INTERDEPARTMENTAL COMMITTEE ON FOREST SPRAYING OPERATIONS

AGENDA FOR MEETING OF SEPTEMBER 26, 1958.

1. Field Trials of insecticides against the spruce budworm in New Brunswick - J. J. Fettes.

2. Effects on salmon populations of insecticides used in No. 1 - Fisheries Research Board.

3. Laboratory trials of insecticides against spruce budworm. - J. J. Fettes.

4. Trials of insecticides used in No. 3 against salmon under laboratory conditions - Fisheries Research Board.

5. Review of forest insect infestations with regard to control operations in 1959 - M. L. Prebble.

6. Possible continuation of joint field and laboratory investigations - Forest Biology Division, Fisheries Research Board.

7. Other Matters.

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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 9:00 a.m. - on September 26, 1958.

IN ATTENDANCE -

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

Dr. Prebble as Chairman submitted an Agenda for consideration of the meeting. Copy attached hereto. The meeting agreed that the Agenda was satisfactory.

ITEM NO. 1 - Field Trials of Insecticides.

This was reviewed by Dr. Fettes. He stated that last winter the Science Service and the Fisheries Research Board had set out to design experiments to try to discover insecticides which would kill the spruce budworm without serious hazard to fish. It had been decided to check 4 preparations - DDT, DDD, Korlan and Sevin. These would be tested at different concentrations and through bio-assay tests on fish and budworms in the laboratory, and by aircraft spray tests in the field in New Brunswick. He submitted a map showing the location of the spray plots used in New Brunswick.

The Research Board set up aquatic insect and fish population tests in the various spray plot areas. The results of the tests on the fish and aquatic insects would be reviewed by Dr. Kask later in the meeting. Dr. Fettes then reviewed a preliminary report of the field trials of the effect of the 4 insecticides on the spruce budworm, (attached hereto as Appendix I). He pointed out that their effectiveness on the budworm was in the same order that had been established on fish by the bio-assay tests at Nanaimo, that is DDT, DDD, Korlan and Sevin. He stated that in the field tests only DDT and DDD were tested on fish since there was not enough information available on the other two insecticides to warrant large scale tests. He pointed out that

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NORTHERN AFFAIRS AND NATIONAL RESOURCES

14-0-21

INTRADEPARTMENTAL CORRESPONDENCE

TO: Mr. J.D.B. Harkin

DATE January 6th, 1958.

FROM: D. R. Redmond

REFERENCE 42-7

SUBJECT | Fisheries Research Board of Canada

The Fisheries Research Board of Canada held a meeting in the Chateau Laurier Hotel in Ottawa on January 4th from 9:30 a.m. to 1:30 p.m. I was invited to attend by the Department of Agriculture, and was told that this meeting would give a lot of the technical background for the discussion to be held at the meeting on January 10th, 1958, in which fish mortality resulting from the application of insecticides to control forest insects would be discussed.

2. The opening remarks, made by the Chairman, Dr. Hayes, summarized results of the meeting held on January 3rd. He then introduced four speakers whose papers covered the following material:-

1. Dr. F. E. Webb, Forest Biology Laboratory, Fredericton, N.B., gave a very concise summary of spraying operations against the spruce budworm that have been carried out in New Brunswick since 1952 and in south-eastern Quebec since 1954. He outlined the history of the development of the insect outbreak, and the history of spraying as affected by acreage sprayed each year and the dosage used. His talk was very well documented with coloured slides that showed typical damage by the insect, and the extent of damage that is prevalent when spraying is first considered, as well as the appearance of a forest that has been sprayed recently. The type of sampling used to determine budworm mortality from spray was outlined, and the effects of D.D.T. on budworm and other insects were discussed. At the end, he listed the conditions under which D.D.T. should be applied as a control measure for forest insects, and warned of the necessity of knowing the ecology of the insect being controlled, as well as that of other insects that may be affected at the season of spray application. One point worthy of note that was made showed that in New Brunswick, where streams

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were very often used as a boundary for spray blocks, these streams received dosages of D.D.T. double the amount that they would have received had they not been used as boundaries. This is because the streams receive spray twice, once when each of the blocks they delimited was being sprayed.

2. Dr. M. H. A. Keenleyside of the Fisheries Research Board, St. Andrews, N. B., discussed salmon populations as they were determined in the Miramichi River since 1950. The population study was initiated in 1950 to determine the effect of controlling mergansers on the population of salmon fry and parr. Control of mergansers was begun in 1950, and the resulting increase in small salmon was immediately apparent. However, in 1954, the year that D.D.T. was first applied on the Northwest Miramichi, the salmon fry population was almost nil. The populations of small parr and large parr were reduced considerably. In 1955, the population of small fry was more than double that of any year since the study had begun. The reason for the decrease in population in 1954 appears to be toxicity of D.D.T. There are several theories regarding the extremely high population of small fry in 1955. None of them have been completely tested. There has been no means developed for testing the effect of D.D.T. on smolts, running to the sea in the spring, and it is too early to determine that the adult population returning to the rivers has been reduced by the 1954 mortality. This study has been expanded to cover population changes of salmon in branches of the Miramichi other than the Northwest, and has recently been initiated on the Tobique River.

3. Dr. F. P. Ide, Fisheries Research Board, University of Toronto, discussed at considerable length results of his population sampling of aquatic insects on river bottoms in New Brunswick. He was able to show that nearly all aquatic insects are eliminated for a short period following aerial spray with D.D.T. Small insects, such as midges, occur again in great numbers within a few weeks after spraying, but large insects, such as the larger stone flies and the web-spinning caddis flies seem to be eliminated for at least three years. These larger insects provide a great volume of the fish food in the rivers.

4. Mr. W. R. Hourston, Federal Department of Fisheries, Vancouver, outlined the spray programme against the black-headed budworm conducted on 155,000 acres of forest land in British Columbia in 1957. The greater part of his paper dealt with the effect of aerial spray on the population of Coho fry in salmon streams in the treated areas. An emulsifier was used in the preparation of the spray and was found to be toxic to Coho fry at

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concentrations exceeding 2.5 p.p.m. It is not thought that concentrations of the emulsifier reached this level during ordinary spray applications. Mortality of Coho fry was excessively high, approaching 100%, in many of the streams in the spray area. This was unexpected because salmon streams were not used as boundaries for spray areas, and special attempts were made to avoid spraying salmon streams where they could be seen from the air. If a plane was flying directly across the stream, the spray apparatus was shut off while it crossed. In many instances, contour flying was used and spray planes flew parallel to streams. In such cases, the flight along the stream bank was omitted. Studies have shown that concentrations less than 0.005 p.p.m. of D.D.T. are not lethal against salmon fry. Samples of water collected from the several streams in the spray area were tested for concentration of D.D.T. and it was found that the concentration varied from less than 0.01 to as much as 0.40 p.p.m. Sampling of aquatic insect populations revealed that insect mortality was similar to that described by Dr. Ide in the Miramichi in New Brunswick. The Fisheries officers in British Columbia are hoping to restock the rivers in which mortality was excessively high. To date, no firm plans have been made.

DRR

D. R. R.

Members of the Federal-Provincial Co-ordinating Committee on Atlantic Salmon

G. R. Clark, Deputy Minister of Fisheries of Canada, Ottawa (Chairman)

John A. Paterson, Deputy Minister, Department of Industry and Development, New Brunswick

W. W. McCormack, Deputy Minister, Department of Lands and Mines, New Brunswick

Dr. A. Labrie, Deputy Minister of Fisheries, Department of Game and Fisheries, Quebec

L. A. Richard, Deputy Minister, Fish and Game, Department of Game and Fisheries, Quebec

John Bigelow, Deputy Minister of Trade and Industry, Nova Scotia

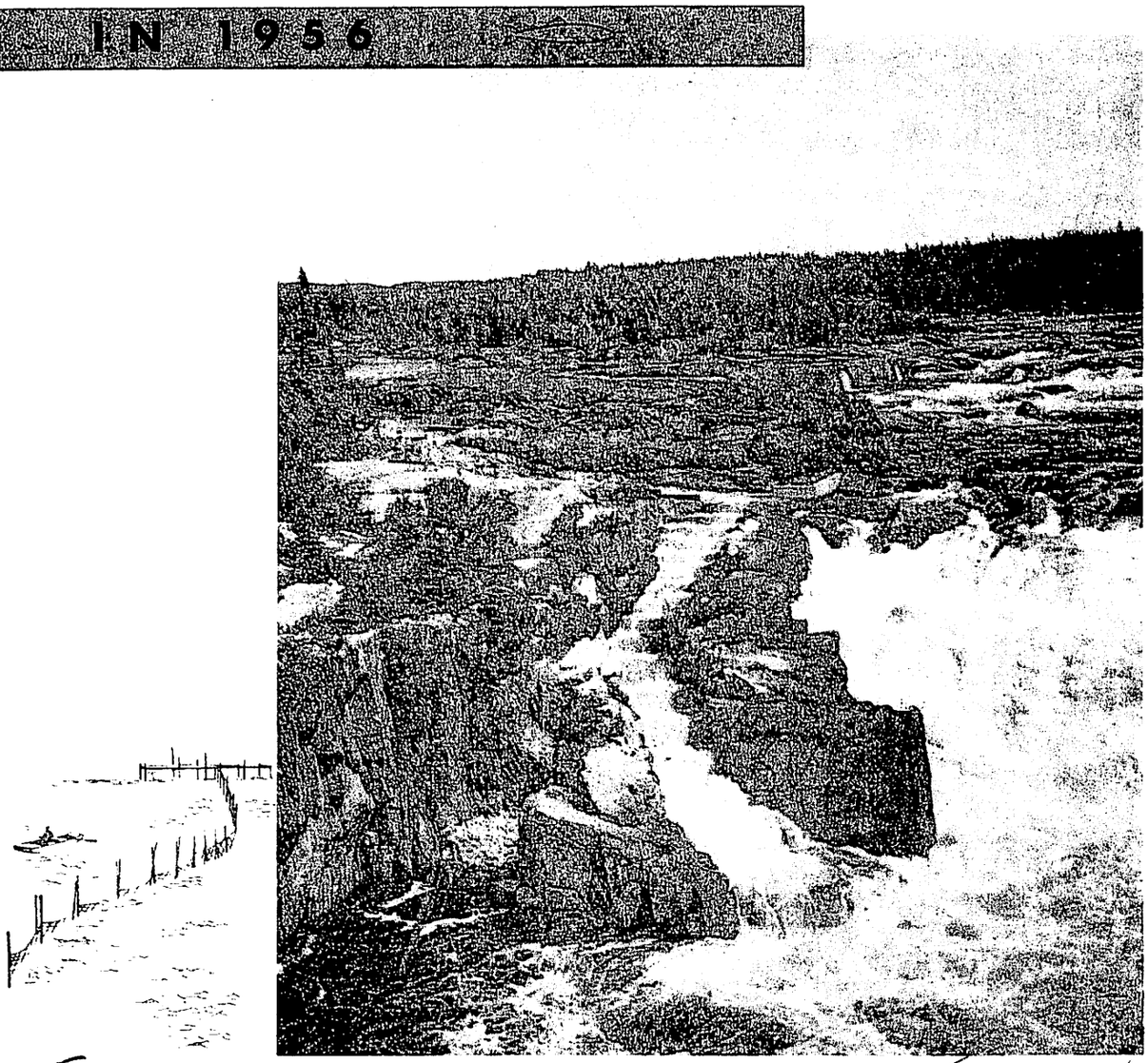
P. J. Murray, Deputy Minister of Mines and Resources, Newfoundland.

E. M. Gosse, Deputy Minister of Fisheries, Newfoundland

P. A. Murnaghan, Deputy Minister, Department of Industry and Natural Resources, P.E.I.

E. M. Gorman, Deputy Minister of Fisheries, P.E.I.

INVESTIGATION AND MANAGEMENT OF ATLANTIC SALMON IN 1956



FEDERAL - PROVINCIAL
CO-ORDINATING COMMITTEE
ON ATLANTIC SALMON

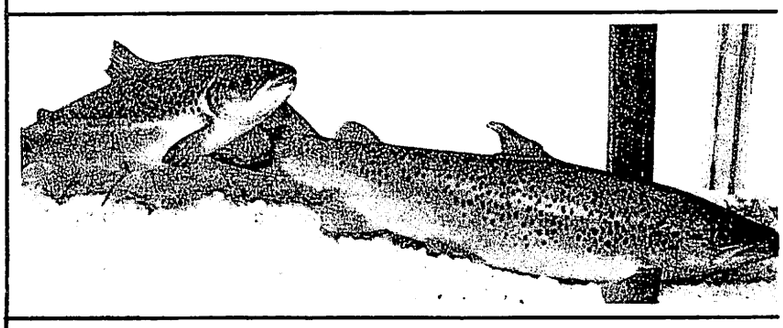
Federal-Provincial Co-ordinating Committee on Atlantic Salmon

Report of the Scientific Sub-committee

Reprinted from the June, 1957, issue of "Trade News,"
published by the Department of Fisheries of Canada

1956

INVESTIGATION and MANAGEMENT of THE ATLANTIC SALMON



SINCE 1949, Canada's research and management programme for the betterment of the country's Atlantic salmon resources has been carried out under the direction of the federal-provincial Co-ordinating Committee on Atlantic Salmon. The articles on the following pages review the present situation and the progress made in the investigational and management activities during 1956.

The first article, beginning on this page, is a statement made by Dr. J.L. Kask, Chairman of the Fisheries Research Board of Canada, at a meeting in Ottawa on February 5, 1957, of the members of the Co-ordinating Committee and their advisers.

The two succeeding articles constitute the report of the Scientific Sub-committee on the progress made during 1956. That starting on page 5 deals with the research programme and is by Dr. C.J. Kerswill of the Research Board's Biological Station at St. Andrews, N.B. The second half of the report, starting on page 15, is by Dr. W.M. Sprules, Special Assistant to the Deputy Minister of Fisheries of Canada, Ottawa.

The Changing Environment

By J.L.KASK

Atlantic Salmon ("Salmo salar") spawn in rivers occurring in restricted latitudes of Western Europe and North America. On the North American side the original distribution extended from southern New England to mid-Labrador. With increase in population and industrialization the southern extremity of distribution has been progressively pushed northward. Salmon still occur in fluctuating numbers in some 300 streams and rivers of Canada's Atlantic Provinces. It is estimated however that more than 75 per cent of remaining salmon run to about six principal river systems of New Brunswick and Newfoundland.

Salmon have a complicated life history and they are very delicately adjusted to their varied environmental requirements. Their survival depends on the availability of a number of demanding conditions in the salt water of the sea, the brackish water of estuaries and in the clear, cold, fresh water of certain streams. Of these environments the streams are the most easily vulnerable.

Adult salmon lay their eggs, and their young are born and reared, in restricted areas of some streams. If conditions in the rivers of their birth are substantially changed, or even slightly changed for some characteristics, they cannot survive for long.

Because salmon come from their ocean feeding grounds, at appropriate seasons, to their chosen streams to spawn, they can be seriously reduced in numbers by unrestricted fishing. It is doubtful, however, that they can be exterminated entirely by fishing so long as even a very few escape to spawn. But by changing their fresh water environment so that they cannot survive or make a living, the population of a whole river system can be completely wiped out.

Most of the rivers in North America that formerly supported salmon runs and no longer do, have lost their runs more from adverse changes in the very restricted and demanding freshwater environment in which they are born

and spend the first half of their life, than from overfishing.

Significant changes in the freshwater environment can be caused by a number of factors that usually accompany increases in population and industrial development. Agricultural, urban and industrial pollution (including spraying forests and waters with DDT) contribute substantially. Removal of adjacent forest cover with attendant fast run-offs and exposure of critical river areas to increases in light and in temperature can have deleterious effects. Multiple water uses for irrigation, power, navigation, etc., and physical interference with the river itself such as often accompanies logging, mining or roadbuilding all can, and do, affect the river as an environment for living organisms.

Just when an effect or a combination of effects becomes a limiting factor to salmon survival and growth is often difficult to determine. These effects can be the more dangerous as they frequently creep up slowly and defy positive detection.

PRICE OF DEVELOPMENT

No responsible person can deny that Canadian salmon rivers have undergone, and are undergoing, serious changes of the kind just reviewed. As Canada develops some of the prices of development will have to be paid, as has been the case in other areas. We should, however, be able to learn some things from previous mistakes, so that the price we have to pay may be kept to a minimum.

It is my view that the eventual loss of the Atlantic Salmon from its principal streams does not have to be included in this price, but some sizable sacrifices will have to be made if we are to keep our salmon rivers worthy of the salmon.

What more can be done, then, in addition to the excellent work already being carried out by the federal and provincial Governments in research and regulation, and by the untiring efforts of the various salmon and natural history associations that are vitally interested in the continuance and the increase of this remarkable resource?

The simple answer, it appears to me, is that we must keep our salmon rivers in such a state that salmon will continue to be attracted to come back to them from the sea to lay their eggs, and that their young can make a pleasant living in the streams during the years they are preparing for their trip to sea and ultimate return. Of course provision must be made, too, to allow the best number and best quality of salmon to escape the fishery (both rods and nets) to provide an adequate spawning stock.

Much good effort is already being expended on the latter requirement. Research workers are defining the races of salmon, are determining the productivity of waters and the best numbers of salmon to utilize the productive capacity. Regulatory officers determine fishing seasons and see that adequate numbers reach the spawning grounds. It is to the first matter, that of guarding the salmon's all important freshwater environment, that small importance is being attached, and where much can and should be done.

If 75 per cent of Canada's present salmon stocks spawn in the waters of a half-dozen principal river systems, then these most important rivers must be attended to first. The rivers themselves and the land for an appropriate distance from the river must be declared a forest and wildlife refuge, the inviolability of which must be carefully guarded. The amount and effect of all pollutants which are constantly being poured into rivers in ever-increasing amounts, must be carefully measured and controlled and their ill effects neutralized. Forest spraying in the area of streams must be carefully controlled and more specifically carried out even if extra costs are considerable, or else less damaging sprays must be quickly developed. The activities of man must be carefully supervised not only in his fishing, hunting and firebuilding, but in the disposal of wastes, building of barriers and river manipulation as well.

Nothing less than this will prove adequate to save the salmon.

Although the above few recommendations appear simple and acceptable, they will require some doing to be effective. Rivers are put to so many uses and competition for their use is ever increasing. If we want to preserve the rivers for salmon as well as to put their waters to other uses, then each new use will have to be examined and modified if necessary to suit the salmon's requirements. This, with the setting aside of "sanctuary" streams, is a big job, much more than can be done by the federal Government alone or even in co-operation with provincial and other governments. It is a job that will require the burning desire and the continuous effort of all interested people. And it has a high priority. Increases in the number of patrol officers, further restrictions on fishermen, increased hatchery services or even increased researches into life history and habits will be of little avail if the salmon's freshwater environment is allowed to deteriorate and become progressively less conducive to survival.

Investigation & Management of Atlantic Salmon in 1956

Part 1--

The Research Programme

By C.J. KERSWILL

THE OBJECT of the research programme is to get facts that will allow the Atlantic salmon fisheries to be managed to give the best possible catches for everyone concerned. Such management may be by regulations controlling the catch of the fish and by various fish culture and development practices. In planning and carrying out such a research programme on Atlantic salmon many complicating factors must be taken into account. Some of these are: (1) The great popularity of the fish among both commercial fishermen and anglers so that adequate supplies are needed by many groups of people over a wide area; (2) the salmon's complicated life history involving part time in fresh water and part in the ocean; (3) the natural variations in living conditions for the fish in different parts of the coastal region; (4) the changes in these environmental conditions in the rivers, which are constantly being made by man.

Our present research programme was organized in 1950 and revised slightly in 1954. Plans were finalized only after a careful review of the information already obtained by scientists in Canada and other countries, including the British Isles and other parts of Europe, where the same species of salmon occurs. The programme is always subject to revision as new problems develop, as some projects are completed, or as techniques are developed to allow new kinds of study to be started. At present it includes the following projects: (1) to collect and analyse statistics on commercial landings and angling catches; (2) to learn the size of spawning runs and the success of the resulting spawnings at all stages of the salmon from egg to smolt; (3) to learn how many salmon are contributed to the various fisheries by typical rivers; (4) to develop effective ways of increasing smolt production through the use of hatchery stock; (5) to learn the value of controlling predatory birds in improving smolt production; (6) to learn the extent of damage to salmon by aerial spraying of DDT and ways of overcoming these harmful effects.

In 1956 these projects were carried forward by the Fisheries Research Board of Canada mainly on the Pollett and Miramichi Rivers in New Brunswick and the Little Codroy River in Newfoundland, and by the province of Quebec on the Port Daniel River in the Gaspe peninsula. The federal Department of Fisheries was responsible for the actual removal of mergansers in experimental bird control operations on the Miramichi River, N.B., and the St. Mary's River, N.S. Valuable assistance was provided also by the provinces of Nova Scotia and New Brunswick. The success of many phases of the programme, for example, the reporting of marked and tagged salmon, resulted from excellent cooperation of fishery officers and the public.

The following review discusses briefly the highlights of some of the research projects on which interesting information was obtained in 1956.

STATISTICS

There are records of salmon catches by commercial fishermen in various areas of the Atlantic provinces (not including Newfoundland) for the past 80 years. The total landings show many ups and downs with several peak years when production exceeded 3,500,000 pounds and several examples of low production, falling below 2,000,000 pounds. For Newfoundland the commercial landings, indicated by salmon export figures for the past 40 years, show similar fluctuations in the total annual catch from 3,000,000 pounds to over 6,000,000 pounds. The most recent peak year of production was 1930, when over 13,000,000 pounds were landed by commercial fishermen on the whole Atlantic coast. Since then there has been a gradual decline in catches by commercial nets and this has been mainly responsible for the recent widespread concern over the Atlantic salmon stocks.

Reliable statistics on salmon catches in eastern Canada by anglers are not available for such a long period. The information which is available fails to show that fewer fish are being angled nowadays than many years ago. There is good reason to believe that even more salmon are angled now because the sport has gained popularity. A natural outcome is that the experienced individual angler cannot expect to catch as many fish per day or week as in earlier times.

Starting in 1954 we have shown in this annual review graphs of the commercial and angling catches since 1949 for the Maritime region. In figures 1 and 2 these are brought up to date by the addition of the 1956 statistics. The extent of the three areas into which the Maritime region is divided has been described in previous reports. Also

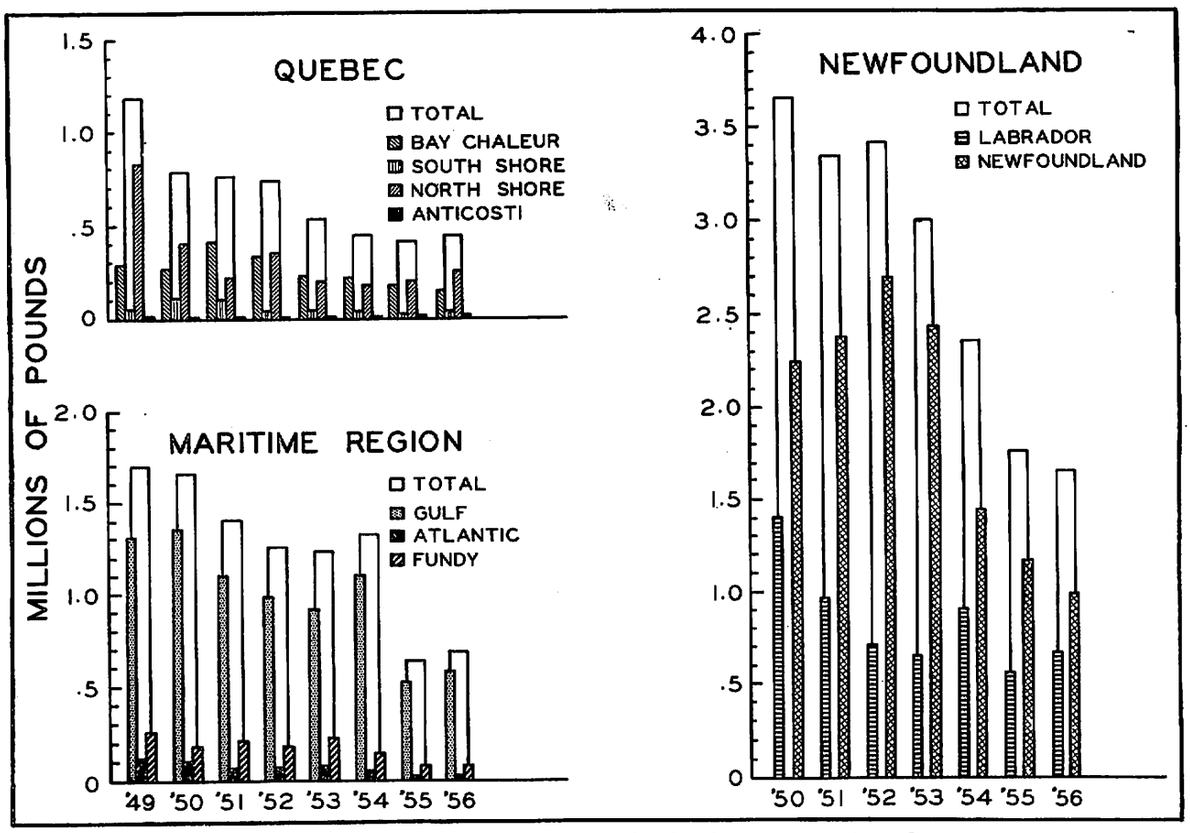


Figure 1. Commercial landings of Atlantic salmon in Canada.

included in figure 1 are commercial landings in the provinces of Quebec and Newfoundland. The Quebec landings are from the published reports of the province of Quebec; all the other statistics were provided by the federal Department of Fisheries.

Commercial Landings

Commercial fishing for Atlantic salmon is allowed only in salt water, where it is carried on by offshore floating drift nets in a few places, fixed trap nets along the shores of bays and estuaries, and set gill nets. As shown in figure 1, the total catch by nets operated in waters bordering Quebec and the Maritime provinces was about 15 per cent higher in 1956 than in 1955. These increases resulted from larger catches on the north shore of the St. Lawrence River in Quebec, and in the Gulf area of the Maritime region. The landings in the Gulf area were made mostly by fisheries in the Miramichi River and vicinity.

