1959

Meetings of the Interdepartmental Committee on Forest Spraying Operations

14-0-31

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE 78361?

FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, CANADA

February 9, 1959

MEMORANDUM TO:

Dr. A. L. Pritchard
Dr. J. L. Kask
Mr. H. W. Beall
Mr. W. W. Mair

As a follow-up to the information on spraying operations made available at the Meeting of the Committee on September 26, 1958, (see Hourston's report of meeting dated October 9, 1958) I wish to report a recent development in British Columbia that should be drawn to the attention of the Committee. As a result of continued collaboration between our Victoria Laboratory and the B.C. Loggers' Association, arrangements have been made for experimental aerial spray operations against the ambrosia beetles on timber leases of MacMillan and Bloedel Ltd. and Crown Zellerbach Ltd., as follows:

MacMillan and Bloedel:

Two logging settings have been prepared in the Northwest Bay Logging Division of this company and one of these, about 18 acres in size, is to be sprayed. A small watercourse passes within several hundred feet of the experimental setting, the watercourse being about 1½ to 2 miles east of the south fork of Englishman's River.

Crown Zellerbach:

Two settings have been prepared in the Nanaimo Lakes Logging Division. The 13-acre setting to be sprayed is within a few hundred feet of Wolf Creek, which flows into the Nanaimo River about 1 mile downstream from the first Nanaimo Lake.

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Memo. to: Drs. Pritchard and Kask, Messrs. Beall and Mair

Ottawa,
Feb. 9, 1959

The spray formulation to be used is BHC in fuel oil at a dosage of about 10 Imperial gallons per acre, distributed from a helicopter operating at a height of about 20 feet and speed of 20 m.p.h. It is believed that with this method of application, contamination can be held to a minimum. Nevertheless, Fisheries staff in British Columbia have been informed of the proposals and I understand that they are to inspect the experimental settings through Mr. H. A. Richmond on behalf of the B.C. Loggers' Association.

I believe these very small-scale experiments are unlikely to cause any interference with fish populations but, no doubt, Dr. Pritchard and Dr. Kask will receive information directly from their staff in B.C. If, as result of such information, there are any suggestions for additional precautions to be taken in the course of the experiments, please let me know.

M. L. Prebble,
Director,
Forest Biology Division.

MLP/KP

1. Provide DDT insecticide 12½% formulation for dilution for the series.

2. Provide mixing and storing facilities.

3. Make arrangements for aircraft service to be paid for by Forest Biology.

Chemical Control Section, Forest Biology Division will accept the responsibility for:

1. Personnel for laying out plots, preparing insecticide, checking spruce budworm populations and the general conduct of the operation.

2. Providing whatever limited necessary help to Fisheries Research Board in the field.

3. Materials for sampling and spray chemicals.

Fisheries Research Board:

Make arrangements for the studies of aquatic fauna.

Associated Studies:

1. Continuation of laboratory toxicity tests against spruce budworm larvae using DDT and introducing Malathion. Chemical Control Section, Forest Biology Division.

2. Measurement of the insecticide concentration in the streams after spraying. Chemical Control Section, Forest Biology Division.

3. Tolerance tests for young salmon using DDT and Malathion - Fisheries Research Board, Nanaimo, B.C.

The Proposed Spray Area:

The spruce budworm population in New Brunswick is rapidly decreasing. The areas which promise dense populations in 1959 are scarce and the choice of site for the 1959 project is thereby limited. A survey of overwintering larval populations by personnel of the Forest Biology Laboratory, Fredericton, revealed 2 areas which may be suitable. The areas are situated just north of the Saint John River, one about 10 miles west, the other about 15 miles east of Fredericton. The western area is considered to be the most suitable. Arrangements are being made to examine these areas within a few days. The St. Andrews Fisheries Research Staff will be notified of the inspection tour and will probably wish to join the Forest Biology Staff for the inspection.

J.J. Fettes,
Chemical Control Section,
Forest Biology Division.

April 10, 1959.

Forest Spraying and the Hazards to Aquatic Fauna -
A co-operative project with the Fisheries Research
Board of Canada

Report to The Interdepartmental Committee on Forest Spraying

April 10, 1959.

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The views expressed at the September 26, 1958, meeting of the Committee have not changed materially with a more critical examination of the data obtained in the spray trials of 1958. The comparisons of DDT, DDD, Korlan and Sevin indicate that DDT is clearly the superior insecticide in its effectiveness against spruce budworm larvae. The other insecticides were ineffective enough to be eliminated from further consideration for field trials. The lowest dose of DDT used (¼ lb. in 1 gallon formulation per acre) proved adequately effective against spruce budworm larvae while producing no observable adverse effects on aquatic fauna.

Proposed Trials - 1959.

The results of the 1958 Trials suggested the need of further tests with lower insecticide concentrations and volumes to determine more precisely the minimum effective dose of DDT. In addition, it is proposed to introduce Malathion into the spray series. Malathion is a proven excellent insecticide which is not as persistent as DDT. It hydrolyses quite rapidly in water in the alkaline and higher acid ranges, but is relatively stable at pH values between 5.0 and 7.0. The streams treated in New Brunswick in 1958 ranged in pH from 7.4 to 7.0 suggesting that the period of the persistence of Malathion would be relatively short (several days). The advantage over long-term persistence of DDT is clear. Tests with Malathion in 1953 were not promising but several conditions of the tests were not advantageous. Larval development was much advanced and the weather conditions were not conducive to efficient spray deposition.

Proposed Series of Tests - 1959.

1. DDT - ¼ lb. in 1 gallon per acre.
2. DDT - ¼ lb. in ½ gallon per acre.
3. DDT - 1/8 lb. in 1 gallon per acre.
4. DDT - ½ lb. in ½ gallon per acre.
5. MALATHION - ¼ lb. in 1 gallon per acre.
6. MALATHION - 1/8 lb. in 1 gallon per acre.
7. 2 CHECK PLOTS.

The decision to initiate the 1959 series was attendant upon (a) Evidence of a suitable area of high spruce budworm population, (b) Authorization to proceed.

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The treatment is to follow the same format as in 1958. The program is about the same size and requires about the same personnel and finance. Of equal importance as the control of the spruce budworm is the measurement of the effects of the treatment on aquatic fauna. Aquatic faunal measurements similar to those made in 1958 are needed:

1. Measurement of the effects on caged young salmon.
2. Measurement of the effects on aquatic insect populations.
3. Observations on other aquatic fauna.

The Plot Requirements Are:

1. 6 plots infested by spruce budworm and covering a portion of headwaters of a stream. All of the water sources feeding the study stream must be included in the spray area.

2. Check areas must be remote enough to be free from contamination. Aquatic checks need not be closely associated with the insect checks.

3. The areas must be a workable distance from an airstrip (25 miles or less).

Personnel:

Forest Biology:

1 or 2 officers.
10 assistants.

Fisheries Research Board:

To be determined.

A minimum number of study points for aquatic faunal studies would probably be in the areas to be sprayed in Tests 1, 3 and 5, as designated above, plus checks. Aquatic study points for all spray plots would be better.

Responsibilities and Co-operation:

Forest Protection Limited: It is expected that Forest Protection Limited will be operating on a small scale in population surveys as a follow-up to the New Brunswick large-scale spray program. Tentatively, Forest Protection Limited has agreed to:

. . . . 3

NOTES ON A MEETING OF THE INTERDEPARTMENTAL COMMITTEE ON FOREST SPRAYING OPERATIONS HELD IN THE OFFICE OF DR. A.L. PRITCHARD Department of Fisheries at 2:00 p.m. - on April 10, 1959.

IN ATTENDANCE:

Dr. M. L. Prebble	- Forest Biology Division -
Dr. J. J. Fettes	- Department of Agriculture.
Dr. J. L. Kask	- Fisheries Research Board.
Mr. W. W. Mair	- Department of Northern Affairs
Mr. H. W. Beall	- and National Resources.
Dr. A. L. Pritchard	- Department of Fisheries.
Mr. W. R. Hourston	- " " "

Dr. Prebble, as Chairman, opened the meeting by passing out a report that had been prepared by Dr. Fettes summarizing a proposed investigation for 1959. (Attached hereto). Such an extension of research had been agreed to at the meeting of September 26, 1958. This matter had been reviewed by Dr. Fettes and Dr. Webb and a possible area for the tests had been located near Fredericton. Dr. Fettes was asked to review the proposal.

Dr. Fettes stated that last September they were optimistic that spruce budworm control could be obtained with DDT at a concentration of ¼ pound per gallon per acre. This suggestion was based on only one experiment and it would be desirable to duplicate the tests. It would be desirable to test even a lower concentration of DDT. The dosage of one gallon per acre employed in 1958 was double that used in large-scale operations of the last six years and it was recognized that additional experiments with reduced quantities of DDT should be carried out with a dosage of the diluent that did not exceed that used in commercial operations, namely, one-half gallon per acre. He then made reference to the report that Dr. Prebble had distributed and stated that Dr. Webb had surveyed areas in New Brunswick with a residual population of spruce budworm and had located two areas which might be used for the tests in 1959. Both areas were near Fredericton and since they contained small streams he felt they would also be suitable for the salmon studies. Dr. Webb favoured the area west of Fredericton because of its accessibility. Dr. Fettes exhibited a map in which the two areas were blocked off. The one favoured by Dr. Webb included the Mactaquac River. Dr. Fettes was proceeding to Fredericton next week to look over the areas with Dr. Webb.

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With reference to the second area, Mr. Beall pointed out that it included the Acadia Forest Experimental Station and it would be advisable to carry out the tests here without advising the Station.

Dr. Fettes referred to the proposed series of tests outlined on Page 1 of the attached report and drew attention to Nos. 5 and 6 which involved Malathion. This was known to be an excellent insecticide at low concentrations. Tests with Malathion had been carried out in 1953 but considerable population fluctuations were encountered and the results were not sufficiently conclusive to warrant recommending the use of this insecticide in commercial operations. Therefore, it seems desirable to repeat tests with Malathion in 1959. Malathion decomposes quite rapidly in slightly alkaline conditions and since the waters of New Brunswick were of this nature, it could be a much better insecticide than DDT in so far as fish were concerned.

With reference to test No. 6, Dr. Prebble suggested that it be changed to ¼ pound in ½ gallon rather than 1/8 pound in 1 gallon. He also advised the meeting that his Department had both funds and staff available to carry out the proposed programme this year in so far as it applied to budworm. His Department did not want to appear to be putting pressure on any other Department to carry out a programme and although it would be most desirable to have the Fisheries studies carried out at the same time, if this were not possible, they proposed to carry out their tests as outlined. He felt this information was important with respect to future operations.

Dr. Fettes referred to the report from the St. Andrew's Station last year and stated he agreed with their statements that in order to get conclusive results a long-term study would be desirable. He pointed out, however, even if caged fish were used in the 1959 tests, it would be better than nothing at all.

Dr. Pritchard stated his Department could supply fish for the cages and that he also felt some native fish would be present in the proposed area.

Dr. Fettes also commented that in the 1958 tests there were no important differences in measured mortality due to insecticide between caged and liberated fish.

Dr. Kask, in referring to the proposed tests, stated that as far as the Fisheries Research Board was concerned personnel was the only limiting factor. He made reference to a meeting held in Moncton on March 12 at which Dr. Kerswill advised that the Board could not contribute to the programme this year because of other more important projects.

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Dr. Pritchard briefly reviewed this meeting and stated he understood Dr. Kerswill to say sufficient staff were not available for a comprehensive programme but the same type of programme as 1958 might be possible.

Dr. Kask pointed out this was probably so but that the staff which had been requested had not been obtained. He agreed wholeheartedly as to the advisability of the programme but felt the contributions of the Board would depend on the scope of the Fisheries studies. He would explore the possibility of what could be done by the Board once it was established from this meeting what was required.

Dr. Prebble stated again his group was going to carry out the budworm tests this year since the only other alternatives would be Ontario or Northern British Columbia, both areas of which were unsuitable. If the tests were not done this year, they could not be carried out for another few years. Dr. Kask agreed every effort should be made to include Fisheries studies this year and he would explore the possibility of Board participation and would advise the Committee at the earliest possible moment.

Dr. Prebble referred to Dr. Fettes' inspection next week and suggested he might look at stands of timber some distance from the streams. This was in the event that no Fisheries programme was carried out, it would not be desirable to contaminate the streams unnecessarily. Dr. Fettes agreed.

Dr. Pritchard inquired as to the time element involved. He wondered whether Forest Protection Limited would have to know immediately in order to arrange for aircraft. Dr. Prebble advised funds were available for alternative charter if necessary.

Dr. Fettes again referred to the proposed series of tests and suggested if complete fisheries tests could not be carried out then Nos. 1, 3 and 5 be done with caged fish. This would give a check on the 1958 studies and would also include a lower DDT concentration plus Malathion. The meeting agreed that some Fisheries participation would be most desirable if at all possible. Dr. Kask stated that at the present time a fisheries programme was not possible but he would advise whether a reduced programme might be possible.

In referring to the Fisheries programme Dr. Fettes suggested it might not be necessary to have an entomologist available. He wondered whether the work might not be done by a technician who would collect and label the material and this could be examined by an entomologist at a later date. He also suggested the same might apply in the case of Fisheries biologists. He pointed out that if the programme could be set up properly by the technical staff, the field work itself could be carried out with a minimum of such personnel. Dr. Kask agreed.

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Mr. Hourston inquired whether there had been any change in the report on infestations across the country that Dr. Prebble had made at the September meeting. Dr. Prebble stated there had been no change in this regard. He added further that of the forest regions in Canada, British Columbia was the most likely to have recurrent infestations of defoliators that might require control action from time to time due to the relative frequency of severe outbreaks of the black-headed budworm and the hemlock looper.

Dr. Pritchard made reference to the matter of bioassays that were carried out at the Nanaimo Station of the Fisheries Research Board. Dr. Fettes inquired whether they would be available to carry out tests with Malathion. He pointed out this would be most desirable since it would fill in the complete picture. Dr. Kask stated he would check this and advise.

Dr. Fettes suggested that even if the bioassays could not be carried out at the time of the tests, samples of the formulation should be sent to Nanaimo in the event the analysis could be carried out at a later date. Dr. Kask agreed.

Dr. Prebble then referred to Dr. Fettes' surveys of the following week and stated that a report on this would be sent to the Committee members.

Dr. Kask inquired as to the period of the operation. Dr. Fettes advised that spraying would probably commence about June 10 or a bit earlier depending on the weather. He stated this would allow them about 8 weeks to set up the test project.

Dr. Pritchard referring to the matter of staff for the Fisheries studies suggested the Department might supply some assistance if the Board were unable to provide enough personnel. Dr. Kask indicated he would keep this in mind.

Dr. Prebble then made reference to the publication of a joint statement of the 1958 studies.

Dr. Fettes said there were two aspects left to be completed:

(1) The effects on the aquatic insects of the ¼ pound per gallon per acre - and
(2) The report on the amount of insecticide in the water.

This was almost completed. If the preliminary reports from the Board could be considered as final reports then they could be put together with the Forest Biology reports by the Department of Agriculture and prepared for publication. The meeting agreed.

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With reference to the DDT water samples from the 1958 operations Dr. Fettes stated no DDT was detected when they were analysed. One possible explanation was that the DDT was adsorbed on the material in the water and it was probably present both on the surface of the water and on the stream bottom. He referred to the fact that DDT was detected in the water samples from the West Coast operations and pointed out water in these streams is much clearer than Richibucto water.

Dr. Prebble made reference to the proposed experimental spraying for Ambrosia beetle control by helicopter in British Columbia. This operation will be done on felled timber. The areas for the experiment were in the vicinity of Englishman's River and Nanaimo Lakes on Vancouver Island. The concentration of the spray will be ten gallons per acre. Dr. Pritchard made reference to the fact that these operations were being discussed with Fisheries personnel in the Pacific area.

Meeting adjourned at 3:30 p.m.

W. R. Hourston,
Secretary,
Interdepartmental Committee on
Forest Spraying Operations.

O t t a w a,
April 30, 1959.

Attach. 1.

14-0-31

OTTAWA, April 10, 1959.

MEMO FOR FILE

Interdepartmental Committee on Forest Spraying

A meeting of the Committee was held this afternoon. The attached program for experimental spraying in the summer of 1959 was presented by Dr. Fettes of the Department of Agriculture. The study will include several low concentrations of D.D.T. and of Malathion. Korolan and Sevin have been ruled out on the basis of last year's results.

2. The Committee agreed with the proposed program except that there is some doubt as to the extent to which the work on fish and acquatic insects can be carried out by the Fisheries Research Board owing to an acute shortage of staff. Dr. Prebble intends to proceed with the budworm studies in any case, as this is expected to be the last year in which there will be a sufficient spruce budworm population in the country to make such tests possible for some time to come.

3. It is expected that Forest Protection Limited will provide the D.D.T. insecticide and arrange for aircraft service.

4. The only two areas considered by Dr. Webb to be at all suitable for the test are located a few miles to the northeast and northwest of Fredericton, respectively. From a sketch map shown at the meeting, the easterly area seems to include most if not all of the Acadia Forest Experiment Station, but extends over a considerably larger area to the north and east. The westerly area is considered more suitable and will likely be used unless unforeseen difficulties with land owners arise. Dr. Fettes is going to Fredericton next week for a further examination of the areas. Dr, Prebble assured me that any use that might be made of the eastern area would be referred to, and cleared with, the Forestry Branch in advance.

5. Mr. Mair reported that there are growing indications of the harmful effect of D.D.T. on mammals. He mentioned that a Doctor at the Mayo Clinic is gathering evidence which seems to indicate that D.D.T. may be a cause of leukemia and other blood diseases of humans.

H. W. Beall,
Chief.

1959

Forest Spraying and the Hazards to Aquatic Fauna – A co-operative project with the Fisheries Research Board of Canada

Report to The Interdepartmental Committee on Forest Spraying
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Proposed Trials - 1959

The results of the 1958 Trials suggest the need of further tests with lower insecticide concentrations and volumes to determine more precisely the minimum effective dose of DDT. In addition, it is proposed to introduce Malathion into the spray series. Malathion is a proven excellent insecticide which is not as persistent as DDT. It hydrolyses quite rapidly in water in the alkaline and higher acid ranges, but is relatively stable at pH values between 5.0 and 7.0. The streams treated in New Brunswick in 1958 ranged in pH from 7.4 to 7.0 suggesting that the period of the persistence of Malathion would be relatively short (several days). The advantage over long-term persistence of DDT is clear. Tests with Malathion in 1953 were not promising but several conditions of the tests were not advantageous. Larval development was much advanced and the weather conditions were not conducive to efficient spray deposition.

Proposed Series of Tests - 1959

1. DDT - $\frac{1}{4}$ lb. in 1 gal. per acre
2. DDT - $\frac{1}{4}$ lb. in $\frac{1}{2}$ gal. per acre
3. DDT - 1/8 lb. in 1 gal. per acre
4. DDT - $\frac{1}{2}$ lb. in $\frac{1}{2}$ gal. per acre

5. Malathion - $\frac{1}{4}$ lb. in 1 gal. per acre
6. Malathion - 1/8 lb. in 1 gal. per acre, or
   1/4 " " 1/2 " "
7. 2 Check Plots.

The decision to initiate the 1959 series was attendant upon (a) evidence of a suitable area of high spruce budworm population, (b) authorization to proceed.

The treatment is to follow the same format as in 1958. The program is about the same size and requires about the same personnel and finance. Of equal importance as the control of the spruce budworm is the measurement of the effects of the treatment on aquatic fauna. Aquatic faunal measurements similar to those made in 1958 are needed:

1. Measurement of the effects on caged young salmon. (or natural runs if available)
2. Measurement of the effects on aquatic insect populations.
3. Observations on other aquatic fauna.

The Plot requirements are:

1. 6 plots infested by spruce budworm and covering a portion of headwaters of a stream. All of the water sources feeding the study stream must be included in the spray area.

2. Check areas must be remote enough to be free from contamination. Aquatic checks need not be closely associated with the insect checks.

3. The areas must be a workable distance from an air-strip (25 miles or less).

Personnel:

Forest Biology:

1 or 2 officers
10 assistants

Fisheries Research Board:

To be determined.

A minimum number of study points for aquatic faunal studies would probably be in the areas to be sprayed in tests 1, 3 and 5, as designated above, plus checks. Aquatic study points for all spray plots would be better.

Responsibilities and Co-operation:

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Protection Limited has agreed to:

1. Provide DDT insecticide 12½% formulation for dilution for the series.

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Fisheries Research Board:

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Associated Studies:

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J.J. Fettes,
Chemical Control Section,
Forest Biology Division.

April 10, 1959.

FILE No. .....

CANADA

DEPARTMENT OF FISHERIES

OTTAWA

735878

April 16, 1959.

Mr. H. W. Beall, Chief,
Forest Operations Division,
Department of Northern Affairs
and National Resources,
Motor Building, Sparks Street,
O t t a w a, Ontario.

Dear Mr. Beall:

There is enclosed notes of the recent meeting of the Interdepartmental Committee on Forest Spraying Operations.

It would be appreciated if you would advise of any additions, deletions or corrections. When these have been received the notes will be mimeographed for formal distribution. Dr. Fettes' report will be attached at this time.

It would be appreciated if you would also advise the number of copies required.

Yours very sincerely,

A. L. Pritchard,
Director,
Conservation & Development Service.

Copies for files 14-0-31
F.O. 730-1

Taken from
Page 7
American Forests, April 1959

TWO BIG "BREAKTHROUGHS"

"To foresters at the Twenty-fourth North American Wildlife Conference, held this year in New York City, the most important single pronouncement was that of Dr. Walter Dykstra of the U.S. Fish and Wildlife Service, who reported that as a result of stepped-up research in the insecticide field there are now encouraging signs that hazards to wildlife from the use of insecticides can be greatly reduced. One of the new insecticides, Sevin, shows promise as a possible control for gypsy moth, spruce budworm, and certain other forest and agricultural pests. Data supplied by the manufacturer indicates that its toxicity to fish is only about 1/200 that of DDT, and the toxicity to warm-blooded mammals is about ½ of that of DDT. Large-scale tests are scheduled this spring, and it is the hope of the Fish and Wildlife Service that encouraging results attained in the laboratory can be duplicated under field conditions, Dr. Dykstra said."

and

"One perplexing aspect of pesticide-wildlife relationships, and probably one of the most important, is the determination of the degree and significance of mortality resulting from the multiple exposure of migratory birds and wide-ranging mammals to a variety of pesticides applied in areas along their routes of travel, Dr. Dykstra said. This is particularly true of species such as the woodcock, which may winter in southern fields treated for fire ant or crop insect control and then move northward in the spring to raise its young in areas of Michigan or New England where it may be exposed to other insecticides applied for forest or crop insect control. Since minute quantities of several chlorinated hydrocarbons in the daily diet of some birds are particularly detrimental to reproduction, the effect on breeding populations can be serious. This aspect of the problem has been explored by Dr. James DeWitt, chief of the Biochemical Research Division of the Fish and Wildlife Service. His laboratory experiments show very definitely that some insecticides affect reproduction, although others have countered with the statement that a bird flying free has a greater choice in what it will eat than a bird being studied under laboratory conditions.

...

"The need for more facts continues to be great in this complex field, and a hopeful development at the conference was a plan outlined by the Committee on Agricultural Pests, Subcommittee on Vertebrates, working under the auspices of the National Academy of Sciences and the National Research Council. As outlined by Dr. Dykstra, this group hopes to serve as a catalytic agent in starting a proper assessment of losses caused by wild mammals and birds to agriculture, livestock, forestry, and related industries. This effort to help wildlife and agriculture to live together more harmoniously represents, in effect, an attempt to explore the overall problem from a new direction, and could provide substantial aid in viewing the picture in its entirety. In addition to Chairman Dykstra, the committee consists of Lloyd W. Smith, of the Forest Service; Dr. Walter E. Howard, University of California; Howard A. Merrill, Interior Department; Dr. James S. Lindzey, Patuxent Research Refuge, and Dr. Charles A. Damback, Ohio State University. Both the Society of American Foresters and The American Forestry Association offered their assistance on this research project."

14-0-31

HWB/MJ

OTTAWA, April 20, 1959.

Dr. A. L. Pritchard,
Director,
Conservation & Development Service,
Department of Fisheries,
O t t a w a, Ontario.

Dear Dr. Pritchard:

Thank you for your letter of April 16th enclosing the draft minutes of the recent meeting of the Interdepartmental Committee on Forest Spraying Operations.

I have no amendments to suggest to these minutes and would appreciate receiving three copies of the final text.

Yours very truly,

H. W. Beall,
Chief.

14-0-31

CANADA

DEPARTMENT OF AGRICULTURE

~~SCIENCE SERVICE~~
RESEARCH BRANCH

FOREST BIOLOGY DIVISION

786109

QUOTE FILE

OTTAWA, CANADA

April 27, 1959

MEMORANDUM TO:

Dr. A. L. Pritchard
Dr. J. L. Kask
Mr. W. W. Mair
Mr. H. W. Beall ✓

Subject: Trials - Spruce budworm, New Brunswick, 1959

Following our last meeting on April 10, Dr. Fettes spent some time at Fredericton in the week of April 13 examining the areas of residual budworm infestation in the vicinity of Fredericton. He also had contact with Dr. Kerswill and Mr. Flieger. Dr. Fettes has summarized the present status of planning in 1959 as follows:

"The area north of the St. John River, west of Fredericton in the vicinity of Keswick Ridge and the Mactaquac River appears satisfactory as a location for the proposed Spray Trials for 1959. The following points have been investigated or discussed:-

(1) There are several small permanent streams draining watersheds which are covered with spruce budworm-infested spruce-fir forests.

(2) A conversation by phone with Dr. Kerswill indicated that the Fisheries Research Board staff at St. Andrews is prepared to participate in a limited capacity. Fish cages will be placed in several streams and the effects of insecticides on caged fish will be measured.

(3) The Fisheries Research Board will not be able to do any work with aquatic insects but will collaborate with Forest Biology Division personnel to take stream bottom samples of aquatic insects. The samples will

.... 2.

Memo. to: Dr. Pritchard, Dr. Kask, Mr. Mair, Mr. Beall

give a measure of insecticidal effects. Precise localities for the studies will be decided at a later date when plot locations are certain.

(4) Accommodation will be available at the Maritime Forest Ranger School. Room and board will cost $5.00 per day for normal days and $4.50 per day on spray days when breakfast is required about 4:00 a.m

(5) Tentative arrangements for spray plane service have been made with B. W. Flieger of Forest Protection Limited. Two Stearman spray planes will be supplied.

(6) Forest Protection Limited will also supply the required amount of 12½% DDT oil solution, and the mixing, pumping and storing facilities.

(7) The Keenan landing strip is within the plot area and will be used as a base of operations. Its use is pending inspection and whatever repairs are needed.

(8) The Forest Biology Division is taking steps to hire nine students to work on the project."

M. L. Prebble,
Director,
Forest Biology Division.

MLP/KP

cc: Dr. J. J. Fettes

GOVERNMENT OF CANADA

ACTION REQUEST

CGSB 6-GP-12
P.P.&S. Cat. 3433

TO [illegible]

LOCATION [illegible]

FOR:

FILE NO.....

	ACTION		NOTE & FORWARD
	APPROVAL		NOTE & RETURN
	COMMENTS		REPLY, PLEASE
	DRAFT REPLY		SEE ME, PLEASE
✓	INFORMATION		SIGNATURE
	INVESTIGATION		TRANSLATION
	MORE DETAILS		YOUR REQUEST
	NOTE & FILE		

PREPARE MEMO TO:.....

