GRAZING EFFECTS ON THE STRUCTURE AND DYNAMICS OF GRASSLAND ECOSYSTEMS
Project No. 1786

Complementary Rotation Grazing System in Western North Dakota

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Introduction

Complementary grazing uses domesticated grass, legume, or annual crop pastures to add to or complement native range pastures. Rotation grazing moves livestock through a successive series of pastures in a preplanned sequence. Management of native range and domesticated grass pastures must be based on sound ecological principles that consider the growth and development of the dominant species and the physiological needs, weaknesses and strengths of the plants to maintain productive stands. The nutritional needs of the livestock must be included in management considerations. Sound management recommendations can only be based on reliable scientific research.

Procedures

This project compares nongrazed, seasonlong grazing and rotation grazing on three native range sites to evaluate species composition, herbage production, and animal performance and the use of domesticated grass pastures in a complementary rotation grazing system. The present complementary rotation grazing system has been in place at the ranch headquarters of the Dickinson Experiment Station since 1983. It consists of two crested wheatgrass (Agropyron desertorum) pastures of 13 acres for spring grazing from early May to 1 June and two altai wildrye (Elymus angustus) pastures of 30 acres for fall and early winter grazing from 15 October to 15 December. Native range has been grazed as two sets of three pastures during the summer from 1 June to 15 October and managed as a twice over rotation system. Two pastures were 80 acres and one pasture was 75 acres. Twenty-six cow-calf pairs were used on each replication of the rotation grazing treatment. The seasonlong pasture treatments were established in 1986 and grazed from mid June to late October and consisted of 3 replicates of 80 acres of native range. Ten cow-calf pairs were used on each replication of the seasonlong grazing treatment. The two native range nongrazed treatments were established in 1987 and have not been grazed for more than 30 years.

The intended purpose of the trial is to maximize herbage and livestock production for a cow-calf operation, lengthen the grazing season in the spring and fall, improve range condition of native range, and reduce total acreage required to carry a cow and calf. The intention is to accomplish these goals with a low number of pastures with few rotation times and be flexible enough to be adapted by a wide range of livestock operations. This type of grazing system should improve operation efficiency, reduce costs and decrease labor per unit of production, and increase saleable production per acre.

Plant data collected on the treatments in this study were above ground herbage production, plant species composition, and leaf height measurements and phenological phases of eight major graminoid species. Animal weight performance for the commercial crossbred cattle used in this trial was collected only while livestock were on pasture at 15 or 30 day intervals.

Results and Discussion

The 1988 grazing season experienced drought conditions. A total of only 8.46 inches of precipitation fell for the entire year. The long term mean was 15.89 inches. Only 5.30 inches of precipitation occurred during the growing season, April to October.

The length of the grazing periods on the complementary rotation grazing system and seasonlong grazing treatments were reduced because of the drought conditions. The crested wheatgrass pastures were grazed from 16 May to 1 June for 16 days. Generally these pastures were grazed for 21 days. The native range was grazed from 1 June to 6 September for 97 days. The native range was previously grazed from 1 June to 15 October for 136 days. The altai wildrye pastures were grazed from 6 September to 5 October for 29 days. Generally these pastures were grazed from 15 October to 15 December or later for 60 plus days. The native range seasonlong pastures were grazed from 15 June to 12 September for 89 days. Generally these pastures were grazed from mid June to late October for 129 days.

The total plant percent basal cover (Table 1) decreased on the silty and shallow range sites by 6 to 15 percent but increased on the sandy range sites by 1 to 13 percent from 1987 data.

The total above ground herbage production (Table 2) was reduced on the sandy, shallow and silty range sites of the nongrazed, seasonlong and rotation grazing treatments. The standing live vegetation in mid July was reduced in 1988 from 1987 by 67%, 74%, and 40% for the rotation, seasonlong and nongrazed treatments, respectively.

The cow and calf average daily gain (Table 4) was increased in 1988 over 1987 on the seasonlong treatments. The calf average daily gain (Table 4) was increased on the crested wheatgrass, native range, and altai wildrye pastures of the complementary rotation treatments in 1988 over 1987. The cow average daily gain (Table 4) for the rotation treatments was increased on the crested wheatgrass pastures but decreased on the native range and altai wildrye pastures in 1988 over 1987. The gain per acre on native range for livestock was generally reduced in 1988 because of the reduction in the number of days grazed.

Summary

The management of this complementary rotation grazing system has been based on ecological principles that consider the physiological needs, weaknesses, and strengths of the dominant plant species. Consideration of the nutritional needs of the livestock have been incorporated. Season of use of each pasture type was limited to periods of grazing when the detrimental effects of grazing were minimized and the potential for improvement in animal weight performance was maximized to near potential. Effort has been made to limit the number of pastures and rotation times to the minimum. One pasture of crested wheatgrass was used for spring grazing. A second pasture may be necessary to move the starting date earlier. The native range was managed with three pastures, each grazed two times during the grazing season. One pasture of altai wildrye was used in this system for fall and early winter grazing. The grazing season has been lengthened from the traditional 6 months to 7.1 months. This system has the potential to lengthen the grazing season to 8.0 months with additional research. The acreage required to carry a cow and calf was reduced from 24.4 acres for 6 months to 11.6 acres for 7.1 months.

