PROGRESS REPORT OF THE VERMONT TREE IMPROVEMENT PROJECT

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The original Vermont Forest Tree Improvement Work Plan dated September 5, 1962, outlines 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 before grafting was done.

Scion material was gathered in February and March and kept in plastic bags at a temperature between 34^0 and 38^0 F in one of the nursery 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 a varying degree of carefulness. After the first day, a permanent shade frame was put over the entire area being used. Being low, the shade frame caused some restriction in activity of the grafter or at least awkwardness of 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 about the first three grafts, it was thought that shade frames would keep temperatures within bounds, and combined with use of the overhead water system would control both temperature and humidity.

The only successful grafts in September 1963 were fourteen white pine grafts. This is an extremely disappointing result and indicates 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 Section of Region 7, U. S. Forest Service had a geneticist, a request was made that he look the situation over and help formulate future plans. On March 6, 1964, Mr. Clyde Hunt conferred with Vermont Forest Service personnel and looked over hat 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.
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 rootstock had not been transplanted for a long enough period before grafting.
6. Some drying out may have occurred in storage of scions, Scion stock material may have been too large, having needle mass that took large amounts of moisture out of the smaller stems.

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For the 1964 season the following specific points were agreed upon as additions to the general work plan.

1. Grafts will be made as follows: White Pine - 100; Red Pine - 140; 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 in pots approximately 5 inches in diameter, this spring, 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 green -house.
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 a way 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 of grafts 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 percent 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 percent are estimated successful. Only about 10 percent 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 to give favorable results. There was ample protection for the graft area, with ample humidity. Excessive condensation under the plastic could drain 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, collection 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.

In spite of past losses, there are on hand grafted stock which will form a substantial beginning toward improved white pine seed production. We are optimistic enough to hope that the 1965 grafting season will give us enough spruce, larch, and red pine for a good nucleus of "plus" trees for seed production.