REPLY FOR SIGNATURES OF: The area

REMARKS:

mentioned does not include the Arctic F.E.S., but is about 30 miles to the west

FROM	PHONE	LOCATION	DATE
Hewy			Oct 28/55

Attn: Mr. Howett

I am not well informed personally on the details of the larger budworm infestation in northeastern Saskatchewan, of recent years, but I understand that white spruce, while defoliated, has not been killed to any extent.

My own view, therefore, is very similar to that expressed by Mr. Meeks. If the area along the Birch River were of particular concern in its own right and there was a risk of imminent mortality owing to prolonged infestation, one could reach a considered judgment as to the advisability of spraying that area to protect the timber thereon. To spray the area along the Birch River, not to protect timber in that area but to remove a suspected risk of infestation to spruce stands removed by some ten miles or more, is quite a different concept and outside any experience that I am aware of, especially with the spruce budworm. We could have no objection whatever to a project undertaken by Saskatchewan and we would render what assistance we could in organization, but, unfortunately, we could not recommend it within the framework of experience and policies that we have followed in recent years.

Yours sincerely,

H. L. Prebble,
Director,
Forest Biology Division.

MLP/KP

cc: Mr. W. A. Meeks

cc: Dr. A. L. Pritchard
Dr. J. L. Kask
Mr. H. W. Beall
Mr. W. W. Mair

cc: Mr. Beall ✓

DEPARTMENT OF AGRICULTURE

~~SCIENTIFIC SERVICE~~ RESEARCH BRANCH

CANADA

FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, CANADA

April 28, 1959

Mr. W. H. Parks,
Director of Forests,
Department of Natural Resources,
Prince Albert, Sask.

Attention: Mr. F. H. Hewett

Dear Mr. Hewett:

This is further to my telephone conversation with you from Saskatoon April 21 concerning spruce budworm infestations in north-eastern Saskatchewan. On my return from Saskatoon I was in touch with Mr. Reeks and Mr. Prentice of our Winnipeg Laboratory who were able to let me have maps of the areas in question showing the presently known budworm infestations. It was also an advantage to have an opportunity to review earlier correspondance between the Winnipeg Laboratory and your department.

Members of Headquarters organization cannot be expected to know the detailed circumstances in different regions of Canada nearly so well as the permanent staff of our regional laboratories. Mr. Reeks' suggestion, therefore, that you get in touch with Frank Webb or myself, or Barney Flieger, is obviously based on the idea that a general review of the possibilities of an aerial spray program would be helpful to you rather than the concept that we might be able to make a more critical appraisal of a specific situation in Saskatchewan.

The extensive aerial spray program of the last seven years in eastern Canada had a very specific objective, namely, to keep heavily infested and vulnerable forests alive during a prolonged outbreak. No part of the forest was sprayed until there was a serious risk of imminent tree mortality which, in practice, meant that substantial blocks of the forest were sprayed only in the third or fourth year of severe infestation. Repeat spraying of

.... 2.

Attn: Mr. Hewett

previously sprayed areas was called for at intervals of two or three years, depending upon build-up of infestation and further deterioration of condition of the trees. Between 1952 and 1958 about one-third of the infested area was sprayed. Notwithstanding, when the population collapsed, due to natural factors, it collapsed uniformly over the entire area. Aerial spraying was not the primary cause of collapse, although it undoubtedly contributed to some degree. The principal objective of the spraying was accomplished in that the forest, by and large, is in good condition, whereas very serious timber mortality occurs on check areas reserved from spraying and on a number of other areas that were sprayed too late or ineffectually.

The experience in New Brunswick and the Gaspe Peninsula, therefore, does not contribute significantly to the rather different concept which you have in mind, namely, spraying an area of approximately 1400 acres along the Birch River as a preventive measure for the ultimate protection of a very much larger area of white spruce in the Pasquia Hills, some ten miles, or more, away. No one can deny that an effective spraying operation in the Birch River area would reduce the number of moths available for dispersal at mid-summer in 1959, but no one can make a considered appraisal of the threat that moths originating in the Birch River area would pose to white spruce stands in the Pasquia Hills region. According to information provided, small populations of the budworm already occur in the Pasquia Hills - as indeed they must occur in all areas containing balsam fir and white spruce, because the budworm is the native species which never completely disappears from suitable forest areas. In general, infestations develop when the climatic and forest-stand conditions are suitable for population increases and moth flights are not considered to be a primary factor in the build-up of major outbreaks. At the same time moth flights are important in the spread of existing infestations.

On the other hand, stands that are composed primarily of white spruce are not considered very vulnerable to spruce budworm infestations even though defoliation may continue for several years. Heavy mortality of white spruce has occurred in other infestations only when there is an important admixture of balsam fir in the same stands. There has not been, within our knowledge, extensive mortality of white spruce caused by budworm infestations in Canada west of northwestern Ontario.

..... 3.

14-0-31

DEPARTMENT OF AGRICULTURE

CANADA

~~SCIENCE SERVICE~~
RESEARCH BRANCH
FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, CANADA

April 28, 1959

MEMORANDUM TO:

Dr. A. L. Pritchard
Dr. J. L. Kask
Mr. W. H. Beall
Mr. W. W. Mair

The attached letter to Mr. Hewett, of the Department of Natural Resources, Saskatchewan, is drawn to your attention because earlier I had stated that there was no known situation in Canada that was likely to warrant aerial spraying in 1959. I think this judgment still stands because the enquiry from Saskatchewan is regarding the possible preventive value of aerial spraying rather than protecting timber values in immediate risk of serious injury.

If there is any follow-up suggesting that a spraying operation may be carried out, I will be in touch with the Interdepartmental Committee further.

M. L. Prebble,
Director,
Forest Biology Division.

MLP/KP

FILE No. 702-1-10

786286

14-0-31

CANADA

DEPARTMENT OF FISHERIES
OTTAWA

May 1, 1959.

Mr. H. W. Beall, Chief,
Forestry Operations Division,
Department of Northern Affairs
and National Resources,
O t t a w a, Ontario.

noted RHR May 4/59

Dear Mr. Beall:

Please find enclosed three copies of the Minutes of the Interdepartmental Committee on Forest Spraying Operations as requested in your letter of April 20, 1959.

You will note that certain revisions have been made.

Yours very sincerely,

A. L. Pritchard,
Director,
Conservation & Development Service.

Encls. 3.

FILE No. 702-1-10

CANADA

DEPARTMENT OF FISHERIES
OTTAWA

May 4, 1959.

Mr. H. W. Beall, Chief,
Forestry Operations Division,
Department of Northern Affairs
and National Resources,
O t t a w a, Ontario.

Dear Mr. Beall:

It has been drawn to our attention that a word has been left out of the Minutes of the Interdepartmental Committee on Forest Spraying Operations sent you on May 1, 1959. It would be appreciated therefore if you would correct Page 2 - Paragraph 1 - Line 3 to read as follows: "it would <u>not</u> be advisable to carry....."

We apologize for the inconvenience caused by this deletion.

Yours very sincerely,

A. L. Pritchard,
Director,
Conservation & Development Service.

14-0-31

HWB/MJ

OTTAWA, May 4, 1959

H. D. Heaney, Esq.,
District Forest Officer,
P.O. Box 428,
FREDERICTON, N.B.

Sir:

Enclosed, for your information and that of your staff, are notes on a meeting of the Interdepartmental Committee on Forest Spraying Operations held on April 10, 1959. As I think you already know, distribution of the reports of this Committee is restricted to the federal departments concerned.

With regard to the choice of two possible areas near Fredericton for experimental spraying this summer, referred to in the second paragraph, I understand that it has now been decided to use the westerly area, which is some 25 miles or more away from the Acadia Forest Experiment Station.

Yours faithfully,

H. W. Beall,
Chief.

BRITISH COLUMBIA LOGGERS' ASSOCIATION

ROOM 401 - 550 Burrard Street
Vancouver 1, B.C.
August 17th, 1959.

Dr. M. L. Prebble, Chief,
Forest Biology Division,
Department of Agriculture,
Ottawa, Ontario.

Dear Dr. Prebble:

At a recent meeting of our Pest Control Committee, minutes of which are attached, some concern was expressed regarding the progress being made by the Inter-Departmental Committee on Forest Spraying Operations at Ottawa, especially with respect to investigations as to the effect on fish of the bacterial disease now being investigated for its effect on budworm and looper at your Sault Ste. Marie laboratory.

The reason for the Committee's alarm is due to the recent reports of the heavy infestation of black-headed budworm in the Queen Charlotte Islands where any control measures would most certainly clash with the fishing interests. It appears that no control measures will be required until 1961 however, it was felt every possible avenue should be investigated to insure adequate control of the insect with minimum damage to fish.

The feeling was expressed that British Columbia could be better served by having a representative on the Ottawa Committee in order to present first hand British Columbia problems as they occur. We feel that our problem is unique in Canada as nowhere else does the insect control problem conflict with commercial fishing interests to such an extent.

If representation on a Committee is not possible then an invitation to attend an early Committee meeting might serve a very useful purpose at this time.

Your comments and action on these suggestions will be appreciated.

Yours very truly,

(Sgd. John H. Burke

John H. Burke
Secretary-Manager

cc: Mr. H. W. Beall

14 - 0 - 31

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

RESEARCH BRANCH

FOREST BIOLOGY DIVISION

QUOTE FILE 7.10.6

OTTAWA, CANADA

August 19, 1959

Mr. John L. Burns,
Secretary-Manager,
British Columbia Loggers' Association,
Room 401 - 550 Burrard St.,
Vancouver 1, B.C.

Dear Mr. Burns:

Thank you very much for your letter of August 17 to which was attached a copy of the Minutes of the B.C. Pest Control Committee Meeting of August 7. I will try to deal with the topics that you have dealt with in your letter arising out of the Minutes as briefly as possible with the expectation that there may be further correspondence as the situation on the Queen Charlotte Islands becomes somewhat clearer.

I can understand your feeling that there should be a representative of British Columbia on the Interdepartmental Committee on Forest Spraying Operations that was established in 1956. However, the composition of the Committee was purposely kept small and to departmental representatives in Ottawa so that the full Committee could be convened on very short notice if necessary to deal with problem requiring immediate attention. Therefore, rather than at this time proposing one or more additions to the Interdepartmental Committee I would prefer to work on the basis that invitations could be extended to other agencies to send an observer to attend such meetings of the Committee that deal with problems of interest to the agencies concerned. Specifically I do not see why a representative of the B.C. Loggers'

.... 2.

Association could not be invited to the meeting of the Committee this fall when the black-headed budworm problem on the Queen Charlotte Islands will, undoubtedly, be discussed.

I should refer briefly to work that has been undertaken under the sponsorship of the Interdepartmental Committee. Experimental spraying operations were undertaken in New Brunswick in 1958 and these were repeated and extended in 1959. A synopsis of the information available this spring was included in the notes of the Interdepartmental Committee meeting of April 10, copies of which were made available to you through Mr. Lejeune early in May. Full reports on the 1958 work are only awaiting integration of the forest insect experiments and the fisheries experiments, some portions of which were finally cleared away only this summer. The results on the 1959 experiments should be available during the coming fall or winter. Very briefly, it may be said that results of this work in New Brunswick have a definite bearing on recommendations that would be made in the case of spraying operations against the black-headed budworm in British Columbia. In 1958 ½ lb. DDT per 1gal. spray gave good results in that budworm mortality was very high/effects on aquatic organisms were not serious. In 1959 these results were repeated and the experiments were extended to 1/8 lb. DDT per gallon spray per acre. The latter concentration also had favourable results as far as budworms and aquatic organisms were concerned.

So far as I know, specific work has yet to be done on the effects of bacterial insecticides on aquatic organisms. The opinion of our insect pathologists at Sault Ste. Marie is that there would be no danger in the use of the bacterial insecticide developed at Sault Ste. Marie as far as aquatic organisms are concerned. Before such material could be recommended for wide-scale application over forested areas adjacent to waterways, tests should be carried out with fish, and preferably, with aquatic insects.

.... 2.

If you have further suggestions arising from these comments I will be very glad to hear from you.

With kindest regards,

Yours sincerely,

M. L. Prebble (per HP)

M. L. Prebble,
Director,
Forest Biology Division.

MLP/kp

cc: Mr. LeJeune
Dr. Cameron
Dr. Potter
} Not indicated on the original

Mr. A. L. Pritchard
Mr. J. L. Hank
Mr. W. W. Muir
Mr. H. V. Beall
} " "

789412 14-0-31

DEPARTMENT OF AGRICULTURE

~~SCIENCE SERVICE~~
RESEARCH BRANCH
FOREST BIOLOGY DIVISION

CANADA

QUOTE FILE 7.9.14

OTTAWA, CANADA

September 14, 1959

MEMORANDUM TO:

Dr. A. L. Pritchard
Dr. J. L. Kask
Mr. W. W. Mair
Mr. H. W. Beall ✓

In accordance with the results of our telephone contacts with members of the Interdepartmental Committee on Forest Spraying Operations I would like to have a meeting of the Committee on October 14, to review investigational work carried out in 1959 and to consider infestation situations in some parts of Canada where control action might be warranted in 1960. The budworm infestations along the southern fringe of the formerly sprayed area in New Brunswick are giving some concern and control action may be recommended in 1960. Incidentally, a similar situation exists in the State of Maine. There is also some indication from the Queen Charlotte Islands that the black-headed budworm situation may required attention next year. I still need to receive further information from our field laboratories before the October 14 meeting.

As you know from a copy of a letter recently sent to Mr. Burke of the British Columbia Loggers' Association there is a strong feeling in the Association that they should be somewhat closer to the work of the Interdepartmental Committee. I do not think the Committee should be enlarged and I believe that the aspirations of the B.C. Loggers' Association can be met by extending an invitation to send a representative to those meetings of particular concern to the Association. Therefore, I am extending an invitation to Mr. John H. Burke, Secretary-Manager, to have an Association representative at the October 14 meeting.

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Through Dr. Pritchard's kindness the meeting will be held in his office at 2:00 p.m. October 14.

Yours sincerely,

M. L. Prebble,
Director,
Forest Biology Division.

MLP/kp

cc: Dr. J. J. Fettes

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p
y

DEPARTMENT OF AGRICULTURE
Research Branch

Forest Biology Laboratory

College Hill
Fredericton, N.B.
September 17, 1959

Mr. H. D. Heaney
District Forest Officer
Forestry Branch
Dept. Northern Affairs and
National Resources
P.O. Box 428
FREDERICTON, N.B.

Re: Spruce Budworm Situation, Acadia Station

Dear Mr. Heaney:

As indicated in Mr. Forbes' report, our surveys show that the Acadia Station comes within the area of high hazard as defined by Dr. Webb's method of analysis and classification. This means that the balsam fir will suffer considerable loss of growth and at least some mortality from next year's attack. Spruce, however, is not in immediate danger of severe damage.

In view of your considerable investment in experimental work at the Acadia Station, I expect you are anxious to protect the trees as much as possible from further damage. If Forest Protection Ltd. decides to continue the spraying, I would advise that the Acadia Station be included in the sprayed area.

As you know, we have a long-term study going on at the Station on the introduced parasites and the disease of the European spruce sawfly and are not anxious to have our plots sprayed. However, I am afraid it would be quite impracticable to except them owing to the effects of drift and the fact that they are in the centre of the station forest. Spraying, however, would not necessarily completely disrupt our work there and we do not think we can make out a case for avoiding spraying on these grounds. Your experimental investment is greater than ours.

Yours very truly,

(signed) R. E. Balch

Officer-in-Charge.

c.c. Dr. F. E. Webb
Dr. R. F. Morris

c
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CANADA

DEPARTMENT
OF
NORTHERN AFFAIRS AND NATIONAL RESOURCES

FORESTRY BRANCH

YOUR FILE NO. 41-2-2(N.B.)

OUR FILE NO.

ADDRESS REPLY TO
FOREST RESEARCH DIVISION

P.O. Box 428,
Fredericton, N.B.

September 21, 1959.

Dr. D. R. Redmond,
Chief, Forest Research Division,
Forestry Branch,
Dept. NA and NR,
OTTAWA, Ontario.

Sir:

Please refer to my letter of September 8 and yours in reply of September 14 and September 18, concerning the spruce budworm epidemic at the Acadia Forest Experiment Station.

I had already been in touch with Dr. Balch before receiving your letter of September 18, and I am enclosing a copy of Dr. Balch's letter indicating that although they would like to exclude the area concerned with long-term study of the European spruce sawfly, they realize that this is rather difficult because of the drift. He advises that if spraying takes place in 1960, that the Acadia Station be included in the sprayed area.

Yours faithfully,

(signed)

H. D. Heaney
District Forest Officer

Encl.

NORTHERN AFFAIRS AND NATIONAL RESOURCES

INTRADEPARTMENTAL CORRESPONDENCE

copy for file 14-0-51

TO: Dr. J.D.B. Harrison DATE September 22, 1959

FROM: D. R. Redmond REFERENCE 41-2-2(N.B.)

SUBJECT

In summarizing the correspondence regarding aerial spraying with insecticide of the Acadia Forest Experiment Station in 1960, there is no reason why the Forest Research Division should object to this spraying. We can present an argument for the spraying in that balsam fir, doomed to be killed by repeated defoliation, will be given a chance to recover temporarily and prolong its life to where it can be salvaged under the proposed management plan to be incorporated for the Station in the next few years.

(signed)
D.R.R.

FOOTNOTE REPLY

Dr. Redmond
I agree. Please take whatever action is necessary.

J.H. 23-9-59

Interdepartmental Committee on Forest Spraying Operations

Agenda for Meeting of October 14, 1959

1. Brief synoptic review of results of experimental studies in 1958. (These have been reported at previous meetings. J.J.Fettes to inform the members re status of proposed joint publication of results by Forest Biology Division and Fisheries Research Board officers)

2. Experimental studies of insecticides in 1959.

   (a) Aerial spray trials in New Brunswick
   (i) budworm control - J.J. Fettes
   (ii) effect on fish - J. L. Kask (review of report submitted Oct.6/59 by C. J. Kerswill)

   (b) Laboratory trials of insecticides on the oak looper (close relative of hemlock looper in British Columbia) J.J. Fettes

   (c) Tests of a bacterial toxin as insecticide for forest defoliators; preliminary trials at Insect Pathology Research Institute, Sault Ste. Marie M. L. Prebble (review of results reported by J. M. Cameron)

3. Experimental studies of virus against Neodiprion swainei.

   (a) Field trials by W. A. Smirnoff - M.L.Prebble to review

   (b) Laboratory tests at Ottawa - J.J.Fettes to review

   (c) Prospects for aerial spray trials in Lake St. John region of Quebec in 1960, W. A. Smirnoff and J. J. Fettes - M. L. Prebble to review

4. Review of forest insect infestations with regard to commercial control operations in 1960. - M.L.Prebble H.A.Richmond (representing B.C.Loggers' Association)

5. Discussion of problems arising out of No. 4, that may require integration of viewpoints of federal government agencies and the forest industry.

6. Preparation of review article on spray project in eastern Canada, by Forest Biology Division and Fisheries Research Board, for publication in Canadian Geographic Journal.

7. Other matters.

Summary of tests, summer of 1959, with Merck's "bacterial insecticide", carried out by staff of Insect Pathology Research Institute.

Note: Fundamental studies on pathogenic action of Bacillus cereus group of bacteria have been done at Sault Ste. Marie. Several firms are now making a commercial product for use in insect control.

The tests were done with Merck's product, mixed with water at 2 to 2½ lbs. per 100 gallons. In field trials, a latex sticker was added, and a small mist blower was used for application of the mixture.

(a) Oak looper and hemlock looper from B.C.

In laboratory trials, these insects appeared to be susceptible. Feeding was inhibited in the first day, but onset of mortality was slow, peak being reached 8 or 9 days after treatment of the foliage.

(b) Hemlock looper, Parry Sound District, Ontario.

A small infestation occurred on an island in Lake [redacted] Joseph, Parry Sound District. No satisfactory statistical data obtained, but results were generally in line with the laboratory trials (a).

(c) Black-headed budworm from B.C.

In limited laboratory trials, the larvae of this species appeared to be susceptible. Larval feeding was inhibited after the first day, and cumulative mortality reached about 90% in five days. A considerable number of older larvae placed on sprayed foliage pupated, even though feeding ceased on the treated foliage. About two-thirds of the resulting pupae produced moths.

Further field trials, with daily observations and arrangements for adequate statistical information, are required before any recommendation can be made for wide-scale application.

October 14th, 1959 Meeting of the Interdepartmental Committee on Forest Spraying Operations

NOTES ON A MEETING OF THE INTERDEPARTMENTAL COMMITTEE ON FOREST SPRAYING OPERATIONS held in the office of Dr. A.L. Pritchard Department of Fisheries at 2:00 p.m. October 14, 1959.

IN ATTENDANCE:

Dr. M. L. Prebble	-	Forest Biology Division -
Dr. J. J. Fettes	-	Department of Agriculture.
Dr. J. L. Kask	-	Fisheries Research Board.
Mr. W. W. Mair	-	Department of Northern Affairs
Mr. H. W. Beall	-	and National Resources.
Dr. A. L. Pritchard	-	Department of Fisheries.
Mr. W. R. Hourston	-	" "
Mr. H. A. Richmond	-	B. C. Loggers Association.

Dr. Prebble, as Chairman, opened the meeting by submitting the agenda for consideration (Appendix I). The Committee agreed that the proposed agenda covered the various items which would require consideration and they were discussed as follows.

1. Brief synoptic review of results of experimental studies in 1958.

Dr. Fettes reported that all information from the participating parties had been received. This included the Fisheries Research Board field tests and bio-assay tests; the laboratory and field studies, and water sample analyses by the Forest Biology Division. Most of the reports were in the editorial stage. He suggested that each report be presented as an entity with a general appraisal as a prelude. He estimated that this could be ready by late December.

Dr. Kask inquired as to where this might be published.

Dr. Fettes stated that the report would be prepared in multigraphed form and that a decision as to formal publication could be made later. It would be a matter of deciding whether the Fisheries and Agriculture reports should be published separately by the individual organizations. Dr. Pritchard would prefer to see them published together.

Dr. Prebble inquired as to a possible avenue for such a publication. Dr. Kask referred to the publications of the Fisheries Research Board, particularly the Journal and the Bulletin. He felt that there would be no problem in arranging publication of the material as a Bulletin. In view of this development, Dr. Fettes suggested the 1959 work should also be included. The meeting agreed this would be desirable. Dr. Fettes indicated that under these circumstances it would probably require another month's work before the material would be ready.

2. Experimental studies of insecticides in 1959.

(a) Aerial spray trials in New Brunswick.

(i) Budworm control.

Dr. Fettes distributed a report summarizing the budworm control tests in 1959 (Appendix II).

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In reviewing the tests, he referred to results in 1958 which had indicated that ¼ pound per gallon per acre had given good control of the budworm and also that there had been no apparent effect on fish and little on aquatic insects. In reviewing the summary of the 1959 data he pointed out an error in No. 6 Plot. This was to have been a test of 1/8 pound per gallon per acre but due to formulation error it had been applied at the rate of ¼ pound per gallon per acre. In this test also, he referred to the recovery of the insecticide in Column 4. This recover of 26.5 drops per cm^2 was much higher than in any of the other tests. This was a direct result of the ideal spraying conditions which prevailed during this test. He pointed out that this was comparable to an emitted dose of 1½ to 2 gallons per acre under average spraying conditions. In summary, the general control achieved in 1959 was not as good as in 1958 but considering the conditions under which the tests were carried out, the results were comparable. The fisheries tests in 1959 also showed results comparable to those in 1958. He then referred to the "Tentative Conclusions" which indicated that a smaller concentration of DDT could be used to achieve effective control (6.25%).

Dr. Prebble commented that the industry would not like to go back to using a dosage of 1 gallon per acre. He also explained that the control achieved in the 1959 tests was that due to spraying only, i.e. effects of natural control factors had been removed so the results were shown as corrected per cent control.

With reference to the practical aspects of using ¼ pound per ½ gallon per acre, Dr. Fettes pointed out that more efficient spray equipment would be needed to obtain effective coverage.

Mr. Beall inquired whether the Avenger aircraft was more suitable in this regard.

Dr. Fettes replied that it is a much better spray aircraft from a spray break-up standpoint than the Stearman because of its higher speed and high pressure spray equipment. The Stearman has potential which could be achieved with some adjustments to the spray system.

Dr. Prebble made reference to the search for alternatives to DDT and reported that results had not been encouraging. It would be impossible to screen the thousands of insecticides on the same basis as the present tests.

Dr. Fettes referred to the tests on Malathion. He stated that in the laboratory Malathion was just as good an insecticide as DDT but was much less effective in field tests. He had no explanation for these results.

Mr. Richmond asked how long DDT was effective. Dr. Fettes replied that it would be effective for 10 to 12 days under normal weather conditions. Malathion would be effective for about the same period. Malathion is likely to decompose more rapidly than DDT in water.

(ii) Effect on fish.

Dr. Kask reviewed the report on the Fisheries tests that had been submitted by Dr. Kerswill (Appendix III). As had been indicated by Dr. Fettes, the results were comparable to those obtained in the 1958 tests. He also referred to Dr. Kerswill's comment that the streams used in the tests were below the minimum size of typical salmon rearing waters and had somewhat more forest

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cover than usual. In reply to Dr. Prebble's inquiry regarding the results of the aquatic insect sampling Dr. Kask advised that they would be ready in the near future.

(b) Laboratory trials of insecticides on the Oak Looper.

Dr. Fettes reviewed the laboratory tests of DDT on the oak looper which is a close relative of the hemlock looper. The results showed that the oak looper was much more susceptible to DDT than the spruce budworm. He pointed out however that the hemlock looper itself should be tested since considerable differences in susceptibility to DDT had been found in closely related species.

(c) Tests of a bacterial toxin as insecticide for forest defoliators.

Dr. Prebble briefly reviewed the work that had been done on bacterial toxins by the insect pathology laboratory of the Department of Agriculture at Sault Ste Marie. Five years ago one of the staff members in studying a pathogenic Bacillus noted the presence of crystals at spore formation. The crystals were as toxic as the living bacterial cells. It was also established that death of insects from the toxin was caused by paralysis. About two years ago some of the large drug firms became interested in this material and obtained basic cultures from the Sault Ste. Marie lab and began production on a commercial scale. Mixtures of Bacillus spores and crystals were made available this year to various agencies for experimental purposes. Some tests with the Merck commercial product were carried out by the laboratory at Sault Ste. Marie. The results of these tests are shown in Appendix IV.

In commenting on the field trials in the Parry Sound district Dr. Prebble stated that there was very little doubt that the insecticide behaved the same as in the laboratory, although inadequate quantitative results were obtained. He felt also that aerial spray tests must be carried out. In this regard none of the tests had been made using oil as a suspending material. This was quite important in connection with the factor of evaporation in aerial spraying. No information on costs was available at the present time.

Mr. Richmond commented on the particular advantages of the bacterial insecticide and indicated that the B. C. Loggers Association hoped to carry out an aerial test in British Columbia some time next year. Dr. Prebble inquired whether Mr. Richmond had any information on the effects of this insecticide on fish. Mr. Richmond stated that he had discussed this with Dr. Larkin of the Fisheries Institute at the University of British Columbia and also with other fisheries agencies in the United States. None had any knowledge of the material.

Dr. Prebble stated that the Forest Biology Division was interested in carry out further field trials and he hoped that the fish and game people would also make tests. The Committee agreed that every consideration should be given to developing a cooperative field trial in 1960.

Dr. Prebble agreed that he would make inquiries through Merck to see if they had any information on its effect on warm-blooded animals. Dr. Pritchard agreed to make inquires re effects on fish, and Mr. Mair in connection with small mammals.

