NOT FOR PUBLICATION

COPY NO. 1

NATIONAL RESEARCH COUNCIL OF CANADA

PROCEEDINGS

OF THE

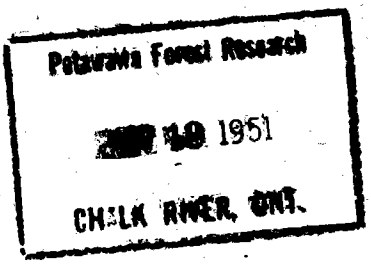
TWENTY-THIRD MEETING

OF THE

SUBCOMMITTEE ON FOREST TREE BREEDING

OF THE

ASSOCIATE COMMITTEE ON FORESTRY



OTTAWA

6 MARCH 1951

TABLE OF CONTENTS

	Page
Attendance	1
Introduction of Mr. Holst and Appointment of Secretary	1
Minutes	1
Progeny of Superior Trees	1
Dr. Cram's report on Tree Breeding at Indian Head	2
Dr. Hunter's report on Breeding for Resistance to Dutch Elm Disease	2
Mr. McCallum's report on Distribution of Dutch Elm Disease	2
Dr. Heimburger's report on Breeding of White Pine and Poplars	3
Mr. Holst's Report on Work at Petawawa Forest Experiment Station	3
Mr. Moore's Report on Cytogenetics of Caragana	3
Membership	3
Equipment for Tree Breeding Work	4
Acquisition of Plant Material from Foreign Countries	4
Strain Tests of White Pine	5
Cooperation Between Various Organizations at Connaught Ranges	5
Representation at International Conferences	5
Breeding of Ribes for Tests of Resistance of White Pine to Blister Rust	5
Effects of 2-4 D	6
Adjournment	6

APPENDICES

Appendix "A" Report of 1950 Tree Breeding at Indian Head, by W. H. Cram

Appendix "B" Report for 1950 on Breeding for Resistance to Dutch Elm Disease at the Division of Horticulture, Central Experimental Farm, Ottawa, and on the Propagation of Ulmus americana at the Dominion Experimental Station, L'Assomption, Que., by A.W.S. Hunter.

Page

APPENDICES (cont'd)

Appendix "C" Dutch Elm Disease, by A. W. McCallum

Appendix "D" Report for 1950 on Forest Tree Breeding at Maple, Ont., by C. Heimburger.

Appendix "E" Report of the Work at Petawawa 1950-51, by Mark Holst

Appendix "F" Cytogenetics of Caragana, by R. J. Moore

Appendix "G" Equipment for Tree Breeding - Ladder, by John Walker.

Initial Distribution.

NATIONAL RESEARCH COUNCIL

PROCEEDINGS OF THE TWENTY-THIRD MEETING OF THE

SUBCOMMITTEE ON FOREST TREE BREEDING

ASSOCIATE COMMITTEE ON FORESTRY

Held in Room 304, Langevin Block, Wellington and Metcalfe Streets, Ottawa on 6 March, 1951 at 2 P.M.

Attendance

Mr. H. D. Heaney, Chairman
Mr. A. Bickerstaff
Mr. S. J. Cook
Dr. W. H. Cram
Dr. N. H. Grace
Mr. J.D.B. Harrison
Mr. J. M. Holst
Dr. A.W.S. Hunter
Mr. A. W. McCallum
Dr. K. W. Neatby
Dr. H. A. Senn
Mr. J. Walker
Dr. C. C. Heimburger, Secretary

251. Introduction of Mr. Holst and Appointment of Secretary

THE CHAIRMAN introduced Mr. J. M. Holst who since the summer of 1950 has been employed in forest tree breeding at the Petawawa Forest Experiment Station, Chalk River, Ont., and appointed Dr. C. Heimburger to act as secretary, in the absence of Mr. Farrar.

252. Minutes

The Minutes of the twenty-second meeting were APPROVED.

