Environmental Impact Assessment on the proposed
330kV Power Line from Katima Mulilo to Ngoma:

Impact on the Vegetation

Report prepared by

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for:
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EXECUTIVE SUMMARY

NamPower proposes to construct a 330 kV powerline between the Katima Mulilo powerstation to Botswana, crossing at Ngoma the Chobe. Construction of this powerline will require a 80 m servitude, of which the centre 12 m are to be cleared of all vegetation.

In order to assess the impact of this project on the vegetation, a survey of the vegetation along the proposed route has been conducted. Six different vegetation communities have been described, in addition to the Bukalo – Liambezi and Chobe grasslands. These have been rated regarding their sensitivity. The main reasons for moderate to high sensitivity of these communities are their species diversity and specifically a relatively high component of protected and/or threatened species. The least sensitive communities are the grasslands of the Gunkwe Mulapos, the Bukalo – Liambezi channel and the Chobe river.

21 tree and shrub species were found, which are protected under the Forestry Act (Act 12 of 2001), whilst two other species are protected under the Nature Conservation Ordinance (Ordinance 4 of 1975). A full list of species found during field work along the route is presented in Appendix 1.

Four major impacts were identified:

a) Destruction of high-value timber species: This concerns the following species: *Baikiaea plurijuga* (Zambesi teak), *Pterocarpus angolensis* (African teak), *Afzelia quanzensis* (Pod mahogany), *Dialium engleranum* (Kalahari podberry), *Guibourtia engleranum* (False mopane / rosewood), *Burkea africana* (Burkea) and *Colophospermum mopane* (Mopane). Except for mopane, all are used for commercial timber production, and trees of these species are to be reported to the District Office of the Directorate of Forestry for removal. Mopane is used by the local population extensively as construction wood.

b) Destruction of protected species: In addition to the 21 tree species protected under the Forestry Act (which mostly are covered in the above impact), two plant species are protected under the Nature Conservation Ordinance. *Aloe zebrina* (Zebra aloe) is a small, spreading ground succulent. This species is not threatened. *Ansellia africana* is a vulnerable tree orchid in Namibia, Botswana and South Africa, and is threatened by collection as well as habitat destruction through deforestation. Should populations of these species be found along the powerline route, these are to be reported to the National

Botanical Research Institute[1], who will arrange for the rescue and rehabilitation of such plants.

c) Clearing of vegetation and exposure of soils: The Kalahari soils are known to be extremely nutrient-poor. This situation is aggravated by the fact that nitrogen is fixed by cyanobacteria in the soil surface into forms which are available for plants as nutrients. Exposure of the soil surface to heat (by e.g. removing shading plants) will however result in these fixed nitrogen nutrients to decompose to ammonia, which is gaseous and escapes into the atmosphere. Clearing of the soil surface will thus lead to the reduction in soil fertility and production potential, and will likely also expose the soil surface to wind erosion.

d) Regrowth and coppice control: Several species found along the powerline route are known to coppice strongly. Bulldozing the vegetation will also lead to disturbances, which allow aggressive encroacher species like *Dichrostachys cinerea* and *Clerodendron uncinatum* to establish. Several methods of herbicidal treatments, both based on different application methods as well as different active ingredients, are available. Soil application is not recommended, as the reaction is slow, dependant on the clay content of the soil, and the herbicides are likely to leach through water movement (and thus affect non-target trees). Because of similar reasons, aerial application of herbicides (whether as foliar application or as ground application) is also not recommended. Foliar application should be limited to control the regrowth of specific high coppice shrub stands. In general, the treatment of stumps after felling is recommended. Herbicide products with active ingredients Picloram and Triclopyr or Tebuthiuron are recommended. Regrowth can effectively be controlled by annually mowing the grass along the clearing after the growing season.

The following general recommendations are made to limit the impact on the vegetation:

- Trees are to be felled along the cutline, not bulldozed. Timber species are to be reported to the District Forestry Office, who will remove the wood for sawmilling. Other species, especially *Colophospermum mopane*, provide building materials for the local populations.

[1] Contact Silke Rügheimer, Curator: National Botanical Garden, Tel 202 9111 or e-mail silker@nbri.org.na, for assistance.

- Bulldozing is to be limited to the 12 m strip needed for the access- and construction path. The remainder of the clearing is also to be cleared by felling, either with axes, chain saws or brush cutters.
- All stumps are to be treated with a suitable herbicide. Possible choices are preparations with either a Picloram / Triclopyr mixture, or with Tebuthiuron.
- Herbicides may not be applied onto the soil surface (as root treatment), neither as selective hand-treatment, nor as aerial treatment. Herbicides are also not to be applied as aerial foliage treatment for clearing purposes.
- Should protected species be encountered (especially the vulnerable tree orchid *Ansellia africana*), these need to be reported to the National Botanical Research Institute for rescue and rehabilitation efforts.
- In order to keep the clearing cleared of tall vegetation (shrubs, trees), regular (annual) mowing after the rainy season (May / June) is recommended. This will keep the grass short, thus creating an effective fire break, but will also cut short any woody coppicing and prevent these from growing tall.
- Depending on the density, any tall regrowth is to be removed by felling and stump treatment with herbicides. Foliar application of herbicides should be limited to short regrowth (below 2 m height) during the active growing season. No aerial application of herbicides is permitted, due to the highly unselective treatment such aerial application represents.

1 INTRODUCTION

1.1 BACKGROUND

NamPower proposes to construct a 330kV transmission line from Katima Mulilo to Ngoma in the Caprivi Region (**Figure 1**) The proposed power line is estimated to be approximately 80km long and the route skirts the denser settlements along the main road.

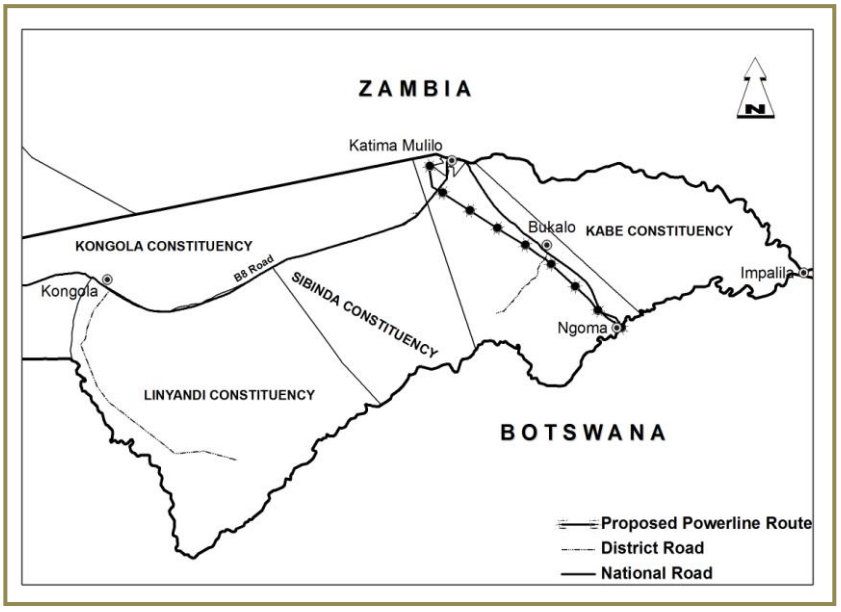

Figure 1: Proposed Route for the Katima Mulilo-Ngoma 330kV transmission line.

The recently constructed Caprivi Link Interconnector joins the Namibian and Zambian/Zimbabwean electricity networks to ensure reliable power transfer capability between the east and west of the South African Power Pool. The link also ensures reliable power supply to the Eastern Caprivi that is now connected to the Namibian electricity grid.

The ZIZABONA parties (ZESA, ZESCO, BPC and NamPower) have agreed to cooperate in the development of transmission infrastructure which involves the construction of a high voltage power transmission interconnection between Hwange 330kV substation in Zimbabwe, the proposed Victoria Falls switching station in Zimbabwe, the proposed Livingstone substation in Zambia, the proposed Pandamatenga substation in Botswana and the Zambezi substation in Namibia. The

establishment of this specific infrastructure of which the proposed route from Katima Mulilo to Mgoma in Namibia forms a part, will allow full utilisation of the Caprivi Link interconnector to the benefit of Namibia and the SAPP member countries.

The structures to be used on the proposed line will either be a guyed or a self supporting structure, or a combination of both. An example is illustrated in **Figure 2**.

Figure 2: An example of the proposed structures to be used for this transmission line.

The spacing between the pylons will be between 400 and 500 metres depending on the wind and weight spans.

The servitude will be 80 metres wide, but only 12 metres width will to be totally cleared of vegetation.

1.2 METHODOLOGY

A field survey was conducted during the period 8 to 12 August 2011. During this survey, 32 points located as close as possible to the proposed powerline route were surveyed. These points were selected in such a way that the most prominent vegetation types, as described in the "Environmental profile and atlas of Caprivi" (Mendelsohn & Roberts, 1997) were covered.

At each sample point, a list of species occurring was established, following the methodology used for the Vegetation Survey of Namibia project (Strohbach, 2001). This method has been proven to give a good insight on the floristic biodiversity as well as vegetation types of the study area (Strohbach et al., 2004; Strohbach & Strohbach, 2004; Strohbach & Petersen, 2007). In addition to the list of species, the estimated abundance of these species, as well as general site- and habitat

descriptors have been recorded. These include: position, altitude (both determined with a GPS), landscape, slope range, lithology of the soil, erosion and disturbances.

Unknown species were pressed and identified at the National Herbarium of Namibia.

The data were data-based in TurboVeg (Hennekens & Schaminée, 2001) and classified using the Modified TWINSPAN procedure in Juice (Tichý, 2002; Roleček et al., 2009). The resulting vegetation communities were compared with the vegetation map presented in the "Environmental profile and atlas of Caprivi" to confirm the correctness of these units, and to assess the diversity of the vegetation along the powerline route. The plot data is presented in Appendix 2.

The vulnerability of the vegetation units was assessed by determining the species which are (i) protected, (ii) threatened, as per Red Data List and (iii) restricted range endemic species or (iv) exotic species, using available literature (Craven, 1999; Loots, 2005; Mannheimer & Curtis, 2009). The number of species, as well as the estimated number of species, was also taken into consideration. The estimation of number of species was done with a Jackknife procedure (Heltshe & Forrester, 1983), which has been proven very effective for this purpose (Palmer, 1990; Strohbach & Strohbach, 2004).

The vulnerability of the communities was assessed as follows:

A biodiversity index was calculated as follows: An estimation was made of the expected number of species per community, based on the actual number of species observed in the community, as well as the number of species observed on a single plot, using the jackknife procedure (Heltshe & Forrester, 1983; Palmer, 1990). This estimate was expressed as a percentage of the total number of species recorded in Namibia (4012) (Craven, 1999). In addition, the number of protected species, irrespective of the protection mechanism, the number of rare species (i.e. species listed in the Red Data List, excluding those classified as "Least Concern") (Loots, 2005), multiplied by a factor of 10, as well as the total number of species observed per community, multiplied by a factor 2, were added.

In addition, a habitat sensitivity index was calculated by adding a topographic factor to the estimated the Erosion hazard, which is based on the slope, rainfall energy (as calculated from the annual average rainfall) and canopy cover of each community, following the SLEMSA model (Stocking, 1987; Stocking et al., 1988). The topographic factor was derived from the typical topographic position of the community, recognising that floodplains and water courses have a greater impact if disturbed on surrounding vegetation than for instance plain habitats (Pringle & Tinley, 2003).

