

## CHAPTER 6

THE TREES AND SHRUBS OF THE WATERBERG BIOSPHERE RESERVE  
AND THEIR VALUE TO THE TOURISM INDUSTRY

## 6.1 Introduction

The presence of trees in the landscape and their characteristic growth forms often reflect the biome, veld type or habitat to which the tree is adapted. Different structural variations occur within the upper layer of woody plants of the Savanna Biome of Southern Africa, namely Shrubveld (short, close to the ground), Woodland (tall, dense woody component) and Bushveld (intermediate stage) (Low & Rebelo, 1996). Several of the 1700 indigenous tree and shrub species within southern Africa (Van Wyk & Van Wyk, 1997) are restricted to this biome, and the shrub-tree layer may vary from 1 to 20 m in height, although typically being between 3 and 7 m in the Bushveld (Low & Rebelo, 1996).

Trees have been an essential part of human existence and survival since the earliest time. They provide shelter, food and clothing, timber, fiber, firewood, medicine, poison, tans and dyes (Van Wyk *et al.* 2000). Several botanists have studied and recognized the practical values of trees and shrubs for the many African cultures (Van Wyk *et al.* 1997; Van Wyk & Gericke, 2000). Furthermore, trees are important in maintaining a healthy savanna ecosystem, and a host of organisms depend entirely on trees for their survival. However, it is still the imposing architecture, enormous size and spectacular flowering displays of trees that inspire people (tourists) (Van Wyk *et al.* 2000).

Corporate Author (1991) showed how valuable the mangrove trees of the Kisarawe District, Tanzania can be for the tourism industry. Considering the diversity and many interesting characteristics and conspicuousness of trees and shrubs within southern Africa, the value of these plants for tourism might be huge if tourists are made conscious of them. However, the conservation and management of the many indigenous trees of the Savanna Biome should never be neglected for tourism purposes.

The aim of this chapter is to show the value of trees and shrubs within the different identified plant communities (Chapter 4) of the Waterberg Biosphere Reserve to the tourism industry. Values will be allocated to each woody species in terms of synoptic table frequency values and tourism values (medicinal properties, browsing value, conspicuousness, general uses and diagnostic species).

## 6.2 Methods

### 6.2.1 Synoptic table reduction

The trees and shrubs species in the synoptic table (Table 4.2, Chapter 4) of the plant communities of the Waterberg Biosphere Reserve were identified. The grasses, forbs, wild flowers and herbaceous species were removed from the synoptic table to produce a new reduced synoptic table with 33 species groups for the trees and shrubs presented in Table 6.1. Trees were absent from the *Fuirena pubescens-Andropogon huilensis* sponges and *Phragmites australis-Persicaria serrulata* vleis communities, and were subsequently discarded from the table. The following steps were followed after reduction of the original synoptic table was done:

- All the frequency values of trees and shrubs lower than 10% were discarded
- The frequency values of 10% and above were divided by 20 to give a frequency value out of 5. These values were used in the following analysis.

### 6.2.2 Tree characteristics

Trees have many functions and are essential to our existence (Venter & Venter, 1996). Although the frequency values in the synoptic table (Table 6.1) give information on the distribution / abundance of trees and shrubs in the associated plant communities, tourists would like to know interesting facts about trees and shrubs (e. g. medicinal properties, food source value to mammals, human uses), especially when in flower. Therefore every tree and shrub species was evaluated and given marks in terms of the interesting characteristics as presented in Table 6.2. These characteristics were obtained from information in field guides (Venter & Venter, 1996; Van Wyk &

Van Wyk, 1997; Van Wyk *et al.* 2000). The values of the trees and shrubs for each characteristic are presented in Appendix 6.1.

Table 6.2 Tree and shrub characteristics valuable to tourism

Tree / Shrub Characteristics	Mark
Medicinal / Veterinary Properties	Yes - 1; No - 0
Food source to mammals or birds	Yes - 1; No - 0
Wood / Leaf / Bark use by humans	Yes - 1; No - 0
Conspicuousness	2 marks in terms of conspicuousness: growth form - 1, Flowers - 1; None of above - 0
Diagnostic to a community / habitat (Table 4.2, Chapter 4)	Yes - 1; No - 0

The total values of trees or shrubs out of 6 were then converted to a value out of 5.

### 6.2.3 Tree tourism values

The values for the trees (out of 5) for frequency / abundance in plant communities and the tourism value of trees (out of 5) (Appendix 6.1) were combined to give a value out of 10. This value was converted to a percentage value. Trees and shrubs within each community thus get a value within each community based on their abundance / frequency and special characteristics possibly valuable for tourists. The trees were subsequently rated within each community for their importance to tourism, although their abundance in specific communities cannot be neglected.

### 6.3 Results and Discussion

A total of 117 trees and shrubs within the Waterberg Biosphere are included in Table 6.2, and although more species may occur in the Biosphere Reserve, the species included were selected from the synoptic table in Chapter 4. The following section gives a short description of the most dominant trees and shrubs in the plant communities (Chapter 4) and their value to tourism in the Waterberg Biosphere Reserve.

### 6.3.1 *Podocarpus latifolius*-*Diospyros whyteana* Kloof Community

This community represents part of the Afro-Montane element of southern Africa (Coetzee *et al.* 1981). Large trees like *Podocarpus latifolius* and *Celtis africana* occur within kloofs, which are often dominated by trees, shrubs and climbers (Acocks, 1988). Woody plants represent 50 % of the species within forests, and include canopy trees (15 %), subcanopy trees (27 %), woody shrubs (47 %) and woody climbers (11 %). The physical characteristics of the kloofs within the Waterberg Biosphere Reserve include deep ravines and gorges under similar moist conditions to the kloof communities of the eastern Orange Free State Drakensberg (Du Preez *et al.* 1991). The size and species composition of different forest patches may vary (Geldenhuys, 1999). The trees and shrubs within the community according to their combined (tourism and abundance) values (rating) are as follows:

<i>Podocarpus latifolius</i>	68.7	<i>Dovyalis zeyheri</i>	40.3
<i>Syzygium cordatum</i>	63	<i>Vangueria infausta</i>	40.3
<i>Diospyros whyteana</i>	62.3	<i>Grewia occidentalis</i>	39.3
<i>Celtis africana</i>	61.7	<i>Pterocelastrus echinatus</i>	39.3
<i>Rothmannia capensis</i>	59.5	<i>Euclea natalensis</i>	39.3
<i>Ficus sur</i>	54.7	<i>Berchemia zeyheri</i>	39.3
<i>Curtisia dentata</i>	52.2	<i>Cussonia paniculata</i>	39.3
<i>Calpurnia aurea</i>	52.2	<i>Combretum molle</i>	39.3
<i>Ilex mitis</i>	52.2	<i>Rhus leptodictya</i>	39.3
<i>Kirkia wilmsii</i>	51.2	<i>Myrsine africana</i>	38.7
<i>Acacia caffra</i>	49.7	<i>Osyris lanceolata</i>	38
<i>Syzygium guineense</i>	48.7	<i>Clutia pulchella</i>	34.5
<i>Dombeya rotundifolia</i>	48.7	<i>Canthium gilfillanii</i>	34.5
<i>Brachylaena rotundata</i>	48.7	<i>Heteropyxis natalensis</i>	34.5
<i>Olea europaea</i>	48.3	<i>Mimusops zeyheri</i>	34.5
<i>Cussonia spicata</i>	47.7	<i>Maytenus undata</i>	33.2
<i>Apodytes dimidiata</i>	47.7	<i>Widdringtonia nodiflora</i>	33
<i>Acokanthera oppositifolia</i>	44.8	<i>Rhus dentata</i>	33
<i>Buxus macowanii</i>	44.8	<i>Olea capensis</i>	32
<i>Ficus thonningii</i>	43.8	<i>Englerophytum magalismsontanum</i>	32
<i>Croton gratissimus</i>	42.8	<i>Ochna holstii</i>	31
<i>Pappea capensis</i>	42.8	<i>Diospyros lycioides</i>	31
<i>Pittosporum viridiflorum</i>	41.3	<i>Euphorbia ingens</i>	29.7
<i>Faurea saligna</i>	41.3	<i>Tricalysia lanceolata</i>	19.8
<i>Vepris lanceolata</i>	40.3		

