SOIL MOISTURE CONDITIONS AFTER CHEMICALLY KILLING MANZANITA BRUSH IN CENTRAL OREGON 1 /

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Selective herbicides are being used on an increasing scale to kill undesirable plants in the Pacific Northwest. On Forest lands, chemical control affords one of the most promising means for preparing for reforestation areas now occupied by brush or weeds. 2/

In central Oregon, trials of chemical control in brush fields of a nonsprouting species of manzanita (Arctostaphylos parryana var, pinetorum) have been singularly successful. 3/ Here, the next step is to reestablish a stand of ponderosa pine through planting or seeding. Of immediate interest in this problem of artificial regeneration is the effect of brush control and brush removal on physical site factors. One of the factors most often critical in the establishment of ponderosa pine seedlings -- soil moisture -- was singled out for attention in this exploratory study.

METHOD

Within a large brush field on the Deschutes National Forest in central Oregon, dense manzanita on several large plots had been killed by aerial spraying in July 1954. 3/ On some of the brush-killed areas, the dead plants had been subsequently pulled and removed to improve access for seeding or planting and to reduce fire hazard. Thus, three very different conditions of ground cover were available for the study of soil moisture: green brush; dead brush; and cleared (brush killed and removed).

1 / Reprinted from Research Note No. 156, December 1957, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

2/ Dahms, Walter G., and James, George A. Brush control on forest lands. U. S. Forest Serv,, Pacific Northwest Forest and Range Expt. Sta. Res. Paper 13, 81 pp., illus. 1955.

3/ Dahms, Walter G. Chemical brush control on central Oregon ponderosa pine lands. U. S. Forest Serv. Pacific Northwest Forest and Range Expt. Sta. Res. Note 109, 5pp. 1955.

Three plots, each 80 feet square, were established in each of the three ground-cover conditions. All plots occupied a position of similar aspect, elevation, and soil. Five sampling points were randomly selected on each of the plots. At each point, soil moisture samples were taken at depths of 10-14 inches and 20-24 inches on 5 different dates: May 24, June 27, July 29, September 8, and September 29. Moisture content, expressed as percent by weight, was determined after ovendrying.

Surface soil on this area is a loamy coarse sand grading to a pumicy loamy coarse sand. At a depth of about 24 inches, the soil is a rich brown, fine sandy loam immediately overlying basalt rock.

RESULTS

At the beginning of the study in late May, the soil was well charged with moisture (fig. 1) with no significant difference in moisture content between the three plots nor between the 2 depths sampled.

By June 27, soil moisture on the "dead brush" and "cleared" plots had decreased slightly, but with no significant difference between the two. Soil moisture beneath green brush, on the other hand, had decreased at both depths to a content significantly lower than that of the other two ground-cover conditions.

By July 29, soil moisture in the dead brush and cleared plots had scarcely altered from the previous month's level, whereas it had again decreased significantly under the green brush cover. The same trend in soil moisture continued through September 8.

The only precipitation during the study was a rainfall of about 0. 25 inch during the period between September 14 and 24. This addition was reflected on September 28 in a slight increase in soil moisture for all samples except those for the 20- to 24-inch depth beneath green brush. However, relative soil moisture under the three ground-cover conditions was the same as for the period prior to the rain. Dead brush and cleared plots showed no difference in moisture content while soil moisture beneath green brush remained significantly lower.

At no time during the study did soil moisture on either of the nonvegetated plots fall appreciably below the moisture equivalent. Beneath green brush, however, moisture at the 10- 14-inch depth declined more than twice as much, percentage wise, as in the nonvegetated plots. At the 20- to 24-inch depth, moisture decline under green brush was almost three times that of the nonvegetated plots

The first permanent-wilting percentage, approximated by 15 atmosphere-tension determinations, was neared in early September at the 10- to 14-inch depth and somewhat earlier at the 20- to 24-inch depth. Critical moisture levels were probably reached much earlier in the season because of immobility of soil water at low levels of moisture content.

Conservation of soil moisture is especially important in the ponderosa pine region where the moisture is derived mostly from snowmelt and stored in the soil for use during the summer. When vegetation is removed, transpiration is eliminated' as a source of moisture loss and evaporation becomes the primary controlling factor. In coarse-textured pumicy soils of the study area evaporation is evidently minimized by a dust mulch at the soil surface. As a net result of these factors, the killing of the manzanita cover with chemicals greatly reduced the loss of soil moisture during the summer drought. The amount of moisture saved was about the same, whether the dead brush was removed or left standing.