These two indices, the habitat sensitivity and biodiversity, were added to come up with a total ecosystem vulnerability rating. This rating was classed as follows:

- Below 100: low
- Between 100 and 200: moderate
- Between 200 and 300: high
- Above 300: very high

This method is still to be published in full (Strohbach, in prep.), but has been used in this study as an objective comparison of the ecosystem sensitivity.

1.3 ASSUMPTIONS AND LIMITATIONS

A major limitation to this study was the fact that the field work could only be conducted during the dry season in mid August 2011. This resulted in the majority of herbaceous species, including grasses, not being identifiable. The assumption was however made that the major impact of the proposed powerline will be on woody species (trees and shrubs), as well as species directly relying on these for habitat, thus allowing the herbaceous layer to be mostly ignored.

2 REGAL AND REGULATORY ENVIRONMENT

Plant species are protected under two separate legal instruments, being the Forestry Act (Act 12 of 2001) as well as the Nature Conservation Ordinance (Ordinance 4 of 1975).

Under the Forestry Act, a number of tree species are confirmed as declared protected species. These have been declared under the Forestry Ordinance of 1952 as well as Proclamation 486 of 1972 of the SWA Administration. Special permission is required by the Directorate of Forestry to remove these species. In addition to these specially protected species, permission is also needed from the Directorate of Forestry for general clearing of woody plants, as well as the transport of any such wood or wood products from the site / property it has been cleared from.

In a discussion with the District Forester at Katima Mulilo, Mr Dennys Sikabongo (Tel. 081 223-9858 / (066) 253-143, fax: (066) 253-322), it was indicated that the Directorate of Forestry would not oppose a formal request for such a clearing permit, under the condition that:

(a) the cleared wood is left on site, in order for the local population to be able to use it for timber and/or firewood purposes.

(b) any sizable trees (diameter of more than 15 cm) of timber species found along the cutline are to be reported to the Forestry Office, who will cut these trees and remove them for cutting in the sawmill. These species include:

- *Baikiaea plurijuga* (Zambezi teak)
- *Pterocarpus angolensis* (African teak / kiaat)
- *Afzelia quanzensis* (Pod mahogany)
- *Dialium engleranum* (Kalahari podberry)
- *Guibourtia coleosperma* (False mopane / rosewood)
- *Burkea africana* (Burkea)

Under the Nature Conservation Ordinance, the removal of specially protected species is prohibited, unless special permission has been granted (for e.g. development projects. In addition, trade restrictions under the CITES convention are being enforced. Two of the species found in the study area are specially protected, being *Aloe zebrina* (zebra aloe) and *Ansellia africana* (African tiger orchid or tree orchid).

A full list of species found, as well as their protection status, has been attached in Appendix 1.

3 AFFECTED ENVIRONMENT

The vegetation of the Caprivi Region forms part of the Forest Savanna and Woodland (northern Kalahari) (Giess, 1971). In this, a number of vegetation units are recognised by the "Environmental profile and atlas of the Caprivi" (Mendelsohn & Roberts, 1997). According to their map, the following units will be crossed by the proposed powerline: Teak woodland and Teak shrubland, *Burkea* – kiaat – false mopane woodland, Gunkwe molapos, Mopane – *Aristida* woodlands, Bukalo – Liambezi grasslands, *Burkea – Terminalia* woodlands as well as Chobe grassland – hummock mosaic (in sequence from north to south). The authors, however, give little information on the composition of these vegetation units, making this description not very suitable for determining the vulnerability, and the potential impact, the proposed powerline has on the vegetation.

A recent study on the vegetation of the Sachinga Livestock Development Centre provides some information on especially the northern Teak woodlands and Teak Shrublands (Lushetile, 2009), but provides no further information regarding the more southern vegetation units, especially parallel to the Katima Mulilo – Ngoma road.

In **Figure 3**, an overview of the affected vegetation units as described in the "Environmental profile and atlas of Caprivi", is given. Also indicated on the map are the various vegetation sample points, indicating the classification results.

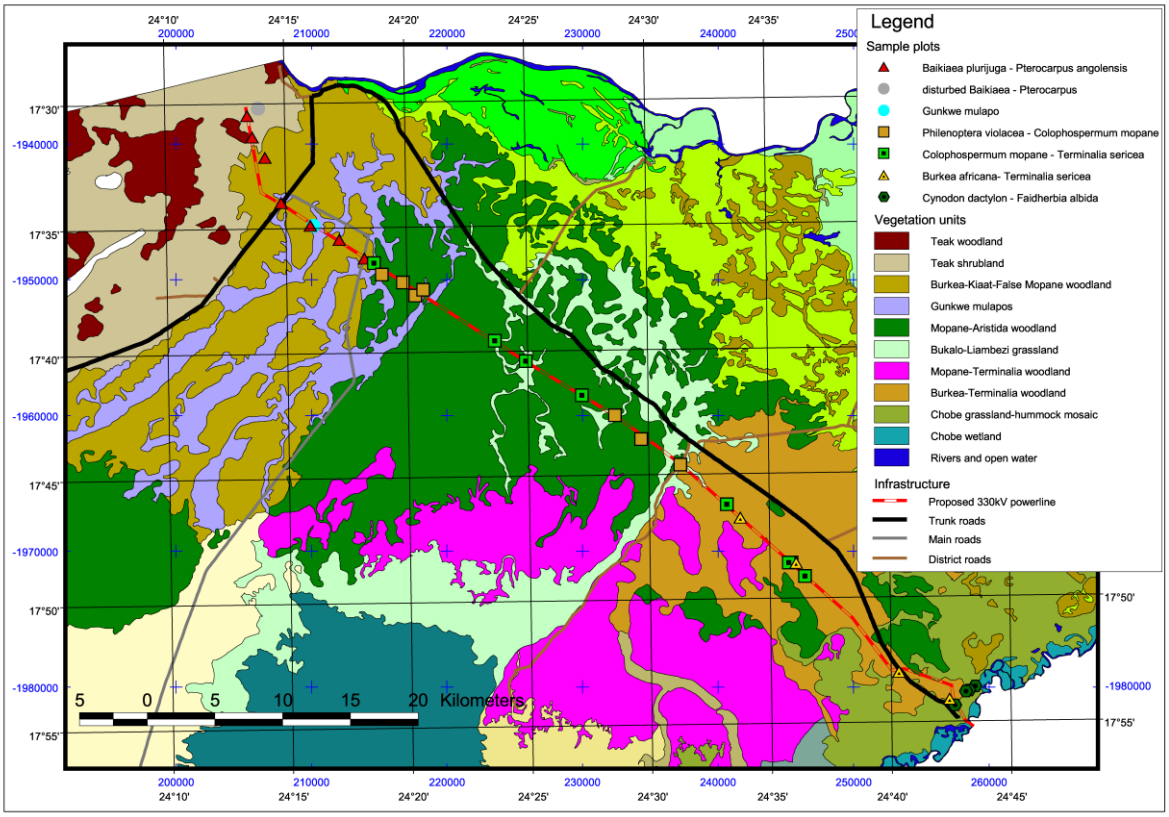

Figure 3: Map of the vegetation units effected by the proposed 330 kV powerline between Katima Mulilo and Ngoma. Also indicated are the vegetation sample sites. The vegetation units have been taken from Mendelsohn & Roberts (1997).

Due to more intense sampling for the purpose of the EIA, the vegetation units identified during the field survey do not correlate exactly with the vegetation units mapped by Mendelsohn and Roberts (1997):

- The Teak woodlands, Teak shrublands and *Burkea*-kiaat-false mopane woodlands have a very similar vegetation, described here as the *Baikiaea plurijuga – Pterocarpus angolensis* bushlands.
- The Mopane – *Aristida* woodlands consists of a mosaic of *Philenoptera violacea – Colophospermum mopane* woodland and *Terminalia sericea Colophospermum mopane* bushland.

- The *Burkea – Terminalia* woodlands consist of a mosaic of *Terminalia sericea Colophospermum mopane* bushland and *Burkea africana – Terminalia sericea* shrubland.

In the following sections, the vegetation communities identified during the field work are described. No attempt has been made to map the extent of these communities, as the sampling density was too low. An overview of the characteristics contributing towards the sensitivity rating is given in Table 1, and a full list of species found is presented in Appendix 1.

3.1 THE *Baikiaea plurijuga – Pterocarpus angolensis* BUSHLANDS:

These bushlands are characterised by *Acacia fleckii, Acrotome inflata, Baikiaea plurijuga, Baphia massaiensis* subsp. *obovata* var. *obovata, Bauhinia petersiana* subsp. *macrantha, Dactyloctenium giganteum, Digitaria seriata, Eragrostis jeffreysii, Guibourtia coleosperma, Jacquemontia tamnifolia, Rhus tenuinervis, Schinziophyton rautanenii, Sesbania* sp. and *Strychnos pungens*. These are constantly accompanied by: *Acacia erioloba, Burkea africana, Combretum collinum, Grewia retinervis, Hibiscus* sp., *Ochna pulchra, Pogonarthria fleckii, Terminalia sericea* and *Vernonia poskeana*.

These bushlands occur on the deep sandy soils in the north-western part of the powerline route, between the Katima Mulilo power station and the quarantine camp. Here a large number of timber tree species occur, including *Pterocarpus angolensis, Guibourtia coleosperma, Baikiaea plurijuga* and *Burkea africana* (**Figure 4**).

Clearing of the *Baikiaea plurijuga – Pterocarpus angolensis* bushlands will result in extensive bare patches, which will be recolonized only slowly with annual grasses like *Aristida stipitata,* as well as the low shrub *Clerodendron uncinatum*. Depending on the clearing technique, extensive coppicing of *Combretum collinum* and *Bauhinia petersiana* can be expected. These cleared patches will be encroached by *Dichrostachys cinerea* shrubs as well (**Figure 5**). *Clerodendron uncinatum* is a weedy species, typically encroaching disturbed areas, and can be expected to encroach into all cleared areas along the powerline route (**Figure 6**).

Figure 4: *Baikiaea plurijuga – Pterocarpus angolensis* bushlands as seen at plot C1, along the B6 main road SW of Katima Mulilo.

Figure 5: *Baikiaea plurijuga – Pterocarpus angolensis* bushlands after being cleared, under the powerline towards Katima Mulilo (plot C5). Note the relative low regrowth of shrubs.

Figure 6: *Clerodendron uncinatum*, a weedy, thorny dwarfshrub, can be expected to encroach all cleared areas under the powerline.

Due to the large number of protected trees occurring within this vegetation community (a total of 13 protected species found here), these bushlands have a high sensitivity rating of 258 points (Table 1).

3.2 GUNKWE MULAPOS

A single plot was surveyed in the grasslands of the Gunkwe mulapos at the quarantine camp. These are essentially grasslands, characterised by the grasses *Aristida meridionalis, Eragrostis cimicina, Eragrostis pallens, Hyparrhenia hirta, Perotis patens, Pogonarthria squarrosa, Schizachyrium sanguineum, Tristachya superba, Vernonia poskeana* as well as the prostrate dwarfshrub *Dichapetalum rhodesicum.* Tree and shrub species are rare, mostly short shrubs of *Terminalia sericea*, which are a result of bush encroachment due to infrequent fires (**Figure 7**).

Figure 7: The grasslands of the Gunkwe mulapos at plot C6 in the quarantine camp.

As the grass layer is unlikely to be disturbed during the clearing for the powerline, and limited trampling is expected during construction, this vegetation unit is regarded as having a low sensitivity in terms of biodiversity. The fact these mulapos form a water course, however, means that any herbicide used here will likely spread downstream and thus damage other ecosystems. For this reason, these grasslands have a moderate sensitivity with a rating of 174 (Table 1).

