

**THE PLANT COMMUNITIES
BELOW
TURFLOOP DAM, LEBOWA**

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and
D.R.J. van Vuuren**



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SUMMARY

The vegetation below Turfloop dam, near the University of the North in Lebowa, has been successfully classified by means of the Braun-Blanquet method. Differences in vegetation are associated with differences in topography and various soil properties. The following plant communities have been distinguished and ecologically interpreted:

1. The pioneer *Scirpus triquetus* Vlei Community in the small permanent streams directly below the dam wall.
2. The *Phragmites australis* Reed Community in the seasonally flooded vlei below the dam wall.
3. The *Acacia karroo* Riverine Communities:
 - (a) The dense *Acacia karroo* - *Ziziphus mucronata* Thickets along the stream banks.
 - (b) The open *Acacia karroo* - *Sporobolus africanus* Savanna on the clay soils adjacent to the stream banks.
4. The *Acacia tortilis* Savanna Communities of the undulating drier areas surrounding the vlei.
 - (a) The *Acacia tortilis* - *Spirostachys africanus* Savanna of the south facing slopes.
 - (b) The *Acacia tortilis* - *Euclea crispa* Savanna of the north-east facing slopes.
 - (c) The *Acacia tortilis* - *Pogonarthria squarrosa* Savanna of the north facing slopes.
5. The *Cynodon dactylon* Grassveld Community of the flat plains.

Descriptions of the plant communities include habitat features, differentiating species groups as well as prominent and less conspicuous species for the tree, shrub, and herbaceous strata.

This account could serve as a basis for further ecological research in the area, for the compilation of a management programme for the area, and also for the practical training of students of ecology of the University of the North.

SAMEVATTING

Die plantegroei onderkant Turfloopdam, naby die Universiteit van die Noorde, Lebowa, is deur middel van die Braun-Blanquet metode suksesvol geklassifiseer. Verskille in die plantegroei word met verskille in die topografie en verskeie grondeienskappe geassosieer. Die volgende plantgemeenskappe is onderskei en ekologies geïnterpreteer:

1. Die pionier *Scirpus triquetus* - vleigemeenskap in die klein, permanente waterstroompies direk onderkant die damwal.
2. Die *Phragmites australis* - rietgemeenskap in die seisoenaal oorstroomde vlei onderkant die damwal.
3. Die *Acacia karroo* - oewergemeenskappe:
 - (a) Die digte *Acacia karroo* - *Ziziphus mucronata* - bosse op die rivieroewer.
 - (b) Die oop *Acacia karroo* - *Sporobolus africanus* - savanna op die kleigronde aangrensend aan die rivieroewer.
4. Die *Acacia tortilis* - savanna gemeenskappe van die golwende, droër gebiede rondom die vlei.
 - (a) Die *Acacia tortilis* - *Spirostachys africanus* - savanna teen die suidfront glooiings.
 - (b) Die *Acacia tortilis* - *Euclea crispa* - savanna teen die noord-oosfront glooiings.
 - (c) Die *Acacia tortilis* - *Pogonarthria squarrosa* - savanna teen die noordfront glooiings.
5. Die *Cynodon dactylon*-grasveld van die vlaktes.

Beskrywing van die plantgemeenskappe sluit eienskappe van die habitat, differensiërende spesiegroepe, asook opvallende en minder opvallende spesies van die boom-, struik- en kruidstrata in.

Hierdie verslag kan as 'n basis vir verdere ekologiese navorsing in die gebied, vir die opstel van 'n bestuursprogram vir die gebied, en ook vir die praktiese opleiding vir ekologie-studente aan die Universiteit van die Noorde dien.

INTRODUCTION

The vegetation of the Pietersburg plateau is little known floristically and ecologically. This vegetation was described broadly by Acocks (1953), and by Van der Schijff (1971). Tomlinson (1970), Edwards (1972) and Bredenkamp and Theron (1976) indicated that neither land use nor conservation objectives can be attained without a thorough knowledge of the ecology of a particular area. Plant communities are the fundamental units of the ecosystem (Major, 1969; Küchler, 1973) and their study is basic for the compilation of management programmes.

An account of the vlei and adjacent plant communities below Turfloop Dam is presented here.

The study area could serve as an ideal practical outdoor laboratory for the training of Botany and Zoology students of the University of the North in field ecology, and this account could serve as a basis for this training, as well as for further, more intensive ecological research.

THE STUDY AREA

Turfloop Dam is situated on the farm Turfloop 35 km east of Pietersburg and 5 km east of the University of the North in Lebowa.

General topography and geology:

Post-Messina Archaean granite fixed on the firm foundation of more primitive systems covers the whole of the Pietersburg plateau.

Ancient granite and gneissic rocks, intrusive into the primitive systems, are exposed over a vast area. The old rocks have been worn down, and the intrusions laid bare to form the gentle undulating plains, dotted with granitic outcrops which are characteristic of the region (Du Toit, 1954).

Turfloop Dam was constructed in the Pou River, which flows in a westward direction, but the dam also receives water from a few smaller streams. Below the dam wall a vlei area was created. This vlei receives water from the overflow of the dam as well as from the Ntlwanangwe River which flows in a northern direction and enters the vlei more or less 1 km below the dam wall. The vlei is drained by the Pou River.

The study area includes the vlei as well as the adjacent slightly undulating dry areas. It covers approximately 70 ha and is situated at an altitude of between 1265 m and 1300 m.

