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THE GRAZING AND BROWSING CAPACITY OF THE BUFFALO RIVER BASIN

AGRICULTURAL AND RURAL DEVELOPMENT
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THE GRAZING AND BROWSING CAPACITY OF THE BUFFALO RIVER BASIN

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Figures 1 and 2 are large maps (scale 1:10 000) and can not be included in the report. They may be ordered from ARDRI, Private Bag X1314, ALICE 5700, CISKEI.

In the interest of completeness and to provide the reader with an impression of these maps, photographical reductions are included in the report.

Figure 1 reflects the findings of a botanical survey of the Buffalo River Basin, while Figure 2 indicates the veld-types in the Basin.

INTRODUCTION

The object of this study was to estimate the maximum and mean current grazing and browsing capacities of the veld in the Buffalo River Basin of Ciskei. The importance of such a study is reflected in the realisation that overstocking is one of the most important problems limiting veld rehabilitation and the development of an economically viable livestock industry in Ciskei (Brown, Bishop and Wilke, 1978; Trollope and Coetzee, 1978).

The current grazing and browsing capacities were defined as the grazing and browsing capacities, respectively, of the vegetation in its current state.

Finally, all data are represented on a veld types basis as was done by Trollope and Coetzee (1978).

PROCEDURE

1. Study Area

The study area comprised that part of the Buffalo River Basin demarcated by Robinson and Gibbs Russell (1980), with the exception of the white-owned land within this area (Figure 1). It included most of the land from the Amatola Mountains to Mount Coke (the N-S axis), and from Dimbasa to Peelton (the W-E axis).

The extent of the study area was approximately 102 251 hectares. Acocks (1975) divided this area into four veld types: Dohne Sourveld (of the northern mountainous areas), Eastern Province Thornveld (of the gently undulating plains), Valley Bushveld (of the dissecting river valleys), and a small portion of Coastal Forest and Thornveld (in the southern-most extremity of the study area) (Figure 2). The later area, however, was included in the Eastern Province Thornveld for the purposes of this report, because it was very similar in botanical composition and structure. The Dohne Sourveld was not surveyed, because it comprised almost entirely indigenous forest (63 per cent), that is not used for agricultural purposes. Each veld type consisted of homogeneous vegetation units as demarcated by Robinson and Gibbs Russell (1980). These vegetation units probably represented different stages of succession within the veld types. The extent of these vegetation units within each veld type is given in Table I.

TABLE I The areas of the vegetation units occurring in the different veld types of the Buffalo River Basin expressed in hectares.

Vegetation Units	Veld Types			
	Dohne Sourveld	Coastal Forest Thornveld	Valley Bushveld	Eastern Province Thornveld
High Altitude Forest	11011	-	-	1228
Riverine Forest Community	-	-	46	48
Dry Forest Community	62	212	1449	99
Wild Olive Community	-	371	870	659
Rock Outcrop Bushclump Community	-	-	706	521
Woody Invasion Communities	71	90	2301	2890
Dwarf Shrub Communities	44	-	79	462
Grassland Communities	3269	266	3770	16998
Woody Invasion into Grassland	612	865	6048	9036
Towns and Villages	193	115	1049	3466
Cultivated Land	1608	488	4217	16265
Plantations	43	-	175	472
Rock Outcrop Bushclump/Woody Invasion into Grassland Community	-	-	-	52
Dwarf Shrub/Woody Invasion into Grassland Community	-	-	-	125
Woody Invasion into Grassland/Debe Hummocks and Hollows	-	-	-	56
Debe Hummocks and Hollows	-	-	164	8398
High Altitude Forest/Grassland Community	498	-	5	708
TOTAL	17417	2407	20879	61483
GRAND TOTAL 102 186				

