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# SURVIVAL AND HEIGHT GROWTH OF COASTAL AND INTERIOR WESTERN WHITE PINE SAPLINGS IN NORTH IDAHO

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## ABSTRACT

*Western white pine saplings from the Olympic Peninsula of Washington and from north Idaho sources planted together in north Idaho did not differ in their survival rates. There has been no visual evidence of freezing injury to either group. At age 12, height of the coastal saplings generally falls within the height range for north Idaho saplings. The findings lend support to earlier results, which indicated that most of the variation in north Idaho white pines is found within, rather than between, populations.*

KEYWORDS: *Pinus monticola*, geographic variation, provenance trials.

Several tests have been established to study adaptability and variation in the north Idaho portion of the interior range of western white pine *(Pinus monticola* Dougl.), but there has been no rangewide study of the species. Within north Idaho we have found white pine broadly adaptable with little variation among young trees that can be related to elevation or latitude of seed collection (Steinhoff 1979; Rehfeldt 1980). Seedlings from northwestern Washington were tested for survival in northern Idaho and to compare growth rates with local seedlings. In this research note I present and compare survival and height data for a 12-year-old test of western white pine saplings from northwestern Washington and northern Idaho.

## MATERIALS AND METHODS

The north Idaho seed was collected from five trees in each of 45 collection areas, from approximately 46° to 49° N. latitude and from 455 m to 1 585 m elevation. The coastal seed came from the east and west sides of the Olympic Peninsula. The collection from the west side consisted of seed from five trees growing at an elevation of approximately 160 m near Humptulips, Wash., in an area referred to as the "Promised Land." On the east side of the Peninsula, the seed was collected from five trees growing at elevations ranging from 350 to 600 m on the Olympic National Forest near Shelton, Wash.

The coastal seed was added when the tests were underway and therefore received only 40 days of stratification as compared to 100 days for the north Idaho seed. As a result of the shorter stratification period, fewer of the coastal seeds germinated and some did not germinate until the second year. Nevertheless, because of records kept on germination time and our culling practices, I believe the data reported here offer a valid comparison.

Seed from both the "Promised Land" and Olympic National Forest collections were included along with all 45 north Idaho collections in a replicated nursery trial. Seedlings in the test were grown for 3 years in 10-tree row plots at a spacing of 5 x 10 cm in a 1:1:1 mix of sand, forest soil, and peat moss. Two replicates from that test were outplanted to a plot called Ida Creek at the Priest River Experimental Forest (PREF) in north Idaho at an elevation of 790 m. Seedlings from the other two replicates were outplanted to a different plot where they were killed by pocket gophers. At Ida Creek, the seedlings were planted in two replicates, with 5 seedlings from each family in a stand planted together in a row 25 seedlings long. Spacing was 1.2 x 1.2 m.

In a second part of the test, seed from only the "Promised Land" and 24 of the north Idaho collections was broadcast sown in native soil in the same nursery at Moscow, Idaho. Seedlings from that planting were transplanted to a series of six field plantations. Data from the low and high plantations at PREF are reported here. The other plantations have been plagued with mortality problems resulting from inadequate site preparation and early infection by white pine blister rust *(Cronartium ribicola)*. In this phase of the test, seedlings from the individual families in a stand were mixed and planted together in 10-tree row plots replicated five times. Further details of seed collection and nursery practices as well as early growth data for the north Idaho

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seedlings have been reported earlier (Steinhoff 1979). The saplings are now 12 years old and have been in the plantations for 9 years.

## RESULTS

In all the plantations, survival of the coastal saplings fell within the range of survival values for saplings of the north Idaho collections (table 1). To date ther has been no visual evidence of spring or fall frost damage or differential winter freezing injury among any of the populations of saplings even though there have been two severe winters. In contrast, during the winter of 1972-73, nearly all of the coastal Douglas-fir *(Pseudotsuga menziesii* [Mirb.] Franco) seedlings were killed, while interior seedlings suffered much less mortality and injury in a nursery test 2 km away at approximately the same elevation as the Ida Creek plantation (Rehfeldt 1977).

**Table 1.—Survival and height of coastal and north Idaho white pine saplings at age 12 years**

| Seed source | Plantations | | | | | |
|---|---|---|---|---|---|---|
| | Ida Creek[1] | | PREF Low[1] | | PREF High[2] | |
| | Survival | Height | Survival | Height | Survival | Height |
| | *Percent* | *Meters* | *Percent* | *Meters* | *Percent* | *Meters* |
| Olympic National Forest[3] | 96 | 2.62 | | | | |
| Promised Land[4] | 94 | 2.39 | 88 | 1.63[5] | 62 | 1.45 |
| North Idaho $\bar{x}$ | 95[6] | 2.49 | 84[7] | 1.92[5] | 74[7] | 1.52 |
| Range | 88-100 | 2.22-2.75 | 66-92 | 1.75-2.27 | 60-86 | 1.37-1.68 |

[1]Adjacent plantations at the Priest Experimental Forest - latitude 48° 21' N. Elevation 790 m.
[2]Plantation elevation 1 400 m.
[3]East side, Olympic Peninsula near Shelton, Wash., elevation 350-600 m.
[4]West side, Olympic Peninsula, near Humptulips, Wash., elevation approx. 160 m.
[5]Significantly different at 1 percent level
[6]Mean of collections from 45 stands from 46° to 49°, N. latitude, elevation 455 to 1 585 m.
[7]Mean of collections from 24 stands.