Soils:

According to Dlomu (1966) great diurnal variations of temperature have favoured the weathering of the granite into large boulders associated with fine sandy materials. The grey ferruginous lateritic soils are shallow and spread over the old granitic rock. Colluvial soils are found around the granitic outcrops, while alluvial soils are found in the river valley.

The residual soils of the region are friable at the top but going deeper they become gravelly and studded with a few ferruginous concentrations. Below the friable top layer is a layer of mottled clay sand which contains many ferruginous concentrates that are often cemented to form a hardpan. The soils are poor in plant nutrients and although their water absorption capacity is high their capacity to retain moisture is very low (Dlomu, 1966). Several deeply-eroded dongas occur in the study area.

Climate:

Data on rainfall at Turfloop was obtained from the Department of Geography, University of the North, while data on temperatures at Turfloop was taken from Dlomu (1966).

The average annual rainfall for the period 1970 to 1976 is 554,8 mm, with 92,6% of the precipitation occurring during the period October to April. However, the rainfall varies considerably from year to year. The maximum annual rainfall for the period 1970 to 1976 was 670 mm, whilst a minimum of only 382 mm was recorded during 1970.

According to Dlomu (1966) the daily maximum temperatures at Turfloop are 30°C or higher during the summer months, and as high as 24°C during June and July. Summer daily minimum temperatures are relatively high, exceeding 13°C and often above 16°C. In winter, however, the daily minimum temperatures may drop to 0°C. Mean monthly maximum temperatures range between 26°C and 15°C, and mean monthly minimum temperatures between 20°C and 11°C (Dlomu, 1966).

Rainfall and temperature data are summarized in Fig. 1. The rainfall graph illustrates the mean monthly rainfall for the period 1970 to 1976, while the temperature graph represents the monthly mean temperatures for the period 1963 to 1965.

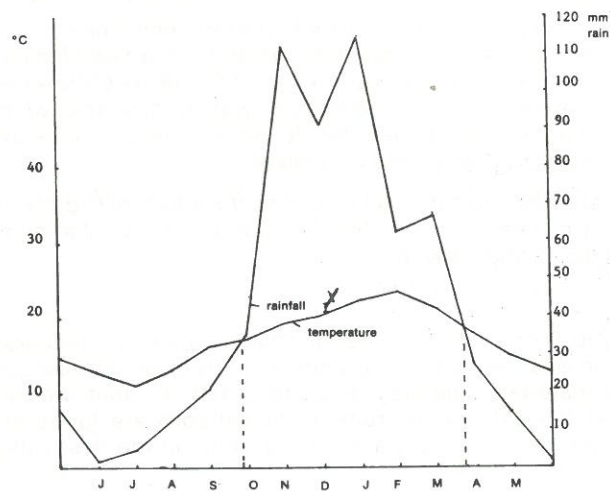


Fig. 1. A climate diagram for Turfloop.

METHODS

Thirty two sample plots were placed at random within the study area. Plot sizes were fixed at 200m² for woody vegetation and 100 m² for the herbaceous vegetation. In each sample plot the habitat data was recorded in the following classes. The symbols used refer to Table 1.

- (a) Topography:
- v - vleis
 - p - flat plains
 - s - slopes
 - r - river banks
- (b) Aspect:
- N - north facing
 - S - south facing
 - E - east facing
- (c) Slope: Direct measurement in degrees.
- (d) Soil texture, determined according to Loxton (1966):
- S - sand
 - C - clay
 - SL - sandy loam
 - SCL - sandy clay loam
 - CL - clay loam
- (e) Soil pH: direct measurement in a 1:1 soil/distilled water suspension, using glass electrode pH meter.
- (f) Soil colour, according to the Munsell colour charts:★
- dg - dark grey
 - dbg - dark greyish brown
 - yb - yellow brown
 - db - dark brown
 - wr - weak red
 - b - brown
 - drb - dark reddish brown
 - dsr - dusky red
 - rb - reddish brown
- (g) Soil consistency according to Loxton (1966):
- 1 - loose
 - 2 - soft
 - 3 - slightly hard
- (h) Soil resistance; direct measurement in ohms, of a 1:1 soil/distilled water suspension.
- Data recorded on vegetation structure included estimations of the percentage total canopy cover as well as percentage canopy cover and average height of the tree, shrub and herb strata. Trees were designated as woody plants taller than 2m, and shrubs as woody plants up to 2m tall.

★Munsell Color Division. Kollmorgen Corporation, Baltimore, Maryland 21218 U.S.A. 1971 Edition.

In the floristic survey Braun-Blanquet cover-abundance values for each species in every sample plot were estimated as follows:

- r - single individual with a very small cover
- + - cover up to 1% of the sample plot area
- 1 - cover between 1% and 5% of the sample plot area
- 2 - cover between 5% and 25% of the sample plot area
- 3 - cover between 25% and 50% of the sample plot area
- 4 - cover between 50% and 75% of the sample plot area
- 5 - cover between 75% and 100% of the sample plot area

A phytosociological Table (Table 1) was compiled according to the methods of the Zürich-Montpellier school of phytosociology (Shimwell, 1971; Mueller-Dombois and Ellenberg 1974). In this Table each column represents a relevé and thus a stand of vegetation. The rows represent the species which occur in the stands. The matrix of the Table is the cover-abundance values for each species in each relevé.

Species with similar distribution patterns are grouped together, and are indicated by species groups a to k in Table 1. Furthermore, floristically related relevés are grouped together into noda which represent the communities. Certain species are more or less restricted to certain communities and thus differentiate between the communities. The relationships between the communities are indicated by the groups of species they have in common. Information on the habitat and vegetation structure is entered at the top of Table 1.

