

Chloris roxburghiana and *Enneapogon cenchroides*. The fact remains that these termite mounds make an important contribution to the physiognomy of the landscape.

9. *Colophospermum mopane* Savanna on Basic Soils

Location and Geomorphology

The parent material underlying this landscape is mainly amphibolite from the Swaziland System and to a lesser degree granite and gneiss mixed with weathered material from gabbro and dolerite (Schutte 1974). It is a relatively flat landscape in comparison with the adjacent undulating terrain on granite. This area is situated north of the old Letaba/Phalaborwa tourist road and south of the Letaba River, excluding the direct southerly drainage to the Letaba River. It is drained by the Ngwenyeni, Malopene and Nwanedzi spruits, and is situated between 300 and 380 metres above sea level. This landscape occupies 546 km² or 2.8 percent of the KNP.

Climate

There is no reason to believe that the climate of this landscape differs much from Landscapes 8 and 10. Surrounding weather stations and their annual average rainfall are Mahlangene 490 mm, Phalaborwa 481 mm, Letaba Ranch 487 mm and Letaba 471 mm (Gertenbach 1980). As a result of the flat terrain the possibility of frost in winter is poor (See Table 5 for temperature data).

Soil Pattern

Considering that this landscape is reasonably flat, there is no great variation in soil types. There is a gradation in the clay content of the soil from the uplands to the bottomland areas with the more clayey soils occurring in the latter. The soil is normally red in colour and the following soil Forms and series can be expected: Glenrosa/Dunvegan — Lomondo — Dothole — Achterdam — Ponda and Hutton/Malunga — Vergenoeg — Shigalo — Hardap. A characteristic of this landscape is the presence of small pans which once again indicates that the landscape is reasonably flat. It sometimes happens that weathered granite mix with material originating from the great gabbro sills that intersect the landscape. In such cases soils of the Mayo Form can be expected.

Vegetation

The vegetation of this landscape is an open savanna with a sparse shrub layer and a relatively dense grass cover (Fig. 22). The structural analysis of the woody component of the landscape is approximately as follows:

Stratum	Percentage Crown Cover
5 - 10 metres	1
2 - 5 metres	12
1 - 2 metres	5
0,5 - 1 metre	3
Field layer	80
	41



Fig. 22. Landscape 9. *Colophospermum mopane* Savanna.

The woody vegetation is dominated by *Colophospermum mopane*. *Combretum apiculatum* occurs commonly where the soil is more sandy, but disappears completely on clayey soils. Other associated woody species are: *Acacia nigrescens*, *Cissus cornifolia*, *Combretum imberbe*, *Ozoroa engleri*, *Maerua parvifolia*, *Albizia harveyi*, *Lannea stuhlmannii*, *Grewia bicolor*, *Neorautanenia amboensis* and *Commiphora africana*. The vegetation of this landscape shows similarity to the vegetation on granite bottomlands and also with vegetation of dolerite intrusions. The field layer is dense with the following dominant grasses: *Bothriochloa radicans*, *Themeda triandra*, *Digitaria eriantha* var. *pentzii* and *Heteropogon contortus*. Other associated grass species are *Pogonarthria squarrosa*, *Schmidtia pappophoroides*, *Panicum coloratum*, *P. maximum*, *Urochloa mosambicensis*, *Eragrostis superba* and *Aristida congesta* subsp. *barbicollis*. The following forbs occur regularly: *Seddera capense*, *Cassia mimosoides*, *Crotalaria virgulata*, *Rhynchosia totta*, *Phyllanthus asperulatus*, *Corchorus asplenifolius*, *Hibiscus micranthus* and *Cucumis hirsutus*. The riverine vegetation is comparable to that of Landscape 6.

Fauna

This landscape provides ideal habitat for game preferring plains. The only herd of roan antelope in the central KNP occurs in this landscape and on the adjacent gabbro intrusions. Eland (*Taurotragus oryx*), another relatively rare game species in the KNP is also encountered here. Quite a few groups of wildebeest are present and zebra are common and usually found in larger groups. Browsers such as kudu and giraffe are not well represented and impala may be sporadically found in this landscape close to water. This landscape is ideal for buffalo but elephant are generally less common. As a result of a large number of veld pans, water is reasonably

available until late into the dry season and therefore warthog are very common in this landscape. Interesting to note is that sable antelope which are plentiful in the adjoining landscapes are not present here.