Height of the coastal saplings also was within the range of values for north Idaho saplings in two of the three plantations (table 1 and fig. 1). In the low PREF plantation, the height of the "Promised Land" saplings was significantly less than the average for the north Idaho saplings. For the other plantations, there were no significant differences between the means for coastal and north Idaho saplings. The substantial difference between the means for the Ida Creek and PREF low plantations are primarily the result of different nursery growing conditions, i.e., spaced planting in a soil:sand:peat moss mix versus dense broadcast sowing in a heavy clay soil respectively which resulted in sizable initial differences in size and condition of the two groups of seedlings.

## DISCUSSION AND CONCLUSIONS

Although the number of collections of coastal white pine is too small to draw broad conclusions, the initial impression is that saplings of coastal white pine sources differ little from those of interior sources when grown in north Idaho. In another small plantation on Vancouver Island, B.C., 7-year old seedlings originating from north Idaho seed were taller than local seedlings but not significantly so, i.e., 56 versus 47 cm respectively (personal communication from R. C. Bower, MacMillan Bloedel Ltd.). Hunt and von Rudloff (1977) also found that no obvious differences between coastal and interior populations could be detected by comparing leaf-oil-terpene percentages. In their study, within population variation was generally much higher than that between different populations. All of these results lend support to our earlier findings that within population variation is generally higher than that between populations with regard to height growth for north Idaho white pine.

The results with western white pine contrast markedly with growth differences between coastal and interior forms of Douglas-fir and grand fir *(Abies grandis* [Dougl.] Lindl). In Idaho tests, the few coastal Douglas-fir

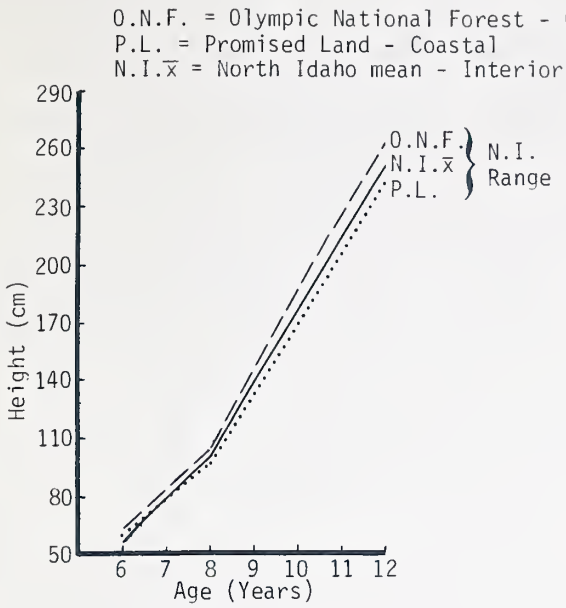


*Figure 1.—Growth of coastal and north Idaho white pines from age 6 to age 12 at Ida Creek.*

seedlings that survived to age 4 were about 60 percent taller than those from the interior (Rehfeldt 1977) but they did not survive the winter cold once they were taller than the protective snow cover. In coastal trials, the coastal trees are also much faster growing than interior ones (Haddock and others 1967). Seedlings from a single coastal grand fir population tested in north Idaho were 50 percent taller than interior seedlings at age 4 (Steinhoff 1980). During one winter, both coastal and interior seedlings that were not protected by snow had most of their exposed foliage and some buds killed, but all seedlings survived. Nevertheless, preliminary artificial freezing tests have indicated that the coastal seedlings are injured at warmer temperatures than interior ones. In trials in Oregon (Douglas 1974), coastal grand fir seedlings also were faster growing than interior ones. Thus, in north Idaho tests among similar geographic samples of these three species, young coastal and interior western white pine trees grow at about the same rate and all appear completely cold nardy; young coastal grand fir trees grow faster than interior ones but are more easily damaged by cold temperatures; and coastal Douglas-fir seedlings are faster growing than interior ones but are not cold hardy.

Test results indicate no potential for increasing the growth of interior western white pine by introducing genes from coastal populations. Conversely, there would be no growth loss if interior trees or genes from them were used in coastal programs. Because of the equality of growth rates and the apparent cold hardiness of coastal trees, the transfer of genes for other traits, such as blister rust resistance, might be made from coast to interior breeding programs, or vice versa, through a simple one-step hybridization process.

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