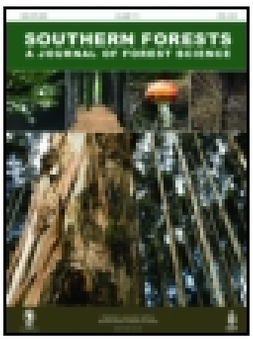

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Woodlands in South Africa and the National Forests Act

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SYNOPSIS

The development of the National Forestry Action Programme (NFAP) and promulgation of the National Forests Act (NFA) have established a new vision for the care, management and distribution of benefits from South Africa's woodlands. The Department of Water Affairs and Forestry is mandated with ensuring this vision is put into practice. However, historically the Department has had little to do with woodlands, and suffers from a lack of capacity and expertise, a situation which it readily acknowledges. Additionally, the legal definition of a woodland within the NFA is problematic. Within this context, this paper examines oft cited definitions of woodlands and seeks to find an appropriate one for the South African context. It then briefly reviews the major classifications of woodland types at a national scale, as the minimum basis for homogenous reporting units for which monitoring of the success of the NFAP and the NFA should be pursued. Finally, a brief description of moist/dystrophic and arid/eutrophic woodlands is presented.

INTRODUCTION

With the promulgation of the National Forestry Action Programme (NFAP) in September 1997 and the National Forests Act (April 1998) the Department of Water Affairs and Forestry (DWAF) assumed responsibility for the legislative and policy frameworks affecting the indigenous woodlands of South Africa, alongside their long-standing responsibilities for indigenous forests. This is the first time in South Africa that woodlands have received legislative significance, along with a positive vision for the productive use and maintenance of the woodlands for the benefit of the country as a whole (NFAP, 1997). This reflects the international trend towards a broader and more inclusive definition of forests and forestry, and the role of local communities and indigenous peoples in their utilisation and management (Cline-Cole, 1996; Othusitse, 1997).

Given the past focus of DWAF on indigenous forests and commercial plantations, there is much uncertainty within DWAF and externally, regarding its new role in woodlands, and indeed, what constitutes a woodland and in what manner it differs from an indigenous forest. After all, the FAO does not recognise the terms woodland, nor savanna, but places all categories of wooded land under the term forest. In FAO terms a forest is any area with a woody canopy cover of greater than 10 %. Vegetation types with less woody cover fall under the category of "other wooded land". To many researchers, myself included, the term woodland is seen as synonymous with the term savanna.

The legislative framework affecting woodlands and how it is interpreted and applied by DWAF will depend upon the definition employed. In terms of the National Forests Act (1998) (NFA) a woodland is taken to mean "a group of indigenous trees which are not a natural forest, but whose crowns cover more than 5 % of the area bounded by the trees forming the perimeter of the group". This is different from a natural forest that is defined as "a group of indigenous trees whose crowns are largely contiguous, or which have been declared by the Minister to be a natural forest under section 7(2)" of the NFA. Section 7(2) of the NFA allows the Minister to declare a group of indigenous trees whose crowns are not contiguous to be a natural forest. There is a definition of a tree within the NFA but it is defined using the term tree within the definition, which is circuitous.

From an ecological and legal perspective this definition of a woodland is inadequate. In terms of the NFA, the definition of woodland would include areas that are currently deemed to be fynbos, thicket and some woodland, but excludes other areas of woodland with either sparse (< 5 %) or dense canopy cover (>75 %). This will compromise estimates of total woodland area and conservation status, as different definitions result in different areas being delineated as woodland or not. The definitions of forest and woodland overlook that canopy cover is a dynamic attribute that changes in relation to management and disturbance. For example, bush encroached areas frequently have contiguous crowns, and would therefore be classified as a forest in terms of the NFA. Were remedial action to be applied, this forest would then become a woodland as the canopy was opened up, although the species composition would probably not greatly change. Fire and subsistence harvesting may

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have a similar effect in reducing canopy cover. Once the driving pressure is eased, the canopy cover tends to increase again. Another problem is that the definition of woodland and forest overlap in instances where there is dense, but not necessarily contiguous, canopy cover.