10. Letaba River Rugged Veld

Location and Geomorphology

This landscape includes the whole western drainage to the Letaba and Klein Letaba Rivers. It occupies 700 km² or 3,6 percent of the KNP and is comparable to Landscape 7 viz. Olifants River Rugged Veld. The slopes are relatively steep and there are quite a few prominent koppies viz. Ngodzi, Kaleka, Milavamhisi, Munamungwe and Byashishi koppies. The drainage takes place via the Shipikane, Byashishi and Tsende to the Letaba and Klein Letaba Rivers. The underlying material is granite, gneiss and Swaziland rock formations like amphibolite, serpentine and schist (Schutte 1974). Although the landscape is comparable to the Olifants River Rugged Veld as far as the vegetation is concerned, it is different as far as the geology and terrain formation is concerned. The Letaba River Rugged Veld is less dissected and the slopes less steep. The area is nevertheless naturally dry and the altitude varies between 250 and 400 metres with the Ngotsekop as the highest point viz. 473 metres.

Climate

This landscape experiences a dry climate, the result of a low rainfall (450 to 500 mm per year), steep slopes and shallow soils. The summers are very hot and the winters mild with frost as the exception in the bottomlands. Average monthly maximum and minimum temperatures for Letaba are given in Table 5.

Soil Pattern

The soils of this landscape are shallow and stony and can be classified as lithosols. Other soil Forms that can be expected are Mispah, Glenrosa and Hutton. Where the influence of the Swaziland rock formation is strong the soil is normally red in colour, the slopes are not as steep and the soils are deeper than on the adjacent granites.

Vegetation

The vegetation of this landscape is very similar to that of the Olifants River Rugged Veld (Landscape 7) and also includes certain elements of the vegetation of the Thickets of the Sabie and Crocodile Rivers (Landscape 4). The woody vegetation is usually dense in the shrub layer with single trees (Fig. 23). Dominant woody species are *Colophospermum mopane*, *Combretum apiculatum*, *Terminalia prunioides*, *Grewia* spp., *Rhigozum zambesiaceum* and *Dichrostachys cinerea* subsp. *africana*. Other species that occur here are the same as those of the Olifants River Rugged Veld.

The field layer is sparse and is dominated by annual grasses and forbs such as: *Aristida congesta* subsp. *barbicollis*, *Enneapogon cenchroides*, *Melhanianthus forbesii*,



Fig. 23. Landscape 10. Letaba River Rugged Veld.



Fig. 24. Landscape 10. Riverine vegetation, Letaba River.

Phyllanthus asperulatus, *Heliotropium steudneri* and *Solanum panduraeforme*. The grey perennial forb *Hemizygia elliotii* and *Xerophyta retinervis* are typical plants for this dry landscape. Refer to Landscape 7 for a complete list of plants which are also found in the field layer of this landscape. The stream banks of the Letaba River (Fig. 24) are more open than the Olifants River (Landscape 7), but the species occurring are the same.

Fauna

A large variety of game is found in this landscape of which elephant, buffalo, zebra, impala and giraffe are the most important. Waterbuck are plentiful along the Letaba River and the area possibly accommodates the largest population of the species in the KNP. Baboon, warthog and steenbok also occur regularly. White rhino are also present in this landscape, since a group of \pm four animals are encountered every year in the vicinity of Tsale windmill. Sable antelope are found in the far eastern and northern areas of this landscape and eland are often seen along the Mooiplaas/Phalaborwa service road. A small group of \pm 15 wildebeest occur on the brackish spots in the vicinity of Tsale windmill. Elephant are present in large herds along the Letaba and the Shipikane spruit is a popular environment for breeding herds. South of Ngotsikop elephants are encountered and the confluence of the Klein Letaba and Byashishi accommodates what is possibly the largest and most stable breeding herd of elephant in the KNP. Spring hare (*Pedetes capensis*) are present along the Letaba River.

11. Tsende Sandveld

Location and Geomorphology

This landscape forms the high lying area between the Letaba and Shingwedzi Rivers on the western side of the KNP. North of the Shingwedzi the landscape is discontinuous with sub-sections right up to the Mphongolo River. This landscape is undulating granite terrain with distinct uplands and bottomlands. Amphibolite from the Swaziland System occurs fairly regularly and the remainder of the landscape is intersected by numerous dolerite intrusions. An interesting phenomenon about the dolerite intrusions is that they have a south-west/north-east orientation. This is explained by the theory that, as a result of the eastward movement of a portion of the African continent, a downward pressure is being exerted on the eastern edge of the continent which has resulted in a south-west/north-east tension. A result of this tension was that cracks formed into which the melted magma has entered to cause the south-west/north-east orientated dolerite intrusions (Brandt 1948; Schutte 1974).