Detailed descriptions of the communities are given. The descriptions include notes on the habitat, the vegetation structure, the differential species, the dominant species with high cover and constancy values, and also the less conspicuous species. Lists of species are given in sequence of constancy for each stratum and the constancy values for the species are indicated as a percentage.

A vegetation map (Fig. 2) is included.

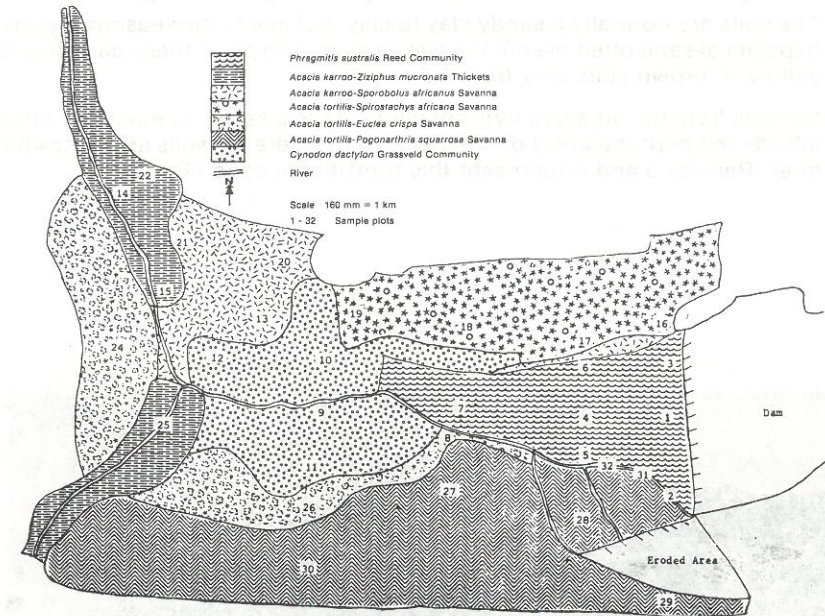
RESULTS

Five major plant communities are distinguished:

1. The pioneer *Scirpus triqueter* Vlei Community
2. The *Phragmites australis* Reed Community
3. The *Acacia karroo* Riverine Communities
4. The *Acacia tortilis* Savanna Communities
5. The *Cynodon dactylon* Grassveld Community

The vegetation of all the above communities is at present severely overgrazed and trampled by the herds of cattle and goats of the local people. Consequently hardy pioneers and weeds are often conspicuously present in most stands representing the communities.

Fig. 2 A map of the plant communities below Turfloop Dam.



1. The pioneer *SCIRPUS TRIQUETER* Vlei Community.

Relevés 2, 31 and 32 represent this vlei community which is the pioneer vegetation in the small permanent streams (Fig. 3) just below the overflow at the southern end of the dam wall.

The permanently water-soaked, dark grey clay soils are alkaline, with pH values of 8,3 to 8,4 and with soil resistance values of 3600 ohms to 3800 ohms.

This vlei vegetation is characterised by species group a (Table 1), which includes the prominent sedges *Scirpus triqueter* (100%) and *Juncellus laevigatus* (100%). These two species form dense, 0,5 m tall stands, but the taller *Typha latifolia* ssp. *capensis* (66%) is locally very abundant and forms dense patches of pure stands. The total canopy cover of the vegetation is nearly 100%. Other species include *Cyperus* sp. (66%) and *Scirpus* sp. (66%).

2. The *PHRAGMITIS AUSTRALIS* Vlei Community.

Relevés 1, 3, 4, 5 and 6 represent this seral reed community (Fig. 3) which covers most of the vlei area below the dam wall. This area is seasonally flooded and is normally under water during the period December to May. The vegetation and soils are disturbed by a number of furrows which were previously dug, probably to drain the area.

The soils are normally a sandy clay to clay, but due to the seasonal floods, deposits of sand often overlie the clayey soils. The pH of these dark grey to yellowish brown soils vary from 6,2 to 8,9.

Species from the adjacent hygrophylous *Acacia karroo* Community often intrude the periferal areas of this vlei (Fig. 3) where the soils are somewhat drier. Relevés 3 and 6 represent this transitional zone (Table 1).

