

Planting Western Larch: A Comparison of Stocktypes and Season of Planting in Northeast Washington

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Two-year-old bareroot seedlings and 6-month-old container stock were planted at three locations in fall and in spring. Survival and height growth were assessed after one and two growing seasons. Fall-planted seedlings were superior to spring-planted seedlings, and bareroot seedlings were taller than container seedlings after two seasons. Tree Planters' Notes 40(4):20-24; 1989.

Western larch (*Larix occidentalis* Nutt.) is an important species of many habitat types in northeast Washington. The Washington Department of Natural Resources manages over 130,000 acres on which larch is the primary or a secondary species. Its high value and rapid juvenile growth make it well-suited to shorter rotations and even-aged management. Management recommendations in northeast and north-central Washington call for planting larch in many cases, but many managers have had only limited experience with raising and planting this species. There are still unanswered questions regarding survival and early growth of different stock types planted at different seasons.

Spring planting has been favored for the last 40 to 50 years, because seedling survival

was thought to be better. There is currently renewed interest in fall planting, however. For one thing, planting some sites in the fall may relieve pressure on busy springtime operations, both in the nursery and in the field. Fall-planted stock does not need extended cold storage. There is evidence that planting stock of some species may be in better physiological condition in the fall than in the spring. When spring comes, stock planted the previous fall is already in place and ready to grow, as soon as environmental conditions permit. Planting sites are often more accessible in the fall than in the spring, when roads must be plowed of snow. In addition, soil moisture at the site may drop to unacceptably low levels by the time sites become accessible naturally.

There are disadvantages to fall-planting as well. There is only a short time period between the onset of adequate seedling dormancy at the nursery and the end of the fall planting season, when poor weather conditions preclude planting. This calls for close coordination between the nursery and planters. Fall-planted seedlings face greater risk of frost heaving, especially on sites subject to alternate freezing and thawing cycles. The success of fall planting is less predictable than that of spring

planting, partly because of weather conditions; a long dry Indian summer can decrease survival. The different physiological states of individual seedlings or species can also result in unpredictability.

Many species can be planted as either bareroot or container stock. Bareroot stock has been preferred where competition is intense; often, it tends to outgrow its competition because it is taller to start with.

Container stock has several advantages in terms of cost, lead-time, and ease of handling in the nursery and the field. Survival and growth of container stock have sometimes been better than that of bareroot stock.

It is not the purpose of this report to review the relative effects of planting season and stocktype on survival and growth of plantations, but to date, no clear preference for either stocktype or season of planting has emerged. The objectives of this study were to

- A. Determine survival and height growth of two larch stocktypes, 6-month container ("plug") stock and 2+0 bareroot seedlings.
- B. Determine the better season to plant larch (spring vs. fall) in northeastern Washington.

Literature Review

The subject of raising and planting larch stock has received less attention than is the case with some other species. Natural regeneration usually occurs readily in northeast Washington, so planting there often has been unnecessary. What is known indicates that larch is different from the more commonly planted ponderosa pine and Douglas-fir. Larch seedlings grow faster, and seedlings can rapidly become too large to handle and plant effectively. Larch seedlings tend to develop deep taproots, which are easily broken during lifting or become J-rooted during planting. Schmidt et al. (5) recommended that seedlings should be 4- to 8-inch tall and have 8-inch-long roots. Nursery controls such as density regulation, restricted watering, top-pruning, and root-pruning may be helpful to produce quality stock that will survive and grow well in the field. Barber (unpublished report) found that specially hardened larch container stock survived and grew well after fall planting in north-central Washington.

Several studies have been published on the effect of lifting date on survival of larch stock. Larch is physiologically active

longer in the fall than other conifers, so it is important not to lift it too soon. Sinclair and Boyd (6) recognized this, suggesting that the physiological condition of stock was at least as important as the environmental conditions at the planting site. They recommended lifting and planting no earlier than October 15 in northern Idaho; earlier lifting resulted in poor survival of fall-planted 1 +0 seedlings. Morby and Ryker (4) and McDonald et al. (3) recommended that larch stock be lifted in the fall and stored at 28 or 33 °F in poly-lined bags until spring planting.