The topography of the landscape is similar to that of the Phalaborwa Sandveld (Landscape 8). It is drained by the Shingwedzi with all its tributaries, the Tsende, the Byashishi and to a lesser degree the Phugwane and Mphongolo. The altitude varies between 300 and 450 metres and an important characteristic of the landscape is the absence of prominent koppies. On the other hand, veldpans are a very common phenomenon and can be seen as a unique characteristic. The following large pans occur in this landscape: Mahubyeni, Mtomene, Mhlatuba, Tol-se-Pan, Basa-Basa, Olifantbadpan and Uitspan. This landscape occupies 1 156 km² or 5.9 percent of the KNP.

Climate

According to Gertenbach (1980) this area receives between 450 and 550 mm rain per year. Shangoni in the north-western corner of this landscape has an annual average rainfall of 572 mm and it can be concluded that this landscape, as a result of orographical conditions, receives more rain than the adjacent Letaba River Rugged Veld (Landscape 10). Due to the high altitude of this area frost is the exception. Average monthly maximum and minimum temperatures for Shingwedzi are given in Table 6.

Table 6

Temperature data for Shingwedzi
(Data collected since September 1981)

Temperature °C

Month	Average Daily Maximum	Absolute Maximum	Average Daily Minimum	Absolute Minimum
January	34,3	42,5	21,7	17,0
February	33,9	43,2	21,2	16,5
March	33,2	39,7	20,0	13,7
April	30,4	35,0	17,4	11,5
May	26,8	31,8	11,5	6,5
June	25,8	28,5	6,7	4,1
July	25,9	33,5	9,2	3,0
August	28,3	37,2	10,6	5,0
September	27,8	34,6	12,9	7,2
October	27,3	38,9	14,0	8,2
November	33,3	42,0	19,0	13,4
December	32,4	42,0	19,1	15,4

Soil Pattern

The soil pattern of the landscape is comparable to that of landscapes 5, 6 and 8. The soils of the uplands are sandy with less than 15 percent clay in the A-horizon. The dominant soil Forms are Hutton, Clovelly and Glenrosa. The seepline is poorly developed to absent and the soils of the bottomlands are more clayey, with the dominant Forms being Valsrivier, Sterkspruit, Glenrosa with Estcourt as an exception.

The soils originating from amphibolite of the Swaziland System are deeper and red in colour. Dominant soil Forms are Hutton and Glenrosa with the more clayey series most common. Soils that develop on dolerite can be red or even black in colour. Expected soil Forms are Swartland, Glenrosa, Hutton, Mayo and Milkwood.



Fig. 25. Landscape 11. Upland Tsende Sandveld.



Fig. 26. Landscape 11. Bottomland Tsende Sandveld.

Vegetation

The vegetation on the uplands of this landscape is moderately high shrub savanna with single large trees (Fig. 25). The structural analysis of the vegetation of an upland, middleslope and a bottomland is more or less as follows:

Stratum	Percentage Crown Cover		
	Upland	Middleslope	Bottomland (brack)
5 - 10 metres	2	6	4
2 - 5 metres	12	8	10
1 - 2 metres	8	4	6
0,5 - 1 metre	1	3	1
Field layer	75	80	50

The dominant woody plants of this landscape are: *Colophospermum mopane* and *Combretum apiculatum*. On the sandy uplands the latter is more dominant. However, moving towards the bottomlands the soil becomes more clayey and *Combretum apiculatum* gives way to *Colophospermum mopane* (Fig. 26). Plants more common to the uplands are *Combretum apiculatum*, *Colophospermum mopane*, *Cissua cornifolia*, *Albizia harveyi*, *Tephrosia sericea*, *Terminalia sericea*, *Grewia bicolor*, *Dichrostachys cinerea* subsp. *africana*, *Sclerocarya caffra*, *Dalbergia melanoxylon*, *Peltophorum africanum*, *Strychnos madagascariensis* and *Commiphora africana*.

The field layer is dense, approximately 750 mm high and is dominated by *Digitaria eriantha* var. *pentzii*, *Panicum maximum*, *Heteropogon contortus*, *Pogonarthria squarrosa*, *Schmidtia pappophoroides*, *Tephrosia polystachya*, *Cassia absus* and *Cyperus rupestris*. Other species in the field layer are: *Brachiaria nigropedata*, *Aristida meridionalis*, *Perotis patens*, *Eragrostis rigidior*, *Tricholaena monachne*, *Rhynchelytrum repens*, *Bothriochloa radicans*, *Aristida congesta* subsp. *barbicollis*, *Andropogon gayanus*, *Vigna stenolobum*, *Dolichos trilobus*, *Agathisanthemum bojeri*, *Cassia mimosoides*, *Clerodendrum ternatum*, *Phyllanthus asperulatus*, *Rhynchosia totta*, *Talinum caffrum*, *Ipomoea magnusiana*, *Indigofera filipes*, *Merremia tridentata*, *Hemizygia bracteosa*, *Tephrosia longipes*, *Jatropha zeyheri*, *Evolvulus alsinoides* and *Fimbristylis complanata*.

