

## CHAPTER 9

# ARID NORTHERN BUSHVELD

### 9.1 Background

Few phytosociological studies have been conducted on bushveld (the local term equivalent to savanna) vegetation types of the Northern Province (Werger *et al.* 1978; Van der Meulen 1979; Breebaart & Deutschlander 1997). Therefore, the vegetation of some areas still remains to be investigated and described, both on reconnaissance level and in more detail. Such an area is the arid valleys and hills of the Potlake Nature Reserve-Mecklenburg region, identified as the Arid Northern Bushveld (Siebert *et al.* 2002a) in the northern areas of the Steelpoort Subcentre in the SCPE (Van Wyk & Van Wyk 1997; Van Wyk & Smith 2001). The Steelpoort Subcentre is floristically noteworthy in that many endemics with distributions correlated with the geological substrate, occur here (Siebert 1998; Siebert *et al.* 2001).

Bredenkamp & Van Vuuren (1977) recognised various arid bushveld vegetation types on the adjacent Pietersburg Plateau, which show a definite floristic affinity with the Steelpoort Subcentre (Siebert *et al.* 2002a). Acocks (1953) mapped the vegetation of the study area as Tropical Bush and Savanna veld types, namely Mixed Bushveld (18) and Sourish Mixed Bushveld (19). Acocks (1953) accurately distinguished a sour bushveld type on the mountain slopes of the northern ranges of the Leolo Mountains that links with the vegetation on the southern slopes of the Serala Subcentre and the western slopes of the Blyde River Subcentre (Matthews 1991). It is not a typical sour bushveld and needs further attention to determine its true identity. The vegetation described here only includes those plant communities that are part of the SCPE Arid Northern Bushveld (*Acacia tortilis*-*Eragrostis barbinodis* Arid Northern Bushveld) (Siebert *et al.* 2002a). Arid thornveld is the major vegetation type of this drier northern parts of the Steelpoort Subcentre. It is mostly restricted to the valleys between the Leolo Mountains and the Northeastern Escarpment.

The study area (northern limit of the SCPE) is situated in the southern part of the Northern Province between latitude 24°15'00"–24°30'00"S and longitude 29°30'00"–30°10'00"E (Figure 15). The area covers approximately 1 250 km<sup>2</sup> and comprises a heterogeneous geology (Visser *et al.* 1989), with a moderately heterogeneous physiography (Land Type Survey Staff 1987). Which is underlain by different types of pyroxenite belts covered by surficial deposits of alluvium and scree (Visser *et al.* 1989). Other prominent rocks include Jagdlust harzburgite, Shelter norite and Karoo dolerite.

In this arid northern region of sequential bands of hills and large valleys, the predominant characteristic vegetation feature is low open savanna. The difference in altitude between the two most extreme locations is approximately 200 m. The study area lies in the summer rainfall region, with the annual precipitation averaging about 460 mm (South African Weather Bureau). The rainfall pattern is strongly influenced by the area's topography (Siebert 1998), varying from 416 mm in the east to 499 mm per annum in the west, and 522 mm in the south to 478 mm per annum in the north (Erasmus 1985). Daily average temperatures range from a minimum of 8°C in winter to a maximum of 38°C in summer, with an average annual temperature of 20°C (South African Weather Bureau). Minimum temperatures of below freezing point are extremely rare, even in the high-lying areas.

## 9.2 Classification

The analysis resulted in the identification of eight plant communities, classified as four associations and five sub-associations (Table 24). Since the study area lies in the climatically uniform dry and warm northern region of the SCPE, no major macro-climatic variation plays a role in local differentiation of the plant communities. The major plant communities relate to soil character, aspect and terrain type. Communities were not always distinctive in the field and this is attributed to the heterogeneity of the environmental factors, which cause a complex mosaic distribution pattern of habitats and associated vegetation.

The hierarchical classification of the vegetation reinforces the correlation between habitat and plant communities (Figure 16). The distribution of SCPE endemic/near-endemic

and rare/threatened taxa among the various plant communities is listed in Table 25. A summary of selected community attributes is supplied in Table 26.

Plant communities of the SCPE dry northern bushveld (*Acacia tortilis–Eragrostis barbinodis* Arid Northern Bushveld) are classified as follows:

***Panico maximi–Acacietea tortilis* class (Winterbach *et al.* 2000)**

**I. *Eragrostis barbinodis–Acacia tortilis* community of arid systems**

1. *Panico colorati–Crotonetum menyhartii*
2. *Melhanio rehmannii–Acacietum tortilis*
  - 2.1 *Melhanio rehmannii–Acacietum tortilis grewetosum bicoloris*
  - 2.2 *Melhanio rehmannii–Acacietum tortilis rhigozetosum obovati*
  - 2.3 *Melhanio rehmannii–Acacietum tortilis diospyretosum lycioidis*
  - 2.4 *Melhanio rehmannii–Acacietum tortilis acacietosum niloticae*
  - 2.5 *Melhanio rehmannii–Acacietum tortilis indigoferetosum rhytidocarpae*
3. *Enneapogono cenchroidis–Salvadoretum australis*
4. *Urochloo panicoidis–Agavetum americanae*

**9.3 Description**

The *Acacia tortilis–Eragrostis barbinodis* Arid Northern Bushveld is predominantly restricted to the valleys and lower slopes of undulating hills. Surface rocks are common and abundant in many of the communities, with soil clay percentages varying from 15% to 35%. The structure of the vegetation can mainly be classified as shrubland thicket (bush encroachment) and open tree savanna (anthropogenic grassland) (Edwards 1983).

**I. *Eragrostis barbinodis–Acacia tortilis* community of arid systems**

Classified under the *Panico maximi–Acacietea tortilis* class (Winterbach *et al.* 2000).

*Environmental data.* The vegetation representing this order, forms a transition from anthropogenic grassland to degraded systems with bush encroachment and could be interpreted as anthropogenically driven vegetation units. It rather seems to be part of a

management practice whereby the veld is manipulated for grazing by game or cattle, a disturbed system of fields, and a highly erodable upper horizon associated with the soils of the region. These habitats and vegetation occur on gentle footslopes (1–5°) on all aspects (Table 26). The dominant soil types are the Steendal and Valsrivier forms. Average rock size varies from 100–400 mm and covers 10–50% of the soil surface.

*Diagnostic and dominant/prominent taxa.* This order is characterised by species group W (Table 24). The forb *Seddera suffruticosa*, the grass *Eragrostis barbinodis* and the tree *Acacia tortilis* are the diagnostic species of this syntaxon. The acacias are the most distinctive, dominant and largest group of trees in this vegetation type. They are generally associated with typical Mixed Bushveld landscapes. Other prominent herbaceous species include the forbs *Felicia clavipilosa*, *Kleinia longiflora*, *Leucas capensis* and *Tribulus terrestris*, and the graminoids *Aristida congesta*, *Enneapogon cenchroides* and *Tragus berteronianus*. Prominent woody taxa of the order are *Acacia grandicornuta*, *Albizia anthelmintica* and *Ehretia rigida*.

*Notes on floristic diversity.* Alien species are common in this vegetation type and human disturbance is a key determinant of this arid bushveld. Important, but widely distributed, species with conservation value in this order is the endemic form of *Leucas capensis*, the red data list taxa *Boscia foetida* subsp. *minima* (Rare) and *Plinthus rehmannii* (Vulnerable), and the small tree near-endemic *Rhus engleri* (Table 25).

1. *Panico colorati*–*Crotonetum menyhartii* ass. nova hoc loco

Nomenclatural type: relevé 383 (holotypus)

*Environmental data.* The vegetation is a short, sparse open shrubland associated with the lower midslopes and footslopes of hills. The habitat is restricted to predominantly eastern aspects that are gently sloped (1–3°) and slightly eroded (Table 26). Loam soils are predominant, mostly the Glenrosa form, with a black coloured ortic A-horizon over a lithocutanic B-horizon. The surface rock cover percentage is 20–50% and the average rock diameter between 250–500 mm (Table 26).

*Diagnostic and dominant/prominent taxa.* Characteristic species are represented in species group A (Table 24). Dominant trees/shrubs of the association are the diagnostic *Maerua cafra* and *Mundulea sericea*. Diagnostic forbs include *Blepharis pruinosa*, *Cleome angustifolia*, *Helichrysum cerastioides*, *Petalidium oblongifolium* and *Polygala* sp. nov. (Van Wyk & Siebert 13311). Diagnostic grasses of this association are *Eustachys paspaloides*, *Fingerhuthia africana* and *Panicum coloratum*. Other prominent trees/shrubs of the sub-association are *Acacia mellifera*, *Balanites maughamii*, *Croton menyhartii* and *Rhus engleri*. Dominant forbs are *Geigeria filifolia*, *Indigofera enormis* and *Kleinia longiflora*. Conspicuous grasses of the sub-association include *Emneapogon scoparius* and *Eragrostis barbinodis*.

