

Fig 4: *Harpochloa falx* - *Elionurus muticus* mountain grassland



Fig 5: *Wahlenbergia undulata* - *Hyparrhenia hirta* old field grassland





Fig 6: *Terminalia sericea* - *Burkea Africana* bushveld on sand



Fig 7: *Tristachya leucothrix* - *Trachypogon spicatus* mountain bushveld



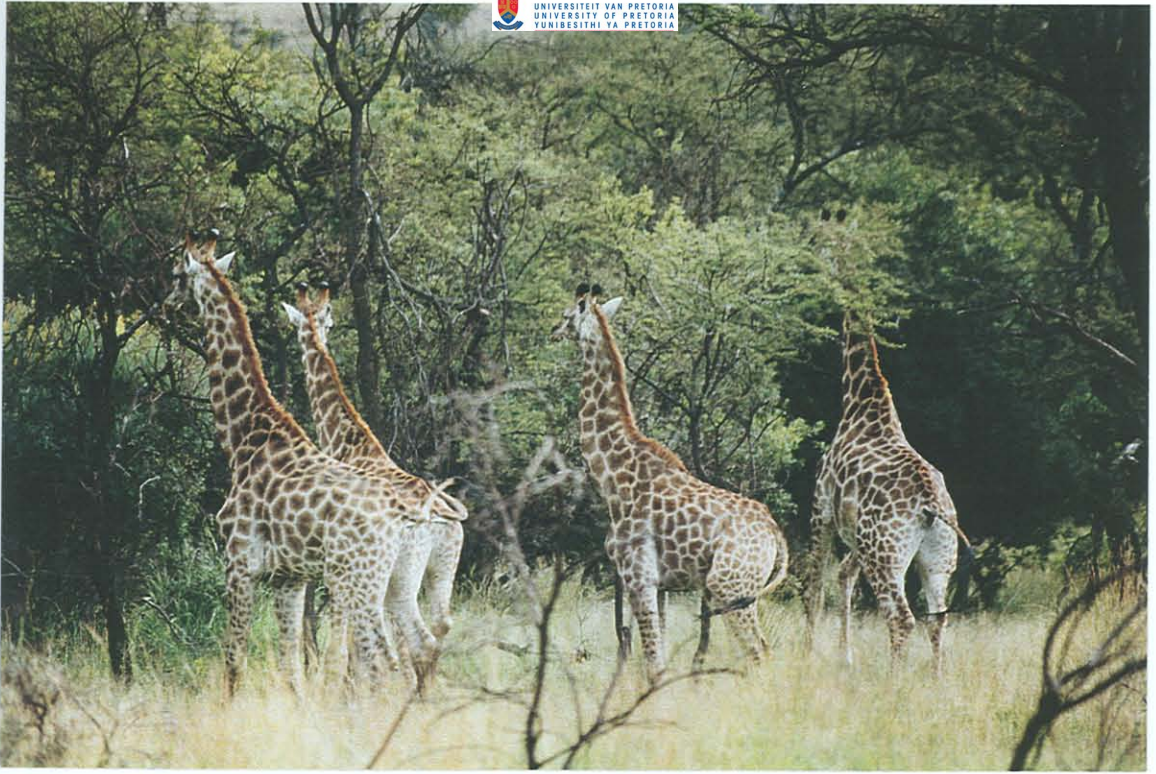


Fig 8: *Cynodon dactylon* - *Acacia karroo* bushveld



Fig 9: *Cynodon dactylon* - *Acacia karroo* bushveld



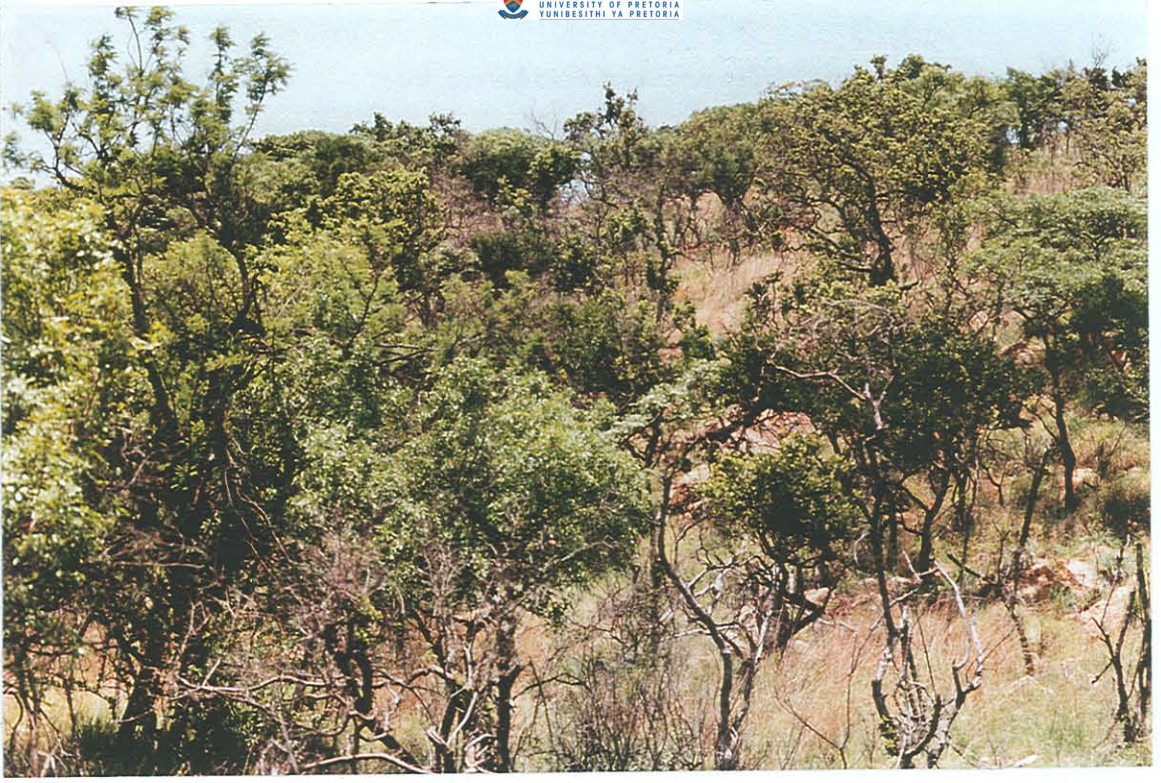


Fig 10: *Combretum apiculatum* - *Dombeya rotundifolia* bushveld of northern slopes



Fig 11: *Eucalyptus grandis* plantation





Fig 12: *Ischaemum fasciculatum* - *Phragmites australis* wetland



Fig 13: *Phragmites australis* slimes dams wetland



## 4.2. Grazing capacity and veld condition

The veld condition and grazing capacity was determined for nine plant communities. The analyses for plant communities one, four and five include all variations within those communities. Analyses were done for three different rainfall scenarios: A year of average rainfall (600 mm), a year of below average rainfall (400 mm) and a year with a high rainfall (851 mm).

### 1. *Harporchloa falx* - *Elionurus muticus* mountain grassland

The veld condition index is 58,1%(Table 2). The grazing capacity for this community is 8,7 ha/L.S.U for game in an average rainfall year or 4,9 ha/L.S.U for cattle. Because of the size (130 ha) this community can theoretically support 14,9 L.S.U. game or 26,7 L.S.U. cattle.

