1
	Ma 1	Malelane	30 468	
	Ma2	Stolsnek	10 858	
<b>Skukuza</b>			382 043	19.6
	Sk1	Pretoriuskop	47 267	
	Sk2	Napi	39 473	
	Sk3	Randspruit	23 697	
	Sk4	Lwakhale	51 290	
	Sk5	Makuthwanini	15 840	
	Sk6	Renosterkoppies	37 173	
	Sk7	Skukuza	57 422	
	Sk8	Nhlanguleni	63 508	
	Sk9	Muzandzeni	35 067	
	Sk10	Rabelais	8 112	
	Sk11	Timbavati	3 194	
<b>Phalaborwa</b>			507 726	26.6
	Ph1	Houtboschrand	19 801	
	Ph2	Shidyanamani	13 286	
	Ph3	Tsheri	51 289	
	Ph4	Phalaborwa	30 020	
	Ph5	Shivhulani	18 204	
	Ph6	Malopeni	24 399	
	Ph7	Mahlangeni	138 476	
	Ph8	Tsende	66 109	
	Ph9	Nalatsi	21 334	
	Ph10	Bububu	53 014	
	Ph11	Mphongolo	50 907	
	Ph12	Dothole	20 887	
<b>Vutome</b>			78 819	4.1
	Vu1	Vutome	78 819	
<b>Bulweni</b>			32 384	1.7
	Bu1	Bulweni	9 417	
	Bu2	Marithenga	12 966	
	Bu3	Tsotsi	10 000	



LAND SYSTEM	LAND TYPE ID	LAND TYPE	AREA (ha)	% of KNP
<b>Satara</b>			275 867	14.2
	Sa1	Satara	130 811	
	Sa2	Mavumbye	38 451	
	Sa3	Bangu	14 819	
	Sa4	Balule	25 103	
	Sa5	Orpen	58 124	
	Sa6	Salitje	8 559	
<b>Letaba</b>			356 664	18.3
	Le1	Olifants	38 068	
	Le2	Letaba	29 509	
	Le3	Mooiplaas	147 163	
	Le4	Manyeleti	53 270	
	Le5	Shingwedzi	45 222	
	Le6	Mashikiri	15 648	
	Le7	Shilawuri	27 784	
<b>Sabiepoort</b>			84 122	4.3
	Sp1	Sabiepoort	52 312	
	Sp2	Rietpan	16 033	
	Sp3	Pumbe	2 875	
	Sp4	Nwanetsi	12 902	
<b>Klipkoppies</b>			45 733	2.4
	Kl1	Gorge	6 835	
	Kl2	Klipkoppies	38 898	
<b>Pafuri</b>			92 423	4.7
	Pa1	Punda	28 104	
	Pa2	Madzaringwe	12 646	
	Pa3	Lanner Gorge	10 539	
	Pa4	Boabab Hill	23 505	
	Pa5	Pafuri	9 198	
	Pa6	Malonga	8 431	
<b>Nwambiya</b>			40 879	2.1
	Nw1	Nwambiya	20 056	
	Nw2	Masokosa	20 823	



The landscape classification system with the areas (ha) of each unit found in the Kruger National Park.

LANDSCAPE NUMBER	LANDSCAPE NAME	AREA (ha)	% of KNP
1	Lowveld Sour Bushveld of Pretoriuskop	53000	2.8
2	Malelane Mountain Bushveld	47000	2.4
3	<i>Combretum</i> Woodland	54000	2.8
4	Thickets of the Sabie & Crocodile Rivers	124200	6.2
5	<i>Combretum</i> spp./ <i>Terminalia sericia</i> Woodland	157800	8.1
6	<i>Combretum/Colophospermum</i> Woodland	46930	2.4
7	Olifants River Rugged Veld	36000	1.8
8	Phalaborwa Sandveld	39600	2.0
9	<i>Colophospermum mopane</i> Savanna on Basic Soils	54600	2.8
10	Letaba River Rugged Veld	70000	3.6
11	Tsende Sandveld	115600	5.9
12	<i>Colophospermum/Acacia nigrescens</i> Savanna	104200	5.5
13	<i>Acacia welwitschii</i> Thickets on Karoo Sediments	52000	2.7
14	Kumana Sandveld	16400	0.8
15	<i>Colophospermum mopane</i> Forest	18000	0.9
16	Punda Maria Sandveld on Cave Sandstone	11700	0.6
17	<i>Sclerocarya caffra/Acacia nigrescens</i> Savanna	141100	7.2
18	Dwarf <i>Acacia nigrescens</i> Savanna	35600	1.8
19	Thornveld on Gabbro	68500	3.5
20	Bangu Rugged Veld	20400	1.0
21	<i>Combretum/Acacia</i> Rugged Veld	27000	1.4
22	<i>Combretum/Colophospermum</i> Rugged Veld	89400	4.6
23	<i>Colophospermum mopane</i> Shrubveld on Basalt	199300	10.3
24	<i>Colophospermum mopane</i> Shrubveld on Gabbro	28400	1.5
25	<i>Adansonia digitata/Colophospermum</i> Rugged Veld	28400	1.5
26	<i>Colophospermum mopane</i> Shrubveld on Calcrete	11700	0.6
27	Mixed <i>Combretum/Colophospermum</i> Woodland	32900	1.9



