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Petawawa 1983-1985

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GENETICS OF WHITE SPRUCE, LARCHES AND HARDWOODS,  
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The work of the past two years represents, essentially, a continuation of studies referred to in previous reports from Petawawa National Forestry Institute (PNFI). The range-wide provenance test of tamarack (*Larix laricina* [Du Roi] K. Koch) is now in the field establishment phase, following almost 10 years of effort to assemble a representative seed collection. Field planting of the range-wide provenance tests of white spruce (*Picea glauca* [Moench] Voss) has been completed and measurements of early growth have been collected in many tests. Publication of results of older field tests of white spruce and larch has a high priority as it is recognized that the information is needed to guide those planning operational tree improvement programs and to provide direction for future research activities.

WHITE SPRUCE

Provenance

A provenance test of white spruce was planted at PNFI in May 1985. This was the last of the range-wide tests in the series of range-wide and regional tests (Murray and Cheliak 1984) scheduled for planting in Ontario with the cooperation of the Ontario Ministry of Natural Resources. A total of 6 range-wide and 9 regional tests have been planted in Ontario, but two of the regional tests have been destroyed by fire. In four blocks of the PNFI test, 4 trees of each provenance were planted in random non-contiguous plots in each of two interlocking replicates per block. An equal number of trees was planted in 4-tree row plots in each of 8 blocks in a randomized complete block design. The purpose of this arrangement is to allow evaluation of provenance performance and comparison of row and non-contiguous plots. One interlocking replicate will be removed in thinning at a later date.

Measurement of new and old series of provenance tests has been continued, as scheduled, at 5-year intervals. A paper on results from some of the older tests was prepared by Murray and Skeates (1984). Review

and discussion of all available results of white spruce provenance research will be part of a provenance workshop/symposium being planned for 1986 at PNFI.

### Selection, Breeding and Progeny Testing

We have completed selection of trees that will form the breeding population for use in research on advanced generation breeding. An exceptionally heavy cone crop in 1984 made it possible to collect seed from many of the selected trees. However, so few buds were left to produce vegetative shoots that scion collection and grafting could not be done as scheduled in 1985. Open-pollinated seed have already been made available to cooperators for inclusion in family tests.

Isoenzymes were used in the study of inheritance, population structure, mating system, and variance effective population size (Cheliak, Pitel and Murray 1984).

### Wood Quality

Under the terms of a PRUF (Program of Research by Universities in Forestry) contract, Dr. J. Balatinecz, University of Toronto, is studying the wood quality of several species, including white spruce. Work done includes observations of Pilodyn penetration in different provenances, and detailed study of wood properties of trees in full-sib families.

## LARCH

### Tamarack

Although there are still some gaps in the distribution of seed samples collected for the cooperative range-wide provenance test of tamarack, a start has been made with the establishment of field tests. Staff at the Maritimes Forest Research Centre have planted a number of tests and the first of a series of tests in Ontario is scheduled for field planting at PNFI in 1986.

Progress made in the study of geographic variation of isoenzymes in the tamarack seed collected for the range-wide test includes a paper describing the inheritance and linkage of allozymes (Cheliak and Pitel 1985).

Data collected in a tamarack family test planted at PNFI on three different sites were used in an investigation of the correlation between height measurements made between the ages of 4 and 14 years. Results of this investigation are contained in a thesis submitted to the University of New Brunswick by Mr. Graydon Smith as part of the requirements for his degree of Bachelor of Science in Forestry (Smith 1985).

### Exotic Larches

Variation in growth and yield of different sources of European larch (Larix decidua Mill.) and a single source of hybrid larch (Larix eurolepis Henry) was evident in recent measurements of 27- and 28-year-old replicated tests at PNFI. The best growth was made by the hybrid larch which reached a mean height of 18 metres in 27 years with mean volume of 286.4 m<sup>3</sup>/ha (MAI = 10.6 m<sup>3</sup>/ha/yr). Part of this yield was removed in 1970 (17.6 m<sup>3</sup>/ha) in a non-commercial thinning, and in 1979 (58.9 m<sup>3</sup>/ha) when the trees were of marketable size. The European larch giving the highest yield on the same site, a larch of Sudeten origin obtained from a Danish seed orchard, had a total volume of 255.7 m<sup>3</sup>/ha, while the poorest larch from an unimproved source in Austria produced 144.7 m<sup>3</sup>/ha.

Scions from European and Japanese (Larix leptolepis [Sieb. and Zucc. Gord.]) larch selected at different locations in Ontario and Quebec have been grafted at PNFI. Some of this material has been included in a seed orchard planted by the Ontario Ministry of Natural Resources in southeastern Ontario. Ramets of most clones will also be planted in a clonal archive at PNFI.

Samples of larch removed in recent thinnings are being used in Dr. Balatinecz's study of wood quality referred to earlier in this report.

### HARDWOODS

Work on hardwoods in the past two years has been limited to inspection and tending of existing plantations of green ash and white ash (Fraxinus pennsylvanica Marsh. and F. americana L.).

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