

*(Research Note) No. 20*

**DIRECT SEEDING**  
of  
**WESTERN RED CEDAR**

By  
**W. H. ENGSTROM**



**OREGON STATE BOARD OF FORESTRY**  
George Spaur, State Forester  
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**SALEM, OREGON**

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## INTRODUCTION

An attempt to establish a stand of western red cedar (*Thuja plicata*) by direct seeding was made in 1950 by the Oregon State Board of Forestry in the Tillamook burn. Most of the Tillamook burn is in rugged mountainous country, but a considerable part of the area along stream bottoms and near the headwaters of watersheds is flat and at one time supported excellent stands of western red cedar. Three cedar plots were hand broadcast in March and April, 1950 on an area which had previously been sown with one-third of a pound of Douglas fir seed per acre. Two of the cedar plots are on the Devils Lake Fork watershed and one is on the upper portion of the Elliott Creek watershed; all three plots are located on areas that formerly supported western red cedar stands and are now without a seed source.

This experiment deals primarily with the results obtained by hand broadcasting western red cedar.

The stocking percentages of Douglas fir found on the same areas are given as a matter of interest and for comparative purposes.

## LITERATURE REVIEWED

1. ISAAC, L. A. Reforestation by broadcast seeding with small-seeded species. Pac. N.W.For.&Rge.Exp.Sta., Portland, Oregon. Res. Note 27-1939.

The publication indicates that adequate stocking of western red cedar, sitka spruce, western hemlock and red alder can be obtained by broadcasting seed at the rate of one to two pounds per acre in the spruce-hemlock region. In order to get satisfactory results, the seeding must be done within two years after the slash is burned. The author was of the opinion that further experimentation was necessary to determine the quantities of seed required to produce acceptable stocking under different ground conditions. By seeding on recently logged areas and using small seeded species, seed consumption by rodents was apparently no problem.

2. SCHOPMEYER, C. S. and HELMERS, A. F. Seeding as a means of reforestation in the Northern Rock Mountain region. USDA Circular No. 772—Nov. 1947 pp. 23-25.

This work indicated that successful spot seeding of western red cedar is possible without rodent protection. Good to excellent seedling establishment was found on fresh burns and cut-over areas with only moderate plant cover. Results on brushy areas were unsatisfactory. Figures over a five-year period indicated that fall sowing gave higher seedling survival than spring sowing.

## PURPOSE OF THE EXPERIMENT

The purpose of the experiment was to determine if it is possible to secure adequate stocking of western red cedar by direct seeding and, if so, to determine the amount of seed per acre necessary.

## EXPERIMENTAL PROCEDURES

### Plot Selection

The plots were selected from areas which once supported stands of western red cedar. These were used to obtain replications of the various poundages sown per acre and to cover differences in ground cover and topography. Each plot was divided into three sub-plots, each of which received a different amount of seed.

### Description of Plots

Two of these plots are on the Devils Lake Fork watershed and the other on the upper portion of Elliott Creek.

Plot number 1 (see Plate I) is 22.5 acres in size. Most of the plot is in Section 31, Township 2 North, Range 5 West, in the middle portion of the Devils Lake Fork watershed. The general topography is flat and the primary exposure is slightly north. It has an average elevation of about 1,500 feet above mean sea level. The soil is favorable but not too well drained. Ground cover was classed as light to medium. The original stand was composed of western red cedar and Douglas fir. This plot was burned in the 1933 Tillamook fire, and reburned again in 1945.

