

## Climate

The landscape has a temperate climate with the occurrence of sporadic frost confined strictly to the bottomlands. The phenomenon of temperature inversions (Oosting 1956) is very distinct in this undulating landscape. During daytime higher temperatures are experienced in the bottomlands than on the uplands, but at night it becomes colder in the bottomlands. Table 3 gives the temperature data for Satara which is also applicable to this landscape. Rainfall varies between 550 and 600 mm per year with the average annual rainfall for Skukuza, Tshokwane and Kingfisherspruit 546,3, 561,3 and 582,3 mm respectively.

## Soil pattern

This landscape has an interesting and most unique cantenary sequence of soils that correspond strongly with position in the topography. The upland soils are sandy with between 6 and 15 percent clay and the dominant soil Forms are Hutton and Clovelly with Portsmouth/Swartfontein and Denhere/Makuya respectively as the dominant Series. Where the slopes become steeper Glenrosa soils can be expected. Venter (1981) shows a diagrammatic representation of a cantena on granite which explains the situation in this landscape (Fig. 7). Where the convex topography changes into a concave topography conditions of temporary water saturation prevail and gleyed sandy soils are present (Cartref and Fernwood). Over a period of time an accumulation of clay has taken place in the bottomlands and therefore the soil in the bottomlands has become clayey, often sodium saturated with a massive prisma-cutanic structure in the underground horizons. Dominant soil Forms are Estcourt, Sterkspruit, Swartland and Valsrivier. Chemical and mechanical analysis of typical soils in the different positions in the topography are shown in Table 4.

Table 4  
*Chemical and mechanical analysis of soils in Landscape 5*

Parent material	Granite		Granite		Granite	
Topography	Upland		Middleslope		Bottomland	
Soil Form	Clovelly		Cartref		Valsrivier	
Soil Series	Denhere		Kusasa		Valsrivier	
	A-Horizon	B-Horizon	A-Horizon	B-Horizon	A-Horizon	B-Horizon
% Sand	84	81	82	83	70	63
% Silt	6	5	7	8	11	6
% Clay	9	10	7	7	12	22
pH (H <sub>2</sub> O)	6,2	5,6	5,9	6,1	6,0	6,6
P (ppm)	2	2	4	2	2	2
K (ppm)	40	20	80	20	60	20
Ca (ppm)	320	140	260	140	520	520
Mg (ppm)	208	50	196	116	266	306
Na (ppm)	140	40	80	80	640	140
Resistance (Ohm)	7 800	16 000	1 300	4 100	2 600	2 000

The banks of the spruits are formed by recent alluvial soils of which Oakleaf, Dundee and Inhoek are the most important Forms.

The frequent occurrence of dolerite intrusions in the granite of this landscape sometimes has the potential to obscure the catenary sequence, as described above. The soil on the dolerite intrusions is darker in colour (Mayo, Milkwood, Bonheim) and usually much more clayey (15 to 35 percent for the A-horizons). In the vicinity of a dolerite intrusion the weathered material from the dolerite and granite blends and it sometimes happens that the A-horizon originates from dolerite but the B-horizon from granite. These soils accommodate a heterogeneous vegetation that does not always fit in with the recurrent pattern (Mayo, Glenrosa).

### Vegetation

The vegetation of this landscape is described under the following names: *Combretum*-veld (Van der Schijff 1957), Mixed *Combretum* Savanna Woodland (Pienaar 1963) *Combretum*-veld on Granite Undulations (Van Wyk 1973), Tropical Semi-Arid Granitic Lowveld (Coetzee 1983) and Arid Lowveld (Acocks 1975). It is an area with dense bush savanna vegetation on the uplands, open tree savanna in the bottomlands and with dense riverine vegetation on the banks of spruits and rivers.

The vegetation on the deep sandy soils of the uplands consist of a *Terminalia sericea*/*Combretum zeyheri*/*Combretum apiculatum*-community with a dense low and high shrub layer and few or no trees (Fig. 13). Dominant woody species are *Combretum apiculatum*, *C. zeyheri*, *Terminalia sericea*, *Strychnos madagascariensis*, *Commiphora africana*, *Cissus cornifolia*, *Dichrostachys cinerea* subsp. *africana*, *Sclerocarya caffra*, *Acacia exuvialis*, *Dalbergia melanoxylon*, *Lannea stuhlmannii*, *Pterocarpus rotundifolius*, *Acacia burkei*, *Peltophorum africanum*, *Ormocarpum trichocarpum* and *Ziziphus mucronata*.