253. Progeny of Superior Trees

The discussion of this item (see Min.244) was continued. The summary report to the Associate Committee was not prepared. Mr. Holst suggested using the paper by Richens (Richens, R.H. 1945, Forest Tree Breeding and genetics. Imperial Agricultural Bureaux, Joint Publication No. 8) as a basis for a report by going over it and picking up the details of interest to the Associate Committee. Dr. Grace suggested a collaboration resulting in a popular report to the Associate Committee suitable for publication. The Chairman suggested the appointment of a working committee on this report. Mr. Cook stated that the Associate Committee was still in a state of indeterminate suspense, because of the absence of its Chairman overseas and no action taken since the last meeting of this Sub-committee. Mr. Harrison briefly outlined the history of the Associate Committee since its inception. In recent years the

Subcommittees on Forest Fire Research and on Forest Tree Breeding have been more active than the Associate Committee. Dr. Heimburger stated that the question of raising the Subcommittee on Forest Tree Breeding to the status of an Associate Committee had once been considered and might again become active. Mr. Cook explained various possible developments of the Associate Committee as a result of the Canada Forestry Act and the re-organization of the Forestry Branch, Department of Resources and Development. In a forthcoming meeting of Council this will be discussed and the Subcommittee on Forest Tree Breeding will be notified about the results. It was agreed to ask the Chairman to appoint a working committee for the preparation of a report on the value of the progeny of superior trees if the status of the Associate Committee will warrant this.

254. Dr. Cram's report on Tree Breeding at Indian Head

DR. CRAM read a report on tree breeding at the Indian Head Forest Nursery Station during 1950 (see Appendix "A"). The work comprised selection of Caragana, Scotch pine, Spruce and exploratory investigations in Poplar. In the discussion Dr. Heimburger stated that strains of Scotch Pine perhaps better adapted to prairie conditions than the 6 strains found at Indian Head, and growing on dry calcareous soils are found in the Russian steppes, but it is at present not possible to obtain such material directly. Northwest poplar has in former work at the Petawawa Forest Experiment Station shown rather poor rooting capacity from stem cuttings and the use of a good rooting cottonwood clone as a standard was suggested. Mr. Walker replied that such a cottonwood has not yet been found and that the cottonwoods found at Indian Head showed very poor rooting capacity from stem cuttings. Mr. Holst suggested survival tests with a fairly large number of strains of Scotch Pine and continued work with the strains showing most promise in such tests under prairie conditions.

255. Dr. Hunter's report on Breeding for Resistance to Dutch Elm Disease

DR. HUNTER reported on the progress of elm breeding for resistance to Dutch elm disease (see Appendix "B"). In the discussion Mr. Holst suggested using Ulmus japonica as an additional source of resistance to Dutch elm disease. Dr. Heimburger pointed out that in former work with plant growth hormones, in co-operation with Dr. Grace, softwood cuttings of elm had shown good response to indolyl preparations in rooting and the problem of vegetative propagation in elm appeared easier than with most hardwood species.

256. Mr. McCallum's report on Distribution of Dutch Elm Disease

MR. McCALLUM presented a short history of the distribution of Dutch elm disease in Canada (see Appendix "C"). During the discussion it was stated that the vector of the disease is not always the elm bark beetle, as this insect is lacking in Windsor, Ont., where recent outbreaks have occurred. Thus protection of valuable elm specimens by spraying with DDT is not always certain. Artificial

infection of elm seedlings, for purposes of testing for disease resistance, is now accomplished by injection of spore suspensions with a syringe.

257. Dr. Heimburger's report on Breeding of White Pine and Poplars

DR. HEIMBURGER reported on the work at Maple, Ont. (see Appendix "D") with breeding of white pine and poplars. In the discussion Mr.Walker inquired about the hardiness of the dwarf variety of trembling aspen found in Ontario as it possibly also could be used to advantage in poplar breeding at his Station. Dr. Heimburger replied that the dwarf aspen is probably a prairie biotype and a relic from the Xerothermic Period in southern Ontario. Similar biotypes have been observed in Michigan, Minnesota, North Dakota and the range possibly extends to Montana, along the southern fringe of the range of trembling aspen. It may possibly also be found growing native at Indian Head.