BUFFALO RIVER BASIN (CISKEI)	SURVEY BY Dr. G.E. Gibbs Kieser Botanical Research Institute Pretoria E.R. Robinson Botany Department University of Witwatersrand
Figure 1. PLANT COMMUNITIES	SCALE 1 : 50 000
	FINAL MAP DRAWN BY Lynne Trollope ARDRI Cartographic Center University of Fort Hare DATE March 1992
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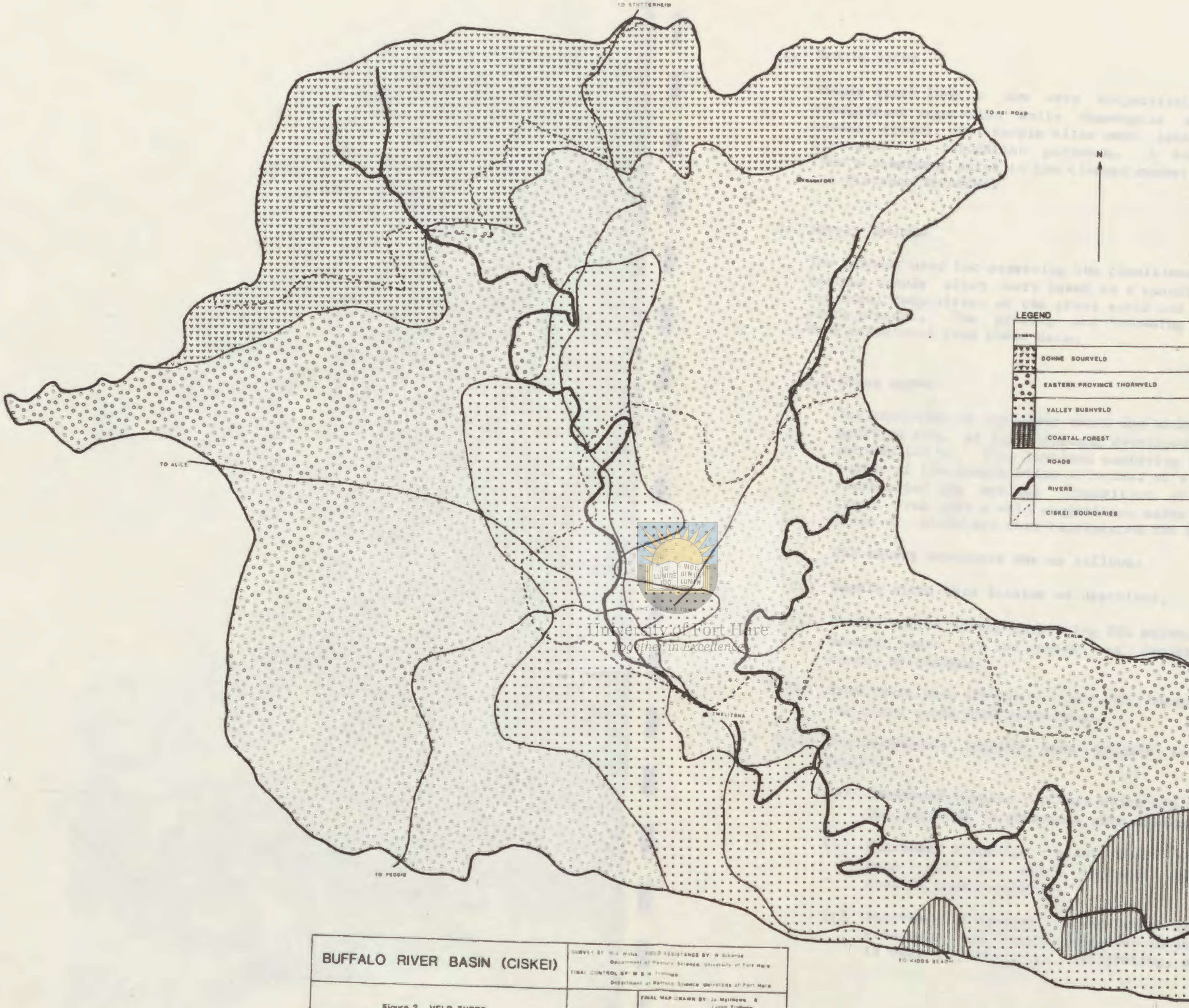

BUFFALO RIVER BASIN (CISKEI)

Figure 2. VELD TYPES

SURVEY BY M.J. Willis FIELD ASSISTANCE BY W. Sibanga
Department of Pasture Science, University of Fort Hare
FINAL CONTROL BY: W S W Trollope
Department of Pasture Science University of Fort Hare

SCALE: 1 : 50 000

FINAL MAP DRAWN BY Jo Matthews & Lynne Trollope
ARDRI Cartographic Centre
University of Fort Hare
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2. Sample Sites

Sample sites 100m x 50m were subjectively located within the homogeneous vegetation units demarcated by Robinson and Gibbs Russell (1980). All sample sites were located in a north-south direction for relocation purposes. A compass bearing was taken from a prominent point to the closest corner of the sample site and the distance recorded.

