FOREST RESEARCH NOTES

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

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TYPE AREAS IN SELECTED OREGON AND WASHINGTON COUNTIES

In connection with the forest survey of the Douglas fir region, a number of generalized type maps for several counties in Oregon and Washington have been prepared recently for use by the Agricultural Experiment Stations, who will assist in estimating the acreages likely to be withdrawn from forest areas for agricultural use within the next three decades. In the following table the broad type areas of six selected counties are given, showing some interesting conditions and variations.

Type Areas in Acres for Six Oregon and Washington Counties

	Oregon Counties			Washington Counties		
	Benton	Clatsop	Columbia	Clark	Cowlitz	Wahkiakum
Cultivated and pasture	206,618	30,992	84,400	238,303	85,599	17,395
Merch. Timber over 20" D.B.H.	121,528	265,540	72,619	22,114	287,789	48,257
Second Growth under 20" D.B.H.	70,803	100,414	119,232	37,127	225,804	65,456
Deforested burn	17,613	3,697	1,862	67,230	17,710	632
Nonrestocking cut over		6,725	30,218	19,761	23,613	13,124
Cut over since 1920	17,481	95,802	99,735	13,471	73,792	19,668
Hardwood	1,277	7,187	14,555	2,637	5,165	6,143
*Nonforest land	5,000	15,083	1,059	9,617	18,448	205
Total	440,320	525,440	423,680	405,760	737,920	170,880

*Includes barrens, brush, swamps, cities, industrial sites, etc.

The dependence of some counties upon the forests for their economic existence is evident upon inspection of the above table. Clatsop and Columbia Counties in Oregon and Cowlitz and Wahkiakum Counties in Washington all show

less than 20 per cent of their area at present converted to agricultural use; by far the greatest area is in some sort of forest cover. It is reasonable to assume that in these four counties future conversion of forest land to farm land will be of little consequence, and that the economic future of these counties is dependent upon the continued productivity of their forest areas. On the other hand, Benton County in Oregon and Clark County in Washington have nearly half their acreage already under cultivation or in pasturage. In these two counties the forest assumes therefore only a secondary economic role.

R. W. Cowlin

THE CONTROL OF HEMLOCK LOOPERS BY AIRPLANE DUSTING

The modern airplane has opened up many new possible uses in connection with forest work, one of which is the control of forest defoliators. In the past outbreaks of insects which strip forest trees of their foliage and kill extensive areas in a few tragic years have been allowed to run their course, because there was no practical means of dealing with them. The refined methods applicable to the control of park and shade tree insects have no place in commercial forestry. But the airplane, and the clouds of poisoned dust which it can liberate, gives us a new weapon to use in such emergencies.

The technique of airplane dusting was first developed for use with such field crops as cotton. Later it was adapted to forest purposes and has been tried in the eastern United States and Canada for the control of such leaf-eating pests as the gypsy moth, catalpa sphinx and hemlock looper. All of these projects have been essentially on an experimental basis, but they have shown every promise of success, even though the cost has usually been high (from $6.00 to $7.00 per acre).

During the past summer this method was used to control a serious outbreak of the hemlock looper in Pacific County, Washington for the first time in the western United States. This project was by far the largest of its kind ever attempted, and the dusting of 5400 acres placed it on a commercial scale. The project was financed largely by the State of Washington and the Weyerhaeuser Timber Company. The Northwest Air Service furnished a Ryan monoplane with 300 h.p. motor, equipped with a hopper capable of carrying 1,000 pounds of dust. A gate in the bottom of the hopper, operated by a lever in the cockpit, released the dust when desired, and two electrically driven "agitators" kept the dust in motion and assured a uniform feed. The beach at Ocean Park was used as a landing field, and here a loading platform and hopper was built which enabled the plane to be loaded in eight minutes. All of the mechanics of the operation were worked out in detail under the supervision of Mr. C. S. Cowan of the Washington Forest Fire Association and Mr. T. S. Goodyear, Assistant State Supervisor of Forests. The operation at the loading end functioned perfectly.

