Prospective Uses of Planting Stock in the Northeast

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Abstract-Public forest-tree nurseries were established in the Northeast decades ago mainly to provide for reforestation and timber production on grassy abandoned farms and old burns. This kind of planting has diminished in importance. Society still needs to plant trees although the kinds of trees and the purposes keep changing. Among the relatively new things now needed are the reforesting of city streets, erosion control along highways, improving the species composition of forests, enrichment planting, wildlife food, and repairing the effects of depredations of insects and diseases.

The role of large-scale planting of coniferous monocultures for wood and timber is likely to be much smaller than that in the South and other regions where hard pines are common in nature. In the Northeast advanced regeneration is very common and the competing pioneer vegetation that appears after site preparation more competitive and persistent than in most other places. There is a place for plantation culture of white pine in mixture with other pines on dry sandy sites. Some paper corporations grow spruce pulpwood in plantations in spite of high costs of establishment as a means of protecting their wood supply. The high production rates available on good northern hardwood soils have also been attractive for intensive plantation management.

There is a role for enrichment planting with fast-growing valuable timber species. We also need to plant trees to forestall invasive exotics and to deal with problems caused by the loss of native species to exotic pests. The time may come to plant pest-resistant American chestnuts and eastern hemlocks to re-establish them in our forests. Public nurseries should be become more involved in providing tree and shrub planting stock for erosion control along highways. The use of large seedlings grown in tree shelters should be explored as a low-cost solution to the problem of establishing street and shade trees.

Forest-tree nurseries were established in the Northeast mainly for reforesting abandoned farmland, although replanting after forest fires was a common objective. Large areas of such land were planted before the pace of abandonment of pastures and open fields slowed during recent decades. Now much farmland is being converted to suburban and exurban residences as well as second homes. In some localities, residences are invading the forest. While there will probably always be some grassy areas to plant with trees the old-field stand or plantation of pine or spruce will come to be almost in the category of the museum piece. Providentially burned-over areas in need of planting have also become rare.

IMPEDIMENTS TO PLANTATION SILVICULTURE

The kind of plantation silviculture in which pre-pre-existing forest stands are regenerated by planting softwoods has not become common in the Northeast, even on the substantial areas of industrial softwood ownership in northern New York and northern New England. This is because the spruce-fir forests of the region normally have superabundant advanced regeneration. During the 1970s there was a flurry of federally subsidized spruce planting in the adjacent Marltime Provinces of Canada. This program stopped when it was ruefully

concluded that it was merely adding to the precommercial thinning problem that is the silvicultural curse of the northeastern spruce-fir forest.

In other parts of the continent, planting to regenerate previous stands of trees has usually gone with industrial forestry on sites where periods of dryness during the growing season tend to favor conifers. Plantation silviculture usually goes with intolerant early-successional species that grow fast on short rotations.

Most of the important commercial species of the region are not ecological pioneers but species that are adapted to get started as advanced regeneration beneath older stands. They are not adapted to follow fire like the southern pines or coastal Douglas-fir. Generally they are adapted to start beneath old stands and start rapid development after the old trees have blown down or been killed by pests. Species of trees adapted to start as advanced regeneration seldom grow fast in height when they are small even when grown in the open. Probably they divert much carbohydrate into building good root systems. At least they often accelerate in height growth after they are well established and released. These characteristics often discourage their planting even if height growth in the later stages is excellent.

One impediment to forest planting in many localities and sites where hardwoods grow well is that too many different species compete too aggressively. During the summer much of the region has a climate not greatly different from that of the humid tropics. In general only plantations on soils that are too dry or are too wet with poorly aerated water escape the chaos of jungle competition.

The highly successful culture of loblolly and slash pine in the South works on soils where late summer droughts restrict the vigor of hardwood competition. The baring of mineral soil during site preparation favors annuals during the first growing season and perennial grasses later. The grasses discourage hardwoods enough that hardwood plantations have to be Cultivated like corn or soybeans. The reason for the late-summer moisture restrictions is heavy evapotranspiration and the poor soils of the Coastal Plain and the badly eroded Piedmont. It is significant that the pine culture usually falls in the well-watered bottomlands of meandering streams and becomes more difficult with increasing latitude (because of less solar radiation).

Somewhat the same situation applies to the culture of red and jack pines on extensive areas of upland soils in the Great Lakes Region. The late-summer dryness there is probably the result of comparatively low precipitation.