Total Newfoundland landings were slightly lower in 1956 than in 1955, according to the preliminary 1956 statistics. It is of interest that landings on the Labrador coast were considerably higher than in 1955.

It is encouraging to note that everywhere, with the possible exception of Newfoundland, the downward trend of recent years has halted. Still, total landings for the whole Canadian Atlantic coast were just over $2\frac{1}{2}$ million pounds in 1956, or about half the average level of the past 25 years. In 1956 retail prices were quite high at over one dollar per pound at many centres in eastern Canada. Landed values were around 50 cents per pound and sometimes higher, which partly compensated for the relatively low level of production.

Angling Catches

Salmon angling was again a very popular recreation on the freshwater sections of a great many rivers. On most rivers the 1956 season was good by comparison with recent years, as indicated by figure 2, which shows total catches in the Maritime region and on some of the individual rivers in it since 1949. These statistics are for salmon of all sizes including grilse and kelts or black salmon which can be taken in early spring in New Brunswick under special permit. Most of the kelts are taken in the Miramichi River, N. B., and the proportion of the catch which they represent as well as the proportion of the total Miramichi catch which are grilse are discussed below.

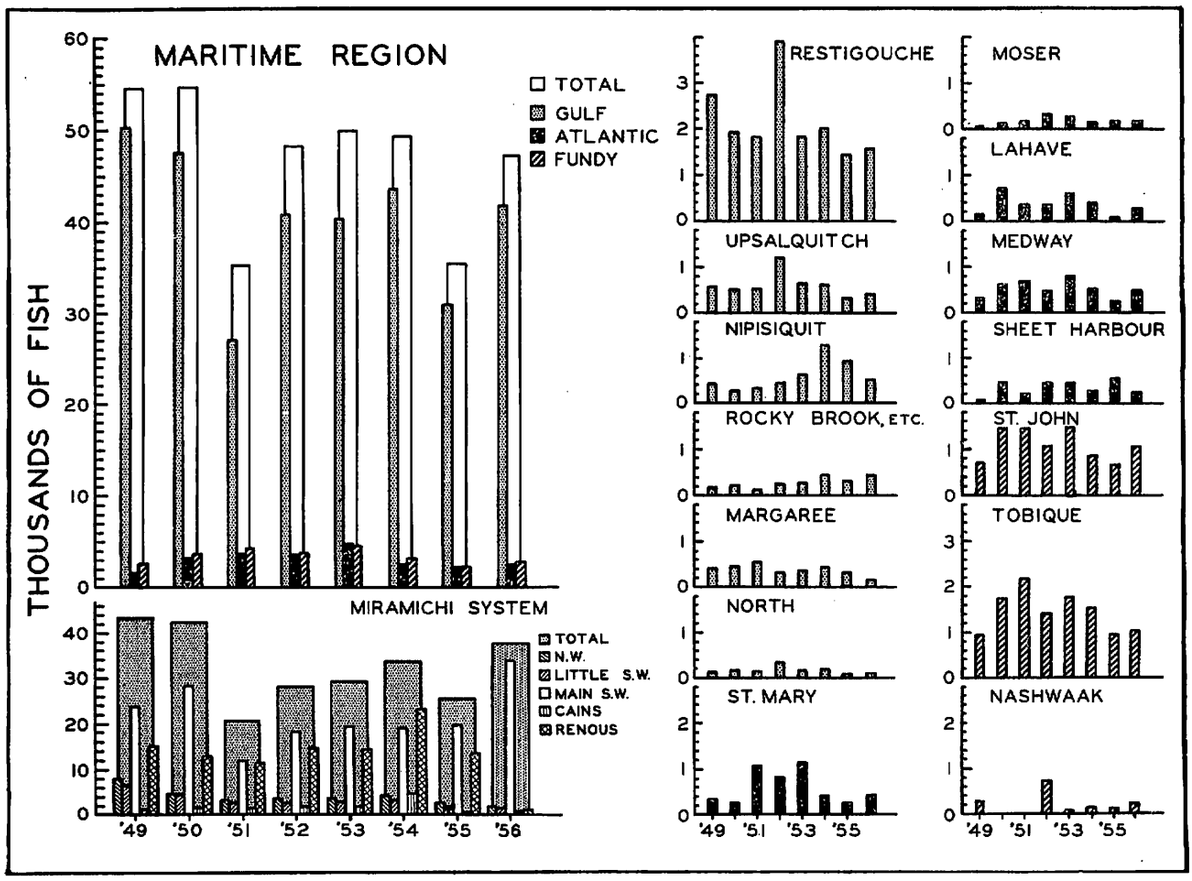


Figure 2. Angling catches of Atlantic salmon in the Maritime Region of Canada.

The outstanding feature of the 1956 sport fishing season in the Maritime region was a phenomenal abundance of both grilse and large salmon in the Main Southwest Miramichi River, N. B., during September. In this final month of the angling season 4,900 grilse and 10,400 large salmon with a weight of 56 tons were caught in this one tributary. This large catch was responsible for the increase in the total Miramichi River catch to almost 38,000 fish, 30 per cent higher than in 1955 and the highest recorded since 1950. Of these 38,000 fish, 7,600 or 20 per cent were kelts taken during the regular spring season which ends on May 24. Only 51 per cent of all the bright salmon angled between June 5 and September 30 were grilse, the balance being large salmon of which most were 2-sea-year fish.

In recent years anglers have often expressed concern about the supply of early-run salmon, fearing that they were almost extinct in the Miramichi River. Yet in June and July, 1956, Miramichi anglers caught over 1,000 large salmon and over 4,000 grilse; in August over 1,300 large salmon and over 4,200 grilse were caught. So the total catch of salmon which may be classified as "early-run" exceeded 10,000 fish on the Miramichi in 1956.

In most of the other rivers of the Maritime provinces more salmon were caught by angling than in 1955, but the catches were somewhat below the average level of the past eight years except on the St. John River system and Rocky Brook in New Brunswick and the Medway River in Nova Scotia. The total catch of 47,312 fish in 1956 resulted from an effort of 154,924 rod-days by the anglers as compared to an effort of 147,447 rod-days which produced the 35,988 fish caught in 1955.

In Newfoundland over 17,000 salmon were angled in 1956 according to preliminary report, as compared to about 15,000 in 1955. Visiting sportsmen are reported to have been pleased with angling conditions there in 1956. It is expected that interest in angling will increase greatly in Newfoundland as transportation facilities improve, making more rivers accessible.

MIRAMICHI SALMON RUNS IN 1956

In these annual reviews the runs of salmon into the Miramichi River are given special attention because it is the only river in eastern Canada having large commercial and sport fisheries for sal-

mon, where sampling traps and counting fences are operated by research staff through the open water season. Information obtained here is a useful guide for solving salmon management problems on other streams where special research studies cannot be undertaken at present.

In 1956 an unusually large number of grilse and large salmon entered the Miramichi River. This was shown by our commercial type sampling trap which is now operated from spring to fall every year in the estuary just below Chatham. This trap net resembles the regular gear used by local commercial fishermen except for the size of the mesh which is $3\frac{1}{2}$ inches extension measure instead of five inches, so that grilse can be retained. All captured fish are released after being counted and examined for marks or tags. The following table shows the total number of fish caught by this trap in the past three years, as well as the number taken during the regular commercial season.

	Large Salmon	
	Total	During Commercial Season (June 5-Aug. 31)
1954	2,080	333
1955	2,787	72
1956	3,360	234

	Grilse	
	Total	During Commercial Season (June 5-Aug. 31)
1954	1,832	905
1955	1,790	668
1956	3,534	1,143

As in previous years only a small number of large salmon was caught during the commercial trap net season but a great increase occurred after the season closed. In 1956 this fall run was the largest since the trap has been operating. On September 20 the highest count was made -- 268 large salmon. This was higher than the total catch during the whole commercial season. The movement of grilse through the estuary was more evenly distributed so that fair numbers occurred throughout the regular commercial season, but these could not be taken by the regular trap nets.

The movement of salmon through the trap net fishing area into fresh water seems to depend partly on water temperatures in the estuary. The summer of 1955 was hot and dry and few fish were caught in the sampling trap for several weeks in July and August when water temperatures were consistently over 68°F. In 1954 and 1956 summer water temperatures in the estuary were lower and large salmon and grilse were taken throughout the summer.

Although more salmon were moving through the estuary in 1956 than in previous years the numbers recorded at the counting fence on the Northwest Miramichi River about six miles above head of tide were the lowest since recording began in 1950. Small runs of large salmon and grilse passed through the fence in June and early July and again in October, but during most of July, August and September almost no upstream movement occurred. This may have been caused by low water and a lack of freshets in the river during the summer. Another explanation may be the DDT spraying of the forests in the region of the Northwest Miramichi in June, 1954. A total of only 775 grilse was counted as compared to 2,756 in 1955 and counts of over 2,100 each year since 1950. Large salmon totalled 587 as compared to 778 in 1955 and counts of over 1,000 in the three preceding years.

The number of large salmon passing through the counting fence on the Dungarvon River in 1956 was 305 which was about average for the past few years; the number of grilse was 404, which was slightly below average. A light grilse run occurred in June and July, and many large salmon and grilse passed through the fence in late September and October. Low water conditions in the river were likely responsible for little upstream movement during the summer.

This was the final year of operation of a counting fence on the Dungarvon River. At the close of the season in November, 1956, all the Dungarvon equipment was transferred to the vicinity of Camp Adams on the upper Northwest Miramichi. A fence will be installed here in 1957 to provide a second checking point for ascending fish about 30 miles above the lower fence which has been operated since 1950.

Unusually large numbers of sea lice were observed on salmon entering the Miramichi estuary in 1956. Grilse seemed to be more heavily infested than large salmon. In many cases lice were so numerous on the head and gill covers of the fish that the skin in affected areas became loosened. When the lice fell off in fresh water large patches of the weakened skin also fell off exposing the underlying flesh. Infestation reached a peak in August when many anglers complained of catching salmon with large raw sores on the head. Although this parasite is common on Atlantic salmon it seldom occurs in such large numbers in our waters. A similar heavy infestation occurred, however, in the Moser River, N.S., in 1939.

SMOLT-MARKING EXPERIMENTS ON FIVE SALMON RIVERS

Since the development of an expanded research programme for Atlantic salmon under the Federal-Provincial Co-ordinating Committee which was formed in 1949, the marking of smolts by finclipping has been undertaken at four new counting

fences in addition to the Pollett River, N.B., fence where all smolts produced in experiments since 1942 have been marked. These new operations started on two tributaries of the Miramichi River system in 1950, on the Port Daniel River on the Gaspe coast of Quebec in 1953, and on the Little Codroy River in southwestern Newfoundland in 1954. The Port Daniel programme is operated by the Quebec Government and all the others by the Fisheries Research Board. The work in the Maritime provinces is part of the programme of the St. Andrews, N.B., Station; the Little Codroy project is operated by staff of the St. John's Newfoundland Station.

The object of the experiments is to learn the annual production of smolts by a series of typical salmon streams, and to estimate their contribution to the various commercial and sport fisheries over the whole Atlantic coast and to the spawning escapement. To do this large numbers of descending smolts are trapped each year on all the streams, marked by fin-clipping with the same fins removed every year on a particular stream, and released. As many as possible commercially caught and angled salmon are examined for marks in the various fishing areas each season, and records are made of numbers of marked and unmarked fish. Scale samples are required for all marked fish, to permit classification into years of smolt run. Scale samples are obtained also from large representative samples of unmarked salmon in various fishing areas so that the relative strengths of various age-classes in the catches can be estimated. Records of marked and unmarked fish are kept throughout the season at up-traps maintained in the various counting fences and in other research sampling traps, such as in the Miramichi estuary.

The table at the foot of this page gives the number of smolts marked and released each year on the five streams.

To date the recoveries of marked adults reported to the St. Andrews Station by special observers and fishery officers from catches by commercial fishermen and anglers total 2,640. About 290,000 of the smolts marked so far will have reached catchable size as grilse or large salmon. So the returns indicate that at least 0.9 per cent of the marked smolts have survived to be taken by the fisheries. This is a minimum estimate of the actual utilization of smolt production by the fisheries because of the possibility of considerable marking mortality and because all the catches are not examined completely for marks. When allowance is made for incomplete checking of catches, based particularly on data for the Newfoundland area, at least 2 per cent of the total smolt production appears to be taken ultimately by the fisheries.

The following picture of salmon movements and utilization is coming from these experiments. Adult salmon are usually taken in fresh water by anglers only in the rivers from which they came as smolts. But many may be caught by commercial nets in the sea far from their rivers of origin. For example, smolts leaving the Miramichi River in June of one year, say 1956, may stay in the sea for two years and thus survive to be 8- to 12-pound salmon by June 1958. While swimming along the shores of Newfoundland, perhaps on their way back to New Brunswick, some may be caught in the commercial nets. Others will return to the New Brunswick coast and wander into other estuaries than the Miramichi, for example, into Bay Chaleur, and be caught there in commercial trap nets. Many will eventually enter the Miramichi estuary and although some will be taken there by commercial gear many will reach fresh water. Some of these will be caught by anglers and those escaping will provide the spawning stock of the Miramichi.

Information of this kind, supported by estimates of the percentages of fish which may be expected to be used in various ways, is needed as a background for setting up the most effective regulations for the salmon fisheries. The object of such regulations is to assure that (1) there is a sufficient supply of adult fish in each river for spawning, to give the most suitable smolt production in two or three years' time; (2) the best use is made of the

	Number of Smolts Marked and Released						
Site	1950	1951	1952	1953	1954	1955	1956
N.W. Miramichi R., N.B.	7,969	33,407	848	25,218	25,660	25,735	13,057
Dungarvon R., N.B.	253	14,966	461	19,966	20,254	12,733	9,130
Pollett R., N.B.	13,190	25,187	26,297	3,639	23,751	8,052	4,897
Port Daniel R., Que.	-	-	-	4,063	1,847	923	2,379
Little Codroy R., Nfld.	-	-	-	-	12,210	11,136	14,400
Total	21,412	73,560	37,606	52,886	83,722	58,579	43,863

salmon not needed for spawning, by permitting their capture by commercial fishermen and anglers.

PRODUCTION OF YOUNG SALMON

The studies discussed above have dealt principally with salmon at the adult stage when they are useful either for capture by various fisheries or for spawning in the rivers. Now some of the results of investigations of the salmon's early life history in fresh water will be outlined. These studies are being undertaken to provide a sound basis for future management techniques. Such management must always be aimed at assuring that the best quantity of smolts is produced each year by all salmon rivers, either by natural reproduction or artificial propagation or a combination of both.

Change to Smolts Depends on Parr Length

One of the puzzles of salmon production has been why in some streams the young change to smolts and migrate to sea at two years of age, while in others they may wait until they are three or four years old or more. Older smolts were known to come usually from colder streams, where growth is slower. But information on the amount of growth required before the transformation would take place, was lacking. Research during the past year shows that in several areas in Canada as in Europe, about 95 per cent of the smolts had one feature in common. All reached a length of about four inches (10 cm.) some time during the year before they became smolts. If they reached it early and grew fast, they became big smolts; if they reached it late and grew slowly, they made little smolts. If they did not reach a 4-inch length before fall they stayed in fresh water for an additional year or more. Such information helps explain why production in some streams may take longer than in others. But it can also assist the fish-culturist in planning how to get the best smolt production from particular streams through controlled plantings of available hatchery stock.

Year-to-year Variation in Smolt Production

At first thought it seems obvious that the way to get more salmon for use is to have more young salmon, or more salmon eggs, placed in our streams. But the situation is not quite so simple. It should be no mystery that a salmon stream is much like a farm in that it can support just so much stock.

The amount may vary, of course, because of favourable or unfavourable years. For example, the Pollett received ample stocking of young in five different years. The average production over the five subsequent years was about 20,000 smolts. But one year it fell as low as 14,000, and another year rose as high as 25,000. So far this is our best clue to the amount of normal variation to expect in smolt production. Note that the extreme high value (25,000) comes close to being double the extreme low value (14,000).

Rearing Capacity of Streams

As indicated in the 1955 report, the maximum rate of production for the Pollett was five to six smolts per 100 square yards of stream bottom. This is an average value for the streams as a whole, not a precise number which might be expected to occur in any particular spot. Physically, the Pollett is a relatively good stream for young salmon. So the number given can be thought of as a satisfactory yardstick for many salmon streams. Not many Canadian streams can give better production than this; in cold or infertile streams it will not be as good. Among the streams where salmon research is being or has been done, the Miramichi in New Brunswick, Little Codroy in Newfoundland and probably the Lahave and Margaree in Nova Scotia appear to fit the same category as the Pollett. The Port Daniel, in Quebec, is apparently much less productive, probably being able to produce only about half as many smolts per average area.

Strict American Merganser Control Needed

Even with the best management man can yet apply, there is bound to be loss from the time that salmon eggs are deposited in the river gravel until the smolts migrate to sea. Fortunately some of this loss can be avoided. In order to get five or six smolts per unit area from the Pollett it was necessary to have about 10 large parr for each similar area in the preceding summer. It was only possible to get this number of large parr when strict control of mergansers was applied throughout the year. In the Maritimes, these fish ducks are one of the worst enemies of young salmon over three inches long. Such control has now been applied to the Pollett for nine consecutive years. At first glance the records make it appear that the birds have recently been getting scarcer, perhaps because control removed the breeding stocks. But this has not actually happened. Analysis of the data (Figure 3) show that in reality the birds have been scarcer only in years when parr were scarcer. Hence we must conclude that on a small area, like the Pollett drainage basin, control does not noticeably affect the general stock of birds, but must be carried on year after year at about the same intensity.

Up to the present merganser control in the Miramichi area seems to have helped parr populations. On the Northwest Miramichi, with thorough control, eight to 10 large parr per 100 square yards were obtained in the years 1951-53. Thereafter parr were reduced as a result of DDT spraying as shown in Figure 4. The Dungarvon and Renous failed to show high parr populations after general bird control was started in 1954. This, too, seems largely to be the effects of spraying on these streams. Control undoubtedly saved from mergansers many of the parr which did survive spraying.

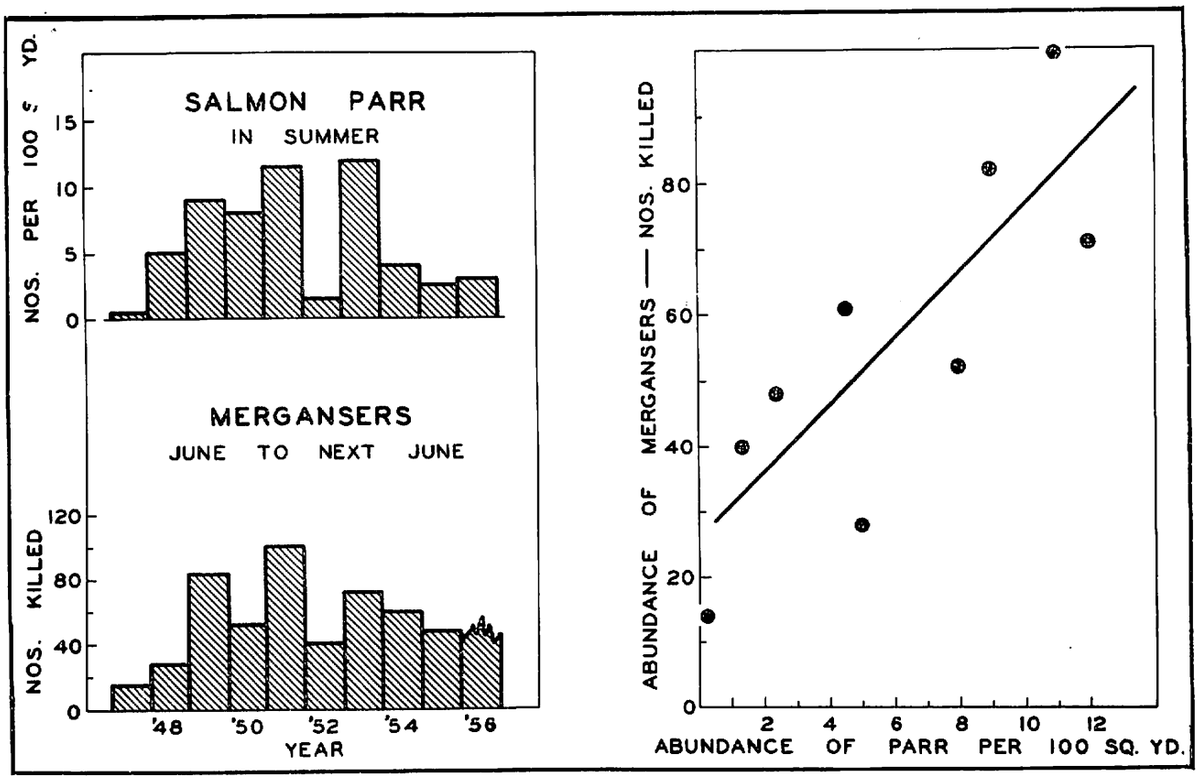


Figure 3. The relationship between abundance of mergansers (as indicated by number killed in bird control experiment) and salmon parr (from seining operations); showing Pollett River data in two different ways.

On the Cains, with no spraying, parr have increased to about five per unit area. Control on this stream has not yet been as thorough as on the Northwest Miramichi or the Pollett Rivers. A detailed analysis of the Pollett results indicates that control must be quite thorough to give the kind of result indicated earlier. Whether useful results can be obtained with a more economical level of operations is one subject of the Miramichi investigations.

Good Stocking From Hatchery Plantings

In general, our studies have indicated that where streams are reasonably fertile and mergansers are scarce, about 35 hatchery fingerlings per 100 square yards are needed for streams giving mostly 2-year smolts, and about 60 for streams giving mostly 3-year smolts. But if the streams are in barren country or if many mergansers have free use of the water, fewer smolts will be forthcoming. In such cases there would be no advantage in planting more than 10 and 15 fingerlings per 100 square yards respectively. Additional fish would be wasted because either they would starve to death, or mergansers would eat them, before they became smolts. Whether these same basic rates should be used for reinforcing inadequate native populations with hatchery stock is being investigated on the Pollett now. Preliminary results indicate that such planting rates may properly be used.

Good Stocking From Natural Spawning

How many mature salmon, or salmon eggs, are needed to get the best production of smolts? In the Pollett River there have now been four years of natural spawning -- natural except that the number of adults has been manipulated to give various spawning intensities, from very light to fairly heavy. In the course of the next three years all these spawnings will have been followed through to the smolt stage. So far, the survival rate from eggs to fry has been about six per cent from light spawnings. Light spawnings mean no undue waste and hence the highest value to be counted on with safety. Survival rates from fry to parr have been high -- around 80 per cent. It is possible to make a tentative calculation that to get maximum smolt production, eggs should be brought into the stream at a rate of about 200 per 100 square yards. With similar survival rates, streams producing 3-year smolts could use about 250 eggs per 100 square yards, but need less than this if mergansers are going to remove a large proportion of the parr, anyway, before they become smolts. Note that these numbers for eggs have been based on fish entering

the river but still subject to regular inland fishing effort. They are higher than the actual numbers required to be deposited in spawning redds.

Present Status of Miramichi Stocks of Young Salmon

The table at the foot of this page shows the general abundance of Miramichi young salmon observed under four different sets of conditions which have existed here since 1949. All figures are average rates per 100 square yards of stream.

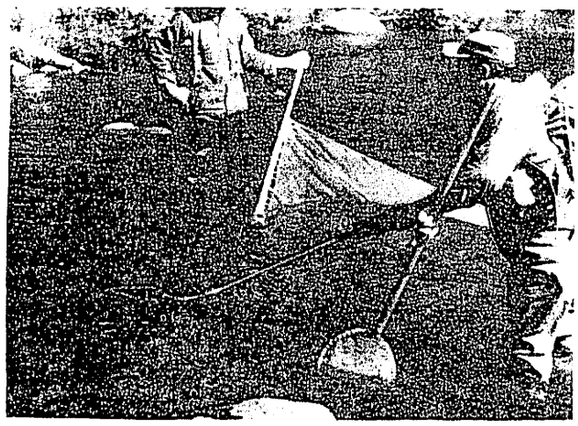
One fact stands out. Judging by egg and fry requirements suggested by the foregoing section the river system seems to have received about as much natural stocking as it could convert to smolts under favourable conditions. Under unfavourable conditions, such as heavy merganser predation, or extensive spraying of DDT, a considerable increase in natural stocking should not be expected to add many smolts. It would simply result in still greater waste of fish.

Whether the heavy population of young fish in the first year after spraying will counterbalance some of the harmful effects of spraying remains to be seen. The numbers look promising; but as will be discussed below the fish are actually in very poor physical condition as the result of a second spraying in 1956, and may not survive to become smolts.

At the present time it looks as though carefully planned stocking of hatchery-reared fry and parr might be the best way to assure a good smolt run where stream drainage basins must be sprayed with DDT to preserve the forests.

Young Salmon in Ellerslie Brook, P.E.I.

On Prince Edward Island a counting fence was installed 10 years ago at the mouth of Ellerslie Brook, a small 4½ mile long tributary to Malpeque Bay, for the trout investigations of the Fisheries Research Board. The populations of all species of fish in the brook are studied each year by seining with electrofishing. Interesting information has been obtained on Atlantic salmon because a few adults have usually entered the brook in November. These have spawned successfully and produced good numbers of young in the 2,000 yards of stream length available to them.



Seining with electrofishing to estimate populations of young salmon at one sampling station on Northwest Miramichi River, September, 1956.

From 1947 to 1954 a total of 100 salmon entered the brook, but since 1955 none can ascend because of a dam built to create an experimental trout pond. In 1956 the total number of salmon parr in the 2,000-yard stretch was found by electrofishing to be 2,654, and besides the parr there were 3,053 fingerling trout and 3,923 older trout in the same section. This means that the parr averaged 44 per 100 square yards of available stream area so the population level of young salmon was considerably higher than has been found in New Brunswick study streams.

