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FORESTRY BRANCH
DEPARTMENT OF RESOURCES AND DEVELOPMENT

PROCEEDINGS OF THE FIRST MEETING OF THE

COMMITTEE ON FOREST TREE BREEDING

Held in Lecture Room, Forest Products Laboratory,
Metcalfe and Isabella Streets, Ottawa,
on 2 March, 1953, at 9 A.M.

Attendance

Mr. H. D. Heaney, Chairman -
Mr. A. Bickerstaff -
Dr. J. E. Bier
Dr. W. H. Cram
Mr. J. L. Farrar -
Mr. J. D. B. Harrison -
Mr. J. M. Holst -
Dr. A. W. S. Hunter
Dr. R. J. Moore
Mr. A. W. McCallum
Dr. E. C. Smith
Dr. C. C. Heimburger, Secretary

1. Introduction

Mr. Heaney opened the meeting and stated that the present Committee on Forest Tree Breeding is being sponsored by the Forestry Branch, Department of Resources and Development, and is the successor of the Subcommittee on Forest Tree Breeding, Associate Committee on Forestry, National Research Council.

2. Minutes

The minutes of the last, twenty-fourth, meeting of the Subcommittee on Forest Tree Breeding, Associate Committee on Forestry, were read and APPROVED.

3. Welcome

Mr. Harrison welcomed the members of this Committee under the aegis of the Forestry Branch, Department of Resources and Development, and outlined the history of the Subcommittee on Forest Tree Breeding, Associate Committee on Forestry. The Associate Committee on Forestry has now ceased to function. It has served a useful purpose, chiefly in sponsoring the preparation of a manual on the handling of woodlots and in urging the Dominion Forest Service to develop research in forest economics. Of the two major Subcommittees, the one on Forest Fire Research is now being succeeded by the Associate Committee on Forest Fire Research. The National Research Council has facilities for testing fire pumps, fire hose and other fire fighting equipment and thus has the means of active contribution to this phase of forestry.

The Subcommittee on Forest Tree Breeding is being succeeded by the present Committee. Suggestions about terms of reference for this new Committee will be welcome. The Committee is of value for the exchange of experience between workers in genetics and forest tree breeding and a valuable means for interchange of correspondence in

these fields. The Canadian Pulp and Paper Association is at present conducting a study of forest plantations established by the member-industries and sending out questionnaires. The aim is to ascertain which Companies have planted what tree species and with what success. The inquiry concerns the areas planted and is supplemented by a special questionnaire on individual plantations. The last paragraph in this asks whether the Company would be interested in setting out small provenance test plantations of the species used. The Quebec Forest Service is also interested in this study. Mr. Heaney remarked that this survey would reveal areas that could be useful to tree breeders.

4. Dr. Cram's Report

Dr. Cram presented a report on his work at Indian Head, Sask. (see Appendix "A"). It deals with, (1) Caragana, (2) spruce and (3) pine, as in previous years. In Caragana studies of seed maturity and viability, self-fertility and vegetative propagation are reported. In spruce, seed germination of Colorado spruce after cold water pre-treatment and stratification were compared and in pine, the preliminary results of a strain of Scotch pine were presented. Mr. Holst and Dr. Heimburger questioned Dr. Cram about several details of his Caragana work, particularly the self-fertility studies, and recommended more work with white spruce as being of importance to prairie shelterbelts. Mr. Bickerstaff inquired how far from Indian Head the work of Dr. Cram extended. The answer was: concentration at Indian Head, but the work with Caragana covered the prairies pretty well. The selections of white spruce made by Dr. L.P.V. Johnson outside of Indian Head were also included in Dr. Cram's work, while the Scotch pine strains were derived from materials grown at Indian Head. Mr. Harrison stated that a general survey of forest plantations in Saskatchewan has been under-taken by the Forestry Branch and a report on this is being prepared. The information about the seed source of the stock planted was often inadequate.

