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STATEMENT OF PUBLICATION PURPOSE

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This publication is printed primarily to inform professional range administrators of important range improvement and management developments and findings. These "notes" may include extracts of published papers, unpublished preliminary reports of research work, unpublished reports on administrative studies and personal observations or suggestions of other range administrators. No claim is made as to the accuracy or completeness of studies or conclusions drawn.

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Some Observations On A Bitterbrush Rejuvenation Project In Southern Idaho

By
Thomas A. Phillips*

In recent years range and wildlife managers have shown considerable interest in rejuvenating decadent stands of bitterbrush. Greatly increased growth has been noted on bitterbrush where the crowns of old and decadent plants have been broken up or shattered by railing, dozing, pruning, rolling, or beating. Little has been done to determine how the rejuvenation treatment affects current annual growth, mortality, reproduction and species composition.

A study to determine these effects was conducted on a 900-acre bitterbrush rejuvenation project on the Cassia Division of the Sawtooth National Forest. Three methods were used in shattering bitterbrush crowns on the project: Railing with a 55-pounds-per-yard rail; dozing with a D-7 tractor with a dozer set at one to two feet from the ground; and rolling with a roller fashioned from a large Douglas-fir log. In October of 1960, approximately 500 acres were treated by railing and dozing, and in October of 1961, an additional 400 acres were treated by rolling. Treated strips, 50 to 100 yards in width, were run through the bitterbrush stands (Figure 1). Studies were conducted on a selected strip in each treatment area. Three 1/100th-acre circular plots were established at random on each study strip, and three control plots were established on an untreated strip. Measurements and observations were made on the plots prior to treatment in 1960 and annually each fall through 1963. Measurements and observations made were: (1) number of plants and age classification, (2) current year's growth, (3) seedling counts, and (4) changes in species composition. Following is a summary of the data from the studies.

Number of Plants and Age Classification

A total of 126 plants was counted on the plots prior to treatment. Sixty-five percent of these were decadent, 30 percent mature, and 5 percent young. No seedlings were found on any of the plots. Criteria described by Dasmann were used in making the age classification.

Current Year's Growth

The net change in growth that occurred on the treated plots during the three years following treatment is shown in Table 1.

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* Range Conservationist - Sawtooth National Forest.

Table 1

Net Increase or Decrease in Growth Attributable to Treatment on Bitterbrush Plots Railed, Dozed or Rolled - 1961-1963

Years After Treatment	Railed Plots %	Dozed Plots %	Rolled Plots %	Average %
1	+317	+347	+382	+ 349
2	+190	-49	-208	-67
3	-95	-155	-	-125

Phenomenal growth occurred on all plots the first year after treatment regardless of the type of treatment applied. Growth the second year after treatment was highly erratic, but a marked decline in growth occurred on all plots. The smallest decline was on the railed plots, while the greatest decline was on the rolled plots. A marked decline in growth continued through the third year after treatment. The average loss the third year for all treatments was a minus 125 percent (Figure 2).

Mortality

Mortality was zero on the rolled plots, 6 percent on the dozed plots and 32 percent on the railed plots. The average death loss for all treatments was 13 percent. While no dead plants were recorded on the rolled plots, considerable mortality was evident on the area next to the plots. Belt transects run through the study strip indicated a mortality of 10 percent. A close examination of the dead plants indicated mortality was due to the crushing action of the tractor treads rather than to the rolling action of the roller. It is probable that little or no mortality would have resulted had the roller been pulled by a wheel tractor rather than by the heavy D-7 tread tractor. The greatest death loss occurred at the time of treatment and during the third year after treatment. Mortality at the time of treatment was caused by plants being completely uprooted or broken off at the root crown. Death loss the third year after treatment occurred among plants which had been badly mangled during treatment but which were able to survive for two additional years.