Laird and Boyd (2) compared survival of stock lifted in fall and stored at 28 °F to stock lifted early in spring and stored until planting time and to "hot-lifted" stock (that is, lifted and planted immediately in spring). The survival of fall-lifted stock was better than that of spring-lifted or hot-lifted stock. Height growth was also better. These authors recommended fall-lifting and freezing for 1 +0 stock, and planting as early in spring as sites were accessible.

Planting date is also important. Larch breaks dormancy earlier than most species, often while still in cold storage (unless frozen). Sinclair and Boyd (6) reported that foliage became

chlorotic and moldy when stored over the winter, and that late fall planting (October 15 or later) avoided this problem, resulting in better survival than spring-planting.

Schmidt et al. (5) also reported that fall planting, in soil moistened 12 inches deep by fall rains, resulted in better survival than spring planting, unless the site was prone to frost heaving. They concluded that, if larch is to be planted in spring, it should be done as early as possible, to avoid premature flushing in storage. Survival declined sharply when nondormant seedlings were planted.

Methods

Study areas. Three study sites in Pend Oreille County, WA, were selected: King's Road, Mt. Pisgah, and Deer Valley. All three were located within the grand fir series; habitat types have not been defined for this area, but the Mt. Pisgah site appears to be similar to the grand fir-queencup beadlily habitat type (ninebark phase) described by Cooper et al. (1). The sites were similar enough that they were treated as replicates for purposes of data analysis.

Nursery. Seedlings were grown at the Department's Webster Nursery in Olympia, WA, in 1985. Bareroot stock was 2+0; container seedlings were grown in Styroblock-4's. Sowing was timed to coincide with planting dates, so that stocktypes were of comparable ages, regardless of whether planted in fall or spring.

Dormancy of fall-planted stock was induced by withholding water. (This represents a significant departure from some studies of fall-planted stock, in which seedlings were not fully dormant at the time of lifting.) Bareroot stock for spring planting (in 1986) was lifted in November 1985 and stored at 33 °F until planting.

Planting sites. Sites received only minimal preparation; the seedlings did not receive any special consideration not normally afforded operational planting stock. At the time of planting, fall rains had moistened the soil to a depth of 8 to 10 inches on one of the three sites; soil was dry and powdery at the other two. Soil moisture was high at all sites during spring planting.

Thirty trees were planted 1 foot apart, in rows spaced 2 feet apart. Four rows were planted to each stocktype. Trees were planted October 15 to 16, 1985 and April 14 to 15, 1986. Initial

heights were measured at the time of planting.

Survival and height growth were assessed at 6, 12, and 24 months after planting. Trees were considered alive if they had any green needles left at the time of measurement. No attempt was made to record specific causes of mortality, although major animal damage was noted. Survival data were analyzed by the Kruskal-Wallis test, and height growth data by standard analysis of variance.

Results and Discussion

Survival. Overall, bareroot stock survived better (.05 level)

after two growing seasons than container stock. Survival of the four treatments is shown in figure 1 for the first and second growing seasons.

There were no significant differences in survival after one growing season. At the end of the second growing season, the fall-planted bareroot stock had survived significantly better (.01 level) than fall-planted container stock; other comparisons indicated nonsignificant differences. Thus, bareroot stock planted in the fall is the best treatment from the standpoint of survival. Spring-planted container stock appears to be the least desirable alternative.

