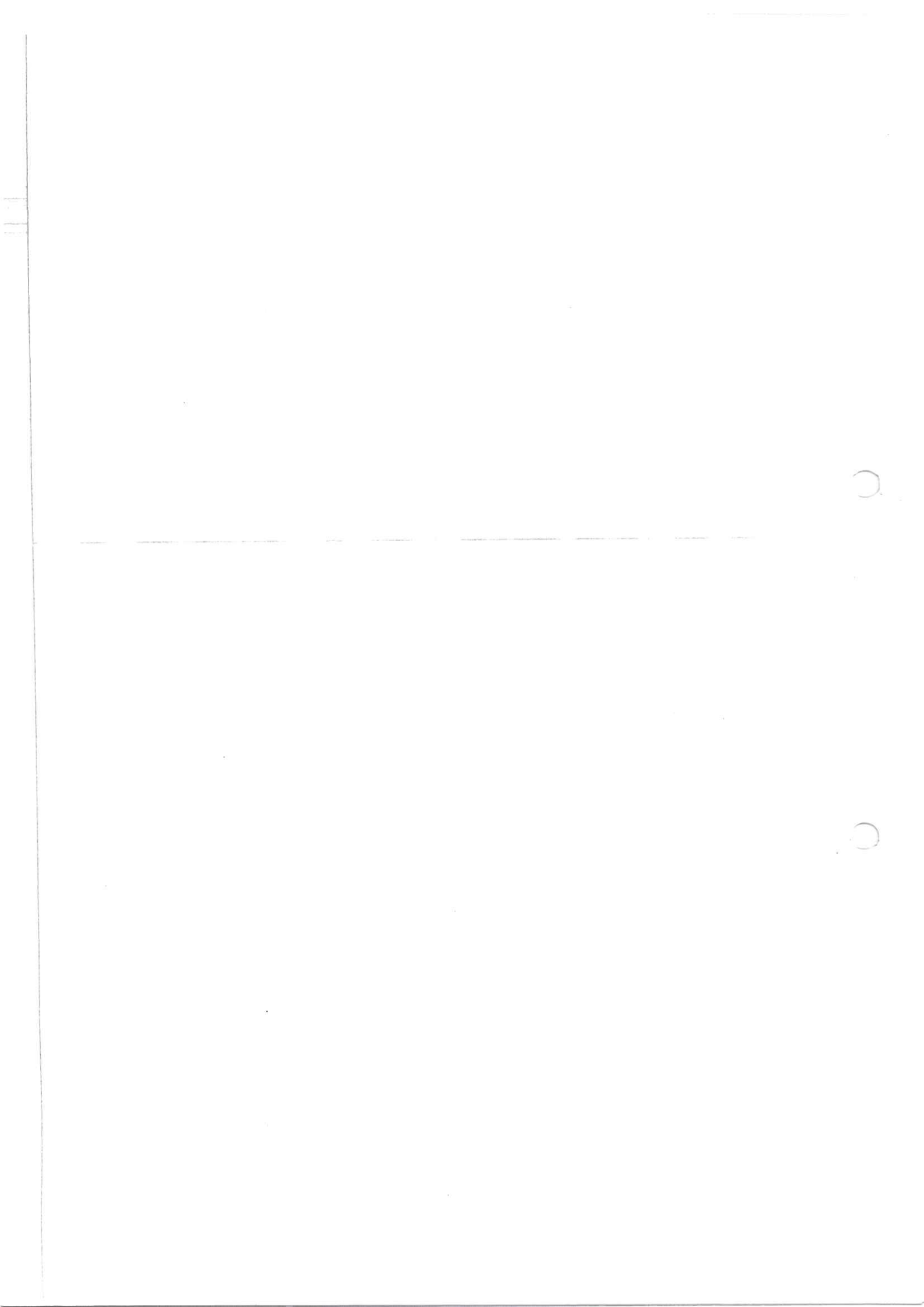


**ANNEXURE 16**



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# *1Habitat suitability of SARGBA properties in Bojanala region of the NW Province for breeding of high value species – a first approximation*

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Pieter Nel  
Ecological services  
BCMD  
North West Parks Board

## **Introduction**

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The NWREAD and the NWPB have embarked on a project with the SA Rare Game Breeders Association to assist emerging game farmers to establish a business in the breeding of high value game species. The game industry is currently growing at an enormous rate and is providing opportunities for new entrants to establish themselves in this industry. Transformation of the game industry has been recognized as a priority not only for the provincial government, but also for established game farmers.

Five properties have been identified, all managed under the umbrella of the SARGBA. Rare game breeding programs have been established on all of these properties. The objective with this project will be to expand the individual breeding programs through offering shareholding to selected emerging game farmers. These farmers will secure shareholding into the business through entering good breeding stock into the breeding programs. These animals will be acquired by government through purchase or donation from provincial nature reserves, and will be made available to these projects through an agreement.

The purpose of this investigation was to evaluate the habitat and veld condition in the five respective properties for the breeding and management of high value species. High value species in this context refer to roan antelope, sable antelope, buffalo, tsessebe and rhinos.

## Location of the properties

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The project will be located in the Kgetleng local municipality, as illustrated below.

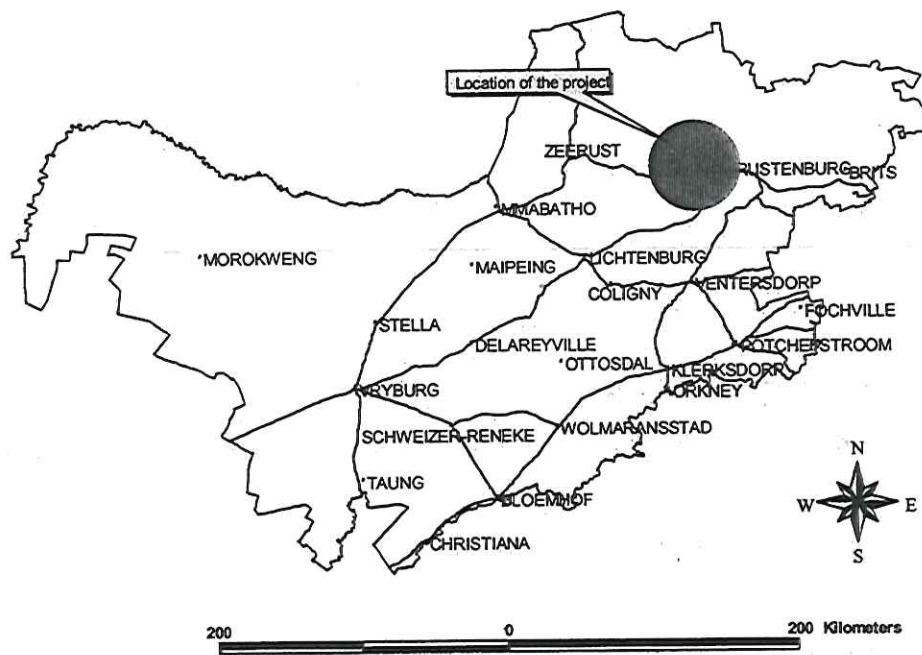


Figure 1: Location of the Kgetleng Game Breeding project

The project will initially be conducted on five properties:(please note the sizes were calculated with Arcview GIS and may not correspond exactly with the official sizes)

<b>Eiland</b>	591.6
<b>Inyati</b>	299.8
<b>Mooivallei</b>	367.6
<b>Midfort</b>	262.7
<b>Ebisu</b>	455.6
<b>Total size</b>	1977.3

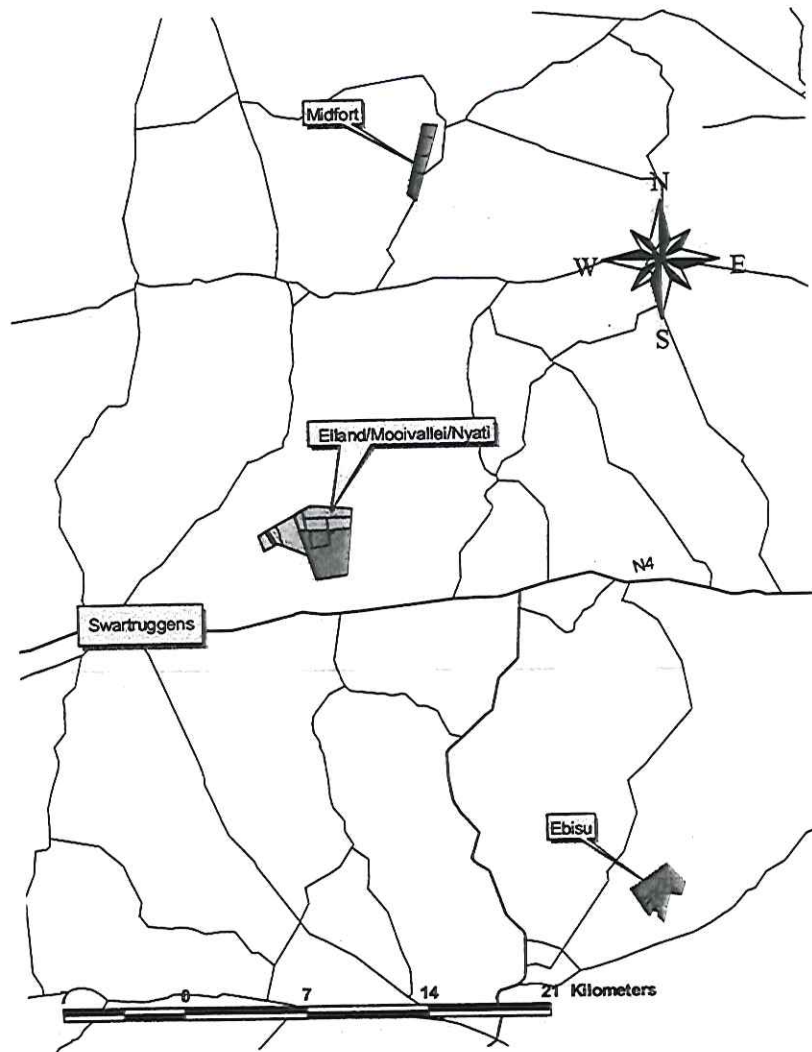


Figure 2: Location of the farms in relation to each other and the town of Swartuggens

## Biophysical properties of the farms

The farms have different biophysical properties and each will be discussed separately in terms of veld type, veld condition and grazing capacity. The underlying geology is an important determinant in the grazing capacity of the farms, as the type of parent material has a significant impact on the nutrient and mineral content of the soils, which in turn affects the nutrition levels of the vegetation. These aspects are briefly discussed

## Ebisu Game Ranch

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Ebisu Game Ranch is the most southerly located of the five farms. The farm covers an area of 455ha. The main camp covers an area of approximately 408ha, with two smaller camps of approximately 25ha in size. The camps are under planted pastures, mainly Eragrostistef (Tef grass).

