EVALUATION OF RANGE CONDITION AND TREND OF SAMBISA GAME RESERVE, BORNO STATE.

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ABSTRACT

The study was designed to evaluate the range condition and trend of Sambisa Game Reserve in Borno State, Nigeria. Assessment of herbaceous cover and composition, woody plant density and plant vigor were carried out in randomly selected sample plots. Litter cover was determined by step point transect method, while erosion and its extent was assessed by presence and degree of gullies. Results obtained showed that the mean herbaceous cover was 68% and is composed of perennials (26%), annuals (50%) and weeds (24%). Mean litter cover and mean tree/shrub density were 68% and 218 trees and shrubs per hectare respectively. Erosion was slight. Water is available in the reserve for 9 months in a year. The range condition was evaluated to be in good condition and on a downward trend because of the rapid succession of less desirable plants (annuals and weeds), stunted plants and presence of slight erosion.

Key words: _Range sites, woody plant, herbaceous plant, quadrat, transect, density._

INTRODUCTION

Range condition is the state of health and vigor of a rangeland in relation to its full productive potential (Heady, 1998). It describes an evaluation of the current status of rangeland vegetation. According to Manske (2004), knowledge of range condition is the starting point for decisions regarding site evaluation in monitoring vegetation and soil conditions which are essential elements of good range management. It is one of the methods of range evaluations that enable judgement to be made of the adequacy of stocking and management practices. It has become the basis for the adjustment of stocking figures and revision of management plans. It measures the degree of range deterioration and improvement. The initial and critical step in evaluating a range condition is to classify range sites in order to determine site potentials (Frost and Smith, 1991). Range condition is used as a guide to ensure sustainable land use; to determine carrying capacity for stocking rate adjustment; to identify potential responses to range improvement programs, and to evaluate

the best locations for fencing and watering facilities to improve utilization within a range land (Tueller, 1991).

Range trend indicates the direction of change in range condition. The trend may be on the declining side or on the improving side. Range trend assessments depend upon evaluation of the general health of individual plants, the vegetation and the soil (Heady, 1998).

According to Kefa and Oche(1989) and Heady(1998), the major attributes that need to be monitored and inventoried to determine the condition of rangelands are vegetation cover, frequency, density or abundance, herbage yield and species composition, Parameters in herbaceous layer survey includes cover, density and frequency. Water availability is another factor that needs to be assessed as it influences the presence of animals in rangelands and undoubtedly affects distribution and promotion of the survival and production. Animals tend to move away from areas with available forage to areas where the forage is overgrazed but there is water.

MATERIALS AND METHODS

The research was conducted at Sambisa Game Reserve which is located between longitude 13° 30' and 14° 00' East and latitude 11° 00' and 11° 30' North. It lies between Bama, Gwoza and Konduga Local Government Areas of Borno State and about seventy (70) kilometers south of Maiduguri town and fourteen (14) kilometers off Kawuri village along Maiduguri-Bama road. The methods used for evaluation of range condition and trend were those outlined by Kefa and Oche (1989), Ola-Adams (1985) and Akosim *et al* (2004). A reconnaissance survey was conducted for the purpose of identifying and delineating major range sites. Five range sites (A, B, C, D and E) were delineated based on the major plant communities as suggested by Heady (1998). A survey of vegetation was conducted. This includes the grass, forbs as well as trees and shrubs. Parameters measured were litter cover, plant vigor, erosion, number of trees/shrubs per hectare, relative density of plant species, perennial and annual species. In each of the five range sites, a 18×20m plot was marked out. Each plot contained 360 sub-plots of 1×1m each. Each plot represents about 5% or more of each range site.

Herbaceous layer estimate was made using a one meter square quadrat frame. At each five (5) steps interval along the transect, the mapper located a sampling point by placing the quadrat in such a way that the step point lied at the centre of the quadrat. Estimate of green or dry herbaceous materials of the current growing season was considered. Litter cover was assessed by walking along a line transect of 100m long and recording at every two (2) steps, the presence or absence of litter. Only detached leaves and straws, whether green or dry, were considered as litter. Data were collected along five (5) transects in each range site.

