SEASONAL RESPONSE OF BITTERBRUSH TO BURNING AND CLIPPING IN EASTERN OREGON

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Antelope bitterbrush *(Purshia tridentata)* is a valuable browse species in western North America. Its leaves and twigs contain high levels of protein, commonly above 15 percent in summer and fall, and are relished by livestock and big game. Where it is abundant, bitterbrush contributes significantly to the winter diets of deer, elk, and antelope.

The range of bitterbrush has been estimated at 340 million acres making it one of the most widely distributed western shrubs. In Oregon it grows in every county east of the Cascade Mountains and locally in Jackson County. It has been found above the 7,000-foot level on Hart Mountain to below 300 feet elevation near the Columbia River. It grows extensively with ponderosa pine on the east slopes of the Cascades, and is commonly associated with western juniper and big sagebrush in eastern Oregon.

Thousands of acres of bitterbrush have been exposed to wildfires in the western states. In general, bitterbrush has been harmed by fire on most sites, and has been classified as a weak sprouter. Consequently, a study was conducted to isolate some of the environmental variables which may be responsible for sprouting of bitterbrush after burning or mechanical top removal.

METHODS

Two sites representing different plant communities were used for several treatments during the fall of 1977 and spring of 1978. Site I is about 19 miles northwest of Burns on a juniper/big sagebrush--bitterbrush site, and supports an erect, tree-like form of bitterbrush up to 15 feet tall. Site II is about 26 miles northwest of Riley on a ponderosa pine/bitterbrush site. On site II, bitterbrush is a decumbant, free branching shrub seldom more than three feet tall. Soil depth and texture are similar on both sites, although the surface layer on site I is more coarse, and contains less litter. Elevation and precipitation on both sites also are similar but snow persists about two weeks longer on site II.

Fall treatments were applied in August when 95 percent of the seeds had been shed. Burn treatments consisted of individually burned, pre-watered, post-watered, or unwatered plants. The burning was conducted with an individual plant burner calibrated to attain a soil surface temperature of 500 degrees Fahrenheit, 45 seconds after flame initiation. In the watered treatments, water was applied as a fine mist either 24 hours before, or immedinately after, burning to simulate a two-inch storm. Fall clip treatments included severing two sets of plants within four inches of the soil surface. One of the sets of severed plants also was watered.

Spring treatments included burning one set and clipping one set of plants on each site. The spring treatments were applied in early April as soon as the sites were accessible.

RESULTS

Bitterbrush on both sites was damaged by burning. The pre-watered plants were expected to sprout better than unwatered, fall-burned plants because higher soil moisture should have protected dormant buds near the soil surface. However, none of the unwatered or pre-watered, fall-burned plants on site I sprouted, nor did any of the unwatered plants on site II. Twenty percent of the pre-watered plants on site II did sprout.

Similarly, post-watered plants were expected to sprout more often than unwatered plants because water was applied immediately after burning and should have removed immediately the heat which damages both dormant buds and cambium. Only 10 percent of the post-watered plants sprouted on each site, however. The response of these plants, watered either before or after burning, indicates that soil moisture on these two sites may not be critical for sprouting of fall-burned plants.

Spring-burned plants sprouted better than fall-burned plants. On site I, 30 percent of the plants sprouted, and on site II, 50 percent. Because the plants were dormant during fall burns, but had initiated growth before the spring treatments, and because soil moisture was considered not to be a major factor, one possible explanation for the better spring response is air temperature. The temperature during the spring treatments was 54 degrees Fahrenheit at site I and 50 degrees Fahrenheit at site II, compared with 84 and 81 degrees Fahrenheit, respectively, during the fall treatments. Thus, the spring burns were conducted under cooler conditions.

Clipped plants sprouted better than burned plants. On site I, 60, 40, and 40 percent of the fall-clipped, fall clipped then watered, and spring-clipped plants sprouted, respectively. One site II, 40, 50, and 90 percent of the plants under these treatments sprouted.

The results of this study have several implications for bitterbrush management. First, growth form appears to affect sprouting after burning or clipping. The decumbant growth form on site II sprouted better than the erect form on site I in every treatment except the fall-clipped plants. This result has been confirmed by studies in other areas. Second, plants treated in the fall were harmed more severely than spring-treated plants even though fall-treated plants were dormant and spring-treated plants were not. The reason for this is unclear, although similar responses, especially to burning, have been reported in other areas. Third, burning treatments were more detrimental than clipping. Thus, planning fire treatments where bitterbrush is an important forage species should consider growth form, and type and season of treatment.