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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

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SOME RECENT EXPERIMENTS IN SNAG FALLING

One of the greatest obstacles to the control of fire in the Douglas fir region is the snags on the logged-off lands and old burns. To make such land "safe for reforestation", it is a prime requisite to get down the snags.

In order to discover cheaper and quicker ways of snag falling, the Forest Service last year conducted a series of experiments with various methods in the Wind River Valley, Washington. One hundred ninety-seven (197) trees were sawed down as a comparison with other methods. Burning with the aid of power bored draft holes was attempted on 90 trees, and explosives were used on 169 trees with the powder placed in (a) a belt around the outside of the snag, (b) in the ground under the snag, and (c) in power bored holes in the snag. The most unique feature of the experiments was the use of a power drill to bore the trees either for blasting or burning.

The boring apparatus consisted of a small Delco electric generator mounted in a truck to give it mobility, electric cable, and portable electric drill, with 1-inch ship auger. In preparing the snags for burning, a sharply inclined vent hole was bored, then a nearly horizontal draft hole was bored so as to connect up with the first hole at its lower extremity. Fifteen methods of ignition were tried; the one that proved most satisfactory was by means of bits of kerosene-soaked charcoal placed at the junction of the two holes, ignited, and fanned with a hand bellows. More dry charcoal was supplied from time to time until the snag was half burned. The fire tends to burn out a chamber in the heart of the snag and under favorable conditions will so weaken it as to make it fall. If too much air enters the chamber the fire goes out. Burning is not always successful for of the 90 snags treated only 64 fell.

Blasting down the snags by the belt method and by charges placed in the ground were found impractical because of the large amount of explosives required and because of the uncertainty of getting the snags down by these means.

In blasting with an internal charge the same equipment was used for boring as in the case of the snags bored for burning. Holes are drilled on two sides of the snag, about 2 holes for 30 to 40 inch trees and up to 6 or more for 60 to 70 inch trees. The holes are inclined upward on one side of the snag and downward on the other so that all are in the same plane. Placing the holes in this manner permits some regulation of the direction of fall of the snag. The powder recommended is 40 per cent dynamite using four sticks to the hole.

Of the three principal methods tried, burning was found to be the cheapest. It cost $.67 to burn down an average snag of 33.6 inches diameter, $.95 to saw it down, and $.75 to blast it down. Burning, however, is both uncertain and hazardous. Many of the snags do not burn down; there is a possibility of uncontrolled fires from the snags that do burn; and there is danger from snags falling without warning. Blasting, on the other hand, if properly done, is both safe and certain and on a typical lot of snags is estimated to save about 20 per cent over the cost of sawing at the prevailing market price of powder.

In falling snags in the course of fire fighting, either those actually afire or those which must be put down ahead of the fire, elapsed time is of more importance than cost and here again blasting has the advantage, for a snag that would require an hour to saw down may be blasted down in 12 or 15 minutes. Of course, the use of the blasting method away from roads presupposes a portable boring apparatus, either direct connected or electrical. Experiments, that promise success, are now in progress on the Columbia National Forest in constructing and assembling such portable boring machines.

NEW DATA ON GROWTH OF WESTERN YELLOW PINE AFTER SELECTION CUTTING

The accompanying table shows the diameter that immature trees left standing after logging in western yellow pine forests may be expected to attain in 10, 20, 30, or more years. This is a preliminary table for three localities in south-central Oregon for which the field and office work has been concluded as a part of the comprehensive study of the growth of western yellow pine forests, both even-aged and uneven-aged, in eastern Oregon and Washington.

In this study there have been laid out to date 68 plots in areas which had been cut selectively anywhere from 10 to 44 years ago, and where a good sprinkling of trees over 4 inches in diameter had survived logging either through conscious intent or otherwise. With an increment borer cores were taken of all trees and the diameter growth both before and after cutting measured by decades. Most trees increased their rate of growth after being released by the cutting, the amount depending upon the degree of release and the character of their crowns. This is a subject of particular study in this project.

In using these tables with a suitable volume table to compute per acre yield for a given tract, it is necessary to know the average number of trees per acre of each diameter class that will survive logging and be alive at the end of the time covered by the prediction. This necessitates making due allowance for the trees likely to be killed in slash disposal, by insects, and by other causes.