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3. Experimental studies of virus against Neodiprion swainei.

Dr. Prebble reviewed the work on virus control that had been done by Dr. Smirnoff in Quebec. He stated that this development was a most interesting one and that Dr. Smirnoff had wished to carry out an aerial spray test this year. The Forest Biology Division had felt, however, that since aerial spraying is a specialized operation, the tests should be postponed until 1960 so they could be set up properly. It had not been established whether a helicopter or a fixed wing aircraft would be used in these tests.

Dr. Fettes reviewed the results of Dr. Smirnoff's field tests which he had observed. He stated that a dosage as low as ,2 million polyhedra per ml. had given 100 per cent control of the sawfly larvae.

4. & 5. Review of forest insect infestations with regard to commercial control operations in 1960, (Appendix V) - and - Discussion of problems arising out of No. 4, that may require integration of viewpoints of federal government agencies and the forest industry.

Maritime Region -

Dr. Prebble referred to the spruce budworm situation in New Brunswick and reported the following information that had been obtained in telephone conversation with R. E. Balch and F. E. Webb on the morning of October 14, following a meeting of Forest Protection Limited on October 13 in Fredericton:

(a) It appears that Forest Protection Limited is generally agreed on a spraying program in 1960 ranging up to about 2¼ million acres. This is more than the area of high hazard defined by Balch and Webb and obviously introduces elements of preventive spraying to reduce heavy populations in certain areas where the hazard of imminent tree mortality is not great. Apparently a substantial section in Northumberland Countywould fall in this category.

(b) In general, the earlier formulation and dosage would be adhered to but claims for exceptions or modifications would be entertained by Forest Protection Limited if advanced by other groups.

(c) Owing to the Fisheries interests it is proposed to omit the Cains River, but probably not the Southwest Miramichi.

(d) With concurrence of the Forestry Branch, the Acadia Forest Experiment Station would be included in the spray program as well as the area in general adjacent to Fredericton. However, on representation, it is probable that certain areas would be exempted, such as the Experimental Farm, the U. N. B. woodlot, and certain areas containing study plots used in investigations of Adelges and its predators.

(e) Forest Protection Limited will organize and conduct the program as in previous years but will probably enlist the financial participation of three or four of the larger timberland owners in the southern part of the area to be sprayed. Small private owners, farmers, etc., would not be asked to contribute. In general it is believed that these small owners would welcome spraying operations over their private holdings.

(f) From the standpoint of good public relations it was expected that Forest Protection Limited would arrange rather careful advance notification of the proposed spraying program in 1960.

Considerable discussion of the Committee's responsibilities concerning this operation followed. The Committee agreed that the minutes of this meeting should be forwarded to Forest Protection Limited pointing out that there were certain areas in the proposed spray area that were of concern to the Committee and that the Committee considered this would merit an early meeting to discuss these problems looking to arrangements which would minimize damage to the resources concerned. The Committee would recommend that representatives of the Interdepartmental Committee on Forest Spraying Operations, Forest Protection Limited, and the St. Andrews Station of the Fisheries Research Board should attend such a meeting.

Mr. Beall inquired about the salmon situation in previously sprayed areas. Dr. Pritchard reported that populations of salmon had been reduced as a result of these operations but that the major effects were not expected until 1960 and 1961.

The situations in Quebec, Ontario, Manitoba, Saskatchewan and Alberta were noted and there was a brief discussion regarding the possible spraying in the Cypress Hills area of Saskatchewan and Alberta. Dr. Prebble advised that this would only involve an area of 3-5 square miles.

With reference to the situation in British Columbia Mr. Hourston inquired as to the extent of the satin moth infestation in the Okanagan Valley that might require spraying. Dr. Prebble did not have too much information on this but indicated that it would probably be confined to resort areas. Mr. Hourston indicated that the Pacific area staff of the Department might make some further inquiries through Mr. Lejeune regarding such an operation.

In connection with the Black-headed budworm infestations on the Queen Charlotte Islands, Dr. Prebble asked Mr. Richmond to review the situation. Mr. Richmond advised that he had just returned from a survey of the infestation. He stated that the infestation was well distributed over both islands up to the area of Massett Inlet. It was heaviest in Skidegate Inlet where there was severe damage. It was also present on the north side of Cumshewa Inlet and also at Alliford Bay, South Bay, and Trounce Island. Lyell Island had been severely infested. He reported that branch samples representing three trees per sample had been taken in some 85 areas and these had been sent to the Victoria lab of the Forest Biology Division for examination. He stated that it was the opinion of the Loggers Association that damage was severe enough to warrant control operations in 1960. However, no decision would be made until the results of the sample analysis had been received.

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Dr. Pritchard pointed out that substantial runs of pink and chum salmon are present in Skidegate and Cumshewa Inlets.

Mr. Richmond advised that the B. C. Loggers Association were most concerned about possible damage to salmon runs resulting from any control operations. It was the particular desire of the Association to establish a procedure whereby spraying operations could be carried out without interference from the Department of Fisheries provided certain terms, which would be developed through discussions with the Department, were agreed upon and adhered to. In other words if the Minister of Fisheries would approve such an operation, there would be no possibility that the operation would be shut down. In this regard he pointed out that the initiation of such a project involved months of planning.

Dr. Pritchard referred to the responsibilities of the Minister of Fisheries and pointed out that under the terms of the Fisheries Act the Minister could not approve such operations. He stated, however, that the Department was always prepared to discuss mutual problems with the Industry and once agreement had been reached on the precautions that would be taken to protect the fisheries resources, there was very little possibility that the operation would be shut down. He pointed out however, that if in spite of the above agreements, large numbers of fish were being killed, the Minister would have no alternative but to terminate the operation in that area. Mr. Richmond agreed that this course was understandable.

Dr. Pritchard also pointed out that even though every cooperation was developed between the Association and the Department regarding control operations, people could still make representation. However, if satisfactory arrangements had been reached then the Department would give every support under the circumstances. Mr. Richmond stated he appreciated the Minister's position in such cases and was sure that the B. C. Loggers Association would be prepared to cooperate with the Department along the lines indicated by Dr. Pritchard.

Dr. Pritchard stated that it would be essential that the B. C. Loggers Association contact Mr. Whitmore, the Area Director in Vancouver, as soon as any decision had been made regarding control operations in 1960. Mr. Richmond replied that the Loggers Association had planned to do this. He expressed his appreciation for the opportunity of attending the Interdepartmental Committee meeting. He stated that he was particularly interested in the results of the research that had been carried out through the Committee on the problem of the effect of insecticides on aquatic life. He then distributed a statement by the B. C. Loggers Association to the Interdepartmental Committee (Appendix VI).

Dr. Prebble expressed the Committee's pleasure in having Mr. Richmond attend on behalf of the B. C. Loggers Association.

6. Preparation of review article on spray project in eastern Canada, by Forest Biology Division and Fisheries Research Board, for publication in Canadian Geographic Journal.

Preparation of a joint review article had been under consideration for some months, and a start had been made by officers of the Forest Biology Division. The need for control operations in 1960 might justify deferment. After discussion it was considered

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that deferment was not necessarily desirable because, in effect, the intention was to bring together in one publication the principal results to date, which had already been published or distributed in various journals and reports. Therefore, unless the authors felt that the review article should be deferred, the Interdepartmental Committee would be pleased to see its publication according to the original intention. Dr. Prebble agreed to learn the views of the officers involved in this project.

7. Other Matters.

None.

Meeting Adjourned at 5:30 p.m.

W.R. Hourston,
Secretary,
Interdepartmental Committee
on Forest Spraying Operations.

O t t a w a,
October 16, 1959.

Attach:

App. I - VI.

APP.I

Interdepartmental Committee on Forest Spraying Operations

Agenda for Meeting of October 14, 1959

1. Brief synoptic review of results of experimental studies in 1958. (These have been reported at previous meetings. J.J.Fettes to inform the members re status of proposed joint publication of results by Forest Biology Division and Fisheries Research Board officers)

2. Experimental studies of insecticides in 1959.

   (a) Aerial spray trials in New Brunswick
   (i) budworm control - J.J. Fettes
   (ii) effect on fish - J. L. Kask (review of report submitted Oct.6/59 by C. J. Kerswill)

   (b) Laboratory trials of insecticides on the oak looper (close relative of hemlock looper in British Columbia) J.J. Fettes

   (c) Tests of a bacterial toxin as insecticide for forest defoliators; preliminary trials at Insect Pathology Research Institute, Sault Ste. Marie M. L. Prebble (review of results reported by J. M. Cameron)

3. Experimental studies of virus against Neodiprion swainei.

   (a) Field trials by W. A. Smirnoff - M.L.Prebble to review

   (b) Laboratory tests at Ottawa - J.J.Fettes to review

   (c) Prospects for aerial spray trials in Lake St. John region of Quebec in 1960, W. A. Smirnoff and J. J. Fettes - M. L. Prebble to review

4. Review of forest insect infestations with regard to commercial control operations in 1960. - M.L.Prebble H.A.Richmond (representing B.C.Loggers' Association)

5. Discussion of problems arising out of No. 4, that may require integration of viewpoints of federal government agencies and the forest industry.

6. Preparation of review article on spray project in eastern Canada, by Forest Biology Division and Fisheries Research Board, for publication in Canadian Geographic Journal.

7. Other matters.

APP. II

RESULTS OF AIRPLANE SPRAY TRIALS NEW BRUNSWICK 1959

Comparing four applications of DDT and three of Malathion.

A preliminary report to the Interdepartmental Committee on Forest Spraying Operations.

The series of airplane spray trials completed in York Co., New Brunswick in 1959 was a continuation of the investigations initiated in 1958 at the suggestion of the Committee. A report to the Committee, September 26, 1958 indicated that no substitute for DDT had been found but that DDT concentrations of less than the 12.5% popularly in use would obtain satisfactory spruce budworm population reductions. The 1959 trials were designed to determine the validity of the success in 1958, of dosages of DDT as low as 0.25 pounds in one gallon of formulation per acre. In addition, Malathion was introduced into the series upon the consideration that earlier trials were not adequate and in view of the success of Malathion as a good general insecticide.

The Fisheries Research Board, St. Andrews Station collaborated by studying the effects of the insecticides on fish and other aquatic fauna on three of the study plots. Whereas an application of .25 pounds of DDT in one gallon per acre showed no adverse effects on fish and little on aquatic insects in 1958; a repeat of the experiment was scheduled.

Forest Protection Limited arranged for the flying service and supplied, without charge, the necessary DDT concentrate, tanks and loading facilities.

A summary of the data is presented in the following table.

Summary of Data from New Brunswick Field Trials, 1959

Plot	Spray Date	Nominal Dose	Insecticide Deposited: Gals. per acre	Drops per cm^2	Lbs. per acre	Expected Larval Density#	Observed Larval Density	Corrected Per Cent Control
1##	11/6	DDT ¼lb./gal/acre	0.30	14.6	0.08	.124	.017	86
2##	19/6	DDT ½lb./½gal/acre	0.23	14.3	0.19	.124	.012	90
5	6/6	DDT ¼lb./½gal/acre	0.14	7.6	0.075	.145	.030	79
6###	6/6	DDT ¼lb./gal/acre	0.59	26.5	0.20	.149	.015	91
3##	19/6	MALATHION ¼lb./gal/acre	0.34	13.3	0.085	.036	.017	53
7	7/6	MALATHION ¼lb./½gal/acre	0.20	11.0	0.10	.105	.108	0
4	7/6	MALATHION 1/8lb./½gal/acre	0.37	17.3	0.095	.105	.080	24

\# Larval density = $\frac{\text{No. larvae}}{\text{No. Buds}}$

Aquatic fauna study plot.

Intended as a 1/8 lb./gal./acre application. Mixing error resulted in increase of DDT. This is the plot where trout died in a shallow pool.

Several observations may be drawn from the data as presented.

1. 0.25 pounds of DDT in one gallon per acre did not compare favourably with that of 1958; 86% control versus 96%. The reduced effect is due to erratic deposit caused by meteorological conditions or inconsistent flight tracks. The detailed deposit data shows intermittent high and low deposit across the plot. Where deposits were normal the effects were acceptably high.

2. 0.5 pounds of DDT in 0.50 gallons per acre shows a higher degree of control (90%) but less than the 0.50 pounds in 1.0 gallons per acre (97%) achieved in 1958.

3. 0.25 pounds of DDT in 0.50 gallons per acre fall somewhat below the desired effective control limits (79%). Note however, that the over-all deposit is very light, particularly the number of drops per square centimeter. Where observed, deposits were normal, the larval survival was low.

4. Malathion does not prove to be as effective as DDT against the spruce budworm. The highest degree of control was 53% at a dosage of 0.25 pounds in one gallon per acre. Malathion would probably be adequately effective at higher concentrations; but since it is as lethal to aquatic fauna as DDT it was not applied at dosages high enough to be lethal to fish.

5. Plans to test 0.125 pounds DDT in 1 gal. were negated by an error in the mixing schedule. Plot 6 received a nominal dosage of 0.25 pounds DDT in one gallon per acre and the deposition was abnormally high.

Tentative Conclusions

1. DDT is likely to be effective against spruce budworm larvae at concentrations below the 12.5% now used. A formulation of 6.25% DDT applied at the rate of 0.50 gallon per acre would probably give adequate results providing the application is uniform over the forest and the spray break-up fine enough to provide a deposit of about 20 drops per square centimeter. The spray break-up effected by the equipment used on the Stearman aircraft is too coarse to obtain adequate continuous contamination. The present pattern of applying 0.50 gallons per acre by broadening the swath width results in intermittent over-and under-dosing. The desired effect could be achieved by increasing the pressure in the system and installing smaller orifices in the nozzles. Finer break-up would increase the buoyancy of the spray cloud and therefore dictate more stringent meteorological limits for spraying.

2. Malathion is not sufficiently effective against spruce budworm larvae to be considered for use in large-scale spray projects.

James J.Fettes
Forest Biology Division
Chemical Control Section
Ottawa,
October 13, 1959.

APPENDIX III

Preliminary Report on Observations on young salmon and trout subjected to forest spraying with DDT and Malathion in the vicinity of the Mactaquac River, N.B., 1959

In an experiment carried out in 1958 near Richibucto, Kent County, N.B., aerial spraying with DDT insecticide at concentrations of 1 lb., and 1/2 lb. DDT per acre were followed within three weeks by significant mortalities of introduced salmon parr 2 to 3 inches in length. Spraying with 1/4 lb. DDT per acre had no apparent effect on the fish within this period. In 1959 the Department of Agriculture, Department of Fisheries and Fisheries Research Board of Canada joined in a similar insecticide spraying experiment in the vicinity of the Mactaquac River, York County, N.B. It provided an opportunity for repeating observations on the effects on introduced young salmon and native trout of spraying DDT at rates of 1/2 lb. and 1/4 lb. DDT per acre as well as Malathion at 1/2 lb. per acre.

PLAN

The experiment followed the general plan developed in 1958. Eight plots of woodland were selected by Department of Agriculture scientists for determining effects of various spray formulations on spruce budworms. Three of the plots were traversed by small streams that seemed suitable for short-term comparison of the effects of different sprays on young introduced salmon. The streams were, however, below the minimum size of typical salmon-rearing waters, with somewhat more forest cover than usual. A fourth similar stream was found nearby to serve as an unsprayed control.

Hatchery-reared yearling parr 2 to 3 inches long and fry about 1 inch long were provided by the Department of Fisheries hatcheries at Florenceville and Haley Brook, N.B. By June 4, samples of 50 of both sizes had been distributed in cages at the lower end of each stream. After clearance of obstructions, additional samples of about 100 parr were distributed over about 100 linear yards above barrier fences set across the lower ends of each stream.

Observations on fish survival and water conditions were made daily from June 4 to July 14, then only twice weekly until the cages and fences were removed on August 10.

Staff and other facilities were not available for a study of effects of the sprayings on the food of young salmon, by following the daily emergence of adult insects into cage-traps as was done at Richibucto. Instead, bottom samples of immature stages of stream insects were taken on the study streams before and after spraying, by Messrs. J.B. Sprague and D.L. Peer, Fisheries Research Board. The collections will be worked up this winter.

STAFF AND TRANSPORTATION

The field observations were made by two seasonals, Mr. G.D. Maddison employed by the Department of Fisheries, and Mr. R.H. Peterson, a Fisheries Research Board employee. Construction and installation of the equipment was supervised by Mr. E.J. Schofield, Fisheries Research Board. The vehicle needed for regular visits to observation points was provided by the Fish Culture Development Branch of the Department of Fisheries.

RESULTS

The observations on survival of the salmon fry and yearling parr introduced into the four streams are summarized in Table 1.

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Up to July 11 when fish started to die in the unsprayed control stream (KC), that is during the period of 3 to 4 weeks after spraying, the caged salmon parr showed no ill effects of either the 1/4 lb. per acre DDT (K1), 1/2 lb. per acre DDT (K2) or the Malathion (K3). Differential mortality of the caged fry occurred within this period however, since 69% of those subjected to DDT at 1/2 lb. per acre (K2) died, as compared to 0, 11 and 4% mortalities in the K1, K3 and KC plots respectively.

The routine daytime observations on parr that had been planted in the lower sections of the experimental streams agreed with the observations on caged parr, in showing no harmful effects of any of the three insecticides. The total numbers of dead parr picked up from June 4 to August 10 in the four plots were: K1 - 0, K2 - 1, K3 - 3, KC - 1.

In the period June 30 to July 9 night observations on the four streams using lights confirmed the survival of introduced salmon parr and numerous native trout. For example, in Plots K1, K2 and K3 respectively, 27, 56 and 83 healthy parr were seen, while 52 parr were seen in the part of the control (KC) that was not hidden from view by a bridge. Also, 19, 25, 12 and 72 trout were seen in the four streams.

In the July 4-11 period, temperatures of the four streams as a group ranged from 8°C to 18°C, like stream temperatures in 1958 at Richibucto. Daily temperatures of the K1, K3 and KC streams usually agreed within 2°C, while the K2 stream was sometimes 2° to 3° warmer than the other three. Freshet conditions prevailed from June 15 to 20, with increases in water level of as much as 7 inches above normal. Less pronounced rises in water level occurred on July 2-3 and July 13.

On June 8 when a spray plot (K6) outside the fish-checking series was sprayed with DDT at 1/8 lb. per gal. per acre, trout were seen at its lower boundary in a small shallow pond 1/10 acre in area, that was fed by a small uncharted stream that traversed the spray woodland. Regular visits permitted the collection of six trout, 5 to 7 inches long, that died within four days of spraying. On July 6 when the pond was calm and clear, at least 15 native yearling trout and as many fry were counted in the pond, and several active fry were observed in the stream above. The yearling trout and fry were observed frequently up to August 6 when observations ended.

When on June 11 the spray plane accidentally struck a tall tree at the lower boundary of Plot K2, almost the whole spray load (DDT to be applied at 1/2 lb. per 1/2 gal. per acre) was dumped in a marsh that fed into the stream below. For several days the red-dyed insecticide could be seen on the bottom of the stream for 1/2 mile below the site of the accident and rising to the surface. Within three days many trout up to 6 1/2 inches in length and frogs were affected, and dead specimens were collected.

SIGNIFICANCE OF RESULTS

Aerial spraying of DDT at rates of 1/2 lb. per acre and 1/4 lb. per acre had no observable short-term effects on caged salmon parr in the 1959 experiment, whereas the 1958 spraying with DDT at 1/2 lb. per acre was followed by significant mortalities of caged parr at Richibucto. In 1959 a differential effect of the two DDT formulations was shown, however, by the caged fry; many of these smaller fish died within a few days of application of DDT at 1/2 lb. per acre, but elsewhere all fry survived for at least another

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week. This would be likely to occur if DDT at 1/2 lb. per acre had marginal effects on survival of young salmon. From earlier observations in the Miramichi area it would be expected that the smallest available sizes of young salmon would be affected more severely than the larger sizes.

The 1959 results with DDT at 1/4 lb. per acre confirmed those obtained in 1958, in that spraying had no apparent short-term effects on survival of the young introduced salmon.

In 1959, spraying with a still lower concentration of DDT, at 1/8 lb. per acre, was followed by the deaths of a fraction, believed to be small, of yearling native trout in a little pond and stream. (*)

The 1958 and 1959 results of spraying young salmonid fishes with different DDT formulations have varied considerably. Such variations would be expected to occur, however, because of regional differences in the physical and chemical characteristics of streams, for example, in extent of forest cover, rate of stream flow, pH, and suspended matter. Significant differences might occur in the quantity of insecticide reaching the water from year to year, related to slight differences in spraying techniques. Some of these variations may be brought out by the Department of Agriculture's data, such as, the chemical analyses of water samples taken at all plots before and after spraying, and spray deposition as shown by test cards.

The Malathion results are probably insignificant because the insecticide did not provide worthwhile control of budworms.

Small-scale experiments of this kind on streams that are smaller than typical salmon-rearing waters and which lack native populations of young salmon may be useful for preliminary screening of various insecticide formulations under field conditions. It seems unlikely that the effects on young salmon survival of modified large-scale spraying techniques could be predicted on the basis of such experiments alone.

C. J. Kerswill

St. Andrews, N.B.
October 6, 1959.

Attach. Table 1

(*) Secretary's Note

Dr. Kerswill's report was produced before the error in this formulation was discovered. As indicated in Line 6 Page 2 of the notes this dosage was ¼ pound per gallon per acre. This also applies to Paragraph 5 on the preceeding page.

TABLE 1

	K1 DDT 1/4 lb./1 gal./acre		K2 DDT 1/2 lb./1/2 gal./acre		K3 Malathion 1/2 lb./1 gal./acre		KC Unsprayed Control	
Date sprayed	June 11/59		June 19/59		June 19/59			
No. fish in cages June 3	Fry 50	Parr 54	Fry 50	Parr 50	Fry 50	Parr 50	Fry 50	Parr 50
No. caged salmon dead by weeks								
June 3-6	0	0	5	(2)	3	0	1	(1)
7-13	4	0	0	(1)	0	0	0	0
14-20	0	(1)	0	0	0	0	0	0
21-27	0	0	23	1	0	0	0	(2)
28-July 4	0	0	3	0	0	0	0	0
July 5-11	0	(2)	5	0	5	0	2	0
12-18	9	(1)	9	4	19	0	14	2
19-25	33	0	1	4	13	1	24	1
26-Aug. 1	0	1	0	22	1	14	4	9
Aug. 2-8	0	2	0	0		14		8
9-10	0	0	0	1	1	16		10
(a) No. of deaths between spraying dates and July 11, not from physical causes	0	0	31	1	5	0	2	0
(b) Total no., from which above specimens died	46	51	45	47	47	50	49	49
% died ($\frac{a}{b}$ x 100)	0	0	69%	2%	11%	0	4%	0

Figures in brackets show parr known to have died from physical injury, through crushing by fry cages. Approximate dates of spraying indicated by lines (____).

Summary of tests, summer of 1959, with Merck's "bacterial insecticide", carried out by staff of Insect Pathology Research Institute.

Note: Fundamental studies on pathogenic action of Bacillus cereus group of bacteria have been done at Sault Ste. Marie. Several firms are now making a commercial product for use in insect control.

The laboratory tests were done at a concentration of 2 milligrammes of the mixture of bacterial spores and crystals per cubic centimetre of water. In field trials 2-to-2½ pounds of the mixture were added to 100 gallons of water. A latex sticker was incorporated in the spray and a small mist blower was used for application to the foliage of trees.

(a) Oak looper and hemlock looper from B.C.

In laboratory trials, these insects appeared to be susceptible. Feeding was inhibited in the first day, but onset of mortality was slow, peak being reached 8 or 9 days after treatment of the foliage.

(b) Hemlock looper, Parry Sound District, Ontario.

A small infestation occurred on an island in Lake Joseph, Parry Sound District. No satisfactory statistical data obtained, but results were generally in line with the laboratory trials (a).

(c) Black-headed budworm from B.C.

In limited laboratory trials, the larvae of this species appeared to be susceptible. Larval feeding was inhibited after the first day, and cumulative mortality reached about 90% in five days. A considerable number of older larvae placed on sprayed foliage pupated, even though feeding ceased on the treated foliage. About two-thirds of the resulting pupae produced moths.

Further field trials, with daily observations and arrangements for adequate statistical information, are required before any recommendation can be made for wide-scale application.

APP.V

Review of Forest Insect Infestations in 1959, and Prospects for Commercial Control Operations in 1960.

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1. Maritime Region

Spruce budworm infestations in the Gaspe Peninsula and northern New Brunswick declined further due to natural causes in 1959, and there is no prospect of control operations in these regions in 1960.

The situation is quite different in central New Brunswick. The budworm infestations bordering the southern and eastern boundaries of spraying operations of 1952-1958, did not decline during 1959, but rather intensified in spite of rather high parasitism. Weather during the early part of the feeding period was conducive to rapid development and high survival. Heavy infestation in 1959 was more discontinuous than in earlier years of the outbreak, and more closely related to areas of concentration of mature balsam fir. The total area of moderate to severe infestation in 1960 is forecast as 2.5 million acres; the acreage of high hazard (areas in which tree mortality is likely to result from continued infestation in 1960) aggregates some 1.4 million acres in Carleton, York, Sunbury, and Northumberland Counties, and about 0.2 million acres in Kent County. Owing to the relatively minor position of balsam fir in Kent County, and considerable injury caused by Adelges piceae, the Forest Biology Division would not recommend spraying operations for budworm control in this region of high hazard. However, much valuable balsam fir occurs in the main region of high hazard, and consideration is now being given by the Government of New Brunswick and Forest Protection Limited to the need for spraying operations in 1960.

It should be noted: (1) that the Acadia Forest Experiment Station falls in the area of high hazard; (2) a number of experimental areas where the biological control of Adelges piceae through introduced predators is being studied, fall in the high hazard areas adjacent to Fredericton; (3) parts of the Southwest Miramichi River and the Cains River fall in the area of high hazard.

2. Quebec

No infestations considered for aerial control operations in 1960, except Neodiprion swainei infestations in Lake St. John region where aerial trials with a virus of this sawfly will be carried out by the Forest Biology Division.

3. Ontario

No plans for widespread aerial control operations. Small-scale chemical control operations in plantations in southern Ontario will undoubtedly be carried out by private owners and the Department of Lands and Forests.

4. Manitoba - nil

5. Saskatchewan and Alberta

Rather small infestations of the forest tent caterpillar and the spruce budworm in the Cypress Hills may be sprayed by the Saskatchewan and Alberta governments.

5. Saskatchewan and Alberta (cont'd)

There is a possibility that forest tent caterpillar infestations in Prince Albert National Park may be sufficiently heavy to warrant control action in this resort area.

Small infestations of Bruce spanworm on poplar in Alberta may be sprayed by private owners.

6. British Columbia

Interior: Infestations of the satin moth around resort camps in the Okanagan Valley may require spraying. This would be limited at most to very small acreage.

Coast: A mixed infestation of hemlock looper and green-striped forest looper in Stanley Park, Vancouver, may require spraying in 1960. Spraying was carried out in 1959, but no details are available.

Black-headed budworm infestations on the Queen Charlotte Islands are at high levels, particularly on Moresby Island. Aerial surveys in August indicated rather general light defoliation, with a number of scattered areas of greater concentration. Ground surveys were scheduled for early October, with particular attention being devoted to egg populations. It is expected that H. A. Richmond may have some further information to report by October 14.

Interdepartmental Committee on Forest Spraying Operations

A. Statement by the B.C. Loggers Association

October 14, 1959

The Forest Industry of British Columbia is greatly concerned over the problem of protecting forests and forest products from insect attack and the complicating problem of fish damage.