The condition of the veld is relatively good, but as a result of the rocky habitat, the grass cover is only 70%.

This community shows signs of moderate grazing with a high percentage of Increasers 2b.

In a below average rainfall year when the mean annual rainfall drops to 400 mm the grazing capacity is almost halved to 16,2 ha/L.S.U. for game or 9,1

ha/L.S.U. for cattle. In such a year the veld can only support 8,0 L.S.U. game or 14,4 L.S.U. cattle (Table 3).

In an above average year where the rainfall is 851mm, as it was in 1996, the grazing capacity was 5,5 ha/L.S.U. for game or 3,1 ha/L.S.U. for cattle. In such a year the veld can support 27,2 L.S.U. cattle or 15,2 L.S.U. game (Table 4).

## 2. *Wahlenbergia undulata* - *Hyparrhenia hirta* old field grassland

The veld condition index for this community is 39,3% (Table 2). This is the second lowest of all the plant communities, as a result of the lack of decreaser species. Because of the history of disturbance in this community pioneer species abound, and this is seen by the great number of Increaser species.

In an average rainfall year with rainfall of 600 mm the grazing capacity is 5,7 ha/L.S.U. for cattle or 10, ha/L.S.U. for game. This is the worst grazing capacity of all the communities, possibly because of its recovering status, as well as slight overgrazing. The size of the community is 80 ha and therefore the community can sustain 14 L.S.U. cattle or 7,9 L.S.U. game (Table 2).