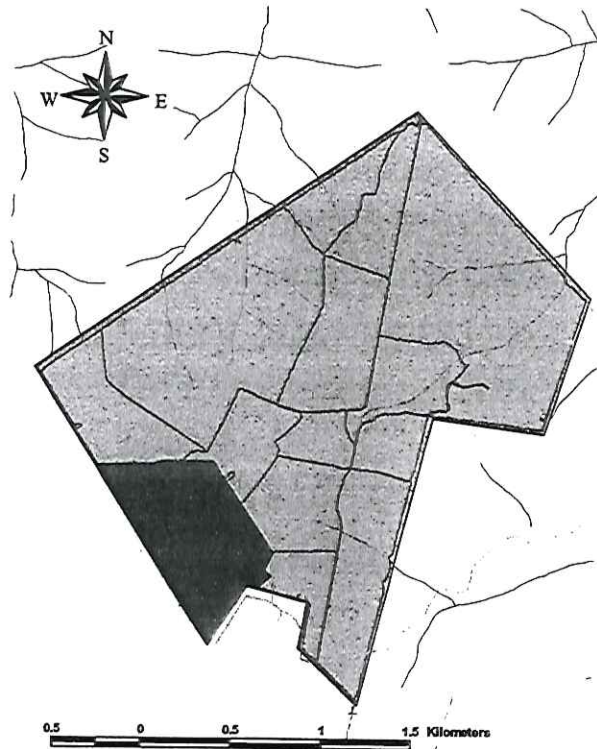


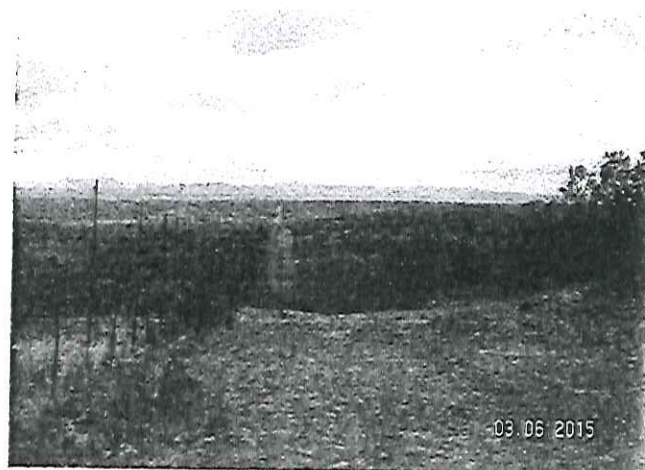
Figure 3: Basemap for Ebisu Game Ranch

## Geology

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The landscape in which the farm is located is characterized by very broken topography, hills and slopes underlain by shallow soils.

The farm is underlain by shale, slate and hornfels of the Pretoria Group, Transvaal sequence. Shale and slate are fine-grained



clastic sedimentary rocks, made up of very fine clay and silt particles and with varying degrees of lithification. Shale and slate contains large quantities of quartz ( $\text{SiO}_2$ ) (20-30%) and clay minerals (50-60%), and also other important soils minerals, especially feldspar ( $\text{KAlSi}_3\text{O}_8$ ), mica ( $\text{K}(\text{Mg,Fe})_3\text{AlSi}_3\text{O}_{10}(\text{OH})_2$ ) carbonate and other heavy metals. The availability of the macro and micro soil nutrients directly influences the nutritional value of the vegetation, and therefore the carrying capacity of the veld.

## Vegetation

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The vegetation type the farm falls within is broadly classified as the Moot Plains Bushveld (SVcb8). This vegetation type occurs on clastic sediments, as is found in Ebusu. Veldtype is opened to very closed, and bottomlands is characterized by various species of Acacia. The important woody species in this veld type includes *Acacia nilotica* (Scented-thorn acacia), *Acacia tortilis* (Umbrella thorn), *Rhus lancea* (karee), *Olea europaea* subsp. *africana* (olive tree) and *Euclea undulata* (ghwarry bush). Herbaceous layer dominated by *Heteropogon contortus* (Spear grass), *Setaria sphacelata* (Common bristle grass) and *Themeda triandra* (red awn grass).



## Midfort Game Ranch

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Midfort Game Ranch is the furthest northerly located farm in the project. It is located on flat terrain, and covers an area of 262ha, also further divided into 4 different camps of 52, 71, 61, and 78 ha in size respectively. In the most northerly camp, lucerne is cultivated under irrigation.

The Roosspruit is running through the farm, and could be the reason for the high yield in water from boreholes. All water for irrigation on the farm is sourced from 4 or so boreholes.

The farm has a long stretched out shape. The farm is divided by a provincial road.

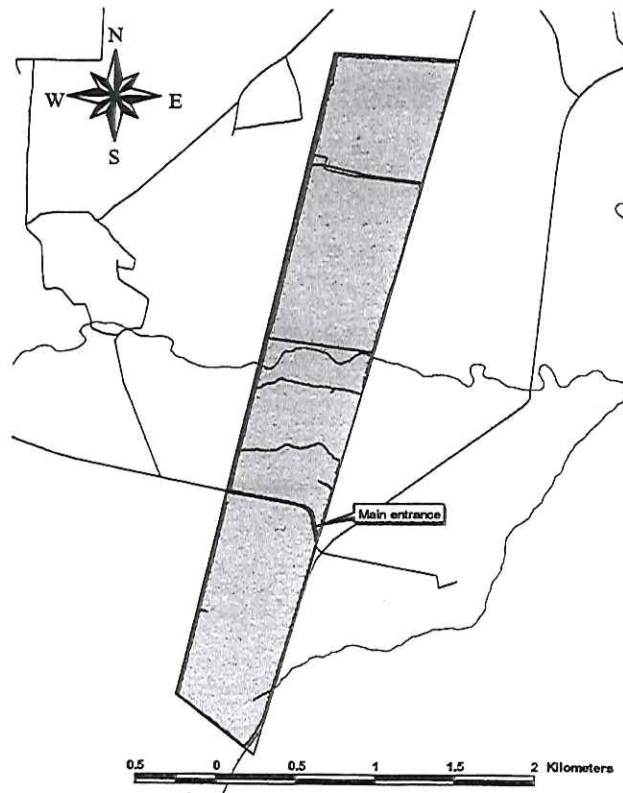
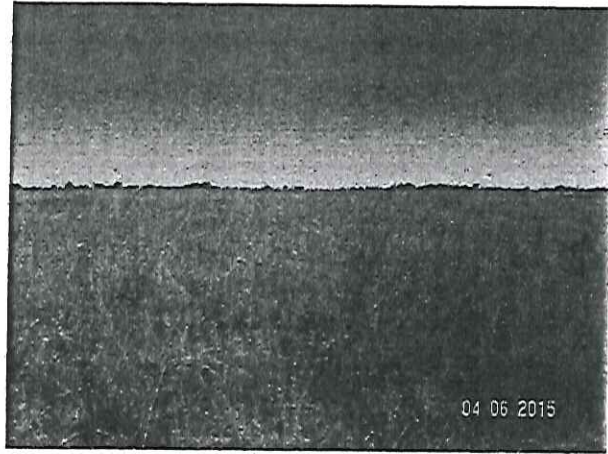


Figure 4: Base map for Midfort Game Ranch

## Geology

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The farm is underlain by undifferentiated surface deposits. This results in deep soils with very high clay content. Shale/slate outcrops were also noted in the central parts of the northern section of the farm, resulting in rocky shallow soils. These areas were fairly small in relation to the rest of the farm. Black cotton soils were noted in the central parts where the drainage line runs through the farm. these soils has a much higher clay content, which will have implications in terms of water retention.

## Vegetation

---

The vegetation type within which Midfort fall, is classified as ZeerustThornveld (SVcb3). Rhusiancea (karee) is very characteristic to the vegetation in this unit, with other species such as Ziziphusmucronata (buffalo thorn), Acacia karroo (Sweet thorn), Acacia tortilis (Umbrella thorn), Ehretiarigida (Puzzle bush) and Diospyroslyciodes (bloubos) also fairly conspicuous. The herbaceous layer is characterized by Cymbopogonplurinodes (terpentine grass), as well as Setariasphacelatavarsphacelata (Common bristle grass), Eragrostiscurvula (Weeping love grass), Eragrostischloromelas (Narrow curly leaf), and Themedatriandra (red awn grass).

## Eiland Game Ranch

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Eiland Game Ranch covers an area of approximately 600ha (592.2ha). The northern parts of the ranch are subdivided in smaller camps, covering an area of approximately 100ha. Further subdivisions is still being fenced out, which will see probably a third of the total into smaller camps.

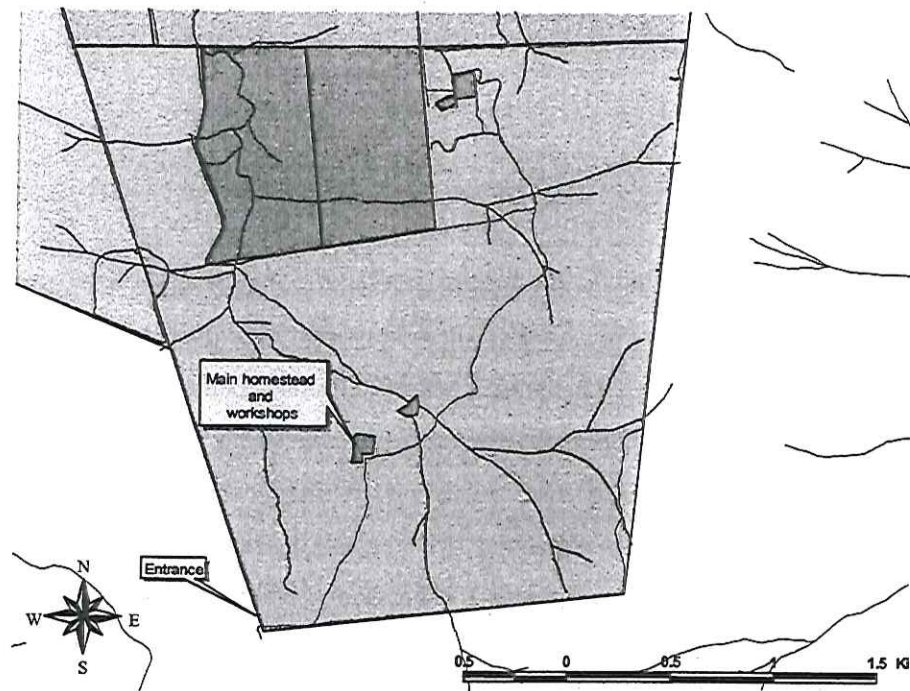
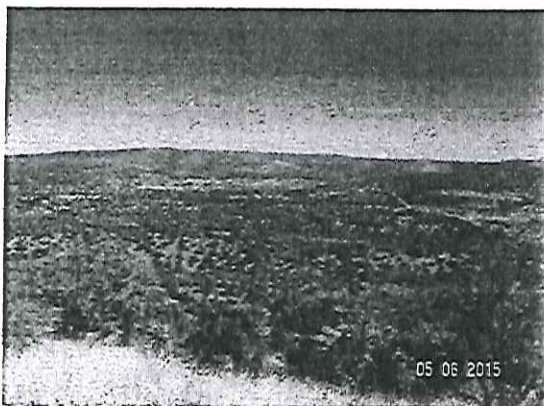


Figure 5: Base map for Eiland Game Ranch



The terrain is also fairly broken and uneven and characterized by high-lying areas with fairly steep slopes interspersed with low-lying areas and valleys.

