Ungulate Management to Enhance a Grazed Seasonal Rangeland Ecosystem

Dennis P. Sheehy

SUMMARY

Seasonal rangeland in the lower Hells Canyon provides forage for domestic and wild ungulates during the winter and spring. Preliminary information suggests that grazing by cattle improves forage quality for wild ungulates, especially Rocky Mountain elk. Although cattle and elk may have a synergistic relationship, the impact of several ungulates on ecological stability of grazed plant communities needs to be determined in greater depth.

INTRODUCTION

Seasonal and winter rangeland is a complex of vegetation and terrain features providing forage for large ungulate grazers during a critical period in the yearly grazing cycle. Rocky Mountain Elk (*Cervus elaphus nelsonii)*, mule deer (*Odocoileus hemionus hemionus)*, and bighorn sheep (*Ovis canadensis*) use seasonal rangeland in late autumn and early spring. Although most livestock use seasonal rangeland as transitional range in late spring and early fall, lower-elevation seasonal rangeland and winter rangeland, if available, is also used for winter grazing by cattle and sheep.

In northeastern Oregon, the impact of livestock grazing on biological resources is being increasingly scrutinized by the general public. Livestock producers feel that large wild ungulates often compete with livestock for forage on publicly and privately managed seasonal and winter rangeland (Sheehy 1988, Vavra 1980). Also, a major concern of environmental groups is that biological resources of environmentally sensitive seasonal rangeland are being diminished by livestock grazing, and that livestock grazing should be eliminated or restricted.

The conflict over allocation of grazing resources between large domestic and wild ungulates has been long-standing and usually adversarial in context. However, recent concern over the impact of ungulate grazing in general on habitat used by threatened and endangered species has placed ungulate grazing in a new context. If cattle grazing improves the quality of seasonal rangeland forage available to elk during critical periods of nutritional stress, then removal of cattle from publicly managed seasonal rangeland will lower the forage quality for elk and cause them to concentrate foraging activities on seasonal rangeland that continues to be grazed by cattle, i.e., privately owned seasonal rangeland. Privately owned seasonal rangeland often contains stream and riparian habitat important to many species of fish and wildlife.

The study seeks to provide more information on: 1) the role of livestock in improving forage condition for wild ungulates on winter and seasonal rangeland, especially the role of cattle in conditioning forage; 2) the response of bunchgrass communities to timing of grazing, grazing intensity, and grazing by several ungulates; and 3) ungulate grazing management strategies that enhance ecological stability of private and public rangeland.

METHODS AND MATERIALS

Ecological Site Measurements

Replicated transects to measure vegetation and soil parameters of plant communities comprising seasonal rangeland have been established in each grazing allotment. Along each general transect line, 20-square-meter macroplot sites situated according to differences in elevation, aspect, and vegetation type were established. Terrain features (slope, aspect, elevation, and slope position) at each macroplot were recorded. Measurements of vegetation in the macroplot are obtained from 10, 0.2-square-meter micro-plots placed along a 20-meter plot transect line at 2-meter intervals. Movable net wire exclosures (1.0-square-meter) have been placed on each macroplot and used to determine plant phenology, growth curves, and standing crop of vegetation. Standing crop of plant species in each macroplot are harvested from 0.25-square-meter paired plots (protected and unprotected by the exclosure) at intervals determined by the presence of livestock in each allotment.

Ungulate Diet Selection.

Fecal samples from each ungulate species are collected at bi-weekly intervals while the animals are in each allotment of the study area. These samples are used to determine composition of ungulate diets and ungulate diet quality (crude protein and digestible dry matter) obtainable from grazed and non-livestock-grazed allotments. Crude protein content and digestible organic matter (DOM) of vegetation forming ungulate diets is determined at bi-weekly intervals using Near Infra-Red Spectrometry (NIRS) procedures for fecal profiling to determine an index of ungulate diet quality (Stuth and Lyons 1992). A sub-sample of fecal material collected from ungulates in each allotment is analyzed.

RESULTS

Forage Availability.

During winter and spring, cattle and wild ungulates graze the same seasonal rangeland in the lower Hells Canyon. Consequently, availability and quality of forage that is available are important constraints influencing economic survival of the rancher, and also viability of wild ungulate populations.

The study area has three separate management units (breaks, benches, and river) that are grazed by livestock at different times during the winter. The breaks, which are seasonal rangeland at higher elevation, are grazed by livestock between November and January, and again in late April and May after calving. The benches are medium-elevation seasonal rangeland grazed by livestock from late January to late February. The management unit contains the benches and lower-elevation seasonal rangeland along the Imnaha River that are grazed in March and April during which calving occurs. Approximately 800 elk also graze the "breaks" during winter and spring. Forage standing crop on the three management units is diverse (Table 1).

The quantity of forage standing crop is highest in the breaks. If new growth of forage indicates higher nutrient availability, forage standing crop in the breaks also has higher

nutrients available than either the "benches" or the "river" management units during winter. The data samples suggests that plant communities in the "breaks" provide high-quality forage for both cattle and elk, at least compared to the forage available on the "benches," and even more so compared to forage that would be available to cattle or elk during the winter in the "river" management unit.