Where the slopes become steeper and the soils more shallow, *Strychnos madagascariensis* disappears and larger trees such as *Sclerocarya caffra*, *Albizia harveyi* and *Acacia drepanolobium* are found. The difference between the two variations of vegetation on the uplands is mainly due to the composition of the field layer. The field layer on the uplands of the landscape is dominated by *Pogonarthria squarrosa*, *Tricholaena monachne*, *Eragrostis rigidior*, *Rhynchelytrum repens*, *Trichoneura grandiglumis*, *Perotis patens*, *Brachiaria nigropedata*, *B. serrata*, *Aristida argentea*, *Digitaria eriantha* var. *pentzii*, *Panicum maximum*, *Aristida congesta* subsp. *barbicollis*, *A. meridionalis*, *Schmidtia pappophoroides*, *Urochloa mosambicensis*, *Enneapogon cenchroides* and *Heteropogon contortus*. The dominant forbs are *Tephrosia polystachya*, *Commelina bengalensis*, *Rhynchosia totta*, *Clerodendrum ternatum*, *Leucas glabrata*, *Evolvulus alsinoides*, *Cassia mimosoides*, *Waltheria indica*, *Indigofera filipes*, *Agathisanthemum bojeri*, *Kohautia virgata*, *Cassia absus*, *Merremia tridentata* and *Stylosanthus fruticosa*. The two variations of the community on the uplands are distinguished by the absence of *Strychnos madagascariensis* in the *Sclerocarya caffra*-variation and the following herbaceous plants are limited to the last named variation: *Ceratotheca triloba*, *Cyperus rupestris*, *Andropogon gyanus*, *Crotalaria virgulata*, *Hibiscus micranthus*, *Phyllanthus asperulatus*,



Fig. 13. Landscape 5. Upland Mixed *Combretum* spp./*Terminalia sericea* Woodland.



Fig. 14. Landscape 5. Bottomland Mixed *Combretum* spp./*Terminalia sericea* Woodland.

*Brachiaria xantholeuca*, *Cucumis africanus*, *Tragia dioica* and *Hermannia boraginiflora*.

On the ecotone or seepline where the convex topography changes to a concave topography, a dense fringe of *Terminalia sericea* trees occur. Other woody species present in this association are *Combretum zeyheri*, *C. apiculatum*, *Sclerocarya caffra*, *Maytenus heterophylla*, *Peltophorum africanum*, *Albizia harveyi* and *Acacia gerrardii*. The field layer is very similar to that of the uplands except that the following species are also present: *Eragrostis gummiflua*, *Hyperthelia dissoluta*, *Sporobolus fimbriatus*, *Cyperus* sp., *Fimbristylis complanata* and *Epaltes gariepina*.

The bottomlands of this landscape are open tree savanna with a dense grass cover if not overgrazed (Fig. 14). Gertenbach (*in prep.*) classifies it as an *Acacia nigrescens/Combretum apiculatum* association which is comparable to the vegetation of Landscape 4. Depending on the clay content of the soil and the degree of overgrazing the following two sub-associations in the bottomlands of this landscape can be differentiated viz. *Aristida barbicollis/Acacia nigrescens/Combretum apiculatum*-sub-association and the *Acacia gerrardii/Acacia nigrescens/Combretum apiculatum*-sub-association.

Dominant woody species for both these sub-associations are *Combretum apiculatum*, *Acacia nigrescens*, *Combretum hereroense*, *Dichrostachys cinerea* subsp. *africana*, *Grewia bicolor*, *Acacia gerrardii*, *Dalbergia melanoxylon*, *Lannea stuhlmannii*, *Ziziphus mucronata*, *Acacia tortilis*, *Pterocarpus rotundifolius*, *Cissus cornifolia*, *Combretum imberbe*, *Commiphora africana*, *Ormocarpum trichocarpum*, *Ehretia rigida*, *Albizia harveyi* and *Bolusanthus speciosus*. The difference between the two sub-associations is mainly determined by the composition of the field layer. Grasses normally present in both these sub-associations are *Digitaria eriantha* var. *pentzii*, *Panicum maximum*, *Aristida congesta* subsp. *barbicollis*, *Schmidtia pappophoroides*, *Urochloa mosambicensis*, *Heteropogon contortus* and *Enneapogon cenchroides*, but more specifically *Cymbopogon plurinodis*, *Eragrostis superba*, *Bothriochloa radicans* and *Eragrostis rigidior*. In the *Aristida barbicollis*-sub-association *Aristida congesta* subsp. *barbicollis*, *Pogonarthria squarrosa* and *Andropogon gayanus* are more dominant, while *Themeda triandra*, *Urochloa brachyura* and *Panicum coloratum* are more dominant in the *Acacia gerrardii*-sub-association.