In a below average rainfall year of 400 mm the grazing capacity drops to 13,2 ha/L.S.U. for cattle or 23,4 ha/L.S.U. for game. this in fact means that only 6,1 L.S.U. cattle or 3,4 L.S.U. game can be sustained (Table 3)

In an above average rainfall year the grazing capacity is 3,3 for cattle or 5,9 for game. In such conditions 24 L.S.U. cattle or 13,6 L.S.U. game can be supported (Table 4).

### 3. *Terminalia sericea* - *Burkea africana* sour bushveld

The veld is mostly in a good condition, however, the fairly high percentage of increasers 1 indicate that there is slight under-utilisation of this community.

The veld condition index for this community is 61,0% (Table 2). The grazing capacity of 3,7 ha/L.S.U. for cattle or 5,3 ha/L.S.U. for game in a normal year is also indicative of a healthy veld condition. 37,2 L.S.U. cattle or 25,5 L.S.U. game can be sustained by the community in an average rainfall year (Table 2).

In a below average rainfall year with a mean rainfall of 400 mm the grazing capacity for cattle is 6,6 ha/L.S.U. or for game is 9,6 ha/L.S.U.. This relates to 20,5 L.S.U. cattle or 14,1 L.S.U. game that can be sustained (Table 3).

In a particularly good rainfall year with a rainfall of 851mm, the grazing capacity is 2,3 ha/L.S.U. for cattle or 3,4 ha/L.S.U. for game. In such a year 58,0 L.S.U cattle or 39,8 L.S.U. game can be supported (Table 4).



#### 4. *Tristachya leucothrix* - *Trachypogon spicatus* mountain savanna

The community is the second largest (174 ha) in the Game Park, and it is therefore important for the grazing animals. A fair percentage of decreasers (14%) causes the veld condition index to be relatively high (63,8%) (Table 2).

In an average rainfall year with a rainfall of 600 mm, the grazing capacity is 3,6 ha/L.S.U. for cattle or 5,2 ha/L.S.U. for game, which indicates a good grazing capacity. In such circumstances the community can sustain 48,9 L.S.U. cattle or 33,7 L.S.U. game (Table 2). This is an important percentage of the total game numbers in the Park.

In a below average rainfall year where the mean rainfall is only 400 mm the grazing capacity decreases to 6,3 ha/L.S.U. for cattle or 9,2 ha/L.S.U. for game. In such a year the number of L.S.U. that can be sustained is 27,5 for cattle or 19,0 for game (Table 3).

In a good rainfall year (851 mm), the grazing capacity of the veld recovers to 2,3 ha/L.S.U. for cattle or 3,3 ha/L.S.U. for game. In such times 75,7 L.S.U. cattle or 52,2 L.S.U. game can be sustained (Table 4).

In this community there is a high percentage of Increasers 1. This indicates that the veld is under-utilised. This is possibly as a result of the inaccessibility of the rocky terrain and sour grasses to animals that prefer the plains. Only species fond of rocky terrain were seen in this community.



## 5. *Cynodon dactylon* - *Acacia karroo* bushveld

Being by far the largest community in the Game Park, covering 838 ha, it is the most important resource for the ungulates to utilise.

From the veld condition index of 58,6% (Table 2), it can be seen that the veld is in a fairly good condition. The grazing capacity in an average rainfall year (600 mm) is 4,0 ha/L.S.U. for cattle or 5,2 ha/L.S.U. for game. Because of this, and the large size, by far the greatest numbers of game or cattle can be supported by this community, being 209,9 L.S.U. cattle or 159,7 L.S.U. game (Table 2).

In a below average rainfall year (400 mm) the grazing capacity drops to 7,4 ha/L.S.U. for cattle or 9,7 ha/L.S.U. for game. This however is not critical and the community can still support 113,6 L.S.U. cattle or 86,4 L.S.U. game (Table 3).

In a good rainfall year (851 mm), the grazing capacity is 2,5 ha/L.S.U. for cattle or 3,3 ha/L.S.U. for game. In such a good season the veld can support 330,9 L.S.U. cattle or 251,8 L.S.U. game (Table 4).

In this community there is a balance between Decreasers, Increasers 1 and Increasers 2. This indicates that the community is not under-utilised, nor is it particularly over-utilised, yet light grazing does take place. As many parts of the community were previously disturbed, it is clear that they have recovered



well to become relatively stable areas that provide valuable resources to the game that utilise them.