Reproduction

None of the treatments increased bitterbrush reproduction. No new plants were counted on the plots at the end of the three-year period. Favorable conditions for seed germination occurred during two consecutive years of the study. During these years precipitation was above

average and ample seed crops were produced. Factors which may have adversely affected seedling establishment were extended drouth periods during July and August of each year and an extremely high meadow mouse population during the last two years of the study.

Changes in Species Composition

Composition was determined by running standard Region 4 Forest Service site analysis production transects on contiguous treated and untreated strips.

A definite change in species composition was indicated on all treated areas. The degree of change varied widely with site. A slight to moderate change from browse to grass occurred on the level, very rocky tableland sites, while complete type conversion from browse to grass resulted on the smooth, rock-free canyon slope sites (Figure 3). On the tableland sites browse production on the untreated strips was 10 percent greater than on the railed strip and was 17 percent greater than on the dozed strip. On the canyon slope sites browse production on the untreated strips was 38 percent higher than on the railed strips. The marked type conversion that occurred on the canyon slope site indicates high mortality on bitterbrush. This was borne out by data from belt transects which indicated a death loss of nearly 25 percent.

Summary and Conclusions

This study shows rejuvenating decadent stands of bitterbrush by railing, dozing or rolling is a highly questionable practice. The study indicated the following:

1. Growth was greatly stimulated the first year after treatment, but a rapid decline in growth occurred the second and third year after treatment. A net loss in growth was recorded on all plots the third year after treatment. This means that more growth would have resulted had treatment not been applied.

2. Treatment resulted in a rather high death loss, a loss not being replaced by new plants, since reproduction was nil on all sites and on all treated plots.

3. A significant change in species composition occurred on all treatments; on some sites a complete type conversion from browse to grass resulted. Such a conversion is highly undesirable on key game winter range, but may or may not be undesirable on summer range being used in common by deer and cattle.

Fig. 1 - Distant views of railed strips on canyon slopes of project.

Fig. 2 - Severely mangled plant attached to root crown by a small portion of the stem.

Can Fertilizer Aid in Establishing Grass on Native Ranges?

By
H. R. Cosper, soil scientist
A. Y. Alsayegh, agricultural research technician*

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Influence of Fertilizer and Moisture Studied

The influence of starter fertilizer, moisture and their interrelation on establishing a new stand of western wheatgrass with and without competition from existing vegetation was determined.

When 20 or 40 pounds of nitrogen were used in combination with 20 pounds of phosphorus per acre with only rainfall, the number of grass plants established was double the number obtained without fertilizer. Under optimum soil-moisture conditions as were established in part of this study, starter fertilizer had little effect on the total number of western wheatgrass plants established after 2 years. Optimum soil moisture alone increased about sixfold the number of grass plants established as compared to rainfall only.

Interseeding western wheatgrass in rows at 30-inch intervals into an established stand of crested wheatgrass was unsuccessful, even when fertilizer and additional water were applied.

Western wheatgrass - the grass tested - is a medium tall native species found on most range sites in central and western South Dakota. It has an excellent yield potential and is relatively drought tolerant. The grass was seeded in rows 8 inches apart at the rate of 8-1/2 pounds per acre on March 29, 1961. The fertilizer was placed 1 inch directly beneath the grass seed at seeding. The nitrogen fertilizer source was ammonium nitrate (33-1/3 %N) and the phosphorus source was treble superphosphate (45% P_2O_5). Two additional variables, moisture and plant competition, were included in the study. Seeding with plant competition was obtained by interseeding western wheatgrass in rows at 30-inch intervals into an established stand of crested wheatgrass. The seedbed for the interseeding was prepared by passing a 6-inch-wide sweep through the crested wheatgrass to a depth of 4 to 6 inches in the soil. All crested wheatgrass plants were removed from this 6-inch-wide area to accommodate the western wheatgrass seeding. The crested wheatgrass plants outside this area were not disturbed. The two moisture levels, wet and dry, were used in the establishment year of 1961, but not in 1962. The wet treatments received 3.3 inches of supplemental water at the rate of 0.2 inch every 7 to 10 days in addition to rainfall of 6.34 inches (April 1 - September 1). The dry treatments received only rainfall.