Characteristic forbs of both the sub-associations of the bottomlands of this landscape are *Waltheria indica*, *Asparagus plumosus*, *Blepharis integrifolia*, *Pavonia patens*, *Hibiscus micranthus*, *Phyllanthus asperulatus*, *Tragia dioica*, while more common species such as *Tephrosia polystachya*, *Commelina bengalensis*, *Rhynchosia totta*, *Clerodendrum ternatum*, *Cyphocarpa angustifolia* and *Leucas glabrata* also occur. The banks of the spruits have a dense, mostly evergreen, forest community with the following dominant species: *Diospyros mespiliformis*, *Combretum imberbe*, *Acacia robusta*, *Euclea divinorum*, *Lonchocarpus capassa*, *Schotia brachypetala*, *Cassine aetiopica* and *Spirostachys africana*. Dominant grasses are *Panicum maximum*, *Digitaria eriantha* var. *pentzii*, *Sporobolus fimbriatus* with *Abutilon guineense* as the most common forb.

On the numerous dolerite intrusions that occur in the granite, the woody vegetation immediately becomes more sparse with a denser grass cover. *Acacia nigrescens* usu-

ally occurs in denser stands and *Bolusanthus speciosus* is a good indicator of doleritic soils. Dominant grasses are *Themeda triandra*, *Bothriochloa radicans* and *Cymbopogon plurinodis*. The plant communities on dolerite can be compared to that of Landscape 19 viz. Thornveld on Gabbro and it is also similar to that occurring in the bottomlands of the landscape.

#### Fauna

Time has shown this landscape to be ideal habitat for sable antelope, while kudu and giraffe are well represented. Zebra occur in smaller groups but wildebeest are restricted to dolerite intrusions or brackish soils with sparse grass cover. Elephant and buffalo are commonly found and impala are limited to the spruits where water is available. Small game such as steenbok and duiker are dispersed throughout the landscape. Warthogs (*Phacochoerus aethiopicus*) are plentiful in the brackish bottomlands where surface water is available. Carnivores such as lion and leopard are present.

#### 6. *Combretum* spp./*Colophospermum mopane* Woodland of the Timbavati-area

##### Location and Geomorphology

This landscape is located in the triangle formed by the Olifants River, Timbavati River and the western boundary of the KNP. The substratum is mainly granite and gneiss intersected by numerous intrusions of dolerite. This landscape is also intersected by a large gabbro-body which is classified as a separate landscape (Landscape 19). Amphibolite from the Swaziland System occur extensively throughout this landscape (Schutte 1982) and have an important influence on the soil and vegetation. The terrain is undulating and is drained by the tributaries of the Timbavati River of which the Shisakashanghondo, Chalons, Brak, Mbhanswe and Mshatu spruits are the most important.

The altitude of this landscape varies between 300 and 500 metres and it occupies 469,3 km<sup>2</sup> or 2,4 percent of the KNP.

##### Climate

This landscape is subject to a temperate climate with hot summers and cool winters with frost as an exception in the low lying areas. Compare Table 3 for temperature data. Rainfall varies between 450 and 550 mm per year (Kingfisherspruit 582,3 mm, Letaba 462,2 mm) (Gertenbach 1980).

##### Soil pattern

The soil pattern of the *Combretum* spp./*Colophospermum mopane* Woodland of the Timbavati-area is, to a limited extent, similar to that of the Mixed *Combretum* spp./*Terminalia sericea* Woodland (Landscape 5). As a result of the lower rainfall and the influence of the Swaziland System the uplands are less sandy with Hutton-/Zwartfontein, Clovelly/Denhere and Glenrosa/Dunvegan as the dominant soils. The seep line is usually absent and the soil becomes increasingly more clayey with the movement towards the bottomlands. The common soils for the middleslopes are Glenrosa, but the more clayey series occur in the bottomlands viz. Dothole and



Fig. 16. Landscape 6. Bottomland *Combretum* spp./*Colophospermum mopane* Woodland of the Timbavati-area.

Woody species typical of the middle-and footslopes are again *Colophospermum mopane* (Fig. 16) with less *Combretum apiculatum* and species such as *Ormocarpum trichocarpum*, *Acacia gerrardii*, *A. nigrescens*, *Euclea divinorum*, *Bolusanthus speciosus*, *Combretum hereroense*, *C. imberbe*, *Terminalia prunioides*, *Grewia bicolor*, *Maerua parvifolia* and *Ximenia caffra*.