3. Survey Methods

The methods used for assessing the conditions of the veld at the various sample sites were based on a quantitative estimate of the botanical composition of the grass sward and the bush component, where present. The grazing and browsing capacities of the veld were calculated from these data.

3.1 Grass Survey

The condition of the grass sward was assessed using a slightly modified form of the technique developed by Foran, Tainton and Booysen (1978). This involved comparing the composition of the swards of the sample sites with that of a benchmark site which represented the optimal composition of that particular veld type. From this a veld composition score was calculated on a scale of 0-100 and this represented the condition of the veld.

The survey procedure was as follows:

(i) Sample sites were located as described.

(ii) A wheel-point survey comprising 200 points was conducted. The nearest plant to the point was recorded together with the number of strikes.

(iii) From these data the basal cover and botanical composition of the grass sward were calculated.

(iv) The herbaceous species were divided into four ecological groups:

(a) Decreaser species - plants which are abundant in good veld but decrease in abundance with mismanagement;

(b) Increaser I species - plants which are not abundant in good veld but which increase in abundance in veld that is under-utilized;

(c) Increaser II species - plants which are not abundant in good veld but which increase in abundance in veld that is over-utilized (e.g. overgrazing, overburning);

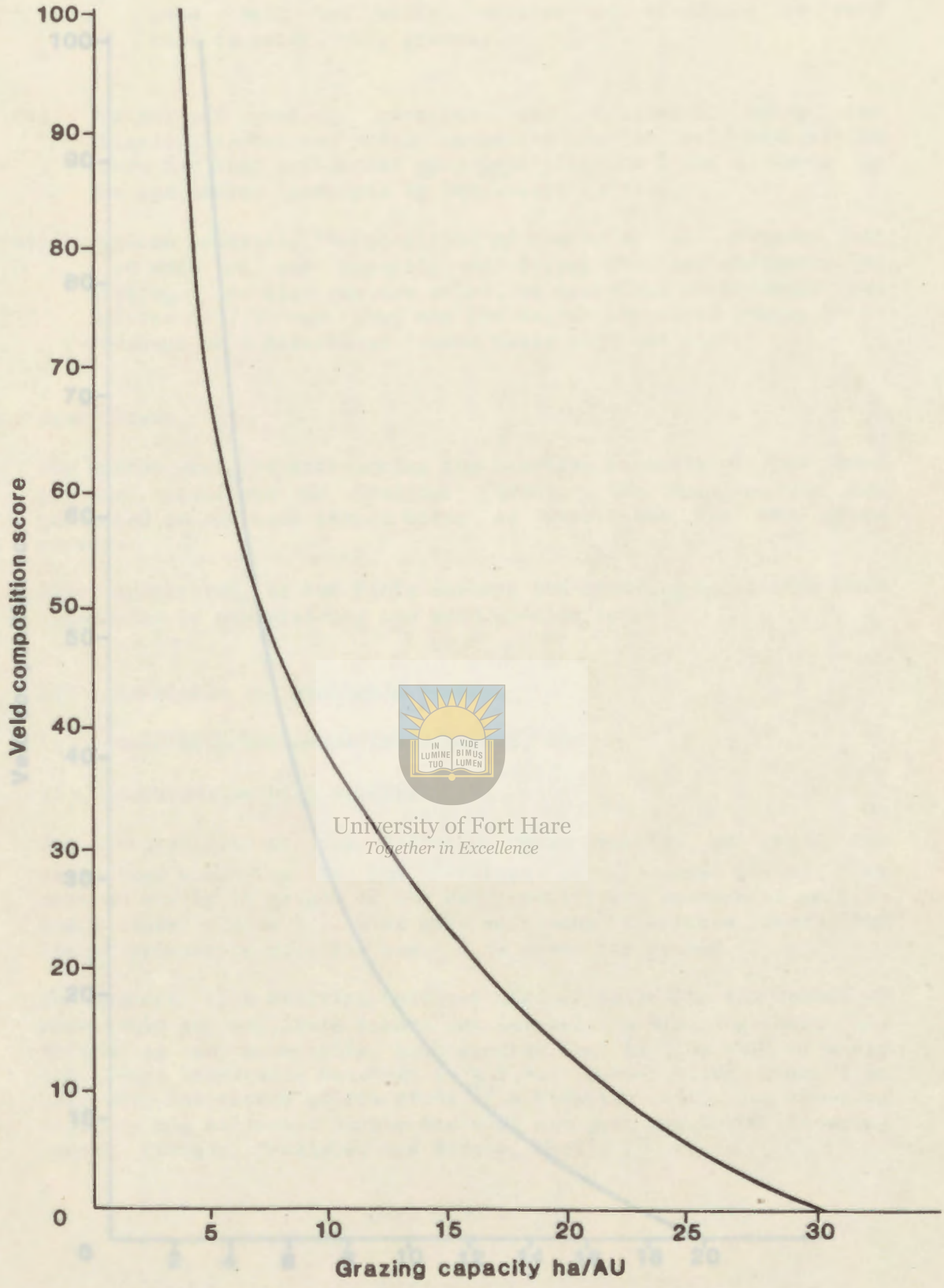

Fig. 3 Veld composition score vs grazing capacity for False Thornveld of the Eastern Province