* Northern Plains Branch, Soil and Water Conservation Division, Agricultural Research Service, USDA - Newell, South Dakota.
Reprinted from South Dakota Farm and Home Research, Winter 1964 issue.

No western wheatgrass seedlings were established in either the 1961 or 1962 season from the interseeding into crested wheatgrass in 1961. With supplemental water in addition to rainfall, sufficient moisture was available for the crested wheatgrass to make good growth. However competition for moisture from the crested wheatgrass was too great to allow western wheatgrass seedlings to become established. Fertilizer placed beneath the interseeded western wheatgrass seed was of no benefit in establishment either with or without additional water. The effect of varying the interval of interseeding and the degree of competition from the crested wheatgrass was not studied.

Fertilizer Increase Establishes Rate

Results of western wheatgrass seedlings established with only rainfall and without competition in 1961 showed fertilization successfully increased the number of seedlings. The fertilizer treatments of 20 and 40 pounds of nitrogen in conjunction with 20 pounds per acre of P_2O_5 produced 3.3 and 2.9 plants per square foot. The unfertilized treatment produced 1.2 plants as shown in Table 1. Nitrogen fertilizer, when used alone, did aid in seedling establishment. However, the increase in number of seedlings over the unfertilized treatment was considerably less as compared with the nitrogen plus P_2O_5 treatments. The application of additional water (wet treatments) increased about sixfold the number of seedlings established as compared to rainfall only (dry treatments). Fertilizer with supplemental water further increased the number of seedlings but the increases were small and insignificant.

Table 1

The Effect of Fertilizer and Moisture Levels Applied in 1961 on Establishment and Subsequent Growth of Western Wheatgrass on Pierre-Promise Clay Soil of Western South Dakota.

Fertilizer Treatment lbs. /acre		Dry Treatments Plants/square foot		Wet Treatments Plants/square foot	
N	P_2O_5	1961	1962	1961	1962
0	0	1.2	6.0	6.7	39.1
20	0	2.1	7.1	7.5	38.8
40	0	2.1	6.8	7.9	39.4
0	20	1.7	6.6	6.4	38.7
20	20	3.3*	12.9#	8.8	38.7
40	20	2.9*	11.5*	8.0	43.3
Mean		2.2	8.5	7.6	39.7

* Significantly greater than check at 5% level of probability.

\# Significantly greater than check at 1% level of probability.

The following year (1962) the natural increase in numbers of western wheatgrass plants in all treatments was associated with unusually favorable moisture. Total precipitation for the period April 1 to September 1 was 19.38 inches with 8.60 inches occurring during May. Moisture levels were not maintained in 1962, nor was additional fertilizer applied. New grass plants which originated in 1962 developed from rhizomes of previously established plants. The two fertilizer treatments of 20 and 40 pounds of nitrogen in combination with 20 pounds of phosphorus per acre at seeding in 1961, with only rainfall, doubled the number of grass plants at the end of 2 years (Table 1). Fertilizer used with supplemental water in 1961 had little effect on the total number of western wheatgrass plants established after 2 years.

Because of drought conditions in 1961, no forage yields were taken for those treatments which received only rain. The seasonal precipitation of 6.34 inches for 1961 was well below the 54-year mean of 10.56 inches. However, yields taken in 1962 showed that 20 pounds of nitrogen per acre in combination with 20 pounds of phosphorus applied in 1961 produced 1287 pounds of forage (oven dry), which was a significant increase over the 812 pounds of forage produced from the nonfertilized treatment.