Ecologically, the definition of a woodland, or savanna, solely in terms of canopy cover also fails to tease out the functional differentiation between this vegetation type and others, particularly forest and grassland. The ecological and legal status of thicket remain open to debate. Some authors have made a clear argument in favour of thicket being recognised and treated as a distinct vegetation type (Everard, 1987; Low and Rebelo, 1996), whereas recent texts and the NFA have not done so (Rutherford and Westfall, 1986; Cowling *et al.*, 1997; NFA, 1998). It is important that functional differentiations between major vegetation types are clear because they are the basis for ecosystem function and behaviour, and hence dictate the type of management options and actions that will be successful in a specific situation.

Within the context of the new policies and legislation this article attempts to make a contribution through (i) a review of existing definitions of the terms savanna and woodland, (ii) a recommendation regarding a standardised definition, and (iii) an overview description of the two major types of woodlands in South Africa.

CURRENT DEFINITIONS OF SAVANNA OR WOODLAND WITHIN THE SOUTH AFRICAN CONTEXT

There has been much debate over a definition of the term savanna, both internationally and in South and southern Africa. There has been equal debate whether or not it is synonymous with the term woodland, or whether a woodland is a distinct vegetation type between savannas and forests (e.g. White, 1983). Perhaps much of the confusion is a result of the wide array of vegetation types that have been termed savannas in the past (Cole, 1986; Solbrig, 1993), ranging from grasslands through arid, low shrublands, to dense tall woodlands. With such a wide range, it is perhaps inevitable that there are exceptions to most definitions that have been proposed. The result being that some authors have elected to abandon the term altogether. However, frequently this still has not resulted in a workable definition or classification that accommodates all the exceptions to the definitions of savanna that prompted the scrapping of the term in the first place.

Most of the definitions have not been developed in South Africa, but have nonetheless been found useful in most South African contexts. A summary of the commonly used definitions within South or southern Africa in the last two decades is provided in *Table 1*. The level of detail in some is greater than others. This is not solely due to differing interpretations of the concept of savannas or woodlands, but also to the diverse readership, purpose and mapping scale for which the text, and definitions, were written.

Each of the definitions has been disaggregated into its constituent components and elements *(Table 2)*. The most common components to the above definitions are vegetation structure and distribution. A few mention aspects of climate, but only one (Scholes and Walker, 1993) provides a process-based definition of savannas. Concerning the distribution component of the definition, there is a dichotomy between definitions stating that savannas are found in the tropics only, and those that include subtropical areas. From a South African perspective, the exclusion of subtropics (in a latitudinal sense) would exclude much of what is generally accepted as savanna or bushveld by most of the above definitions.

In terms of the structural component of the definitions above, all highlight that savannas have both a woody and a herbaceous layer, except for the National Forests Act (1998) which mentions only a woody element. Perhaps the greatest uncertainty, not readily apparent from these definitions, is whether or not there should be specified upper and lower limits of woody canopy cover to a woodland or savanna. Many authors state that the woody layer must be discontinuous for it to be classified as a savanna, whereas others say that it can be continuous or discontinuous. These authors differentiate savannas from forests on the basis of the presence of a well developed grass layer in savannas and the important role of fire, neither of which are a characteristic of forests. Other commentators note that in South Africa, forests are dominated by evergreen species, and woodlands by deciduous species. Some authors recognise woodlands to be another vegetation type intermediate between forests and savannas. Scholes and Walker (1993) and Scholes (1997) emphasise that any stipulated upper and lower limits to woody canopy cover are arbitrary and therefore not particularly meaningful. Additionally, the extent of canopy cover is not static, and can increase or decrease quite dramatically within one or two decades (Scholes, 1997). These issues can only be addressed through a more inclusive definition, rather than exclusive. Consequently, any differentiation between savannas and woodlands is difficult in practice and therefore I support the argument that they be regarded as synonymous within the South African context. In terms of the herbaceous layer, several definitions state that it is continuous. Recently, however, Scholes (1997) has argued that it is simply an artefact of the relative scale of measurement between the two strata, and that most often the herbaceous layer is not continuous.