That we will be faced with a large scale spraying programme in the future is certain. If we can offer no better means of control than the previously used DDT formulations the problem will be greater than ever. During this period between outbreaks, which may last for but one or several years we have a brief respite to attempt the development of some new approach to insect control or of some new and less harmful formulation of previously used chemicals. While the forest industry fully appreciates that the Government recognizes the issue and is desirous of developing something toward this end we are concerned that there may not be a full appreciation of the magnitude or the urgency of the situation in B.C. The problem in British Columbia does not lend itself readily to comparisons with that of eastern Canada as experienced during the past budworm outbreak. There are marked differences both biologically and economically which should be borne in mind when appraising the British Columbia situation.

Unlike those in the east, previous outbreaks on the west coast have been extremely violent and generally short lived. They have reached a peak after a few years of heavy feeding and in their final year have undergone a sudden collapse. Spray applied during that peak year has a good chance of protecting the forest with little fear of a recurrence of that particular outbreak. Applied control stands a good chance of success.

Perhaps the most significant difference is in forest values. An average fir-hemlock stand on the coast of B.C. will average about 50 thousand feet board measure (100 cords) per acre. A typical spruce-balsam stand in eastern Canada will average about 12 cords per acre. These differences measured in stumpage values amount to about $450.00 per acre in favour of the B.C. forest. When based on pulp values the difference is more pronounced. An eastern stand of 12 cords per acre produces a value of $780.00. A western stand of 50 thousand f.b.m. per acre will produce over $6,000.00 per acre in lumber and pulp, a difference of more than $5,000.00.

Economists have a rule-of-thumb evaluation by saying that for each dollar produced ten dollars are circulated through the nation's economy and the relative tax return to the Canadian Government is in direct proportion to these values through corporation tax, income tax, sales tax on equipment and supplies, etc.

At the same time, the fisheries are another highly important industry in B.C., being valued in 1956 at $68 million dollars accounting for 43% of the market value of all fish caught in Canada. It is estimated that the total marked value of salmon landed by Canadian fishermen will increase under favourable conditions to $132 million by 1980. (B.C. Natural Resource Conference 1958).

In the National interest, therefore, these are two highly important industries that must receive maximum protection.

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The complexities of this problem were demonstrated in the last spraying programme on Vancouver Island against the black-headed budworm and we would expect a much more difficult situation if a similar programme should be undertaken at the present time. There seem to be two main problems. One, and most important, is the killing of fish and aquatic life, a problem already in the hands of the Fisheries; the other the matter of public sentiment. The latter seems to be an insurmountable hurdle. Many of the antagonists would seem to have pre-conceived opinions unwilling to change regardless of the evidence produced. Certain of the pressure groups openly hostile are well-meaning and honest individuals but incapable of understanding the full impact of the problem. In this group are many of the Indians, and certain fishermen and others. There are the extremists opposed to anything designed to curb the normal course of nature. When aroused all of these people recruit or convert followers and they through various representations to governing bodies, the press and others, can seriously affect the course of events.

Within the public mind there will naturally be many shades of opinion. To those charged with the responsibility of administering these two resources, however, there should be unanimity of understanding. This is a problem of National interest and should be accepted as a mutual responsibility of both Forestry and Fisheries personnel. The Forest Industry in B.C. has been trying to develop this philosophy within its own ranks and has conscientiously tried to promote a spirit of confidence and understanding with the Department of Fisheries and the B.C. Game Branch. We are presently trying to evolve some kind of an over-all control in the use of chemicals on forest lands to avoid unnecessary damage with ensuing complications from chemicals improperly applied either through ignorance or indifference.

To this end we feel there should be a clear statement of policy from the Federal Government with respect to the use of chemicals on forest lands. Since a large scale programme involves months and possibly a year or more in its planning, we in the industry would like to know what should be done to fulfill our commitments, if any, what assurances can be given that the project can be completed and what safeguards can be given against pressure groups that could conceivably cause the discontinuance of a project. It is of fundamental importance to the Industry that there should be some method of final approval of the proposed project through the Head Office of the Department of Fisheries in Ottawa, whose decision could be accepted as final and incontestable, so long as the stipulated terms are adhered to such decisions should be finalized in adequate time to permit proper planning.

Despite all that we may do or plan, the simple fact remains that insects are ever present, ever-threatening, and sooner or later we must make a decision on control. At the present time indications point to a general increase in the budworm population in the Queen Charlotte Islands of British Columbia which may necessitate some form of applied control in 1960. It is therefore of utmost importance to the Forest Industry of B.C. that all progress possible be made toward a solution of this problem.

14-0-31
(FO 730-1)

Ottawa, October 15, 1959.

Memorandum for file

Notes on meeting of
Interdepartmental Committee on Forest Spraying Operations
October 14, 1959

A report on experimental work with insecticides relating to both insects and fish, covering both the Forest Biology Division's and the Fisheries Research Board's studies in 1958 and 1959, is to be prepared and published jointly, probably under the auspices of the Fisheries Research Board.

2. Experiments in New Brunswick in 1959, while they did not give quite as good results as in 1958, showed that ¼ pound of DDT in ½ gallon per acre would probably give acceptable control against the spruce budworm if distributed uniformly enough. The present Stearman spray equipment is deficient in this respect, but could be improved; the Avenger is much better. One-quarter pound DDT per acre showed practically no effect on small fish and very little on aquatic insects.

3. Malathion, although it showed up well in the laboratory, did not in the field. Of the insecticides tried to date, only DDT is definitely effective.

4. The laboratory tests show that the oak looper (closely related to the hemlock looper) is six times as susceptible to DDT as is the spruce budworm.

5. Interesting but inconclusive results were obtained from preliminary tests of a new bacterial toxin used as an insecticide against defoliators. Nine publications on this subject were obtained from Dr. Prebble. This insecticide is now in about the same stage as DDT was in 1945. Further trials are to be made next year.

6. Experimental studies of a virus against Swain's jack pine sawfly during the past three years are very promising. A gallon of water in which a few infected larvae are macerated is sufficient to spray an acre.

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7. Dr. Prebble had received a telephone report that the Directors of Forest Protection Limited in Fredericton on October 13th had authorized Mr. Flieger to make arrangements for spraying up to 2¼ million acres in 1960. As the total high hazard area is only 1.6 million acres, this presumably means that preventive spraying will be done in moderate hazard areas to the south and southeast. The Forest Biology Division recommended against spraying in Kent County where there is not much balsam fir and it is heavily infested by the balsam woolly aphid.

8. It was further reported that the Fredericton meeting recommended using the same formulation as in previous years, that is ½ pound DDT in ½ gallon per acre. Forest Biology would like to reserve from spraying some experimental plots relating to the balsam woolly aphid, near Fredericton. Forest Protection Limited is prepared to except the Cains River from spraying due to high salmon value. I said the Forestry Branch has no objection to, and is indeed in favour of, spraying the Acadia Forest Experiment Station.

9. Several large forest owners in Central New Brunswick will be asked to share in the cost with the original companies, but small owners and farmers will not be asked to contribute though it is understood that their forests will be sprayed and that they are generally in favour of it.

10. It was agreed that after the minutes of today's meeting have been sent to Forest Protection Limited there should be a further meeting with representatives of Forest Protection Limited and of members of the Forest Biology Division and Fisheries Research Board from New Brunswick. This step was taken in view of the concern of the Fisheries Department and Fisheries Research Board on the matter. Dr. Pritchard reported that a follow-up of salmon runs in areas sprayed in 1954 and 1955 indicates generally reduced numbers.

11. Mr. H. A. Richmond (representing the British Columbia Loggers Association) reported that there were several scattered areas of heavy black-headed budworm infestation in the central

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part of the Queen Charlotte Islands. Sample analysis is not yet complete but it is likely that spraying operations will be undertaken next summer. However, no request for spraying has yet been made by the British Columbia Loggers, and nothing was said about asking for financial aid from the Dominion. Mr. Richmond recognizes the high value of fisheries in this area.

12. The Minister of Fisheries has authority to prohibit the discharge of injurious effluents into any waters containing fish. So far this has not been invoked in any forest insect spraying operations, but the British Columbia forest industry is worried about its position. Dr. Pritchard indicated that, provided all reasonable precautions were taken, it was unlikely that any action would be taken by his Minister.

13. Mr. Mair of the Canadian Wildlife Service mentioned that he expects to have someone available in the next year or so to study depredations of wildlife on forest regeneration.

H.W.B.

14-0-31

CANADA

DEPARTMENT OF AGRICULTURE

~~SCIENCE SERVICE~~
RESEARCH BRANCH

FOREST BIOLOGY DIVISION

QUOTE FILE 7.9.14

OTTAWA, CANADA

October 28, 1959

Mr. W. W. Mair

Mr. H. W. Beall ✓

Dr. J. L. Kask

This is just to let you know that in discussions with Mr. Hourston, on behalf of Dr. Pritchard, we have tentatively set November 10 p.m. as the time for the next meeting of the Interdepartmental Committee. I have sent out invitations to representatives of Forest Protection Ltd., the New Brunswick Department of Lands and Mines, and the Fredericton Forest Biology Laboratory. I believe Mr. Hourston and Dr. Kask will be extending invitations to representatives of the Fisheries Department and Fisheries Research Board.

Would you kindly reserve the afternoon of November 10 for this meeting. If there has to be a change of time I will be in touch with you.

M. L. Prebble,
Director,
Forest Biology Division.

MLP/kp

14-0-31

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

RESEARCH BRANCH
FOREST BIOLOGY DIVISION

QUOTE FILE 7.9.14

OTTAWA, CANADA

November 6, 1959

MEMORANDUM TO:

Dr. A. L. Pritchard, Attention: Mr. Hourston
Dr. J. L. Kask
Mr. W. W. Mair
Mr. H. W. Beall ✓

Through the kindness of Dr. Cameron, Director of the Insect Pathology Research Institute, I obtained a reference to Robert Fisher's article on Toxicology of the Microbial Insecticide, Thuricide, in reference to hazards to mammals. A photostat copy is attached as I thought you might like to review this matter before our meeting of November 10.

By correspondence of October 23, Mr. Fisher also informed Dr. Cameron that tests with wild pheasants and "chucker"* had shown complete lack of oral toxicity of the Thuricide for these birds.

We expect to have some indication of costs before too long.

This will serve as a reminder to Mr. Mair and to Drs. Kask and Pritchard that they propose to make some enquiries about the toxicity of the microbial insecticide to animals and fish.

M. L. Prebble,
Director,
Forest Biology Division.

MLP/kp
cc: Dr. Cameron

*There seems to be some variation in spelling - also "Chukar".

M.L.P.

Toxicology of the Microbial Insecticide, Thuricide

ROBERT FISHER
Bioferm Corp., Wasco, Calif.
LAWRENCE ROSNER
Rosner-Hixson Laboratories, Chicago, Ill.

One of the advantages of the new living insecticide based on the viable spores of the microorganism *Bacillus thuringiensis* Berliner is its nontoxic nature for man, other animals, and plants. This characteristic was firmly established in a series of tests which included an unusual human volunteer test. The toxicology studies described in this paper represented a pioneering effort, as there was no precedent to guide the manufacturer or government officials in establishing that the proposed use of the pesticide would be without hazard to health.

Thuricide (Bioferm Corp., Wasco, Calif.) is a live pest control agent which is a fatal, quick-acting disease for susceptible insects. The active principle consists of the spores of the microorganism *Bacillus thuringiensis* Berliner, a bacterium first isolated in 1911 from diseased larvae of the Mediterranean flour moth. A review of the literature (2, 12, 18) reveals no authenticated instance of this insect pathogen having caused infectious disease in warm-blooded animals or plants either experimentally or in nature. On December 10, 1958, the Food and Drug Administration authorized the application of the microbial insecticide Thuricide directly to food and forage crops under the conditions of a temporary exemption from a tolerance. Part of the exhaustive 2-year toxicological study which satisfied government officials and the manufacturer as to the safety of Thuricide is described.

Experimental

The toxicological studies on Thuricide were divided into four groups: infectivity and sensitization, acute and chronic toxicity, effect on human volunteers, and toxicity in the field. Some of the tests in the first, second, and third groups are presented here.

The Thuricide used in most of the tests contained approximately 9×10^9 viable spores of *B. thuringiensis* per gram, and in the human volunteer study, 3×10^9 viable spores per gram. Spore count was determined by a plating method (3).

In addition to the active spores, the product contained a diatomaceous earth filler which had some toxic effect on animals in the massive doses given. When vegetative or sporulated cultures of the microorganism itself were used in these tests, they were designated as *Bacillus thuringiensis* Berliner.

Virulence of Thuricide Following Serial Passage through Mice. One-half gram of Thuricide was added to 20 ml. of nutrient broth and incubated at 37° C. for 72 hours. Immediately before injection into the test animals, another 0.5 gram of the sample was added to the incubated material, providing both spores and vegetative forms of the microorganism.

Thirty-five white mice, weighing 17.0 to 23.0 grams, were assembled into seven groups of five mice each. The animals were placed in wire cages and fed a standard mouse diet and water ad libitum. The mice in group 1 were injected intraperitoneally with 1.0 ml. of the prepared material. After 6 hours, 0.3 ml. of blood was withdrawn by cardiac puncture and injected intraperitoneally into group 2. This technique was repeated for a total of six transfers using five more groups of mice. Group 7 was weighed prior to injection and after 24 and 48 hours. No weight losses nor abnormal symptoms during the test period were observed. In group 1, one mouse died within 4 hours after injection of the prepared sample. Gross pathology indicated a severe irritation of the peritoneum. The other mice in this group displayed signs of malaise prior to cardiac puncture.

To determine whether the cause of death and the symptoms observed in group 1 were associated with the carrier in which the microorganisms of the sample were incorporated, the following tests were performed.

One-half gram of the sample was incubated in 20 ml. of nutrient broth for 24 hours. A portion of the supernatant liquid was decanted into another tube of nutrient broth and incubated for an additional 48 hours. The resulting cell suspension was then centrifuged and washed twice with isotonic saline solution. This technique resulted in a suspension which was largely free of the carrier material and it contained about 3×10^8 organisms per ml. One milliliter of this suspension was injected intraperitoneally into five mice. No deaths or abnormal symptoms were observed.

One gram of the sample was incubated for 48 hours in 20 ml. of nutrient broth. After incubation, the material was autoclaved. The bacterial cell count was about 3×10^8 nonviable organisms per ml. One milliliter of this material was injected intraperitoneally into five mice. All of the five mice died within 16 hours, displaying symptoms of abdominal irritation and sensitivity.

One milliliter of the nutrient broth was injected intraperitoneally into five mice. No deaths or abnormal symptoms were observed.

Although direct intraperitoneal injection of Thuricide into mice caused toxic symptoms, this effect was due to the carrier only. The organisms themselves had no toxic effect, nor was any virulence developed by serial passage through mice.

Persistence of *B. thuringiensis* in Blood of Mice Following Intraperitoneal Injection. Sixty white mice weighing 17 to 33 grams were assembled into six groups of 10 mice each. The animals were held in wire cages and fed a standard laboratory mouse diet and water ad libitum. Groups 1, 2, and 3 were injected intraperitoneally with 0.1 ml. of a 24-ml. nutrient broth culture of *B. thuringiensis*. Groups 4, 5, and 6 were injected with 0.1 ml. of a 24-hour broth culture of *B. cereus*, an organism which is generally considered as nonpathogenic under most conditions and is morphologically related to *B. thuringiensis*. This organism was included for comparative purposes.

Blood samples, 0.3 ml., were withdrawn by cardiac puncture from groups 1 and 4 after 24 hours, from groups 2 and 5 after 48 hours, and from groups 3 and 6 after 72 hours. Each blood sample was plated on tryptone glucose extract agar and the resulting *B. thuringiensis* or *B. cereus* colonies were counted.

The plate counts showed that both organisms persisted in the blood up to 48 hours. However, as neither organism was found at 72 hours, the persistence of *B. thuringiensis* was no greater than that of the strain of *B. cereus* used in this test.

Determination of Relative Pathogenicity of *B. thuringiensis* by Parenteral Administration into Guinea Pigs. The pathogenicity of *B. thuringiensis* for guinea pigs was compared with that of *B. cereus* and of *B. subtilis*, both considered to be nonpathogenic under most conditions. The method employed was that of Clark (5). The test organisms were cultured in glucose broth for 24 hours before injection. To obtain higher concentrations of organisms, 24-hour glucose agar slants were prepared and the organisms were washed off with 1 ml. of saline.

The groups of guinea pigs injected with the 24-hour broth culture received 4 ml. each. The groups injected with the slant washings received 1 ml. containing the growth from one slant. All injections were intraperitoneal. The animals were observed for 7 days after injection. Data are shown below.

Organism	Type of Culture	No. of Animals In-jected	No. of Animals Sur-viving
B. thuringiensis	Broth	10	10
	Slant	10	3
B. cereus	Broth	5	5
	Slant	5	0
B. subtilis	Slant	5	5

Massive doses of the microorganisms are required to overcome the guinea pigs defense mechanism, because injection of the broth cultures caused no fatalities.

Inhalation Toxicity of *B. thuringiensis* Berliner in Mice. Inhalation toxicity was determined by placing 10 mice identified as Test Group 1, in an exposure chamber 30 × 30 × 30 cm. and dispersing Thuricide with a powder blower by means of compressed air. The animals were subjected to four exposures over a period of 6 days. The duration of each exposure was 15 minutes, during which time 10 grams of sample were dispersed. Between exposures the animals were housed in wire cages and were fed laboratory mouse diet and water ad libitum. The mice were weighed initially and at the end of the test. Observations were made of their reaction in the exposure chamber as well as of their general well-being throughout the test period.

In order to determine whether irritation to the lungs might result from the inhalation of only the carrier in which the active ingredient of the sample was incorporated, a portion of the test sample was sterilized by autoclaving and another group of 10 mice was subjected to the same exposure.

During repeated exposures of the mice to inhalation of the test material, no untoward reaction was observed in either group. Observations of their general well-being throughout the test period showed no departure from normal in either group, as was demonstrated also by normal weight gains for both groups. Gross pathology findings were negative.

The Allergenicity of Thuricide in Guinea Pigs. The procedure of Draize, Woodward, and Calvery (6) was employed for the determination of the allergenicity of Thuricide. Twenty white male guinea pigs were distributed into two groups of eight each and one group of four. The hair was removed from the back and flanks by close clipping. The sample was tested by the following methods.

Injection of a 0.1% Suspension in Water. Injections were made intracutaneously using a 25-gage needle. Ten sensitizing doses were administered, by injection, every other day for 3 weeks. Sites of injection were at random over the backs and flanks. The first injection was 0.05 ml., while the other nine contained 0.1 ml. each. Eight animals were used.

Topical Application on Abraded Skin. Ten sensitizing applications were administered every other day for 3 weeks. The abrasion for each application was made, at random, on the backs and flanks. The test material was applied with a powder blower, covered with an aluminum patch and taped in place. The first application was approximately 25 mg., while the other nine were approximately 50 mg. each. Eight animals were used.

Topical Application to Intact Skin. Ten applications were made in the same manner as on the abraded skin, except that the skin was left intact. Four animals were used.

Readings were taken 24 hours after the first application or injection to record any initial allergenic response as evidenced by the development of erythema and/or wheal formation. Two weeks after the tenth application or injection the challenge injection or application was made in the region of the lower flank, where no previous application had been made. The challenge dose was the same as that given in the first sensitizing dose. Twenty-four hours later readings were taken again for correlation with those obtained after the first injection or application.

Administration of Thuricide by injection or by application to abraded skin caused a slight erythema and edema, indicative of local irritation. There was no reaction from its application on intact skin. There was no evidence of any allergenic response by any route of administration.

Inhalation and Ingestion of Thuricide by Human Volunteers. Eighteen human subjects were employed in this experiment. All of the individuals were subjected to physical and laboratory examinations immediately before the start of the experiment. They then ingested 1 gram of the Thuricide in capsules daily for 5 days. In addition to oral ingestion, five of the subjects inhaled 100 mg. of the powder daily for 5 days. Inhalation was from an inhaler device (Abbott's inhalator) and both oral ingestion and nasal inhalation were used on alternate days. At the end of the 5-day test period, the subjects again received physical and laboratory examinations and again in 4 or 5 weeks later. In addition to these tests, the individuals who inhaled the insecticide also were subjected to x-ray examinations at the same intervals.

The physical examinations included a detailed history and records of height, weight, temperature, blood pressure, respiratory rate, pulse rate immediately after exercise and 30 and 60 seconds thereafter, and vital capacity (in the inhalation group). They also included evaluations of the genitourinary, the gastrointestinal, the cardiorespiratory, and the nervous sytems. Laboratory tests included routine urinalysis, with qualitative and quantitative (when indicated) urobilinogen determination, complete blood count, sedimentation rate, blood urea nitrogen, glucose, bilirubin, and thymol turbidity tests. All of the subjects remained well during the course

of the experiment. All laboratory findings were negative.

Investigation of Hazard to Humans from Continued Random Exposure to Thuricide. Eight Biofarm employees in different parts of the manufacture and control of Thuricide production were observed during a 7-month exposure to Thuricide.

Whole Fermentation Broth. Exposures of 300 ml. to several thousand gallons per day.

Moist Fermentor Cake. Exposures of 1 gram to several thousand pounds per day.

Spray Powder. Exposures from 300 ml. to several thousand gallons per day.

Dust Powder. It contained up to 10^{10} viable spores per gram. Exposures of 10 grams to several thousand pounds per day. This material is ground, blended, and packaged. It is finely divided and dusts easily.

The normal records of the eight employees during exposure was free of complaints of any kind. Two of the employees, who had been exposed to a greater quantity than any of the others (total exposure 2.1 tons) to all types of production and control, were given complete physical examinations. These two subjects were observed as healthy and free of evidence of clinical disease. Because of any undue exposure to animals traced to the plant. The results of this record indicate that no hazard to health exists from prolonged and continued exposure to Thuricide spore powder or Thuricide in a spray.

Acute Oral Toxicity of Thuricide. Thuricide was administered to rats in a 10% aqueous suspension containing 0.5% of carboxymethylcellulose as a thickener. Administration was made by means of a gavage having attached polyethylene needle with a ball tip. The dose was passed directly into the animal's stomach. Doses up to 24 grams of Thuricide, assaying 2×10^{10} viable spores per gram, per kilogram of body weight were administered to groups of 10 rats and the animals were observed for 2 weeks. No fatalities occurred and there were any gross pathological symptoms of toxicity. Gross and histological examination of tissues revealed no differences from the tissues of control animals.

Discussion

The tests which have been described have emphasized the harmlessness of the microbial insecticide Thuricide and the active ingredient, *B. thuringiensis* Berliner, for warm-blooded animals. The results of these tests partially satisfied the toxicity requirements of the Food and Drug Administration.

In addition, the area of lack of toxicity has been considerably extended in reports from other laboratories (*1, 2, 9*). This further work has included acute and chronic toxicity tests with chicks, laying hens, young swine and hogs, fish, adult honey bees, and honey bee larvae. In one of these tests (*4*), a group of New Hampshire Red laying hens received as part of their diet a daily supplement of 0.5 to 10 grams of Thuricide for 23 months. No significant differences in weight, appearance, or egg number and quality were observed between the test and control groups of laying hens.

One of the recurring questions about the harmlessness of *B. thuringiensis* to warm-blooded animals has been the important matter of the taxonomic grouping of this microorganism in the same genus with *Bacillus anthracis*. The morphological similarity of these two microorganisms is the basis for this classification. However, this does not by any means indicate that the characteristics of the two are interchangeable. The specific question that has been whether these two microorganisms can be confused with one another to the detriment of Thuricide formulations and not whether *B. thuringiensis* has any of the virulent characteristics of *B. anthracis*. These questions have been answered in the negative as cited in the literature (*5*). In the manufacture of Thuricide during the last 2½ years no evidence has been found of accidental contamination or of mutation of *B. thuringiensis* into a virulent form for man, animals, or plants (*3, 10*). In addition, by the strict quality control procedures applied (*2*) the final definitive test before the release of any batch of Thuricide is a mouse safety test described by Simmons and Steinhaus (*11*).

Finally, there have been no reports of toxicity of any kind to plants, animals, beneficial insects, or humans during the field application of nearly 1000 pounds of Thuricide in the 1957 and 1958 seasons.

Acknowledgment

The advice and help of many people are gratefully acknowledged; among these are E. A. Steinhaus, J. D. Briggs, G. M. Hall, C. G. Thompson, and Y. Tanada. In addition, the authors thank H. E. Einstein, J. J. Menn, and E. L. Nicholson for their aid. Finally, they would like to mention the fine cooperation and patience of the many government officials who worked so closely with them during the long development of this new insecticide.

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Received for review March 27, 1959. Accepted June 25, 1959. Division of Agricultural and Food Chemistry, 135th Meeting, ACS, Boston, Mass., April 1959. During the period of experimental testing, Thuricide was identified as No. 57-18 Microbial Insecticide and was manufactured by Pacific Yeast Products, Inc., which merged with Biofarm Corp., Wasco, Calif., Jan. 1, 1959. The Rosner-Hixson Laboratories were formerly known as the Laboratory of Vitamin Technology.

Toxicological Studies of *O,O*-Dimethyl-*O*-(2,4,5-trichlorophenyl) Phosphorothioate (Ronnel) in Laboratory Animals

DONALD D. McCOLLISTER, FRITZ OYEN, and VERALD K. ROWE

Biochemical Research Laboratory, The Dow Chemical Co., Midland, Mich.

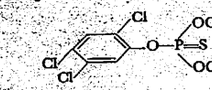
Ronnel is an organic phosphorus compound offered as a systemic for control of the cattle grub. It is also available as a spray for use against flies, roaches, screw worms, and other pests. Studies with laboratory animals were undertaken to ascertain handling precautions and for the evaluation of safety for proposed uses. Ronnel is low in acute toxicity by oral administration or skin absorption, it exerts but slight irritating effects on the skin or eyes, and is not a skin sensitizer. No morphological changes resulted from long term feeding studies on rats at 1.5 mg. per kg. per day, nor in dogs at 10 or 25 mg. per kg. per day. Plasma cholinesterase levels were depressed to a greater extent than those of RBC or brain, although substantial amounts of enzyme remained even after the feeding of large dosages of ronnel. No unusual handling precautions appear necessary. Potentiation is not of significance. Ronnel is shown to be safe for use as recommended.

Ronnel is the common name which has been assigned to *O,O*-dimethyl-*O*-(2,4,5-trichlorophenyl) phosphorothioate by the American Standards Association. Former code names were Dow ET-57 and FT-14. This substance is highly effective as a systemic insecticide for cattle grub control (*3, 16, 22*) and is available commercially for this use under the name of Trolene. As Korlan, ronnel is available as a residual spray for the control of flies in barns and in other premises (*3, 12, 13*). Korlan formulations have shown promise when applied to livestock for ectoparasite control (*12, 13*). A number of veterinarians have found these preparations to be effective against Demodectic mange in dogs (*3*).

The toxicological information already reported included observations on cattle during extensive evaluation for grub control (*3, 21*). The metabolism of the compound has been studied by Plapp and Casida (*20*). The following studies were undertaken to obtain additional toxicological data, to recommend safe handling practices in manufacturing, formulating, and field use of the material, and to assist in the evaluation of safety for proposed uses from the standpoint of public health.

Material Description

O,O-Dimethyl-*O*-(2,4,5-trichlorophenyl) phosphorothioate has the following structural formula:



The synthesis of ronnel has been patented (*19*) and the description of a manufacturing process has been given by Martin (*17*).