Woody plants in the bottomlands are *Colophospermum mopane*, *Combretum apiculatum*, *Lonchocarpus capassa*, *Grewia monticola*, *Acacia nigrescens*, *Combretum hereroense*, *Acacia tortilis*, *Bridelia mollis*, *Grewia bicolor*, *Cassia abbreviata*, *Grewia flavescens* and *Albizia harveyi*. The field layer of the bottomlands are more dense and species such as *Eragrostis superba*, *Bothriochloa radicans*, *Themeda triandra*, *Urochloa mosambicensis*, *Panicum coloratum*, *Cymbopogon plurinodis* and *Enneapogon cenchroides* are more common. Associated forbs are *Corchorus asplenifolius*, *Ceratotheca triloba*, *Heliotropium steudneri*, *Melhanian forbesii*, *Orthosiphon australis*, *Crotalaria virgulata*, *Cleome monophylla*, *Blepharis integrifolia*, *Hermibstaedtia odorata* and *Asparagus plumosus*.

Along certain spruits on brackish spots a type of vegetation occurs that differs from the normal bottomlands (Fig. 27). Woody species under such conditions are *Euclea divinorum*, *Colophospermum mopane*, *Spirostachys africana*, *Ehretia rigida* and

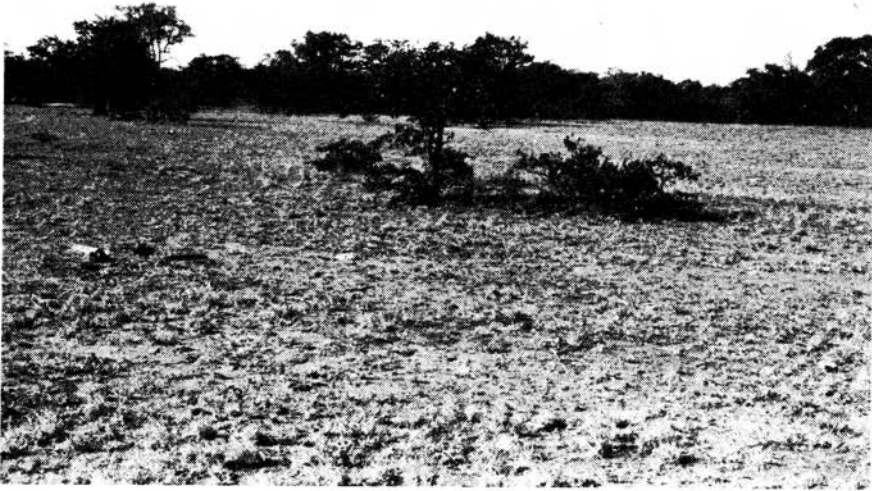


Fig. 27. Landscape 11. Sodic bottomland Tsende Sandveld.



Fig. 28. Landscape 11. Dolerite intrusion Tsende Sandveld.

Albizia harveyi with *Sporobolus fimbriatus*, *Dactyloctenium aegyptium*, *Eragrostis lehmanniana*, *Sporobolus nitens*, *Chloris virgata*, *Portulaca kermesina*, *Pharnaceum elongatum*, *Justicia flava*, *Mariscus rehmannianus*, *Asparagus buehneri* and *Sansevieria grandis* as the dominants in the field layer.

On the clayey soil originating from dolerite and amphibolite, the mopanies are usually more dense and larger trees occur (Fig. 28). The shrub layer is not strongly developed and the field layer is dominated by dense stands of *Themeda triandra* and *Bothriochloa radicans*. The denser grass cover possibly results in hotter fires which control the shrub layer.

The riverine vegetation of this landscape is the same as that of the *Combretum* spp./*Colophospermum mopane* Bushveld of the Timbavati area (Landscape 6).

Fauna

The Tsende Sandveld is also preferred habitat for sable antelope. Elephant, buffalo, kudu and zebra are present while waterbuck and impala are restricted to areas close to water. Eland are fairly common in this area and in 1981 a herd of ± 50 animals were counted along the upper course of the Tsende spruit. White rhino had become extinct in this part of the KNP, but in 1964, 13 bulls and three cows were released along the Shongololo spruit. At first they wandered all over the area, eventually settling down and at present a population of 30 animals including calves are regularly seen. Although giraffe are relatively scarce in the mopane-veld, a group of 20 to 30 are regularly encountered along the Shongololo spruit. A few groups of roan antelope also occur in this landscape but these animals are more associated with Landscape 24 which is basically a gabbro intrusion which cuts through the Tsende Sandveld. Lion, leopard and hyaena are scarce and plains loving animals such as wildebeest and tsessebe (*Damaliscus lunatus*) are altogether absent.