The three localities covered by this advance table are all in Klamath County, Oregon, and all are on Site IV. This site is defined as one where 100-year-old dominant trees will be between 71 and 86 feet high and mature trees between 101 and 125 feet high. It might be mentioned that most of the western yellow pine forests east of the Cascade Range in Oregon and Washington are Site IV or Site V, and very little is Site III, so that the growths here indicated are probably as good or better than can be expected in most parts of these States.

Some of the plots were on National Forest timber-sale areas, logged according to the standard selection cutting system, and others were on private lands where the cutting was light and simulated an unintentional selection method. On the Fort Klamath group of plots there are now an average of 24 trees to the acre over 4 inches in diameter, with a basal area of 60 square feet. On the Pokegama area (all private land cut over lightly from 29 to 36 years ago) there are now 27 trees to the acre with a basal area of 60 square feet; on the Odessa area there are now 29 trees to the acre with a basal area of 63 square feet.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION, PORTLAND, OREGON

DIAMETER INCREASE IN WESTERN YELLOW PINE FOLLOWING SELECTION CUTTING
(OUTSIDE BARK IN INCHES)

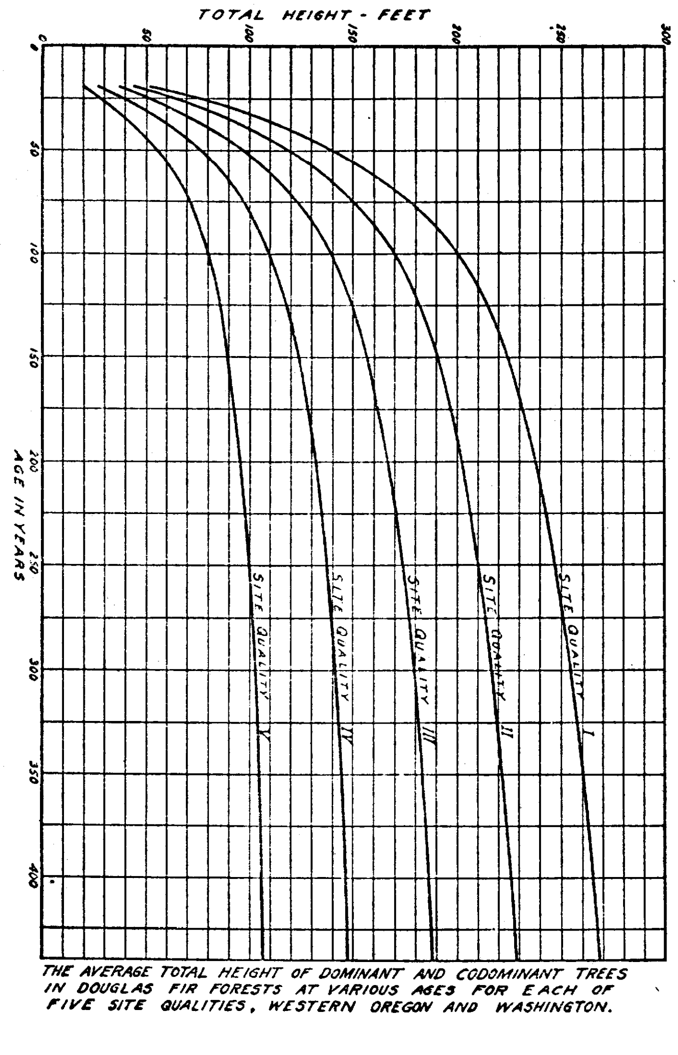
D.B.H. TIME OF CUTTING	FORT KLAMATH, KLAMATH CO., ORE. BASIS: 251 TREES, 10.5 ACRES T. 33 S. R.6½ E.W.M. SITE - GOOD IV			POKEGAMA, KLAMATH CO., ORE. BASIS: 142 TREES, 5.3 ACRES T. 40 S. R.5 E. W. M. SITE - MEDIUM IV			ODESSA, KLAMATH CO., ORE. BASIS: 320 TREES, 11.0 ACRES T. 36 S. R.6 E. W. M. SITE - POOR IV			
	D.B.H. 10 YRS. LATER	D.B.H. 20 YRS. LATER	D.B.H. 30 YRS. LATER	D.B.H. 10 YRS. LATER	D.B.H. 20 YRS. LATER	D.B.H. 30 YRS. LATER	D.B.H. 10 YRS. LATER	D.B.H. 20 YRS. LATER	D.B.H. 30 YRS. LATER	D.B.H. 40 YRS. LATER
4	5.4	7.1	8.2	4.7	5.8	6.7	4.6	5.3	6.2	7.0
5	6.5	8.3	9.8	5.8	7.1	8.2	5.7	6.5	7.6	8.2
6	7.6	9.5	11.1	6.9	8.4	9.8	6.8	6.8	9.0	10.0
7	8.7	10.7	12.4	8.1	9.8	11.2	7.9	9.0	10.3	11.5
8	9.7	11.9	13.6	9.2	11.1	12.6	9.0	10.1	11.6	12.8
9	10.8	13.0	14.8	10.4	12.3	14.0	10.0	11.2	12.8	14.0
10	11.9	14.1	15.9	11.5	13.6	15.3	11.1	12.4	14.0	15.3
11	13.0	15.1	17.0	12.6	14.7	16.6	12.2	13.5	15.1	16.4
12	14.0	16.2	18.1	13.8	15.9	17.8	13.2	14.6	16.1	17.4
13	15.0	17.2	19.1	14.8	17.0	18.9	14.2	15.6	17.2	18.5
14	16.1	18.3	20.1	15.9	18.1	20.1	15.3	16.6	18.2	19.6
15	17.1	19.3	21.1	17.0	19.3	21.2	16.3	17.7	19.2	20.6
16	18.2	20.3	22.1	18.0	20.4	22.3	17.3	18.7	20.2	21.6
17	19.2	21.3	23.1	19.1	21.4	23.4	18.4	19.7	21.2	22.6
18	20.2	22.3	24.1	20.2	22.5	24.5	19.4	20.8	22.2	23.5
19	21.2	23.3	25.0	21.2	23.6	25.6	20.4	21.7	23.1	24.4
20	22.2	24.3	26.0	22.2	24.6	26.6	21.4	22.7	24.0	25.3
21	23.2	25.3	26.9	23.2	25.6	27.6	22.3	23.7	24.9	26.2
22	24.2	26.3	27.8	24.3	26.6	28.6	23.3	24.6	25.8	27.1
23	25.2	27.2	28.7	25.3	27.6	29.6	24.3	25.6	26.7	27.9
24	26.2	28.2	29.6	26.3	28.5	30.5	25.2	26.5	27.6	28.8