Trees with higher values (e. g. *Podocarpus latifolius*, *Diospyros whyteana*, *Celtis africana*) may be seen as general trees in kloof communities with high significance to tourism, while trees like *Widdringtonia nodiflora* are more rare. Tourists interested in trees might find the kloof communities extremely fascinating on walking trails, although care must be taken since these areas are usually wet and slippery, and small

trees and shrubs (e. g. *Diospyros whyteana*) often form dense thickets at the entrance of ravines. The kloof communities also provide shelter and food to dangerous mammal species like leopard and elephant (Skinner & Smithers, 1990), and in nature reserves, guided walks should rather be undertaken into kloof communities. The potential danger of the trampling of sensitive species (e. g. fern species, mosses) in the herbaceous stratum of kloof forests must also be taken into consideration when planning walking trial paths in kloof forest, and special management principles need to be applied to prevent damage. For example the trial should rather follow paths used by animals and should be as narrow as possible.

The community provides tourists the opportunity to identify and see some of the many large trees associated with this moist, sheltered habitat. Geldenhuys (1999) noted that southern African forests also play an increasingly important role in providing recreation and aesthetics for the growing urbanized and industrialized societies. The recognition of the products and values of forests is one of the basic requirements in order to reduce conflicts in land-use options and to conserve forests. The availability of recreation areas, like the Waterberg Biosphere Reserve, is important not only for the burgeoning tourist industry, but also as a tool in conservation education (Geldenhuys, 1999).

### 6.3.2 *Protea caffra*-*Loudetia simplex* Cool Slopes Community

This community may vary greatly as shown in Chapter 4. Not many tree species occur, and shrub species like *Englerophytum magalismontanum* are more common. The structure of the community is mostly an open woodland (Edwards, 1983) and small trees like *Protea caffra* often dominate rocky southern slopes. The following important trees and shrubs occur in this community according to their value rating:

<i>Protea caffra</i>	63.7
<i>Vangueria infausta</i>	57.8
<i>Protea roupelliae</i>	52.7
<i>Acacia caffra</i>	46.7
<i>Englerophytum magalismontanum</i>	43.0
<i>Vitex rehmannii</i>	41.3
<i>Rhus dentata</i>	41.0
<i>Faurea saligna</i>	39.8
<i>Combretum molle</i>	39.3
<i>Ozoroa paniculosa</i>	38.3

<i>Heteropyxis natalensis</i>	30.5
<i>Maytenus tenuispina</i>	14.8
<i>Ancylobotrys capensis</i>	13.3

Acocks (1988) describes the higher parts of mountains in Northeastern Mountain Sourveld as scrubby thornveld, sometimes forming dense thickets where, apparently the breaking down of forest into grassveld has never been completed. The high altitude areas within this community are classified as the sourveld variation of Northeastern Mountain Sourveld by Acocks (1988). Van Staden (in prep.) described these areas in the Marakele National Park, although they occur on most southern slopes and eastern slopes throughout the Biosphere Reserve. The plant species composition and species richness of this community suggest that the vegetation have a heterogeneous origin, with contributions from grassland, savanna and the Drakensberg. (Bredenkamp, 1999).

Trees occur sparsely in this community, although when in flower, both *Protea* species are extremely conspicuous (Van Wyk *et al.* 2000), while fruitbearing species like *Englerophytum magalismontanum* and *Ancylobotrys capensis* provide tourists the opportunity to taste these edible wild fruits (Van Wyk & Gericke, 2000). The presence of these edible fruits, together with poisonous and medicinal plants could provide useful environmental education to hikers (Wahl & Hugo, 1995) or tourists visiting the area. Other savanna species like *Acacia caffra* and *Combretum molle* occur in slightly warmer, sheltered spots, while Coetzee *et al.* (1981) noted that species like *Heteropyxis natalensis* and *Faurea saligna* are only dominant in the coolest deciduous bushveld communities. The low tree diversity provides tourists with an opportunity to easily identify most of the trees and shrubs in the community, while the low density of trees and shrubs also allow walking trails to be designed through it. However, Wahl & Hugo (1995) noted that erosion could occur on walking trial paths if the gradient exceeds 6 to 8 degrees, and this must be taken into consideration. However, the high altitude areas (1500-2100m above sea level) of the community (e. g. Marakele National Park) have spectacular visual beauty over the surrounding areas, and this is even further enhanced when the *Protea* species occurring in this community are flowering.

### 6.3.3 *Diplorhynchus condylocarpon-Englerophytum magalismontanum* Rocky Slopes community

Typically sourveld of the warm slopes of lower altitude (< 1500 m) mountainous regions, this community includes several deciduous, broadleaf species (Coetzee *et al.* 1981). The trees of the savanna biome are well adapted to browsing and possess several survival strategies (Bredenkamp, 1999<sup>b</sup>). The diversity of trees and shrubs are high within this community and the following species occur in the community, with the values representing their importance value:

<i>Combretum molle</i>	76.8	<i>Dombeya rotundifolia</i>	47.7
<i>Burkea africana</i>	67.8	<i>Brachylaena rotundata</i>	47.2
<i>Lannea discolor</i>	67.2	<i>Combretum zeyheri</i>	45.8
<i>Elephantorrhiza burkei</i>	61.7	<i>Croton gratissimus</i>	45.3
<i>Diplorhynchus condylocarpon</i>	61.3	<i>Tapiphyllum parvifolium</i>	43.5
<i>Englerophytum magalismontanum</i>	58.0	<i>Combretum apiculatum</i>	42.8
<i>Mundulea sericea</i>	54.7	<i>Euclea natalensis</i>	41.3
<i>Pterocarpus rotundifolius</i>	54.2	<i>Faurea saligna</i>	39.8
<i>Vitex rehmannii</i>	53.8	<i>Ziziphus mucronata</i>	38.3
<i>Ozoroa paniculosa</i>	53.3	<i>Rhus leptodictya</i>	37.8
<i>Vangueria infausta</i>	52.8	<i>Rhoicissus revoilii</i>	35.2
<i>Ochna pulchra</i>	51.3	<i>Heteropyxis natalensis</i>	32.5
<i>Pseudolachnostylis maprouneifolia</i>	51.3	<i>Rhus dentata</i>	30.5
<i>Terminalia sericea</i>	49.7	<i>Grewia monticola</i>	30.5
<i>Gardenia volkensii</i>	49.2	<i>Maytenus tenuispina</i>	28.3
<i>Vitex pooara</i>	48.7	<i>Hexalobus monopetalus</i>	25.7
<i>Strychnos pungens</i>	48	<i>Strychnos madagascariensis</i>	24.2
<i>Combretum nelsonii</i>	47.7	<i>Ancylobotrys capensis</i>	13.8

Two Waterberg endemics occur within this community namely *Vitex pooara* and *Combretum nelsonii* (Van Wyk & Van Wyk, 1997). Fruit-bearing species like *Strychnos* species, *Englerophytum magalismontanum*, *Vangueria infausta* and *Ancylobotrys capensis* are present, and are utilized by the local communities and animal species (Van Wyk & Gericke, 2000). Certain tree and shrub species might be more common when the environmental conditions are more suitable. Species like *Diplorhynchus condylocarpon* dominates over large areas of warm, low-lying mountainous terrain of the Waterberg. However, dominant species within this community are only indicators of combinations, which include several woody species (Coetzee *et al.* 1981).