There is little debate regarding the climatic or process components of definitions of savannas, but they are frequently not included. Their inclusion may help satisfy some of the uncertainty in definition, especially in helping to differentiate savannas from forests.

Based on the analysis of the definitions and the

TABLE 1: Summary of the commonly applied definitions of savanna / woodland within South or southern Africa in the last two decades.

No.	Definition	Source
1	Savannas include all ecosystems in which C4 grasses potentially dominate the herbaceous stratum and where woody plants, usually fire-tolerant, vary in density from widely scattered individuals to a closed woodland broken now and again by drainage-line grasslands. Rainfall occurs in the warmer, summer months with a dry period of two to eight months duration during which fire is a typical phenomenon at intervals varying from one to fifty years.	Huntley (1982)
2	Savannas are wooded C4 grasslands of the tropics and subtropics in which the density, height and growth form characteristics of both the woody and grass components vary markedly between the two principal types in southern Africa, i.e. arid eutrophic savannas and moist dystrophic savannas.	Huntley (1984)
3	A tropical savanna is a type of ecosystem of the warm (lowland) tropics dominated by a herbaceous cover consisting mostly of bunch grasses and sedges that are more than 30 cm in height at the time of maximum activity. The herbaceous cover shows a clear seasonality in its development, with a period of low activity related to water stress. Fire is a recurring natural factor. The savanna may include woody species (shrubs, trees, palms), but they never form a continuous cover that parallels the grassy one.	Sarmiento (1984)
4	The term savanna, although lacking precise definition, is useful in identifying, by structure and function, some unity of vegetation types determined by environmental controls such as climate, soils, fire and providing man with a particular type of agronomic and pastoral resource. Savanna vegetation is characterised by a continuous graminoid stratum, more or less interrupted by trees or shrubs. The climate associated with savanna lands is always seasonal with wet, warm to hot summers alternating with more or less dry, warm to cool winters. These lands represent the grazing lands of the tropics and subtropics.	Johnson and Tothill (1985)
5	The savanna is a rather imprecise term used to designate this extremely variable tropical biome, consisting of more or less continuous perennial or seasonal grass cover, in association with an upper storey ranging from a woodland of trees, with more or less closed canopy, to lightly scattered trees and shrubs with an open canopy	Okigbo (1985)
6	The term savanna includes those forms of vegetation that occur between the equatorial rain forests and the mid-latitude deserts and have a continuous grass stratum that is either treeless or studded by trees and shrubs of variable height and density. The various forms share structural and functional characteristics that enable them to withstand seasonal drought, and they exhibit distinctive seasonal rhythms of growth and productivity and they are dynamic. The role of fire in the creation and structure of savannas remains unresolved.	Cole (1986)
7	Savannas, defined broadly, include all those tropical and near-tropical ecosystems characterised by a continuous herbaceous cover consisting mostly of heliophilous C4 grasses and sedges that show clear seasonality related to water stress. Woody species (shrubs, trees, palms) occur, but seldom form a continuous cover parallelling that of the grassy layer.	Frost *et al.* (1986)

(TABLE 1. Continue on page 4)