Actual dusting operations started on July 3 and continued until July 16, when the entire 54 tons of dust had been spread. The rate of application was figured at 20 pounds per acre, and the dust laid down in strips approximately 140 feet in width, with the plane flying not more than 40 feet above the tree tops. It was extremely hazardous work, but fortunately no accidents occurred. In order to secure satisfactory adhesion, it was necessary that the foliage be moist with dew. This required the dusting to be done in the early morning hours between 5:00 a.m. and 9:00 a.m. Wind in excess of 10 miles per hour, low humidity, fog or rain necessarily stopped the work. The total cost of the job was approximately $15,000, which averaged $2.75 per acre or about 9 cents per thousand board feet of timber dusted.

The results of the dusting were determined through studies made by the Office of Forest Insect Investigations. Check plots, consisting of muslin frames of 10 square feet each, were distributed through the forest and records kept before and after dusting. The daily caterpillar droppings indicated the rate of mortality and showed the results of the work. The effect of the dusting was also indicated by the number of dead caterpillars found on the frames. The plots in the path of the dust clouds showed the effects within one day, and the greatest mortality occurred during the second and third days. The average of seven dusted plots as compared with ten undusted ones showed a reduction of 70 per cent at the end of the first week. At the end of the season the dusted areas showed a noticeable difference from undusted areas in the amount of foliage retained.

The greatest difficulty was in securing a uniform coverage. Without flight markers, which it was found impractical to erect, it was impossible to lay down the dust clouds in parallel and overlapping strips, and so the resulting kill was somewhat spotty. It was also found that the dosage used satisfactorily in eastern forests was somewhat low for the tall trees and dense stands of the Pacific Northwest. The tops of the trees absorbed all of the dust, and very little sifted through to the lower branches. This resulted in saving the tops of the trees, the most important part, while the lower foliage was often completely stripped. Then too, portions of the area were of such rough topography that releasing the dust at anything less than 100 feet from the tree tops was quite out of the question. So parts of the area had to be abandoned to the loopers.

The main objective of this dusting project was to break up the concentrated infestation which threatened to completely defoliate and kill large patches of timber. The halting of the epidemic or the prevention of its spread to other areas was not considered as being practical, since it was discovered that some 32,000 acres were more or less infested. All that could be looked for was a saving of the more valuable stands until the epidemic passed over and was ultimately brought under control by natural factors. If a complete stripping of the trees could be prevented and 50 per cent of the foliage retained, the trees would recover. A complete defoliation, even for one year, was known to be fatal. This purpose of the dusting project was to a large degree satisfactorily accomplished, and much of the timber north of the Nasello River that would have been killed this year has been saved. Now the indications are that the looper outbreak is rapidly declining and possibly is already at an end. We shall all hope so, for the toll taken in past outbreaks has often passed the half billion board foot mark, and such a loss is one that the timber owners can ill afford to take at the present time.

F. P. Keen

LUMBER CONTENT OF SOUND WESTERN YELLOW PINE LOGS

Log rules are used to measure the board foot volumes of logs of different diameters and lengths. Construction of a reliable log rule presupposes certain manufacturing practices, and any deviation therefrom results in an excess or deficit in the scaled contents, known respectively as overrun and underrun.

A comparison is made in the table below between the Scribner log rule and the actual board footage obtained from over 2,000 sound sixteen-foot western yellow pine logs of different diameters, turned down in sawing at two modern eastern Oregon band mills. The tally, made of the lumber in a rough-green state, is of No. 5 Common and Better grades, excluding molding strips and six-foot or shorter Common and Select pieces.