Assessment of erosion was done using the method of Ola-Adams (1985). There is no erosion (none) if there are no signs of gullies and exposure of sub-soil, erosion is slight if there are no signs of shallow fresh gullies and exposure of sub-soil and severe if there are many deep gullies and large scale exposure of sub-soils in the area.

Plant vigor was determined from color of leaves; capabilities to flower and setting of seeds and to reach maximum height of the species.

Density of trees/shrubs was assessed by counting the total number of trees and shrubs present in one hectare.

Relative density of herbaceous species was determined as:-

Relative density=

$$\frac{\text{No. of individuals of a species}}{\text{Total no. of all species}} \times \frac{100}{1}$$

Water availability was assessed through information obtained from the game rangers and the support zone communities. The assessment was done taking into consideration the number of months in a year with available water to the game animals inhabiting the game reserve.

Data was analyzed using descriptive statistics, tables, percentages and ANOVA (Analysis of Variance).

RESULTS

Table1shows the number of dominant grass species in the game reserve estimated at random using a 1m^2 quadrat in the range sites. The result shows that 12 grass species are dominant in the game reserve with six (6) species (*Aristida stipoides, Hyparrhenia rufa, Andropogon gayanus, Cynodon plectostochyus, Setaria pallidefusca* and *Eragrostis ciliaris*) occurring in all the range

sites at varying diversities. However, the result of the analysis of variance (ANOVA) shown in Table 2 indicates that there is no significant difference in the distribution of dominant grass species for range sites (P>0.05). When the result was subjected to follow-up test, it was found that the mean number of individuals of the dominant grass species per range site was not significantly different from one another (Table 3). Table 4 shows the relative densities of herbaceous species. The result shows that *Pennisetum pedicellatum* has the highest percentage of 22.27%, while *Cynodon plectostachyus* has

the least (3.27%). The mean percentage herbaceous cover is 68%. Composition of perennials, annuals and weeds are 26%, 50% and 24% respectively. The results also show that the plants are stunted, erosion is slight, woody plant density is 218 per hectare while mean lither cover is 86% with the highest in site E (100%) and site C has the least with 73% (Table 5). Water is available in the reserve for over a period of 9 months. The total range condition rating point is 70.50% (Table 6) and the range condition of the game reserve is classed to be of good condition (Table 7).

Table 1: Dominant Grass Species in the Range Sites Estimated at Random using a 1m^2 Quadrat

	Range sites				
Species	**A**	**B**	**C**	**D**	**E**
Pennisetum pedicellatum	30	101	11	92	00
Aristida stipoides	20	07	16	09	13
Hyparrhenia rufa	03	28	33	09	46
Andropogon gayanus	09	07	30	42	17
Cynodon plectostachyus	07	05	13	22	02
Sporobolus Pyramidalis	63	00	27	21	32
Cenchus biflorus	00	49	101	00	37
Setaria pellidefusca	22	19	34	22	17
Schoenefeldia gracilis	21	00	39	51	63
Digitaria longiflora	07	11	14	23	00
Eragrastis ciliaris	05	19	05	33	29
Echinochloa pyramidalis	09	00	00	22	33
Total	196	246	423	346	289

Table 2: Analysis of Variance of the Distribution of Dominant Grass Species in the Range Sites.

Sources of Variation	DF	SS	MS	F-cal	F-tab
Treatment	4	2591.50	647.88	0.96	2.53 (ns)
Error	55	36972.50	672.23		
Total	59	39564			

Ns =not significant at 0.05

Table 3: Follow -up Test of Mean Number of Dominant Grass Species in the Range Sites

Range site	Mean
C	35.25a
D	28.83a
E	24.04a
B	20.50a
A	16.33a

Mean number of dominant grass species in the range sites subjected to follow-up test using LSD at 0.05. The arrangement of values is in descending order.

Table 4: Relative Density of Herbaceous Species.