Table 2

The Influence of Starter Fertilizer and Moisture Levels in 1961 on Forage Yields of Western Wheatgrass in 1961 and 1962

Fertilizer Treatment lbs. / A.		Dry Treatment Pounds per acre (oven dry)	Wet Treatment Pounds per acre (oven dry)	
N	P_2O_5	1962	1961	1962
0	0	812	627	2153
20	0	749	729	2203
40	0	1049	721	2162
0	20	1139	586	2148
20	20	1287	794#	2276
40	20	1033	741*	2412
Mean		1012	700	2225

* Significantly greater than check at 5% level of probability

\# Significantly greater than check at 1% level of probability

Hay yields were substantially greater in 1962 because of favorable moisture and additional new plants. For comparative purposes, yields were taken in 1961 and 1962 from those treatments which received

supplemental water in 1961. Yields in 1961 from those treatments receiving additional water showed some fertilizer treatments did significantly increase hay yields over that obtained from the check treatment (Table 2). However, fertilizer treatments applied in 1961 on the wet moisture level had no effect on forage yields in 1962. Hay yields in 1962 from the wet moisture level were approximately twice the yields of those from the dry treatments.

The use of starter fertilizer at seeding in 1961 had some influence on the crude protein content of the forage. Protein produced depended on the forage produced. Protein per acre varied from a low of 94 pounds for the unfertilized grass to 157 pounds from grass fertilized with 20 pounds of nitrogen plus 20 pounds of phosphorus. Protein produced per acre from forage of the wet moisture level was about twice that obtained from the dry treatments. The protein content of the nonfertilized plants from the dry moisture level was 11.6% in 1962. With added fertilizer, protein content of the hay increased as high as 13.3% (Table 3).

Table 3

The Influence of Starter Fertilizer and Moisture Levels in 1961 on Protein Content and Yield of Protein from Western Wheatgrass

Fertilizer Treatments		Dry Treatments		Wet Treatments			
N	P_2O_5	% protein	Yield of protein lbs./ A.	% protein		Yield of protein lbs. /A.	
		1962	1962	1961	1962	1961	1962
0	0	11.6	94	17.1	8.7	107	187
20	0	13.2	99	17.4	9.2	127	203
40	0	12.4	130	16.7	9.4	130	203
0	20	11.3	129	16.3	9.8	96	211
20	20	12.2	157	16.3	9.4	129	214
40	20	13.3	137	16.6	9.8	123	236
Mean		12.3	124	16.7	9.4	117	209

These western wheatgrass seedlings were not fertilized.

These western wheatgrass seedlings received 20 pounds of nitrogen and 20 pounds of phosphorus.

MORE GRASS - LESS FIRE DAMAGE*

By
Arthur R. Pirsko
Research Forester

"We have a good stand of grass this spring so we'll have another bad fire year."

"There's hardly any grass; everything is so dry, this year'll be a bad one for fires."

Which of these two contradictory, but seemingly logical statements is correct? According to an analysis of fires and grass conditions in California, the second is more accurate. We can infer that a better grass crop indicates average or better rainfall and a correspondingly higher moisture content in medium and heavy fuels; hence, fewer acres burned by wildfire.

The annual acreage burned in California was obtained from U. S. Forest Service and California Division of Forestry reports. The amount of grass cover was taken from the May 1 Livestock, Pasture, and Range report of the California Crop and Livestock Reporting Service. 1/

Grass ratings are subjective measures; 100 represents excellent grass condition; 90-99 very good; 80-89 good; 70-79 fair; 60-69 poor; 50-59 bad; 49 and less very bad. Both sets of data were for the 11 year 1951-1961 period.

By plotting these data and computing a straight line regression, we find that acreage burned is significantly related to grass condition (Figure 1). 2/ The acreage of wildlands burned decreases as the grass approaches the luxuriant optimum condition.

1/ The May 1 reports are used because they reflect the full effects of winter precipitation and the spring growing season.

2/ The calculated regression Y-786, 47-6.57X. One standard deviation is +50,000 acres. With ten degrees of freedom, the "T" test was applied and found to be 3.402, or highly significant at the one percent level.

* From RANGE AND WILDLIFE DIGEST - Northern Region, March 2, 1964

Apparently, once a minimum grass cover is established to carry fire, the excess amount of grass is not an important factor in fire spread. At this point, the controlling variables in fire spread are the effects of current and past weather.