Ronnel of 99.4% purity has been prepared. This material is a white powder with a melting point of 40.97° C. and a vapor pressure of 0.0008 mm. of mercury at 25° C. It is quite soluble in most good organic solvents, such as acetone, carbon tetrachloride, diethyl ether, methylene chloride, and toluene. However it is practically insoluble in water (0.004 gram per 100 grams at 25° C.).

The samples of ronnel used in the first toxicological studies on laboratory animals were dependent on the purity of the 2,4,5-trichlorophenol used in the process. The purity ranged from 89 to 95% for this raw material. Later, the final products were submitted for analyses by infrared techniques. The test material used in some of the early acute toxicity experiments was 94 ± 3% pure. However, all other studies, including the dietary feeding and potentiation, employed a white powder material with a melting point of 40.41° C. and designated purity of 98 ± 2%.

In vitro, ronnel has little, if any, inherent effect on cholinesterase activity, whereas the oxygen analog is a potent cholinesterase inhibitor having about 1000 times the activity of the sulfur compound. The oxygen analog has been used as the basis for an assay method for residues of ronnel employing bromine oxidation followed by a manometric procedure with flyhead cholinesterase (*14*).

Acute Oral Toxicity

Small Animals. The test substance was given by intubation in single oral doses as a solution or suspension in corn oil to eight animal species. All of the animals that survived were observed until it was certain they had fully recovered from any toxic effects (usually about 2 weeks). Data for these acute oral tests are outlined in Table I along with the LD_{50} values calculated by the Weil (*23*) modification of the method of Thompson. Excessive dosages of ronnel result in symptoms characterized by various degrees of salivation, tremors, diarrhea, pinpoint pupils, and respiratory distress. These symptoms are those of a cholinergic nature commonly associated with organic phosphate compounds.

Large Animals. No LD_{50} has been determined for cattle or other large domestic animals. Radcleff and Woodward (*21*) found that dosages of 400 mg. per kg. of body weight in cattle produced adverse reactions, but were not fatal. Ronnel has been administered to thousands of cattle in doses of 110 to 150 mg. per kg. of body weight without producing harmful effects, except in some isolated cases where other factors have been involved. Calves and pregnant cows tolerated ronnel as well as the other cattle. Oral doses of 400 mg. per kg. have not caused adverse effects in sheep and goats under the conditions observed to date. Horses tolerated 110 mg. of ronnel per kg. of body weight.

Cholinesterase Activity in Animals Following Single Oral Doses

Rats and Dogs. Predosing cholinesterase values were obtained on samples of blood obtained from the tail tip of rats and an ear vein of dogs. Then the animals were given single oral doses of ronnel by intubation. The dosages employed, number of animals per dose, and cholinesterase activities measured in

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CANADA

DEPARTMENT OF AGRICULTURE

~~SCIENCE SERVICE~~ RESEARCH BRANCH

FOREST BIOLOGY DIVISION

730690

QUOTE FILE 7.9.14

OTTAWA, CANADA

November 4, 1959

MEMORANDUM TO:

Dr. A. L. Pritchard,
Attention: Mr. W. R. Houston
Dr. J. L. Kask
Mr. W. W. Mair
Mr. H. W. Beall ✓

Subject: Meeting of Interdepartmental Committee on Forest Spraying Operations, November 10, 2:00 p.m.

This morning I had a 'phone call from Bruce Wright of the Northeastern Wildlife Service, Fredericton, N.B., requesting permission to attend the meeting next Tuesday. The work of his Service may be influenced by the spraying program in New Brunswick in 1960 and he would like to be present during the discussions. I suggested that it would be quite in order for him to attend. I hope this meets with your approval.

M. L. Prebble,
Director,
Forest Biology Division.

MLP/kp

November 10th, 1959 Meeting of the Interdepartmental Committee on Forest Spraying Operations

NOTES ON A MEETING OF THE INTERDEPARTMENTAL COMMITTEE ON FOREST SPRAYING OPERATIONS held in the office of Dr. J. L. Kask at 2 p.m. - November 10, 1959.

IN ATTENDANCE:

Dr. M. L. Prebble	(Ottawa)	- Forest Biology,
Dr. J. J. Fettes	(Ottawa)	- Department of
Dr. F. E. Webb	(Fredericton)	- Agriculture.
Dr. J. L. Kask	(Ottawa)	- Fisheries Research
Dr. C. J. Kerswill	(St. Andrews)	- Board of Canada.
Dr. V. E. F. Solman	(Ottawa)	- Department of
Dr. W. E. Stevens	(Ottawa)	- Northern Affairs &
Mr. H. W. Beall	(Ottawa)	- National Resources.
Mr. W. R. Hourston	(Ottawa)	- Department of
Dr. R. R. Logie	(Halifax)	- Fisheries,
Mr. E. W. Burridge	(Ottawa)	- " "
Mr. K. B. Brown	(Fredericton)	- New Brunswick Department of Lands & Mines,
Mr. B. S. Wright	(Fredericton)	- Northeastern Wildlife Station,
Mr. B. W. Flieger	(Montreal)	- Forest Protection Ltd.

The Committee's Chairman, Dr. Prebble, opened the meeting by welcoming those who were not regular members. He stated that no agenda had been drawn up since the points to be discussed were fairly clear cut. Before getting to the main business of the meeting he referred to a recent meeting of the Pest Control Committee of the B. C. Loggers Association to consider a tentative spray programme against the black-headed budworm in 1960 in the Queen Charlotte Islands.

The hazard areas, of approximately 30,000 acres, are adjacent to Skidiget Inlet, Copper Bay and Cumshewa Inlet. In view of findings reported at the Interdepartmental Committee on October 14, consideration was being given to spraying at a concentration of ¼ lb. of DDT per acre.

Dr. Prebble commented that he was anxious to have a test made in this area using the recently developed bacterial toxin (Bacillus).

Dr. Prebble called on Dr. Webb to review the spruce budworm situation in New Brunswick. Dr. Webb stated that a year

. 2

ago they had reported a decline in the main outbreak area, where spraying had been carried out in previous years; and while there was a residual budworm population in the southern portion of the outbreak area, spraying was not considered essential in 1959. No operational spraying was done in 1959. However in central New Brunswick conditions had been favourable for the budworm and feeding heavy in 1959; egg counts were high this fall. He added that the egg pattern was unique in that the boundaries were quite distinct. In the high hazard areas another year of feeding would result in tree mortality. The high hazard areas have clear cut boundaries.

A brief discussion followed on the relationship between preventive spraying and high hazard spraying. Mr. Brown remarked that with the present density pattern of egg deposition it had been considered necessary to recommend preventive spraying in some areas in 1960 to eliminate the need for a control programme in 1961.

Mr. Flieger explained that the boundaries of the spray area shown on the map had been decided at the meeting of the Advisory Committee of Forest Protection Ltd., which is made up of representatives of the Provincial government and the Forest Industry. This spray programme was then presented to and agreed on by the directors of Forest Protection Ltd.

It was explained by Mr. Brown that the area to be sprayed is one-third Crown land, one-third small private holdings and one-third large private holdings.

Dr. Prebble stated that with the above as background the meeting should now deal with the problems arising from the prospects of a 1960 spray programme. The Chairman then called on Mr. Wright for comment.

Mr. Wright explained that a number of wildlife study areas are located just inside the southern boundary of the spray area. He reviewed the projects involving woodcock, ducks and ruffed grouse explaining that his budget and programme for 1960 studies are settled. He pointed out that the direct effect of DDT on these birds had not been studied; however for a short period during their early life they feed exclusively on insects. Since spraying would eliminate the insects there would likely be heavy losses through starvation. He asked that serious consideration be given to omitting the wildlife study areas from the overall spray area. (Full statement attached as Appendix I).

Dr. Webb in reply to a question from Dr. Solman explained that exempting a small area would lessen the effectiveness of the programme and could necessitate additional spraying in the following year.

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A discussion followed on the destruction of insects in the area and the effect on ducks.

With reference to the Acadia Forest Experiment Station Mr. Beall stated that the Forestry Branch would like to see the station area sprayed to keep the trees alive, to permit the continuation of their work on growth and yield.

Dr. Prebble advised that a request had been received from the Director of the Experimental Farm of the Canada Department of Agriculture, for the exemption of the farm and a protective band around the property. He added that the Forest Biology Division has a number of plots south of the Saint John River, in the proposed spray area, where studies on introduced predators of Adelges piceae are being carried out. A discussion followed on possible ways of dealing with these proposed exemptions. Mr. Flieger pointed out that it was dangerous to leave unsprayed patches within the hazard area. He added that since the Adelges plots are on the perimeter of the spray area they could be omitted without a great risk to the programme.

Dr. Prebble asked Dr. Kask if he or Mr. Hourston would review the fisheries problems. Dr. Kask asked Mr. Hourston to lead off.

Mr. Hourston stated that the Department of Fisheries was very pleased with the information on infestations provided by the Interdepartmental Committee. He continued that through the Committee other insecticides and lower concentrations of DDT had been tested in the field. These field studies showed that ¼ lb. of DDT per acre could effect control of the budworm without appreciable damage to fish.

Mr. Hourston referred to the proposed spray programme which had been announced at the October meeting of this Committee. He produced a tracing showing the location of salmon streams in the spray area. He stated that since it is a known fact that ½ lb. DDT per acre will kill fish no effort would be made by fishery agencies to assess the damage if this concentration is used. He added that the alternative of ¼ lb. DDT per acre should be considered for use in the entire spray area. If this concentration is used the fishery agencies would undertake an assessment programme. He then stated that if the alternative was not favourably considered, in view of the fact that Federal funds were involved, the matter would be put before the Minister of Fisheries for consideration by the Government.

In reply to a question by Dr. Kask, Mr. Beall stated that the cost of such spray programmes is divided equally between the Federal and Provincial Governments and the forest industry.

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Dr. Kask inquired as to who decides on the concentration to be used. Dr. Prebble stated that to date it has been a rule of thumb developed from earlier work done in Ontario and Quebec. In reply to Dr. Kask's question on who would decide on the concentration to be used in 1960, Dr. Prebble stated that the proposed concentration had not been changed from the previous New Brunswick programmes.

A discussion followed on the development of the concentration now used. Dr. Prebble stated that the Forest Biology Division is responsible for infestation surveys, population studies, and assessment of hazard; and has assisted in calibration of aircraft, in scheduling of spraying operations in relation to phenological development, etc. To date, the Division had not recommended a change in concentration of the spray formulation. He added that the Forest Biology Division is not a member of Forest Protection Limited, but supplies information and acts in an advisory capacity.

Dr. Kask asked what concentration is proposed for the 1960 programme. Mr. Flieger stated that insecticide had been ordered and it was proposed to formulate and apply the spray in the concentration and dosage used in previous years (½ pound DDT per ½ gallon per acre). Dr. Kask stated that the would like to see a firm recommendation from the Committee that the proposed programme be carried out at a concentration of ¼ lb. of DDT per acre.

At the request of Dr. Prebble, Dr. Fettes reviewed the results of the 1958 and 1959 field trials. He stated that none of the other insecticides tested were as effective as DDT. In 1958 good control resulted using ¼ lb. DDT per gallon per acre. He added that in the 1959 programme a lower volume was used (¼ lb. / ½ gallon / acre). This was established to be a lethal concentration giving as good control as the higher concentration. He added that the plots were small and the results may or may not be applicable to a large scale project. He recommended that the ¼ lb./½ gallon/acre be used in one watershed in 1960 where fisheries studies could be carried out to compare the effects with the ½ lb. per ½ gallon per acre.

Dr. Webb added that the use of the ¼ lb. per ½ gallon per acre could necessitate respray and might result in forest kill from continuing budworm defoliation. A lengthy discussion followed on the effect of the spray on salmon stocks, the difference between small plots and large spray areas.

Dr. Kask suggested that since the resources belong to the people of Canada perhaps the spraying might be undertaken by the two governments.

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Discussion continued on the factors controlling the effectiveness of the spray on budworms. Dr. Fettes illustrated various points by presenting data from the 1959 field tests. Dr. Prebble stated that effectiveness obviously depended on recovery, at a near ground level, of a sufficient density of lethal droplets; and that the 1958 and 1959 trials appeared to show convincingly that with good coverage, the droplets from a formulation of ¼ lb. DDT per ½ gallon produced an acceptably high budworm mortality. Since there appeared to be concern about the wisdom of reducing the DDT concentration, the data should be set forth in greater detail. Dr. Fettes stated that there were a number of statistical problems involved in analysing the data.

Dr. Prebble stated that his group will have the data analysed by Monday (November 16). He added that if the data, when presented more fully than hitherto, confirm the effectiveness of the lower concentration in producing budworm mortality, Dr. Kask's recommendation would have to be supported. It was important to note that use of an effective but reduced spray concentration would not alter other variables in the spraying operation, e.g. meteorological conditions, flying pattern, dosage per acre, etc. If the lower concentration was effective in 1958 and 1959, the prospects of obtaining satisfactory results in 1960 operations should not be lessened.

The Chairman stated that there were three decisions to be made:

(1) Mr. Wright's Proposal for area exemption.
(2) Department of Agriculture's proposal for area exemption.
(3) Concentration of the operational spray.

Dr. Logie asked for an exemption of a band along the Saint John River. Mr. Flieger indicated that the river would not be sprayed directly.

Mr. Flieger stated that he would like a copy of the complete data from the field trials. Dr. Prebble agreed to supply these data.

The meeting adjourned at 5:45 p.m., with the understanding that the Committee would be called together in the very near future to consider recommendations re proposed exemptions and concentration of the operational spray.

E. W. Burridge,
Protem Secretary,
Interdepartmental Committee
on Forest Spraying Operations.

O t t a w a,
November 17, 1959.

Attach: Appendix I.

APPENDIX I

Remarks to the Interdepartmental Committee
on Forest Spraying Operations, November 10, 1959

by

Bruce S. Wright, Director,
Northeastern Wildlife Station,
University of New Brunswick,
Fredericton, N. B.

I want to point out to you some aspects of your programme that impinge upon my field-terrestrial wildlife.

Woodcock

New Brunswick is second only to Michigan as a woodcock producing State or Province on this continent. The highest count of singing male woodcock ever recorded anywhere was made on the Richibucto road area of Sunbury County. This is our Noonan Study Area, and we have nest and brood density figures for it that have not been duplicated anywhere else. The census here was started in 1940, the oldest in the Province, and is part of the annual continental count. You are now planning to spray this area.

In 1958 I showed that there is a statistically significant decrease in the number of young woodcock produced in the sprayed areas of New Brunswick than in any of the other breeding grounds in southern New Brunswick, Maine, Massachusetts, and Minnesota. None of these other areas were sprayed.

This past summer the Massachusetts Wildlife Research Unit has carried out a series of tests to determine the tolerance of woodcock to DDT. The tests show that woodcock are very tolerant of DDT as far as direct poisoning is concerned. The effect on the reproductive rate, and upon chicks, has not yet been measured. All birds tested so far were full grown. This project is continuing.

The collection of wings for age and sex analysis in the northern sprayed zone was continued this year. The material is in the process of working up now. The age trend in this area will be followed closely and compared with the control areas to the south -- at least that was the plan. Now I learn, from a girlat a cocktail party, that you are going to spray my control areas this summer. I would have appreciated being told before a decision was reached. It makes a difference in my budget.

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Ruffed Grouse

New Brunswick is just emerging from a low of the grouse cycle. The increases are spotty, but the nadir has been passed.

The sole food of young grouse for the first month of their lives is insects. You are planning a drastic reduction in insects over some 2¼ million acres of some of the best grouse habitat in New Brunswick -- and during the month of June when the grouse nests hatch.

The ruffed grouse is the most important upland game bird in New Brunswick as judged by the number of hunters seeking it. This drastic reduction in the food supply of the chicks at a time when densities are very low cannot help but retard the recovery of the species. This will be particularly important to the hunters as the area to be sprayed is in the zone of maximum hunting pressure.

Ducks

The most important duck breeding areas in New Brunswick is the Saint John Estuary and the Grand Lake Watershed. Portobello Stream, Indian and French Lakes, and the Sheffield Intervale are the scene of waterfowl surveys, part of the continental waterfowl inventory, which have been made annually since 1945. The feeder streams leading into Portobello Stream and Indian and French Lakes are primary rearing cover heavily used by all local breeding ducks.

The continental waterfowl population is at a low ebb, and the Maritimes generally are also down. The only bright spot in the picture last year was the Grand Lake region of New Brunswick. Here predator control has been used experimentally for two years with excellent results. It is planned to extend this control next year.

The sole food of ducklings for the first two weeks of their lives is insects and their larvae -- particularly aquatic insects. These are mainly consumed when the ducklings are in the primary rearing cover, the small streams and ponds of the bush country above the flood level of the large lakes. This period is from mid-May until the end of July for most species.

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A large scale reduction in insects at this time might well cancel out any beneficial effects of the predator control campaign, and completely defeat any effort to evaluate this project. It also would be generally detrimental to the recovery of local breeding ducks in his heavily shot region.

I think I have said enough to make my point that ALL natural resources must be considered in making a decision such as this. In this instance, for the second time in a row, the terrestrial wildlife values have apparently been ignored -- or at least the persons most concerned with them have not been consulted.

In closing I would like to ask if even now a plea for the exclusion from the spray programme of the watersheds of the brooks draining into Portobello Stream, French Lake, and Indian Lake in Sunbury County might be entertained. This area would include both the duck breeding areas, and the Noonan Study Area so important to our woodcock research programme. Thank you.

* * * *

R F Wolff

[illegible] Wright [illegible] from N.B.

Lat. Rabb Comments on Forest Survey Spec. Nov. 10/59

Queen Charlotte Islands Falling completely B.C. Reconnaissance Committee
Propose to survey abt 30,000 ac. in
3 areas near Queen. Plan to ~~finish~~ resurvey
Propose to survey at reduced standard from 1957? Queen
Sectors. Likely that B.C will ask for provincial
aid on some basis as before.
Perhaps survey also needed to beyond classification

Area quoted as 6 million ac. by mistake for
grading as "reduced survey". Compare with N.B.; Queen B.C.

Vancouver Burnaby

F. Wolff plan to ~~resurvey~~ well defined boundaries
to ~~Fish~~ beyond areas, Wolff for last time recommends "reconnaissance"
survey, i.e. survey roads as well as lots beyond to value classes
for further regulation re. exploitation.

B. Fleming says study area proposed to survey
~~entirely last & incl. beyond~~ all of Acadia F.E.S.
included.

B. Wright Protested survey & Wolff's last study area -
~~says~~ will affect forest, with previous. Has already known
~~same~~ N.B. survey reduced woodcock population. Survey is fine
values insect food for grouse chicks, also dwellings in
waterfowl study area, Suggested excluding Vancouver study area (East west of Acadia)
& some others from survey. Bruce would like to have Acadia
excluded also, as all wetlands shallow ponds in
Grand Lake study area surrounded by John R.

Unofficial I could exclude Vancouver study area, as area
small; also if big enough area alone would affect
Acadia station to expectation from west.

If area is surveyed, it will give routine indication of effect
of DDT on some birds, not available anywhere else.
Vancouver there are other study areas in N.B. & elsewhere in
Maritimes. Thanks opportunity not as right as these. (Vancouver
& Grand Lake)

U. N. B. has agreed to excempt U. woodlot from spray. A small farm will probably want to be excluded, too. These include only those for which plots for fall. really applied study that Dr. Bird want to keep unsprayed.

From fisheries standpoint, whole proposed spray area is inept. Hope that ¼ lb. mixture can be used. If ½ lb. needed, would inform Fisheries Minister by charges to fish, & ask him to take it up with Cabinet when fish contamination being discussed, also to inform N. B. Cabinet.

T. Cleary (Fredericton) pointed out that small mole eyed by Acadia could be stored as fresh from operational standpoint, even millions of acres due to pilot errors, spray equipment, weather, etc. Feller & Cleary proposed using a large land area only (all in one watershed) at ¼ lb/ac., and at ½ lb.

Agreed (Feller) to analyze data further, as quality basis on fish, & have further meeting Committee, probably during 16th. Until study Feller's approval is O.K., have not reasons for to support Fisheries position.

14-0-31

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, CANADA

November 13, 1959.

CIRCULAR MEMORANDUM TO:

Dr. J.L.Kask,
Chairman,
Fisheries Research Board,
West Block,
Parliament Buildings,
Ottawa, Ont.

Mr. W.R.Houston,
Conservation and Development Branch,
Fisheries Department,
Room 321, West Block,
Parliament Buildings,
Ottawa, Ont.

Mr. N.W.Muir,
Chief,
Canadian Wildlife Service,
Dept. of Northern Affairs & National Resources,
Norlite Bldg.,
115 Wellington St.,
Ottawa, Ont.

Mr. H.W.Beall,
Chief, Forestry Operations Division,
Forestry Branch,
Dept. of Northern Affairs & National Resources,
Motor Bldg.,
236 Sparks St.,
Ottawa, Ont.

Confirming views exchanged by telephone this morning, this will set the time of the next meeting of the Inter-departmental Committee on Forest Spraying Operations at 2:00 p.m., Monday, November 23, in Room 321, West Block. Absences of several members of the Committee from town makes it impossible to hold the meeting in the week of November 16th.

As a follow-up to the meeting held November 10th, I think it is important that decision be reached on recommendations regarding the following points:

(a) Claims for exemption of areas from the operational spray program of 1960 advanced by Mr. Wright of the Northeastern Wildlife organization, by the Department of Agriculture and by the Fisheries Department;

(b) The formulation to be recommended by the Committee for the operational spray program in 1960.

Dr. Pettes and his associates are now drawing together data from the experimental program of 1958 and 1959 in comparison with very extensive data gathered in 1951. This material will be reduced to a short, descriptive statement, a number of tabulations and charts, and will be available at the time of the meeting, November 23rd but, owing to absences next week, probably not before the meeting.

I understand from Mr. Mourston that a draft copy of a report on the meeting of November 10th is now about ready and a final report should, therefore, be at hand by November 23rd.

M.L.Prebble
Director, Forest Biology Division.

MLP/M

Harrison/J

The Deputy Minister, Attention Mr. Côté.

J.D.B. Harrison, Director, Forestry Branch. → 14-0-31.

Nov.13/59.

Interdepartmental Committee on Forest Spraying Operations.

Attached for your information are two copies of a report prepared by Mr. H. W. Beall, on a meeting of the Interdepartmental Committee on Forest Spraying Operations, held on 10 November. I believe the Minister will be interested to know the position taken by the representatives of the Department of Fisheries and also the objections raised by Mr. Bruce Wright who is Head of the Northeastern Wildlife Service in Fredericton.

J.D.B.H.

HWB/CS

Dr. J.D.B. Harrison

H.W. Beall

14-0-31

Interdepartmental Committee on Forest Spraying Operations — Nov. 12, 1959

The Committee met on November 10th mainly for the purpose of considering the proposed spraying operation against the spruce budworm in New Brunswick in 1960. Observers present included Mr. B.W. Flieger of Forest Protection Limited, Mr. K.B. Brown of the New Brunswick Department of Lands and Mines and Mr. B.S. Wright of the Northeastern Wildlife Service in Fredericton.

2. At the previous Committee meeting Dr. Fettes of the Forest Biology Division had reported favourably on the results of experiments using one-quarter of a pound of D.D.T. per acre instead of the usual one-half pound per acre as regards effectiveness on budworm. Dr. Kask of the Fisheries Research Board had found that the lower dosage was very much less toxic to fish and aquatic insects. In these circumstances, Dr. Kask told the meeting that the Fisheries people would be prepared to support the New Brunswick program for 1960 provided that one-quarter pound per acre is used. However, if it were proposed to spray at the rate of one-half pound per acre, the Fisheries Department would have no alternative but to recommend to their Minister that the danger to fisheries be represented by him to the Cabinet when the proposal for financial aid to the project is being considered. He also felt that the Federal Government should take the question up with the Government of New Brunswick.

3. Dr. Fettes and Mr. Flieger pointed out that the experiments with the one-quarter pound dosage had been conducted on a very small scale and there was some doubt as to whether this would apply on a full-sized operation having regard to pilot errors, limitation of the spray equipment used on the aircraft and the critical effect of weather conditions at the time of application. They proposed that one or two watersheds within the spray area be given the one-quarter pound per acre dosage with the remainder spray at one-half pound per acre in order to try the reduced dosage on an operational scale. Dr. Kask was not prepared to accept this.

4. The Chairman, Dr. Prebble, thought that more conclusive results might be obtained from the existing evidence by a more detailed analysis of Dr. Fettes' data. It was agreed that this would be done immediately and that a further meeting of the Committee would be held early next week. Dr. Prebble added that if Dr. Fettes' earlier conclusions were sustained regarding the effectiveness of the lighter dosage, the Committee would have no option but to go along with the Fisheries' proposal. It was evident, however, that Forest Protection Limited would have misgivings about such

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an arrangement. Dr. Kask made it clear that he felt that Forest Protection Limited had had too much say in arranging the spray programs in the past and that the stage had been reached when the Governments should take a greater hand.

5. Mr. Wright pointed out that his Service is conducting woodcock studies in the Noonan area immediately west of the Acadia Forest Experiment Station. He strongly urged that this be reserved from spraying since insects form a large part of the young chicks' diet. He would also like to have the Acadia Station deleted from the spray area since some of the streams in it drain into Grand Lake where duck studies are in progress.

6. I pointed out that the Forestry Branch strongly favoured spraying the Acadia Station since it is in a high hazard area where another year's defoliation is likely to cause extensive mortality of the affected species, and research projects have been in progress since the early 1930's. From the subsequent discussion, I do not think that there will be very strong support in the Committee for Mr. Wright's position as far as Acadia is concerned. However, this question together with the exemption from spraying of a number of small plots close to Fredericton, where the Forest Biology Division is studying the balsam woolly aphid, was deferred until next week's meeting.

7. Dr. Prebble had just received from Victoria the report that the British Columbia Pest Control Committee proposes to spray three small areas totalling about 30,000 acres in the Queen Charlotte Islands next summer. It was likely that the British Columbia Government would ask for Federal financial aid on the same basis as for the Vancouver Island operation in 1957. The latter covered an area of 156,000 acres and the Federal contribution was $85,027.

H.W.B.

Mr Beall Hers

DRR:EBC
14[illegible]-0-31
~~M-201~~

Ottawa, November 13th, 1959.

Mr. H. D. Heaney,
District Forest Officer,
P.O. Box 428,
Fredericton, N. B.

Sir:

On November 23rd there will be a further meeting to discuss aerial spraying in New Brunswick during 1960. Certain information may be required by Mr. Beall to permit him to adequately discuss the pros and cons of the spraying program on the Acadia Forest Experiment Station. Could you supply us with two copies please of general information on the stand composition of the forests on the Acadia Forest Experiment Station? We would like to have, as a percentage of the total area, the proportion in balsam and spruce by age groups. The following age groups would be satisfactory:- less than 40 years; 41 to 60 years; over 61 years.

Would you kindly forward this information as quickly as possible so that Mr. Beall can incorporate it in any prepared statement he makes?

Yours faithfully,

DRR

D. R. Redmond,
Chief.

14-0-31

CANADA

DEPARTMENT OF AGRICULTURE

~~SCIENCE SERVICE~~
RESEARCH BRANCH
FOREST BIOLOGY DIVISION

QUOTE FILE 7.9.14

OTTAWA, CANADA
November 16, 1959

Mr. H. W. Beall,
Chief, Forestry Operations Division,
Forestry Branch,
Dept. of Northern Affairs & National Resources,
Motor Bldg.,
238 Sparks St.,
Ottawa, Ont.

