

REPORT OF THE NEFTIC HARDWOOD IMPROVEMENT COMMITTEE

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The present report summarizes information on hardwood tree improvement projects in eastern United States and eastern Canada. It was compiled from answers to questionnaires sent to research organizations in these areas. Although our poll was quite thorough, there is always the possibility that someone may have been overlooked when questionnaires were mailed. Where questionnaires were sent out and no answers received, it was assumed that there were no hardwood improvement projects to report.

The studies or projects listed in this report appear under one of three categories:

- A. Recently completed but results are not yet in print.
- B. Currently in progress.
- C. In the final planning stages but not yet in operation.

Included under each category is (a) name of the species involved, (b) a short descriptive title, and (c) a statement of the objectives. Information has been taken directly from the questionnaires as reported.

EASTERN CANADA

CANADA DEPARTMENT OF FORESTRY, PETAWAWA FOREST EXPERIMENT STATION
(Chalk River, Ontario)

- B1 (a) Populus species and hybrids.
 - (b) Growth and performance of Populus plantations.
 - (c) Observe performances of Populus species and hybrids.
- B2 (a) Betula verrucosa and B. pubescens.
 - (b) Trial of Scandinavian elite birch for future breeding purposes.
 - (d) To test the adaptability of the species to local environments.
- B3 (a) Betula papyrifera, B. latifolia, B. davurica, B. costata, B. ermani,
B. maximowicziana, B. platyphylla var. japonica.
 - (b) Cooperative study of Canadian, European, Korean, and Japanese birches.
 - (c) To test survival and growth of the species under local conditions and to compare results with cooperators in England, Denmark, Norway, Sweden, Finland, Germany, Korea, and Japan.
- B4 (a) Betula verrucosa, B. pumila, B. japonica.
 - (b) Species collection for breeding purposes,
 - (c) To provide material for a birch breeding program.
- B5 (a) Betula papyrifera, B. coerulea-grandis, B. glandulosa, B. nealaskana,
B. occidentalis.
 - (b) Establishment of Dr. W. H. Brittain's Canadian white birches.
 - (c) To observe survival and growth of birches from various parts of Canada.
- B6 (a) Alnus glutinosa.
 - (b) Testing of five European Alnus glutinosa provenances from plus stands in east Germany.
 - (c) To introduce an alder with commercial potential that could be used as a nurse tree for spruce on grassy and frosty locations.
- B7 (a) Betula verrucosa, B. pubescens, B. papyrifera.
 - (b) Study of European x paper birch hybrids.
 - (c) To test hybrid growth and develop resistance to birds (sapsuckers), insects, and diseases.

LAVAL UNIVERSITY, FACULTY OF LAND SURVEYING AND FOREST ENGINEERING (Quebec, Canada)

- B1(a) Juglans nigra, J. cinerea, and J. sieboldiana.
(b) Interspecific hybridization in walnut.
(c) To produce walnut hybrids that are winter hardy.
- B2(a) Juglans nigra and J. cinerea.
(b) Provenance tests.
(c) To test (1) the adaptability and performance of walnut species to conditions outside their natural range and (2) their ability to produce trees of sawlog size.
- B3(a) Tilia americana, Betula lutea, Fraxinus americana, Acer saccharum,
A. saccharinum, and Juglans cinerea.
(b) An inventory and selection program for commercially important hardwoods.
(c) To provide material for practical and research purposes in forest tree improvement through a search of the best natural stands in each forest district.

ONTARIO DEPARTMENT OF LANDS AND FORESTS, RESEARCH BRANCH (Maple, Ontario)

- B1(a) Silver maple.
(b) Selection of plus trees for the production of lumber and veneer.
(c) To produce superior planting stock for reforesting areas devastated by the Dutch Elm disease.
- B2(a) Silver maple.
(b) Selection of plus trees for the production of maple sap.
(c) To expand the maple syrup industry into areas which are at present nonproductive
- B3(a) Silver maple.
(b) Asexual reproduction of plus trees.
(c) To reforest areas with superior trees for the production of lumber and maple sap.
- B4(a) European alder.
(b) Provenance testing of progeny from five strains selected in Germany for their lumber qualities.
(c) To establish a gene bank of these valuable strains for future stock if required,

