Chamise Control with Aircraft

herbicides applied by aircraft in spring following fall burn controlled chamise sprouts and brush seedlings in range test

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The use of aircraft to apply herbicides in the control of chamise and associated brush species—as a follow-up to controlled burning and seeding—was studied on a chamise dominated area. The test site was at a 1,400′ elevation in the foothills of the west slope of the Sierra Nevada, about 10 miles west of Placerville.

Chamise is the most characteristic and abundant member of the California chaparral. Of the 8.5 million acres of chaparral vegetation in the state, an estimated 5–5.5 million acres are predominantly chamise.

Attempts to convert chamise lands by burning have been directed toward increasing forage for livestock and improving the habitat for deer. Unless the burns are small and scattered, so browsing by livestock will keep regrowth under control, the lands quickly revert to a stand of brush, frequently more dense than before. Successful seeding of burns to grasses and other forage plants will provide competition to the regrowth of brush and invasion of undesirable herbs. Combined with browsing by animals, plant competition will delay reclaiming of the site by chamise. However, the result quite often is the same, whether or not the burns are seeded. There are few examples of complete conversion to desirable forage species by burning and browsing, or by burning, seeding, and browsing.

General view of 10-acre converted chamise chaparral field. The brush was crushed in 1954, burned and seeded in 1955, and sprayed with two pounds 2,4-D per acre in 1956. The picture was taken July, 1957.

The use of chemicals offers considerable promise in controlling regrowth of chamise and the seedlings of other chaparral species when applications are made at proper growth stages of the plants and under favorable conditions of soil moisture.

Broadcast spraying of brush areas with ground equipment is often difficult because of topography, rocky nature of the terrain and the density of the brush or the fire-killed stems. However, such spraying has been highly successful in experimental studies.

Aircraft spraying is more practical than ground equipment in applying chemicals for brush control on most of the chaparral lands. In the United States, most aircraft spraying has been confined to applications on mature stands of brush. Outside of California little has been done with aircraft spraying as an adjunct to initial removal of brush by fire

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Differences in the control of chamise sprouts by aircraft spraying are clearly indicated in this photo. The area to the right of the road was burned 2½ years prior to spraying, the area to the left in the fall prior to spraying. Both areas were sprayed with the same mixture simultaneously.

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or other methods. Therefore a study was initiated to develop information on that specific point.

Formulations of 2,4-D and 2,4,5-T or combinations of the two were the spray materials used. The main formulations tested were the butoxy ethanol esters and the mixed propylene glycol butyl ether esters. The main additive was water; but others included diesel oil, kerosene, and various nontoxic spray oils.

The most dependable chamise-sprout control by aircraft applications was achieved by spraying in the spring following a summer or fall burn. The main factors affecting chamise-sprout control appear to be adequate soil moisture, uniform spray coverage—as for all types of foliage spraying—and the age of the sprouts which is important after the first year. Older sprouts become increasingly hard to kill until individual plant treatment is required for satisfactory results.

Diesel emulsions proved superior to straight oil mixtures. When used correctly, consistent results were generally obtained ranging as high as 95% kill of sprouts and 100% of the seedlings.

In these studies, the brush seedlings of all species encountered were controlled. However, some seedlings emerged and were established after spraying in certain test areas that had not been seeded following burning or where grass failed to become established. In those cases where —for various reasons—no grass was established or where the stand was sparse, there was generally some delayed germination and survival of brush seedlings following the spraying. This points out the importance of seeding and establishing grass as an essential part of the whole control operation.

When plant sensitivity is not optimum, a mixture of 2,4-D and 2,4,5-T appears to result in a greater kill of chamise sprouts than does 2,4-D by itself. A dosage of three pounds of acid equivalent per acre was clearly superior to two pounds in obtaining a satisfactory kill.

Total volume of grass production, especially of established perennials, is greatly increased when brush competition is reduced or eliminated by spraying. A single application of two pounds of 2,4-D per acre nearly tripled forage production the following year.

An aircraft spray application the spring following a fall burn results in a remarkable general kill on a broad range of brush seedlings, and it also kills most of the chamise sprouts. However, the sprouts of other nondeciduous plants are generally not killed by the spray application, although they are severely injured. Probably a ground-spray application on those sprouts in the fall following the spring aircraft spraying would give the best results. Many sprouts, including toyon and a sprouting manzanita, have been killed by a single application of the spray. More than one application was necessary to complete the cleanup job on live oak, leather oak, scrub oak, and coffeeberry. By starting the ground spraying in the fall, very small amounts of chemical per bush were needed, thus simplifying the cleanup job. The spray mixture used was one gallon of brush killer —4-pound mixture of 2,4-D and 2,4,5-T esters—in one gallon of diesel oil and enough water to make 100 gallons of spray.

Successful control of sprouting chamise by aircraft depends on two conditions. First, the sprouts must be fully emerged and they must be small—within the first growing period following burning—to ensure a high mortality of the sprouting burls. Second, the soil moisture must be high. This means a rather short critical period between full emergence of the sprouts and loss of soil moisture due to summer drought when the plants rapidly become less susceptible.

General view of a 30-acre converted chamise chaparral field. The brush was crushed in 1953, burned and seeded in 1954, and sprayed with two pounds 2,4-D per acre in 1955.

Conversion of selected areas of chamise to grassland within a relatively short period of time appears entirely possible—provided initial removal of the brush, usually by burning—is followed by successful reseeding in the late fall and by aircraft spraying for sprout and seedling control in the spring.

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No sprouting occurred during the entire storage period at 32°F. At higher temperatures some of the treated tubers showed signs of more active sprouting than did untreated tubers. As the storage temperature increased from common—45°F–55°F—to 50°F and 59°F, some of the sprouts of the treated tubers were noticeably longer than those on the untreated. At 59°F there was a wide range in length of sprouts. Tubers from plants receiving full coverage of MH-40 developed rosette type sprouts. Because of this wide variability in sprouting, no sprout weight measurements were recorded.

The difference in sprouting found among treated tubers strongly suggests that the application of the growth regulator by aircraft was not uniform. Drifting and overlapping of swaths of spray is more than likely when aircraft spraying results are measured. Many growth regulators are found in small quantities in plants. Small dosages of such substances can stimulate growth activity.

Chip color was markedly influenced by storage temperature and reducing sugar content. Chips made from tubers stored at 32°F and 41°F were unacceptable because of a dark brown color. Chips from tubers held at 50°F and higher temperatures were lighter in color and acceptable.

Tubers held at 32°F and then placed into 68°F for reconditioning for three weeks did not produce chips which were acceptable. However, tubers from the 41°F storage were reconditioned after two weeks at 68°F and gave the same colored chips as tubers stored at 59°F.

Where the reducing sugar content of tubers was 0.20% or less, chips were of acceptable color. No difference in chip color was found between untreated and treated tubers at similar storage temperatures.

Further studies are in progress to evaluate ground spray foliar applications.

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