Dear Mr. Beall:

I wonder if you would be good enough to bring to the meeting of the Interdepartmental Committee on Forest Spraying Operations, November 23, a map of the Acadia Forest Experiment Station of such a scale that it will be possible to see to what extent there are conflicts of interest between the Forestry Branch in its desire to have the Station sprayed, and of the Northeastern Wildlife Station which wishes to have the headwaters of streams flowing southward into Grand Lake exempted.

I have also written to Mr. Wright and Dr. Webb, and to Mr. Hourston, to have maps submitted, showing other areas proposed for exemption.

With thanks,

Yours sincerely,

M. L. Prebble,
Director,
Forest Biology Division.

MLP/kp

Area Acadia FES - 35 16 sq. mi
= 22,500 acres
= 1% of proposed spray area.

41-2-2(N.B.).

Th Scott Hse

YOUR FILE NO.....

OUR FILE NO. M.201

CANADA

DEPARTMENT

OF

NORTHERN AFFAIRS AND NATIONAL RESOURCES

FORESTRY BRANCH

ADDRESS REPLY TO
FOREST RESEARCH DIVISION

P. O. Box 428,
Fredericton, N. B.

November 19, 1959.

Dr. D. R. Redmond,
Chief, Forest Research
Division,
Forestry Branch,
Dept. N.A. and N.R.,
OTTAWA, Ontario.

DRR

3
019

Sir:

In reply to your letter of November 13, I am attaching two copies of a memorandum to me from Mr. Hughes. This together with his Table 1 provide the information requested on the proportions of Acadia (area) occupied by fir and spruce cover types brokwn down into age groups. Table 2 was added to the memorandum in the belief that some information on volumetric stocking might be useful.

In addition to the possible direct loss of timber through the budworm outbreak, we are also concerned over the damage that may be done to several of our long-term cutting experiments. This includes projects M.205, 206, 304, 308, and 321.

Yours faithfully,

G. C. Cunningham,
for/District Forest Officer.

Att.

Fredericton, N. B.
November 19, 1959.

MEMO TO MR. G.C. CUNNINGHAM:

The relative amounts of the various cover types, age classes and an estimate of merchantable volume for the Acadia Forest Experiment Station have been summarized and are shown in Tables 1 and 2 attached.

Table 1 shows that stands composed principally of balsam fir occupy 17 per cent of the Station area, spruce stands occupy 35 per cent, mixedwood stands 31 per cent, and hardwood stands 17 per cent.

Table 2 shows that on average there is about 2.9 cords of fir per acre, amounting to 18 per cent of the merchantable volume in softwoods and hardwoods.

These figures would indicate that there is a low average volume of fir per acre and that only a small amount of the Station supports fir cover types. But most of the balsam fir is concentrated in certain areas, particularly near major streams, where the softwood stands are predominantly balsam fir and contain more than 10 cords of fir per acre. Fir is an important component in only about one quarter of the spruce and mixedwood types. Thus nearly all of the 64,000 cords of fir are concentrated on about 30 per cent of the Station. Spruce (all species) makes up about 38 per cent of the total merchantable volume of all species. Thus the ratio of spruce to fir, other species ignored, is about 2:1.

E. L. Hughes.

Att.

Table 1. Distribution of Cover Types by Age Classes*, Acadia Forest Experiment Station.

Age Classes	Cover Types					
	Softwood Type		Mixedwood	Hardwood	Total Softwood (Spruce & Fir only)	Total
	Mainly Spruce	Mainly Fir				
Over 61	10.1	7.0	7.1	0.8	17.1	25.0
40-60	22.3	9.4	21.3	11.7	31.7	64.7
Less than 40	2.5	0.4	2.9	4.5	2.9	10.3
Total	34.9	16.8	31.3	17.0	51.7	100.0

*Calculated from the proportion of line plots falling in each condition.

Table 2. Estimate of merchantable volumes, cords/acre, Acadia Forest Experiment Station.

Compartments	Approx. Area	Merchantable Volume		Per cent Balsam Fir	Total Estimates	
		All Species	Balsam Fir		All Species	Balsam Fir
	(acres)	cords/acre	cords/acre		cords	cords
14 to 16 and 22 to 24	5,040	17.1	3.6	21	86,200	18,100
1 to 8	6,210	12.7	1.4	11	78,900	8,700
17 and 9 to 13	5,435	17.1	2.9*	17	92,900	15,800
18 to 21	2,560	16.9	5.2	31	43,300	13,300
25 to 28	2,880	15.7**	2.9**	18	45,200	8,400
Whole Station	22,125	15.7	2.9	18	346,500	64,300

*Computed as 80 per cent of the volume of fir in compartments 14 to 16 and 22 to 24 and based on the less frequent occurrence of fir cover types.

**Computed as average for rest of Station, no recent estimates available. Spruce makes up about 5.9 cords (38 per cent) per acre (Estimates for compartments 9 to 17 and 22 to 24). Total estimate of spruce is about 130,000 cords for the whole Station.

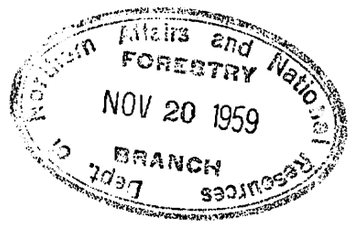
14-0-31

THE GOVERNMENT OF
THE PROVINCE OF NEW BRUNSWICK

DEPARTMENT OF LANDS AND MINES
FREDERICTON, N. B., CANADA

November 19, 1959.

Mr. H. W. Beall
Chief
Forest Operations Division
Forestry Branch
Dept. of Northern Affairs
and National Resources
Ottawa, Canada



Dear Mr. Beall:

I am enclosing a copy of a letter going forward to Malcom Prebble on the subject of the aerial spraying operation.

Yours very truly,

Ken

K. B. Brown
Executive Assistant

KBB/hg
Enc.

THE GOVERNMENT OF
THE PROVINCE OF NEW BRUNSWICK

DEPARTMENT OF LANDS AND MINES
FREDERICTON, N. B., CANADA

November 19, 1959.

Dr. M. L. Prebble
Director
Forest Biology Division
Research Branch
Department of Agriculture
Ottawa, Canada

Dear Malcolm:

Reg Baleh has told me that you have made a further study of the records of experimental spraying and are impressed with the apparent effectiveness of an insecticide containing 6% DDT applied at ¾ gallon to the acre under the experimental conditions. Since we have not had an equal opportunity to examine the records you cannot expect us to be equally impressed.

As you know we consider it highly important to accomplish as effective a spraying job as possible in 1960 and have some hope that if it is successful it will contribute to the final collapse of the present outbreak. Results of spraying in previous years, particularly 1958, leave something to be desired and we would hesitate to recommend anything that would further weaken the hope of success.

We are quite willing to discuss and explore ways and means of improving the over-all results of the spraying operation including the effect on fish and wildlife, provided that it is done objectively and with people with open minds. We must admit, however, that our thinking is influenced by the relative economic importance of the resources concerned and the difficulty of repairing damage to them. These considerations should also influence the persons who must make the final decision.

We are prepared to recommend to our principals that a fair trial should be made of insecticides containing less than 12½% DDT under operating conditions, provided that adequate provision is made for assessing results. We would suggest that this should be done on the Miramichi watershed where the salmon is regarded as being more important. It seems particularly important to provide maximum protection for farm woodlots and small holdings which predominate in the Saint John watershed.

Reg has also told me that you are holding another meeting of the federal Interdepartmental Committee on Forest Spraying Operations on Monday, November 23. It would seem unfortunate if you felt forced to reach a decision and recommendation at that time before the proposal can be fully considered by all concerned. I believe that much more can be gained by presenting a plan of operation which is mutually agreeable as a result of a full understanding of the situation than by presenting separate conflicting arguments.

I will look forward to hearing from you.

Yours very truly,

Ken

K. B. Brown
Executive Assistant

KBB/hg

COPY

DEPARTMENT OF LANDS AND MINES

Fredericton, N. B., Canada

The Government of
The Province of New Brunswick

November 23, 1959.

Dr. M. L. Prebble,
Director
Forest Research Division
Research Branch
Department of Agriculture
Ottawa, Ontario

Dear Malcolm:

Thank you very much for your special delivery letter and enclosed report. I have read both very carefully but since I have only a superficial knowledge of the matter there are many questions in my mind.

It appears to me that the proposed dosage of $\frac{1}{10}$#/$\frac{1}{2}$ gal/acre was tested only once in the two years of experiments and that only one line out of two has been used as a basis of the conclusions drawn. I have also been unable to find any records in the reports you sent me to indicate that the effect of this dose was tested on fish.

As you know we consider this to be a very serious matter and not to be decided hastily or lightly.

I do not expect to see Barney again until early in December but meanwhile I will find out what I can so that I may be able to contribute something to future discussions.

Yours very truly,

(sgd) K. B. Brown
Executive Assistant

KBB/hg

SUMMARY OF A MEETING OF THE INTERDEPARTMENTAL COMMITTEE ON FOREST SPRAYING OPERATIONS HELD IN THE OFFICE OF DR. A.L.PRITCHARD, DEPARTMENT OF FISHERIES AT 2:30 P.M., NOVEMBER 23, 1959.

IN ATTENDANCE:

Dr. M.L. Prebble	-	Forest Biology Division,
Dr. J.J. Fettes	-	Department of Agriculture.
Mr. W.W. Mair	-	Department of Northern
Mr. H.W. Beall	-	Affairs & National Resources.
Dr. J.L. Kask	-	Fisheries Research Board.
Mr. W.R. Hourston	-	Department of Fisheries.
Mr. E.W. Burridge	-	Department of Fisheries.

As agreed at the meeting of November 10, the Committee met to discuss the detailed analysis of the field trial data which had been prepared by Dr. Fettes - (Attached as Appendix I). The Committee also reviewed the matter of DDT concentration in relation to the fisheries resource and the matter of exemptions of wildlife, forestry and agricultural research areas.

The Committee accepted the additional evidence provided by Dr. Fettes as supporting the conclusion that adequate budworm control could be effected by 6.25 percent concentration of DDT at the normal operational dosage per acre, provided that the spray application is carefully carried out.

After due consideration of all factors concerned the Committee agreed to three recommendations, two of which related to the fisheries problem and one to the matter of area exemptions. These are attached as Appendix II.

The Committee having received representations from the Federal Forestry Branch regarding the long-term research activities at the Acadia Forest Experiment Station and the need to protect this area from injury, approved the inclusion of that Station in the operational spray program for 1960, consistent with recommendations (1) and (2).

Meeting adjourned at 5:15 p.m.

E.W. Burridge,
Protem Secretary,
Interdepartmental Committee on
Forest Spraying Operations.

Ottawa, Ontario.
November 25, 1959.

Attach: App: I - II.

APPENDIX I

RESULTS OF THE 1958 AND 1959 AIRPLANE SPRAY TRIALS AGAINST THE SPRUCE BUDWORM IN NEW BRUNSWICK

Report to the Inter-departmental Committee on Forest Spraying Operations, November 23, 1959.

At the Committee Meeting of November 10th, 1959, several pertinent questions were raised about the effectiveness of DDT concentrations lower than those currently used in the spray operations against spruce budworm in New Brunswick. Since parallel studies on aquatic fauna, done by the personnel of the Fisheries Research Board, showed that emitted dosages of $\frac{1}{4}$ lb. DDT per acre were much less harmful to aquatic fauna than higher dosages, serious consideration was given to making recommendations for the reduction of DDT dosages in future spray operations. A more critical examination of the data obtained from the 1958 and 1959 spray trials is presented below to clarify the brief report presented to the Committee, October 14, 1959. The data from which the graphs and subsequent conclusions were drawn are appended.

Many sources of variation inherent in this type of study must be considered in the interpretation of the data. For the most part, the sources of variation cannot be controlled and must become a part of the results. For this reason, masses of data from specific treatments have been pooled so that variations deriving from uncontrolled sources will tend to off-set one another.

The bulk of uncontrolled variation falls into two categories:

(1) Variability in larval samples:

a) A great variation in the number of shoots per unit branch length influences the measurement of larval density.

b) The distribution of larvae throughout a tree or a plot is variable so that any one branch sample may differ greatly from the mean for the plot.

c) The systematic selection of branch samples may include branches which were screened from the spray or, conversely, received greater than normal dose.

(2) Variability in spray deposit samples:

a) The physical behaviour of a spray cloud falling from an aircraft is variable, producing irregular dosages at the target level. A deposit sample card placed in an opening in the forest may be screened by a dense tree upwind. It is important to note that the deposit and biological samples are spatially separated.

b) Effects of meteorological factors:

(i) When a temperature inversion is present, the spray cloud will be drawn into the forest in its entirety, including the tiny droplets which, while effective, do not contribute to the volume deposit figures. When a temperature lapse is present, the opposite is usually true, that is, the air is turbulent and buoyant and small droplets will not be deposited.

(ii) Evaporation, increasing with higher temperature, may sufficiently decrease the size of smaller droplets to prevent their deposition.

The series of trials of 1958 and 1959 were designed to determine the effectiveness of several insecticides, including DDT. Insecticides Korlan, Sevin, DDD and Malathion showed little promise as substitutes for DDT. Consequently, only the results of the DDT spray plots are presented here. The concentrations and dosages of DDT used were:

1# per gallon per acre - full strength (12½% DDT)

½# per gallon per acre - half strength (6¼% DDT)

¼# per gallon per acre - one quarter strength (3 1/8% DDT)

½# per ½ gallon per acre - full strength (12½% DDT)

¼# per ½ gallon per acre - half strength (6¼% DDT)

In an extensive study of DDT application in 10% oil solution on spruce budworm-infested forests, carried out in collaboration with the Defence Research Board, an analysis of a large body of data showed that

the number of spray drops per unit area was the most useful criterion for judging dosage effectiveness (Suffield Report, No. 176, October, 1953, see curve in Fig.1). The data from the 1958 and 1959 experiments as plotted in Fig. 1 agree with the "Suffield" curve and portray the same relationship between drop deposit density and budworm control. Several significant observations can be made from Fig.1:

(1) The results of the 1958 trials are generally somewhat better than those of the 1959 trials.

(2) The full strength dosages (1#/gal/acre) in 1958 produced mortalities equivalent to, if not superior, to the Suffield results.

(3) The $\frac{1}{2}$ strength dosages ($\frac{1}{2}$#/gal/acre or $\frac{1}{4}$#/$\frac{1}{2}$gal/acre) produced mortalities comparable to that of full strength dosages at equivalent deposit densities, with the exception of Line A, of Plot 5, 1959, on which the results were erratic.

(4) $\frac{1}{4}$ strength DDT produced larval mortalities somewhat lower than those produced by higher concentrations, at equivalent deposit densities.

(5) In general, 10 or more drops per square centimeter of a concentration of $6\frac{1}{4}$% DDT, i.e. $\frac{1}{2}$ strength, should give an average of 90% control; whereas about 18 drops per square centimeter would be needed to effect the same control with a concentration of 3 1/8%, i.e. $\frac{1}{4}$ strength.

In a spray operation, it may be desirable to predetermine the final mortality early enough to re-spray or make some change in formulation. Consequently, the data were again graphed to show the relationship between cumulative mortality and time after spray date. Fig. 2 indidates that about 75% of the total mortality should occur within two days. Therefore, the success or failure of a treatment could be judged within two days of the spray application.

Ottawa, Ontario
November 23, 1959.

James J.Fettes,
Chemical Control Section.

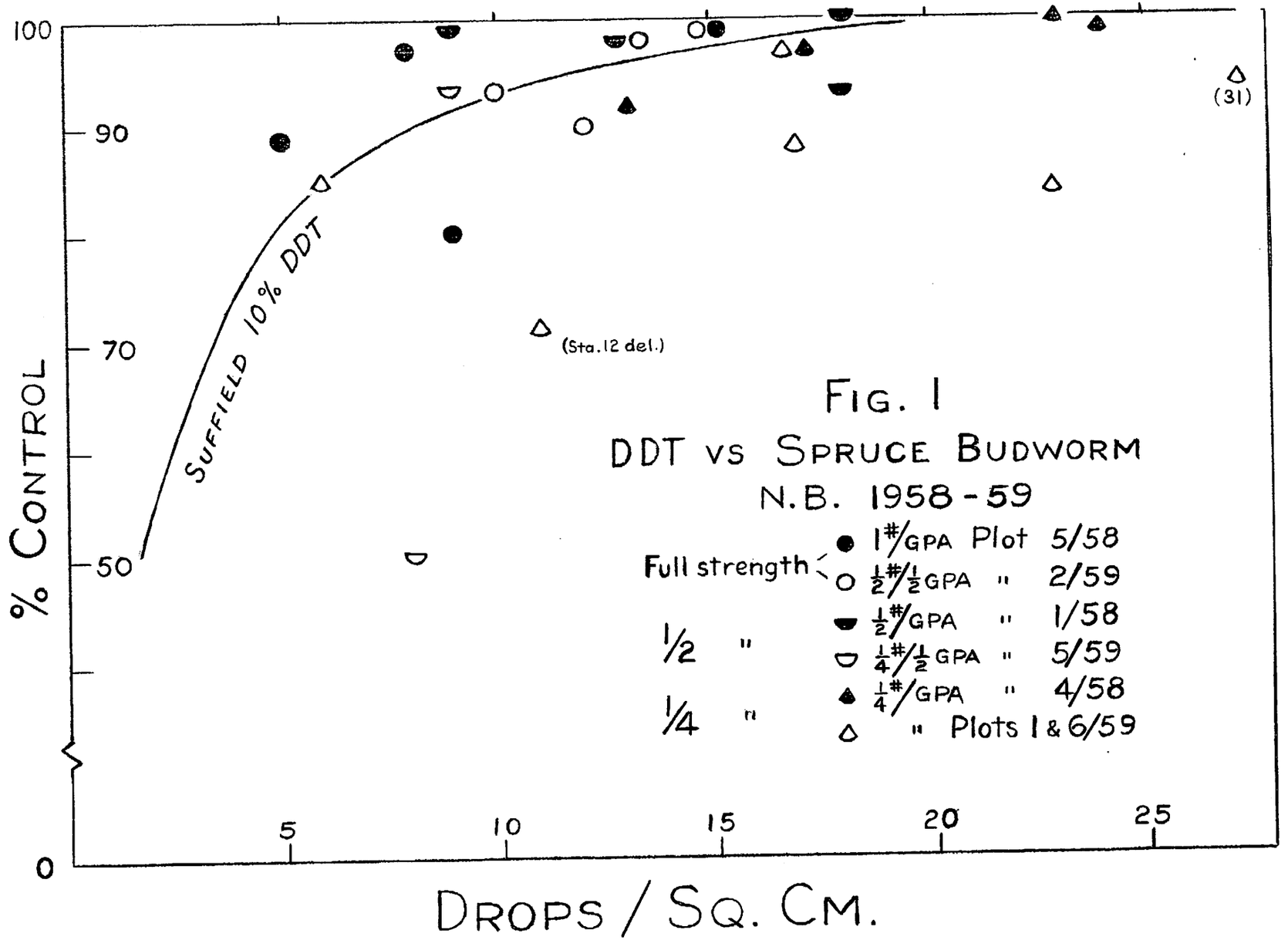


FIG. 1

DDT VS SPRUCE BUDWORM

N.B. 1958-59

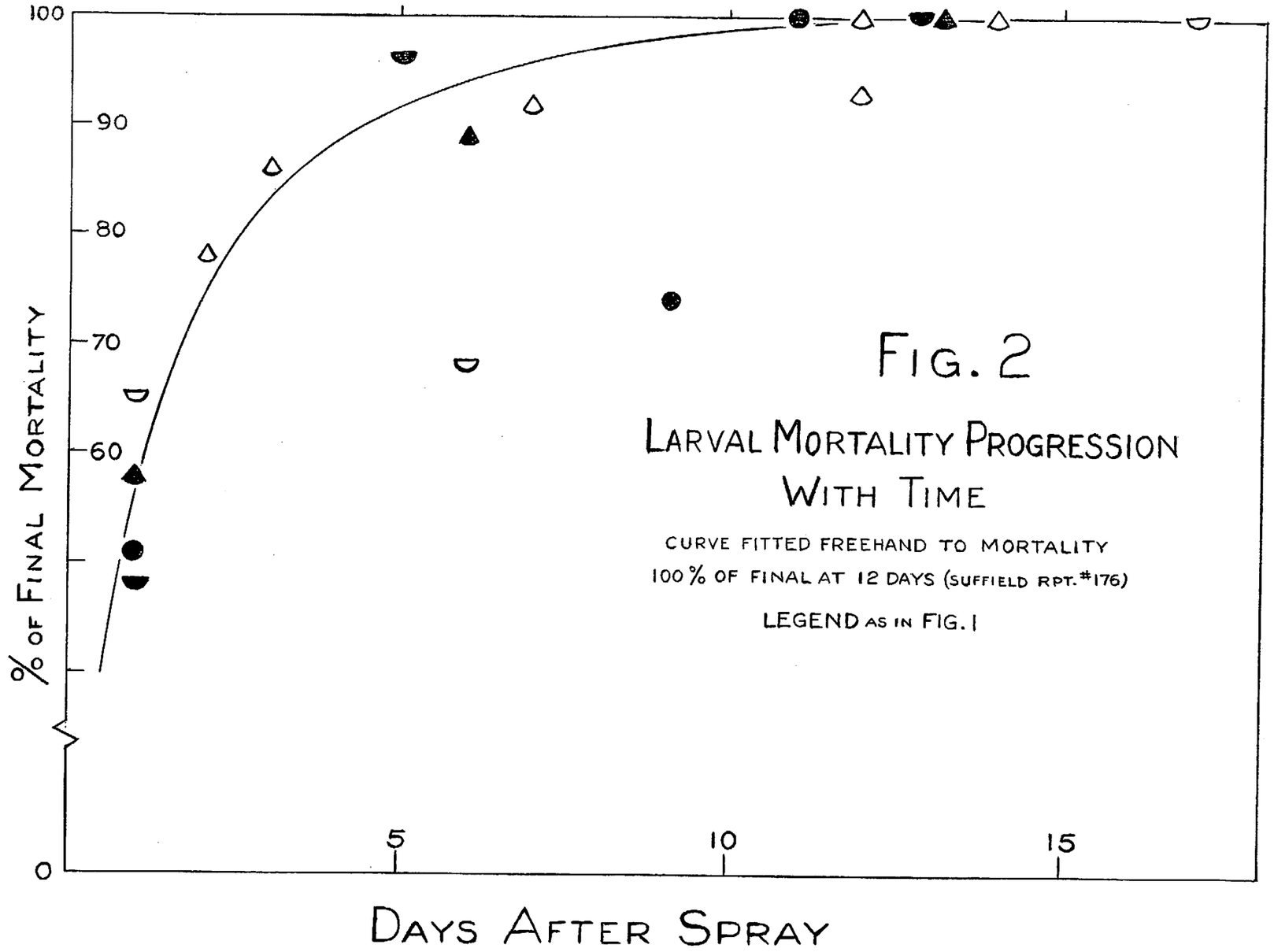


FIG. 2

LARVAL MORTALITY PROGRESSION WITH TIME

CURVE FITTED FREEHAND TO MORTALITY
100 % OF FINAL AT 12 DAYS (SUFFIELD RPT. #176)

LEGEND AS IN FIG. 1

PLOT 1. 1958 DDT 6¼% ½#/Gal/acre

JULY 1 = SPRAY DATE +12 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A +					
0	1.24	21.5	0		
2	.52	5.4	.032		
5	.38	11.6	.004		
6	.45	11.2	0		
8	.29	6.3	0		
10	.24	6.9	0		
12	.57	14.1	0		
14	.35	9.1	0		
16	.31	6.1	.018		
18	.65	6.6	0		
20	1.08	20.6	0		
AV.	.55	17.6	.005	.069	92.8
LINE B +					
0	.46	4.2	.008		
2	.28	1.4	0		
4	.49	7.0	0		
6	.43	24.7	0		
8	.52	17.7	0		
10	.28	12.3	0		
12	.21	3.6	0		
14	.29	8.2	0		
16	.26	1.8	0		
18	.52	6.4	0		
20	.31	10.9	0		
AV.	.37	8.9	.0008	.089	99.1
LINE A -					
2	1.01	25.2	0		
4	.33	20.7	0		
6	.74	16.8	0		
8	.93	10.9	0		
10	.67	9.5	0		
12	.55	22.2	0		
14	.75	23.1	0		
16	.75	19.6	0		
18	.68	18.5	0		
20	.92	11.8	0		
AV.	.73	17.8	.000	.063	100
LINE B -					
2	.38	14.1	0		
4	.33	14.2	0		
6	.55	15.3	0		
8	.43	16.3	.003		
10	.49	16.2	0		
12	.50	11.9	0		
14	.40	8.1	0		
16	.85	13.5	0		
18	.65	14.2	0		
20	.46	7.6	.010		
AV.	.50	13.1	.0015	.080	98.1
TOTAL	.54	11.9	.0018	.073	98

PLOT 4. 1958. DDT 3 1/8% $\frac{1}{4}$#/Gal/Acre

JULY 2 = SPRAY DATE + 12 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A+					
0	.54	16.2	.014		
1	.62	12.3	0		
2	.49	11.1	0		
3	.57	17.1	.009		
4	.69	16.8	.032		
5	.53	12.3	0		
6	.37	12.0	.011		
7	.74	14.1	.006		
8	1.06	14.3	0		
9	.72	10.5	.027		
10	.58	8.7	.054		
Av.	.61	13.2	.010	.129	91.5
LINE A-					
0	.54	16.2	0		
1	.22	12.0	0		
2	.27	9.9	0		
3	.54	11.9	0		
4	.81	15.2	0		
5	.95	21.4	0		
6	.04	24.1	0		
7	-	-	0		
8	.55	16.5	.019		
9	.62	20.0	0		
10	.46	18.0	0		
Av.	.51	16.6	.0015	.064	97.7

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE B+					
0	1.44	21.5	.033		
1	1.34	22.5	0		
2	1.05	22.0	0		
3	1.06	22.4	0		
4	1.37	28.1	0		
5	1.37	30.0	0		
6	1.21	24.8	0		
7	1.14	21.7	0		
8	0.95	23.2	0		
9	0.96	23.9	0		
10	0.87	19.6	0		
Av.	1.02	23.63	.0007	.050	98.6
LINE B-					
0					
1	1.23	19.0	0		
2	1.00	17.1	0		
3	0.81	18.8	0		
4	0.67	22.4	0		
5	0.92	20.3	0		
6	1.23	25.6	0		
7	0.94	25.3	0		
8	0.71	25.5	0		
9	0.94	27.4	0		
10	1.22	30.6	0		
Av.	0.97	23.2	.000	.077	100
Total	.78	19.2	.003	.080	96.3

PLOT 5 1958 DDT 12½% 1#/Gal/Acre

JUNE 30 - SPRAY DATE + 17 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A+					
0	.52	22.5	0		
2	.48	18.3	0		
4	.39	8.2	0		
6	.32	9.3	.032		
8	.07	4.8	.019		
10	.07	6.0	.008		
12	.13	4.3	.0		
14	T .04	4.8	0		
16	.04	3.6	0		
18	.04	1.2	0		
20	.06	1.7	0		
Av.	.20	8.2	.003	.098	97
LINE A-					
2	.36	20.7	0		
4	.30	14.5	0		
6	.53	12.5	0		
8	.30	10.0	0		
10	.14	3.8	.050		
12	.25	5.9	.009		
14	.19	4.5	.0		
16	.32	2.2	.081		
18	.85	6.2	.089		
20	.56	10.8	0		
Av.	.38	9.1	.025	.127	80
Total	.33	9.5	.009	.100	91