258. Mr. Holst's Report on Work at Petawawa Forest Experiment Station

MR. HOLST is continuing the work initiated by several members of this Subcommittee at the Petawawa Forest Experiment Station and has outlined it in a brief report (see Appendix "E"). Mr. Harrison, Associate Chief, Forest Research Division, elaborated on this in outlining the present policy in this respect of the Forestry Branch, Department of Resources and Development. Spruce breeding, to satisfy the needs of the pulp and paper industry in eastern Canada, will be the main project, and other work will include hard pines, spruce of western origin and larch.

259. Mr. Moore's Report on Cytogenetics of Caragana

DR. SENN read a report prepared by Mr. R. J. Moore, of the Division of Botany and Plant Pathology, Science Service, Department of Agriculture, on the cytogenetics of Caragana in co-operation with Mr. Walker and Dr. Cram (see Appendix "F").

260. Membership

The five names proposed for membership in this Subcommittee (see Min. 247) were forwarded to the Council by Mr. Cook but no action was taken because of the present status of the Associate Committee. Mr. Cook promised to forward the recommendations of this meeting to Council. The Chairman proposed to add Mr. Holst to the list of members and announced that Mr. Farrar had submitted his resignation because of studies abroad.

It was MOVED by Mr. Walker and SECONDED by Dr. Senn,

That Dr. Heimburger be appointed to act as secretary for 1951. CARRIED.

Dr. Archibald has resigned from the Associate Committee because of retirement and Mr. M. B. Davis was nominated in his place. The Chairman further proposed Dr. E.S. Hopkins instead of Mr. Davis, and Dr. Neatby for membership. Dr. Grace suggested that both Dr. Hopkins and Mr. Davis be appointed as members. Mr. Mulloy has resigned from the Associate Committee because of retirement and is replaced by Mr. Bickerstaff. Mr. Cook suggested the Subcommittee consist of working members and their chiefs. After much discussion it became evident that the ultimate membership of this Subcommittee will depend on the status of the Associate Committee and its activities in the future. The situation needs to be clarified and Mr. Cook promised to bring this matter to the attention of the President of the National Research Council. Dr. Senn asked if other people could be invited to the meetings of this Subcommittee and Dr. Neatby answered that such was the practice with other Associate Committees of the National Research Council. The Secretary asked to be notified by Mr. Cook about the status of the Associate Committee as soon as this becomes clarified. Mr. McCallum reported the resignation of Dr. C.G. Riley, because of the nature of his present work.

261. Equipment for Tree Breeding Work

MR. WALKER presented a report on the construction of an extension ladder with a platform for work in tops of trees (see Min. 249) and described the most recent model constructed (see Appendix "G"). It was decided to publish an illustration of the ladder in the Minutes of this meeting. The ladder is mounted on a 2-ton truck and is suitable for the work of 2 men.

262. Acquisition of Plant Material from Foreign Countries

As outlined in Min. 238 it was found desirable to obtain seeds and scions of exotic white pines for the work of Dr.Heimburger, from Japan and Pakistan. Mr. Harrison reported that the Department of External Affairs has given a high degree of co-operation. Contacts have been established through the Canadian Liaison Mission, Tokyo, with the Japanese Ministry of Agriculture and Forestry to collect scions and seeds of the wild form of Japanese white pine (Pinus parviflora) from northern Japan, and through the High Commissioner for Canada in Pakistan, with the Pakistan Forest Research Institute to collect scions of Himalayan white pine (Pinus excelsa) from elevations above 11 thousand feet. The shipments will be made by air and involve a considerable expenditure of energy. The Department of External Affairs very kindly agreed to arrange for immediate notification of individual packages by cabled advice from the embassies so as to reduce the time of the parcels in Canada to the lowest possible amount. These shipments should also provide valuable experience for the acquisition of living plant materials from other distant parts of the world for the work of other members of this Subcommittee. Dr. Senn mentioned the work of the Committee on Plant Introduction of the Department of Agriculture, which is also concerned with the acquisition of tree seeds that might be of value in this connection. Mr. Harrison mentioned that the Headquarters of the F.A.O. will shortly be in Rome, which might facilitate the acquisition of plant materials from Italy. According to Dr. Heimburger this has been disappointing recently.