28	Limpopo/Levubu Floodplains	28400	1.5
29	Lebombo South	76500	4.8
30	Pumbe Sandveld	17700	0.1
31	Lebombo North	48000	2.9
32	Nwambia Sandveld	13900	0.8
33	<i>Pterocarpus rotundifolius/Combretum</i> Woodland	18000	0.9
34	Punda Maria Sandveld on Waterberg Sandstone	29700	1.7
35	<i>Salvadora angustifolia</i> Floodplains	13300	0.7



The seven vegetation types found in the Kruger National Park.

<b>VEGETATION TYPE NUMBER</b>	<b>VEGETATION TYPE NAME</b>	<b>AREA (ha)</b>	<b>% of KNP</b>
9	Mopane Shrubveld	2618.3	13.9
10	Mopane Bushveld	6597.8	34.9
11	Soutpansberg Arid Mountain Bushveld	217.7	1.2
13	Lebombo Arid Mountain Bushveld	1651.5	8.7
19	Mixed Lowveld Bushveld	3680.5	19.5
20	Sweet Lowveld Bushveld	3496.6	18.5
21	Sour Lowveld Bushveld	636.7	3.4

## APPENDIX 2

Classifications commonly used as templates for  
management, scientific and GIS work in the Kruger  
National Park\*

\*Ms. In Press: M. Solomon, N. Zambatis, H.C. Biggs & N. Maré. Classifications commonly used as templates for management, scientific and GIS work in the Kruger National Park. *Koedoe* 42(2).



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## News and Views

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

M. SOLOMON, N. ZAMBATIS, H.C. BIGGS and N. MARÉ

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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



### Primary Classification System

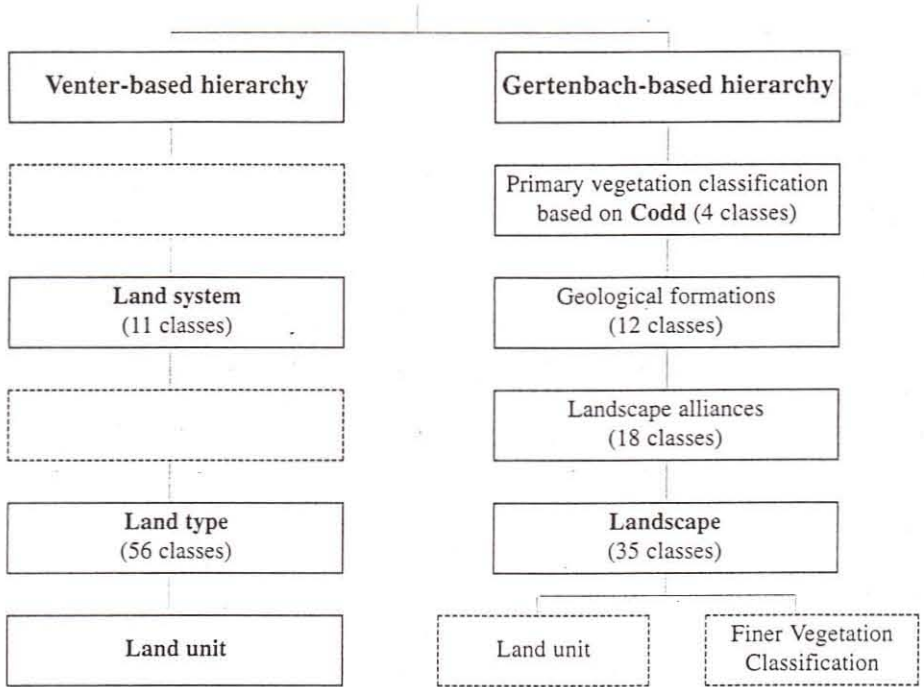


Fig. 1: The main sub-classifications of the Venter (1990) and Gertenbach (1983) land classification systems.