Table 1. Forage standing crop (g/0.25 m^2 D.w.) on three-management units grazed by domestic and wild ungulates in the lower Hells Canyon.

		Grass			Forb			Total		
		Tot	New	Old	Tot.	New	Old	Tot.	New	Old
Breaks	4 (NW)	120.4	27.4	93.0	6.0	0.8	5.2	126.4	28.2	98.2
	1 (S)	140.3	42.7	97.6	13.4	4.7	8.7	153.7	47.3	106.3
	1 (SE)	60.0	4.7	55.3	0.5	0.0	0.5	60.1	4.8	55.3
	6 x	113.7	8.2	87.5	6.3	1.3	5.0	119.9	27.5	92.4
Bench	3 (SE)	147.0	11.2	135.8	1.8	0.6	1.2	148.6	11.8	137.0
	2 (SW)	52.4	5.2	43.8	3.4	0.0	3.4	52.4	5.2	47.2
	4 (NW)	66.6	15.3	51.3	5.4	0.5	4.9	72.4	15.8	56.6
	1 (S)	123.8	18.1	105.7	5.2	0.0	5.2	129.8	18.1	111.7
	1 (N)	36.3	10.2	26.1	0.6	0.0	0.6	36.9	10.2	26.7
	11 x	88.4	12.1	75.6	3.6	0.3	3.3	91.5	12.4	79.1
River	3 (S)	59.0	2.0	56.6	8.2	0.0	8.2	67.2	2.8	64.5
	1 (S)	81.0	5.0	76.0	3.4	0.0	3.4	90.4	8.0	79.4
	1 (SW)	91.0	3.1	87.9	2.2	0.0	2.2	95.4	5.3	90.3
	2 (N)	69.4	22.4	47.0	3.0	0.0	3.0	72.4	22.6	50.0
	1 (NE)	83.4	5.0	78.4	9.6	0.0	9.6	93.0	5.0	88.0
	1 (NW)	59.0	8.9	50.1	8.1	0.0	8.1	67.1	8.9	58.2
	9 x	70.0	8.2	61.8	6.0	0.0	6.0	76.9	9.0	67.7

Winter Range Nutrient Availability.

Fecal profiling of livestock using near infrared spectroscopy technology allows prediction of dietary crude protein (%CP), and digestible organic matter (%DOM) on a dry-matter basis is a developing technology of the Grazing Animal Nutrition Laboratory at Texas A&M University. The information collected in this study will facilitate development of predictive equations for Rocky Mountain elk, mule deer, and bighorn sheep.

Table 2. Near Infra-Red Spectroscopy (NIRS) values for crude protein (CP) and digestible organic matter (DOM) in the diets of large ungulates using winter and seasonal rangeland lower Hell's Canyon. Elk diets were estimated using cattle equations; deer and bighorn sheep using goat equations.

	CATTLE		ELK		DEER		BIGHORN	
Date	CP	DOM	CP	DOM	CP	DOM	CP	DOM
12-92	3.83	50.37	4.75	53.42				
1-93	3.69	49.71	5.59	51.63				
2-93	4.85	49.24	5.04	51.97	6.54	51.01	7.45	53.26
5-93			14.40	61.65				
6-93			15.64	61.66				
10-93					7.27	55.84		
12-93	5.72	53.90					7.46	53.45
1-94	4.22	52.07			3.08	50.58		
2-94	5.13	54.17	4.15	49.75				
3-94	4.66	50.86			6.23	51.79	7.97	52.92

Cattle on the McClaran winter rangeland have an obvious crude protein and digestible organic matter deficiency during the winter because of the low quality of forage standing crop available to them during the winter months. The data suggests that forage standing crop had higher CP and DOM levels in 1994 compared to 1993. This prediction is consistent with field observations of forage standing crop, which during the winter of 1992-1993, appeared to be highly leached and poorly cured. Record spring-summer precipitation was received during summer, 1992. This caused record levels of forage production on seasonal and winter ranges that possibly had low nutrient levels and cured poorly.

The level of CP and DOM available to Rocky Mountain elk from the same seasonal/winter range increased dramatically between the winter months and late spring, even though the values obtained from NIRS cannot be used to directly predict levels of CP and DOM in elk diets. The data does suggest that elk had approximately three times the amount of crude protein in their diets in the spring as during the winter. The data also suggests that the level of available DOM from forage was significantly higher in the spring than in the winter. The data suggests that bighorn sheep and mule deer were able to maintain higher levels of CP and DOM in their diets during the winter than cattle or elk.

DISCUSSION

It is not clear what impacts current levels of domestic and/or wild ungulate grazing are having on ecological stability and secondary succession of vegetation comprising the seasonal

rangeland plant communities used for winter grazing. A primary concern of resource managers is maintaining or enhancing ecological stability of vegetation that comprises the forage resource for ungulate grazers.

A synergistic relationship does exist between ungulate grazers, whereby one ungulate species improves forage quantity and quality for a second ungulate species. It is possible that removal of one ungulate grazer will alter behavior and/or distribution of the other. Such alteration could locally increase herd sizes to the point that community stability is decreased and intra-specific competition is increased. Although the sample data does not address it, another important question that must be addressed is the impact of ungulate grazing on ecological stability of plant communities, especially on plant communities receiving grazing by more than one ungulate.

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