Tourists visiting the Waterberg Biosphere Reserve will encounter most of the woody species during game drives or walks. The woody species often also have medicinal properties (Appendix 6.1), and species like *Dombeya rotundifolia*, *Ochna pulchra* and *Gardenia volkensii* are quite conspicuous when flowering (Van Wyk & Van Wyk, 1997). Guides may thus share many interesting facts about these trees with tourists during activities. Tourists interested in botany will find this community challenging to identify the many trees and shrubs occurring on the many varying warm slopes of the Waterberg Biosphere Reserve.

### 6.3.4 The *Burkea africana*-*Setaria spbacelata* Undulating Plains, Terraces and Footslopes Community

This community can be found in many different areas of the Waterberg Biosphere Reserve. It plays a major role as one of the dominant communities in the Mixed Bushveld Vegetation Type described by Van Rooyen & Bredenkamp (1996). The tree and shrub diversity is relatively high, and similar woody species occur compared to the *Diplorhynchus condylocarpon*-*Englerophytum magalimontanum* community. However, similar species have different importance values between the two communities, and the trees and shrubs accordingly are the following:

<i>Protea caffra</i>	60.2	<i>Ochna pulchra</i>	42.3
<i>Elephantorrhiza burkei</i>	59.7	<i>Terminalia sericea</i>	41.7
<i>Vitex rehmannii</i>	56.3	<i>Combretum zeyheri</i>	39.3
<i>Acacia caffra</i>	54.7	<i>Ximenia caffra</i>	38.8
<i>Vangueria infausta</i>	54.3	<i>Ziziphus mucronata</i>	38.3
<i>Faurea saligna</i>	54.3	<i>Combretum apiculatum</i>	37.8
<i>Lannea discolor</i>	54.2	<i>Heteropyxis natalensis</i>	36.0
<i>Dombeya rotundifolia</i>	52.2	<i>Mimusops zeyheri</i>	34.5
<i>Burkea africana</i>	51.8	<i>Rhus dentata</i>	34.0
<i>Apodytes dimidiata</i>	51.2	<i>Olea capensis</i>	32.5
<i>Brachylaena rotundata</i>	49.2	<i>Tapiphyllum parvifolium</i>	31.5
<i>Combretum nelsonii</i>	47.7	<i>Diospyros lycioides</i>	31.0
<i>Ozoroa paniculosa</i>	47.3	<i>Strychnos pungens</i>	30.0
<i>Gardenia volkensii</i>	47.2	<i>Rhoicissus revoilii</i>	27.2
<i>Pterocarpus rotundifolius</i>	46.2	<i>Gymnosporia buxifolia</i>	23.7
<i>Euclea crispa</i>	44.3	<i>Ancylobotrys capensis</i>	17.3
<i>Rhus leptodictya</i>	42.8	<i>Maytenus tenuispina</i>	14.8

This structure of this community is an open woodland (Edwards, 1983), and different tree species might dominate the varying foothills, undulating plains, terraces and plateaus. Acocks (1988) classified variations within the Mixed Bushveld Veld Type



mostly according to the occurrence of the woody species. On the shallow, rocky soils of the undulating plains and terraces, *Combretum apiculatum* is the dominant tree (Bredenkamp, 1999<sup>b</sup>), while other typical species include *Pterocarpus rotundifolius*, *Combretum nelsonii*, *Englerophytum magalismsontanum* and *Combretum molle*. Two variations of the Mixed Bushveld Veld Type classified by Acocks (1988) are similar to the above mentioned areas, namely *Combretum apiculatum* Veld Proper, and *Combretum-Pterocarpus* Veld. On the slightly deeper sandy soils with interspersed rocks of the plateaus and foothills, almost pure stands of *Burkea africana* occur (Coetzee *et al.* 1981), with species like *Combretum zeyheri*, *Ochna pulchra*, *Maytenus tenuispina*, *Elephantorrhiza burkei* and *Dombeya rotundifolia*. Acocks (1988) classified this as the *Burkea* veld variation within the Mixed Bushveld Veld Type. Fruit-bearing species are similar to the *Diplorhynchus* community, and most of the trees have some medicinal properties. However, these plants play an important role in providing food to browsers like kudu on the many game reserves and game farms in the Waterberg Biosphere Reserve, and certain animals seem to prefer grazing in these rocky areas (Eltringham, 1979) (Chapter 7).

Tourists may find the identification of trees and shrubs within this community slightly easier compared to previously discussed communities. The woody species composition of localized communities doesn't seem to vary much, and is sometimes low due to the dominance of species like *Combretum apiculatum*. However, many interesting tree and shrub species occur, and the tree density makes tourist activities like game viewing and walking trials easy.

### 6.3.5 The *Terminalia sericea*-*Eragrostis pallens* Deep Sands Community

This community occurs in the low-lying areas and seepage lines throughout the Biosphere Reserve. Acocks (1988) described it as *Terminalia* Veld Proper due to the fact the tree species *Terminalia sericea* often dominates the infertile, deep sandy soils of these areas (Bredenkamp, 1999<sup>b</sup>). Other trees and shrubs occurring within this community are the following:

<i>Terminalia sericea</i>	79.7	<i>Ozoroa paniculosa</i>	49.3
<i>Burkea africana</i>	73.3	<i>Strychnos pungens</i>	49.0
<i>Ochna pulchra</i>	68.3	<i>Vitex pooara</i>	48.2

<i>Strychnos cocculoides</i>	67.0	<i>Mundulea sericea</i>	48.2
<i>Dombeya rotundifolia</i>	61.2	<i>Securidaca longepedunculata</i>	47.8
<i>Combretum molle</i>	60.8	<i>Combretum apiculatum</i>	42.8
<i>Lannea discolor</i>	59.7	<i>Ximenia caffra</i>	40.3
<i>Vitex rehmannii</i>	58.8	<i>Euclea undulata</i>	39.8
<i>Dichrostachys cinerea</i>	57.3	<i>Rhus leptodictya</i>	39.8
<i>Combretum zeyheri</i>	55.3	<i>Diplorhynchus condylocarpon</i>	37.8
<i>Grewia flavescens</i>	52.5	<i>Diospyros lycioides</i>	31.0
<i>Peltophorum africanum</i>	51.7	<i>Grewia monticola</i>	29.5
<i>Euclea natalensis</i>	50.3		

Typical woody species that are associated with sandy soils of low-lying areas are *Terminalia sericea*, *Burkea africana*, *Ochna pulchra* and *Securidaca longepedunculata*. Although dense, fairly tall bush occurs on deep loose sand of seepage lines (Acocks, 1988), the vegetation structure of the community is generally an open woodland (Edwards, 1983). The community is often dominated by a few tree species, with a scanty undergrowth of small shrubs like *Diospyros lycioides*, *Grewia flavescens*, *Vitex rehmannii* and *Euclea undulata*, varying in species composition from place to place (Acocks, 1988).

The diversity of woody species is low in this community, possibly due to the homogenous substrate and low nutrients in the soil. This, together with the low density of woody species result in the easier identification of tree species in the community, although the community does not provide as much opportunity to tourists interested in botany. Trees like *Peltophorum africanum* and *Ochna pulchra* are however quite conspicuous when in flower and seem to attract tourists' attention when in flower. The ever-present *Terminalia sericea* does not only attract attention with its silvery clustered leaves and reddish seeds, mammals also browse the species at certain times of the year, as several other species in this community. Although certain interesting tree species occur within this community, the community is not the best in terms of diversity, however, tourists might find the identification of most of the trees easier than other communities.