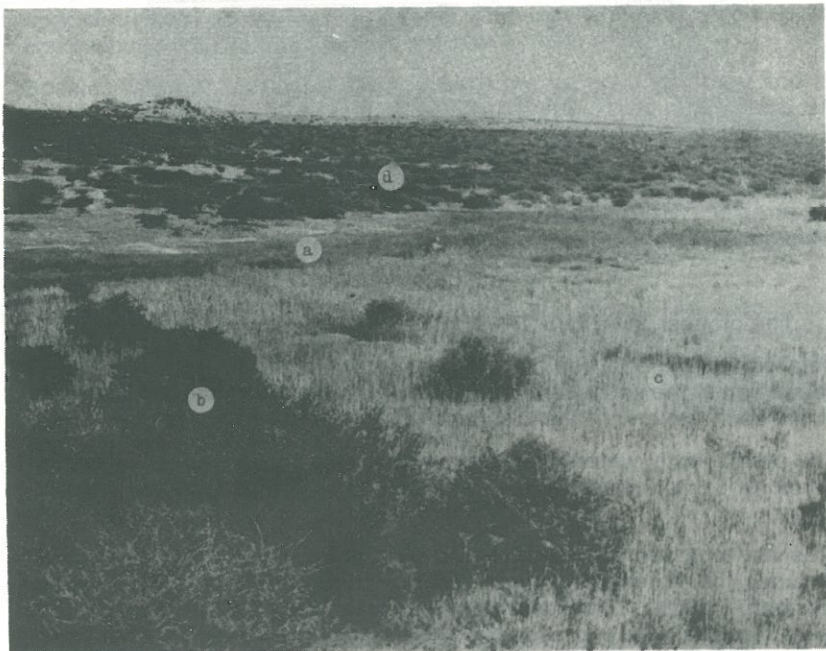


Fig. 3

The pioneer *Scirpus triqueter* Vlei Community (a) in small permanent streams, with *Acacia karroo* (b) intruding into the *Phragmites australis* Reed Community (c), and the *Acacia tortilis* - *Pogonarthria squarrosa* Savanna (d) on the gradual north facing slopes.

Species group b (Table 1) characterises this community. The differential species are:

<i>Phragmites australis</i>	100%
<i>Cirsium vulgare</i>	60%
<i>Berkheya</i> sp.	60%
<i>Kohautia cynanchica</i>	40%
<i>Ranunculus multifidus</i>	40%

The most prominent plant is the reed *Phragmites australis*, mostly up to 2 m tall, and covering the greater part of the vlei area. The total canopy cover of this community is 90% to 95%.

Other species often present, include:

<i>Cynodon dactylon</i>	60%
<i>Conyza floribunda</i>	60%
<i>Eustachys mutica</i>	60%
<i>Oxalis</i> sp.	40%
<i>Withania somnifera</i>	40%
<i>Senecio burchellii</i>	40%

Species intruding from the adjacent communities and present in the transitional relevés 3 and/or 6 include:

Trees and shrubs	Herbs
<i>Acacia karroo</i>	<i>Rubia petiolaris</i>
<i>Maytenus senegalensis</i>	<i>Bidens bipinnata</i>
<i>Grewia flava</i>	<i>Schkuhria pinnata</i>
<i>Asparagus africanus</i>	<i>Aristida congesta</i>
<i>Lantana rugosa</i>	<i>Digitaria cf eriantha</i>
<i>Diospyros lycioides</i>	<i>Pollichia campestris</i>
<i>Clerodendrum glabrum</i>	<i>Eragrostis curvula</i>
	<i>Ehrharta melicoides</i>
	<i>Panicum maximum</i>
	<i>Solanum panduraeforme</i>
	<i>Tagetes minuta</i>
	<i>Achyranthes aspera</i>
	<i>Oxygonum sinuatum</i>
	<i>Zinnea peruviana</i>

Due to a totally different species composition sample plot 7 was excluded from Table 1. Here a *Populus* sp. plantation covers a considerable area of the vlei. The *Populus* trees seem to spread rapidly and may endanger the vlei vegetation.

3. The ACACIA KARROO Riverine Communities.

This fairly open to dense woody vegetation occurs mainly along the streams which drain the vlei and the adjacent areas of clayey soils.

The dark brown clayey soils are more or less neutral, the pH values ranging from 6,3 to 7,9. Deposits of sand due to the seasonal floods, are locally very prominent along the stream banks.

The vegetation is characterised by species group c (Table 1), which includes trees and shrubs of *Acacia karroo* (100%) and *Rhus pyroides* (57%), and the following herbaceous plants:

<i>Setaria woodii</i>	71%
<i>Xanthium spinosum</i>	71%
<i>Aloe greatheadii</i>	57%
<i>Bidens bipinnata</i>	57%

The tree stratum is dominated by *Acacia karroo* (100%) but other trees often present include *Aloe marlothii* (71%), *Rhus pyroides* (57%), and *Acacia rehmanniana* (43%). Shrubs include younger plants of the tree species, as well as *Asparagus africanus* (100%) *Lantana rugosa* (85%) and *Lippia javanica* (43%).

Cynodon dactylon (100%) *Setaria woodii* (71%) and *Achyranthes aspera* (57%) are the most abundant and prominent herbs in this community. Other herbs include:

<i>Solanum panduræ forme</i>	85%
<i>Xanthium spinosum</i>	71%
<i>Aloe greatheadii</i>	57%
<i>Bidens bipinnata</i>	57%
<i>Tagetes minuta</i>	57%
<i>Leucas martinicensis</i>	57%
<i>Senecio burchellii</i>	43%

Two variations can be distinguished in this community:

- The *Acacia karroo* - *Ziziphus mucronata* Thickets along the stream banks and
 - the *Acacia karroo* - *Sporobolus africanus* Savanna adjacent to the stream banks.
- (a) The ACACIA KARROO - ZIZIPHUS MUCRONATA Thicket.

Relevés 14, 15, 22 and 25 represent this variation. The very dense woody vegetation (Fig. 4) occurs along the stream banks where moisture conditions are probably more favourable than in the adjacent, areas where the *Acacia karroo* - *Sporobolus africanus* Savanna occurs. The soils along the stream banks have relatively high resistance values, ranging from 4 000 ohms to 5 000 ohms (Table 1), which indicate that soluble salts are leached out.