*Notes on floristic diversity.* Floristically the sub-association shows an affinity with other associations and sub-associations in species groups F, H, N and T (Table 24). The average number of plant species encountered per sample plot is 25, with the total number for this association being 59 (six relevés) (Table 26). The SCPE near-endemic *Petalidium oblongifolium* is restricted to this sub-association. A further two endemics, two near-endemics and two Red Data List taxa occur (Table 25).

## 2. *Melhanio rehmannii*–*Acacietum tortilis* ass. nova hoc loco

Nomenclatural type: relevé 368 (holotypus)

*Environmental data.* The vegetation is short sparse open shrubland that is associated with valleys, footslopes and lower midslopes of hills. It is managed for grazing purposes in and around to the Potlake Nature Reserve. It is situated on relatively level slopes (1–5°) and with a surface rock cover percentage of 5–15% (Table 26). Average rock diameter is approximately 100–500 mm (Table 26).

*Diagnostic and dominant/prominent taxa.* Characteristic species of the association are represented in species group B (Table 24). *Corchorus asplenifolius*, *Corbichonia decumbens*, *Limeum viscosum*, *Melhania rehmannii*, *Ptycholobium contortum*, *Solanum coccineum*, *S. panduriforme* and *Sericorema remotiflora* are the diagnostic forbs. Diagnostic grasses for the association include *Schmidtia pappophoroides* and *Tricholaena*



*monachme*. *Eragrostis barbinodis*, *Panicum maximum* and *Tragus bertoronianus* are abundant grasses. Diagnostic woody species typical of the association include the small trees *Acacia mellifera*, *Balanites maughamii*, *Commiphora pyracanthoides* and *Euclea undulata*. *Acacia grandicornuta*, *A. tortilis*, *Dichrostachys cinerea*, *Ehretia rigida* and *Rhus engleri* are the dominant small trees of the association.

*Notes on floristic diversity.* The association shows strong floristic affinities with the other associations of the study area in especially species groups N, T and W (Table 24). The average number of plant species encountered per sample plot is 40, with the minimum total number of species estimated for this association being 110 (34 relevés) (Table 26). Of the three taxa restricted to this association one is a SCPE endemic *Aloe* sp. nov. (Siebert 1419) and the other a SCPE near-endemic *Huernia stapelioides* (Table 25). The highest number of endemics (4) and near-endemics (3) occur in this association, which is also the community with the highest number of taxa (10) with a conservation value.

2.1 *Melhanio rehmannii*–*Acacietum tortilis grewetosum bicoloris* sub-ass. nova hoc loco  
Nomenclatural type: relevé 354 (holotypus)

*Environmental data.* In the study area this sub-association represents vegetation units on black loam soils underlain by gypsum-rich lower horizons. This short shrub thicket occurs on moderately sloped (3–5°) of footslopes and lower midslopes of hills. It occurs on predominantly northern aspects. The dominant soil types are melanic, namely the Steendal form (soft carbonate B-horizon) interspersed by Milkwood form (A-horizon underlain with hard rock). Rocks cover a relatively small area of approximately 10–15% of the soil surface, with an average size of 100–400 mm (Table 26).

*Diagnostic and dominant/prominent taxa.* Species group C contains the diagnostic species for this sub-association (Table 24), which are dominated by the woody shrub species *Cadaba aphylla*, *Grewia bicolor* and *Triaspis hypericoides* subsp. *nelsonii*. The climber *Dregea macrantha*, and the forbs *Hybanthus enneaspermus*, *Indigofera tristoides*, *Limeum pterocarpum*, *Oropetium capense*, *Psiadia punctulata* and *Tephrosia burchellii*, and the succulents *Huernia stapelioides*, *Opuntia ficus-indica* (naturalised alien), *Portulaca*

*kermesina*, *Sarcostemma viminale* and *Talinum arnotii* are the diagnostic herbaceous taxa. Other prominent taxa of the sub-association include the trees *Acacia grandicornuta*, *A. mellifera*, *Albizia anthelmintica*, *Commiphora pyracanthoides*, *Croton menyhartii* and *Ptaeroxylon obliquum*. Forbs such as *Becium filamentosum*, *Hibiscus praeteritus*, *Lantana rugosa*, *Melhania rehmannii* and *Seddera suffruticosa* occur frequently. Dominant grasses are *Aristida congesta*, *Eragrostis barbinodis*, *Panicum maximum*, *Schmidtia pappophoroides* and *Tragus berteronianus*.

*Notes on floristic diversity.* Floristically the sub-association is noteworthy in that it shows a link with association 3 in species group R (Table 24). Plant species encountered per sample plot average 50 and the total number recorded for this association was 110 (five relevés) (Table 26). One SCPE near-endemic is restricted to this association, namely *Huernia stapelioides*. One SCPE endemic, three SCPE near-endemics and two Red Data List taxa of conservation value are part of this association (Table 25).

2.2 *Melhanio rehmannii*-*Acacietum tortilis rhigozetosum obovati* sub-ass. nova hoc loco  
Nomenclatural type: relevé 368 (holotypus)

*Environmental data.* This sub-association is tall, closed shrubland of footslopes and midslopes. It occurs on relatively deep loam soils of the Valsrivier form (ortic A-horizon over a pedocutanic B-horizon) that is interspersed with shallow soils of the Glenrosa form (ortic A-horizon over a lithocutanic B-horizon). It prefers south-easterly aspects of hills. The habitat is characterised by gentle slopes of approximately 1–5°. Rock cover of the surface is 10–20%, with rocks reaching a maximum average size of 300–500 mm (Table 26).

*Diagnostic and dominant/prominent taxa.* Diagnostic species are presented in species group D (Table 24). The shrub *Rhigozum obovatum* is the diagnostic woody species. *Aneilema hockii*, *Asparagus suaveolens*, *Barleria prionitis*, *Commelina livingstonii*, *Melhania virescens*, *Mollugo nudicaulis* and *Polygala hottentotta*. Other diagnostic species comprise the succulents *Aloe* sp. (Siebert 1419), *Portulaca quatrifida* and *Stapelia gettliffei*. The grasses are the common and abundant *Aristida congesta*, *Eragrostis*

*barbinodis*, *Panicum maximum* and *Tragus berteronianus*. Forbs that occur frequently are *Felicia clavipilosa*, *Melhania rehmannii*, *Phyllanthus maderaspatensis* and *Seddera suffruticosa*. Conspicuous trees/shrubs include *Acacia luderitzii*, *A. tortilis*, *Croton menyhartii* and *Ptaeroxylon obliquum*.

*Notes on floristic diversity.* Floristically the sub-association, together with sub-association 1.2, is noteworthy in that it shows a link with association 3 in species group R (Table 24). The average number of species encountered per sample plot is 46, with the total number for this sub-association being 92 (four relevés) (Table 26). An undescribed Sekhukhuneland Centre endemic, *Aloe* sp. nov. (*Siebert 1419*), is restricted to the communities of this sub-association. Of the two SCPE endemic and two SCPE near-endemic taxa, one is a Red List taxon with conservation value (Table 25).

2.3 *Melhanio rehmannii–Acacietum tortilis diospyretosum lycioidis* sub-ass. nova hoc loco  
Nomenclatural type: relevé 360 (holotypus)

*Environmental data.* This sub-association represents short, sparse open tree savanna of footslopes and lower midslopes on red loam soils. It lies on gently sloped areas on southern aspects of undulating hills (1–5°). Soils are predominantly of the Shortlands form (ortic A-horizon with a red-structured B-horizon), interspersed with soils of the Glenrosa form. Rock cover of the surface is 10–20%, with rocks reaching a maximum size of 100–400 mm in diameter (Table 26).

*Diagnostic and dominant/prominent taxa.* Diagnostic species are represented by species group G (Table 24). *Diospyros lycioides* is the only woody diagnostic species in the sub-association. However, the syntaxon is rich in diagnostic forbs which include *Coccinia rehmannii*, *Dipcadi viride*, *Melhania acuminata*, *Phyllanthus incurvus* and *Pollichia campestris*. Only one diagnostic graminoid occurs, namely *Eragrostis trichophora* along the footpaths. Other dominant grasses are *Aristida congesta*, *Cenchrus ciliaris*, *Eragrostis barbinodis*, *Schmidtia pappophoroides*, *Tragus berteronianus* and *Urochloa mosambicensis*. Prominent forbs are *Blepharis integrifolia*, *Monechma divaricatum*, *Pechuel-Loeschea leubnitzia*, *Phyllanthus maderaspatensis* and *Seddera suffruticosa*.



Dominant, conspicuous woody species include the small trees *Acacia tortilis*, *A. mellifera* and *Ehretia rigida*.

