SIMPLIFIED TECHNIQUES FOR ASSESSING VELD CONDITION FOR LIVESTOCK PRODUCTION IN THE CISKEI REGION

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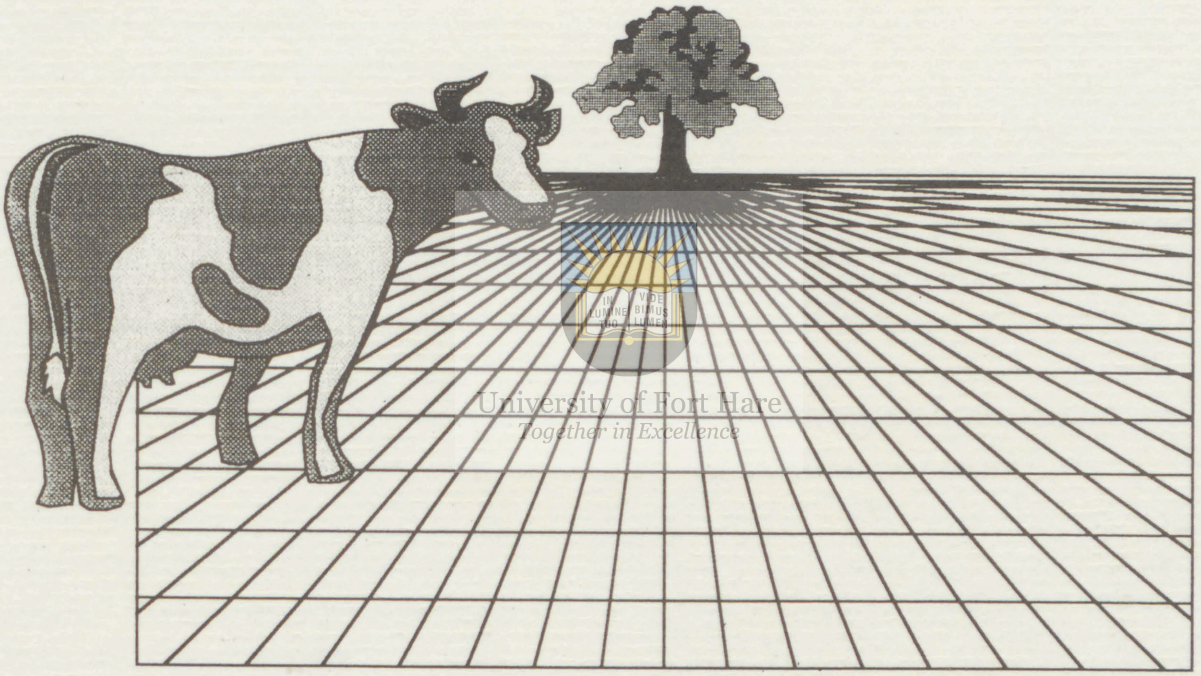

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CHAPTER 1

INTRODUCTION

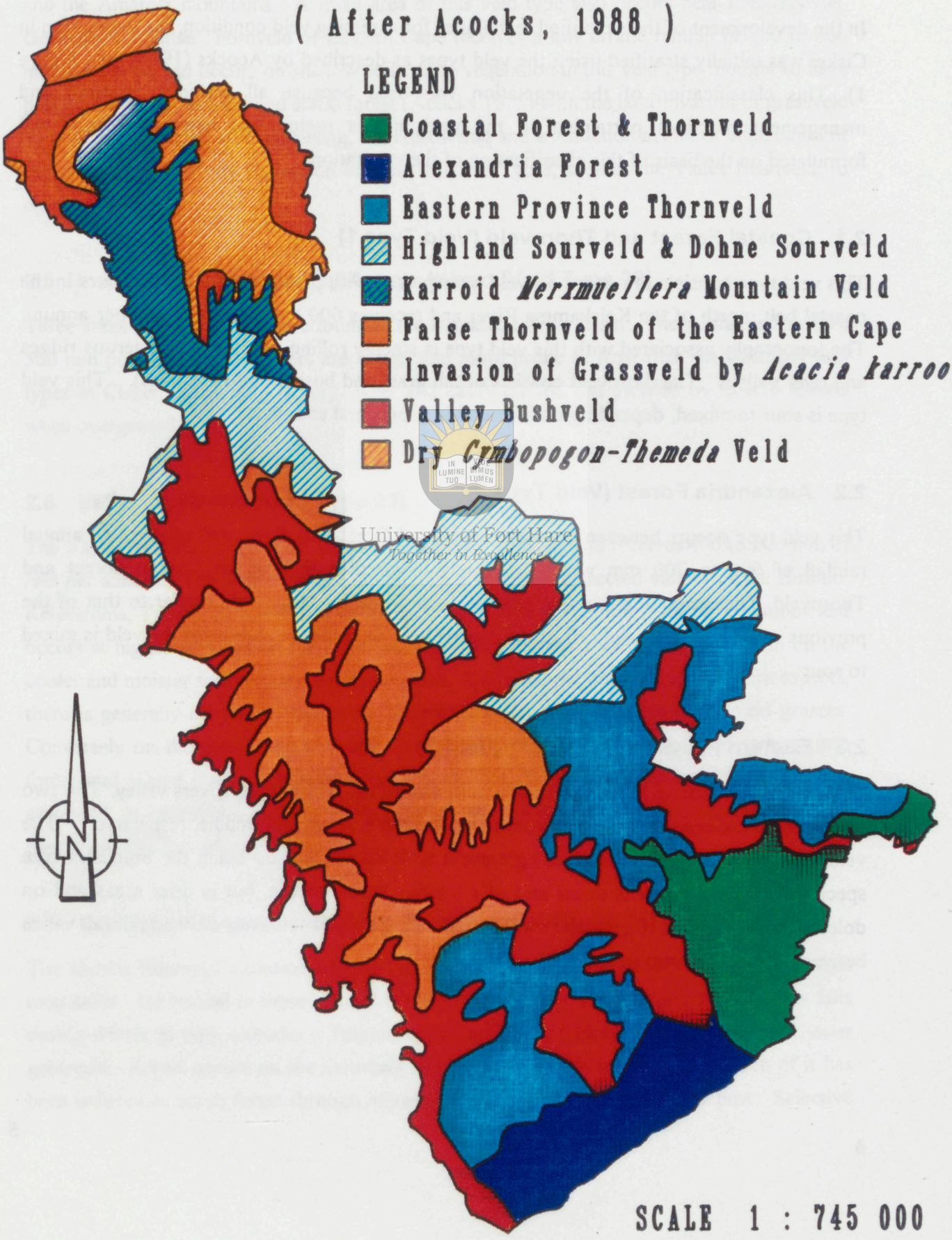
Veld condition refers to the condition of vegetation in relation to some functional characteristic, normally forage production and resistance to soil erosion (Trollope, Trollope & Bosch 1991). The purpose of assessing veld condition is to determine the current condition of the vegetation and to use this information to formulate veld management practices such as stocking rates, grazing and browsing management, rotational resting, and veld burning.

Techniques to assess the grazing and browsing capacity of the veld have been developed for agricultural purposes in Ciskei (Trollope, 1986; Danckwerts, 1989). These techniques, however, had two serious faults, namely they were too laborious and required that the user be able to identify all the grass and bush species occurring in the veld. This realization identified the need for the development of simplified techniques for assessing veld condition, specifically for use by extension officers and farmers. With this in mind attention was first given to developing a simplified technique for assessing the condition of the grass sward and the problem was solved by identifying those key grass species that had the greatest effect on veld condition in terms of their potential to produce forage. In the case of the bush component a series of quantitatively described photographs were developed which represented tree and shrub vegetation in different conditions for utilization by goats.

This formed the background and rationale to the initiation of the research project on the assessment of veld condition in Ciskei. It was decided to call the project the *Iqunde Project*, the Xhosa name for *Themeda triandra*, one of the most important grass forage species in Ciskei and the Eastern Cape. The project was conducted by the Department of Livestock and Pasture Science under the auspices of the Agricultural and Rural Development Research Institute (ARDRI) at the University of Fort Hare, and was funded by the Development Bank of Southern Africa.

Fig.2 VELD TYPES OF CISKEI

(After Acocks, 1988)



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CHAPTER 2

VELD TYPES OF CISKEI

In the development of the simplified techniques for assessing veld condition, the vegetation in Ciskei was initially stratified using the veld types as described by Acocks (1975) (see Figure 1). This classification of the vegetation was used because all previous research and management practices pertaining to the veld in this region had been conducted and formulated on the basis of this classification of the vegetation.

2.1 Coastal Forest and Thornveld (Veld Type 1)

This veld type consists of open thornveld interspersed with patches of forest. It occurs in the coastal belt, north of the Keiskamma River and receives 600 to 800 mm of rain per annum. The topography associated with this veld type is steeply rolling terrain with numerous ridges and river valleys. The thornveld consists of tall grass and bush clumps (thickets). This veld type is sour to mixed, depending on the rainfall, aspect and soil type.

2.2 Alexandria Forest (Veld Type 2)

This veld type occurs between the Keiskamma and Great Fish rivers and receives an annual rainfall of 600 to 700 mm which is slightly lower than that of the Coastal Forest and Thornveld. The vegetation consists of very dense forest and thornveld similar to that of the previous veld type. Like the rest of the coastal belt, the soils are stable and the veld is mixed to sour.

2.3 Eastern Province Thornveld (Veld Type 7)

This veld type is found in two areas on either side of the Keiskamma Rivers valley. The two areas are on the coastal plateau around King William's Town and Peddie, respectively. The veld type consists of thornveld and grassveld with *Acacia karroo* being the dominant tree species. The grass cover is dense and of a sourish mixed nature, but in drier areas and on doleritic soils, the veld is generally sweet. The topography is relatively flat and rainfall varies between 600 to 700 mm per annum.

2.4 False Thornveld of Eastern Cape (Veld Type 21)

Geographically, this veld type occurs between the Kat, Tyume and Keiskamma River valleys and the Amatola mountains. A small area of this veld type also occurs near Breakfastvlei. Generally the False Thornveld of Eastern Cape receives a low erratic rainfall of 400 to 600 mm per annum and occurs on shallow soils. The vegetation in this veld type thought to have previously been grassveld and scrub forest (Acocks 1975) with the later invasion of grassveld by bush being caused by overgrazing, underbrowsing and a reduction in and/or elimination of fire allowing the woody vegetation of more arid veld types, such as the Valley Bushveld, to encroach.

2.5 Invasion of Grassveld by *Acacia karroo* (Veld Type 22)

Three areas of this veld type are found in the Black Kei River basin. The rainfall is less than 500 mm per annum and winters are colder and more prone to frost than the southern veld types in Ciskei. The veld is very sweet and easily eroded and invaded by *Acacia karroo* when overgrazed.

2.6 Valley Bushveld (Veld Type 23)

The Valley Bushveld is the most extensive veld type in Ciskei and receives 400 to 500 mm of rain per annum. This veld type is found in the dry, deeply dissected valleys of the Buffalo, Keiskamma, Tyume, Bira, Kat and Great Fish rivers. The vegetation tends to be scrubby and occurs at higher altitudes on the drier and hotter northern and western aspects than on the cooler and moister southern and eastern aspects. On the upper northern and western aspects, there is generally a zone of thicket and *Acacia karroo* thornveld with mixed veld grasses. Conversely on the upper southern and eastern aspects, tall *Euphorbia* forest merges into forest and where it has been destroyed, the Valley Bushveld vegetation transforms into grassveld or thornveld. This veld type is very sweet and is extremely sensitive to overgrazing and overbrowsing.

2.7 Highland Sourveld and Döhne Sourveld (Veld Type 44)

The Döhne Sourveld variation of this veld type occurs on the Winterberg and Amatola mountains. the rainfall in these areas is between 600 to 1000 mm per annum and snow falls during winter at high altitudes. This veld type consists of forest, fynbos and dense, sour grassveld. Forest occurs on the mountain slopes and in the river valleys but much of it has been reduced to scrub forest through injudicious clearing and burning in the past. Selective

grazing of this veld encourages *Elionurus muticus* at lower altitudes, overgrazing causes the toxic herbaceous species, *Senecio retrorsus,* to increase significantly. Extensive areas are also prone to the encroachment of fynbos in the mountainous regions when fire is excluded and the veld is overgrazed.

2.8 Karroid *Merxmuellera* Mountain Veld (Veld Type 60)

This veld type is found in the northern portion of Ciskei and receives a rainfall of 600 to 800 mm per annum. It occurs on the northern slopes and foothills of the Winterberg mountains, and is transitional to Döhne Sourveld. The dominant grass species is *Merxmuellera disticha* in rocky, sandstone areas, while in doleritic areas and where the topsoil is still present, *Themeda triandra* is the dominant species. The acceptability of this veld ranges from sweet or mixed veld.

CHAPTER 3

VELD CONDITION ASSESSMENT: THE GRASS SWARD

3.1 Introduction

The technique used for assessing the condition of the grass sward involves comparing the presence or absence of key grass species in a **"sample site"** with those in a **"benchmark site"** which is representative of veld in an optimum condition for livestock production (Danckwerts, 1989). Furthermore it is based on the assumption that there is a direct relationship between the grass species present in a site and the veld management practices that should be applied for sustained livestock production. Although this assumption has limitations it does provide a good starting point for any livestock system based on veld.

3.2 Positioning of sample sites

The first step in assessing veld condition is to subdivide the area under consideration into homogenous vegetation units (HVU) using an aerial photograph or by visual evaluation from some vantage point. HVU's are defined by the specific environmental characteristics of an area which are mostly related to soil type, slope, geology and aspect. Figure 2 is an example of how HVU's are identified using slope and aspect. Homogeneous sample sites measuring 50m x 100m are located in representative areas of each HVU. There must be at least one sample site per HVU but preferably more. A practical rule of thumb is to have at least one sample site per 100 hectares.

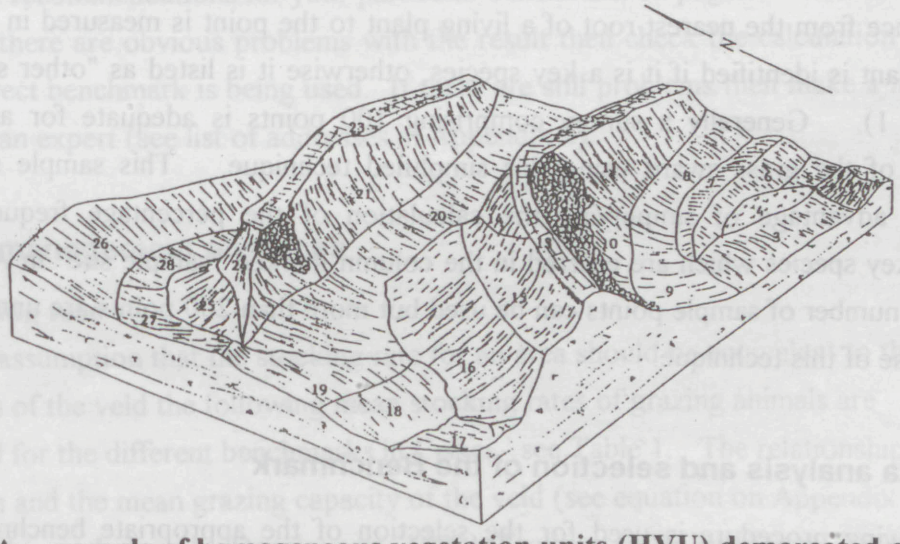


Figure 2: An example of homogeneous vegetation units (HVU) demarcated according to aspect and slope.

3.3 Data collection

Data is collected using a step point method. The point can be a mark on the front of a shoe or a sharp stick which is placed every two steps on two transects located 25m apart in the sample site i.e. two rows of fifty points (Fig 3).

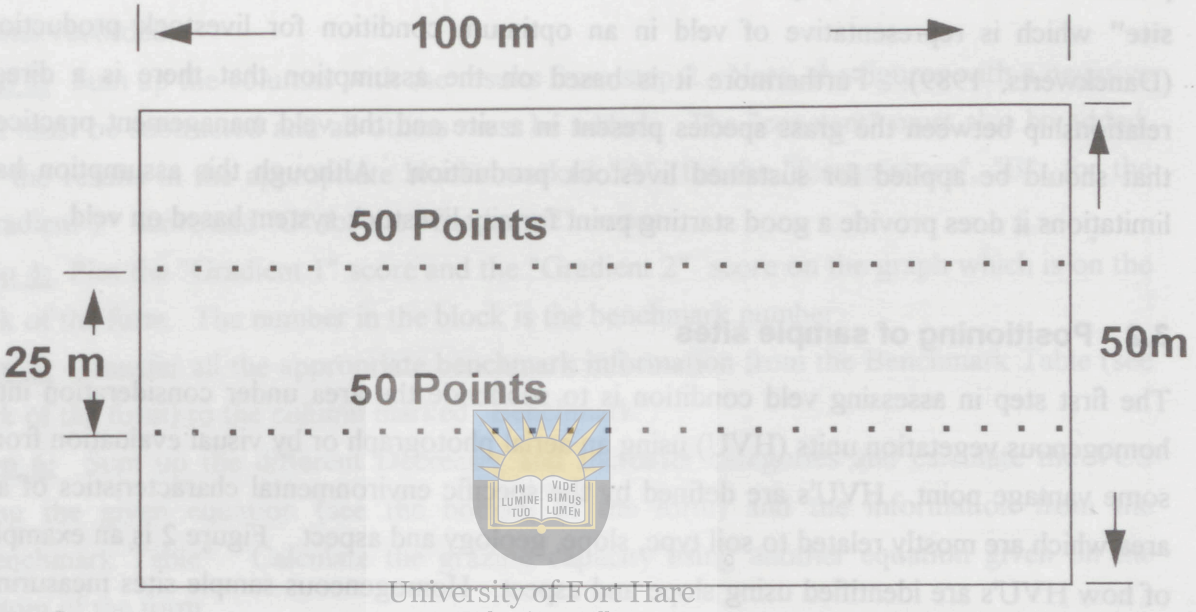


Figure 3. A diagram illustrating how to set out the sample site.

The distance from the nearest root of a living plant to the point is measured in centimetres, and the plant is identified if it is a key species, otherwise it is listed as "other species" (see Appendix 1). Generally a survey comprising 100 points is adequate for assessing the condition of the grass sward using this simplified technique. This sample size has the numerical advantage of simplifying the calculation of the percentage frequency of the different key species which are entered in the column marked "sample site" in Appendix 1). A greater number of sample points can be used but more than 200 points are unnecessary for the purpose of this technique.

