PROCEDURE FOR SELECTION OF HYBRID POPLAR CLONES FOR COMMERCIAL TRIALS IN THE NORTHEASTERN REGION

Ernst J. Schreiner[1]

This article will be limited to a description of the procedure for selecting 40 hybrid poplar clones in a 15-year clonal test on the former Lawrence Hopkins Memorial Experimental Forest in Williamstown, Massachusetts [2]. These hybrids stem from the large-scale breeding program initiated in 1924 by the Oxford Paper Company in cooperation with The New York Botanical Garden. More than 13,000 hybrid seedlings, representing 99 cross combinations between 34 different types of poplars, were produced between 1924 and 1926 (Stout and Schreiner, 1933) [3].

[1] Principal Geneticist, forest genetics research, Northeastern Forest Experiment Station, Forest Service, USDA, Durham, New Hampshire.

[2] A detailed description of the clonal tests, and individual ratings and evaluations of the selected clones, will be presented in a separate publication.

[3] The history of this project and the early selections and distribution of hybrids for worldwide and nationwide trials will be included in a comprehensive report covering this poplar research from 1924 to the present.

Poplar species and hybrids have two serious handicaps; they are very sensitive to environmental conditions, and they are susceptible to facultative parasites that can cause extensive mortality even under temporarily inimical conditions. To insure against unpredictable catastrophy, particularly on the variable upland sites in the Northeastern Region, it will be necessary to avoid extensive monoclonal cultures. Since it is probable that 50 to 100 superior clones representing 20 or more parentages will be required for the wide diversity of environments throughout this region, it was considered necessary to test a large number of clones, derived from phenotypically superior ortets, under a wide variety of environments. Williamstown, Massachusetts, was one of 8 clonal-test locations originally selected to sample the environmental conditions within the Northeastern Region.

EXPERIMENTAL DESIGN

The Williamstown tests, on two sites, included a total of 240 clones, 226 clones in sapling tests (for clonal evaluation between 4 to 8 years), and 105 clones in crop-tree tests.

The sapling tests (16-tree plots, 4 rows of 4 trees) were established at 4- x 4-foot spacing in four randomized blocks, two on an upland terrace site at approximately 790 to 820 feet in elevation, and two on a slope approximately 900 to 1,000 feet in elevation. Fifty clones were established in sapling tests each year from 1949 to 1953.

The crop-tree tests (100-tree plots, 10 rows of 10 trees at 4- x 4-foot spacing) were established in two randomized blocks, one on the upland terrace and one on the higher slope site, adjacent to the sapling tests established in the same years. Since clonal differences would be confounded with year of planting, five clones were included as standards in all crop-tree tests. This permitted testing a total of 100 clones, 20 new clones plus the 5 standard clones in each of the five years (1949-1953). The selection of clones for the 1949 and 1950 crop-tree tests was based on their performance in earlier trials in the United States and foreign countries or on the phenotypic excellence of the ortet; and for the later crop-tree tests, on their growth and development in the sapling tests.

Poplars are so susceptible to deleterious root interactions that early and regular thinnings of dense stands are essential for sustained growth and survival. Systematic thinnings were planned to provide reasonably uniform spacing in these test plantations. Sapling tests were to be thinned to 8 trees per plot by the end of the fourth year, and to one tree per plot for continued observation after 8 years. Crop-tree plots were to be thinned to a residual stand of about 50 trees per plot by the end of the fourth year, to about 25 trees per plot between the 6th and 9th years, and to approximately 13 trees after the 10th year.

These planned, systematic thinnings and the timing of such thinnings could not be applied without modification even within the first 4 years. Canker diseases, top breakage, and mortality necessitated thinning by individual tree selection for many clones, and lack of field assistants prevented optimum timing of some thinnings and measurements.

PLANTING STOCK AND PLANTATION ESTABLISHMENT

The planting stock was dormant cuttings, 12 inches in length, and graded to 3/16- to 1/2-inch middle diameter. All cutting stock was grown in a stool nursery on the former Beltsville Experimental Forest located between Laurel and Bowie, Maryland.

The test plantations were on land that had been cropped for hay for many years. Site preparation consisted of plowing, disking, and spring-tooth harrowing, or roto-tilling. Cuttings were check-planted to permit tractor cultivation in two directions during the first growing season.