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

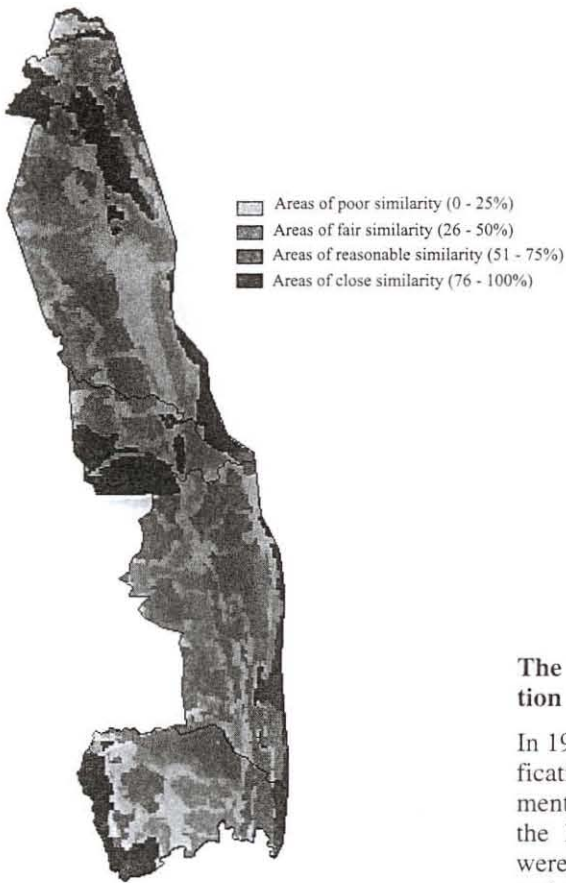


Fig. 2: A spatial comparison of 56 land types (Venter) and 35 landscapes (Gertenbach)

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-



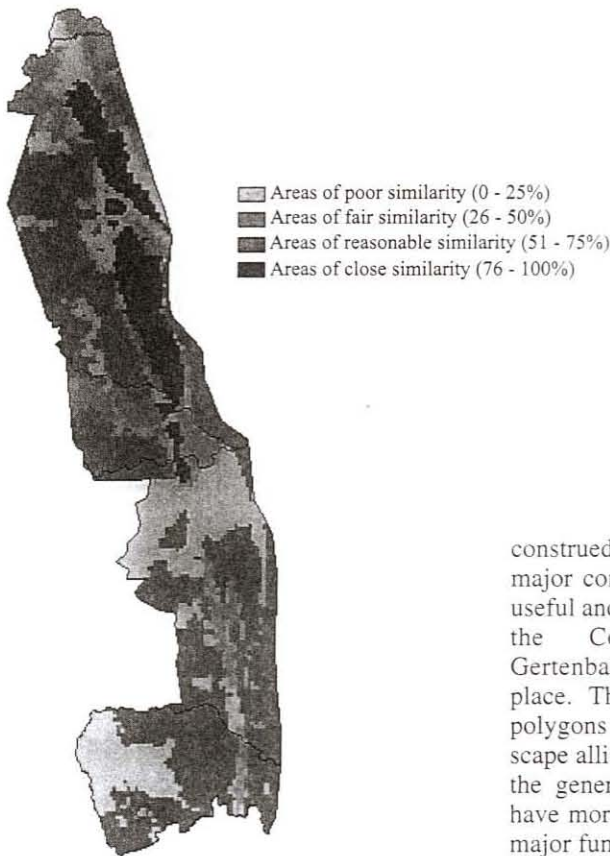


Fig. 3: A spatial comparison of 11 land systems (Venter) and 12 main geological formations (Gertenbach).