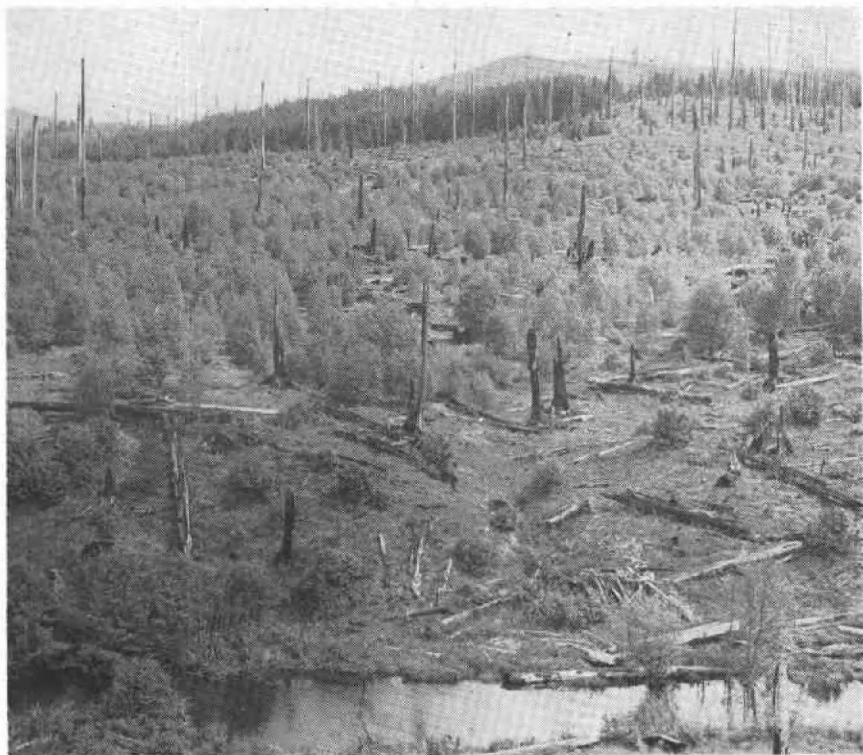


Plate I—Plot No. 1

Plot number 2 (see Plate II) is 32 acres in size. It is on the upper Devils Lake Fork watershed in Section 1, Township 1 North, Range 6 West. The general topography is flat and the exposure is west. The plot has an average elevation of about 1,600 feet above mean sea level. Soil and the drainage were favorable and ground cover was classed as medium. The original stand was composed of western red cedar and Douglas fir. This plot was burned in the 1933, 1939 and 1945 Tillamook fires.

