Larch Plantation Management in the Northeast[1]

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ABSTRACT. The potential productivity of native and exotic larch plantations in the northeastern United States and eastern Canada is summarized. Attainment of high productivity over short rotations depends on the application of silvicultural practices that differ from those that are commonly applied to other, more tolerant, northern conifers. Practices leading to the successful establishment and management of larch plantations are discussed.

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Larches have been favored species for plantation management in northern Europe for hundreds of years. Indeed, one well-known Siberian larch plantation in Finland probably holds the Scandinavian record for sustained volume production. This plantation, established in 1738, had standing volumes as high as 283 cords/ac in 1924, equivalant to an annual productivity of 1.52 cords/ac/yr (Heikinheimo 1927). Fortunately for twentieth-century foresters, larches can achieve similar annual productivity rates over much shorter rotations, on the order of 20 to 30 yr.

In eastern Canada and the northeastern United States, a growing emphasis on more intensive silvicultural practices during the past decade has been accompanied by an increased interest in the planting of native and exotic larches. This is evidenced by the establishment of larch seed orchards by industry and/or governmental agencies in Newfoundland, Prince Edward Island, New Brunswick, Quebec, Maine, and New York, among others. The primary reason for this activity is the recognition that larches have very rapid early growth and are likely to reach merchantable size in a shorter time than other conifers in this region. Larches have exhibited superior height growth when compared to spruces (black, white, and Norway) and pines (jack, Scotch, white, and red) in locations as diverse as Newfoundland and Pennsylvania (Hall 1983, Grisez 1968).

Several larch species are suitable for planting in eastern North America. These include our native tamarack, European larch, Japanese larch, and the European × Japanese hybrid larch. Each of these species differs from the others in some important ways, and as a group the larches have silvicultural requirements that differ significantly from those of the more tolerant conifers in this region. This paper provides an overview of the knowledge that has been accumulated from experience with larch plantations in the Northeast.

PLANTATION ESTABLISHMENT

The planning and actual establishment stages are most critical for success of larch plantations. Once they are firmly established, larches will present few problems to the silviculturist. Many plantations, however, may be lost in their initial stages if foresters are unfamiliar with the requirements and characteristics of these species. Successful plantation establishment demands (1) matching the correct species to site conditions, such as soil and climate, and (2) site preparation to ensure that the larch gets ahead of competing vegetation.

Japanese, European, and hybrid larches grow best on well- or moderately well-drained soils, but will not tolerate poor drainage. Tamarack, in contrast, is capable of growing in a wide range of soil moisture conditions, although its growth is depressed on very wet sites. In plantations on unproductive heaths and bog sites, tamarack may easily outgrow spruces and pines (Hall 1983). All species are able to thrive on a variety of soil textures and pH.

Potential damaging agencies in larch plantations include frost, porcupines, and several insects and diseases that should be considered when selecting plantation locations. Exotic larches, especially Japanese and hybrid larch, are more susceptible to damage from late spring and early fall frosts than are native confiers. We have observed widespread mortality and growth loss in plantations located on low-lying areas with poor air drainage. Young seedlings are most affected, and the trees often become less susceptible as they grow above the frost zone. To avoid this danger, plantations should be located in areas with good air drainage. Porcupines will kill or deform trees by feeding on larch bark, so planting in areas with large porcupine populations should be avoided. Japanese larch are less frequently attacked by porcupines than are European larch and tamarack (Park and Fowler 1983). Robbins (1985) has recently summarized the major insect and disease pests of larch, together with suggestions for avoiding these problems.

Larches are more shade-intolerant than any other conifer in this region, and this has important silvicultural implications for plantation establishment and management. Seedlings must be free of competing vegetation if they are to survive and grow well. Larches are also sensitive to herbicides, so young plantations must be established carefully to ensure that the larches will outgrow potential competition within the first 2 to 3 yr. Our experience has shown that clean clearcut areas can sometimes be planted without additional treatment, but, if competition is likely to develop, some mechanical site preparation or treatment with a nonpersistent herbicide prior to planting may be needed. Several plantations in Maine have been successfully established by planting on the sides of V-plow furrows where the concentration of topsoil is greatest, and drainage is favorable (Fig. 1). The V-plow pushes slash aside to improve accessibility for the planting crew, as well as reducing competing vegetation. Alternatively, clearcut areas with established competition may be treated with a nonpersistent herbicide and planted with larch in the following spring.

