CONFIDENTIAL

COPY NO. 7

NATIONAL RESEARCH COUNCIL OF CANADA

PROCEEDINGS

OF THE

THIRTEENTH MEETING

OF THE

SUBCOMMITTEE ON FOREST TREE BREEDING

PETAWAWA FOREST
EXPT. STATION

JAN 20 1945

Chalk River, - Ont.

OTTAWA

24 NOVEMBER, 1944

NATIONAL RESEARCH COUNCIL

PROCEEDINGS

of the

THIRTEENTH MEETING

of the

SUBCOMMITTEE ON FOREST TREE BREEDING

Held at the National Research Council Laboratories, Ottawa, 24 November, 1944.

Members present:

Mr. D. Roy Cameron, Chairman
Dr. N. H. Grace
Dr. C. Heimburger
Mr. M. B. Morison
Mr. W. M. Robertson
Dr. H. A. Senn
Dr. A. J. Skolko
Dr. L.P.V. Johnson, Secretary.

128. Minutes — The minutes of the Twelfth Meeting were approved without amendment.

129. Meeting with Walker and Kerr — The Chairman requested the Secretary to outline the main points arising out of the meeting with Messrs. J. Walker and W.L. Kerr on 11 August, 1944. This meeting was arranged by Dr. Malloch, then Chairman of the Subcommittee, and Dr. Archibald, Director of Experimental Farms Service, with the view of co-ordinating the shelterbelt breeding work of the Subcommittee with that of the prairie Forest Nursery Stations, and of enlisting, on an official basis, the facilities of the Forest Nursery Stations for testing and distributing experimental materials of the Subcommittee. It was considered that to attain these ends, the Superintendents of the Forest Nursery Stations should have a voice in planning the shelterbelt breeding program of the Subcomittee. Messrs. Walker and Kerr were accordingly proposed for membership in the Subcommittee.

The new members-elect inspected experimental materials of the Subcommittee at the Petawawa Forest Experiment Station and at the N.R.C. Annex nursery.

130. Ratification by parent Committee

There are at present a number of actions of the subcommittee which require ratification by the parent body, Associate Committee on Forestry. These are confirmation in membership of Messrs. Walker and Kerr, and confirmation in office of the newly appointed chairman, Mr. Cameron. Mr. Cameron, as Dominion Representative to the Associate Committee on Forestry, will bring these matters to that body's attention at its next meeting.

131. Entomological member

The opinion was expressed that in view of the fact that Dr. Atwood was away from Ottawa on field duty for the greater part of the year and thereby prevented from attending Subcommittee, the Division of Entomology should be approached regarding a representative more suitably situated for participation in Subcommittee affairs. It was agreed that entomological representation on the Subcommittee was a matter of considerable importance. Mr. Cameron was selected to look into this matter.

132. Trip to prairies

Dr. Johnson was called upon to report on his trip to the prairies. His report is appended to these Minutes as Appendix A.

Considerable discussion followed the presentation of this report with, however, only one point leading to action. It was agreed that the lack of meteorological records for the Alberta section of the Cypress Hills forest area presented difficulties to studies in the region. Mr. Cameron undertook to write to the Provincial Forester on the matter.

Dr. Heimburger suggested that oak be added to the genera studied by Dr. Johnson. Oak is considered by the Russians to be among the most important of long-lived shelterbelt trees. Mr. Skinner of Dropmore, Man., has worked with the burr oak (Quercus macrocarpa) which occurs naturally in S.W. Manitoba.

133. Dr. Johnson's winter work

Dr. Johnson outlined his winter program under the following headings:

1. Colchicine treatments of forest tree seeds and seedlings.
2. Interspecific hybridization in Populus and Ulmus by the detached branch method.
3. Cytological work on colchicine-treated materials; perfection of a new squash

method for chromosome countings.

4. Development of a sulphuric acid method of basswood seed extraction; extraction of four bushels of basswood fruits for Ontario Forest Stations.