SPRUCE-FIR FORESTS

In the Great Lakes Region, the Northeast, and Atlantic Canada the planting of spruces to regenerate the spruce-fir type on the characteristic poorly drained sites has not been anywhere near as successful. The planted trees grow slowly and southern-style site preparation calls forth not grass but such woody pioneers as raspberries, gray birch, and aspen. Much herbicide treatment is necessary to release small spruces. In the eastern portions of the spruce-fir forest, advanced regeneration in stands old enough to regenerate is usually so abundant that planting ordinarily aggravates a precommercial thinning problem. However, there could be a useful role for the planting of very widely spaced pines and Eurasian larches that are capable of

keeping ahead of advanced regeneration of spruce and fir. However, as far as spruce and fir are concerned, precommercial thinning is normally a better investment than planting and doing all the release work that is necessary to free planted trees. In fact, on such sites it is very important to avoid the soil disturbance that calls forth pioneer weeds.

The more successful post-harvest plantings of spruces are on the better soils where the northern hardwoods normally grow. Some of the most successful of these have been on industrial free-hold land in New Brunswick. Pulpwood yields have been high. It is, however, not clear how much herbicide treatment has been necessary to keep the plantations from being overwhelmed by hardwood competition.

EASTERN WHITE PINE

There are some possibilities for plantation culture of eastern white pine for timber production but they mostly depend on developing ways of reducing the stern deformities caused by the white pine weevil. Except in the southern Appalachians this insect has turned open-grown plantations into forests of crooked trees covered with dead branches.

Where there are many weevils the only dependable solution involving planting is to start white pines under the shade of taller trees and not release the pines until they are at least one log tall. Weevil-free white pine could be grown in mixed plantings with faster-growing red, pitch, or Scotch pines. These seem to cast enough shade to discourage the weevil. I once found, to my sorrow, that Japanese larch does not. European experience indicates that numbers of nurse trees should be restricted to one-quarter of the total number so they will not overwhelm the lower-stratum species. It would be necessary to harvest most of the nurse trees for pulpwood, poles, or small logs when they had served their purpose.

This kind of white pine plantation culture would best be followed on soils dry enough that hardwoods grow poorly but where pines grow comparatively well. Intensive programs of precommercial thinning and pruning are necessary to grow the high-quality white pines needed for lumber. The growing of white pine for sawlogs is best done well or not at all.

On the other hand, at least one paper company has been growing plantations of white pine primarily for pulpwood. With appropriate thinning to rescue straight codominants from weevilled dominants it is also possible to have some trees straight enough to carry on to sawlog size, even in localities where weevilling is common.

NORTHEASTERN HARDWOODS

Under most circumstances it is generally better to learn to understand and live with the complexity of the hardwood forest than to try to fight it by establishing pure plantations. One partial solution that can be borrowed from the tropics involves the "enrichment" planting of so-called emergent species that can either stay ahead or overtake their competition. This usually entails planting a few widely spaced trees and using the typically profuse natural regeneration of other, preferably slower-growing, species to train the stems of the planted trees. In the tropics frequent release cutting is usually necessary and the trees are often planted in lines so that they can be found more easily during the release operations. Honduran mahogany is often planted this way. The basic objective is to produce stands with more of the

emergent species, which are often grow large and become valuable, than arise from natural regeneration. In many cases they have been eliminated by high-grading.

Where it will grow satisfactorily, yellow-poplar is the epitome of the emergent. It grows fast in height at virtually all stages of life. It is probable that the ill-fated American chestnut grew even faster in height and at all stages, at least if it was of stump-sprout origin; it was also an emergent overtopping oaks on many kinds of sites. There are other emergent species, although it is well to note that the height growth of a species relative to others depends heavily on what the other species are and the nature of the site. For example, white ash is an emergent on the best northern hardwood sites but falls behind oaks where oaks are common. White pine can be an emergent in hardwood stands but only after it and its associates get to be about 40 or 50 feet tall. Before then it grows comparatively slowly and usually has to be artificially released unless one is content with the density of about one pine per acre that seems to have prevailed in the original forests. White pine is, however, an emergent right from the beginning in many spruce-fir forests. Eurasian larches develop as emergents in many mixed plantations and could do so if planted after heavy cuttings in more natural stands; they can produce sawlogs on 30-year rotations.