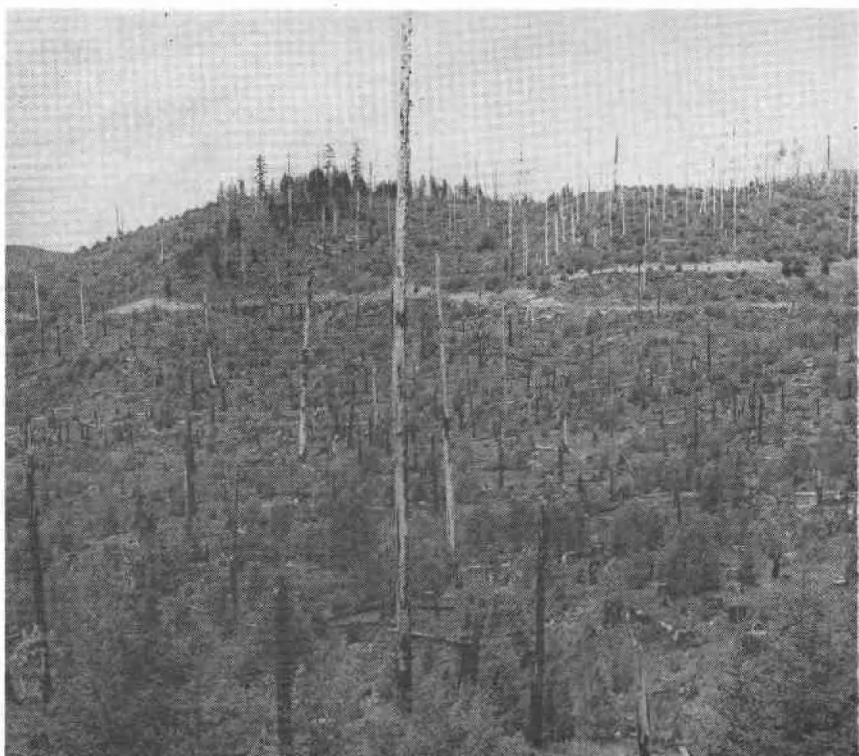


Plate II—Plot No. 2

Plot number 3 (see Plate III) is slightly over 43 acres in size. It is located on the upper Elliott Creek watershed in the SE $\frac{1}{4}$  of Section 2, Township 1 North, Range 6 West. The general topography is flat, the exposure slightly south. The elevation is about 1,600 feet above mean sea level. Soil was favorable but poorly drained and ground cover was classed as medium. The original stand was composed of western red cedar and Douglas fir. This plot was burned in the 1933 and 1945 Tillamook fires.

All three plots had a natural stocking of less than 17 per cent as determined by four-milacre samples.

### **Rodent Control**

The areas where all of these are located were baited for rodents the last week in September, 1949, using wheat treated with 1080 compound and thallium sulphate. The distribution was one pound ( $\frac{1}{2}$  lb. thallium sulphate,  $\frac{1}{2}$  lb. 1080) per acre. The areas were trapped in mid-October, 1949 and only a very few white-footed deer mice (*Peromyscus maniculatus rubidus*) caught.

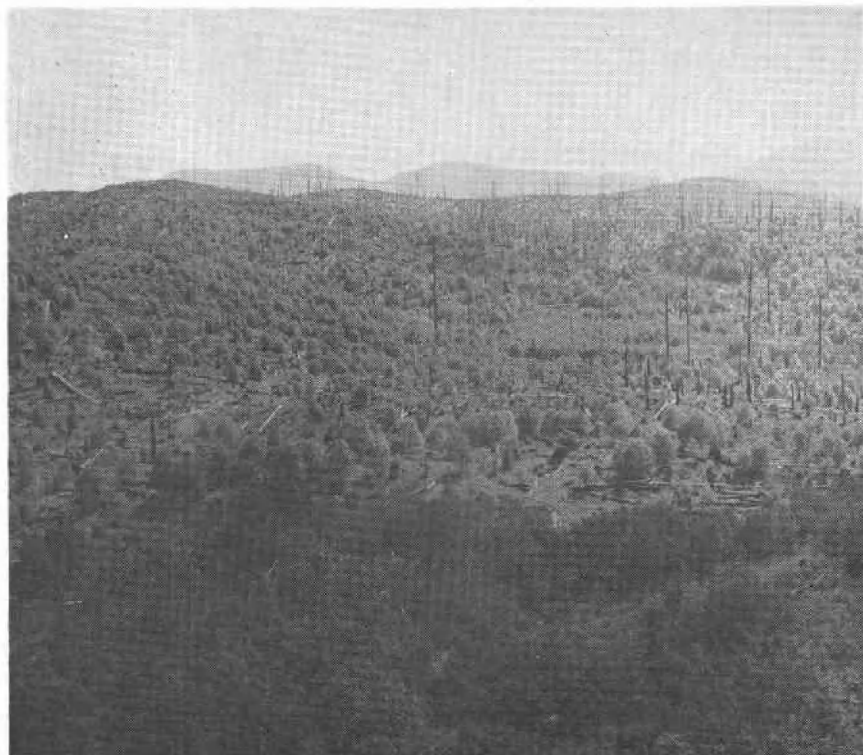


Plate III—Plot No. 3

### **Seed Collection**

The seed for this experiment was collected in the fall of 1949 at approximately the 1,000 foot elevation in the Molalla-Silverton area of Oregon. The seed was kept in cold storage until used. A germination test showed it to be 68 per cent viable.

### **Seed Distribution**

The seed was hand broadcast in late March and early April, 1950. During seeding light precipitation occurred and wind velocities varied from zero to ten miles per hour.

The hand broadcast was done in a manner to simulate as nearly as possible the pattern of seed dissemination expected from aerial seeding. The presence of stumps and logs were disregarded in distribution of the seed. The seed was distributed by a ten-man crew. Since western red cedar seed is light and difficult to hand broadcast, the wind, when fairly uniform in velocity and direction, was relied upon to aid in disseminating the seed. The width of strips covered by the crew varied from one chain when there was no wind to two chains when there was a fairly uniform wind of approximately ten miles per hour.