*Notes on floristic diversity.* Species groups J and K shows the relationship between this vegetation unit and the other sub-associations of association 2 (Table 24). In this sub-association the average number of plant species encountered per sample plot is 34, with the total number for this sub-association being 87 (seven relevés) (Table 26). No taxa with conservation are restricted to the sub-association. Four taxa of conservation value are present and include one SCPE endemics, two near-endemics (one is also a Red List taxon) and a Red Data List species (Table 25).

2.4 *Melhanio rehmannii*–*Acacietum tortilis acacietosum niloticae* sub-ass. nova hoc loco  
Nomenclatural type: relevé 361 (holotypus)

*Environmental data.* This association represents short secondary thicket. It occurs on deep, loam clay soils (500–1000 mm) of the Valsrivier form (ortic A-horizon). It is situated on gently sloped footslopes and valleys (1–3°) that are heavily grazed. It is found predominantly on north and south aspects. Approximately 5–10% of the soil surface is covered by rocks, with an average size of 200–400 mm (Table 26).

*Diagnostic and dominant/prominent taxa.* Diagnostic species are represented by species group I (Table 24). The diagnostic woody species found in the association are the trees *Acacia nilotica* and *Ziziphus mucronata*, and the shrub *Gossypium herbaceum*. Diagnostic forbs are plentiful and include the geophyte *Dipcadi glaucum*, the climber *Pergularia daemia*, and herbs *Hibiscus palmatus*, *Ipomoea magnusiana*, *Kohautia cynanchica*, *Lycium cinereum*, *Polygala uncinata*, *Seddera capensis* and *Tragia rupestris*. Diagnostic grass species are *Eragrostis rigidior* and *Melinis repens*. Although disturbed, the grass cover is dense and species rich, including graminoids such as *Aristida adscensionis*, *A. congesta*, *Enneapogon cenchroides*, *Eragrostis barbinodis*, *Panicum maximum*, *Tragus berteronianus* and *Urochloa mosambicensis*. The association is dominated by the encroachment of *Acacia tortilis*, with other conspicuous trees including *Albizia anthelmintica*, *Cadaba termitaria*, *Dichrostachys cinerea* and *Ehretia rigida*. Herbs

are frequent and this species rich growth form is dominated by *Corchorus asplenifolius*, *Gisekia africana*, *Hermannia odorata*, *Hibiscus praeterius*, *Indigastrum costatum*, *Lantana rugosa*, *Leucas capensis*, *Melhanio rehmannii*, *Monechma divaricatum*, *Phyllanthus maderaspatensis* and *Solanum panduriforme*.

*Notes on floristic diversity.* Species groups J, K and L (Table 24) show the strong floristic relationship that exists with association 1. Species group Q indicates a slight floristic link with association 3. The average number of species encountered per sample plot is 38, with the total number for this association being 109 (11 relevés) (Table 26). *Gossypium herbaceum* subsp. *africanum*, a Red Data List taxon described as Insufficiently Known (K) for Swaziland, is the only species restricted to the association. Altogether there are six taxa of conservation value that include three SCPE endemics, two near-endemics (one also a Red List taxon) and the Red Data List species mentioned above (Table 25).

#### 2.5 *Melhanio rehmannii*–*Acacietum tortilis indigoferetosum rhytidocarpae* sub-ass. nova hoc loco

Nomenclatural type: relevé 370 (holotypus)

*Environmental data.* In the Arid Northern Bushveld of the SCPE this association represents plant communities of disturbed zones of previously cultivated land. The soils are characterised by melanic loams of the Bonheim form (pedocutanic B-horizon). This short, open disturbed tree savanna occurs in the valleys and on lower footslopes. It is characterised by gentle slopes of 1–3° (Table 26). The vegetation of the alliance prefers warmer northern aspects. Average rock size varies from 300–400 mm in diameter and cover 05–10% of the soil surface (Table 26).

*Diagnostic and dominant/prominent taxa.* Species group M contains the diagnostic species for this association (Table 24). Diagnostic grasses for the association are *Eragrostis biflora* in the shade, *Sporobolus nitens* in the open and the alien *Dactyloctenium aegyptium* where water collects. No diagnostic woody species were recorded for this association, however, diagnostic forbs are frequent and dominant. The herbs are *Corallocarpus bainesii*, *Dipcadi gracillimum*, *Indigofera circinnata*, *I. rhytidocarpa*, *Ipomoea sinensis*, *Kohautia*

*aspera*, *Leucas sexdentata*, *Limeum sulcatum*, *Peliostomum leucorrhiza*, *Phyllanthus burchellii* and *Trianthema salsoloides*. Certain alien forb species are also diagnostic of this association, namely *Acalypha segetalis*, *Amaranthus thunbergii* and *Schkuhria pinnata*. Dominant grasses of the association include *Aristida congesta*, *Chloris virgata*, *Eragrostis barbinodis*, *Sporobolus ioclados*, *Tragus berteronianus* and *Urochloa mosambicensis*. Prominent forbs are *Becium filamentosum*, *Corchorus asplenifolius*, *Felicia clavipilosa*, *Gisekia africana*, *Hermannia modesta*, *Phyllanthus maderaspatensis* and *Seddera suffruticosa*. *Acacia tortilis* dominates the association with *A. grandicornuta* and *Dichrostachys cinerea* to a lesser degree.

*Notes on floristic diversity.* A strong floristic relationship exists with associations 1 and 2 in species groups N and association 2 and 3 in species group S (Table 24). In this association the average number of plant species encountered per sample plot is 39, with the total number for this sub-association being 108 (seven relevés) (Table 26). In the Arid Northern Bushveld this is the association with the most plant species with Red Data List categories (three taxa). Five taxa of conservation value can be found and include two endemic and one near-endemic species (Table 25).

### 3. *Enneapogono cenchroidis*–*Salvadoretum australis* ass. nova hoc loco

Nomenclatural type: relevé 356 (holotypus)

*Environmental data.* This short, closed to open tree savanna represents relatively undisturbed vegetation units of predominantly warm, but moist, northerly aspects. It is characterised by gentle footslopes and valley undulations (1–3°). The dominant soil type is the Steendal form. Average rock size varies between 250 and 400 mm in diameter and covers 05–15% of the soil surface.

*Diagnostic and dominant/prominent taxa.* Species group O (Table 24) contains the diagnostic species for this association in the Arid Northern Bushveld of the SCPE, which are characterised by diagnostic tree species such as *Acacia robusta*, *Cordia monoica*, *Maerua edulis* and *Salvadora australis*. Diagnostic grasses are plentiful and include *Brachiaria deflexa*, *Diplachne eleusine*, *Enneapogon desvauxii*, *Eragrostis curvula* and

*Setaria verticillata*, *Abutilon grandiflorum*, *Hibiscus micranthus*, *Justicia odora*, *Pegolettia senegalensis* and the succulent *Sansevieria hyacinthoides* are the diagnostic forbs of the association. Prominent, frequently occurring trees of the association include *Acacia grandicornuta*, *Boscia foetida* and *Cadaba termitaria*. Graminoids such as *Aristida adscensionis*, *Cenchrus ciliaris*, *Chloris virgata*, *Enneapogon cenchroides*, *E. scoparius*, *Sporobolus ioclados* and *Tragus berteronianus* dominate the grass layer. Forbs that are common include *Barleria senensis*, *B. virgula*, *Becium filamentosum*, *Blepharis integrifolia*, *Hermannia modesta*, *Ruellia patula* and *Tribulus terrestris*.

*Notes on floristic diversity.* Floristically this association shows an affinity with all the other associations of the Arid Northern Bushveld of the SCPE (Table 24). On average 48 species were recorded per sample plot for this association, with a total of 98 different plant species overall (four relevés) (Table 26). No taxa of conservation value are restricted to this association, however, one SCPE endemic, one SCPE near-endemics and two Red Data List taxa occur (Table 25).

#### 4. *Urochloa panicoidis*–*Agavetum americanae* ass. nova hoc loco

Nomenclatural type: relevé 390 (holotypus)

*Environmental data.* Association of sparse, open, species-poor savanna on disturbed, compacted soils adjacent to natural migration routes of the Pedi and their domestic livestock. It lies on gently sloped undulating valleys of 1–3°. All aspects are favoured. Soils are diverse and may include turf soils such as the Arcadia form (vertic A-horizon), clay soils such as the Steendal form (melanic A-horizon), loam soils such as the Shortlands form (ortic A-horizon, red-structured B-horizon) and sandy soils such as the Hutton form (ortic A-horizon, red-apedale B-horizon). Approximately 05–10% of the soil surface is covered by stones with an average size of 50–100 mm (Table 26).