### 6.3.6 The *Cynodon dactylon*-*Dichrostachys cinerea* Old Fields Community

Woody species occurring in this community only occurs as part of the older successional stage of old fields or disturbed overgrazed areas (Chapter 4). The secondary old fields are often only dominated by one or two tree species at the stage

where woody species start to invade the old fields. Bothma (2000) noted that incorrect grazing practices, often occurring on old fields, reduce the growth and water utilization of grasses close to the soil surface, causing increased competition from woody species. More species are however associated with disturbed areas, like the abandoned settlements within the Nylsvley Nature Reserve described by Coetzee *et al.* (1976). Within the community the following woody species occur within disturbed areas and secondary old fields (numerical values indicate importance):

<i>Terminalia sericea</i>	69.2	<i>Ziziphus mucronata</i>	43.8
<i>Peltophorum africanum</i>	53.2	<i>Combretum zeyheri</i>	43.3
<i>Burkea africana</i>	50.8	<i>Ochna pulchra</i>	41.8
<i>Dichrostachys cinerea</i>	50.8	<i>Grewia flava</i>	40.8
<i>Pterocarpus rotundifolius</i>	50.2	<i>Grewia bicolor</i>	40.3
<i>Terminalia brachystemma</i>	49.7	<i>Ozoroa paniculosa</i>	39.3
<i>Acacia caffra</i>	49.7	<i>Rhus pyroides</i>	39.3
<i>Acacia karroo</i>	49.7	<i>Faurea saligna</i>	38.3
<i>Lannea discolor</i>	49.2	<i>Rhus leptodictya</i>	37.8
<i>Dombeya rotundifolia</i>	48.2	<i>Euclea natalensis</i>	37.3
<i>Combretum apiculatum</i>	46.8	<i>Grewia flavescens</i>	37.0
<i>Euclea crispa</i>	44.8	<i>Grewia monticola</i>	30.0
<i>Vitex rehmannii</i>	44.3	<i>Rhoicissus revoilii</i>	20.2
<i>Combretum molle</i>	43.8		

The geology and soils on which the old fields occur will mostly determine the woody species composition of secondary old fields. Old fields associated with sandy soils will favour the growth of species like *Terminalia* species, *Burkea africana* and *Lannea discolor*, while more loamy or clayey soils will provide suitable invading habitat to species like *Dichrostachys cinerea*, *Acacia karroo* and *Ziziphus mucronata*. These areas usually attract large numbers of game (Chapter 7), and therefore the trees growing in this community can be identified by the tourists while doing a game drive. Browser-grazers (e. g. impala) usually utilize trees like *Dichrostachys cinerea* in this community. Conspicuous trees include *Dichrostachys cinerea*, *Acacia karroo* and *Dombeya rotundifolia* (flowers), *Burkea africana*, *Faurea saligna* and *Terminalia sericea* (growth form).

This community does have more woody species compared to the *Terminalia sericea-Eragrostis pallens* community, however, the tree diversity and density are usually low in the old fields, and the species composition rather depend on the age of old fields, similar to those in the Transkei (Smits *et al.* 1999). Tourists visiting nature reserves

might not be interested in identifying or learning about the trees within these areas, since the areas are usually overpopulated by game. However, the disturbed areas (old villages, kraals etc.) provide an excellent opportunity for cultural tourism, since about 30% of all foreign visitors have some sort of a cultural experience during their stay in South Africa (DEAT, 1998).

### 6.3.7 The *Dombeya rotundifolia*-*Panicum maximum* Sweet Rocky Community

The woody component of this community is usually dense along diabase and dolerite dykes, as well as on the outcrops of these stones. Canopies of woody plants sometimes touch and interlock, contributing 30-40% cover. Trees and shrubs do not exceed 5m in height (Van der Meulen, 1979). The following trees and shrubs occur within this community according to importance values:

<i>Dombeya rotundifolia</i>	77.2	<i>Vitex rehmannii</i>	45.8
<i>Ziziphus mucronata</i>	73.3	<i>Pseudolachnostylis maprouneifolia</i>	44.8
<i>Pappea capensis</i>	67.3	<i>Cussonia paniculata</i>	43.8
<i>Schotia brachypetala</i>	63.5	<i>Croton gratissimus</i>	43.8
<i>Euclea crispa</i>	61.8	<i>Grewia flavescens</i>	43.0
<i>Rhus leptodictya</i>	60.8	<i>Combretum hereroense</i>	42.3
<i>Kirkia acuminata</i>	60.5	<i>Diospyros whyteana</i>	41.3
<i>Clerodendrum glabrum</i>	60.5	<i>Vangueria infausta</i>	41.3
<i>Acacia caffra</i>	59.7	<i>Grewia bicolor</i>	41.3
<i>Combretum apiculatum</i>	57.3	<i>Mimusops zeyheri</i>	41.0
<i>Aloe marlothii</i>	55.5	<i>Obetia tenax</i>	40.3
<i>Acacia karroo</i>	55.2	<i>Diplorhynchus condylocarpon</i>	40.3
<i>Brachylaena rotundata</i>	53.2	<i>Combretum zeyheri</i>	40.3
<i>Peltophorum africanum</i>	53.2	<i>Ficus thonningii</i>	40.3
<i>Grewia flava</i>	52.8	<i>Boscia albitrunca</i>	40.3
<i>Ximenia americana</i>	52.2	<i>Grewia monticola</i>	40.0
<i>Sclerocarya birrea</i>	52.2	<i>Ozoroa paniculosa</i>	38.8
<i>Euclea natalensis</i>	51.3	<i>Faurea saligna</i>	38.8
<i>Lannea discolor</i>	50.7	<i>Euclea undulata</i>	37.8
<i>Elephantorrhiza burkei</i>	50.7	<i>Gymnosporia buxifolia</i>	36.2
<i>Gardenia volkensii</i>	50.7	<i>Englerophytum magalismontanum</i>	35.5
<i>Berchemia zeyheri</i>	50.3	<i>Heteropyxis natalensis</i>	32.0
<i>Dichrostachys cinerea</i>	49.3	<i>Commiphora mollis</i>	32.0
<i>Spirostachys africana</i>	48.7	<i>Diospyros lycioides</i>	30.5
<i>Pterocarpus rotundifolius</i>	48.7	<i>Euphorbia ingens</i>	30.2
<i>Olea europaea</i>	48.3	<i>Euphorbia cooperi</i>	29.5
<i>Acacia nigrescens</i>	48.3	<i>Rhoicissus revoilii</i>	23.7
<i>Terminalia sericea</i>	47.2	<i>Strychnos madagascariensis</i>	23.7
<i>Combretum molle</i>	46.8	<i>Maytenus undata</i>	23.7
<i>Bridelia mollis</i>	45.8	<i>Acacia robusta</i>	23.7

Several tree species are quite conspicuous within this community. The community is also the most diverse community in terms of woody species composition compared to

other communities in the Biosphere Reserve. Species like *Dombeya rotundifolia* and *Schotia brachypetala* are conspicuous when in flower, and dense stands of these trees are very striking when flowering. *Euclea undulata* is often the dominant shrub, while trees like *Acacia karroo*, *Pappea capensis*, *Rhus pyroides*, *Ziziphus mucronata* and *Spirostachys africana* are locally dominant in the tree layers on diabase dykes (Van der Meulen, 1979). The tree diversity is further increased due to the fact that a mixture of sweet bushveld associated woody species (e. g. *Sclerocarya birrea*, *Acacia nigrescens*) and sourveld associated species (e. g. *Diplorhynchus condylocarpon*, *Englerophytum magalismontanum*) occur together on the diabase rocky outcrops. Many tree species are also of importance to local communities. Fruit-bearing species like *Berchemia zeyheri* and *Pseudolachnostylis maprouneifolia* are present, while tree species like *Combretum apiculatum* and *Dichrostachys cinerea* are important sources of indigenous firewood (Van Wyk & Gericke, 2000). The leaves and twigs of several of the tree species like *Combretum* species, *Acacia* species and *Grewia* species, further provide nutritious meals to browsing animals (Van Wyk *et al.* 2000), and this might interest tourists to show interest about the specific tree species being browsed on.

This community has a high potential for tourists interested in identifying the many interesting tree species in the Biosphere Reserve. The tree diversity and density over a small area, will certainly challenge tourists to identify as many trees as possible, however the tree density might also be too dense for tourist to move around freely.