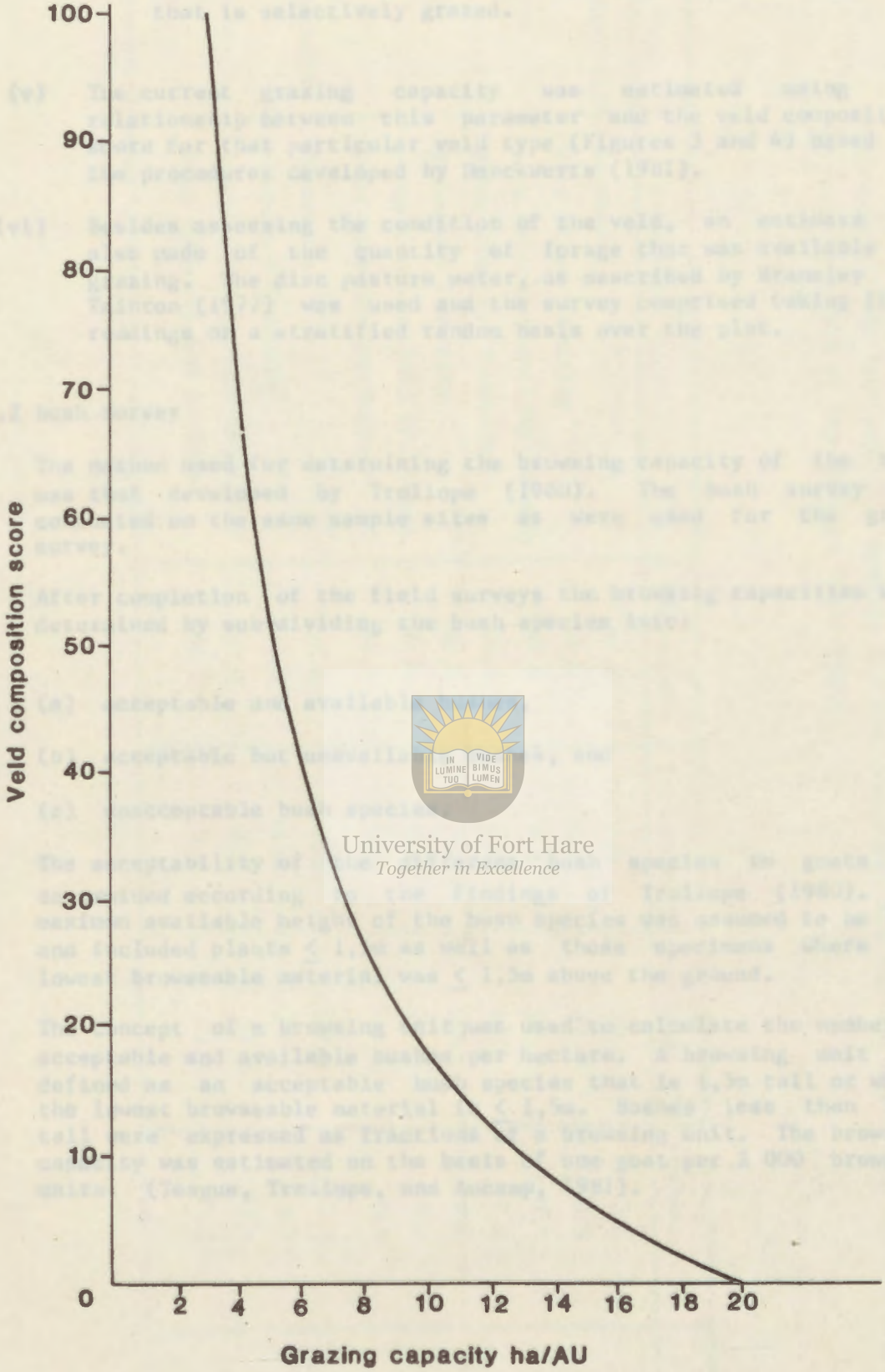

Fig.4 Veld composition score vs grazing capacity for Eastern Province Thornveld

(d) Increaser III species - plants which are not abundant in good veld but which increase in abundance in veld that is selectively grazed.

(v) The current grazing capacity was estimated using the relationship between this parameter and the veld composition score for that particular veld type (Figures 3 and 4) based on the procedures developed by Danckwerts (1981).

(vi) Besides assessing the condition of the veld, an estimate was also made of the quantity of forage that was available for grazing. The disc pasture meter, as described by Bransley and Tainton (1977) was used and the survey comprised taking fifty readings on a stratified random basis over the plot.

3.2 Bush Survey

The method used for determining the browsing capacity of the bush was that developed by Trollope (1980). The bush survey was conducted on the same sample sites as were used for the grass survey.

After completion of the field surveys the browsing capacities were determined by sub-dividing the bush species into:

(a) acceptable and available bushes,

(b) acceptable but unavailable bushes, and

(c) unacceptable bush species.

The acceptability of the different bush species to goats was determined according to the findings of Trollope (1980). The maximum available height of the bush species was assumed to be 1,5m and included plants $\leq$ 1,5m as well as those specimens where the lowest browseable material was $\leq$ 1,5m above the ground.