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					
	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)	
	Similarities											
	Number & Type of Unit	5 Vegetation Regions	5 Veld Types	6 Communities	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
	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
Differences	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; FNb; BPd; NUc	FNb; NUa	BPd; NUc	BPd; NUc	BPd; NUc	FNb; BPd	3880 000



Key to the abbreviations used in Table 2

1. Objectivity (OB)		Climate and geology	d
Subjective, little or no quantitative data used	a	Game habitats	e
Semi-objective, some quantitative data used	b		
Objective, scientifically based	c		
2. Foundation (FN)		3. Boundary position (BP)	
Geological formations, regardless of vegetation dominants	a	Approximately placed	a
Geological formation and vegetation dominants	b	Semi-accurately to accurately placed	b
Climate, geology and vegetation dominants	c	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 agglomeration 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 from 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

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GERTENBACH (1983)  
Braun-Blanquet  
35 LANDSCAPES

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

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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 SCHUIFF (1957) Belt transects 6 COMMUNITIES	
1. Large deciduous-leaved bush	1 2 3 19	9. Lowveld sour bushveld	1 15 16 25	1. <i>Dichrostachys-Terminalia</i> <i>Hyparrhenia</i> communities	1 2 3
2. <i>Combretum</i> communities	4 5 6 7 8 19	10. Lowveld	34 1 2 3 4 5	2. <i>Combretum</i> communities	4 5 6 7 11 12
3. Knobthorn-Marula open parkland	13 14 15 17 18 20 21 29 30	11. Arid Lowveld	17 19 29 6 7 13 14 17 18	3. <i>Acacia nigricens-Sclerocarya birrea</i> associations	19 24 29 31 33 4 12 13 14
4. Mopanieveld	9 10 11 12 15 22 23 24 25 26 27 28 31 32 33 35	15. Mopani Veld	19 20 21 29 30 8 9 10 11 12 13 14 15 22 23 24 25	5. <i>Colophospermum mopane</i> communities	17 18 20 21 21 6 7 8 9 10 11 12 15 16 22-28 35
5. Punda Maria Sandveld	16 36	18. Mixed Bushveld	16 18 25	6. Mixed communities of Punda Maria Sandveld 7. <i>Baphia massaiensis</i> communities of the Nwambiya sandveld Unmapped communities 4. Communities of doleritic intrusions 8. Hygrophilic communities 9. Communities of rock sheets, koppies & ridges 10. Communities of termitaria	16 34 30 32  16 34 30 32  16 34 30 32





Table 3 (continued)

PIENAAR (1963) Subjective 19 GAME HABITATS		VAN WYK (1972) Subjective 19 VEGETATION ZONES		COETZEE (1983) Braun-Blanquet 20 VEGETATION ZONES	
1. Pumbe Sandveld	30	AREA A		A. AZONAL REGION	
2. Deciduous shrub thickets (Nyandu bush)	32	A <sub>1</sub> Red bush-willow veld (granite undulations)	3	1. Riparian	28
3. Bush or forest-clad mountainous or rocky outcrops	2	A <sub>2</sub> Thorny thickets (brackish flats of granite origin)	4		35
4. Lebombo mountain range	16	AREA B		B. SUBHUMID REGIONS	
	25	Red bush-willow/ mopani veld (granite undulation)	24	2. Subhumid plains	1
	26		33	3. Southern subhumid hills and mountains	2
	29			4. Northern subhumid hills and mountains	34
	31	AREA C		C. SEMI-ARID REGIONS	
5. Light montane forest and overgrown valleys	2	C <sub>1</sub> Shrub mopani veld (basalt plains)	22	5. Semi-arid granitic plains	3
	34		23		5
6. Riparian forest	28	C <sub>2</sub> Tree mopani veld (sandstone plains & alluvial soils)	15	6. Semi-arid amphibolitic and andesitic plains	33
	35			7. Semi-arid dolerite plains	17
7. Mopani shrub savanna of Lebombo flats	11	C <sub>3</sub> Mixed mopani veld (basalt ridges)	25		18
	23		26		19
	24		27		19
	27				17
8. Mopani tree savanna of Lebombo flats	23	AREA D		8. Semi-arid basaltic plains	17
9. Grassland plains and dambos	23	D <sub>1</sub> Knobthorn/marula veld (basalt plains and dolerite intrusions)	17		20
			18		13
			19	9. Semi-arid Karoo sediment plains	14
10. Mixed Mopani - <i>Combretum</i> savanna woodland	6-12		20	10. Semi-arid sand plateau	30
	22		17	11. Semi-arid hills and inselberge	31
	24	D <sub>2</sub> Leadwood/marula/ <i>Albizia</i> veld (basalt plains)			
	26				
	33	AREA E			
11. Mixed Mopani - <i>Combretum</i> tree savanna	7	<i>Terminalia</i> /sicklebush veld (granite undulations)	1	D. ARID REGIONS	
	8			12. Arid granitic plains	6
	11				7
	12	AREA F			8
12. Mopani woodland	15	F <sub>1</sub> Mixed red bush-willow and mopani veld (rhyolite ridges)	29		9
13. Dense thorn thickets	4		31		10
14. Mixed <i>Combretum</i> savanna woodland	3	F <sub>2</sub> Lebombo ironwood forest (rhyolite ridges)	29		11
	4				12
	5				24
	19	AREA G			33
15. Mixed <i>Combretum</i> <i>Acacia</i> tree savanna	5	Punda Maria Sandveld (Sandstone ridges)	34	13. Arid dolerite plains	22
	13				23
	14	AREA H			22
	19	H <sub>1</sub> Wambija sandveld(sandy flats)	32	14. Arid basaltic plains	23
16. Long grass savanna woodland and tree savanna	1	H <sub>2</sub> Pumbe sandveld(sandy flats)	30		15
				15. Arid karoo sediment plains	4
17. Dry deciduous forest	16	AREA I		16. Southern spiny arid bushveld	21
	31	Mixed montane vegetation (granite mountains)	2	17. Northern spiny arid bushveld	25
	34				26
18. <i>Acacia nigriscens</i> <i>Sclerocarya birrea</i> tree savanna	17	AREA J			27
	18	Delagoa thorn thickets (brackish flats of granite origin)	13	18. Arid sand plateau	32
	20		14	19. Arid sandstone hills	16
	21	AREA K		20. Arid inselberge, ridges and rhyolite range	29
19. <i>Acacia nigriscens</i> <i>Sclerocarya birrea</i> savanna woodland	17	Karoo sandveld (karoo sediments)	16		31
	18				
	21	AREA L			
		<i>Terminalia/Commiphora</i> /knobthorn veld (basalt undulations)	21		
		AREA M			
		Riverine forest (Alluvial soils)	28		
			35		