3.4 Data analysis and selection of the Benchmark

The following procedure is used for the selection of the appropriate benchmark and its associated botanical composition which is used in the calculation of the grazing capacity and the veld condition score (VCS) of a sample site. A special score sheet has been developed for this purpose (see Appendix 1), which must be completed on both the back and front of

the form. Any reference to columns for forms in the following description refers to this score sheet. The procedure is as follows:

Step 1: Fill in the percentage frequency for each key species that was identified during the botanical survey. i.e. in the column designated as "Sample site".

Step 2: Multiply the percentage of each key grass species with the coefficients under the headings. "Forage Score", "Gradient 1" and "Gradient 2" and enter the product in the adjacent columns. Enter a zero (0) in the row where there is either no multiplier or no species recorded.

Step 3: Sum up the columns with the results from step 2. Note, the figures with a negative sign must be subtracted and all others must be added. The "constant" must also be added. Put the results in the appropriate blocks marked "A" for the "forage score", "B" for the "Gradient 1" score and "C" for the "Gradient 2" score.

Step 4: Plot the "Gradient 1" score and the "Gradient 2" score on the graph which is on the back of the form. The number in the block is the benchmark number.

Step 5: Transfer all the appropriate benchmark information from the Benchmark Table (see back of the form) to the column marked "Benchmark".

Step 6: Sum up the different Decreaser and Increaser categories and calculate the VCS using the given equation (see the bottom of the form) and the information from the "Benchmark Table". Calculate the grazing capacity using another equation given on the bottom of the form.

Step 7: Calculate the average point to plant distance.

Step 8: Identify your "Situation" (on page 13) and then look up the appropriate management recommendations for your particular benchmark on pages 15 to 21.

Step 9: If there are obvious problems with the result then check the calculation and check that the correct benchmark is being used. If there are still problems then make a note of this and contact an expert (see list of addresses in Appendix 2).

3.5 Veld management practices

3.5.1 Stocking rate

Based on the assumption that the stocking rate for an area should be equivalent to the grazing capacity (GC) of the veld the following mean stocking rates of grazing animals are recommended for the different benchmarks in Ciskei - see Table 1. The relationship between veld condition and the mean grazing capacity of the veld (see equation on Appendix 1) was derived from the work done by Danckwertz (1981), Trollope (1986) and from information obtained from experienced farmers. The estimates reflect the long term potential of the grass

sward to produce forage for grazing animals and should be used for planning purposes only because annual rainfall will influence short term management of animal numbers.

Table 1: The recommended mean stocking rates of grazing animals for veld in different condition for each benchmark in Ciskei expressed in hectares per animal unit.

VCS	Benchmark 1	Benchmark 2	Benchmark 3	Benchmark 4
%	HA/AU	HA/AU	HA/AU	HA/AU
100	5.0	2.0	3.0	6.0
90	5.6	2.2	3.3	6.7
80	6.3	2.5	3.8	7.5
70	7.1	2.9	4.3	8.6
60	8.3	3.3	5.0	10.0
50	10.0	4.0	6.0	12.0
40	12.5	5.0	7.5	15.0
30	16.7	6.7	10.0	20.0
20	25.0	10.0	15.0	30.0
10	50.0	20.0	30.0	60.0

3.5.2 Livestock ratios

Livestock ratios refer to the ratio of bulk grazers to concentrate grazers and the selective grazing habits of domestic livestock is related to the grazing sequence in which these different classes of animals utilise the veld. Normally heavy bulk grazers (cattle) precede light concentrate grazers (sheep) thus preparing the pasture for use by those animals which follow. Research in the Eastern Cape shows that in sourveld areas the ratio of cattle to sheep should not exceed 1 AU : 6 SSU (Danckwerts, 1981) while experience in the sweetveld areas indicates that it should not exceed 1 AU : 3 SSU because in arid areas veld is more susceptible to selective grazing. Thus, if the condition of the veld indicates selective grazing due to the dominance of Increaser I grass species e.g. *Cymbopogon plurinodis*, the ratio of cattle to sheep utilizing the veld should be investigated and adapted if necessary. Based on this information it is recommended that the following maximum ratios of cattle to sheep be used in the different benchmark areas in Ciskei:

- **Benchmark 1 = 1 AU: 3 SSU;**
- **Benchmark 2 = 1 AU: 6 SSU;**
- **Benchmark 3 = 1 AU: 3 SSU;**
- **Benchmark 4 = 1 AU: 3 SSU**

3.5.3 Interpretation of the average point to plant distance

The average point to plant distance can be related to the total basal cover and/or the type of basal cover (Beckerling 1991). All interpretations are therefore based on the assumption that this distance is negatively related to changes in basal cover. Table 2 gives some simple interpretations. More sophisticated interpretations can be done so original data should be kept if other interpretations are required.

Table 2. Interpretations of the average point to plant distance for the grasslands of the Eastern Cape.

Less than 3 cm.	Greater than 3 but less than 6 cm.	Greater than 6 cm.
There is high basal cover.	Basal cover is moderate to low and there should be some concern about possible changes in the grass sward.	Basal cover is probably very low and there is a threat of soil erosion and invasion of Increaser species.

3.5.4 Rotational grazing, rotational resting and veld burning

Once the appropriate benchmark has been selected the following procedure is used for formulating veld management practices related to rotational grazing, rotational resting and veld burning for a given site. The condition of the veld in the sample site is compared with that in the benchmark site in terms of the relative proportions of Increaser I, Increaser II's and Decreaser species. There are four standard situations which can be encountered.

Situation 1: The sample site has a VCS of greater than 80% and the proportion of Decreaser species is approximately the same as the benchmark. This indicates that the sample site has been well managed in the past and has not been over or under stocked.

Situation 2: The sample site has a VCS less than 80% and the proportion of the Increaser I species is higher than that of the benchmark. This indicates that the site has been under stocked or selectively grazed in the past resulting in a decline in the proportion of Decreaser species.

Situation 3: The sample site has a VCS less than 80% and the proportion of Increaser II species is higher than that of the benchmark. This indicates past and/or present overstocking of the site resulting in a decline in the proportion of Decreaser species.

Situation 4: The sample site has a VCS of less than 80% and the proportion of both the Increaser I and Increaser II species is higher than in the benchmark. This indicates selective grazing caused by a low stocking density resulting from the use of large camps.

Depending upon which benchmark is selected the following veld management practices are recommended for veld in situations 1, 2, 3 and 4.

Benchmark 1

Description

This is typical Karroid *Merxmuellera* Mountain Veld with shallow (less than 30 cm) loam and sandy soils overlying sandstone and mudstone. The slopes are usually greater than 5 degrees and the soils are sensitive to erosion. The mean annual rainfall is approximately 550 to 650 mm.

Situation 1: Rotational grazing: The veld is in excellent condition and the dominance of Decreaser species can be maintained by applying HPG which will ensure a high production of forage and excellent animal performance. However, it is necessary to apply HUG periodically to prevent the grass sward from developing to the Increaser I stage.

Rotational resting: As the veld is dominated by Decreaser species it is not necessary to rest for seed production. The priority rests are rather for the maintenance of plant vigour and the provision of a fodder reserve. This can be achieved by giving the veld a short rest during the late summer and autumn period (January - April) which will reduce the extent to which the grass will become mature and unpalatable to livestock.

Veld burning: Controlled burning is only necessary to remove moribund and/or unacceptable grass material when veld is in this condition. A cool head fire (<1000 kJ/s/m) is recommended and should preferably be applied after a rainfall event of at least 13 mm in spring. HPG can be applied after the burn when the veld has recovered to >50 mm in height. If correctly managed it should not be necessary to burn veld in this condition more than once every four years.

Situation 2: Rotational grazing: HUG is recommenced as the priority from of rotational grazing when veld is dominated by *Merxmuellera disticha* in order to encourage Decreaser species. This can be combined with either burning or the provision of nitrogen/protein licks so as to minimise the negative effects of HUG on animal performance. However, once *Merxmuellera disticha* becomes unpalatable to livestock, HPG must be applied to maintain the vigour of the Decreaser species and ensure positive animal performance.

Rotational resting: Resting to promote seed production of grass is recommended for veld in this condition. Generally the key Decreaser species will be *Themeda triandra* and to promote maximum seed production a quarter of the veld should be rested from January to January.

Veld burning: Controlled burning can be applied in combination with HUG to control and/or utilise *Merxmuellera disticha*. A cool head fire (<1000 kJ/s/m) is recommended preferably after a rainfall event of at least 13 mm in spring. The frequency of burning will depend upon the rate at which the *Merxmuellera disticha* become unpalatable to livestock but burning should not be more frequent than once every four years. HUG with cattle for periods not exceeding a week must be applied after the burn when the veld is >50 mm in height. This grazing treatment will be applied for approximately two growing seasons after the burn following which HPG will be applied until the next burn.

Situation 3: Rotational grazing: HPG is recommended for veld in this condition in order to replace the dominant Increaser II species with Decreaser species. This is achieved by grazing the desirable Decreaser species to maintain plant vigour and allowing the Increaser II species to become moribund and less competitive.

Rotational resting: A seeding rest from January to January is recommended to promote an increase in *Themeda triandra,* the key Decreaser species in this type of veld.

Veld burning: There is no necessity to burn this veld except when it has been encroached by false karroid species like *Chrysocoma ciliata* and *Felicia filifolia.* In this case the veld must be rested for a year prior to burning to accumulate adequate grass fuel to carry a fire. An intense head fire (>2000 kJ/s/m) must be applied in late winter/spring (September/October) to ensure a clean burn, after which the veld must be rested for 18 months to allow the veld to recover vegetatively and allow *Themeda triandra* to seed during the second season.

Situation 4: Rotational grazing: The basic solution for veld in this condition is to increase the stocking density of livestock by sub-dividing the veld into smaller camps in order to apply rotational grazing. Otherwise the same form of rotational grazing is applied as in Situation 2.

Rotational resting and veld burning: Same as Situation 2.

Benchmark 2

Description

This benchmark represents typical sourveld in the Coastal Forest and Thornveld, Döhne Sourveld and the moister portions of the Eastern Province Thornveld. The soils are usually >40 cm deep with a sandy or loam texture, and are generally leached and acid with a very poor nutrient status. The annual rainfall is usually higher than 650 mm.

Situation 1: Rotational grazing: A combination of HPG and HUG is recommended when veld is in this condition. HPG is applied to maintain the vigour of the desirable decreaser species in the grass sward and to ensure satisfactory animal performance. HUG is used to prevent the veld from developing to the Increaser I stage. Being sourveld HUG is applied after burning to prevent the veld from becoming rank and unpalatable to livestock. However, by the second season this becomes more difficult and HPG is recommended to maintain animal performance and the vigour of the more acceptable grass species. This form of rotational grazing is applied until the next burn. HUG can also be combined with the feeding of nitrogen or protein licks to improve the utilization of unpalatable veld.

Rotational resting: Same as Situation 1 in Benchmark 1.

Veld burning: Same as Situation 1 in Benchmark 1.

Situation 2: Rotational grazing: The condition of this type is characterised by a greater proportion of Increaser I species like *Tristachya leucothrix, Elionurus muticus* (isilevu), *Miscanthus capense* (idobo), *Cymbopogon marginatus* (idobo) and *Festuca costata* (irwashu). HUG is recommended when the veld is in this condition in order to encourage Decreaser species. This can be combined with either burning or the provision of nitrogen/protein licks so as to minimise the negative effects of HUG on animal performance. However, once the veld becomes unpalatable to livestock HPG must be applied to maintain the vigour of the Decreaser species and ensure positive animal performance.

Rotational resting: Resting to promote seed production of grass is recommended for veld in this condition. Generally the key Decreaser species will be *Themeda triandra* and to promote maximum seed production, a quarter of the veld should be rested from January to January.

Veld burning: Controlled burning can be applied in combination with HUG to control and/or utilize the aforementioned Increaser I grass species. A cool head fire (<1000 kJ/s/m) is recommended preferably after a rainfall event of at least 13 mm in spring. The frequency of burning will depend upon the rate at which grazing becomes unpalatable to livestock but burning should not be more frequent than once every four years. HUG with cattle for periods not exceeding a week must be applied after the burn when the veld is >50 mm in height. This grazing treatment must be applied for approximately two growing seasons after the burn following which HPG must be applied until the next burn.

Situation 3: Rotational grazing: Veld in this condition is frequently dominated by *Eragrostis plana* and *Ricardia humistrata* (Peelton weed). HPG is recommended in order to replace the Increaser II species with Decreaser species. This is achieved by grazing the Decreaser species to maintain plant vigour and allowing the Increaser II species to become moribund and less competitive.

Rotational resting: A seeding rest from January to January is recommended to promote an increase in *Themeda triandra*, the key Decreaser species in this type of veld.

Veld burning: Generally, it is unnecessary to burn veld in this condition except when it is dominated by particularly unpalatable Increaser II species like *Eragrostis plana*. In this case a cool head fire (<1000 kJ/s/m) is recommended on an opportunistic basis, preferably after a rainfall event of at least 13 mm in spring.

Situation 4: Rotational grazing: The basic solution to veld in this condition is to increase the stocking density of livestock by sub-dividing the veld into smaller camps in order to apply rotational grazing. Otherwise the same form of rotational grazing is applied as in Situation 2.

Rotation resting and Veld burning: Same as Situation 2.

Benchmark 3

Description

Habitats with deep (>30 cm), moist, loam to clay soils (often with dolerite parent material), with a slope <10 degrees and an annual rainfall of 500 - 650 mm occurring in the moister variations of the False Thornveld of the Eastern Cape and the drier variations of the Eastern Province Thornveld.

Situation 1: Rotational grazing: A combination of HPG and HUG is recommended when veld is in this condition. HPG is applied to maintain the vigour of the desirable Decreaser species in the grass sward and to ensure satisfactory animal performance. HUG is used to prevent the veld from developing to the Increaser I stage and should be applied once every three years just prior to applying a rotational rest period. This treatment is particularly important in preventing *Cymbopogon plurinodis* from increasing in the grass sward at the expense of *Themeda triandra* and was developed by Mr Edgar Matthews on the farm "Tukulu" in the Alice district.

Rotational resting: It is recommended that one third of the veld be rested from July to July to promote and maintain the vigour of the grass sward and provide a fodder reserve for periods of scarcity at the end of the dry winter period and during droughts.

Veld burning: Generally, burning is unnecessary when the veld is in this condition but may be applied on an opportunistic basis after exceptionally high rainfall conditions when the veld becomes rank and unpalatable. A cool head fire (<1000 kJ/s/m) is recommended preferably after a rainfall event of at least 13 mm in spring.

Situation 2: Rotational grazing: The Increaser I species *Cymbopogon plurinodis* increases under these conditions and if it constitutes more than 20% of the sward, it can be controlled by applying HUG with cattle or goats, or both after burning. This treatment must be maintained for 18 months after the fire, following which HPG should be applied until it is necessary to burn again. HUG can also be applied in combination with nitrogen/protein licks to achieve the aforementioned result.

Rotational resting: Resting to promote seed production of grass is recommended for veld in this condition. The key Decreaser species is *Themeda triandra* and, to promote maximum seed production a third of the veld should be rested from January to January.

Veld burning: A cool head fire (<1000 kJ/s/m) is recommended preferably after a rainfall event of at least 13 mm in spring. This should be applied at a frequency of approximately once every five years.

Situation 3: **Rotational grazing:** HPG is recommended for veld in this condition in order to replace the Increaser II species with more productive Decreaser species like *Themeda triandra*. This is achieved by grazing the Decreaser species according to their physiological requirements and allowing the Increaser II species to become moribund and less competitive.

Rotational resting: For veld in this condition one third of the grazing area must be rested from January to January to promote the seeding of *Themeda triandra*, the most important Decreaser species in this type of veld. In situations where the veld is being burnt to control karroid species like *Chrysocoma ciliata* and *Felicia filifolia*, a rest period of 18 months must be applied after the fire to promote the vegetative recovery of the veld and to provide the opportunity for seeding of the Decreaser species like *Themeda triandra*.

Veld burning: Generally, veld burning is unnecessary except when the veld has been encroached by unpalatable Increaser II species like *Chrysocoma ciliata* and *Felicia filifolia*. In this case an intense head fire (>2000 kJ/s/m) is recommended on an opportunistic basis, preferably at the end of winter just prior to the first spring rains.

Situation 4: **Rotational grazing:** The basic solution to veld in this condition is to increase the stocking density of livestock by sub-dividing the veld into smaller camps in order to apply intense rotational grazing. Otherwise the same form of rotational grazing is applied as in Situation 2.

Rotational resting and Veld burning: Same as Situation 2.

Benchmark 4

Description

This represents typical sweetveld areas of the False Thornveld of the Eastern Cape, Dry *Cymbopogon-Themeda* Veld and dry habitats found in the other veld types. Note the abundance of Increaser II species. The soils are usually shallow loams to clays, often with a high silt content. The dry habitats are often caused by low rainfall, steep slopes and shallow soils derived from shales and mudstones.

Situation 1: Rotational grazing, resting and veld burning same as for Benchmark 3.

Situation 2: Rotation grazing, resting and veld burning same as for Benchmark 3

Situation 3: Rotational grazing, resting and veld burning same as for Benchmark 3.

Situation 4: Rotational grazing, resting and veld burning same as for Benchmark 3.

3.6 Veld management systems and layouts

Veld management can be divided into two broad categories, namely pauci- and multi-camp systems. Pauci-camp systems have less than five camps per group of animals and multi-camp systems have more than five camps per group of animals. In pauci-camp systems three camps per herd are best suited to sweetveld areas, and four camps per herd in sourveld areas. This number of camps enables the implementation of a rotational resting program as discussed under veld management practices, but tend to be inadequate for the optimum application of the different types of rotational grazing. In the case of multi-camp systems, twelve camps per herd are best suited to sweetveld areas and eight camps per herd in sourveld areas. The greater number of camps enables the more effective implementation of rotational grazing and resting programs. Generally multi-camp systems are preferred to pauci-camp systems because selective grazing can be more easily controlled and they provide greater managerial flexibility. Conversely, multi-camp systems are more expensive in terms of fencing and drinking points, and in practice, the actual number of camps that are developed on a farming unit depends on the heterogeneity of the veld and economics.