It was decided that *Septoria musiva* Peck. should be introduced into the clonal tests because this pathogen had caused severe cankering in 1935 on some of our most vigorous clones growing in Port Chester, New York. Trees were inoculated in a grid that located an inoculated tree at uniform distances from the trees in each sapling and crop-tree plot. No diseased trees were removed from the plantations; in thinning operations, all felled stems were left on the ground. It was soon apparent that we were building up a very large volume of inoculum for the continuous infection of the residual stand by potential pests.

SELECTION PROCEDURES

The most important criteria for the selection of clones for commercial poplar culture are rooting ability, rapid growth (volume production), and sufficient pest resistance to predict an early and profitable harvest.

Rooting Ability

The 240 clones included in these tests had met the requirement for 95-100 percent nursery rooting. This was based on 50 graded cuttings (12 inches in length and 3/16- to 1/2-inch middle diameter) derived from 1-year-old growth on nursery stools.

Height at 4, 9 or 10, and 15 Years

Clone mean height, at or above the replicate mean, was used as the first selection criterion because it is the least affected by high stand density at 4 years and by spacing variation at 9, 10, or 15 years. Numerical ratings for height are shown in table 1.

Clones were rated for each measurement year by sites and replicates. These ratings were then combined and the coefficient of the combined ratings was computed as shown in table 2.

The selection of clones for further consideration required a coefficient of combined ratings of 75 percent for 4-year height, and 67 percent for 9- or 10-year and for 15-year height. Clones that failed to meet these requirements in at least one of the three measurement years were rejected in this first round of selection.

Table 1.--Numerical ratings for height growth.

Mean height	Type of test	Ratings for 4-year height	Ratings for 9- or 10-yr. height	Ratings for 15-year height
Clone height 20% or more above replicate mean	Sapling	3	3 for clones with 3 or more trees 2 for clones with 2 trees 1 for clones with 1 tree	
	Crop tree	3	3 for clones with 20 or more trees 2 for clones with 10-20 trees 1 for clones with less than 10 trees	3 for clones with 10 or more trees 2 for clones with 5-10 trees 1 for clones with less than 5 trees
Clone height between replicate mean and 20% above	Sapling	2	2 for clones with 3 or more trees 1 for clones with 1 or 2 trees	
	Crop tree	2	2 for clones with 20 or more trees 1 for clones with less than 20 trees	2 for clones with 10 or more trees 1 for clones with less than 10 trees
Clone height below replicate mean rated 0				

Table 2.--Computation of the coefficients of combined height ratings.

Clone	Plantation[1]	Ratings by years, sites, and replicates						Combined ratings			Coefficients of combined ratings[2]		
		4 years		9 or 10 years		15 years		4 yrs.	9 or 10 yrs.	15 yrs.	4 yrs.	9 or 10 yrs.	15 yrs.
		T[3]	S[3]	T	S	T	S						
NE-228	49S	0 0	3 2	0 0	3 2	2 2	3 2	5	5	9	42	42	75
	53C	3	3	2	3	3	3	6	5	6	100	83	100

[1] 49S = 1949 Sapling test; 53C = 1953 Crop-tree test.

[2] Coefficients of combined ratings (in percent) for:
Sapling tests = combined rating divided by 12.
Crop-tree tests = combined rating divided by 6.

[3] T = Terrace site; S = Slope site.

Volume Production

The estimated mean total volume per acre (in cubic feet) was computed from the conical volume of the average tree (basal area x 1/3 total height), and the estimated number of trees per acre (calculated from the number of residual trees on each plot). Conversion to cords was on the basis of one cord = 90 cubic feet.

A 4-year mini-rotation for fiber production would require closer than 4- x 4-foot spacing to fully utilize the land area. Comparisons of 4-year volume at 1- x 4-foot nursery spacings[4] with the 4- x 4-foot volumes in these tests indicated that the volume of the average tree was approximately the same at both spacings. Therefore, the volumes per acre at 4 years were estimated on the basis of 7,623 trees per acre (70 percent survival at 1- x 4-foot spacing). The volumes for 9 or 10 years and for 15 years were computed from the number of residual trees and the plot size (sapling plots, 1/170 acre; crop-tree plots, 1/27.2 acre).

Clones were rated for mean annual increment of all replicates on each site and for mean annual increment of the best replicate on each site, as follows:

Rating	Mean annual increment	
	Cu. ft. per acre	Cords per acre
0	0 - 44	0 - 0.49
1	45 - 134	0.5 - 1.49
2	135 - 224	1.5 - 2.49
3	225 - 314	2.5 - 3.49
4	315 - 404	3.5 - 4.49
5	405 - 494	4.5 - 5.49

Field Resistance to Pests

Clones were not rated for insect resistance. Branch and stem borers occurred on many clones and may have been responsible, at least in part, for the high incidence of stem cankers.