Lumber Tally, Log Scale, and Overrun Per Cent
For Sound Sixteen-foot Western Yellow Pine Logs of Different Diameters

Log Diam. Inches	Lumber Tally[1] Bd.ft.	Log Scale[2] Bd.ft.	Overrun P. ct.	Log Diam. Inches	Lumber Tally Bd.ft.	Log Scale Bd.ft.	Overrun P.ct.
				21	335	300	11.7
10	90	60	50.0	22	367	330	11.2
11	102	70	45.7	23	403	380	6.1
12	115	80	43.7	24	440	400	10.0
13	128	100	28.0	25	479	460	4.1
14	145	110	31.8	26	518	500	3.6
15	165	140	17.8	27	559	550	1.6
16	188	160	17.5	28	600	580	3.4
17	215	180	19.4	29	643	610	5.4
18	242	210	15.2	30	686	660	3.9
19	272	240	13.3	31	733	710	2.8
20	301	280	7.5	32	766	740	4.9

[1]Lumber Tally, No. 5 Common and Better rough-green lumber, excluding molding strips and lumber shorter than six feet.

[2]Scribner log rule.

At one of the mills light slabbing and intensive manufacture were practiced, resulting in a three to four per cent greater recovery of lumber. This same mill had an average overrun of 21.42 per cent for the mill-run of sound logs of all diameters and lengths which were either sawed alive, taper sawed, or turned down in sawing. The second mill had a smaller overrun, 15.30 per cent. The composite overrun for both mills based on all sound logs, numbering 4,716 was 17.85 per cent.

E. F. Rapraeger

OVERTOPPING OF DOUGLAS FIR SNAGS BY REPRODUCTION

Snags get shorter and second growth trees get taller, and eventually on thousands of acres in the "old burn" type of the Douglas fir region, the erstwhile reproduction overtops the snags. And the fire protectionist gives a sigh of relief because the disappearance of the tinder-dry snags means an immense reduction in the fire hazard.

But how soon after the "old burn" does this desirable transformation take place? If the new forest growth starts promptly and abundantly after a crown fire in old growth Douglas fir timber, a majority of the snags will be overtopped by the forest canopy about 40 years after the fire. This estimate is the result of a preliminary study of the problem and is based on an analysis of thirty "old burns". Figures I and 2 summarize the principal results of this study.

From several sources it was determined with considerable certainty that a fire in old growth Douglas fir leaves about 50 snags per acre. Very few of these snags fall during the first 20 years after the fire. But from 30 to 50 years after there is a very rapid decrease. During the fourth decade, for example, there remains scarcely 15 per cent of the original number. Ordinarily old burns appear well stocked with snags even 40 years after a fire, but a check will show that at least three fourths of the original number have fallen.

Although the number of snags remains nearly constant for at least two decades, many of them steadily become shorter as portions of their tops decay sufficiently to break off. It is probable that during the first two decades, the snags reduce, on the average, one half in height. This progressive shortening of the snags continues at a rather fast rate for about 40 years more, at which time (60 years after the fire) the average snag is around 20 feet in height.

If reproduction comes in promptly after the fire, the larger trees will be as tall as the average surviving snag in about 35 years, and will overtop a majority of the snags about 5 years later. This estimate applies to site classes III and IV; the time of overtopping would be about 5 years or sooner on site class I. If reproduction does not follow the crown fire immediately, the time of overtopping will be delayed by the number of years required for the establishment of reproduction.

There is a great diversity in types of snags and in individual snags of the same type. Any analysis of the snag problem is consequently rather complex. The snags of one species may have an outer shell of casehardened wood, although the interior ordinarily is disintegrating from rot. This condition may not be typical of snags of another species. Some species decay more rapidly than others; hemlock snags, for instance, are likely to fall sooner than the snags of other species. Yet a nonresinous wood is no indication of rapid decay, for cedar snags are notoriously long-lived. Size also influences the length of time required for snags to fall. The information given here does not include cedar snags which were scarce on these 30 areas, but does include hemlock, white fir, and white pine, as well as Douglas fir snags.