3.3 THE *Philenoptera violacea – Colophospermum mopane* WOODLANDS

These woodlands form the typical form of the Mopane – *Aristida* woodlands *sensu* Mendelsohn & Roberts (1997). Although these authors state that mopane is often occurring as the only tree, a large variety of tree species have been found here. This community is characterized by *Aristida adscensionis, Balanites aegyptiaca, Colophospermum mopane, Croton menyharthii, Euclea undulata, Philenoptera violacea, Monechma divaricatum, Sansevieria pearsonii*, with *Ximenia americana* occurring constantly as well (**Figure 8**).

Figure 8: The *Philenoptera violacea – Colophospermum mopane* woodlands are dominated by mopane trees, but host a large variety of other tree species as well, as can be seen at Plot C13.

Figure 9: Two species occurring here are protected under the Nature Conservation Ordinance, being *Ansellia africana* (left) and *Aloe zebrina* (right).

The diversity of species occurring here is relatively high, with 53 species being recorded, of which 10 are protected either by the Forestry Act or by the Nature Conservation Ordinance (*Figure* 9). Being part of an extensive floodplain system towards Lake Liambezi, the sensitivity of this community is rated as high (score of 222) (Table 1).

3.4 BUKALO – LIAMBEZI GRASSLANDS

These grasslands have not been sampled due to their limited occurrence along the proposed powerline route. Mendelsohn and Roberts (1997) describe these as *Cynodon dactylon* dominated grassland in a wetter state, or as a grassland similar to those found along the Gunkwe Mulapos.

Again, impact on the vegetation will be limited, as virtually no large trees occur here. Being a water channel, though, means that any herbicides used for clearing will be carried downstream into Lake Liambezi, thus a rating of moderate sensitivity.

3.5 THE *Colophospermum mopane – Terminalia sericea* BUSHLANDS

These bushlands are characteristic for the Mopane – Terminalia woodlands *sensu* Mendelsohn & Roberts (1997), but occur in mosaic with the *Philenoptera violacea – Colophospermum mopane* woodlands to the north as well as the *Burkea africana – Terminalia sericea* shrublands further south. These bushlands are characterised by the species *Aristida stipoides* and *Colophospermum mopane*, which are constantly associated by the species: *Aristida stipitata, Burkea africana, Combretum collinum, Grewia retinervis, Hibiscus* sp*., Pogonarthria fleckii* and *Terminalia sericea* (**Figure 10**).

The habitat is typically ecotonal of nature, being a mosaic of sandy plains and patches of loamy sands. Because of this ecotonal nature of this community, a relative high number of species (54 species) have been observed. The relative low number of protected species (8) and the fact that these bushlands occur on relative sandy plains downgrades the sensitivity though to moderate with a sensitivity score of 194 (Table 1).

Figure 10: *Colophospermum mopane – Terminalia sericea* bushlands form an ecotone between the northern heavier soils and the southern sandy soils, here seen at plot C26.

3.6 THE *Burkea africana – Terminalia sericea* SHRUBLANDS

These shrublands occur on deeper, sandy soils south of the Bukalo – Liambezi channel, in mosaic with the previous community. They are characterised by the presence of *Acacia erioloba, Combretum collinum, Commiphora tenuipetiolata, Phylenoptera nelsii, Ochna pulchra, Tapinanthus oleifolius, Vangueria infausta* and are constantly accompanied by *Aristida stipitata, Digitaria seriata* and *Terminalia sericea* (**Figure 11**).

Forming a lower shrubland, with less large trees, the species diversity is also lower with only 32 species observed, of which only four species are protected (Table 1). Being a plain, with both sandy and loamy soils, also lowers the sensitivity rating to "moderate" with a score of 135.

Figure 11: Typical *Burkea africana – Terminalia sericea* shrublands, as seen at plot C27.

3.7 THE *Cynodon dactylon – Faidherbia albida* OPEN WOODLANDS

These woodlands are found as typical vegetation in the Chobe grassland – hummock mosaic *sensu* Mendelsohn and Roberts (1997). Other than stated by these authors, though, the dominant tree species is *Faidherbia albida* (ana tree). Other characteristic species include *Cynodon dactylon, Flueggea virosa, Hyphaene petersiana, Marsdenia species, Gymnosporia senegalensis, Trichilia emetica, Vetiveria nigritana* and *Ziziphus mucronata,* constantly associated with *Acacia erioloba, Combretum imberbe, Dichrostachys cinerea* and *Terminalia sericea* (**Figure 12**).

These woodlands are under threat from especially human land use (clearing of fields, cattle grazing) but also animals, as elephants constantly cross these woodlands to reach the waters of the Chobe. Relative little elephant damage has been seen, though – mainly on the few *Grewia* shrubs occurring in these woodlands.

The diversity is relative low, as only 24 species have been recorded. One of these, *Eucalyptus camaldulensis* (blue gum) is an exotic, and likely an escapee from the nearby Ngoma Forestry Research Station. Being part of the flood-plain system of the

Chobe, increases the sensitivity of this community to a "moderate" rating with a score of 143.

Figure 12: Typical *Cynodon dactylon – Faidherbia albida* open woodlands near Ngoma at plot C28.

3.8 THE CHOBE WETLANDS

These wetlands form around the Chobe river channel as the final part of the route. Due to time constraints, no sample plot was done here. According to Mendelsohn and Roberts (1997), woody plants are rare. The vegetation is mainly dominated by wetand grasses and sedges. Prominent amongst these is the reed-like grass *Veteveria nigritiana*. During the dry season (no flooding), these grasslands are used extensively for cattle grazing (Figure 13). Construction of the powerline should have little impact on the vegetation here.

Figure 13: The Chobe Wetlands at Ngoma.

Table 1: Biodiversity and ecosystem characteristics as related to the calculation of the community sensitivity.

	Baikiaea plurijuga - Pterocarpus angolensis	Gunkwe Mulapo	*Phylenoptera violacea - Colophospermum mopane*	*Terminalia sericea - Colophospermum mopane*	*Burkea africana - Terminalia sericea*	*Cynodon dactylon - Faidherbia albida*
No of sample plots	7	1	8	7	4	4
Biodiversity:						
No of species	71	31	53	54	32	24
Estimated no of species	34.5	-	31.0	73.7	43.3	95.0
Representing Namibian species (%)	2.33%	0.76%	1.75%	1.81%	1.06%	0.85%
Species density (per 1000 m^2)	25.7	31.0	13.9	15.9	14.0	12.0
No of endemic species	0	0	0	0	0	0
No of RDL species	2	0	0	0	0	0
No of protected species	13	0	10	8	4	7
Biodiversity rating:	**203.0**	**93.8**	**131.6**	**133.7**	**83.1**	**67.8**
Ecosystem sensitivity:						
Topographic position	sand plain	omuramba	floodplain	plain	sand plain	floodplain
Topographic rating	5	7	7	5	5	7
Slope class	1	0	1.5	1	1	1
Maximum slope (%)	5	2	8	5	5	5
Slope factor (X)	2.07	0.83	3.85	2.07	2.07	2.07
Average annual rainfall	700	700	700	700	700	700
Average annual rainfall energy	13192.2	13192.2	13192.2	13192.2	13192.2	13192.2
Erosivity factor (K)	118.26	118.26	118.26	118.26	118.26	118.26
Vegetation cover (%)	62.77	31.00	49.90	51.01	71.29	63.25
Protection Factor (C)	0.02	0.16	0.05	0.05	0.01	0.02
Erosion Hazard (X*K*C)	5.67	15.24	22.78	11.47	3.40	5.50
Erosion Hazard class	1	2	2	2	1	1
Habitat sensitivity rating:	**60**	**90**	**90**	**70**	**60**	**80**
Ecosystem sensitivity rating:	**263.0**	**183.8**	**221.6**	**203.7**	**143.1**	**147.8**
Ecosystem sensitivity score:	**High**	**moderate**	**high**	**high**	**moderate**	**moderate**

4 IMPACT ASSESSMENT

4.1 DESTRUCTION OF HIGH-VALUE TIMBER SPECIES

Discussion

For the powerline, a 30 m servitude is required. A 12 m strip in the middle of this is to be cleared of tall vegetation directly under the powerline. The nature of this requirement means that several trees need to be removed, irrespective whether protected, of high value as timber species, or of other use.

In the first section of the powerline route, up to about the eastern border of the quarantine camp, occur the *Bakiaea plurijuga – Pterocarpus angolensis* bushlands. These contain several high-value timber species, specifically *Pterocarpus angolensis* (African teak), *Baikiaea plurijuga* (Zambezi teak), *Guibourtia coleosperma* (False mopane / rosewood), *Dialium engleranum* (Kalahari podberry), *Burkea africana* (Burkea) and potentially *Afzelia quanzensis* (Pod mahogany). *Burkea africana* occurs also to a lesser extend further south (south of the Lake Liambezi road from Bukalo) towards Ngoma, in both the *Colophospermum mopane – Terminalia sericea* and the *Burkea africana – Terminalia sericea* communities.

Two of these species, *Baikiaea plurijuga* and *Pterocarpus angolenis*, are regarded as near-threatened due to over-exploitation in Namibia (Loots, 2005).

Colophospermum mopane (Mopane) is not regarded as a high-timber species, but is highly regarded by the local population for their straight poles for construction wood. Such trees occur widespread, from the quarantine camp / Linyanti road to well south of the Sambalala road.

Impact summary

Criteria	Construction phase*
Nature	Destruction of timber species along the entire powerline route during construction. These include the following: • *Pterocarpus angolensis* (African teak) • *Baikiaea plurijuga* (Zambezi teak) • *Guibourtia coleosperma* (False mopane / rosewood)

	• *Dialium engleranum* (Kalahari podberry) • *Burkea africana* (Burkea) • *Afzelia quanzensis* (Pod mahogany) • *Colophospermum mopane* (Mopane)
Extent	Site specific, along the clearing along the entire route
Duration	Permanent
Intensity	Magnitude: destructive Degree: medium
Probability	Definite
Significance	Before mitigation: High After mitigation: Medium
Degree of Confidence in Predictions	High

* No impact during operations phase.

Mitigation

If removed properly (felled rather than bulldozed where possible), the wood can be used for timber or construction purposes. It is thus recommended that such trees are felled in close collaboration with the Directorate of Forestry. DoF requested that they remove all high-value timber to the sawmills, whilst other wood, including mopane, is to be left along the clearing for the local population to collect and utilize.

4.2 DESTRUCTION OF PROTECTED SPECIES

Discussion

The impact is very similar to those discussed previously for the destruction of timber species (5.1 above). A total of 21 tree and/or shrub species are protected under the

Forestry Act. A fair number of these are timber species, others are protected due to their scarcity or potential over-utilization as fuel- or construction wood.

Trees which are not felled for timber (as recommended before) are to be taken out and heaped along the side of the cutline, in order for the local population to utilize these timber- or firewood resources.

Two species were found which are protected under the Nature Conservation Ordinance. The ground-dwelling *Aloe zebrina* will likely be destroyed through bull-dozing, but this species is not regarded as threatened. A potential mitigation measure would be the removal of these plants by hand, and replanting them nearby the cultline in similar habitats.

Of bigger concern is the epiphytic *Ansellia africana* (tree orchid or African tiger orchid). This species is regarded as vulnerable in Namibia and Botswana, and as near-threatened in South Africa (Golding, 2002). In all cases, collection and habitat destruction (deforestation) is seen as the major threat. This orchid grows ca 8 to 12 m high on tree trunks, and has been observed on *Colophospermum mopane* and *Kigelia africana* trees. A population of *Ansellia africana* (7 plants) was found ca 300 m off the powerline route and should thus not be endangered; it can however not be excluded that other populations might be found along the route.