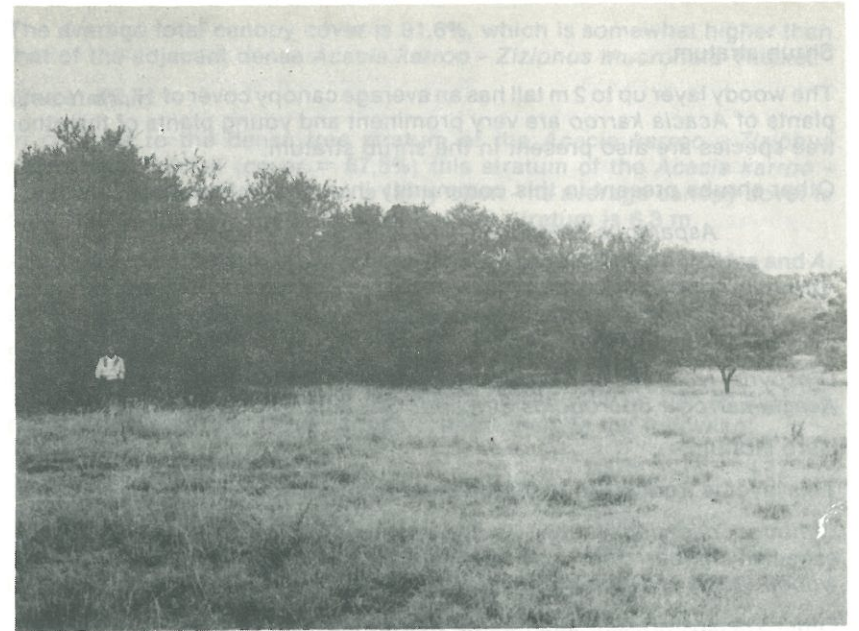


Fig. 4.

The dense *Acacia karroo* - *Ziziphus mucronata* Thickets.

The *Acacia karroo* - *Ziziphus mucronata* Thicket is characterised by species group d (Table 1), which includes

<i>Ziziphus mucronata</i>	100%
<i>Aloe marlothii</i>	100%
<i>Rubia petiolaris</i>	75%
<i>Salvia</i> sp.	75%

The average total canopy cover of the vegetation is 80%.

Tree stratum.

The very dense tree stratum has an average maximum height of 8,2 m and an average canopy cover of 67,5%.

Acacia karroo (100%) is by far the most prominent plant in this community, but *Ziziphus mucronata* (100%) *Aloe marlothii* (100%), *Acacia nilotica* (75%) and *Rhus pyroides* (50%) are also well represented.

Ziziphus mucronata and *Acacia nilotica* are rare in the related open *Acacia karroo* - *Sporobolus africanus* Savanna.

Shrub stratum.

The woody layer up to 2 m tall has an average canopy cover of 17,5%. Young plants of *Acacia karroo* are very prominent and young plants of the other tree species are also present in the shrub stratum.

Other shrubs present in this community include the following:

<i>Asparagus africanus</i>	100%
<i>Lantana rugosa</i>	100%
<i>Diospyros lycioides</i>	75%
<i>Lippia javanica</i>	50%
<i>Aloe cryptopoda</i>	50%

Diospyros lycioides and *Aloe cryptopoda* are mostly absent in the related *Acacia karroo* - *Sporobolus africanus* Savanna.

Herb stratum.

This layer is from 0,1 m to 0,3 m tall, with an average canopy cover of 75%.

Cynodon dactylon (100%) is the most abundant species but locally, especially under trees and shrubs *Panicum maximum* (100%) *Setaria woodii* (75%) and *Achyranthes aspera* (75%) are very prominent.

Other species present include the following:

<i>Xanthium spinosum</i>	75%
<i>Salvia</i> sp.	75%
<i>Rubia petiolaris</i>	75%
<i>Solanum panduraeforme</i>	75%
<i>Aloe greatheadii</i>	50%
<i>Bidens bipinnata</i>	50%
<i>Tagetes minuta</i>	50%
<i>Senecio burchellii</i>	50%
<i>Leucas martinicensis</i>	50%
<i>Blepharis integrifolius</i>	50%
<i>Schistostephium heptalobum</i>	50%

Rubia petiolaris, *Blepharis integrifolius* and *Schistostephium heptalobum* are usually absent in the related *Acacia karroo* - *Sporobolus africanus* Savanna.

(b) The ACACIA KARROO - SPOROBOLUS AFRICANUS Savanna.

Relevés 13, 20 and 21 represent this variation. This fairly open savanna occurs on the plains, usually adjacent to the stream banks where the dense *Acacia karroo* - *Ziziphus mucronata* Thicket occurs. The clay soils of these areas have relatively low soil resistance values, ranging from 2 800 ohms to 3 000 ohms.

Species group e (Table 1) which includes *Sporobolus africanus* (100%), *Schkruhria pinnata* (100%) and *Sida rhombifolia* (100%) characterises this community floristically.

The average total canopy cover is 91,6%, which is somewhat higher than that of the adjacent dense *Acacia karroo* - *Ziziphus mucronata* Thicket.

Tree stratum.

In contrast to the dense tree stratum of the *Acacia karroo* - *Ziziphus mucronata* Thicket (cover = 67,5%) this stratum of the *Acacia karroo* - *Sporobolus africanus* variation is fairly open - its average canopy cover is only 16,6%. The average total height of this stratum is 6,3 m.

Acacia karroo (100%) is the most prominent tree, but *Rhus pyroides* and *A. rehmanniana* (66%) are also conspicuous. *Acacia rehmanniana* is mostly absent in the *Acacia karroo* - *Ziziphus mucronata* Thicket.

Shrub stratum.

The shrub stratum, dominated by *Acacia karroo* (100%), has an average canopy cover of 10%. Other shrubs present include the following:

<i>Rhus pyroides</i>	100%
<i>Asparagus africanus</i>	100%
<i>Lantana rugosa</i>	66%
<i>Acacia rehmanniana</i>	66%

Herb stratum.