12. *Colophospermum mopane*/Acacia nigrescens Savanna

Location and Geomorphology

The major portion of the area between the Bububu and Mphongolo Rivers consists of this landscape. A sub-section of this landscape also occurs further south towards the western boundary of the KNP in the vicinity of Timatoro. It extends northwards up to the Waterberg Sandstone. The underlying geological formations are undifferentiated metamorphic rock and amphibolite from the Swaziland System, as well as granite and gneiss. The terrain is much less dissected than the adjacent granite and small pans are common. The following pans are the most well known: Nyamnyulu, Mahlbandlopfu and Solle-se-Pan.

The landscape is drained by the Shingwedzi, Bububu, Phungwane and Mphongolo Rivers and three warm springs viz. Malahlapanga, Mafayeni, and Matiovila occur. The absence of prominent koppies are characteristic of the area and the altitude varies between 400 and 460 metres above sea level. The landscape occupies 1 042 km² or 5,5 percent of the KNP.

Climate

Rainfall in the vicinity varies between 500 and 600 mm per year, with Shangoni with an annual average of 572 mm as the centre point of this landscape. Temperatures are mild and frost seldom occurs. It can be concluded that the temperature will correspond with or be even milder than that of Shingwedzi as provided in Table 6.

Soil Pattern

Due to the relatively flat topography there is very little variation in soil types. The soil, usually red to reddish brown in colour, is deeper than the soils found on granite. Dominant soil Forms are Hutton, Swartland, Glenrosa and Shortlands and the clay content of the soils is 15 percent and more. Close to the Bububu, Phungwane and Mpongolo Rivers, brackish floodplains occur which can be classified as Valsrivier and Sterkspruit soils. On the dykes of the rivers Oakleaf soils can be expected.

Vegetation

The vegetation of this landscape is an open tree savanna with odd low shrubs (Fig. 29). The structural analysis is as follows:

Stratum	Percentage Crown Cover
5 metres	10
2-5 metres	4
1-2 metres	2
0-1 metre	5

The grass cover is dense (90%) with an average height of 1 metre.



Fig. 29. Landscape 12. *Colophospermum mopane*/*Acacia nigrescens* Savanna.

Dominant trees in the landscape are: *Colophospermum mopane*, *Acacia nigrescens*, *Combretum hereroense* and *Acacia gerrardii*. The shrub layer consists of the following species: *Euclea divinorum*, *Albizia harveyi*, *Dalbergia melanoxylon*, *Cissus cornifolia*, *Neorautanenia amboensis*, *Maytenus heterophylla*, *Rhus spinescens*, *Combretum apiculatum* and *Tephrosia sericea*. *Combretum collinum* subsp. *suluense* is also present in this landscape but always at low densities.

The field layer is dense and is dominated by *Themeda triandra*, *Bothriochloa radicans*, *Digitaria eriantha* var. *pentzii* and *Panicum maximum*. Other species which may occur are *Pogonarthria squarrosa*, *Urochloa mosambicensis*, *Eragrostis rigidior*, *Cymbopogon plurinodis*, *Aristida congesta* subsp. *barbicollis*, *Heteropogon contortus*, *Eragrostis superba*, *Urochloa brachyura*, *Brachiaria nigropedata* and *Setaria holstii*. Herbaceous plants are *Clerodendrum ternatum*, *Cassia mimosoides*, *Indigofera schimperi*, *Evolvulus alsinoides*, *Ruellia patula*, *Mariscus rehmannianus* and *Corchorus asplenifolius*.

On the brack soils along the spruits the grass cover is usually much sparser and species such as *Chloris virgata*, *Sporobolus nitens* and *Urochloa mosambicensis* occur. Woody species such as *Colophospermum mopane*, *Spirostachys africana*, *Diospyros mespiliformis* and *Euclea divinorum* are present.

Fauna

This landscape is preferred habitat for a variety of game. Depending on whether the veld has been burnt, large numbers of zebra, buffalo, eland, elephant, ostriches (*Struthio camelus*), tsessebe and warthog are present. Sable and roan antelope, kudu and even white rhino occur in this veld when the grass increases in height. Impala are restricted to the areas close to the rivers.