## RESULTS

The results (see Tables I and II) from all three plots indicated an unsatisfactory overall stocking and distribution of western red cedar. In no instance was stocking found which would satisfy the minimum standard of 30 per cent by milacre and 40 per cent by four milacre.

There was no correlation apparent between the amount of stocking and the various poundages of seed sown. In each of the plots a different poundage was responsible for the best stocking. It would normally be expected that  $1\frac{1}{2}$  pounds of seed per acre would produce the best stocking; 1 pound per acre would produce less than  $1\frac{1}{2}$  pounds but more than  $\frac{1}{2}$  pound and that  $\frac{1}{2}$  pound per acre would produce the least. This, as can be seen by the results in Table II, was not the case. The highest stocking was produced by  $1\frac{1}{2}$  pounds; this was followed very closely by  $\frac{1}{2}$  pound, and 1 pound per acre produced the lowest stocking.

TABLE I  
Western Red Cedar Stocking by Year and Poundage

Date Examined	Plot No.	Pounds of Seed Per Acre	Stocking Per Cent		No. of Trees Found
			By Milacre	By Four Milacre	
Nov. 1950 .....	1	$1\frac{1}{2}$	17.0	40.0	46
Nov. 1950 .....	2	$1\frac{1}{2}$	17.0	35.0	140
Nov. 1950 .....	3	$1\frac{1}{2}$	8.3	11.0	23
Oct. 1951 .....	1	$1\frac{1}{2}$	10.7	44.0	6
Oct. 1951 .....	2	$1\frac{1}{2}$	5.3	15.7	14
Oct. 1951 .....	3	$1\frac{1}{2}$	2.9	11.7	11
Nov. 1952 .....	1	$\frac{1}{2}$	7.1	28.5	5
Nov. 1952 .....	1	1	0.0	0.0	0
Nov. 1952 .....	1	$1\frac{1}{2}$	10.7	35.7	8
Dec. 1952 .....	2	$\frac{1}{2}$	12.5	40.0	27
Dec. 1952 .....	2	1	7.5	25.0	8
Dec. 1952 .....	2	$1\frac{1}{2}$	7.5	30.0	21
Dec. 1952 .....	3	$\frac{1}{2}$	1.7	7.1	1
Dec. 1952 .....	3	1	5.0	25.0	4
Dec. 1952 .....	3	$1\frac{1}{2}$	3.7	15.0	6

**TABLE II**  
**Composite of Western Red Cedar by Year and Poundage**

<i>Date Examined</i>	<i>Plot Nos.</i>	<i>Pounds of Seed Per Acre</i>	<i>Stocking Per Cent</i>	
			<i>By Milacre</i>	<i>By Four- Milacre</i>
Nov. 1950 .....	1, 2, 3	1½	14.0	28.0
Oct. 1951 .....	1, 2, 3	1½	6.0	22.0
Nov. 1952 .....	1, 2, 3	½	7.0	25.0
Dec. 1952 .....	1, 2, 3	1	3.7	12.9
Dec. 1952 .....	1, 2, 3	1½	7.4	27.0
1952 .....	1, 2, 3	½, 1, 1½	6.4	21.7

Table III is presented to facilitate a comparison between the cedar and Douglas fir stocking found on the cedar plots. The seeding of Douglas fir has produced stocking which does meet the minimum standard for adequate stocking and distribution (30 per cent mil-acre—40 per cent four-milacre).