Veld management layouts can be divided into two broad categories, namely conventional and "wagon wheel" layouts. The conventional layout of camps involves sub-dividing the veld into homogenous vegetation units which serve as the basic units for developing pauci- or multi-camp systems. Normally, each camp is provided with a separate livestock drinking point or it may be shared between camps, depending upon circumstances. The "wagon wheel" layout of camps generally involves a multi-camp system with a centrally situated hub, from which camps radiate out to the perimeter of the grazing area. A single drinking point is located in the central hub, but other livestock handling facilities can also be developed in this area for ease of management.

The greatest advantage of the "wagon wheel" layout is the ease with which the veld and the livestock can be managed in terms of inspecting the state of the grazing in the camps and the easy movement and handling of livestock. Only having one drinking point is also a great advantage in terms of development and maintenance costs and there is a significant saving in labour because of the efficient mustering and handling of livestock. The greatest disadvantage of the "wagon wheel" layout is the greater potential for area selective grazing occurring, because with a central drinking point camps are long and narrow and not homogenous. Therefore this type of layout is better suited to flat areas rather than undulating and broken terrain. However, this problem can be minimised with careful and

imaginative planning. Another serious disadvantage of the "wagon wheel" layout is that it requires more fencing. This is because the length of fencing required for each camp is standard as it always spans the same distance between the perimeter and the central hub irrespective of the size of the camp.

It is difficult to conclude which is the more desirable layout of camps. Suffice it to say that when planning a veld management program, both types of layout should be considered and the final choice made on the basis of the particular circumstances prevailing in the area to be planned.

CHAPTER 4

VELD CONDITION ASSESSMENT: THE WOODY LAYER

4.1 Introduction

The assessment of the condition of thornveld is done by determining the potential productivity of available browse and the competitive effect of the woody plants on grass productivity (Teague, 1989a). Browse units and tree equivalents (Teague *et al.*, 1981), which are indices of browse potential and bush phytomass respectively, are used to predict the productivity of available browse and grass for agricultural purposes (Teague, 1989a). A tree equivalent (TE) is defined as a tree or shrub 1,5 m tall and a browse unit (BU) is defined as a tree or shrub that is acceptable to goats and is either 1,5 m tall or has browse within 1,5 m of ground level (Teague *et al.*, 1981; Trollope *et al.*, 1990).

The technique that has been developed so far comprises photographs that represent thornveld in different conditions in Ciskei. Each photograph is accompanied by a description of the woody vegetation in the form of parameters that are relevant to veld management. It is possible to rapidly assess the condition of thornveld and decide on management practices by referring to the photographs and the associated information. The technique is conceptually similar to that developed by Koski & Fischer (1979) and Fischer (1981) in the United States for estimating quantities of forest fuels for evaluating potential fire hazards and for controlled burning. Similarly, Stuart-Hill (1991) developed a visual technique for assessing the condition of succulent Valley Bushveld in the Eastern Cape.

4.2 Use of the simplified techniques

The simplified technique for assessing the condition of woody vegetation is used in conjunction with the simplified technique for assessing the condition of the grass sward (Chapter 3). Both techniques are used at the same site. The technique for assessing the woody vegetation is a series of three photographs which have been selected to represent the condition of woody vegetation in sour thornveld, sweet thornveld, sour *Acacia* thornveld and sweet *Acacia* thornveld. These photographs represent thornveld that has low, medium and high potential for producing available browse for goats. On the page opposite each series of photographs, is a list of parameters that describe the woody vegetation in each photograph.

The second page after each series of photographs has a list of common tree and shrub species associated with that series.

The assessment of the condition of thornveld by means of the simplified technique should be done during October to April when the trees and shrubs have foliage and are similar in appearance to those represented in the photographic series. The user must first decide which series of photographs to use relative to the type of thornveld being assessed. The results of the grass survey will indicate whether the veld is sweet or sour and Figure 1 may be referred to if necessary. The user must then decide which photograph best represents the condition of the vegetation being assessed. Because of the wide variety of vegetation structure (physiognomy) and botanical composition encountered in sour and sweet thornveld, the user may often find it helpful to look at more than one series of photographs simultaneously. Although the user may be in a veld type that is regarded as sweet thornveld, the vegetation may resemble the photographs of sour thornveld.

Sour Thornveld

(>600 mm rain/year) Top photograph. *Low browse potential*

Percentage available bushes (<1,6m): 98%
Percentage acceptable bushes: 75%
Percentage Acacia karroo: 50%
Bush phytomass: <3000 TE/ha
Browse potential: <1650 BU/ha
Browsing capacity: 1,8ha/SSU
Stocking rate: 0,6 SSU/ha

Middle photograph. *Medium browse potential*
Percentage available bushes (<1,6m): 95%
Percentage acceptable bushes: 75%
Percentage Acacia karroo: 30%
Bush phytomass: 3000-6000 TE/ha
Browse potential: 1650-3000 BU/ha
Browsing capacity: 0,7 ha/SSU
Stocking rate: 1,4 SSU/ha

Bottom photograph. *High browse potential*
Percentage available bushes (<1,6m): 90%
Percentage acceptable bushes: 65%
Percentage Acacia karroo: 20%
Bush phytomass: 6000 TE/ha
Browse potential: 3000 BU/ha
Browsing capacity: 0,3 ha/SSU
Stocking rate: 3,3 SSU/ha

Common Tree & Shrub Species:

Acceptable species:

Acacia karroo
Burchellia bubalina
Canthium spinosum
Coddia rudis
Ehretia rigida
Grewia occidentalis
Lippia javanica
Maytenus heterophylla
Maytenus. polyacantha
Scutia myrtina
Scolopia zeyheri
Zanthoxylum capense

Unacceptable species:

Aloe ferox
Diospyros dicrophylla
Diospyros. scabrida
Lantana camara
Rhus refraeta
R.hus undulata

Sweet Thornveld

(<600 mm rain/year)

Top photograph. *Low browse potential*

Percentage available bushes (<1,6m): 90%
Percentage acceptable bushes: 75%
Percentage Acacia karroo: 15%
Bush phytomass: <3000 TE/ha
Browse potential: <1650 BU/ha
Browsing capacity: 2,4ha/SSU
Stocking rate: 0,4 SSU/ha

Middle photograph. *Medium browse potential*

Percentage available bushes (<1,6m): 90%
Percentage acceptable bushes: 80%
Percentage Acacia karroo: 10%
Bush phytomass: 3000-6000 TE/ha
Browse potential: 1650-3000 BU/ha
Browsing capacity: 0,9 ha/SSU
Stocking rate: 1,1 SSU/ha

Bottom photograph. *High browse potential*

Percentage available bushes (<1,6m): 80%
Percentage acceptable bushes: 80%
Percentage Acacia karroo: 10%
Bush phytomass: 6000 TE/ha
Browse potential: 3000 BU/ha
Browsing capacity: 0,4 ha/SSU
Stocking rate: 2,5 SSU/ha

Common Tree and Shrub species:

Acceptable species:

Acacia karroo
Buddleja saligna
Coddia rudis
Ehretia rigida
Grewia occidentalis
Lippia javanica
Lycium ferocissimum
Maytenus heterophylla
Maytenus polyacantha
Olea europaea
Plumbago auriculata
Phyllanthus verrucosus
Ptaeroxylon obliquum
Rhus lucida
Scuta myrtina
Zanthoxylum capense

Unacceptable species:

Aloe ferox
Diospyros lycioides
Lantana camara
Rhus refraeta

Acacia Thornveld

Top photograph. ***Low browse potential***

Percentage available bushes (<1,6m): 90%
Percentage acceptable bushes: 95%
Percentage Acacia karroo: 75%
Bush phytomass: <1500 TE/ha
Browse potential: <1250 BU/ha
Browsing capacity (sour): 2,0 ha/SSU
Stocking rate (sour): 0,5 SSU/ha
Browsing capacity (sweet): 2,7 ha/SSU
Stocking rate (sweet): 0,4 SSU/ha

Middle photograph. ***Medium browse potential***

Percentage available bushes (<1,6m): 85%
Percentage acceptable bushes: 98%
Percentage Acacia karroo: 85%
Bush phytomass: 1500-3000 TE/ha
Browse potential: 1250-2200 BU/ha
Browsing capacity (sour): 0,9 ha/SSU
Stocking rate (sour): 1,1 SSU/ha
Browsing capacity (sweet): 1,2 ha/SSU
Stocking rate (sweet): 0,8 SSU/ha

Bottom photograph. ***High browse potential***

Percentage available bushes (<1,6m): 65%
Percentage acceptable bushes: 95%
Percentage Acacia karroo: 80%
Bush phytomass: 3000 TE/ha
Browse potential: 2200 BU/ha
Browsing capacity (sour): 0,5 ha/SSU
Stocking rate (sour): 2,0 SSU/ha
Browsing capacity (sweet): 0,6 ha/SSU
Stocking rate (sweet): 1,7 SSU/ha

Common Tree and Shrub species:

Acceptable species:

Acacia karroo
Coddia rudis
Ehretia rigida
Grewia occidentalis
Lycium ferocissimum
Maytenus heterophylla
Rhus lucida
Scutia myrtina

Unacceptable species:

Diospyros lycioides
Rhus undulata

While comparing the photographs with the vegetation under assessment, the user may find the following hints helpful. Spend time (10 to 15 minutes) walking through the area, taking note of the following features of the vegetation. Firstly, consider the height of the vegetation, especially in relation to a person's shoulder height, and secondly, consider the structure of the vegetation, especially the vertical distribution of browse and the proportion of browse above and below a person's should height. If the height of vegetation is generally below shoulder height, the first photograph in the series being referred to is probably the relevant one. Otherwise, one of the remaining two photographs is probably relevant and the user must decide which one is most relevant by considering the continuity of the tree and shrub canopy. If the canopy is more continuous than open, then the third photograph should be considered. Otherwise, consider the second photograph. If most of the browse is above shoulder height, then the vegetation has most likely been overbrowsed. The procedure for identifying the most relevant photograph is summarised in Figure 4.

4.3 Veld management practices

The veld management practices comprise the stocking rate of goats, browsing management, rotational resting and the use of fire or chopping to maintain the woody vegetation at an available height for goats and to reduce its competitive effect on the grass sward. The type of management to be applied will depend on the objectives of the farmer.

4.3.1 Stocking rates

The stocking rates of goats is based on the mean browsing capacity of the veld. To assist the user in the formulation of stocking rates, the user should consider the tree and shrub species that occur in the area being assessed. The deciduous nature of *A. karroo* reduces the period of potential browse production in *Acacia* thornveld to six to nine months during the period from September to May (Milton, 1987), depending on rainfall. The browsing capacities that apply to *Acacia* thornveld are applicable to this period of browse production and not the whole year. Furthermore, in an area dominated by an unacceptable species such as *Diospyros lycioides,* the user must be aware that the browse potentials associated with the photographs will be overestimates. The user must then rely on personal experience and intuition in order to make a rational assessment of the potential browse productivity of the thornveld.

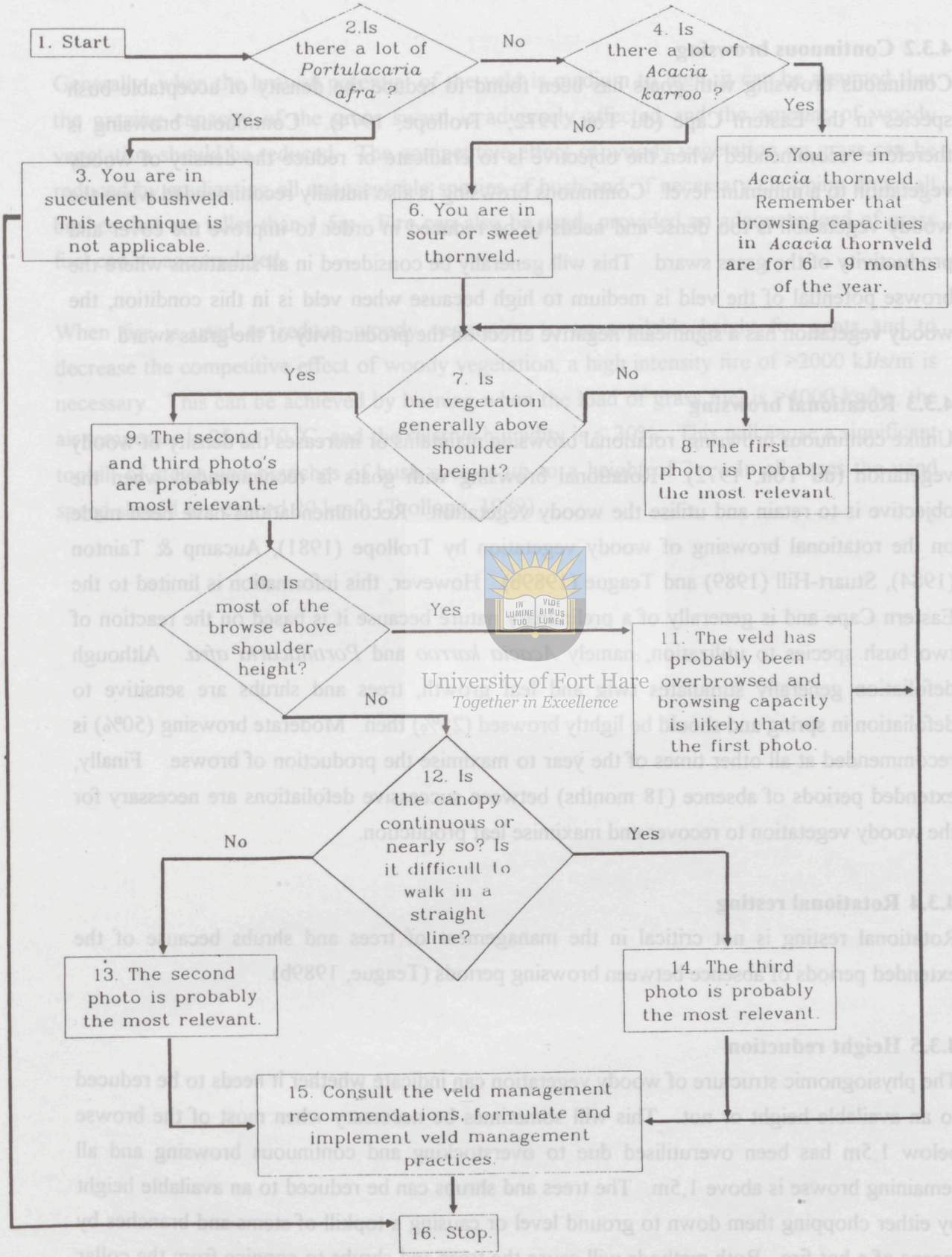


Figure 4. An algorithm to identify which photograph to use.

4.3.2 Continuous browsing

Continuous browsing with goats has been found to reduce the density of acceptable bush species in the Eastern Cape (du Toit, 1972; Trollope, 1974). Continuous browsing is therefore recommended when the objective is to eradicate or reduce the density of woody vegetation to a minimum level. Continuous browsing is also initially recommended when the woody vegetation is too dense and needs to be reduced in order to improve the cover and productivity of the grass sward. This will generally be considered in all situations where the browse potential of the veld is medium to high because when veld is in this condition, the woody vegetation has a significant negative effect on the productivity of the grass sward.

4.3.3 Rotational browsing

Unlike continuous browsing, rotational browsing maintains or increases the density of woody vegetation (du Toit, 1972). Rotational browsing with goats is recommended when the objective is to retain and utilise the woody vegetation. Recommendations have been made on the rotational browsing of woody vegetation by Trollope (1981), Aucamp & Tainton (1984), Stuart-Hill (1989) and Teague (1989b). However, this information is limited to the Eastern Cape and is generally of a preliminary nature because it is based on the reaction of two bush species to utilization, namely *Acacia karroo* and *Portulacaria afra*. Although defoliation generally stimulates twig and leaf growth, trees and shrubs are sensitive to defoliation in spring and should be lightly browsed (25%) then. Moderate browsing (50%) is recommended at all other times of the year to maximise the production of browse. Finally, extended periods of absence (18 months) between successive defoliations are necessary for the woody vegetation to recover and maximise leaf production.

4.3.4 Rotational resting

Rotational resting is not critical in the management of trees and shrubs because of the extended periods of absence between browsing periods (Teague, 1989b).

4.3.5 Height reduction

The physiognomic structure of woody vegetation can indicate whether it needs to be reduced to an available height or not. This will sometimes be necessary when most of the browse below 1,5m has been overutilised due to overstocking and continuous browsing and all remaining browse is above 1,5m. The trees and shrubs can be reduced to an available height by either chopping them down to ground level or causing a topkill of stems and branches by means of a hot fire. Both methods will cause the trees and shrubs to coppice from the collar region at ground level, thus providing available browse for goats.

Generally, when the browse potential of the veld is medium to high, it can be assumed that the grazing capacity of the grass sward is adversely affected and the amount of woody vegetation should be reduced. The competitive effect of woody vegetation on grass can be reduced by eradicating all unacceptable species of bush and, if necessary chopping down all bushes that are taller than 1,5m. Fire can also be used, provided an adequate load of grass fuel can be accumulated.

When fire is used to reduce woody vegetation to an available height for goats and to decrease the competitive effect of woody vegetation, a high intensity fire of >2000 kJ/s/m is necessary. This can be achieved by burning when the load of grass fuel is >4000 kg/ha, the air temperate is 25 to 30 ^{0}C. and the relative humidity is < 30%. This will cause a significant topkill of stems and branches of bush species up to a height of 3m. In all cases the wind speed should not exceed 20 km/h (Trollope, 1989).

CHAPTER 5

IDENTIFICATION OF KEY SPECIES

5.1 Introduction

The correct identification of the key grass species is vital for correct assessment of the grass sward using the grass technique. It is often not necessary to know all the key species if the farm is restricted to a certain veld type. The approach should be to get aquainted with those key species that occur in the specific area that is in question. The grasses should be studied at different stages of growth and defoliation. Although colour and hairs on the grass can be useful features for identification, caution should be taken when using these features as they tend to vary on the same species. Figure 5 gives a breakdown of the different grass parts that are referred to in the descriptions.