DETERMINING THE SITE QUALITY OF DOUGLAS FIR LAND

In classifying forest land according to its productivity and in using yield tables to make growth prediction, it is necessary to know the site quality of the land in question. The method of determining the site quality which has found most ready acceptance is the total height of the dominant and codominant trees, since the total height of stands seems to reflect quite well the quality of the site. This method was adopted in the recently concluded studies of the normal yields of immature Douglas fir forests and the application of these tables to actual stands. These studies based on thousands of measurements gave very dependable relations between height and age for each of five sites up to 160 years.

In order that the relation might be known for older forests, about 40 even-aged Douglas fir stands ranging in age from 160 to over 400 years old were examined and measured instrumentally. This information was then used to extend the existing curves for the younger stands. The resulting graph is attached (in a form convenient to cut down for a pocket notebook) and should be useful in determining for any even-aged Douglas fir stand the quality of the land. Since the dominant and codominant trees in an old growth stand vary considerably in height and many of them have imperfect tops, it is important to get measurements on a good number of full crowned trees to give a true average; it is also important that the stand be really even aged and be one that has always been in a normal well-stocked condition.

A method of determining the site quality of bare logged-off or burned land, when there is no contiguous standing timber in which to measure heights, is much needed; so far there is no satisfactory way of classifying such lands in this region according to its forest productivity.



THE AVERAGE TOTAL HEIGHT OF DOMINANT AND CODOMINANT TREES IN DOUGLAS FIR FORESTS AT VARIOUS AGES FOR EACH OF FIVE SITE QUALITIES, WESTERN OREGON AND WASHINGTON.