In other years the total numbers of salmon fry in the available area twice exceeded 4,000 per year, and the total number of salmon parr has often exceeded 1,000 per year. Over a five-year period the number of smolts moving through the counting fence into the estuary varied from 215 to 653 per year and averaged 400.

The relatively high production of young salmon as well as trout by this small area of brook is associated with the high fertility of Prince Edward Island streams.

Unfortunately adult salmon enter all Prince Edward Island streams so late in the fall that they cannot be utilized by fisheries. The young salmon

Conditions	Eggs estimated brought into river	Resulting fish		
		Fry	Small parr	Large parr
Natural	250	22	12	4
With control of mergansers	250	21	17	8
Merganser control and DDT spraying	180	5	4	3
One year after spraying	150	42	18	to be measured in 1957

leaving as smolts likely contribute significantly to fisheries outside the province.

EFFECTS OF DDT SPRAYING ON MIRAMICHI SALMON

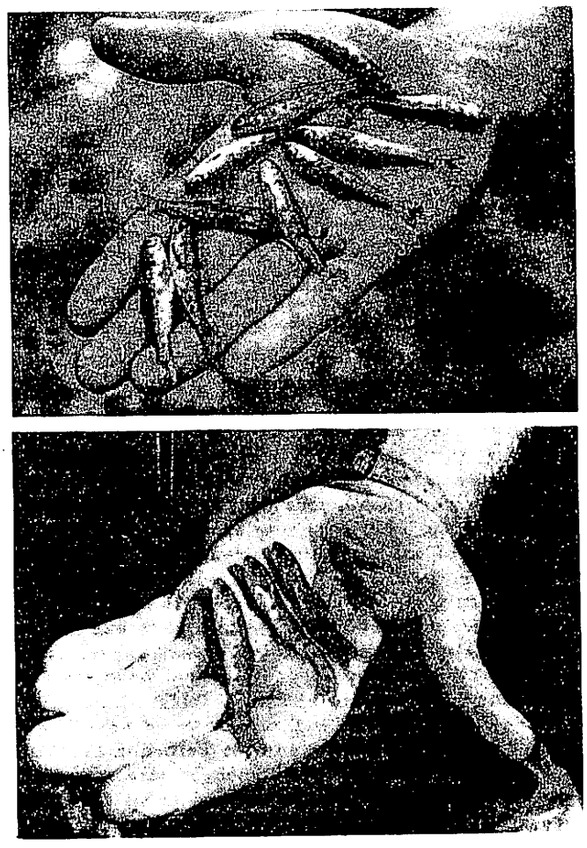
The spraying of woodland with insecticide from aircraft to control insect pests has become standard forestry practice. Recently a severe outbreak of the spruce budworm in eastern Canada has threatened vast stands of balsam, fir and spruce. When the epidemic moved eastward into northern New Brunswick, spraying with DDT was undertaken by Forest Protection Limited. In 1952, an area of 200,000 acres was sprayed as an experiment to test the technique, and since then the area has increased steadily as the budworms spread into new areas. By 1955 a total of over 4,000,000 acres had been sprayed in New Brunswick, and the programme now calls for the spraying of 2,000,000 acres or more each year. These operations include re-spraying of large areas, since the budworms cannot be eliminated by spraying and it appears that the pest can be controlled only by repeated applications of DDT every two or three years, or sometimes every year.

It has been known for many years that DDT in extremely low concentration in water can kill fish coming in contact with it, but there was no well-documented evidence of serious effects on salmon or trout in streams through aerial spraying of adjacent woodland. The opportunity to get such facts arose in 1954 when part of the Miramichi River system was included in the spraying programme of Forest Protection Limited. Since 1950 the populations of young salmon in the Northwest Miramichi had been followed closely each autumn by seining on sample areas extending from the headwaters to near head of tide, a distance of about 45 miles. The 1954 census, starting two months after completion of spraying in June, showed, that the number of young salmon was much below the level of the preceding years. The youngest fish which were fry of the year were practically absent, and parr in their second year were more seriously affected than large parr in their third year. Observations on young salmon held in cages inside and outside the sprayed area, and the finding of large numbers of dead young salmon along the river within a few days of spraying led to the conclusion that the mortalities were mainly the result of a direct lethal effect of the DDT. Besides these direct effects on the fish, serious reductions were observed in the stream insects which are their main food. Observations up to November, 1955, on the effects of the 1954 spraying were summarized in last year's report, published in the April, 1956, issue of "Trade News".

Woodland around the lower part of the Northwest Miramichi was sprayed again in June, 1956. Observations on the effects of both the 1954 and 1956 sprayings on young salmon and stream insects were continued through the 1956 season. Advantage was taken of the opportunity for further study of the effects of the 1954 spraying in areas not sprayed since 1954, and for observations on the areas re-sprayed in 1956.

Effects on Salmon

Figure 4 summarizes the facts obtained since 1950 on populations of young salmon in the Northwest Miramichi, before and after the two DDT sprayings. The heights of the bars represent the numbers of fish of the three size groups per 100 square yards of stream, averaged for the 10 seining stations. Looking from top to bottom of the diagram along the different columns shows the average numbers of fish of these three sizes obtained by the autumn seinings in each year since 1950. Looking from left to right along each row shows our information on what happened to the three size groups of young salmon produced by the spawnings of adult fish each fall since 1949.



The top photograph shows salmon parr of normal appearance picked up immediately after being affected by DDT in Northwest Miramichi River, June, 1954. Lower photograph shows salmon parr, very thin but still alive, from sample seined in Northwest Miramichi River, September, 1956.

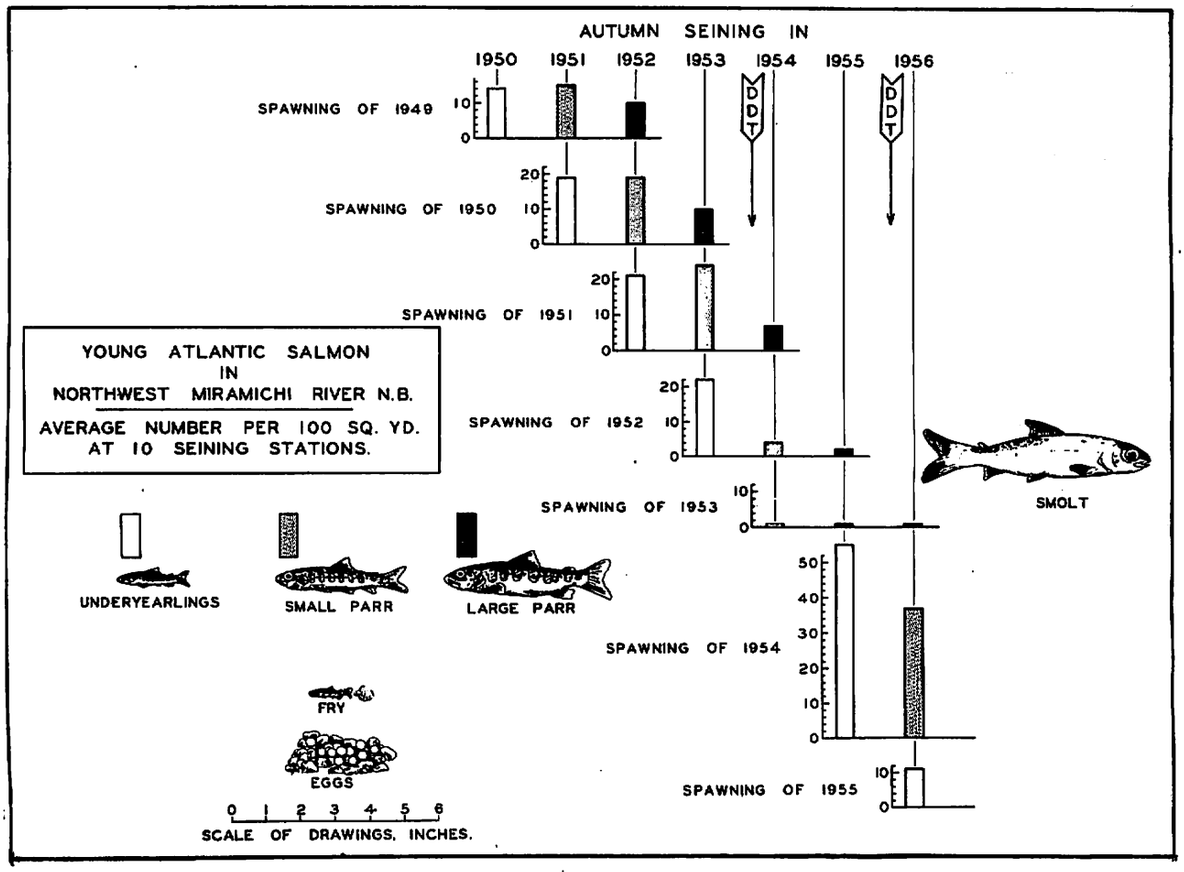


Figure 4. Effect of aerial spraying of DDT on young salmon in the Northwest Miramichi River, N.B.

The unusually low bars in the middle section of the figure clearly show the effects of the 1954 spraying in reducing the numbers of young salmon that would become smolts. Parr usually become smolts in their fourth year of life in this area. The effect of the 1956 spraying on the unusually high population of underyearlings produced by the spawning of 1954 is not so obvious as far as number of small parr per unit area in 1956 is concerned. Although the number of these small parr was unusually high, averaging 33 per 100 square yards, many were very thin at seining time and there may be poor survival over the 1956-57 winter. The photographs on page 13 show three of these small parr picked at random from a sample seined in September, 1956, and still alive, compared to a sample of small parr of normal appearance, from the same area in June, 1954.

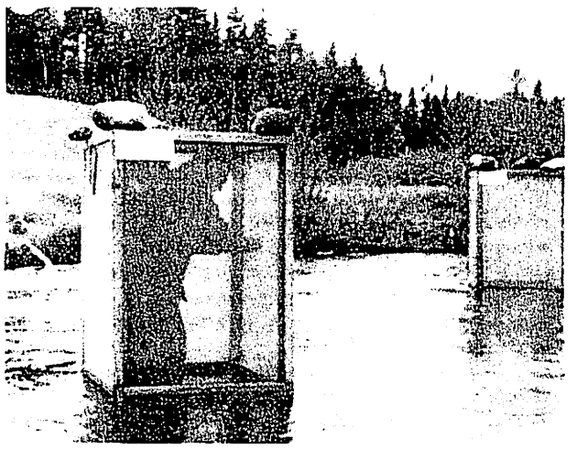
Only the lower seven stations were affected by the 1956 spraying, so the average numbers of underyearlings and small parr shown for the autumn seining in 1956 are higher than occurred on the sprayed sections of the river alone. On the sprayed sections of the river, the average number of underyearlings was under two per 100 square yards in 1956. So the young salmon produced by the spawning of 1955 were practically reduced to extinction, in the same way as the underyearlings produced by the spawning of 1953 were reduced by the 1954 spraying.

Seining data for each year since 1950 are available also for the Dungarvon River, a tributary to the Southwest Miramichi. In 1955 and 1956 seining stations were added to the general Miramichi programme, on two other tributary streams, the Renous and Cains, of which the latter has not yet been sprayed. These data confirm those for the Northwest Miramichi and show that the young salmon in sprayed streams are very scarce as compared to the populations in unsprayed areas.

Effects on Stream Insects

In 1956, cage-traps were used again on sprayed and unsprayed streams in the Northwest Miramichi area, to learn how the production of various kinds of stream insects was affected by the 1954 and 1956 sprayings of DDT. These cage-traps (see photograph) cover one square yard of stream

bottom and allow the emerging adult insects to be collected daily for identification, counting, and volume measurement.



Cage traps used in 1955 and 1956 to determine daily emergence of adult stream insects from sample square yards of river bottom in Miramichi area.

The results of the 1956 study confirm those of 1955, in that both the number and kinds of stream insects in the sprayed area were reduced. The greatest reduction occurred among the larger insects, including the caddis flies and the large forms of mayflies and stoneflies, while the small-sized forms, particularly midges, showed better survival and were actually quite numerous. The large insects have failed to return by the second year after spraying.

In the past two years studies have been made of the feeding habits of young salmon, by examining stomach contents of samples of fish taken in unsprayed and sprayed areas. The normal diet of the underyearlings consists largely of small insects, particularly midges. Older salmon (small parr and large parr) normally have a diet of larger caddis flies, mayflies and stoneflies and do not appear to utilize the small forms, even when the latter are particularly abundant.

The great reduction in numbers of larger stream insects and their failure to be re-established in sprayed areas within two years, must mean drastic loss in food for the larger sizes of young salmon, which may affect their survival to the smolt stage. Experiments to show the possibility of re-establishing some of the missing species of insects are planned for 1957.

Investigation & Management of Atlantic Salmon in 1956

Part 2 - -

The Management Programme

By W.M. SPRULES

THE MAIN OBJECTIVE of the Atlantic salmon management programme is to maintain and develop the important Atlantic salmon stocks, which frequent the waters of the northwestern Atlantic ocean off the coast of Canada and the coastal streams from southern New Brunswick to northern Labrador, in order that a regulated annual catch may be taken both by commercial and sport fishermen without depleting essential spawning runs.

Although many separate management techniques are used to reach the objective referred to above these fall into two main categories, namely: protection of the stocks through enforcement of regulations, made under the Fishery Act, designed to ensure efficient use and sufficient escapement to unspoiled spawning areas; and environmental improvement designed to increase the productive capacity of certain waters for salmon. In Labrador, Newfoundland, Nova Scotia, New Brunswick and Prince Edward

Fishery protection officers checking size of mesh of commercial salmon trap-net.

Island these techniques are applied by officers of the Conservation and Development Service of the Department of Fisheries of Canada while in Quebec officers of the provincial Department of Fisheries are responsible for such application.

Fundamental research is essential to the development of sound management practices. The results of such research provide the basis for scientific regulation of the various fisheries and indicate the fish cultural techniques which should be applied to increase the size of the salmon stocks. The research and management programmes are closely co-ordinated to insure that each research finding may be immediately translated into an experimental management technique through controlled application in the field followed by broad application if the original field experiment shows promising results.

SURVEYS OF SALMON RIVERS

Systematic surveys of selected salmon rivers have been made each year since 1953 in order to provide an inventory of certain physical characteristics of the rivers which limit salmon production. In addition to general observations on the abundance of food organisms, existence of predators and water conditions, detailed information on the extent and location of barriers to migration, physical and chemical pollution, spawning areas, and nursery areas is recorded. Recommendations for management such as stream improvement and regulation of the fishery are based on analysis of the data obtained during the surveys.

In 1956 surveys were completed on seven rivers in New Brunswick including the St. Croix, Tabusintac, Jacquet, Nipisiguit, Nashwaak, Keswick and Pocologan; on six rivers in Nova Scotia including the Liscomb, Jordan, Salmon (Jeddore), Wallace, Salmon (Guysboro) and River Phillip; on seventeen rivers in Quebec including the Ours, Corneille, Little Piashti, Piashti, Veronique, Washishou, Little Washishou, Pashashibou, Nabesipi, Aguanizh, Natashquan, Kegaska, Musquaro, Musquanousse, Washicoutai, Olomane and Wastawaka. Aerial surveys by helicopter were carried out on several streams in Newfoundland including South Brook, Indian River, Middle Arm Brook, Western Arm Brook, Main River and all eastern tributaries of the Exploits River below Red Indian Lake.

To date nearly 200 salmon streams have been surveyed. All important rivers in Labrador have been completed and it is expected that the Quebec rivers will have been covered by the end of 1957. Although the important rivers in New Brunswick and Nova Scotia have been surveyed there are other smaller rivers of fair potential which will be surveyed within the next year or two. In Newfoundland preliminary surveys of the largest river systems are completed but a continuing programme will be required for some years in order to obtain essential data on the many smaller but none the less important salmon rivers.

In addition to the inventory developed by stream surveys counting traps have been operated in several rivers to determine the size and time of the salmon runs to specific areas. The data obtained from these counts provide information on annual changes in the run and are used to correlate the features of the run with environmental conditions existing from year to year such as temperature, water level and the effect of industrial developments on the specific rivers. An example of the counts obtained is contained in Table 1, at the foot of this page.

These data coupled with future counts will prove of considerable value in assessing the effect of the new power development at Beechwood on the Saint John River and the efficiency of the fish passage facilities proposed for this development since salmon will have to pass the Beechwood structure before reaching the Tobique Narrows fishway.

TABLE 1: Number of salmon released from counting trap at the head of the fishway in the power dam at Tobique Narrows on the Tobique River, N.B.

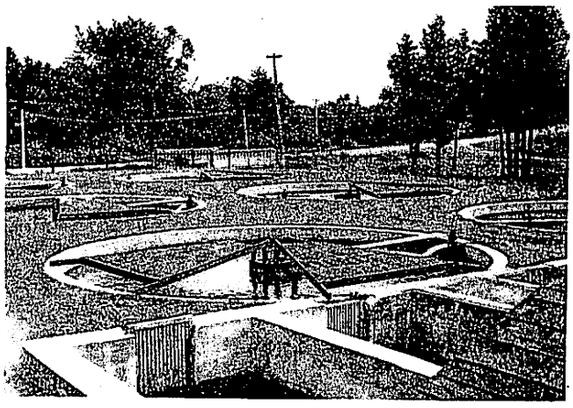
	NUMBER OF SALMON							
YEAR	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	TOTAL
1953	58	1,866	1,979	228	106	384	35	4,656
1954	79	1,052	1,542	1,288	836	184	5	4,986
1955	13	682	1,376	858	270	555	21	3,775
1956	2	376	1,326	751	731	467	70	3,723

Period trap operated: 1953 May 24 to November 8 — 1955 May 20 to November 21

1954 May 20 to November 16 — 1956 May 7 to November 26

HATCHERY PRODUCTION

The important role of the salmon hatchery in the management of this resource should not be overlooked at this time when the value of hatcheries in general, as a means of maintaining specific commercial fisheries, has been proved of little significance. The products of the salmon hatcheries are used to augment the populations of young fish in areas where natural reproduction is limited but where rearing conditions are favourable; to provide essential stock of known age and origin for experiments; and to provide stock for seeding previously barren areas once these have been made accessible to adult runs through construction of fishways at barriers or removal of obstructions to migration.



Fish hatchery in New Brunswick

More than 8,100,000 Atlantic salmon were distributed in selected rivers during 1956 from the hatcheries in New Brunswick, Nova Scotia and Prince Edward Island. At this time a record of the salmon production of Quebec hatcheries is not available but significant numbers were produced and distributed in that province.

Although most of the hatchery production is distributed as advanced fry or fingerlings up to approximately three inches in length, provision was made in 1955 to carry approximately 600,000 young salmon through the winter for distribution as yearlings in 1956. Unfortunately the heavy freshets that occurred in Nova Scotia during January flooded a number of ponds in which these salmon were being retained and serious losses resulted. However, approximately 400,000 were carried through the winter successfully and many had already assumed smolt dress when distributed as post-yearlings.

Some 1,250 three-year-old salmon ranging from $1\frac{1}{2}$ to 4 pounds in weight were distributed in Big Salmon River, N.B. These salmon were progeny of adults from the selective breeding experiments that have been carried on for several years at the Saint John hatchery. Each fish was tagged with a distinctive loop of coloured Flexite Polyethylene and released in specific sections of the river so that data on survival, migration and behaviour may be obtained.

EARLY - LATE RUN EXPERIMENT

Once again ample stocks of ova were obtained for the experiment designed to determine whether or not the tendency for salmon to run early or late is inherited or a result of environmental conditions prevailing in the rivers. Some 426,000 eggs were obtained from late run stock in River Phillip, N.S., and a total of 329,000 ova from early run parents from Rocky Brook, N. B. and the Nictaux River, N.S. The young salmon that hatch from these eggs will be retained until they become yearlings in 1958, at which time they will be marked and distributed. Progeny of the early run stock will be released in River Phillip which carries a late run of salmon while the late run River Phillip progeny will be released in the LaHave river which is fundamentally an early run river.

Only a few thousand yearlings of known origin were available for distribution in connection with the early-late run experiment in 1956 since very few eggs were obtained in the fall of 1954 as a result of adult losses brought about by damage to retaining fences following the hurricanes of that year. In addition the floods which occurred during the early part of 1956 resulted in the loss of many small salmon which had developed from the eggs collected in 1954. A total of 5,498 marked yearlings of early run origin was distributed in River Phillip and 3,232 marked yearlings of late run origin were distributed in the LaHave river.

The first returns from this experiment may appear in the rivers during 1957 when grilse resulting from the yearling releases made in 1955 could return from the sea. A total of 35,759 yearlings from early run Rocky Brook stock was marked by removal of the left ventral fin and distributed in River Phillip between September 27 and October 1, 1955. At this time the salmon averaged $4\frac{1}{2}$ inches in length and 0.4 ounces in weight. Similarly 59,661 yearlings from late run River Phillip stock were marked by removal of the right ventral fin and distributed in the LaHave river between April 7 and May 5, 1955. These fish averaged approximately 6-3/4 inches in length and 1.1 ounces in weight when released. Every effort will be made during 1957 and subsequent years to locate these marked salmon wherever they may appear in order to determine whether they retain the characteristics of the parents with regard to time of run or whether they assume the characteristics of the run native to the rivers in which they were released.

EXPERIMENTAL PREDATOR BIRD CONTROL

American merganser populations were controlled once again during the summer of 1956 on the Miramichi river system in New Brunswick and the St. Mary's River in Nova Scotia, by means of organized shooting carried out by several two-man

crews making regular sweeps down the rivers. This project is being carried out as an experiment to assess the benefits to the salmon production of these rivers resulting from control of the American merganser populations and to determine whether or not this particular technique can be applied on a large scale. Authority to kill American mergansers on these experimental rivers was obtained from the Canadian Wildlife Service of the Department of Northern Affairs and National Resources, which administers the Migratory Birds Convention Act in Canada.

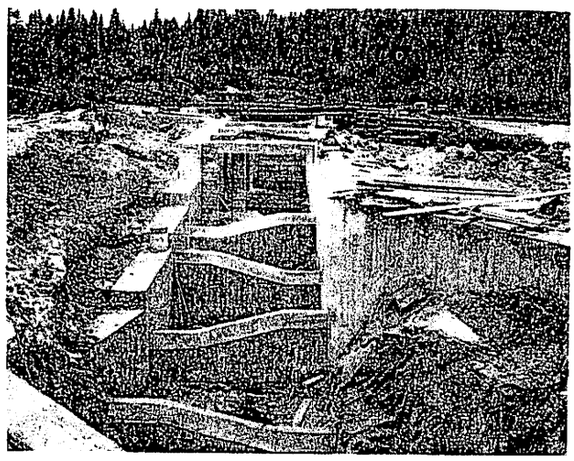
The results obtained from this experiment have been encouraging since the number of birds killed each year has decreased on both rivers although the shooting effort has remained relatively constant. Further, the number of young salmon observed in these rivers has increased since predator bird control was undertaken but this has proved difficult to assess accurately, particularly in the Miramichi river where the deleterious effect of DDT offsets the beneficial effect of predator control. It is expected that returns of grilse and adult salmon to the St. Mary's river fisheries within the next year or two will clearly demonstrate the value of predator bird control in improving Atlantic salmon stocks. The number of American mergansers killed each year is summarized below:

	1954	1955	1956
Miramichi R., N.B.	1028 (revised)	436	178
St. Mary's R., N.S.	424 (revised)	240 (revised)	113

Analyses of the stomach contents of 100 American mergansers have been made each summer during 1954, 1955 and 1956. The results of this study show that salmon parr constitute the most important single food item during the summer months. In 1954 an average of 3.7 salmon per stomach were found in the sample analysed and 4.0 and 3.9 respectively in the 1955 and 1956 samples. It was found that the diet consisted almost exclusively of fish although crayfish, aquatic insects and vegetative debris were found occasionally. Six species belonging to the minnow family were identified in the stomach analyses. Considered as a single food item an average of 2.3, 1.9 and 2.3 minnows per stomach were found in the 1954, 1955, and 1956 sample respectively. Less than one sucker per stomach was found each year. Other species which occurred in relatively small numbers in the stomachs included sticklebacks, smelts, trout, sculpin, eel, tomcod, gaspereau and killifish.

STREAM IMPROVEMENT

General stream improvements were carried out on several salmon rivers during the year and these were designed to ease the passage of migrating salmon, particularly during periods when critical water levels prevail. Improved channels were bulldozed in sections of North River, Salmon River and Gold River in Nova Scotia. New channels were blasted in the rock at minor obstructions located in Cape Roger River, Bay de l'eau River, Little Salmonier River and Northwest Brook in Newfoundland. Several unused timber dams were breached and accumulations of logs and debris removed from important salmon rivers.



Fishway under construction

Three fishways were constructed during 1956 including one on Harry's River at Pinchgut Lake in Newfoundland and two on the LaHave River in Nova Scotia at Zwicker's Dam and Parnell's Dam. At the Parnell site a pool-type fishway 270 feet long was constructed to provide passage for salmon over a combined natural falls and mill dam 31 feet in height. This makes approximately 280 square miles of good salmon producing water available for the first time. Although a few adult salmon may use the fishway immediately an intensive stocking programme is planned for these waters to ensure early development of a substantial salmon run in this branch of the LaHave River.

Biological and engineering surveys were completed and analyses made of the fisheries problems presented by many proposed industrial developments involving the use of water in important salmon rivers. Minor modifications were suggested in the design of fish collection facilities and the skip hoist which will carry salmon over the power dam which is under construction at Beechwood on the Saint John River in New Brunswick. Analysis of the salmon problem associated with construction of a power project on Little Rattling Brook in Newfoundland was completed and it has been recommended that attempts be made to transfer the run to a nearby river which is understocked. Many other problems such as the passage of fish through aboiteaux and the effect of industrial effluents on resident and migrant fish populations were investigated as they arose and solutions presented for necessary action.