5. Dr. Heimburger's Report

Dr. Heimburger presented a summary of his report, as the main body of the report was not ready at the time of the meeting. The complete report (see Appendix "B") deals with work in white pine, aspen poplars, the establishment of an arboretum and the initiation of a new project, namely work with 2-needled pines, concerned largely with resistance to the European pine shoot moth which is becoming a problem in Southern Ontario. The work has been seriously hampered by lack of adequate assistance in the abnormally early spring of 1952, but it was still possible to follow the program of previous years. In white pine acquisition of new materials comprised scions of P. Hunnewellii, a natural hybrid of P. Strobus with P. parviflora dis-covered by A. G. Johnson on the Hunnewell estate in Wellesley, Mass. and the scions of Himalayan white pine obtained from high elevations in Pakistan in the fall of 1951 and now successfully grafted. Other important acquisitions were a fairly large shipment of various white pine scions from Denmark, of P. Peuce from Finland and of western white pine from B.C. Crossing of white pine was undertaken on a fairly large scale and involved 243 bags; inoculation with blister rust was also carried out on a larger scale than previously, thanks to the assistance from the Dominion Laboratory of Forest Pathology in Toronto. In aspen poplar the acquisition of new materials, especially silver poplars from several parts of Europe was continued on a fairly large scale. A giant type, perhaps triploid, of large-

tooth aspen was found at Maple, Ont., used in crosses and yielded numerous progeny. Cuttings of several poplar clones were distributed to three paper companies for trial plantings on their limits, and further propagation. In 2-needled pines, acquisition of scions of several exotic species was started and four crosses were made. The arboretum was supplemented with a large number of poplars and some pine grafts.

In discussion, Dr. Smith mentioned a biological survey undertaken in the Maritime Provinces; included in this were chromosome number determinations of native poplars. Thus far counts have been made on about 150 clones of Populus grandidentata, 200 clones of P. tremuloides and 75 clones of P. tacamahacca, without detecting any polypoidy. Mr. Harrison mentioned the Heron Bay project, undertaken in cooperation with the Ontario Paper Company, where a small experiment in girdling of selected trees, to induce increased seed production, was planned. Mr. Holst described the girdling experiments under way at the Petawawa Forest Experiment Station, to induce early and abundant flowering. Red pine was being partially girdled and open-grown trees on a sand plain were being treated with fertilizers. Early-flowering spruce were being selected and an instance of flowering nursery stock of Scotch pine was cited. Dr. Cram proposed experiments in lifting and root pruning of Scotch pine nursery stock, to induce early flowering.

6. Telegram from Mr. Carman

At about this time the following telegram arrived from Mr. R. S. Carman, of Angus, Ont.: "Unable to attend meeting due to illness stop hope you have a good session."

7. Mr. Holst's Report

Mr. Holst read his report on tree breeding activities at the Petawawa Forest Experiment Station (see Appendix "C"). It deals with white spruce, red pine, and other species of the Laricioneae group, jack pine and propagation techniques. In spruce provenance studies were continued. A refugium of white spruce near the Great Lakes is postulated. In Norway spruce, a correlation of weevil damage with crown form was found. In red pine, provenance studies were continued and crosses made between strains of different geographic origin as well as species crosses. Experiments to induce early and abundant flowering were continued. In jack pine, a provenance test was started and crosses made between different strains and with several other related species. Grafting was started in the new greenhouse, and experience gained in maintaining the grafts indoors. Transplanting of spruce and pine seedlings in the nursery was undertaken on a rather large scale.

In the discussion, Dr. Cram mentioned his studies of germination behaviour of white and Colorado spruce seeds in relation to dormancy and stratification requirements. Cone insects of pines are a problem in Saskatchewan; a chalcid infected about 50% of the seeds. A 3-way cross in pines was made, to determine combining ability. Dr. Heimburger asked if propagating materials of selected Norway spruce could be made available for establishing seed orchards elsewhere and Mr. Holst stated that these materials are being propagated as rapidly as possible for just such uses in the future. Mr. Bickerstaff suggested that the atomic energy plant at Deep River could be used for studying radiation effects on red pine and to

induce mutations in spruce but Mr. Holst was of the opinion that this would not be immediately useful. Mr. Heaney said that land for reforestation purposes had been made available by the Atomic Energy Commission at Deep River and some of it could be used for provenance tests, as part of a single reforestation project.