*Diagnostic and dominant/prominent taxa.* Diagnostic species are represented by species group U (Table 24). A sparse herb layer dominates the vegetation unit with the predominant diagnostic forbs including *Aptosimum lineare*, *Chamaesyce prostrata* (alien species), *Dicoma tomentosa*, *Felicia mossamedensis*, *Geigeria burkei*, *Indigofera spicata*,

*Melhania forbesii*, *Phyllanthus parvulus*, *Sida dregei* and *Withania somnifera*. *Aristida canescens*, *Eragrostis racemosa*, *Heteropogon contortus* and *Urochloa panicoides*. The large succulent alien species, *Agave americana*, is the dominant diagnostic in the association. Large individuals of *Schotia brachypetala* are scattered in this anthropogenic grassland and dense clumps of the succulent *Euphorbia tirucalli* are also common. The vegetation is species-poor due to long-term wood harvesting and overgrazing and trampling by cattle and goats. *Aristida congesta* and *Eragrostis barbinodis* are other dominant grasses of the association. No other common species of the local bushveld type of the study area occur frequently in this association.

*Notes on floristic diversity.* Floristically the association only shows a slight relationship with the other associations in species groups V and W (Table 24), however this association is distinct and is only grouped with the other associations due to its locality in the SCPE and its anthropogenical alteration. Plant species encountered per sample plot average 24 and the total number recorded for this association was 55 (three relevés) (Table 26). Three taxa of conservation value are restricted to this association, namely the SCPE near-endemics *Aloe castanea* and *Grewia vernicosa* and a common endemic taxon (Table 25). These are also the only taxa of conservation value found in this association.

#### 9.4 Vegetation key

A vegetation key is presented to facilitate plant community identification (Table 27). The definitions are broad indications of typical groups and should be seen as a guideline. A diagnostic characteristic of the vegetation or habitat is given, followed by the most diagnostic and visual species of a group. The first species is restricted to the specific group only, and the second is dominant in the group, but also occurs in other groups. Where one species is given, no species was restricted to the group only.

#### 9.5 Ordination

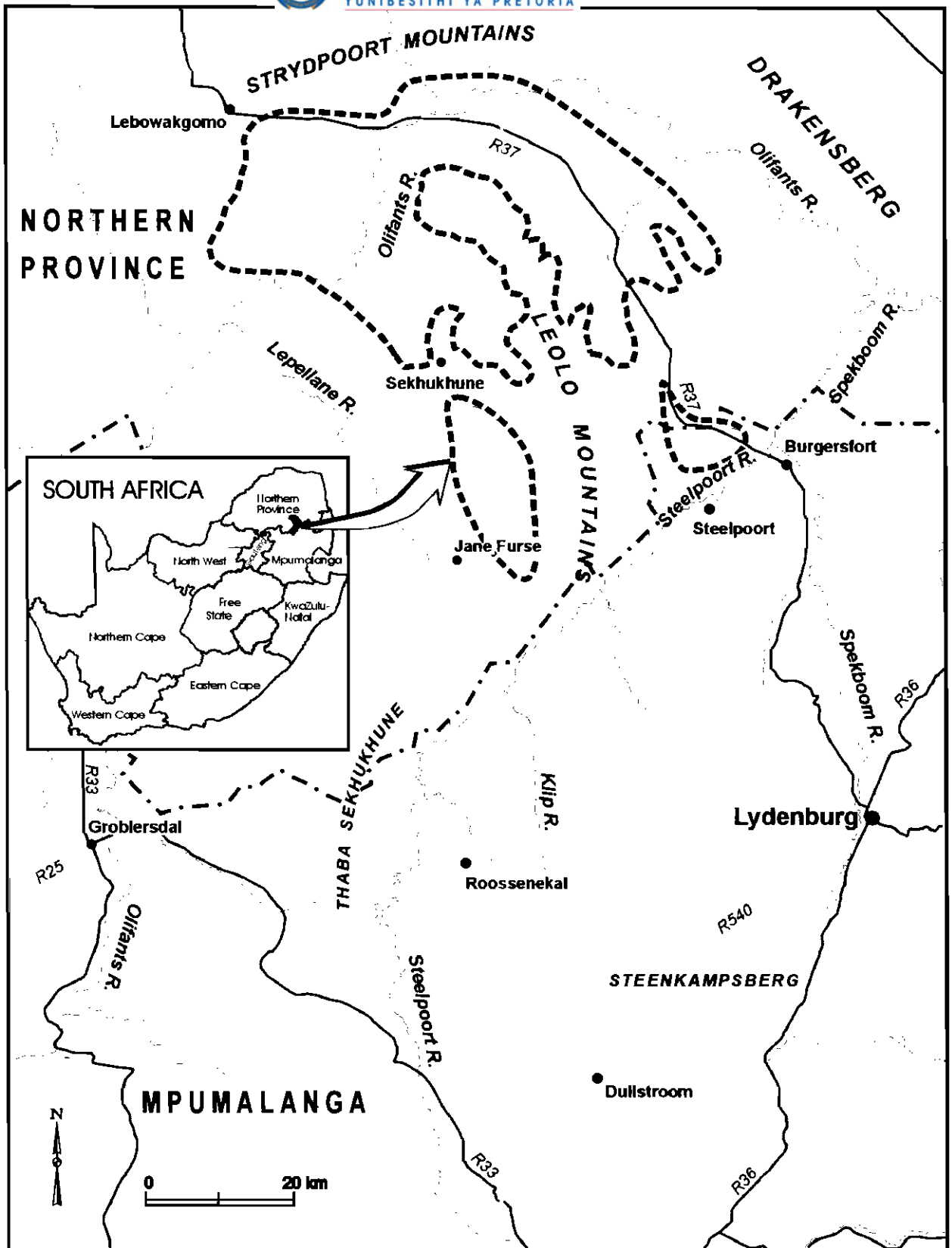
On a regional scale the northern bushveld vegetation of the SCPE is characterised as naturally sparsely vegetated due to aridity, with many taxa that are locally typical for this



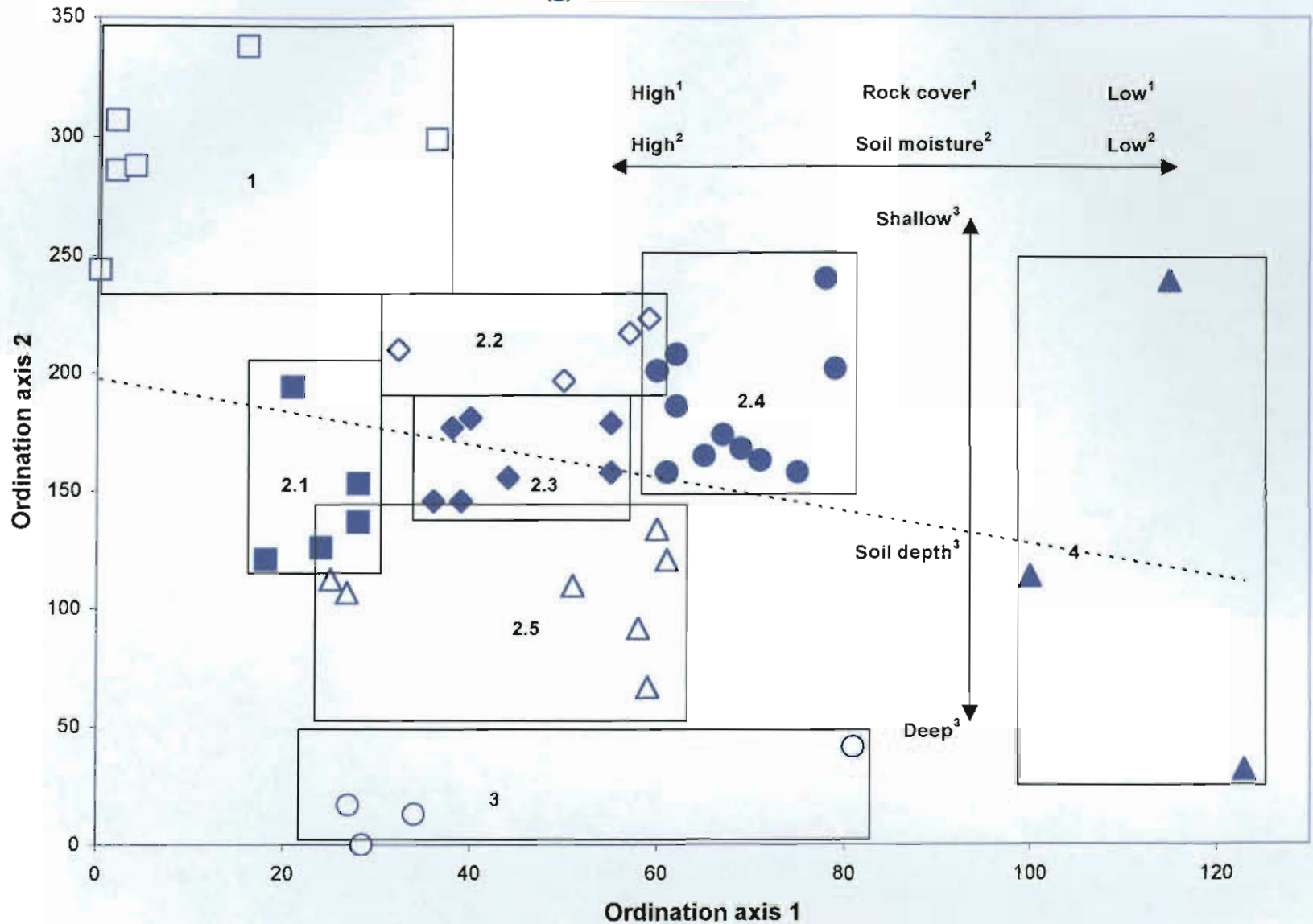
habitat—occurring nowhere else in the study area. When compared with other habitats of the SCPE, the major environmental factors such as climate and geology for this major vegetation group is relatively homogeneous. However, a combination of factors such as rock cover, soil moisture and soil depth affects the species composition of its plant communities. The ordination indicated the gradients which are mainly caused by topography.