Other orchid species (and other protected species) have not been found during field work, but could include a number of geophitic species. Unless bulldozing goes below the soil surface, such plants should not be effected.

A list of species which were found along the powerline route, with their conservation status and collection status, is presented in Appendix 1.

Impact summary

Criteria	Construction phase*
Nature	Destruction of protected species along the entire powerline route during construction. Next to 21 tree and shrub species, these include the following: • *Aloe zebrina* (Zebra aloe) • *Ansellia africana* (tree orchid / African tiger orchid)
Extent	Site specific, along the clearing along the entire route

Duration	Permanent
Intensity	Magnitude: destructive Degree: medium for *Ansellia africana,* low for *Aloe zebrina*
Probability	Highly probable
Significance	Before mitigation: High After mitigation: Low
Degree of Confidence in Predictions	Moderate (uncertainty of occurrence of populations)

* No impact during operations phase.

Mitigation

Should any such plants be found along the route, these should be carefully removed. It is suggested that someone from the NBRI be coopted to go with the survey team so that any protected plants may be identified ahead of time. *Aloe zebrina* plants are to be replanted nearby in similar habitats, whilst *Ansellia africana* plants are to be made available to the National Botanical Research Institute in Windhoek. These plants will be re-established in the Botanical Garden[2], whilst excess plants (possibly also plants propagated from cuttings and/or seeds) will be made available to interested public.

4.3 CLEARING OF VEGETATION AND EXPOSURE OF SOILS

Discussion

The sandy soils of the Kalahari (including those in Caprivi) are extreme nutrient-poor (Wang et al., 2007). Nitrogen and phosphates are generally regarded as the growth-limiting plant nutrients. Where phosphates occur only in a mineral form in especially

[2] Contact Silke Rügheimer, Curator: National Botanical Garden, Tel 202 9111 or e-mail silker@nbri.org.na, for assistance.

deeper soil layers, nitrogen is fixed by cyanobacteria in the soil crust as nitrate (NO_3) or an ammonium compound (NH_4^+). Both are suitable for uptake by plants, but both are susceptible to degradation. Nitrates generally degrade to nitrites (NO_2), a stable gas which escapes into the atmosphere. Heating the soil surface (by e.g. the sun) results in the degrading of ammonia compounds into ammonium (NH_3), which is also gaseous and escapes into the atmosphere (Schlesinger et al., 1990; Schlesinger & Peterjohn, 1991).

Clearing of the vegetation will result in less shade on the soil, and thus the heating of the soil surface. This in turn will result in an extreme loss of available nitrogen to plants (Schlesinger et al., 1990), and in this way significantly lowering the productivity of the soils. Bulldozing will have the added effect that the biological soil crust containing the nitrogen-fixing cyanobacteria will be destroyed (Belnap, 2002; Dougill & Thomas, 2004; Berkeley et al., 2005)

The clearing of the soil surface will also have the effect that this will be exposed to erosion. Due to the flat topography, and the relative coarseness of the soil texture (predominantly sand), water erosion is unlikely to be a problem. Wind erosion might, however, become a serious problem, as predicted for the entire Kalahari basin as far north as southern Angola, over the next 50 years (Thomas et al., 2005).

On the positive side, the clearing under the powerline can function as an additional fire break for an area already prone to very frequent fires (Mendelsohn & Roberts, 1997), if cleared regularly.

Impact summary

Criteria	Construction phase*
Nature	Clearing of vegetation will result in loss of soil fertility and productivity, as well as increased wind erosion.
Extent	Site specific, along the clearing along the entire route
Duration	Long
Intensity	Magnitude: destructive Degree: medium
Probability	Highly probable

Significance	Medium
Degree of Confidence in Predictions	High

* No impact during operations phase.

Mitigation

Clearing should be limited to the absolute minimum area required for the construction (i.e. no wider than the required 12 m). Other than this, no other mitigation measures are known of.

4.4 REGROWTH AND COPPICE CONTROL

Discussion

Several species in the area are known to coppice strongly. Especially *Dichrostachys cinerea, Colophospermum mopane* and *Combretum collinum* are known for their coppicing ability (Strohbach, 1998, 2000a, 2000b). *Dichrostachys cinerea* is also known as the most aggressive encroaching species in Namibia, encroaching especially in disturbed areas (Bester, 1998; De Klerk, 2004). *Clerodendron uncinatum* is less well-known as encroacher (mainly because of it's relative low growth, and often not persisting shoots), but has been observed to encroach extensively in disturbed areas like road verges and old fields (own observations, Figure 4).

Bush clearing follows two broad methods: mechanical clearing or clearing with herbicides. Mechanical clearing either involves the felling of trees and shrubs, using hand tools (bush picks and/or axes) or powertools like chainsaws, brush cutters, etc.; or can also be done by bulldozing ("blading"). The advantage is immediate removal of the woody plants. With hand tools, the wood can be utilised as timber or building wood, with bulldozing such trunks are often broken or splintered, and can only be used as firewood. With bulldozing, the soil is also greatly disturbed, and enables aggressive encroachers like *Dichrostachys cinerea* to establish (Smit et al., 1999). This has also been observed along existing powerlines near Katima Mulilo.

Herbicide treatment can be applied in three ways:

- Herbicides can be applied to the soil, either by hand near the base of the tree, or by aerial broadcasting. Disadvantage of this method is (a) the herbicides will only react once the soil is wet after the first rains, (b) herbicides can be taken up by nearby trees, whose roots get into contact with contaminated soils[3]. This problem is especially pronounced with aerial broadcasting. (c) In certain soil types, especially heavier (clay) soils, more herbicides are needed than in sandy soils. In soils with a clay content of more than 35 %, soil application is virtually ineffective. (d) The herbicides can wash downstream into other habitats, especially with flowing water (Smit et al., 1999; De Klerk, 2004). As large parts of the Caprivi environment form part of extensive floodplain systems, this is a likely result. Soil application of herbicides is thus **NOT** recommended.

- Herbicides can be applied to the foliage, either as hand spraying or as aerial spraying. Hand application is labor intensive, whilst aerial application can potentially harm adjacent vegetation, depending on the accuracy of delivery the herbicide (which in turn is wind-dependant, in addition to pilot error).

- Herbicides can be applied in conjunction with felling. In this case, the felled trunks are treated with herbicides onto the cut of the trunk, or the adjacant bark. A red dye can be added to the herbicide mixture (either with water or diesel as carrying agent, depending on the type of herbicide used), enabling the accurate identification of treated and untreated stumps.

Depending on the type of herbicide used, these are reported to be mildly toxic to humans and animals, but virtually non-toxic to birds, fish and bees. Firewood with remains of herbicides is said to be totally safe to be used (De Klerk, 2004). In all cases, caution needs to be taken not to spill any herbicides.

Both herbicidal and felling treatments are most effective if applied during the active growing season. This is because (a) the plant's resources are in the leaves and stems, not stored underground in roots, and (b) the active metabolism ensures a fast uptake of herbicides, thus preventing the potential degeneration of active ingredients due to heat and water.

In all cases, regrowth (either as coppice, most likely however as newly established plants, has to be expected. In order to prevent such regrowth to become an

[3] Tree roots can extend far beyond the reach of their crown. Roots of specific trees have been observed up to 100 m away from the tree (*Sclerocarya birrea*) (own observation).

impenetrable thicket, regular aftercare treatments are needed (Bester, 1985a, 1985b; De Klerk, 2004).

Impact summary

Criteria	CONSTRUCTION	OPERATION
Nature	Bulldozing of the cutline will damage or destroy wood which could be used as timber or construction wood, and will make it possible for aggressively encroaching species to easily establish. Injudicious application of herbicides will destroy nearby plants, which are not targeted, either through direct contact, or through herbicides distributed by water and/or in the soil.	Injudicious application of herbicides will destroy nearby plants, which are not targeted, either through direct contact, or through herbicides distributed by water and/or in the soil.
Extent	Site specific and local	Site specific and local
Duration	Long	Long
Intensity	Magnitude: destructive Degree: medium	Magnitude: destructive Degree: medium
Probability	Highly probable	Highly probable
Significance	Before mitigation: High After mitigation: Low	Before mitigation: High After mitigation: Low
Degree of Confidence in Predictions	High	High

Mitigation

a) Any large trees are to be felled using chain saws or other appropriate mechanical devices.

b) Bulldozing is to be limited to the absolute minimum, along the access route, i.e. the 12 strip of vegetation to be cleared underneath the power line.

c) Training is to be given by a specialist consultant in the application of herbicides beforehand. This training is to include safety aspects, as well as environmental friendly herbicide application.

d) Stump treatment with herbicides is strongly recommended. Either herbicides with Picloram and Triclopyr, mixed with diesel as carrying agent (e.g. Tordon Super), or with Tebuthiuron, mixed with water (e.g. Access) can be used.

e) Regrowth can be prevented by either regularly mowing the cutline below the powerline (and in this way also creating an effective fire break), or by treating excessive regrowth on a five-year cycle with foliar sprays. The felling and stump treatment of such regrowth can also be considered.

5 CONCLUSIONS AND RECOMMENDATIONS

The impact on the vegetation will be of a highly destructive, very permanent nature during construction. The operational phase will have only limited impacts on the vegetation, but regrowth of the vegetation could, if not controlled, impact on the powerline operation. The control of such regrowth could be very easy, with limited impacts, if done regularly, but could also become very costly, with potentially great impacts on the environment, if left unchecked.

In most cases, no other mitigation measures can be applied than limiting the damage done. In order to achieve this, the following recommendations are made:

- Trees are to be felled along the cutline, not bulldozed, except within the 12m strip which will have to be bulldozed. Timber species are to be reported to the District Forestry Office, who will remove the wood for sawmilling. Other species, especially *Colophospermum mopane*, provide building materials for the local populations.

- Bulldozing is to be limited to the 12 m strip needed for the access- and construction path. The remainder of the clearing is also to be cleared by felling, either with axes, chain saws or brush cutters.

- All stumps are to be treated with a suitable herbicide. Possible choices are preparations with either a Picloram / Triclopyr mixture, or with Tebuthiuron.
- Herbicides may not be applied onto the soil surface (as root treatment), neither as selective hand-treatment, nor as aerial treatment. Herbicides are also not to be applied as aerial foliage treatment for clearing purposes. Excessive regrowth can be treated on a five-year cycle.
- Should protected species be encountered (especially the vulnerable tree orchid *Ansellia africana*), these need to be reported to the National Botanical Research Institute for rescue and rehabilitation efforts.
- In order to keep the clearing cleared of tall vegetation (shrubs, trees), regular (annual) mowing after the rainy season (May / June) is recommended. This will keep the grass short, thus creating an effective fire break, but will also cut short any woody coppicing and prevent these from growing tall.
- Depending on the density, any tall regrowth is to be removed by felling and stump treatment with herbicides. Foliar application of herbicides should be limited to short regrowth (below 2 m height) during the active growing season. No aerial application of herbicides is permitted, due to the highly unselective treatment such aerial application represents.

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7 APPENDIX 1: ANNOTATED SPECIES LIST FOR THE STUDY AREA

Note: Abundance ratings follow those of Strohbach & Strohbach (2004).