#### 6. *Euclea crispa* - *Acacia karroo* bushveld on diabase

The grazing capacity in a normal rainfall year (600mm) is 5,4 ha/L.S.U. (Table 2) for cattle or 6,7 ha/L.S.U. for game. This means that 1,3 L.S.U. cattle or 1,0 L.S.U. game can be supported by this community (Table 2).

In a below average rainfall year (400 mm) the grazing capacity is 10,2 ha/L.S.U. for cattle or 13,3 ha/L.S.U. for game. In such a year the community is virtually useless to ungulates and offers subsistence for only 0,7 L.S.U. cattle or 0,5 L.S.U. game (Table 3).

In an above average rainfall year the grazing capacity increases to 3,3 ha/L.S.U. for cattle or 4,1 ha/L.S.U. for game. In such a time the community can support 2,1 L.S.U. cattle or 1,3 L.S.U. game (Table 4).

This is a fairly insignificant community as it covers only 7 ha. However it is a unique association of plants and therefore needs to be protected.

As a result of trees covering most of this community the bush factor is high.

The high percentage of Increasers 2 is a cause for concern as it indicates overgrazing. This is understandable as the grasses that grow under the trees are sweet and palatable species, and the trees also provide shelter and shade. Although insignificant in size, this community provides an important



habitat for bushbuck and nyala that depend on these densely wooded areas for shelter and feeding.

#### 7. *Combretum apiculatum* - *Dombeya rotundifolia* bushveld on northern slopes

This community is preferred by particularly impala and wildebeest, as is also shown in the habitat selection analysis. This is reiterated by the fact that there is a particularly high percentage of Increasers 2c (56%) (Table 2), and a very low percentage of decreaseers.

This leads to a disturbed veld and a low veld condition index of 31,3% (Table 2) which is an indication of a poor veld condition.

In an average rainfall year (600 mm) the grazing capacity for cattle is 5,7 ha/L.S.U. or for game is 7,7 ha/L.S.U. Because of the small size of the community (25ha) it can only sustain 4,4 L.S.U. cattle or 3,4 L.S.U. game (Table 2).

In a below average rainfall year (400 mm) the grazing capacity deteriorates rapidly to 15,5 ha/L.S.U. for cattle or 20,0 ha/L.S.U. for game. In such a year the community can only support 1,6 L.S.U. cattle or 1,2 L.S.U. game (Table 3).



In an above average rainfall year the grazing capacity for cattle is 3,2 ha/L.S.U. or for game is 4,1 ha/L.S.U. In such a case the community can support 7,8 L.S.U. cattle or 4,1 L.S.U. game (Table 4).

#### 8. *Euclalyptus grandis* plantations

In an average rainfall year (600 mm) the grazing capacity is 4,2 ha/L.S.U. for cattle or 7,5 ha/L.S.U. for game. In such a time 8,2 L.S.U. cattle or 4,7 L.S.U. game can be supported (Table 2).

In a below average rainfall year (400 mm) the grazing capacity deteriorates to 7,3 ha/L.S.U. for cattle or 13,0 ha/L.S.U. for game, which means that only 4,8 L.S.U. cattle or 2,7 L.S.U. game can be sustained (Table 3).

In a good rainfall year the grazing capacity for this community is 2,8 ha/L.S.U. for cattle or 4,9 ha/L.S.U. for game. In such a time 12,6 L.S.U. cattle or 7,1 L.S.U. game can be sustained (Table 4).

This community is dominated by alien vegetation, and is therefore avoided by most of the game species, as alien vegetation usually causes a decrease in biodiversity. This is proven by the fact that game was seen very seldom in this community, and there is a high percentage of Increasers 1 that indicates under-utilisation taking place.

## 9. *Ischaemum fasciculatum* - *Phragmites australis* wetlands

This community consists mainly of grass species and reeds which grow vigorously and rapidly, and form a dense blanket which covers the whole community. The large number of decreasers causes the veld condition index to be fairly high at 65,2%. This community also contains a number of invader species, which could pose a problem to the community in the future.

In an average rainfall year (600 mm) the grazing capacity for cattle is 4,2 ha/L.S.U. or for game is 7,4 ha/L.S.U. (Table 2). This calculates to 17,6 L.S.U. cattle or 9,4 L.S.U. game for the whole community (Table 2).