Discussion of the program related mainly to the cytological work. Dr. Heimburger pointed out that very little work was being done on hybrid material, particular reference being made to the Populus grandidentata (diploid) X P. canescens (triploid crosses. Dr. Johnson agreed that the breeding work was being held up in several instances by lack of cytological information. He stated that some of these problems were beyond his cytological capacities (in terms of training, equipment and assistance), while others could be undertaken only at the exclusion of other important work. He pointed out that his program was necessarily influenced by the training and aptitude of his assistants, none of whom had proved satisfactory in cytological work. The meeting agreed that Dr. Johnson should prepare for the Chairman a memorandum on the cytological situation. (This memorandum is appended hereto as Appendix B.)

Mr. Morison expressed the opinion that the sowing of untreated basswood fruits, which led to a certain amount of germination from year to year, was preferable in practice to the use of extracted, readily germinable seeds. Dr. Heimburger supported this view as far as acid treatments were concerned; he favoured mechanical extraction, but this has never been put on a practical basis.

134. Dr. Heimburger's report.

Dr. Heimburger stated that he had made no plans for winter work in forest tree breeding since laboratory work arising out of his site classification studies would occupy most of his time. Results of summer work on tree breeding and propogation would be reported at the forthcoming Spring meeting. He stressed the fact that the last twelve months had been particularly effective in testing the climatic adaptation of breeding materials: there had been heavy frosts last Fall and in the Spring and drought during the Summer.

135. Dr. Grace's report.

Dr. Grace reported that, while he had not undertaken any new work on vegetative propagation, he had spent considerable time in preparing for publication data from experiments completed in 1941 and 1942. A paper entitled "Effects of media, chemical treatments, length of cutting, and covering of the propagation frame on the rooting of Norway spruce cuttings in the greenhouse" was in its final stages of preparation.

High lights of the results are briefly as follows:-

Peat humus-sand mixtures gave 80% rooting. Canadian peat moss and Swedish peat were inferior to peat humus, but weekly addition of potassium acid phosphate and magnesium sulphate solutions to Swedish peat-sand medium gave 96% rooting. It was shown that the superiority of peat humus is related to available nutrients.

Propagation under deliberately imposed unfavorable conditions disclosed markedly beneficial effects from active silica, particularly when used as a mulch.

Plant hormone chemicals were in general injurious or ineffective, but naphthyl butyric acid at 2000 p.p.m. in charcoal gave significant increases in rooting.

Medium cuttings, 3 to 6 inches long, rooted 96%, while long cuttings, 6 to 10 inches, gave only 71% rooting.

Uncovered cuttings and cuttings covered with celloglass gave better results than those under either cheese-cloth or factory cotton screens.

136.
Dr. Skolko's report.

Dr. Skolko reported on his observations on disease condition of nursery stock at Petawawa and Annex nurseries. The report is attached hereto as Appendix C.

137.
Mr. Walker's suggestions

Mr. Walker sent in a list of seven suggestions for consideration at the Meeting. These were given careful consideration. In most cases the suggested action is already receiving attention. This brought out the fact that the new members, Messrs. Walker and Kerr, should be supplied with a set of Sub-committee Proceedings. The Secretary was instructed to see that this was done.

One of Mr. Walker's proposals, breeding of elms resistant to Dutch elm disease, was given special consideration. The Secretary was instructed to ask Mr. McCallum for a statement on the disease and its recent discovery in Quebec (see Appendix D).

After considerable discussion the Meeting agreed that the procedure in breeding resistant elms should be to send our breeding stock to England for testing, rather than to introduce the organism for local tests. A precedent for this procedure has already been set in the case of poplars.

138. Mr. Kerr's proposal

In a letter to the Secretary Mr. Kerr stated that he believed that ".....it would be timely to consider the full time employment of one or two men on tree breeding and selection for the Prairie provinces........conditions are sufficiently different and the problem is important enough to warrant such a move."

Unfortunately this letter, although delivered to the Secretary's office while the meeting was in progress, was not available for consideration. However, the substance of the communication is hereby placed before the members who are urged to give the matter serious thought before the Spring Meeting.

