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Control of Madrone and Tanoak Stump Sprouting[1]

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MADRONE *(Arbutus menziesii Purch.)* and tanoak *(Lithocarpus densiflora* (H & A) Rehd.) are often considered undesirable along the Pacific Coast. These weed trees are removed to increase forage production; to remove competitors of more valuable timber trees, especially Douglas fir (*Pseudotsuga menziesii* (Mirb) Franco); or to obtain firewood or charcoal. Tanoak is occasionally cut for tanbark harvest. Control of stump sprouting following cutting would be desirable.

Both madrone and tanoak sprout vigorously after being cut. Sprout growth is so rapid that cutting these species provides only temporary release for other crop trees (4, 5, 6). Sprouts of both species may reach twelve feet in three growing seasons. Madrone or tanoak sprouts are rarely browsed heavily enough to control regrowth. Likewise they are difficult to control by repeated burning.

Killing stumps with herbicides is not new. Sodium arsenite and other chemicals were used before discovery of the phenoxy herbicides. Stump spraying with the esters of the latter herbicides in oil is widely used to prevent or reduce sprouting of stumps. Their effectiveness has been known since at least 1948 (1). The effectiveness of concentrates of the mixed alkanolamine salts of 2,4–D (2,4–dichlorophenoxyacetic acid) to prevent or reduce sprouting represents the basis of recommendations by Leonard and Harvey (3). The present study is a comparison of the effectiveness of the ester and amine treatments in preventing or reducing sprouting of madrone and tanoak.

METHODS AND MATERIALS

Madrone and tanoak grow in a region of warm to hot dry summers and mild wet winters with only occasional snow. Stumps were treated in each of the four seasons. The field work was at Garberville, California, 175 miles north of San Francisco and near the coast. Annual rainfall averages 56 inches there, with almost no precipitation between May 15 and October 1.

Treatments were on April 19, 1956, July 12, 1956, October 10, 1956 and February 6, 1957. Forty trees of each species were cut on each of these dates. Stems were cut at a twelve-inch stump height. If a group of stems appeared to be joined underground (probably sprouts from an earlier stem) they were considered as one tree. The number of stems per tree varied from 1 to 5 in madrone and 1 to 7 in tanoak, respectively averaging 1.6 and 1.8. Stem diameter twelve

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inches above the ground varied from 1 to 24 inches for madrone and 1 to 20 inches for tanoak.

Herbicides were applied, not more than one hour after tree cutting, to ten trees of each species at each date with the following treatments:

1) Mixed alkanolamine salts of 2,4–D (4 lb/gal ae), hereafter referred to as 2,4–D amine, daubed on the top of the stump with a paint brush. With stumps six inches or less in diameter, the entire top surface was covered with 2,4–D amine by daubing the brush up and down. More material is applied by daubing than by just painting. Larger stumps were treated in a 3- to 4-inch peripheral band on the top of the stump. The amount of 2,4–D applied averaged 74 cc per square foot of stump top, roughly equal to treating 260 six-inch stems with 1 gallon of 2,4–D amine.

2) Entire stump sprayed wet to the ground surface with a 16 lb aehg solution of 2,4–D butoxy ethanol ester, hereafter referred to as 2,4–D ester, in diesel oil.

3) Entire stump sprayed wet to ground with a total of 16 lb aehg of a solution containing equal parts of 2,4–D ester and the butoxy ethanol ester of 2,4,5–T (2,4,5–trichlorophenoxyacetic acid), hereafter referred to as 2,4,5–T ester, in diesel oil. The amount of spray material used in treatments 2 and 3 averaged 1 gallon of spray material for each 5.63 square feet of stump top. This is roughly equal to treating 30 stumps six inches in diameter with one gallon of spray solution.

4) Ten trees of each species were cut at each of the four dates and left untreated as a check.

RESULTS AND DISCUSSION

All stumps were observed for 3 successive years after treatment. The number, height, and condition of sprouts were recorded in June, 1957, August, 1958, and May, 1959.

New sprouts continued to appear on untreated stumps of both species following all cutting dates for two growing seasons. There was no increase in the total number of sprouts between the second and third growing season. Untreated tanoak stumps consistently produced half again as many sprouts as did madrone at all dates of cutting (Figures 1 and 2). Both species produced the greatest number of sprouts when cut in April, and the least when cut in February or July.

Average sprout height continued to increase throughout the three years measured. The differences in sprout length between species varied with the season at which the trees were cut. Average sprout length of check trees cut in February was more than twice as great for madrone as for tanoak, but tanoak had a greater mean sprout length than madrone with all other cutting dates (Figures 3 and 4). Madrone produced the longest sprouts when cut in February, but tanoak produced the longest sprouts when cut in April.