The concept of a browsing unit was used to calculate the number of acceptable and available bushes per hectare. A browsing unit was defined as an acceptable bush species that is 1,5m tall or where the lowest browseable material is $\leq$ 1,5m. Bushes less than 1,5m tall were expressed as fractions of a browsing unit. The browsing capacity was estimated on the basis of one goat per 2 000 browsing units. (Teague, Trollope, and Aucamp, 1981).

TABLE II The mean veld composition scores (V.C.S.) and percentage frequency of Decreaser, Increaser I, Increaser II and Increaser III species for the benchmarks and for the vegetation units occurring in each veld type in the Buffalo River Basin.

Veld Type	Vegetation Unit	Decreaser	Increaser I	Increaser II	Increaser III	V.C.S.
Valley Bushveld	Benchmark	59,0	2,0	39,0	0,0	100,0
	Wild Olive Community	32,5	0,5	67,0	0,0	54,5
	Rock Outcrop Bushclump Community	49,5	0,5	50,0	0,0	56,0
	Woody Invasion Community	35,5	0,0	64,5	0,0	56,5
	Grassland Community	48,0	0,0	52,0	0,0	68,5
	Woody Invasion into Grassland	14,0	0,0	86,0	0,0	19,5
	Debe Hummocks and Hollows	31,0	0,0	68,5	0,0	57,0
E P Thornveld	Benchmark	24,0	40,0	27,5	8,5	100,0
	Grassland Community	6,0	12,0	77,5	4,5	45,5
	Woody Invasion into Grassland	20,5	4,0	74,0	1,5	54,0
	Debe Hummocks and Hollows	31,0	0,0	69,0	0,0	61,0

TABLE III The mean, minimum and maximum veld composition scores and grazing and browsing capacities of the vegetation units occurring in the different veld types of the Buffalo River Basin.