Wide initial spacing in larch plantations is desirable so that the need for thinning will be delayed until the trees are of merchantable size. Morrow (1978) analyzed the effects of spacings ranging from 6.6 × 6.6 to 14 × 14 ft in European larch. He concluded that an initial stocking of 400 trees/ac (10 × 10 or 8 × 12 ft spacing) was optimum for most objectives. Compared to the 6.6 × 6.6 ft spacing, this 10 × 10 ft spacing results in lower planting costs and shorter rotations, accompanied by an increase in average branch diameter of 0.2 in and an increase in average dbh of 1.5 in at age 25.

Successful plantation establishment also requires the use of vigorous,

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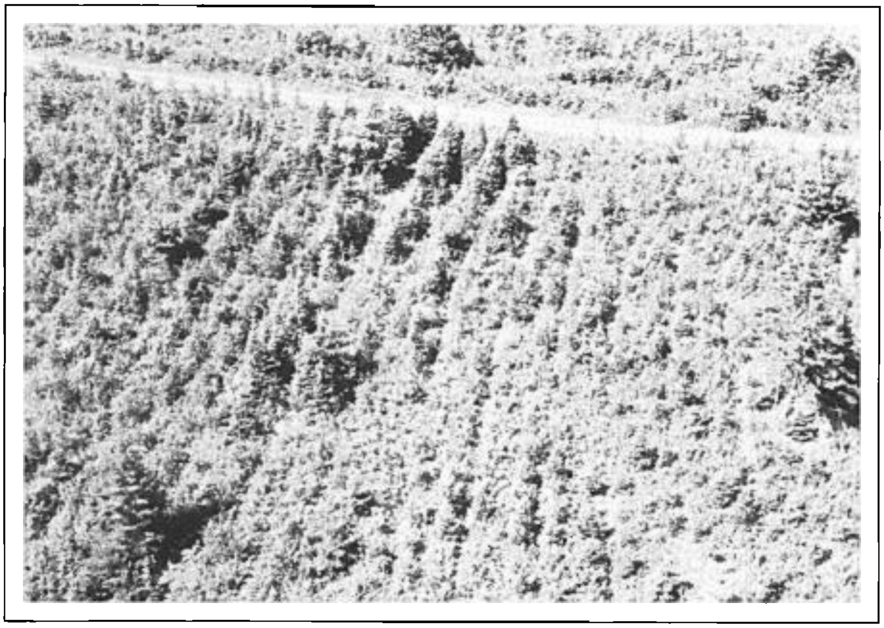

Fig. 1. Four-year-old larch plantation established using V-plows for site preparation.

sturdy seedlings. In Ontario this is done by using 2-0 nursery stock that has been lifted in the fall and frozen overwinter to ensure dormancy at planting time (Graham et al. 1983). In Maine we have planted 5-mo-old containerized seedlings with survival rates well above 90%. Containerized seedlings should be stocky, not spindly, and must be hardened off prior to outplanting. Nonhardened stock may be easily killed by late spring frosts. Clonal propagation through the use of rooted cuttings is also possible (Fig. 2).

