

Progress Report of the Vermont Tree Improvement Project

Session I

The original 1962 Vermont Forest Tree Improvement Program work plan has been included under NEFTIC proceedings.

At the end of the 1964 field season, no improved seed production areas had been established.

The result of the 1963 work and plans for 1964 were written in April 1964, and are given herewith.

"The original Vermont Forest Tree Improvement Work Plan" dated September 5, 1962, outlined the general objectives of Vermont's tree improvement program and the general plan of operation.

During Calendar Year 1963, scion material was collected from white pine, red pine, Norway spruce, white spruce, balsam fir, European larch, and Japanese larch and 574 grafts made. The root stock was three-year seedling stock, all of which was in standard seedling beds except the larch which had been transplanted from seedling beds about four weeks prior to grafting.

Scion material gathered in February and March was kept in plastic bags at a temperature between 34° and 38 F in one of the nursery's cold storage areas. Grafting technique was a standard (2"-4" long) side graft as used at Syracuse University. Grafting was done when root growth was judged to be active and top growth was "flushing." Grafting was done by a number of individuals with varying degrees of carefulness. After the first day, a permanent shade frame was put over the entire area being used. The low shade frames restricted the activity of the grafter to an awkward position. Each grafted tree had a plastic bag over it, wired about the base of the tree. In most cases, excess water could drain out satisfactorily. After putting aluminum foil around the first three grafts, it was assumed that shade frames would control extreme temperatures and, combined with the use of the overhead water system, would hold both temperature and humidity.

The only successful grafts in September 1963, were fourteen white pine grafts. This was extremely disappointing and indicated an obvious lack of our knowledge or skill in doing the work, perhaps combined with unfavorable weather conditions.

Upon finding that the State and Private Division of Region 7, U. S. Forest Service, had a geneticist, a request was made that he look over the situation and help formulate future plans. On

March 6, 1964, Mr. Clyde Hunt conferred with Vermont Forest Service personnel viewing what was left of last year's work. The following major points were agreed upon:

1. The technique of grafting was generally good.
2. The scion was generally too long and too many needles had been left on the stem. Scions may have been too large, having needle mass that took large amounts of moisture out of the smaller stems.
3. High heat conditions undoubtedly were a major factor causing failure.
4. Spruce scion stock was probably taken too early in the season.
5. Larch root stock may not have been transplanted long enough before grafting.
6. Some drying out may have occurred in storage of scions.

For the 1964 season, the following points were specifically agreed upon as additions to the general work plan:

1. Grafts will be made as follows:

White Pine	100
Red Pine	40
Norway Spruce	40
White Spruce	20

2. Grafting of larch and balsam fir will be deferred one year.
3. One hundred and fifty larch 2-year stock will be potted this spring in pots approximately 5 inches in diameter in anticipation of greenhouse grafting early in 1965.
4. The nursery will insure that potted stock is stored so as to be available, even during the winter.
5. Arrangements will be made during the summer or early fall for greenhouse space, either at the University of Vermont or rented space in a commercial greenhouse.
6. Scion stock for pine will be collected between March 6 and 31; spruce scions will be taken between April 10 and May 1, depending upon weather.

7. Some attention will be given to soaking scion stock prior to use in the field for grafts. Storage of scions will be in such a way as to insure a minimum loss of moisture from the stock while in storage.
8. Grafting will start about May 15, with Mr. Hunt present to suggest techniques of grafting and care of scions and grafted stock.
9. A lath shade house will be constructed over each area grafted to reduce excessive heat.
10. It will be standard practice to put a plastic bag on each grafted tree.
11. If each tree is "bagged," it would be of little avail to install an automatic spray system for humidity control. Should money be available, part of the trees may be left "open" (no plastic bag) and an automatic spray or other humidity control installed.

The amended work plan was followed with assistance in May at grafting time by Clyde Hunt, U. S. Forest Service, Upper Darby, Pennsylvania. White pine grafts were about 95% successful. Red pine, which appeared to be successful in July, have since proved unsatisfactory by springing apart at the graft. This is partly because of the larger, stiffer scion material used. (About 20% are estimated to be successful.) Only about 10% of the Norway spruce are successful. Many of these grafts were less than 3/16 inch in diameter.

It would appear that the size of graft is important. Scion stock smaller than 3/16 inch in diameter gave poor results. It is believed that scions between 3/16 inch and 5/16 inch in diameter give better results. Probably this is due to the ease of mechanical manipulation by the grafter.

Some injury to the trees occurred by keeping them too humid for too long a period of time. Those grafts having aluminized plastic wrapped about the graft area appeared better. There was ample protection for the graft area with ample humidity. Excessive condensation under the plastic drained out.

It seems particularly important to have spruce scion material at an optimum moisture content when collected. This means, in our present state of knowledge, that collection should occur at the latest possible date before the tree bursts its buds in new growth.

While the 1964 season was far more successful than the 1963 season, it is far from being completely successful. We have much to learn, particularly in handling spruce grafts.

The 1965 grafting program was carried out basically as amended during the 1964 season. The only difference in collecting scion stock was in getting Norway spruce as late in the season as possible. The results of grafting on August 23, 1965, are:

	<u>Number</u>	<u>Species</u>	<u>% Living</u>
<u>1964 Grafts:</u>	245	White Pine	50
	73	Red Pine	20
	122	Norway Spruce	15
<u>1965 Grafts:</u>	164	White Pine	65
	116	Red Pine	0
	135	Norway Spruce	27
	148	European Larch	27

All 1963 grafts (13 left) died during the open winter of 1964-1965.

The 1966 grafting material will be collected as late as possible and kept in moist cold storage. More "potted" stock will be grafted under "greenhouse" conditions. It has been noted that exceptionally small diameter grafts continue to die the second and third year even though they appear to be successful the first year. Since grafted stock has not appeared to be making satisfactory growth, more attention will have to be given to water and fertilizing during the growing season. It is hoped that some field planting may be done in the spring of 1966.

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