Veld Type	Vegetation Unit	Veld Composition Score			Browsable and Available			Mean Grazing Capacity (ha/AU)*	Mean Browsing Capacity (ha/SSU)**
		Mean	Min.	Max.	Mean	Min.	Max.		
Valley Bushveld	Wild Olive Community	54,5	25,5	54,5	2531	2531	2532	7,8	1,6
	Rock Outcrop Bushclump Community	56,0	-	-	-	-	-	7,6	-
	Woody Invasion Community	56,5	-	-	-	-	-	7,6	-
	Grassland Community	68,5	68,5	72,0	-	-	-	6,4	-
	Woody Invasion into Grassland	19,5	9,5	59,5	1781	1781	2594	15,2	2,0
	Debe Hummocks and Hollows	57,0	-	-	-	-	-	7,6	-
E P Thornveld	Grassland Communities	45,5	22,0	77,5	-	-	-	6,7	-
	Woody Invasion into Grassland	54,0	32,5	70,0	219	219	1063	6,0	17,9
	Debe Hummocks and Hollows	61,5	32,0	78,0	200	-	-	5,4	20,8

* Hectares per animal unit

** Hectares per small stock unit

RESULTS, DISCUSSION AND CONCLUSIONS

The mean grazing/browsing capacities of the individual vegetation units within the study area were subjectively assigned on the basis of field experience to best represent that vegetation unit.

1. Valley Bushveld

The Valley Bushveld comprised an area of approximately 20 879 hectares (approximately 20 per cent of the study area). The most extensive vegetation units within this veld type were the Woody Invasion Community (11 per cent), Grassland Communities (18 per cent), and the Woody Invasion Into Grassland (29 per cent). The remaining veld vegetation units were of negligible area.

1.1 Grass Component

The mean veld composition scores for the different vegetation units within each veld type and the composition of the benchmark sites are presented in Table II.

The veld composition scores for each sample site within the Valley Bushveld are presented in Table III.

All sites had low scores for Decreaser and Increaser I species and excessively high scores for Increaser II species relative to the benchmark site. In particular Digitaria eriantha, forbs and, in some cases, karroo bush species were prevalent. The low proportion of Decreaser and Increaser I species and the high proportion of Increaser II species indicates that all sample sites were being overgrazed, particularly the Woody Invasion into Grassland vegetation unit which comprised 29 per cent of the Valley Bushveld. The high proportion of forbs in most sites seemed to indicate that no form of rotational grazing or resting of the veld was being practised in the study area.

The disc meter readings taken for each site were extremely low (Table IV). The mean disc meter reading for the study area as a whole was only 1,5cm, which indicated that particularly the cattle were in a condition of restricted intake, i.e. there was insufficient available forage to satisfy the maintenance needs of this class of animal. The ultimate result of this state of affairs must be heavy stock losses by starvation.

TABLE IV The mean disc meter reading for the sample sites in the Buffalo River Basin expressed in centimetres.

Veld Type	Vegetation Unit	Site No.	Disc Meter Reading (cm)
Valley Bushveld	Wild Olive Community	5	-
		40	1,0
	Rock Outcrop Bushclump Community	18	1,7
	Woody Invasion Communities	34	0,8
	Grassland Communities	7	1,3
		9	1,4
	Woody Invasion into Grassland	3	1,5
		4	1,2
		20	1,2
		21	1,8
		22	- *
		41	1,4
	Debe Hummocks and Hollows	1	1,2
E P Thornveld	Grassland Communities	6	1,6
		8	1,4
		14	0,8
		15	1,5
		16	1,8
		19	3,0
		23	1,4
		24	1,3
		25	1,3
		26	2,7
		27	1,3
		30	1,0
		32	1,5
		33	1,6
		35	1,0
		36	1,5
		37	1,6
		38	1,3
	Woody Invasion into Grassland	17	2,2
		28	2,2
		29	2,2
		31	5,5
	Debe Hummocks and Hollows	2	1,2
		10	1,3
		11	1,2
		12	1,6
		13	1,2
		39	1,4
Mean			1,5

* No reading possible because of stoney terrain and the incidence of Karroo bushes.

TABLE V The browsing capacities of the bushed sample sites in the Buffalo River Basin expressed in hectares per small stock unit (ha/SSU).