Herbaceous plants in the field layer which are common for the uplands and bottomlands of this landscape are *Pogonarthria squarrosa*, *Eragrostis rigidior*, *Aristida congesta* subsp. *barbicollis*, *Digitaria eriantha* var. *pentzii*, *Panicum maximum*, *Enneapogon cenchroides*, *Heteropogon contortus*, *Schmidtia pappophoroides*, *Urochloa mosambicensis*, *Indigofera floribunda*, *Rhinacanthus rotundifolius*, *Cyphocarpa angustifolia*, *Rhynchosia totta*, *Indigofera bainesii*, *Tephrosia polystachya*, *Ruellia patula*, *Asparagus plumosus*, *Corchorus asplenifolius* and *Hibiscus micranthus*. Species associated with the above-mentioned plants and occurring only on the uplands are *Tricholaena monachne*, *Rhynchelytrum repens*, *Brachiaria serrata*, *Trichoneura grandiglumis*, *Waltheria indica*, *Evolvulus alsinoides*, *Euphorbia neopolycnemoides*, *Kohautia virgata*, *Agathisanthemum bojeri* and *Fimbristylis complanata*. Characteristic herbaceous species for the bottomlands are *Themeda triandra*, *Cymbopogon plurinodis*, *Eragrostis gummiflua*, *E. superba*, *Panicum coloratum*, *Bothriochloa radicans*, *Dyschoriste rogersii*, *Pavonia patens*, *Vernonia fastigiata* and *Abutilon austro-africanum*.



Riverine vegetation is comparable from landscape to landscape and the following plant species are typical of spruits for landscapes 6, 8, 9, 10 and 11 (Fig. 17): *Colophospermum mopane*, *Combretum imberbe*, *C. hereroense*, *Lonchocarpus capassa*, *Acacia robusta*, *Albizia harveyi*, *Diospyros mespiliformis*, *Schotia brachypetala*, *Euclea natalensis*, *Ziziphus mucronata*, *Dalbergia melanoxylon*, *Lannea stuhlmannii* and *Euclea diviurum*. Dominant plants in the field layer are *Panicum maximum*, *Urochloa mosambicensis*, *Cenchrus ciliaris*, *Abutilon ramosum*, *A. guineense*, *Justicia flava*, *Pupalea lappacea* and *Achyranthes aspera*.



Fig. 17. Landscape 6. Stream bank *Combretum* spp./*Colophospermum mopane* Woodland of the Timbavati-area.

The dolerite intrusions that occur in the granite are not very broad, but as a result of the mixing of the weathered material of dolerite and granite the influence of the dolerite is sometimes bigger than can be expected. The vegetation structure on these soils derived from dolerite and amphibolite are much the same. It is usually an open savanna with large *Colophospermum mopane* trees, a moderate shrub layer of 1 to 1,5 metres high and a dense grass cover of *Bothriochloa radicans*, *Themeda triandra*, *Cymbopogon plurinodis*, *Heteropogon contortus* and *Eragrostis superba*. The vegetation on the dolerite intrusions are also comparable to that of the granitic bottomlands.

#### Fauna

The landscape is suitable habitat for sable antelope, elephant, buffalo, kudu and impala close to the spruits. Zebra occur regularly but in smaller groups of about six individuals. Giraffe are not very common in the mopane-veld, but do occur where the veld is more mixed. Due to the density of the woody vegetation there is a relatively low density of plains preferring game.

## 7. Olifants River Rugged Veld

### Location and Geomorphology

This landscape includes the direct drainage area adjoining the Olifants River, from the western boundary of the KNP to approximately the sandstone koppies at Shiswayini. To the north it extends to about the Letaba/Phalaborwa powerline and southwards to the northern boundary of the neighbouring area of Peru. It is a strongly undulating terrain with steep slopes and a great number of small spruits which drain into the Olifants River. Among the most important are the Tshutsi, Mulalane, Misumane, Manyukelani from the north and the Klaseri, Tseri, Nhlaralume and Mvubuspruits from the south. According to Schutte (1982) the parent material of the area comprises metamorphic rock such as amphibolite, serpentine, quartzite, quartz-schist and other rocks of Swazium age.

The altitude varies a lot but the greater portion of the landscape is situated between 250 and 300 metres. In the north-western part of this area the uplands can reach 400 metres above sea level. The landscape occupies 360 km<sup>2</sup> or 1,8 percent of the KNP.

### Climate

This landscape is relatively dry with a rainfall of between 450 and 500 mm per year. The dryness of the area is accentuated by the steep slopes and shallow soils. High temperatures are experienced during the summer months and a temperature of 40° C at Letaba is not uncommon. Frost sometimes occurs during the winter but is limited to the low lying areas. Table 5 provides the temperature data for Letaba which is largely applicable to this landscape.