8. Dr. Hunter's Report

Dr. Hunter presented his report on the selection of elm for resistance to the Dutch elm disease (see Appendix "D"). The crosses U. pumila x americana was repeated using cut branches with flower buds in the greenhouse, but no true hybrids were obtained. To-date only one definite hybrid, obtained in 1949, is at hand. Resistant elm varieties have been imported from Holland. Several interspecific Ribes hybrids have been produced, that should be sterile, susceptible to white-pine blister rust and thus could be used in breeding work with white pines.

9. Work of Mr. Porter

Mr. Heaney asked Dr. Bier to describe the work of Mr. W. A. Porter in British Columbia. Mr. Porter has since 1952 been engaged in a survey of white-pine blister rust in B.C., mainly in the Coast region, and has selected trees free from disease under conditions of severe infection. Grafts from these trees are being inoculated with blister rust and tested further in a disease garden where they are subjected to natural infection. Scions are being exchanged with Dr. A. J. Riker in Madison, Wis. and Dr. Heimburger. Dr. Bier then mentioned a proposed new project dealing with a leaf disease of Douglas fir caused by Rhabdocline Pseudotsugae at Cowichan Lake. The disease attacks the blue form as well as the green form of Douglas fir with plenty of variation in susceptibility within both forms. There are two reaction types of the fungus, and one that never produces fruiting bodies. It is proposed to collect cones from individual trees susceptible to one form of Rhabdocline and to inoculate the seedlings, to study the inheritance of susceptibility to specific reaction types of the fungus.

10. Mr. McCallum's Report

Mr. McCallum gave a general account of the spread of the Dutch elm disease in eastern Canada since its discovery in Quebec in 1944. The distribution is now continuous from Windsor, Ont. to the original place of outbreak in Quebec. General measures of control of this disease have been discontinued. The Government of Canada is still responsible for the identification of the disease. We do not know at present as much about the distribution of Dutch elm disease in Canada as formerly because there is no longer an organized survey.

11. Dr. Moore's Report

Dr. Moore summarized the work of the past year (see Appendix "E") on cytogenetic studies in Caragana. As many species and forms of Caragana as possible have been collected at the Dominion Arboretum and chromosome numbers of seedlings have been determined. Caragana arborescens seems to be a complex entity and the seedlings of different varieties and sub-species intergrade. Much new material has been obtained from foreign botanical gardens. No interspecific hybrids have as yet been obtained. Dr. Cram asked if the cross C. microphylla x arborescens had been successful. The answer was: No.

12. Status of the Tree Breeding Committee

Mr. Heaney reiterated the statement of Mr. Harrison (see minute 3) and read a letter received from Dr. N. H. Grace, at present director of the Research Council of Alberta. Dr. Grace felt that he could no longer be a member of the Committee since its dissociation from the National Research Council and cited certain disadvantages of the new status of the Committee. Mr. Heaney was of the opinion that these disadvantages could be outweighed by closer association of the Committee with the Research Councils of several Provinces and suggested that Dr. Grace be retained as a corresponding member. Dr. Bier thought that the Forestry Branch was the logical organization to sponsor the Committee. Dr. Heimburger was of the opinion that other sponsors of forest tree breeding should be present at the meetings of this Committee. Dr. Smith stated that the Provinces could contribute more to tree breeding; the matter of expenses is an important part which should be considered by sponsoring organizations.