Veld Type	Vegetation Unit	Sample Site	Total No. Bushes/ha	No. Non-Browsable Bushes/ha	No. Browsable Bushes/ha	No. Browsable Non-Available Bushes/ha	No. Browsable Available Bushes/ha	No. Browsing Units /ha	Browsing Capacity (ha/SSU)
Valley Bushveld	Wild Olive Community	5	3125	562	2563	31	2532	1452	1,38
		40	2844	313	2531	-	2531	1250	1,60
	Woody Invasion into Grassland	3	1938	344	1594	-	1594	740	2,80
		4	2094	313	1781	-	1781	1010	1,98
		21	2594	188	2406	-	2406	1570	1,27
		41	3563	969	2594	-	2594	1756	1,14
E P Thornveld	Woody Invasion into Grassland	29	1063	-	1063	-	1063	372	5,38
		42	219	-	219	-	219	112	17,86
	Debe Hummocks	2	344	94	250	-	250	96	20,83

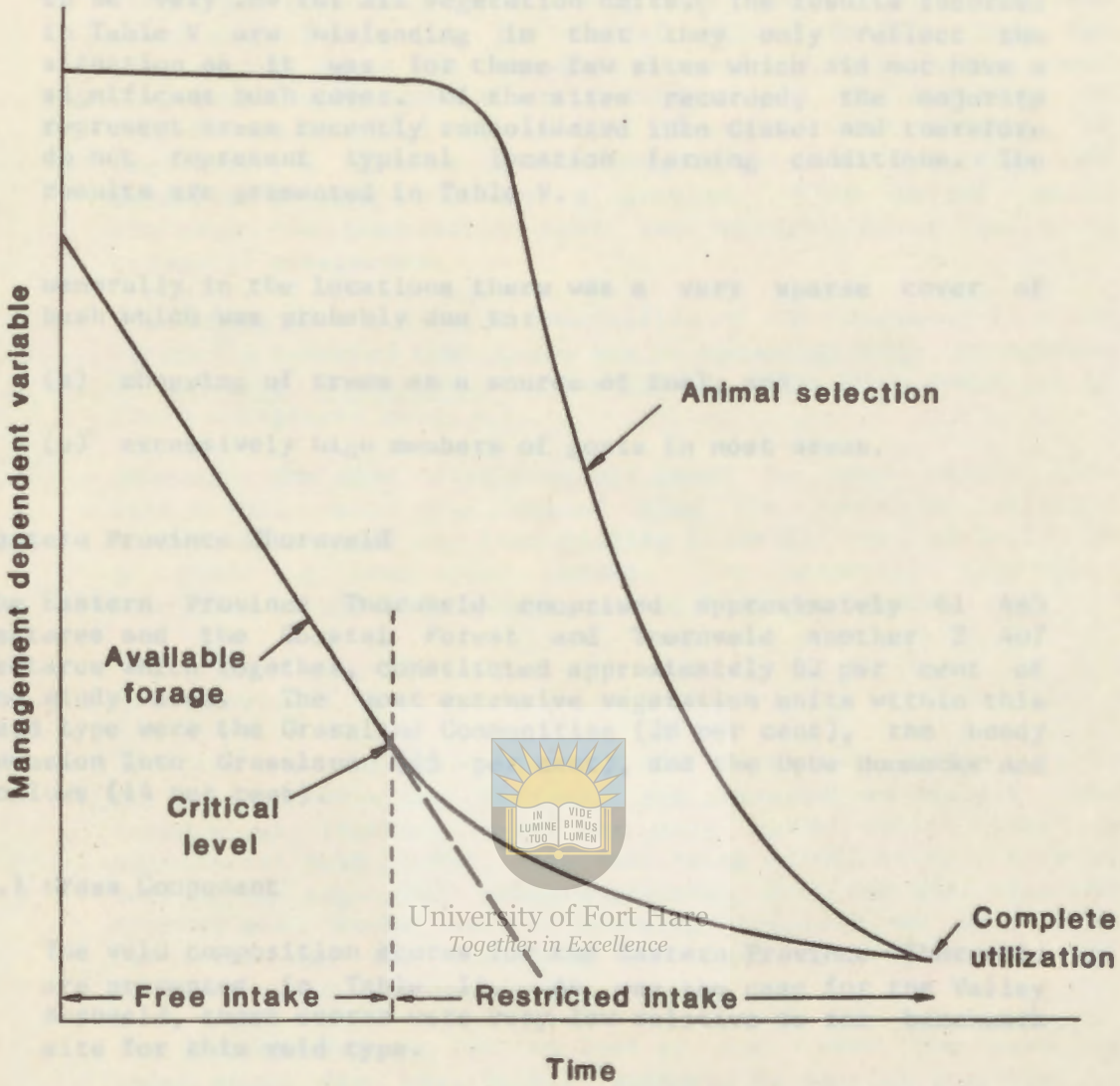

Fig. 5 Hypothetical relationships of available forage and animal selection with time during a grazing period (Danckwerts, 1981).