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Conference with Forest Biol. Div. Re Rept copy of Fisheries Dept re DDT spraying

Conference on Problems Introduced by Outbreaks of Forest Defoliators, Aerial Spraying of Insecticides, and Resultant Fish Mortality

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January 10, 1958 - 9: 00 A.M.
Board Room (#479), Department of Agriculture, Confederation Building, (cor. Wellington and Bank Sts)
Ottawa

Chairman: K.W. Neatby, Director, Science Service, Department of Agriculture

Agenda

1. Introductions (see attached list)

2. Opening remarks: K.W. Neatby

3. Functions and policy of Forest Biology Division in relation to direct control of forest defoliators:
   M.L. Prebble

4. The spruce budworm in New Brunswick and Quebec
   a. history of outbreak, control program, assessment of results, outlook

   b. the fisheries problem

   c. general discussion

5. The black-headed budworm in British Columbia

   a. history of outbreak, control program, assessment of results, outlook

   b. the fisheries problem

   c. general discussion

   (noon recess scheduled at this point)

6. Possibilities of avoiding injury to fish populations

   a. alternative insecticides

   b. adjustments in techniques of insecticide application

7. Improved liaison

   a. full exchange of information

   b. collaboration on advice and recommendations

8. Research requirements.

List of those expected to be at the Conference,

January 10, 1958.

Department of Agriculture

Dr. K.W. Neatby, Director, Science Service
Dr. M.L. Prebble)
Dr. B.M. McGugan) Forest Biology Division Headquarters, Ottawa
Mr. D.E. Gray)

Dr. J.J. Fettes)
Mr. A.P. Randall) Forest Biology Division, Chemical Control
Mr. W. Haliburton) Section, Ottawa
Mr. W.W. Hopewell)

Dr. H. Hurtig, Entomology Division, Ottawa
Dr.A.R.G. Emslie, Chief, Chemistry Division, Ottawa

Dr. R.E. Balch)
Dr. F.E. Webb) Forest Biology Laboratory, Fredericton
Dr. R.F. Morris)

Dr. L. Daviault) Forest Biology Laboratory, Quebec
Dr. J.R. Blais)

Dr. R.M. Belyea)
Mr. K.R. Elliott) Forest Biology Laboratory, Sault Ste. Marie

Mr. R.R. Lejeune, Forest Biology Laboratory, Victoria, B.C.

Department of Fisheries and Fisheries Research Board

Dr. A.L. Pritchard)
Dr. W.M. Sprules)
Mr. E.W. Burridge) Fisheries Department, Ottawa
Mr. E.B. Young)

Mr. W.R. Hourston, Fisheries Department, Vancouver
Dr. J.L. Kask, Fisheries Research Board, Ottawa
Dr. F.P. Ide, Fisheries Research Board, U. of Toronto

Dr. J.L. Hart)
Dr. C.J. Kerswill) Fisheries Research Board,
Dr. M.H.A. Keenleyside) St. Andrews

Could not attend because of illness
Dr. J.R. Brett)
Dr. A.W.H. Needler) Fisheries Research Board, Nanaimo

Department of Northern Affairs and National Resources

Dr. D.R. Redmond, Chief, Research Division, Forestry Branch
Mr. H.W. Beall, Chief, Operations Division, Forestry Branch

Forest Protection Limited

Mr. B.W. Flieger, Manager

Forest Pest Control Committee (B.C. Loggers' Association)

Mr. W.S. Hepher, Chairman

Quebec Department of Fisheries

One or two representatives to be named Dr Gagnon.

N.B. Department of Lands and Mines

Mr. W.W.McCormack, Deputy Minister (or his representative)

Quebec Department of Lands and Forests

Representative to be named

B.C. Department of Lands and Forests

Representative to be named

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   a. full exchange of information
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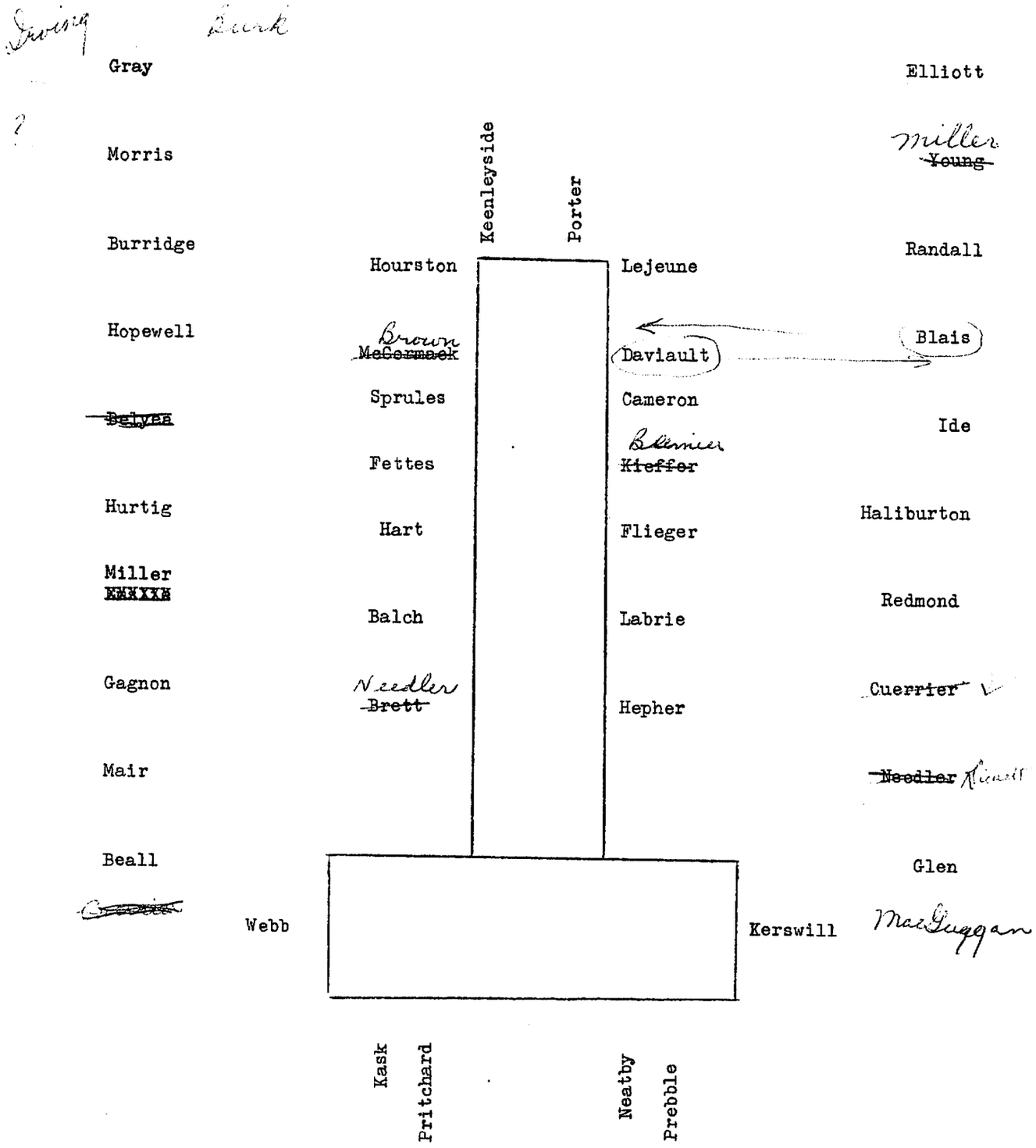
SEATING PLAN



Entrance 179 Confederation Building

Jan. 10, 1958.

FOREST BIOLOGY DIVISION

SCIENCE SERVICE, CANADA DEPARTMENT OF AGRICULTURE

by Prebble

FUNCTIONS

1. Comprehensive surveys and research on forest insect and disease problems throughout Canada.

2. Control experiments utilizing biological control agents, cultural techniques, and various direct control measures including insecticides and fungicides.

3. Consultative and advisory services on the need for, and method of, conducting commercial control operations.

4. In connection with large-scale control operations, assessing hazard to the forest, providing data on phenological development for scheduling operations, evaluating short-term results by studies of pest populations and tree vigour, and assessing long-term results in representative areas and sample plots.

DIVISIONAL ESTABLISHMENTS

Regional laboratories, responsible for the surveys and investigations in their areas of jurisdiction, are located as follows:

Newfoundland	(Corner Brook)	Manitoba	(Winnipeg)
Nova Scotia	(Debert)	Saskatchewan	(Saskatoon)
New Brunswick	(Fredericton)	Alberta	(Calgary)
Quebec	(Quebec City)	British Columbia	(Victoria)
Ontario	(Sault Ste.Marie, Maple)		(Vernon)

In addition to the regional laboratories, the Division has four subject-matter sections:

Chemical Control, at Ottawa
Insect Pathology, at Sault Ste. Marie
Cytology and Genetics, at Sault Ste. Marie
Bioclimatology, at Victoria.

Divisional Headquarters are in the Science Service Building, Experimental Farm, Ottawa.

PUBLICATIONS

1. Forest Insect and Disease Survey Report (annual)

2. Bi-Monthly Progress Report

3. Scientific and Technical Papers are published in numerous periodicals or as Departmental bulletins. Reprints are distributed widely.

PUBLICATIONS (continued)

4. Interim reports on surveys and on research projects are distributed to limited groups, but are available more widely on request.

DIVISIONAL POLICY ON CONTROL PROJECTS

1. Where there is any expection that introduction of parasites, predators, or insect diseases will reduce damage from forest insect infestations, steps are taken to introduce such agents from abroad.(Co-operative effort with the Entomology Division, Science Service, and the Commonwealth Institute of Biological Control).

2. Where modified cultural techniques, management or utilization practices hold promise of reducing forest insect or disease damage, appropriate recommendations are made to government forestry departments, industrial firms, or private owners.

3. In some of the most serious forest insect outbreaks, methods (1) and (2) are quite incapable of preventing serious current losses. Very prompt action is necessary to avert losses due to infestations of certain sawflies in pine plantations, and of the hemlock looper in mature stands of western hemlock (B.C.) and balsam fir (Quebec and Newfoundland). Injury develops more gradually in infestations of the black-headed budworm (2-3 years) and of the spruce budworm (3-5 years). Divisional policy is to recommend forest spraying just before the danger of serious damage is imminent - that is, in the year when the forest needs relief from further intensive defoliation in order to prevent extensive timber mortality. The policy is therefore aimed at forest protection in specified places and at specified times in relation to the known tolerance limits of the timber species affected, and the forecast insect population. Eradication is never the aim.

The Division has no regulatory authority or responsibility. Decisions to undertake direct control projects rest with the owners and operators of timberlands. Likewise the organizing, financing and execution of the control projects are the responsibility of special groups set up to represent the owners and operators.

RÉSUMÉ OF MAJOR FOREST DEFOLIATORS IN CANADA by M.L. Prebble

(In this statement are included only species capable of causing timber mortality, that are also susceptible to insecticides applied from the air)

Spruce Budworm, Choristoneura fumiferana (Clem.)

Principal hazard areas are the widespread balsam fir-spruce forests of New Brunswick, Quebec, Ontario. Lesser hazard areas are in Newfoundland, Nova Scotia, and restricted portions of Manitoba and Saskatchewan. Hazard in the recently-infested pure white-spruce stands along the MacKenzie River is uncertain.

Less acute hazard areas are the spruce-alpine fir stands in the interior of British Columbia (where the insect has a two-year life-cycle), and Douglas-fir-amabilis fir stands in the lower coastal area.

Black-headed budworm, Acleris variana (Fern.)

Widespread outbreaks occur at intervals of 10-15 years in western hemlock-amabilis fir forests in coastal British Columbia. Infestations in any one area may be intense, but usually collapse about the 3rd or 4th year due to natural control factors.

There is a lesser hazard in the balsam fir forests of Nova Scotia, New Brunswick, and Quebec.

Hemlock looper

(a) Subspecies, Lambdina fiscellaria fiscellaria (Guen.)

Intensive outbreaks, usually of a few square miles but ranging up to 50 square miles or more, occur periodically in balsam fir forests of Newfoundland, Quebec, and northeastern Ontario; smaller outbreaks occur in eastern hemlock stands in the Muskoka and Thousand Islands areas of Ontario.

(b) Subspecies, Lambdina fiscellaria lugubrosa (Hulst)

Intensive outbreaks, usually of limited extent but ranging up to 70 square miles or more, occur at intervals of 10-15 years in forests of western hemlock and associated species in coastal British Columbia and in certain sections of the interior wet belt.

Outbreaks of the hemlock looper may be sufficiently intense to cause nearly complete stripping of trees in a single season. They tend to collapse about the 3rd or 4th year, usually without progressive spread.

Douglas fir tussock moth, Hemerocampa pseudotsugata McD.

Periodic outbreaks occur in the southern interior of British Columbia. Individual infestations range from a few acres to several square miles, but the total area of infested stands may aggregate over 100 square miles. Infestations are usually brought to an end by a virus disease and parasites, but not always before mortality of Douglas fir and yellow pine has occurred.

False hemlock looper, Nepytia canosaria Wlk.

An unusual outbreak occurred in the Kootenay area of British Columbia in the late 1940's. Defoliation was severe in young Douglas fir stands over 40 square miles. This species is a potential threat to young stands in the Nelson and Kamloops districts.

Pine sawflies, Neodiprion spp.

Outbreaks of several species occur in plantations or natural stands of pine in Ontario and Quebec. N. lecontei is a common defoliator of young red pine plantations, and numerous small control operations have been carried out in Ontario. N. swainei and N. pratti banksianae are common defoliators of jack pine in natural stands and infestations may be widespread. Extensive timber mortality has occurred in parts of northern Quebec following persistent infestations of N. swainei. Little or no aerial spraying has been undertaken to control infestations to date, but one might anticipate the need in the future.

Forest Tent Caterpillar, Malacosoma disstria Hbn.

Spectacular outbreaks, which may cover hundreds of thousands of square miles occur at intervals of 10-12 years. Although the infestation may persist for 4-5 years in any one area, poplar and other host trees usually survive with no more serious injury than branch killing and reduced increment. To date, aerial spraying has been limited to small areas around resorts. It is unlikely that widespread control operations will be undertaken in the foreseeable future.

The Spruce Budworm in Quebec Province

by L. Daviault and J.R. Blais
Forest Biology Laboratory, Science Service, Canadian Dept. of Agric., Quebec, P.Q.

The present spruce budworm outbreak has been in progress in the Province of Quebec for the past seventeen years, and during this period all regions where balsam fir occurs in abundance have been invaded.

The presence of the insect was first recorded in 1939 in the Abitibi region. A survey made the following year revealed that all coniferous stands in an area of one hundred square miles near Lake Abitibi were already severely attacked and a good number of trees were seriously damaged. From this point the infestation spread gradually in an easterly direction to finally reach the Gaspe Peninsula about 1950. The progress of the invasion was more or less rapid depending on the prevalence of mature balsam fir in various regions. It was noted that in many areas the general outbreak was preceded by a few isolated foci of infestation acting somewhat like the advance guard of an invading army.

The region which has been most severely affected occurs in a band of territory having an area of approximately 100,000 square miles extending from the Ontario border to the Atlantic. This territory is limited to the north by continuous stands of black spruce, and to the south by cultivated land, cut-over areas, and hardwoods.

The intensity of the infestation varied with stand composition, being more serious in those containing a high percentage of balsam fir. Local fluctuations in insect population occurred, but in any one area, the outbreak always lasted from 8 to 10 years. When the insect population finally decreased, balsam fir stands were left in a state of almost complete devastation.

The behaviour of the outbreak in the region of the Kabonga can be given as an example. In this region the insect was first recorded in 1943, and the following year the population had reached damaging proportions. In June 1944, heavy frosts killed at least 95 per cent of the freshly opened buds on balsam fir, and the young budworm larvae starved for lack of proper food. As a result, the insect population was considerably reduced during the next two years but it increased again and attained a high level in 1947. Mortality of balsam fir started in 1948 and by 1952, at least 75 per cent of the trees were killed.

Since the beginning of the outbreak, many operating companies have attempted to salvage what they could of the affected timber. This has necessitated alterations in cutting programmes and management plans, sometimes at considerable expense. Notwithstanding these efforts, enormous quantities of timber could not be salvaged, and were left to rot in the woods.

At the present time the budworm is especially active in the Lower St. Lawrence and Gaspe. Throughout this region, considerable amounts of white spruce trees were killed by the European spruce sawfly about 20 years ago, and more recently almost all the yellow birch and paper birch were destroyed by the birch die-back. As a result, stands that contained a fair percentage of spruce and birch are now composed almost entirely of balsam fir, and, in many instances, these trees are overmature and decadent. Such stands offer ideal conditions for a spruce budworm outbreak.

When the outbreak struck the Lower St. Lawrence and Gaspe, provincial authorities and companies with limit holdings in these regions decided to do whatever was possible to protect from destruction stands that could not be exploited in time. Aerial spraying with an insecticide was the only measure applicable under the circumstances. It was understood from the beginning that the treatment would be applied only as an emergency measure, and only in such cases where any further delay would endanger the life of already seriously damaged trees.

The number of acres treated each year in Quebec since 1954 is as follows: 1954, 318,000 acres; 1955, 1,040,000 acres; 1956, 442,000 acres; 1957, 1,255,000 acres. Only about 15 per cent of the total territory treated to date has been sprayed more than once.

Throughout the region of the Lower St. Lawrence and Gaspe, but especially in the western and central parts, there are very extensive forest stands alive to-day, which would certainly have succumbed had they not been treated.

Spruce budworm infestations will be less severe when all our forests are managed. Unfortunately, it will take many years before this goal is reached. In the meantime, there appears to be only one possible way of protecting certain stands and that is to spray them. By doing this, we can prolong the life of trees at least for a few years, until they can be cut.

THE SPRUCE BUDWORM AND AERIAL SPRAYING IN NEW BRUNSWICK

by D. F. E. W. Webb.

Outbreak History

The spruce budworm is a native insect and the most destructive in Canadian forests. Infestations have been reported from some part of Eastern Canada almost every year for the last 40 years and widespread outbreaks involving tremendous losses of timber are known to have occurred periodically for more than 150 years. Intervals between general outbreak periods have varied from 35-40 years in New Brunswick to about 70 years in northwestern Ontario. The most recent ones occurred between about 1909 and 1920 and from about 1940 until the present time. Infestation is currently at a relatively low ebb over most of Ontario and Quebec north of the St. Lawrence and is most severe in the Atlantic-Maritime region.

The previous outbreak in New Brunswick lasted from 1912 to 1920. All the spruce-fir forests were attacked; the fir was more or less completely killed over large areas and much of the spruce also died. The spread of the current outbreak since 1949 is shown in Table 2. By 1957 the total area of severe attack covered about three-fourths of the entire Province.

Nature of Outbreaks

Outbreaks follow several successive years of favorable weather combined with favorable conditions in the forest. Once they gain momentum they seldom end before extensive killing of host trees, particularly balsam fir. Their apparent spread is generally west to east, in the direction of prevailing winds, sometimes aided by huge "flights" of moths carried along convective storm fronts. The small caterpillars also drift on silken threads and contribute to uniform local spread. Thus, once an outbreak has developed, all types of spruce-fir stands usually become severely infested.

The danger of destructive outbreaks is greatest when there are large areas of forest containing a high percentage of fir. The danger also increases with the age of the forest but area and density are the chief factors in susceptibility.

After an outbreak has destroyed most of the susceptible forest the danger is removed until the new forest grows up or the surviving young stands mature. The new forest, however, nearly always contains a high proportion of fir and becomes susceptible to new outbreaks. The principle upon which control through forest management is based is to ensure, through manipulation of cutting practices, a greater diversity of age-class and stand composition in the next crop.

History of Spraying

Large-scale aerial spraying against spruce budworm is a development chiefly of the last 10 years. Particularly large operations have been underway since 1949-53 in the Pacific Northwest and Northern Rocky Mountain Regions of the United States and since 1952-54 in New Brunswick and Lower St. Lawrence-

Gaspe Regions of Quebec. The total area treated in both countries is now between 20-25 million acres. The extent of spraying in New Brunswick in relation to total area of severe attack is shown in Table 2 and on the attached maps. The policy in Canada has been to spray only where a year's further delay would seriously threaten the life of trees. The standard dosage of 1 lb. DDT in 1 U.S. gallon oil solvent per acre has been reduced by half in the New Brunswick-Quebec operations.

Assessment of Results in N.B.

In general, immediate results show large reductions in pest populations (80-100%) as compared to unsprayed checks. Good timing aided by drift to ensure uniformity of deposit, has also resulted in substantial foliage protection and this is generally reflected in particularly good growth recovery the following year. Reinfestation has been rapid, however, owing to mass moth flights and the resurgence of residual populations. There is no evidence that the latter is due to reduced per cent parasitism or per cent predatism in sprayed areas. A more likely result is that spraying is checking the decline of the outbreak by preserving the food supply of the larvae. Continued prevention of mortality appears to require respraying every other year, or at the most every third year until the outbreak declines or the crop is harvested. After eight years of attack, mature stands in unsprayed check areas are largely dead or dying and stocking is being depleted in immature stands. Mortality in sprayed areas has been largely forestalled over most of the 5 million acres now involved and severe damage is chiefly confined to relatively small patches where treatment was too late or was otherwise inadequate.

There are yet no signs of serious lasting effects against other terrestrial insects and there have been no measurable increases in other pests. Neither is there any evidence of adverse effects against birds and mammals. Substantial reductions have been noted in aquatic insects, however, and recovery of some important fish-food forms may be delayed.

Outlook for the Future in N. B.

There is no way of predicting the eventual course of the outbreak. Some slackening in intensity is indicated for 1958 particularly in the older outbreak areas but this cannot yet be attributed to other than temporary causes. Present plans must take into account the possibility of a resurgence in 1959 and beyond. Spraying to protect the most severely damaged stands from serious mortality in 1958 will most likely involve 2-2½ million acres. The possibilities of improving natural control by use of parasites or disease is being studied but no positive results have yet been obtained. Biological and silvicultural methods of improving natural control may eventually become effective, but aerial spraying used in the context of an intelligent management plan remains the best prospect for protection in the foreseeable future.

Appendix I

Note Concerning Fundamental Research on Population Dynamics and Forest Management

The reduction of budworm damage through forest management is a long-term proposition, and will be mentioned only briefly because it is not likely to provide a solution to the immediate problems with which this Meeting is concerned.

However, it may be of interest to people outside the Division of Forest Biology to know that an intensive program on the population dynamics of the spruce budworm has been in progress on the Green River Watershed in northern New Brunswick since 1945. The Federal Forestry Branch, the New Brunswick Forest Service, and Fraser Companies are co-operators in this study, with the research being conducted mainly by the Forest Biology Division and the Forestry Branch. The fundamental work on budworm population and its relation to forest conditions employs a team of six research officers aided by technicians and students and has received excellent support both inside and outside the Forest Biology Division. For example, when the need for biological assessment of aerial spraying arose in 1952 and subsequent years, it was met by other means than diverting effort or experienced personnel from this long-term research. Also, although considerable tree mortality and loss of wood was virtually certain, the New Brunswick Government and Fraser Companies agreed to the establishment of a check area of some 30 square miles where the natural behaviour of the budworm could be studied. By an Order-in-Council, this area has been reserved indefinitely from both spraying and cutting. These are only two examples of the very gratifying support which this fundamental population work has enjoyed.

Very briefly, the results to date support earlier observations of a more general nature that were published after the 1912 outbreak, and show that the population behaviour of the spruce budworm is closely related to the nature of the forest. We have also been fortunate in discovering some of the basic mechanisms that determine this relationship, although much additional work is needed, especially with low budworm populations. It is likely that budworm outbreaks will always be a threat in a predominantly balsam fir area like northern New Brunswick but there is every reason to believe that management and utilization can reduce both their severity and extent in the future, as well as the terrific momentum which is a salient feature of the present outbreak. This will require many years, however, and is therefore not very comforting to those who are competing with the budworm for the existing reserves of mature and overmature wood.

We cannot say more than this without becoming involved in details of population dynamics, and as mentioned earlier this would not contribute much to immediate problems. However, we shall be glad to supply reprints or other material to those who may be interested in further information on the population dynamics of the budworm.

Forest Biology Laboratory
Fredericton, N. B.

January 1, 1958

Table 1

History of Large-Scale Forest Spraying Operations in Canada. DDT-Oil Formulations Used in All Cases.

Insect	Year	Province	Dose: DDT	Acres	Sq. mi.
Western hemlock looper	1946	B.C.	1 lb./acre	12,000	19
False hemlock looper	1948	B.C.	1 lb./acre	11,000	17
Black-headed budworm	1957	B.C.	1 lb./acre	156,000	240
Spruce budworm	1945	Ont.	1 lb./acre	64,000	100
	1946	Ont.	2 lb./acre	29,000	45
	1952	N. B.	1 lb./acre	186,000	290
	1953	N. B.	*½ lb./acre	1,800,000	2,800
	1954	N.B. & Que.	½ lb./acre	1,500,000	2,300
	1955	N.B. & Que.	½ lb./acre	2,200,000	3,400
	1956	N.B. & Que.	½ lb./acre	6,500,000	10,200

*Approximately 25% of 1953 area treated twice.

Table 2

Areas of Severe Attack by Spruce Budworm
in New Brunswick and Areas Treated by Aerial Spraying

Year	Areas - sq. mi.		% severely attacked area sprayed
	Severe attack	Sprayed	
1949	200	0	-
1950	400	0	-
1951	2,200	0	-
1952	5,000	300	6%
1953	11,000	2,800	25
1954	13,000	1,800	14
1955	13,000	1,800	14
1956	16,000	3,100	19
1957	20,000	8,100	40
1958	?	(3,600 ?)	