Melampsora rusts have been of no practical importance in these clonal tests. Selection for field resistance to rust was accomplished in the early years of the project by clonal selection for maximum rust resistance in the nursery over a period of 4 to 5 years, and by natural selection in the hybrid seedling plantations in Frye, Maine. Severe rust infection in the hybrid seedling plantations was responsible for the early death of practically all seedlings in some highly susceptible progenies, and of most of the susceptible seedlings in all parentages.

[4] Schreiner, E. J. 1970. Mini-rotation forestry. USDA Forest Serv. Res. Paper NE-174. 32 pp. Northeast. Forest Exp. Sta., Upper Darby, Pa.

Marssonina and other leaf spots could always be found on leaves late in the growing season, but infestations were never of sufficient intensity to justify selection for resistance.

Stem cankers caused by *Septoria,* Valsa, *Dothichiza,* and probably other facultative canker organisms have been most important in these tests. These pathogens often kill newly planted trees, and young trees under inimical environmental conditions. Sapling and pole-sized hybrids in good vigor on suitable sites may be killed if they are highly susceptible to *Septoria,* but seldom by Valsa and *Dothichiza.*

Personal observations on thousands of hybrid poplars since 1924 have indicated that even large cankers do not significantly reduce the growth rate of the individual tree on a good poplar site. But stem cankers greatly increase the risk of volume loss through wind breakage.

The following ratings for field resistance were based on the probability of a profitable harvest, on suitable poplar sites, from a 15- to 25-year timber rotation; from a medium-length boltwood rotation; or from a mini-rotation for fiber production:

0 = No stem cankers observed.

1 = Possible small cankers, not positively identifiable. No apparent disease risk.

2 = Small cankers, but very slight risk of loss from mortality or wind breakage within a 15- to 25-year rotation.

3 = Small and medium cankers primarily in the upper stem; only slight risk of stem loss below merchantable height.

4 = Large and/or small cankers, but evidence for reaching harvest size for boltwood with little to medium risk.

5 = Medium to high risk for longer than mini-rotation boltwood production.

These canker ratings will be most useful for recommending clones for particular mini-rotations (fiber, boltwood, or timber). Clones with high volume production in the Williamstown tests were not discarded on the basis of stem-canker ratings at 15 years for the following reasons:

1. Their promising use for either mini-rotation fiber or boltwood production.

2. Their usefulness as early starters in clonal mixtures at spacings that will permit profitable mini-rotation fiber and boltwood thinnings.

3. Their performance in other localities.

CLONES RELEASED FOR COMMERCIAL TRIALS IN 1970 AND 1971

The most important criteria for the selection of clones for poplar fiber and timber production are rapid growth (volume production) and sufficient pest resistance to predict an early and profitable harvest. Because these hybrids will be planted over an extremely wide environmental range, the selection of some of the clones distributed in previous years has been weighted by their performance in other localities in the United States and Europe.

Since 1930, cuttings of more than 150 of the hybrid poplars produced by Stout and Schreiner have been distributed world wide in response to requests for cuttings for experimental use. The earliest distributions (1930 to 1936) were sent out under family pedigree numbers (e.g. 96-4). About 1936, the designations were changed to numbers preceded by OP- (Oxford poplar) and later by NE- (Northeast), but without change of the OP- numbers (e.g. OP-41 and NE-41 identify the same clone).

The parentages and ratings for the 40 clones released to State Forest Nurseries for commercial trials in 1970 and 1971 are listed in table 3. They now have been named USA-NE- to include the country of origin (United States of America-Northeast selection) followed by the previous OP- or NE- numbers (e.g. USA-NE-41 identifies the clone previously numbered OP-41 and NE-41). Designation of the country of origin is in accord with European practice (e.g. 1-214, 1-58/57, I-BL, etc., for clones selected in Italy); and it will also permit naming other USA selections with different regional or other distinctive designations.

First-year survival is listed in table 3 as a rating for rootability under field (plantation) conditions.

The minimum requirement for selection of clones for release in 1970, 1971 was based on a mean annual increment rating of 2 (1.5-2.49 cords; 135-224 cubic feet per acre) on one site in any measurement year; selection for mini-rotation fiber, boltwood, and timber production. There are two volume ratings for clones in the sapling tests, one for the site mean, and one for the best replicate on the site. Only one rating is available for clones tested only in crop-tree plantations (e.g. USA-NE-264).