EASTERN UNITED STATES

CONNECTICUT AGRICULTURAL EXPERIMENT STATION (New Haven, Connecticut)

- A1(a) Chinese chestnut, Castanea mollissima.
(b) Natural regeneration from a 40-year-old Chinese chestnut planting.
(c) To determine the survival of the Chinese trees in the original planting,
A five-acre adjacent field was surveyed and stocking density of volunteer Chinese chestnut seedlings was found to be about 50 trees per acre.
- B1(a) Chestnut species and hybrids.
(b) A study of host-parasite relationships.
(c) To improve methods for screening chestnut seedlings for resistance to the chestnut blight fungus,
- B2(a) Chestnut.
(b) Hybridization and testing for blight resistant chestnuts.
(c) To develop blight resistant chestnuts for forest, orchards and ornamental use,

INSTITUTE OF PAPER CHEMISTRY (Appleton, Wisconsin)

- A1(a) Populus tremuloides, P. tremuloides X tremula hybrids.
(b) Early growth and wood properties of triploid aspen and triploid aspen hybrids,
(c) Investigate the form, rate of growth, and wood properties of triploid and triploid aspen hybrids.

- A2 (a) Populus tremuloides.
- (b) Quaking aspen geographic variation.
- (c) To increase our knowledge of the natural variation of wood, fibers, and growth characteristics, and to accumulate data needed for establishing "base lines" for judging wood quality of quaking aspen.
- B1 (a) Populus tremuloides.
- (b) Heritability of form, rate of growth, and wood properties in quaking aspen,
- (c) To obtain narrow sense heritability information from controlled quaking aspen crosses, Such heritability information is to be used with information on natural variation to select growth and wood properties to be emphasized in an intensive tree improvement program.
- B2 (a) Populus canescens, P. grandidentata, P. tremuloides.
- (b) Nutrient requirements of aspen and aspen hybrids.
- (c) To investigate the relative nutrient requirements of a number of aspen hybrids in relation to the requirements of seedlings of the parent species.
- B3 (a) Populus spp.
- (b) Aspen tissue culture studies.
- (c) To investigate the usefulness of tissue culture techniques in studying the physiology and cytology of tree growth and differentiation,
- B4 (a) Populus deltoides, P. tremuloides.
- (b) Cytology of fertilization and embryo initiation in Populus.
- (c) To determine the time after pollination of fertilization and embryo initiation.

MICHIGAN STATE UNIVERSITY, FORESTRY DEPARTMENT (East Lansing, Michigan)

- B1 (a) Yellow birch.
- (b) Provenance test.
- (c) (1) To determine the patterns of variation in yellow birch over its entire range; (2) to determine the possible occurrence of distance morphological and/or physiological races within the species; (3) to determine possible correlations between characteristics of juvenile and adult trees; (4) to provide a diversity of genotypes for use in other studies and in practical improvement.
- C1 (a) Black walnut.
- (b) Study of segregation among black walnut hybrids.
- (c) Study of segregation among black walnut hybrids.

MICHIGAN TECHNOLOGICAL UNIVERSITY, DEPARTMENT OF FORESTRY (Houghton, Michigan)

- B1 (a) Sugar maple.
- (b) Variation in bark characters of sugar maple,
- (c) The appearance of sugar maple bark is often highly variable, This study is an attempt to assess some of this variation and consists of two parts: (1) delineation of bark classes and relation of these classes to tree growth; and (2) anatomical studies on selected bark samples of each class,
- B2 (a) Sugar maple.
- (b) Variation in wood quality of sugar maple.
- (c) To determine the range of variability of wood characteristics of sugar maple that may affect wood quality. Characteristics under study include both within and between tree variation of specific gravity, spiral, grain, and fiber length.
- B3 (a) Sugar maple.
- (b) Range-wide sugar maple provenance study.
- (c) (1) To inquire into the nature and extent of genetic variation within and between provenances throughout the species range; and (2) to compare juvenile and mature performances within provenances.