R. E. McArdle

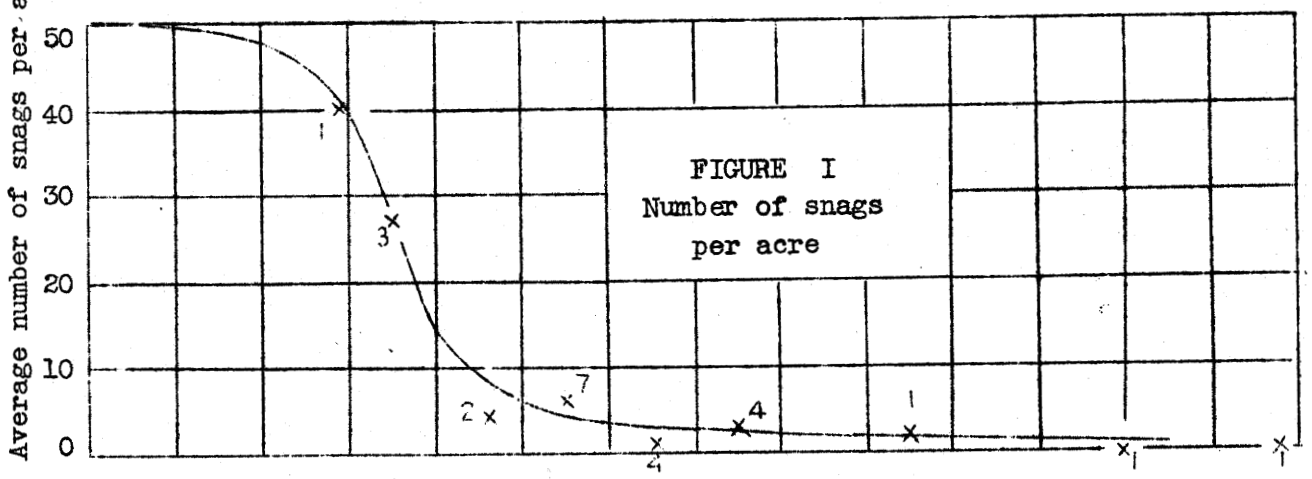

FIGURE I
Number of snags per acre

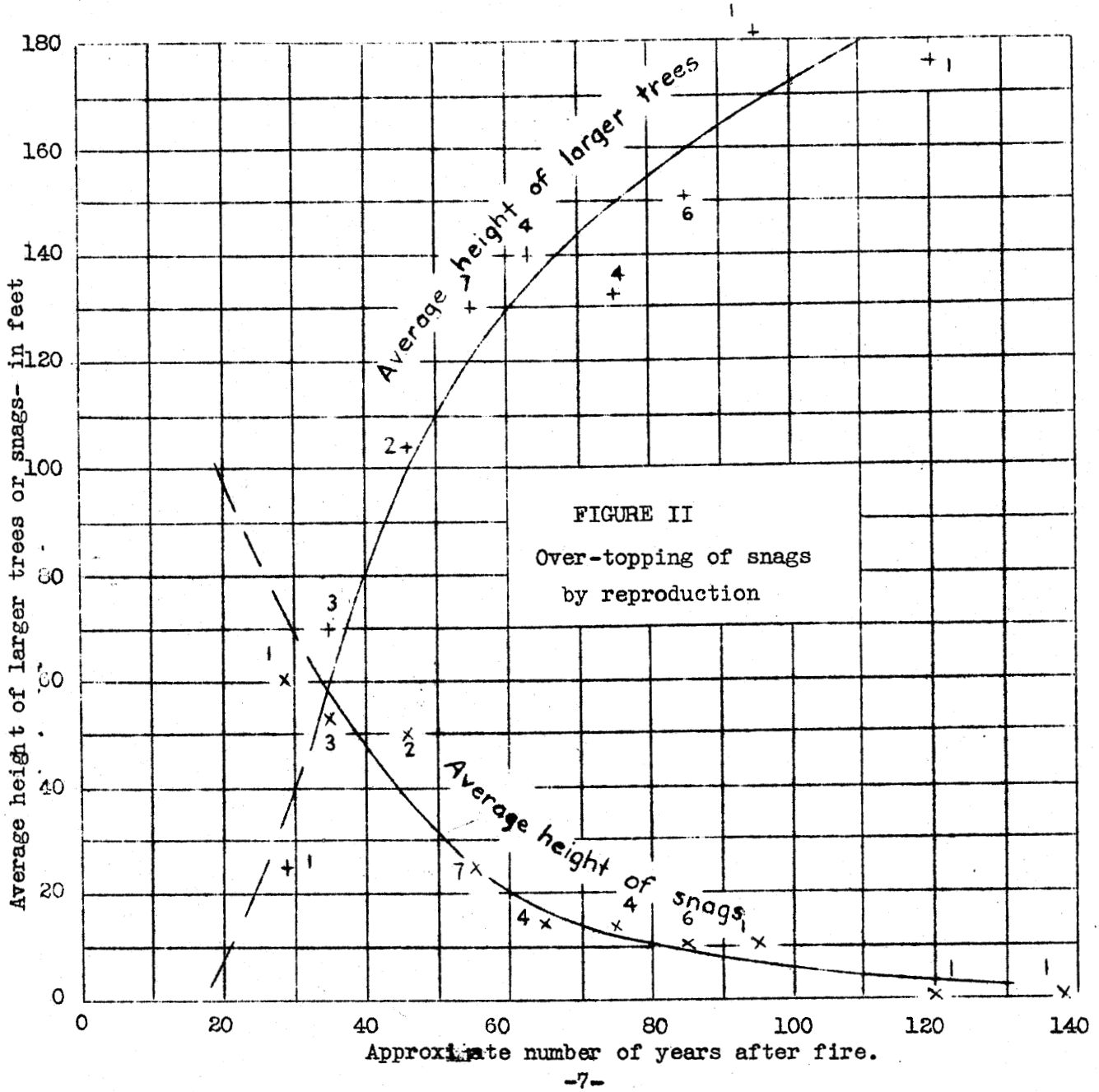

FIGURE II
Over-topping of snags by reproduction

GROWTH CYCLES IN THE WESTERN YELLOW PINE REGION OF OREGON AND WASHINGTON

Interesting evidence has been given by various investigators, both European and American, to indicate that the rate of growth of trees, especially upon a so-called "sensitive site", is intimately related to the variation in the amount and seasonal distribution of precipitation. In this opinion we also concur, although maintaining that many other factors may be present which affect the growth rates of single trees. An investigation, therefore, which will give a satisfactory solution to the problem of fluctuating growth of stands as a whole must be based upon sufficient material. During the past year a study was started in connection with the growth and yield investigation of western yellow pine in an attempt to determine whether or not growth rates over extensive areas have periods of good growth and periods of poor growth. Sixteen locations in Oregon and seven in Washington were picked as being fairly representative of the region, and in each of these 23 areas, about 10 mature trees were chosen, bored, and the cores measured ring by ring back to the center of the trees. Some of the records extend back for 400 years.