Table 3 (continued)

GERTENBACH (1998) Synthesis of allied landscapes 17 LANDSCAPE ALLIANCES		GERTENBACH (1998) Grouped according to predominant woody vegetation 8 DOMINANT WOODY SPECIES GROUPINGS		LOW & REBELO (1998) Published classifications 7 VEGETATION TYPES	
1.	Granitic plains with <i>Terminalia sericea</i> tree savanna	1	MOPANI Tree, bush or shrub savanna on:	6	SAVANNA BIOME
2.	Granitic mountains with <i>Combretum apiculatum</i> bush savanna	2	i) Lightly, moderately, irregular or very irregular granitic plains	7 8	9. Mopane shrubveld
3.	Granitic lowlands with <i>Acacia grandicornuta</i> tree savanna	4	ii) Basaltic plains, moderately undulating or irregular basaltic plains	9 10 11	
4.	Granite plains with <i>Combretum zeyheri</i> or <i>C. apiculatum</i> bush savanna	3	iii) Slightly undulating gabbroic plains	12 15	10. Mopane bushveld
5.	Granite plains with <i>Colophospermum mopane</i> bush or tree savanna	6	iv) Undulating metalava plains	22	
6.	Metalava with <i>C. mopane</i> tree savanna	7	v) Karoo sediment plains	23	
7.	Granitic plains with <i>C. mopane</i> bush savanna	9	vi) Irregular calcitic plains	24 25	
8.	Metalava plains with <i>C. mopane</i> tree savanna; or Andesitic plains with <i>Combretum collinum</i> shrub savanna	10		26 31	
9.	Karoo sediment plains with <i>Acacia welwitschii</i> tree savanna; or with <i>T. sericea</i> bush savanna	11	8 COMBRETUM spp. <i>C. apiculatum</i> or <i>C. zeyheri</i> bush savanna; or <i>C. collinum</i> shrub savanna on:	2 3 5	11. Soutpansberg arid mountain bushveld
10.	Karoo sediment plains with <i>C. mopane</i> tree savanna	12	i) Moderately undulating granitic plains or low granitic mountains	27 29	13. Lebombo arid mountain bushveld
11.	Clarens sandstone hills with <i>T. sericea</i> bush savanna; or Soutpansberg group mountains with <i>Burkea africana</i> tree savanna	13	ii) Slightly undulating basaltic plains	33	
12.	Basaltic or gabbroic plains with <i>S. birrea</i> tree savanna; or <i>Acacia nigrescens</i> bush or shrub savanna	14	iii) Andesetic plains		19. Mixed lowveld bushveld
13.	Basaltic or gabbroic plains with <i>A. nigrescens</i> bush savanna; or <i>C. mopane</i> bush or shrub savanna	15	iv) Low rhyolitic mountains		
14.	Basaltic plains or rhyolite mountains with <i>C. apiculatum</i> or <i>C. mopane</i> bush savanna	16	ACACIA spp. <i>A. nigrescens</i> bush or shrub savanna or <i>A. grandicornuta</i> or <i>A. welwitschii</i> tree savanna on:	4 13 18 19	20. Sweet lowveld bushveld
15.	Basaltic or calcitic plains with <i>C. mopane</i> shrub savanna	17	i) Granitic lowlands	19	
16.	Alluvial plains with <i>Faidherbia albida</i> or <i>Salvadora angustifolia</i> tree savanna	18	ii) Karoo sediment plains	20	
17.	Recent sand plains with <i>T. sericea</i> bush savanna; or with <i>Baphia massaiensis</i> bush savanna	19	iii) Slightly, moderately or irregular basaltic plains	21	
		20	SCLEROCARYA BIRREA Tree savanna on basaltic plains	17	21. Sour lowveld bushveld
		21	TERMINALIA SERICEA Tree or bush savanna on:		
		22	i) Moderately undulating granitic plains	1	
		23	ii) Karoo sediment	14	
		24	iii) Recent sand plains	16 30	
		25	BURKEA AFRICANA Tree savanna on low Soutpansberg group mountains		
		26	ALLUVIUM <i>Faidherbia albida</i> or <i>Salvadora angustifolia</i> tree savanna on alluvial plains	34	
		27			
		28	BAPHIA MASSAIENSIS Bush savanna on recent sand plains	28 35	
		29			
		30			
		31			
		32			
		33			
		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](mailto:gbredenk@scientia.up.ac.za).