Ratings for field resistance to canker diseases are based on the probability of a profitable harvest, on suitable poplar sites, from a 15- to 25-year timber rotation; from a medium-length boltwood rotation; or from a mini-rotation for fiber production. The Williamstown, Massachusetts, column lists the range of ratings for the individual 15- to 20-year-old ramets; the Frye, Maine, figures are ratings of the ortets in the 42- and 43-year-old plantations on an upland hardwood slope.

Table 3.--Clones distributed for commercial trial 1970, 1971.

First-year survival, volume, and canker ratings.

Clone USA-NE-	Percent survival, First year		Volume ratings, Mean annual increment[1]						Canker ratings[2]	
			Terrace site			Slope site				
	Terrace	Slope	4 years	9 or 10 years	15 years	4 years	9 or 10 years	15 years	Ramets Mass.	Ortets Me.
Populus cv. Angulata x P. cv. Plantierensis										
-375	91	97	0 (0)	1 (2)	2 (3)	1 (1)	1 (2)	2 (3)	0-4	4
Populus cv. Angulata x P. trichocarpa Torr. & Gray										
-252	91	88	0 (0)	2 (3)	2 (3)	0 (0)	3 (3)	5 (5)	0-4	0
-253	92	97	2 (2)	1 (2)	1 (2)	1 (1)	1 (2)	2 (2)	2-5	3
-372	97	94	0 (0)	2 (2)	2 (2)	2 (2)	3 (3)	3 (3)	1-5	3
-373	94	97	1 (1)	3 (3)	5 (5)	1 (1)	4 (4)	4 (4)	0-1	3
-374	81	97	0 (0)	1 (2)	2 (3)	1 (1)	2 (2)	3 (4)	2-4	4
Populus cv. Angulata x P. cv. Volga										
-264	96	99	1	1	3	0	0	1	0	0
Populus cv. Betulifolia x P. trichocarpa Torr. & Gray										
-296	100	98	2 (2)	2 (3)	3 (4)	2 (3)	3 (3)	4 (5)	0-2	2
-298	96	75	1 (1)	3 (5)	4 (5)	1 (1)	2 (2)	2 (3)	2-4	4
-299	90	97	1 (2)	2 (2)	1 (1)	1 (2)	2 (2)	5 (5)	2-5	4
-300	80	96	1	2	2	2	1	3	2-4	4
-383	100	91	1 (2)	2 (2)	2 (3)	1 (1)	2 (3)	3 (3)	2-5	3
Populus cv. Candicans x P. cv. Berolinensis										
-386	99	95	1 (1)	2 (2)	3 (3)	0 (0)	2 (2)	3 (3)	2-4	4
-387	91	93	1 (1)	1 (2)	1 (1)	0 (1)	2 (2)	3 (3)	3-5	4
Populus cv. Charkowiensis x P. cv. Caudina										
-17	98	97	3 (4)	2 (3)	1 (2)	1 (1)	2 (2)	4 (5)	2-3	NI
-19	100	100	0 (1)	2 (3)	2 (3)	0 (0)	2 (2)	2 (3)	2-4	NI
-311	100	100	1 (1)	3 (3)	3 (4)	1 (1)	2 (2)	2 (3)	2-4	3
-379	91	84	0 (0)	1 (2)	1 (2)	0 (0)	2 (3)	2 (3)	2-4	3

- Continued -

[1] Figures without parentheses are ratings for the site means; figures in parentheses are ratings for the best replicate. There is only one rating for clones tested only in crop-tree plantations.

[2] NI = Ortets that were not included in the Maine plantation.
M = Ortet missing, cause of mortality not known.

Table 3. (Concluded)