## Geology

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The farm is underlain by andesite, basalt, tuff and agglomerate. Andesite and basalt is intrusive igneous rocks. Andesite is intermediate in terms of its silica content; basalt is mafic (dark colored) rock, containing dark minerals, including feldspar, another important mineral in soils. Soils derived from andesite and basalt are more clayish, deep red soils, and contain high levels of the important soil minerals. Vegetation on these deep red soils will therefore have higher nutritional value, and hence will be prone to overgrazing/browsing by game.

## Vegetation

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Broadly classified, the vegetation in this farm is described as Dwarsberg-Swartruggens Mountain Bushveld (SVcb4). The important taxa in terms of woody species are *Acacia caffra* (Common hookthorn), *Dombeyarotundifolia* (Wild pear), various *Rhus* species (*Rhus lancea* (karee), *Rhus leptodictya* (Mountain karee), *Rhus pyroides* (Common wild currant)), as well as *Faureasaligna* (Beechwood), *Combretum molle* (Velvet bush willow), *Acacia robusta* subsp. *robusta* (Enkeldoring) and *Ziziphus mucronata* (buffalo thorn). The herbaceous layer is characterized by *Uryletrum agropyroides* (quinine grass), *Schizachyrium sanguineum* (Red autumn grass), *Triraphis andropogonoides* (Broom needle grass), *Setaria phacelata* (Common bristle grass) and more palatable *Themeda triandra* (red awn grass) and *Digitaria eriantha* (vinger grass), especially in the low-lying deeper soils.

## Mooivallei Game Ranch

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Mooivallei Game Ranch covers an area of approximately 367 ha, and has been sub-divided into 5 camps.

Camps	Size (in ha)
Mooivallei	44.6
Mooivallei	78.7
Mooivallei	80.1
Mooivallei	142.5
Mooivallei	21.40

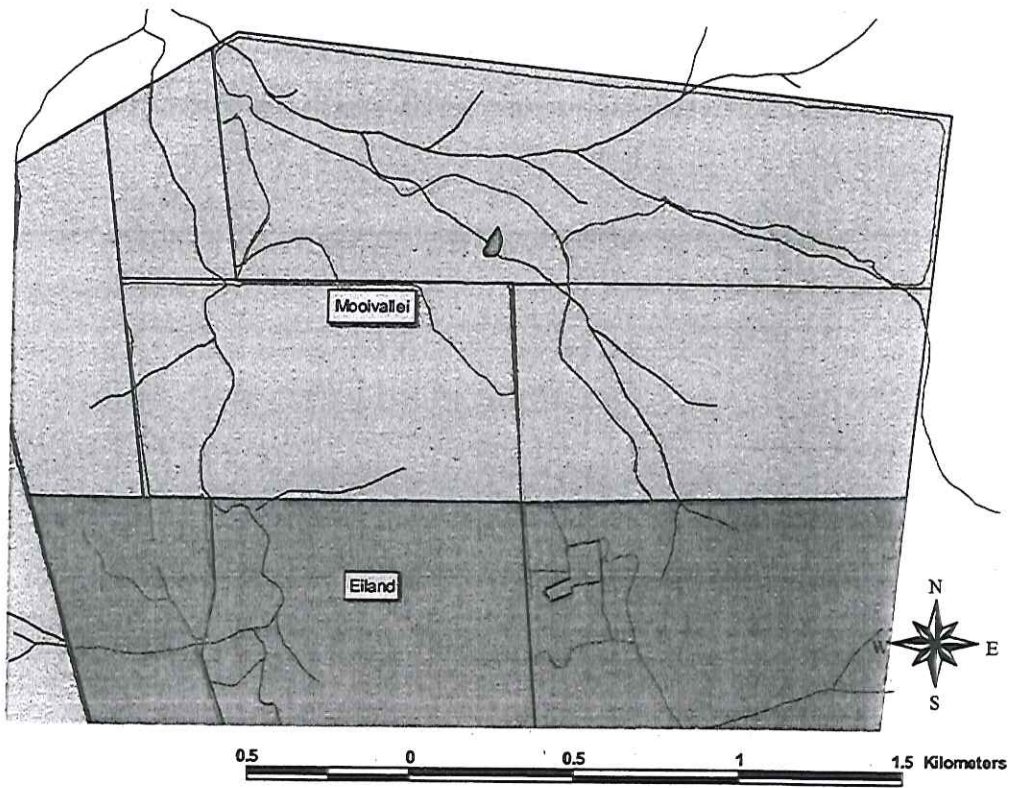


Figure 6: Base map for Mooivallei Game Ranch

Geology

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See Eiland geology

Vegetation

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See Eiland vegetation

## Nyati Game Ranch

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The low-lying areas of Nyati Game Ranch have been subdivided into small breeding camps for intensive breeding of high value species. The ranch covers an area of approximately 300 ha.

Camps	Size (in ha)
Inyati	194.7
Inyati	50.0
Inyati	39.1
Inyati	4.0
Inyati	3.7
Inyati	3.5
Inyati	3.2
Inyati	1.6
	299.8

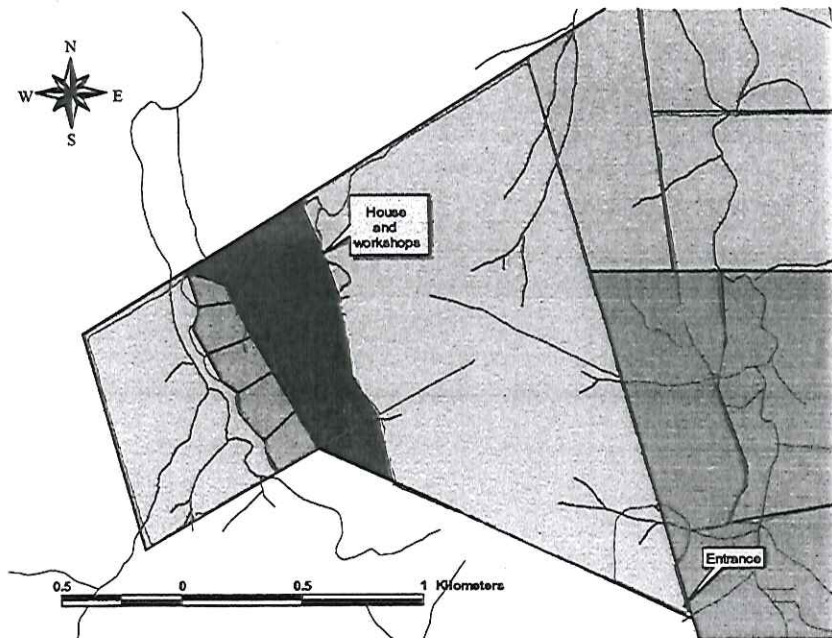


Figure 7: Base map for Nyati Game Ranch

## Geology

See Eiland geology

## Vegetation

See Eiland vegetation

## Grazing capacity of the veld in the different farms

A Landscape analysis was done and preliminary vegetation boundaries were delineated. Survey sites were randomly located within each class. At each site the following information was collected:

- Broad vegetation description
- Soil depth
- % Rocks
- Soil texture: The following texture classes were used:
  - 1 - <10% sandy
  - 2 - 10-15% Loamy sand
  - 3 - 15-20% Sandy loam
  - 4 - 20-35% Sandy clay loam
  - 5 - 35-55% Sandy clay
  - 6 - 55%+ Clay
- Slope

A subjective cover assessment was allocated to each species which could be identified within each site. The scale used by Bredenkamp, Deutschlander and Theron (1993) was adjusted to provide for a finer resolution.

- 1 - <10% of the cover
- 2 - 11-20% of the cover
- 3 - 21-30% of the cover
- 4 - .....etc. →

- 9 - 81-90% of the cover  
 10 - 91-100% of the cover

The growth form of each plant species. (G-grass; F-forb; DS-dwarf shrub (<2m); S-shrub (>2m<4m); T-tree (>4m))

At each site a disk pasture meter was used to obtain a reading on standing biomass. A Disk pasture meter is an aluminum instrument that is used to determine herbaceous biomass per hectare (kg/ha). These readings were used in the following equation, describing the relationship between standing biomass and disk pasture meter reading (Trollope *et al* 2000):

$$y = -3019 + 2260 \sqrt{x}$$

where: y = mean fuel load (kg/ha)  
 x = mean disk height

### Veld condition and carrying capacity

### Ecological Index method

The grass species of South Africa is classified into ecological classes. The ecological classes are Decreaser, Increaser I, Increaser IIa, Increaser IIb and Increaser IIc, which relates to the grass species's degree of palatability and the veld's degree of utilization (Tainton 1999). The ecological classes are (Van Rooyen 2002):

- Decreaser: Grass species that are abundant in veld that is in a good condition, but decreases when the veld is being over-or underutilized.
- Increaser I: Grass species that increase in veld that is being under-utilized.
- Increaser IIa: Grass species that increase in veld that is being utilized lightly or is being over-utilized selectively.



- **Increaser IIb:** Grass species that increase in veld that is utilized moderately or is being overgrazed selectively.
- **Increaser IIc:** Grass species that increase in veld that is trampled, disturbed or overgrazed severely, including weeds and other invader species.