TABLE 1: Continue

No.	Definition	Source
8	The term savanna is now widely accepted as describing vegetation with a herbaceous, usually graminoid, layer with an upper layer of woody plants, which can vary from widely spaced to 75 % canopy cover. In the latter case savanna is often referred to as a woodland.	Rutherford and Westfall (1986)
9	Savannas are tropical systems intermediate between dry xerophytic woodlands and moist deciduous forests. They are a distinct biome characterised by the presence of a continuous canopy of graminoids, principally C4 grasses and sedges, and a discontinuous canopy of trees and shrubs. The woody elements may be rare or even absent under certain circumstances, or they may be represented entirely or primarily by shrubs.	Solbrig (1991)
10	These authors do not provide a definition per se for savanna, but they do provide a mechanistic determination through a suite of algorithms to differentiate each of the biomes in South Africa. Inputs are the mean temperature during the growing season, mean temperature during the non-growing season, and the number of growth days.	Ellery *et al.* (1991)
11	A savanna is a tropical vegetation type in which ecological processes are strongly influenced by both woody plants and grasses and only weakly influenced by other growth forms.	Scholes and Walker (1993)
12	A savanna is a mixed vegetation of trees and grasses, resulting from the tropical monsoon pattern of rainfall with a yearly alternation of a rainy and a dry season.	Solbrig and Young (1993)
13	A savanna is an ecosystem of the warm tropics dominated by a herbaceous cover consisting mostly of bunch grasses and sedges that are more than 30 cm in height at the time of maximum activity, and show a clear seasonality in their development, with a period of low activity related to water stress. The savanna may include woody species (shrubs, trees, palms), but they never form a continuous cover that parallels the grassy one.	Solbrig (1993)
14	The savanna biome is characterised by a grassy ground layer and a distinct upper layer of woody plants. Where this upper layer is near the ground, the vegetation may be referred to as Shrubland. Where it is dense it is known as a woodland, and the intermediate stages are locally known as Bushveld.	Low and Rebelo (1996)
15	The savanna concept is that it is a tropical vegetation type co-dominated by woody plants and grasses. The tree layer canopy is largely discontinuous, and the grass layer may be temporarily absent or replaced by dicotyledonous herbs during drought or disturbance. There is a strongly seasonal delivery and availability of water.	Scholes (1997)
16	The savanna biome is characterised by a grassy ground layer and a distinct upper layer of woody plants. Where this upper layer is near the ground, the vegetation may be referred to as Shrubland. Where it is dense it is known as a woodland, and the intermediate stages are locally known as Bushveld.	NFAP (1997) (from Low and Rebelo (1996))
17	Woodland means a group of indigenous trees which are not a natural forest, but whose crowns cover more than five per cent of the area bounded by the trees forming the perimeter of the group.	National Forests Act (1998)
18	The FAO does not have definition for the term savanna. Vegetation types with dense tree cover (woodlands) fall under the definition of forest, and have a woody canopy cover of greater than 10 %. Vegetation types with less woody cover fall in the category of "other wooded land"	FAO (1995, 1998)

principle of inclusivity, I propose that within the South African context, the term savanna or woodland be defined as follows:

The term savanna, or woodland, refers to a suite of tropical and subtropical vegetation types in which fire-adapted, co-dominant, continuous or discontinuous herbaceous and largely deciduous woody strata of indigenous plants, experience markedly seasonal growth patterns and processes in relation to the seasonal delivery of precipitation, which occurs during hot summers, followed by cooler, but warm, dry winters. Generally the herbaceous stratum is dominated by C4 grasses and sedges, but this, and the overall cover of the woody and herbaceous strata, may be temporarily altered by a range of disturbance phenomena.

CURRENT CLASSIFICATIONS OF SOUTH AFRICAN FORESTS AND WOODLANDS

There are numerous classification systems for South African forests and woodlands. Faced with such an array, it is important to note that there is no one correct classification, but rather, any classification system must be matched to the scale and objectives for which it was originally designed. Scale is important, in that it dictates the degree of detail in terms of similarities and differences that lead to the lumping or splitting of perceived different types (Rutherford and Westfall, 1986). Scholes and Walker (1993) demonstrated the importance of scale in commenting that at a continental scale (for the whole of Africa) White's (1983) classification had three types of savanna in the former Transvaal of South Africa, whereas at a national scale, Acocks (1988) delimited 13 savanna veldtypes in the same area, but Gertenbach (1983), at a regional scale, identified 19 savanna landscape units for just a portion of this area.

In a similar manner, the objectives of any classification have a bearing on the final format of the classification. For example, if one wishes a classification of vegetation types to define homogenous units in terms of the amount of timber that can be harvested sustainably, there is little use in providing a classification based on floristics and species richness. It would not match the original objectives of the

TABLE 2: Analysis of elements of the definitions of savanna.