139. Change of meeting place

Dr. Johnson drew attention to the fact that the Dominion Forest Service members now outnumbered those of the National Research Council, and that the Dominion Forester was the new Chairman. Taking into consideration the additional fact that Forest Service headquarters were more convenient than the N.R.C. Laboratories for the Department of Agriculture members, it appeared reasonable to hold future meetings at Forest Service headquarters. This was agreed upon.

APPENDIX A

Selection and Testing Trees for Prairie Shelterbelt Improvement.

L. P. V. Johnson

The period from 21 August to 18 September was spent on a trip to the prairies for the purpose of studying the natural selection taking place among the trees growing in woodland-prairie transition zones and in older planted shelterbelts, with the view of selecting superior types as source of stock or of breeding materials in a programme of shelterbelt improvement.

The transition zone between the northern park belt and and prairies did not appear to afford a suitable testing ground for isolating superior types of trees. Trembling aspen makes up a large proportion of the tree vegetation in this zone and it does not encroach upon the prairie under severe exposed conditions nor as individual trees. No selections were made.

The transition zone represented by the Kananaskis (Seebe) region of Alberta provides at least one very good testing ground - the dry, southern slopes of the low wooded mountains. On these slopes scattered trees, mainly lodgepole pine, persist under very adverse conditions of cold and draught. No selections were made but notes were made for future work.

The foothills (Porcupine Hills) of S.W. Alberta provide excellent tests of a several species, especially Douglas fir, limber pine, lodgepole pine and white spruce. The higher hills are typically wooded on their north slopes mainly with aspen and white spruce, while the south slopes are grassy with scattered individuals of coniferous species (listed above) on the higher reaches of the slope (white spruce near crest only). Conditions on the south slope are very severe and the division between south and north slope vegetation is very abrupt. A number of selections were made of each of the coniferous species mentioned.

The southern slopes and high plateaus (benches) of the Cypress Hills probably afford very good tests of adaptability to severe conditions of wind and cold, especially for lodgepole pine and white spruce. A number of selections were made. A more extended study of this region should be made. It should be mentioned that meteorological data for the region are not available, and also that, because of the higher altitude, the climate is not comparable to that of the prairies. The difference in climate most readily apparent in the summer is the pronounced drop in temperature at night.

The work on the older planted shelterbelts was carried on mainly in the Stavely and Claresholm districts of Alberta, and in the Swift Current district of Saskatchewan. There can be no doubt that the principle of the "survival of the fittest" has been operative in the older shelterbelts (20 to 40 years old) and that the superior individuals represent valuable breeding materials. This statement applies to all species propagated from seed, notably green ash, white elm, Manitoba maple and white spruce. A number of selections were made of each of these species.

The steps in making a selection, either in natural stands or shelterbelts were as follows:

1. Choose for study a habitat which afford a rigorous test of the individual's capacity to grow under severe conditions of draught, cold and exposure: e.g., southern slopes of hills having a sparse stand of trees (minimum of snow trapping), high rate of run-off and evaporation, and no favourable conditions such as a subterranean source of water supply; or, a shelterbelt sited on high, dry ground.

2. Examine trees for their inherent qualities of form, vigour, adaptability to severe conditions, etc. Avoid selecting, individual enjoying more favourable conditions than its neighbour. In green ash an important characteristic is the capacity of the leaves to remain green and persistent well into the fall.

3. Consider source of pollen, especially in dioecious species (green ash, Manitoba maple). For example, in selecting a green ash female for seed collection, the fact that the mother is good is only half of the story - the father places an equal imprint on the progeny. Therefore, to be selected, a good female was required to be flanked by a good male, preferably adjacent on remaining sides to females or other good males. In monoecious species, such as white spruce, the opportunity for cross fertilization and by what kind of individual was taken into consideration.

4. The selected tree marked with a permanent metal tag.

5. Seeds collected from females (in case of tree being out of season, arrangements made for collection). In case of male selections, arrangements made for having branches or pollen forwarded to Ottawa.

6. Details of selected tree, habitat, etc. recorded.

The seed of each collection will be sent to the Prairie Nursery Stations where the seedlings will be grown under a Selection Number. Eventually the derived seedlings will be distributed under the Selection Number and tested in selected regions in comparison with the ordinary stock being distributed. These tests will be considered as one-parent (approaching two-parent) progeny tests. If further testing or more extensive collections are required the permanently-labelled individual will again be brought into use.