NEW YORK STATE COLLEGE OF FORESTRY (Syracuse, New York)

- A1 (a) Prunus serotina.
(b) An investigation of microsporogenesis and embryogenesis.
(c) (1) To investigate the reproductive cytology in hardwoods; (2) to investigate self-compatibility and reproduction in this species.
- A2 (a) Liriodendron tulipifera.
(b) Intraspecific hybridization studies between northern and southern populations.
(c) (1) To define the growth rate of intraspecific hybrids; and (2) to investigate the cold-hardiness of the hybrid seedlings.
- A3 (a) Ulmus americana and Ulmus glabra.
(b) An investigation of microsporogenesis and embryogenesis.
(c) To investigate the reproductive cytology in hardwoods. Particular areas of interest in these studies are the polyploid nature of U. americana as compared to the diploid U. glabra and the extent of self-compatibility and crossability in the two species.
- A4 (a) Populus tremuloides.
(b) Investigations of the rooting ability of juvenile and mature tissues.
(c) (1) To study the effects of gamma radiation on rooting ability; (2) to investigate the biochemical basis for root initiation.
- A5 (a) Populus tremuloides and P. alba.
(b) An investigation of the effects of labeling pollen with phosphorus - 32 on controlled intraspecific and interspecific crosses.
(c) To develop methods for evaluating monoploid production, and a way of defining the competitive abilities of the two pollens on P. tremuloides females,
- B1 (a) Prunus serotina.
(b) Investigation of self-compatibility.
(c) To develop information to be used in planning for seed orchard and controlled breeding work with this species.
- B2 (a) Liriodendron tulipifera.
(b) A study of the effects of gamma radiation on pollen used in controlled crosses,
(c) (1) To investigate population effects and mutation induction in hierarchical mating systems, and (2) to study the relative amounts of additive and non-additive variance associated with wide-range intraspecific crosses,
- B3 (a) Populus maximowiczii X P. trichocarpa; P. betulifolia X P. trichocarpa; and P. deltoides x P. caudina.
(b) A study of the constancy of genetic control (repeatability) of wood characteristics and pulping properties in fast and slow grown clones of these hybrid poplars.
(c) Same as title (b).
- B4 (a) Populus tremuloides.
(b) A heritability study of leaf morphology and wood characteristics.
(c) To add to our basic knowledge of inheritance in forest trees,
- B5 (a) Betula alleghaniensis.
(b) Provenance study,
(c) (1) To determine the patterns of variation in yellow birch over its entire range; (2) to determine the possible occurrence of distinct morphological and/or physiological races within the species; (3) to determine possible correlations between characteristics of juvenile and adult trees; (4) to provide a diversity of genotypes for use in other studies and in practical improvements.
- B6 (a) Acer saccharum.
(b) Provenance study,
(c) (1) To inquire into the nature and extent of genetic variation within and between provenances throughout the species range; and (2) to compare juvenile and mature performance within provenances.

- B7(a) Acer saccharum.
- (b) Selection for high sugar content.
- (c) To develop seed orchard for producing genetically improved sugar maples for sap sugar production.
- 01(a) Hardwood.
- (b) Wood and pulp quality of fast and slow grown hardwoods.
- C2(a) Hardwood,
- (b) Bio-taxonomic studies of selected hardwood genera.
- C3(a) Hardwood,
- (b) Cytological studies of important northern hardwood species.
- 04(a) Hardwood.
- (b) Inter-disciplinary research into insect and disease resistance in northern hardwood species.

NEW YORK STATE CONSERVATION DEPARTMENT, DIVISION OF LANDS AND FORESTS
(Albany, New York)

- B1(a) Acer saccharum Marsh.
- (b) Range-wide provenance study.
- (c) To study the kind and the distribution of genetic variability within the species' range and to look for relations of juvenile and mature performances.

OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER, DEPARTMENT OF FORESTRY
(Wooster, Ohio)

- B1(a) Acer saccharum.
- (b) Selection for sap sugar content.
- (c) To study inheritance of sap sugar content by testing one- and two-parent progenies, and to develop sources of seed of selected material by sexual and asexual propagation.
- B2(a) Acer saccharum.
- (b) Geographical variation patterns.
- (c) To study patterns of genetic variation of the entire Acer saccharum species complex (including subspecies and varieties), to provide a basis for selection and a gene pool for breeding purposes.
- B3(a) Quercus rubra.
- (b) A 32-origin provenance-progeny test, replicated by 12 similar tests in 8 other states as part of the NC-51 program in the North Central region.
- B4(a) Quercus spp.
- (b) Varying numbers of provenances and families of 23 species, a replicate of the Michaux Quercetum at Philadelphia, Pa.
- B5(a) Robinia pseudoacacia
- (b) A test of 10 clones selected for form, vigor and borer resistance, replicated in 3 other Ohio locations.
- B6(a) Populus deltoides
- (b) An 0-family range wide provenance-clonal test (NC-51).

PENNSYLVANIA DEPARTMENT OF FORESTS AND WATERS (Harrisburg, Pennsylvania)

- B1(a) Black cherry.
- (b) Establishment of a clonal seed orchard.
- (c) To provide seed from parent trees selected for high quality veneer log production.
- B2(a) Commercially important hardwood species in northwestern Pennsylvania.
- (b) A study of seed production for seven hardwood species in northwestern Pennsylvania.
- (c) To study the relation of flower and seed production with tree characteristics, density, and climate.

UNIVERSITY OF MINNESOTA, SCHOOL OF FORESTRY (St, Paul, Minnesota)

- B1(a) All species of Section LEUCE plus *P. deltoides* and *P. nigra* in Sec, AIGEIOS.
 - (b) Hybridization studies in Populus.
 - (c) (1) To produce and test promising intra- and interspecific F1 hybrids in the Sections LEUCE and AIGEIOS for outplanting in Minnesota; and (2) produce F2 and backcross populations for segregation analyses within selected F1 hybrid populations.
- B2(a) Betula papyrifera Marsh:
 - (b) Additive and dominance genetic variances in Betula papyrifera Marsh.
 - (c) Estimation of additive genetic variance and genetic dominance variance of height and diameter growth after one season in the greenhouse, using 68 control-pollinated progenies. The ratio between these two quantities is applicable in choosing between alternative selection systems.

UNIVERSITY OF TENNESSEE, DEPARTMENT OF FORESTRY (Knoxville, Tennessee)

- B1(a) Yellow-poplar,
 - (b) Seed orchards.
 - (c) Three clonal orchards are in different states of development. Superior phenotypes have been selected in the three main physiographic regions of Tennessee. The oldest clones, now 6 years old, are flowering heavily. Open-pollinated seed is produced for the State nurseries while control crosses will be made to determine breeding value of the different clones,
- B2(a) Yellow-poplar.
 - (b) Breeding orchard.
 - (c) A large number of selected phenotypes from Tennessee and neighboring States has been established in a clonal breeding orchard. Inbreeding and different degrees of outcrossing will be done to evaluate the results of intraspecific hybridization in this species,
- B3(a) Black walnut
 - (b) Seed orchards.
 - (c) Three clonal orchards, representing the three main physiographic regions in Tennessee, have been started in a location in West Tennessee. In addition to production of nuts for the State nursery the orchards will be used for production of controlled crosses.
- B4(a) American chestnut,
 - (b) Grafted seed orchard
 - (c) A large number of American chestnut trees with apparent resistance to the blight have been selected. Some of these selections have been grafted in a clonal orchard for clonal tests and intraspecific hybridization,
- B5(a) American chestnut.
 - (b) Irradiated testing orchard,
 - (c) Several thousand nuts have been irradiated and the resulting seedlings outplanted in a testing orchard. Many of the trees have produced nuts which again are irradiated for production of R2 individuals.
- B6(a) American chestnut,
 - (b) Development of testing criteria for resistance to chestnut blight.
 - (c) Extractives of the inner bark of American, Chinese, and hybrid trees were used in culture media to test growth of *Endothia*. The results indicated that it will be necessary to separate the different compounds in the extractives. Using autoprep gas chromatography the fungus will be grown on media containing the different compounds in an effort to determine which are responsible for resistance to the blight.

