

Wetland plant communities of the Verlorenvlei Nature Reserve in the North-eastern Sandy Highveld, Transvaal

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As part of the formulation of a management policy for the Verlorenvlei Nature Reserve, a phytosociological study of the wetlands was initiated. The classification, by means of the PHYTOTAB computer program, revealed two plant communities with one of the communities divided into seven vegetation zones. A classification description and ecological interpretation as well as a DECORANA ordination is presented.

As deel van die formulering van 'n bestuursplan vir die Verlorenvleinatuurreservaat is 'n fitososiologiese studie van die vleigebiede onderneem. Die klassifikasie, met behulp van die PHYTOTAB-rekenaarprogram, onderskei twee plantgemeenskappe met een van die gemeenskappe wat in sewe plantegroei-sones verdeel kan word. 'n Klassifikasiebeskrywing en ekologiese interpretasie so ook 'n DECORANA-ordening word gegee.

Keywords: Classification, ordination, plant communities, wetlands.

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Introduction

Of all the environments in South Africa, wetlands are probably amongst the most vulnerable and a well-formulated management policy is needed to conserve this environment (Batchelor *et al.* 1982). The wetlands in the Verlorenvlei Nature Reserve are also the last breeding grounds in the Transvaal of the endangered Wattled Crane (*Grus carunculatus* Gmelin) (Tarboton 1981).

A detailed classification and description of the adjoining grassland vegetation was given by Bloem *et al.* (1993) while the results of the wetland vegetation survey are described in this paper.

Study area

The Verlorenvlei Nature Reserve is an undulating area with wetlands situated in the lower areas (Figure 1). These wetlands are the catchment area for the Crocodile, Elands and Steelpoort Rivers (Lombaard 1984).

The wetlands are formed by the underlying quartzite rocks forming so-called geological lips which serve as draining blocks for the wetlands (Lombaard 1984). The sizes of individual wetlands range between 2 ha and 250 ha (Tarboton 1981).

Methods

Relevés were compiled in 42 random stratified sample plots with a plot size of 16 m². Environmental data noted at each sample plot included soil type, soil depth, aspect, slope, slope position, rockiness, as well as grazing pressure, trampling and erosion.

The PHYTOTAB computer package (Westfall *et al.* 1982) was applied to the floristic data to classify the data according to the Zürich-Montpellier method (Mueller-Dombois & Ellenberg 1974). The result of the classification is presented in one phytosociological table (Table 1).

Detrended Correspondence Analysis (DECORANA — Hill 1979) was used to determine the ecological status of the plant species and the influence of environmental factors on the distribution of the plant species.

Taxa names conform to those of Gibbs Russell *et al.* (1985; 1987).

Results

The classification resulted in the recognition of two communities with the latter divided into seven vegetation zones (Figure 2). The communities and vegetation zones are summarized as follows:

1. *Phragmites australis* Vlei
2. *Andropogon appendiculatus* Vlei
 - 2.1 *Andropogon appendiculatus* – *Pycnostachys reticulata* Zone
 - 2.2 *Andropogon appendiculatus* – *Nerine angustifolia* Zone
 - 2.3 *Andropogon appendiculatus* – *Andropogon schirensis* Zone
 - 2.4 *Andropogon appendiculatus* – *Disa rhodantha* Zone
 - 2.5 *Andropogon appendiculatus* – *Ascolepis capensis* Zone
 - 2.6 *Andropogon appendiculatus* – *Helichrysum pilosellum* Zone
 - 2.7 *Andropogon appendiculatus* – *Juncus oxycarpus* Zone

1. The *Phragmites australis* Vlei

This community comprises a single vlei in the south-western corner of the reserve. Occurring in deep water (500 mm+) on soils of the Champagne form with a soil depth of 1 200 mm. The differential species of this community is indicated in Table 1, Appendix 1 (Species group A). Non-differential dominants include *Juncus oxycarpus* and *Cyperus denudatus*.