In brief the tentative results of this study show a pronounced wave-like progression in growth. It is possible to establish the following periods as being approximate dates of good and poor growth over the general region east of the Cascades in Oregon and Washington.

Periods of good and poor growth in virgin western yellow pine stands of eastern Oregon and Washington

Period	Character of Growth	No. of Years
1930-1917	Poor	14
1916-1904	Good	13
1903-1898	Poor	6
1897-1895	Good	3
1894-1886	Poor	9
1885-1876	Good	10
1875-1870	Poor	6
1869-1853	Good	17
1852-1842	Poor	11
1841-1836	Good	6
1835-1827	Poor	9
1826-1811	Good	16
1810-1795	Poor	16
1794-1777	Indeterminate	18
1776-1763	Good	14
1762-1755	Poor	8
1754-1745	Good	10
1744-1735	Poor	10
1734-1727	Good	8
1726-1718	Poor	9
1717-1713	Good	5
1712-1708	Poor	5
1707-1700	Good	8

Summary	Average Length	Range in Years
Periods of good growth	10.0	3-16
Periods of poor growth	9.3	5-16

Practically all the short flares in growth are omitted from consideration in this table; they may occur at any time differently for almost every area. The average length of the periods shown in the table summary is affected somewhat by a multiplicity of cycles which can easily shorten or lengthen the individual periods by a number of years. The sum of the two average periods, 19.3 years, is a cycle probably closely connected with one varying between 21 and 24 years, but whose exact length has not yet been determined. Further intensive study is being made on this subject.

