

# An Eastside Sierra Nevada Aerial Spraying Project

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Aerial application of 2,4-D to control big sagebrush, (*Artemisia tridentata*,) has been widely used on western ranges for several years with varying degrees of success. The role of hormone-type chemicals in the range improvement field has been well established. Brush control by this means is the most economical improvement measure that can be undertaken in many range situations.

Early research concerned with chemical control of big sagebrush established basic criteria concerned with chemical formulation and rate, kind and amount of carrier and time of application. Land managers have since refined some of the methods and techniques developed earlier. The following account of sagebrush spraying with fixed-wing aircraft summarizes an experience in northeastern California which may add to present knowledge.

## Project Area

The project area was locally known as the Signal Butte unit of the Eagle Lake allotment, Lassen National Forest. This 700-acre, relatively flat mesa constituted a naturally isolated grazing unit. Slope varied from five to 10 percent. Annual precipitation approximates 25 inches and occurs mostly during the December to May period. The soil is a deep, fertile sandy loam, typical of many big sagebrush areas.

Vegetation on the area before treatment consisted of big sagebrush, black sagebrush (*A. arbuscula*), antelope bitterbrush (*Purshia tridentata*), Idaho fescue (*Festuca Idahoensis*), sandberg bluegrass, (*Poa secunda*),

mine pre-treatment cover. These data provide a measure of plant frequency by species but do not indicate the extent of the brush canopy. The latter was estimated to occupy between 50 and 60 percent of the project area.

The project area was grazed by cattle prior to 1956 and pro-

Table 1. Toe-point record (hits) of vegetation and surface soil condition before and after spraying.

Item	Before	After
<b>Ground Surface</b>		
Bare Soil	47	17
Erosion Pavement	9	3
Rock	3	0
Litter	13	12
	<hr/>	<hr/>
	72	32
<b>Shrubs</b>		
Big sagebrush	10	0
Black sagebrush	1	0
Antelope bitterbrush	1	0
	<hr/>	<hr/>
	12	0
<b>Herbaceous Plants</b>		
Idaho fescue	4	33
Needlegrass	1	21
Sandberg bluegrass	1	0
Squirrel tail	0	7
Sedges	9	6
Forbs	1	1
	<hr/>	<hr/>
	16	68
	<hr/>	<hr/>
<b>Total</b>	<b>100</b>	<b>100</b>

squirrel tail (*Sitanion hystrix*), needlegrasses (*Stipa occidentalis* and *S. columbiana*), sedge (*Carex spp.*) and several annual forbs. The "toe-point" method<sup>1</sup> of sampling was used to deter-

mined about 90 cow months of grazing. From 1956 to the present the area has been grazed ex-

<sup>1</sup>Range analysis field guide, 1960, California Region, U.S. Forest Service.



FIGURE 1. Aerial spraying is quick and easy over sagebrush ranges.

clusively by sheep. A band of 900 head grazes the unit early in June and again during August and September, providing about 405 sheep months of grazing annually.

### Treatment

The vegetation on the project area was sprayed with butoxy ethanol ester of 2,4-D using a fixed-wing plane. Spraying was done during a 5-day period in late June 1959. Operations were discontinued when wind velocity exceeded four MPH and/or temperature rose about 70 degrees F. Current leader growth of big sagebrush averaged 3½ inches. Soil moisture was readily available at a 3-inch depth. Two pounds of 2,4-D were applied in mixture with one half gallon of diesel oil and nine gallons of water per acre (total volume of ten gallons). Table 2 summarizes the costs of the entire project.

### Results

Treatment effects were readily apparent by the fall of 1959. Two years later, 1961, the project area vegetation was re-inventoried by the toe-point method. Comparison of before and after treatment

**Table 2. Range improvement costs, 700-acre Signal Butte unit.**

Item	Dollars
2,4-D	1358
Diesel oil	78
Mixing	300
Flagging	200
Application	1225
	Total
	3161
	Per acre
	4.50

data (Table 1) shows about a fourfold increase in desirable forage species. Control of sagebrush was nearly complete. Elimination of brush competition was reflected in increased vigor and herbage production of residual grass plants. Needlegrass and squirrel tail seedlings had become established in the former bare interspaces in the two year period following spraying. Although not apparent from the inventory data, bitterbrush was not materially affected. Some minor burning of current growth occurred in the year of treatment but the plants recovered and were more thrifty subsequently.

Grazing capacity of the area was increased from 405 to 1920

sheep months as a result of treatment. Equally significant was the increased availability of herbaceous vegetation. Travel conditions for the grazing animals were materially improved and should continue with deterioration of brush plant skeletons.

### Discussion

The improvement in ground cover and grazing capacity indicates the kind and magnitude of benefits that can be expected from chemical control of sagebrush on rangelands. It should be borne in mind, however, that an adequate, desirable, herbaceous, residual cover is necessary if maximum release benefits are to be realized. Seeding to adapted forage species is necessary where a good residue of native herbaceous plants is not present under the brush. Damage to bitterbrush can be avoided by proper timing of herbicide application. At least one and one-half growing seasons of rest from grazing after treatment should be provided for plant vigor restoration. Sound, conservative management should follow.