APPENDIX B

Cytological studies on breeding materials of the Subcommittee on Forest Breeding

Failure to appoint a successor to Dr. Peto, who resigned from the N.R.C. staff in April 1940, left the Subcommittee without the services of a trained cytologist and led, as a matter of policy, to the transfer of much of the cytological equipment to the Chemical Warfare Laboratory. At the end of the war it is possible that a cytologist will be appointed and that the equipment now on transfer will be recovered. I am not acquainted with the Divisional policy on this point.

Since 1940 the work on forest tree breeding, as far as the N.R.C. is concerned, has been on a maintenance basis - essentially a matter of carrying on with a minimum appropriation and with no increase in staff. I accepted this situation as the best course during the war and, further, have lent freely of my services and those of my staff to the war projects of the Division. In carrying on a programme with a natural tendency to expand, it became necessary, as the work piled up, to do less and less on more and more.

Being only casually trained in cytology, and having incomplete equipment, and not having suitable assistance, my cytological efforts have been of rather an elementary nature - pretty much a matter of routine chromosome counts by a quick, squash method. While I am aware that these efforts do not even touch a number of important cytological problems that have arisen out of our breeding programme, I do not see my way clear to undertake additional cytological work.

The cytological work has suffered, but not any more than other equally important aspects of the breeding programme. When we get the "go" signal our efforts must be increased on a number of problems, cytological problems included.

In the meantime, what can be done about the specific cytological problem stressed as urgent at the meeting? This problem relates to _Populus grandidentata_ (diploid) X _P. canescens_ (triploid) F1 hybrids which have now overgrown their spacing in the Annex nursery. The most simple, though incomplete, attack on this problem would be a series of cytological observations which would identify triploid individuals among the hybrids. Even this approach would give me considerable difficulty, as I would have to change my procedure. The better approach would be to make meotic studies in _P. canescens_, repeat the cross, and follow through from the start with cytological studies on young hybrid seedlings, preferably in the greenhouse. The older hybrids now in the nursery would, as more mature specimens, provide useful additional material for the study.

Such a study would perhaps be attractive as a graduate thesis at a University; but I would prefer to see a cytologist in the Subcommittee undertake this and other cytological work, and I would be willing to wait a year or two for materialization.

L. P. V. Johnson.

9 December, 1944.

APPENDIX C

SUBCOMMITTEE ON FOREST TREE BREEDING

Report on Disease Condition
of Nursery Stock.

September, 1944.

A. J. Skolko

This Year's examination of the breeding stock in the two nurseries at the Petawawa Forest Experiment Station was made on Sept. 25 and 26. Poplar rust was generally severe again this year and the following list shows the incidence of rust according to Schriner's grading classification (0, no rust; 4, heavily rusted).

Nursery #1

Compt. 3, Bed 1:	Deg. Rust
P. Rasumowskyana x P. tacamahaca (425)	2
C x AG (424)	1
P. Jackii x P. tristis (423)	1
P. grandidentata x P. alba (424)	0
P. Rasumowskyana x P. tacamahaca (425)	2

Compt. 6:	Deg. Rust		Deg. Rust
AG 33-17	2	BNW 25	1
AG 33-19	1	BNW 22	3
BNW 15	0	BNW 6	3
AcE 11	2	BNW 11	0
BNW 11	0	BNW 23	0
BNW 22	4	BNW 17	1
BNW 1	4	BNW 8	3
CG 6	0	BNW 19	2
CG 30	0	BNW 4	3
CG 28	0	BNW 16	2
CG 8	0	BNW 18	-
CG1	0	BNW 1	4
AG 33-5	0		
#CG17	0		
CG 27	0		
CG 17	0		
CG 16	0		
CG 17	0		
CG 27	0		

Although these CG poplars show no open rust sori, probably because of the dense tomentum on the underside of the leaf, many of the lower leaves showed yellowed or necrotic areas which may be the result of rust infection.