### **6.3.8 The *Acacia tortilis*-*Panicum maximum*-*Ziziphus mucronata* Termitaria and Encroached Areas Community**

This community does not have the highest tree diversity but localized communities are rather dominated by individual woody species (Chapter 4). Coetzee *et al.* (1981) observed that large areas of the plains within the Mosaic Ecozone (Chapter 5) are encroached by *Dichrostachys cinerea*, which excludes several other woody species. Both the vegetation of these areas, and termitaria comprise dense, often impenetrable, thorny bushclumps (Van der Meulen, 1979). The trees and shrubs include the following species:

<i>Dichrostachys cinerea</i>	66.3	<i>Acacia mellifera</i>	43.8
<i>Acacia karroo</i>	61.7	<i>Combretum hereroense</i>	43.3
<i>Ehretia rigida</i>	58.2	<i>Combretum apiculatum</i>	42.3
<i>Acacia erioloba</i>	57.5	<i>Rhus pyroides</i>	41.8
<i>Acacia burkei</i>	57.5	<i>Acacia nigrescens</i>	41.3
<i>Ziziphus mucronata</i>	53.8	<i>Pappea capensis</i>	40.8
<i>Grewia flava</i>	51.3	<i>Euclea divinorum</i>	40.8
<i>Terminalia sericea</i>	50.7	<i>Euclea crispa</i>	39.8
<i>Grewia bicolor</i>	50.3	<i>Combretum imberbe</i>	39.3
<i>Peltophorum africanum</i>	49.2	<i>Grewia monticola</i>	34.0
<i>Acacia erubescens</i>	47.8	<i>Gymnosporia polyacantha</i>	30.5
<i>Euclea undulata</i>	47.8	<i>Diospyros lycioides</i>	30.5
<i>Grewia flavescens</i>	46.5	<i>Gymnosporia buxifolia</i>	25.7
<i>Rhus leptodictya</i>	43.8		

The woody species (e. g. *Dichrostachys cinerea* and several *Acacia* species) within the encroached areas provide local communities with firewood. Ellery *et al.* (2000) noted that woody species within encroached areas of the Thukela Biosphere Reserve, Kwazulu-Natal, play an important role in the sustainable utilization of these woody species as firewood, and the same utilization strategy should possibly be followed in the Waterberg Biosphere Reserve. The management and clearance of these areas are extremely important (Bothma, 2000), and the clearance of bush in the Marakele National Park for game-viewing purposes is already being effective (Engelbrecht, pers. comm.). These areas are otherwise often impenetrable and do not favour tree identification on walking trials for tourists interested in botany.

Woody species dominate vegetation associated with termitaria (Van der Meulen, 1979). Emerging trees like *Pappea capensis* are often found in the centre of the bushclump (reaching 8-10m) with other trees (e. g. *Rhus pyroides*, *Ziziphus mucronata*) and shrubs (e. g. *Grewia* species, *Diospyros lycioides*) grouped around them, covering 5-15%. Although the termitaria bushclumps also form dense thickets, tourists might find the identification of the trees easier than the encroached areas, due to the more open surrounding areas (Coetzee *et al.* 1976) and low density of tree species growing on the termitaria. The bushclumps further appear as a striking composition of woody species, and this feature might interest tourists.

### 6.3.9 The *Acacia nigrescens*-*Grewia flava* Plains Community

This community is typical of plains areas around the main Waterberg basin. Schmidt (1992) described two structural variations of the woody component of a similar community at Rhino Ranch near Ellisras as short closed woodland (Edwards, 1983), dominated by *Combretum apiculatum*, and tall open woodland (Edwards, 1983), with a tall and short variant, dominated by the woody species *Acacia nigrescens* and *Acacia tortilis* respectively. The diversity of woody species within this community is not high, due to many variations of this community often being locally dominated by certain species. The following woody species occur within the community (numerical values indicates importance):

<i>Acacia tortilis</i>	79.2	<i>Peltophorum africanum</i>	51.2
<i>Grewia bicolor</i>	71.8	<i>Sclerocarya birrea</i>	50.2
<i>Grewia flava</i>	70.8	<i>Acacia mellifera</i>	43.8
<i>Acacia nigrescens</i>	67.8	<i>Euclea divinorum</i>	43.8
<i>Dichrostachys cinerea</i>	66.8	<i>Boscia albitrunca</i>	41.8
<i>Acacia karroo</i>	54.2	<i>Combretum imberbe</i>	39.8
<i>Grewia monticola</i>	54.0	<i>Commiphora mollis</i>	35.5
<i>Combretum apiculatum</i>	52.3	<i>Ehretia amoena</i>	34.5
<i>Commiphora africana</i>	52.2	<i>Acacia robusta</i>	24.2
<i>Boscia foetida</i>	51.7		

Coetsee (1971) noted that woody species from Acocks' (1988) Mixed Bushveld Veld Type (e. g. *Combretum apiculatum*, *Grewia* species) and Arid Sweet Bushveld Veld Type (*Acacia tortilis*, *Acacia nigrescens*, *Boscia* species, *Commiphora* species) form a relationship within this community. Most of the woody species are also eagerly browsed by mammal species (Venter & Venter, 1996), and therefore the woody species further plays an important part for game viewing on game farms and nature reserves. Van der Meulen (1979) classified a similar community as part of the arid habitat of the Xeric lowland bushveld.

Tourists interested in identifying trees or learning about them, might find this community fascinating. The several *Acacia* species are always conspicuous when in flower (Van Wyk *et al.* 2000), while traditional uses of species like *Boscia albitrunca* (Van Wyk & Gericke, 2000) further enhances the potential the woody component of this community has for the tourism industry. The diversity of trees and density of

woody species allow tourist activities like walking trials to be provided by ecotourism destinations.

### 6.3.10 The *Setaria incrassata-aristida bipartita* Vertic Clay Community

This community occurs only within the Nylsvley Nature Reserve and very few woody species occur within it. Coetzee *et al.* (1976) noted that the woody component only occurs where the water table is generally lower than the neighboring grassland in the Nylsvley Nature Reserve. The following woody plants (in order of importance) only contributes about 5-15% canopy cover and do not exceed 5m in height (Van der Meulen, 1979):

<i>Acacia nilotica</i>	71.7
<i>Acacia tortilis</i>	51.7
<i>Acacia karroo</i>	51.7
<i>Rhus pyroides</i>	43.3
<i>Dichrostachys cinerea</i>	43.3
<i>Ziziphus mucronata</i>	43.3

The *Acacia* species occurring in the community have stunted growth forms due to the vertic, black clayey soils. The sweet veld is also highly sought after by grazing animals (Bredenkamp, 1999<sup>b</sup>) and the woody component provides important shelter and shade to many mammal species (Chapter 7). Although not many tourists would be interested in identifying the few trees within this community, the growth form of the stunted *Acacia* species is quite conspicuous (also when in flower) and creates a typical African savanna landscape.

## 6.4 Conclusion

Although Preston & Fuggle (1988) have shown that the study of plants are significantly behind game viewing or bird watching for tourists, they also noted that limited exposure to subjects influence tourist preferences. Tourists always welcome the chance to be taught about nature on various ecotourist activities (e. g. walking trials, game drives) (Preston & Fuggle, 1988), and therefore the promotion of tree identification as a specialized tourist activity could increase tourist interests for trees.



Trees and shrubs have many interesting features that could be shared with tourists on their visits to game reserves and other ecotourist destinations within the Biosphere Reserve (medicinal properties, browsing value, firewood, arts and crafts). The sharing of these characteristics with tourists might further improve the nature experience for tourists visiting game reserves in the Waterberg Biosphere Reserve, or any other game reserve in southern Africa.

Different tree and shrub species occur under different environmental conditions and within the plant communities of the Waterberg Biosphere Reserve, the species composition varies. However, aspects like species diversity and density, conspicuousness, special characteristics and physical environmental conditions might contribute in determining whether the plant community will be a preferred area for tree identification and other tourist activities. For example, the high tree diversity and aesthetic value of the Kloof Community would probably be preferred by hikers, however the moist conditions within these gorges and ravines (Van Staden (in prep.) make the surface slippery and unsafe. In this instance, guided walks should be conducted into these preferred, but dangerous areas.