263. Strain Tests of White Pine

DR. HEIMBURGER mentioned his current work in strain tests of white pine and the desirability of co-operation between the Forestry Branch of the Department of Resources and Development and the Research Division of the Ontario Department of Lands and Forests. An area of about 5-10 acres will be required for test plantations to be established during this coming spring at the Petawawa and Valcartier Forest Experiment Stations. Mr. Harrison stated that areas and labour will be available for this and promised positive action in this enterprise by the Forestry Branch, Department of Resources and Development.

264. Co-operation Between Various Organizations at Connaught Ranges

MR. BICKERSTAFF reported that Dr. Archibald had made the necessary arrangements (see Min. 242) for the maintenance of the Connaught Range disease garden for white pine, and the weeds were cut down there in 1950. Dr. Hunter agreed to arrange for further maintenance. There are now about 2000 living white pine of different origins planted on this area and the Chairman proposed that a plant pathologist should inspect the material. Dr. Heimburger briefly outlined the method used in Wisconsin for artificial inoculation of large planted white pine with blister rust, as natural infection is insufficient in our dry climate with Indian summers. Mr. McCallum agreed to look into this matter. Dr. Neatby pointed out that a stand of white pine very heavily infected with blister rust, is found on the experimental farm at Ste. Anne de la Pocatière, Que., and trees free from disease there might possibly be inherently resistant. Dr. Heimburger explained the exceptionally favourable infection conditions at Pointe Platon and believed the situation at Ste. Anne de la Pocatière might be similar in this respect and warrant further investigation.

265. Representation at International Conferences

DR. HEIMBURGER opened a discussion about the representation of the Subcommittee at international meetings dealing with forest tree breeding. During the discussion it was the unanimous opinion that such representation would greatly benefit the activities of the Subcommittee by establishing contacts and making arrangements for the exchange of breeding materials and ideas. It was pointed out, however, that a Federal Department would not be in a position to supply funds for this purpose to an employee of a Provincial Government. Dr. Grace asked the Chairman to request Council for funds for this purpose. Dr. Senn suggested that wood-using industries might also enter the picture insofar as forest-tree breeding was in their best interests. It was decided to submit a letter about this to Mr. Cook to be presented to Council at its next meeting.

266. Breeding of Ribes for Tests of Resistance of White Pine to Blister Rust

DR. HUNTER mentioned previous correspondence about this matter with Dr. Heimburger. It is desirable to produce a sterile Ribes, highly

susceptible to white-pine blister rust and easily propagated by vegetative means. This would be inter-planted with white pine in test plantations and should not be distributed by birds to localities where its presence might be undesirable. Several sterile Ribes hybrids are in existence that may be suitable. Dr. Hunter mentioned a cross between the Viking variety of the red currant, which is resistant to white-pine blister rust, and the black currant, which is highly susceptible. This cross had yielded a few plants that were completely sterile but also resistant to the rust. He promised to repeat the cross this year, using a susceptible variety of red currants as one of the parents. The forthcoming hybrids might possibly be susceptible to blister rust and suitable for the purpose outlined.

267. Effects of 2-4 D.

MR. WALKER briefly mentioned that boxelder shows symptoms of abnormal growth after use of 2-4D in fields near his Station. Apparently this species is more susceptible than other trees and shrubs in his area to this growth hormone used as a weed killer.