UNIVERSITY OF VERMONT, BOTANY DEPARTMENT (Burlington, Vermont)

B1(a) Acer saccharum Marsh.

- (b) Sugar concentration variability in the sap of juvenile sugar maples and the effect of some environmental factors and management practices on the concentration.
- (c) (1) To determine whether superior maples can be selected by testing concentration ages 5-25 years. (2) To determine whether environmental or phenotypic factors are associated with high sugar concentrations and which, if any, such factors can be manipulated to improve the concentration.

UNIVERSITY OF WEST VIRGINIA, FORESTRY DEPARTMENT (Morgantown, West Virginia)

B1(a) Black cherry.

- (b) Vegetative propagation of black cherry.
- (c) To develop a successful technique for rooting of cuttings.

B2(a) Black cherry.

- (b) Range-wide provenance study.
- (c) To study variability within the species.

B3(a) Black cherry.

- (b) Individual tree variation in black cherry within a given site.
- (c) To study the variation between trees for wood properties and other characteristics.

B4(a) Red oak.

- (b) Individual tree variation in red oak within a given site.
- (c) To study between tree variation in wood properties and other characteristics.

B5(a) Black locust.

- (b) A study of the effect of environment on various black locust genotypes.
- (c) To study the reaction of clonally propagated genotypes, selected for habit, to different environments.

U. S. FOREST SERVICE, NORTH CENTRAL FOREST EXPERIMENT STATION, INSTITUTE OF FOREST GENETICS (Rhinelander, Wisconsin)

B1(a) Yellow birch.

- (b) A study of natural variation in yellow birch.
- (c) (1) To determine the patterns of variation in yellow birch over its entire range; (2) to determine the possible occurrence of distinct morphological and/or physiological races within the species; (3) to determine possible correlations between characteristics of juvenile and adult trees; (4) to provide a diversity of genotypes for use in other studies and in practical improvement.

B2(a) Birch species.

- (b) A study of compatibility in the genus Betula.
- (c) (1) To determine the amount of self-compatibility present in the native birch species and in the most important exotic species; (2) to determine whether intraspecific incompatibilities exist in birch; (3) to determine which species of the genus Betula can be intercrossed and to what degree they are compatible; (4) to attempt to develop methods of overcoming incompatibility barriers.

B3(a) Paper birch, yellow birch, river birch.

- (b) Grafting compatibilities of paper, yellow, and river birch.
- (c) (1) To determine whether grafting of paper birch, yellow birch, and river birch is equally successful on rootstocks of any of these species; (2) to determine whether the growth of the grafts is affected by the scion/rootstock combination.

- B4(a) Betula papyrifera, B. pumila, B. nana.
- (b) Effect of understock on growth of birch grafts.
- (c) To determine whether grafting of paper birch scions on rootstocks of two shrubby birch species has a dwarfing effect on the grafts.
- C1(a) Sugar maple; yellow birch.
- (b) A study of the variation in northern hardwood seedling gamma radiosensitivity between species, and between seed origins within species.
- (c) (1) To evaluate radiosensitivity as determined by measuring various growth and reproductive processes; (2) to identify differences in cytological factors related to variation in radiosensitivity.
- C2(a) Birch species and hybrids.
- (b) A chromatographic study of wintergreen in birch species and hybrids.
- (c) (1) To study the presence and concentration of wintergreen in birch species by means of gas chromatography; (2) to determine whether wintergreen is transmitted from species containing it to natural and artificial hybrids; (3) to develop micro-methods of verifying hybridity by gas chromatography.