All herbaceous species was classified into the above ecological classes. Each ecological class has a grazing index value as determined (van Rooyen 2002). The frequency percentages of the grass species in the Decreaser class were summed and an average obtained per vegetation unit. This was done for all the other ecological classes in each vegetation unit. The presence of each herbaceous species and its grazing value index score was used to determine the grazeable component of the total available forage for each vegetation unit. This is expressed in kg/ha.

**Table 3: Grazing index values for ecological classes adapted from Tainton 1999**

Ecological class	General grazing index value
Decreaser	10
Increaser I	7
Increaser IIa	4
Increaser IIb	4
Increaser IIc	1

A forage value score was also assigned to the herbaceous species recorded on the ranch. This was done according to the values assigned to species by Van Rooyen (2010), as well as own experience and knowledge. These scores assisted in calculating the palatable portion of all standing phytomass. Under different conditions, herbaceous species are grazed at variable intensities, although cattle are physiologically adapted to utilize unpalatable grass species.

Grazing capacity was further expressed as the area required to sustain one Grazer unit for one year. The dry matter requirement of a grazing unit (GU) is about 4.5kg/day (2.5% of the body weight of a blue wildebeest), while the daily dry matter requirement of a browser unit (BU) is about 3.5kg (2.5% of the body weight for a kudu). Using this, substitution values of other game species have been calculated and will be used to determine how many individuals of a species can be supported based on current available dry mass.

It is also important to note that annual rainfall and especially the rainfall of the preceding season will have a significant role in standing biomass. These calculations will therefore have to be used as an initial approximation of the carrying capacity, and the grazing capacity need to be assessed on an annual basis. It is important that the principle of adaptive management be applied in refining the grazing capacity, and in managing changes in annual rainfall.

## Results

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The field data were consolidated and broad vegetation units were identified. These were used as a basis for calculating grazing capacity for the different units. It is acknowledged that considerable variation is present within the different units, but it should provide a good basis for a first approximation of grazing capacity. Rehabilitation and restoration of degraded areas is currently being undertaken which would also impact on the grazing potential of the farm.

### Eiland, Mooivallei and Nyati

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The vegetation on these 3 farms will be discussed together. To provide for variation in soil depth, clay content, slope and other environmental variables, aerial photos were studied and the farms were divided into broad distinguishable habitats

Habitat type	Size
Degraded areas	27.3
Drainage lines	252.7
Hills and hill tops	415.8
Slopes	561.4

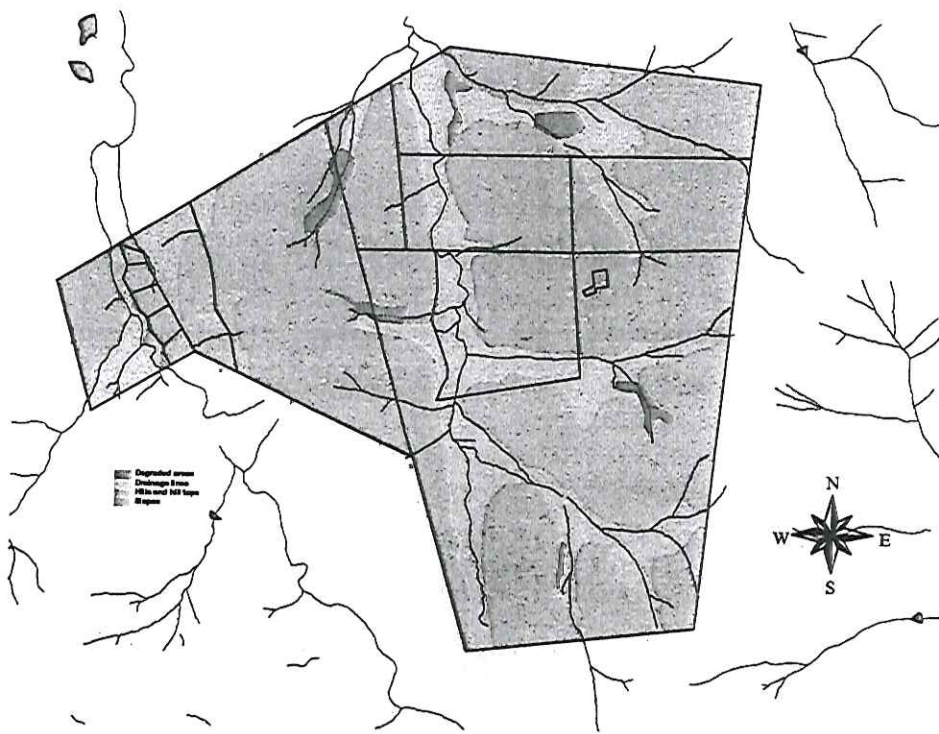
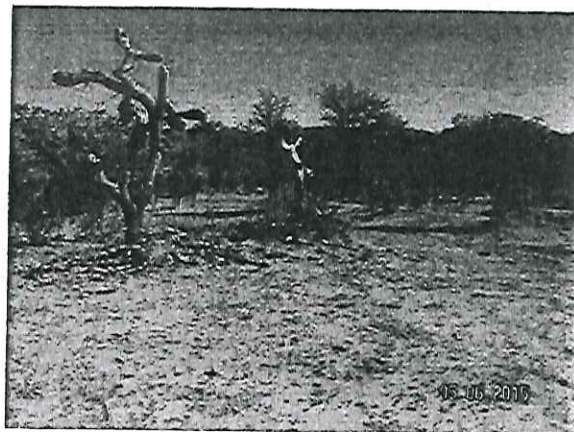


Figure 8: Habitat map for Eiland/Mooivallei/Nyati

### Degraded areas

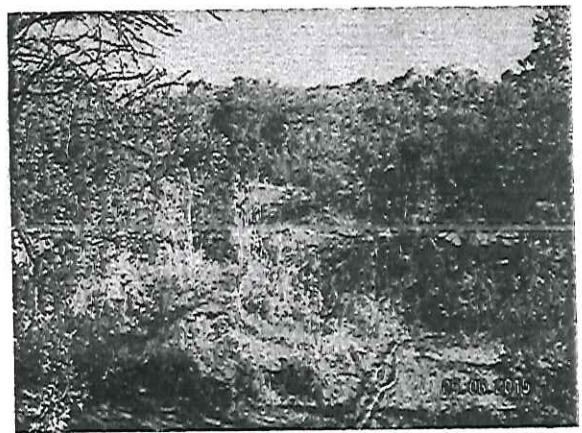
- These areas are basically denuded of any cover, and splash erosion is very prominent
- Herbaceous layer almost absent; sometimes only present either a Increaser 2 species, mostly just bare areas
- Woody layer made up primarily by Acacia species, i.e. Acacia tortilis (Umbrella thorn), Acacia mellifera (Black thorn), Acacia nilotica (Scented-thorn acacia), and also Rhus lancea (karee), Euclea undulata (ghwarry bush) and Rhus leptodictya (Mountain karee)



## Drainage lines

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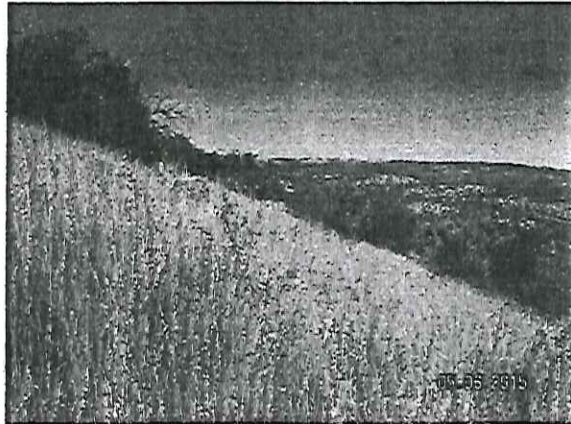
- The vegetation structure in the drainage lines is very dense, and large areas shows signs of historic mismanagement.
- Large areas are denuded of all herbaceous cover. Herbaceous species limited to the cover under trees with *Cymbopogon plurinodes* (terpentine grass) the most important species, and *Aristida congesta subsp. barbicollis* (Spreading Three-awn) and *Themeda triandra* (red awn grass) secondary
- Woody species is very diverse and includes species such as *Ehretia rigida* (Puzzle bush), *Rhus leptodictya* (Mountain karee), *Rhus lancea* (karee), *Olea europaea subsp. africana* (olive tree), *Pappus capensis* (Jacket plum), *Euclea crispa* (Guarri) and *Euclea divinorum* (Magic quarri), *Dodonea angustifolia* (Sand Olive) and *Acacia nilotica* (Scented-thorn acacia) and *Acacia caffra* (Common hookthorn)



## Hills and hill tops

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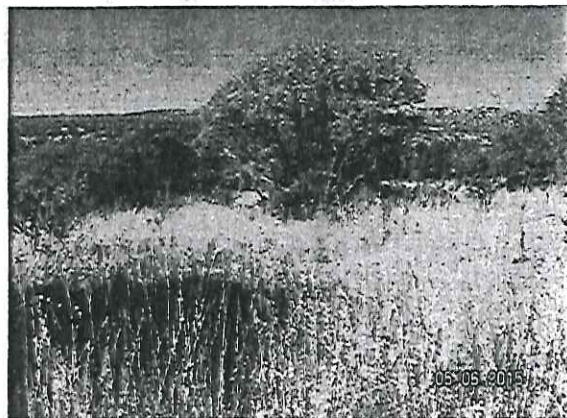
- Characterized by tall grassland, varying from very open to dense woodlands.
- Most important herbaceous species recorded were *Uryletrumagropyroides* (quinine grass), *Schizachyriumsanguineum* (Red autumn grass), *Diheteropogonamplectens* (Broadleaf blue grass), *Andropogonschirensis* (Stab grass), *Themedatriandra* (red awn grass) and *Brachiariaserrata* (Velvet grass)
- Woody species were confined to *Acacia caffra* (Common hookthorn), *Rhuslancea* (karee), *Rhusleptodictya* (Mountain karee), and *Vangueriainfausta* (Mountain medlar)



## Slopes

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- The slopes will be the important grazing areas on the farms
- Vegetation structure slightly more open and dominated by large trees.
- Herbaceous layer also more prominent in most areas, and dominated by *Cymbopogonplurinodes* (terpentine grass), *Schizachyriumsanguineum* (Red autumn grass), *Eragrostisnindensis* (Wether love grass), *Themedatriandra* (red awn grass), *Setariasphacelatavarsphacelata* (Common bristle grass), *Aristidacongesta subs congesta* (Tussel Three-awn) and



