

Timber Growth Studies

tree growth in Whitaker's Forest, Tulare County, during 33-year period; 1915 to 1948

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Removal of old and overmature forest trees—and thinning to relieve competition in the young stands—can substantially increase the rate of timber growth.

Timber estimates of the 320 acres comprising the University of California's Whitaker's Forest in Tulare County indicate the mean annual growth was 449 board feet per acre during a 33-year period.

The estimates—the first in 1915 and the last in 1948—show an increase in the volume of board feet from 2,896,500 board feet to 7,631,600 board feet—or an increase of 4,735,100 board feet.

During the war years selective logging operations were carried on to remove old and overmature trees of all species except sequoia. In general, no trees smaller than 36 inches in diameter were removed and the cutting served to open up the stand to a degree which probably will result in good reproduction of sequoia, white fir and pine. This logging operation removed 2,839,400 board feet of logs with a total stumpage return to the forest of \$6,644.93.

The first timber was cut from Whitaker's Forest during the 1870's. A mill which operated from 1873 to 1879 is reported to have cut mostly sugar pine and sequoia lumber which when delivered in the valley had a value of about \$16 per thousand. No figures are available as to the volume of timber cut during those years, but it may well have been in the neighborhood of five million feet.

Following this partial cutting, the opening up of the crown canopy and the disturbance of soil in the logging operations, conditions for several years were evidently very favorable for germination of seed and the establishment of reproduction throughout the tract.

Some brush species including manzanita, ceanothus, willow and a ground cover of bear clover did come on parts of the forest following fires incidental to the old logging.

These brush species—though much in evidence 35 years later—did not constitute a dense enough cover to interfere with the young trees, though the competition must have been severe for much of that period. The brush species have now been killed by shade from the timber stands. Studies made in five sample plots laid out in 1915 emphasize the remark-

able growth and vigor of the young sequoias.

About forty years after the logging of the '70's a timber estimate was made at Whitaker's Forest during August 1915. At this time timber in trees 11 inches and over amounted to 2,896,500 board feet. A second cruise of the timber made in 1941 showed an increase in volume to

died. One of these was struck by lightning. The timber volume in these old veterans is estimated at approximately six million board feet—an average of 18,700 board feet per acre.

These old trees run from eight to over 12 feet in diameter and from 225 to 275 feet in height. The largest one is the Merritt Pratt Sequoia which has a diameter

Timber Stands, Whitaker's Forest: 1915 to 1948

| Species | Vol. 1915 M. feet | Vol. 1941 M. feet | Vol. 1948 M. feet | Vol. logged M. feet | Returns |
|----------------|----------------------|----------------------|----------------------|------------------------|-------------------|
| Sugar pine | 534 | 647.7 | 413.2 | 523.4 | \$1,995.71 |
| Ponderosa pine | 776 | 1,164.4 | 174.6 | 1,175.5 | 1,914.41 |
| White fir | 344.5 | 2,005.6 | 1,191.5 | 1,336.5 | 2,642.70 |
| Incense cedar | 398 | 737.7 | 729.7 | 32.4 | 70.61 |
| Sequoia | 344 | 2,088.6 | 2,283.2 | 5.4 | 21.50 |
| Totals | 2,896.5 | 6,644.0 | 4,792.2 | 2,839.4 | \$6,644.93 |

6,644,000 board feet in timber above 11 inches in diameter.

The 1948 estimate—made in the fall after completion of logging operations—showed a total volume, then on the ground in growing stock, of 4,792,000 board feet in trees above 11 inches in diameter.

The rate of growth is being maintained in spite of the ground space occupied by some 200 old sequoia veterans which will not be removed until they die or fall.

These old trees probably average about 1,000 to 1,200 years old, but in the last thirty-five years only four of them have

of 16½ feet. Some of the old trees were cut in the early days for lumber and posts and massive stumps are still present.

The largest and perhaps the oldest sequoia on Redwood Mountain stood on the property north of Whitaker's Forest. This twenty-foot diameter tree was nearly dead in 1947 so it was removed and worked up into 7,700 seven-foot fence posts. The tree had a stumpage value of about \$500 at that time and the posts when laid down in the San Joaquin Valley were worth approximately \$5,000.

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Dense stand of thrifty second growth sequoias—60 to 70 years old—near Redwood Mountain, Tulare County.



PHOSPHATE

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concentrations greater than 0.50 ppm deficiency is unlikely to occur—only two out of 30 soils gave a response.

In the light of field and greenhouse results, the following ranges of phosphate in water extract are suggested for tentatively defining the status of available phosphorus in a given soil.

Class 1. Response likely, less than 0.30 parts per million of phosphate.

Class 2. Response uncertain, from 0.30 to 0.50 parts per million of phosphate.