U. S. FOREST SERVICE, NORTH CENTRAL FOREST EXPERIMENT STATION (Ames, Iowa)

- B1(a) Juglans nigra L.
- (b) Black walnut seed source study.
- (c) (1) To determine whether genotypic variation in black walnut is ecotypic or clinal and to define the limits of ecotypes, if they exist. (2) To obtain estimates of genotypic variation within stands, between stands, and between regions. (3) To determine the suitability of seed sources to various environments (the outplanting phase).
- B2(a) Juglans nigra L.
- (b) Genotypic variation of apical dominance in black walnut.
- (c) (1) To test the hypothesis that crooked walnut stems are the result of the death of the terminal shoot apex and the failure of a lateral shoot to assume the vertical position. (2) To estimate the genotypic variation for epicotyl curvature, leaf or branch angle, bud suppression, and leaf or branch length for progeny from four parent trees per stand and five stands. (3) To correlate seedling stem-straightness with epicotyl curvature, leaf or branch angle, leaf or branch length, and bud suppression. (4) To correlate mature stem-straightness with epicotyl curvature, leaf or branch angle, leaf or branch length, bud suppression, and seedling stem-straightness.
- B3(a) Juglans nigra L.
- (b) Seasonal accumulation of nutrients and dry matter by black walnut seedlings from different geographic sources.
- (c) To determine if the pattern of dry matter accumulation and nutrient uptake is influenced by the seed source.

U. S. FOREST SERVICE, NORTH CENTRAL FOREST EXPERIMENT STATION (Carbondale, Illinois)

- B1(a) Black walnut.
- (b) Progeny study.
- (c) (1) To find black walnut trees that produce superior seedlings for planting selected areas within the commercial range of the species. (2) To locate trees for breeding research.
- B2(a) Hardwoods.
- (b) Breeding collections for high-value hardwoods,
- (c) To establish arboreta that will allow easy crossing within collections of high-value hardwoods, especially walnuts.

U. S. FOREST SERVICE, NORTHEASTERN FOREST EXPERIMENT STATION (Burlington, Vermont)

- A1(a) Acer saccharum.
(b) Reproductive behavior in sugar maple; self-compatibility, cross-compatibility, agamocarpy, and agamospermy.
(c) To study the reproductive behavior in sugar maple as related to sexual and asexual production of fruits and seeds.
- A2(a) Acer saccharum.
(b) The inflorescence of sugar maple.
(c) To study the morphology of the inflorescence and the evolutionary significance related to its structure.
- A3(a) Acer saccharum.
(b) Dichogamy in sugar maple.
(c) To determine the types of dichogamy in sugar maple and describe their mode of operation.
- A4(a) Acer saccharum.
(b) Effect of collection date on rooting and establishment of sugar maple cuttings
(c) To determine in relative terms of maximum rooting and over-wintering survival, the most favorable time for collection of cuttings for rooting,
- B1(a) Acer saccharum, A. nigrum.
(b) Taxonomic relationship of black and sugar maple,
(c) To study morphological similarities and differences between parents and progenies from reciprocal crosses and to determine whether specific or varietal ranking should be given to black maple.
- B2(a) Acer saccharum.
(b) The initiation and development of flower primordia in sugar maple.
(c) To determine the time of initiation of flower primordia and to study the development of male and female floral parts.
- B3(a) Acer saccharum.
(b) A survey for variation in sugar content in sap among sugar maples and the selection of high-Yielding phenotypes.
(c) (1) To determine whether certain areas of New England and surrounding environs show greater between-tree variation in sugar content than do others; (2) to obtain some idea of the maximum between-tree variation in sap sugar and selection differentials that may be present among sugar maples; and (3) to make selections of superior sugar producing phenotypes.
- B4(a) Acer saccharum.
(b) Range-wide provenance study of sugar maple.
(c) (1) To determine the nature, magnitude, and pattern of genetic variation within and between provenances throughout the species range, and (2) to look for a correlation in performance between juvenile and later stages in provenance development.
- B5(a) Acer saccharum.
(b) Chemically-induced break of dormancy and greenhouse maintenance of sugar maple cuttings.
(c) (1) To develop techniques for breaking dormancy; (2) to obtain information on the prior period of winter rest required for induced dormancy break and normal floral development; and (3) to study the effectiveness of the culturing technique for maintenance of the cuttings to seed maturity.
- B6(a) Acer saccharum.
(b) A study of the effects of pollen treatments on agamospermy and agamocarpy in sugar maple.
(c) To determine the frequency of occurrence of agamospermy and agamocarpy after various treatments have been given to the pollen.