Although there is a huge potential to promote the trees and shrubs of the Waterberg Biosphere Reserve as tourist interests, the main aim of most nature reserves within the Biosphere Reserve remains the viewing of wildlife by tourists. Most of the larger mammals occurring within Southern Africa may be encountered on game reserves within the Biosphere Reserve and will be discussed in the following chapter.

Table 6.1 Synoptic table of the trees and shrubs of the Waterberg Biosphere Reserve  
(Community numbers similar to Chapter 4)

Vegetation type	1	2	3	4	5	6	7	8	9	10	11	12
Number of relevés	11	3	43	90	387	156	182	432	44	76	48	5

**Species Group 1**

Podocarpus latifolius	54	9			4							
Myrsine africana	44	1			8							
Celtis africana	40								7	1		
Secamone alpini	37	1	2	1								
Osyris lanceolata	26		2	4				7				
Syzygium cordatum	26		1	5								
Ficus sur	26				1							
Cheilanthes viridis	26	2	8						2			
Acokanthera oppositifolia	23											
Buxus macowanii	23									3		
Tricalysia lanceolata	23			1								
Curtisia dentata	21											
Calpurnia aurea	21								7			
Clutia pulchella	19	3	4	1					2			
Rothmannia capensis	19	7	3	2								
Kirkia wilmsii	19		1						9			
Plectranthus fruticosus	19											
Canthium gilfillanii	19		8			2			5			
Widdringtonia nodiflora	16	6										
Asplenium splendens	16											
Pittosporum viridiflorum	16		1									
Syzygium guineense	9	14	2									
Vepris lanceolata		14										
Cheilanthes viridis	9	14	1	4	1	2			5			
Dovyalis zeyheri		14			3				5	1		
Blechnum attenuatum		12										
Ochna holstii		12										
Grewia occidentalis		12		2					9	1		
Pterocelastrus echinatus		12										
Abrus laevigatus		12		1					2			
Cussonia spicata		12	4	4							1	

**Species Group 2**

Ilex mitis	9	21
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**Species Group 3**

Anthospermum hispidulum	32			1	2	7
Protea roupelliae	22					
Passerina montana	7	11				
Rhus magalismsontana		10	4		1	

**Species Group 4**

Hexalobus monopetalus		18	3			2
Lantana rugosa	2	16	5	8	8	9
						1

**Species Group 5**

Rhus gracillima	8	18	25		4	
Tapiphyllum parvifolium	4	37	13			9
Combretum nelsonii		12	12	1	4	7

**Species Group 6**

Protea caffra		44	3	37		2	2	
Ancylobotrys capensis	2	10	11	18	3			
Maytenus tenuispina	2	13	40	13	3	8	9	4

**Species Group 7**

Apodytes dimidiata		12	4	8	19		2	
Rhus dentata		16	32	11	18		5	
Olea capensis		14			15		7	

**Species Group 8**

Securidaca longepedunculata		1			29			1
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**Species Group 9**

Lanea edulis	3	5	16	16	4			
Ximenia caffra		8	11	14	1	9	7	

**Species Group 10**

Strychnos pungens	3	46	10	48	9	9		
Vitex pooara		14	6	13	1	9		
Mundulea sericea	2	26	7	13	7	7	4	

**Species Group 11**

Terminalia brachystemma		4	1	2	16			5
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**Species Group 12**

Lopholaena coriifolia	2	7	23	1	10			
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**Species Group 13**

Burkea africana	2	8	69	37	80	35	5	
Ochna pulchra	8		36	18	70	17		

**Species Group 14**

Schotia brachypetala	9	1			1	27	5	
Bridelia mollis	2	5			3	25	1	
Kirkia acuminata		3			4	21	3	2
Ximenia americana						21		8
Clerodendrum glabrum	5	3	8		6	21		
Spirostachys africana	2					14	5	
Obetia tenax	2					14		
Aloe marlothii		9	3		2	11	3	
Euphorbia cooperi		1				9		

**Species Group 15**

Pseudolachnostylis maprounceifolia	1	36	6	3	5	23		
Lanea discolor	3	51	25	36	15	18		
Elephantorrhiza burkei	3	40	36		7	18		4
Gardenia volkensii	5	1	15	11	4	18	4	
Diplorhynchus condylocarpon	1	56	5	9	8	14		
Pterocarpus rotundifolius		25	9	1	17	14		
Rhoicissus revoilii	4	37	21		7	14	7	
Combretum zeyheri		25	12	44	20	14	1	
Strychnos madagascariensis	1	15			4	14		

**Species Group 16**

Vitex rehmannii	5	16	41	46	51	22	25	
Ozoroa paniculosa	2	10	40	28	32	12	11	

**Species Group 17**

Dombeya rotundifolia	14	3	12	21	39	13	71	7
Euclea natalensis	12		16	4	34	8	36	9
Acacia caffra	16	10	5	26	6	16	36	1
Berchemia zeyheri	12	1	1	1		2	34	
Mimusops zeyheri	19		7	19		2	32	1
Olea europaea	30			2		2	30	
Euphorbia ingens	26		2				27	1
Combretum molle	12	12	87	60	55	21	27	1
Brachylaena rotundata	14	8	11	15			23	1
Cussonia paniculata	12	1	2				21	
Croton gratissimus	19		24	4	1	4	21	1
Englerophytum magalismsontanum	14	36	66	35	1	4	21	1
Diospyros whyteana	58	1	7				16	
Vangueria infausta	14	49	39	42	2	5	16	
Rhoicissus tridentata	16	6	5	8		2	16	1
Ficus thonningii	21	1	2	4		4	14	
Maytenus undata	33	2	3	4			14	
Heteropyxis natalensis	19	11	15	22		3	14	1
Faurea saligna	16	13	13	42	4	10	11	

**Species Group 18**

Ehretia rigida	9		9		7	7	9	33
Acacia erubescens						7	2	29
Acacia erioloba						2		15
Acacia burkei					2	4		15
Maytenus polyacantha	9		1				7	11

**Species Group 19**

Carissa bispinosa	5				3			21	21
Combretum hereroense			3		1	2		18	20

**Species Group 20**

Grewia flavescens			8	4			55	24	36	43	8
Euclea undulata							13	2	9	29	
Aloe greatheadi v davyana			2				25		2	20	

**Species Group 21**

Maytenus heterophylla			5				14	8	7	39	18	2
Euclea crispa	9	2	5				22	3	23	57	13	

**Species Group 22**

Terminalia sericea							16	5	76	55	11	18
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**Species Group 23**

Rhus leptodictya	12		9	19	13	9	55	21				
Pappea capensis	19		3	4	3	4	68	15				
Diospyros lycioides	12		3	12	12	7	11	11				

**Species Group 24**

Commiphora africana									2	1	21	
Boscia foetida											20	
Ehretia amoena											19	
Clerodendrum ternatum											13	

**Species Group 25**

Acacia mellifera						2	2	7	21	21		
Euclea divinorum								2	15	21		

Combretum imberbe 2 5 

12	13
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**Species Group 26**

Acacia nigrescens 2 

30	16	69
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 Commiphora mollis 3 3 

14	3	21
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 Sclerocarya birrea 2 2 4 

21	4	17
----	---	----

  
 Boscia albitrunca 1 

14	4	17
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 Acacia robusta 5 2 

14	5	15
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**Species Group 27**

Grewia bicolor 5 

14	16	34	77
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 Grewia flava 2 1 2 1 4 

15	39	36	75
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**Species Group 28**

Peltophorum africanum 3 3 

20	23	23	15	19
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**Species Group 29**

Grewia monticola 

11	3	9	10	30	18	58
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 Combretum apiculatum 

19	9	19	27	48	18	38
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**Species Group 30**

Acacia nilotica 4 2 2 

12	6	60
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 Acacia tortilis 5 4 7 