## References

- ACOCKS, J.P.H. 1975. Veld types of South Africa. *Memoirs of the botanical Survey of South Africa* 40: 1-128.
- CODD, L.E.W. 1951. Trees and shrubs of the Kruger National Park. *Memoirs of the botanical Survey of South Africa* 26: 1-192.
- COETZEE, B.J. 1983. Phytosociology, vegetation structure and landscapes of the Central District, Kruger National Park, South Africa. *Dissertations Botanicae*. FL-9490 Vaduz, Germany.
- GERTENBACH, W.P.D. 1978. Plantgemeenskappe van die Gabbro-kompleks in die noordweste van die Sentrale Distrik van die Nasionale Kruger Wildtuin. M.Sc. thesis, University of Potchefstroom for CHE, Potchefstroom.
- GERTENBACH, W.P.D. 1983. Landscapes of the Kruger National Park. *Koedoe* 26: 9-121.
- LOW, A.B. & A.G. REBELO (eds.). 1996. *Vegetation of South Africa, Lesotho and Swaziland*. Pretoria: Dept Environmental Affairs & Tourism.
- PIENAAR, U. DE V. 1963. The large mammals of the Kruger National Park—their distribution and present day status. *Koedoe* 6: 1-37.
- TOMLIN, C.D. 1990. *Geographic information systems and cartographic modeling*. New Jersey: Prentice-Hall.
- VAN DER SCHUIFF, H.P. 1957. Ekologiese studie van die Flora van die Nasionale Krugerwildtuin. Deel I. D.Sc. thesis. University of Potchefstroom for CHE, Potchefstroom.
- VAN ROOYEN, N. 1978. 'n Ekologiese studie van die flora van die plantgemeenskappe van die Punda Milia-Pafuri-Wambiyagebied in die Nasionale Krugerwildtuin. M.Sc. thesis, University of Pretoria, Pretoria.
- VAN WYK, P. 1972. *Trees of the Kruger National Park*. Vols. I & II. Cape Town: Purnell.
- VENTER, F.J. 1986. Soil patterns associated with the major geological units of the Kruger National Park. *Koedoe* 29: 125-138.
- VENTER, F.J. 1990. A classification of land for management planning in the Kruger National Park. Ph.D. thesis. University of South Africa, Pretoria.