*Uryletrumagropyroides* (quinine grass),

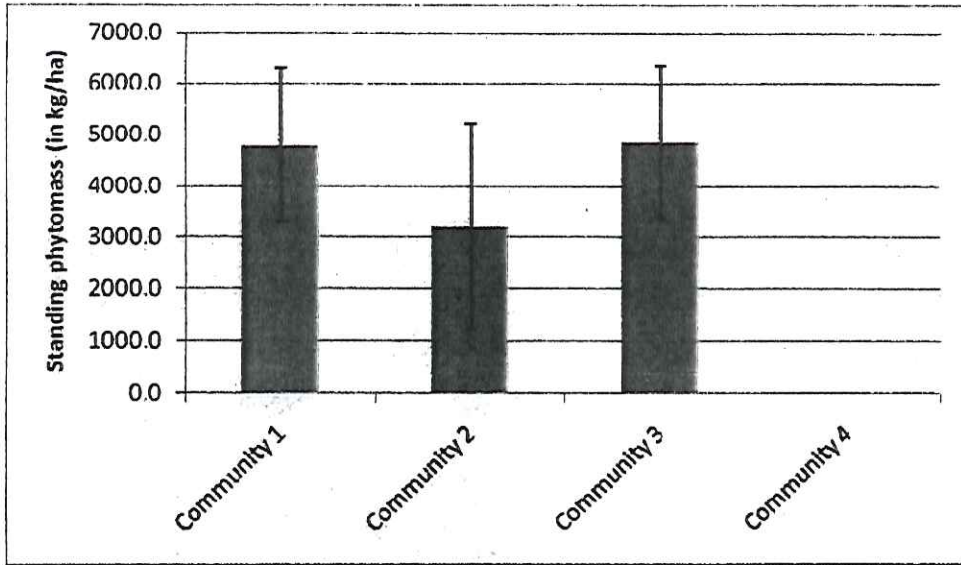


Figure 9: standing biomass (in kg/ha) for vegetation units in Eiland, Mooivallei and Nyati

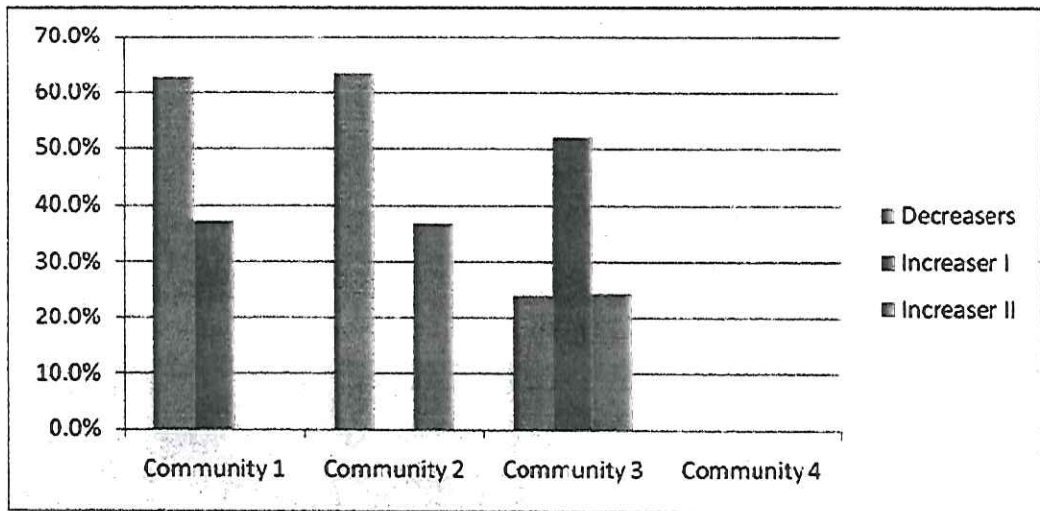


Figure 10: Ecological status of the vegetation units in Eiland, Mooivallei and Nyati

**Table 1: Stocking rate for veg units for Eiland, Mooivallei and Nyati**

Community number	Community 1	Community 2	Community 3	Community 4
Vegetation community	Degraded areas	Drainage lines	Hills and hill tops	Slopes
Size of unit (in ha)	27	253	416	561
Veld condition score	237	264	684	637
As % of benchmark	29.98%	33.42%	86.68%	80.70%
Standing biomass (kg/ha)	226.7	1437.8	5094.6	2742.9
Variance (in kg/ha)	554.4	386.0	205.4	293.1
Total biomass (in kg)	6188.3	363327.0	2118354.8	1539859.6
Effective grazing (in kg/ha)	15.5	100.2	470.0	371.8
% grazing available	7%	7%	9%	14%
Biomass available for grazing (kg/ha)	422.9	25316.2	195430.7	208711.4
Large stock units	0.1	6.9	53.5	57.2
Stocking rate for cattle (ha/GU)	235.60	36.43	7.77	9.82
Available biomass adjusted for game	422.9	25316.2	195430.7	208711.4
Grazer units	0.3	15.4	119.0	127.1
Stocking rate for grazing game (ha/GU)	106.0	16.4	3.5	4.4

### Ebisu Game Ranch

The vegetation in Ebisu Game Ranch is also diverse and similarly as above, it was also classified into broad habitat classes.

Habitat type	Size (in ha)
Disturbed areas	10.1
Drainage lines on deeper soils	123.3
Hills and slopes on shallow soils	276.7
Planted pastures	45.2

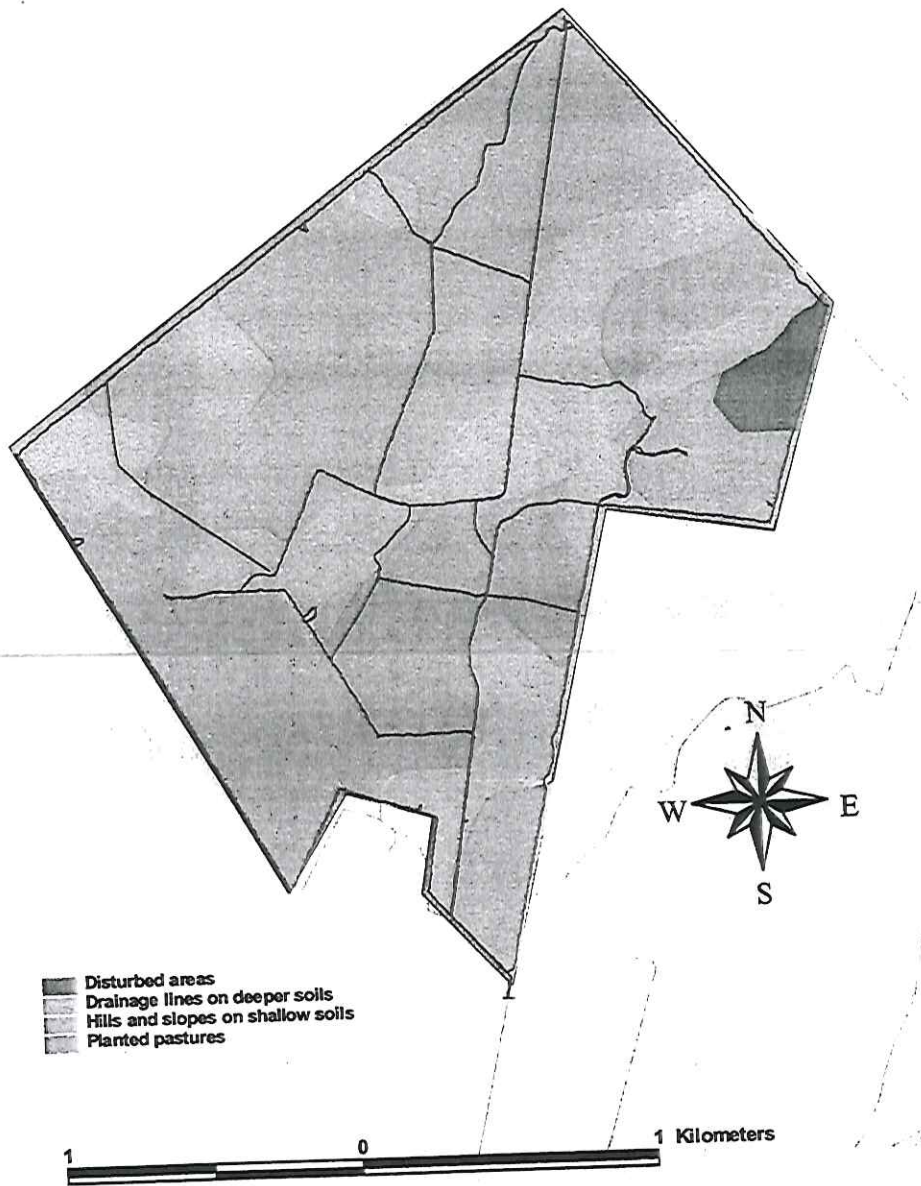


Figure 11: Habitat map for Ebisu Game Ranch



## Disturbed areas

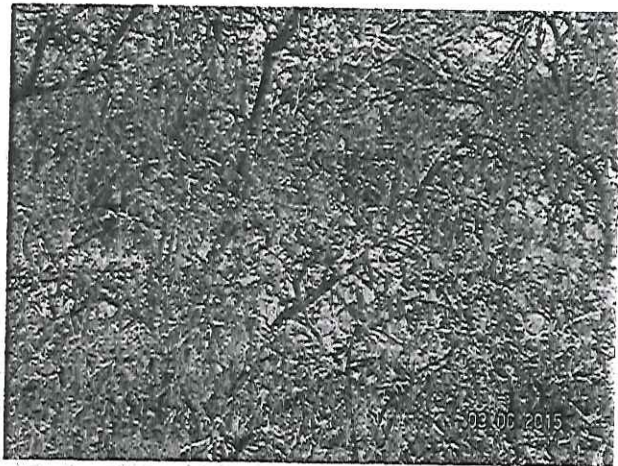
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An area used for the horse's stables and training

## Drainage lines on deeper soils

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- The woody layer in the drainage lines is dominated by *Buddlejaligna* (False olive), and *Olea europaea* subsp. *africana* (olive tree). *Rhus lancea* (karee) and *Gymnosporia polyacantha* (Kraal spike thorn) are also very conspicuous. Other woody species includes *Rhus pyroides* (Common wild currant), *Acacia karroo* (Sweet thorn), *Gymnosporia buxifolia* (Common spikethorn), *Zanthoxylum capense* (small knobwood), *Euclea crispa* (Guarri) and *Euclea undulata* (ghwarry bush)
- The herbaceous layer is dominated by *Setaria phacelata* var. *phacelata* (Common bristle grass) and *Themeda triandra* (red awn grass), with *Heteropogon contortus* (Spear grass) also very prominent. *Cymbopogon plurinodes* (terpentine grass) and *Melinis repens* (Natal Red Top) were also recorded