268. Adjournment

The Meeting adjourned at about 5 P.M.

APPENDIX "A"

REPORT OF 1950 TREE BREEDING AT INDIAN HEAD

by W. H. Cram
Forest Nursery Station, Indian Head, Sask.

As previously reported the tree breeding work at the Forest Nursery Station, Indian Head, comprises 3 main projects: (1) caragana, (2) pine, (3) spruce; and exploratory work in poplar.

Caragana Improvement

The object is to produce hybrids within C. arborescens manifesting superior vigor under drought and chinook conditions. As caragana has proven to be the most widely adapted and versatile species for shelterbelt planting in the prairies, this project has been given prime consideration to date. In fundamental studies, the relationships of seed size, cross- and self-pollination and self-fertility to seedling vigor have been investigated. Vigorous trees exhibiting self-sterility, or low self-fertility, and a high degree of open-fertility, are being selected for polycross tests. It appears necessary to propagate selections into clonal observation nurseries to obtain precise and comparable data on vigor, fertility, and phenological characteristics.

Vegetative propagation methods for caragana have been briefly explored. It appears that softwood cuttings offer the most practical and economical method. Seed maturity studies indicate that seed of this species may be harvested 15 days prior to natural dehiscence of the pods without materially affecting seed viability, using germination capacity as the criterion.

Pine Improvement

The aim of this project is to evaluate, via open-pollination, existing material of six geographic strains (Aberdeen, Finnish, German, Rigensis, Russian, Scotch) of Scotch Pine (Pinus sylvestris), as to reliability of seed bearing, viability of seed, survival of seedbed and transplant seedlings, yield of transplants per cone, and progeny trials carried to maturity.

Seed harvested from all bearing trees in 1947, 1948, 1949, 1950 and 1951 is being used to obtain the desired information. In this way it is hoped to select superior seedtrees for future evaluation by controlled pollinations, when the desired equipment is available.

Out of 94 trees from which cones were harvested in 1947, 50 proved adequate seedbearers for inclusion in the 1948 germination tests. Of these 45 trees produced sufficient seedlings for transplanting in 1950. In 1948, 121 of the 253 seedtrees available produced adequate seed for the 1949 germination test. Of these it would appear that some 80 to 90 will have large enough progenies for transplanting in 1951.

Spruce Improvement

The principle activity of this project has been the determination of effective methods of stratification to ensure adequate germination of seed from 4 species of Spruce (Picea pungens, P. abies, P. glauca, and P. g. albertiana). This project was initiated in 1949, as a result of exploratory germination studies conducted in 1947-48 with open pollination seed of seedtrees. These studies demonstrated the existence of a seed viability problem in spruces. The solution of this problem was given precedence over seedtree evaluations.

The results obtained with seed from 2 trees of each species stratified for two months at 41-45°F. are summarized (on a table) for reference. Results to date suggest: (1) stratification increased germination of seed of all species of spruce; (2) treatment applied approached the optimum condition for Norway spruce seed, but not for seed of the other species; (3) seed from different trees of Colorado and Blackhills spruce exhibited varying degrees of dormancy (see table); (4) seedbed management is not a factor contributing to the low germination of spruce seed (average seedbed germination for all species was 57.3% cf. to 62.3% in the greenhouse).

Summary of the Germination for Stratified and Non-stratified Seed from Two Seedtrees of each of 4 Species of Spruce.