This stratum is 0,2 m to 0,3 m tall and has an average canopy cover of 91,6%.

Cynodon dactylon (100%) is the most abundant species, but *Achyranthes aspera* (66%) is very prominent in the shade under the trees.

Other species present in this stratum include the following:

<i>Sporobolus africanus</i>	100%
<i>Schkruhria pinnata</i>	100%
<i>Sida rhombifolia</i>	100%
<i>Solanum panduraeforme</i>	100%
<i>Setaria woodii</i>	66%
<i>Xanthium spinosum</i>	66%
<i>Aloe greatheadii</i>	66%
<i>Bidens bipinnata</i>	66%
<i>Tagetes minuta</i>	66%
<i>Leucas martinicensis</i>	66%
<i>Conyza floribunda</i>	66%

4. The ACACIA TORTILIS Savanna Communities (Fig. 5).

This vegetation is part of the widely distributed open savanna found on the undulating landscape on the north-eastern portion of the Pietersburg plateau (Adcocks, 1953). Differences in vegetation can be correlated with differences in topography and certain soil characteristics. In the study area this vegetation occurs on gradual south, north and east facing slopes, on sandy loam acid soils.

The *Acacia tortilis* Savanna is floristically differentiated by species groups i and j (Table 1), and includes the following species:

Trees and shrubs		Herbs	
<i>Acacia tortilis</i>	100%	<i>Aristida congesta</i>	100%
<i>Maytenus senegalensis</i>	92%	<i>Digitaria eriantha</i>	83%
<i>Acacia nilotica</i>	83%	<i>Eragrostis curvula</i>	83%
<i>A. hebeclada</i>	58%	<i>Ehrharta melicoides</i>	67%
<i>Dichrostachys cinerea</i>	58%	<i>Eragrostis superba</i>	67%
<i>Lippia javanica</i>	58%	<i>Pollichia campestris</i>	67%
		<i>Themeda triandra</i>	58%
		<i>Felicia muricata</i>	42%
		<i>Deverra burchellii</i>	25%

Other common species in this savanna, but which also occur in other communities in the study area, include the following:

Shrubs		Herbs	
<i>Asparagus africanus</i>	75%	<i>Panicum maximum</i>	100%
<i>Lantana rugosa</i>	67%	<i>Cynodon dactylon</i>	92%
<i>Diospyros lycioides</i>	67%	<i>Senecio burchellii</i>	92%
<i>Opuntia</i> sp.	33%	<i>Solanum panduræforme</i>	67%
<i>Aloe cryptopoda</i>	33%	<i>Tagetes minuta</i>	42%
		<i>Achyranthes aspera</i>	42%
		<i>Leucas martinicensis</i>	42%



Fig. 5 The *Acacia tortilis* Savanna.

In the study area the *Acacia tortilis* Savanna is represented by three communities:

- the *Acacia tortilis* - *Spirostachys africana* Savanna,
- the *Acacia tortilis* - *Euclea crispa* Savanna,
- the *Acacia tortilis* - *Pogonarthria squarrosa* Savanna.

(a) The **ACACIA TORTILIS - SPIROSTACHYS AFRICANA** Savanna.

Relevés 16, 17, 18 and 19 situated on the gradual south facing slopes, often directly adjacent to the *Phragmitis australis* Reed Community, represent this community. The deep, reddish-brown sandy loam to sandy clay loam soils of this community have pH values of 5,2 to 6,9, while the soil resistance is between 5000 ohms and 6000 ohms.

This vegetation is characterised by species group f (Table 1), which includes the following species:

Trees and shrubs		Herbs	
<i>Spirostachys africana</i>	100%	<i>Brachiaria serrata</i>	100%
<i>Ehretia rigida</i>	75%	<i>Oxalis</i> sp.	75%
<i>Rhus leptodictya</i>	50%		

A conspicuous feature is the variation in floristic composition and vegetation structure within this community. A number of species often characteristically present in stands of the *Acacia tortilis* Savanna Communities, are absent in relevés 16 and 17 (see species group j, Table 1). The relatively vigorous growth of the woody and herbaceous plants in these two relevés, in contrast to the plants in the other relevés which represent this community, is clearly indicated by the height and cover values of the different strata of this vegetation (Table 1). Relevés 16 and 17 are situated very near to the hygrophylous *Phragmitis australis* Reed Community, whilst relevés 18 and 19 are further away from the vlei. Furthermore, the transition from the wet vlei community to the *Acacia tortilis* - *Spirostachys africana* Savanna is gradual and occurs via the hygrophylous *Acacia karroo* Community in the areas of relevés 16 and 17. Therefore it seems that the soil moisture regime at relevés 16 and 17 is probably often more favourable (moist) than at relevés 18 and 19, and this could explain the floristic and structural differences.

The total average canopy cover in relevés 16 and 17 is 85% and in relevés 18 and 19, 60%.

Tree stratum.

In the denser parts near the vlei (relevés 16 and 17) the tree stratum has an average maximum height of 5 m and an average canopy cover of 50%. However, in the more typical stands the average maximum height is 4 m and the average canopy cover is 12,5%.

Acacia tortilis (100%) is the most prominent tree, but *A. nilotica* (75%) *A. hebeclada* and *Spirostachys africana* (100%) are also very conspicuous. Other trees present include *Maytenus senegalensis* (75%) *Dichrostachys cinerea* (75%) and *Diospyros lycioides* (50%).

Shrub stratum.