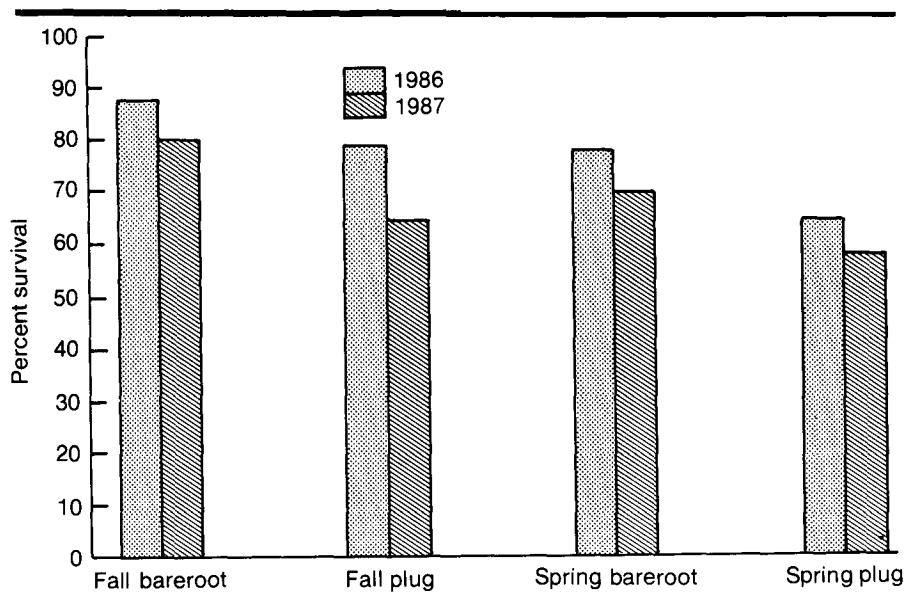


Figure 1—Survival of bareroot and container (plug) seedlings of western larch out-planted in spring and fall during their first two growing seasons.

These results are in general agreement with those of Sinclair and Boyd (6), who reported that larch was the most sensitive to lateness of spring planting of the four species they tested—larch, Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), grand fir (*Abies grandis* (Dougl. ex D. Don) Lindl. and Engelmann spruce) (*Picea engelmannii* Parry ex Engel m.)—especially in drier habitat types. They also reported that fall-planted 1 +0 larch had consistently good survival only when planted in mid-October.

They suggested that this was due to the physiological condition of the stock at the time of lifting and planting, in response to shorter photoperiods and cooler temperatures. This conclusion is in general agreement with the results of the present study, in which seedlings were artificially hardened off by withholding water at the nursery.

Heights and Height Growth.

Initial, first-year, and second-year heights are shown in figure 2; bareroot seedlings were sig-

nificantly taller than container stock, regardless of the season of planting, partly because they were taller to begin with. Heights at the Mt. Pisgah site were especially good; several trees (fall-planted bareroot stock) were almost 4 feet tall at a total age of 4 years and were easily outgrowing competing vegetation, primarily grasses and low shrubs.

Mean height increments are shown in figures 3 and 4. Bareroot seedlings grew about the same in the first year, regardless of season of planting. By contrast, container stock grew much better when planted in the fall and actually suffered a height loss when planted in spring (fig. 2). This was due to animal damage, primarily at the Mt. Pisgah site. First-year height growth of fall-planted container stock was significantly greater than that of bareroot stock, although this was not enough to overcome the greater initial height of the latter.

Analysis of variance indicated that there was no difference in second-year height growth of bareroot stock and container stock, but there was a difference due to season of planting. Fall-planted seedlings grew significantly more in their second season than spring-planted seedlings (.05 level).

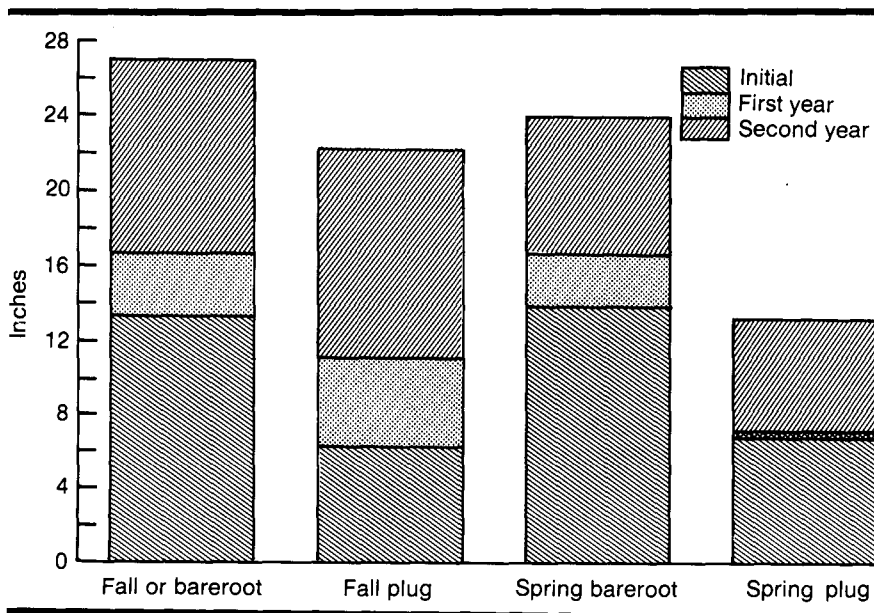


Figure 2—Cumulative height growth of bareroot and container (plug) seedlings of western larch outplanted in the spring and fall. (Spring plug seedlings suffered animal damage and thus showed a net loss in height during their first year.)