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE B+					
0	.23	10.7	0		
2	.22	15.2	0		
3	.18	11.2	0		
6	.33	12.0	0		
8	.26	17.8	0		
11	.67	22.0	0		
12	.74	21.6	0		
14	.80	21.8	0		
16	.41	22.4	.004		
18	.25	6.0	0		
20	.29	8.9	0		
Av.	.40	15.4	.00064	.097	99.3
LINE B-					
2	.09	2.9	0		
4	.15	9.6	0		
6	.10	6.2	0		
8	.21	1.5	.023		
10	.48	6.2	.009		
12	.35	8.0	0		
14	.32	7.1	0		
16	.23	3.6	.022		
18	.52	4.1	.022		
20	.79	9.3	0		
Av.	.32	5.1	.00833	.078	89

PLOT 1. 1959 DDT 3 1/8% (3.64% actual) (#/Gal/acre

JUNE 25 = SPRAY DATE ± 13 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A +					
0	.21	10.9	.062		
1	.06	9.3	.071		
2	.00	6.0	.017		
3	.00	2.6	.012		
4	.11	3.5	.006		
5	.22	6.5	.007		
6	.13	5.8	.017		
7	.05	4.3	.023		
8	.10	6.8	.0		
9	.10	8.0	.009		
10	.05	4.8	.0		
AV.	.09	6.3	.019	.124	85
			(June 24		73)
LINE B +					
1	.21	18.0	0		
2	.56	6.7	0		
3	.04	57.0	0		
4	.68	13.0	0		
5	1.05	12.9	0		
7		8.1	.012		
8		5.2	0		
10		13.7	.012		
11			.025		
			.005		
		16.8	.003	.124	98
AV.			(June 24		78)
LINE A -					
1	.49	15.4	0		
2	.57	20.7	0		
3	.50	22.7	0		
4	.51	23.0	0		
5	.42	19.9	.010		
6	.43	17.6	.068		
7	.72	21.0	.125		
8	.87	32.1	0		
9	.66	34.7	0		
10	.33	17.8	.034		
	.550	22.5	.020	.124	84
			(June 24		91)
LINE B -					
1	.07	8.4	0		
3	<.04	3.4	.043		
5	<.04	8.3	.016		
7	<.04	18.4	.050		
8	<.04	22.0	.013		
10	<.04	5.2	.093		
12	1.40	92.0	0		
13			0		
14			0		
15			0		
			.022	.124	82
		22.5	(June 24		53)
			Deleting Sta. 12	10.9	.036 .124 71
TOTAL	.30	14.6	.017	.124	86

(TOTAL June 24 = 78%)

PLOT 2. 1959 DDT 12½% (10.83% actual) ½#/½Gal/Acre

JUNE 25 - SPRAY DATE + 6 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A+					
4	.38	25.7	0		
5	.51	32.8	0		
6	.10	8.0	0		
7	.36	12.8	0		
8	.26	11.9	0		
9	.51	8.0	0		
10	.10	(6.3)	.019		
11	.04	4.6	0		
12	.10	5.0	.057		
13	.30	4.9	.101		
Av.	.27	12.0	.019	.124	85
			Corrected 90 *		
LINE B+					
1	.14	4.9	0		
2	.22	7.3	.012		
3	.21	13.3	0		
4	.19	16.5	0		
5	.25	15.7	.009		
6	.36	20.5	0		
7	.38	25.8	0		
8	.26	21.7	.012		
9	.10	16.3	.011		
10	.13	12.0	.018		
	.214	15.3	.007	.124	94
				Corrected	99
LINE A-					
1	.40	7.0	.012		
2	.17	13.3	.011		
3	.27	18.6	0		
5	<.02	0.8	.025		
7	<.02	3.5	.046		
8	.14	13.4	0		
10	<.02	3.4	.040		
11	.23	4.2	0		
13	.19	18.6	0		
14	.30	17.6	0		
Av.	.18	10.0	.015	.124	88
			Corrected 93		
LINE B-					
0	.07	5.3	0		
2	.28	7.0	0		
4	.20	14.0	.016		
6	.24	27.6	0		
8	.31	(20)	0		
10	.40	13.7	0		
12	.21	9.2	0		
14	.03	4.4	.064		
16	.31	11.3	0		
18	.23	13.4	.016		
20	.41	20.1	.012		
	.27	13.2	.009	.124	93
				Corrected	98

* Mortality approx. 95% complete in 6 days (see Fig. 2)

Total .23 14.3 .012 .124 90

Dosages A + 9, 11, 12, 13 obtained by matching with line B

Dosage A + 10 is mean of 9 & 11

Dosage B - 8 is mean of B - 6 & 10

Density Average is computed from

$$\frac{\text{Total Larvae}}{\text{Total Shoots}}$$

PLOT 5. 1959 DDT 6¼% (7.81% actual) (1#/½ Gal/acre)

JUNE 24 SPRAY DATE + 17 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control	Sta.	Gals. per Acre.	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A											
1	0	0.20	.052								
2	0	3.9	.086								
3	.45	8.9	.015								
4	.22	8.0	.000								
5	.09	6.1	.000								
6	.07	7.0	.055								
7	.06	8.8	.000								
8	.04	8.2	.105								
9	.10	7.8	.157								
10	.17	9.2	.190								
11	.12	10.9	.085								
12	.07	11.9	.021								
13	T	8.2	.060								
14	.03	5.5	.086								
15	.04	7.0	.098								
	AV.10	7.5	.073						.073	.145	50
LINE B											
1	0	0.0	.006								
2	0	0.05	.000								
3	.43	4.8	.007								
4	.35	11.4	.011								
5	.11	11.5	.015								
6	.04	5.0	.018								
7	.04	3.7	.011								
8	.17	6.8	.015								
9	.42	11.3	.015								
10	.12	26.8	.000								
11	.18	14.8	.000								
12	.09	10.2	.011								
13	.07	6.5	.041								
14	.03	5.4	.019								
15	.03	7.0	.000								
	AV.14	8.5	.010						.010	.145	93
						TOTAL			.031	145	79

PLOT 6. 1959 DDT 3 1/8% (4.79% actual) $\frac{1}{4}$#/Gal/Acre

JUNE 20 = SPRAY DATE + 12 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A					
1	.89	43.5	.019		
2	.84	35.3	0		
3	.92	42.6	0		
4	1.36	54.5	.009		
5	1.33	56.5	0		
6	.79	46.4	.012		
7	.60	39.1	0		
8	.56	40.0	0		
9	.49	33.8	0		
10	.57	34.3	.013		
11	.54	36.8	.012		
12	.35	21.0	0		
13	.17	6.6	0		
14	.09	3.3	.127		
15	.07	2.4	0		
Av.	.64	30.8	.009	.145	93
Total	.59	26.5	.015	.145	90
LINE B					
1	1.08	29.4	0		
2	.44	30.0	.005		
3	.60	20.8	0		
4	1.15	25.1	.011		
5	.95	22.9	0		
6	1.78	23.2	.024		
7	.18	14.3	.057		
8	.15	12.7	.053		
9	.38	27.2	0		
10	.67	19.7	.039		
11	.20	8.2	.015		
12	.26	6.6	.077		
13	.15	10.4	.060		
14	.23	7.1	0		
15	.04	3.8	0		
Av.	.55	17.4	.018	.145	88

APPENDIX II

RECOMMENDATIONS OF THE INTERDEPARTMENTAL COMMITTEE ON FOREST SPRAYING OPERATIONS WITH REFERENCE TO THE PROPOSED 1960 NEW BRUNSWICK DDT SPRAY OPERATION.

"The Interdepartmental Committee on Forest Spraying Operations having studied the report on experimental spray operations against spruce budworm in New Brunswick in 1958 and 1959 as presented by Dr. Fettes under date of November 23, 1959, accepts the evidence that a uniformly applied spray of 6¼% DDT at one-half gallon per acre yielding a droplet density of 10 or more drops per square centimeter at ground level produces as satisfactory budworm control as higher concentrations of DDT spray at the same droplet density. The Committee also has experimental evidence of the lesser hazard to fish and other aquatic life resulting from reduced concentrations of DDT in aerial sprays. The Committee therefore recommends -

(1) that half strength DDT spray (6¼%) be employed as the operational spray for control operations to be carried out in New Brunswick in 1960;

(2) that if there are restricted portions of the proposed spray area on which full strength (12½%) should, in the opinion of the New Brunswick government, be employed, that the areas to be so treated be a matter of negotiation between the New Brunswick government and the Department of Fisheries.

The Committee, having received representations from the Northeastern Wildlife Station for the exemption from the area to be sprayed of the long-term water fowl and woodcock study area from the Richibucto Road south to the Saint John River and east to Indian Lake, and from the Department of Agriculture for the exemption of the Experimental Farm property south of the Saint John River near Fredericton and adjacent territory in which long-term studies of introduced predators of the Balsam Woolly Aphid are being carried out, recognizes the value of the long-term research being conducted and therefore recommends -

(3) that these agencies negotiate directly with the Government of New Brunswick regarding these claims for exemption".

Harrison/J

CONFIDENTIAL

Mr. E. A. Côté Confidential

J.D.B. Harrison. Forestry Branch 14-0-31

Spruce Budworm Spraying. Nov.24/59.

I am attaching a memorandum from Mr. Beall covering agreement reached at the meeting of the Interdepartmental Committee on Forest Spraying Operations held yesterday afternoon. You will note that it was agreed that the ¼ pound of D.D.T. per acre formula was to be used as a standard dosage, with certain areas subject to negotiation re use of ½ pound. No representative of Forest Protection or New Brunswick was present at the meeting.

2. The copy of your Aide Memoire to the Minister on this subject has just come to my attention, and it seems to cover the subject very well. However, the indication on page 2 that "Quebec forces the industry to pay 100 per cent" is not in accordance with the information we have. I believe Quebec pays half the cost.

J.D.B.H.

14-0-31

Cascade F.E.S.

Timber - Balsam stands 17% [illegible]
Spruce " 35% " " " " "
52% " " "

Mixedwood Contour zone
Balsam above 31%
83%

Balsam about equally divided between 40-60 yrs & over 60
Spruce, 2/3 in 40-60 age class

By Volume, Balsam 64,300 cords @ $4.50 = $290,000
Spruce 130,000 " " = 585,000
Sub Total 194,300 " (56% [illegible]) $875,000
all other species 152,200 "
Total 346,500 "

Experimental Values - 5 long-term cutting experiments would be made in operation if forest on these lipped substantially from surrounding op. [illegible] forest it represents.
At H.Q. 22 fieldmen. Expenditures on stations amount to between 1/5 & 1/4 million dollars annually.

Net value of Forest Industries N.B. 1957, £97 million
" " " Fisheries " " " £13 "
(No listing available from D.O.S. for wildlife)
Use of Voges & Saunders on lines 1 & 2 in chart in N.B., in terms of total value.

Arguments for Survey Reader

1. Wood value. Up-beds shrimpage close to £7 million more. Value of wildlife £13 billion. Tidal property-owners duty to protect.

2. Research value. Orchard & clay good research stn. in Maritimes, designed to guide forest management, ~~mainly~~ in up-beds type in central N.B. 22 bldgs. annual expenditure over £200,000. At least 5 long term cutting exptl. woodlot workshops

3. Watersheds. (a) Conserve only small part of total drainage with Indian lake, & very small part of Great lake. (b) If Acadian forests (which lie particularly along streams) killed, & especially if over-run by fire, reduction in streamflow reg. & possible washing of soils into streams might do more damage to fish & wildlife than / storm spraying.

4. Re-establishment, Measures. If tree killed, would take (at 50-100 years to grow new crop). Much shorter rotation for wildlife, & stay on profile.

5. Relative Values in Economy. Value of forest work (including) tourist, throughout zones fresh in New economy.

HWB/bfc

Dr. J.D.B. Harrison

H. W. Beall 14-0-51

Interdepartmental Committee on Forest Spraying Operations Nov. 24, 1959

At a Meeting yesterday, the Committee gave detailed consideration to the attached report by Dr. Fettes on spraying trials of D.D.T. against the spruce budworm in New Brunswick in 1958 and 1959. The following statement was agreed to.

> "The Interdepartmental Committee on Forest Spraying Operations, having studied the report on experimental spray operations against the spruce budworm in New Brunswick in 1958 and 1959 as presented by Dr. Fettes under date of November 23, 1959, accepts the evidence that a uniformly applied spray of 6 1/4% DDT at one-half gallon per acre yielding a droplet density of 10 or more drops per square centimeter at ground level produces as satisfactory bud-worm control as higher concentrations of DDT spray at the same droplet density. The Committee also has experimental evidence of the lesser hazard to fish and other aquatic life resulting from reduced concentrations of DDT in aerial sprays. The Committee therefore recommends: (1) that half-strength DDT spray (6 1/4%) be employed as the operational spray for control operations to be carried out in New Brunswick in 1960; (2) that if there are restricted portions of the proposed spray area on which full strength (12½%) should in the opinion of the New Brunswick government be employed, the areas to be so treated be a matter of negotiation between the New Brunswick government and the Department of Fisheries."

2. These recommendations will be submitted to the Minister of Fisheries immediately for transmittal to the Minister of Lands and Mines, New Brunswick, in view of the need for action on recommendation (2).

...2

RESULTS OF THE 1958 AND 1959 AIRPLANE SPRAY TRIALS AGAINST THE SPRUCE BUDWORM IN NEW BRUNSWICK

Report to the Inter-departmental Committee on Forest Spraying Operations, November 23, 1959.

At the Committee Meeting of November 10th, 1959, several pertinent questions were raised about the effectiveness of DDT concentrations lower than those currently used in the spray operations against spruce budworm in New Brunswick. Since parallel studies on aquatic fauna, done by the personnel of the Fisheries Research Board, showed that emitted dosages of $\frac{1}{4}$ lb. DDT per acre were much less harmful to aquatic fauna than higher dosages, serious consideration was given to making recommendations for the reduction of DDT dosages in future spray operations. A more critical examination of the data obtained from the 1958 and 1959 spray trials is presented below to clarify the brief report presented to the Committee, October 14, 1959. The data from which the graphs and subsequent conclusions were drawn are appended.

Many sources of variation inherent in this type of study must be considered in the interpretation of the data. For the most part, the sources of variation cannot be controlled and must become a part of the results. For this reason, masses of data from specific treatments have been pooled so that variations deriving from uncontrolled sources will tend to off-set one another.

The bulk of uncontrolled variation falls into two categories:

(1) Variability in larval samples:

a) A great variation in the number of shoots per unit branch length influences the measurement of larval density.

b) The distribution of larvae throughout a tree or a plot is variable so that any one branch sample may differ greatly from the mean for the plot.

c) The systematic selection of branch samples may include branches which were screened from the spray or, conversely, received greater than normal dose.

(2) Variability in spray deposit samples:

a) The physical behaviour of a spray cloud falling from an aircraft is variable, producing irregular dosages at the target level. A deposit sample card placed in an opening in the forest may be screened by a dense tree upwind. It is important to note that the deposit and biological samples are spatially separated.

b) Effects of meteorological factors:

(i) When a temperature inversion is present, the spray cloud will be drawn into the forest in its entirety, including the tiny droplets which, while effective, do not contribute to the volume deposit figures. When a temperature lapse is present, the opposite is usually true, that is, the air is turbulent and buoyant and small droplets will not be deposited.

(ii) Evaporation, increasing with higher temperature, may sufficiently decrease the size of smaller droplets to prevent their deposition.

The series of trials of 1958 and 1959 were designed to determine the effectiveness of several insecticides, including DDT. Insecticides Korlan, Sevin, DDD and Malathion showed little promise as substitutes for DDT. Consequently, only the results of the DDT spray plots are presented here. The concentrations and dosages of DDT used were:

1# per gallon per acre - full strength (12½% DDT)

½# per gallon per acre - half strength (6¼% DDT)

¼# per gallon per acre - one quarter strength (3 1/8% DDT)

½# per ½ gallon per acre - full strength (12½% DDT)

¼# per ½ gallon per acre - half strength (6¼% DDT)

In an extensive study of DDT application in 10% oil solution on spruce budworm-infested forests, carried out in collaboration with the Defence Research Board, an analysis of a large body of data showed that

the number of spray drops per unit area was the most useful criterion for judging dosage effectiveness (Suffield Report, No. 176, October,1953, see curve in Fig.1). The data from the 1958 and 1959 experiments as plotted in Fig. 1 agree with the "Suffield" curve and portray the same relationship between drop deposit density and budworm control. Several significant observations can be made from Fig.1:

(1) The results of the 1958 trials are generally somewhat better than those of the 1959 trials.

(2) The full strength dosages (1#/gal/acre) in 1958 produced mortalities equivalent to, if not superior, to the Suffield results.

(3) The $\frac{1}{2}$ strength dosages ($\frac{1}{2}$#/gal/acre or $\frac{1}{4}$#/$\frac{1}{2}$gal/acre) produced mortalities comparable to that of full strength dosages at equivalent deposit densities, with the exception of Line A, of Plot 5, 1959, on which the results were erratic.

(4) $\frac{1}{4}$ strength DDT produced larval mortalities somewhat lower than those produced by higher concentrations, at equivalent deposit densities.

(5) In general, 10 or more drops per square centimeter of a concentration of $6\frac{1}{4}$% DDT, i.e. $\frac{1}{2}$ strength, should give an average of 90% control; whereas about 18 drops per square centimeter would be needed to effect the same control with a concentration of 3 1/8%, i.e. $\frac{1}{4}$ strength.

In a spray operation, it may be desirable to predetermine the final mortality early enough to re-spray or make some change in formulation. Consequently, the data were again graphed to show the relationship between cumulative mortality and time after spray date. Fig. 2 indidates that about 75% of the total mortality should occur within two days. Therefore, the success or failure of a treatment could be judged within two days of the spray application.

Ottawa, Ontario
November 23, 1959.

James J.Fettes,
Chemical Control Section.

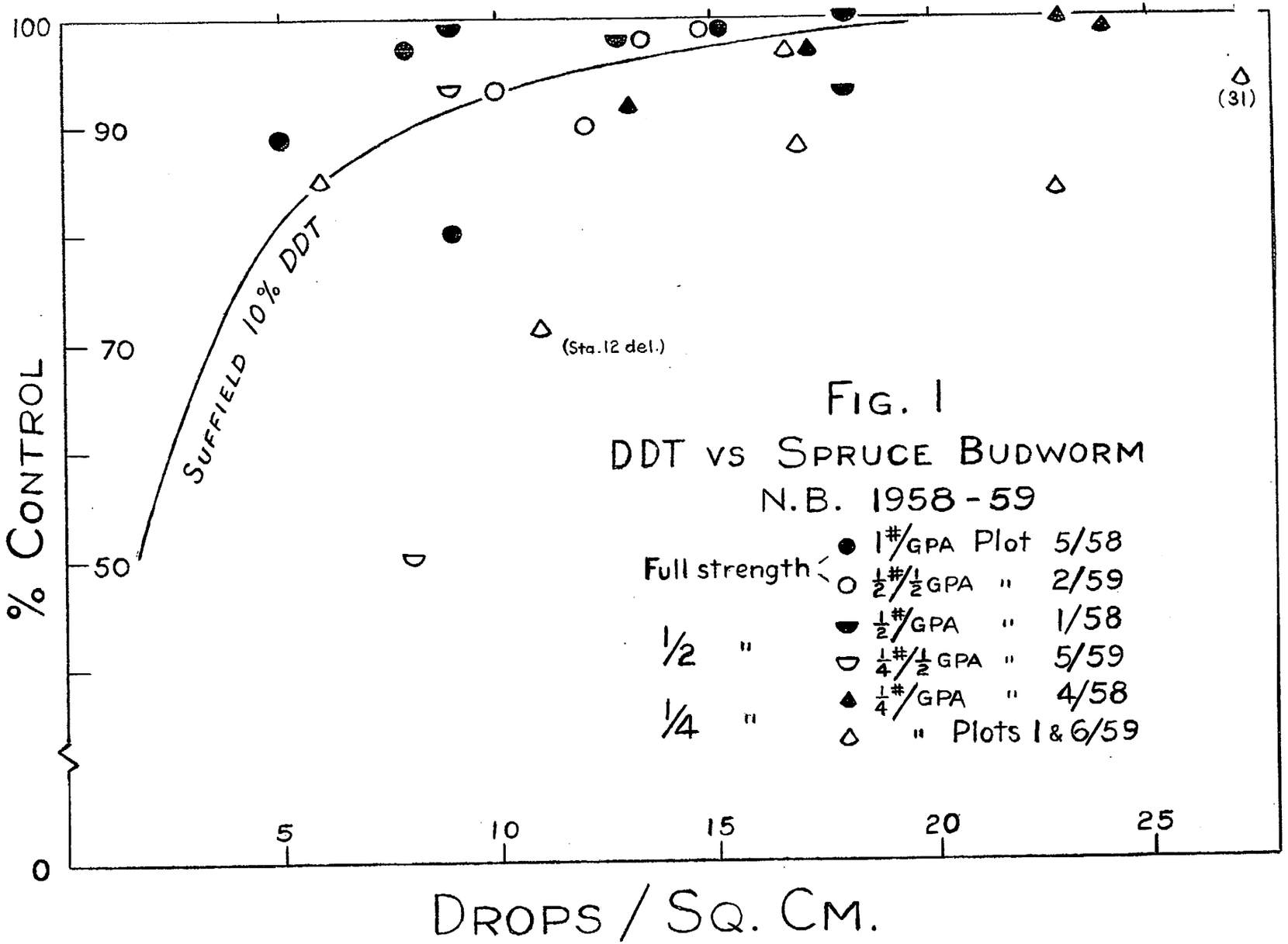


FIG. 1

DDT VS SPRUCE BUDWORM

N.B. 1958 - 59

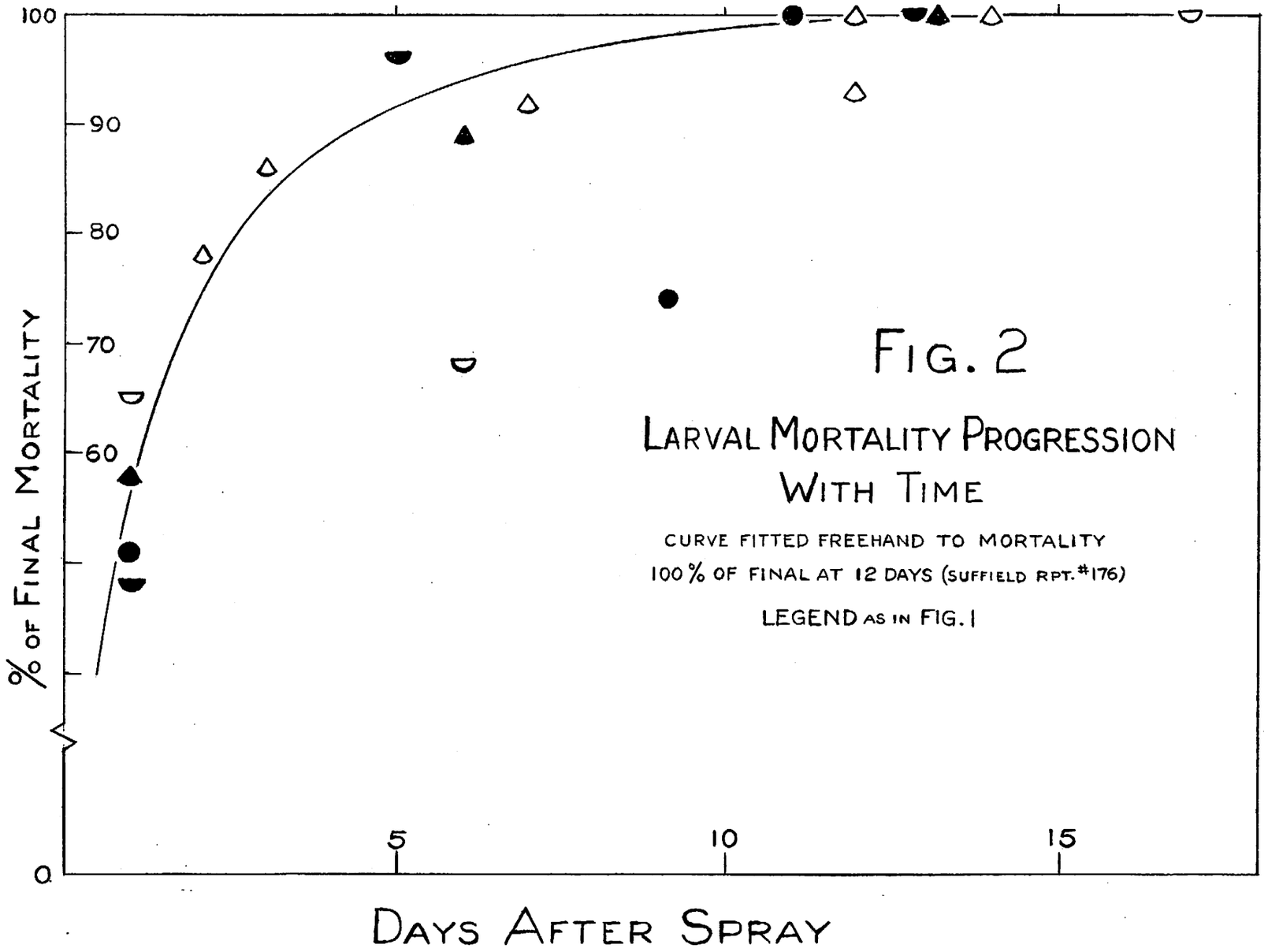


Fig. 2

Larval Mortality Progression With Time

Curve fitted freehand to mortality
100 % of final at 12 days (Suffield Rpt. #176)
Legend as in Fig. 1

PLOT 1. 1958 DDT 6¼% ½#/Gal/acre

JULY 1 = SPRAY DATE +12 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A +					
0	1.24	21.5	0		
2	.52	5.4	.032		
5	.38	11.6	.004		
6	.45	11.2	0		
8	.29	6.3	0		
10	.24	6.9	0		
12	.57	14.1	0		
14	.35	9.1	0		
16	.31	6.1	.018		
18	.65	6.6	0		
20	1.08	20.6	0		
AV.	.55	17.6	.005	.069	92.8
LINE B +					
0	.46	4.2	.008		
2	.28	1.4	0		
4	.49	7.0	0		
6	.43	24.7	0		
8	.52	17.7	0		
10	.28	12.3	0		
12	.21	3.6	0		
14	.29	8.2	0		
16	.26	1.8	0		
18	.52	6.4	0		
20	.31	10.9	0		
AV.	.37	8.9	.0008	.089	99.1
LINE A -					
2	1.01	25.2	0		
4	.33	20.7	0		
6	.74	16.8	0		
8	.93	10.9	0		
10	.67	9.5	0		
12	.55	22.2	0		
14	.75	23.1	0		
16	.75	19.6	0		
18	.68	18.5	0		
20	.92	11.8	0		
AV.	.73	17.8	.000	.063	100
LINE B -					
2	.38	14.1	0		
4	.33	14.2	0		
6	.55	15.3	0		
8	.43	16.3	.003		
10	.49	16.2	0		
12	.50	11.9	0		
14	.40	8.1	0		
16	.85	13.5	0		
18	.65	14.2	0		
20	.46	7.6	.010		
AV.	.50	13.1	.0015	.080	98.1
TOTAL	.54	11.9	.0018	.073	98