By using a complementary rotation grazing system similar to the one at the Dickinson Experiment Station, livestock producers have the potential to: lengthen the grazing season, reduce the acreage required to feed a cow and calf, and increase the amount of saleable beef produced from each livestock unit.

TABLE 1. Mean Percent Basal Cover for Native Range Treatments, Dickinson Experiment Station, July, 1988

RANGE SITE Treatment	Grass	Sedge	Forb	Shrub	Other Plant	Total Plant	Litter	Soil
SANDY								
Ungrazed								
Nongrazed	18.0	11.4	3.9	0.1	0.1	33.5	66.2	0.5
Seasonlong	---	---	---	---	---	---	---	---
Rotation	14.8	9.6	5.6	0.6	0.0	30.6	65.4	1.4
Grazed								
Seasonlong	15.7	8.7	6.5	0.0	0.0	30.9	63.4	5.7
Rotation	13.0	7.7	3.7	0.5	0.1	25.0	64.2	7.0
SHALLOW								
Ungrazed								
Nongrazed	9.2	10.2	8.0	0.3	0.2	27.9	66.0	6.0
Seasonlong	---	---	---	---	---	---	---	---
Rotation	15.0	6.0	3.5	0.3	0.8	25.6	62.9	7.3
Grazed								
Seasonlong	11.5	9.8	4.3	0.1	0.5	26.2	62.5	10.7
Rotation	14.4	6.6	3.3	0.3	0.5	25.1	55.8	15.6
SILTY								
Ungrazed								
Nongrazed	9.7	4.5	5.5	2.8	0.0	22.5	77.2	0.5
Seasonlong	17.7	2.9	5.9	0.0	0.1	26.6	68.1	5.3
Rotation	17.2	4.9	6.3	0.0	0.0	28.4	68.7	1.0
Grazed								
Seasonlong	11.9	3.7	10.2	0.0	0.3	26.1	62.5	10.7
Rotation	14.6	5.2	3.8	0.0	0.2	23.8	65.9	8.3

TABLE 2. Mean Herbage Production in Pounds per Acre, Dickinson Experiment Station, July, 1988

RANGE SITE Treatment	Cool Season	Warm Season	Sedge	Forb	Shrub	Total Live	Standing Dead	Total Above Ground Herbage	Litter
SANDY									
Ungrazed									
Nongrazed	51	772	197	56	0	1076	1548	2624	2881
Seasonlong	115	142	378	337	0	972	589	1561	1608
Rotation	196	283	244	143	0	865	495	1359	1541
Grazed									
Seasonlong	118	255	255	92	0	718	548	1266	1434
Rotation	100	263	234	64	0	661	577	1238	1931
SHALLOW									
Ungrazed									
Nongrazed	116	58	222	58	0	454	417	871	1491
Seasonlong	220	73	208	73	25	598	158	756	733
Rotation	250	114	116	70	0	549	162	711	931
Grazed									
Seasonlong	237	141	167	64	0	608	302	911	839
Rotation	157	129	85	82	0	453	342	794	1324
SILTY									
Ungrazed									
Nongrazed	329	96	213	180	0	819	774	1592	1744
Seasonlong	258	238	176	88	0	760	209	969	762
Rotation	185	198	113	143	0	639	337	976	1340
Grazed									
Seasonlong	136	199	59	106	0	499	189	689	1059
Rotation	103	189	84	72	0	449	225	674	1071

TABLE 3. Mean Cow and Calf Periodic Weight in Pounds, Dickinson Experiment Station, 1988

Treatment	15 May	1 Jun	15 Jun	1 Jul	15 Jul	1 Aug	15 Aug	1 Sep	15 Sep	1 Oct	15 Oct	30 Oct	15 Dec
Seasonlong			Native										
Rotation	Crested						Native		Altai				
COW													
Seasonlong			1340		1351		1394		1381				
Rotation	1160	1214	1214	1221	1227	1246	1254	1261		1212			
CALF													
Seasonlong			298		378		478		557				
Rotation	226	266	298	343	385	430	482	529		578			

TABLE 4. Mean Cow and Calf Average Daily Gain and Gain per Acre in Pounds, Dickinson Experiment Station, 1988

	Crested Wheatgrass	Native Range	Altai Wildrye
Average Daily Gain (ADG)			
COW			
Seasonlong	-----	0.45	-----
Rotation	3.36	0.49	- 1.70
CALF			
Seasonlong	-----	2.92	-----
Rotation	2.53	2.71	1.72
Gain/Acre (G/A)			
COW			
Seasonlong	-----	4.88	-----
Rotation	107.31	5.94	- 42.72
CALF			
Seasonlong	-----	31.03	-----
Rotation	80.77	28.76	43.24