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SURVIVAL OF ONE-YEAR-OLD DOUGLAS FIR SEEDLINGS

In order to explain the failure of natural reproduction where it should occur, it is important to know the actual physical conditions necessary for germination and survival. Knowing these the forester may be able to modify the factors that will favor natural reproduction. If the seedlings need a surface mulch, mineral soil exposure, shade, or some other condition, he can perhaps modify logging method, slash disposal practice, or the handling of grazing animals so as to bring about these favorable conditions.

This was the purpose of an intensive study of a piece of typical cut-over land in the upper Wind River Valley, Washington, where instrumental measurements of physical factors were taken during the summer of 1928. Air and soil temperatures, precipitation, relative humidity, and evaporation were recorded, and soil moisture and wilting point determinations were made.

A total of 720 seedlings germinated on the area, and a record was kept of the survival or cause of death of each one. This record is summarized in the following table. The figures are in per cent of total germinated.

Cause of death	Amount of Shade			
	None	Medium	Dense	Totals
Heat	71	40	2	53
Drouth	18	30	19	22
Other	3	4	9	4
Totals	92	74	30	79
Per cent alive at end season	8	26	70	21

The effect of shade in favoring survival is striking. The proportion of seedlings killed by heat under different shade conditions is about as may be expected, but the higher per cent of failure from drouth under medium and dense shade is, at first sight, confusing. This apparent irregularity occurs because a large number (71 per cent) of the seedlings in the open were killed by heat early in the summer and when the dry season approached there was but a small part of the total number of unshaded seedlings left to be exposed to drouth.

Air temperatures of 80° F or above are apt to develop surface soil temperatures of 140° or higher on dark unshaded surfaces. Such temperatures are injurious to seedlings under a month old. The tender stem is literally cooked at the soil surface and the seedling topples over. Twice during May killing temperatures occurred, the maximum in each instance being 96°F.

This early loss from heat was surprising. It occurred between May 1 and June 15, and amounted to 53 per cent of the total germination. As mid-summer advanced higher temperatures occurred but the stem tissues of the seedlings had hardened sufficiently to prevent direct injury from surface heat. The highest air temperature recorded was 112°F, yet this developed a surface soil temperature of 166°. However, the seedling's demand for moisture increased with the temperature and the per cent of soil moisture constantly grew less. During this period the combined effect of heat and drouth was the apparent cause of death. Toward the end of the summer season the soil moisture dropped to the wilting point at a 3-inch depth and seedlings died from drouth alone. These two periods took a toll of 22 per cent of the total number of seedlings. A 4 per cent loss occurred from insects, rodents, mechanical injury, and other causes, bringing the total loss for the season up to 79 per cent.

The greatest single cause of loss in this instance, heat or high surface temperature, can be greatly reduced by proper shading. The shading in turn will reduce evaporation and drouth conditions, especially if the shade comes from dead material such as slash, that makes no demand on the soil moisture. Also unburned surfaces result in lower surface temperatures and less evaporation than do the black charcoal surfaces produced by burning.

Thus by possible changes in cutting methods or slash disposal our seedling losses from the major causes may be greatly reduced and our cut-over areas be more sure to reproduce with a minimum seed supply.

STATION NEWS ITEMS

The Forest Research Council (advisory to the Department of Agriculture) held its annual meeting February 27 in Portland. New members of the Council, on the appointment of the Secretary of Agriculture, are A. R. Watzek of Portland and Sol Reed of Shelton, Washington, who take the places of Russell Hawkins of Portland and Frank H. Lamb of Hoquiam, respectively, whose terms have expired.

As officers for the ensuing year Dean Geo. W. Peavy was elected chairman, A. R. Watzek, vice chairman, and Thornton T. Munger, secretary.

The national survey of forest resources and requirements, authorized by the McSweeney-McNary Act and for which Congress has now made an initial appropriation, will be begun in the Pacific Northwest this summer. This will be a systematic and adequate effort to find out exactly the amount and character of the present timber supplies and the present requirements for forest products and to forecast the probable future supplies and requirements.