Component	Element	Definition number																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Distribution	Tropical		*	*	*	*	*	*		*		*		*		*			
	Subtropical		*		*		*	*											
Structure	Woody plants	*	*	*	*	*	*	*	*	*			*	*	*	*	*	*	
	Grasses	*	*	*	*	*	*	*	*	*			*	*	*	*	*		
	Other herbaceous plants			*				*	*	*				*		*			
	Discontinuous canopy	*		*		*		*	*	*				*		*			
	May include closed woodland	*				*													
	Altered by disturbance															*			
	Fire plays a role	*		*			* ?												
Climate	Seasonal water availability	*		*	*		*	*					*	*		*			
	Hot summers, warm winters	*			*														
Processes	Dominated by those relating to grasses and woody plants											*							

classification exercise. In terms of DWAF's role in policy, management and monitoring of woodlands at a national scale, it is necessary to have a classification that (i) is suitable at a national scale, (ii) does not have too many categories, and (iii) has some logical geographic or ecological basis.

There is a range of existing classification systems based on different criteria *(Table 3)*. The two most commonly used are structure and/or floristics. The use of structure alone is not particularly useful because of its sensitivity to management impact. Thus, the structure can be readily altered, resulting in different classifications of the same parcel of land at different times. Floristics are useful, but are very scale dependent in terms of the number of recognised types. Even at a national scale there are a number of anomalies within supposedly homogenous units delimited by Acocks (1988), and again by Low and Rebelo (1996). Classifications incorporating abiotic criteria are attractive since such criteria are less prone to modification by management or mismanagement. Recently, Fairbanks (in press) provided a comprehensive abiotic classification of the South African savanna biome into statistically validated, homogenous physio-climatic units. This resulted in 26 homogenous units. This is a useful contribution to the understanding and management of South African savannas, but is perhaps too detailed for DWAF's needs.

This then leaves the functional classifications of Solbrig (1993) and Huntley (1982), whilst recognising that the primary designation of Huntley's classification is based on abiotic criteria (rainfall and soil nutrient status). That of Solbrig is for all savannas worldwide, the result being that nearly all those in South Africa fall within one category. Huntley (1982), and subsequent workers, delimited two classes on the basis of parent material and mean annual rainfall; namely arid/eutrophic savannas and moist/dystrophic savannas, against which they identified functional correlations, including fire frequency, herbivore levels, and leaf nitrogen content, to name a few.

TABLE 3: Classification systems for South and southern African savannas at a national scale, or continental systems for Africa as a whole, including South and southern Africa.

Primary classification criterion	Reference	Number of categories	Notes
Floristic	Acocks (1953)	13 (incl. 'False' types)	
	Werger (1978)	3 regions, with 5 domains	
	White (1983)	5	Did not recognise savannas as a discrete vegetation type, but divided it up into woodland, bushland, thicket, shrubland and wooded grassland.
	Low and Rebelo (1996)	25	
Structural	Cole (1963, 1986)	5	Based on height and density of trees, and height of grasses.
	Edwards (1983)	-	Did not use the term savanna. System was a national classification for all vegetation types.
Functional	Solbrig (1993)	4	Most of South Africa's savannas fall within only one of the four categories.
	Huntley (1982), Scholes (1990) (based on abiotic criteria)	2	Based on annual rainfall and parent material, into two classes: moist/dystrophic savannas and arid/eutrophic savannas.
Abiotic	Fairbanks (in press)	26	Classified the savanna biome into homogenous physio-climatic units based on growth days, altitude, and geology.

This is useful because precipitation and soil nutrient status are generally regarded as the two primary determinants of savannas (Frost *et al.*, 1986; Scholes and Walker, 1993). There has been some informative work exploring the differences between these two types of savannas, with differences in fire regime and herbivory, the secondary determinants of savannas, correlated with these two classes.

It is possible that the arid/eutrophic savannas could be split again into two classes. Those of the Northern Cape, Northwest Province and western Free State are characterised by being at a relatively high altitude (generally > 1 000 m a.s.l.), with low annual rainfall (generally < 400 mm) and are located on predominantly sandy soils of non-marine origin. In comparison, the rest of the eutrophic savannas in South Africa, occurring largely in the Northern Province, Mpumalanga, KwaZulu-Natal and the Eastern Cape are at low altitude (< 900 m a.s.l.), have a higher rainfall (> 400 mm p.a.) and are on a range of substrates, but if sands, usually of marine origin. Whilst this split is on the basis of abiotic differences, it is probable that this would be reflected in functional differences too. It is probable that these differences in substrate, altitude and rainfall would lead to differences in rates of fuel-load accumulation and hence fire frequency, density of herbivores, and plant productivity. These two types could be termed upland eutrophic savannas and lowland eutrophic savannas, respectively. The current VegeMap project of the National Botanical Institute may be able to validate, or not, such a dichotomy at a national scale. At a more local scale there are exceptions to the hypothesised dichotomy, with the differences being more along a continuum from one type to the other, rather than discrete classes. It is desirable that a new typology of woodlands into approximately 5 - 6 classes is developed to allow DWAF to prioritise its activities within woodlands.