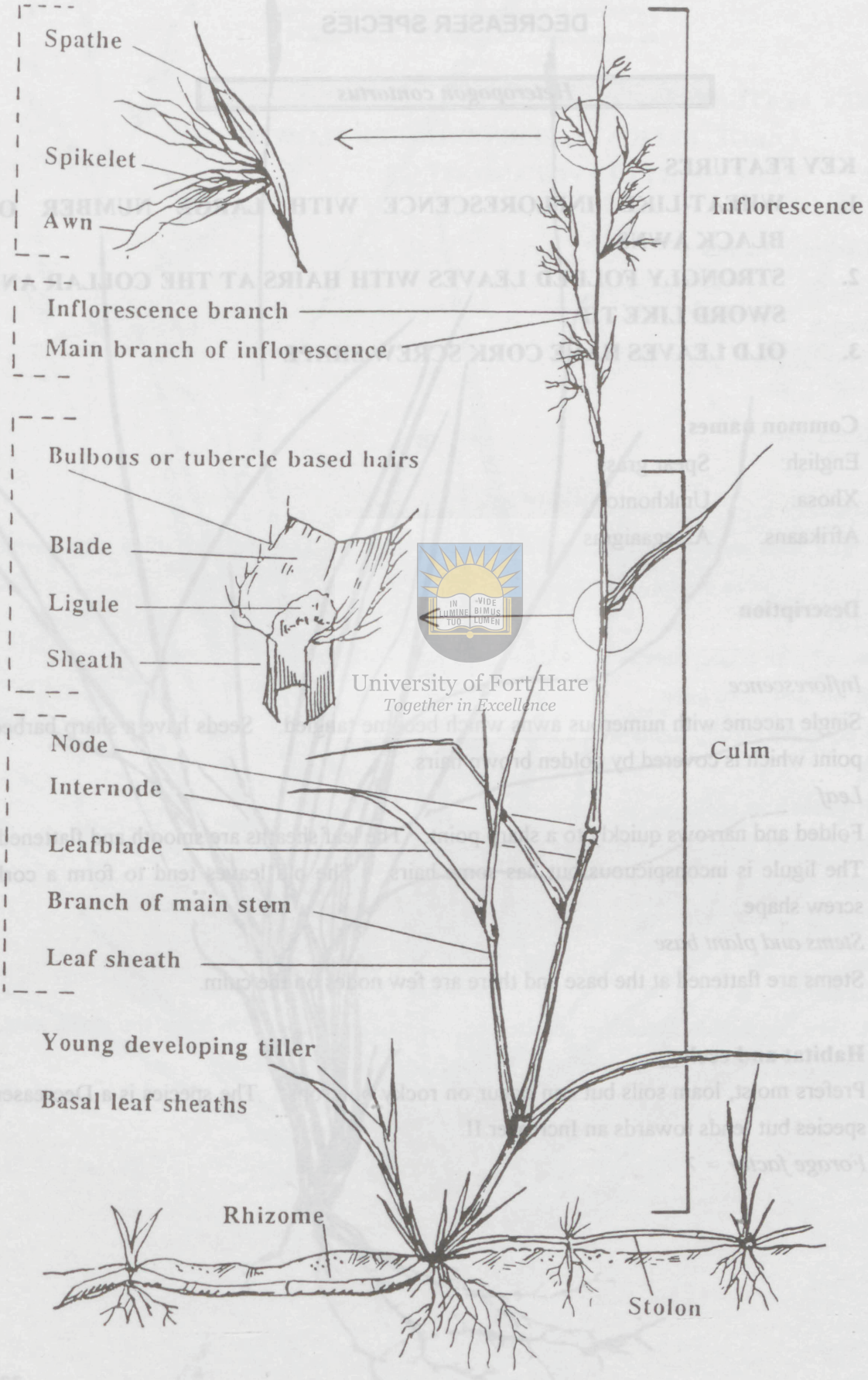


Figure 5. The structural parts of a grass plant and the terms used to describe them (Tainton et al 1985).

DECREASER SPECIES

Heteropogon contortus

KEY FEATURES

1. **WHEAT-LIKE INFLORESCENCE WITH LARGE NUMBER OF BLACK AWNS**
2. **STRONGLY FOLDED LEAVES WITH HAIRS AT THE COLLAR AND SWORD LIKE TIP**
3. **OLD LEAVES HAVE CORK SCREW SHAPE**

Common names

English: Spear grass
Xhosa: Umkhonto
Afrikaans: Assegaaigras

Description

Inflorescence

Single raceme with numerous awns which become tangled. Seeds have a sharp barbed point which is covered by golden brown hairs.

Leaf

Folded and narrows quickly to a sharp point. The leaf sheaths are smooth and flattened. The ligule is inconspicuous but has some hairs. The old leaves tend to form a cork screw shape.

Stems and plant base

Stems are flattened at the base and there are few nodes on the culm.

Habitat and ecology.

Prefers moist, loam soils but can occur on rocky outcrops. The species is a Decreaser species but tends towards an Increaser II.

Forage factor = 7

Panicum maximum

KEY FEATURES

1. **LARGE, DELICATE, PURPLE-TINGED FLOWER**
2. **VERY HAIRY LEAVES AND STEMS**

Common names

English: Guinea grass

Xhosa:

Afrikaans: Witbuffelsgras

Description

Inflorescence

Large open panicle with delicate, drooping branches. The seeds are often tinged with purple. Culms can be 120 cm high.

Leaf

Broad with a long narrow tip, and covered with white hairs.

Stems and plant base

Very hairy, strong stems with a coarse appearance.

Habitat and ecology.

Associated with bush and often grows under trees and among old branches of a dead tree.

Forage factor = 10

Remarks

A very productive species in selected habitats and animals often leave the stems after grazing to give a hedgehog effect. This species will not burn easily.

Setaria sphacelata

KEY FEATURES

1. **GOLDEN COLOUR OF OLD LEAVES**
2. **HAIRS ON THE INFLORESCENCE AFTER THE SEEDS HAVE DROPPED**

Common names

English: Bristle grass

Xhosa:

Afrikaans: Mannagras

Description

Inflorescence

A compacted panicle with hairs on the central axis. These hairs remain once the flowers have lost their seeds.

Leaf

Broad, soft leaves which can be hairy and which turn golden yellow when mature. The tips can also have corkscrew shaped tips once the leaves dry out. The leaves are also folded at the base.

Stems and plant base

Flat smooth base which can have rhizomes. The stems can be very long (60 cm) but vary depending on the growing conditions.

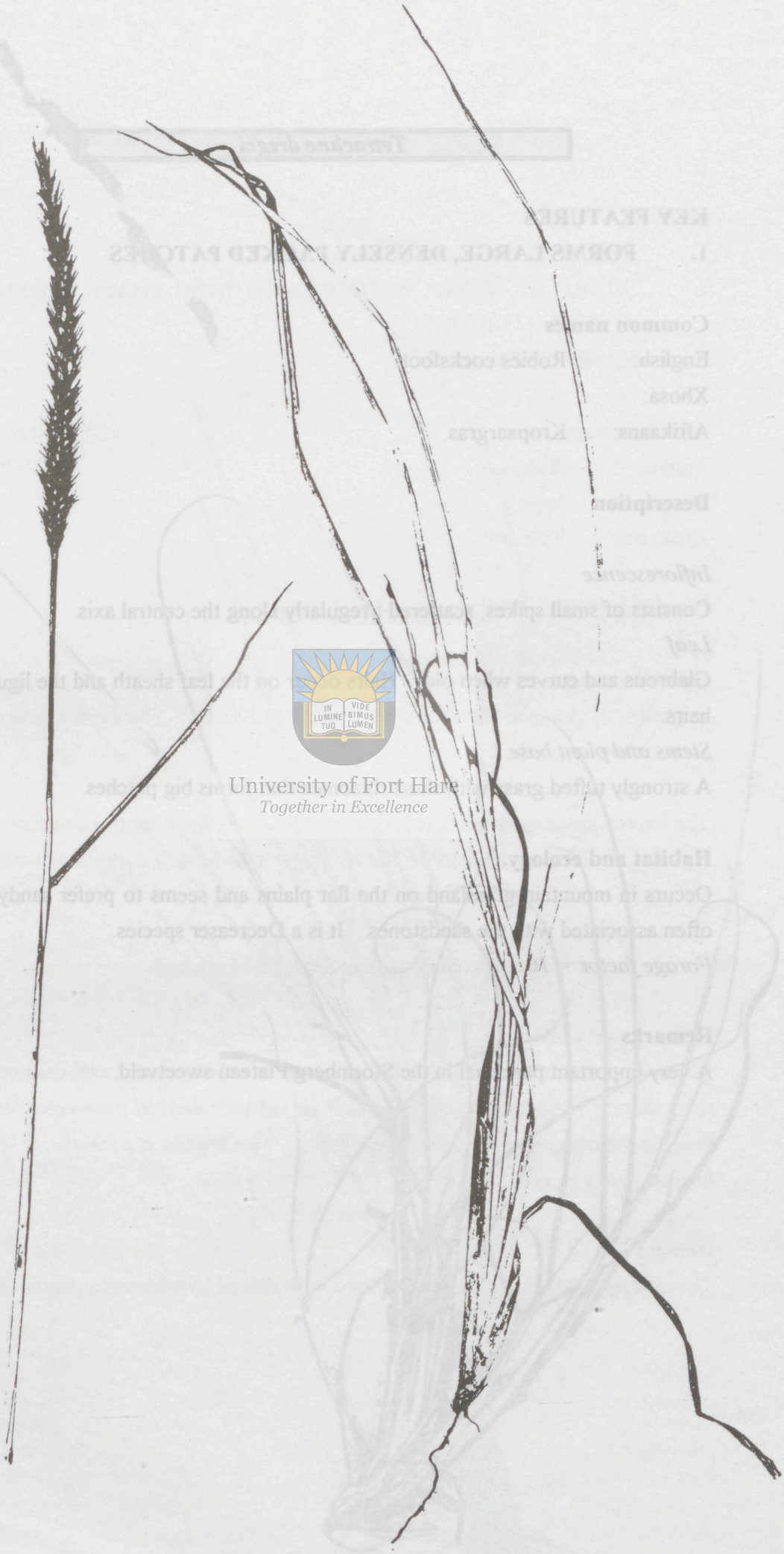
Habitat and ecology.

Prefers moist, sandy soils although some varieties do seem to grow in dry habitats. It is a Decreaser species.

Forage factor = 7

Remarks

Can be easily confused with *Pennisetum* spp. The many varieties of this species are difficult to distinguish but most are fairly palatable.



KEY FEATURES

1. FORMS LARGE, DENSELY PACKED PATCHES

Common names

English: Robies cocksfoot

Xhosa:

Afrikaans: Kropaargras

Description

Inflorescence

Consists of small spikes, scattered irregularly along the central axis.

Leaf

Glabrous and curves when old. Hairs occur on the leaf sheath and the ligule is a ring of hairs.

Stems and plant base

A strongly tufted grass with short rhizomes that forms big patches.

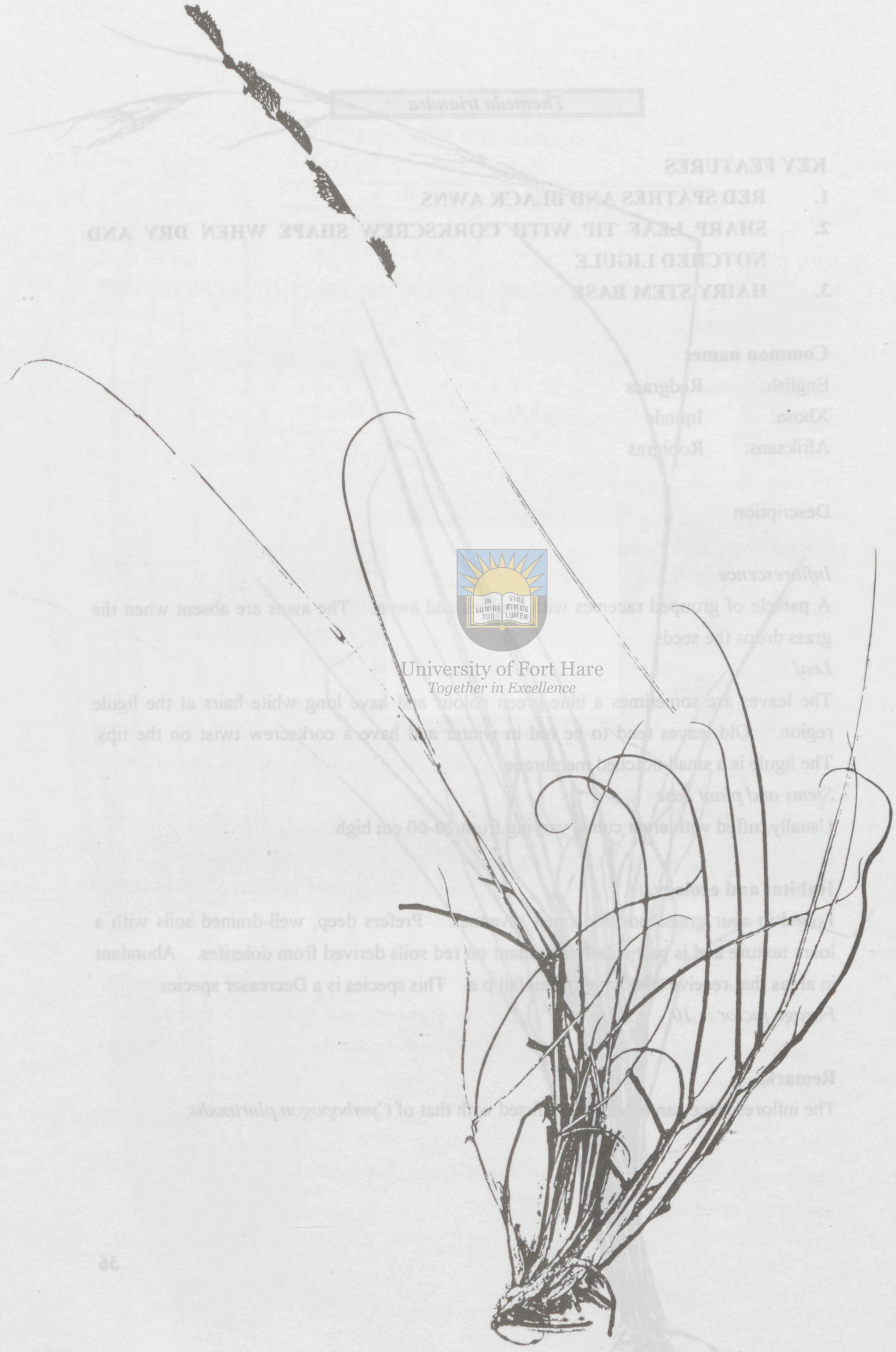
Habitat and ecology.

Occurs in mountain grassland on the flat plains and seems to prefer sandy soils so it is often associated with the sandstones. It is a Decreaser species.

Forage factor = 10.

Remarks

A very important perennial in the Stormberg Plateau sweetveld.



Themeda triandra

KEY FEATURES

1. **RED SPATHES AND BLACK AWNS**
2. **SHARP LEAF TIP WITH CORKSCREW SHAPE WHEN DRY AND NOTCHED LIGULE**
3. **HAIRY STEM BASE**

Common names

English: Redgrass
Xhosa: Iqunde
Afrikaans: Rooigras

Description

Inflorescence

A panicle of grouped racemes with spathes and awns. The awns are absent when the grass drops the seeds.

Leaf

The leaves are sometimes a blue-green colour and have long white hairs at the ligule region. Old leaves tend to be red in winter and have a corkscrew twist on the tips. The ligule is a small notched membrane.

Stems and plant base

Usually tufted with erect culms varying from 20-60 cm high.

Habitat and ecology.

Found in sour grasslands and open savannas. Prefers deep, well-drained soils with a loam texture and is particularly abundant on red soils derived from dolerites. Abundant in areas that receive >500 mm of rainfall p.a. This species is a Decreaser species.

Forage factor = 10.

Remarks

The inflorescence can be easily confused with that of *Cymbopogon plurinodis*.

INCREASER I SPECIES

Cymbopogon plurinodis

KEY FEATURES

1. **A STRONG TURPENTINE ODOUR WHEN THE LEAVES ARE CRUSHED**

Common names

English: Bushveld turpentine-grass
Xhosa: Isiqungu
Afrikaans: Turpentyngras

Description

Inflorescence

A panicle of grouped racemes with spathes and awns. The awns develop from the lemma and are therefore absent after seed are dispersed.

Leaf

Leaves are long and reasonably narrow, tapering to a very long, narrow tip. The tip sometimes curls backwards. No hairs are present. The old leaves are reddish with a white midrib.

Stems and plant base

Stems are strong and can be as long as 100 cm. The nodes are distinct with a dark purple appearance. Short hairs may be found on the base of the sheath and appear to have a silvery colour.

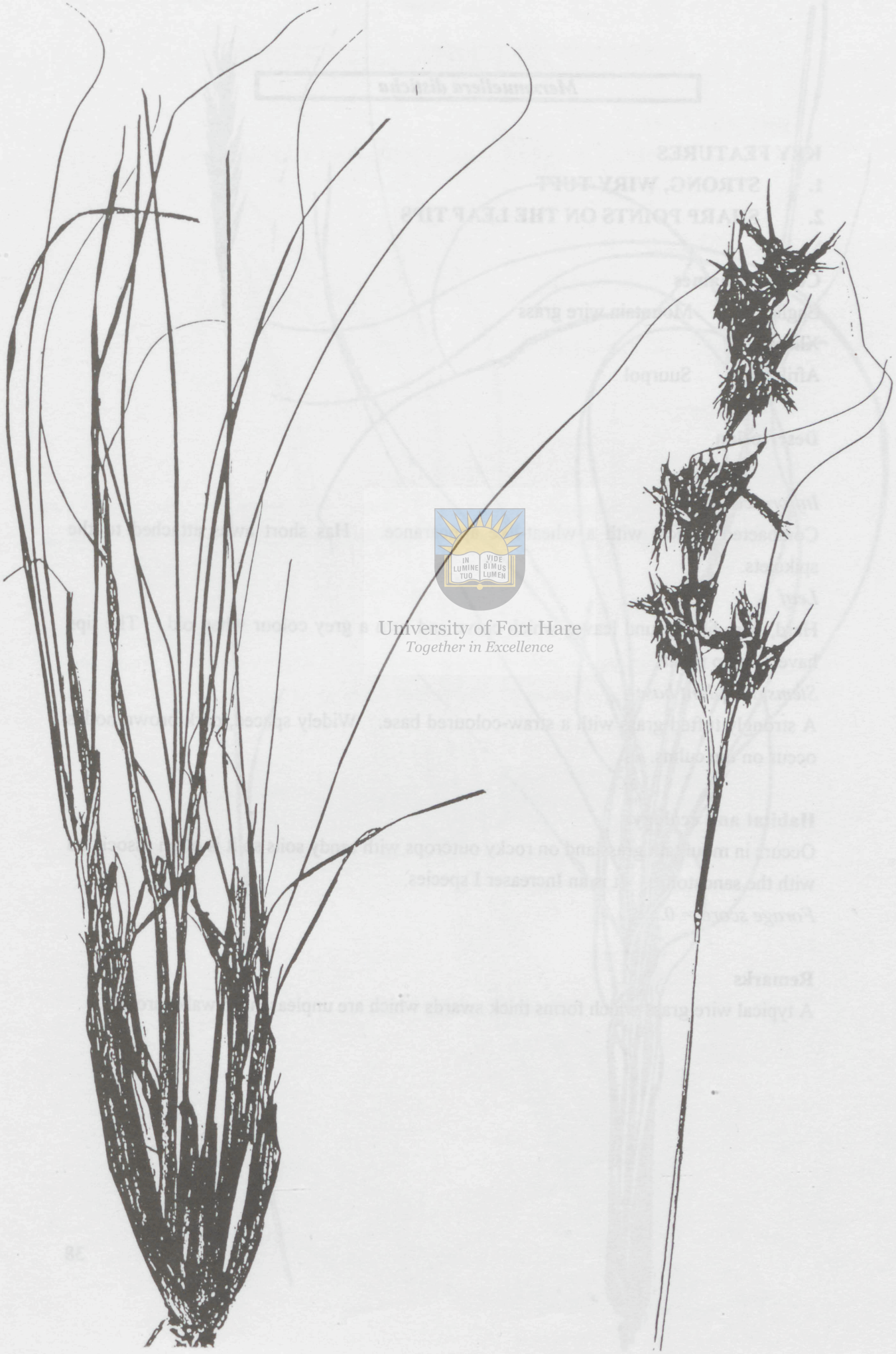
Habitat and ecology.

