

The Effect of Intensity and Season of Use on the Vigor of Desert Range Plants¹

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The desert ranges of the Intermountain region are commonly used for winter grazing by both sheep and cattle from about October 1 until April or early May. Many, however, are used year-long by cattle.

Growth on these desert ranges generally starts in late March and continues until the dry season begins in late June. The vegetation generally is dormant during the balance of the year except following unusual summer storms.

Desert ranges exist in a state of delicate balance, and even slight mismanagement may do damage that will require many years to overcome. Knowledge of the physiological response of plants to various intensities of defoliation at different seasons is fundamental to proper management of desert ranges.

Review of Literature

Several studies in the Intermountain area have shown that removal of herbage before or after the normal growth period reduced plant vigor less than harvesting during the active growing season (Blaisdell, *et al.*, 1949; McCarty and Price, 1943; and Stoddart, 1946).

In Nevada, harvesting during the winter did not prevent seed production of winterfat (*Eurotia lanata*), but harvesting during the summer did prevent seed production (Eckert, 1954). Studies in Washington and Oregon have shown that clipping shrubs at light, moderate, and heavy intensity each winter stimulated

twig production but reduced seed production. A few years of heavy clipping caused a marked reduction in vitality of plants (Garrison, 1953).

Method and Procedure

One phase of the study was conducted from 1955-1958 and another from 1958-1961. In each phase, seven dominant range plants were subjected to three successive years of treatment. Both phases were conducted on typical salt-desert ranges in west central Utah.

During the first phase the plants were harvested at three intensities at each of four seasons. The three intensities were 25, 50, and 75 percent of the annual herbage removed. The four seasons were fall (November 1), early winter (January 1), late winter (March 1), and spring. The spring clipping was made at the time plants had made about 20 percent of their annual growth, usually about May 1. These treatments were replicated at two locations about 90 miles apart.

The seven species studied at each location included big sagebrush (*Artemisia tridentata*), black sagebrush (*Artemisia nova*), shadscale (*Atriplex confertifolia*), Nuttall saltbush (*Atriplex nuttallii*), winterfat (*Eurotia lanata*), squirreltail grass (*Sitanion hystrix*), and Indian ricegrass (*Oryzopsis hymenoides*).

Ten plants of each species were harvested for each treatment at each location. The plants were harvested in a manner simulating forage removal by grazing animals.

Each year during late summer, records were taken to eval-

uate the effect of treatments upon crown cover and death of plants.

The second phase of the study included the same species but a third location was added. The clipping treatments included three intensities (30, 60, and 90 percent) and four seasons. The seasons were winter, early spring, late spring, and winter and again in late spring. Early spring was at about the time new growth appeared (usually April 1) and late spring was about the time 20 percent of the new growth was produced (usually May 1).

All locations received approximately eight inches of precipitation annually; about 60 percent of this was snow during the winter months and the remainder came as rain primarily during April, May, and October.

Results and Discussion

Both season and intensity of harvesting caused marked changes in crown cover and death of plants.

Season of Harvesting

In the first phase of the study, spring harvesting was significantly more detrimental than the other three seasons (Table 1). It caused about 89 percent more death loss of plants and about 54 percent greater crown reduction in the living plants than other seasons of harvesting. There were no significant differences ($P < .05$) among the average losses from fall, early winter, and late winter harvesting.

As a result of the marked influence of spring harvesting during the first phase, greater emphasis was placed on this treatment in the second phase of the study. As would be expected, harvesting twice, once during winter and again in late spring, was the most detrimental to plants, and late spring harvesting only was second most harmful (Table 2). The differences

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Table 1. Average plants dead and reduction in crown cover of live plants as a result of three years defoliation during four periods at three intensities. Phase I, 1955-58, averages for treatments are from seven dominant desert species with ten plants per treatment at each of two locations.

Season	Intensity of harvesting	Plants dead	Reduction
		1958 (Percent)	in crown cover of live plants 1955-58
Fall (November 1)	25	5.1 ^a	10.8 ^a
	50	6.4 ^a	11.9 ^a
	75	11.5 ^b	23.2 ^b
	Avg.	7.7 ^a	15.3 ^a
Early Winter (January 1)	25	2.8 ^a	9.8 ^a
	50	5.7 ^a	11.6 ^a
	75	11.4 ^b	22.8 ^b
	Avg.	6.4 ^a	14.7 ^a
Late Winter (March 1)	25	2.6 ^a	11.5 ^a
	50	5.0 ^a	10.4 ^a
	75	12.5 ^b	20.7 ^b
	Avg.	6.7 ^a	14.2 ^a
Spring (May 1)	25	4.0 ^a	13.8 ^a
	50	13.5 ^b	20.3 ^b
	75	22.7 ^c	34.1 ^c
	Avg.	13.1 ^b	22.7 ^b
Average	25	3.6 ^a	11.5 ^a
	50	7.7 ^a	13.6 ^a
	75	14.5 ^b	25.2 ^b

Exponent letters that differ for comparable figures indicate significance at the .05 level of probability.

between winter and early spring harvesting at various intensities were not significantly different. Late spring clipping was considerably more detrimental than early spring.