Compt. 7:

	Deg. Rust
18P39-7, CS	3
V64	0
V69	0
V48	2
V94	1
V23	tr.
V55	2
38P38, CS	2
t11, PW	2
Brooks 7	1
alba 44	0
alba 45	0
Jackii 16	4
t8, PW	0 (Sept. med.)
#t12, PW	0
Jackii 14	3
D 9	3
t7, PW	tr.
D 8	2

Jackii 13	3
t 13, PW	2
Jackii 15	4
t 9, PW	0
Jackii 17	4
t 3, PW	0
Jackii 18	4
t 4, PW	0
laurifolia 4	0
AG 12	0
t 14, PW	4
#t 2, PW	1
#t 1, PW	0
t 6, PW	4
t 5, PW	0
Maximoviczii 6	0
t 10, PW	0
AG Masson	0
AG Aylmer	0

Nursery #2

Compt. 1:

V 69	0
18P39-7, CS	2
V 64	0
38P38, CS	3
V 23	2
V 48	1
V 55	2
Sutherland 4	2
GC 11	1
#CG 30	0
#CG 17	0
AG/AT (379)	0'
C8/AG37, Fl	0'
A 3	0
A 4	0
Macimoviczii 3	0
Maximoviczii 4	0
Maximoviczii 5	0

A 38	0
A 39	0
A 40	0
A 36/G, Fl	0
AG 33-5	0
A 17	0
A 18	0
A 20	0
A 21	0
A 34	0
A 37	0
Rt 35	4
Rt 36	3
Rt 37	-
Rt 42	-
Rt 43	4
Rt 44	4
Rt 45	4

\# Clones marked thus showed only yellow or necrotic areas indicating rust infection but no open Sori.

Compt. 1 (cont'd)

szechuanica 1	1	
koreana 6	2	
Andrewsii 1	3	
6709-39	0	
6710-39	1	
A 29	0	
A 38	0	
A 42	0'	
A 43	0'	
AG, Aylmer Rd	0	
AG 30	0'	
D 5	2	
D 7	2	
Maximoviczii 1	1	
Maximoviczii 2	1	
Brooks 10	2	
Brooks 4	2	
Calgary 23	1	
Carolina 2	3	
Carolina 3	3	
Carolina 1	2	
D 483	2	
GCH 4	0	
D7	4	
D481	1	
D482	2	
D484	2	
D5	4	
Jackii 3	4	
Jackii 9	-	
Jackii 11	4	
Jackii 12	4	
D1	4	
D2	4	
berolinensis/Lombardy, Fl	0	Sept. tr.
R/t, Fl	3	
''Calgary 91	4	
''Calgary 93	4	
''Calgary 94	4	
''Calgary 95	4	
''Calgary 96	4	
berolinensis/Simonii, Fl	1	
berolinensis/Lombardy, Fl	0	
angulata/Simonii, Fl	2	
berlinensis/Simonii, Fl	0-3	
angulata/Simonii, Fl	2-4	
Rt 48	3	
Rt 50	4	
Jackii 10	3	
Rt 26	3	
Rt 27	4	
Rt 28	3	
Rt 29	4	
Rt 30	4	
Rt 34	4	
Rt 3	4	
Rt 7	3	
Rt 9	0	
Rt 11	3	
Rt 12	2	
Rt 15	3	
Rt 16	2	
Rt 17	2	
Rt 19	4	
Rt 23	4	
Cathayana 15	1	
Cathayana 17	1	
trichocarpa 11	4	
N 8	1	
Maximoviczii 4	0	
Roxbury	2	
''Calgary 98	4	
''Calgary 106	4	
''Calgary 108	4	defoliated
''Calgary 109	4	defoliated
''Calgary 120	-	
''Calgary 121	4	defoliated
koreana 6	1	Sept. med.
koreana 9	0	
BNW 19	2	Sept. med.
Cathayana 1	1	

' Clones marked thus showed only yellow or necrotic areas indicating rust infection but no open sori.

'' These Calgary clones have high % of Septoria and rust on few remaining leaves.