Total area in New Brunswick treated one or more times:

8,100 sq. mi., or 5.2 million acres

Total insecticide used against spruce budworm since 1952:

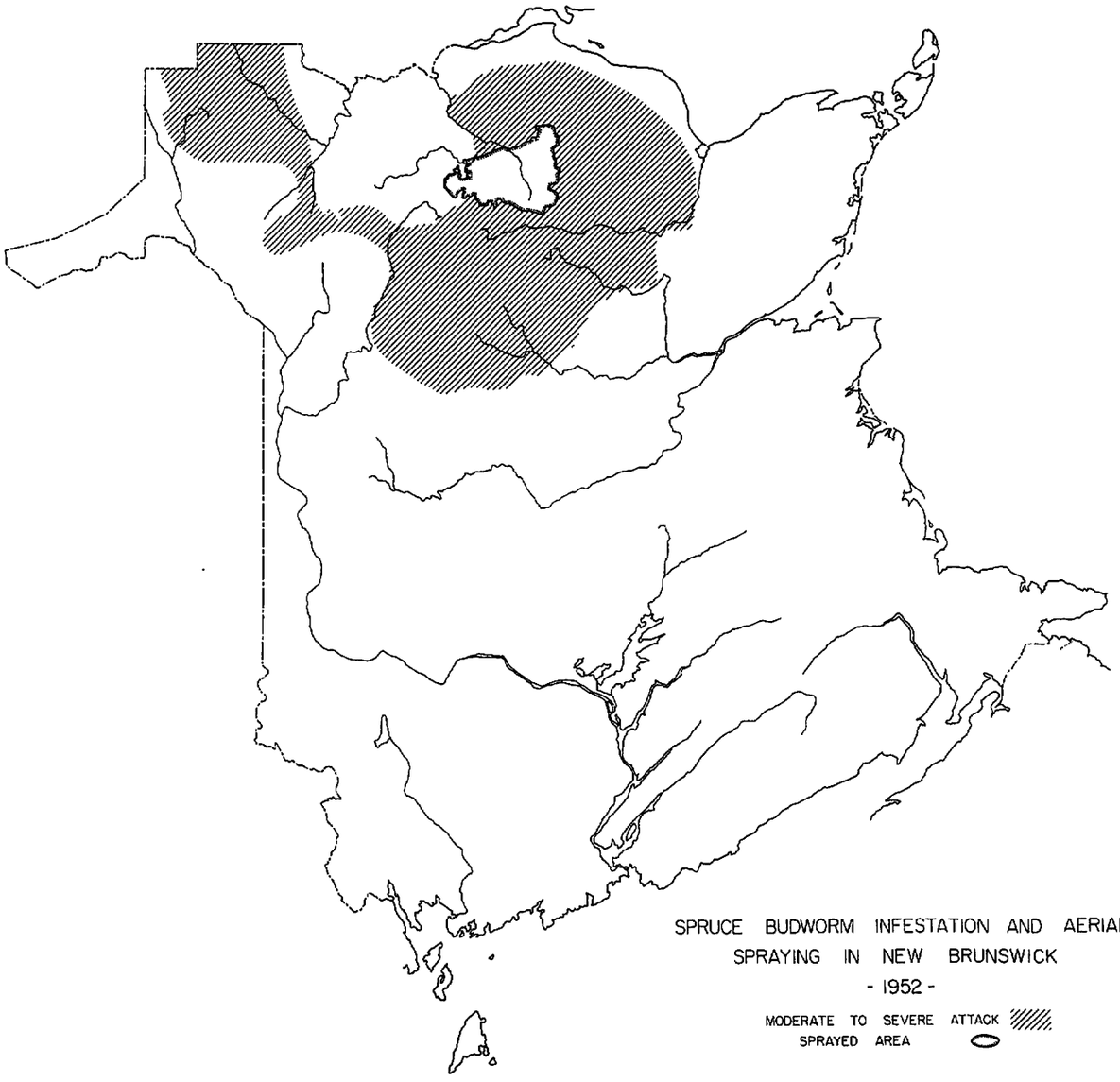
6 million lbs. DDT in 6 million U.S. gals. oil solvent

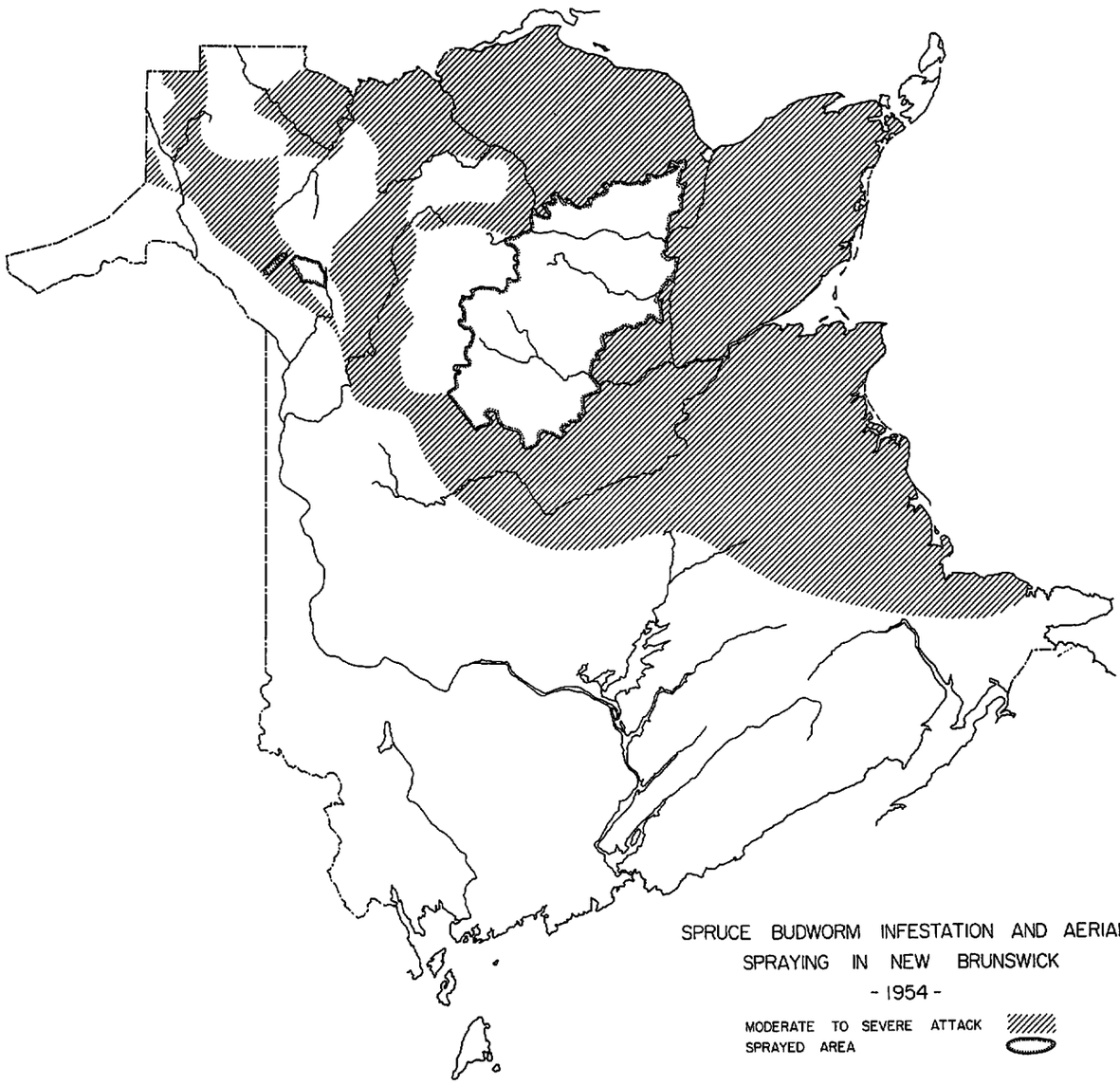
Percentage of N. B. areas sprayed once: 13.7%

twice: 55.5

three times: 28.3

four times: 2.5


SPRUCE BUDWORM INFESTATION AND AERIAL
SPRAYING IN NEW BRUNSWICK
- 1952 -
MODERATE TO SEVERE ATTACK
SPRAYED AREA


SPRUCE BUDWORM INFESTATION AND AERIAL
SPRAYING IN NEW BRUNSWICK
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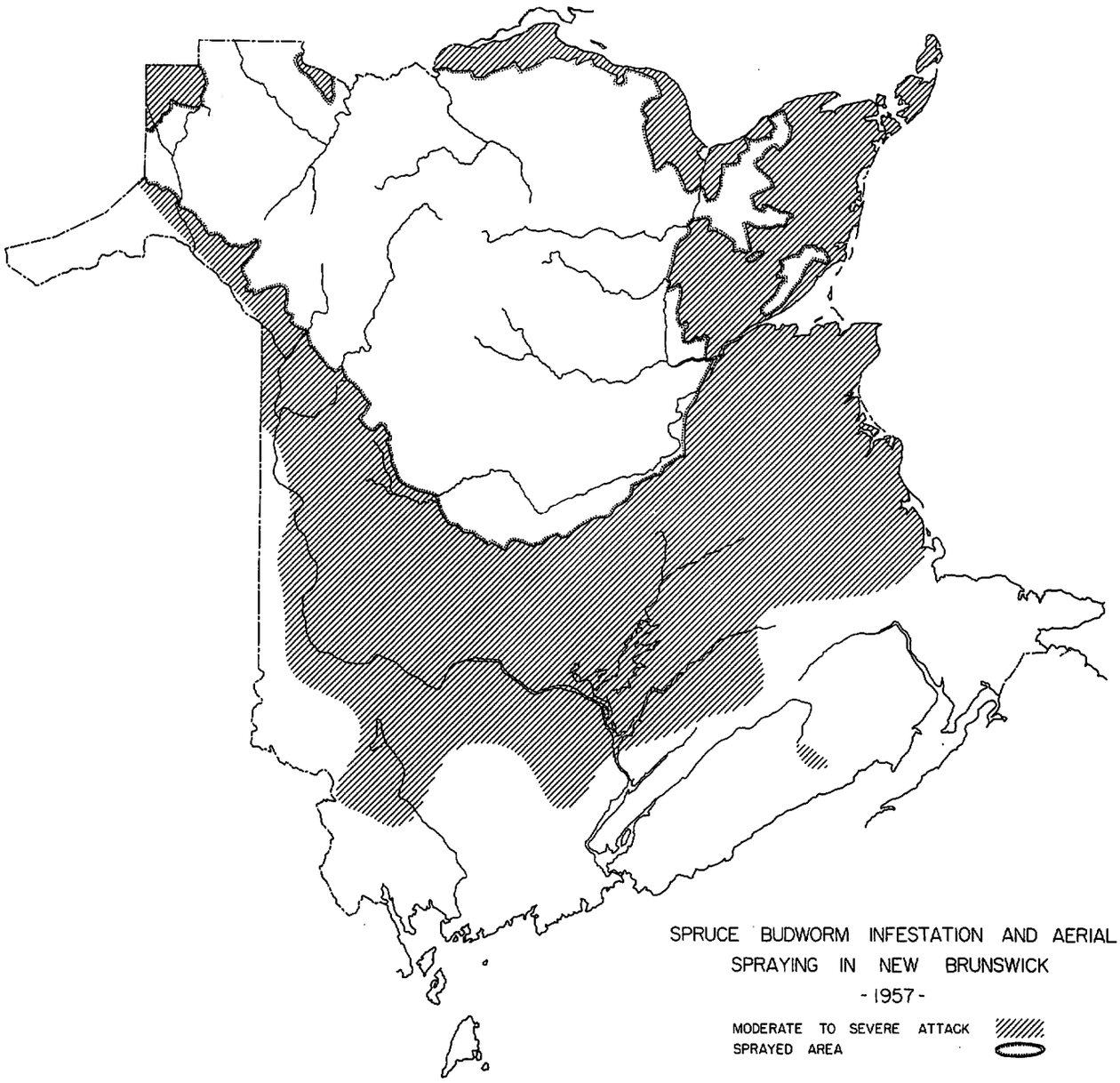
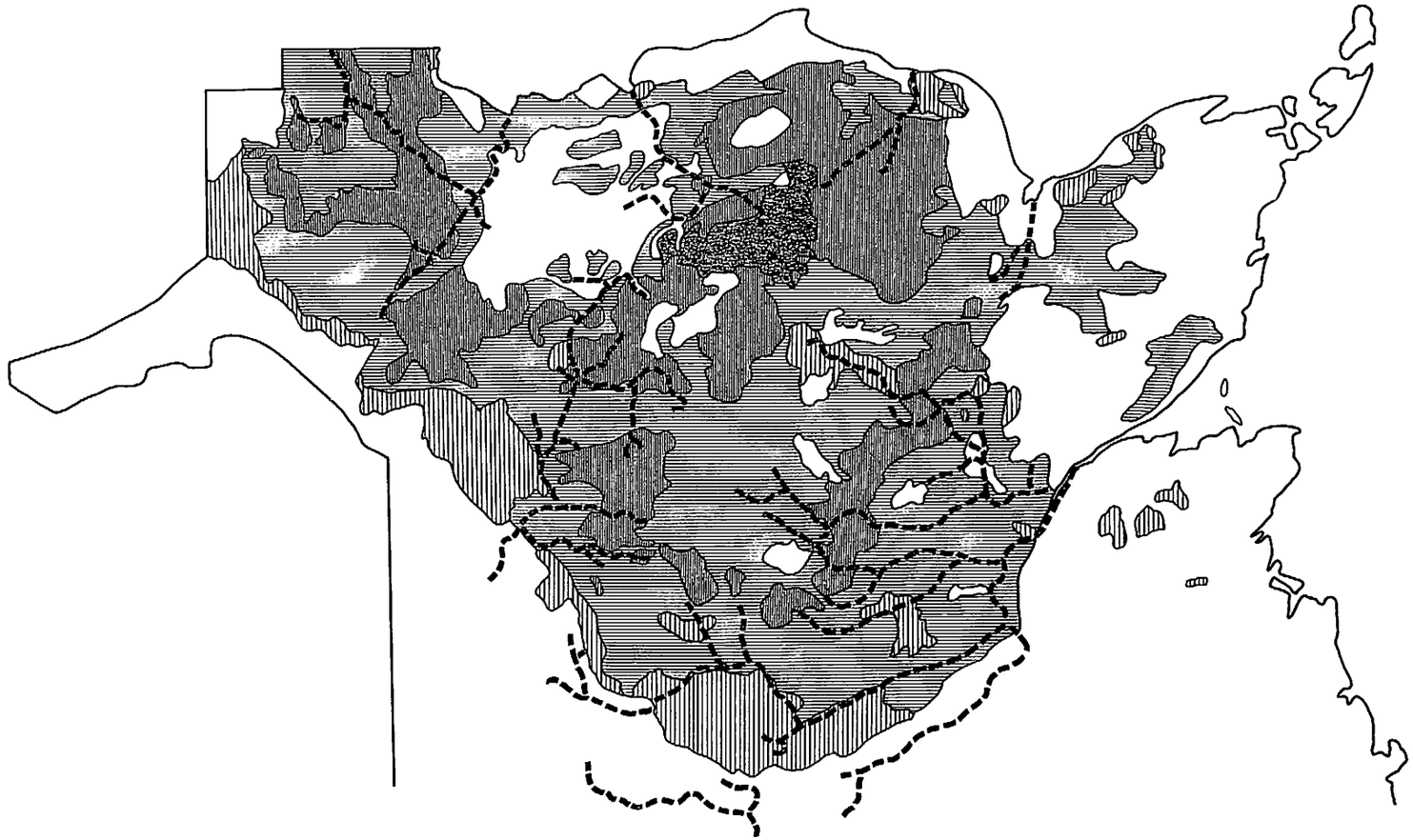
MODERATE TO SEVERE ATTACK
SPRAYED AREA


SPRUCE BUDWORM INFESTATION AND AERIAL
SPRAYING IN NEW BRUNSWICK
- 1957 -
MODERATE TO SEVERE ATTACK
SPRAYED AREA



SPRUCE BUDWORM SPRAYING PROGRAMME - 1952-1957

SPRAYED ONCE
" TWICE
" THREE TIMES
" FOUR TIMES
ATLANTIC SALMON STREAMS

THE BLACK-HEADED BUDWORM IN BRITISH COLUMBIA

by R.R. Lejeune

History of outbreak:- Populations showed signs of increase on the coastal areas of B.C. in 1952. By 1954 heavy "spot" infestations were found at several points on the northern part of Vancouver Island. In 1955 about 1 million acres of forest showed signs of defoliation, much of it severe. The area infested increased to about 2 million acres in 1956, of which 630,000 acres were severely defoliated. Egg surveys in the fall of 1956 showed that substantial defoliation could be expected in 1957 of about 155,000 acres of forest then already in poor condition from two consecutive years of moderate to heavy attack. Based on this information recommendations were made which resulted in a decision to spray this particular area in 1957.

Spraying to date:- In 1956, 240 acres of western hemlock were sprayed experimentally to obtain information on time of application and dosage of DDT required for effective control.

In 1957 some 156,000 acres in the Englewood - Port Hardy - Port Alice triangle were sprayed during the period June 10 - 20. About 146,000 acres were treated with the operational spray solution (DDT in oil solution containing an emulsifier applied at the rate of 1 lb. of DDT per U.S. gal. of solution per acre). Five thousand acres were sprayed experimentally with diluted operational spray solution (0.5 lb. DDT per gal. per acre), and another 5,000 acres were sprayed with the full strength oil solution without emulsifier.

The aircraft for the spray job (4 TBM Gruman Avengers) and the insecticide mixing and loading facilities were based at the Department of Transport airport at Port Hardy. The maximum ferrying distance to any part of the spray area was about 40 miles.

Spraying was to commence when the budworm population had developed to the point where the majority of larvae were in the 2nd instar and with the 1st and 3rd instars about equally represented. This point was reached at elevations under 1,000 feet by June 10 but to allow for retarded development at higher elevations spraying did not commence above 1,000 feet until June 17.

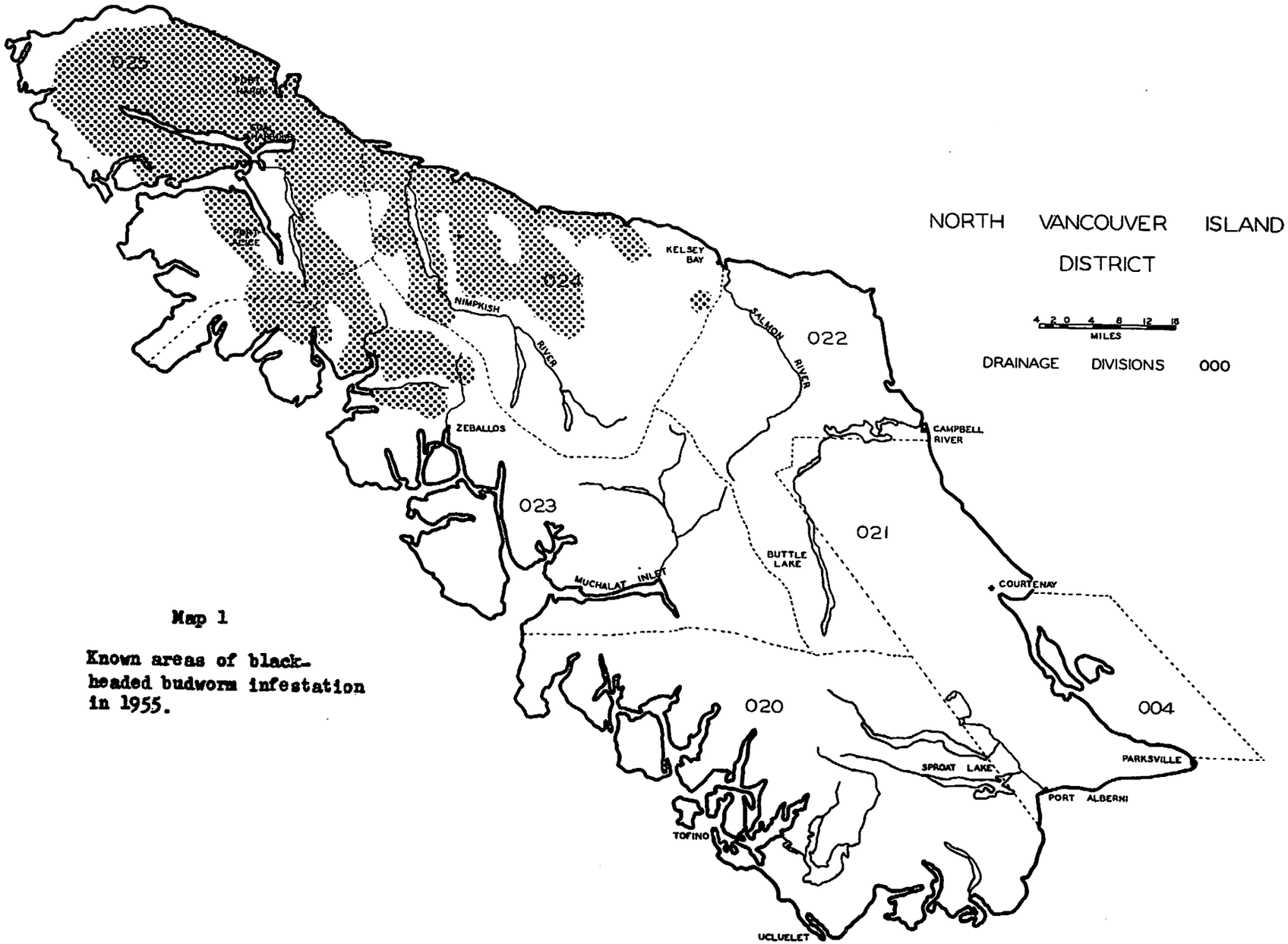
Assessment of results:- Control achieved was determined by comparing insect populations in sprayed and unsprayed plots before and after spraying. Sampling of plots was discontinued on the 12th day after spraying. Spray deposit was assessed from droplet stain patterns on dyed cards placed in the sample plots, and also on or near all accessible logging roads, lakes and streams.

Spray deposit data showed that a light to medium recovery would be indicative of the over-all spray deposition in the sprayed area. Deposits were lighter in areas skip-sprayed to avoid lakes, streams, cut-overs, and cedar swamps and heavier where avoidance of specific landmarks was not required.

The operational spray solution effected complete control where coverage was adequate. The indicated over-all control of about 90 per cent was sufficient to prevent serious defoliation in 1957. Results obtained with the diluted operational spray solution indicated that it was potentially as effective as the full-strength solution. Results with the diesel oil without emulsifier were inconclusive.

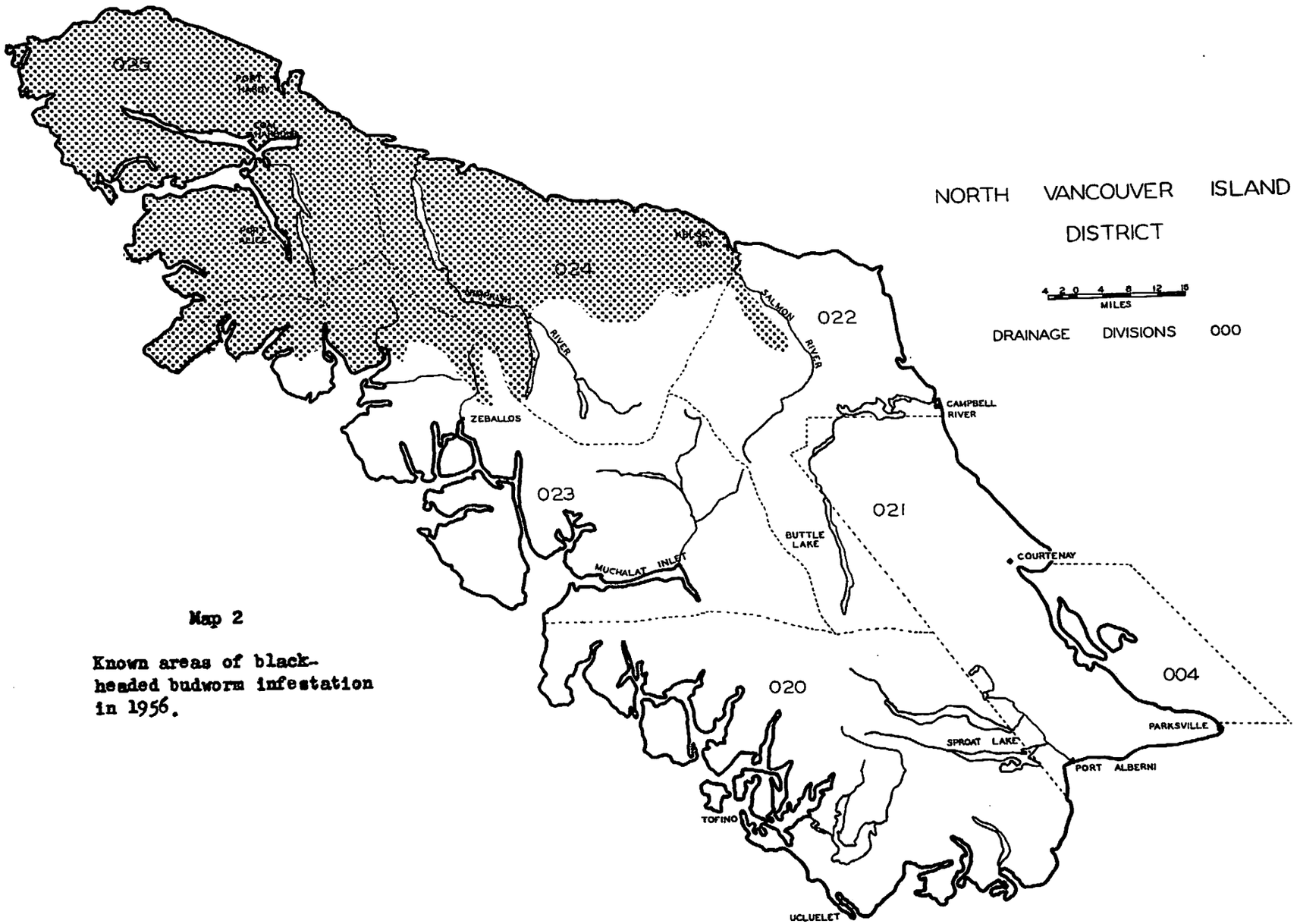
Outlook:- About 50,000 acres showed evidence of defoliation from the air in 1957. The budworm population declined rapidly during the last larval instar and a survey conducted in October, 1957, showed a light overwintering population averaging less than 1 egg per 18-inch branch sample, compared with a high of 42 per sample in 1955. No serious defoliation is expected in 1958.

December 30, 1957, Victoria, B.C.