**TABLE III**  
**Douglas Fir Stocking Found in the Western Red Cedar  
Direct Seeding Plots\***

<i>Date Examined</i>	<i>Plot No.</i>	<i>Stocking Per Cent</i>	
		<i>By Milacre</i>	<i>By Four- Milacre</i>
Nov. 1950 .....	1	48	87
Nov. 1950 .....	2	33	70
Nov. 1950 .....	3	36	61
1950 .....	1, 2, 3	38	72
Nov. 1952 .....	1	34	69
Dec. 1952 .....	2	18	47
Dec. 1952 .....	3	39	76
1952 .....	1, 2, 3	29.6	62

\* Stocking resulting from aerial seeding in fall of 1949 at rate of ½ pound Douglas fir seed per acre.

A further comparison which emphasizes the poor stocking obtained in this experiment is given in Table IV. This table presents the results obtained by sowing western red cedar by helicopter on an area having similar ground and cover conditions, but somewhat better drainage.

**TABLE IV**  
**Western Red Cedar Stocking from 1952 Rehabilitation Aerial  
 Seeding on the Tillamook Burn**

<i>Date Examined</i>	<i>Pounds of Seed Per Acre</i>	<i>Stocking Per Cent</i>		<i>No. of Trees Found</i>
		<i>By Milacre</i>	<i>By Four- Milacre</i>	
Fall 1953 .....	1/4	43	60	1891

The comparison of the two western red cedar seeding projects raised the question as to whether or not drainage might be a major factor in seedling establishment. Inasmuch as drainage had not been a primary consideration at the outset the following is presented as a matter of interest but cannot be subjected to any type of analysis. The plots were revisted and the areas which were well drained were mapped separately from areas which were poorly drained. The stocking survey lines were then overlaid on these maps and stocking tallied by drainage type. Table V presents this comparison.

**TABLE V**  
**Composite 1952 Western Red Cedar Stocking by Drainage on all  
 Three Hand Broadcast Plots**

<i>Plot No.</i>	<i>Drainage</i>	<i>No. Milacre Plots</i>	<i>No. Stocked</i>	<i>Milacre Stocking Per Cent</i>
1, 2, 3 .....	Good	304	34	11.2
1, 2, 3 .....	Poor	320	6	1.9

## CONCLUSIONS

The western red cedar stocking was unsatisfactory. Milacre stocking per cents averaged 7.0, 3.7 and 7.4 for the 1/2, 1 and 1 1/2 pounds of seed per acre. This is far below the 30 per cent usually considered to be the minimum stocking per cent acceptable for adequate stocking.

Some factor or combination of factors other than quantity of seed per acre apparently controlled the amount of seedlings that were established. No correlation of quantity of seed and amount of stocking was apparent.

The experiment indicates that possibly drainage is a very important factor in the germination and survival of this species. It would be well to determine the effect of drainage on western red cedar establishment in an experiment designed to test this factor.

A comparison of the results of the 1952 fall aerial seeding of

western red cedar with the spring hand broadcast seeding of this experiment indicates that fall seeding would probably be better than spring seeding.

## SUMMARY

An attempt to artificially establish western red cedar (*Thuja plicata*) by direct seeding was made in 1950 in northwest Oregon by the Oregon State Board of Forestry. Various poundages ( $\frac{1}{2}$ , 1 and  $1\frac{1}{2}$ ) of cedar seed per acre were broadcast to simulate an aerial seeding. The cedar was hand broadcast over a portion of a larger area which had been seeded with Douglas fir by helicopter. The seeding was done on three separate stream flats, which had supported red cedar stands before the occurrence of the Tillamook fires.

The cedar stocking obtained was unsatisfactory. This appeared to be due to a combination of factors such as the dry spring of 1951, insufficient drainage and heavy sod plant cover. Douglas fir on the same plots, in contrast, germinated and became well established.

Some limited cedar stocking did, however, become established in the better drained parts of the plots. Good cedar stocking was obtained in a 1952 aerial seeding where the seed was disseminated on a well drained area.

The amount of seed hand broadcast per acre made little difference in the amount of stocking found. It appears that satisfactory cedar stocking can be obtained by using as little as  $\frac{1}{2}$  pound or less seed per acre, providing the ground cover, drainage, and the moisture during the growing season are favorable. Experience indicated that fall sowing of western red cedar may give better results than spring sowing.