

RESPONSE OF WINTERING BIGHORN SHEEP TO A REST-ROTATION GRAZING SYSTEM  
IN CENTRAL IDAHO<sup>1</sup>

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ABSTRACT

A change from season long domestic livestock grazing to a rest-rotation grazing system occurred in 1973 on the Morgan Creek bighorn sheep winter ranges in central Idaho. Sex and age of bighorn were recorded and the location of each group was plotted on maps annually from 1973-1979. Comparisons of changes in sex and age in the population, use of individual pastures, and use by livestock grazing treatment were made. Although populations increased, the number of breeding age ewes remained static. Under a season-long grazing system, bighorns preferred to use areas not grazed by domestic livestock. After 4 years of rest-rotation grazing, bighorn use shifted from an area closed to livestock grazing to the livestock use pastures. Bighorns appeared to prefer the late-use pasture over early-use or rest treatments. Results are preliminary, as use shifts appear to continue.

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## INTRODUCTION

Bighorn sheep-livestock relationships in the Morgan Creek drainage have been a source of heated controversy since a 4-year bighorn ecology study was completed in this area by Morgan (1970). His study determined that, between 1963 and 1970, bighorn populations dropped from approximately 250 to 100 animals, and considerable competition for winter forage existed between mule deer and bighorns, and for grass between domestic livestock and sheep. He reported that livestock grazing had increased sagebrush domination of the grassland communities, forcing bighorns to winter on areas not used by livestock. A highly emotional controversy developed from Morgan's recommendations to reduce livestock grazing pressure, exclude livestock use from key bighorn winter use areas, and reduce the wintering deer population. This problem was one of the main catalysts in the court-ordered suit forcing the Bureau of Land Management (B.L.M.) to write Environmental Impact Statements on their livestock management plans. Prior to the court order, and after Morgan's study, a joint livestock management plan had been developed for the Morgan Creek area by the Salmon District of B.L.M., Challis National Forest, and Idaho Department of Lands. The primary components of the plan were a three pasture rest-rotation grazing system and exclusion of livestock grazing from 3,500 acres of critical bighorn sheep winter range.

Little data are available in the literature on the effect of rest-rotation grazing on wildlife. Data on it's effects on bighorns are practically non-existent although rest-rotation grazing is becoming a preferred grazing system on National Forest and B.L.M. lands.

The objectives of this study were to determine the effects of rest-rotation grazing on:

- 1) bighorn population dynamics and trends; and
- 2) bighorn winter distribution.

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#### METHODS AND MATERIALS

Aerial survey flights were flown by helicopter once during the most critical period of winter severity from 1973 through 1979. Winter range flight lines were flown on the contour at approximately 152 m (500 ft) intervals. Locations of bighorns were plotted on maps and sex and age data were recorded. The chi-square test of independence was used to compare levels of bighorn use by pasture and by grazing treatment including the area closed to livestock grazing.

#### STUDY AREA

The Morgan Creek bighorn winter ranges are located in central Idaho approximately 6.4 km (4 miles) north of the town of Challis. Elevations range from 1,524 m (5,000 ft) at the mouth of Morgan Creek along the southern border to 2,134 m (7,000 ft) at the top of Cat-Ear Butte.

Annual precipitation varies from 15.0cm (6 in.) to 25.4 cm (10 in.) at the highest altitudes. Most precipitation falls as snow in winter.

The vegetation is typical of arid high desert ranges. Sagebrush (Artemisia spp) - grass are the most commonly occurring habitat types. Lesser amounts of mountain mahogany (Cercocarpus ledifolius) - rock cliff,

shadscale (Atriplex confertifolia) - grass, mahogany and Douglas-fir types are also scattered throughout the study area.

The most important grasses from a frequency and canopy coverage standpoint are bluebunch wheatgrass (Agropyron spicatum) and Sandberg bluegrass (Poa sandbergii). Lesser amounts of Indian ricegrass (Oryzopsis hymenoides), sand dropseed (Sporobolus cryptandrus), and salina wildrye (Elymus ambiguus), are found on dry sites. Bluebunch wheatgrass is the most important forage species in bighorn diets in this area (Morgan 1970).

Forb composition is typical of dryland sagebrush sites in the Great Basin. The most common genera present are: Phlox; Eriogonum; Penstemon; Eriogonum; Lupinus; and Astragalus.

Land ownership of the study area is primarily B.L.M. with lesser amounts managed by U.S.F.S., State Department of Lands, and private land owners. A three-pasture rest-rotation grazing system was instituted in 1973 (Anonymous 1972) by the public land management agencies. The grazing system has been closely managed and followed. Approximately 3,500 acres of critical bighorn winter range were fenced and excluded from livestock grazing in 1973. The bighorn winter ranges are located primarily on lands administered by the B.L.M. and the Idaho State Department of Lands. Approximately 20,250 hectares (50,000 a) are involved in the study area. The three livestock use pastures are approximately equal in the number of livestock animal unit months (A.U.M.'s) available.

## PRELIMINARY RESULTS AND DISCUSSION

### Population Dynamics

Herd composition data gathered from 1973 through 1979 were compared

with data provided by Morgan (1970) in Table 1. The data indicate a severe population decline between 1963 and 1970. There appears to have been an increase in population between 1973 and 1975 and a somewhat stable population trend between 1974 and 1979. The relatively stable number of adult (breeding age) ewes from 1973 through 1979 indicates that the breeding ewe population has not significantly changed. Increases were primarily in the ram and lamb components. The closure of all sheep hunting on this population could account for some of the increase in the number of rams.

Table 1. Population characteristics of Morgan Creek bighorn sheep for 1973-79 compared with Morgan's (1970) data for 1963, 1967 and 1970.