- B7 (a) Acer saccharum.
 (b) A study of factors influencing over-wintering survival of rooted sugar maple cuttings.
 (c) To develop a technique for successfully over-wintering rooted sugar maple cuttings originating from mature trees.
- B8 (a) Betula species.
 (b) Birch arboretum.
 (c) To gather into one plantation all species and varieties of birch that grow to a minimum height of 40 feet in their native habitat.
- C1 (a) Acer saccharum.
 (b) Grafting and budding flower-bud-bearing sugar maple scions.
 (c) To determine the feasibility of various grafts for carrying inflorescences to seed maturity.
- C2 (a) Acer saccharum.
 (b) Long-term storage of sugar maple pollen.
 (c) To determine satisfactory techniques for the long-term storage and transport of sugar maple pollen so as to maintain viability.
- U. S. FOREST SERVICE, NORTHEASTERN FOREST EXPERIMENT STATION (Durham, New Hampshire)
- B1 (a) Hybrid poplars,
 (b) A clonal test of 250 hybrid poplar clones in the northeastern United States.
 (c) To select the best clones for use in clonal mixtures in the Northeast, especially on upland sites.
- B2 (a) Hybrid poplars.
 (b) A nation-wide hybrid poplar clonal test.
 (c) To test the practicability of nation-wide distribution to introduce new hybrids.
- B3 (a) Populus Section AIGEIROS.
 (b) A biosystematic study of the American cottonwoods.
 (c) To determine the probable phylogeny of the American cottonwoods on the basis of taxonomic study of collections from natural stands throughout the range of the native cottonwoods.
- B4 (a) Acer cappadocicum, A. henryi, A. negundo, A. platanoides, A. rubrum, A. saccharinum,
Betula alleghaniensis, B. lenta, B. maximowiczii, B. papyrifera,
B. populifolia, B. verrucosa,
Fraxinus americana, F. pennsylvanica, F. velutina,
Quercus alba, Q. bicolor, Q. robur.
 (b) Field trials of species-hybrids and intraspecific progenies derived from controlled breeding.
 (c) To evaluate growth rate, tree form, disease, and insect resistance.
- B5 (a) Quercus (44 species, 9 varieties; 2-parent trees per provenance).
 (b) Provenance study of oak (Michaux Quercetum Project).
 (c) To obtain preliminary information on racial variation in oak species. (Started in cooperation with the Morris Arboretum of the University of Pennsylvania and the American Philosophical Society. Progenies are currently being tested by several additional cooperators.)
- B6 (a) Fraxinus americana, F. oregona, F. pennsylvanica, F. velutina.
 (b) A provenance test in ash.
 (c) To evaluate racial variation.
- B7 (a) Fraxinus americana.
 (b) A study of wood characteristics of white ash from different provenances, (Cooperation with Forest Products Laboratory.)
 (c) To determine the presence and extent of polyploidy in the sample trees and its possible relation to fibril angle and wood density.

- B8(a) Acer campestre, A. pseudoplat
 Betula davurica, B. mandshurica,
 Fraxinus chinensis, F. publinervis, F. spaethena
Liriodendron chinensis.
Ginkgo biloba.
- (b) Tests of exotics in the Northeastern Region,
 (c) To provide breeding material and to obtain preliminary information on exotic forest tree species that might justify more extensive tests, particularly provenance studies,

U. S. FOREST SERVICE, NORTHEASTERN FOREST EXPERIMENT STATION (New Haven, Connecticut)

- A1(a) Chestnut.
 (b) Examination of hybrid and Asiatic chestnut plots,
 (c) To investigate genetic resistance to the chestnut blight.
- B1(a) Red maple, aspen, and ash,
 (b) Feeding preferences of gypsy moth to red maple, aspen (*P. tremuloides*), and ash (white and/or green),
 (c) To determine the physiochemical bases of attraction and/or feeding inhibition of these tree species to gypsy moth larvae,
- B2(a) Hardwood.
 (b) Study of factors affecting numerical differences in place and changes over time of gypsy moth populations
 (c) To reveal the effects of measurable intrinsic and extrinsic factors (including certain individual tree characters) on gypsy moth numbers. It is relatively long term and broad enough in scope to yield some information of value to tree improvement, as related to resistance to attack by the insect involved.