The shrub stratum has an average canopy cover of 11%. All the tree species mentioned above are present in this stratum, as well as *Asparagus africanus* (100%) and *Lantana rugosa* (100%).

Herb stratum.

This stratum is 0,2 m to 0,3 m tall. In the denser parts near the vlei the average canopy cover is 85%. In the more typical areas the average canopy cover is 60%.

Cynodon dactylon (100%) and *Aristida congesta* (100%) are the most prominent species but *Panicum maximum* (100%) and *Achyranthes aspera* (100%) are often conspicuous under the trees and shrubs.

Other species present include the following:

<i>Senecio burchellii</i>	100%
<i>Digitaria eriantha</i>	75%
<i>Pollichia campestris</i>	75%
<i>Themeda triandra</i>	75%
<i>Eragrostis superba</i>	75%
<i>Solanum panduraeforme</i>	75%
<i>Tagetes minuta</i>	75%
<i>Leucas martinicensis</i>	75%
<i>Schkuhria pinnata</i>	50%
<i>Eragrostis curvula</i>	50%
<i>Ehrharta melicoides</i>	50%
<i>Senecio longiflorus</i>	50%
<i>Conyza floribunda</i>	50%
<i>Eustachys mutica</i>	50%

(b) The ACACIA TORTILIS - EUCLEA CRISPA Savanna.

Relevés 23, 24, 26 and 8 represent this community, which occurs on the gently north-east facing slopes

The dark brown soils are acid with pH values of 4.9 to 7,1.

The soil from relevé 8 has a pH of 7,1, but this stand is not typical. The vegetation of this stand is not only severely disturbed by overgrazing and cutting of woody plants, but this area is probably transitional between this community, the *Acacia tortilis* - *Pogonarthria squarrosa* Savanna and the *Cynodon dactylon* Grassveld Community (see Fig. 2). The soil resistance is between 4000 ohms and 9000 ohms.

The *Acacia tortilis* - *Euclea crista* Savanna is characterised by species group g (Table 1), with the following differential species:

Trees and shrubs		Herbs	
<i>Euclea crista</i>	100%	<i>Cymbopogon plurinodis</i>	75%
<i>Grewia flava</i>	100%	<i>Geigeria burkei</i>	50%
<i>Rhus pyroides</i>	75%	<i>Rhynchelytrum repens</i>	50%
		<i>Eragrostis gummiflua</i>	50%

The average total canopy cover of the vegetation is 73,8%.

Tree stratum.

The average maximum height of the tree stratum is 4,7 m and the average canopy cover is 30%.

In relevé 8 no trees occur, probably due to previous cutting.

Maytenus senegalensis (100%) and *Acacia tortilis* (100%) are the dominant trees.

Other tree species which may be present include:

<i>Diospyros lycioides</i>	100%
<i>Acacia hebeclada</i>	75%
<i>A. nilotica</i>	50%
<i>A. karroo</i>	50%

Shrub stratum.

This stratum has an average canopy cover of 31,6%, but in relevé 8 the cover is only 5%. Shrubs include all the above tree species as well as *Asparagus africanus* (100%) and *Lippia javanica* (75%).

Herb stratum.

This stratum is 0,2 m to 0,3 m tall and has an average canopy cover of 73,8%.

Cynodon dactylon (100%) and *Aristida congesta* (100%) are the dominant grasses.

Other herbs which may be present include:

<i>Eragrostis curvula</i>	100%
<i>E. superba</i>	100%
<i>Panicum maximum</i>	100%
<i>Digitaria eriantha</i>	75%
<i>Themeda triandra</i>	75%
<i>Senecio burchellii</i>	75%
<i>Solanum panduraeforme</i>	50%
<i>Felicia muricata</i>	50%
<i>Ehrharta melicoides</i>	50%

(c) The *ACACIA TORTILIS* - *POGONARTHRIA SQUARROSA* Savanna.

This community is represented by relevés 27, 28, 29 and 30, situated on gradual north facing slopes (Fig. 3) on dark reddish brown soils. The pH of the soils vary from 6,0 to 6,3. The relatively high soil resistance of 9000 ohms to 11000 ohms is a conspicuous feature of the habitat of this community.

The vegetation is characterised by species group h (Table 1), which includes the following species:

<i>Pogonarthria squarrosa</i>	100%
<i>Withania somnifera</i>	100%
<i>Kalanchoe rotundifolia</i>	75%
<i>Commelina africana</i>	75%
<i>Carissa bispinosa</i>	75%
<i>Aloe ammophila</i>	75%

The average canopy cover of the vegetation is 68,75%.

Tree stratum.

The tree stratum has an average maximum height of 4,25 m and an average canopy cover of 23,8%.

The dominant trees are *Maytenus senegalensis* (100%) *Acacia nilotica* (100%) and *A. tortilis* (100%). Other trees which may present include *Dichrostachys cinerea* (100%), *Acacia hebeclada* (50%) and *Diospyros lycioides* (50%).

Shrub stratum.

The shrub stratum has an average canopy cover of 26,25%. All tree species are well represented and *Lippia javanica* (100%), *Lantana rugosa* (75%) and *Aloe cryptopoda* (50%) are often present.

Herb stratum.

The herbaceous layer is 0,2 m to 0,4 m tall and has an average canopy cover of 68,8%. The most prominent grasses are *Aristida congesta* (100%) and *Cynodon dactylon* (75%).