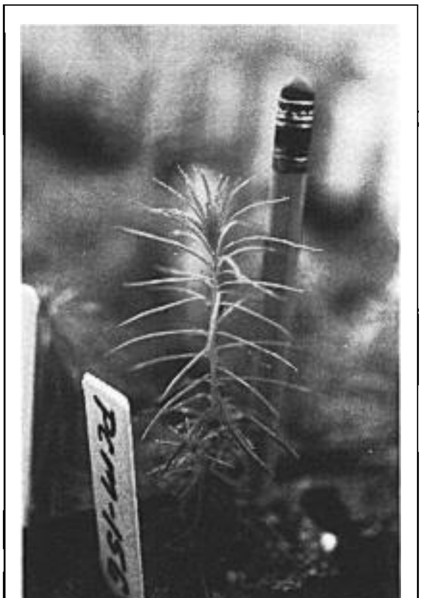

Fig. 2. Three-month-old rooted tamarack cutting. Rooted cuttings can be used when seed supplies are limited, or to progagate genetically superior selections.

GROWTH AND YIELD

Once trees are successfully established, stand development should be monitored often. For northern foresters accustomed to the growth habits of spruce and fir, the swift development of larch plantations presents new challenges. As Turner and Myers (1972) noted, "Cultural decisions must be made without hesitation because stand growth is so rapid." Thinning is necessary as soon as crown closure begins in order to prevent mortality and growth increment reduction, which can occur rapidly as competition increases. If the plantation was established at a good spacing, this first thinning should yield merchantable stems of 5 to 8 in dbh some time around age 15 to 24 (Fig. 3). Alternatively, the entire stand could be harvested as pulpwood prior to age 30.

Several early plantations of European, Japanese, and hybrid larch were established in the Northeast in the 1920s and 30s. Information from these early plantations and from later work indicates that when successfully established, exotic larches consistently demonstrate impressive growth. In Pennsylvania, an examination of 71 plantations aged 41 to 84 showed that European and Japanese larch outgrew all other species in height, and were surpassed in diameter only by red pine (Grisez 1968). There are several examples of 20- to 30- yr-old exotic larch plantations in southern Quebec that have had mean annual increments of 5.4 to 12.4 m^3/ha/yr (0.9 to 2.2 cords/ac/yr) (Graham et al. 1983). Stone's (1957) yield tables for European and Japanese larch in New York indicate that this level of productivity can be maintained through age 50. In New Hampshire, Japanese larch planted at a 7 × 7 ft spacing on a sandy loam soil produced an average of 1.6 cords/ac/yr through age 29 (Turner and Myers 1972). We have observed similar growth rates on average sites of Maine. Investment analysis indicates a financial rotation age of 25–30 yr is appropriate for larch pulpwood production (Graham et al. 1983). These productivity figures compare favorably with those for southern pine plantations with a similar rotation length.

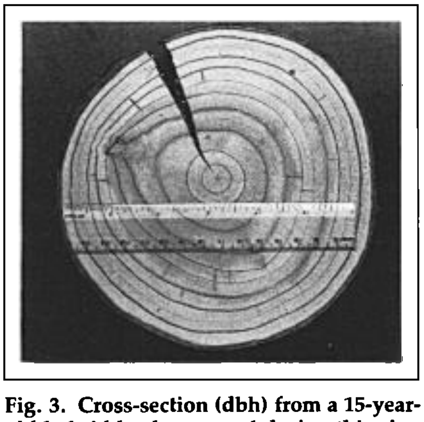

Fig. 3. Cross-section (dbh) from a 15-year-old hybrid larch removed during thinning of a plantation in Maine.

In mild climates such as New York state and southern New Hampshire, the growth of Japanese and hybrid larches has proven to be superior to that of European larch or tamarack. European larch has a great deal of genetic variation, however, and some provenances, especially those from the Sudetan region in Czechoslovakia, can equal the growth rate of Japanese and hybrid larch. In the severe climate of interior Maine, however, we have found that the early growth of Japanese larch lags behind that of other exotics. Fig. 4 illustrates this species difference and indicates the range of variability found among provenances within species. Species rankings in interior Maine are similar to those observed in Wisconsin by Riemenschneider and Nienstaedt (1983). Data regarding volume growth of tamarack are less common, but its yields are expected to be about one-third less than for the exotic larches (Graham et al. 1983). Tamarack, however, is the only larch capable of growing on wet sites and will outgrow other species such as black spruce on these sites. (Mead 1978).