Species	Protection status	Conser-vation status	Overall abundance	Average abundance in community:					
				4.1	4.2	4.3	4.5	4.6	4.7
Annual grasses:				1	2	3	5	6	7
Aristida adscensionis L.			occasional			occasional	occasional		
Aristida rhiniochloa Hochst.			rare			occasional			
Aristida stipitata Hack.			common	abundant			common	common	
Aristida stipoides Lam.			occasional				common		
Brachiaria deflexa (Schumach.) C.E.Hubb. ex Robyns			rare			occasional			
Chloris virgata Sw.			rare				rare		
Dactyloctenium giganteum Fisher & Schweick.			occasional	occasional					
Digitaria velutina (Forssk.) P.Beauv.			rare	occasional					
Eragrostis annulata Rendle ex Scott-Elliot			rare	occasional					
Eragrostis biflora Hack. ex Schinz			rare				occasional		
Eragrostis dinteri Stapf			rare	occasional					
Heteropogon melanocarpus (Elliott) Benth.			occasional	rare			occasional		
Perotis patens Gand.			occasional	occasional	rare		occasional		
Pogonarthria fleckii (Hack.) Hack.			common	occasional			occasional	occasional	
Setaria pumila (Poir.) Roem. & Schult.			rare			occasional			
Setaria verticillata (L.) P.Beauv.			rare			occasional			
Tricholaena monachne (Trin.) Stapf & C.E.Hubb.			occasional	occasional			occasional	occasional	
Trichoneura grandiglumis (Nees) Ekman			rare				occasional		

Species	Protection status	Conser-vation status	Overall abundance	Average abundance in community:					
				4.1	4.2	4.3	4.5	4.6	4.7
Perennial grasses:									
Aristida meridionalis Henrard			occasional		rare		rare		
Aristida pilgeri Henrard			rare				occasional		
Cynodon dactylon (L.) Pers.			occasional						abundant
Digitaria seriata Stapf			common	common			occasional	occasional	
Eragrostis cimicina Launert			occasional	rare	rare				
Eragrostis jeffreysii Hack.			occasional	common					
Eragrostis lehmanniana Nees			rare				occasional		
Eragrostis pallens Hack.			occasional	occasional	rare		occasional		
Eragrostis rigidior Pilg.			occasional	abundant			occasional		
Eragrostis superba Peyr.			rare			occasional			
Eragrostis trichophora Coss. & Durieu			occasional	common		occasional			common
Heteropogon contortus (L.) Roem. & Schult.			occasional			occasional	occasional		
Hyparrhenia hirta (L.) Stapf			occasional		common		occasional		
Panicum kalaharense Mez			occasional				occasional	occasional	
Pogonarthria squarrosa (Roem. & Schult.) Pilg.			occasional		rare		occasional		
Schizachyrium sanguineum (Retz.) Alston			occasional		common	occasional	occasional		
Schmidtia pappophoroides Steud.			occasional	occasional			occasional		
Sporobolus fimbriatus (Trin.) Nees			rare			occasional			
Sporobolus sp.			rare			occasional			
Triraphis schinzii Hack.			occasional	common					
Tristachya superba (De Not.) Schweinf. & Asch.			common	occasional	common	occasional	occasional		
Vetiveria nigritana (Benth.) Stapf			occasional						common
Herbs:									
Achyranthes aspera L. var. *sicula* L.			occasional	occasional					
Acrotome inflata Benth.			occasional	common					

Species	Protection status	Conser-vation status	Overall abundance	Average abundance in community:					
				4.1	4.2	4.3	4.5	4.6	4.7
Asparagus sp.			occasional	occasional		occasional		occasional	
Baissea wulfhorstii Schinz			occasional	occasional			occasional	common	
Bidens biternata (Lour.) Merr. & Sherff			occasional	occasional		occasional			
Blepharis leendertziae Oberm.			rare			rare			
Blepharis obmitrata C.B.Clarke			rare	rare					
Hemizygia bracteosa (Benth.) Briq.			common	occasional			occasional	occasional	
Hermannia eenii Baker f.			rare	occasional					
Hibiscus sp.			common	common			occasional	occasional	
Indigofera sp.			occasional	occasional					
Ipomoea sp.			rare	occasional					
Jacquemontia tamnifolia (L.) Griseb.			occasional	occasional					
Kalanchoe brachyloba Welw. Ex Britten			rare			occasional			
Merremia pinnata (Hochst. Ex Choisy) Hallier f.			rare	rare					
Monechma divaricatum (Nees) C.B.Clarke			occasional			occasional	common		
Ocimum americanum L. var. *americanum*			rare						occasional
Rhynchosia sp.			occasional	rare				occasional	
Sesbania sp.			occasional	occasional					
Solanum delagoense Dunal			rare	occasional					
Tephrosia dregeana E.Mey.			rare	occasional					
Vernonia poskeana Vatke & Hildebr.			common	occasional	rare		occasional		
Xanthium strumarium L.			rare	occasional					
Xenostegia tridentata (L.) D.F.Austin & Staples			rare	occasional					
Geophyte:									
Acanthosicyos naudinianus (Sond.) C.Jeffrey			occasional	occasional				rare	

Species	Protection status	Conser-vation status	Overall abundance	Average abundance in community:					
				4.1	4.2	4.3	4.5	4.6	4.7
Epiphyte:									
Ansellia africana Lindl.	Nature Conservation Ordinance, CITES II		rare			occasional			
Parasites:									
Tapinanthus oleifolius (J.C.Wendl.) Danser			occasional					occasional	
Succulents:									
Aloe zebrina Baker	Nature Conservation Ordinance, CITES II		occasional			common			
Sansevieria pearsonii N.E.Br.			occasional			common	occasional		
Geoxylic suffrutices:									
Dichapetalum rhodesicum Sprague & Hutch.			rare		abundant				
Diospyros chamaethamnus Mildbr.			occasional	common					
Dwarf shrubs (below 1 m):									
Clerodendrum uncinatum Schinz			occasional	abundant				occasional	
Combretum platypetalum Welw. ex M.A.Lawson			rare	rare					
Hyphaene petersiana Klotzsch			occasional						occasional
Lianas:									
Fockea multiflora K. Schum.			rare			occasional			
Marsdenia species			occasional					occasional	occasional
Shrubs (between 1 and 5 m):									
Acacia fleckii Schinz			occasional	common					
Balanites aegyptiaca (L.) Delile			occasional			common			
Baphia massaiensis Taub. subsp. *obovata* (Schinz) Brummitt			common	common				abundant	
Bauhinia petersiana Bolle subsp. *macrantha* (Oliv.) Brummitt & J.H.Ross			common	common					

Species	Protection status	Conser-vation status	Overall abundance	Average abundance in community:					
				4.1	4.2	4.3	4.5	4.6	4.7
Boscia albitrunca (Burch.) Gilg & Gilg-Ben.	Forestry Act		rare			common			
Capparis tomentosa Lam.			occasional			occasional			
Combretum apiculatum Sond.			rare				occasional		
Combretum elaeagnoides Klotzsch			occasional			abundant	abundant	occasional	
Combretum hereroense Schinz			occasional			common			
Combretum psidioides Welw.			occasional	occasional					
Commiphora sp.			occasional	rare		occasional		occasional	
Croton menyharthii Pax			occasional			occasional			
Dalbergia melanoxylon Guill. & Perr.			occasional	occasional			occasional		
Dichrostachys cinerea (L.) Wight & Arn.			common	common		occasional	common	common	common
Diospyros lycioides Desf.			rare				occasional		
Euclea undulata Thunb.			occasional			occasional			
Flueggea virosa (Roxb. ex Willd.) Voigt			occasional			occasional			occasional
Grewia flavescens Juss.			occasional				occasional	abundant	common
Grewia retinervis Burret			common	common		common	common	common	abundant
Gymnosporia senegalensis (Lam.) Loes.			occasional			common			common
Helinus integrifolius (Lam.) Kuntze			rare	rare					
Ozoroa species			rare			occasional			
Pterocarpus lucens Lepr. ex Guill. & Perr.			rare	occasional					
Ricinus communis L.		exotic	rare	occasional					
Salvadora persica L.			rare			occasional			
Searsia tenuinervis (Engl.) Moffett			occasional	occasional					
Steganotaenia araliacea Hochst.			rare			common			
Terminalia brachystemma Welw. ex Hiern.			occasional			occasional			

Species	Protection status	Conser-vation status	Overall abundance	Average abundance in community:					
				4.1	4.2	4.3	4.5	4.6	4.7
Vangueria infausta Burch.			occasional					common	
Ximenia americana L.			common	occasional		common	occasional		common
Ximenia caffra Sond.			common	occasional		occasional	occasional	common	
Trees or shrubs:									
Ochna pulchra Hook.	Forestry Act		common	occasional			common	common	
Peltophorum africanum Sond.	Forestry Act		occasional	common		occasional	common		
Piliostigma thonningii (Schumach.) Milne-Redh.			occasional	occasional			occasional		common
Trees (higher than 5 m):									
Acacia erioloba E.Mey.	Forestry Act		common	common			occasional	occasional	common
Acacia nigrescens Oliv.			common	occasional			common	occasional	
Acacia polyacantha Willd.			occasional			occasional	occasional		
Acacia sieberiana DC.	Forestry Act		rare						occasional
Adansonia digitata L.	Forestry Act		occasional			common			occasional
Albizia anthelmintica (A.Rich.) Brongn.	Forestry Act		occasional			common			
Amblygonocarpus andongensis (Welw. ex Oliv.) Exell & Torre			rare				occasional		
Baikiaea plurijuga Harms	Forestry Act	near threatened	occasional	common			occasional		
Burkea africana Hook.	Forestry Act		common	common			common	common	
Colophospermum mopane (J.Kirk ex Benth.) J.Kirk ex J.Léonard	Forestry Act		abundant	common		abundant	abundant		
Combretum collinum Fresen.			common	common			common	common	
Combretum imberbe Wawra	Forestry Act		common	occasional		occasional	common		occasional
Combretum zeyheri Sond.			rare					common	
Commiphora pyracanthoides Engl.			occasional			occasional		occasional	
Commiphora tenuipetiolata Engl.			occasional					common	
Dialium engleranum Henriq.			occasional	occasional		occasional	occasional	occasional	
Diplorhynchus condylocarpon (Müll.Arg.) Pichon			rare	rare					
Eucalyptus camaldulensis Dehnh.		exotic	rare						occasional

Species	Protection status	Conser-vation status	Overall abundance	Average abundance in community:					
				4.1	4.2	4.3	4.5	4.6	4.7
Euclea divinorum Hiern			occasional			common	occasional		
Faidherbia albida (Delile) A.Chev.	Forestry Act		occasional						abundant
Gardenia volkensii K.Schum. subsp. *spatulifolia* (Stapf & Hutch.) Verdc.			occasional			occasional			occasional
Guibourtia coleosperma (Benth.) J.Léonard	Forestry Act		occasional	common					
Philenoptera nelsii (Schinz) Schrire	Forestry Act		occasional					common	
Philenoptera violacea (Klotsch) Schrire	Forestry Act		common	occasional		common	occasional		occasional
Pterocarpus angolensis DC.	Forestry Act	near threatened	occasional	occasional					
Schinziophyton rautanenii (Schinz) Radcl.-Sm.	Forestry Act		occasional	common					
Sclerocarya birrea (A.Rich.) Hochst.	Forestry Act		occasional			common			
Strychnos cocculoides Baker	Forestry Act		occasional	occasional					
Strychnos pungens Soler.	Forestry Act		occasional	occasional					
Swartzia madagascariensis Desv.			rare	rare					
Terminalia sericea Burch. ex DC.			widespread	common	occasional	occasional	abundant	abundant	common
Trichilia emetica Vahl			occasional						occasional
Ziziphus mucronata Willd.	Forestry Act		occasional						common

8 APPENDIX 2: PLOT DATA COLLECTED DURING THE SURVEY

=> Relevé number: 10295

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/09
Relev, area (m2)	: 1000.00
Altitude (m)	: 952
Latitude (degr./min/sec)	: 17-34-01
Longitude (degr./min/sec)	: 24-14-48
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 150
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 1: Along B6, ca 1 km SW of turn-off to Linyanti. Photos 913 and 914.

