

Spray---

To Control Big Sagebrush

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Foreword

During the lifetime of the pioneers who settled in the western sagebrush country, vast areas have changed slowly from predominantly bunchgrasses to areas dominated by big sagebrush. Prior to the advent of herbicides, livestock operators and land managers had to rely primarily on rail and the use of fire and range management as a means of restoring the dominance of grass over sagebrush.

The work on the Squaw Butte-Harney Experiment Station¹ near Burns, Oregon, clearly points out the place of chemical spraying as a means of regaining the grass-sagebrush relationship found by the pioneers.

Increasing land values, economic pressure requiring more efficient production, and forthcoming increased demand for livestock products point to the need for increasing forage production on our sagebrush range land. The use of growth regulator chemicals, as outlined in the following pages, should receive careful consideration when plans are being developed for the improvement of sagebrush range.

A handwritten signature in cursive script, reading "F. E. Price". The signature is written in dark ink and is positioned above the printed name.

Dean and Director.

¹ Squaw Butte-Harney Branch Range and Livestock Experiment Station is jointly operated and financed by the Bureau of Land Management, Department of the Interior, and Oregon Agricultural Experiment Station, Oregon State College, Corvallis, Oregon.

Spray--- To Control Big Sagebrush

by

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Research has shown that big sagebrush (*Artemisia tridentata*) can be controlled easily by spray applications of growth regulators and that such control permits forage plants to make phenomenal increases in production. This summary of information gained through research is presented to guide initial field trials. As research yields more and better information, it should supplement and improve these recommendations.

What Chemical to Spray

Butyl ester of 2,4-D at 1 to 1½ pounds per acre (acid equivalent) in water at 5 to 6 gallons per acre. Add about ½ gallon of a good wetting agent or liquid detergent to each 100 gallons of water.

Butyl ester of 2,4-D has given the best control for the money even though the growth regulator 2,4,5-T has killed more brush. Do

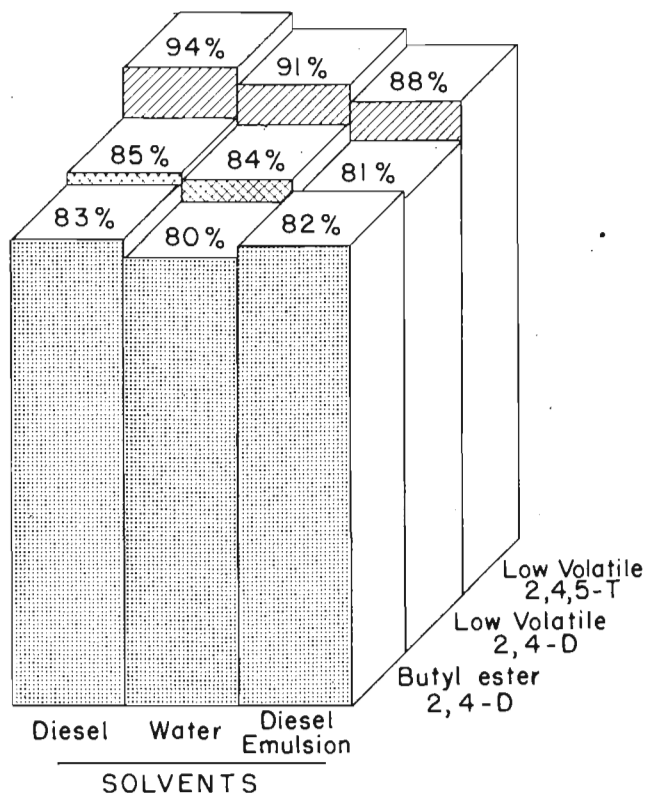


Spray big sagebrush and watch the grass grow.

not use sodium or amine salts of either growth regulator, and do not use the isopropyl ester of 2,4-D at less than $1\frac{1}{2}$ pounds per acre.