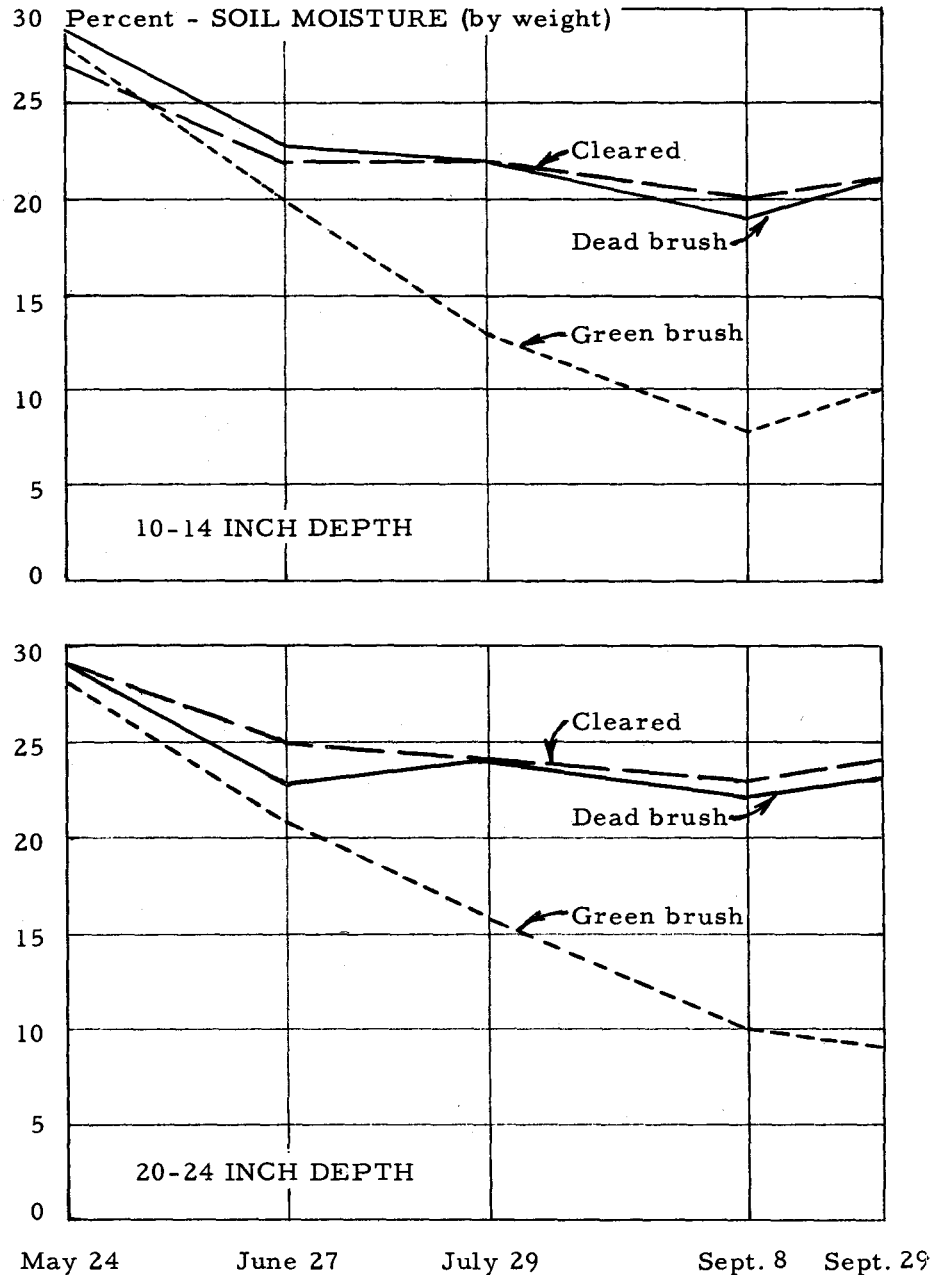

Figure 1. - Trend of soil moisture at depths of 10-14 and 20-24 inches.