This grass occurs in shallow, dry soils on mudstone and shale. It also occurs in selectively grazed sites and is therefore an Increaser I species.

Forage factor = 4.

Remarks

Inflorescence can be confused with that of *Themeda triandra.* Leaves have a definite turpentine smell when crushed.



Merxmuellera disticha

KEY FEATURES

1. **STRONG, WIRY TUFT**
2. **SHARP POINTS ON THE LEAF TIPS**

Common names

English: Mountain wire grass

Xhosa:

Afrikaans: Suurpol

Description

Inflorescence

Compacted panicle with a wheat-like appearance. Has short awns attached to the spikelets.

Leaf

Hard, wire like, round leaves which curve and turn a grey colour when old. The tips have a sharp point.

Stems and plant base

A strongly tufted grass with a straw-coloured base. Widely spaced, dark brown nodes occur on the culms.

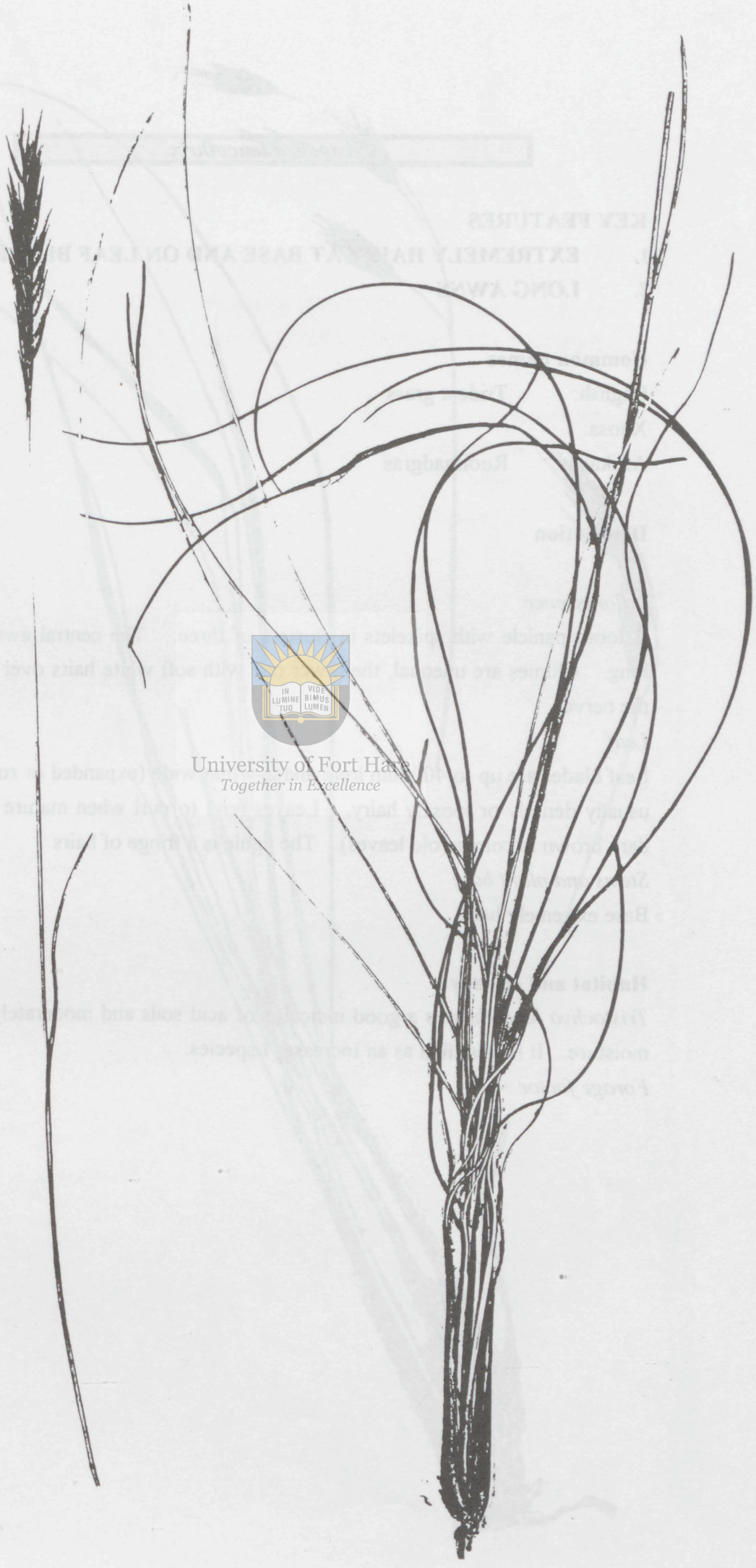
Habitat and ecology.

Occurs in mountain grassland on rocky outcrops with sandy soils so it is often associated with the sandstones. It is an Increaser I species.

Forage score = 0.

Remarks

A typical wire grass which forms thick swards which are unpleasant to walk through.



Tristachya leucothrix

KEY FEATURES

1. **EXTREMELY HAIRY AT BASE AND ON LEAF BLADES.**
2. **LONG AWNS**

Common names

English: Trident grass

Xhosa:

Afrikaans: Rooisaadgras

Description

Inflorescence

A loose panicle with spikelets in clusters of three. The central awns are 50-100 mm long. Glumes are unequal, the lower one with soft white hairs over the back or along the nerves.

Leaf

Leaf blades are up to 400 mm long and 2-6 mm wide (expanded or rolled). Leaves are usually densely or loosely hairy. Leaves tend to curl when mature and are brown to dark brown in colour (old leaves). The ligule is a fringe of hairs.

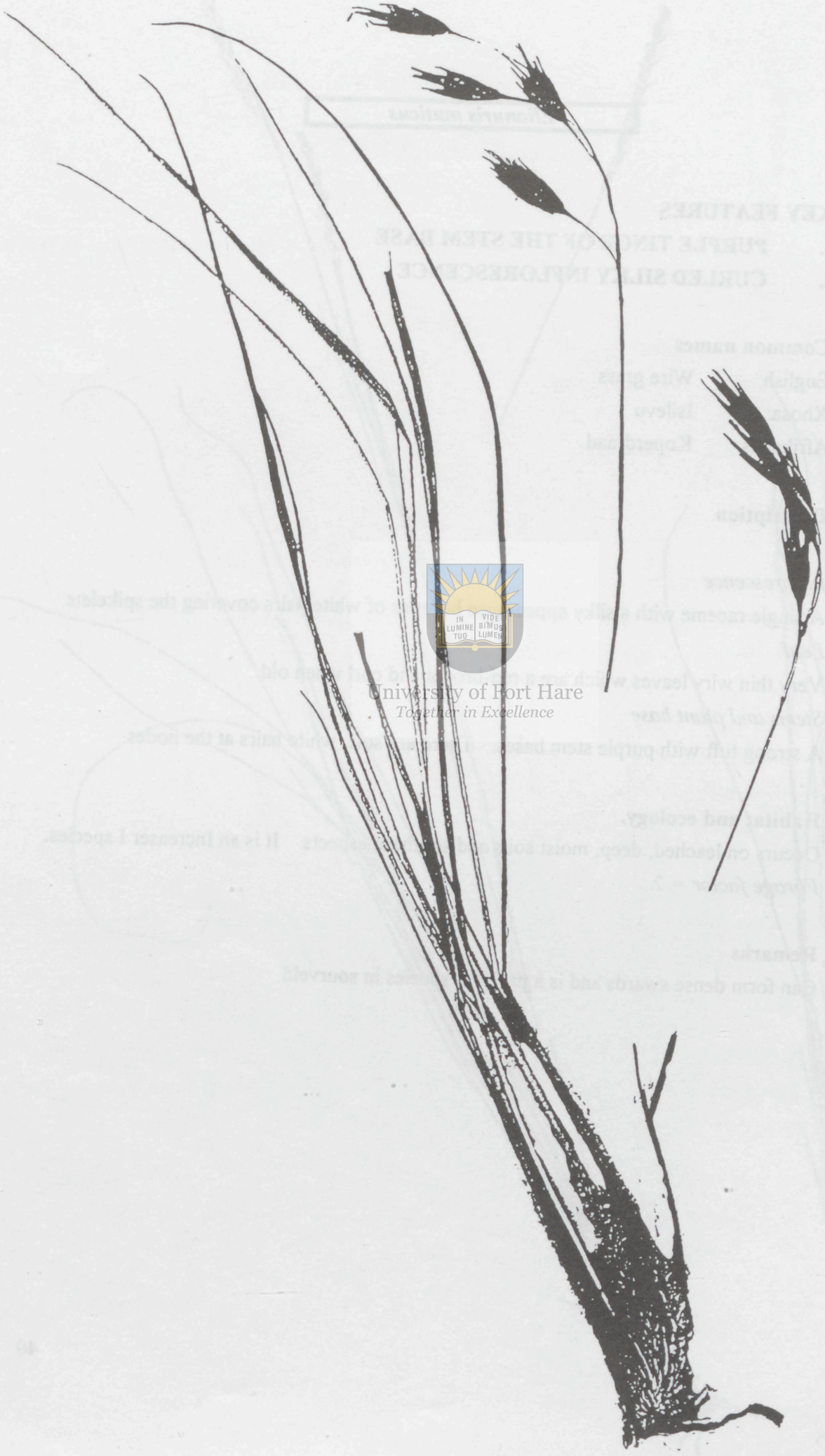
Stems and plant base

Base extremely hairy.

Habitat and ecology.

Tristachya leucothrix is a good indicator of acid soils and moderately high to high soil moisture. It is classified as an Increaser I species.

Forage factor = 7



Elionuris muticus

KEY FEATURES

1. **PURPLE TINGE OF THE STEM BASE**
2. **CURLED SILKY INFLORESCENCE**

Common names

English: Wire grass
Xhosa: Isilevu
Afrikaans: Koperdraad

Description

Inflorescence

A single raceme with a silky appearance because of white hairs covering the spikelets.

Leaf

Very thin wiry leaves which are a red-brown and curl when old.

Stems and plant base

A strong tuft with purple stem bases. There are soft, white hairs at the nodes.

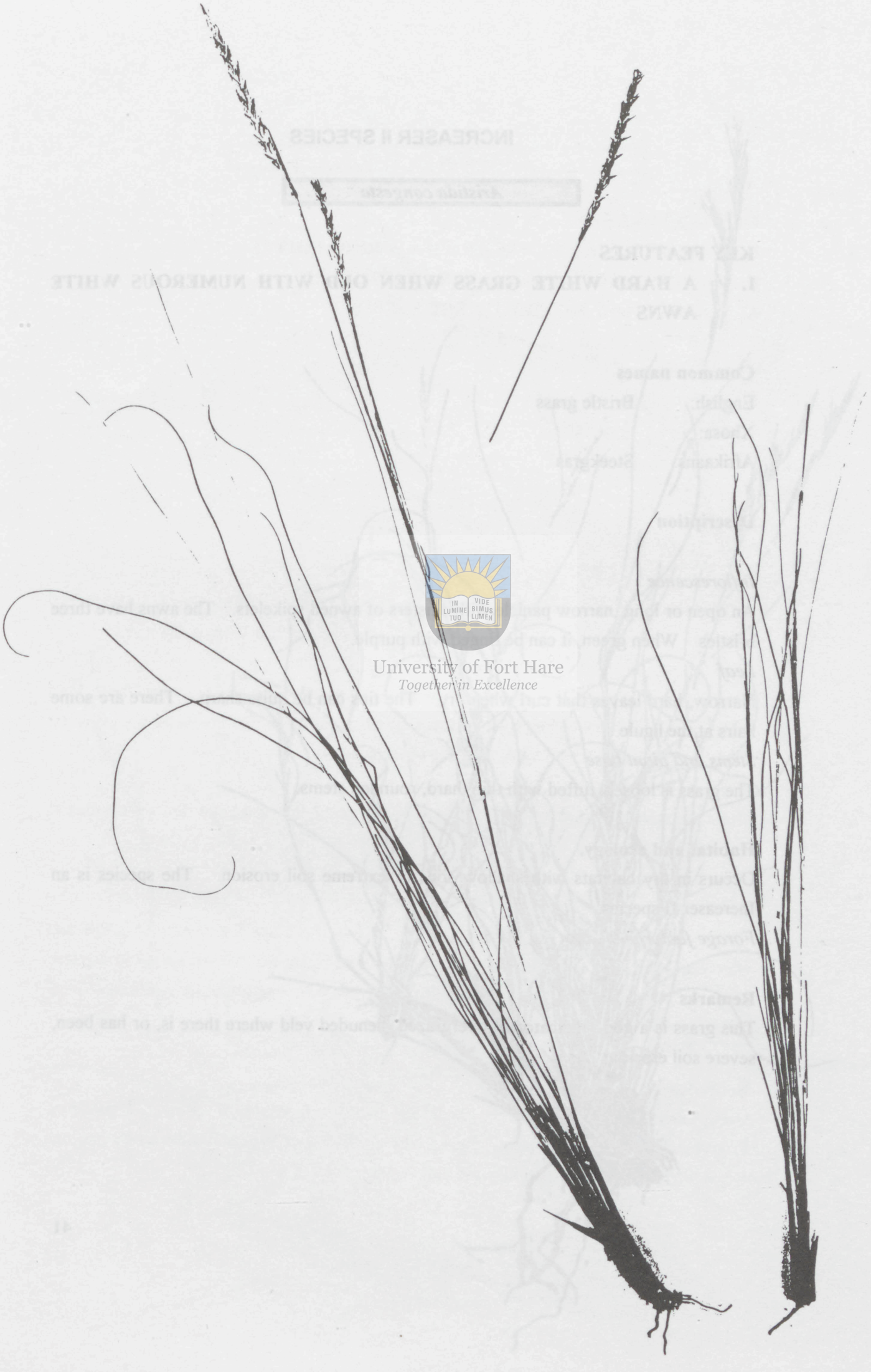
Habitat and ecology.

Occurs on leached, deep, moist soils and southern aspects. It is an Increaser I species.

Forage factor = 2.

Remarks

Can form dense swards and is a problem species in sourveld.



INCREASER II SPECIES

Aristida congesta

KEY FEATURES

1. A HARD WHITE GRASS WHEN OLD WITH NUMEROUS WHITE AWNS

Common names

English: Bristle grass

Xhosa:

Afrikaans: Steekgras

Description

Inflorescence

An open or long, narrow panicle with clusters of awned spikelets. The awns have three bristles. When green, it can be tinged with purple.

Leaf

Narrow, hard leaves that curl when dry. The tips can be quite sharp. There are some hairs at the ligule.

Stems and plant base

The grass is loosely tufted with thin, hard, rounded stems.

Habitat and ecology.

Occurs in dry habitats with shallow soils or extreme soil erosion. The species is an Increaser II species.

Forage factor = 0

Remarks

This grass is a good indicator of overgrazed, denuded veld where there is, or has been, severe soil erosion.

Cynodon dactylon

KEY FEATURES

1. **FOUND NEAR GATES AND WATERING POINTS**
2. **HEN'S FOOT APPEARANCE OF THE SEED**
3. **CREEPING NATURE OF THE STEMS**

Common names

English: Couch grass
Xhosa: Uqaqaqa
Afrikaans: Kweekgras

Description

Inflorescence

Small, whorled raceme usually with three or four branches. The culm is usually very short (10 - 30 cm high). Seeds are arranged on one side of the raceme branches.

Leaf

There seem to be a number of varieties which range from soft hairy leaves to short, hard leaves with stiff hairs. The former occur on dry, loam and clay soils and the latter on sandy, leached soils. The ligule is a short membrane.

Stems and plant base

There are stolons and rhizomes. The stems are generally round and thin with nodes at frequent intervals.

