

Bryant found in the Blue Mountains of Oregon that throughout most of the summer grazing season cattle favored the riparian zone but during the latter part of the grazing season they favored the upland vegetation.

In our small special management pastures, late cattle grazing did not necessarily shift more forage utilization to the streamside zone, but there was a 12% greater overall utilization of the streamside zones under late grazing compared with early grazing. Other factors, though, must be considered in the decision to graze early or late, such as the greater susceptibility of streambanks to hoof shearing during the early grazing period before banks have dried out, and the fact that late grazing can eliminate the vegetative mat needed to protect the streambank soils from the following high water flows. The timing and location of grazing in the specially managed riparian pastures can be controlled much more effectively than in the large allotment pastures, offering an easier way to get the type of grazing needed for compatibility with other resources.

Conclusions

Our studies show that, on conventionally managed allotments using rotation, rest-rotation, deferred, and season-long continuous cattle grazing strategies, cattle graze riparian range types more heavily than the uplands. Fencing streamside corridors to exclude grazing is expensive (possibly the new electric fences may solve some of this problem)

and a large amount of forage is lost. Special management pastures will also be expensive, but the forage can be efficiently utilized. Furthermore, eliminating grazing from certain allotments is not sociologically, economically, or politically acceptable; in certain situations, therefore, we must turn to some other alternative. The special management riparian pasture is a promising alternative.

By experimenting with different types of riparian and upland range, different sizes and shapes of pastures, and different ratios of riparian forage to upland forage, it may be possible to efficiently graze riparian vegetation without damaging this sensitive zone. Special management pastures would need to be larger in mountain meadow ranges than the ones we used to better match benefits derived from improved riparian and fish habitat with the costs of fencing. The influence of a cattle herd's home range on grazing use will need careful analysis; pastures may have to be larger than a herd's home range in less productive range types. When the fencing of narrow streamside corridors or the elimination of livestock grazing from the allotment are the only alternatives available for maintaining productive riparian and fishery habitats, the cost of special management pastures may not seem exorbitant.

References Cited

- Bryant, L.D. 1982. Response of livestock to riparian zone exclusion. *Journal of Range Management*. 35:780-785.

Control of Big Sagebrush by Aerial Application of 2,4-D

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The application of 2,4-D to control sagebrush is an important management tool to improve Wyoming rangelands. Big sagebrush (*Artemisia tridentata*) covers 270 million acres in the Western U.S., and Wyoming has approximately 37 million acres dominated by sagebrush.

Advantages of spraying big sagebrush are erosion control, increased moisture availability, and increased forage value. Erosion is reduced by increased basal cover of grasses, whereas with burning, there is an increased chance for erosion. The moisture availability is increased to understory plants by reducing competition from sagebrush. Through spraying, there has been an increase in forage production for livestock as well as for wildlife.

2,4-D is usually applied by air from fixed-winged planes or helicopters. Recommended rates are a maximum of 2 pounds per acre, usually applied in a total volume of 2 gallons of No. 2 diesel or water used as a carrier. Lower amounts may be applied for a lower percent control, and higher rates are not

economically feasible.

Selection of an area to be sprayed should include the following criteria:

1. Sites with an adequate grass understory.
2. Sites at higher elevations where there is adequate precipitation.
3. Sites with a sagebrush canopy cover of 15% or greater.
4. Sites with deep soils found in swells producing thick stands of brush.
5. Sites that are not critical wildlife habitat.

The sagebrush shown in the first photo is located in the Bighorn Mountains of Wyoming. Big sagebrush (*Artemisia tridentata*) cover is dense with a low forage production. The second photo represents the same area after spraying, showing a 200 to 300% increase in production of grasses (Alley 1955). Forbs showed a decrease after spraying, but 2 to 3 years following spraying, showed an increase.

Studies of wildlife use on sprayed sites were conducted for big game animals and upland game bird species. Antelope, deer, and elk were studied. Antelope were least benefited by

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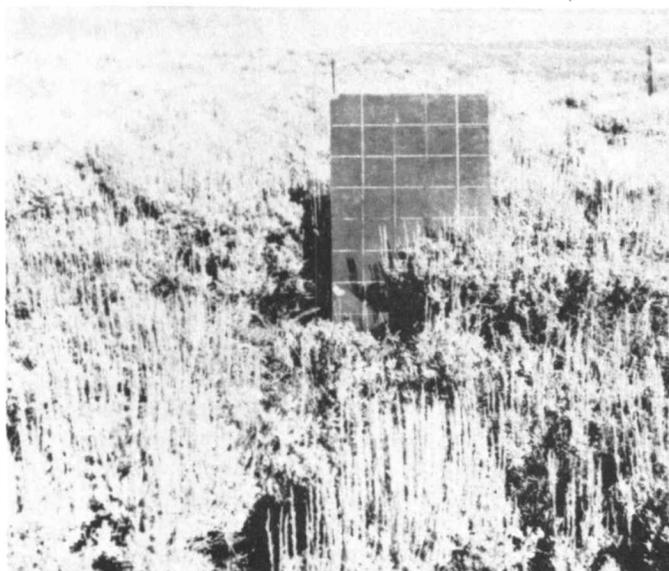


Photo by Harold Alley
Big sagebrush in the Bighorn Mountains of Wyoming. The cover is dense with low forage production. The picture of this nonsprayed plot was taken in August, 1954.