Class 3. Response unlikely, greater than 0.50 parts per million of phosphate. It must be emphasized that these ranges of phosphate are expressed on the solution basis.

An anticipated response to phosphate fertilization implies that only phosphorus is the limiting element and that there exists no toxic condition in the soil. In California often nitrogen must be added to secure a phosphate response.

In the case of a phosphorus-deficient soil, response can be expected only when sufficient amounts of phosphate have been added. In the case of a soil containing minerals of the kaolinite type, fixation would be great. This would require considerably more phosphate for a response or a banding of the fertilizer in the immediate vicinity of the roots.

The ranges of phosphate suggested for interpretation of the chemical extraction apply only to the crops listed, mainly pastures, field crops and truck crops.

Field experiments suggest that these responses are especially pronounced for winter crops.

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CLINGS

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is becoming moist is to compare the thermometer readings.

Because of the large trimming losses—pits and peel—the over-all drying ratio is less favorable than for other fruit. A good quality fruit dries about 9:1 and a higher ratio is found for orchard run lots.

To complete the reduction of moisture content to about 20%, the fruit is removed from the dehydrator and allowed to stand for several hours.

In foggy climates this plan can not be followed, for standing fruit might actually absorb additional moisture from the air. In such places, the temperature at the finishing end of the tunnel is reduced to about 150° F and the drying finally completed while the fruit is still in the tunnel.

The cooled fruit is removed from the trays to clean, wooden boxes for temporary storage before shipping.

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CITRUS

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ation of 500 gallons of 2,4-D spray are given in the accompanying table.

Experimentally the spray has been applied as a complete coverage spray of from 15 to 20 gallons per tree to as little as about six gallons per tree. Applications of four gallons per tree or less do not appear to be satisfactory at the concentrations listed. It seems reasonable to expect that spray-dusters, boom sprayers, or other equipment applying at least six gallons per tree of the 2,4-D sprays listed, would be satisfactory.

Much more information is needed on application methods before more than these tentative conclusions may be drawn.

Inasmuch as 2,4-D used to reduce mature fruit drop has been found to be compatible with the usual spray chemicals, it seems likely that when used at somewhat higher concentrations for fruit size increase it will likewise be compatible.

When applying 2,4-D, it seems desirable to reduce the curling of the new young leaves by delaying application until after the spring leaf growth has occurred. In some trials, although leaf curling has been severe, it has not reduced production of fruit quality. Succeeding leaf growth flushes usually have appeared normal.

Spraying Valencia oranges and grapefruit with 2,4-D to increase fruit size of next season's crop has not been found to increase fruit size of the current, mature crop. It will, however, effectively reduce mature fruit-drop of the current crop.

Trials are now in progress to compare 2,4-D with 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) and other chlorinated phenoxy acids for effectiveness in increasing fruit size. Preliminary data indicate that 2,4,5-T is at least as effective as 2,4-D.

The over-all effect of 2,4-D sprays to increase citrus fruit size seems to be an accentuation of the juvenile characteristics of the fruit. This includes large fruit size, delayed maturity, dark green young fruit; somewhat rough, pebbly rind to maturity; and thick fruit-stems.

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SPINACH

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trace of fungus penetration or development. The freedom from disease, then, can be considered to be true immunity, rather than high-level resistance.

The consistent reaction of the immune stocks during the winters of 1947-48 and 1948-49, have not suggested the presence of any physiologic strains of the fungus in the Davis areas, although there was ample opportunity for infection from natural sources throughout the course of the experiments.

Because of the predominantly dioecious habit of spinach, self-pollination is not normally possible. Inheritance data, therefore, have been secured on the first generation resulting from the cross between immune and susceptible plants and on the first backcross of immune first generation plants to the susceptible types.

The results of these experiments have shown that immunity is simply inherited as a single dominant genetic character. Because of this, it will be possible to transfer to commercial spinach varieties the complete freedom from downy mildew which has been found in the Iranian variety.

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TIMBER

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Whitaker's Forest is situated in one of the most productive timber types in California. Sugar pine, ponderosa pine and white fir are all important timber trees, and the sequoias here have demonstrated their ability to grow in height and volume at a rate exceeding that of most softwood tree species.

The east portion of the forest above the camp clearing is cooler and somewhat more moist than the west portion and contains a mixed stand of sugar pine, white fir and sequoia with occasional incense cedars and black oaks.

Ponderosa pines appear in greater number towards the west with increase in warmth and dryness and the sequoias drop out of the stand before the west boundary is reached.

From there west on the National Forest there are virtually no sequoias at this elevation. A heavy stand of mature ponderosa pine on the ridge west of the property produced a large volume of timber when cut under National Forest timber sale in 1944 and 1945.

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