Utilization potential of larch for pulp production has been summarized by Einspahr et al. (1984). While old, slow-growing tamarack and exotic larches are undesirable because of their high extractive contents, 18- to 24-yr-old trees produce kraft pulp comparable to that from jack pine and

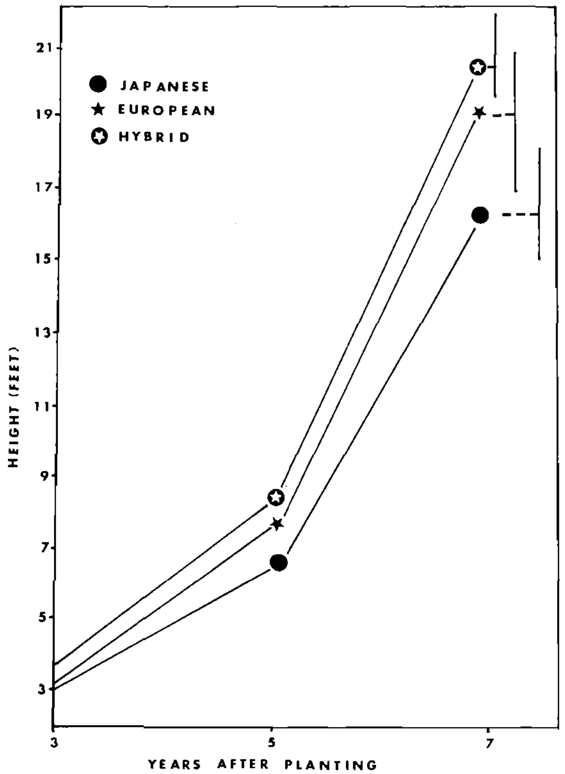

Fig. 4. Growth of exotic larches near Milo, ME. Vertical bars at year 7 indicate the range of provenance means within each group.

is currently admixed with spruce to supply some kraft mills (Graham et al. 1983).

SUMMARY

When established on appropriate sites, tamarack and exotic larches have the potential for producing excellent fiber yields on rotations that are economically attractive. For best results, larch plantation establishment and management plans should consider the following:

1. Match the various larch species to appropriate planting sites, considering such factors as soil drainage, climate, and potential pests.
2. Avoid planting exotic larches in areas subject to late spring or early fall frosts.
3. When establishing plantations, it is essential to control competing vegetation during the first few years.
4. Wider spacings are needed for larch than for other conifers, to ensure a merchantable first thinning.
5. Thinnings will be needed earlier and more often than for other conifers, due to the very intolerant nature of the species. □

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Successful Black Walnut Management Requires Long-Term Commitment

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ABSTRACT. Intensive management of both naturally occurring and planted black walnut trees is necessary to meet the requirements of the furniture and other wood product industries for this high-value hardwood. Successful intensive culture of black walnut requires a consideration of the biological requirements of the trees as they relate to soil properties, competing vegetation, thinning or release, and pruning. Growers must understand the need for consistent and periodic cultural activities if they are to realize the objectives of short-rotation, high-quality production forestry.

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Black walnut has long been considered one of the premier woods for furniture, veneer, and gunstocks. Stumpage prices for prime and select veneer logs have recently averaged $2,700 and $1,850 per Mbf, respectively. Prices for prime, #1, #2, and #3 grade saw logs have averaged $550, $400, $250, and $115 per Mbf, respectively (Hoover and Park 1984). These prices reflect both a continued strong demand for and a limited supply of walnut, particularly high-quality logs. As a result, high prices have fueled strong interest in establishing plantations and in managing individual trees in natural stands.

The amount of walnut harvested has fluctuated during the last 60 yr from a high of 94 MMbf in 1960 to a low of 28 MMbf in 1973 (Landt and Phares 1973). In recent years, production has averaged about 60 MMbf per year (Rink 1985). The resource in standing timber declined from 2.7 billion bd ft in 1963 to 2.2 billion in 1977 (Anonymous 1978). Thus, there appears to be strong justification for