The scatter diagram displays the distribution of relevés along the first and second ordination axes (Figure 16). The vegetation units are represented as groups, their distribution on the diagram corresponding with certain physical environmental conditions. The rockiness and soil properties determine a definite gradient that is depicted by both the first (eigen value = 0.629) and second axis (eigen value = 0.344). Rockiness, soil moisture and soil depth determines the moisture retention and drainage of the habitat. The gradient on the x-axis expresses rock cover as a percentage of the soil surface, with the left of the scatter diagram representing rocky foot slopes with and the right depicting the open valley plains. This relates closely to soil moisture, as rock covered soils have large resources of available water. On the y-axis, the gradient indicates deeper soils at the bottom of the graph that indicates water availability over the long term, because deep clayey soils remain moist over a longer period. Steep slopes with shallow soils dry out quickly and are at the top of the diagram. The scatter diagram exhibits a gradient from the top, left corner (available moisture in the wet season) to deep, clay soils at the bottom, right corner (low soil moisture due to water retention, but a valuable resource in the dry season).

All these gradients correlate closely with each other and have a strong influence on the vegetation structure and species composition. The three most dominant and conspicuous taxa of each growth form (trees/shrubs/suffrutices, forbs/sedges and grasses) are given for each of the eight major vegetation types depicted in the scatter diagram (Table 28).



**Figure 15** Location of the Arid Northern Bushveld of the Sekhukhuneland Centre of Plant Endemism in the Northern Province, South Africa.



**Figure 16** Relative positions of all the releves along the first and second axis of the ordination of the Arid Northern Bushveld of the Sekhukhuneland Centre of Plant Endemism. Numbers correspond with the plant communities in Table 24.

**Table 24** A phytosociological table of the Arid Northern Bushveld of the Sekhukhuneland Centre of Plant Endemism.

Releve	3 3 3 3 3	3 3 3 3 3	3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3	3 3 3 3 3 3 3	3 3 3 3 3 3 4
	7 7 8 8 8 8	4 4 5 5 8	4 8 8 7	5 5 5 8 7 7	7 8 9 0 1 7 8	4 4 4 5 5 5 6 6 8 8 8 7	1 2 9 9 0 3 5	4 4 4 8 7 7 7	4 5 5 8 9 9 0
	2 8 0 1 2 3	0 6 0 4 8	4 7 8 4						7 2 6 5 0 6 2
Association	1	2	2	2	2	2	2	2	3
Sub-association	1	1	2	3	4	5	5	5	4
Species group A									
<i>Panicum coloratum</i>	1 + 1 1 1 1							R	
<i>Maerua cefra</i>	+ + + R		R					R	
<i>Blepharis pruinosa</i>	R + + R R	R						R	
<i>Helichrysum cerastoides</i>	1 . R + R								
<i>Polygala sp. (SS 449)</i>	+ . . . R R					R			
<i>Petalidium oblongifolium</i>	. 1 1 1 A 1								
<i>Mundulea sericea</i>	. 1 + + +	R		R					
<i>Cleome angustifolia</i>	. + + + +	R	R					R	
<i>Eustachys paspaloides</i>	. R R +								+
<i>Fingerhuthia africana</i>	. + + + R						R		
Species group B									
<i>Schmidia peppohoroides</i>	. . . +	1 R + + +	+ + + +	1 1 1 + R	R R + . . . R	+ + + +	R + R + R		
<i>Methania rehmannii</i>	. R . . .	+ + + + R	+ + + +	+ R + 1	+ + + + R	+ + + +	R . + + R		R
<i>Ptychobium contortum</i>	. . . . .	+ + + + R	+ + + +	R R . . .	R . . . .	R . . . .	R . + R R		
<i>Tricholena monachne</i>	. . . . .	R . . + R	R . R . .	R . . . .	R + . . . .	+ 1 . . . .	R . . R R		
<i>Limium viscosum</i>	. . . . .	. . . + R	+ R R R	R R + + +	. . . . .	. . . . .	+ R . . . .		R
<i>Solanum coccoineum</i>	. R . . .	+ R R +	R + . . .	R R + . . .	R R . . . .	+ R + R + + +	+ R . R . .		R
<i>Corchorus esplenoides</i>	R . . . .	R . . +	. . . . .	+ + + +	R . . . .	+ + + + + R	+ + + + 1 R		
<i>Sarcocoma remotiflora</i>	. . . . .	. . . +	. . . . .	. . . . .	R . . . .	1 . . . .	. . . . .		
<i>Corbichonia decumbens</i>	. . . . .	. . . +	R . . . .	. . . . .	+ + + +	+ + + +	+ . R R . .		
<i>Solanum panduriforme</i>	. . . . .	. . . + R	+ . R . .	R . R R +	1 + + + R	R . . . .	R . . . .		R
Species group C									
<i>Grewia bicolor</i>	. . . . .	R + + 1 R							R
<i>Hybanthus enneaspermus</i>	. . . . .	R + R . R						R	
<i>Cadaba aphylla</i>	. . . . .	R + . R							
<i>Talinum amotii</i>	. . . . .	R + . R + R						R	R
<i>Opuntia ficus-indica</i>	. . . . .	A . . R							
<i>Tephrosia burchellii</i>	. . . . .	+ + + . R				R + . . .			+
<i>Sarcostemma viminalis</i>	. . . . .	R R + +	R					R	R
<i>Huemia stapelioides</i>	. . . . .	R . R +							
<i>Indigofera tristoides</i>	. R . . .	+ . . 1 R					R		
<i>Limium pterocarpum</i>	. . . . .	. . . R							+
<i>Psidium punctulata</i>	. . . . .	R R . R							
<i>Triaspis hyperoides subsp. nelsonii</i>	. . . . .	. 1 + R .							
<i>Oropetium capense</i>	. . . . .	. R . R +							
<i>Dregea macrantha</i>	. . . . .	. R . R R							
<i>Portulaca kermesina</i>	. . . . .	. . R R R							
Species group D									
<i>Polygala hottentotta</i>	. . . . .	. R . . .	+ + + R	R . . . .	R . . . .				
<i>Mollugo nudicaulis</i>	. . . . .	. . . . .	+ R R R						
<i>Barleria prionitis</i>	. . . . .	. . . . .	R R 1 .						
<i>Commelina livingstonii</i>	. . . . .	R . . . .	+ + . R						
<i>Aloe sp. (SS 1419)</i>	. . . . .	. . . . .	+ R . R						
<i>Asparagus suaveolens</i>	. . . . .	. R . . .	+ . R 1						R
<i>Aneilema hockii</i>	. . . . .	. . . . .	+ . R R						
<i>Stapelia geiffii</i>	. R . . .	. . . . .	+ . . .						
<i>Rhigozum obovatum</i>	. . . . .	. . . . .	+ A R .	R . . . .					
<i>Portulaca quadrifida</i>	. . . . .	. . . . .	+ + R .					R	
<i>Methania virscens</i>	. . . . .	. . . . .	+ . R .						
Species group E									
<i>Kalanchoe paniculata</i>	. . . . .	. R R . +	. . + R						
<i>Acacia nederitzi</i>	. . . . .	+ A . . .	A + . . .					+	
<i>Rhus gweintii</i>	. . . . .	R . R +	. . + R		R . . . .				
<i>Blepharis diversispina</i>	. . . . .	R . . +	+ R . . .						
Species group F									
<i>Ptaeroxylon obliquum</i>	+ R . +	B 1 . R	B R 1 .				R . . . .	R	
<i>Blepharis subvolutiilis</i>	. R . +	R . . +	+ + R R				R . . . .		
<i>Croton menyhertii</i>	. A A 1 A	B 1 A .	B A B B					+	R
<i>Asparagus africanus</i>	. 1 . R R	. R R +	+ + . .			R . . . .			R R
Species group G									
<i>Pollichia campestris</i>	. . . . .	. . . . .	. R . . .	R . . +	R . . . .				
<i>Eragrostis trichophora</i>	. . . . .	. . . . .	. R . . .	R . . +					
<i>Methania acuminata</i>	. . . . .	. . . . .	. R . . .	R . . +					
<i>Dipcadi viride</i>	. . . . .	. . . . .	. + R +	R . . .					
<i>Diospyros lycioides</i>	. . . . .	. . . . .	. R + R +				R . . . .		R



Table 24 continued.