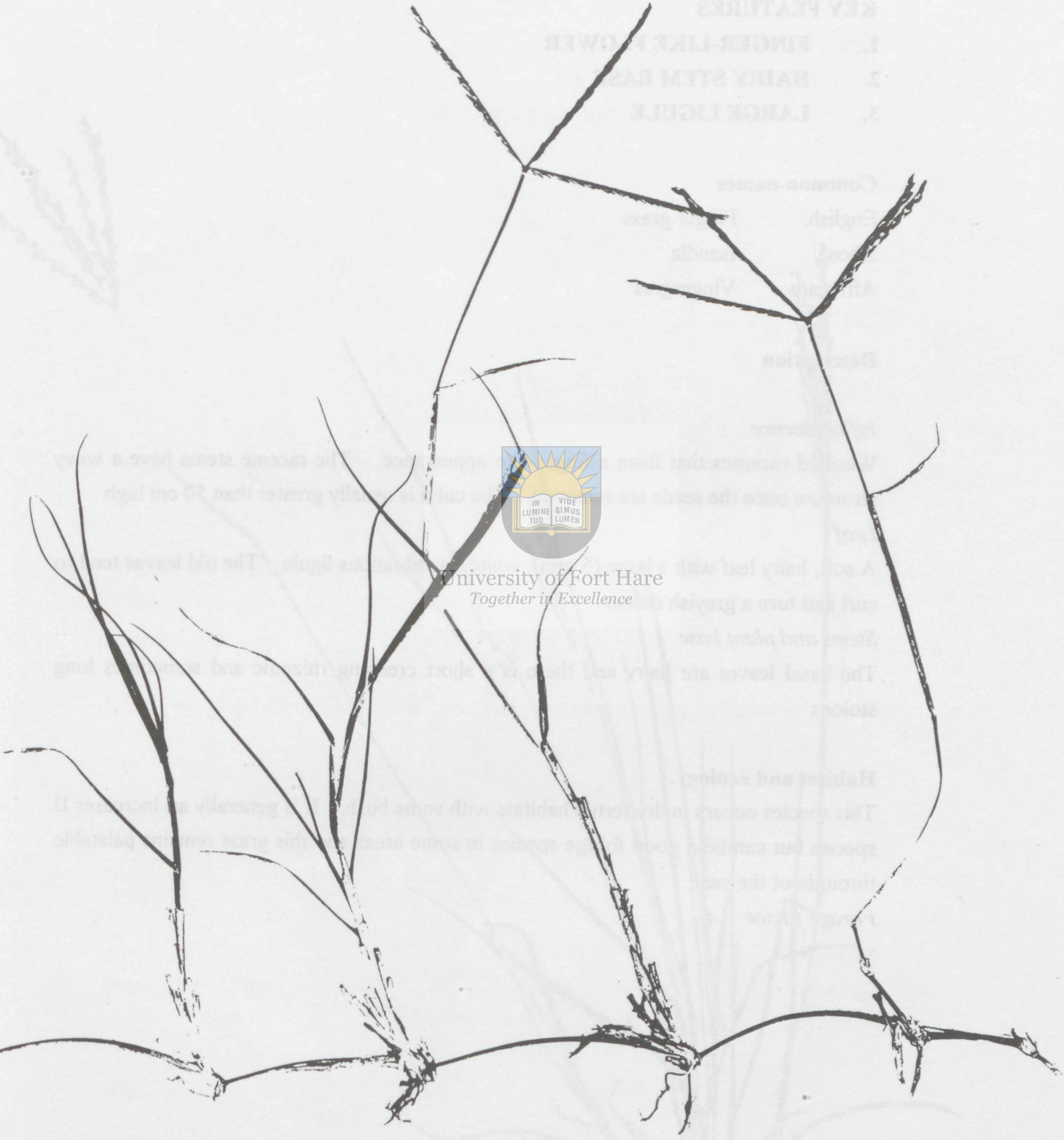
Habitat and ecology.

This grass is extremely tolerant of grazing and is therefore found around gates and watering points but also occurs in overgrazed veld. Its genetic variability is extreme and so it is not associated with any specific veld type. It is an Increaser II species.

Forage factor = 2

Remarks

Used as a lawn and has been used for the development of cultivated pastures. Productive in moist fertile sites. Due to the shallow root system it wilts easily and can cause prussic acid poisoning in cattle and sheep.



Digitaria eriantha

KEY FEATURES

1. **FINGER-LIKE FLOWER**
2. **HAIRY STEM BASE**
3. **LARGE LIGULE**

Common names

English: Finger grass
Xhosa: Isandla
Afrikaans: Vingergras

Description

Inflorescence

Whorled racemes that form a finger-like appearance. The raceme stems have a wavy structure once the seeds are removed. The culm is usually greater than 50 cm high.

Leaf

A soft, hairy leaf with a large (5 mm), white, membranous ligule. The old leaves tend to curl and turn a greyish colour.

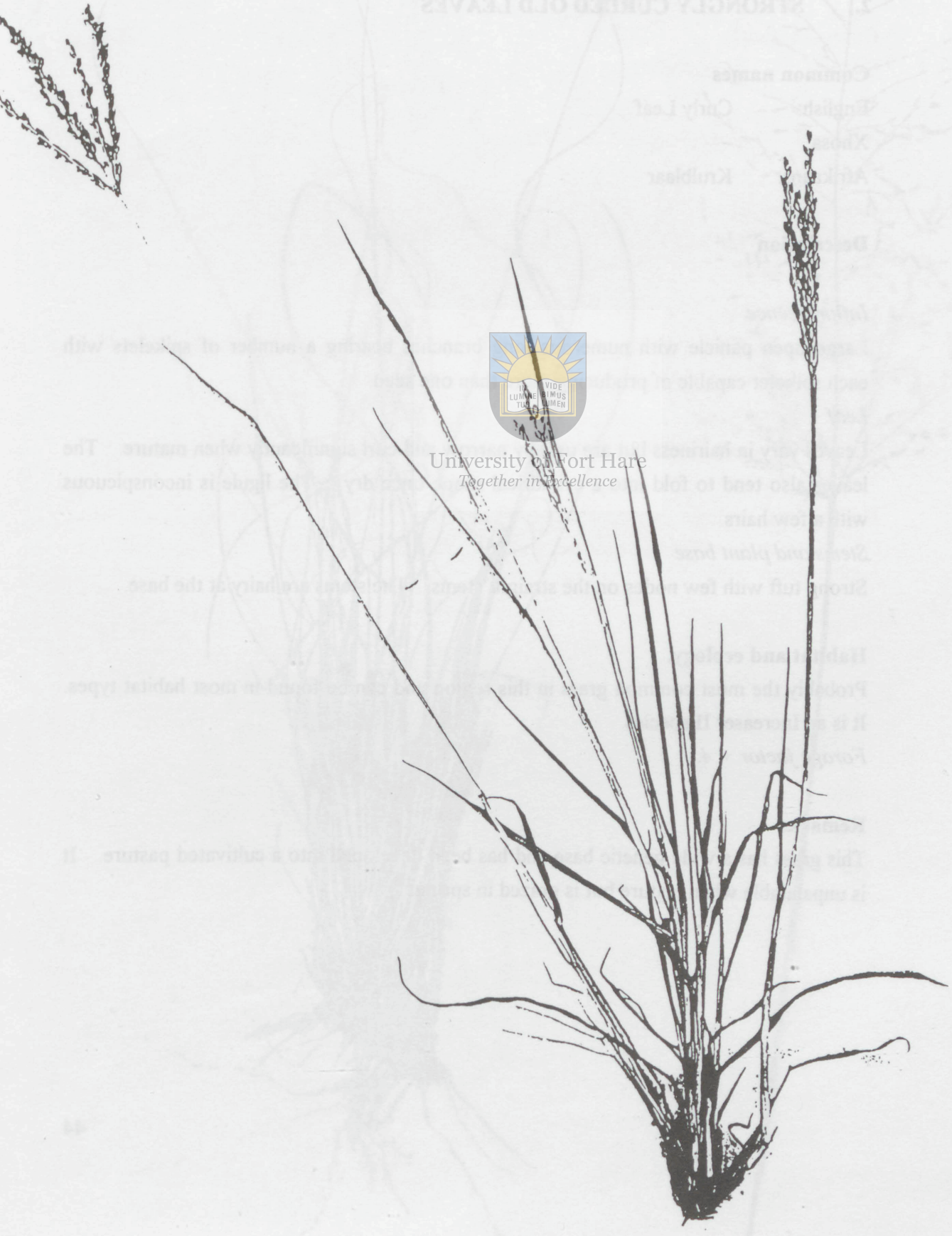
Stems and plant base

The basal leaves are hairy and there is a short creeping rhizome and sometimes long stolons.

Habitat and ecology.

This species occurs in dry fertile habitats with some bush. It is generally an Increaser II species but can be a good forage species in some areas and this grass remains palatable throughout the year.

Forage factor = 4.



Eragrostis chloromelas

KEY FEATURES

1. **LARGE OPEN PANICLE**
2. **STRONGLY CURLED OLD LEAVES**

Common names

English: Curly Leaf

Xhosa:

Afrikaans: Krulblaar

Description

Inflorescence

Large open panicle with numerous long branches bearing a number of spikelets with each spikelet capable of producing more than one seed.

Leaf

Leaves vary in hairiness but are usually narrow and curl significantly when mature. The leaves also tend to fold into a cylindrical shape once dry. The ligule is inconspicuous with a few hairs.

Stems and plant base

Strong tuft with few nodes on the straight stems. The stems are hairy at the base.

Habitat and ecology.

Probably the most common grass in this region and can be found in most habitat types. It is an Increaser II species.

Forage factor = 4.

Remarks

This grass has a wide genetic base and has been developed into a cultivated pasture. It is unpalatable when mature but is grazed in spring.

Eragrostis lehmanniana

KEY FEATURES

1. DISTINCT, BENT NODES

Common names

English: Lehmann's love grass

Xhosa:

Afrikaans: Knietjiesgras

Description

Inflorescence

An open panicle with small multifloreted spikelets.

Leaf

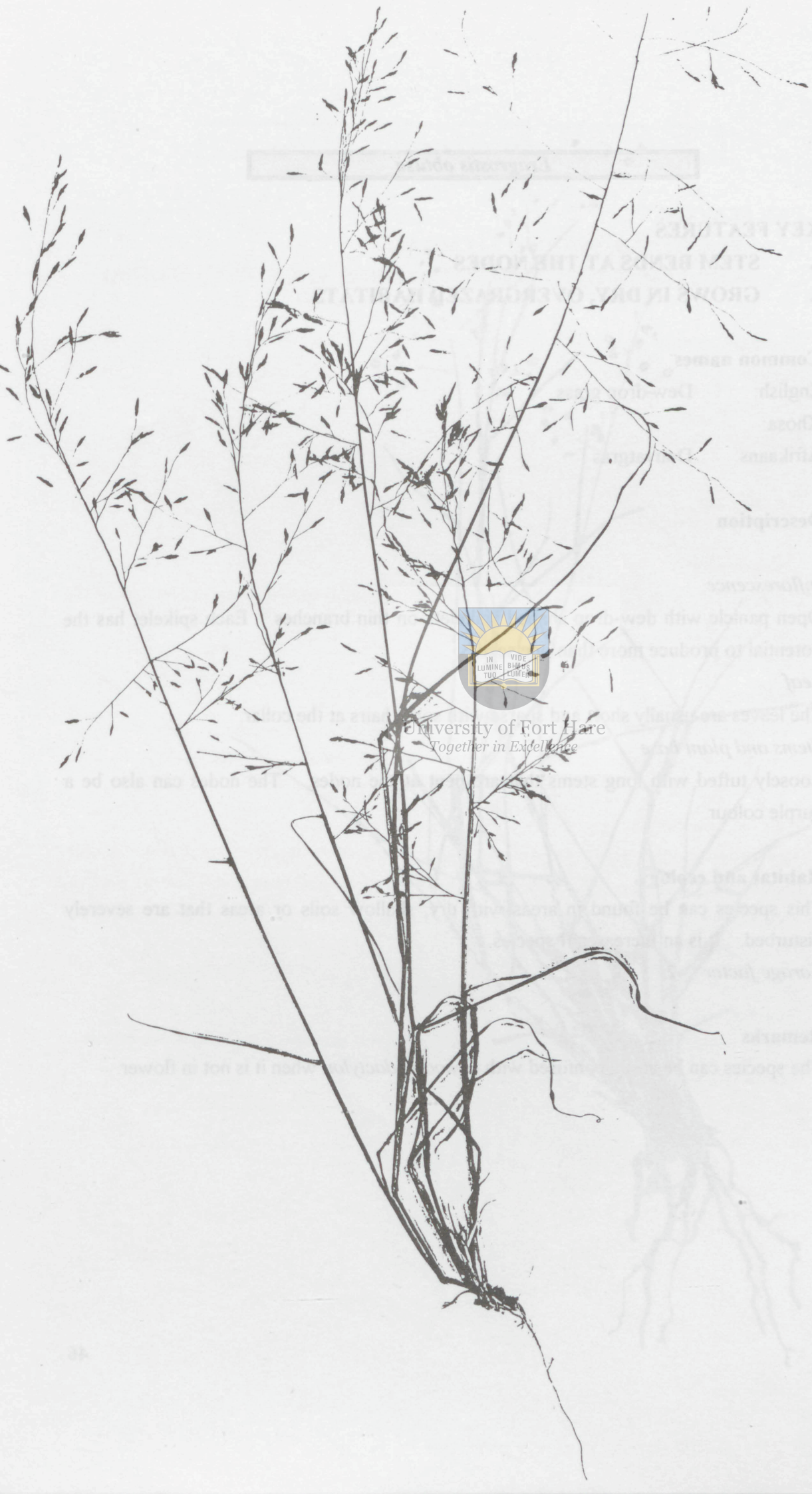
The leaves are sparse and narrow (2-5 mm) with a hard tip.

Stems and plant base

The ligule is a ring of white hairs. The stems are often bent at the nodes.

Habitat and ecology.

Occurs on sandy soils and disturbed sites. An Increaser II species.
Forage factor = 4.



Eragrostis obtusa

KEY FEATURES

1. STEM BENDS AT THE NODES

3. GROWS IN DRY, OVERGRAZED HABITATS

Common names

English: Dew drop grass

Xhosa:

Afrikaans: Douvatgras

Description

Inflorescence

Open panicle with dew-drop shaped spikelets on thin branches. Each spikelet has the potential to produce more than one seed.

Leaf

The leaves are usually short and sparse with some hairs at the collar.

Stems and plant base

Loosely tufted with long stems that are bent at the nodes. The nodes can also be a purple colour.

Habitat and ecology.

This species can be found in areas with dry, shallow soils or areas that are severely disturbed. It is an Increaser II species.

Forage factor = 2.

Remarks

The species can be easily confused with *Cynodon dactylon* when it is not in flower.

Eragrostis plana

KEY FEATURES

1. **FLATTENED, SMOOTH STEM BASE**
2. **CHRISTMAS TREE-SHAPED INFLORESCENCE WHEN MATURE**

Common names

English: Fan love grass

Xhosa:

Afrikaans: Taaipol

Description

Inflorescence

Open panicle with the base wider than the top and each spikelet may contain more than one seed.

Leaf

Glabrous, strong, smooth leaves, curling when mature.

Stems and plant base

Very smooth and flattened with a straw colour when mature. Strongly tufted.

Habitat and ecology.

This grass is often found in wet soils and where there is excessive trampling along footpaths. It can become dominant in sourveld areas and is very difficult to eradicate without using mechanical or herbicidal means. It is an Increaser II species.

Forage factor = 2.

Remarks

Can be regarded as a problem species in sourveld but protects the soil in areas that are excessively overgrazed.

Karroochloa purpurrea

KEY FEATURES

1. **SHORT COMPACT TUFT**
2. **CURVED LEAVES**

Common names

English: Quagga Couch

Xhosa:

Afrikaans: Haasgras

Description

Inflorescence

Spikelets 5-7 mm long and 4 mm wide and often tinged with purple around the keel.

Leaf

Leaf blades are approximately 40 mm long and may be hairy. Leaf blades are narrow (1 mm) and are rolled, appearing to be cylindrical.

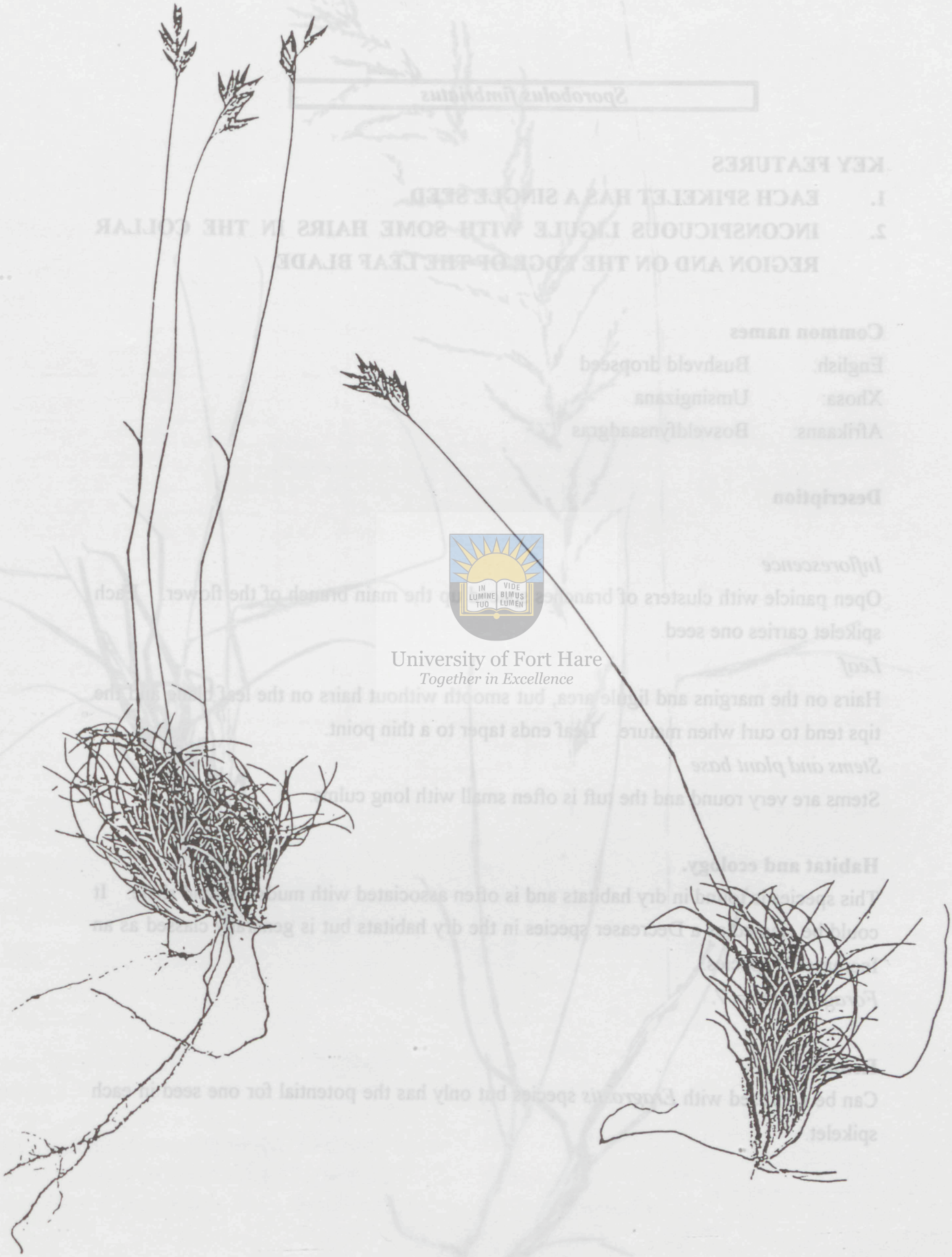
Stems and plant base

Plant base very compact. Shortly rhizomatous and tufted. The stem is cylindrical and narrows towards the top. Stem has a strong golden colour when mature. It appears to have a single, brown coloured node, with the leaf sheath tightly fitted around the stem.

