



U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE  
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# Research Note



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## A COMPARISON OF CONIFERS PLANTED ON THE HEMLOCK EXPERIMENTAL FOREST

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Test plantings have been made on the Hemlock Experimental Forest <sup>1/</sup> in cooperation with the St. Regis Paper Company to test suitability of several native conifers for planting on heavy bracken- and brush-covered Site II areas typical of the western Olympic Peninsula. In the spring of 1950, 2,500 Douglas-fir seedlings from the Forest Industries Tree Nursery at Nisqually were planted. In 1952, planting was continued with 1,000 Sitka spruce, 500 grand fir, and 1,000 western redcedar from the U. S. Forest Service Nursery at Wind River, and in 1953 with 2,500 western hemlock, a gift of the British Columbia Forest Service. Spacing was 6 x 6 feet for all species except hemlock, which was spaced 4 x 4 feet. The latest remeasurement of the plantations was made on January 26 and 27, 1955. Species suitability is rated according to:

1. Survival
2. Height growth
3. Immunity to animal damage

Seedlings were planted in short rows of from 20 to 25 seedlings. Rows to be measured were selected at random, and all seedlings in selected rows were counted and marked with cedar stakes. Since all plantings were not made in the same year, differences in results may

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<sup>1/</sup> Maintained jointly by the St. Regis Paper Company and U. S. Forest Service in Grays Harbor County, Washington.

be due to variations in growing seasons as well as to differences in species. However, more reliable conclusions can be drawn for those species or classes planted in the same year.

### Survival

At the end of the second growing season, western hemlock has shown the best survival, 88 percent, with 1-0 Douglas-fir next with 85 percent (table 1). Western redcedar, 2-0 Douglas-fir, jumbo <sup>2/</sup> Douglas-fir, and Sitka spruce are closely grouped in third place; and grand fir is last with 40 percent. Of three classes of Douglas-fir stock planted in 1950, the 1-0 stock has the best fifth-year survival, 66 percent. There is little difference in survival between the jumbo and the 2-0 stock. Sitka spruce and western redcedar have identical third-year survival, 66 percent; while grand fir again has the lowest, 31 percent.

### Height Growth

Jumbo Douglas-fir is the tallest and most rapidly growing of all seedlings in the test plantation (table 2); 2-0 and 1-0 stock of Douglas-fir rate second and third, respectively. After allowance is made for initial height advantage of the jumbo stock, there is little difference in rate of height growth among the three classes of Douglas-fir. The small differences that exist now will doubtless be absorbed in the more rapid period of development that lies immediately ahead. All other conifers in the plantation are shorter and have grown more slowly than Douglas-fir in height. All species, however, with the possible exception of grand fir, are apparently growing fast enough to successfully compete with the cover of bracken and salal.

These height measurements illustrate how slowly our western conifers grow during early life. After 7 years (from seed) even the uninjured Douglas-fir of jumbo stock averages only 25 inches in height (table 2). This is fairly typical of growth of planted trees in the Puget Sound area, but is approximately 35 inches less than the average height expected for natural dominant seedlings on site II. <sup>3/</sup> Alder,

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<sup>2/</sup> Extra large 2-0 stock sorted out on the grading table.

<sup>3/</sup> McArdle, Richard E., Meyer, Walter H., and Bruce, Donald. The yield of Douglas Fir in the Pacific Northwest. U. S. Dept. Agric. Tech. Bul. 201, 74 p. Rev. Oct. 1949.

an important competitor of Douglas-fir, would be about 15 feet tall at 7 years. All other species in the plantation, even though slower in growth rate, are better able to compete with hardwoods because they are more tolerant than Douglas-fir. Lag in early development of western conifers is often a serious hindrance to successful establishment by either natural or artificial regeneration. Research looking toward improvement of initial height growth to overcome this handicap merits early attention.