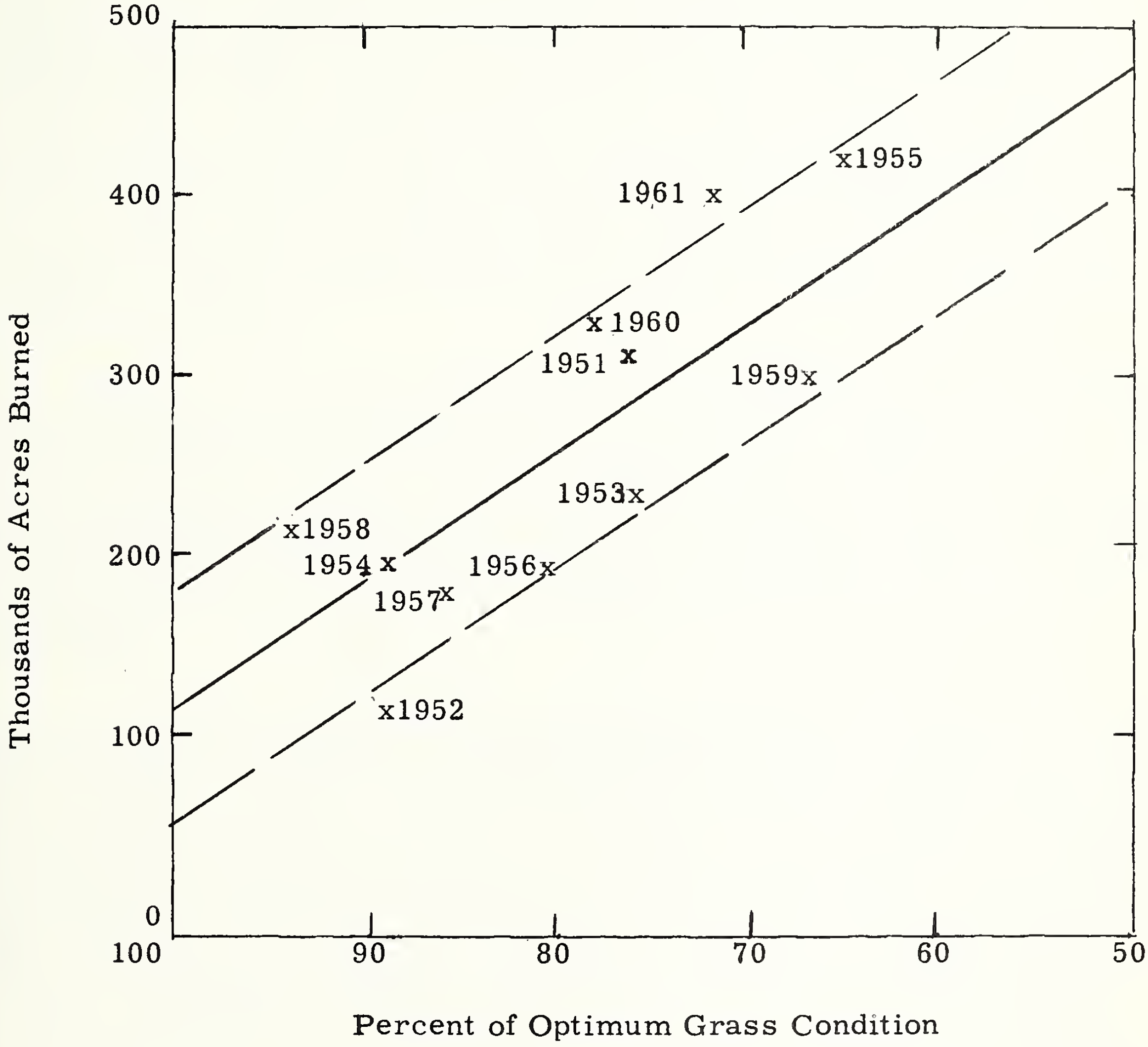

Figure 1. Regression of Acres Burned Related to Grass Condition in California, 1951-1961.