Habitat and ecology.

This species occurs on the flat plains of the Stormberg sweetveld. It is an Increaser II species.

Forage factor = 2



Sporobolus fimbriatus

KEY FEATURES

1. **EACH SPIKELET HAS A SINGLE SEED**
2. **INCONSPICUOUS LIGULE WITH SOME HAIRS IN THE COLLAR REGION AND ON THE EDGE OF THE LEAF BLADE.**

Common names

English: Bushveld dropseed
Xhosa: Umsingizana
Afrikaans: Bosveldfynsaadgras

Description

Inflorescence

Open panicle with clusters of branches spaced up the main branch of the flower. Each spikelet carries one seed.

Leaf

Hairs on the margins and ligule area, but smooth without hairs on the leaf blade and the tips tend to curl when mature. Leaf ends taper to a thin point.

Stems and plant base

Stems are very round and the tuft is often small with long culms.

Habitat and ecology.

This species is found in dry habitats and is often associated with mudstone and shale. It could be classed as a Decreaser species in the dry habitats but is generally classed as an Increaser II species.

Forage factor = 7.

Remarks

Can be confused with *Eragrostis* species but only has the potential for one seed in each spikelet.

Appendix 1

Date:_____ Grid Reference:_____

Soil Depth:_____cm Soil Texture: | sand | loam | clay |

Bush picture:_____

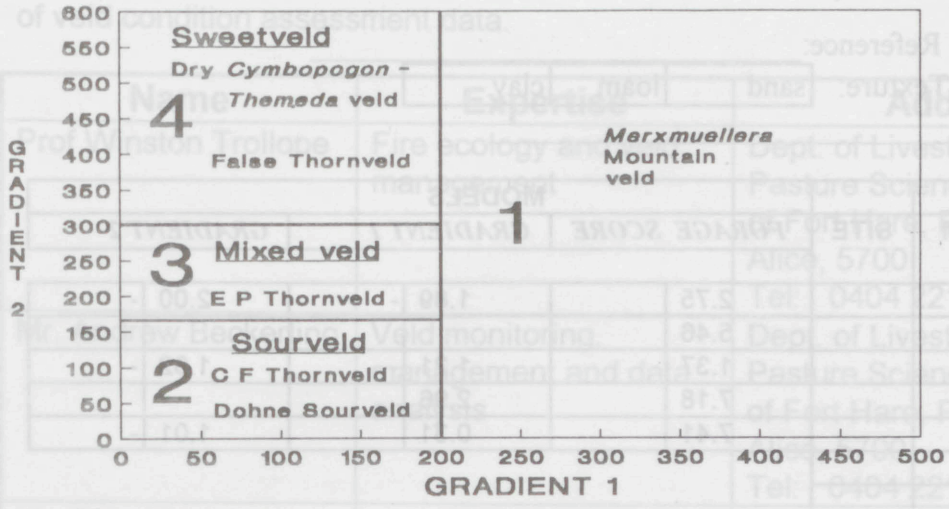
			MODELS					
	BM	SITE	*FORAGE SCORE*		*GRADIENT 1*		*GRADIENT 2*	
DECREASER								
Heteropogon contortus			2.75		1.89	-	2.00	-
Panicum maximum			5.46					
Setaria sphacelata			1.37	-	1.21	-	1.32	-
Tetrachne dregei			7.18		2.96			
Themeda triandra			7.41		0.31		1.01	-
TOTAL DECR								
INCREASER I								
Cymbopogon plurinodis							2.12	
Merxmuellera disticha			2.73	-	3.25			
Tristachya leucothrix			3.94		1.22	-	3.30	-
Elionuris muticus			3.68	-	1.51		2.59	-
TOTAL INCR I								
INCREASER II								
Aristida congesta			4.52	-	0.85	-	3.05	
Cynodon dactylon			0.93	-	0.28	-		
Digitaria eriantha			0.92		0.39		1.43	
Eragrostis chloromelas					3.50			
Eragrostis lehmanniana					1.31	-	4.37	
Eragrostis obtusa			4.79	-			3.05	
Eragrostis plana							1.20	-
Forbs and sedges			3.20	-				
Karroochloa purpurea			1.22	-	4.55			
Sporobolus fimbriatus			4.95				1.83	
TOTAL INCR II								
Other Species				+		+		+
Point / Plant distance								
CONSTANT				311.06		106.58		227.03
TOTAL				A		B		C

Please turn over the page to identify your benchmark. Plot the gradient 1(B) and 2(C) scores on the graph to select your benchmark.

Veld condition score = (FS Site(A) / FS BM) X 100 = _____ %

Grazing capacity(GC) = (FS BM / FS Site(A)) X GC of BM (Ha/AU) = _____ ha/au

Note: FS = Forage Score, BM = Benchmark and GC = Grazing capacity



	BM 1	BM 2	BM 3	BM 4
DECREASER				
Heteropogon contortus	0	13	0	0
Panicum maximum	0	0	0	0
Setaria sphacelata	0	0	5	0
Themeda triandra	30	37	62	3
TOTAL DECREASERS	30	50	67	3
INCREASER I				
Cymbopogon plurinodis	0	0	0	5
Merxmuellera disticha	23	0	0	0
Tristachya leucothrix	0	12	0	0
Elionuris muticus	0	8	0	0
TOTAL INCREASER I	23	20	0	5
INCREASER II				
Aristida congesta	0	0	0	0
Cynodon dactylon	0	8	1	3
Digitaria eriantha	1	0	24	19
Eragrostis chloromelas	19	2	0	0
Eragrostis lehmanniana	0	0	0	0
Eragrostis obtusa	0	0	0	0
Eragrostis plana	0	0	1	0
Forbs and sedges	2	3	1	7
Karroochloa purpurea	12	0	0	0
Sporobolus fimbriatus	0	0	0	35
TOTAL INCREASER II	34	13	27	65
OTHER	13	17	6	27
TOTAL	**100**	**100**	**100**	**100**
FORAGE SCORE	**533**	**638**	**768**	**555**
GRAZING CAPACITY (HA/AU)	**5**	**2**	**3**	**6**

Appendix 2. A list of people who can assist with the analysis and interpretation of veld condition assessment data.

Name	Expertise	Address
Prof Winston Trollope	Fire ecology and veld management	Dept. of Livestock and Pasture Science, University of Fort Hare, Pb x1314, Alice, 5700 Tel: 0404 22101
Mr. Andrew Beckerling	Veld monitoring, management and data analysis	Dept. of Livestock and Pasture Science, University of Fort Hare, Pb x1314, Alice, 5700 Tel: 0404 22101
Mr. Peter Scogings	Bush growth and response to fire and grazing	Dept. of Livestock and Pasture Science, University of Fort Hare, Pb x1314, Alice, 5700 Tel: 0404 22101
Mr. Mandla Mbelu	Veld monitoring and data analysis.	Dept. of Livestock and Pasture Science, University of Fort Hare, Pb x1314, Alice, 5700 Tel: 0404 22101

Glossary of terms

A.

ABIOTIC : Non-living, basic elements and compounds of the environment (Kothman, 1974).

ACCEPTABILITY : Attractiveness of feed to animals as determined by factors of the forage and the environment (Tainton, 1981).

AERIAL FUELS : All combustible material, live or dead, located in the understory and upper canopy of tree and shrub communities (Brown & Davis, 1973).

AGRO-ECOLOGICAL UNIT : An area in which the climate, landscape, soil and vegetation are homogeneous to the extent that the adaptability and response of any particular plant species would not change markedly from place to place within the unit (Tainton, 1981).

AGROSTOLOGY : Classification, management and utilization of grasses (Heath, Metcalfe & Barnes, 1978).

ALLOGENIC SUCCESSION: Succession in which one kind of plant community replaces another because of a change in the environment external to and independent of that produced by the plants themselves (Gabriel & Talbot, 1984).

ANIMAL UNIT (AU) : An animal with a mass of 450 kg and which gains 0,5 kg per day on forage with a digestible energy percentage of 55% (). (See **Large Stock Unit**)

ANIMAL UNIT EQUIVALENT: $M^{0.75}/97,7$ where **M** is the mass of the animal under consideration (Tainton, 1981).

APICAL DOMINANCE: Inhibiting effect of a terminal bud upon the development of lateral buds (Heath, Metcalfe & Barnes, 1978).

AREA SELECTIVE GRAZING/BROWSING : Habit of grazing/browsing animals to graze/browse certain areas of the veld/pasture in preference to others (Booysen, 1967).

ARTIFICIAL PASTURE : An area that has been artificially established to selected forage plants (Tainton, 1981).

ASPECT : Predominant direction of slope of the land (Kothman, 1974).

AURICLE : Earlike appendage sometimes present at the collar of the leaf sheath in grasses (Chippindall & Crook, 1976).

AUTECOLOGY : Ecology of individual species (Abercombie, Hickman & Johnson, 1980).

AUTOGENIC SUCCESSION : Succession in which the replacement of one plant community by another results chiefly from the amelioration of the site by the plants themselves (Gabriel & Talbot, 1984).

AVERAGE DAILY GAIN (ADG) : Average gain in live mass per animal per day for a specified period - kg/d.

AWN : Bristle-like projection arising from the seed of a grass (Walker, pers. comm.[1]).

AXILLARY BUD: New bud arising in the axil of a leaf (Heath, Metcalfe & Barnes, 1978).

AXILLARY TILLER : New tiller arising in the axil of a leaf (Heath, Metcalfe & Barnes, 1978).

B.

BACK FIRE : A fire burning against the wind (Trollope, 1983).

BASAL AREA : See **Basal Cover**.

BASAL COVER : Area of ground covered by the living basal portions of plants.

BENCHMARK SITE : A representative area of veld that is in optimum condition for sustained livestock production (Tainton, 1981).

[1] Walker, B.H., Division Wildlife & Rangelands Research CSIRO, Canberra, Australia.

BIOMASS : Total amount of living material (plant and animal) present in a particular area at any given time - kg/ha (Gabriel & Talbot, 1984).

BIOME : Major regional ecological community of plants and animals (Abercombie, Hickman & Johnson, 1980).

BIOTA: All the species of plants and animals occurring within an area (Kothman, 1974).

BIOTIC : Living components of the ecosystem.

BROWSE : That portion of the woody vegetation that is available for consumption by animals.

BROWSING : Utilization of woody vegetation by animals (Kothman, 1974).

BROWSING CAPACITY : See **Grazing Capacity**.

BROWSING UNIT : Tree or shrub that is acceptable to goats and is either 1.5 m tall or has browse within 1.5 m of ground level (Teague, Trollope & Aucamp, 1986).

BROWSER : An animal that utilizes browse.

BUSHVELD : See **Savanna**.

C.

CAMP : Smallest unit to which grazing and/or browsing management is applied (Tainton, 1981).

CANOPY : Cover of leaves and branches formed by the tops or crowns of plants (Gabriel & Talbot, 1984).

CANOPY COVER : Proportion of the ground area covered by the vertical projection of the canopy - % (Gabriel & Talbot, 1984).

CARRYING CAPACITY: Potential of an area to support livestock through grazing and/or browsing and/or fodder production over an extended number of years without deterioration to the overall ecosystem - ha/AU or AU/ha (Danckwerts, 1981).

CLIMATIC CLIMAX : Ultimate phase of ecological development of plant communities that the climate of a region will support (Gabriel & Talbot, 1984).

CLIMAX SPECIES: A species that is self-perpetuating in the absence of disturbance, with no evidence of replacement by other plant species (Gabriel & Talbot, 1984).

CLIMAX VEGETATION : Final stable plant community in an ecological succession which is able to reproduce itself indefinitely under existing environmental conditions (Gabriel & Talbot, 1984).

CO-DOMINANT : One of two or more species which dominate a plant community, no one to the exclusion of the others (Gabriel & Talbot, 1984).

COLLAR : Junction of the leaf blade and sheath in grasses.

COMMUNITY : An assemblage of plants growing together and interacting among themselves in a specific location (Gabriel & Talbot, 1984).

CONTINUOUS GRAZING/BROWSING : Type of management whereby animals are placed in a camp when the forage becomes ready for grazing/browsing at the start of the growing season and they or their replacements are left in that camp for the entire grazeable/browseable period of each year (Booysen, 1967).

CONTROLLED BURNING : Burning of veld for a specific reason.

CONTROLLED SELECTIVE GRAZINC (CSG) : See **High Production Grazing**.

CROWN COVER : See **Canopy Cover**.

CROWN FIRE : A fire that burns in the canopies of trees and shrubs (Brown & Davis, 1973 & Luke & McArthur, 1978).

CULM : Flowering stem of a grass plant.

CULTIVATED PASTURE : Pasture which has been established by conventional means involving soil disturbance, removal of existing vegetation, and seedbed preparation (Booysen, 1967).

CURRENT GRAZING/BROWSING CAPACITY : Grazing/browsing capacity of the vegetation in its current state - ha/AU or AU/ha (Booysen, 1967).

D.

DECREASER SPECIES : Species which dominate in good veld but decrease when veld is mismanaged (Tainton, 1981).

DENSITY: Number of plants per unit area - No/ha (Gabriel & Talbot, 1984).

DIGESTIBILITY : Proportion of a feed that has the potential to be ingested by animals.

DISCLIMAX : A distinctive type of climax community, seral to the climatic climax which retains its character only under continuous or intermittent disturbance such as heavy grazing or periodic burning - see Fire Climax (Gabriel & Talbot, 1984).

DIVERSITY : An expression of the variety of species that exists in a community (Gabriel & Talbot, 1984).

DOMINANCE : Degree of influence that a plant species exerts over a community as measured by its mass or basal area per unit area of the ground surface or by the proportion it forms of the total cover, mass, or basal area of the community (Gabriel & Talbot, 1984).

DYSTROPHIC : Habitat which is both low in basic nutrients and toxic substances (highly leached) (Gabriel & Talbot, 1984).

E.

ECESIS : Succesfull establishment of a plant in a new area from germination or its equivalent, to reproduction whether sexual or vegetative (Gabriel & Talbot, 1984).

ECOLOGICAL AMPLITUDE : Degree of tolerance of a species to an environmental factor such as moisture, drought, cold, etc. (Gabriel & Talbot, 1984).

ECOLOGICAL NICHE : Range or sets of environmental conditions which an organism's behavioural, morphological, and physiological adaptations enables it to occupy (Gabriel & Talbot, 1984).

ECOLOGY : Study of the interrelationships between organisms, and between them and their environment.

ECOSYSTEM : Biological system comprising both living organisms and the abiotic components of the environment (Odum, 1971).

ECOTONE : Transitional area of vegetation between two communities, having characteristics of both kinds of neighbouring vegetation as well as characteristics of its own (Kothman, 1974).

ECOTYPE : Plant type or strain within a species resulting from long-term exposure to a particular environment (Heath, Metcalfe & Barnes, 1978).

EDAPHIC CLIMAX : Any distinctive type of stable plant community whose successional advance has been terminated by unfavourable soil conditions.

EDGE EFFECT : Influence of two communities upon their adjoining margins, affecting the composition and density of the population in these bordering areas (Gabriel & Talbot, 1984).

ENCROACHMENT : The spread of a plant into an area where previously it did not occur.

EUTROPHIC : Habitat rich in nutrients (poorly leached) (Gabriel & Talbot, 1984).

F.

FINE FUELS : Combustible plant material comprising standing grass, herbaceous plants, leaves, twigs and branches all with a diameter of < 6mm (Luke & McArthur, 1978).

FIRE BEHAVIOUR : Release of heat energy during combustion as described by fire intensity, rate of spread of the fire front, flame characteristics and other related phenomena (Trollope, 1983).

FIRE BREAK : Natural or man-made barrier used to prevent or retard the spread of a fire (Kothman, 1974).

FIRE CLIMAX : Any type of apparently stable vegetation which is maintained by regular burning.

FIRE ECOLOGY : Study of the response of the biotic and abiotic components of the ecosystem to the season, frequency, type and intensity of fire (Trollope, 1983).

FIRE INTENSITY : Release of heat energy per unit time per unit length of fire front - kJ/s/m; kW/m (Byram, 1959).

FIRE REGIME : Season and frequency of burning and the type and intensity of fire (Trollope, 1983).

FLAME HEIGHT : Perpendicular height of flames from ground level - m (Luke & McArthur, 1978).

FLORET : Grass flower (Chippindall & Crook, 1976).

FODDER : Livestock feed that includes forage, hay and silage.

FODDER BANK : Fodder reserve intended for use during periods of scarcity.

FODDER FLOW : Supply of fodder available to livestock throughout the year expressed on a monthly basis - kg/month.

FODDER PRODUCTION CAPACITY : Potential of a farming unit to produce livestock fodder from arable areas without deterioration to the edaphic environment - ha/AU or AU/ha (Danckwerts, 1981).

FODDER UNIT : An animal that has a daily intake of 10 kg of fodder containing at least 66 per cent total digestible nutrients.

FORAGE : That portion of a living plant that is available for consumption by animals (Kothman, 1974).

FORAGE FACTOR : Index of the sustained forage production potential of a plant species (Trollope, 1986).

FORAGE FLOW : Supply of forage (grazing/browse) available to livestock throughout the year expressed on a monthly basis - kg/month.

FORB : Non-graminaceous, herbaceous plant.

FORMATION: A continental scale vegetation unit comprising all plant communities that resemble each other in appearance and in major features of their environment (Gabriel & Talbot, 1984).

FREQUENCY : Ratio between the number of sample units that contain a plant species and the total number of sample units (Kothman, 1974).

FREQUENCY OF BURNING : Frequency with which fires are applied, expressed as the number of years elapsing between burns e.g. annual burn, biennial burn.

FUEL COMPACTION : The placement of individual pieces of fuel in relation to one another (Luke & McArthur, 1978).

FUEL MOISTURE : Ratio of moisture to fuel expressed as a percentage on a dry matter basis - % (Brown & Davis, 1973).