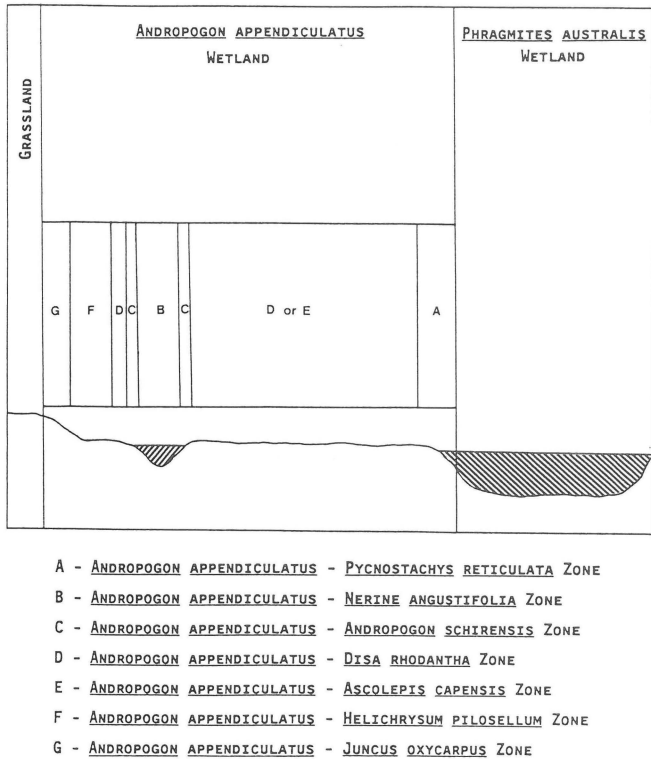


Figure 2 Zonation of the wetlands in the Verlorenvlei Nature Reserve.

2. The *Andropogon appendiculatus* Vlei

This community occurs on soils of the Champagne form. The differential species of this community are indicated in Table 1 (Species group B). Non-differential dominants include *Juncus oxycarpus* and *Stiburus alopecuroides*.

Seven zones can be distinguished within the vleis and can be separated from each other on the presence/absence of water, water and soil depth.

2.1 The *Andropogon appendiculatus* - *Pycnostachys reticulata* Zone

Occurring in water 30 – 200 mm deep and on deep soils (1000 mm). The differential species are indicated in Table 1 (Species group C). Non-differential dominants include *Cyperus denudatus*.

2.2 The *Andropogon appendiculatus* - *Nerine angustifolia* Zone

Occurring in water with a depth of 25 – 160 mm and on soils 600 – 800 mm deep. The dominant species is indicated in Table 1 (Species group D). Other dominants include *Andropogon appendiculatus* and *Cyperus denudatus*.

2.3 The *Andropogon appendiculatus* - *Andropogon schirensis* Zone

Confined to the edges of the drainage channels of the vlei (Figure 1). Occurring in shallow water (10 – 30 mm) on deep soils (800 – 1200 mm). The dominant species is indicated in Table 1 (Species group E).

2.4 The *Andropogon appendiculatus* - *Disa rhodantha* Zone

Occurring on shallow soils (100 – 300 mm) with no surface

water present. The differential species are indicated in Table 1 (Species group F). Non-differential dominants include *Andropogon appendiculatus* and *Juncus oxycarpus*.

2.5 The *Andropogon appendiculatus* - *Ascolepis capensis* Zone

Occurring between two drainage channels on shallow soils (<200 mm) and no surface water. The differential species are indicated in Table 1 (Species group G). Non-differential dominants include *Andropogon appendiculatus* and *Stiburus alopecuroides*.

2.6 The *Andropogon appendiculatus* - *Helichrysum pilosellum* Zone

Represents the ecotone between the vlei and the grassland. Occurring on shallow soils (100 – 300 mm). The species in this zone (Table 1, Species group H) are arranged along a gradient that can not be explained by any measured environmental factors. Dominant species include *Andropogon appendiculatus*, *Juncus oxycarpus* and *Stiburus alopecuroides*.

2.7 The *Andropogon appendiculatus* - *Juncus oxycarpus* Zone

This zone is characterized by the presence of the diagnostic species of the *Andropogon appendiculatus* Vlei (Table 1, Species group B) and of the wetlands (Table 1, Species group I).

Ordination

The distribution of relevés along the first and third axes is given in Figure 3. The plant communities are restricted to specific areas of the scatter diagram. The different zones of the *Andropogon appendiculatus* Vlei are combined into three areas of the scatter diagram. The indistinct differentiation into the seven zones in the scatter diagram shows that ordination is not as sensitive as a phytosociological classification in distinguishing floristic differentiation.