Compt. 2:

CW 1509	4	defoliated
AGE 2	4	"
AGE 3	4	"
AGW 1	4	"
AGW 3	4	"
AGW 5	4	"
AGW 7	4	"
AGW 8	4	"
A W 9	4	"
AGW 10	4	"
AGW 13	4	"
AGW 14	4	"
AGW 16	4	"
AGW 18	4	"
AGW 20	4	"
AGW 22	4	"
AGW 26	4	"
AGW 29	4	"
AGW 32	4	"
AGW 34	4	"
AGW 35	4	"
AGW 37	4	"
AGW 38	4	"
AGW 41	4	"
AGW 43	4	"
AGW 55	4	"
AGW 46	4	"
AGW 47	4	"
AGW 52	4	"
AGW 43	4	"
AGW 41	4	"
AGW 29	4	"
AGW 44	4	"
AGW 37	4	"
AGW 38	4	"
AGW 34	4	"
AGW 35	4	"
AGW 31	4	"
AGW 32	4	"
AGW 26	4	"
AGW 20	4	"
AGW 24	4	"
AGW 14	4	"
AGW 17	4	"
AGW 16	4	"
AG. 13	4	"
C -45	[illegible]	"
Calgary 23	0	Sept. med.

AGW 44	4	def.
AGW 46	4	"
AGW 51	4	"
AGW 52	3	
AGW 53	4	"
AG 10	0	
TS 7	-	
'CG16	0	
'CG 8	0	
CG12	0	
'CG27	0	
AG 73	0	
Ta 2	1	
AG 112	0	
AG 10	0	
CG 17	0	
CG 30	0	
CG 16	0	
AG 112	0	
AG 73	-	
AG 92	0	
CG 12	0	
Ta 2	2-4	
CG 8	0	
CG 27	-	
CW 1083	4	defol.
CW 791	4	"
CW 733	4	"
CW 727	4	"
CW 440	4	"
CW 334	4	"
CW 756	4	"
CW 689	4	"
CW 460	4	"
CW 122	4	"
CW 208	4	"
CW 435	4	"
CW 101	4	"
CW 102	4	"
CW 354	4	"
CW 316	4	"
CW 647	4	"
CW 247	4	"
CW 538	4	"
CW 407	4	"
CW 641	4	"
CW 39	4	"
CW 372	4	"

Nursery 2; Compt. 2: (cont'd)

AGW 8	4	defoliated
AGW 10	4	"
AGW 9	4	"
AGW 7	4	"
AGW 4	4	"
AGW 5	4	"
AGW 3	4	"
AGW 1	4	"
CW 1325	4	"
AGE 2	4	"
AGE 3	4	"
CW 1476	4	"
CW 1509	4	"
CW 1389	4	"
CW 1330	4	"
CW 1320	4	"
CW 1348	4	"
CW 1246	4	"
CW 1261	4	"
CW 920	4	"
Jackii 2	4	
4P42, CS	2	
5P42, CS	0-1	
A36/G, Fl	0	
szechuanica 1	0	
All Cw in this row	2-4	
Ta 2	0	
4P42, CS	2	
D 5	3	
6710-39	1	
koreana 6	3	
koreana 9	0	
D 7	3	
Jackii 9	4	
gelrica	0	
D 1	4	
A 10	0	
A 38	0	
Cl	0	
C 5	0	
D 2	4	
BNW 9	2	
BNW 11	2	
BNW 15	3	
BNW 16	4	
BNW 17	3	
BNW 18	3	
BNW 22	3	
BNW 23	2	
BNW 25	2	
Maximoviczii 1	2	

CW 526	4	defol.
CW 260	4	"
CW 385	4	"
CW 175	4	"
A 38	4	"
Jackii 3	4	"
Jackii 7	4	"
BNW 4	4	"
BNW 25	4	"
Calgary 23	0	Sept.med.
Vernirubens	2-4	
OP-38	4	
OP-38	4	
Brooks 10	4	
22-11	4	
OP-45	0	
OP-45	0	
OP-45	0	
Brooks 4	4	
DT	4	
trichocarpa 11	4	
acuminata 2	4	
acuminata 1	4	
Masson	4	
6701-39	4	
szechuanica 1	4	
Andrewsii 1	4	
N 13	4	
N 8	1	
D 2	4	
Andover	3	
koreana 9	-	
koreana 6	0	
D 483	3	
koreana 9	0	
D 5	3	
Big Brooks	2	
D 484	3	
D 1	0	
Rt 41 to Rt 52	missing	
Jackii 3	4	
Jackii 7	-	
DT 3	4	
Jackii 9	4	
D 7	4	
D 483	3	
Rt 1	1	
Rt 2	1	
Rt 4	4	
Rt 5	4	
Rt 6	3	