Acanthosicyos naudinianus-hl	1	Grewia retinervis-s1	1
Acrotome inflata-hl	2	Hibiscus species-hl	2
Aristida stipitata-hl	40	Ochna pulchra-s1	1
Bauhinia petersiana s. macrantha-s2	1	Pogonarthria fleckii-hl	1
Bidens biternata-hl	.1	Pterocarpus angolensis-t1	1
Burkea africana-t1	10	Pterocarpus lucens-s1	1
Combretum collinum-t2	1	Schinziophyton rautanenii-s1	1
Combretum platypetalum-s2	.1	Sesbania species-hl	1
Combretum psidioides-t2	1	Strychnos pungens-s1	1
Dactyloctenium giganteum-hl	.1	Terminalia sericea-t2	2
Dialium engleranum-t1	1	Tricholaena monachne-hl	1
Digitaria seriata-hl	5	Triraphis schinzii-hl	.1
Diospyros chamaethamnus-s2	2	Vernonia poskeana-hl	1
Eragrostis jeffreysii-hl	2	Ximenia americana-s1	1

=> Relevé number: 10296

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/09
Relev, area (m2)	: 1000.00
Altitude (m)	: 952
Latitude (degr./min/sec)	: 17-31-23
Longitude (degr./min/sec)	: 24-13-37
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_set	: WGS84

Caprivi 2: Ca 2 km South of Katima Powerstation, ca 500m SE of Village. Photos 930, 931 and 932.

Acacia erioloba-t1	20	Hermannia eenii-hl	1
Acacia fleckii-s1	1	Hibiscus species-hl	1
Acacia fleckii-t3	1	Indigofera species-hl	1
Baikiaea plurijuga-t1	20	Ipomoea species-hl	1
Baphia massaiensis s. obovata v. obovata	2	Jacquemontia tamnifolia-hl	1
Blepharis obmitrata-hl	.1	Perotis patens-hl	1
Combretum collinum-t3	1	Rhus tenuinervis-s1	1
Dichrostachys cinerea-s1	2	Schinziophyton rautanenii-t3	1
Digitaria seriata-hl	2	Tephrosia dregeana-hl	1
Grewia retinervis-s1	30	Tricholaena monachne-hl	1
Helinus integrifolius-s2	.1	Vernonia poskeana-hl	1
Hemizygia bracteosa-hl	1		

=> Relevé number: 10297

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/09
Relev, area (m2)	: 1000.00
Altitude (m)	: 959
Latitude (degr./min/sec)	: 17-32-12
Longitude (degr./min/sec)	: 24-14-09
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Disturbance	: Fire
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 3: Ca 1.7 km further south of previous. Photos 933, 934 and 935. Pterocarpus angolensis occurs nearby.

Aristida stipitata-hl	5	Heteropogon melanocarpus-hl	.1
Baissea wulfhorstii-hl	1	Indigofera species-hl	.1
Baphia massaiensis s. obovata v. obovata	1	Jacquemontia tamnifolia-hl	1
Bauhinia petersiana s. macrantha-s1	2	Merremia pinnata-hl	.1
Burkea africana-t1	2	Ochna pulchra-s1	1
Combretum psidioides-t3	1	Pogonarthria fleckii-hl	1
Dialium engleranum-s1	1	Schinziophyton rautanenii-t3	1
Digitaria seriata-hl	1	Strychnos cocculoides-t3	.1
Eragrostis dinteri-hl	1	Strychnos pungens-s1	1
Eragrostis jeffreysii-hl	1	Swartzia madagascariensis-t3	.1
Eragrostis pallens-hl	.1	Terminalia sericea-t2	5
Grewia retinervis-s1	2	Tristachya superba-hl	1
Guibourtia coleosperma-s1	1	Vernonia poskeana-hl	1
Hemizygia bracteosa-hl	.1	Ximenia americana-s1	.1

=> Relevé number: 10298

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/09
Relev, area (m2)	: 1000.00
Altitude (m)	: 970
Latitude (degr./min/sec)	: 17-30-32
Longitude (degr./min/sec)	: 24-13-25
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 9
Gps_set	: WGS84

Caprivi 4: Ca 500 m south of Powerstation. Photos 948, 949, 950, 951 and 952. Partially still under the influence of nearby riverine forest, with Acacia nigrescens occuring nearby.

Acacia erioloba-t1	2	Eragrostis jeffreysii-hl	1
Acacia fleckii-s1	1	Hemizygia bracteosa-hl	1
Baikiaea plurijuga-t1	10	Hibiscus species-hl	2
Baissea wulfhorstii-hl	.1	Jacquemontia tamnifolia-hl	1
Baphia massaiensis s. obovata v. obovata	20	Pogonarthria fleckii-hl	1
Bauhinia petersiana s. macrantha-s1	2	Rhus tenuinervis-s1	1
Bidens biternata-hl	1	Rhynchosia species-hl	.1
Clerodendrum uncinatum-s2	1	Schinziophyton rautanenii-t2	1
Combretum collinum-s1	2	Schmidtia pappophoroides-hl	1
Dactyloctenium giganteum-hl	.1	Sesbania species-hl	.1
Dichrostachys cinerea-s1	5	Terminalia sericea-s1	2
Digitaria seriata-hl	1	Vernonia poskeana-hl	.1
Diplorhynchus condylocarpon-s2	.1	Xenostegia tridentata-hl	1

=> Relevé number: 10299

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/09
Relev, area (m2)	: 1000.00
Altitude (m)	: 959
Latitude (degr./min/sec)	: 17-30-14
Longitude (degr./min/sec)	: 24-13-54
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Disturbance	: Mechanical clearing
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 8
Gps_set	: WGS84

Caprivi 5: Along road from Powerstation towards Katima Mulilo - next to road, under small powerline. Photos: Example of regrowth after clearing & construction of powerline.

Acacia erioloba-s2	1	Digitaria seriata-hl	1
Acacia fleckii-s1	2	Digitaria velutina-hl	1
Acanthosicyos naudinianus-hl	1	Eragrostis jeffreysii-hl	1
Acrotome inflata-hl	1	Eragrostis trichophora-hl	2
Baissea wulfhorstii-hl	1	Grewia retinervis-s1	1
Baphia massaiensis s. obovata v. obovata	5	Jacquemontia tamnifolia-hl	1
Bauhinia petersiana s. macrantha-s1	2	Pogonarthria fleckii-hl	1
Clerodendrum uncinatum-s2	20	Ricinus communis-hl	1
Combretum collinum-s1	10	Sesbania species-hl	1
Dactyloctenium giganteum-hl	1	Solanum delagoense-hl	1
Dichrostachys cinerea-s1	2	Xanthium strumarium-hl	1

=> Relevé number: 10300

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/09
Relev, area (m2)	: 1000.00
Altitude (m)	: 944
Latitude (degr./min/sec)	: 17-34-56
Longitude (degr./min/sec)	: 24-16-09
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Oshanas
Slope class	: Flat, 0-1¦ (0-2%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: weak
Soil depth	: 120
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 7
Gps_set	: WGS84

Caprivi 6: Caprivi Quarantine Camp: in centre molapo. Photos: 981 and 982

Aristida meridionalis-hl	.1	Pogonarthria squarrosa-hl	.1
Dichapetalum rhodesicum-hl	20	Schizachyrium sanguineum-hl	2
Eragrostis cimicina-hl	.1	Terminalia sericea-s1	1
Eragrostis pallens-hl	.1	Tristachya superba-hl	5
Hyparrhenia hirta-hl	2	Vernonia poskeana-hl	.1
Perotis patens-hl	.1		

=> Relevé number: 10301

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/09
Relev, area (m2)	: 1000.00
Altitude (m)	: 948
Latitude (degr./min/sec)	: 17-34-56
Longitude (degr./min/sec)	: 24-16-00
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Flat, 0-1¦ (0-2%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 150
Disturbance	: Fire
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 8
Gps_set	: WGS84

Caprivi 7: Caprivi Quarantine Camp: ca 200 m west of previous, in woodland. Photos: 983, 984 and 985

Aristida stipitata-hl	1	Hibiscus species-hl	1
Baikiaea plurijuga-s1	2	Ochna pulchra-s1	1
Baikiaea plurijuga-t1	1	Perotis patens-hl	.1
Baphia massaiensis s. obovata v. obovata	1	Pterocarpus angolensis-t1	1
Bauhinia petersiana s. macrantha-s1	1	Strychnos cocculoides-s1	1
Burkea africana-t1	10	Strychnos pungens-s1	1
Digitaria seriata-hl	1	Terminalia sericea-t2	5
Diospyros chamaethamnus-s2	2	Tristachya superba-hl	1
Grewia retinervis-s1	1	Ximenia americana-s1	1
Guibourtia coleosperma-t1	1	Ximenia caffra-s2	1

=> Relevé number: 10302

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/09
Relev, area (m2)	: 1000.00
Altitude (m)	: 944
Latitude (degr./min/sec)	: 17-35-31
Longitude (degr./min/sec)	: 24-17-12
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: none
Soil depth	: 2
Disturbance	: Bush encroachment
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 8: Caprivi Quarantine Camp: along eastern border. Photos: 986, 987, 988 and 989

Acacia erioloba-s1	1	Phylenoptera violacea-t3	1
Acacia nigrescens-t3	1	Ochna pulchra-s1	1
Achyranthes aspera v. sicula-hl	1	Peltophorum africanum-s1	1
Acrotome inflata-hl	1	Peltophorum africanum-s1	1
Asparagus species-hl	1	Piliostigma thonningii-t3	1
Bauhinia petersiana s. macrantha-s1	20	Rhus tenuinervis-s1	1
Burkea africana-t1	1	Schinziophyton rautanenii-t1	10
Combretum collinum-t2	1	Strychnos pungens-s1	1
Combretum imberbe-t2	1	Terminalia sericea-t2	5
Dactyloctenium giganteum-hl	1	Tristachya superba-hl	1
Dialium engleranum-t2	1	Vernonia poskeana-hl	1
Digitaria seriata-hl	5	Ximenia americana-s1	1
Eragrostis cimicina-hl	.1	Ximenia caffra-s1	1
Eragrostis rigidior-hl	20		

=> Relevé number: 10303

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/09
Relev, area (m2)	: 1000.00
Altitude (m)	: 939
Latitude (degr./min/sec)	: 17-36-16
Longitude (degr./min/sec)	: 24-18-14
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Disturbance	: Bush encroachment
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 9
Gps_set	: WGS84

Caprivi 9: Road to Linyanti: ca 1.5 km south of turn. Photos: 1009, 1010 and 1011

Acacia erioloba-t1	1	Eragrostis jeffreysii-hl	2
Acacia fleckii-s1	1	Eragrostis pallens-hl	1
Acacia nigrescens-t1	1	Guibourtia coleosperma-t1	2
Achyranthes aspera v. sicula-hl	1	Hemizygia bracteosa-hl	1
Aristida stipitata-hl	2	Hibiscus species-hl	1
Baikiaea plurijuga-t2	1	Jacquemontia tamnifolia-hl	1
Baphia massaiensis s. obovata v. obovata	1	Phylenoptera violacea-t1	1
Bauhinia petersiana s. macrantha-s1	.1	Ochna pulchra-s1	1
Burkea africana-t1	1	Pogonarthria fleckii-hl	1
Colophospermum mopane-t2	2	Schinziophyton rautanenii-t1	2
Combretum collinum-t1	1	Terminalia sericea-s1	20
Combretum imberbe-t1	1	Terminalia sericea-t2	10
Commiphora species-s1	.1	Triraphis schinzii-hl	2
Dalbergia melanoxylon-s1	1	Tristachya superba-hl	1
Digitaria seriata-hl	1	Vernonia poskeana-hl	1
Eragrostis annulata-hl	1	Ximenia caffra-s1	1