One pound of butyl ester, 2,4-D is sufficient on even-aged stands of old-mature sagebrush. Where brush seedlings are prevalent in the understory or the stand is largely young-mature, $1\frac{1}{2}$ pounds per acre should be applied. This rate will give an actual kill of about 70 to 80 per cent of the sagebrush and the crowns of the remaining live plants will be partially killed. If a higher kill seems desirable, one should consider the application of 1 pound per acre of an ester formulation of 2,4,5-T.

Diesel oil may be used as the solvent rather than water plus a wetting agent. Average results tend to be slightly better with oil than with water, but the money spent for diesel oil could be better spent for additional 2,4-D. Diesel oil does not help enough to justify



Butyl ester of 2,4-D is a good killer of big sagebrush.

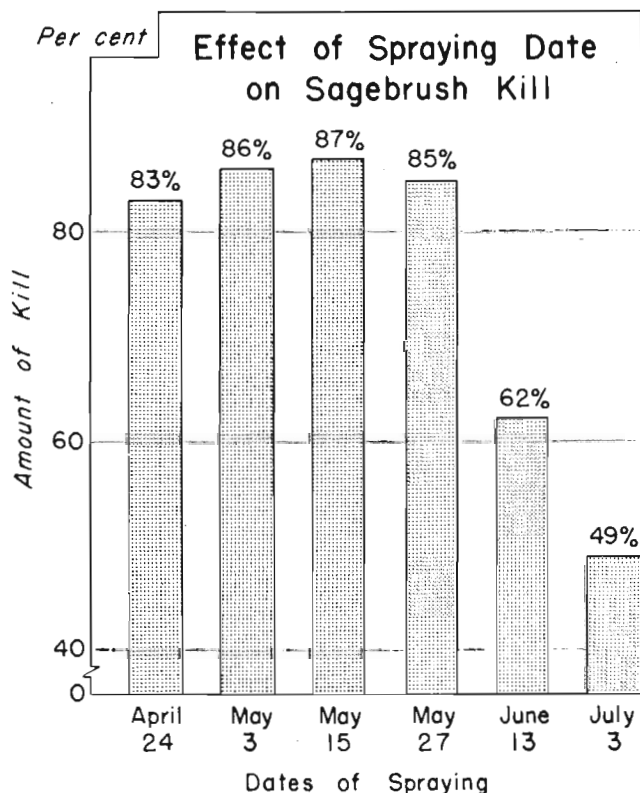
its additional cost. Water without the wetting agent is unsatisfactory; however, many commercial chemicals contain sufficient wetting agent, and it is not always necessary to add it when mixing the spray solution.

At present do not consider spraying with less than 5 gallons of solution to the acre. One pound of 2,4-D in 6 gallons of solution has given better kills than 2 pounds of 2,4-D in 3 gallons.

When to Spray

From first "head showing" development of Sandberg bluegrass (*Poa secunda*) to "green color about $\frac{1}{2}$ gone."

Sandberg bluegrass, sometimes incorrectly called June grass, is common to the sagebrush range.



Effects of spraying-date during 1952 on sagebrush kill.

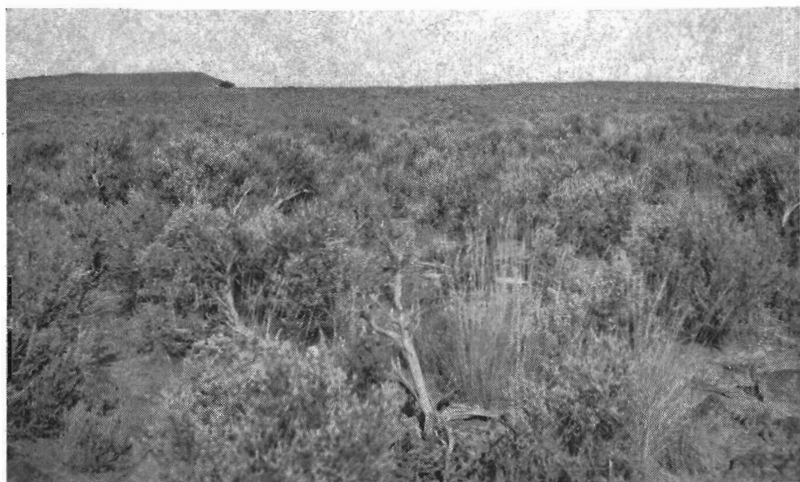
At Squaw Butte, which is located on the Oregon high desert at an elevation of 4,600 feet and which has an average annual precipitation of about 11 inches, the spray must usually be applied in May. On south, exposed sites and during dry years results will be poor from spraying during the last week of May. During wet years, and at high elevations, spraying may be fully effective into July.