## Hills and slopes on shallow soils

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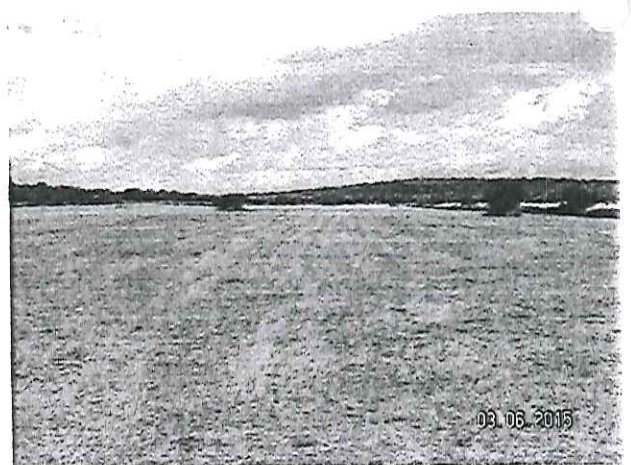
- These areas are characterized by dense stands of *Olea europaea* subsp. *africana* (olive tree) and *Buddleja saligna* (False olive). In certain areas *Dodonea angustifolia* (Sand Olive) have also invaded natural veld, and appears to be increasing. Other woody plants include *Euclea crispa* (Guarri), *Gymnosporia polyacantha* (Kraal spike thorn), *Euclea undulata* (ghwarry bush) and *Gymnosporia buxifolia* (Common spikethorn). *Acacia karroo* (Sweet thorn), *Rhus leptodictya* (Mountain karee), *Acacia robusta* subsp. *robusta* (Enkeldoring) and *Grewia flava* (Raisin bush) were also recorded in this unit.
- The herbaceous layer is well developed in certain areas and is dominated by *Heteropogon contortus* (Spear grass), *Cymbopogon plurinodis* (terpentine grass) and *Setaria spachelata* (Common bristle grass). Other important species includes *Themeda triandra* (red awn grass), *Panicum natalense* and *Melinis repens* (Natal Red Top). *Protasparagus laricinus* (Wild asparagus) and *Protasparagus suaveolens* (Wild asparagus) was also conspicuous



## Planted pastures

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- These fields fenced out and located in the south of the farm.
- *Eragrostis tef* (Tef grass) were sown in and are mowed regularly



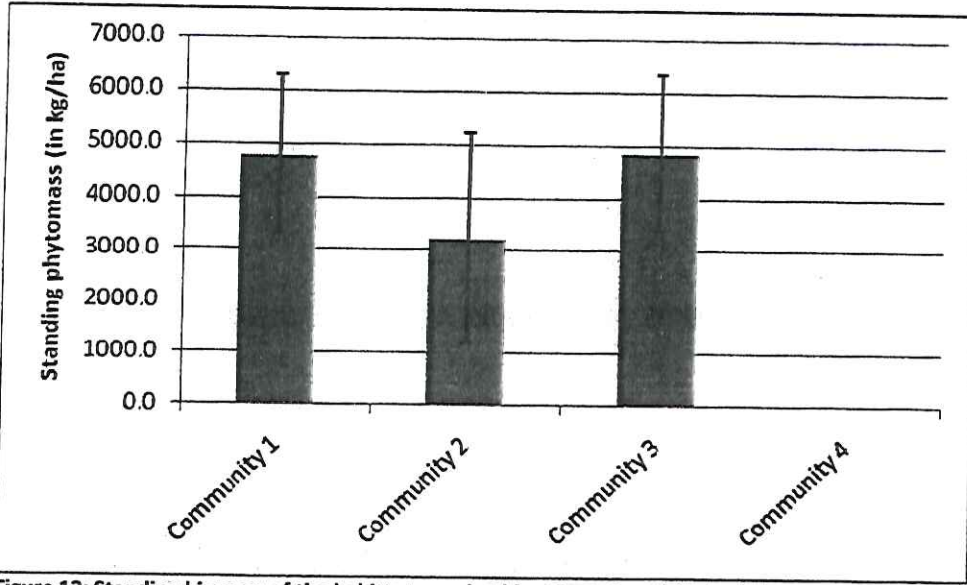


Figure 12: Standing biomass of the habitta types in Ebisu Game Ranch (in kg.ha)

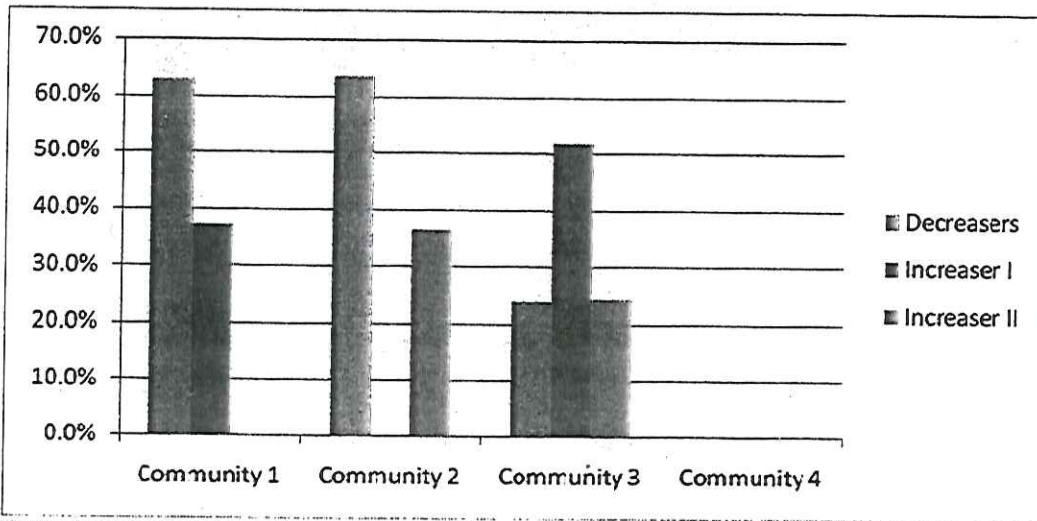


Figure 13: Ecological status of respective vegetation communities in Ebisu Game Ranch

**Table 2: Grazing capacity of Ebisu Game Ranch**

Community number	Community 1	Community 2	Community 3	Community 4
Vegetation community	Disturbed areas	Drainage lines on deeper soils	Hills and slopes on shallow soils	Planted pastures
Size of unit (in ha)	10	123	277	45
Veld condition score	50	106	615	1000
As % of benchmark	6.33%	13.48%	77.87%	126.66%
Standing biomass (kg/ha)	177.1	1730.6	2281.2	1775.2
Variance (in kg/ha)	205.3	135.7	121.2	134.4
Total biomass (in kg)	1788.9	213381.2	631199.7	80238.3
Effective grazing (in kg/ha)	3.0	117.2	338.9	414.2
% grazing available	2%	7%	15%	23%
Biomass available for grazing (kg/ha)	29.8	14454.9	93770.8	18722.3
Large stock units	0.0	4.0	25.7	5.1
Stocking rate for cattle (ha/GU)	1236.43	31.13	10.77	8.81
Available biomass adjusted for game	29.8	14454.9	93770.8	18722.3
Grazer units	0.0	8.8	57.1	11.4
Stocking rate for grazing game (ha/GU)	556.4	14.0	4.8	4.0

### Midfort Game Ranch

Vegetation in Midfort Game Ranch is fairly homogenous, and distinction between the vegetation units was made on the basis of vegetation structure. Four units can be distinguished, although only 3 will be applicable to the grazing capacity of the farm

Habitat type	Size (in ha)
Drainage on deep clay soils	25.54726
Lucerne under irrigation	34.52622
Previously cultivated lands	80.19383
Pastures	7.592914
Open woodland	115.0399

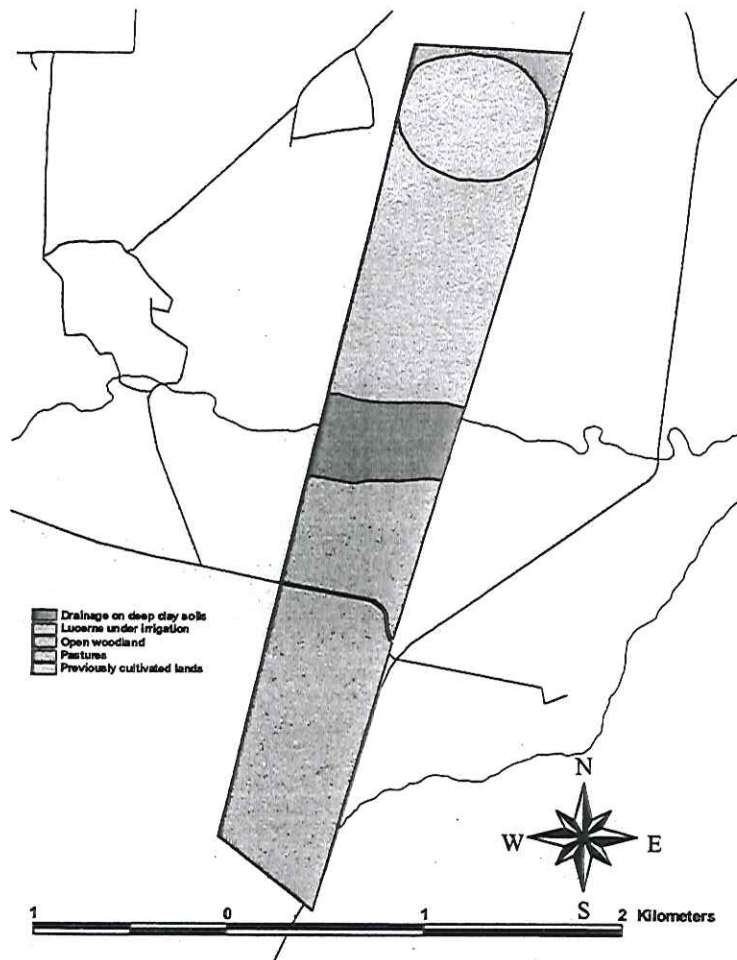
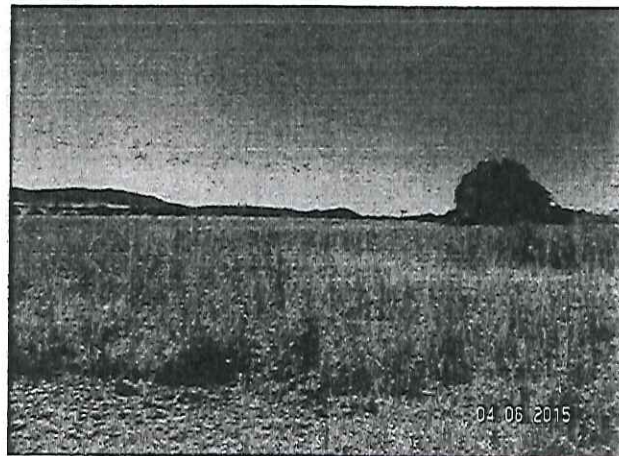