Table 5  
*Temperature data for Letaba*  
(Data collected since September 1981)

Temperature °C				
Month	Average Daily Maximum	Absolute Maximum	Average Daily Minimum	Absolute Minimum
January	34,0	42,2	22,0	17,3
February	34,9	42,3	21,5	17,7
March	34,3	39,5	20,5	15,4
April	33,4	39,5	19,4	14,0
May	28,6	33,0	12,6	7,7
June	26,7	33,0	8,0	4,0
July	26,7	34,0	10,4	3,0
August	28,9	38,4	11,3	5,5
September	27,8	35,5	12,9	8,3
October	27,3	39,8	14,0	12,5
November	33,3	42,6	19,0	13,8
December	32,4	43,0	19,1	18,0



### Soil Pattern

The soils of this landscape are shallow and stony and can only be described by the term lithosols. Shallow Mispah and Glenrosa soils also occur. The shallow soil is a result of steep slopes and a relatively stable parent material. Loose rocks of all sizes are present on the surface.

### Vegetation

As a result of the steep slopes and shallow stony soil, the landscape is relatively dry and the vegetation shows xerophytic characteristics (Fig. 18). The field layer, especially, is very sparse and never develops a stable grass cover even under circumstances of no grazing. The woody component is usually not higher than 5 metres and can sometimes be quite dense. The reason for the relative high density of the woody component lies in the absence of regular fires. Woody plants that dominate the landscape are as follows: *Combretum apiculatum*, *Colophospermum mopane*, *Commiphora mollis*, *C. africana*, *Terminalia prunioides*, *Grewia villosa*, *Boscia albitrunca*, *Acacia nigrescens*, *Combretum hereroense*, *Albizia harveyi*, *Cissus cornifolia*, *Dichrostachys cinerea* subsp. *africana*, *Grewia bicolor*, *Sclerocarya caffra*, *Dalbergia melanoxylon*, *Lannea stuhlmannii*, *Maerua parvifolia*, *Rhigozum zambesiaccum*, *Zanthoxylum humilis*, *Ziziphus mucronata*, *Combretum imberbe*, *Acacia nilotica*, *Securinega virosa*, *Acacia exuvialis*, *Maytenus heterophylla*, *Ozoroa engleri*, *Tricalysia allenii*, *Grewia flavescens* and *Pappea capensis*. As a result of the variation in habitat a variety of trees occur here which are relatively scarce in the KNP. Species that can be mentioned are *Holmskioldia tettensis*, *Kirkia wilmsii*, *Ficus smutsii*, *Olex dissitiflora*, *Hexalobus monopetalus*, *Albizia anthelmintica*,

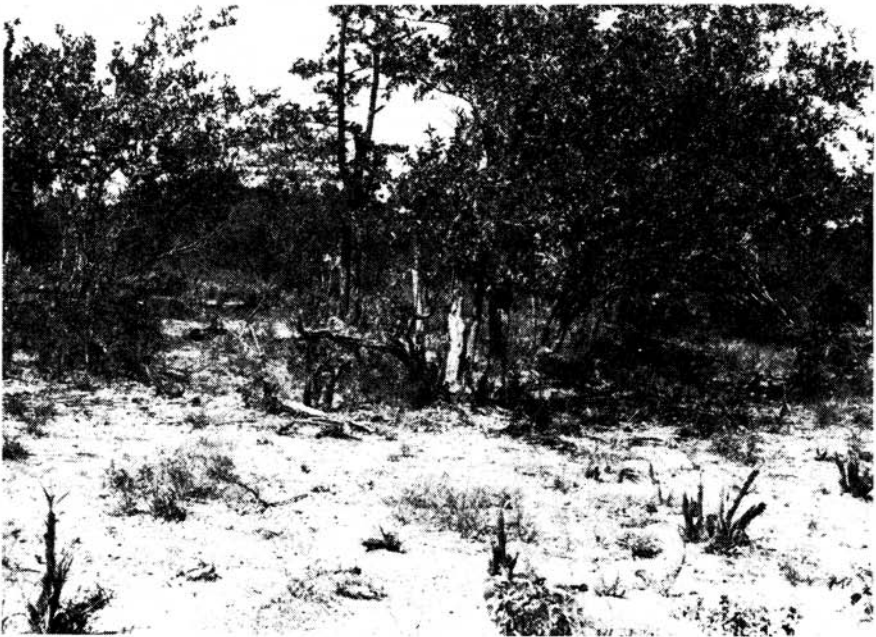


Fig. 18. Landscape 7. Olifants River Rugged Veld.