13. Functions of the Tree Breeding Committee

Mr. Heaney stated that the main function of the Committee should be to meet and to discuss the various phases of forest tree breeding. Dr. Heimburger asked about the relation of the Canada Forestry Act to forest tree breeding work. Mr. Bickerstaff replied that the Act possibly could be implemented to supply funds for forest tree breeding. Dr. Cram asked about the relation of the Forestry Branch to the Canada Department of Agriculture in matters of forest tree breeding and Mr. Heaney answered that it would be about the same as that under the former Subcommittee. Dr. Bier recommended two main functions of the Committee, namely, (1) an advisory function that should come from the workers to their sponsors and (2) the Committee should be a medium for work conferences. Mr. Heaney remarked that at the moment we are mainly discussing our work. Mr. Holst was also of the opinion that the Committee should advise on, promote and sponsor forest tree breeding. Mr. Farrar made two minor proposals, (1) lectures on forest tree breeding should be given at each of the forestry schools, perhaps every other year, to acquaint forestry students with our aims and methods, and (2) we should take steps to preserve genetically superior native materials. Logging, as carried out according to current methods, usually takes the best and leaves the worst--we should preserve superior stands or individuals. Mr. Holst stated that we should locate superior stands and preserve them, but that this would entail rather difficult administrative problems. He further recommended setting up of a fund for lectures on forest tree breeding. Mr. Heaney then summarized the present functions of the Committee as set forth in the second part of the terms of reference outlined at the 20th meeting of the former Subcommittee. Dr. Cram asked if the Committee eventually should handle forest tree breeding on a Canada-wide scale. The consensus of the opinion of the meeting was in the affirmative. Mr. Farrar moved that a committee consisting of Messrs. Heaney, Holst and Heimburger draw up new terms of reference. This was seconded by Dr. Smith and was APPROVED. Mr. Bickerstaff suggested that every organization concerned with the activities of this Committee should also receive a copy of the new terms of reference. Mr. Farrar recommended that the Forestry Chronicle should receive an abstract of the minutes covering about one-half page. This was approved by Mr. Holst and Dr. Bier. Dr. Bier suggested further that (1) the Minister of Resources and Development be asked to contact the heads of other organizations

concerned with forest tree breeding and request attendance of members to meetings of this Committee--this would give more bite in the organization at a high level, (2) we invite an outstanding geneticist in the United States of America to attend our meetings and (3) asked if the meetings always would be held in Ottawa. Mr. Farrar moved that the Secretary be authorized to submit a notice about the organization of this Committee to the Forestry Chronicle--a generalized idea of things being done. This was seconded by Mr. McCallum. It was further suggested that an editorial committee of two be set up for this, consisting of the Secretary and Chairman. Dr. Bier asked if the Committee would make steps to obtain financial help within the year. Dr. Heimburger asked for more cooperation from the entomologists which have been absent from the meetings for several years.

14. Provenance Studies and Acquisition of Materials

Mr. Holst outlined his current and proposed provenance studies with spruce and 2-needled pines. The aim is to study the composition of the species concerned in respect to climatic races and biotypes. This should form the basis of evaluation of available materials and be a guide to present and future breeding work. Some cooperation in this is being given by the Ontario Department of Lands and Forests. Further cooperation and assistance by the Provinces and the industry will be needed in the future. The Forestry Branch is already cooperating with Dr. Heimburger in strain tests of white pine.

15. The Disease Garden at Connaught Ranges

Dr. Hunter stated that the disease garden had been weeded in 1952. Mr. Holst had made a survey of the white pine there, and a report on this is available. Dr. Heimburger inquired about the observations made by Dr. Riley and Dr. Skolko on incidence of blister rust in the materials while they still were in the National Research Council nursery at Eastview, and at the time of setting out at the Connaught Ranges. It is important to follow the incidence of the disease within all populations tested by means of periodic observations. It has thus far not been possible to obtain the data from these earliest observations. These are needed for correlation with the more recent tallies, as an aid in the evaluation of the present materials. This should be done before it is too late to derive maximum benefit from the tallies. Dr. Bier promised to look into this matter, to obtain the missing old data and to direct a new tally of the white pine materials.

16. Membership and Officers

Mr. Heaney stated that it would be desirable to have the membership of this Committee restricted to active tree breeders and their sponsors. After considerable discussion about this matter, it was moved by Dr. Cram and seconded by Mr. Farrar to establish a membership Committee consisting of the Chairman and Secretary, to report to the next meeting. This was APPROVED. It was also decided to retain the present Chairman and Secretary for one year.

17. Adjournment

The meeting adjourned at 4.45 P.M. A recess for lunch from 12 noon to 1.30 P.M. was taken.

1952 Summary Report on Tree Breeding at the Indian Head F.N.S.

(W.H. Cram)

As previously reported the work was divided into three main projects: 1) caragana, 2) spruce, and 3) pine.

Caragana (C. arborescens, Lam.)