Figure 14: Vegetation map for Midfort Game Ranch

### Drainage on deep clay soils

- Vegetation structure very open, tall grass
- Herbaceous layer characterized by *Setariasphacelatavarsericia* (Golden bristle grass), *Themetriandra* (red awn grass) and *Cymbopogonplurinodes* (terpentine grass)
- The woody layer is poorly developed and restricted to individuals of *Rhuslancea* (karee), *Rhuspyroides* (Common wild currant), *Diospyroslyciodes* (bloubos) and

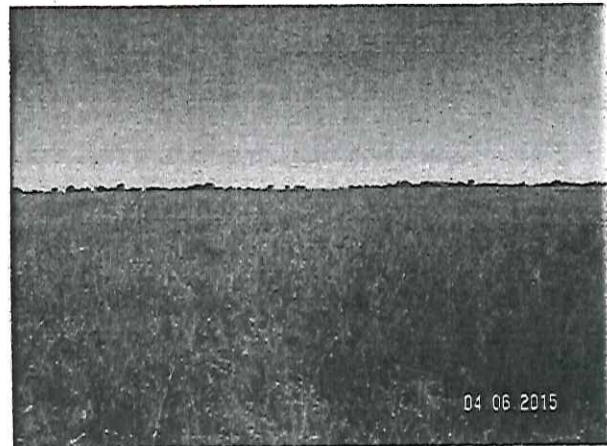


*Grewiaflava* (Raisin bush)

Previously cultivated lands

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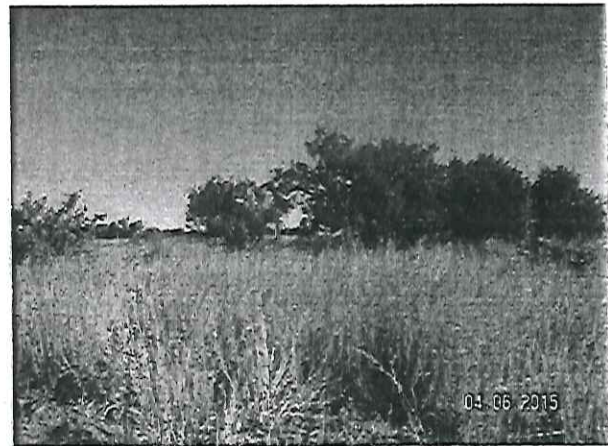
- Herbaceous layer well developed and diverse. Good mix of perennial species. important species are *Cymbopogonplurinodes* (terpentine grass), *Themetrandra* (red awn grass), *Heteropogoncontortus* (Spear grass), *Panicumcoloratum* (Small buffalo grass), *Brachiarianigropedata* (Black-footed signal grass), and a few annuals species such as *Eragrostisrigidior* (Broad-leaved Curly leaf) and *Cynodondactylon* (Couch grass)
- Woody layer almost absent



Open woodland

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- Good diversity of herbaceous species. dominated by perennial species such as *Cymbopogonplurinodes* (terpentine grass), *Hyparrheniahirta* (thatching grass), *Themetrandra* (red awn grass), *Setariasphacelatavarsphacelata* (Common bristle grass) *Heteropogoncontortus* (Spear grass) and *Digitariaeriantha* (vinger grass). Other important species includes *Cynodondactylon* (Couch grass) and *Aristidacongesta subs congesta* (Tussock Three-awn)
- Woody layer well developed, with *Rhuslancea* (karee) dominating composition. *Rhuspyroides* (Common wild currant) and *Grewiaflava* (Raisin bush) are the important shrubs in this unit. A few individuals of *Acacia erubescens* (Geelhaak), *Ziziphismucronata* (buffalo thorn) and *Acacia caffra* (Common hookthorn) were also recorded.



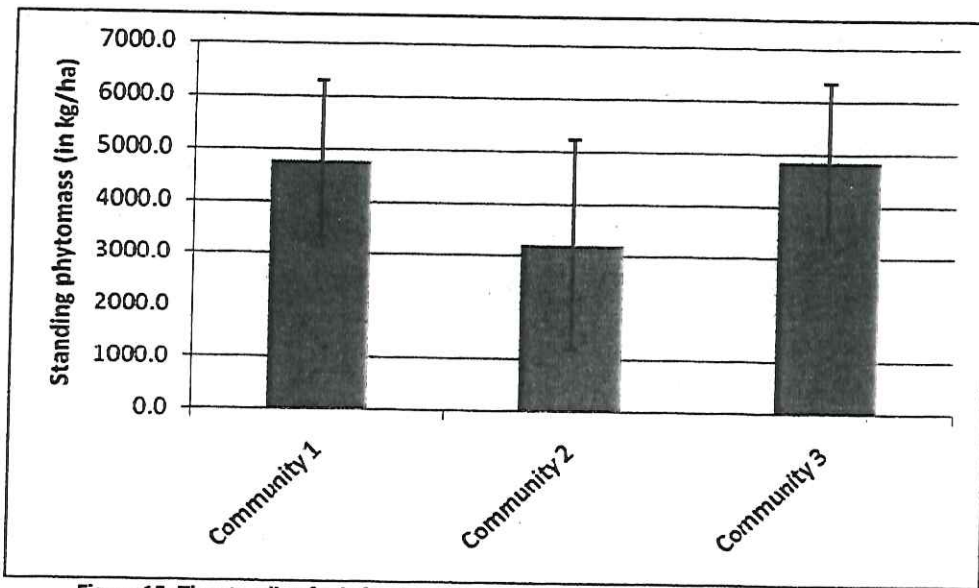


Figure 15: The standing fuels for the different units in Midfort Game Ranch (in kg/ha)

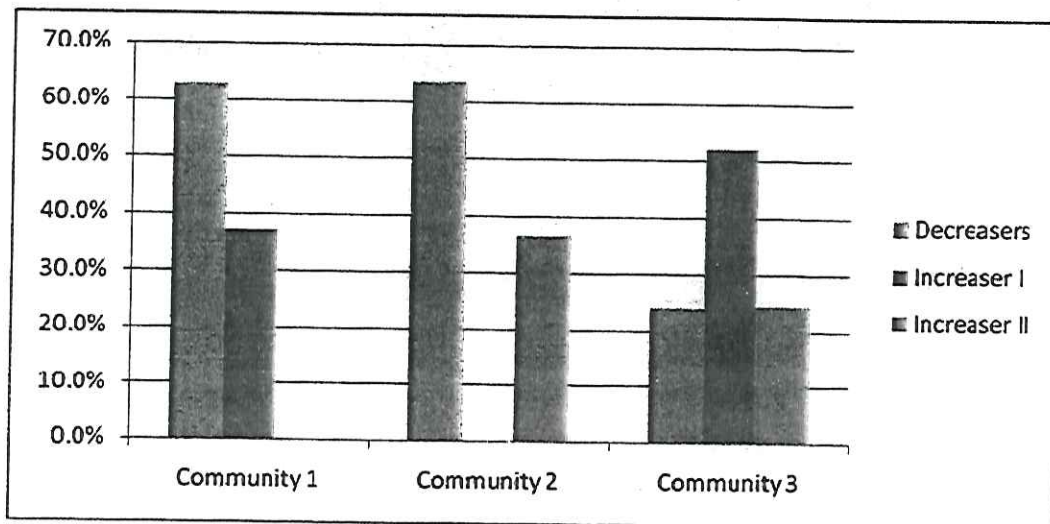


Figure 16: The ecological status of the veg units in Midfort Game Ranch

**Table 3: The veld condition and stocking rates of the veg units in Midfort Game Ranch**

Community number	Community 1	Community 2	Community 3
Vegetation community	Drainage on deep clay soils	Previously cultivated lands	Open woodland
Size of unit (in ha)	26	80	115
Veld condition score	888	732	629
As % of benchmark	112.47%	92.67%	79.62%
Standing biomass (kg/ha)	4793.5	3211.4	4856.3
Variance (in kg/ha)	1482.8	2005.7	1468.2
Total biomass (in kg)	122461.9	257533.7	558672.0
Effective grazing (in kg/ha)	947.2	758.5	695.3
% grazing available	20%	24%	14%
Biomass available for grazing (kg/ha)	24197.3	60824.5	79987.6
Large stock units	6.6	16.7	21.9
Stocking rate for cattle (ha/GU)	3.85	4.81	5.25
Available biomass adjusted for game	24197.3	60824.5	79987.6
Grazer units	14.7	37.0	48.7
Stocking rate for grazing game (ha/GU)	1.7	2.2	2.4

### Habitat suitability of farms for high value species

#### Habitat preference of roan antelope

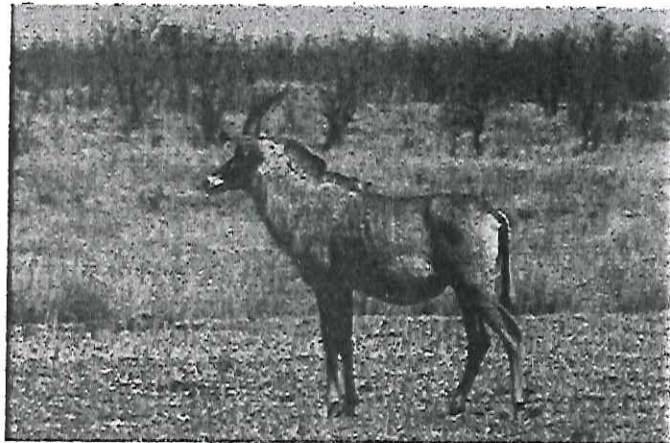
Roan antelope are very popular for their hunting trophies and also for live sales. Their average auction price has increase with almost 90% over the past 3years. Approximately eight years ago a huge debate developed over the genetic integrity of roan antelope in South Africa, and a number of provincial authorities developed policies restricting the movement and selling of these animals, resulting in a huge drop in the value of these animals. Game farmers were reluctant to farm with these animals and their prices stagnated for a few years. Research has however indicated that only two subspecies of roan antelope can be distinguished with significance: the western roan and the eastern roan, of which the eastern roan is the species more commonly present in South Africa.