Harvesting during winter and again during late spring for three successive years killed an average of 29 percent of the plants and reduced crown cover of the remaining plants about 33 percent (Table 2). Late spring clipping alone killed 18 percent of the plants and resulted in 22 percent reduction in crown cover of living plants. Early spring clipping killed nine percent of the plants and reduced living crown cover 17 percent.

Intensity of Harvesting

In both phases, percent of plants killed and reduction in living crown cover increased with increased intensity of herbage removal (Tables 1 and 2). This was true for all seasons of clipping. However, in the first phase the overall effect of in-

tensity of harvesting was not statistically significant ($P < .05$) between 25 and 50 percent herbage removal, but 75 percent forage removal was significantly more harmful than 50 percent (Table 1). The overall effect of intensity of harvesting in the second phase showed that 60 percent herbage removal caused significantly more death loss and reduction in crown cover than 30 percent herbage removal and 90 percent was significantly more detrimental than 60 percent (Table 2).

A statistically significant ($P < .05$) interaction occurred between intensity and season of harvesting in both phases of the study. In the first phase, differences between 25 and 50 percent herbage removal were not significant except for late spring harvesting and 50 percent and 75 percent forage removals were comparatively more detrimental during the spring than during

Table 2. Average plants dead and reduction in crown cover of live plants as a result of three years defoliation during four periods of three intensities. Phase II, 1958-61, averages for treatments are from seven dominant desert species with ten plants per treatment at each of three locations.

Season	Intensity of harvesting	Plants dead	Reduction
		1961 (Percent)	in crown cover of live plants 1958-61
Winter (January 1)	30	2.4 ^a	5.7 ^a
	60	5.4 ^a	9.4 ^a
	90	20.1 ^b	28.5 ^c
	Avg.	9.3 ^a	14.5 ^b
Winter and Spring (Jan. 1 and May 1)	30	6.7 ^a	17.9 ^b
	60	20.1 ^b	34.1 ^c
	90	60.1 ^d	46.0 ^d
	Avg.	29.0 ^c	32.7 ^d
Early Spring (April 1)	30	2.5 ^a	3.0 ^a
	60	5.8 ^a	14.5 ^b
	90	18.9 ^b	34.5 ^c
	Avg.	9.0 ^a	17.3 ^b
Late Spring (May 1)	30	4.0 ^a	6.9 ^a
	60	12.6 ^b	17.5 ^b
	90	37.9 ^c	42.5 ^d
	Avg.	18.2 ^b	22.3 ^c
Average	30	3.9 ^a	8.4 ^a
	60	11.0 ^b	25.1 ^c
	90	34.2 ^c	34.6 ^d

Exponent letters that differ for comparable figures indicate significance at the .05 level of probability.

the other three seasons (Table 1). In the second phase, there was no significant difference in death loss or reduction in crown cover between 30 and 60 percent removal during winter harvesting, but during the other three seasonal treatments all three intensities were significantly different (Table 2).

Conclusion

It is concluded from these studies that desert plants can be grazed in late spring, only if herbage removal is 30 percent or below. Utilization of 50 percent or more during this season is extremely detrimental. It is also concluded that forage removal during the winter and again in the spring could not exceed 30 percent at any one season if satisfactory range conditions are to be maintained. This might be the case where sheep graze winter range until late spring or when cattle graze desert ranges yearlong.

The data indicate that desert ranges are best adapted to winter grazing and if used in this manner would have about twice the grazing capacity they have when used during the spring.

Summary

From 1955-61 research was conducted on typical desert range in west central Utah to determine the effect of intensity and season of use on the vigor of desert range plants.

Treatments in one phase included three intensities (25, 50 and 75 percent) and four seasons (fall, early winter, late winter, and spring). Treatments in a second phase included three intensities (30, 60, and 90) and four seasons (winter, early spring, late spring, and winter and late spring in combination).

Ten plants of each of seven dominant desert species were chosen at two locations for phase one and at three locations for phase two. These were subjected to a schedule of clipping treatments for three successive years. Data were collected on reduction in live crown cover and percent of plants killed.

In the first phase, spring harvesting was the most detrimental and there was no significant difference among the fall, early winter, and late winter periods of harvesting. In the second phase, forage removal during the winter and again in late spring was the most detrimental. Late spring grazing was significantly

more harmful than early spring.

Percent plants killed and reduction in crown cover increased with increased intensity of forage removal during all seasons for both phases of the study. This response to intensity was most apparent with late spring clipping.

It was concluded that desert ranges are best adapted to winter grazing and if used during this period would have about twice the grazing capacity as when grazed in the spring.

LITERATURE CITED

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