In a below average rainfall year (400 mm) the grazing capacity drops to 7,4 ha/L.S.U. for cattle or 13,0 ha/L.S.U. for game. At such a time the community can sustain 9,5 L.S.U. game or 5,4 L.S.U. game (Table 3). A result of the perennial streams which are part of the community there will always be moisture to sustain a good grazing capacity.

In a good rainfall year (851 mm) the grazing capacity is 2,7 ha/L.S.U. for cattle or 4,8 ha/L.S.U. for game. In such a time the community can sustain 25,8 L.S.U. cattle or 14,5 L.S.U. game (Table 4).

### General

The overall grazing capacity in an average rainfall year of 600 mm per annum, is 4,1 ha/L.S.U. for cattle or 5,7 ha/L.S.U. for game. This implies that 262 L.S.U. game can be sustained by the whole Game Park.



In a poor rainfall year of 400 mm per annum the grazing capacity for cattle is 7,5 ha/L.S.U. or for game is 10,6 ha/L.S.U.. This is calculated to a total of 141 L.S.U. game that can be supported. This scenario is important to be assessed carefully as there are predictions of droughts in the not too distant future as a result of the El Nino phenomenon. Management schemes for this scenario are discussed in the next chapter

In the good rainfall year such as the one from March 1996 - March 1997 (851 mm), it is interesting to see how much more game can be supported. Here the grazing capacity is 2,6 ha/L.S.U. for cattle or 3,6 ha/L.S.U. for game. In such a year the Game Park can support 410 L.S.U. game. This is the capacity and not necessarily the stocking rate, as the next year may be dry, and the game will suffer. It is important to take note that the model uses an average annual rainfall over a 20 year period, and therefore one year with an unusually high or low rainfall period does not necessarily cause the game park to be under or overstocked, as the model might show. If the veld condition is poor however, an unusually poor rainfall year might be the trigger that pushes the ecological processes beyond the recovery threshold.

Table 2: Graze analysis for nine plant communities in an average rainfall year (600 mm)

Unit	1	2	3	4	5	6	7	8	9
Size (ha)	130	80	136	174	838	7	25	35	70
Trees %	1	0	33	34	52	85	57		
Shrubs %	10	3	5	5	15	10	15	2	2
Bush factor	1,00	0,99	0,76	0,76	0,60	0,40	0,57	0,99	0,99
Decreasers	23	1	20	14	27	23	8	22	40
Increasesers 1	14	28	40	63	22	9	11	55	36
Increasesers 2a									
Increasesers 2b	49	42	13	13	37	49	25	17	
Increasesers 2c	5	32	17	11	14	19	56	6	
Encroachers									26
Bare soil									
Total	92	103	90	101	100	100	100	100	102
Veld Condition Index %	58,1	39,3	61,0	63,8	58,6	50,8	31,3	67,9	65,2
Grass cover %	71	80	74	74	85	80	80	81	100
Rainfall (mm/yr)	600	600	600	600	600	600	600	600	600
Accessibility	1	1	1	1	1	1	1	1	1
Fire (0.8\1)	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80
Grazing Capacity									
In a normal year									
ha/LSU Cattle	4,9	5,7	3,7	3,6	4,0	5,4	5,7	4,2	4,2
ha/LSU Game	8,7	10,1	5,3	5,2	5,2	6,7	7,4	7,5	7,4
Number Cattle	26,7	14,0	37,1	48,9	209,9	1,3	4,4	8,2	16,7
Number LSU Game	14,9	7,9	25,5	33,7	159,7	1,0	3,4	4,7	9,4
Grazing Capacity									
In a bad year									
ha/LSU Cattle	8,4	11,0	8,1	7,8	8,1	9,1	12,7	7,3	7,2
ha/LSU Game	15,1	18,8	9,1	8,8	9,0	11,8	14,5	12,6	12,5
Number Cattle	15,4	7,5	21,7	28,8	122,1	0,7	2,2	4,9	9,9
Number LSU Game	8,6	4,3	14,9	19,8	92,9	0,6	1,7	2,8	5,6
Total Grazing Capacity (ha/LSU)				Cattle	4,1	Game	5,7		