Effectiveness drops quickly as lack of soil moisture and high temperatures become critical to growth activity. It has been better to spray too early than too late. As the soil dries out, Sandberg bluegrass loses green color and spray effectiveness drops rapidly. Do not spray after Sandberg bluegrass has lost half of its green color.

Where to Spray

Big sagebrush range in fair to good condition, and reseeded fields that have been invaded by big sagebrush.

To make spraying pay, there must be an understory of grasses to take over as the sagebrush dies out. Plants that move in most quickly after spraying have been squirreltail grass (*Sitanion hystrix*), June grass (*Koeleria cristata*), cheatgrass (*Bromus tectorum*), and weeds such as Lupine. Larkspur might also come in quickly after spraying where it is fairly abundant; therefore, a larkspur range must at present be considered a poor risk, even though spraying reduces the existing stand.



There must be an understory of grasses to take over as the sagebrush dies out.

On some range areas many desirable weeds may be killed, so proceed carefully with small-area trials on those ranges that produce an important quantity of good weed forage.

One of the most frequent mistakes in selecting the area for spraying may be due to incomplete consideration of the species in the brush overstory. Some are good ones (such as bitterbrush), and others (such as rabbitbrush) are worse than big sagebrush. Also remember that we have sagebrush species other than big sagebrush.

Until it is known that we can selectively kill big sagebrush out of a stand of bitterbrush, stay away from those areas or proceed slowly with small-area trials.

Do not spray where rabbitbrush is common or where sagebrush control may do more harm than good. The rabbitbrush will not be completely killed and will have the opportunity to fill in after the sagebrush dies out.

Know the different species of sagebrush, and be careful not to identify silver sagebrush (*Artemisia cana*) as big sagebrush. Silver sagebrush is found in swales where water often stands in the spring.

Big sagebrush will not stand with its feet in the water, and it is easily killed by flooding. Silver sagebrush, like rabbitbrush, can produce new sprouts at the stem base after fire or other killing back of the crown. Big sagebrush does not produce new shoots at the stem base. With this in mind it is easy to guess that silver sagebrush is more difficult to kill than big sagebrush. A spraying demonstration indicates that such a guess is correct.

Low forms of sagebrush (*Artemisia tridentata* subspecies) are also common to Oregon. They are called "black sagebrush" or "small sagebrush," because of small size, and provide some forage for both big game animals and sheep. Small sagebrush appears to be easily killed, but spraying is not recommended because in Oregon this species usually indicates that the site is low in productive capacity.

Above all, remember that the information applicable to spraying big sagebrush is not a cure for all our range. Much range land, however, is strictly big sagebrush-bunchgrass range in fair-to-good condition. Select these areas that are sure to be a success.

Other factors to consider in site selection are:

- ▶ Topography. Level topography is easier to spray evenly.
- ▶ Distance from a landing strip if spraying is to be done by airplane—the closer the landing the better.



Big sagebrush
leaves



Silver sagebrush
leaves

► Distance from a supply of water—the closer the better. If possible, use reasonably soft, fresh water for mixing the spray solution.