The influence of seed maturity upon viability of seed from caragana was investigated. When seed was harvested from four seedtrees on six dates, both size and viability of the seed increased with maturity. Maximum viability of caragana seed was attained 60 days after the date of first bloom, or, in other words, 16 days prior to natural maturation (and dehiscence) on the tree. (Incidentally, the seed of Colorado spruce was previously found to be fully mature 16 days prior to natural release.)

Self- and open-fertility determinations for 93 vigorous selections were carried out in 1952. As a result of fertility determinations for over 200 seedtrees since 1947 twelve caragana seedtrees have been selected for propagation into polycross tests. The twelve seedtrees were selected on the basis of either self-sterility, or low self-fertility, combined with a high degree of natural cross compatibility. It was found that the frequency distribution, for self-fertility values of 197 selections, exhibited asymmetry with positive skewness and negative kurtosis. This divergence, from the fertility curve expected for a normal population, indicated that the local collection of C. arborescens contained an excess of seedtree with low self-fertility. It is possible that selection for vigor may have been automatic selection for low sexual-viability, although this seems unlikely in view of the high cross-fertility of such selections. A more plausible explanation of the excess of low self-fertility seedtrees would be natural mass inbreeding within a limited population (i.e. sibbing between descendents of one small original seed collection.) By such a process self-fertility of the progeny would gradually decrease; however, this would also tend to be associated with reduced vigor. To offset such a possibility new seed collections from various origins are being made to ensure genetic diversity.

Vigor of inbred progenies resulting from the 1948 self-fertility determinations of 30 selections was recorded in 1952. Mean height of the 4-year-old progenies ranged from 80.0 $\pm$ 2.4 cm. to 164.4 $\pm$ 3.7 cm. Thus, the vigor complex of some seedtrees would appear to be twice as favorable as that of others. Inbred progenies seem to offer potentialities as parental material for increasing vigor.

Vegetative propagation studies with caragana demonstrated the superiority of cuttings over budding. Increased rooting of both hardwood and softwood cuttings was obtained by the use of hormones. Vermiculite proved superior to sand as a rooting medium. One polycross block was planted in 1952 with rooted cuttings from 12 selections, which demonstrated a fertility range from self-sterility to high self-fertility. Polycross progenies, which will be obtained from this planting by natural pollination, will evaluate combining ability for vigor as well as provide an estimate of the relationship between self-fertility of seedtrees and vigor of their progeny.

Spruce

The efficiency of cold water pretreatment, as a means of breaking dormancy of Colorado spruce seed, was investigated in 1952. Germination speed was materially increased by both the stratification and the cold water pretreatments. On the other hand, cold water pretreatment resulted in a lower germination capacity than stratification. It seemed evident that both 5 and 15 days pretreatment in cold water were excessive. Seedling progenies from 36 selections were transplanted into plots for vigor comparisons.

Pine

Data, pertaining to the vigor and productivity of six geographic races of Scotch pine, have been summarized in Table 1. These results, although based on very small samples incapable of precise comparisons, suggest the relative adaptability of the races under prairie conditions. The Finnish race exhibited the highest survival and the Scottish race the greatest vigor. However, it would appear that the Russian race demonstrated the best combination of survival and vigor. On the other hand, the Rigensis race, which exhibited inferior vigor, proved the most consistent producer of seedcrops.

Table 1. Survival, Vigor and Productivity of Seedtrees within Six Geographic Races of Pinus sylvestris
(originally 100 plants per plot)

Character	Geographic Races					
	Germ.	Riga	Scot.	Russ.	Aber.	Finn.
Year planted	1908	1913	1913	1913	1924	1924
Survival % in 1949	20	25	26	40	43	79
Height in 1949:-						
range (ft.)	31-46	24-39	30-49	25-42	18-33	19-29
mean (ft.)	39.8±1.1	28.4±0.8	39.5±0.9	34.9±0.7	25.3±0.7	25.0±0.3
D.B.H. in 1949:-						
range (in.)	4.6-9.2	2.6-8.4	4.6-9.5	3.1-7.7	1.5-5.9	2.5-5.0
mean (in.)	6.8±0.3	4.8±0.3	6.3±0.3	5.3±0.2	3.4±0.2	3.2±0.1
Trees with more than 25 cones in:-						
1947 (%)	?	20	31	35	53	58
1948 (%)	60	44	69	45	63	58
1949 (%) †	15	44	19	12	0	15
1950 (%)	0	36	0	2	21	0
1951 (%) ‡	?	?	?	?	?	?
1952 (%)	0	16	15	10	12	5
Average (%)	18.7	32.0	26.9	21.0	29.8	27.1