Walter H. Meyer

LOSS IN OVERSIZE SAWING OF DOUGLAS FIR LUMBER

In the recent survey of so-called "waste" in the Douglas fir mills of western Oregon and Washington, several hundred accurate measurements of the lumber sizes manufactured were made at each of the six mills studied. The following table shows the nominal sizes and also the actual average sizes cut. It will be noted that in all cases, the actual dimensions cut were in excess of the nominal dimensions. The nominal sizes in all items are considered to allow sufficient material for shrinkage in drying, dressing, and running to pattern. There is a loss in wood volume in the one-inch stock due to cutting oversize of from 4.22 to 9.02 per cent and in the two-inch stock 1.41 to 7.41 per cent. Although this loss is not large for an individual piece, the aggregate loss where large quantities are produced would be considerable.

Actual and nominal dimensions cut in Douglas fir mills and the wastage from oversize sawing

Nominal dimensions		Actual dimensions	Loss
Inches	64ths of inch	64ths inch	Per Cent
1x3	64x192	68x197	9.02
1x4	64x256	66x263	5.94
1x6	64x384	67x391	6.60
1x8	64x512	68x518	7.57
1x10	64x640	68x647	7.41
1x12	64x768	66x777	4.22
2x3	128x192	134x197	7.41
2x4	128x256	131x261	4.34
2x6	128x384	130x391	3.41
2x8	128x512	130x521	3.33
2x10	128x640	129x644	1.41
2x12	128x768	131x776	3.41

Herman M. Johnson

PUBLICATIONS AVAILABLE UPON APPLICATION TO THE PACIFIC NORTHWEST FOREST EXPERIMENT STATION

Following is a list of publications resulting from the research of the Forest Service in Oregon and Washington of which the Experiment Station has a sufficient supply for further limited free distribution to interested persons. Articles on silviculture, management and mensuration prepared in part or full by members of the Experiment Station staff will be found in the first group; publications on forest products prepared by the Section of Products, formerly connected with the Regional Office, now a branch of this Station are listed in the second group. The list is not to be considered complete in any sense, but simply an index of publications available at the present time.

1 - Publications issued by the Pacific Northwest Forest Experiment Station or completed with the cooperation of the Experiment Station:

1. Slash Disposal in the Western Yellow Pine Forests of Oregon and Washington. U. S. Dept. Agri. Tech. Bull. 259, by T. T. Munger and R. H. Westveld.

2. Timber Growing and Logging Practice in the Douglas Fir Region. U.S.D.A. Dept. Bull. 1493, by Thornton T. Munger.

3. Some Forest Problems of the Northwest: Particularly as They Relate to Sciences Other Than Forestry. Reprint from Northwest Science, June, 1928, by Thornton T. Munger.

4. Seed Flight in the Douglas Fir Region. Reprint from Jour. of Forestry, April, 1930, by Leo A. Isaac.

5. Phenology An Instrument of Forest Administration. Reprint from Northwest Science. Sept. 1931, by Ernest L. Kolbe.

6. The Yield of Douglas Fir in the Pacific Northwest. U.S.D.A. Tech. Bull. 201, by Richard E. McArdle and Walter H. Meyer.

7. A Study of the Relation Between Actual and Normal Yields of Immature Douglas Fir Forests. Reprint from Jour. of Agri. Research, November 1, 1930, by Walter H. Meyer.

8. Diameter Distribution Series in Even-aged Forest Stands. Yale School of Forestry Bulletin 28, by Walter H. Meyer.

9. Volume Tables and Volume Alinement Charts for Western Yellow Pine on Sites II, III, IV, V, and VI, by Walter H. Meyer.