Clone USA-NE-	Percent survival, First year		Volume ratings, Mean annual increment[1] — Terrace site			Slope site			Canker ratings[2]	
	Terrace	Slope	4 years	9 or 10 years	15 years	4 years	9 or 10 years	15 years	Ramets Mass.	Ortets Me.
Populus cv. Charkowiensis × P. deltoides Bartr.										
-318	94	97	1 (1)	1 (2)	3 (3)	1 (1)	1 (1)	2 (2)	0-4	3
Populus cv. Charkowiensis × P. cv. Robusta										
-316	98	100	1 (2)	2 (2)	2 (3)	2 (2)	2 (2)	4 (4)	0-4	3
Populus deltoides Bartr. × P. cv. Caudina										
-222	91	98	0 (1)	1 (1)	1 (1)	1 (2)	1 (2)	3 (3)	2-4	3
-228	87	97	0 (0)	0 (1)	1 (1)	1 (1)	1 (2)	2 (3)	3-4	0
-351	97	97	1 (1)	2 (2)	4 (4)	1 (2)	1 (2)	2 (3)	1-4	0
-357	97	75	1 (1)	2 (4)	4 (5)	1 (2)	2 (3)	2 (3)	1-4	4
-366	94	94	0 (0)	1 (1)	2 (2)	1 (1)	2 (2)	3 (3)	2-5	M
Populus deltoides Bartr. × P. trichocarpa Torr. & Gray										
-200	91	98	1 (2)	1 (1)	3 (4)	1 (1)	1 (1)	2 (3)	1-3	Cut
-205	89	98	1 (2)	1 (1)	2 (3)	0 (1)	1 (1)	2 (3)	2-4	3
-206	95	95	3	1	2	1	1	2	2-4	4
-207	98	100	2	1	2	2	1	3	1-3	4
-212	97	100	1 (1)	1 (1)	3 (3)	0 (0)	1 (1)	3 (3)	0-2	3
-216	95	96	1 (2)	1 (2)	2 (4)	1 (3)	2 (3)	3 (4)	2-4	2
-220	99	91	0 (0)	1 (2)	2 (4)	0 (0)	1 (2)	2 (4)	2-4	3
-346	97	99	0 (0)	1 (2)	2 (2)	0 (0)	1 (1)	3 (3)	0-1	0
-348	97	88	0 (0)	2 (2)	3 (4)	0 (0)	2 (2)	2 (3)	3-4	3
Populus deltoides Bartr. × P. cv. Volga										
-238	89	92	0 (0)	1 (2)	1 (3)	0 (1)	1 (1)	1 (2)	2-4	4
Populus maximowiczii Henry × P. cv. Berolinensis										
-47	98	98	3 (3)	1 (1)	1 (2)	1 (2)	1 (1)	1 (1)	3-5	NI
-50	82	95	1 (1)	1 (1)	2 (3)	1 (1)	1 (1)	2 (2)	3-5	NI
Populus maximowiczii Henry × P. cv. Plantierensis										
-51	100	100	1 (1)	1 (1)	1 (1)	1 (2)	1 (2)	1 (1)	2-5	NI
Populus maximowiczii Henry × P. trichocarpa Torr. & Gray										
-41	98	98	1 (1)	1 (2)	1 (1)	3 (3)	3 (3)	2 (2)	2-4	NI
Populus nigra L. × P. laurifolia Ledeb.										
-1	95	100	1 (2)	1 (1)	0 (0)	3 (4)	2 (3)	2 (3)	2-4	NI

DISCUSSION

CAMPANA - Do you have a special reason for using such a high dosage of ozone?

DEMERITT - We found that we needed dosages of 50 to 55 pphm ozone to get good phenotypic discrimination of resistance using exposure periods of 6 or 12 hours.

CAMPANA - Another question in the same area--do you find a sharp difference in the tissue from that exposed to that not exposed?

DEMERITT - With a sharp delineation?

CAMPANA - Yes.

DEMERITT - We haven't observed any indication of translocation of ozone from exposed to unexposed portion of the needle. There is a sharp line between injured and uninjured tissue at the rubber disc on severely injured fascicles.

LEDIG - I have a question for Tim also. How does the response of the seedling in your apparatus compare with its growth in a polluted area? Do you have any idea?

DEMERITT - We don't know yet. During the next phase of the study we plan to field test the same trees fumigated in the nursery. We feel the apparatus actually subjects the trees to higher dosages than in a polluted area and thus any resistant trees selected would be resistant in a polluted area. At present, we have only data on two-year-old nursery-grown seedlings.

CAMPANA - This was the basis for my question originally; it was hard for me to visualize circumstances in nature where we would get as much as 55 pphm of ozone.

GERHOLD - Measurements in some cities have shown that concentrations of 25 parts per hundred million are not uncommon during the summer. When the average daytime concentration is that high, there must be periods when there are higher concentrations, such as 50 pphm. So we regard 50 to 60 parts per hundred million as a reasonable level for selection. Our objective, of course, is to be able to select a small proportion of the trees that show little or no damage at these higher concentrations.

