Some Thoughts about Tree Planting and Nursery Culture in New Hampshire

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"He plants trees to benefit another generation"
— CICERO

As a forester one of the best and worse things about my work is the time involved to grow a forest. Most benefits of my work will be realized long after my last steps are taken on this earth. It's comforting to me to know that 3 generations from now, people will be harvesting trees that I have planted, or that have regenerated from cuttings that I have made in the forest.

On the other hand, I often wish that I could get in a time machine and zip ahead into the future to see how things will work out; which species will do best; how well they will grow; how well this forest will match up to the previous forest that I managed.

We owe so much to previous generations that have contributed their time, efforts, sweat, and careers to the forest. The State of New Hampshire has benefited from the planting stock that has been developed and provided by the State Forest Nursery and from the many cooperative programs over the years that helped improve the stock which it provided.

The Norway spruce (*Picea abies*) plantation (Figure 1) at the Caroline A Fox Research and Demonstration Forest in Hillsborough, New

Figure 1. Norway spruce (*Picea abies*) plantation on the Fox Research and Demonstration Forest in Hillsborough, New Hampshire.

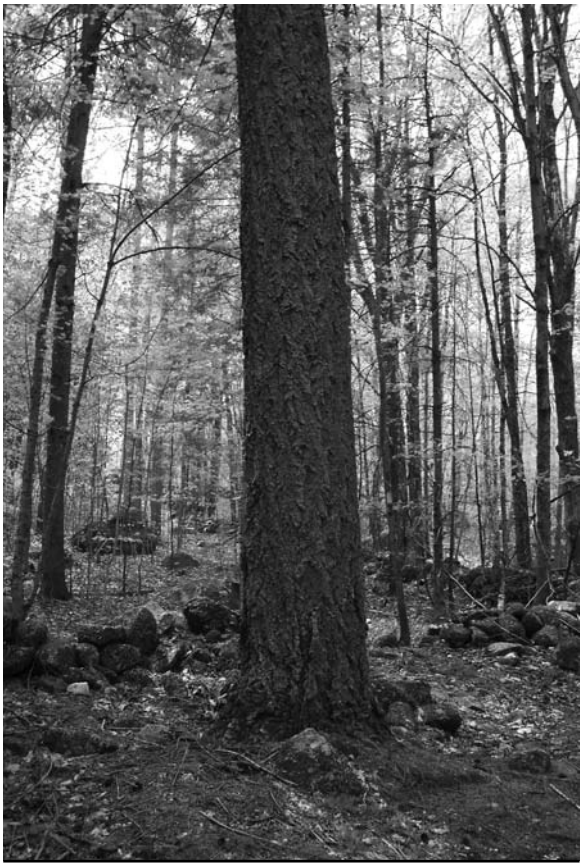

Figure 2. Douglas-fir (*Pseudotsuga menziesii*) groves on the Fox Forest.

Hampshire (43°08'15.86''N, 71°54'56.53''W) was planted in 1936. Seeds for this plantation were collected across much of Europe as part of a provenance trial to examine geographic variation of seed source, and to try and discern how local seed sources react to new climatic conditions. This stand, in particular, has been heavily studied by master and doctoral degree candidates and used to help decipher problems with Norway spruce in the Black Forest of Germany. These seeds were sent to Fox Forest and raised in a small nursery on site by Dr Henry I Baldwin, the forest's first research forester.

A similar plantation of Norway spruce was planted about 10 km (6 mi) east at the Vincent State Forest. This plantation was part of a huge provenance experiment by the International Union of Forest Research Organizations (IUFRO). New Hampshire has one of the best plantations from this experiment because most were situated in Europe and destroyed or severely damaged during World War II.

Also located at Fox Forest are several small groves of Douglas-fir (*Pseudotsuga menziesii*) (Figure 2). These seeds were collected from across the American west and planted in the Fox Forest nursery as part of a Christmas tree study to determine which local sources did best in New Hampshire. The Santa Fe New Mexico seed source eventually proved best for Christmas tree culture. Personally, Douglas-fir is my favorite Christmas tree. I usually need to grow my own, however, because New England growers prefer to grow balsam fir (*Abies balsamea*). Baldwin eventually elected to leave some of these groves instead of harvesting them all, providing us with this excellent specimen to enjoy. This grove currently has a dozen or so individuals growing in it, this stem being the largest at about 76 cm (30 in) diameter at breast height after about 70 years.

Just beyond the Douglas-fir grove is a small plantation of Carolina cottonwoods (*Populus deltoides*) (Figure 3). These trees were grown from cuttings provided by Oxford Paper Company in the 1930s. Their intention was to provide the cut-

tings to landowners who wished to grow pulpwood for their mill in northern Massachusetts. These trees are very fast growers.