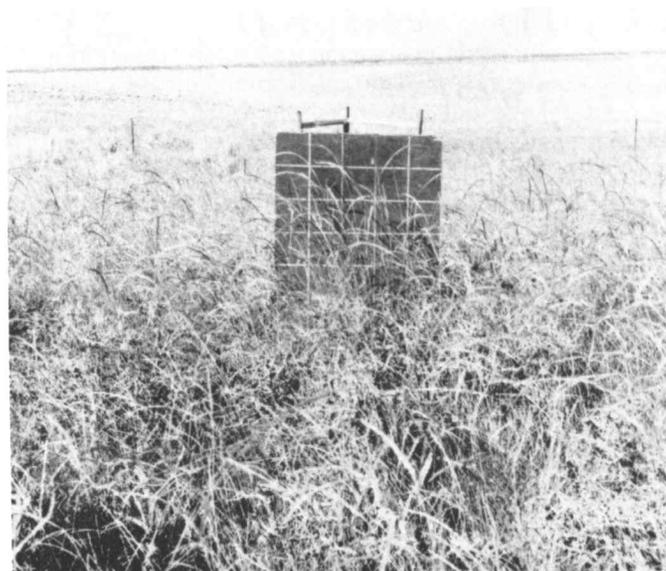


Photo by Harold Alley
Same area as the first photo following spraying. The site has a 200 to 300% increase in grass production. Forbs decreased at first but increased in 2 to 3 years. This plot was sprayed in 1952 and photo taken in August 1954.

the spraying, although after spraying, they returned to the site with little decrease in population size. If deer requirements for brush cover and quantity and quality of forbs were present, spraying dense stands of brush generally increased deer use. Elk tended to use sprayed sites for calving and grazing in the spring and low sites in the winter as long as hill tops were left undisturbed. Sagegrouse, a primary upland game bird, relies on sagebrush for cover and food. Although research showed that sagegrouse moved out of the sprayed sites the year following spraying, 2 to 3 years later they moved back to the site. Sagegrouse do need sagebrush during certain times of the year, but they also used the sprayed sites for forage of grass seedlings and forbs.

2,4-D is not as effective on black sagebrush (*Artemisia nova*) as other artemisia species due to its resprouting ability and to the dryness of its characteristic sites. Some wildlife and livestock will consume this forage, but spraying this species may not be beneficial because it is an indicator of poor range sites.

The effect that percent control and cover have on animal unit months (AUM's) depends on time of application, weather, and understory present. When control is 75% or greater with an ample understory of forage, AUM's tend to increase. Sites sprayed with a 90% kill of sagebrush have lasted up to 15 years since the first spraying programs occurred in 1954, and these sites are still being studied. Follow-up management is still important to maintain this longevity. Thus, the longevity in controlling sagebrush is of economic importance.

The cost in Wyoming is \$4.00 per acre in 1954, but declined to \$3.00 per acre until 1972 and was \$10.00 per acre in 1982. This cost includes chemical, application, and flagman. Even though the cost increased from 1972 to 1982, it is still economical to spray sagebrush-infested rangelands.

The reduction of rangelands due to growth of sagebrush is of economic importance to improve the productivity of

infested rangelands. Applying 2,4-D to infested rangelands tends to increase forage production, moisture availability, and carrying capacity. If wildlife habitat requirements are met, their populations show little decrease. A prominent Wyoming rancher, Wes Hyatt concluded ". . . that with the problem of range reduction cuts, and with ranges producing less each year due to vigorous growth of sagebrush, there have been tremendous results since spraying programs began in 1954. There was more grass available for forage production for livestock. There were increased flow from springs and better utilization of range. There was a higher percentage of calf crops, plus more pounds of calves and lambs were sold."

Aerial spraying with 2,4-D is an important management tool to control sagebrush. We need to implement management practices to take advantage of this tool and then maintain the improved range conditions.

Sources

- Allen, A.D.** Harold Alley, A.R. Hylton, and G.R. Savage. 1978. The use and effects of herbicides for rangeland sagebrush control. Environmental Protection Agency Office of Water Programs.
- Beetle, A.A.** 1960. A study of sagebrush, the Section *tridentatae* of *Artemisia*. Bull. 368, Univ. Wyoming Agr. Exp. Sta.
- Dietz, Donald R., Robert H. Udall, and Lee Yeager.** 1962. Chemical composition and digestibility by mule deer of selected forage species, Cache La Poudre Range, Colorado. State of Colorado-Department of Game and Fish.
- Holechek, Jerry L.** 1981. Brush control impacts on rangeland wildlife. J. Soil and Water Conserv., September-October 1981, p. 265-269.
- Kearl, Gordon W., and James W. Freeburn.** 1980. Economics of big sagebrush control for mitigating reductions of federal grazing permits. Agr. Ext. Serv. Div. Agr. Econ., Univ. Wyoming.