13. *Acacia welwitschii* Thickets on Karoo Sediments

Location and Geomorphology

Geologically the KNP can roughly be divided into granite and gneiss in the western half and basalt in the eastern half (Schutte 1974, 1982). Karoo sediments occur where the granite and basalt make contact and this forms a strip that extends from north to south throughout the KNP. The Karoo sediments consist of Cave Sandstone, Red Beds and Eccas-shales. This landscape is limited to the Eccas-shales. The terrain is concave, low lying and reasonably flat with slight slopes. It extends as a narrow strip from Crocodile Bridge northwards to the vicinity of the Timbavati picnic area. The thickets are seldom broader than four kilometres.

The general orientation of the spruits and rivers in the KNP are from west to east. Considering that the shales are prone to weathering and erosion it often happens that the spruits running from west to east through granite, turns north or south when reaching the shales. Examples of such spruits in this landscape are the Vurhami, Salitji, Nwaswitsontso and Nsemani. The soils have a strong structure and poor internal drainage with the result that small pans commonly occur. Examples are Leeupan, Nkayapan and Ngumula pan. The landscape is low lying (between 260 and 320 metres above sea level) and occupies 520 km² or 2,7 percent of the KNP.

Good examples of this landscape can be seen along the tourist roads at Gomandwane and Leeupan.

Climate

According to Gertenbach (1980) this landscape receives a wide range of rainfall (500 to 600 mm). In the vicinity of Crocodile Bridge the annual rainfall is 599 mm and it declines to as low as 548 mm at Satara. The temperature is high during the summer and there is little possibility of frost during winter. Table 3 indicates the daily maximum and minimum temperatures for Satara which could possibly be the same for this landscape.

Soil Pattern

The Ecc-a-shales were deposited under warm humid conditions and the soils that develop from these shales are rich in sodium. The presence of large quantities of sodium results in the development of soils with a very strong prismatic structure in the B-horizons. A gleyed horizon sometimes develops on the prismacutanic B-horizon, but usually this horizon as well as the A-horizon have been washed away. The common soil Forms in this landscape are thus Sterkspruit, Swartland and Estcourt. Where the material from weathered shales and Cave Sandstone mix, Valsrivier and Oakleaf soils sometimes occur. The soils in this landscape are generally very susceptible to erosion and therefore any disturbance should be kept to a minimum.

Vegetation

The vegetation of this landscape is described by Van Wyk (1973) as Delagoa Thorn Thickets, while Pienaar (1963) describes it as dense thorny bush thickets. The landscape is unique considering that the vegetation is dominated by *Acacia welwitschii* subsp. *delagoensis*, a taxon only found in the Republic of South Africa, apart from certain stands in Swaziland and in the south of Zimbabwe.

According to Gertenbach (*in prep.*) this landscape is differentiated by the following woody species: *Euclea divinorum*, *Acacia welwitschii* subsp. *delagoensis*, *Teclea pilosa*, *Capparis tomentosa*, *Boscia mossambicensis*, *Grewia bicolor*, *Maerua parvifolia*, *Dichrostachys cinerea* subsp. *africana*, *Spirostachys africana* and *Rhus spinescens* (Fig. 30). Other woody species that do occur are *Ehretia rigida*, *Zanthoxylum humilis*, *Securinega virosa*, *Acacia tortilis*, *Bolusanthus speciosus* and *Acacia gerrardii*.

The *Acacia welwitschii*-thickets can be divided into two variations on the basis of the field layer. The *Senecio longiflorus*-variation is characterised by the occurrence of *Senecio longiflorus*, *Enteropogon macrostachyus*, *Oropetium capense*, *Sporobolus smutsii* and *Hibiscus palmatus* while the *Urochloa mosambicensis*-variation does not include these species. Dominant grass species in the field layer of both the variations are *Sporobolus nitens*, *Dactyloctenium aegyptium*, *Chloris virgata*, *Panicum coloratum*, *Chloris roxburghiana*, *Aristida congesta* subsp. *barbicollis*, *Tragus berteronianus*, *Panicum maximum*, *Urochloa mosambicensis*, and *Bothriochloa radicans*. Forbs present are *Abutilon austro-africanum*, *Ruellia patula*, *Cyphocarpa angustifolia*, *Justicia flava*, *Blepharis integrifolia*, *Pupalia lappacea*, *Tragia dioica*,



Fig. 30. Landscape 13. *Acacia welwitschii* Thickets.



Fig. 31. Landscape 13. *Albizia petersiana*-variation.