Relevé	3 3 3 3 3 3	3 3 3 3 3	3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3 3	3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 4
Association	1	2	2	2	4	5	3	4
Sub-association	1	1	2	3	4	5	3	4
<b>Species group G cont.</b>								
<i>Phyllanthus incurvus</i>				. + . + . 1				
<i>Coccinia rehmannii</i>				. R R + R R		. R		R
<b>Species group H</b>								
<i>Commiphora pyracanthoides</i>	+ 1 . + .	1 1 R + 1	. R A +	. + + R .	. . . . . R .			+ . . . . .
<i>Geigeria filifolia</i>	+ . . + + .	. . . . . R R	R .	. + + R . +	. . . . .			. . . . .
<i>Acacia mellifera</i>	. A 1 R R +	1 . 1 . A	+ . . . . .	1 1 R + . 1	. . . . .			. . . . . R
<i>Euclea undulata</i>	. + + + R .	R . 1 1		R + R + . +	. . . . . R			. . . . .
<i>Balanites maughanii</i>	. + + 1 +	+ . . . . .	R + + . . .	. + + R + . +	. . . . .			. . . . . R
<i>Digitaria eriantha</i>	. R . R .	+ . . . . .	+ R .	. + . R R	. . . . .			. . . . . R
<b>Species group I</b>								
<i>Kohautia cynanchica</i>	. . . . . R .	. . . . .			. + + . + . + R	. R R . . . . .		. . . . .
<i>Eragrostis rigidior</i>					. + R 1 1 . R +	. . . . .		. . . . . R
<i>Hibiscus palmatus</i>					R . + R . . + R R	. . . . .		. . . . . R
<i>Tragia rupestris</i>					R . . . . . R + + .	. . . . .		. . . . .
<i>Ziziphus mucronata</i>					R . . . . . + 1 . R .	. . . . .		. . . . .
<i>Acacia nilotica</i>					1 R 1 + 1 + . R +	. . . . . R		. . . . .
<i>Dipcadi glaucum</i>					. + R . . . . . R .	. . . . .		. . . . .
<i>Gossypium herbaceum</i>					. + R . . . . . R +	. . . . .		. . . . .
<i>Ipomoea magnusiana</i>					R + . . . . . R .	. . . . .		. . . . .
<i>Polygala uncinata</i>					R . + . . . . . R .	. . . . .		. . . . .
<i>Seddera cepensis</i>					. + + . . . . . 1 +	. . . . . R		. . . . .
<i>Lycium cinereum</i>				R .	. + . . . . . R + + R	. . . . .		. . . . . R
<i>Melinis repens</i>					. . . . . R R . + . +	. . . . .		. . . . .
<i>Pergularia daemia</i>					. . . . . + R + +	. . . . .		. . . . .
<b>Species group J</b>								
<i>Indigostrum costatum</i>					. + . + . + . + . + . + + + + + 1 1 +	. R . . . . .		. . . . .
<i>Acalypha indica</i>					. + R . R R . + .	R . . . . . R + . + R		. . . . . R
<i>Pecthel-Loeschea leubnitzia</i>					R . + . 1 + . + 1	. + 1 . + . R 1 .	. R . . . . .	. . . . . R
<i>Senna italica</i>	R . . . . .				R + . . . . . + + R	. . . . .		. . . . . R R
<b>Species group K</b>								
<i>Hibiscus praeteritus</i>		1 R R +	+ + + .	. + . . . . . +	. + + R + . 1 + + 1 R	R . . . . .		. . . . . R R
<i>Kyphocarpa angustifolia</i>		. + + + R	. . . . . +	. . . . . + R +	. . . . . + . . . . R . R	. . . . .		. . . . . R +
<i>Hibiscus pusillus</i>		. + R + R	. . . . .	. + R . . . . . +	. . . . . R R R .	. . . . .		. . . . .
<i>Grewia flava</i>		R R . 1	. . . . .	R . + . . . . . R 1	R . . . . . R 1 . . . . 1	. . . . .		. . . . .
<i>Evolvulus alsinoides</i>	R . . . . .	. + . . . . .	+ R . . . . .	. . . . . + R	. + + R . + + + +	R . . . . .		. . . . . R
<b>Species group L</b>								
<i>Rhus angleri</i>	. A + R R +	. R . . 1	. . . . . R .	. + . + . R + R .	. A R R R +	. . . . .		. . . . . R .
<i>Panicum maximum</i>	. + + . . . . .	1 . R 1 +	+ + + 1	1 R R + . R R	+ + + B B + 1 A 1	. . . . .		. . . . . R
<b>Species group M</b>								
<i>Indigofera rhytidocarpa</i>	R . . . . .	. . . . . R	. . . . .	. R . . . . .	. . . . .	. + R + + + +	R . . . . .	. . . . .
<i>Dactyloctenium aegyptium</i>						. + R . R . +	. . . . .	. . . . .
<i>Amaranthus thunbergii</i>	. R . . . . .	. . . . . R	. . . . .	. . . . .	. . . . .	R + . R . R	. . . . .	. . . . .
<i>Eragrostis biflora</i>						. + + + R . R	. . . . .	. . . . .
<i>Leucas sexdentata</i>						. + + + R .	. . . . .	. . . . .
<i>Schkuhria pinnata</i>		R . . . . .	. . . . .	. . . . .	. . . . .	R . . . . . R	. . . . .	. . . . . R
<i>Indigofera circinnata</i>						R . . . . . +	. . . . .	. . . . .
<i>Dipcadi gracillimum</i>						. + R . R R	. . . . .	. . . . .
<i>Sporobolus nans</i>						. . . . . R R R 1	. . . . .	. . . . .
<i>Phyllanthus burchellii</i>						. R . R . +	. . . . .	. . . . .
<i>Kohautia aspara</i>	R . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	R . . . . . +	. . . . .	. . . . .
<i>Vernonia fastigiata</i>						. . . . . R . . . .	. . . . .	. . . . .
<i>Peliosotum leucorrhiza</i>						. . . . . R + +	. . . . .	. . . . .
<i>Trianthema salsoloides</i>					R . . . . .	. . . . . R R +	. . . . .	. . . . . R
<i>Corallocarpus bainesii</i>						. . . . . R R R	. . . . .	. . . . .
<i>Ipomoea sinensis</i>						. . . . . + R R R	. . . . .	. . . . .
<i>Acalypha vegetalis</i>						. . . . . + . R R	. . . . .	. . . . .
<i>Limnium sulcatum</i>		R . . . . .	. . . . .	. . . . .	. . . . .	. . . . . + + R	. . . . .	. . . . .
<b>Species group N</b>								
<i>Indigofera enornis</i>	. + + + + +	R A + . +	+ R + + .	. 1 + + . R	. + + + . R . . . .	R . . . . . + + R	. . . . .	. . . . .
<i>Monechma divaricatum</i>	. + + + + .	. R 1 + +	. + + 1	. + . 1 . 1	1 + 1 1 1 1 . 1 1	. + 1 . R + .	. . . . .	. . . . .
<i>Pinthius rehmannii</i>	. + R + + .	. . . . . R	. . . . .	. . . . .	. . . . . R R	. . . . .		. . . . .
<i>Gisekia africana</i>	. + . . . . .	R + + + .	+ 1 R .	R + R R .	. + + + + B + . . . . R 1 1	. + + + . + 1	. . . . .	. . . . .
<i>Dichrostachys cinerea</i>	. R . + .	R . + 1	. . . . . R	R R + .	1 R A . 1 R A R . 1 +	. 1 + R + .	. . . . . R R	. . . . .
<i>Hermannia odorata</i>	. + + + +	R + + + +	+ R + .	R + + R +	+ R + 1 + + + + + +	. . . . .		. . . . . R
<b>Species group O</b>								
<i>Salvadora australis</i>						. . . . .		1 1 1 1
<i>Justicia odora</i>						. . . . . R . . . .		+ 1 1 1





Table 24 continued.