=> Relevé number: 10304

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/10
Relev, area (m2)	: 1000.00
Altitude (m)	: 940
Latitude (degr./min/sec)	: 17-36-27
Longitude (degr./min/sec)	: 24-18-38
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Undulating, 3-6¦ (5-10%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 9
Gps_set	: WGS84

Caprivi 10: To the east of the road to Linyanti, turning in ca 1km south of turn. Photos: 1025, 1026, 1027 and 1028

Acacia erioloba-t1	1	Hyparrhenia hirta-hl	1
Acacia nigrescens-t2	1	Panicum kalaharense-hl	1
Aristida stipitata-hl	1	Peltophorum africanum-t1	2
Aristida stipoides-hl	1	Perotis patens-hl	1
Burkea africana-t2	1	Piliostigma thonningii-t2	1
Colophospermum mopane-t1	5	Pogonarthria fleckii-hl	1
Combretum imberbe-t1	2	Schmidtia pappophoroides-hl	1
Dalbergia melanoxylon-s1	1	Terminalia sericea-t2	10
Dichrostachys cinerea-s1	2	Tricholaena monachne-hl	1
Eragrostis lehmanniana-hl	1	Vernonia poskeana-hl	1
Eragrostis pallens-hl	1	Ximenia caffra-s1	1
Grewia retinervis-s1	2		

=> Relevé number: 10305

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/10
Relev, area (m2)	: 1000.00
Altitude (m)	: 932
Latitude (degr./min/sec)	: 17-36-55
Longitude (degr./min/sec)	: 24-18-58
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Undulating, 3-6¦ (5-10%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: none
Soil depth	: 80
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 7
Gps_set	: WGS84

Caprivi 11: To the east of the road to Linyanti, turning in ca 1km south of turn. 1 km from previous. Selective wood harvesting. Photos: 1029, 1030, 1031 and 1032.

Acacia nigrescens-t1	2	Euclea divinorum-s1	1
Albizia anthelmintica-t2	5	Euclea undulata-s1	1
Aloe zebrina-hl	10	Fockea multiflora-t2	1
Aristida adscensionis-hl	1	Phylenoptera violacea-t1	2
Balanites aegyptiaca-s1	5	Sansevieria pearsonii-hl	2
Colophospermum mopane-t1	10	Sporobolus species-hl	1
Combretum hereroense-s1	5	Ximenia americana-s1	2
Combretum imberbe-t1	1		

=> Relevé number: 10306

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/10
Relev, area (m2)	: 1000.00
Altitude (m)	: 952
Latitude (degr./min/sec)	: 17-37-14
Longitude (degr./min/sec)	: 24-19-49
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Undulating, 3-6¦ (5-10%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: moderate
Soil depth	: 80
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 7
Gps_set	: WGS84

Caprivi 12: To the east of the road to Linyanti, turning in ca 1km south of turn.
Selective wood harvesting. Photos: 1058, 1059, 1060 and 1061.

Acacia nigrescens-t1	1	Gardenia volkensii s. spatulifolia-t2	1
Albizia anthelmintica-t3	1	Grewia retinervis-s1	2
Aristida adscensionis-hl	1	Heteropogon contortus-hl	1
Balanites aegyptiaca-t3	1	Phylenoptera violacea-t1	1
Blepharis leendertziae-hl	.1	Gymnosporia senegalensis-s1	1
Brachiaria deflexa-hl	1	Peltophorum africanum-t1	1
Colophospermum mopane-t1	40	Sansevieria pearsonii-hl	1
Combretum imberbe-t1	1	Schizachyrium sanguineum-hl	1
Eragrostis superba-hl	1	Sporobolus fimbriatus-hl	1
Eragrostis trichophora-hl	1	Tristachya superba-hl	1
Euclea divinorum-t1	2		

=> Relevé number: 10307

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/10
Relev, area (m2)	: 1000.00
Altitude (m)	: 952
Latitude (degr./min/sec)	: 17-37-47
Longitude (degr./min/sec)	: 24-20-21
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: moderate
Soil depth	: 80
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 13: To the east of the road to Linyanti, turning in ca 1km south of turn.
Selective wood harvesting. Photos: 1080, 1081, 1082, 10083 and 1084.
Ansellia africana: 7 plants seen in vicinity. One host tree has been felled, the plant was lying on the ground. I broke it into 3 parts - one was taken back to Windhoek to the NBRI, the two others I tried to "replant" on nearby trees, but at only about 2 m height (compared to the original 8 - 10 m height).

Adansonia digitata-t1	5	Euclea divinorum-s1	1
Ansellia africana-hl	1	Kalanchoe brachyloba-hl	1
Aristida adscensionis-hl	1	Phylenoptera violacea-t2	1
Aristida rhiniochloa-hl	1	Gymnosporia senegalensis-s1	2
Balanites aegyptiaca-s1	2	Monechma divaricatum-hl	1
Colophospermum mopane-t1	40	Peltophorum africanum-s1	1
Combretum hereroense-s1	1	Sansevieria pearsonii-hl	2
Croton menyharthii-s1	1	Steganotaenia araliacea-s1	2
Dichrostachys cinerea-s1	1		

=> Relevé number: 10308

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/10
Relev, area (m2)	: 1000.00
Altitude (m)	: 941
Latitude (degr./min/sec)	: 17-37-33
Longitude (degr./min/sec)	: 24-20-40
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Flood plain
Slope class	: Undulating, 3-6¦ (5-10%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: strong
Soil depth	: 80
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 7
Gps_set	: WGS84

Caprivi 14: To the east of the road to Linyanti, turning in ca 1km south of turn. Tree island in grassland. Photos: 1093, 1094, 1095 and 1096.

Acacia polyacantha-t1	1	Phylenoptera violacea-t1	1
Aloe zebrina-hl	1	Sansevieria pearsonii-hl	1
Capparis tomentosa-t2	1	Sclerocarya birrea-t1	5
Colophospermum mopane-t1	20	Setaria pumila-hl	1
Combretum elaeagnoides-t3	2	Terminalia trichopoda-t3	1
Croton menyharthii-s1	1		

=> Relevé number: 10309

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/10
Relev, area (m2)	: 1000.00
Altitude (m)	: 941
Latitude (degr./min/sec)	: 17-39-37
Longitude (degr./min/sec)	: 24-23-38
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 150
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 7
Gps_set	: WGS84

Caprivi 15: Along road to Ngoma, turning in to west. Photos: 1119, 1120, 1121 and 1122.

Aristida pilgeri-hl	1	Hibiscus species-hl	1
Aristida stipitata-hl	1	Hyparrhenia hirta-hl	1
Aristida stipoides-hl	1	Panicum kalaharense-hl	1
Burkea africana-t1	5	Pogonarthria fleckii-hl	1
Colophospermum mopane-s2	2	Pogonarthria squarrosa-hl	1
Combretum apiculatum-t2	1	Sansevieria pearsonii-hl	1
Combretum collinum-t1	1	Terminalia sericea-t1	20
Digitaria seriata-hl	1	Trichoneura grandiglumis-hl	1
Grewia retinervis-s1	2	Tristachya superba-hl	1
Hemizygia bracteosa-hl	1	Vernonia poskeana-hl	1
Heteropogon melanocarpus-hl	1		

=> Relevé number: 10310

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/10
Relev, area (m2)	: 1000.00
Altitude (m)	: 935
Latitude (degr./min/sec)	: 17-40-27
Longitude (degr./min/sec)	: 24-24-54
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Undulating, 3-6¦ (5-10%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: moderate
Soil depth	: 120
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 16: Along road to Ngoma, turning in to west. selective clearing. Photos: 1123, 1124 and 1125.

Acacia nigrescens-s1	1	Eragrostis rigidior-hl	1
Aristida meridionalis-hl	.1	Grewia flavescens-s1	1
Aristida stipitata-hl	1	Heteropogon contortus-hl	1
Aristida stipoides-hl	1	Hibiscus species-hl	1
Baikiaea plurijuga-s1	1	Phylenoptera violacea-t3	1
Burkea africana-t1	5	Pogonarthria fleckii-hl	1
Colophospermum mopane-t1	5	Pogonarthria squarrosa-hl	1
Combretum imberbe-t3	1	Schizachyrium sanguineum-hl	1
Diospyros lycioides-s1	1	Terminalia sericea-t1	20
Eragrostis biflora-hl	1	Ximenia americana-s1	1

=> Relevé number: 10311

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 929
Latitude (degr./min/sec)	: 17-41-51
Longitude (degr./min/sec)	: 24-27-13
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 150
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 7
Gps_set	: WGS84

Caprivi 17: Along road to Ngoma, turning in to west. Selective clearing. Photos: 1126, 1127, 1128 and 1129.

Aristida stipitata-hl	20	Ochna pulchra-t3	5
Burkea africana-t1	10	Terminalia sericea-t1	10
Combretum collinum-t2	1	Terminalia sericea-t2	20
Grewia retinervis-s1	10	Tristachya superba-hl	.1
Hibiscus species-hl	1		

=> Relevé number: 10312

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 930
Latitude (degr./min/sec)	: 17-42-39
Longitude (degr./min/sec)	: 24-28-36
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: moderate
Soil depth	: 120
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 7
Gps_set	: WGS84

Caprivi 18: Along road to Ngoma, turning in to west. Selective clearing / wood harvesting. There are huts nearby - ca 50 m from here! Photos: 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1137, 1138, 1139 and 1140.

Acacia nigrescens-t1	1	Euclea undulata-s1	1
Aristida adscensionis-hl	1	Gardenia volkensii s. spatulifolia-t3	1
Balanites aegyptiaca-s1	2	Phylenoptera violacea-t1	1
Bidens biternata-hl	1	Monechma divaricatum-hl	1
Colophospermum mopane-t1	30	Peltophorum africanum-s2	1
Combretum imberbe-t2	1	Sclerocarya birrea-t1	1
Commiphora species-s1	1	Setaria verticillata-hl	1
Croton menyharthii-s1	1	Terminalia trichopoda-t3	1
Dichrostachys cinerea-s1	1	Ximenia americana-s1	1

=> Relevé number: 10313

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 928
Latitude (degr./min/sec)	: 17-43-38
Longitude (degr./min/sec)	: 24-29-40
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Undulating, 3-6¦ (5-10%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: moderate
Soil depth	: 120
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 19: Along road to Ngoma, turning in to west. Photos: 1148, 1149, 1150 and 1151.

Balanites aegyptiaca-s1	1	Flueggea virosa-s1	1
Boscia albitrunca-s1	2	Monechma divaricatum-hl	1
Capparis tomentosa-s1	1	Ozoroa species-t3	1
Colophospermum mopane-s1	30	Salvadora persica-s1	1
Colophospermum mopane-t1	10	Ximenia americana-s1	1
Euclea undulata-s1	1		

=> Relevé number: 10314

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 941
Latitude (degr./min/sec)	: 17-44-40
Longitude (degr./min/sec)	: 24-31-18
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: moderate
Soil depth	: 120
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 20: North of the Lake Linyanti road. Photos: 1152, 1153, 1154 and 1155.