The distribution of the relevés along the horizontal axis (axis 1) is associated with a water/soil depth gradient, with the relevés on shallow soils and no surface water being on the left of the diagram and the relevés on deep soils in deep water being on the right of the diagram. The distribution of

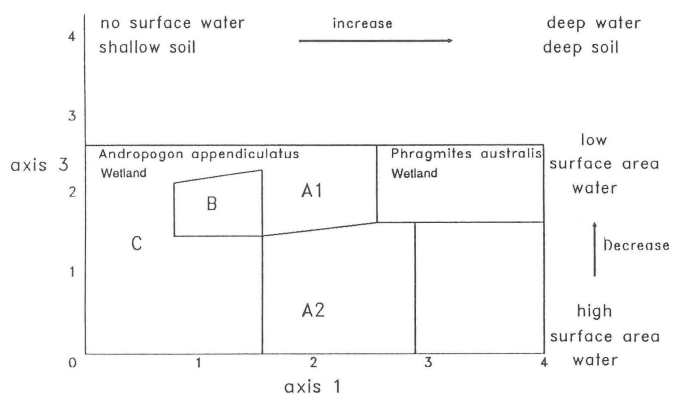


Figure 3 The position of the plant communities along the first and third axes of a DECORANA ordination of the wetlands of the Verlorenvlei Nature Reserve (Eigenvalues axis 1 = 1.000 & axis 3 = 0.603).

the relevés along the vertical axis (axis 3) is associated with the surface area of water, with the relevés with a low surface area of water being at the top and the relevés with a high surface area of water being at the bottom of the diagram.

Discussion

Owing to the vulnerability of the wetlands, a well-formulated management policy was needed. The aim of this study was to identify and characterize the different zones within each of the wetlands on the Verlorenvlei Nature Reserve. Two major plant communities were identified and could be distinguished from each other by a combination of habitat factors. Several zones were identified in the *Andropogon appendiculatus* wetland but could not always be linked to habitat factors.

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Appendix 1 Explanation of the symbols used in Table 1

- a) Altitude
- 1 — 2 049 – 2 055 m
 - 2 — > 2 055 – 2 100 m
 - 3 — > 2 100 – 2 145 m
 - 4 — > 2 145 – 2 214 m
- b) Physiography
- 1 — mountainous
 - 2 — plains
 - 3 — intermediate zone between grassland and wetland
 - 4 — wetland
- c) Geomorphology
- 1 — concave
 - 2 — convex
 - 3 — flat
- d) Aspect
- | | |
|-----------------|-----------------|
| N — north | S — south |
| NE — north-east | SW — south-west |
| E — east | W — west |
| SE — south-east | NW — north-west |
- e) Slope (°C)
- 1 — 0° – 3°
 - 2 — 4° – 6°
 - 3 — 7° – 10°
 - 4 — > 10°
- f) Slope position
- 1 — plains
 - 2 — bottom slope
 - 3 — middle slope
 - 4 — crest and upper slope
- g) Soil form
- CH — Champagne
- h) Soil depth
- | | |
|--------------------|----------------------|
| 1 — < 100 mm | 5 — > 500 – 750 mm |
| 2 — 100 – 150 mm | 6 — > 750 – 1000 mm |
| 3 — > 150 – 300 mm | 7 — > 1000 – 1200 mm |
| 4 — > 300 – 500 mm | |
- i) Root depth
- 1 — < 100 mm
 - 2 — 100 – 200 mm
 - 3 — > 200 – 300 mm
 - 4 — > 300 – 400 mm
 - 5 — > 400 mm
- j) Soil structure
- 1 — Apedal or no-structure
 - 2 — poorly-developed structure
- k) Soil consistency
- 1 — loose
 - 2 — soft
 - 3 — slightly hard
- l) Soil colour
- B — black
- m) Grazing
- 0 — absent
 - 1 — slightly grazed

Appendix 1 Continued

n) Crown cover

1 — 0 – 10%	5 — 41 – 50%
2 — 11 – 20%	6 — 51 – 60%
3 — 21 – 30%	7 — 61 – 70%
4 — 31 – 40%	8 — 71 – 80%

o) Surface water

- Y — present
N — absent

p) Water depth

- 0 — no surface water
1 — 1 – 20 mm
2 — >20 – 50 mm

Appendix 1 Continued

3 — > 50 – 150 mm

4 — > 150 – 300 mm

5 — > 300 mm

q) Water pH

0 — no water to determine pH

1 — < 4.0

2 — 4 – 4.5

3 — > 4.5 – 5.0

4 — > 5.0 – 5.5

5 — > 5.5 – 6.0

6 — > 6.0