FUEL LOAD: Mass of fuel per unit area that is available for combustion during a fire - kg/m^2 (Luke & McArthur, 1978).

FYNBOS: See **Macchia**.

G.

GENOTYPE : Genetic constitution of an organism.

GLUMES : Bracts subtending the spikelet of a grass inflorescence (Chippindall & Crook, 1976).

GRASSLAND SCIENCE: See **Pasture Science**.

GRASSVELD : Veld in which grasses are the dominants and provide most of the forage material (Booysen, 1967).

GRAZER : An animal that utilizes grazing.

GRAZING (noun) : That portion of the herbaceous vegetation that is available for consumption by animals (Kothman, 1974).

GRAZING (verb) : Utilization of herbaceous vegetation by animals (Kothman, 1974).

GRAZING/BROWSING CAPACITY : Productivity of the grazeable/browseable portion of a homogeneous unit of vegetation expressed as the area of land required to maintain a single animal unit over an extended number of years without deterioration to vegetation or soil - ha/AU or AU/ha (Booysen, 1967).

GROUND FIRE: A fire that burns below the surface of the ground in deep layers of organic material (Brown & Davis, 1973 & Luke & McArthur, 1978).

GROUND FUELS: All combustible material occurring below the loose litter of the soil surface (Brown & Davis, 1973).

H.

HABITAT: Type of environment in which a plant or animal normally lives (Gabriel & Talbot, 1984).

HEAD FIRE : A fire burning with the wind (Trollope, 1983).

HEAT OF COMBUSTION : Total amount of heat energy contained per unit mass of fuel - kJ/kg (Luke & McArthur, 1978).

HEAT YIELD : Amount of heat energy available for release per unit mass of fuel - kJ/kg (Luke & McArthur, 1978).

HEAVY FUELS : Combustible plant material comprising stems and branches with a diameter of > 6mm (Luke & McArthur, 1978).

HERBAGE : Leaves, stems and other succulent parts of herbaceous plants.

HIGH PERFORMANCE GRAZING : See **High Production Grazing**.

HIGH PRODUCTION GRAZING (HPG) : Occupation of a camp by grazing animals until the acceptable grass species have been grazed to a stage that will ensure rapid regrowth and a high production of forage (Tainton, 1981).

HIGH UTILIZATION GRAZING (HUG) : Occupation of a camp by grazing animals until all the grass species have been heavily grazed (Tainton, 1981).

I.

INCREASER I SPECIES : Species which dominate in poor veld and increase with understocking or selective grazing (Tainton, 1981).

INCREASER II SPECIES : Species which dominate in poor veld and increase with overstocking (Tainton, 1981).

INDICATOR SPECIES : Those plant species which best indicate the condition of the veld or pasture, or the nature of the environment.

INFLORESCENCE : Flowering part of a plant (Heath, Metcalfe & Barnes, 1978).

INTAKE : Mass of forage consumed by an animal per day expressed on a dry matter basis - kg/d (Tainton, 1981).

INTENSIFICATION : Process of increasing the agricultural production per unit area of land (Tainton, 1981).

INTERNODE : Intervening section of the grass stem between the nodes (Meredith, 1955).

INTRODUCED PASTURE : Pasture which has been established without soil disturbance or complete removal of existing vegetation (Booysen, 1967).

INVADER SPECIES : Species which are not indigenous to a specific area (Tainton, 1981).

K.

KAROO : Veld in which the dominants are dwarf xerophytic shrubs and succulents. Most of the forage material derives from the dwarf shrubs and the associated xerophytic grasses (Booysen, 1967).

KEY SPECIES : Those plant species which have the greatest effect on the condition of the veld or pasture and are responsive to treatment (Willis & Trollope, 1987).

L.

LARGE STOCK UNIT (LSU) : See **Animal Unit**.

LEAF AREA INDEX : Ratio of leaf area to ground surface area (Heath, Metcalfe & Barnes, 1978).

LEAF BLADE: Upper portion of the grass leaf extending beyond the collar region.

LEAF SHEATH : Lower portion of the grass leaf below the collar region, normally enclosing the stem.

LEMMA : Lowermost bract subtending the reproductive parts of a grass spikelet (Chippindall & Crook, 1976).

LEYS : The pasture phase of a crop rotation specifically designed to improve soil productivity.

LIGULE : Outgrowth on the inner surface of the grass leaf at the junction of the blade and the sheath (Walker, pers. comm.).

LIVESTOCK UNIT (LU) : See **Animal Unit**.

M.

MACCHIA (FYNBOS): Veld in which the dominant plants are non-grasses with sclerophyllous, ericoid or cupressoid leaves but in which the associated grasses provide most of the forage material (Booysen, 1967).

MATURE LIVESTOCK UNIT (MLU) : See **Large Stock Unit**.

MERISTEM : Area of rapidly dividing cells (Heath, Metcalfe & Barnes, 1978).

METABOLIC MASS : Mass of an animal raised to the power three quarters.

MIXED VELD : Veld in which the acceptability of the forage plants is intermediate between those in sweet and sourveld thus allowing the veld to be utilized for only a portion of each year.

N.

NODE : Joint in the grass stem from which leaves and buds develop (Meredith, 1955).

NON-SELECTIVE GRAZING (NSG) - See **High Utilization Grazing**.

NUTRITIVE VALUE : Concentration of nutrients in a feed (Tainton, 1981).

O.

ORDINATION : Arrangement of sample units by individual values rather than by group values (Gabriel & Talbot, 1984).

OVERBROWSING : Excessive defoliation of trees and/or shrubs by animals to the detriment of the condition of the veld or pasture.

OVERGRAZING : Excessive defoliation of the grass sward by animals to the detriment of the condition of the veld or pasture.

OVERSEEDING : See **Introduced Pasture**.

OVERSTOCKING : When the stocking rate exceeds the carrying capacity of the veld or pasture.

P.

PADDOCK : See **Camp**.

PALATABILITY : Attractiveness of feed to animals as determined by specific factors of the forage (Tainton, 1981).

PALEA : Uppermost bract subtending the reproductive parts of a grass spikelet (Chippindall & Crook, 1976).

PANICLE : Inflorescence with a central axis and subdivided lateral branches (Heath, Metcalfe & Barnes, 1978).

PASTURE SCIENCE : Study of all matters pertaining to the management of veld, cultivated pastures and fodder crops.

PEDESTALLED : When the soil has eroded from around individual plants leaving them on small pedestals of soil (Kothman, 1974).

PERIOD OF ABSENCE : Length of time between successive periods of occupation during which the veld or pasture is allowed time to grow and attain a suitable stage for grazing and/or browsing (Booysen, 1967).

PERIOD OF OCCUPATION : Length of time which a particular camp is being utilized without interruption (Booysen, 1967).

PERIOD OF REST : Length of time during the growing season when a camp is afforded uninterrupted rest from grazing and/or browsing for the purpose of restoring the productivity of the veld and/or pasture (Booysen, 1967).

PERIOD OF STAY : Length of time during which a particular camp is being utilized without interruption by one group of animals (Booysen, 1967).

PERMANENT PASTURE : Pasture which has been established with a view to providing forage for an indefinite but extended number of years (Booysen, 1967).

PHENOLOGY : Study of the time of appearance of characteristic periodic events in the life cycles of organisms in nature and how these events are influenced by environmental factors (Kothman, 1974).

PHENOTYPE : Externally obvious characteristics manifested by an organism as contrasted with the set of genes possessed by it (Abercombie, Hickman & Johnson, 1980).

PHYSIOGNOMY : General outward appearance of a plant community, determined by the life-form of the dominant species (Gabriel & Talbot, 1984).

PHYTOMASS : Total mass of plants, including dead attached parts, per unit area - kg/ha (Gabriel & Talbot, 1984).

PIONEER PLANTS: Plants capable of invading bare or disturbed sites and persisting there until replaced by other species (Gabriel & Talbot, 1984).

PLANT SUCCESSION : Progressive development of vegetation in an area through a series of different plant communities, finally terminating in a climax community.

POTENTIAL CARRYING CAPACITY : Potential of a farming unit to support livestock through grazing and/or browsing and/or fodder production when all the factors which affect its productivity are at an optimum level - ha/AU or AU/ha.

POTENTIAL FODDER PRODUCTION CAPACITY : Fodder production capacity of an arable area when all the factors which affect its productivity are at an optimum level for producing livestock fodder - ha/AU or AU/ha.

POTENTIAL GRAZING/BROWSING CAPACITY : Grazing/browsing capacity of the vegetation when all the factors which affect its productivity are at an optimum level for grazing/browsing purposes - ha/AU or AU/ha.

PREFERRED SPECIES : Plant species that are preferred and utilized first by animals (Kothman, 1974).

PRESCRIBED BURNING : See **Controlled Burning**.

PRIMARY PRODUCTION : Total amount of organic matter formed in the plant including that used during respiration (Odum, 1971).

PRIMARY SUCCESSION : Succession on surfaces exposed for the first time, which have never before borne vegetation (Gabriel & Talbot, 1984).

Q.

QUADRAT : Small clearly demarcated plot or sample area of known size on which ecological observations and measurements are made (Gabriel & Talbot, 1984).

R.

RACEME : Inflorescence in which pedicelled spikelets are arranged singly along a common main axis.

RACHILLA : Axis upon which florets are borne in grass spikelets (Chippindall & Crook, 1976).

RACHIS : Unbranched axis of a raceme or spike inflorescence in grasses (Meredith, 1955).

RADICAL VELD IMPROVEMENT : Maximisation of the potential herbage production of the veld through either veld reinforcement or replacement (Tainton, 1981).

RANGE : See **Veld**.

RANGE CONDITION : See **Veld Condition**.

RANGE MANAGEMENT : See **Veld Management**.

RANGE MANAGEMENT PRACTICES : See **Veld Management Practices**.

RATE OF SPREAD : Forward movement of a fire front per unit time - m/s (Trollope, 1983).

REGROWTH RATE : Rate of increase in dry mass of the regrowth per unit area of veld or pasture - $g/m^2/d$ (Thomas, 1980).

RELATIVE GROWTH RATE : Rate of increase in dry mass of a plant per unit plant mass per unit time - g/g/d (Thomas, 1980).

RESILIENCE : A measure of the extent to which an ecological system can change in response to external influences but still can return to its original state when conditions revert to what they were previously (Walker, pers. comm.).

RESTING INTENSITY : Mean annual number of days over all periods of rest given to each camp during a complete cycle of rotational resting (Booysen, 1967).

RHIZOBIA : Species of nitrogen-fixing bacteria that live in symbiotic relationship with leguminous plants within nodules on their roots (Heath, Metcalfe & Barnes, 1978).

RHIZOME : Underground stem (Abercombie, Hickman & Johnson, 1980).

ROTATIONAL GRAZING/BROWSING AND RESTING : Simultaneous application of the principles of rotational grazing/browsing and resting (Booysen, 1967).

ROTATIONAL GRAZING/BROWSING : Type of management which requires the grazing/browsing allotted to a group or groups of animals for the entire grazeable/browseable period, to be subdivided into at least one (usually more) camp more than the number of animal groups. It involves successive grazing/browsing of the camps by the animals in a rotation so that at any time the animals are concentrated on as small a part of the grazing/browsing available to them during the entire grazeable/browseable period, as fencing will permit (Booysen, 1967).

ROTATIONAL RESTING : Type of management where the veld and/or pasture is subdivided into at least one more camp than there are groups of animals and involves the successive resting of the camp from grazing and/or browsing for a specific purpose aimed at the restoration of vigour and productivity rather than merely the regrowth of vegetative material for grazing and/or browsing (Booysen, 1967).

ROUGHAGE : Plant materials that are relatively high in fibre and low in nutrients (Heath, Metcalfe & Barnes, 1978).

SAVANNA : A physiognomic type of vegetation comprising a tree or shrub overstory and an herbaceous understory.

SCARIFICATION : Mechanical scarring of the seed coat of "hard" or impermeable seed to permit the rapid imbibition of water for initiating germination (Heath, Metcalfe & Barnes, 1978).

SCLEROPHYLLOUS : Pertaining to evergreen plants having thick, firm-textured leaves that are usually evergreen (Gabriel & Talbot, 1984).

SCRUB : Dense vegetation dominated by short, stunted woody plants (Kothman, 1974).

SEASON OF BURNING : Season of the year during which burning is applied.

SECONDARY SUCCESSION : Succession which occurs after the destruction of part or all of the original vegetation on a site (Gabriel & Talbot, 1984).

SENESCE : To age (Heath, Metcalfe & Barnes, 1978).

SELECTIVE GRAZING/BROWSING : Selective utilization of the grazing/browse by animals.

SHORT DURATION GRAZING (SDG) : Occupation of a camp for a restricted period to prevent animals grazing regrowth during that period of occupation.

SILAGE : Forage preserved in a succulent condition by partial fermentation under anaerobic conditions (Heath, Metcalfe & Barnes, 1978).

SMALL STOCK UNIT (SSU) : An animal which is equivalent to the $^{1}/_{6}$ of a large stock unit e.g. goat or sheep.

SOD : Top layers of soil permeated and held together by roots and rhizomes of grasses and other herbaceous plants (Heath, Metcalfe & Barnes, 1978).

SOD SEEDING : Mechanical placement of seed directly into a grass sod (Heath, Metcalfe & Barnes, 1978).

SOURVELD: Veld in which the forage plants become unacceptable and less nutritious on reaching maturity, thus allowing the veld to be utilized for only a portion of each year in the absence of licks.

SPATHE : Reduced and modified leaf that occurs on the grass inflorescence (Meredith, 1955).

SPECIES ABUNDANCE : Total number of individuals of a species in an area, population or community (Kothman, 1974).

SPECIES COMPOSITION : Relative proportion of different plant species occurring in a specific area.

SPECIES SELECTIVE GRAZING/BROWSING: Habit of grazing/browsing animals to graze/browse certain species of the vegetation in preference to others.

SPIKE : Inflorescence in which sessile spikelets are arranged singly along a common central axis.

SPIKELET : Basic unit of the grass inflorescence comprising one or more florets (Chippindall & Crook, 1976).

SPOTTING : Initiation of a new fire ahead of a main fire by an airborne firebrand or ember (Luke & McArthur, 1978).

STABILITY : The tendency of an ecological system to resist change when subject to fluctuating conditions (Walker, pers. comm.).

STANDING CROP : Total amount of above ground plant material per unit area.

STOCKING DENSITY : Concentration of livestock on the veld and/or pasture at any instant in time - AU/ha (Booysen, 1967).

STOCKING INTENSITY : Mathematical expression reflecting simultaneously both the degree of concentration of livestock and the length of the period of occupation - AU/ha/day (Booysen, 1967).

STOCKING PRESSURE : Amount of available forage that has been allocated per animal unit during a short period of occupation - kg/AU (Booysen, 1967).

STOCKING RATE : Area of land in the system of management which the operator has allotted to each animal unit in the system, and is expressed per length of the grazeable and/or browseable period of the year - ha/AU or AU/ha (Booysen, 1967).

STOLON : Horizontal stem, which grows along the surface of the soil, and roots at the nodes (Kothman, 1974).

STUBBLE : Basal portion of herbaceous plants remaining after the upper portion has been defoliated (Kothman, 1974).

SURFACE FIRE : A fire that burns in the surface fuels (Brown & Davis, 1973 & Luke & McArthur, 1978).

SURFACE FUELS : All combustible material on the soil surface occurring as standing grass, shrublets, seedlings, forbs, fallen leaves, twigs and bark (Brown & Davis, 1973).

SWARD : Above-ground parts of a population of herbaceous plants characterised by a relatively short growth habit (Hodgson, 1979).

SWEETVELD : Veld in which the forage plants retain their acceptability and nutritive value after maturity or in which different plants are acceptable at different times so that the veld can be utilized by stock at all times of the year (Booysen, 1967).

SYNECOLOGY : Ecology of communities (Abercombie, Hickman & Johnson, 1980).

T.

TILLER : Basic unit of the grass plant (Tainton, 1981).

TILLERING: Vegetative reproduction in grasses comprising the development of new tillers.

TOTAL ANNUAL YIELD : Total annual production of dry matter by all species of a plant community (Kothman, 1974).

TRAMPLING : Effect of hoof-action by ungulates on herbaceous plants and the soil surface.

TREE EQUIVALENT : Tree or shrub that is 1,5 m tall (Teague, Trollope & Aucamp, 1981).

TREND : Direction of change in veld condition (Kothman, 1974).

U.

UNDERBROWSING : Underutilization of the woody component of the vegetation.

UNDERGRAZING : Underutilization of the herbaceous component of the vegetation.

UNDERSTOCKING : When the stocking rate is less than the carrying capacity of the veld or pasture.

V.

VELD: Indigenous vegetation used as grazing and/or browsing which may be composed of any of a number of plant growth forms and need not necessarily be climax vegetation (Booysen, 1967).

VELD CONDITION : Condition of the vegetation in relation to some functional characteristic, normally sustained forage production and resistance to soil erosion.

VELD CONDITION SCORE : Condition of the veld in a sample site expressed as a percentage of that in a benchmark site.

VELD MANAGEMENT : Management of natural vegetation for specific objectives related to different forms of land use.

VELD MANAGEMENT LAYOUT : Arrangement of camps in a veld management system.

VELD MANAGEMENT PRACTICES : All treatments applied in the management of the veld.

VELD MANAGEMENT SYSTEM : Formalised program of veld management through which veld management practices are applied.

VELD RECLAMATION : See **Veld Rehabilitation**.

VELD REHABILITATION : Restoration of degraded veld to a productive and stable condition.

VELD REINFORCEMENT : Introduction of more productive pasture plants into the veld and/or the addition of plant nutrients through veld fertilization (Tainton, 1981).

VELD REPLACEMENT : Complete replacement of veld with more desirable pasture plants (Tainton, 1981).

VELD TYPE : Unit of vegetation whose range of variation is small enough to permit the whole of it to have the same farming potentialities (Acocks, 1975).

X.

XEROPHYTE : Plant capable of surviving periods of prolonged moisture deficiency (Gabriel & Talbot, 1984).

XEROSERE : Succession which initiates in a dry habitat (Gabriel & Talbot, 1984).

Z.

ZERO GRAZING/BROWSING : Type of management whereby herbaceous forage is cut and fed green to livestock (Booysen, 1967).

ZOÖTIC CLIMAX : Any type of stable vegetation whose continuous existence depends upon use by animals (Gabriel & Talbot, 1984).

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