Without question, Fox Forest has benefited greatly from nursery work across the world. It also contains several larch (*Larix* spp.) plantations, including specimens from the Duke of Atholl's Dunkeld home in Scotland. These amazing Dunkeld larch hybrids (*Larix marschlinsii*) are a cross between European (*L. decidua*) and Japanese (*L. kaempferi*) larch, and have been known to grow one third faster than either parent.

Other state reservations have also enjoyed the benefits of cultured forests. Figure 4 shows the red pine (*Pinus resinosa*) plantation located at Contoocook State Forest in the town of Hopkinton, New Hampshire. Like so many other red pine plantations in the state, this forest was planted by the Civilian Conservation Corps (CCC) during the Depression years of the 1930s. Red pine is a fast growing, straight-trunk tree that did not have the terrible weevil problem of our more common white pine (*P. strobus*). The CCC was geared up for planting, and the nursery was producing a lot of red pine seedlings during this time. In 1931, the production of red pine planting stock was only 58,932 seedlings. In 1934, however, the nursery produced 508,855 red pine seedlings. In 1935, it produced 361,329 red pine seedlings, with production dropping to 270,942 seedlings in 1936. During that same decade, much of Mast Yard State Forest was planted to red pine or white pine plantations. Some of the Mast Yard plantations have been thinned 6 times so far (Figure 5). In the fall of 1993, following a detailed forest inventory and review of past operations in the stands, some of the Mast Yard plantations had produced nearly 507 m^3 of wood/ha (57 cords of wood/ac) at about age 60.

White pine is probably the tree species most often planted in New Hampshire for reforestation. Over the years, we have improved and thinned many of these plantations with timber stand improvement treatments, biomass/whole tree harvests, and sawtimber thinnings, and we

Figure 3. Carolina cottonwood (*Populus deltoides*) plantation on the Fox Forest.

Figure 4. Red pine (*Pinus resinosa*) plantation on Contoocook State Forest in Hopkinton, New Hampshire.

Figure 5. Early thinning in a Mast Yard State forest red pine (*Pinus resinosa*) plantation.

are now regenerating many of these mature stands. White pine plantations carry a large amount of stocking, with volumes often between 115 to 175 m^3/ha (20,000 to 30,000 bd ft/ac). Many different loggers have harvested timber products from these stands and sent the logs to several sawmills, which process the lumber and send it out to a multitude of local industries in the state. A rule of thumb in New England is that US$ 1 of stumpage money yields another US$ 27 to the local economy. Just think of what the value-added potential is from seedling to sawlogs. The benefits from our white pine plantations have been a mainstay of the forest management program of the state.

What led to the formation of the New Hampshire State Forest Nursery in 1910? It was a reaction to the activities of the times. The science of forestry was in its infancy in the US. Much of the timber harvesting occurring in the state was very heavy-handed. Companies often would buy a woodlot, harvest everything of value on that particular land holding, and then sell the land. The widespread heavy cutting and the resulting forest fires inspired the adoption of the Weeks Act in 1911, which allowed the USDA Forest Service to purchase and protect land along navigable rivers. This was the beginning of our own White Mountain National Forest in New Hampshire and Maine.

So much land was cutover and bare that the state of New Hampshire instituted a program where landowners could deed cutover land to the state, and the state would replant the land and sell it back to the original owner for planting costs plus 4% interest. These were called "Ten Year Tracts" because the owners had up to 10 years to purchase them back. Old biennial reports for the New Hampshire Forestry Commission reveal that planting costs in 1914 were US$ 27/ha (US$ 11/ac), which included the cost of seedlings and all labor. In 1915, crews planted 93 ha (231 ac) of private lands under the program, and an additional 73 ha (190 ac) of state reservations. Even at these low costs, much land was never purchased back by the owners. Many of these tracts make up the current 201 individual properties that form the state reservation system in New Hampshire today.

The state wanted to achieve 3 goals with the formation of a state forest nursery: 1) supply the increasing demand for seedling stock to reforest cutover woodlands; 2) begin a cooperative planting program with towns and private lands; and 3) supply native trees grown locally to prevent the importing of diseased seedlings, especially from Europe.

In 1910, the state leased some land in the town of Pembroke and began a small nursery. The nursery planted transplants and offered them for resale to residents for US$ 3/thousand seedlings. The first year had great success, with 50,000 transplant seedlings sold. The estimated demand, however, was 200,000 seedlings. The following year, the state leased a larger tract of land in the town of Boscawen and produced 250,000 seedlings. This operation was considered so successful that more land was leased at this location and the operation was expanded. In 1914, the nursery produced 717,000 seedlings. To date, we estimate the New Hampshire nursery has sold approximately 76,500,000 seedlings.

Today, the New Hampshire State Forest Nursery continues to produce seedlings for reforestation, Christmas tree culture, wildlife habitat improvement, and ecological restoration. It is the only state nursery still in operation in New England. Its future will be decided by how innovative the staff can be and by how successful it can be at providing important services to residents of the state.