1.2 Bush Component

The mean browsing capacities for the Valley Bushveld were found to be very low for all vegetation units. The results recorded in Table V are misleading in that they only reflect the situation as it was for those few sites which did not have a significant bush cover. Of the sites recorded, the majority represent areas recently consolidated into Ciskei and therefore do not represent typical location farming conditions. The results are presented in Table V.

Generally in the locations there was a very sparse cover of bush which was probably due to:

(a) chopping of trees as a source of fuel, and

(b) excessively high numbers of goats in most areas.

2. Eastern Province Thornveld

The Eastern Province Thornveld comprised approximately 61 483 hectares and the Coastal Forest and Thornveld another 2 407 hectares which together, constituted approximately 62 per cent of the study area. The most extensive vegetation units within this veld type were the Grassland Communities (28 per cent), the Woody Invasion Into Grassland (15 per cent), and the Debe Hummocks And Hollows (14 per cent).

2.1 Grass Component

The veld composition scores for the Eastern Province Thornveld are presented in Table II. As was the case for the Valley Bushveld, these scores were very low relative to the benchmark site for this veld type.

The results in Table III indicate that the percentage of Decreaser species and Increaser I species in all vegetation units was low and that the percentage of Increaser II species was excessively high. This fact is not well illustrated by the benchmark for this veld type. It is the authors' opinion that the chosen benchmark (although the best veld to be found in the area) represented veld which had been allowed to progress too far towards the Increaser I stage of succession. A more appropriate "benchmark" would be:

Decreaser species	45%
Increaser I species	15%
Increaser II species	32%
Increaser III species	8%

This does not, however, alter the conclusions from the results of the study.

The first conclusion was that this veld type had been overgrazed throughout the Buffalo River Basin. This was particularly so in the Grassland Communities which had a mean Decreaser composition of 6 per cent and an Increaser II composition of 77,5 per cent! Secondly, the absence of Increaser III species in all vegetation units indicated that selective grazing was not a problem. This latter point confirms the conclusion that the Buffalo River Basin is generally overgrazed.

A scrutiny of the species composition of the Increaser II group of plants revealed that there was an unusually high proportion of Ricardia humistrata, a low-growing forb which dominates in short overgrazed veld.

Generally the disc meter readings taken on each sample site within this veld type showed that the amount of available forage was limited and that grazing livestock were probably in a state of restricted intake. The generally very poor condition of the livestock supported this conclusion.

2.2 Bush Component

The mean browsing capacities for the vegetation units within the Eastern Province Thornveld are presented in Table V. The three sites recorded were the only sites which had a significant bush cover, the rest being either totally free of bush or had negligible amounts present. Even the site with the densest bush cover had a browsing capacity of only 5,38 ha/s.s.u., and the remaining two only 17,86 ha/s.s.u. and 20,83 ha/s.s.u., respectively.

The probable reasons for the lack of bush were the same as those given for the Valley Bushveld in section 1.2, namely, chopping wood for fuel and a high stocking rate of goats.

3. General Discussion and Conclusions

As a result of the continued overstocking and overgrazing of the study area, the general condition of the veld was poor and was likely to become worse under the existing level of management. This is particularly so in the Valley Bushveld which is inherently more sensitive to mismanagement than the moister Eastern Province Thornveld.

The bush density (and, therefore, the browsing capacity) of the study area varied greatly not only between vegetation units but even within vegetation units of the same veld type. This precludes

any general comment on this component of the vegetation.

The mean grazing capacity of the study area was calculated to be:

Valley Bushveld	6 - 7 ha/A.U.
Eastern Province Thornveld	5 - 6 ha/A.U.

These grazing capacities could almost be doubled if the veld were rehabilitated. The corresponding grazing capacities for these veld types when restored could be in the region of:

Valley Bushveld	± 3,5 ha/A.U.
Eastern Province Thornveld	± 3,0 ha/A.U.

To rehabilitate this veld a policy of rotational grazing/browsing and rotational resting is called for together with the application of realistic stocking rates of cattle, sheep and goats. A detailed outline of suitable veld management practices for Ciskei was given by Trollope and Coetzee (1978) and it is strongly recommended that these recommendations be given serious attention when considering the rehabilitation of the Buffalo River Basin.

ACKNOWLEDGEMENTS

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