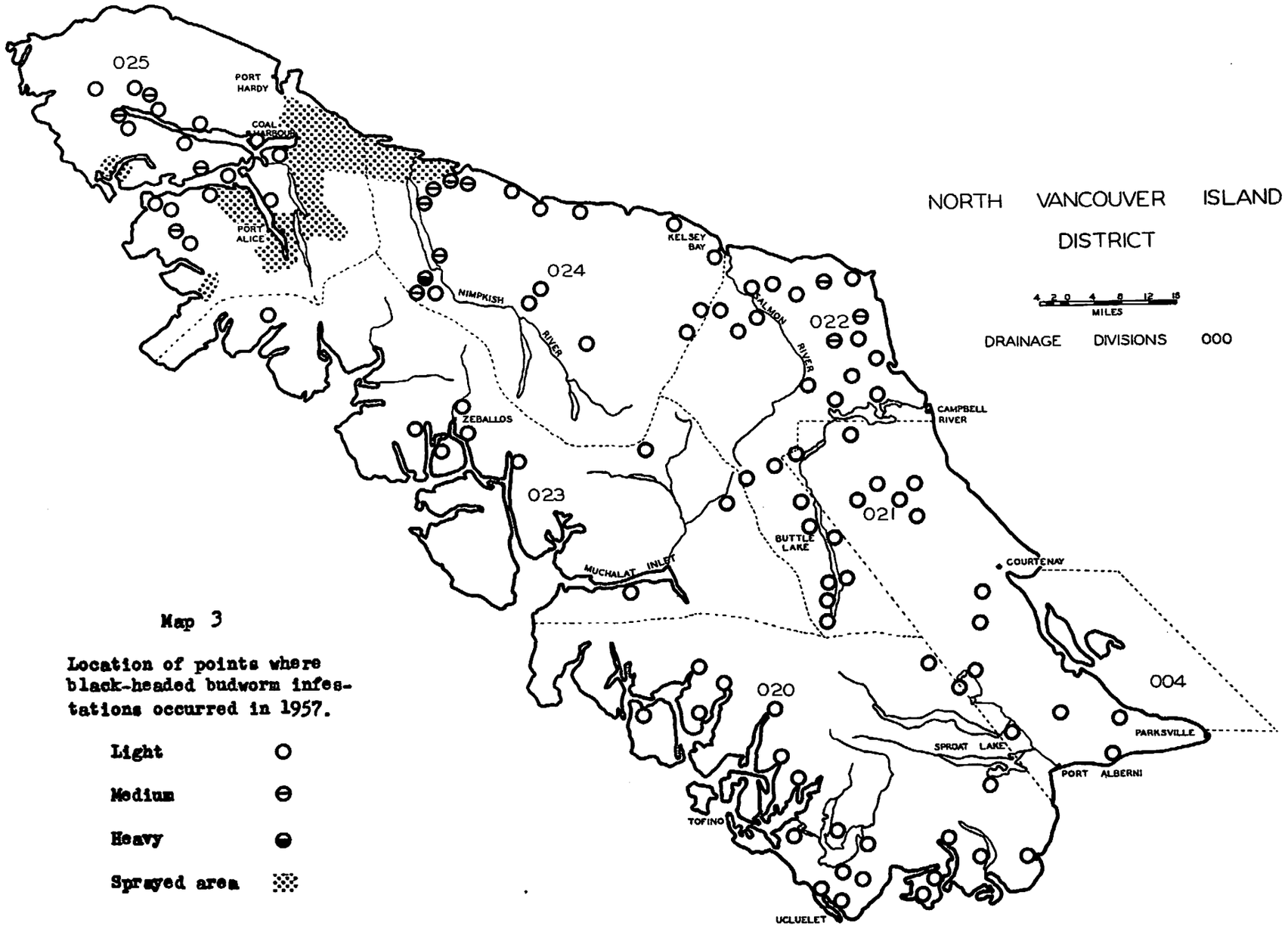
Map 1

Known areas of black-headed budworm infestation in 1955.



Map 2

Known areas of black-headed budworm infestation in 1956.



Map 3

Location of points where black-headed budworm infestations occurred in 1957.

Light O

Medium ⊖

Heavy ●

Sprayed area ▒

False hemlock looper, Nepytia canosaria Wlk.

An unusual outbreak occurred in the Kootenay area of British Columbia in the late 1940's. Defoliation was severe in young Douglas fir stands over 40 square miles. This species is a potential threat to young stands in the Nelson and Kamloops districts.

Pine sawflies, Neodiprion spp.

Outbreaks of several species occur in plantations or natural stands of pine in Ontario and Quebec. N. lecontei is a common defoliator of young red pine plantations, and numerous small control operations have been carried out in Ontario. N. swainei and N. pratti banksianae are common defoliators of jack pine in natural stands and infestations may be widespread. Extensive timber mortality has occurred in parts of northern Quebec following persistent infestations of N. swainei. Little or no aerial spraying has been undertaken to control infestations to date, but one might anticipate the need in the future.

Forest Tent Caterpillar, Malacosoma disstria Hbn.

Spectacular outbreaks, which may cover hundreds of thousands of square miles occur at intervals of 10-12 years. Although the infestation may persist for 4-5 years in any one area, poplar and other host trees usually survive with no more serious injury than branch killing and reduced increment. To date, aerial spraying has been limited to small areas around resorts. It is unlikely that widespread control operations will be undertaken in the foreseeable future.

The Hazard of Forest Spraying to Aquatic Fauna

There is no doubt of the fact that forest spraying for the control of insect pests creates a serious hazard to aquatic life, particularly to fish and fish-food organisms. There are too many authentic reports of catastrophic population reductions following spraying to allow to persist the delusion that the problem is minor. Since the values at stake are tremendous the task at hand is to evaluate the problem, then take definite steps to secure the information needed so that forest protection and fish conservation may co-exist. You may be assured at the outset that no simple solutions are likely to present themselves. Neither is the situation hopeless. The backlog of information at hand is considerable, if confusing. The literature contains a wide selection of results which range from heavy concentrations of toxicant without fish mortality to extremely light concentrations that annihilate entire populations. It is obvious that most of the measurements of effect have failed in some way to reveal the information sought. Furthermore, there is limited opportunity for comparison in the variety of formulations, environmental conditions and fish species encountered. In fact there are hardly two papers which could be considered to be truly comparable.

The state of our knowledge may be partly judged by the response to an information-seeking memorandum circulated October 17th last, in which a brief summary of the literature outlined the general pattern of results of investigations on the subject of Insecticides versus Fish. The memorandum was circulated to the authors of the most significant papers on the subject to that date, to personnel of some organizations which might be expected to be well informed and to several chemical and insecticide companies whose interests might be aroused by our need. The response to the request was predictably unproductive since the indicated literature search had been rather exhaustive. It was unanimously agreed that we had a problem in common with all who are concerned with forest pest control and

The Hazard of Forest Spraying to Aquatic Fauna

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fish conservation. Several suggestions received were worthy of consideration and are incorporated in a following discussion. It was also generally agreed that DDT does not appear to have a serious rival either in its general toxicity to forest insects and/or its comparatively low toxicity to fish, however serious that may be.

To date the experimental program for the control of forest pests has been directed to the immediate problem without adequate regard for other forms of life. Having achieved a measure of success there seemed no urgent need to strive for modification and refinement. Reports of adverse effects on fish and wildlife were not serious and recommended dosage tolerances appeared well above those being applied. It is now quite apparent that the feeling of security was false. As late as 1956 little liaison with other agencies was established and in 1958 it is realized that many areas of investigation have been neglected. No blame is directed but it must be recognized that an active program of investigation with close liaison is the only solution.

Although the immediate need is for information on the relation of forest spraying to aquatic fauna, we should not lose sight of the implications to all forms of life in the forest community. An approximation to an appraisal of the problems may be better appreciated by discussion under appropriate subjects.

Insecticides and Alternatives to DDT

All established insecticides are toxic to fish in varying degrees. Of those tested, DDT is among the least toxic relative to the amounts applied for the control of insects. Certain others, such as Malathion, and several of the chlorinated hydrocarbons may have promise because they are used at much lower concentrations than DDT. DDT is the only one for which we have adequate information of its effect on spruce budworm or black-headed budworm larvae.

further data can be secured by a laboratory screening program followed by field tests. The results of any screening must be paralleled by critical tolerance tests on aquatic fauna. Tolerance of fish to insecticides varies with species and with sizes within species indicating the need for complete testing for all important forms in any area being considered for spraying. If the problem is to be met squarely the mechanism must be made available.

Formulation and the Physical State of the Insecticide

It has been shown that, in general, the nature of the insecticide solution has a marked bearing on its effect on fish. For example, in an experiment with rainbow trout the following results are reported:

DDT in acetone suspension	30 ppm, not lethal
DDT in fuel oil	20 ppm, not lethal
DDT in xylene	5 ppm, lethal
DDT in emulsion	3 ppm, lethal
DDT in kerosene	0.3 ppm, lethal

The above illustration demonstrates the importance of formulation and also suggest a starting point for investigations to develop insecticidal formulations less toxic to fish. In addition it should show the importance of <u>not</u> tampering with formulations which have been proved acceptable unless further tolerance tests are made before application.

Dosage and Effective Deposit

The insecticidal effectiveness of a spray deposit is not related only to volume per unit area; it is also governed by toxicant concentration, particle size distribution and numbers of particles per unit area. Although many field

experiments have produced much valuable data, a precise definition of "minimum effective dose" for the control of a forest defoliator can not be made. The original "1 pound per gallon per acre" rule has persisted for 15 years or more with little change, although ½ pound per gallon per acre has been used extensively in Eastern Canada. Experiments have suggested that volume of material is as important an insecticide concentration to a yet unknown lower limit and that the number of particles per unit area is a more reliable criterion for effective coverage than volume per unit area. Several tests have indicated significant insect mortalities where volumes deposited were below measurable amounts but where particle counts were adequately dense. In aerial spraying the lower limit of particle size is governed by the ability of the particle to fall through air. With a 10% DDT solution these minute particles are apparently lethal to spruce budworm larvae. It has been shown that dosages of 0.1 gallons per acre may be adequate, providing at least 20 particles per square centimeter are deposited. The implications of the foregoing are quite clear. Improved techniques for spray breakup and deposit could result in adequate control of insects with much reduced hazard to fish. It must be understood, however, that smaller particles are more likely to drift. This would narrow the range of meteorological conditions under which spraying could be done and dictate more stringent control over the aircraft.

Flight Control

The location of a line of flight over a forested area at a low altitude is a difficult task. The pilot must rely on landmarks which are usually waterways. These waterways are often used as spray block boundaries, and, as such, are likely to be double-sprayed or over-sprayed. Furthermore, spraying usually is done when the atmosphere is not turbulent and when temperature inversion is likely to occur

in valleys. These conditions favor the drainage of the spray cloud to the lowest point of the terrain, again the waterways. The result, then, is a probable over-dose of toxicant in the water. Unless waterways can be effectively eliminated as landmarks, over-dosing is almost a certainty.

One method of flight control which has been demonstrated would not only eliminate the use of streams as flight control marks but would also produce accurate records of aircraft flights. The method "Decca Navigational Aid" is a radio device which accurately logs a record of plane location, makes it simple to fly directly to a desired point and eliminates the danger of coverage skips or double-dosing. The device is somewhat expensive to use (3 to 10 cents per acre) but the advantages could well prove it an economical adjunct to airplane spraying. One Decca-controlled plane could guide a formation flight of several spray planes. The Decca system will be used extensively in the United States in 1958.

Specifications

It is important that recommendations for spray formulation and application specifications be adhered to strictly. Such recommendations are made on the basis of the best available information, preferably specific experimentation. To change this for reasons of expedience or economics, without the full knowledge and consent of all governing parties, is to discount the background upon which the original recommendations were based.

James J. Pettes,
Science Service,
Ottawa,
January 10, 1958.

NORTHERN AFFAIRS AND NATIONAL RESOURCES

14-0-31

INTRADEPARTMENTAL CORRESPONDENCE

TO: Mr. J. D. B. Harrison DATE January 14th, 1958.

FROM: D. R. Redmond REFERENCE 42-7

SUBJECT	Conference on Problems Introduced by Outbreaks of Forest Defoliators, Aerial Spraying of Insecticides, and Resultant Fish Mortality

I was pleased to be able to attend this meeting held in the Board Room of the Department of Agriculture, Confederation Building, Ottawa, on January 10th, 1958. About 48 delegates were present representing the various departments of the federal government and several provincial governments, as listed on the attached programme. The morning session was devoted to papers, and discussion on them, on the effects of spraying on the spruce budworm in Eastern Canada and the black-headed budworm on Vancouver Island, followed by papers describing the effects of these aerial spraying operations on Atlantic salmon and Coho salmon, respectively. The papers presented in the morning session were similar to, but in less detail, those presented at the Fisheries Research Board meeting, held in the Chateau Laurier Hotel in Ottawa on January 4th, described in my memorandum of January 6th, 1958.

2. Here I would like to refer to one item in this memorandum at about mid-way down page 3: "Studies have shown that concentrations less than 0.005 p.p.m. of D.D.T. are not lethal against salmon fry." It was brought out on January 10th that the studies in British Columbia showed that 0.05 p.p.m. of D.D.T. are barely lethal against salmon fry, but the research officer reporting had introduced a safety factor of 10, and thus reported a non-lethal concentration to be 0.005 p.p.m. All other investigators used a figure of around 0.05 p.p.m. as a safe concentration against salmon fry.

3. One paper of great interest, and I believe a very pertinent paper on this subject, was given by Dr. Gagnon of the Quebec Department of Fisheries. He outlined an investigation wherein he had set out a number of tanks, each containing about 100 salmon fry or salmon parr. He then applied D.D.T. to the surface of the water in the tanks in concentrations equal to 0.5, 0.25, 0.1 and 0.05 lb./acre. These applications are

../2

equivalent to 0.33, 0.18, 0.07, and 0.035 p.p.m. respectively. The water was agitated in some of the tanks, and remained quiet in others. Agitation increased the lethal effect of D.D.T. among the fish.

4. 100% kill was obtained with the first application within 40 to 90 hours after initiation, and with the second concentration within 60 to 150 hours. Mortality with the third concentration began at 80 hours and levelled off at 50% after 190 hours. The fourth application (0.035 p.p.m.) caused mortality to begin at 150 hours, but levelled off at 5% at 185 hours, and attained a maximum of 7% at 10 days. Mortality in controlled tanks was about 1%. These fish were not fed during the treatment to avoid the D.D.T. being adsorbed on the food. It is now thought that such D.D.T. is stored in the fat of the fish and lethal effects often occur when the fish are starving and use up this fat, thus releasing the D.D.T. into their systems.

5. One remark that was made following the presentation of Mr. Lejeune's paper on spraying against the black-headed budworm on Vancouver Island was that there was no evidence of a virus or other disease in the black-headed budworm population in 1957.

6. Much discussion followed Dr. Fettes' paper, a copy of which is attached. It was stated that no studies are being done by chemical companies or others, in their test of insecticides, to determine the concentration of various insecticides that may be lethal to fish. Tests made of prospective insecticides are carried out against selected insects and some birds. One report of interest related how the United States Wildlife Service, in carrying out tests of D.D.T. against quail, found that there was no effect the first year, that D.D.T. seemed to accumulate in the quail, and applications in successive years resulted in rather astounding effects. After five years, adult quails survived, but 90% of their chicks died, although not fed D.D.T., and many of the surviving chicks were crippled.

7. Much discussion was held on improved liaison between the Department of Fisheries, the Division of Forest Biology, Forestry Branch, and any provincial government that may be involved in applying an insecticide on a large forest area. It was felt that this liaison should take place in the appropriate region at the planning of operations level.

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8. A committee was set up that will meet informally at appropriate times to discuss any contemplated aerial spray programmes at Ottawa. This committee is composed of Dr. A.L. Pritchard, Fisheries Department, Ottawa, Dr. M.L. Prebble, Forest Biology Division, Ottawa, and Mr. H.W. Beall, Forest Operations Division, Ottawa.

9. It was felt that a great deal of research as outlined by Dr. Fettes' paper is necessary. Forest Biology Division is prepared to allot members of their staff to a research programme of this nature. Department of Fisheries is not yet ready to make a commitment, but the staff at Nanaimo could make some advance towards it in 1958 through adjustment, and could make fish hatchery space available. It is anticipated that a meeting of those who might participate in such a joint programme would be held around mid-February.

10. Because of the late date, it is impossible to change the 1958 aerial spray programme in New Brunswick in regard to type of insecticide used, type of aircraft used, and type of nozzles being employed on the aircraft. Furthermore, there are no results of recent research that indicate any great change can be brought about effectively at this time.

11. I was assured that a copy of the proceedings as taken down by the secretary would be forwarded to the Forestry Branch as soon as it is available.

12. Although I thoroughly enjoyed the privilege of attending this meeting and did learn much about the problem of aerial spraying as it affects fish life, I feel that it is highly unlikely that I would ever be able to contribute anything to future meetings on this subject and, therefore, feel that future representation from Forestry Branch would be adequately made by Mr. Beall, Chief, Forest Operations Division, or one of his staff. However, I would be very willing to attend any meeting where it was felt that the Forest Research Division could make a contribution.

Encl.

D. R. R.

1958-6.

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pp. 92–93

EFFECT ON GROUSE POPULATIONS OF DDT SPRAYING FOR SPRUCE BUDWORM

Robert S. Hoffman, Reuel G. Janson, and Fred Hartkorn
Department of Zoology, Montana State University, Missoula, Montana; and
Montana Fish and Game Department, Great Falls and Missoula, Montana

Some forests of western Montana are infested with spruce budworm (*Choristoneura fumiferana*), which is controlled by aerial applications of DDT at the rate of 1 pound per acre. The effects of this treatment on the native grouse—*Dendragapus obscurus, Bonasa umbellus,* and *Canachites canadensis*—were unknown. It was supposed that such spraying might affect grouse: (1) through the consumption of DDT-poisoned insects by grouse chicks, or; (2) through food shortage occasioned by large-scale reduction in insects. The two factors could work together, since increased susceptibility of undernourished birds to direct poisoning was indicated by George and Mitchell (1947). However, observations on two broods of ruffed grouse showed no direct poisoning effects of DDT application of ½ pounds per acre (Adams, Hanavan, Hosley, and Johnston, 1949).

We are indebted to the following persons who assisted us in field work: Bert Goodman and Joseph Townsend, of the Montana Department of Fish and Game, and personnel of the Bitterroot, Beaverhead, Helena, and Lewis and Clark national forests. James B. Sammons and Dale Choukalos assisted the senior author in the field. The study was supported by the Wildlife Restoration Division, Project W-74-R-2, Montana Fish and Game Department, and by the U.S. Forest Service.

DESCRIPTION OF STUDY AREAS AND METHODS

The first phase of the study, determination of population density and brood size on sprayed and unsprayed land, was conducted in the Bitterroot Mountains. Two areas, about 118,000 and 51,000 acres in size, were sprayed with DDT in the summer of 1955 at the rate of 1 pound per acre. The closest boundaries of these areas were about 12 miles apart, and each was surrounded by unsprayed forest land. Previous counts of grouse, made along routes established in 1942 (Wright and Hiatt, unpubl. ms.) and walked again in 1946, 1949, and 1952–55, provided a comparison with 1956 findings, since the routes were located in both sprayed and unsprayed areas.

The relative-population-density index consisted of recording all grouse seen and of recording all broods while walking over a given mile of route. Nine routes, totaling 82 miles, were walked in 1956 in the two areas sprayed the previous year. Better than three-fourths of this total route length was well within, i.e., more than two miles from, the boundaries of the sprayed area, while the remaining mileage skirted the boundary at four locations. Similarly, nine routes, totaling 105 miles, were walked in the surrounding unsprayed area; less than ten miles of these came within two miles of the sprayed areas.

The second phase of the study, determination of age composition of grouse in the hunter bag, was carried out at checking stations set up in west-central Montana. These sampled grouse bags were from both sprayed and unsprayed areas. The size of areas sprayed during the summer of 1956, the first year of DDT application here, was as follows: Little Belt and Castle Mountains—254,000 acres; Big Belt Mountains—107,000 acres. The shortest distance between the edges of the two areas was over 30 miles. Control areas, unsprayed in 1956, included the Lewis Range, 50 miles north of the nearest sprayed areas, and portions of the Little and Big Belt mountains adjacent to the sprayed areas. In addition, unsprayed areas in the Garnet, Sapphire, and Bitterroot mountains of western Montana were sampled.

The relative proportion of young to old grouse as determined by development of outer primaries and rectrices, in the kill from each area served as a sample of the population age composition and thus as a measure of juvenile mortality.

RESULTS

If the 1955 spraying in the Bitterroots had seriously affected grouse populations by causing mortality of adults or chicks, population density or brood size in 1955 and 1956 might be expected to show this, but such was not the case. The results of the field observations are summarized in Table 1.

TABLE 1.—POPULATION DENSITY AND PRODUCTION INDICES TAKEN ON AREAS SPRAYED IN 1955, AND CONTROL AREAS

Index	Area Sprayed in 1955	Unsprayed Area
Grouse per mile of census route		
1952–55	0.44	0.73
1956	0.80	0.29
Blue grouse brood size		
1952–54	3.00±.29 (N=15)	3.14±.39 (N=21)
1955	3.00±.63 (N=5)	4.20±1.11 (N=5)
1956	4.00±.50 (N=9)	2.67±.69 (N=9)
Broods : adult ratio		
1952–54	0.60	0.78
1955	1.0	0.56
1956	0.53	0.80

From these results, it may be seen that DDT spraying at the rate of 1 pound per acre did not cause such a marked change in grouse population, brood size, or brood numbers as to be evident in the year following spraying. Because the index to numbers is of limited accuracy and because of the small number of broods observed, this generalized conclusion is the best that can be offered. The population trends, of an increase in grouse on the sprayed area, and a decrease on the unsprayed area, may be real or may simply reflect the limitations of our methods. In any case, if grouse were adversely affected by the spraying in 1955, this result was by no means apparent at the time of our studies in 1956.

A final check on possible influence of the DDT-spraying operation was provided by bag check of grouse hunters. Our age ratios of grouse checked through stations in sprayed and control areas (Table 2) may be compared with ratios of 2.0 young per adult blue grouse, and 1.4 young per adult ruffed grouse, averages established over the period 1949–53 (Hartkorn, unpubl. ms.). Since the proportion of juvenile grouse from DDT-sprayed areas compared favorably with ratios from areas not sprayed, there is no reason to believe that juvenile mortality was increased by the DDT spraying.

TABLE 2.—AGE RATIO OF GROUSE IN HUNTER BAGS

Area	Species of Grouse	No. of Grouse		Juv. Per Adult	Per Cent Juv.
		Adult	Juv.		
SPRAYED AREAS					
Little Belt, Big Belt, and Castle Mts.	Blue	57	108	1.89	65
UNSPRAYED AREAS					
Little Belt, Big Belt, and Lewis Range	Blue	131	199	1.52	60
Garnet, Sapphire, and Bitterroot Mts.	Blue	18	29	1.61	62
	Ruffed	15	20	1.33	57

We believe these age ratios to be the best of three admittedly imprecise methods we employed. The data are quantitatively more adequate, and the distances between sprayed and unsprayed areas sampled reduce the possibility of significant movement between unsprayed and sprayed areas.

Blue grouse in particular are known to feed regularly on grasshoppers (Stewart, 1944; Wright and Hiatt, ms.), and some evidence on the effect of the DDT spraying on these insects was obtained in our study. Our technique of sampling was as follows: An area suitable for grasshoppers, with little understory vegetation, was selected, and several sweep lines were arbitrarily selected. Each line was covered with 50 sweeps of a standard insect net, and insects so taken were preserved in alcohol–glycerine for later identification. Catches were scanty in all of the samples, and showed no significant correlation with the pattern of DDT spraying. The great bulk of insects captured were grasshoppers, and observations in sprayed areas conclusively demonstrated that DDT applied at the 1-pound-per-acre rate did not materially reduce their numbers. At Canyon Creek Ranger Station on the Beaverhead National Forest, grasshoppers were observed to be very abundant on August 8, following the DDT spraying of the area in mid-July. Similarly, grasshoppers were extremely abundant on the South Fork of the Judith River in the Little Belt Mountains in mid-August, following DDT spraying.

SUMMARY

Following 1-pound-per-acre applications of DDT for spruce-budworm control, efforts were made to measure the effects on three species of grouse in Montana. Counts were made of adult birds and of broods before, during, and one year after spraying, and in sprayed and unsprayed areas. Hunter bags of grouse from sprayed and unsprayed areas were also sampled to obtain age ratios. The evidence from all sources, although not of a rigorous nature, agrees with the conclusion that DDT applied at the rate of 1 pound per acre to control spruce budworms is not immediately harmful to populations of "mountain" grouse. Grasshoppers, a staple in the diet of blue grouse, were not noticeably reduced in numbers by the spraying.

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NORTHERN AFFAIRS AND NATIONAL RESOURCES

INTRADEPARTMENTAL CORRESPONDENCE

DEPUTY MINISTER
JAN 16 A.M.
Dept. of Northern Affairs & National Resources

TO: The Deputy Minister: Attention - Mr. Côté DATE January 14, 1958.

FROM: J.D.B. Harkness REFERENCE 42-7 Forestry Branch

SUBJECT: Conference on Aerial Spraying of Insecticides and Fish Mortality

For Back from Dr Redmond dRR

...

The conference held on the above-mentioned subject on January 10 was attended by Dr. D. R. Redmond and Mr. H. W. Beall of this Branch. Dr. Redmond's report on the meeting is attached for your information.

2. It would be appreciated if the documents accompanying Dr. Redmond's report could be returned to this office for file when they have served your purpose.

J.D.B.H.

A note:
2 copies existing now.
Dr. Redmond's report isn't too encouraging!

15/1/58

File ~~427~~
14-0-31

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

FOREST BIOLOGY DIVISION

CANADA

QUOTE FILE

OTTAWA, ONTARIO

February 5, 1958

MEMORANDUM TO:

Mr. J.D.B. Harrison,
Mr. H.W. Gesell,
Dr. D.R. Redmond.

in Mr. Beall's office 23/6/58

Herewith a copy of the report of the joint conference on forest insect and fisheries problems held in Ottawa on January 10.