10. Thinning Experiments in Young Douglas Fir. Jour. of Agri. Research, September 15, 1931, by Walter H. Meyer.

11. Forest Research Notes No. 4
    The Survival of Douglas Fir Seed Trees
    Response of Forest Fuels to Changes in Atmospheric Humidity
    A Site Quality Classification for Western Yellow Pine Lands
    The Effect of Thinning Sapling Douglas Fir Stands

12. Forest Research Notes No. 5
    Two Important Publications on Douglas Fir
    Destiny of Douglas Fir Seeds that Fall in the Virgin Forest
    The Year's Progress on the Forest Survey of the Douglas Fir Region
    Supposedly Harmless Surface Fires Damage Old Growth Forests
    The Interception of Summer Rains by Forest Cover

13. Forest Research Notes No. 6
    Preliminary Alinement Charts for Determining Growth in Selectively Cut Stands of Western Yellow Pine

14. Forest Research Notes No. 7
    Sawmill Waste in the Douglas Fir Region, Amount and Utilization
    Concerning the Reburning of Douglas Fir Cut-over Land
    Does the Form of Western Yellow Pine Change After Release Cutting?
    Relative Cost of Making Logs from Small and Large Trees
    Classifying Stocking in Douglas Fir Reproduction by the Stocked Quadrat Method

II - Publications by the Office of Products, formerly with the Regional Office, now a branch of the Forest Experiment Station:

1. The Forests and the Wood-using Industries of Washington. Reprinted from the West Coast Lumberman, by William H. Gibbons.

2. Logging Waste in the Douglas Fir Region. Reprinted from the Pacific Pulp and Paper Industry and West Coast Lumberman, 1930, by Allen H. Hodgson.

3. The Air Seasoning of Lumber in the Douglas Fir Region. Reprinted from The Timberman, by Herman M. Johnson and William H. Gibbons.

4. Degrade in Air Seasoning Wide Douglas Fir Common Boards. Reprinted from The Timberman, 1928, by Herman M. Johnson.

5. The Air Seasoning of Western Softwood Lumber. U.S.D.A. Dept. Bull. 1425, by S. V. Fullaway, H. M. Johnson, and C. L. Hill.

6. Degrade in Kiln Drying Douglas Fir Common and Finish. Reprinted from The Timberman, 1928, by Herman M. Johnson.

7. Red Alder of the Pacific Northwest: Its Utilization, with Notes on Growth and Management. U.S.D.A. Dept. Bull. 1437, by Herman M. Johnson, Edward J. Hanzlik, and William H. Gibbons.

8. Properties of Western Hemlock and Their Relation to Uses of the Wood. U.S.D.A. Tech. Bull. 139, by R. P. A. Johnson and W. H. Gibbons.

9. The Effect of Tree Sizes on Western Yellow Pine Lumber Values and Production Costs. Reprinted from The Timberman 1929-1930, by William H. Gibbons and Howard R. Spelman.

10. Present Utilization of Sawmill Waste in the Douglas Fir Region. Reprint from The Timberman, 1931, by Allen H. Hodgson.

STATION NEWS NOTES

New Publications - Several articles and bulletins will be issued in the near future covering a variety of topics. A number of them will be distributed directly from Washington, but a few will be sent from Portland. These anticipated publications are:

Slash Disposal in Western Yellow Pine. U.S.D.A. Tech. Bull. 259 by Thornton T. Munger and R. H. Westveld.

Present Utilization of Sawmill Waste in the Douglas Fir Region. Reprint from The Timberman, 1931, by Allen H. Hodgson.

Effect of Release upon the Form and Volume of Western Yellow Pine. Journal of Forestry, December, 1931, by Walter H. Meyer.

Thinning Experiments in Young Douglas Fir. Reprint from Journal of Agricultural Research, September 15, 1931, by Walter H. Meyer.

Station Staff - One of the most common questions that we have to answer these days is "Just how large a staff have you?" The permanent staff of 31 members is divided into the several major forestry activities as follows:

Director	1
Fire studies	2
Silvics and Management	3
Forest Products	3
Forest Survey	11
Selective Logging	1
Forest Insurance	1
Forest Entomology	3
Clerical, Stenographic and Computing Assistants	6
Total	31

The number of temporary assistants varies from four to a dozen, depending upon the time of the year and the urgency of various jobs.