A few farmers however continued with farming and are now reaping the benefits of their efforts. From the auction values it appears as if the market for roan antelope is recovering.



Roan antelope are predominantly grazers, with preference for open savanna with tall mixed grasslands. Good palatable grasses such as *Themeda triandra* (red awn grass) is generally preferred as part of their diet. They do not like burned veld. Roan antelope is also very sensitive to the presence of other herbivores and would avoid areas with high densities of animals, as well as areas with dense bush encroachment.

Breeding takes place throughout the year, with females first conceiving at age 2 years. However, some breeders have found the females to be ready as early as 17-20 months. A calf is born after a gestation period of approximately 280 days and is hidden for the first six weeks after birth. Under ideal situations, roan antelope can calf every 10 months. They are very dependent on water and need to drink every day.



It is generally recommended that roan under intensive situations not be kept in camps of less than 50ha. Certain breeders believe the larger the camps the better. These camps must also include some good habitat – tall grasses of good quality – as well as a few larger trees that they can use for cover. It is advisable to rather under stock with these animals (and sable antelope), as it would be more profitable in the long run. The objective is after all to ensure females calf at least every 47 weeks and therefore management should be aimed at achieving that.

In small camps and under intensive conditions the animals are obviously more stressed and all kinds of diseases become more prevalent in these situations. This needs to be fought actively during the breeding program, but it is important to familiarize them again with natural food and veld before they are released back into natural veld again. Roan antelope in captivity is very susceptible to external parasites. In areas where the brown ear tick occurs, it will almost certainly infect these animals and preventative measures need to be taken with the adults and especially the calves. The calves seem to be more susceptible than the adults. An important proactive response to tick infestations is to ensure animals are in good healthy state and stressed as little as possible. In addition to this, it may be necessary to actively control external parasites – ticks and flies - through environmentally friendly pyrethroid-based insecticides. Different types of applicators are available; however it is important to

ensure each calf and adult receives the correct dosages. Certain breeders capture each calf immediately after birth and apply parasite control by hand.

### Habitat suitability of the farms for sable antelope

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Sable antelope bulls are very popular amongst professional hunters as trophy animals. Similar to buffalo, the market for sable antelope also appears to stand its ground and breeders are getting good dividends from their investment into these animals.

Sable antelope prefer medium tall to tall grasslands. They are typical Type 2 animals and avoid other animals, especially the bigger herds of Type 1 and Type 3 animals. They are very selective grazers and their preferred food includes quality grasses such as *Digitariaeriantha* (vinger grass) and *Panicum maximum* (guinea grass). It is therefore essential to ensure these grasses returns to the veld in which they will be released.

They occur in small groups of up to 30 animals, with a dominant bull herding himself a group together with some adult females, sub adult females, young bulls and calves. Sable antelope starts breeding at age 32-42 months. The intercalving period can be as low as 10-15months. The calves are usually weaned at age 4-5months

Sable antelope do well in captive breeding programs (Kriek 2006). However, they will also be prone to increased parasite loads, especially since they will be under stress. They are also susceptible to extreme cold and may die of pneumonia. In very cold weather, their ears and lips may even freeze. This is why daily visits to the pens are so important, not only to monitor the animals, but also to habituate them to humans and activities around the camps.

Similar to roan, the young males also need to be removed at age 12-15months. Young heifers also need to be removed to another camp with another bull to prevent inbreeding. Care should be taken when animals from different family groups are introduced into a camp, especially at older age. In this case it may be necessary to cover the horn with pipes to prevent them from injuring each other.



## Habitat suitability of the farms for buffalo

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Buffalo is a popular species to farm with, and many farmers have invested in a herd of buffalo for breeding purposes. The market for live buffalo is still growing, but more recently the quality of animals is becoming more and more important and certain genetic ecotypes are becoming highly sought after. This is because of specific traits, i.e. horn length, resistance to diseases, habitat adaptability, productivity, etc. are embedded in the genetic material of these animals and these traits are in huge demand in the industry. Buffalo are also relatively easy to farm with and occur over a wide range of habitats. They can also easily adapt to captive situation and will take food readily.

Buffalo are grazers that prefer open savanna with sufficient shade and water. Du Toit (2005) indicated that water and food are more important for habitat choice than predator evasion, in which case they would prefer taller riverine vegetation. Cover is also important in the winter months to protect their



young against the cool winter nights. They require abundant tall, sweet-grass species, ample surface water, mud baths and sufficient shrub and trees for refuge. These are mostly associated with riverine valleys, marshlands, sub-tropical savannah woodlands and ecotones of broadleaf montane forests. Vast open, grassy plains lacking woody shelter are usually avoided as are sour-veld, short-grass or heavily over-grazed areas. Internal thermo-regulation is a significant problem for mega-herbivores. Mud baths are thus important to buffalo as a mud cover on the skin regulates body temperature and repels ectoparasites and flies. This enables the animal to tolerate air temperatures of up to 40 degrees C.

Natural feeding could be supplemented with good quality feed. Depending on the availability of natural fibre in their diet on the farm, good quality hay could be supplied. This can consist of weeping love grass *Eragrostis curvula*, buffalo grass *Cenchrus ciliaris*, and lucerne. A cattle lick can be added to the hay to supply the essential minerals, vitamins and protein that are lacking in the winter grazing (Du Toit 2006).

A founder population for intensive breeding is typically 1 adult bull with 10-15 females. Quarantine procedures will require the animals to be boma-ed before release, but it will also allow the herd to settle in their new surrounds and enable the management to monitor any abnormalities associated with the transfer or even the purchase. The intercalving period for buffalo varies between 15 and 24 months, although a pregnancy rate of up to 86% in a herd is not unheard of.

#### Habitat suitability of the farms for white rhino

White rhino is a very popular game ranch species which can adjust very easy to most circumstances. Only in very cold environments where there is very little cover, calves seem to be struggling and mortalities can occur during cold spells. Larger bulls also tend to dominate an area and will perpetually fight with younger bulls or bull calves until they are either killed or driven out of the area.

White rhino prefer open grassland with scattered trees which can provide shading during the day. They also require permanent open water to drink, as well as to wallow in. An adult white rhino require at least 50l of good clean water per day. They are primarily grazers who prefer palatable grasses on clayey soils. Rocky areas with unpalatable sour grasses are avoided. During the dry season they would move onto to taller palatable grass such as *Themedatriandra*.

Breeding takes place throughout the year. Cows can be conceived from age 6-7 years, and the first calf is dropped at age 7-8 years. The gestation period for white rhino is approximately 18 months, and intercalving period on average about 3 years.

#### Habitat suitability of the farms for black rhino

Black rhino prefers dense woodlands with sufficient, high quality browse up to a height of 2m. They are not generally associated with grass plains or open savannas. This dense cover not only provides their food source, but also provides shade during midday heat, or protects them from inclement weather conditions. They are water dependent and will drink daily if water is freely available. They also need a regular mud wallow to cool them down and to rid them of external parasites.

Black rhino is primarily browsers. They are highly selective plant species and plant height. They restrict their browsing to a limited number of species at a particular height. According to Du Toit (2005) important plants species in their diet which occur on the farms include *Dichrostachys cinerea* (sickle

bush), *Acacia* species, *Grewia* species (raisin bush), and certain *Combretum* species (bushwillow). Other species in abundance in farms such as *Ziziphismucronata* (buffalo thorn), *Eucleacrispa* (guarri), *Oleaeuropaea* subsp. *africana* (olive tree) *Carissabispinosa* (Numnum) and *Lippiajavanica* (lavender bush) are unfortunately completely avoided by Black rhino. A species particularly favored is *Spirostachysafricana* (Tamboti), but they do not occur on the farm at all.

The Biodiversity Management Plan for Black rhino plan also requires an ideal founder population of at least 10 animals, although a smaller founder of 5-6 animals has also been accepted as sufficient. In line with the goals and objectives of the BMP, the properties should also be able to carry a population of at least 20 animals.

The ecological carrying capacity of the farms for Black rhino is limited and these areas will certainly not qualify as a preferred property for the introduction of Black rhino in line with the BMP. A male only population be considered, but one need to ask the question if it will be worth the trouble. Excess males are becoming more and more available from established key populations and since current policy and legislation do not allow for the utilization of excess males, disposing of these excess males are problematic.

## Legislation

Roan antelope is listed as Vulnerable in terms of the TOPS regulations. Prospective properties therefore need to be registered prior to introduction of a TOPS species.

White rhino is classified Least concern according to the Red Data Book of the Mammals of South Africa (Friedman and Daly 2004). In terms of the TOPS regulations white rhino is categorized as Endangered Species, which implies that permits are required to carry out restricted activities pertaining to this species.

Black rhino (*Dicerosbicornis minor*) is classified Critically Endangered according to the Red Data Book of the Mammals of South Africa (Friedman and Daly 2004). In terms of the TOPS regulations Black rhino is categorized as Endangered Species, which implies that permits are required to carry out restricted activities pertaining to this species. Some of these restricted activities include hunting of black rhino, sale, supply or export of these animals, or purchasing or acquiring a Black rhino that have been bred in captivity.

Black rhino is also listed as CITES Appendix I, which means that they cannot be traded internationally or hunted.

### The Rhino Management Group

The management of Black rhino populations in South Africa, both private and state are coordinated through the Rhino Management Group, a sub-group of the African Rhino Specialist Group. The RMG was formed in 1989 to implement the 'Conservation plan for the black rhinoceros *Diceros bicornis* in South Africa and Namibia'. This Plan had been adopted early in 1989 with the support of 19 conservation agencies and NGOs in the two countries. Since its inception, the RMG has met regularly to discuss strategic issues and review progress towards meeting rhino conservation goals. The group has coordinated and synthesized standardized annual status reporting throughout all black rhino populations in the RMG region, enabling progress towards meta-population management goals to be assessed annually.

A Biodiversity Management plan was developed to give direction to a national conservation effort to improve the situation with regards to Black rhino specifically. Population targets were developed, and strategies were developed to achieve these targets. Some of these strategies include:

- Management of existing populations to maximize recruitment
- Establishment of new populations by selecting most suitable areas. During the initial screening the following will need to be considered:
  - Potential rate of increase of population in recipient area must be greater than donor area
  - Potential founder population must be 10 or more. However, a founder population of 5 animals is considered sufficient
  - Ecological carrying capacity must be at least 20 rhinos
- Captive breeding only considered because in situ conservation may not be sufficient to achieve the goals

These broad guidelines need to be considered when the suitability of an area is evaluated for Black rhino.