49	75	20
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**Species Group 31**

Rhus pyroides 2 1 8 3 

12	7	17	20
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 Acacia karroo 3 3 

16	27	40	25	20
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**Species Group 32**

Dichrostachys cinerea 5 5 

48	35	32	66	67	20
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**Species Group 33**

Ziziphus mucronata 5 

10	10	4	21	80	41	20
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## 6.5 References

- ACOCKS, J. P. H. 1988. Veld types of Southern Africa. *Memoirs of the Botanical Survey of South Africa* 57.
- BOTHMA, J DU P. 2000. *Game Ranch Management*. 3<sup>rd</sup> ed. Van Schaick publishers, Pretoria.
- BREDENKAMP, G. J. 1999<sup>a</sup>. Grassland. In: Knobel, J. (ed.) *The Magnificent Natural Heritage of Southern Africa*. Sunbird Publishing, Cape Town.
- BREDENKAMP, G. J. 1999<sup>b</sup>. Bushveld. In: Knobel, J. (ed.) *The Magnificent Natural Heritage of Southern Africa*. Sunbird Publishing, Cape Town.
- COETZEE, B. J., VAN DER MEULEN, F., ZWANZIGER, S, GONSALVES, P & WEISSER, P. J. 1976. A Phytosociological classification of the Nylsvley Nature Reserve. *Bothalia* 12: 137 - 160.
- COETZEE, B. J., VAN WYK, P., GERTENBACH, W. P. D., HALL-MARTIN, A & JOUBERT, S. C. J. 1981. 'N Plantekologiese Verkenning van die Waterberggebied in die Noord - Transvaalse Bosveld. *Koedoe* 24: 1 - 23.
- COETZEE, J. J. 1971. Die Landboupotensiaal van die Noordwes Transvaalse Soetbosveld. DSc (Agric.), University of Pretoria.
- CORPORATE AUTHOR. 1991. Mangrove Management Plan for Kisarawe District. Manag. Plan Mangrove Ecosyst. Mainl. Tanz. Vol. 5: 105. Ministry of Tourism, Natural Resources and Environment, Dar es Salaam, Tanzania.
- DEAT. 1998. *Investing in Tourism*. Department of Environmental Affairs and Tourism, Government of South Africa.
- DU PREEZ, P. J., BREDENKAMP, G. J. & VENTER, H. J. T. 1991. The syntaxonomy and synecology of the forests in the Eastern Orange Free State, South Africa. 1. The *Podocarpetalia latifolii*. *S. Afr. J. Bot.* 57: 198 - 206.
- EDWARDS, D. 1983. A Broad-scale structural classification of vegetation for practical purposes. *Bothalia* 14 (3 & 4): 705 - 712.
- ELLERY, W, BILL, C, MCKENZIE, A. MURPHY, M. & TOOLEY, J. 2000. Sustainable use of Natural Hardwood Resources in the Thukela Biosphere Reserve. Town and Regional Planning Commission Supplementary Report. Vol. 53. Department of Geographical and Environmental Sciences, University of Natal, Durban.

- ELTRINGHAM, S. K. 1979. *The Ecology and Conservation of Large African Mammals*. The Macmillan Press Ltd., London.
- ENGELBRECHT, M. Personal Communication
- GELDENHUYS, C. 1999. Evergreen Forest. In: Knobel, J. (ed.) *The Magnificent Natural Heritage of Southern Africa*. Sunbird Publishing, Cape Town.
- LOW, A. B. & REBELO, A. G. 1996. *Vegetation of South Africa, Lesotho and Swaziland*. Dept. of Environmental Affairs and Tourism, Pretoria.
- PRESTON, G. R. & FUGGLE, R. F. 1988. Profiles and Preferences of visitors to three South African nature reserves. *S. Afr. J. Wildl. Res.* **18(1)**: 1-5.
- SCHMIDT, A. G. 1992. Guidelines for the management of some game ranches in the Mixed Bushveld communities of the North-Western Transvaal, with special reference to Rhino Ranch. MSc thesis, University of Pretoria.
- SKINNER, J. D. & SMITHERS, R. H. N. 1990. *The Mammals of the Southern African Subregion*. University of Pretoria, Pretoria.
- SMITS, N. A. C., BREDEKAMP, G. J., MUCINA, L. & GRANGER, J. E. 1999. The Vegetation of Old-fields, Transkei. *S. Afr. J. Bot.* **65 (5 & 6)**: 414 - 420.
- VAN DER MEULEN, F. 1979. Plant sociology of the of the Western Transvaal Bushveld, South Africa. A syntaxonomic and synecological study. *Dissertationes Botanicae* 49: 1-234.
- VAN ROOYEN, N & BREDEKAMP, G. J. 1996. Mixed Bushveld. In: Low, A. B. & Rebelo, A. G. (eds.) *Vegetation of South Africa, Lesotho and Swaziland*. Dept. of Environmental Affairs and Tourism, Pretoria.
- VAN STADEN, P. J. In Prep. An Ecological Study of the Plant Communities of the Marakele National Park. MSc thesis, University of Pretoria.
- VAN WYK, A. E. & VAN WYK, P. 1997. *Field Guide to Trees of Southern Africa*. Struik publishers, Cape Town.
- VAN WYK, A. E, VAN WYK B-E, VAN WYK, P. 2000. *Photographic Guide to Trees of Southern Africa*. Briza publications, Pretoria.
- VAN WYK B-E. & GERICKE, N. 2000. *People's Plants: A Guide to useful plants of southern Africa*. Briza publications, Pretoria.
- VENTER, F & VENTER, J-A. 1996. Making the most of indigenous trees. Briza Publications, Pretoria.
- WAHL, M & HUGO, M. L. 1995. *Hiking Trials: Plan before you start*. Dept. of Environmental Affairs and Tourism, Pretoria.

## Appendix 6.1 Tree and shrub species of the Waterberg Biosphere Reserve and some of their interesting characteristics

Tree / Shrub species	Medicinal / Veterinary	Food Source	Wood / leaf/ bark use	Diagnostic	Conspicuous	Total / 6	Total / 5
<i>Acacia burkei</i>	1	1	1	1	2	6	5.00
<i>Acacia caffra</i>	1	1	1	0	2	5	4.17
<i>Acacia erioloba</i>	1	1	1	1	2	6	5.00
<i>Acacia erubescens</i>	0	1	1	1	1	4	3.33
<i>Acacia karroo</i>	1	1	1	0	2	5	4.17
<i>Acacia mellifera</i>	1	1	1	0	1	4	3.33
<i>Acacia nigrescens</i>	0	1	1	0	2	4	3.33
<i>Acacia nilotica</i>	1	1	1	0	2	5	4.17
<i>Acacia robusta</i>	0	1	0	0	1	2	1.67
<i>Acacia tortilis</i>	1	1	1	0	2	5	4.17
<i>Aeokanthera oppositifolia</i>	1	0	1	1	1	4	3.33
<i>Aloe marlothii</i>	1	1	1	1	2	6	5.00
<i>Ancylobotrys capensis</i>	0	1	0	0	0	1	0.83
<i>Apodytes dimidiata</i>	1	1	1	0	2	5	4.17
<i>Berchemia zeyheri</i>	1	1	1	0	1	4	3.33
<i>Boscia albitrunca</i>	1	1	1	0	1	4	3.33
<i>Boscia foetida</i>	1	1	1	1	1	5	4.17
<i>Brachylaena rotundata</i>	1	1	1	0	2	5	4.17
<i>Bridelia mollis</i>	1	1	0	1	1	4	3.33
<i>Burkea africana</i>	1	1	1	0	1	4	3.33
<i>Buxus macowanii</i>	0	1	1	1	1	4	3.33
<i>Calpurnia aurea</i>	1	1	1	1	1	5	4.17
<i>Canthium gilfillanii</i>	1	0	1	1	0	3	2.50
<i>Celtis africana</i>	0	1	1	1	2	5	4.17
<i>Clerodendrum glabrum</i>	1	1	1	1	2	6	5.00
<i>Clutia pulchella</i>	0	0	0	1	2	3	2.50
<i>Combretum apiculatum</i>	1	1	1	0	1	4	3.33
<i>Combretum hereroense</i>	1	1	1	0	1	4	3.33