Solanum coccineum, *Achyranthes aspera*, *Amaranthus thunbergii*, *Ocimum americanum*, *Gisekia africana*, *Cyathula crista*, *Commelina bengalensis*, *Phyllanthus asperulatus*, *Seddera suffruticosa*, *Heliotropium steudneri*, *Solanum panduraeforme*, *Neuracanthus africanus* and a large variety of other species. The combination of grasses and the variety of forbs show that this landscape is heavily grazed. The grass cover is therefore usually less dense (between 30 and 60% crown cover) and sometimes disappears altogether with the advent of the dry season.

The structure of the woody component is a moderate tree savanna with tall shrubs and sparse low shrubs. The following structural analysis describes the landscape fairly accurately.

Stratum	Percentage Crown Cover
>4 metres	20
2-4 metres	20
0,5-2 metres	4

Where the soils originating from shales and Cave Sandstone mix a complex of plant communities occur that consist of a combination of one of the varieties of the *Acacia welwitschii* community and a *Albizia petersiana* subsp. *evansii* community. The latter community usually contains dense tall shrubs with a better grass cover than the *Acacia welwitschii* community (Fig. 31). Other woody species that occur with *Albizia petersiana* are *Dichrostachys cinerea* subsp. *africana*, *Acacia nigrescens*, *Euclea divinorum*, *Acacia tortilis* and *Lonchocarpus capassa*.

Fauna

This landscape carries what is possibly the largest biomass of game in the KNP. As a result of the palatable short grazing and open low shrub layer, a large number of impala, wildebeest and zebra are present. *Acacia welwitschii* is a good fodder tree and therefore giraffe, kudu, steenbok and duiker are all present. Elephant breeding herds prefer the dense tree veld and buffalo are continuously on the move through the thickets. White rhino have a strong association with this landscape and waterbuck are often encountered at the pans between the trees. As a result of the high density of prey species, lion and hyaena are plentiful while cheetah are regularly seen.

14. Kumana Sandveld

Location and Geomorphology

This landscape lies between the Nwaswitsontso and Swenispruits, east of the main tourist road to the north. It is a relatively small landscape that occupies approximately 164 km² or 0,8 percent of the KNP. Coetzee (1983) describes this landscape under the name "Tropical Semi-arid Lowveld on Karoo Sediment Anticline". Venter (1981) refers to an Ecce — Red Bed — Cave Sandstone — Ecce — Cave Sandstone — Anticline in the vicinity of the Sweni spruit and it is also possibly the case in this landscape. Coetzee (1983) claims that the surrounding basalt in this landscape degraded to expose the Karoo sediment anticline. This is a lightly undu-

lating landscape that is drained by the tributaries of the Sweni, namely the Marheya, Mrunzuluku and the Guweni spruits. Drainage to the Nwaswitsontso is very limited.

This landscape is high lying in comparison to the surrounding basalt and the altitude varies between 260-360 metres above sea level.

Climate

According to Gertenbach (1980) the rainfall in this landscape is approximately 550 to 600 mm per annum. Temperatures are probably the same as that of Satara as shown in Table 3. The landscape is slightly undulating and very little difference can be expected in the micro-climate due to the topography.

Soil Pattern

Coetzee (1983) distinguishes nine different habitats in this landscape. The soils vary accordingly from lithosols on sandstone outcrops, shallow sandy soils, deep sandy soils, clayey soils and sodium rich brackish soils. The soil Forms concerned are Mispah and Glenrosa, with between 13 and 15 percent clay in their A-horizons (Coetzee 1983). Deeper Glenrosa and Clovelly soils occur on sandstone, while Swartland soils occur on associated dolerite intrusions. On the shales and finer sandstone, duplex soils occur of which Estcourt and Sterkspruit are the most important.

Vegetation

The sandstone koppies are relatively rich in woody plants and according to Coetzee (1983) the following species are common: *Ficus soldanella*, *Ximenia americana*, *Thilachium africanum*, *Albizia forbesii*, *A. harveyi*, *Acacia welwitschii*, *Dichrostachys cinerea* subsp. *africana* var. *pubescens*, *Schotia brachypetala*, *Cassia abbreviata*, *Peltophorum africanum*, *Erythroxylum emarginatum*, *Phyllanthus reticulatus*, *Bridelia cathartica*, *Spirostachys africana*, *Lannea stuhlmannii*, *Maytenus heterophylla*, *Hippocratea longipetiolata*, *Pappea capensis*, *Grewia bicolor*, *G. flavescens*, *Combretum apiculatum*, *Manilkara mocharia*, *Euclea natalensis*, *E. undulata* and *Diospyros mespiliformis*. •

The field layer consists of the following species: *Heteropogon contortus*, *Digitaria eriantha* var. *pentzii*, *Panicum maximum*, *Rhynchelytrum repens*, *Enteropogon macrostachyus*, *Pogonarthria squarrosa*, *Sansevieria hyacinthoides*, *Asparagus falcatus*, *A. minutiflorus* and *Sarcostemma viminalis*.