Year	Total	Ewes	Lambs	Yr1s*		Rams	Lambs/ 100 Ewes
				E.	R.		
1963	254	141	64			49	45.4
1967	115	71	14			30	12.2
1970	64	42	11			11	17.2
1973	67	45	10	0	4	8	22.2
1974	85	48	17	3	4	12	35.4
1975	111	44	28	7	10	22	63.6
1977	93	43	32	0	3	15	74.4
1978	107	46	18	2	11	30	39.0
1979	95	41	20	1	5	28	48.8

\*Yr1. data not collected in 1963, 1967 and 1970.

We suspect that the ewe population may have an old age structure due to the severe decline in the late 60's and early 70's, and that the recruitment of young ewes to the breeding population is just replacing the loss of these aged ewes. Ewe-lamb ratios have increased over those observed by Morgan (1970). Similar increases during the same period occurred in other hunted and non hunted bighorn populations near the study area where

grazing systems have not been altered. Consequently, we could not relate changes in population trends to improvements in range conditions associated with the implementation of a rest-rotation grazing system in the Morgan Creek area.

#### WINTER DISTRIBUTION

A comparison of bighorn sheep numbers observed in each pasture by year (Table 1) indicates a preference for pastures 1 and 2 over pasture 3. Pasture 3 has less winter habitat and it is of lower quality than in pasture 1 or 2. Use in the exclosure averaged approximately 20 animals during the period 1973 to 1975 and 1 animal from 1977 to 1979 (Table 2). This decrease in use corresponds to the increase observed in the livestock use pastures. The observed change in use was highly significant ( $p < .001$ ,  $\chi^2 = 88.6$  5 d.f. chi-square test). A portion of the total number of sheep were observed outside the livestock allotment area, consequently, totals of animals observed in the pastures (Tables 2 and 3) may be less than total numbers listed in Table 1.

Table 2. Number of bighorns observed by pasture and year.

Grazing Year	Pasture Number			Exclosure	Totals
	1	2	3		
1973	13	13	2	15	43
1974	25	19	18	22	84
1975	10	22	10	22	64
1977	30	34	4	0	68
1978	58	40	9	0	107
1979	43	25	24	3	95
Totals	179	153	67	62	

The first 3 years (1973-1975) of winter bighorn distribution by pasture and grazing treatment were compared (Table 4) with the last

3 years (1977-1979). Comparisons of the percent of bighorn use by grazing treatment indicate a reduction in use of the rested and early use pastures from 79% to 56% and an increase in the observed use of the late

Table 3. Number of bighorns observed by grazing treatment and year.

Grazing Year	Rest	Pastures Early	Late	Exclosure	Total
1973	13	13	2	15	43
1974	18	25	19	22	84
1975	22	10	10	22	64
1977	4	36	34	0	68
1978	40	9	58	0	107
1979	43	25	24	3	95
Totals	140	118	147	62	

use pasture from 21 to 43%. The apparent increase in use of the late use pasture correlated with the reduced use observed in the early use and rest pastures, and with the reduced use in area closed to livestock grazing. This change in bighorn use could be a response to several factors. The late use pasture is the early use pasture of the previous year. Early use treatment usually results in the heaviest grazing by domestic livestock. Much of the dead vegetation is removed during the early use treatment, making the new green growth more available. The late use treatment increases the amount of fall regrowth of bluebunch wheatgrass. Several studies have shown a preference by domestic sheep for second growth bluebunch wheatgrass (Meyer et. al 1957, Arnold 1960) and for bighorns (Eccles 1978, Pitt and Wikeem 1978).

Table 4. Percent bighorn use by pasture, rotation treatment, and time period.

Rotation	Years	Pasture			By Years	Total
		1	2	3		
Rest	73-75	46	52	29	42	36
	77-79	47	37	06	30	
Early	73-75	40	46	26	37	32
	77-79	44	27	08	26	
Late	73-75	24	31	07	21	32
	77-79	54	50	26	43	
Mean	73-75	37	43	20		
	77-79	48	38	13		
	Total	43	41	17		

The changes in use patterns by bighorns of the livestock enclosure may indicate a preference for areas grazed by livestock over those excluded from livestock use. This preference appears to depend upon the system of grazing. During the period of relatively heavy grazing pressure under a season-long system, bighorn use occurred primarily in areas not grazed by livestock. After 8 years of rest-rotation grazing, a significant shift in bighorn use during the critical winter period occurred. This shift of use appears to be an ongoing phenomenon and may change as the vegetation responds to an improved system of domestic livestock grazing. Consequently, the results are preliminary in nature.



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## QUESTION - RESPONSES

Dwight Smith: Walt, that enclosure was still the 3,000 acres?

Walt Bodie: 3,500 acres.

Dwight Smith: And would you expound just a little bit on why the use went down completely to nothing, that's very interesting?

Walt Bodie: Yes, it is. We can only speculate. Apparently, the sheep are finding something outside that particular area that they prefer over what's in that particular area at this point in time. One of the things I think we should be looking at, is changes in nutritional composition of the plants under this grazing system. If we follow and look at what Hormay has determined, and look at plant physiology under a rest-rotation system, there may be some nutritional differences, depending upon the treatment that occurs there. The sheep may be responding to that. I think that is the logical place to start looking.

James Bailey: Was there much change in species composition?

Walt Bodie: We ran the vegetative transects every 3 years. Morgan, Jim Morgan, originally put them in in "68" and "69". We read them again in "74" and "77" and are due to read them again this summer, 1980. We do it every 3 years trying to catch the same period in a rotation cycle. During 1977, the winter of "77-78", we had a very tough winter, we had a fair amount of sagebrush kill and there were changes. But, the changes inside the pasture are very similar; we're looking at canopy coverage, frequency and production. The changes inside the pasture are very similar to the changes outside.