CATTLE AND THEIR SWEET TOOTH*

The results of two wholly independent studies provide a hint as to why cattle tend to over-utilize forage in open parks, and almost ignore lush grass growing under shade.

Mr. Max J. Plice reported in the JOURNAL OF RANGE MANAGEMENT (Vol. 5, No. 1, 1952) that cattle showed a marked preference for forage containing high levels of carbohydrates. Given free choice, the animals tested chose "sweet" forage, even over that with a considerably higher protein level. The frequently-noted case of very limited use of lush individual plants directly affected by animal droppings is an example. Chemical analysis shows the manure-affected plants to be considerably lower in sugar content, although higher in protein and vitamins, than the fertilized plants. ("Balanced" fertilization with chemical fertilizers, however, results in plants with high carbohydrate content, eagerly used by grazing animals.)

Mr. Plice, to confirm his findings, sprayed the plants of low palatability with molasses and other sweeteners. Cattle at once sought them out and ate them greedily. He then reasoned that sugars are important foods, and theorized that the choice by cattle of "sweet" plants might be an instinctive selection between good food materials. As a check, he sprayed the plants of low palatability with synthetic sweeteners such as saccharine. Cattle immediately ate them with relish, although the sweeteners used had no food value.

The second study, which seems to correlate with Mr. Plice's, also is reported on in the JOURNAL OF RANGE MANAGEMENT (p. 216, Vol. 12, No. 4, 1959). It states that carbohydrate levels of shade-grown grasses are markedly lower than are those of plants grown in full light. At normal nitrogen levels, plants receiving light equal to one-third of full sunlight decreased in carbohydrate content to 57 percent of normal. At high nitrogen levels the shading reduced carbohydrates to 76 percent of normal. Tests show that this response of grasses to changes in sunlight is very rapid. Carbohydrate content of individual plants is significantly higher in the evening than in the morning. On cloudy or rainy days the sugar levels of plants growing in the open and of those growing under shade are nearly equal.

The above ideas combined seem to indicate that:

Cattle have a "sweet tooth."

Shade-grown grasses are low in sugar.

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* From RANGE AND WILDLIFE ABSTRACTS - Rocky Mountain Region. February 6, 1964

Cattle, therefore, prefer open-grown forage to that grown under shade.

If the corollary drawn above is valid, there should be relatively light utilization under dense aspen as compared to that in parks. Experience shows this to be commonly true. The range manager who can figure out a way to "sweeten" his shade grown feed (short of complete fertilization or of spraying with molasses) might well solve some serious range problems.

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Never put off enjoyment
There is no time
Like the pleasant.

If you think you'r getting too much government,
Just imagine what it would be like
If you got as much as you're paying for.
INDEPENDENT, Chewelah, Washington.

Noah was the first great financier.
Remember how he floated a lot of stock?
RECORD, Stockton, Kansas.

Condition of Livestock in Relation to Range Condition*

Abstract of paper by Dr. Lincoln Ellison

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The argument that livestock condition is a reflection of range condition is partly true, but the argument that it is an accurate reflection is completely false. This is to say that range condition has something to do with the animal's condition, but not everything, and even more to the point, that there are other considerations in range condition upon which gains in animal weight bear but little.

Studies on the Plains, and indeed on our own Desert Experimental Range in western Utah, have shown that animals do better on range in good condition than on range in poor condition. To argue that the animals are therefore a barometer to the condition of the range is to fall into a logical trap. There is a correlation, and that is all. Under some circumstances on level ground the correlation may be strong; in the mountains it is usually weak.