Picea Species	Seed Tree	Germination Stratified	Germination Non-Stratified
		(%)	(%)
P. abies (Norway)	N-14	95.1	62.3
	N-15	91.0	52.6
P. pungens (Colorado)	C-10	35.6	16.6
	C-27	85.8	75.6
P. glauca (white)	W-421	54.7	3.8
	W-446	60.0	9.0
P.g. albertiana (Blackhills)	B-91	8.8	1.3
	B-93	83.0	6.1
Means		64.2	28.4

Poplar Investigations

Exploration studies are in progress to determine the rooting capacity of promising poplar clones (hybrids and species), as well as the relationship of size of cuttings and type of storage to rooting. Under prairie conditions, a high rooting capacity is an essential prerequisite for all potential distribution and breeding material. Northwest poplar is used as a standard for comparison. Rooting tests are being designed

so as to present comparative information as to vigor, disease reaction, hardiness, etc. of clones.

Although favored by climatic conditions, the 1950 tests were reduced in scope by pipeline construction in the experimental area. Nevertheless, the data obtained could be summarized as follows:

(1) Two natural hybrids of P. deltoides (No.5 and No.63) which appear rust-resistant, demonstrated equal rooting capacity and shoot development (height) to Northwest; while a third (No. 76, or 44-52) exhibited equal rooting and superior growth.

(2) Basal diameter (4-10 mm.) failed to show any relation to rooting capacity or shoot growth.

(3) 56% of the cuttings 'heeled-in' outdoors rooted, while only 36% of those carried-over in moist sand in the storage cellar rooted.

APPENDIX "B"

REPORT for 1950 on Breeding for Resistance to Dutch Elm Disease at the Division of Horticulture, Central Experimental Farm, Ottawa, and on the Propagation of Ulmus americana at the Dominion Experimental Station, L'Assomption, Que.

by A.W.S. Hunter,
Division of Horticulture,
Central Experimental Farm,
Ottawa, Ont.

Crosses were made at Ottawa on an enlarged scale in 1950 between Ulmus americana and the highly resistant species U.pumila using cut branches in water in the greenhouse. No seed was obtained. This method gave one seedling in 1949 and appeared to have some promise. In 1951 it is planned to make this cross outdoors on the trees themselves.

Under the project set up at L'Assomption for the propagation of U. americana, cuttings were collected during 1950 and treated as outlined. The cuttings callused fairly well in some treatments but none rooted. This work was again conducted under rather difficult circumstances since no one had been appointed to have charge of the work, and proper greenhouse and propagating facilities had not yet been provided. However, in October 1950 Mr. C.E.Ouellet was appointed to the staff at L'Assomption. This project and any further extensions of it, will be his sole responsibility. Since his appointment, Mr. Ouellet has been making himself familiar with the work done elsewhere on the subject. He will continue the experiment laid down in the original project outline and, in order to speed up the testing of supposedly resistant U. americana trees, he proposes to begin the propagation of several such trees by budding or grafting. This would not be an economic method from the standpoint of the nurseryman, but it will enable a stock to be built up for artificial inoculation tests.

The facilities for conducting this work at L'Assomption will be much improved with the completion this spring of a special propagation greenhouse which is at present under construction.

APPENDIX "C"

DUTCH ELM DISEASE

by A. W. McCallum
Division of Forest Biology
Science Service
Department of Agriculture
Ottawa, Ontario.

Dutch elm disease was first found in Quebec in 1944 and is now firmly established in the valley of the St.Lawrence River from the city of Quebec to Montreal and up the north shore of the Ottawa River as far as Argenteuil County. In 1950 there was no important extension of the infected area although diseased trees were found for the first time in 4 counties towards the International Boundary.

In Ontario a single infected tree was found in Prescott County in 1946. In 1947 no disease was found but in 1948 there were 14 cases in eastern Ontario. None was found in 1949 but in 1950 infected trees were located in 9 counties from the Quebec border to Windsor in Essex County. In 5 of the 9 counties only a single affected tree was found in each but in Essex County 91 infected trees were discoved in Windsor and vicinity. Evidently the original infection there had occurred some years ago. A total of 106 infected trees were found in Ontario last year and arrangements were made to have them all removed. The reason for the sporadic and widespread occurrence of the disease so far from known sources of infection is not apparent.