PLOT 4. 1958. DDT 3 1/8% $\frac{1}{4}$#/Gal/Acre

JULY 2 : SPRAY DATE + 12 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A+					
0	.54	16.2	.014		
1	.62	12.3	0		
2	.49	11.1	0		
3	.57	17.1	.009		
4	.69	16.8	.032		
5	.53	12.3	0		
6	.37	12.0	.011		
7	.74	14.1	.006		
8	1.06	14.3	0		
9	.72	10.5	.027		
10	.58	8.7	.054		
Av.	.61	13.2	.010	.129	91.5
LINE A-					
0	.54	16.2	0		
1	.22	12.0	0		
2	.27	9.9	0		
3	.54	11.9	0		
4	.81	15.2	0		
5	.95	21.4	0		
6	.04	24.1	0		
7	-	-	0		
8	.55	16.5	.019		
9	.62	20.0	0		
10	.46	18.0	0		
Av.	.51	16.6	.0015	.064	97.7

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE B+					
0	1.44	21.5	.033		
1	1.34	22.5	0		
2	1.05	22.0	0		
3	1.06	22.4	0		
4	1.37	28.1	0		
5	1.37	30.0	0		
6	1.21	24.8	0		
7	1.14	21.7	0		
8	0.95	23.2	0		
9	0.96	23.9	0		
10	0.87	19.6	0		
Av.	1.02	23.63	.0007	.050	98.6
LINE B-					
0					
1	1.23	19.0	0		
2	1.00	17.1	0		
3	0.81	18.8	0		
4	0.67	22.4	0		
5	0.92	20.3	0		
6	1.23	25.6	0		
7	0.94	25.3	0		
8	0.71	25.5	0		
9	0.94	27.4	0		
10	1.22	30.6	0		
Av.	0.97	23.2	.000	.077	100
Total	.78	19.2	.003	.080	96.3

PLOT 5 1958 DDT 12½% 1#/Gal/Acre

JUNE 30 = SPRAY DATE + 17 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A+					
0	.52	22.5	0		
2	.48	18.3	0		
4	.39	8.2	0		
6	.32	9.3	.032		
8	.07	4.8	.019		
10	.07	6.0	.008		
12	.13	4.3	.0		
14	T .04	4.8	0		
16	.04	3.6	0		
18	.04	1.2	0		
20	.06	1.7	0		
Av.	.20	8.2	.003	.098	97
LINE B+					
0	.23	10.7	0		
2	.22	15.2	0		
3	.18	11.2	0		
6	.33	12.0	0		
8	.26	17.8	0		
11	.67	22.0	0		
12	.74	21.6	0		
14	.80	21.8	0		
16	.41	22.4	.004		
18	.25	6.0	0		
20	.29	8.9	0		
Av.	.40	15.4	.00064	.097	99.3
LINE A-					
2	.36	20.7	0		
4	.30	14.5	0		
6	.53	12.5	0		
8	.30	10.0	0		
10	.14	3.8	.050		
12	.25	5.9	.009		
14	.19	4.5	.0		
16	.32	2.2	.081		
18	.85	6.2	.089		
20	.56	10.8	0		
Av.	.38	9.1	.025	.127	80
Total	.33	9.5	.009	.100	91
LINE B-					
2	.09	2.9	0		
4	.15	9.6	0		
6	.10	6.2	0		
8	.21	1.5	.023		
10	.48	6.2	.009		
12	.35	8.0	0		
14	.32	7.1	0		
16	.23	3.6	.022		
18	.52	4.1	.022		
20	.79	9.3	0		
Av.	.32	5.1	.00833	.078	89

PLOT 1. 1959 DDT 3 1/8% (3.64% actual) (#/Gal/acre

JUNE 25 = SPRAY DATE + 13 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A +					
0	.21	10.9	.062		
1	.06	9.3	.071		
2	.00	6.0	.017		
3	.00	2.6	.012		
4	.11	3.5	.006		
5	.22	6.5	.007		
6	.13	5.8	.017		
7	.05	4.3	.023		
8	.10	6.8	.0		
9	.10	8.0	.009		
10	.05	4.8	.0		
AV.	.09	6.3	.019	.124	85
			(June 24		73)
LINE B +					
1	.21	18.0	0		
2	.56	6.7	0		
3	.04	57.0	0		
4	.68	13.0	0		
5	1.05	12.9	0		
7		8.1	.012		
8		5.2	0		
10		13.7	.012		
11			.025		
			.005		
		16.8	.003	.124	98
AV.			(June 24		78)
LINE A -					
1	.49	15.4	0		
2	.57	20.7	0		
3	.50	22.7	0		
4	.51	23.0	0		
5	.42	19.9	.010		
6	.43	17.6	.068		
7	.72	21.0	.125		
8	.87	32.1	0		
9	.66	34.7	0		
10	.33	17.8	.034		
	.550	22.5	.020	.124	84
			(June 24		91)
TOTAL	.30	14.6	.017	.124	86
LINE B -					
1	.07	8.4	0		
3	<.04	3.4	.043		
5	<.04	8.3	.016		
7	<.04	18.4	.050		
8	<.04	22.0	.013		
10	<.04	5.2	.093		
12	1.40	92.0	0		
13			0		
14			0		
15			0		
			.022	.124	82
		22.5	(June 24		53)
Deleting Sta. 12		10.9	.036	.124	71
(TOTAL June 24 = 78%)					

PLOT 2. 1959 DDT 12½% (10.83% actual) ½#/½Gal/Acre

JUNE 25. SPRAY DATE + 6 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A+					
4	.38	25.7	0		
5	.51	32.8	0		
6	.10	8.0	0		
7	.36	12.8	0		
8	.26	11.9	0		
9	.51	8.0	0		
10	.10	(6.3)	.019		
11	.04	4.6	0		
12	.10	5.0	.057		
13	.30	4.9	.101		
Av.	.27	12.0	.019	.124	85
			Corrected 90 *		
LINE B+					
1	.14	4.9	0		
2	.22	7.3	.012		
3	.21	13.3	0		
4	.19	16.5	0		
5	.25	15.7	.009		
6	.36	20.5	0		
7	.38	25.8	0		
8	.26	21.7	.012		
9	.10	16.3	.011		
10	.13	12.0	.018		
	.214	15.3	.007	.124	94
				Corrected	99
LINE A-					
1	.40	7.0	.012		
2	.17	13.3	.011		
3	.27	18.6	0		
5	<.02	0.8	.025		
7	<.02	3.5	.046		
8	.14	13.4	0		
10	<.02	3.4	.040		
11	.23	4.2	0		
13	.19	18.6	0		
14	.30	17.6	0		
Av.	.18	10.0	.015	.124	88
			Corrected 93		
LINE B-					
0	.07	5.3	0		
2	.28	7.0	0		
4	.20	14.0	.016		
6	.24	27.6	0		
8	.31	(20)	0		
10	.40	13.7	0		
12	.21	9.2	0		
14	.03	4.4	.064		
16	.31	11.3	0		
18	.23	13.4	.016		
20	.41	20.1	.012		
	.27	13.2	.009	.124	93
				Corrected	98

* Mortality approx. 95% complete in 6 days (see Fig. 2)

Total .23 14.3 .012 .124 90

Dosages A + 9, 11, 12, 13 obtained by matching with line B

Dosage A + 10 is mean of 9 & 11

Dosage B - 8 is mean of B - 6 & 10

Density Average is computed from

$$\frac{\text{Total Larvae}}{\text{Total Shoots}}$$

PLOT 5. 1959 DDT 6¼% (7.81% actual) (1¼#/½ Gal/acre)

JUNE 24 SPRAY DATE+17 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control	Sta.	Gals. per Acre.	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A											
1	0	0.20	.052								
2	0	3.9	.086								
3	.45	8.9	.015								
4	.22	8.0	.000								
5	.09	6.1	.000								
6	.07	7.0	.055								
7	.06	8.8	.000								
8	.04	8.2	.105								
9	.10	7.8	.157								
10	.17	9.2	.190								
11	.12	10.9	.085								
12	.07	11.9	.021								
13	T	8.2	.060								
14	.03	5.5	.086								
15	.04	7.0	.098								
	AV.10	7.5	.073						.073	.145	50
LINE B											
1	0	0.0	.006								
2	0	0.05	.000								
3	.43	4.8	.007								
4	.35	11.4	.011								
5	.11	11.5	.015								
6	.04	5.0	.018								
7	.04	3.7	.011								
8	.17	6.8	.015								
9	.42	11.3	.015								
10	.12	26.8	.000								
11	.18	14.8	.000								
12	.09	10.2	.011								
13	.07	6.5	.041								
14	.03	5.4	.019								
15	.03	7.0	.000								
	AV.14	8.5	.010						.010	.145	93
						TOTAL			.031	145	79

PLOT 6. 1959 DDT 3 1/8% (4.79% actual) $\frac{1}{4}$#/Gal/Acre

JUNE 20 = SPRAY DATE + 12 DAYS

Sta.	Gals. per Acre	Drops per cm^2	Larval Density Observed	Larval Density Expected	Per Cent Control
LINE A					
1	.89	43.5	.019		
2	.84	35.3	0		
3	.92	42.6	0		
4	1.36	54.5	.009		
5	1.33	56.5	0		
6	.79	46.4	.012		
7	.60	39.1	0		
8	.56	40.0	0		
9	.49	33.8	0		
10	.57	34.3	.013		
11	.54	36.8	.012		
12	.35	21.0	0		
13	.17	6.6	0		
14	.09	3.3	.127		
15	.07	2.4	0		
Av.	.64	30.8	.009	.145	93
Total	.59	26.5	.015	.145	90
LINE B					
1	1.08	29.4	0		
2	.44	30.0	.005		
3	.60	20.8	0		
4	1.15	25.1	.011		
5	.95	22.9	0		
6	1.78	23.2	.024		
7	.18	14.3	.057		
8	.15	12.7	.053		
9	.38	27.2	0		
10	.67	19.7	.039		
11	.20	8.2	.015		
12	.26	6.6	.077		
13	.15	10.4	.060		
14	.23	7.1	0		
15	.04	3.8	0		
Av.	.55	17.4	.018	.145	88

FILE No. 702-1-10

CANADA

DEPARTMENT OF FISHERIES

OTTAWA

811107

November 26, 1959.

Mr. H. W. Beall, Chief,
Forestry Operations Division,
Department of Northern Affairs
and National Resources,
Motor Building, Sparks Street,
O t t a w a.

Dear Mr. Beall:

There is enclosed 3 copies of the summary of the November 23rd meeting of the Interdepartmental Committee on Forest Spraying Operations and also 2 copies of the notes of the November 10 meeting. We would appreciate being advised of any corrections, additions or deletions.

In accordance with the decision reached by Departmental representatives at the meeting the Minister has written to the Minister of Lands and Mines in New Brunswick enclosing a copy of the Committee's recommendations and requesting an opportunity of discussing Recommendations 1 and 2 with him.

Yours very truly,

W. R. Hourston,
Secretary,
Interdepartmental Committee
on Forest Spraying Operations.

Encls. 5.

3. The Committee also:

(a) Approved spraying of the Acadia Forest Experiment Station in 1960 consistent with recommendation (1).

(b) Recommended that exemptions from spraying proposed by the Forest Biology Division with respect to balsam wolly aphid studies and by the Northeastern Wildlife Station regarding woodcock and grouse studies be subject to negotiation between the agency concerned and the Government of New Brunswick.

4. Mr. Mair of the Canadian Wildlife Service hopes that it will be possible to have part of the Noonan Woodcock Study Area sprayed and part exempt from spraying in order to make a study of the effect of spraying on upland game birds. He is to confer with Mr. B.S. Wright on this point and if at all possible, arrange to have the portion of the Woodcock Study Area, which adjoins the Acadia Forest Experiment Station, sprayed, leaving the part furthest from the Station, unsprayed.

H.W.B.

DEPARTMENT OF LANDS AND MINES

Fredericton, N. B., Canada

The Government of
The Province of New Brunswick

November 26, 1959.

Dr. M. L. Prebble
Director
Forest Research Division
Research Branch
Department of Agriculture
Ottawa, Ontario

Dear Malcolm:

Mr. Buchanan has received a letter from the Minister of Fisheries in which he states that "Scientists of the Department of Agriculture (Forest Biology Division) working with scientists of my Department , have conclusively shown that one-half the concentration of DDT (6¼%) is equally destructive to spruce budworm and is not nearly so injurious to young salmon and other aquatic organisms." He also enclosed a copy of your recommendation of November 23rd.

It seems to me that you must have some evidence unknown to us as the grounds for the Minister's statement. Would you please supply us with copies of this data so that we may be in a position to discuss the matter with our principals here.

...2.

We are most anxious to improve the over-all results of the operation but have not yet been convinced that we should risk going all the way in converting to the weaker insecticides as you recommend.

Will you also obtain for me copies of pertinent data from the Fisheries Research Board so that our files will be up to date.

I would like to have this as soon as possible so that a meeting to finalize plans can be arranged.

Yours very truly,

(sgd)K. B. Brown
Executive Assistant

KBB/hg

14-0-31

FILE No. 702-1-10

CANADA

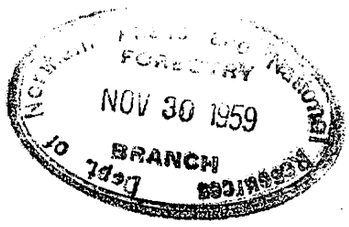
DEPARTMENT OF FISHERIES

OTTAWA

November 27, 1959.

891145

Mr. H. W. Beall, Chief,
Forestry Operations Division,
Department of Northern Affairs
and National Resources,
Motor Bldg., Sparks Street,
O t t a w a.



Dear Mr. Beall:

I am enclosing 3 copies of the revised summary of the November 23rd meeting. Would you please replace the original copies with this.

Rose
Hurst

Yours very truly,

W. R. Hourston,
Secretary,
Interdepartmental Committee on
Forest Spraying Operations.

GOVERNMENT OF CANADA

ACTION REQUEST

CGSB 6-GP-12
P.P. & S. Cat. 3433

TO Mr. [illegible]

LOCATION " Redwood WRR

FOR:

FILE NO.....

	ACTION		NOTE & FORWARD
	APPROVAL		NOTE & RETURN
	COMMENTS		REPLY, PLEASE
	DRAFT REPLY		SEE ME, PLEASE
✓	INFORMATION		SIGNATURE
	INVESTIGATION		TRANSLATION
	MORE DETAILS		YOUR REQUEST
	NOTE & FILE		

PREPARE MEMO TO:.....

REPLY FOR SIGNATURES OF: Mr. Wright

REMARKS:

Copy of the area be counted
except from spraying did not
include, but partly adjoined,
the Acadia F.E.S.

FROM	PHONE	LOCATION	DATE
	Ferg		Nov 27

Copy for Mr. H.W. Beall

OUR FILE NO. 14-0-31

YOUR FILE NO. 891129

CANADA
DEPARTMENT OF NORTHERN AFFAIRS AND NATIONAL RESOURCES

NATIONAL PARKS BRANCH — CANADIAN WILDLIFE SERVICE

Ottawa, November 26, 1959.

Mr. Bruce Wright,
Director,
Northeastern Wildlife Station,
University of New Brunswick,
Fredericton, New Brunswick.

Dear Bruce:

The Interdepartmental Committee on Forest Spraying Operations held its most recent meeting on November 23rd, 1959. At that time your request for the withdrawal of your research area from that to be sprayed came up for discussion. The Committee has authorized me to write you on its behalf, setting forth certain pertinent points and decisions of the meeting. Full minutes will, I believe, be forwarded to you shortly.

The Interdepartmental Committee was set up specifically to come to grips with the problem of the divers, and sometimes seemingly opposed, needs of the several resource agencies concerned with the spray program. The legitimate interests of those agencies were recognized and a research program set up to test the efficacy of several chemicals, including D.D.T., in the control of spruce budworm and the toxicity of those sprays to fish and other aquatic fauna. Tests were carried out using the standard concentration of D.D.T. (12½%) now in use and lower concentrations in one gallon and one half gallon of the formulation or solvent.

It will be seen that the terms of reference of the Committee revolve around the problem of finding ways and means of controlling the insect pest without undue loss to other faunal resources. It is with that problem that discussion in general has dealt.

... 2

The question arose at the November 23rd meeting of the case for exemption of certain research areas from the spray program. After considerable discussion it became clear that regardless of the sympathy of the Committee to research needs in the area, the problem of what areas, if any, should be removed from coverage by the spray program is outside the terms of reference of the Committee. Accordingly it was concluded by the Committee that the Northeastern Wildlife Station, the Department of Agriculture and the Fisheries Department, including the Fisheries Research Board, should make individual representations as required to the appropriate agency for special consideration. You would, I think, make your case to the New Brunswick government (presumably through the Department of Lands and Mines) as the body responsible for the spray program.

I am writing you this because I should like to stress the possibilities for some extremely useful research should part or all of your research areas be in fact sprayed in 1960. Upon reviewing the map depicting spruce budworm hazard I note that an area of extremely high hazard covers the easterly portion of your woodcock research area and some of the waterfowl area immediately to the south. There appears to be a strong probability that that area may have to be sprayed.

As you of course know, there has been considerable research on the effect of insecticides on wildlife carried out in the United States. But even yet our knowledge of the matter is unfortunately sketchy in many respects. Actual field data are sadly few in number and inconclusive. Your research areas, whereon you have continuous data for a very significant number of years, could prove to be most valuable, should the worst come to the worst, in providing us in Canada with the first really well documented evidence on the effect of D.D.T. spraying on game birds. In particular, if portions of your area were sprayed while others were not, and so could act as checks, it should be possible to gain some very worthwhile data. Our Service would be most interested in such research.

I am sorry that the Interdepartmental Committee on Forest Spraying Operations cannot offer more substantial support of your case as presented to it. However you will appreciate, I know, that we must remain within our terms of

... 3

reference if we are to continue as a useful instrument in this important problem of forest insect spraying.

Yours sincerely,

W. Winston Mair,
Chief.

cc: Mr. H. W. Beall

14-0-31

CANADA

DEPARTMENT OF AGRICULTURE

~~SCIENCE SERVICE~~
RESEARCH BRANCH
FOREST BIOLOGY DIVISION

QUOTE FILE 7.9.14

891147

OTTAWA, CANADA
November 27, 1959

Mr. K. B. Brown,
Executive Assistant,
Department of Lands and Mines,
Fredericton, N.B.

Dear Ken:

Thank you for your letter of November 23 with further reference to the proposed 1960 spraying operations in New Brunswick. The Interdepartmental Committee on Forest Spraying Operations met in the afternoon, November 23, as forecast and I am attaching reports on the meetings of November 10 and November 23, as well as an additional copy of Dr. Fettes' statement reviewed by the committee on November 23. The recommendations which accompanied the report of November 23 meeting represent the carefully considered judgment of the five members of the committee. In this connection I should point out that the individual committee members are expected to keep all aspects of the associated problems in mind and are not there as partisans of one viewpoint.

With regard to the contents of the second paragraph of your letter, the following comments may be helpful to you:

1. The significance of Figure 1 of Fettes' report is that, with the minor exceptions to which I drew attention in my previous letter to you, mortality of the budworm progressed from moderate to high kills in relation to spray-deposit density as expressed in droplets per square cm. regardless of the concentration of DDT in the spray between the limits of 3 1/8 and 12½ per cent (identified in Fig. 1 as ¼-to-full strength).

2. The only sound conclusion that can be drawn from the above is that droplets of DDT spray, from concentrations within the above-noted limits and that are of a size to reach the ground and be recorded, are effectively lethal regardless of the DDT concentratin

.. 2.

that was placed in the aircraft. As was explained at our meeting, November 10, the "full strength" formulation was empirically derived in the first place and has been used for years without major modification and really without much scientific evidence of the necessity of such a high concentration of DDT.

3. Also as explained at the meeting of November 10, there is extensive evaporation of droplets between the time of leaving the aircraft and deposit on the ground. Fettes has extensive data on this from laboratory experiments. The result is that a droplet leaving the aircraft at 12½ per cent DDT might actually be at twenty or twenty-five per cent by the time it reaches the ground - depending on diameter at starting time, air temperature, and the time taken to reach the ground. The same, of course, applies to droplets coming from sprays of lesser initial DDT concentration. The net result in the evidence before us seems that droplets reaching the ground from an original ¼-strength concentration are effectively lethal against the budworm.

4. Therefore, provided the spraying is done sufficiently carefully to yield a droplet count per square cm. of ten or more (and this is producible at ½ gallon per acre, if carefully applied, as well demonstrated by numerous field checks) a spray formulation from 3 1/8 per cent DDT upwards should be quite lethal. Actually the committee has recommended the adoption of ½ strength (¼ lb. per ½ gallon per acre) for two reasons: first of all because the operational program since 1953 has been on the basis of ½ gallon per acre, to economize on flying time; and second, because the Fisheries Research Board staff in their studies found that damage to aquatic life was apparently tolerable at ¼ lb. DDT per acre - substantially less than at ½ lb. DDT per acre.

Fettes' report was not intended to include any information on aquatic life, this having been the responsibility of the Fisheries Research Board group who reported to the committee in 1958 and again in 1959. I am sure that Frank Webb or Dr. Balch could produce for you copies of the reports and statements received from St. Andrews staff of the Fisheries Research Board.

... 3.

I have answered at some length because I want you to be convinced that the Interdepartmental Committee takes its responsibilities seriously, much more so than if the various members were meeting simply as partisans of their four or five fields of interest. I do hope that with the recommendations of the committee now formulated it will be possible for those who are responsible for the detailed planning of the program in New Brunswick to negotiate arrangements with the Fisheries Department that are satisfactory to all concerned.

With kindest regards,

Yours sincerely,

M. L. Prebble,
Director,
Forest Biology Division.

MLP/kp

cc: Dr. A. L. Pritchard
Dr. J. L. Kask
Mr. W. W. Mair
Mr. H. W. Beall

Mr. B. W. Flieger
Dr. R. E. Balch

FOOTNOTE TO Mr. Brown: Dictated in advance of receipt of your letter of November 26. I think my letter contains the essential information now requested except for that obtainable from the Fisheries Research Board. I am advising Dr. Kask of your wish for information from his organization.

M.L.P.

14-0-31
HWB/bfc

OTTAWA, November 30, 1959.

Mr. H. D. Heaney,
District Forest Officer,
P.O. Box 428,
FREDERICTON, N. B.

Sir:

Enclosed for your information and that of Mr. E. N. Doyle are copies of minutes of two meetings of the Interdepartmental Committee on Forest Spraying Operations held on November 10th and November 23rd, 1959.

In accordance with previous practice, please treat the information contained in these minutes as confidential.

Yours faithfully,

H. W. Beall,
Chief.

THE GOVERNMENT OF
THE PROVINCE OF NEW BRUNSWICK

DEPARTMENT OF LANDS AND MINES
FREDERICTON, N. B., CANADA

December 3, 1959.

Dr. M. L. Prebble
Director
Forest Research Division
Research Branch
Department of Agriculture
Ottawa, Ontario

Dear Malcolm:

Thank you for your letter of November 27 and enclosed minutes of meetings. I understand that your recommendation is based on the information supplied to us and that you have no further evidence to support it.

Reg Balch has told me that you plan to be in Fredericton next week and I hope there will be an opportunity to discuss the question with you at that time.

We would like to work out a plan of operations that would use lower strengths of DDT on the watersheds of the more important salmon streams and at the same time provide evidence from extensive areas of the effect of this insecticide on budworms.

It seems to me that, in the range of conditions where practical spraying operations must be carried out, there is a strong possibility of a critical variation related to the strength of DDT in the insecticide. This is supported by statements contained in reports of investigations by your staff.

We have an opportunity to obtain conclusive evidence from the 1960 operation at very little cost or risk of damage. It would seem very strange if we failed to take advantage of the opportunity to settle the question. If we convert the whole operation to half strength and for some reason fail to obtain satisfactory results we will never know why and will be in the same position again

next year. In that event we would be likely to swing toward the other extreme.

Although the Government of Canada has more at stake in terms of tax revenue and alternative payment to unemployed, the Province and the forest industries would be hurt first and are thus more directly concerned over failure to provide adequate forest protection. It will ultimately be necessary to obtain their approval of the plan of operation for 1960 and it would be much more satisfactory if we could first reach agreement at the technical level.

It will be much easier to work this out around a table than at this distance and I hope we can make some progress next week.

Yours very truly,

K. B. B.

K. B. Brown
Executive Assistant

KBB/bg

c.c. B. W. Flieger
R. E. Balch
H. D. Heaney

891385

CANADA

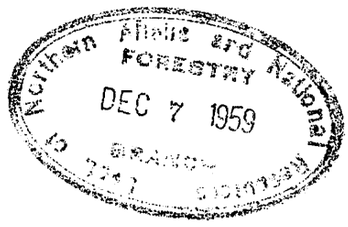
DEPARTMENT
OF
NORTHERN AFFAIRS AND NATIONAL RESOURCES

ADDRESS REPLY TO
FORESTRY OPERATIONS DIVISION

FORESTRY BRANCH

P. O. Box 428,
Fredericton, N. B.

December 4, 1959.



Mr. H. W. Beall,
Chief,
Forestry Operations Division,
Forestry Branch,
Dept. Northern Affairs and
National Resources,
OTTAWA, Ontario.

Sir:

Enclosed is a copy of Mr. K. B. Brown's December 3, 1959 letter to Dr. Prebble of the Department of Agriculture. Since this letter deals with the spruce budworm discussion, I thought that it would be of interest to you.

Yours faithfully,

G. C. Cunningham,
for/District Forest Officer.

Encl.

14-0-31

HWB/bfc

OTTAWA, ~~November 30~~ Dec. 4, 1959.

Mr. H. D. Heaney,
District Forest Officer,
P.O. Box 428,
FREDERICTON, New Brunswick.

Sir:

You have received from Mr. Beall, copies of the minutes of two meetings of the Interdepartmental Committee on Forest Spraying Operations, which were held on November 10th and November 23rd, 1959. Both these meetings dealt with the proposed aerial spraying operation against the spruce budworm in Central New Brunswick next summer.

It will be noted that the Committee, whose members include representatives of the various federal government agencies that are concerned with the effects of forest insect spraying, approved the inclusion of the Acadia Forest Experiment Station in the operational spray program for 1960. This is in accordance with the operational plan which was submitted by Forest Protection Limited for consideration at the Committee's Meeting on November 10th.

The Committee made three recommendations which would have the effect of modifying the operational plan and which are attached as Appendix II to the Minutes of the November 23rd Meeting. While the Committee favoured the employment, as the operational spray for 1960, of the formulation of 6-1/4 per cent DDT (i.e. half the strength of that used from 1953 to 1958), it recognized that the dosage applied to the Acadia Station would be governed by that used in adjacent areas, as a result of negotiations between the New Brunswick Government and the Fisheries Department, as proposed in recommendation (2).

...2

The waterfowl and woodcock study area, for which exemption from spraying was requested by the Northeastern Wildlife Station, are in part adjacent to, but do not include any portion of, the Acadia Forest Experiment Station.

Since the Committee's recommendations do not involve any change in the program proposed by Forest Protection Limited, insofar as the inclusion of the Acadia Station in the sprayed area is concerned, we assume that there has been no change in either the Company's or the provincial government's attitude in this regard. However, in view of the other changes which are now under discussion, it might be as well for you to obtain definite confirmation on this point from the provincial authorities.

As the Cabinet has approved federal financial participation in the 1960 spray program on the same terms as previously, it is expected that Mr. Doyle's liaison duties will be of a similar nature. In the course of his inspection of the spray operation, particular attention should, of course, be paid to the spraying of the Acadia Station as regards the securing of a uniform application of insecticide, and subsequent studies of defoliation by the budworm and residual population of the insect.

Yours faithfully,

J.D.B. Harrison,
Director.