Among the other potential emergents are black walnut on good soils, paper birch at least in the early stages, yellow birch on mediocre sites of the northern hardwood forest, and sweetgum. Some oaks function as emergents after they have been growing for about 20-40 years. Among these are cherrybark oak on the ridges of southern bottomlands and northern red oak in mixture with black birch and red maple. Sometimes as 30-40 trees of emergent hardwood species can form a solid overstory over an acre. In that case some might argue that they were no longer emergents because they were not isolated trees. With these procedures it would not be necessary to plant many trees per acre because most of them would survive to maturity. If that were the case, the investment per planted tree could be quite high and tree shelters might be justified for warding off deer browsing.

REMEDIAL PLANTING

One potential use for forest planting stock is the reestablishment of seed sources and populations of species that have been eliminated by overcutting, fire, or pests. The time will probably come when it will be possible to reestablish the American chestnut or some American-Asian hybrid chestnut in the eastern forest. Past fires have eradicated non-sprouting species over vast areas. There are places formerly cleared for agriculture where not all of the native species have returned. If a control is found for the introduced hemlock adelgid that is eradicating hemlock from the southern part of its range, it will be desirable to underplant it in many hardwood forests. In the spruce-fir forest of Maine there are places where high-grading and the paradoxical effects of the misnamed spruce budworm have eliminated spruce. There is evidence that common natural hybrids of red and black spruce are more resistant to the budworm than pure red spruce.

Planting stock will continue to be needed for erosion control and reforesting burned-over lands and other severely disturbed areas. In fact, it would be useful to grow more non-invasive shrubs for this purpose. Back in the 1930s a forester-ecologist named Hans Bauer was in charge of vegetation management on the Connecticut state highways. He once

described to me how he had observed that the native sweet fern (*Comptonia asplenifolia*) was a highly effective colonizer of exposed sub-soils and how he had used it successfully on highway cuts and fills. It does not grow tall and does not require mowing. He also used eastern redcedar which also grows slowly in these parts. As I drive on Connecticut highways I can still detect the roadsides that were revegetated under the aegis of Hans Bauer. It may be noted that, unlike various Asian species once touted by soil conservationists, sweet fern has not become a plant pest in this locality.

There will also remain a place for shrubs as sources of wildlife food. However, the planting of certain invasive exotic woody plants should be totally discouraged or even banned.

In fact, one very important role for forest planting stock is in the replacement of jungles and vine-lands overrun with invasive exotics. Such introduced Asian ornamentals as Oriental bittersweet, Japanese honeysuckle, multiflora rose, giant knotweed, Japanese barberry, winged euonymous, and porcelain-berry are taking over many areas close to human habitations. Many of these seem aggressive enough and cast enough shade that they are not likely to be overtopped and shaded out like the native pioneer plants to which we have been accustomed.

The work on the New York City Parks that Anthony Emmerich will tell you about shows that many of the invasive exotics are shade-tolerant enough to overwhelm many late-successional trees that we might plant. We need more experimentation with sophisticated kinds of planting that might overcome these problems. I suggest that in the more difficult situations it would be worth following broadcast applications of non-selective herbicides with the planting of combinations of fast-growing hard pines and shade-tolerant lower story species, such as beech, spruce, hemlock, and maple that might cast enough shade to keep the invaders in check. The old-field white pine that once opened the way for stands of native hardwoods to take over are just as hospitable to advance regeneration of the invasive exotics.

OTHER USES OF PLANTING STOCK

Another use for hardwood planting stock might be for low-cost establishment of shade trees done by planting small trees and protecting them with tree shelters. The planting of a sapling costing $150 produces a feeble kind of instant beauty but the trees take a long time getting started and are not as resistant to vandalism as the people who sell them claim. If it cost $10 to plant a large seedling in a tree shelter one could replant the spot 15 times or plant 15 times as many trees for the same cost. Some municipalities in Connecticut show much enthusiasm for planting $150 trees so long as the federal government or some foundation is paying for it but stop completely when the subsidy ceases.

The culture of Christmas trees depends mainly on the planting of nursery stock and is almost sure to continue to do so. The taxol that was initially reputed to come only from the bark of the Pacific yew is more abundant in the foliage of other yews. Some years 97 back I learned that in Hungary the honey produced by a plantation of American black locust is worth $80 per acre annually which is equal to the value of the annual production of wood. These uses suggest that it may be well to look at other uses for planted trees and shrubs that do not involve wood production.

Society needs trees worse than it knows but the reasons why trees need to be planted change in time and space. It is up to foresters and the horticulturists who manage nurseries to keep abreast of the changing needs, persuade society to meet them, and have trees and shrubs ready to meet the needs.

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