† - Frost on May 23, 1949, may have damaged floral organs and embryonic cones.
‡ - Squirrels removed 1951 seedcrop prior to record taking, only light crop.

Comparative data, concerning the 1948 seed and seedling characteristics for 121 seedtrees of Scotch pine races, appear in Table 2. The Rigensis race was outstanding for large seed size, while the Finnish race produced the smallest seed. The low viability (10-18%) manifested by seed from several seedtrees of the Finnish, Scottish and Russian race has been attributed to dormancy. No relationship was found to exist between seed viability and seed size or seed yield, although seed size was found to be associated with seed yield in a negative manner for some races. Absence of any association between germination capacity and seedling losses suggested the possibility that the progenies differed in their reaction to seed-bed diseases and/or other causes of seed-bed losses. It was evident that each race contained at least one seedtree capable of producing sufficient 1/0 seedlings to account for 60 per cent of the seed sown.

Table 2. Summary of Yield, Size and Viability of the 1948 Seedcrop and of the 1949-50 Seedbed Performance of the Seedlings from 121 Seedtrees involving 7 Geographic Races of Pinus sylvestris

Race	No. Trees	Seed Yield (Seeds/Cone)		Seed Weight (gm./1000)		Germination Capacity(%)		1/0 Plants* (% of Seed)	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean
Finn.	44	8-33	20.8	4.6-8.4	6.2	10-72	40.0	8-57	29.8
Russ.	17	5-31	15.0	4.4-7.8	6.4	18-76	52.7	17-58	38.3
Aber.	15	4-25	12.5	5.2-7.9	6.7	25-81	56.4	18-59	39.8
Scot.	12	8-46	14.4	5.2-7.2	6.3	14-76	57.0	13-62	42.2
? †	6	12-31	18.2	4.9-8.2	6.5	44-84	60.4	29-60	46.2
Fren.‡	7	14-33	19.2	4.8-9.7	6.3	48-80	65.2	29-64	46.9
Riga	9	9-24	18.7	6.4-10	8.2	46-83	65.6	34-60	47.6
Germ.	11	9-29	18.4	4.8-9.0	6.6	43-85	65.6	32-73	47.3
Means			17.7		6.5		52.2		38.2

† - Selected seedtrees of unknown origin planted in 1908 and 1910.

‡ - Selected seedtrees from a 1906 plantation of imported French seedlings.

* - 1950 survival of 1949 germination in terms of % seed sown.

Report on Forest Tree Breeding in 1952

C. Heimburger

Working conditions

Lack of adequate assistance still hampered the normal progress of the work. In the fall of 1951 this caused a backlog of unfinished work in the nursery. In the spring of 1952, 74% of the required assistance in terms of man-days from the staff of the Station was available. The very rapid onset of warm weather at that time caused an unusual pressure of seasonal work and resulted in rather high mortality of the transplanted and outplanted breeding materials. The backlog of the fall of 1951 was then not regained. In the fall of 1952 still less assistance in terms of man-days was available from the staff of the Station than in the spring. At that time it was possible to employ a graduate forester on a temporary basis, which largely overcame the lack of assistance from the regular staff of the Station. The warm fall weather and late open season made it possible to continue nursery and other outdoor work beyond the normal span, and only then was the backlog from the fall of 1951 successfully overcome. It was then also possible to carry out much additional work, so that this situation was more favourable than during several previous years. The working conditions in the spring of 1952 were the worst encountered thus far at the Station, and any progress made during the year must be evaluated with this as a background.