The number of sprouts per stump on treated and untreated stumps of the two species were analyzed by the chi-square method

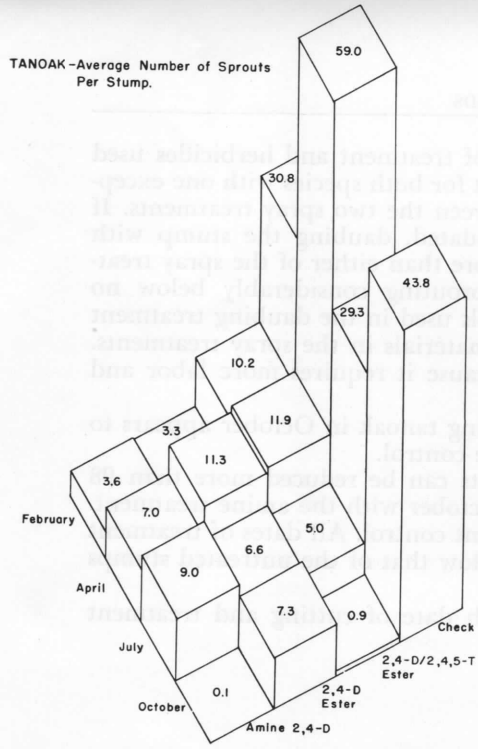

Figure 1. Tanoak—average number of sprouts per stump.

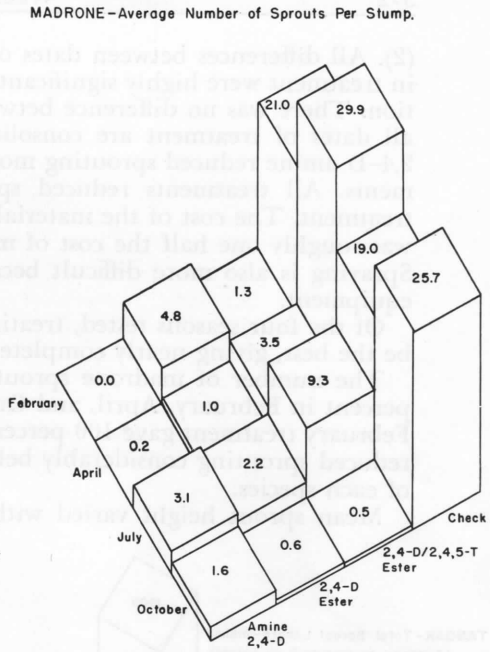

Figure 2. Madrone—average number of sprouts per stump.

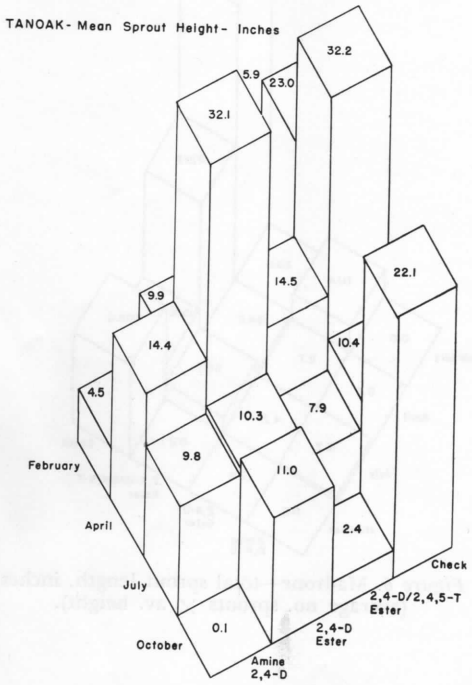

Figure 3. Tanoak—mean sprout height, inches

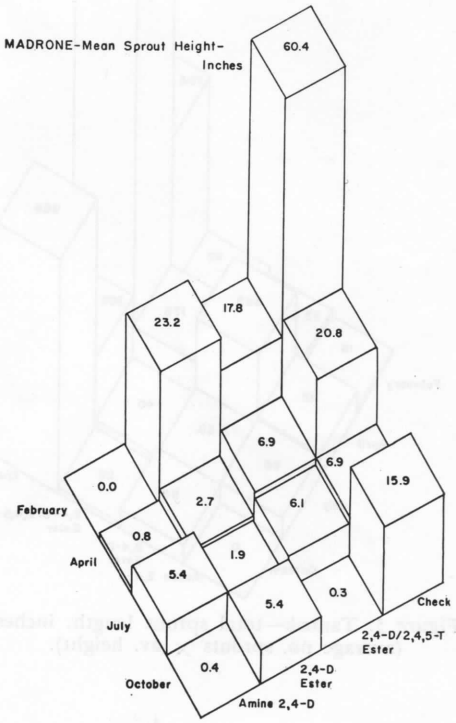

Figure 4. Madrone—mean sprout height, inches

(2). All differences between dates of treatment and herbicides used in treatment were highly significant for both species with one exception. There was no difference between the two spray treatments. If all dates of treatment are consolidated, daubing the stump with 2,4–D amine reduced sprouting more than either of the spray treatments. All treatments reduced sprouting considerably below no treatment. The cost of the materials used in the daubing treatment was roughly one half the cost of materials in the spray treatments. Spraying is also more difficult because it requires more labor and equipment.