Consider a range in which the palatable plants have been killed out and the vegetation is made up primarily of unpalatable plants. Are the animals going to go on a hunger strike and quit eating? They certainly are not. They will fill up with whatever plants may be there, and as range livestock demonstrate every year in the Intermountain West, they will get fat on them. What this proves is that plants which are not very palatable may be nutritious. You and I may like potatoes better than carrots and turnips, but as many people before us have demonstrated, if we had nothing else to eat we could get fat on carrots and turnips. When the palatable perennial herbs are gone the animals will eat unpalatable ones and annual weeds. They will eat shrubs or twigs from the lower branches of trees; and will even eat bark and fallen leaves. No animal likes an empty belly.

Most mountain rangeland that has been overgrazed has lost part of its plant and mulch cover; and whenever severe storms occur, the soil erodes. Spaces between plants are bare and the erosion is often reflected in the fact that the grasses are on remnants of soil as much as an inch or two above the general level. There is very likely to be a drainage pattern of gullies and rills. These features make no difference to the cow. She will graze a grass plant growing on an otherwise bare surface just as eagerly as she would if it were mixed in with other plants as part of a normal cover.

* From RANGE AND WILDLIFE DIGEST - Northern Region, March 2, 1964

As long as she can fill up with some kind of forage, the range will sustain the cow. But what about long-term values to the cow's decendents? If the soil continues to erode, its productivity will certainly go down, and the distance each succeeding cow has to walk between bites will get greater and greater. Eventually deteriorated range condition will be clearly reflected in poor cow condition; but only when the deterioration is extreme and the animal can't get enough to eat.

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SAFETY MESSAGE

Thinkin
drivers
don't
drink -
Drinkin
drivers
don't
think.

- - -

To MULTIPLY accidents - DIVIDE attention.

Chaining Sprayed Sagebrush on Mytoge Mountain
(Seven Mile Cattle Allotment - Fishlake National Forest)

By
James L. Mower [1] and Grant G. Williams [2]

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The chaining of 262 acres of sprayed sagebrush on the Seven Mile Cattle Allotment on Mytoge Mountain was completed in November 1963.

The project was undertaken to make the grass under the dead sage available to livestock and to develop areas for the possible harvest of native grass seed. In order to facilitate easier harvest of seed from these areas in the future, areas chained were chosen for their (1) abundance of native grasses, (2) level terrain and (3) easy accessibility from the main road.

The chain used had 90 feet of 90-pound links in its center with 90 feet of lighter 65-pound links on both ends. The heavier links in the center of the chain did the best job of pulling the sage up. The spacing of two D-7 tractors approximately 100 feet apart gave the best results (Figs 1 and 2).

Ten separate areas were treated. They ranged in size from two to fifty-five acres. Costs are summarized in Table 1.

The cost of moving equipment to, from, and between the small areas treated resulted in higher costs than if larger blocks had been treated.

One-way chaining was found to be as effective as two-way chaining which was tested on 15 acres. The dry brittle sagebrush broke and was pulled easily with a once-over job (Fig. 3).

Bitterbrush was not greatly damaged by the chaining treatment as it was more pliable than the dead sage. The breakup of the dead sagebrush made grass available to livestock that had been previously inaccessible because of the brush skeletons. These grass clumps that have been protected by the brush are more vigorous than those that have been continuously grazed over a long period of years. The increase in grass forage made available to cattle because of the chaining was estimated at 50 percent.

1/ Forester (Adm.) Assistant District Ranger
2/ Staff Officer, Fishlake National Forest

Table 1

COST SUMMARY

Item	Total Cost	Acres	Cost per Acre
47 hours chaining time @ $13 per hour	$ 611	262	$ 2.33
6 hours moving chain to and from job @ $13 per hour	78	262	.29
Chain repair	35	262	.13
Supervision and clerical cost	141	262	.53
Mileage	35	262	.13
Total Cost	$ 900		$ 3.41

Fig. 1 - View showing spacing of "cats."

Fig. 2 - View looking south showing chain cutting swath in cana sage area east of "See Sea" Overlook.

Fig. 3 - View looking east and taken just west of Mampab Pond. This is part of the area which was chained two ways. The sage on this area was the most dense, also the biggest, but was so brittle one-way chaining was as effective as chaining both ways.