Nursery 2: Compt. 2: (cont'd)

Maximoviczii 2	-
Maximoviczii 4	0
Maximoviczii 3	1
Maximoviczii 5	0
AcE 11	4
BNW 1	4
BNW [illegible]	4
BNW 6	4
T 8	0
Northwest	4
Raverdeau	4
DT	4
Northwest	4
6710-39	2
Northwest	4
Carolina	0
Raverdeau	3
Masson	4
Calgary 23	0-1
Brooks 4	3
Jackii 2	4
generosa	4
angulata erecta	3
OP-38	0
22-11	4
[illegible]rnirubens	0-2
OP-45	0
OP-38	0-1
generosa	2-4
gelrica	3
angulata erecta	3
vernirubens	3
22-11	3
Jackii 2	2-3

Nursery 2: Compt. 3:

OP-45	0

Rt 8	4
Rt 10	3
Rt 18	-
Rt 20	2
Rt 21	3
Rt 22	4
Rt 24	1
Rt 25	2
Rt 31	4
Rt 32	3
Rt 33	4
Rt 38	-
Rt 39	3
Rt 40	2

During the early part of the summer inoculum of <u>Septoria musiva</u> was prepared and distributed. Dr. Johnson undertook to make a large number of inoculations in order to select resistant individuals but apparently the high temperatures and low humidity at the time of inoculation was unfavourable and none of the inoculations gave positive canker development. There has been some <u>Septoria</u> canker infection by natural means. These cankered individuals will be removed.

The white pines in the Research Council Annex which have been planted close to <u>Ribes</u> spp. in order to test them for blister rust resistance were examined in the spring at the time when blister rust cankers elsewhere were actively discharging aeciospores. Although a few individuals were found to be dying or had died, the cause could not be attributed to blister rust. When examined again on Oct. 2nd, a considerable number of trees were found to be dying. Many of these trees showed definite blister rust cankers and these individuals will be re-examined next spring at which time the presence of aecial blisters should make positive identification possible. Some trees in these rows had apparently died as a result of the extreme drought of the past summer.

APPENDIX D

Memorandum re Dutch Elm Disease

This disease was first observed in Holland in 1918 and by 1934 it was widely distributed in Europe, being present in France, Belgium, Germany, Portugal, Italy, Hungary, Yugoslavia, and Great Britain. Its origin is unknown, but possibly it was introduced to Europe from Asia during the first World War. In any event, certain Asiatic elms are resistant to the causal fungus.

The pathogen is one of the Ascomycetes, Ceratostomella ulmi, and the symptoms produced are typically those of wilt. The first external symptom is a discoloration and withering of leaves in the crown of the tree or at the ends of side branches. This is followed by premature defoliation and the affected branches either die or produce adventitious shoots. These effects do not often occur before June, and most commonly in July or August. In young trees less than 50 years of age, the infection is more marked and defoliation may occur rapidly. On old trees the symptoms are more apt to be confined to isolated branches and the tree may survive for a number of years.

Internally, diseased wood in cross section shows brown flecks in the early wood of one or more of the outer annual rings. This is caused by the vessels being closed by tyloses and a brown gummy substance. As these spots tend to coalesce they often form a brownish ring, more or less continuous around the stem.

These symptoms, however, both external and internal, are so similar to those of two other diseases of elm that it is not possible to diagnose any of these three diseases in the field with certainty. Determination can only be made by artificial cultural methods and the time required for this is about a week.

The fungus is transmitted from tree to tree by bark beetles of the family Scolytidae. The introduced European elm bark beetle, Scolytus multistriatus, and the native elm bark beetle, Hylurgopinus rufipes, both act as vectors. New infections may also be initiated by natural grafting of roots, but there seems to be little or no dissemination of the fungus by air currents.