The deep sandy soils carry a vegetation with a moderate to dense low shrub layer, a sparse tall shrub layer and a tree layer that is sparse to completely absent (Fig. 32). Dominant woody species are *Balanites maughamii*, *Grewia bicolor*, *Cassia abbreviata*, *Acacia tortilis*, *Peltophorum africanum*, *Combretum apiculatum*, *Dichrostachys cinerea* subsp. *africana*, *Grewia monticola*, *G. flavescens*, *Acacia nigrescens*, *Sclerocarya caffra*, *Lannea stuhlmannii*, *Combretum hereroense*, *Albizia harveyi* and *Ziziphus mucronata*. The field layer is dominated by *Schmidtia pappophoroides*, *Digitaria eriantha*, *Pogonarthria squarrosa*, *Sporobolus fimbriatus*, *Panicum maximum*, *Urochloa mosambicensis* and *Eragrostis rigidior*.



Fig. 32. Landscape 14. Kumana Sandveld.

Where dolerite intrusions are present in the landscape, the soil is clayey and the vegetation changes to a moderate shrubveld with a dense grass cover. Woody species such as *Acacia tortilis*, *Grewia bicolor*, *Acacia nigrescens*, *Maytenus senegalensis* and *Combretum hereroense* are present. The field layer is dominated by *Bothriochloa radicans*, *Themeda triandra*, *Heteropogon contortus* and *Eragrostis superba*.

Sodium-saturated soils occur where the shales appear on the surface because of the anticline. On these soils *Acacia welwitschii* thickets, similar to that described for Landscape 13, are present.

Fauna

Elephant breeding herds prefer the Kumana Sandveld because it is relatively dense and provides shelter for the animals. Browsers such as kudu, giraffe and impala are commonly found, while white rhino are regularly encountered. Wildebeest and zebra are less common but warthog are plentiful. Carnivores such as lion and leopard are present and waterbuck can be seen near permanent water.

15. *Colophospermum mopane* Forest

Location and Geomorphology

This landscape occurs in the vicinity of Punda Maria on the Ecc-shales of the Karoo System. It is situated between the basalts and the Waterberg Sandstone and extends from Vlakteplaas in the south to the Levubu River. Elsewhere in the KNP a comparable mopane forest occurs, but then it is usually on alluvial soil close to larger

spruits and rivers. Examples of this mopane forest is south of the Letaba River, along the Nwanedzi, Tsende, Mpongolo and Shisha. In the latter cases the parent material of the soil is mostly granite. It is a flat to concave landscape and is drained by the tributaries of the Shisha. The altitude varies between 360 and 420 metres above sea level.

Climate

The landscape receives an annual rainfall of between 500 and 550 mm which is restricted to the summer months. The summers are hot with cool winters and frost being the exception. The prevailing temperature of the landscape must be extrapolated from the two weather stations at Shingwedzi and Punda Maria (Tables 6 and 7).

Table 7

Temperature data for Punda Maria
(Data collected since September 1981)

Temperature °C

Month	Average Daily Maximum	Absolute Maximum	Average Daily Minimum	Absolute Minimum
January	34,4	41,4	21,2	17,5
February	31,7	39,0	19,8	16,0
March	31,7	38,0	19,8	14,5
April	29,3	34,0	16,6	12,0
May	26,2	31,4	12,7	8,3
June	24,6	28,0	9,8	8,0
July	25,0	32,6	12,8	7,4
August	26,4	36,0	14,1	9,9
September	27,1	35,0	14,5	11,0
October	29,0	37,1	17,0	12,0
November	32,7	40,0	19,7	13,5
December	31,1	40,5	19,0	13,0

Soil Pattern

The soils in this landscape are usually deep with a strong structure in the subsoil and rich in salts especially sodium salts. These salts possibly originated from the shales from which the soils developed. The following soil Forms and series are the most common: Swartland-Uitsicht/Brokespruit/Malakata/Nyoka, Valsrivier/Craven/Lindley/Valsrivier and Zuiderzee. Hutton soils are usually those with a massive apedal structure such as Hardap, Shigalo, Shorrocks and Makatini. Sterkspruit soils also occur. According to Van Rooyen (1978), the pH of the soil varies between 6,1 and 8,7. The soils of this landscape are similar to those of the *Acacia welwitschii*-thickets.