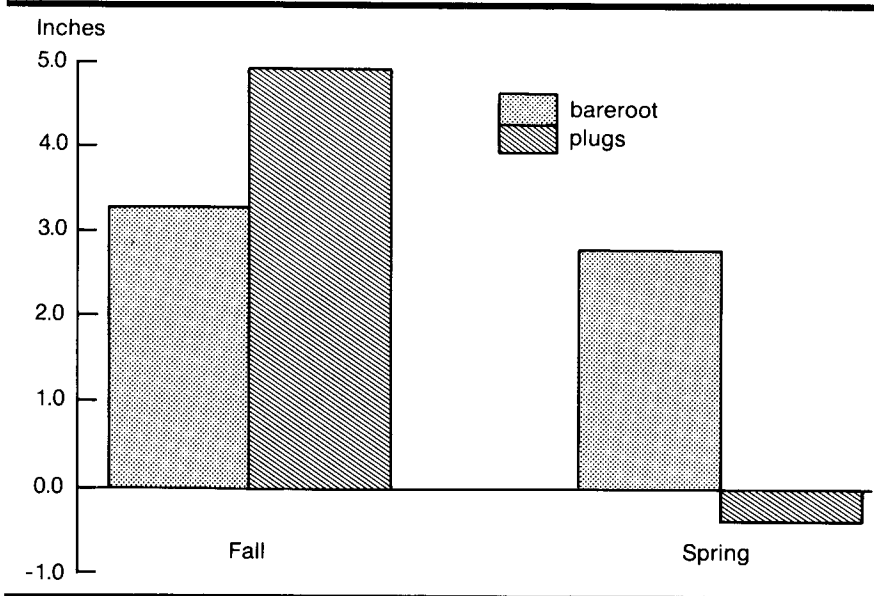


Figure 3—First-year height growth of bareroot and container (plug) seedlings of western larch outplanted in spring and fall.

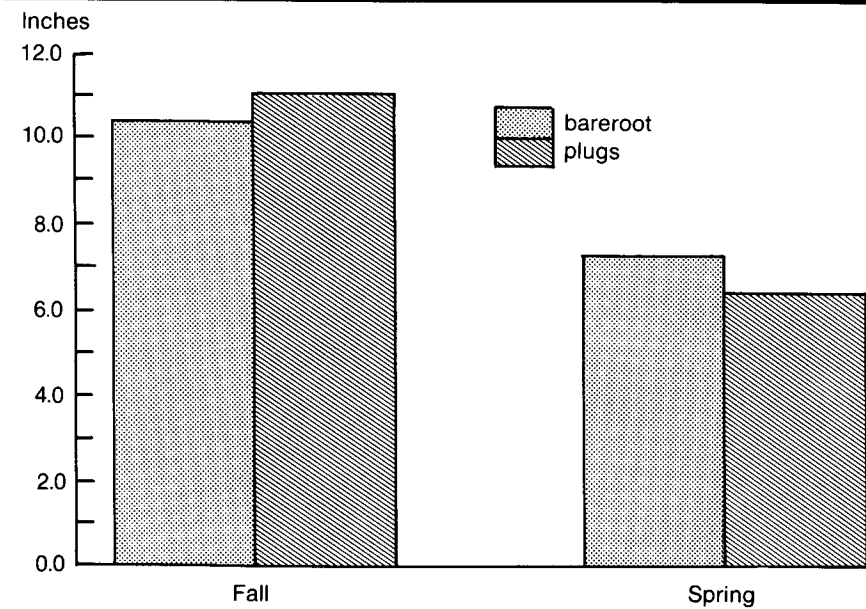


Figure 4—Second-year height growth of bareroot and container (plug) seedlings of western larch outplanted in spring and fall.

Conclusion

Survival, height growth, and total height in the first 2 years after planting all indicate that fall-planting of western larch is preferable to spring planting and that 2+0 bareroot stock is preferable to 6-month container

stock. If planting operations must be conducted in the spring, it is still preferable to plant bareroot stock. Results of this study should be applicable to most sites in northeast Washington where western larch is present as a major stand component.

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