Dutch elm disease was first discovered in the United States in 1930, when a few infected trees were found at Cincinnati and Cleveland, Ohio. In 1933 it was found in New Jersey, and the principal area of infection now centres upon New York City. It was brought into that country in elm burl logs imported from Europe for veneer manufacture.

The effects of the disease vary from a slight dwarfing of leaves, through discoloration and different degrees of defoliation to the death of branches or the entire tree. Infected trees may recover under favourable circumstances.

Since the discovery of this disease in the United States, both Dominion and Provincial officials have been on the lookout for its occurrence in Canada, but until recently no authentic case had been found. In August last Dr. Pomerleau of the Quebec Department of Lands and Forests collected specimens of diseased elm at St. Ours, 11 miles from Sorel, Quebec, and sent them to the Dutch Elm Disease Control Office of the United States Department of Agriculture at East Orange, New Jersey. Additional specimens were requested on two occasions and finally about the middle of October, information that a positive diagnosis had been made was conveyed to both Dominion and Quebec officials. Since then the disease has been found at three additional locations on the south-east shore of Lake St. Peter.

There are three species of elm in Canada, viz. Ulmus americana, U. racemosa, and U. fulva. The former occurs from Cape Breton Island to central Saskatchewan south of the Height of Land. The second species is confined to southern Quebec and Ontario, and does not occur north of the Ottawa River or Georgian Bay. The third species is found in the St. Lawrence Valley and as far west as the eastern end of Lake Superior. In value of lumber and other products, elm stands fifth among the Canadian hardwood species. The wood is strong and tough, and is used principally as slack cooperage, baskets, crates, cheese boxes, furniture, hubs of waggon wheels, in shipbuilding, in framework of heavy agricultural implements, flumes, axe handles, and hockey sticks. However, its value in industry is far surpassed by its value as an ornamental tree. This applies particularly to Ulmus americana, the white or American elm which has been extensively used as a shade tree in city streets, in parks, and in private grounds.

All species of elm native to North America are susceptible to this disease. Siberian elm, U. pumila, is said to be highly resistant as are also U. pumila var. arbarca and the Chinese elm, U. parvifolia. In Holland breeding for resistance was begun before 1930, principally by Dr. Buisman. However, she is now dead and with the occupation of that country, the results of her work may have been lost. A seedling selection from U. carpinifolia, named the Christine Buisman, was the most resistant type found up to last reports. Small numbers of this elm have been brought to the United States.

Sanitation against the insect vectors is the best means of prevention. To this end all diseased, fallen, or damaged elms should be destroyed. Millions of dollars have been spent in the United States in an effort to eradicate this disease, but now it is recognized that this cannot be done, and efforts are at present directed towards isolating the known infected area.

In Canada during 1945, extensive surveys will be conducted to determine the extent of the infected area. If, as may be reasonably expected, it is found that infection is confined to a fairly small district in the neighbourhood of Sorel, it may be possible to eradicate the disease or at least confine it within narrow limits. However, other centres of infection may well be discovered elsewhere in Quebec, Ontario, or the Maritime Provinces as a result of the work which will be done next year.

A.W. McCallum, Forest Pathologist
Department of Agriculture.

December 2, 1944.

Distribution List

Copy No.	Name
1	Mr. D. Roy Cameron, Chairman
2	Dr. C.E. Atwood
3	Dr. N.H. Grace
4	Dr. C. Heimburger
5	Dr. L.P.V. Johnson, Secretary
6	Mr. W.L. Kerr
7	Mr. M.B. Morison
8	Mr. W.M. Robertson
9	Dr. H.A. Senn
10	Dr. A.J. Skolko
11	Mr. J. Walker
12	Dean C.J. Mackenzie
13	Mr. S.J. Cook (Board Room Copy)
14	Mr. S.P. Eagleson (Office Copy)
15	Dr. J.M. Swaine
16	Mr. A.W. McCallum
17	Mr. F.T. Rosser
18 - 22	Reserve Copies