Species	No. of Species	Relative density (%)
Pennisetum pedicellatum	334	22.27
Cenchrus biflorus	187	12.47
Schoenefeldia gracilis	174	11.60
Sporobolus pyramidalis	143	9.53
Hyparrhenia rufa	119	7.93
Setaria pallidefusca	114	7.60
Andropogon gayanus	105	7.00
Eragrostis ciliaris	91	6.07
Aristida stipoides	65	4.33
Echinochloa pyramidalis	64	4.26
Digitaria longiflora	55	3.67
Cynodon plectostachyus	49	3.27
Total	1500	100

Table 5: Assessment of Litter Cover, Plant Vigor, Erosion and Density of Trees/Shrubs per Hectare in the Range Sites.

	sites Range				
Parameter	A	B	C	D	E
Plant vigor	Stunted	Stunted	Stunted	Weak	Stunted
Erosion	None	Slight	Slight	Slight	Slight
Number of Trees and Shrubs/ha	212	164	115	250	350
Litter Cover	86	80	73	92	100

Table 6: **Range Condition Score Card**

Factors	Quantity (%)	Scale of scores	Actual score (%)
Percentage herbaceous cover	75-100		
	50-74		
	25-49	25-32	26
	6-24		
	5-0		
Botanical composition			
Perennial species	0-5		
	6-25	12-16	14.0
	26-50		
	51-75		
	76-100		
Annual species	0-5		
	6-25		
	26-50	0-5	2.0
	51-75		
	76-100		
Weed species	0-5	5-8	6.0
	6-25		
	26-50		
	51-75		
	76-100		
Plant vigor	Healthy		
	Stunted	2-1	1.0
	Week 0		
Soil condition: Litter cover	20% litter		
	20-50% litter	2-1	0.5
	100% litter		

Erosion:

None	0-8% slope		
Slight	8-16% slope	2-1	1.0
Severe	16% slope		
Trees and shrubs	0-250/ha		
	251-500	16-25	16.0
	251-1000		
	1001-2000		
	2000/ha		
Water availability	All year round		4
	9-11 months	1-5	
	6-8months		
	$\leq$6months		
Total			70.5

Table 7: Key for Rating Condition

S/No	Range Condition Class	Total Score (%)
1.	Excellent	80-100
2.	Good	60-79
3.	Fair	40-59
4.	Poor	20-39
5.	Very poor	0-19

DISCUSSION

Analysis of the range and its rating indicated that the game reserve is in a good condition and according to Stoddart *et al* (1975), a range in good condition has fewer desirable plant species (decreasers) than undesirable species (increasers) and a few weed species (invaders). This may be influenced by the feeding habits of the wild animals' composition of the game reserve which may be lower than the potential carrying capacity of the reserve. This agreed with Kefa and Oche (1989) report, that a range in good condition may be on intermediate stage of succession and therefore maybe either improving or deteriorating depending on the proportion of desirable, less desirable and undesirable plant species present. The classification of vegetation used in this study shows that perennials are more desirable group of forage plants than annuals, which are classified as increasers or less desirable forage plants; (Kefa and Oche, 1989). The weeds are also classified as invaders or the undesirable plants. The result of the herbaceous composition analysis showed that annuals (50%) e.g., *Setaria pallidefusca* and *Aristida stipoides*, dominated the range sites.

The result suggests that the game reserve is on a downward trend and this could be attributed to the succession of the less desirable (annuals) and weedy plants. The stunted plants and presence of slight erosion are in conformity with the report of Kefa and Oche (1989); as indications of deteriorating sites. The downward trend may also be attributed to wild fire and illegal grazing by pastoralists. Similar study was carried out by Akosim *et al* (2004) in Jibiro Grazing Reserve, Adamawa State. The grazing reserve was evaluated to be in a fair condition which could be as a result of grazing pressure by resident and nomadic pastoralists. The use of Sambisa Game Reserve by pastoralists is strictly prohibited by the laws protecting the reserve enforced by Game Rangers.

RECOMMENDATIONS

From the results, the range land of Sambisa Game Reserve strongly suggests caution in its utilization to ensure that the condition trend is upward. Results of the analysis of the range sites indicated the dominance of less desirable species and the presence of weeds as well as stunted plants and the emergence of erosion. This suggests the need for manipulation and the use of improvement practices. The following recommendations are therefore made:-

ildfire should be prevented through the construction of fire lines and the use of prescribed burning.

·   Reseeding the range sites with the desirable plant species.
·   Reactivation of the existing dams and construction of new ones to provide a Perennial source of water.
·   Extension workers should enlighten the support zone communities on the benefits   of the game reserve resources and their sustainability.

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