As in former years, the work has been divided into 3 main projects: 1) white pine, 2) poplar and 3) arboretum. An additional project, dealing with the breeding of 2-needled pines and concerned largely with resistance to the European pine shoot moth, was initiated in cooperation with Mr. Holst of the Petawawa Forest Experiment Station.

White Pine

The object of white pine breeding is to select and produce strains having a high degree of inherent resistance to blister rust and a favourable reaction pattern in respect to weevil injury, and satisfactory growth rate and growth form. Such strains are required primarily for use in reforestation in southern Ontario and should also possess the necessary climatic and soil adaptation for this. The breeding program is concerned mainly with the testing, evaluation and propagation promising native white pine materials. It deals also with white pine of other regions and of other kinds, in order to introduce valuable characteristics from these into the production of superior new strains. As in former years, the main efforts were directed towards the collection of breeding materials and their testing and evaluation. A limited amount of breeding work was done with selected individuals of native white pine, and a number of crosses with these were effected.

The acquisition of new materials resulted in 1529 successful grafts of 69 clones and 5115 living seedlings and grafts of 33 populations. Most of the materials were collected in the form of scions in Harvard Forest, the Arnold Arboretum and the Hunnewell Estate in Wellesley, Mass. during a trip there in January. As in 1951, some Pinus Peuce materials were received from Finland. Western white

pine from British Columbia and a collection of various white pine scions from Denmark comprised other important acquisitions. The scions of Himalayan white pine obtained from Pakistan in the fall of 1951 and mentioned in last year's report, were successfully stored in snow over winter and grafted early in 1952, resulting in 105 successful grafts. The seeds of the wild form of Japanese white pine received during the summer of 1951 yielded 1127 seedlings. Two of the white pine test plantations established in 1951 were supplemented, one with 2 strains of about 2500 plants, and the other with 3 strains of about 6000 plants. An additional test plantation was established this year, containing 21 strains and about 12000 plants. Good seeds were harvested from all 4 crosses effected in 1951. These have since yielded a fairly large number of seedlings. White pine planted in Harrison Park, Owen Sound, flowered abundantly in 1952 and the following crosses were made with these as female parents:

x Hunnewellii (Strobus x parviflora)	15 bags
x Peuce 2 (Peuce x strobus)	62 bags
x monticola (rust resistant from Idaho)	51 bags
x pentaphylla (timber form of Jap. white pine)	72 bags
x rust resistant W.P. Pointe Platon, P.Q.	43 bags
	263 bags

Weather conditions were more favourable for infection with blister rust than in 1951. Mr. E. Eggertson, of the Dominion Laboratory of Forest Pathology in Toronto, was detailed to undertake all inoculations this year. Black currant leaves were used from the plants grown in a lath house in the nursery and from bushes grown for berries by farmers in the vicinity. Installation of watering facilities in the compartment with the white pine grafts greatly facilitated the work. In addition to 2122 grafts belonging to 179 clones, 592 control transplants were inoculated. Several of the grafts and controls inoculated earlier, 1950 and 1951, were beginning to show signs of infection. No seedlings were inoculated in 1952.

A small plantation of Korean white pine, just starting to flower, was found at the Provincial Forest Nursery in Orono and pollen from this was collected and sent to California, for crossing with Sugar pine. One such successful cross had previously been made there and it was desirable to repeat it on a slightly larger scale. The trees in question did not have a sufficient number of female flowers to make the reciprocal cross worth while. A trip was made to Pointe Platon in Quebec and pollen collected from 2 resistant white pine there. This was used in our own crosses and portions were sent also to Idaho and Wisconsin, for breeding work there. Two trips were made to Rochester, N.Y., to collect pollen of several 5-needled and 2-needled pines, used in crosses here and sent to Idaho and the Petawawa Forest Experiment Station. A good specimen of Himalayan white pine was found on the property of Glendon Hall in Toronto and its young cones were covered with cloth bags in the early spring, to prevent damage from insects. A fairly large number of good seeds were then harvested from these cones in the fall. These should yield a fair proportion of natural hybrids with native white pine, as usually is the case when the two species are grown and flower together. Cloth bags were also placed on all young cones resulting from last year's crosses. In this manner it was possible, for the first time, to harvest mature cones from the grafts in the nursery and to prevent their being picked by