Of the four seasons tested, treating tanoak in October appears to be the best, giving nearly complete control.

The number of madrone sprouts can be reduced more than 98 percent in February, April, and October with the amine treatment. February treatment gave 100 percent control. All dates of treatment reduced sprouting considerably below that of the untreated stumps of each species.

Mean sprout height varied with date of cutting and treatment

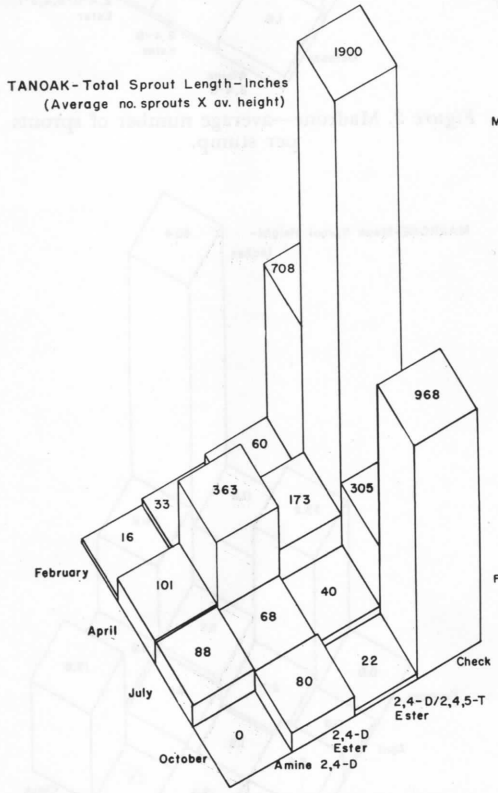

Figure 5. Tanoak—total sprout length, inches (average no. sprouts × av. height).

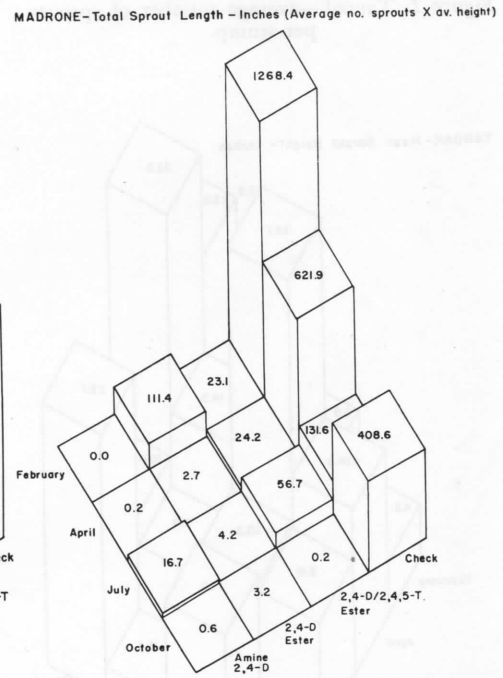

Figure 6. Madrone—total sprout length, inches (average no. sprouts × av. height).

used. With each species these variations closely resembled the variations in numbers of sprouts per stump. Control of sprout height of madrone was best from daubing 2,4–D amine on the cutting dates that produced the longest sprouts on untreated stumps (February, April, and October). Control of sprout height of either species was poorest from treatment in July when compared with the untreated stumps cut at the same date. This was also the month of the shortest sprout length on the untreated stumps of each species.

A volume figure that more nearly describes the sprouting condition as it appears in the field was determined by multiplying the average number of sprouts per stump by the average height of the sprouts. This gives a figure approximating the total length of sprouts produced per stump (Figures 5 and 6). This expression of data best shows the degree of actual control or reduction of the sprouting problem.

SUMMARY AND CONCLUSIONS

Daubing madrone and tanoak stumps with a 4 lb/gal ae solution of mixed alkanolamine salts of 2,4–D gave better control of sprouting than spraying stumps with 16 lb aehg solution of butoxy ethanol esters of either 2,4–D or 2,4–D + 2,4,5–T in diesel oil. Daubing the amine was also the least expensive treatment. Madrone was successfully treated in February, April, and October. Tanoak was best treated in February or October. The April treatment was poor for tanoak. July treatments gave poor results with both species.

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