OVERVIEW OF WOODLAND TYPES

This section provides a brief overview of the two woodland types. More detailed descriptions are available in Huntley (1982), Scholes (1990, 1997) and Scholes and Walker (1993).

The primary differentiating attributes are abiotic, but, as to be expected, with associated changes in structure and function. Arid/eutrophic savannas (hereafter termed eutrophic savannas) occur on eutrophic substrates and at lower rainfall than do moist/dystrophic savannas (hereafter referred to as dystrophic savannas). The core areas of each are readily identified, but the transition boundaries between them are often diffuse, especially since the primary determinants (rainfall and nutrient status) are continuous variables rather than discrete. Additionally, at a local scale, it is possible to find patches of one type located within the other, particularly nutrient rich hot-spots within dystrophic savannas. Such nutrient enriched sites can be a consequence of a number of factors, including amongst others, herbivory, catenal sequences, past and current human activities and termite mounds (Huntley, 1982; Scholes, 1990). Patches of dystrophic savannas occur in eutrophic core areas on acidic sand overlaying crystalline substrates or over sandstones (Huntley, 1982). Scholes (1997) suggested that a useful criterion for delimitation of boundaries between the two is the mean annual rainfall and its influence on herbaceous production. He suggested that the separation be taken as the mean annual rainfall at which the strong linear dependence of herbaceous production in rainfall in eutrophic savannas no longer holds. This occurs at approximately 700 mm p.a. on sands and near 900 mm p.a. on finer textured soils.

Table 4 summarises some of the major differentiating attributes of the two savanna types. It must be emphasised that these typifications represent the opposite ends of a continuum, and that there are areas of savanna intermediate between the two types that will possess a number of attributes of each type. Of the potential total area of savannas in South Africa (420 287 km^2 (Low and Rebelo 1996)), the majority (81,8 %) are eutrophic savannas, and only 18,2 % are dystrophic savannas. According to Ballance et al. (1999), the National Land Cover Map indicates that approximately 10 % of the savanna biome is totally transformed to other land uses, and 9 % is partially transformed.

Eutrophic savannas

The primary locations are the Northern Cape, Northwest Province, Northern Province and the Eastern Cape *(Table 5)*. The National Land Cover Map does not classify most of the large areas of eutrophic savannas in the Northern Cape as savannas, but rather wooded grasslands (Ballance *et al.*, 1999).

The key attributes that differentiate eutrophic savannas from dystrophic savannas have been summarised in *Table 4*. Generally, eutrophic savannas occur at a lower rainfall and on substrates with a higher base status than do dystrophic savannas. They are dominated by tree species of the Mimosaceae (mainly *Acacia* species) and Burseraceae (mainly *Commiphera* species). To the field manager the most readily identifiable characteristics are:

- dominance by the typical tree genera *(Table 4)*
- the prevalence of tree species with relatively small leaves or leaflets
- the prevalence of thorny species
- the presence of succulents
- low herbaceous biomass due to low rainfall and/or high herbivory
- the absence of any well developed litter layer

Dystrophic savannas

Dystrophic savannas form a core area in the Northwest and Northern provinces, and then a strip along

the coastal belt in KwaZulu-Natal. The coastal strip in KwaZulu-Natal overlaps with the distribution of Indian Ocean Coastal-belt forests. In reality the strip of dystrophic savanna is usually further inland than the coastal forest, except in areas where the savanna is secondary, as a result of forest degradation. The total extent of dystrophic savannas in South Africa is 76 638 km^2, thereby constituting only 18,2 % of the South African savanna biome. They are considerably more extensive in the moister regions of Zimbabwe, Mozambique, Zambia and Tanzania to the north. They typically occur in areas of higher rainfall (750 - 1 200 mm p.a.) than eutrophic savannas and on substrates with a low base status. This difference is

TABLE 4: Characteristics of eutrophic and dystrophic savannas (adapted from Scholes 1997).