**Table 3: Graze analysis for nine plant communities in a below average rainfall year (400 mm)**

Unit	1	2	3	4	5	6	7	8	9
Size (ha)	130	80	136	174	838	7	25	35	70
Trees %	1	0	33	34	52	85	57		
Shrubs %	10	3	5	5	15	10	15	2	2
Bush factor	1,00	0,99	0,76	0,76	0,60	0,40	0,57	0,99	0,99
Decreasers	23	1	20	14	27	23	8	22	40
Increasesers 1	14	28	40	63	22	9	11	55	36
Increasesers 2a									
Increasesers 2b	49	42	13	13	37	49	25	17	
Increasesers 2c	5	32	17	11	14	19	56	6	
Eneerachers									26
Bare soil									
Total	92	103	90	101	100	100	100	100	102
Veld Condition Index %	58,1	39,3	61,0	63,8	58,6	50,8	31,3	67,9	65,2
Grass cover %	71	80	74	74	85	80	80	81	100
Rainfall (mm/yr)	400	400	400	400	400	400	400	400	400
Accessibility	1	1	1	1	1	1	1	1	1
Fire (0.8\1)	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80
<b>Grazing Capacity</b>									
<i>In a normal year</i>									
ha/LSU Cattle	9,1	13,2	6,6	6,3	7,4	10,7	15,5	7,3	7,4
ha/LSU Game	16,2	23,4	9,6	9,2	9,7	13,3	20,0	13,0	13,0
Number Cattle	14,4	6,1	20,5	27,5	113,6	0,7	1,6	4,8	9,5
Number LSU Game	8,0	3,4	14,1	19,0	86,4	0,5	1,2	2,7	5,4
<b>Grazing Capacity</b>									
<i>In a bad year</i>									
ha/LSU Cattle	21,6	57,6	19,5	17,9	20,4	27,9	219,2	15,7	16,2
ha/LSU Game	21,5	55,8	15,1	13,9	17,3	29,0	192,4	15,4	15,9
ha/LSU Game	38,4	98,7	22,0	20,2	22,8	36,2	248,7	27,3	28,1
Number Cattle	6,0	1,4	9,0	12,5	48,3	0,2	0,1	2,3	4,4
Number LSU Game	3,4	0,8	6,2	8,6	36,8	0,2	0,1	1,3	2,5
Total Grazing Capacity (ha/LSU)				Cattle	7,5	Game	10,6		

**Table 4: Graze analysis for nine plant communities in an above average rainfall year (851 mm)**

Unit	1	2	3	4	5	6	7	8	9
Size (ha)	130	80	136	174	838	7	25	35	70
Trees %	1	0	33	34	52	85	57		
Shrubs %	10	3	5	5	15	10	15	2	2
Bush factor	1,00	0,99	0,76	0,76	0,60	0,40	0,57	0,99	0,99
Decreasers	23	1	20	14	27	23	8	22	40
Increasesers 1	14	28	40	63	22	9	11	55	36
Increasesers 2a									
Increasesers 2b	49	42	13	13	37	49	25	17	
Increasesers 2c	5	32	17	11	14	19	56	6	
Encroachers									26
Bare soil									
Total	92	103	90	101	100	100	100	100	102
Veld Condition Index %	58,1	39,3	61,0	63,8	58,6	50,8	31,3	67,9	65,2
Grass cover %	71	80	74	74	85	80	80	81	100
Rainfall (mm/yr)	851	851	851	851	851	851	851	851	851
Accessibility	1	1	1	1	1	1	1	1	1
Fire (0.8VI)	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80
Grazing Capacity									
<i>In a normal year</i>									
ha/LSU Cattle	3,1	3,3	2,3	2,3	2,5	3,3	3,2	2,8	2,7
ha/LSU Game	5,5	5,9	3,4	3,3	3,3	4,1	4,1	4,9	4,8
Number Cattle	42,1	24,0	58,0	75,7	330,8	2,1	7,8	12,6	25,8
Number LSU Game	23,6	13,6	39,8	52,2	251,7	1,7	6,1	7,1	14,5
Grazing Capacity	4,8	5,4	4,6	4,6	4,6	4,9	5,8	4,3	4,2
<i>In a bad year</i>									
ha/LSU Cattle	4,8	5,3	3,6	3,5	3,9	5,1	5,1	4,2	4,1
ha/LSU Game	8,5	9,3	5,3	5,1	5,1	6,4	6,6	7,5	7,4
Number Cattle	27,2	15,2	37,6	49,2	214,6	1,4	4,9	8,2	16,9
Number LSU Game	15,2	8,6	25,8	33,9	163,3	1,1	3,8	4,6	9,5
Total Grazing Capacity (ha/LSU)				Cattle	2,6	Game	3,6		