Table 1. -- Plantation survival by species

Species and stock	Year planted	Seed source	Number sample trees	Survival percent					
				Year					
				1st	2nd	3rd	4th	5th	
Douglas-fir	jumbo	1950	Lewis County	100	69	69	54	51	52
Douglas-fir	2-0	1950	Lewis County	106	77	69	60	58	54
Douglas-fir	1-0	1950	Grays Harbor Co.	93	89	85	77	75	66
Sitka spruce	3-0	1952	Siuslaw N. F.	99	75	64	66		
Grand fir	3-0	1952	Mt. Baker N. F.	87	54	40	31		
Western redcedar	2-0	1952	Mt. Baker N. F.	96	80	70	66		
Western hemlock	2-0	1953	Lower Vancouver Island	200	90	88			

### Animal Damage

Up to the present time rabbits have been the sole cause of damage to the plantation, according to Harry Hartwell, mammal control agent of the U. S. Fish and Wildlife Service. Rabbit damage to seedlings has been generally severe for several years on the Olympic Peninsula,<sup>4/</sup> but prior to 1954 the test plantings on the Hemlock Experimental Forest escaped noticeable injury. Widespread rabbit damage was first noted in

<sup>4/</sup> Rabbit Control Committee, Puget Sound Section, Society of American Foresters. Unpublished reports.

February 1954, and continued at about the same level during the following year (table 3). Douglas-fir was the hardest hit of the 5 species, confirming findings from a previous study.<sup>5/</sup> For all classes of Douglas-fir stock, 46 percent of the seedlings were found to be damaged in 1954 and 32 percent in 1955. No appreciable mortality is expected, however, because the trees are now above the size most susceptible to kill from rabbit damage. Sitka spruce and grand fir were scarcely touched. Clipping of western redcedar has increased markedly, and of hemlock, slightly. The rabbit population on the experimental planting is probably higher than would be expected on a more open site because of the natural cover furnished by dense salal and bracken. In general, clipping by rabbits was not severe and should not have lasting effects other than to retard height growth.

Table 2. -- Height and height growth by species

Species and stock	All surviving seedlings		Uninjured seedlings		
	Average height First year after planting	Average annual height growth <sup>2/</sup>	Average height 1955	Average leader growth 1954	
----- inches -----					
Douglas-fir          jumbo	10.9	21.7	2.7	25.3	5.7
Douglas-fir          2-0	10.1	19.2	2.3	23.1	4.5
Douglas-fir          1-0	5.6	14.0	2.1	17.9	4.6
Sitka spruce          3-0	4.1	5.1	.5	5.4	1.3
Grand fir            3-0	2.3	3.0	.4	3.2	.3
Western redcedar    2-0	3.1	5.4	1.2	6.1	1.4
Western hemlock    2-0	5.6	6.1	.5	6.4	1.0

1/ At time of 1955 examination Douglas-fir seedlings had been in the plantation 5 years, western hemlock 2 years, and other species 3 years.

2/ Based on 4 growing seasons for Douglas-fir, 1 growing season for western hemlock, and 2 growing seasons for other species.

5/ Staebler, George R., Lauterbach, Paul, and Moore, A. W. Effect of animal damage on a young coniferous plantation in southwest Washington. Jour. Forestry 52 (10). October 1954.

Table 3. -- Rabbit damage by species

Species and stock	Trees injured in period ending--		Trees uninjured	
	Feb. 1954	Jan. 1955	January 1955	
- - - - - percent of live trees - - - - -				
Douglas-fir	jumbo	49	27	38
Douglas-fir	2-0	40	19	47
Douglas-fir	1-0	50	49	30
Sitka spruce	3-0	3	5	92
Grand fir	3-0	3	0	96
Western redcedar	2-0	4	22	75
Western hemlock	2-0	10	13	81

Summary

For heavy bracken- and brush-covered site II lands of the western Olympic Peninsula, it appears that Douglas-fir plantings will result in a survival of about 50-60 percent. Height growth is slow, lower than expected for Douglas-fir on this site. Rabbit clipping is prevalent but not serious.

Western hemlock has shown exceptional survival during the first two growing seasons and is maintaining a satisfactory growth rate.

Grand fir appears to be a near failure in both survival and development. Apparently the species is not suited to heavy clay-loam soils of the Hoquiam series. Grand fir has been almost free from rabbit damage.

Sitka spruce and western redcedar are fairly similar in survival and growth and appear capable of successful establishment. Rabbits are clipping cedar moderately, but spruce rarely.