U. S. FOREST SERVICE, SOUTHEASTERN FOREST EXPERIMENT STATION
 (Asheville, North Carolina)

- B1(a) Liriodendron tulipifera.
 (b) Yellow-poplar seed source study.
 (c) To determine if geographical races of yellow-poplar exist and, if they do exist, which region is best suited as a source of seed for the southern Appalachians.
- B2(a) *Quercus borealis*,
 (b) Geographic variation of northern red oak,
 (c) To study variation in northern red oak seedlings from six widely distributed geographic locations,
- B3(a) Liriodendron tulipifera.
 (b) Yellow-poplar one-parent progeny test.
 (c) To obtain basic information on variation among one-parent progenies of yellow-poplar.
- B4(a) *Prunus serotina*.
 (b) Inheritance of stem form.
 (c) To determine whether stem form, particularly crook and sweep, is inherited in some black cherry trees.
- B5(a) Quercus alb a.
 (b) Variation in oak to nectria canker.
 (c) To determine response to infection by Nectria galligena of clonal lines of *Quercus alba*,

U. S. FOREST SERVICE, SOUTHEASTERN FOREST EXPERIMENT STATION (Athens, Georgia)

B1(a) Sycamore.

- (b) Genetic variance within sycamore populations at different locations along the Chattahoochee River.
- (c) To study genetic variance in a bottomland species growing along a river system where long range gene flow is possible via water-borne seed,,

U. S. FOREST SERVICE, SOUTHERN FOREST EXPERIMENT STATION, SOUTHERN HARDWOODS LABORATORY (Stoneville, Mississippi)

A1(a) Cottonwood,

- (b) A preliminary test of selected cottonwood clones,
- (c) To evaluate clones for growth, wood properties, and Melampsora rust resistance.

A2(a) Sweetgum.

- (b) Effects of chilling and day length upon growth of sweetgum from two geographical sources.
- (c) To test the effect of chilling treatments and day length on bud-break and growth.

B1(a) Yellow-poplar.

- (b) Yellow-poplar geographic seed source study.
- (c) To test the performance of four sources of yellow-poplar at three different locations.

B2(a) Cottonwood.

- (b) Field selection of superior cottonwood phenotypes.
- (c) To select superior phenotypes for breeding material.

B3(a) Sweetgum.

- (b) Field selection of superior sweetgum phenotypes.
- (c) To select superior phenotypes for breeding material.

B4(a) Cottonwood.

- (b) Testing and selection of progeny from open-pollinated cottonwood mother trees,
- (c) To evaluate selections made for superior growth, wood properties, rust resistance, and phenology.

B5(a) Sweetgum,

- (b) A one-parent progeny test in sweetgum.
- (c) To evaluate selections of sweetgum.

B6(a) Cottonwood.

- (b) A long-term cottonwood clonal test.
- (c) To evaluate cottonwood selections on two different sites.

B7(a) Cottonwood.

- (b) A cooperative cottonwood clonal test with Armstrong Cork Company.
- (c) To evaluate cottonwood selections from central Mississippi and southern Illinois on four sites.

B8(a) Cottonwood.

- (b) Effects of moisture stress on natural variation in growth of cottonwood clones.
- (c) To test the response of cottonwood to various levels of moisture.

C1(a) Cottonwood,

- (b) A cottonwood racial study.
- (c) To study the variation within and between six populations of cottonwood,

C2(a) Cherrybark oak.

- (b) Genetic improvement of cherrybark oak.
- (c) To genetically improve the cherrybark oaks and to establish a seed orchard of superior seed trees.