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CHEMICAL BRUSH CONTROL ON CENTRAL OREGON PONDEROSA PINE LANDS

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Practical brush control appears to be within sight for some of the problem areas in central Oregon as a result of experiments conducted on the Pringle Falls Experimental Forest and Deschutes National Forest. Small-plot trials to determine which chemicals will kill manzanita (Arctostaphylos parryana var. pinetorum (Rollins) Wiesel. & Schrieb.) and snowbrush (Ceanothus velutinus Doug.), and at what season, were made in 1953 using a hand sprayer. In 1954, the hand-sprayer tests were continued with a few of the more promising chemicals, and aerial application was tried on a pilot-plant scale.

These trials show that manzanita (a nonsprouting species) can be completely killed and snowbrush (a sprouter) set back with as little as 1 pound of 2, 4-D per acre. Aerial application was effective with spray volumes as low as 3 gallons per acre. Good results were obtained when sprays were applied from May through mid-July--from the time manzanita blossoms started to fall until snowbrush came into full bloom.

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Chemicals tested were:

1. Low volatile ester of 2, 4-D (propylene glycol butyl ether esters).
2. Butyl ester 2, 4-D.
3. Low volatile ester 2, 4, 5-T.
4. Mixed low volatile esters of 2, 4-D and 2, 4, 5-T.
5. Low volatile ester 2, 4, 5-TP.

The low volatile ester 2, 4, -D proved to be equal to the more expensive 2, 4, 5-T and the mixture containing 2, 4, 5-T; it was superior to the butyl ester 2, 4-D and low volatile ester 2, 4, 5-TP.

One pound per acre (acid equivalent) of low volatile ester 2, 4-D applied from a fixed-wing airplane produced a 100-percent kill of manzanita. In the same trial, only 18 percent of the snowbrush plants showed a complete kill of aerial portions. When 2 pounds of 2, 4-D were applied, the kill of snowbrush rose to 48 percent. Increasing the dosage to 3 pounds, however, did not further increase snowbrush kill.

Carriers used in the aerial spraying trials were:

1. Oil-in-water emulsion with 1 gallon of summer oil per acre.
2. Oil-in-water emulsion with two-thirds gallon of diesel oil per acre.
3. Straight diesel oil.

In applying the summer-oil emulsion, 3, 5, and 10 gallons of spray were used per acre. For the diesel-oil emulsion, the spray was applied at the rate of 6-1/2 gallons per acre and for straight diesel oil, 3 and 5 gallons per acre. In the case of emulsion carriers, water was added to obtain the desired spray volume. All carriers proved equally effective within the range of spray volumes tried. Results on shinnery oak^{2/} in the Southern Great Plains indicate that the cheaper diesel oil-in-water emulsion is just as effective for low volume sprays as the summer oil-in-water emulsion.

^{2/} McIlvain, E. H. Shinnery oak is yielding to 2, 4-D. Down to Earth 8: (4), pp. 6-7, illus. Spring 1953.

Season of application exerted a pronounced effect on the kill obtained with chemical sprays. In these tests, 2, 4-D, 2, 4, 5-T, and mixtures of the two were applied at a uniform rate of 3 pounds (acid equivalent) per acre. Applications were repeated from mid-May to mid-August. All applications between May 18 and July 16 resulted in uniformly high kills (table 1). After that date, percent of kill for both manzanita and snowbrush decreased rapidly. Stage of plant development is probably a better criteria of time to spray than calendar date. On this basis, results with both brush species were good until snowbrush was past full blossom.

Damage to young ponderosa pines growing in the sprayed areas was variable. Trees fully exposed to dosages of 2 pounds or more of 2, 4-D per acre were either completely killed or nearly so. Damage from 1 pound per acre ranged from slight burning of needle tips to killing of terminal buds on some twigs and possibly on some leaders.

Small trees growing underneath brush are partially shielded from the spray. Where either 2, 4-D or 2, 4, 5-T was applied at the rate of 3 pounds per acre in straight water carrier, 55 percent of the understory trees were unharmed, 32 percent damaged, and 13 percent killed. Where oil was used as the carrier, however, only 10 percent of the understory trees escaped injury altogether.

No records are available to show how much damage is done to brush-suppressed trees when only 1 pound of 2, 4-D per acre is used. It seems probable, however, that only a few trees would suffer injury under such circumstances.

Discussion. Because snowbrush resprouts rapidly, effective chemical brush control in central Oregon pine forests is currently limited to those areas where manzanita is the predominant species. On manzanita-dominated areas, 1 pound of 2, 4-D per acre is recommended because it will control brush just as effectively as higher dosages but with much less damage to existing trees.

Oil-in-water emulsion is believed to be the most promising carrier because it gave results comparable to a straight oil carrier. Diesel oil looked best for the oil component in the emulsion because it costs less and is as good as summer oil.

Present information indicates a spray consisting of 1 pound (acid equivalent) per acre of low volatile ester 2, 4-D in a 3-gallon emulsion carrier containing 1 gallon of diesel oil will be effective.

Further trials may show that one or more of the following items can be reduced without loss of effectiveness: amount of 2,4-D, total spray volume, or amount of oil used in the carrier.

In the 1954 trials, costs of applying 1 pound of 2,4-D per acre through aerial spraying were not excessive. Materials cost \$1.52, flying \$1.25, and total cost was only \$2.77 per acre. Flagging and administrative costs were in addition to these figures.

Further research is planned to help make chemical brush control a more effective tool for the pine forester by achieving a better kill on snowbrush and reducing damage to young pines.

Table 1.--Results of spraying manzanita and snowbrush by
date and stage of plant development 1/

Date of appli- cation	Stage of plant development	Results
May 18 and 25	Manzanita - blossoming in last stages Snowbrush - no visible signs of plant activity.	Manzanita-100% kill Snowbrush-nearly 100% kill of aerial parts.
July 1	Manzanita - blossoming complete, new berries forming, terminal buds on twigs about to burst. Snowbrush - twig growth about 20% complete, new leaves one-fourth to three-fourths full size, blossoms nearly ready to open.	Manzanita-100% kill. Snowbrush-100% kill of aerial parts.
July 16	Manzanita - shoot growth on most plants 2 to 3 inches long with a few just starting, largest new leaves three-fourths full size. Snowbrush - in full blossom (first blossoms noticed July 8th). Twig growth well along, full sized new leaves on almost all plants.	Manzanita-100% kill. Snowbrush-100% kill of aerial parts.
July 31	Manzanita - next year's flower buds set, some berries fully developed, and twig growth complete. Snowbrush - blossoms gone, new fruit set, twig growth continuing.	Manzanita-77% of plants killed. Snowbrush--aerial parts completely killed on 64% of plants.
August 13	Manzanita - current year's growth entirely complete, fruits fully developed, old and new leaves similar in appearance. Snowbrush - current year's growth complete except sprouts on injured plants, old and new leaves similar in appearance, fruits mature.	Manzanita-62% of plants killed. Snowbrush--aerial parts of 55% of plants completely killed.

1/ Hand sprayer used. Complete coverage obtained on both dominant and suppressed plants.