Attribute	Eutrophic Savannas	Dystrophic Savannas
Mean annual rainfall	< 750 mm	> 750 mm
Duration of peak rainy season	± 4 months (November - February)	6-7 months (October - March/April)
Geology	Igneous lavas, mudstones, siltstone, limestone	Acidic igneous rocks, sandstones, aeolian sands
Dominant Graminoids sub/families	Chloridoideae, Panicoideae	Paniceae, Andropogoneae, Arundinelleae
Trees/shrubs	Mimiosoideae, Burseraceae	Caesalpinoideae, Combretaceae
Presence of succulents	Present	Generally absent
Dominant tree leaf size	< 1 cm (except for mopani woodlands)	> 2 cm
Herbivore biomass	High	Low
Herbivory	10 - 50 % of standing grass biomass	< 10 % of standing grass biomass
Dominant tree anti-herbivore defence mechanism	Structural (i.e. thorns or spines)	Chemical (primarily condensed tannins)
Fire frequency	Once every 4 - 5 years or longer	Triennial or less
Dominant tree leaf nitrogen content (at maturity)	> 2,5 %	< 2,5 %
Grass leaf nitrogen content at senescence	> 1 %	< 1 %
Above ground biomass	< 15 t/ha	> 15 t/ha
Root:shoot ratio	Low	High
Above ground production	High	Low
Plant species richness	High	Low
Insect species richness	Low	High
Bird species richness	Low	High
Soil fauna	Low, dominated by ants	High, dominated by termites
Litter layer (in the absence of fire)	Absent - unobvious	Obvious

reflected in a number of attributes *(Table 4),* most obviously the floristics. Rather than the fine-leaved, thorny species typical of the eutrophic savannas, dystrophic savannas are dominated by unarmed, broad-leaved species of the Combretaceae (mainly *Combretum* and *Terminalia* species) and Caesalpinoideae (including species of *Burkea, Peltophorum* and *Schotia).* The dystrophic woodlands to the north of South Africa are dominated by species of *Julbernardia* and *Brachystegia.*

In the field the readily identifiable characteristics of dystrophic savannas are:

- dominance by the typical tree genera mentioned above
- the prevalence of tree species with relatively large leaves or leaflets
- the relative absence of thorny species
- the absence of succulents
- the presence of a well developed litter layer (except immediately after a fire)
- high herbaceous biomass

CONCLUSIONS

Savannas, or woodlands, cover just over one-third of South Africa, and are home to approximately 9,2 million rural inhabitants. The rural population resident in savannas represents just under one quarter of all South Africans. Because of this, savannas have the potential to make a marked contribution to the national economy. Not only is the large area of savannas important, but so too is their relatively high biodiversity. Whilst they cannot compare with the extremely species-rich fynbos regions of the Western Cape, the core southern African savanna biome contains about 5 780 species of plants of which 43 % are savanna endemics (Cowling *et al.,* 1989). These areas deserve the attention required by the new policies and Acts. This requires a clearer understanding of their status and function. A functional definition is a prerequisite for this.

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TABLE 5. Area of eutrophic and dystrophic per province (after Low and Rebelo 1996).

Province	Eutrophic savannas		Dystrophic savannas	
	Area (km²)	%	Area (km²)	%
Eastern Cape	34 808	10,1	4 074	5,3
Free State	8 615	2,5	0	
Gauteng	1 021	0,3	1 703	2,2
KwaZulu-Natal	20 638	6,0	16 540	21,6
Mpumalanga	22 114	6,4	9 034	11,8
Northwest Province	67 387	19,6	17 365	22,7
Northern Cape	102 669	29,9	0	
NorthernProvince	86 077	25,1	27 921	36,4
Western Cape	321	0,1	0	
Total	343 650	100,0	76 637	100,0

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