As a follow-up to the suggestion outlined on Page 20, a meeting of several biologists at the working level is being held in Ottawa, February 13.

In early discussions with Dr. Pritchard, it was left to him to make suitable arrangements with the Canadian Wildlife Service and the Forestry Branch for a meeting of representatives of the four services in connection with formation of an inter-departmental committee.

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

MLP:o

14-0-31

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, ONTARIO

February 5, 1958

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

MLP:o

copy report and to Agency.
1 copy to D.R. Redmond
1 " Hardwall - on his Committee file

Insecticides vs Aquatic Fauna

First Work Conference

Ottawa, February 13, 1958

As a result of recommendations at the "Conference on forest insect defoliators insecticide spraying operations, and resultant mortality of fish and fish-food organisms", January 10, 1958, in Ottawa, sponsored by the Fisheries and Agriculture Departments and attended by members of Forest protection organizations, a work conference was held to draft out a joint investigational program on the subject of "Insecticides versus Fish" in the hope of avoiding damage to fish resulting from forest spraying.

In attendance at the meeting were:

Fisheries	Agriculture Forest Biology
Dr. M. Waldichuk	Dr. J.J. Fettes, Chairman
Mr. D. Alderdice	Mr. A.P. Randall
Dr. J.L. Hart	Mr. W.W. Hopewell
Mr. J. Sprague	Mr. W. Haliburton
Dr. C.J. Kerswill	Chemistry Division
Mr. E.W. Burridge	Mr. B. Berck

The primary objectives of the meeting were to:

1. Propose a work plan which could be done in 1958
2. Propose a work plan for projected studies

The meeting opened with a description of a Forest Biology outline of an experimental plan designed to produce the desired results. Throughout the plan were suggestions for parallel fish studies which are necessary.

Outline of Proposed Investigations

1. Screening - Laboratory Phase

As earlier suggested, a number of promising insecticides and formulations should be tested to determine which are most likely to give adequate control of forest defoliators while causing the least disturbance to aquatic fauna. Four candidate insecticides are suggested:

(a) DDT

(b) DDD

(c) Korlan - still experimental.

(d) Sevin

DDT - An excellent insecticide, relatively lethal to fish but may be rendered less lethal by changes in formulation. It is known that DDT in Kerosene is 100 times more lethal to fish than DDT in suspension. Oil solutions are intermediate while the presence of adjuvants such as an emulsifier increase toxicity to insects as well as fish. Modifications in formulation may show that less DDT may be used without appreciably lowering the effect on defoliators while decreasing the contamination of the fish habitat.

DDD - An analogue of DDT is nearly as lethal to fish as DDT but has shown a specificity for leaf rollers to which group the spruce and

black-headed budworm belong. Should the specificity hold for these insects, it may be that relatively light deposits will control the insects and thereby lessen the danger to fish populations.

Korlan - A new insecticide which has been shown in tests against shiners to be some 40 times less toxic than DDT.

Sevin - A new insecticide which appears to be less toxic to fish than DDT, while showing an acceptable toxicity to a variety of insects.

A laboratory screening program with a number of formulations is proposed. The program is, however, dependent on parallel toxicity tests with young salmon. It is suggested that the materials to be used against insects be duplicated and sent to the Fisheries Laboratories for testing along with pertinent information as to concentrations to be used etc. In this way, comparisons can be made and conclusions drawn. Out of the screening program should emerge the acceptable insecticidal formulations least lethal to fish. The list of chemicals for testing should be expanded as facilities become available.

Chemical assessment of insecticide deposit and application is an integral part of the screening program and is also one which will require considerable effort. Methods and analyses can be the responsibility of the Chemical Control Section, Forest Biology Division, if the required help is made available.

Insecticidal tests should include topical application of precisely measured amounts of toxicant and the applications of sprays to insects and foliage. Tests on fish should include all of the formulations used on insects to provide T_{m} values.

Personnel requirements for this portion of the program (Forest Biology only) would be:

1 full-time officer

1 part-time officer

5 assistants

Personnel needs include, (a) rearing and handling insects, (b) application of insecticides and observation of treated insects, and (c) chemical assay of deposit.

(Fisheries personnel needs?)

2. Field Trials, Aerial Spray

Laboratory results can only be used as a guide for planning field tests since field conditions cannot be successfully simulated. Relatively large scale field trials are necessary to prove or disprove laboratory findings.

It is proposed to do field trials with the insecticides listed in 1. above, but not in all their formulations because of limitations of personnel and time. If all four insecticides are to be tested, a minimum of 10 spray plots are needed.

4 insecticides X 2 concentrations)
) 10 plots
2 check plots)

At least 2 concentrations are needed to provide variation in deposit for insect toxicity data. Since DDT is regarded as the standard against which other chemicals are to be compared, DDT should be the most thoroughly studied, especially in view of the possibilities of lessening DDT effects on fish through formulation variation.

The plots should cover fish habitat and ideally an entire portion of a watershed up to the headwaters. Some of the failure of experiments which did not show a marked effect on fish was probably due to the entry of uncontaminated water into the test area. Effects on fish in the streams should be studied at least with captive populations, but preferably with indigenous populations. Parallel studies on other aquatic fauna should be made.

Three distinct phases of the field tests should be studied:

(1) The forest insect population

(2) The aquatic faunal populations

(3) The chemical contamination of the forest and aquatic habitats

Personnel requirements for this portion of the program: (Forest Biology):

1 or 2 officers

12 assistants

Personnel needs include (a) plot establishment, (b) forest insect population studies and (c) chemical assessment.

(Fisheries Personnel needs?)

3. Chemical Sampling and Analysis

In all stages of the program there will be a need for chemical deposit assessment and chemical analysis. These measurements must be as precise as possible since so much depends on the accuracy of data for interpretation of results. The phases requiring chemical analyses are:

(a) Water analysis for laboratory fish tests

(b) Assessment of dosage in laboratory insect tests

(c) Analysis of water in field tests

(d) Assessment of deposit in field tests

(e) Analysis of insecticide concentrations of test formulations

(f) Water analysis of samples of streams in the operational program in western New Brunswick

(g) Water and forest duff analysis to determine the effects of leaching on water contamination

Field assessment of deposit can be done by personnel of 2 above. Water analysis may be done by Forest Biology chemist in Ottawa if samples are taken by field personnel and the necessary assistance for the chemist is made available.

Personnel requirements for this portion of the program (Forest Biology):

1 officer

1 trained assistant

Periodic assistance from personnel listed for 1 above

The analytical work can be done at the Ottawa laboratory of the Chemical Control Section. Some analysis may be done at Nanaimo providing identical procedures are followed.

(Fisheries personnel needs?)

4. Toxicological Studies of Aquatic Fauna

Critical studies of the effects of insecticides on aquatic fauna are indicated. The program should include both laboratory and field studies and should be of a fundamental nature. The following is offered as a starting point.

Considerations for Investigations of Fish Mortality Associated with Aerial Forest Spraying

1. Tolerances of indigenous fish and other important fauna to insecticides in various formulations according to fish size or age class:

   (a) Emulsions

   (b) Oil solutions

   (c) Various solvents

   (d) Various diluents

2. Determination of pathways of contamination:

   (a) Suspended and dissolved in water

   (b) Ingestion with food - aquatic animals etc.

   (c) Contact by gills

   (d) Contact with oil slick

   (e) Contact of contaminated objects, i.e. woods, moss, rocks, etc.

   (f) Effects of suspended material, i.e. silt, clay, organic

3. Investigation of insecticide measurement methods which have real bases of association with fish:

(a) Localized measurements rather than general: particulate, dissolved and adsorbed particulate.

(b) Insecticide concentrations in pools, along shores, in weeds, etc.

(c) Time involved during which fish may be in contact.

(d) Relation between gal/acre and ppm under various conditions (i) still water and (ii) moving water of various flow-rates and depths and turbulence.

(e) Determine the extent of insecticide movement from forest rivulets to large streams under various conditions, i.e. dry or wet conditions. Washing of toxicant into streams from foliage and forest floor.

These studies should be undertaken by a fresh water biologist with training in toxicology.

Following the above outline the meeting was open for discussion. A summary follows, but with no attempt to identify each contributor.

It was immediately evident that only a limited program could be attempted in 1958 but it was agreed that a full program would be proposed to provide grounds for expansion beyond 1958 as personnel and facilities become available.

Limitations in 1958

(1) Non-availability of extra funds in present budget.

(2) Census methods (shocking) for fish populations are in the developmental stages and other methods not reliable.

(3) Facilities and manpower are a serious limiting factor for current laboratory and field studies on fish.

(4) Suitable watersheds for making the various tests described above.

Possibilities in 1958

(1) Fisheries could undertake tolerance tests of a number of formulations on both Atlantic and Pacific young salmon.

(2) Forest Biology could begin screening tests on at least one forest insect, probably spruce budworm.

(3) Forest Biology would supply chemicals to the Fisheries laboratory at Nanaimo and provide information on concentrations etc. In addition a man might be made available to assist the Nanaimo staff with their tests. The Atlantic Biological Station would make one man available to assist with these tests.

(4) Water analysis could be done by Forest Biology at Ottawa. Possibly analysis of water samples from tank tests could be done at Nanaimo.

(5) If Forest Biology decides to do field trials in New Brunswick, the Department of Fisheries could provide hatchery reared young salmon to test contamination of streams. The numbers of fish entered in each test should be adequate.

(6) Water samples from the streams could be analysed at Ottawa.

(7) Water samples could be secured in streams within the Forest Protection spray area preferably in association with fish censusing locations. The samples could be analysed at Ottawa.

(8) Primary studies on leaching of DDT into streams might be done by Forest Biology.

(9) Some assessment on other stream fauna may be done and is highly desirable.

Other Points Considered

(1) Fundamental toxicity studies would probably be better done by universities on a grants-in-aid or other basis.

(2) Studies on other stream fauna should eventually receive as much attention as the fish.

(3) Bioassay methods should be explored. Bioassay provides a qualitative estimation of contamination and could diminish the need for or supplement chemical analysis. For some chemicals bioassay may be the only method of measurement.

(4) It is expected that the studies of 1958 would be a small beginning to a continuing program. A screening program for control agents for forest insects will be a continuing one and facilities for testing promising chemicals on water fauna should be available. It is not expected that Fisheries could launch such a program without additional staff but it appears that the problem is serious enough to consider such a step.

(5) It was agreed that the logical sequence of events would be laboratory results, then the field trials but, in view of the urgency of the problem, the program should be initiated as soon as possible in all phases. However, answers that are needed now would not be forthcoming for several years.

(6) Several factors may influence the effect of a toxicant in the water, e.g. solids in water, temperature, turbulence, pH etc. Effects should be studied in terms of environmental conditions as well as chemical.

The meeting agreed that a start should be made in 1958 if at all possible. The initial targets should be those appearing above under "Possibilities for 1958".

J. J. Fettes

Suggestions for discussion, February 24, 1958 3: p.m.

1. Interdepartmental Committee /

Composition, aims, procedures, official status, relations with regional and local groups.

a. Composition: Fisheries Dept. - Ottawa Representative (s)
Fisheries Research Bd., " "
Forestry Branch - " "
Can. Wildlife Service " "
Forest Biology Division " "

For the Forest Biology Division, two representatives would be desirable - Prebble as Divisional Chief and Pettes as head of Chemical Control Section.

The other agencies may also require more than one representative.

The "official composition" should probably be limited to Ottawa H.Q.'s staff of the agencies, to simplify proceedings. However, it may be questioned whether this is sufficient. Problems will come up in various parts of Canada, and various other agencies (provinces, industrial firms and associations, control operating units, etc.) will have important viewpoints and functions. Therefore, it is suggested that the committee should make provision for inclusion of regional groups as needed, to permit adequate and comprehensive review of specific problems which will always have important regional implications.

b. Aims: (i) Review by the Committee of important regional problems requiring control action - in advance.

(ii) Arrangements, by the committee, to encourage full discussion by all interested agencies, either in Ottawa or in the region where the problem occurs.

(iii) To attempt to co-ordinate the views of the different agencies in relation to public relations (press releases, propaganda, etc.).

(iv) To review research needs, and to assist in attaining the means by which these needs can be met.

(v) To work toward the co-ordination of information transmitted, officially, by each agency to senior departmental officers of the several agencies represented on the committee.

c. Procedures: Frequency of meetings, reports of meetings, maintenance of files, distribution of information, calling in of regional representatives, etc.

d. Official status: Should the committee be set up more or less formally, with official recognition by the several co-operating departments?

e. Relations with regional and local groups: Regional staff of the co-operating departments will, of necessity, have to be in close touch with their respective Headquarters colleagues. It may also be desirable for regional staff to participate directly in the proceedings of the Committee from time to time in connection with specific regional problems.

The position of other regional agencies will require special study. Provincial departments, industrial associations, and agencies set up for control projects have a direct interest in important regional problems. Their participation in the proceedings of the interdepartmental committee, on invitation or by pro tem enlargement of the committee, may well be essential to the accomplishment of some of the aims of the committee, e.g. liaison, co-ordination, and even some of the research needs. However, numerous such groups from different regions of Canada will be involved, from time to time, and the functioning of the committee should not be encumbered by having such regional groups set up as constituent members of the committee.

2. Program of research in 1958.

(A draft copy of report on meeting of February 13, 1958, is available for review).

Laboratory studies of toxicity of insecticides to defoliating insects and fish; field studies and location of test areas in 1958; personnel requirements and sources.

Meeting in Fredericton, March 5, to look into possibility of field trials in 1958 (Raloh, Webb, Kerswill, Flieger, Fettes and Prebble will be at meeting).

14-0-31

HWB/MJ

OTTAWA, February 25, 1958.

Sir:

Enclosed, for your information, is a copy of a report of a joint conference on forest insects and fisheries problems, which was held in Ottawa on January 10th.

The Interdepartmental Committee referred to in Item 7 on Page 18 is now being set up.

I understand a meeting is being held in Fredericton early next week which will be attended by Dr. Prebble and Dr. Fettes of the Forest Biology Division, Ottawa, at which the possibility will be discussed of carrying out limited field experiments on three new insecticides in connection with the budworm spraying operation in New Brunswick this summer. It is understood these insecticides show promise of effectiveness on budworm but are believed to be considerably less toxic than D.D.T. on fish.

Yours faithfully,

H. W. Beall,
Chief.

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

14-0-31

HWB/MJ

OTTAWA, February 25, 1958.

MEMORANDUM FOR FILE:

First Meeting
Interdepartmental Committee on Forest Spraying Operations

The first meeting of the above Committee was held in Dr. Pritchard's office on Monday, February 24th. The following were present:

Dr. M.L. Prebble, Forest Biology Division,
Department of Agriculture, (who was elected Chairman)
Dr. A.L. Pritchard, Fisheries Department
E. W. Burridge, Fisheries Department
Dr. V. Solman, Canadian Wildlife Service
J.P. Cuerrier, Canadian Wildlife Service
H. W. Beall, Forestry Branch

2. It was agreed that the name of the committee should be Interdepartmental Committee on Forest Spraying Operations. This might conceivably include herbicide spraying as well as insecticides if any major problem should develop in the former field.

3. The meeting was concerned mainly with discussion of the suggestions on the attached list which had been prepared by Dr. Prebble.

4. With regard to composition, it was felt that one member from each of the five agencies now represented should be ample, it being understood that an alternate might sit in, in place of any regular member who was unable to attend. Also any agency might have more representatives present if required at a particular meeting. Invitations may be extended to representatives of provincial governments, industries, and other agencies as and when required. Subject to departmental confirmation, it was proposed that the regular members be as follows:

....

Memo for file: February 25, 1958.

Dr. Prebble (Chairman)
Dr. Pritchard
Dr. J.L. Kask (Fisheries Research Board)
W. W. Mair (Canadian Wildlife Service)
H. W. Beall (Forestry Branch)

5. All five of the aims of the committee listed in Dr. Prebble's suggestions, were agreed to.

6. As regards procedure, the following points were agreed to:

(a) There should be a meeting in the fall of each year after all reports have been received on the status of forest insect infestation throughout the country. Additional meetings should be held as frequently as circumstances require, such as progress of research programs.

(b) Enough copies should be made of minutes and reports to inform regional staffs but not other agencies. I requested four copies for the Forestry Branch: one for the Maritimes Office, one for the Alberta Office, and two for Head Office.

(c) Agenda and notice of meetings will be sent out one month in advance if possible, to permit calling in outside representatives if necessary.

7. It was felt that the committee should have official status by securing the approval of each Deputy Minister for the appointment of the member or members from his department. It was requested the Deputy Ministers be approached informally by the Directors concerned, before official correspondence is entered into.

8. Program for Research in 1958.

Dr. Prebble reported on a meeting of Forest Biology and Fisheries laboratory staffs on February 13th. Three insecticides are considered to be of sufficient promise as regards effectiveness on

....

budworm together with much less toxicity than D.D.T. to fish, to justify laboratory experiments in 1958. The laboratory staffs also recommended, and the Committee endorsed, a proposal that limited field trials of these insecticides be carried out in 1958. Field trials will be necessary in any case before a new insecticide is put into full operational use, and such trials will be necessary this year if any operational change is to be made in 1959.

9. Dr. Prebble has discussed the proposed field trials with Mr. Flieger and a meeting is being held at Fredericton next week to consider the matter in detail. It would seem that the only difficulty that may arise is that 12 seasonal assistants will be required during the summer to assess the effectiveness of the experimental sprays. None of the departments concerned can provide for them from present establishments. It is hoped that Forest Protection Limited may be able to employ these additional personnel.

H. W. Beall,
Chief.

DEPT. OF NORTHERN AFFAIRS AND
NATIONAL RESOURCES
FORESTRY BRANCH

Mr. H.		
R. Redwood		
Mr. Dyer		

PLEASE File

.....For Approval	.....Recommended
..... Signature	.....Prepare Draft
..... Comment	..... Reply
..... Your Information	..... Requisition
	.....See Me
.....Note and Return	.....Take Action
..... and File	.....Return with Details
.....Passed to You	..... with File
.....Reply Direct	.....Returned to You
.....Recommend Payment	.....Submitted

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.....Date Feb 26/58

F. 851

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

774589

FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, CANADA

February 26, 1958

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

Dear Mr. Beall:

Herewith for your files a summary of the discussions held in the afternoon of February 24th.

Dr. Taggart's viewpoint on the official status of the Interdepartmental Committee is now being ascertained.

Yours sincerely,

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

MLP:o

INTER-DEPARTMENTAL COMMITTEE ON FOREST SPRAYING OPERATIONS

Summary of Discussions, February 24, 3 to 5 p.m. in Room 321, West Block, Ottawa.

This meeting was held in fulfilment of recommendations made at the joint conference held in Ottawa, January 10, 1968.

IN ATTENDANCE: Dr. A.L. Pritchard, Director, Conservation and Development Service, Fisheries Department.

Mr. H.W. Beall, Chief, Forest Operations Division, Department of Northern Affairs and National Resources.

Dr. V.E.F. Solman, Mr. J.P. Cuerrier, Canadian Wildlife Service, Department of Northern Affairs and National Resources.

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

(Absent, Dr. J.L. Kask, Chairman of the Fisheries Research Board; Mr. W.W. Mair, Chief, Canadian Wildlife Service).

NAME OF THE COMMITTEE:

The suggested name is "Interdepartmental Committee on Forest Spraying Operations".

COMPOSITION OF THE COMMITTEE:

It was suggested that the permanent committee consist of:

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

representing the Fisheries Department, The Fisheries Research Board, The Forestry Branch, the Canadian Wildlife Service and the Forest Biology Division respectively. If any member should be unable to attend any meeting of the committee, he should name an alternate. Other representatives of the various constituent agencies could be called in as advisers as needed but would not be considered as members of the permanent committee.

At the suggestion of A.L. Pritchard and with the concurrence of others in attendance, M.L. Prebble agreed to serve as Chairman of the Interdepartmental Committee for the time being at least.

AIMS: (i) To provide an opportunity for members of the Committee to review important forest insect problems that may, in the near future, require direct control action through forest spraying.

(ii) To encourage full discussion of problems likely to require control action by all interested agencies in Ottawa and in the regions where the problems occur.

(iii) To attempt to co-ordinate the views of the different agencies on prospective control projects with particular reference to anticipated public relations, press releases, etc.

(iv) To review research needs and to assist in attaining the means by which these needs can be met.

(v) To work toward the co-ordination of information transmitted officially by each agency to senior departmental officers of the several agencies represented on the Interdepartmental Committee.

PROCEDURES:

(i) Frequency of Meetings. There should be at least one annual meeting held in the autumn, as soon as the Forest Insect Survey Reports are available for all of Canada, to permit review of infestations which seem likely to warrant direct control action through forest spraying.

Other meetings will be held as frequently as may be necessary to keep the membership fully informed on the progress of control operations under way and on such research programs as may be initiated with the support of the Interdepartmental Committee.

(ii) Notification of Meetings. The Chairman should arrange for meetings giving four weeks advance notification by mail to the members; such notification to be preceded by a telephone canvass of their availability in Ottawa on the date of the proposed meeting.

Members are free to request meetings on need and should so inform the Chairman.

The Chairman will send out an agenda for each meeting along with the official notification of the meeting.

PROCEDURES (continued)

(iii) Reports of the Meetings. The Chairman will be responsible for seeing that a report of each meeting is sent to each member in sufficient copies to enable distribution to regional staffs of the constituent agencies in the following approximate numbers:

Fisheries Department and Fisheries Research Board	-	10 copies
Forestry Branch	-	4 "
Canadian Wildlife Service	-	3 "
Forest Biology Division (about)	-	15 "

Outside distribution of the reports of meetings should be avoided.

(iv) Official files of the Interdepartmental Committee. The Chairman will maintain the official files. Each member may also maintain his own personal files of the proceedings of the Committee.

OFFICIAL STATUS

It was suggested that the Committee be set up officially by mutual consent of the several co-operating departments. Such official recognition of the Interdepartmental Committee by the Deputy Ministers of the three departments would, in effect, impose on each member the necessity of assuming responsibility for a wider range of interests than those represented by his employing agency.

RELATIONS WITH REGIONAL AND OTHER GROUPS

Regional staff of the co-operating agencies will be invited to appear before the Interdepartmental Committee from time to time for thorough discussion of regional problems coming under review by the Committee.

The participation of regional representatives of other agencies, such as provincial government departments, industrial associations and agencies set up for the carrying out of forest spray projects may well be essential to the accomplishment of some of the aims of the Interdepartmental Committee, e.g., liaison, co-ordination, and some of the research projects sponsored by the Committee. Such regional representatives from different parts of Canada may be invited to participate in special meetings of the Committee from time to time.

PROPOSED RESEARCH
PROGRAM IN 1958

Representatives of the Fisheries Research Board, Conservation and Development Service of the Fisheries Department, and of the Forest Biology Division, of the Department of Agriculture, met in Ottawa on February 15th. The following program was suggested:

(i) The initiation of a joint laboratory research program on the toxicity of certain selected insecticides against forest insects (e.g., the spruce budworm) and against Atlantic and Pacific salmon.

(ii) Initiation of joint field studies in 1958;

The Interdepartmental Committee strongly supported the initiation of field studies in 1958, even though adequate sources of assistants are, at present, unknown. M.L. Prebble stated that a meeting is being held in Fredericton, N.B., on March 3 to go into this question more thoroughly with the following in attendance:

C.J. Kerswill, Fisheries Research Board, St. Andrews, N.B.
B.W. Flieger, Forest Protection Ltd., Montreal.
R.E. Balch)
F.E. Webb)
J.J. Fettes) Forest Biology Division
M.L. Prebble)

As soon as possible after March 3, the Interdepartmental Committee will be informed of the results of the discussions in Fredericton.

M.L. Prebble,
Chairman.

Ottawa, February 25, 1958

MLP:o

A. L. Pritchard, Director

E. W. Burridge, Biologist February 26/58

The discussion on the formation of the Inter-Departmental Committee on forest spraying operations

The meeting, held in the West Block on February 24th, was called to order at 3 p.m. The following representatives were present:

M.L. Prebble - Department of Agriculture (Forest Biology Division)

H.W. Beall - Department of Northern Affairs and Natural Resources (Forestry Branch)

V.E.F. Solman - Department of Northern Affairs and Natural Resources (Canadian Wildlife Service)

J.P. Cuerrier - Department of Northern Affairs and Natural Resources (Canadian Wildlife Service)

A. L. Pritchard)
E.W. Burridge) Department of Fisheries

1. Inter-Departmental Committee

Following a brief discussion of possible names for the group the Inter-Departmental Committee on Forest Spraying Operations was decided upon.

Dr. Prebble handed out copies of an agenda which he had prepared for the meeting.

(a) Composition

The first point discussed was the composition of the Committee. It was decided that one member from each

....2

of the five groups should make up this Committee:

Department of Fisheries	- A. L. Pritchard
Fisheries Research Board	- J. L. Kask
Forestry Branch	- H.W. Beall
Canadian Wildlife Service	- W.W. Mair
Forest Biology Division	- M. L. Prebble

It was agreed that an alternate should be kept informed of the Committee's activities.

(b) Aims of the Committee

(1) A review by the Committee of the important regional problems requiring control action -- in advance. It was agreed that Dr. Prebble's division would keep the Committee informed of any future spraying programs.

(2) The arrangements by the Committee to encourage full discussion by all interested agencies either in Ottawa or in the region where the problem occurs. This point was agreed upon after a brief discussion.

(3) To attempt to co-ordinate the views of the different agencies in relation to public relations (press releases, propaganda, etc.). It was felt that this would be very desirable but difficult to carry out.

(4) To review research needs and to assist in attaining the means by which these needs can be met.

....3

(5) To work toward the co-ordination of information transmitted officially by each agency to senior departmental officers of the several agencies represented on the Committee.

Dr. Prebble pointed out that if there were differences of opinion senior officers of the groups should know the points of agreement and disagreement. It was pointed out that the original spraying program would have run more smoothly if this type of co-operation had existed. Dr. Prebble stated that when the program commenced their group had no idea of the fisheries problems involved.