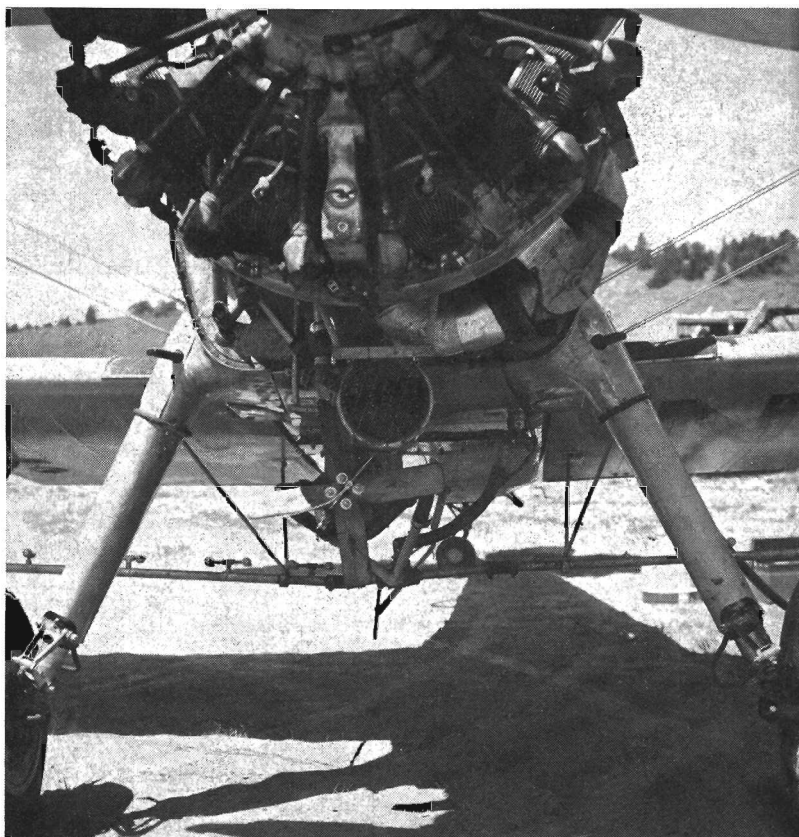
► Length of spray flight, if spraying is to be done by airplane. Make the spray flights as long as is feasible.

How to Spray

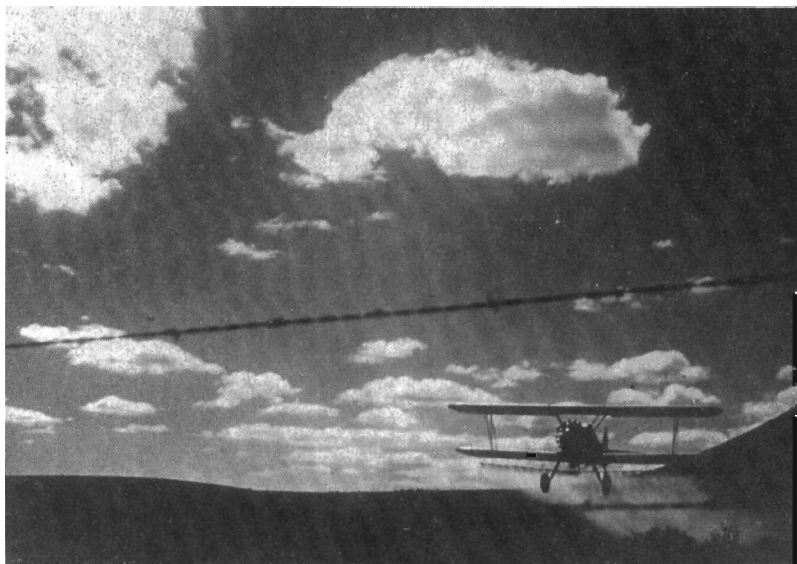
Be sure that the spray solution is properly mixed, constantly agitated, and evenly applied at the proper volume.

► Spray when the air is calm. Do not spray when the wind exceeds ten miles per hour.

► Spray at a right angle to the prevailing wind.



Spray nozzles are doubled on the right side of boom center and omitted to the left side of center to obtain better spray distribution in the propeller-wash area.



Spray from about 5 to 10 feet above the ground.

- ▶ Spray from about 5 to 10 feet above the ground.
- ▶ Do not spray during or just before a rain.
- ▶ Be especially careful if spraying near farm land and homes because drifting spray can damage crops and flowers.