GENYS - Is it possible to establish environmental conditions within the tubes similar to those outside the tubes?

DEMERITT - We recognized there might be differences between ambient and within tubing environmental conditions. We monitored temperature and relative humidity continuously during fumigation. Temperatures were 5 to 8 °F higher and relative humidity 0 to 10% higher in the tubes compared to ambient conditions. We kept fumigant velocity in the tubes at 11/2 to 2 1p miles per hour.

VALENTINE - Have you made any "dry-runs" with just air, but with the temperature and humidity controls operating, to see what effect just the manhandling of the needles in their insertion and the temperature gradients may have?

DEMERITT - Yes, we made "dry-runs" to insure that the system itself wasn't causing needle injury. There were no detrimental effects observed as a result of the system. You do have to be very careful while inserting needles not to damage them in any way.

GENYS - If I understood correctly, there is some change in susceptibility to ozone related to distance from the source of gas. In this case, you have to think of proper replication of the sources you study.

DEMERITT - Regression and correlation analyses on distance from pollutant source and weighted injury revealed there was little decrease in concentration and no correlation between weighted injury scores and distance along the tube. The 150-foot seedling bed fumigated consisted of 2 replications of 4 experiments. The actual fumigation distance for any experiment was only 20 feet. Reduction in concentration would be accounted for in part by replications or block effects.

GROSS - What kind of concentration of SO2 were you using for this experiment?

DEMERITT - We used 350 pphm sulfur dioxide for durations of from 3[1] to 4 hours. Sulfur dioxide injury symptoms developed during fumigation. We terminated fumigation when 50% of the trees showed visible injury.

GROSS - What about your relative humidity with the ozone inside?

DEMERITT - Relative humidity within the tubing varied from 50% to nearly 100% with a mean around 75%.

GROSS - What about your soil preparation? Did you fertilize, or did you analyze it?

DEMERITT - We used regular nursery practices. Ammonium nitrate was added until two weeks prior to the start of fumigations. No fertilizers were added during the fumigation period and no soil analyses were made. We feel we may have had low soil moisture at times and thus it may be desirable to irrigate prior to each fumigation to bring the soil moisture to field capacity.

GROSS - Is it best to fumigate in early morning or in the afternoon?

DEMERITT - We started all fumigations at 10 a.m. and terminated sulfur dioxide around 2 p.m. and ozone at 4 p.m. There is evidence in the literature that plants are more susceptible during early morning and forenoon.

GROSS - Did you say one needle per fascicle?

DEMERITT - No, one needle fascicle per tree. The amount of needle inserted ranged from 40% to 90% depending on the position of the tree in relation to the tube. We are recording amount of needle inserted and position of the fascicle on the leader this year to see what effect, if any, they have on our evaluation system.

GABRIEL - Do you intend to clonally propagate these inherently resistant individuals?

DEMERITT - We plan to clonally propagate by grafting resistant and susceptible trees for testing in polluted urban environments and for comparison of our fumigation method with environmental chambers.

RESOLUTIONS

The Conference adopted by unanimous vote the following resolutions submitted by the Resolutions Committee, In P. Fowler and F. Thomas Ledig, Co-Chairmen.

BE IT RESOLVED that the Conference members and officers express their sincere appreciation for the most successful conduct of the Nineteenth NEFTIC--

> TO Henry Plummer, who stepped into the breech on very short notice to provide a useful and interesting program and a smoothly run Conference in excellent surroundings.
>
> TO Ed Giddings for his aid in completing the NEFTIC arrangements, Lewis Bissell for his assistance in audio and visual facilities, Mrs. Marylou Giddings for organizing the attractive ladies' program, and to the faculty of the University of Maine, School of Forestry, for their hospitality.
>
> TO Peter Garrett for organizing and conducting the field trip to the Penobscot Forest.
>
> TO Bruce Poulton for his welcoming address and Harold Young for his stimulating after-dinner speech following our banquet.

BE IT RESOLVED that the NEFTIC members and officers urge the University of Maine to continue their efforts to secure a forest geneticist for their faculty.

WHEREAS There is a projected, massive deficit of wood fiber in the next quarter-century, and

WHEREAS Norway spruce is one of the most versatile, productive, and manageable of our planted trees, and

WHEREAS its wide genetic variability should offer great opportunity for tree improvement,

Therefore,

BE IT RESOLVED that the NEFTIC plan a workshop on Norway spruce to include paper mill men and land managers as well as geneticists, as promptly as may be, in order to pool our knowledge.