Relevé	3 3 3 3 3 3				3 3 3 3 3 3				3 3 3 3 3 3				3 3 3 3 3 3				3 3 3 3 3 3				3 3 3 3 3 3								
	7 7 8 8 8 8				4 4 5 5 6 6				4 8 8 7 5 5 6 7 7				4 4 4 5 5 6 6 6 7				4 4 4 6 7 7 7				4 5 5 6 9 9 0								
	2 9 0 1 2 3				0 8 0 4 6 4 7 8 4				7 6 9 0 1 7 8				3 5 8 1 3 5 1 2 3 4 6				1 2 9 9 0 3 5				7 2 6 5 0 6 2								
Association	1				2				2				2				2				3				4				
Sub-association	1				2				3				4				5				6				7				
<b>Species group O cont.</b>																													
<i>Meerua edulis</i>					R																R 1 . 1								
<i>Bracharia deflexa</i>					R								R								+ R . R								
<i>Acacia robusta</i>									+				+								A 1 1								
<i>Seselia verticillata</i>									+												+ +								
<i>Cordia monoica</i>																					1 . R								
<i>Pegolletia senegalensis</i>																					+ 1 .								
<i>Hibiscus micranthus</i>																					+ R .								
<i>Sansevieria hyacinthoides</i>																					+ 1								
<i>Abutilon grandiflorum</i>									R												+ R +								
<i>Eragrostis curvula</i>													R R								+ R +								
<i>Diplachne elausina</i>																					+ R .								
<i>Enneapogon desvauxii</i>																					+ R								
<b>Species group P</b>																													
<i>Limnium argute-carneum</i>	R																	+ . . R +				+ . . .							
<i>Boscia foetida</i>	R					R				R				R				+ . R 1 R				+ . . .							
<i>Asystasia subbiflora</i>													R				R + . +				R . . .				+ . . .				
<i>Chloris virgata</i>													R				R + . . .				+ . . .				+ . . .				
<b>Species group Q</b>																													
<i>Hermannia modesta</i>					R . R .								R + . + . R +				+ . . 1 1 +				+ . . 1 R								
<i>Cadaba lermiana</i>					R				R				R + . A 1 + . R . 1				+ . . . R .				1 + . . 1								
<i>Zaleya pentandra</i>					R								R				+ . . .				R . . .				+ . . .				
<i>Hemibryonia fleckii</i>					R								R				+ . . .				R + . . .				R . . .				
<b>Species group R</b>																													
<i>Barleria virgata</i>					+ . . + + . . .								+ . R . R				R				+ . . . .								
<i>Barleria senensis</i>					+ . . R . . . + R								+								R . . .				+ . . . .				
<i>Peristrophe cernua</i>	R					R + . . . + R												R + . . .				+ 1 . . R							
<i>Ruellia patula</i>					R R + . . . R + R				R				R				R				+ 1 1 1								
<b>Species group S</b>																													
<i>Bacium filamentosum</i>	1 + 1 + . . .				+ + R + . . .				+ + R + . . .				+ + + . . . R . . . +				+ + + . . .				+ + + . . .				+ + 1 R				
<i>Urochloa mosambicensis</i>	+ . . + . . .				+ . . + . . .				1 . . R . R +				1 . . + 1 + . . + 1 + 1				+ 1 B A A + 1				+ . . . R								
<i>Phyllanthus maderaspatensis</i>	+ . . R + . . .				+ . . + . . .				1 A 1 A . . .				R 1 + . . + 1 + . . . + R				+ . . + . . .				+ . . . R								
<i>Conchus ciliaris</i>	+ . . + . . .				R . R .				1 + + R . . . + R				R . . .				+ . . .				+ 1 1								
<i>Lantana rugosa</i>	+ + + 1 R R				+ . . + . . .				+ R R A . . .				+ . . + . . .				+ . . . R +				+ . . . R								
<i>Aristida adscensionis</i>	+ . . + 1 . . .				+ . . + . . .				1 . . R + . . .				+ . . + 1 R + 1 1 1 +				+ . . . R +				R A + . . .								
<i>Pupalia lappacea</i>	R . . R R . . .				R . . R . . .				R . . R . . .				+ . . + . . .				R . . .				R . . . R								
<i>Boscia albidunca</i>	+ . . + . . .				R R R . . .				R R . R . R . . .				R . . R . . .				R . . .				R . . .								
<i>Albizia antheminioides</i>	1 A B B . . .								B + . 1 + R . . .				R . A + . . .				R . . .				R . . .								
<i>Acacia grandicornuta</i>	R	A A + A . . .				R R . . .				+ . R + . . . 1				R . . . R . R A . . .				1 R + + 1 R				1 B 1 B							
<i>Leucas glabrata</i>	+ . . R + . . .								R . . .				R . . . 1				1 . . . R +				R . . .								
<i>Sporobolus iochados</i>	+ . . + 1 . . .				+ . . + . . .				+ . . + . . .				+ . . + . . .				+ . . A A + . . .				1 . 1 1								
<i>Blepharis integrifolia</i>	+ . . + . . .				R				A B A . . .				+ 1 . . .				+ . . A 1 R + R				B 1 + 1								
<i>Aristida scabrivalvis</i>	+ . . + . . .				R				+ . . R + . . .				+ . . + . . .				R . . .				+ . . .								
<b>Species group T</b>																													
<i>Enneapogon scoparius</i>	+ + + + . . .				R + . . . R . R . . .								R . . .				R . . .				+ . . 1								
<i>Felicia clavipilosa</i>	R	R . . . + . . .				+ + + + R . . .				+ R R . . .				+ R + + + . . . R + . . .				+ R + + + . . .				+ . . .							
<i>Kleinia longiflora</i>	+ R + . . .				+ . . + . . .				+ R + . . .				+ . . .				+ R . . . R + + + 1				R + 1 R R								
<i>Tragus berteronianus</i>	+ R . . .				R + 1 + . . .				+ . . + . . .				+ + + + 1 R + R R . . .				+ + + + 1 1				+ + + . . .								
<i>Ehretia rigida</i>	R R . R . . .				R . . .				R . . .				+ . . . R				+ . . . 1 R R 1				R . . . R								
<i>Enneapogon cenchroides</i>	+ . . + . . .				+ R + . . .				+ . . + . . .				R . . .				R R . . .				+ + 1 1								
<b>Species group U</b>																													
<i>Agave americana</i>																									+ 1 +				
<i>Aptosimum lineare</i>	R	+ . . .				R + . . .												R + . . .											
<i>Urochloa panicoides</i>																					R . . .				+ 1 +				
<i>Dicoma tomentosum</i>																					R . . .				+ 1 +				
<i>Indigofera spicata</i>																					+ . . .				+ . . .				
<i>Eragrostis racemosa</i>																					+ . . .				+ . . .				
<i>Heteropogon contortus</i>																					R 1 R				+ . . .				
<i>Phyllanthus parvulus</i>																					R . . .				R + R				
<i>Aristida canescens</i>																					+ 1				+ . . .				
<i>Sida dragei</i>																					+ R				+ . . .				
<i>Withania somnifera</i>																					R + . . .				+ . . .				
<i>Geigeria burkei</i>																					+ . . .				+ . . .				
<i>Schottia brachypetala</i>																					+ . . .				+ . . .				
<i>Felicia mossemedensis</i>																					+ . . .				+ . . .				
<i>Chamaesyce prostrata</i>																					R . . .				+ . . .				
<i>Euphorbia thraucii</i>																					+ 1				+ . . .				
<i>Melthania forbesii</i>																					+ . . .				+ . . .				



Table 24 continued.

Relevé	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
	7 7 8 8 8 8	4 4 5 5 8	4 8 8 7	5 5 5 8 7 7 7	4 4 4 5 5 5 8 8 8 8 7	4 4 4 8 7 7 7 4 5 5 8 8 9 0
	2 9 0 1 2 3	0 6 0 4 8	4 7 8 4	7 8 9 0 1 7 8	3 5 8 1 3 5 1 2 3 4 8	1 2 9 9 0 3 5 7 2 6 5 0 6 2
Association	1	2	2	2	2	3
Sub-association	1	2	3	4	5	4
Species group V						
<i>Aristida congesta</i>		1 + + 1 +	B . . +	1 1 1 A . R	+ + + A + 1 1 1 A + B	1 . . + + + + R . A + 1 R 1
<i>Leucas capensis</i>		R . R . R	.	+ . R + . . +	1 . . 1 1 + . . + .	. . . R . + 1 . . + R 1 . .
<i>Tribulus terrestris</i>		+ R . . .	.	. . . R . . .	R . . . R . . . +	. . . . 1 . + + + . R R
<i>Geigeria ornata</i>		.	R . . +	R . . R .	R . . + . . . R	. . . R R + . . . + R . 1
Species group W						
<i>Eragrostis barbimodis</i>	B A 1 A B 1	A + + + 1	A 1 + 1	A 1 B + B B +	+ + B A . 1 1 + 1 1 B	A + 1 A 1 1 B R . 1 + + .
<i>Seddera suffruticosa</i>	+ + . . . +	+ + + + +	+ + 1 +	1 1 + . . 1	+ + 1 + + . . + .	+ R + R + + . + R . 1 + . +
<i>Acacia tortilis</i>	+ R . + + R	1 . . 1 +	1 B R A	A 1 1 A + A A	1 B B B 3 B B B 3 B B	B A A + + A A . . + . + R

**Table 25** Sekhukhuneland Centre of Plant Endemism endemic/near-endemic and Red Data List plant taxa of the Arid Northern Bushveld.