▶ When spraying by airplane, flag the flights according to a good plan, with swath width not wider than 40 feet. A white sign-board 2 by 2 feet makes a good flag in the sagebrush. Each end of the spray run must be flagged, and on rough topography additional flagmen may be required. Have the flagmen follow a compass line across the field, moving one swath width after each spray flight.

Cost of Spraying

The cost of chemicals and spraying is about \$3 or \$4 per acre.

The minimum cost will occur: (1) when spraying an even-aged stand of old-mature sagebrush, (2) when spraying fairly level topography, (3) when spraying an area of 500 acres or more, (4) when spraying an area near a landing strip with readily available water supply, and (5) when there is active competition among applicators and chemical suppliers.

Value of Spraying

Two- to three-fold increase in forage production.

A 40-acre range pasture was used to obtain preliminary information on the value returned from spraying. The sagebrush was sprayed in May, 1952. Herbage production was 280, 305, and 728 pounds (air dry weights) per acre respectively in 1951, 1952, and 1953. The pasture was grazed each August. Yearling gains were



The pictures above show two adjacent plots as they appeared in July 1953. The one below was sprayed for control of big sagebrush during May 1951.

5.6, 8.4, and 17.6 pounds per acre respectively in 1951, 1952, and 1953.

As found in a study of vegetation response to spraying, we can expect: (1) an increase of 300 to 400 pounds of herbage per acre during the first year following the spraying year, and (2) production to be 500 to 700 pounds above unsprayed production during the second year. The two-year total gain equals 800 to 1,100 pounds per acre. If only half of the increase is grazed during those two years, the return is about one ton on four or five acres. Is this ton of feed worth an original cost of \$12 to \$20? Under proper grazing management the higher productivity will probably continue for many years.

Concentrate on making the spraying pay with:

► **MORE EFFICIENT LIVESTOCK GAINS.** The biggest nutritional problem on the range is often that of energy, or quantity of feed consumed. Where there is plenty to eat without too much walking, livestock will gain more.

► **IMPROVED GRAZING MANAGEMENT ON SURROUNDING UNSPRAYED RANGE.** Use the greater production on sprayed range to eliminate overstocking on the rest of it and give the grasses more freedom to grow. Grazing the native range before May is too early. Fields seeded to crested wheatgrass are recommended for the first grazing in the spring. Then the cattle can be moved to sprayed range, and by the time they are moved to unimproved sagebrush range, there should be enough grass to keep the cattle fairly content. In some cases, using spraying and seeding to improve grazing management on all the range can return more over the years than can be realized if cattle numbers are increased to utilize the forage on the acres improved by seeding and spraying. Therefore, use the increased production on improved range to reduce stocking where needed on unimproved ranges, rather than to increase the size of the herd.

► **IMPROVED BREEDING AND CALVING PRACTICES.** Smaller range pastures for calving and breeding will often result in more calves and more efficient use of high quality bulls.

Treatment After Spraying

Leave a lot of grass seed heads standing.

You will not need to prevent grazing on the sprayed field, but you should graze lightly while the grass is green for two or three years. Because of the greater amount of forage produced, continua-

tion of the pre-spraying rate of stocking will often result in light grazing after spraying.

It is important to recognize that the initial response in production is due to greater growth by the existing forage plants. To gain full benefit from spraying, these plants must be permitted to reseed and close the community with forage species, or the sagebrush may come back thicker than before spraying.

Let the watchword be: *Leave a lot of grass seed heads standing.*

The area should be fenced or otherwise placed under good grazing control. Prepare a management plan before spraying.

As a rule, do not plan to remove or burn the dead standing brush.

In conclusion, it is recommended that spraying is for the control of big sagebrush, not for its eradication. There will be some sagebrush remaining after spraying, and others will come in. Moderate grazing, especially during the spring and early summer, will help to insure that the grasses have enough strength to fight the sagebrush as it tries to come back.



Do not plan to remove or burn the dead standing brush. The brush will drift and hold the snow where the moisture is needed by forage plants.