Tree / Shrub species	Medicinal / Veterinary	Food Source	Wood / leaf/ bark use	Diagnostic	Conspicuous	Total / 6	Total / 5
<i>Combretum imberbe</i>	1	1	1	0	1	4	3.33
<i>Combretum molle</i>	1	1	1	0	1	4	3.33
<i>Combretum nelsonii</i>	1	1	1	0	2	5	4.17
<i>Combretum zeyheri</i>	1	1	1	0	1	4	3.33
<i>Commiphora africana</i>	1	1	1	1	1	5	4.17
<i>Commiphora mollis</i>	0	1	1	0	1	3	2.50
<i>Croton gratissimus</i>	1	1	1	0	1	4	3.33
<i>Curtisia dentata</i>	1	0	1	1	2	5	4.17
<i>Cussonia paniculata</i>	1	1	1	0	1	4	3.33
<i>Cussonia spicata</i>	1	1	1	1	1	5	4.17
<i>Dichrostachys cinerea</i>	1	1	1	0	1	4	3.33
<i>Diospyros lycioides</i>	1	1	1	0	0	3	2.50
<i>Diospyros whyteana</i>	1	1	1	0	1	4	3.33
<i>Diplorhynchus condylocarpon</i>	1	1	1	0	1	4	3.33
<i>Dombeya rotundifolia</i>	1	1	1	0	2	5	4.17
<i>Dovyalis zeyheri</i>	0	1	1	1	1	4	3.33
<i>Ehretia amoena</i>	0	1	0	1	1	3	2.50
<i>Ehretia rigida</i>	1	1	1	1	1	5	4.17
<i>Elephantorrhiza burkei</i>	1	1	1	0	2	5	4.17
<i>Englerophytum magalismontanum</i>	1	1	0	0	1	3	2.50
<i>Euclea crispa</i>	1	1	1	0	1	4	3.33
<i>Euclea divinorum</i>	1	1	1	0	1	4	3.33
<i>Euclea natalensis</i>	1	1	1	0	1	4	3.33
<i>Euclea undulata</i>	1	1	1	0	1	4	3.33
<i>Euphorbia cooperi</i>	0	0	1	1	1	3	2.50
<i>Euphorbia ingens</i>	1	0	0	0	1	2	1.67
<i>Faurea saligna</i>	1	0	1	0	2	4	3.33
<i>Ficus sur</i>	1	1	1	1	1	5	4.17
<i>Ficus thonningii</i>	1	1	1	0	1	4	3.33
<i>Gardenia volkensii</i>	1	1	1	0	2	5	4.17

Tree / Shrub species	Medicinal / Veterinary	Food Source	Wood / leaf/ bark use	Diagnostic	Conspicuous	Total / 6	Total / 5
<i>Grewia bicolor</i>	1	1	1	0	1	4	3.33
<i>Grewia flava</i>	1	1	1	0	1	4	3.33
<i>Grewia flavescens</i>	0	1	1	0	1	3	2.50
<i>Grewia monticola</i>	0	1	1	0	1	3	2.50
<i>Grewia occidentalis</i>	1	1	1	1	0	4	3.33
<i>Gymnosporia buxifolia</i>	1	0	1	0	0	2	1.67
<i>Gymnosporia polyacantha</i>	1	0	1	1	0	3	2.50
<i>Heteropyxis natalensis</i>	1	1	0	0	1	3	2.50
<i>Hexalobus monopetalus</i>	0	1	0	1	0	2	1.67
<i>Ilex mitis</i>	1	1	1	1	1	5	4.17
<i>Kirkia acuminata</i>	1	1	1	1	2	6	5.00
<i>Kirkia wilmsii</i>	1	1	1	1	1	5	4.17
<i>Lansea discolor</i>	1	1	1	0	2	5	4.17
<i>Maytenus tenuispina</i>	1	0	0	0	0	1	0.83
<i>Maytenus undata</i>	0	0	1	0	1	2	1.67
<i>Mimusops zeyheri</i>	0	1	1	0	1	3	2.50
<i>Mundulea sericea</i>	1	1	1	0	2	5	4.17
<i>Myrsine africana</i>	0	1	0	1	0	2	1.67
<i>Obetia tenax</i>	1	0	1	1	1	4	3.33
<i>Ochna holstii</i>	0	1	1	1	0	3	2.50
<i>Ochna pulchra</i>	0	1	1	0	2	4	3.33
<i>Olea capensis</i>	0	0	1	0	2	3	2.50
<i>Olea europea</i>	1	1	1	0	1	4	3.33
<i>Osyris lanceolata</i>	0	0	1	1	1	3	2.50
<i>Ozoroa paniculosa</i>	1	1	1	0	1	4	3.33
<i>Pappea capensis</i>	1	1	1	0	1	4	3.33
<i>Peltophorum africanum</i>	1	1	1	0	2	5	4.17
<i>Pittosporum viridiflorum</i>	1	1	0	1	1	4	3.33
<i>Podocarpus latifolius</i>	0	1	1	1	2	5	4.17
<i>Protea caffra</i>	1	1	1	0	2	5	4.17

Tree / Shrub species	Medicinal / Veterinary	Food Source	Wood / leaf/ bark use	Diagnostic	Conspicuous	Total / 6	Total / 5
<i>Protea roupelliae</i>	1	1	0	1	2	5	4.17
<i>Pseudolachnostylis maprouneifolia</i>	1	1	1	0	1	4	3.33
<i>Pterocarpus rotundifolius</i>	1	1	1	0	2	5	4.17
<i>Pterocelastrus echinatus</i>	1	0	1	1	1	4	3.33
<i>Rhoicissus revoilii</i>	0	1	1	0	0	2	1.67
<i>Rhus dentata</i>	0	1	1	0	1	3	2.50
<i>Rhus leptodictya</i>	1	1	1	0	1	4	3.33
<i>Rhus pyroides</i>	1	1	1	0	1	4	3.33
<i>Rothmannia capensis</i>	1	1	1	1	2	6	5.00
<i>Schotia brachypetala</i>	1	1	1	1	2	6	5.00
<i>Sclerocarya birrea</i>	1	1	1	0	2	5	4.17
<i>Securidaca longepedunculata</i>	1	0	1	1	1	4	3.33
<i>Spirostachys africana</i>	1	1	1	1	1	5	4.17
<i>Strychnos cocculoides</i>	1	1	1	1	2	6	5.00
<i>Strychnos madagascariensis</i>	0	1	0	0	1	2	1.67
<i>Strychnos pungens</i>	1	1	0	0	1	3	2.50
<i>Syzygium cordatum</i>	1	1	1	1	2	6	5.00
<i>Syzygium guineense</i>	1	1	1	1	1	5	4.17
<i>Tapiphyllum parvifolium</i>	0	1	1	0	1	3	2.50
<i>Terminalia brachystemma</i>	1	1	1	1	1	5	4.17
<i>Terminalia sericea</i>	1	1	1	0	2	5	4.17
<i>Tricalysia lanceolata</i>	0	0	0	1	0	1	0.83
<i>Vangueria infausta</i>	1	1	1	0	1	4	3.33
<i>Vepris lanceolata</i>	1	1	1	1	0	4	3.33
<i>Vitex pookara</i>	1	1	1	1	1	5	4.17
<i>Vitex rehmannii</i>	1	1	1	0	1	4	3.33
<i>Widdringtonia nodiflora</i>	0	0	1	1	1	3	2.50
<i>Ximenia americana</i>	1	1	1	1	1	5	4.17
<i>Ximenia caffra</i>	1	1	1	0	1	4	3.33
<i>Ziziphus mucronata</i>	1	1	1	0	1	4	3.33