Acacia nigrescens-t2	1	Commiphora pyracanthoides-t3	1
Adansonia digitata-t1	1	Dichrostachys cinerea-s1	1
Asparagus species-hl	1	Gardenia volkensii s. spatulifolia-s1	.1
Balanites aegyptiaca-s1	1	Phylenoptera violacea-t1	1
Colophospermum mopane-t1	30	Monechma divaricatum-hl	1
Combretum elaeagnoides-s1	40	Ximenia americana-s1	1

=> Relevé number: 10315

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 935
Latitude (degr./min/sec)	: 17-46-17
Longitude (degr./min/sec)	: 24-33-13
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: moderate
Soil depth	: 120
Disturbance	: Bush encroachment
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 7
Gps_set	: WGS84

Caprivi 21: West of the Katima-Ngoma road, position C21B. Selective wood harvesting here.
Photos: 1156, 1157, 1158 and 1159.

Acacia erioloba-t2	1	Combretum elaeagnoides-s1	2
Acacia nigrescens-t2	1	Eragrostis rigidior-hl	1
Acacia polyacantha-t2	1	Grewia retinervis-s1	1
Baissea wulfhorstii-hl	1	Hibiscus species-hl	1
Chloris virgata-hl	.1	Phylenoptera violacea-t2	1
Colophospermum mopane-t2	10	Perotis patens-hl	1
Combretum collinum-t2	1	Terminalia sericea-t2	20

=> Relevé number: 10316

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 935
Latitude (degr./min/sec)	: 17-46-49
Longitude (degr./min/sec)	: 24-33-46
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: moderate
Soil depth	: 120
Disturbance	: Bush encroachment
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 22: West of the Katima-Ngoma road, position C21D. Selective wood harvesting here. Huts nearby here - ca 500 m. Photos: 1160, 1161, 1162 and 1163.

Acacia erioloba-s1	1	Digitaria seriata-hl	1
Aristida stipitata-hl	5	Hibiscus species-hl	1
Asparagus species-hl	1	Phylenoptera nelsii-t3	1
Baissea wulfhorstii-hl	2	Ochna pulchra-s1	1
Clerodendrum uncinatum-hl	1	Terminalia sericea-s1	20
Combretum collinum-t3	5	Terminalia sericea-t3	10
Combretum elaeagnoides-s1	1	Ximenia caffra-s1	1
Commiphora species-s1	1		

=> Relevé number: 10317

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 934
Latitude (degr./min/sec)	: 17-48-38
Longitude (degr./min/sec)	: 24-35-53
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: strong
Soil depth	: 120
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 23: West of the Katima-Ngoma road, along Sambalala road. This here is strongly ecotonal, between mopane woodlands and sand woodlands. Photos: 1164, 1165, 1166 and 1167.

Colophospermum mopane-t2	10	Terminalia sericea-t3	1
Commiphora pyracanthoides-t3	1	Ximenia americana-s1	1
Dialium engleranum-t3	1	Ximenia caffra-s1	1
Heteropogon contortus-hl	1		

=> Relevé number: 10318

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 933
Latitude (degr./min/sec)	: 17-48-38
Longitude (degr./min/sec)	: 24-35-46
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: moderate
Soil depth	: 80
Disturbance	: Bush encroachment
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 7
Gps_set	: WGS84

Caprivi 24: West of the Katima-Ngoma road, along Sambalala road, ca 300 m further east.
Photos: 1168, 1169, 1170 and 1171.

Aristida adscensionis-hl	1	Grewia flavescens-s1	1
Aristida stipitata-hl	1	Hibiscus species-hl	1
Burkea africana-t1	2	Ochna pulchra-t3	1
Colophospermum mopane-t2	1	Terminalia sericea-s1	5
Combretum collinum-t1	10	Terminalia sericea-t1	5
Combretum elaeagnoides-s1	20	Ximenia caffra-s1	1
Dialium engleranum-t1	1		

=> Relevé number: 10319

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 933
Latitude (degr./min/sec)	: 17-48-39
Longitude (degr./min/sec)	: 24-35-05
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Disturbance	: Bush encroachment
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 9
Gps_set	: WGS84

Caprivi 25: West of the Katima-Ngoma road, along Sambalala road, ca 300 m east of Caprivi 23. Selective wood harvesting. Photos: 1172, 1173, 1174 and 1175.

Acacia erioloba-s2	1	Ochna pulchra-t3	1
Aristida stipitata-hl	10	Pogonarthria fleckii-hl	1
Combretum collinum-t1	20	Rhynchosia species-hl	1
Combretum zeyheri-t3	2	Terminalia sericea-s1	10
Commiphora pyracanthoides-t3	1	Terminalia sericea-t2	20
Dialium engleranum-t3	1	Vangueria infausta-s1	1
Grewia retinervis-s1	1	Ximenia caffra-s1	2
Hemizygia bracteosa-hl	1		

=> Relevé number: 10320

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 935
Latitude (degr./min/sec)	: 17-49-11
Longitude (degr./min/sec)	: 24-36-27
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: moderate
Soil depth	: 80
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 8
Gps_set	: WGS84

Caprivi 26: West of the Katima-Ngoma road, off Sambalala road to south, along road to community campsite. Photos: 1176, 1177 and 1178.

Amblygonocarpus andongensis-t1	1	Monechma divaricatum-hl	2
Aristida stipoides-hl	2	Ochna pulchra-t3	1
Colophospermum mopane-t1	40	Perotis patens-hl	1
Combretum collinum-t1	5	Pogonarthria fleckii-hl	1
Dichrostachys cinerea-s1	1	Pogonarthria squarrosa-hl	1
Euclea divinorum-s1	1	Terminalia sericea-s1	1
Hemizygia bracteosa-hl	1		

=> Relevé number: 10321

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 930
Latitude (degr./min/sec)	: 17-53-03
Longitude (degr./min/sec)	: 24-40-19
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Disturbance	: Bush encroachment
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 27: West of the Katima-Ngoma road, at crossing of powerline. Photos: 1194, 1195, 1196 and 1197, as well as 1198.

Acacia erioloba-t2	1	Grewia retinervis-s1	10
Acanthosicyos naudinianus-hl	.1	Phylenoptera nelsii-t3	5
Baphia massaiensis s. obovata v. obovata	30	Ochna pulchra-t3	2
Burkea africana-t1	10	Panicum kalaharense-hl	1
Combretum collinum-t3	5	Tapinanthus oleifolius	1
Commiphora tenuipetiolata-t3	5	Terminalia sericea-t1	10
Dichrostachys cinerea-s1	10	Vangueria infausta-s1	2
Digitaria seriata-hl	1		

=> Relevé number: 10322

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 924
Latitude (degr./min/sec)	: 17-53-39
Longitude (degr./min/sec)	: 24-43-30
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Flood plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 8
Gps_set	: WGS84

Caprivi 28: Ngoma, ca 3 km NE, next to Chobe river (beyond ZCC village). Disturbances: Elephant dung seen, but little evidence of damage - only Grewia shrubs. Photos: 1203, 1204, 1205 and 1206. Before these - Chobe river floodplains (with grasslands) next to this plot.

Acacia erioloba-t2	5	Grewia flavescens-s1	5
Combretum imberbe-s1	1	Hyphaene petersiana-s2	1
Cynodon dactylon-hl	20	Marsdenia species-s1	1
Dichrostachys cinerea-s1	1	Ziziphus mucronata-s1	1
Faidherbia albida-t1	30		

=> Relevé number: 10323

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 927
Latitude (degr./min/sec)	: 17-53-49
Longitude (degr./min/sec)	: 24-43-14
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Flood plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 9
Gps_set	: WGS84

Caprivi 29: Ngoma, to NE, ca 500 m back from previous. Disturbances: Trampling. Signs of Elephant damage to Terminalia sericea and Piliostigma thoningii. Photos: 1207, 1208, 1209, 1210, 1211 and 1212.

Acacia erioloba-t2	5	Hyphaene petersiana-s1	1
Combretum imberbe-t3	1	Marsdenia species-s1	1
Cynodon dactylon-hl	10	Piliostigma thonningii-t3	2
Dichrostachys cinerea-s1	2	Terminalia sericea-t1	2
Eragrostis trichophora-hl	5	Vetiveria nigritana-hl	2
Faidherbia albida-t1	20	Ximenia americana-s1	2
Flueggea virosa-s1	1		

=> Relevé number: 10324

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 924
Latitude (degr./min/sec)	: 17-53-52
Longitude (degr./min/sec)	: 24-43-06
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Flood plain
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: strong
Soil depth	: 120
Disturbance	: none
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 7
Gps_set	: WGS84

Caprivi 30: Ngoma, to NE, ca 300 m back from previous. Disturbances: Exotics. Photos: 1217, 1218, 1219 and 1220.

Acacia sieberiana-t2	1	Hyphaene petersiana-s2	1
Adansonia digitata-t1	1	Gymnosporia senegalensis-s1	1
Combretum imberbe-t2	1	Ocimum americanum v. americanum-hl	1
Cynodon dactylon-hl	20	Piliostigma thonningii-s1	2
Dichrostachys cinerea-s1	5	Terminalia sericea-t1	1
Eucalyptus camaldulensis-t1	1	Trichilia emetica-t2	1
Faidherbia albida-t2	20	Vetiveria nigritana-hl	1

=> Relevé number: 10325

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 926
Latitude (degr./min/sec)	: 17-54-24
Longitude (degr./min/sec)	: 24-42-38
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Flood plain
Slope class	: Undulating, 3-6¦ (5-10%)
Lithology	: Fluvial
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Disturbance	: Bush encroachment
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 31: Ngoma. Disturbances: also Trampling. Photos: 1228, 1229, 1230, 1231 and 1232.

Acacia erioloba-t1	20	Phylenoptera violacea-t3	1
Cynodon dactylon-hl	10	Gymnosporia senegalensis-s1	5
Faidherbia albida-t1	10	Terminalia sericea-t1	5
Flueggea virosa-s1	1	Trichilia emetica-t2	1
Gardenia volkensii s. spatulifolia-t2	1	Ximenia americana-s1	1
Grewia retinervis-s1	20	Ziziphus mucronata-t2	2

=> Relevé number: 10326

Country code	: Namibia
Cover abundance scale	: Percentage (%)
Author code	: B. Strohbach
Date (year/month/day)	: 2011/08/11
Relev, area (m2)	: 1000.00
Altitude (m)	: 936
Latitude (degr./min/sec)	: 17-54-09
Longitude (degr./min/sec)	: 24-42-25
Biome/Veg. type	: Forest savanna and woodland
Stratigraphy	: Kalahari
Cover: Gravel	: None
Cover: Small stones	: None
Cover: Medium stones	: None
Cover: Large stones	: None
Rock	: None
Landscape type	: Plain (<8 % slope, <100m/km relief)
Local topography	: Sand drift plain (covered by >50% sand)
Slope class	: Gently undulating, 1-3¦ (2-5%)
Lithology	: Eolian
Erosion	: None
Surface crusting	: none
Soil depth	: 120
Disturbance	: Bush encroachment
Region	: Caprivi
District	: Katima Mulilo
Gps_acc	: 6
Gps_set	: WGS84

Caprivi 32: Ngoma, along road to Forestry Station. Photos: 1238, 1239, 1240 and 1241. Before: View from Ngoma bridge to Botswana onto Chobe floodplains. Also photos of Ochna pulchra here.

Acacia erioloba-s2	.1	Grewia flavescens-s1	20
Aristida stipitata-hl	1	Marsdenia species-s1	1
Baphia massaiensis s. obovata v. obovata	10	Ochna pulchra-s1	5
Burkea africana-t1	5	Ochna pulchra-t2	1
Combretum collinum-t2	10	Tapinanthus oleifolius	1
Commiphora tenuipetiolata-t3	5	Terminalia sericea-s1	10
Digitaria seriata-hl	1	Tricholaena monachne-hl	1