Other species present include the following:

<i>Digitaria eriantha</i>	100%
<i>Pollichia campestris</i>	100%
<i>Eragrostis curvula</i>	100%
<i>Panicum maximum</i>	100%
<i>Ehrharta melicoides</i>	100%
<i>Senecio burchellii</i>	100%
<i>S. longiflorus</i>	75%
<i>Solanum panduraeforme</i>	75%
<i>Eragrostis superba</i>	50%
<i>Rhynchelytrum repens</i>	50%
<i>Felicia muricata</i>	50%

5. The *CYNODON DACTYLON* Grassveld Community.

This grassveld (Fig. 6) which occurs just below the vlei area, on both sides of the stream bank, is represented by relevés 9, 10, 11 and 12.

The neutral to alkaline (pH: 7,0 to 9,1) dark brown clay loam alluvial soils are hard, with a relatively low resistance of 2 200 ohms to 4 000 ohms.

This area is often flooded for short periods, and is severely overgrazed and trampled, and has a very poor species composition.

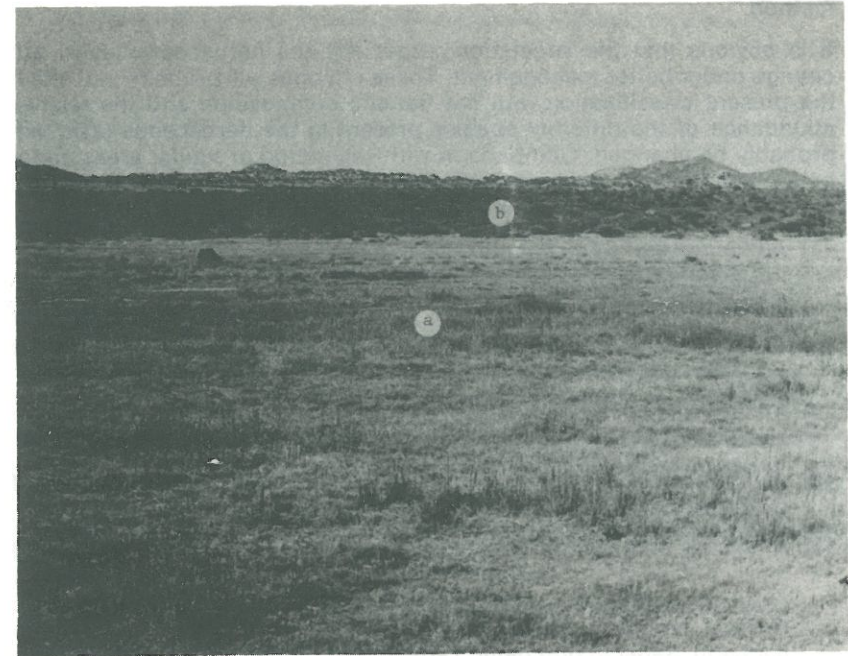


Fig. 6

The short, overgrazed and trampled *Cynodon dactylon* Grassveld Community (a) on the flat plains, and the *Acacia tortilis* Savanna (b) on gradual north facing slopes.

Cynodon dactylon (100%) is the dominant species, and other species present in 2 or more relevés include:

<i>Setaria woodii</i>	50%
<i>Xanthium spinosum</i>	50%
<i>Eragrostis curvula</i>	50%
<i>Senecio burchellii</i>	50%

DISCUSSION

One of the most conspicuous features of the study area is the extremely poor condition of the veld. This condition is due to mismanagement and misuse, especially overgrazing and trampling by the cattle and goats of the local people. The dominant grass in all but the vlei communities is *Cynodon dactylon*, often with *Aristida congesta* as a co-dominant. In spite of this disadvantage the vegetation was classified quite successfully into ecologically meaningful communities, by using the Braun Blanquet method.

It is obvious that the vegetation, especially the herbaceous layer, will change under better management. These changes will probably not affect the present classification, but the floristic composition and the relative abundance of the different species present in the herbaceous layer will probably be changed. Comparison with vegetation of similar areas under better management suggests that changes which may occur and will improve the grazing potential of the area, include the following:

- (a) An increase of *Panicum maximum* in the shade of trees and shrubs in the *Acacia karroo* Riverine Communities and *Acacia tortilis* Savanna Communities.
- (b) An increase of *Setaria woodii* in the *Acacia karroo* Savanna and the *Cynodon dactylon* Grassveld Community.
- (c) An increase of *Themeda triandra*, *Eragrostis curvula*, *Digitaria eriantha* and *Brachiaria serrata* in the *Acacia tortilis* Savanna Communities.
- (d) An increase of *Eragrostis curvula* in the *Cynodon dactylon* Grassveld Community.
- (e) A general decrease of the abundant annual and perennial weeds and hardy pioneers, e.g. *Xanthium spinosum*, *Bidens bipinnata*, *Schkuhria pinnata*, *Geigeria burkei*, *Pogonarthria squarrosa*, *Withania somnifera*, *Aristida congesta*, *Felicia muricata*, *Senecio longiflorus*, *Cynodon dactylon*, *Senecio burchellii*, *Tagetes minuta*, *Achyranthes aspera* and *Conyza floribunda*.

A number of habitat types with different plant communities are found in the study area, and these would constitute an ideal environment for a number of animals, specially water birds. The vegetation map and the description of the communities can serve as a basis to compile a management programme, as well as for further, detailed and quantitative ecological research, and also for the training of students from the University of the North in plant and animal ecology.

It must however be emphasized that the above will only be achieved if the study area is efficiently conserved. Considering the above it must be concluded that the Turfloop Dam area is an ideal environment for the establishment of an official nature reserve and recreation area in the Lebowa homeland.

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