Taxon	Family	Syntaxa							
		1	2.1	2.2	2.3	2.4	2.5	3	4
<i>Aloe castanea</i>	LILI	.	.	.	.	.	.	.	#+
<i>Aloe</i> sp. nov. (S 1419)	LILI	.	.	\$+	.	.	.	.	.
<i>Boscia foetida</i> subsp. <i>minima</i>	CAPP	Rr	Rr	.	Rr	.	R+	R+	.
<i>Gossypium herbaceum</i>	MALV	.	.	.	.	N+	.	.	.
<i>Grewia vernicosa</i>	TILI	.	.	.	.	.	.	.	#r
<i>Heurmia stapelioides</i>	ASCL	.	#+	.	.	.	.	.	.
<i>Leucas capensis</i> [form] (W&S1 3007)	LAMI	.	\$r	\$r	\$+	\$1	\$+	\$+	\$+
<i>Pegolettia senegalensis</i>	ASTE	.	.	.	.	.	Nr	N+	.
<i>Petalidium oblongifolium</i>	ACAN	#1	.	.	.	.	.	.	.
<i>Phyllanthus</i> sp. nov. (S 470)	EUPH	\$r	.	.	.	\$r	\$r	.	.
<i>Plinthus rehmannii</i>	AIZO	V#+	V#+	V#r	V#r	V#+	V#+	.	.
<i>Polygala</i> sp. nov. (S 449)	POLY	\$+	.	.	.	\$r	.	.	.
<i>Rhus engleri</i>	ANAC	#1	#+	#r	#r	#1	.	#r	.
SCPE Endemics		2	1	2	1	3	2	1	1
SCPE Near-endemics		3	3	2	2	2	1	1	2
Red Data List		2	2	1	2	2	3	2	0
Restricted to syntaxon		1	1	1	0	1	0	0	2
Restricted to association		1			3			0	2
Total for syntaxon		6	5	4	4	6	5	4	3
Total for association		6			10			4	3

**Endemism:** \$ = endemic, # = near-endemic; **Red Data List:** R = Rare, V = Vulnerable, N = Not threatened in the northern provinces of South Africa, but in other areas of southern Africa;

**Abundance in communities:** 1 = abundant, + = frequent, r = rare, . = absent; **Collectors:** S = Siebert, W = Van Wyk; **Bold** blocks represent community/syntaxon specific taxa.

**Table 26** Environmental factors and selected attributes associated with the different plant communities of the Arid Northern Bushveld.

Factors/attributes	Syntaxa							
	1	2.1	2.2	2.3	2.4	2.5	3	4
Number of relevés	6	5	4	7	11	7	4	3
Total number of species	59	110	92	87	109	108	98	55
Average number of species per relevé	25	50	46	34	38	39	48	24
Number of endemics/near-endemics	5	4	4	3	5	3	2	3
Number of Red Data List taxa	2	2	1	2	2	3	2	0
Geology*	SH	SH	SH	SH	SH/Q	SH/Q	SH/Q	Q
Topographic position**	F/M	F/M	F/M	F/M	V/F	V/F	V/F	V
Slope (°)	1–3	3–5	1–5	1–5	1–3	1–3	1–3	1–3
Aspect	E	NW	SE	S	NS	N	N	NE/SW
Predominant soil type***	Gs	Sn/Mw	Va/Gs	Sd/Gs	Va	Bo	Sn	-
Rock cover percentage (%)	15–50	10–15	10–20	10–20	05–10	05–10	05–15	05–10
Average rock size (mm)	250–500	100–400	300–500	100–400	200–400	300–400	250–400	50–100

\* SH = Serpentinized harzburgite; Q = Alluvium

\*\* M = midslope; F = footslope; V = valley

\*\*\* Bo = Bonheim; Gs = Glenrosa; Mw = Milkwood; Sd = Shortlands; Sn = Steendal; Va = Valsrivier

**Table 27** A key to the syntaxa of the Arid Northern Bushveld of the Potlake Nature Reserve and surrounding areas in the Sekhukhuneland Centre of Plant Endemism.

Leads/description	Go to/syntaxon
1a Only Glenrosa soils ( <i>Panicum coloratum</i> & <i>Croton menyhartii</i> )	1. <i>Panicum colorati</i> – <i>Crotonetum menyhartii</i>
b Various soil types ( <i>Artisida congesta</i> & <i>Lantana rugosa</i> )	<b>2</b>
2a Rock size < 100 mm ( <i>Agave americana</i> & <i>Geigeria ornativa</i> )	4. <i>Urochloa panicoidis</i> – <i>Agavetum americanae</i>
b Rock size > 100 mm ( <i>Becium filamentosum</i> & <i>Acacia tortilis</i> )	<b>3</b>
3a Steendal soils ( <i>Barleria virgula</i> & <i>Ruellia patula</i> )	<b>4</b>
b Various soil types ( <i>Indigostrum costatum</i> & <i>Eragrostis barbinodis</i> )	<b>5</b>
4a Slope 1–3° ( <i>Salvadora australis</i> & <i>Tribulus terrestris</i> )	3. <i>Enneapogono cenchroidis</i> – <i>Salvadoretum australis</i>
b Slope 3–5° ( <i>Grewia bicolor</i> & <i>Felicita clavipilosa</i> )	2.1 <i>Melhanio rehmannii</i> – <i>Acacietum tortilis grewetosum bicoloris</i>
5a Predominantly southern aspects ( <i>Balanites maughamii</i> )	<b>6</b>
b Predominantly northern aspects ( <i>Cadaba termitaria</i> )	<b>7</b>
6a Valsriver soils ( <i>Rhigozum obovatum</i> & <i>Solanum panduriforme</i> )	2.2 <i>Melhanio rehmannii</i> – <i>Acacietum tortilis rhigozetosum obovati</i>
b Shortlands soils ( <i>Diospyros lycioides</i> & <i>Pechuel-Loeschea leubnitzia</i> )	2.3 <i>Melhanio rehmannii</i> – <i>Acacietum tortilis diospyretosum lycioidis</i>
7a Valsriver soils ( <i>Acacia nilotica</i> & <i>Hibiscus praeteritus</i> )	2.4 <i>Melhanio rehmannii</i> – <i>Acacietum tortilis acacietosum niloticoe</i>
b Bonheim soils ( <i>Indigofera rhytidocarpa</i> & <i>Boscia foetida</i> )	2.5 <i>Melhanio rehmannii</i> – <i>Acacietum tortilis indigoferetosum rhytidocarpo</i>



**Table 28** The three most dominant and conspicuous plant taxa of each of the major vegetation types of the Arid Northern Bushveld depicted in the DECORANA scatter diagram.

Major vegetation type	Trees/shrubs	Forbs/sedges	Grasses
1. <i>Panicum colorati</i> – <i>Crotonenium menyhartii</i> ( <i>Panicum coloratum</i> – <i>Croton menyhartii</i> )	<i>Acacia mellifera</i> <i>Commiphora pyracanthoides</i> <b><i>Croton menyhartii</i></b>	<i>Geigeria filifolia</i> <i>Indigofera enornis</i> <i>Seddera suffruticosa</i>	<b><i>Panicum coloratum</i></b> <i>Schmidtia pappophoroides</i> <i>Tragus berteronianus</i>
2. <i>Melhanio rehmannii</i> – <i>Acacietum tortilis</i> ( <i>Melhania rehmannii</i> – <i>Acacia tortilis</i> )	<i>Acacia nilotica</i> <b><i>Acacia tortilis</i></b> <i>Dichrostachys cinerea</i>	<i>Indigofera rhytidocarpa</i> <b><i>Melhania rehmannii</i></b> <i>Phyllanthus maderaspatensis</i>	<i>Eragrostis barbinodis</i> <i>Panicum maximum</i> <i>Urochloa mosambicensis</i>
3. <i>Enneapogono cenchroidis</i> – <i>Salvadoretum australis</i> ( <i>Enneapogon cenchroides</i> – <i>Salvadora australis</i> )	<i>Acacia grandicornuta</i> <i>Boscia foetida</i> <b><i>Salvadora australis</i></b>	<i>Blepharis integrifolia</i> <i>Justicia odora</i> <i>Tribulus terrestris</i>	<i>Chloris virgata</i> <b><i>Enneapogon cenchroides</i></b> <i>Sporobolus ioclados</i>
4. <i>Urochloa panicoidis</i> – <i>Agavetum americanae</i> ( <i>Urochloa panicoides</i> – <i>Agave americana</i> )	<b><i>Agave americana</i></b> <i>Acacia tortilis</i> <i>Schotia brachypetala</i>	<i>Aptosimum lineare</i> <i>Dicoma tomentosa</i> <i>Senecio latifolius</i>	<i>Aristida congesta</i> <i>Eragrostis racemosa</i> <b><i>Urochloa panicoides</i></b>