In this regard Dr. Prebble pointed out that Mr. Hourston of the Department's Vancouver office had been contacted and permission had been granted for the distribution of his paper on D.D.T. spraying to personnel of the Forest Biology Division.

Dr. Pritchard stated that a permanent Chairman would be necessary for this Committee. He added that if Dr. Prebble was agreeable to accepting the task he would be the most suitable representative. Dr. Prebble replied that he would be willing to undertake it for the time being.

(c) Procedures

Frequency of meetings. Dr. Prebble stated that in the fall of the year his group would know of any signs of danger areas in the forests throughout Canada. It would seem that this would be the most suitable time for an annual meeting. If there were no spraying programs anticipated this would be the only meeting of the year but the research programs would continue as usual. On the other hand if there were several spraying programs more than one meeting would be necessary.

.....4

Reports of meetings. The reports from these would be made available to the regional offices of the participating groups. The following is an estimated number of reports that would be required:

The Department of Fisheries	- 10
Wildlife Service	- 3
Forestry Branch	- 4
Forest Biology Division	- 12

Dr. Prebble stated that there would be no suplus printed for outisde distribution.

Maintenance of files. It was agreed that each group should maintain their own files on the Committee's activities and that the Chairman would also keep his own complete file.

Calling in of regional representatives. It was agreed that these representatives would be called in on invitation when they were required to give advice on local problems.

Notification of meeting. It was decided that one month's notice should be given by the Chairman when a meeting was to be called. The notice would be preceded by a phone canvass at which time the tentative agenda would be discussed. In cases of emergency Committee members could also ask for meetings to be called.

(d) Official status

Following a brief discussion it was decided that the Committee should be set up by correspondence at the Deputy Minister level. It was pointed out that other inter-departmental committees at this level have been

....5

successful. It was agreed that the representatives from the various groups would approach their Deputy Ministers after which the Deputy Minister of Agriculture would write his counter parts in the other departments. It was agreed that all the representatives present would contact Dr. Prebble when they had approached their superiors after which he would get in touch with his Deputy Minister.

(e) Relation with regional and local offices

Dr. Prebble stated that his regional staff will be kept informed of the Committee's activities and they may be called in from time to time.

2. Program of research in 1958

Dr. Prebble reviewed some notes from the February 13th meeting which was called to discuss the 1958 research program. Dr. Prebble stated that their division felt that the 1958 field program should be stepped up. He added that in order to carry out the necessary checking they would require assistance and this might be supplied by Forest Protection Limited. He added that a program to test insecticides requires a crew of twelve men.

Dr. Prebble spoke briefly about the meeting to be held in Fredericton on March 3 which had been called to discuss the 1958 program. One problem that would be discussed at this meeting would be that of manpower. The second would be a suitable watershed in which to carry out these tests. He added that in earlier insecticide testing Forest Protection Limited had supplied the necessary men. A brief discussion followed on possible ways of solving the problems facing the 1958 program. Dr. Pritchard stated that additional funds might be obtained through the supplemental estimates.

The meeting adjourned at 5:20 p.m.

E. W. Burridge

FILE No. 702-1-10

774644

CANADA

DEPARTMENT OF FISHERIES

OTTAWA

February 27, 1958.

Mr. H.W. Beall, Chief,
Forestry Operations Division,
Department of Northern Affairs
and National Resources,
238 Sparks Street,
Ottawa.

Dear Mr. Beall:

Attached please find some notes from our February 24 meeting on the formation of the Inter-Departmental Committee on Forest Spraying Operations. Copies of these notes have been made available to all representatives present at the meeting. We would appreciate receiving any corrections or additions you may have to offer.

Yours very truly,

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

Encl.

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

FOREST BIOLOGY DIVISION

774895

QUOTE FILE

OTTAWA, CANADA

March 7, 1958

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

Dear Mr. Beall:

Herewith a statement on the discussions held in Fredericton, March 3. As you will see, selection of a suitable experimental area depends on receipt of additional information from the fisheries biologists at St. Andrews and this is expected about the end of March.

A formal request for Treasury Board authority cannot be made until the last of March, or early April - and on the other hand, the project can hardly be set in motion in 1958 if a decision to proceed is lacking by about mid-April. Many detailed arrangements will still have to be worked out after a decision is reached and work in the field will have to be started about mid-May.

Therefore, the timing is very critical. This has been drawn to the attention of Dr. Pritchard, Dr. Neatby and Dr. Taggart. I would be grateful if you would discuss the matter tentatively with senior officers of your Department to acquaint them with the situation and to determine whether they might have any suggestions for a speedy resolution at the time when a formal proposition can be made.

Yours sincerely,

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

MLP:o

Forest Biology Division Science Service

CANADA

DEPARTMENT OF AGRICULTURE

Ottawa, March 7, 1958

To: Dr. A.L. Pritchard
Dr. J.L. Kask (attention Mr. O.C.Young)
Mr. H.W. Beall
Mr. W.W. Mair.

Subject: Research on insecticides in relation to the spruce budworm and aquatic fauna.

1. As forecast in the report of the February 24 meeting of the Inter-Departmental Committee on Forest Spraying Operations, discussions were held in Fredericton, March 3, to consider the possibility of organizing a joint field research program on insecticides in relation to the spruce budworm and aquatic fauna in 1958.

2. The meeting was held in the Forest Biology Laboratory, Fredericton. Attendance was as follows:

Fisheries Research Board, Atlantic Biological Station, St. Andrews

C.J. Kerswill
P.F. Elson
M.H.A. Keenleyside

Forest Biology Division

R.E. Balch)
F.E. Webb) Fredericton Laboratory
D.R. Macdonald)

J.J. Fettes, Chemical Control Section
M.L. Prebble, Ottawa Headquarters.

Forest Protection Limited

B.W. Flieger
H.J. Irving

3. Prebble noted that an Inter-Departmental Committee on Forest Spraying Operations was being formed, representing the Fisheries Department, the Fisheries Research Board, the Forestry Branch, the Canadian Wildlife Service, and the Forest Biology Division; and that the Committee was in favor of proposed joint research program on the effects of insecticides on defoliating insects and aquatic fauna.

4. Fettes and Prebble pointed out that arrangements were in progress for laboratory studies of alternative insecticides against the spruce budworm (Chemical Control Section, Ottawa) and against Atlantic and Pacific salmon (Pacific Biological Station, Nanaimo).

5. Results of the laboratory studies would not be available early enough to serve as a guide for field experiments in 1958. Nevertheless, it was agreed at Fredericton that joint field experiments should be carried out in 1958, using several of the more promising alternative insecticides (DDD, Sevin, Korlan), as well as DDT, provided the necessary arrangements could be effected in time.

6. A prerequisite for joint field studies is a forested area with budworm infestation, and with streams inhabited by salmon. The ideal situation would be an area with a main stream and several tributaries, the whole watersheds of which could be used as single plots for treatment, each with a different insecticide. The tributary watersheds should be

separated by well-marked topographic features, each watershed should have an area of several hundred acres as a minimum and, according to fisheries biologists, each tributary stream should have about two miles of salmon-spawning water near its mouth. The main stream and its tributaries should be accessible by road or trail. The area should not have been affected by the spraying operations of 1952 to 1957, inclusive, and should be outside the spray operational area of 1958.

7. The headwaters of the Richibucto River appear to offer the best opportunities. The areawas infested by the budworm in the summer of 1957, carried a sufficient egg population in the autumn, and is accessible by road. Another possibility is the Bartibog River area northeast of Newcastle. The suitability of these areas will be investigated by the fisheries biologists (Kerswill, Elson, Keenleyside) and the forest biologists (Balch, Webb); their combined statement is expected before the end of March. Direct assessment of the areas from the standpoint of salmon populations cannot be made at this time of year, but the fisheries biologists expect to gain the needed information from persons acquainted with the areas.

8. The Kouchibouguacis and Salmon river systems are other possibilities that should be examined in the summer of 1958, for possible experimental studies in 1959.

9. The proposed studies would include:
   (a) assessment of budworm populations on check and treated plots, before and after experimental spraying; spray deposit assessment; analysis of water samples for insecticide in all the streams in the experimental area, and from at least one stream in the 1958 operational area. (Chemical Control Section, Forest Biology Division).

   (b) assessment of salmon fry populations in streams flowing out of control and treated "watershed plots", before and after experimental spraying. Caged fish might be used in the streams as well, but the fisheries biologists preferred not to have to depend on caged populations. (Fisheries Research Board, Atlantic Biological Station).

   (c) experimental spraying to be done by aircraft supplied by Forest Protection Limited, following specifications laid down by the Chemical Control Section.

   Studies of aquatic insects were not discussed in detail at the Fredericton meeting; however, if the joint field program is undertaken in 1958, every effort should be made to include investigations of aquatic insects in the experimental area.

10. Requirements for the joint project are estimated as follows (subject to modification on selection of a suitable area):

Wages for seasonal field assistants (estimated at 12 men for 3 months)	$9,000
Board and accommodation for seasonal assistants and supervisors (latter to be drawn from permanent staff of collaborating agencies)	6,500
Transportation (use of departmental vehicles, supplemented by hired vehicles)	1,200
Aircraft for spraying; communication services	3,000
	$19,700

The estimate of $19,700 does not include the cost of spray materials, which cannot be estimated properly until the area is selected and the number of tributary watersheds and their acreage can be determined. If a suitable area can be found to permit testing of 4 insecticides, at two concentrations, each in "single plot watersheds" of about 500 acres, the cost of spray materials might run to about $4,000 or $5,000 dollars. On this tentative basis, the gross cost estimate is approximately $25,000.

11. Prebble agreed to inform Dr. K.W. Neatby, Director of Science Service, of the discussions, and to submit a statement on the meeting to the members of the Inter-Departmental Committee on Forest Spraying Operations. It seemed likely that authorization of expenditures forecast for the joint field studies could only be provided by Treasury Board. Such authorization could not be sought until a suitable area for the project had been recommended by the fisheries biologists and forest biologists in New Brunswick (see para.7). If the joint studies are to be undertaken in 1958, decision will be required by about mid-April to permit the detailed planning that would be necessary.

12. B.W. Flieger suggested that the fisheries and forest biologists should concentrate on the technical and scientific aspects of the project, and should not be burdened with the organization of accommodation, feeding, and transportation. Forest Protection Limited has had a great deal of experience in such matters in New Brunswick. Flieger suggested that if the joint studies are undertaken, Forest Protection Limited be asked to take over the problems connected with accommodation, feeding, transportation, flying services, supply of labour, etc., at a contract price to be agreed upon when details could be seen more closely.

13. Flieger stated that if difficulty should be encountered in obtaining funds early in the new fiscal year, even though the joint studies might be approved by federal government authority, he thought that Forest Protection Limited would be willing to undertake to provide the services outlined in para. 12, if assurance could be given on competent authority that repayment to the company would be made during the fiscal year 1958-1959.

M.L. Prebble,
Chairman, Inter-Departmental Committee on
Forest Spraying Operations,
Chief, Forest Biology Division.

MLP:o

NORTHERN AFFAIRS AND NATIONAL RESOURCES

INTRADEPARTMENTAL CORRESPONDENCE

TO: Mr. J.D.B. Harrison. DATE March 10, 1958.

FROM: H. W. Beall. REFERENCE 14-0-31

SUBJECT	Proposed Field Tests of Insecticides in New Brunswick -- 1958 Budworm Spraying Operation.

In Dr. Prebble's absence from the City, I discussed the attached letter and report with Dr. J. Fetters of the Forest Biology Division who, together with Dr. Prebble, attended the meeting on the above subject in Fredericton on March 3rd.

2. As is implied in paragraphs 12 and 13 of the report of the meeting, the intention is that the federal government should pay the full cost of the proposed field experiments which are being designed with a view to reducing the damage to fish resulting from forest insect spraying. Several years ago limited trials were made of various combinations of DDT and solvent to determine their effectiveness against insects in the New Brunswick operation. This was treated as part of the cost of the regular operation and shared equally by the industry, the provincial government, and the dominion government. However, as the experiment was not under full control of the Forest Biology Division and is considered to have suffered somewhat in consequence, the entomologists and fisheries research officers prefer that the federal government should pay the whole cost on this occasion.

3. A further argument for the above might be that the results of the tests will be of benefit to any other province, e.g., Quebec and British Columbia, in which the effect of forest insect spraying on fisheries is or may be in future a matter of concern. It seems reasonable that the federal government should, in these circumstances, pay most or all of the cost rather than the agencies which are involved in the operation which happens to be most suitable for the test this year.

4. The Forest Biology Division hopes to be able to employ the twelve field assistants required directly, and to make arrangements with Forest Protection Limited for their board, accommodation and transportation, and for spraying and communication requirements.

....

Mr. Flieger has proposed that Forest Protection Limited's part in the program be carried out on a contract basis, which presumably means a fixed cost per acre or per gallon, rather than on repayment of actual costs. However, details of the contract still have to be worked out.

5. The whole scheme is dependent upon the availability of suitable watersheds, but Dr. Fetts feels that there will be little difficulty on this score. However, once these details are clearly defined there will be little time available for securing authority and funds to proceed with the work.

6. If these field experiments are not carried out in 1958, the possibility of reducing damage to fish on an operational scale by the use of alternative insecticides will likely be delayed by at least one year. I understand from Dr. Fetts that the Departments of Agriculture and Fisheries intend to submit a joint submission to the Treasury Board requesting authority and funds to carry out the project in 1958. Subject to approval of the detailed proposal by the Interdepartmental Committee on Forest Spraying Operations, I would recommend that, in view of the circumstances described above, this department support the submission of Agriculture and Fisheries to the Treasury Board.

7. Dr. Prebble requests that the matter be discussed tentatively with senior officers of this department to acquaint them with the situation and to seek suggestions for a speedy resolution of the formal proposal when it is made.

H.W.B.

HWB/MJ

Mr. J.D.B. Harrison.

March 10, 1958.

H. W. Beall.

14-0-31

Proposed Field Tests of Insecticides in New Brunswick --
1958 Budworm Spraying Operation.

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H.W.B.

My file

SCIENCE SERVICE FOREST BIOLOGY

DEPARTMENT OF AGRICULTURE

OTTAWA, Ontario,
March 17, 1958.

MEMORANDUM TO: 775277
Mr. H. W. Beall,
Chief, Forestry Operations Division,
Northern Affairs & National Resources Dept.,
Motor Bldg.,
OTTAWA, Ont.

Subject: Insecticides vs Aquatic Fauna
First Work Conference Report

Please find attached a final report on the first work conference held at Ottawa, February 13, 1958. The members of the Department of Fisheries and the Department of Agriculture who participated in the meeting have had an opportunity to study a draft report and forward their comments and suggested changes. The present report attempts to include all of the items issuing from the discussions and formed into a proposed work plan. While it is understood that a full scale investigational program might not be entirely initiated in 1958, it is highly advisable that as much of the suggested program as possible be started this year. With the continuation of aerial spraying in New Brunswick and the probability of additional forest spraying in other parts of Canada, we cannot afford to postpone this line of investigation without further endangering stream fauna.

A meeting at Fredericton, New Brunswick on March 3rd in which the Department of Fisheries, Forest Protection Limited, and the Department of Agriculture participated indicated a genuine willingness of all parties to proceed. The advancement of this proposed program now depends on the availability of personnel and funds. It will readily be appreciated that plans and commitments must obtain with all possible haste in order to gain the advantage of investigations in 1958.

James J Fettes

J. J. Fettes, Head,
Chemical Control Section

Encl.
JJF:ms

Dr. A.L. Pritchard
Dr. J.L. Kask (att. Mr.O.C.Young)
Mr. H.W. Beall
Mr. W.W. Mair
Dr. C.J. Kerswill
Dr. P.F. Elson
Dr. M.H.A. Kennleyside
Mr. D.E. Gray
Dr. R.E. Balch
Dr. F.E. Webb
Mr. D.R. Macdonald
Dr. M.L. Prebble
Mr. B.W. Flieger
Mr. H.J. Irving
Dr. M. Waldichuk
Dr. J.L. Hart
Mr. A.P. Randall
Mr. W. Haliburton
Mr. D. Alderdice
Mr. John Sprague
Mr. E.W. Burridge
Mr. W.W. Hopewell
Mr. B. Berck

14-0-31

HWB/MJ

OTTAWA, April 14, 1958.

Memorandum for file:

Meeting of
Interdepartmental Committee on Forest Spraying Operations
April 14, 1958

The main points discussed at the above meeting were as follows:

(1) Due to lack of staff and facilities, the Fisheries Research Board will be unable to carry out a full field test of the four insecticides proposed (that is DDT, DDD, Korlan and Sevin) in connection with the 1958 spraying operation in New Brunswick. Difficulties in obtaining suitable watersheds for the experiment are also greater than anticipated.

(2) It was agreed that the test would be restricted to various treatments of DDT and one other insecticide, probably DDD. The experiment will be carried out in the Richibucto area. Representatives of Forest Biology and Fisheries Research will make a detailed study of the area next week.

(3) In view of the curtailed program, it is not expected that additional funds will have to be requested at this stage from Treasury Board to finance the field experiments. However something may be required by the Forest Biology Division in their supplementary estimates later in the year.

(4) The experiment will cover the effect of various dosages and applications of the two insecticides on the budworm and on fish. It is hoped that arrangements can also be made for some study of the effects of spraying on aquatic insects on which the fish feed.

(5) It seems likely that the offer of Forest Protection Limited to look after accommodation, feeding, etc., of the field parties involved, on a contract basis, will be accepted.

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(6) Dr. Pritchard mentioned that at a recent meeting Dr. Vernon Johnson had brought up the suggestion that after a suitable stage in the New Brunswick spray program has been reached, an effort might be made to restock the salmon streams with hatchery reared smolt. He suggested that the cost might be divided equally between the present participating agencies, that is the federal and provincial governments and the forest industry. It is estimated that the program would involve some two million smolt at a cost of about $2 million.

Not this Dept., surely!

H. W. Beall.

CANADA

DEPARTMENT OF FISHERIES
OTTAWA

FILE No. 702-1-10

Inst. Committee on Forest Spraying

776156

April 18, 1958.

Mr. H. W. Beall,
Chief,
Forestry Operations Division,
Department of Northern Affairs
and National Resources,
238 Sparks Street,
Ottawa.

Dear Mr. Beall:

Attached for your information please find a copy of some notes from the April 14 meeting of the Inter-Departmental Committee on Forest Spraying Operations.

These notes have been read and adjusted by the Committee Chairman, Dr. Prebble.

Yours very truly,

E. W. Burridge,
Division Biologist.

Encl.

NOTES FROM THE APRIL 14 MEETING OF THE INTER-DEPARTMENTAL COMMITTEE ON FOREST SPRAYING OPERATIONS

The meeting was held on the morning of April 14 in the Fisheries Research Board offices in the West Block. The following representatives were in attendance:

M. L. Prebble - Department of Agriculture (Forest Biology Division)

J. J. Pottes - Department of Agriculture (Forest Biology Division)

[illegible] W. Mair - Department of Northern Affairs and National Resources (Wildlife Service)

H. M. Beall - Department of Northern Affairs and National Resources (Forestry Branch)

L. C. Young - Fisheries Research Board

A. L. Pritchard - Department of Fisheries

E. M. Burridge - Department of Fisheries

Mr. Prebble reviewed the March 3rd meeting which had taken place in Fredericton. He pointed out that his service would like to see the three insecticides tested in the field this year, but that it was up to

. . 2

the meeting to decide what could be done. A discussion followed on the number of watersheds available and of the necessary features of a suitable drainage area.

To clarify several points in this connection, a call was put through to Dr. Kerswill. Dr. Pritchard, Dr. Prebble and Dr. Fettes each spoke with Dr. Kerswill on various points in connection with this programme.

Test Area

It was agreed that Dr. Fettes would meet Dr. Kerswill on April 21 at which time, with Dr. Webb, they would examine the most likely test area, the Michibucto drainage. This area has a bud-worm infestation and fairly good access roads.

Insecticides

It was decided that one insecticide in two dilutions was all that could be tested in 1958. The most likely insecticide to be used in this programme would be DDD. It was pointed out by Dr. Fettes that two or more formulations of DDT would also be included in this programme. In addition to the above, Forest

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Biology Division will if possible, test the effectiveness of various concentrations and formulations of other insecticides on bud-worm control only. For this phase of the programme several readily accessible, 50 to 100 acre plots, in a bud-worm infested area will be required. Dr. Fettes and Dr. Webb will attempt to locate suitable areas for this work during the week of April 21.

Programme Financing

Dr. Prebble explained that his Department could look after the salaries of the field crews required to make the daily checks of the test plots. It was mentioned that Mr. Flieger had offered to assist in the programme by providing board and lodging for these men on a repayment basis from Forest Biology Division. It was decided that Forest Biology would undertake the cost of board and lodging as well as the cost of the aircraft hire and the purchase of insecticides. Dr. Pritchard stated that the Fisheries Research Board and the Department of Fisheries would look after the costs incurred where fisheries were involved.

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Mr. Young reported that in his conversation with an official from the Rohm and Haas Company, they had discussed the scholarship referred to in previous correspondence. It appeared unlikely that there would be sufficient time to complete these arrangements for the 1958 programme. It was therefore suggested by Mr. Young to this official that the Fisheries Research Board might hire a man who would be paid by the Rohm and Haas Company to do the aquatic insect study. This man would then report on his findings to Rohm and Haas as well as to the Government agencies involved. The basic programme would be laid out by the Fisheries Research Board. It was agreed at the meeting that this, if accepted by Rohm and Haas, would be a satisfactory way of having this phase of the programme completed.

The meeting adjourned at 11.00 a.m.

Dept of Fisheries

Err

cont

776314

April 21, 1958.

Mr. R.G. Robertson,
Deputy Minister of Northern Affairs
and National Resources,
Department of Northern Affairs and
National Resources,
O t t a w a, Ontario.

Northern Affairs and National Resources
FORESTRY
APR 24 1958
BRANCH

Dear Mr. Robertson:

As you are no doubt aware, officials of our Departments have recently been discussing the rather serious problem which has arisen out of the large-scale spraying projects in New Brunswick and British Columbia. Our Department has, of course, recognized the necessity for action in order to control the insect infestation and to lessen the effects on the timber industry. On the other hand, we have been concerned that there have been serious results from this spraying program on the fish in the areas.

On February 4 a meeting was called at the official level to attempt to assess the various interests and responsibilities. In attendance were representatives from the Department of Northern Affairs and National Resources, the Division of Forestry Biology of the Department of Agriculture, the Department of Fisheries, the Fisheries Research Board of Canada and the industry. It was agreed that every effort should be made to co-ordinate the findings of the various agencies and to co-operate in researches which might produce solutions to alleviate the damage to resources other than timber.

R.G.R. - 21-4-58.

In particular, it was felt that efforts should be made to test other insecticides which might be found less lethal to fish.

In order to co-ordinate the arrangements it was considered desirable to set up an inter-departmental committee on the official level through which plans for work might be cleared and by which the results from and activities of the various agencies might be made available to all. This committee should be constituted of government officials and should, of necessity, include representatives of the Division of Forest Biology, Department of Agriculture, the Forestry Branch of the Department of Northern Affairs and National Resources and the Fisheries Research Board of Canada plus the Department of Fisheries.

I have been in communication with Dr. Taggart whose Department has been very heavily involved in the research work and he has agreed that such a committee might be of help and also has agreed to Dr. M.L. Prebble acting as chairman, if it is our desire.

I am fully aware that there may be some difficulties in deciding what status such a committee should hold. I would suggest, however, that it might work effectively on the official level by agreement between the Deputy Ministers. We have had great success with an Interdepartmental Shellfish Committee on such a basis. If you agree I would be glad to have your nomination of an individual from the Forestry Branch who might co-operate in this regard. Dr. H.W. Beall has

been maintaining the liaison thus far.

I might say that our officials have already developed a certain amount of co-operation on their own and have outlined some rather interesting research programs. It is our hope that during the coming year we may test at least one other possible spray insofar as its effects on fish are concerned and a number in relation to their effects as specific insecticides. I am assured that this limited co-operation has already given rise to fairly substantial benefits.

Yours very truly,

G.R. Clark,
Deputy Minister.

Department of Northern Affairs and National Resources

OFFIC OF THE DEPUTY MINISTER

TO: Mr. Harrison DATE 23/4/58

FOR: Forestry Branch

✓	PREPARATION OF REPLY		DISCUSSION WITH UNDERSIGNED
	ACTION		MAY WE DISCUSS AT YOUR CONVENIENCE
	COMMENT		DIRECT REPLY
	APPROVAL		DIRECT REPLY, COPY TO THIS OFFICE
	INFORMATION		NOTE AND FILE
	SIGNATURE		NOTE AND RETURN
	TRANSLATION		AS REQUESTED

Edey

NANR 22-14

14-0-31

Copy for Director, Forestry Branch

OTTAWA, April 28, 1958.

O. M. Clark, Esq.,
Deputy Minister,
Department of Fisheries,
O T T A W A, Ontario.

Dear Mr. Clark:

I have for acknowledgement your letter of April 21st regarding the proposed interdepartmental committee on forest spraying operations.

The gravity of the problem to which you refer, concerning as it does the preservation and welfare of two great national resources, is a matter of which I am keenly aware. The fullest degree of co-operation on the part of all concerned will be necessary in order to resolve the question in the best interests of both the fisheries and the forests.

I fully agree that an interdepartmental committee on the official level of the nature outlined in your letter, should serve as a useful means of effecting such co-operation and co-ordination of effort. Mr. H. W. Beall of the Forestry Branch of this department is nominated as a member of this committee.

I understand that in preliminary discussions the Canadian Wildlife Service was also represented and, if agreeable to you and Dr. Taggart, I should be glad to have the Chief of that Service, Mr. W. G. Hair, also serve as a member of the committee. The choice of Dr. H.L. Prebble of the Forest Biology Division as Chairman would be entirely agreeable to us.

Yours sincerely,

E. A. COTE

for R. G. Robertson,
Deputy Minister.

HWB/MJ

The Deputy Minister, Attention Mr. E.A. Cote.

April 28, 1958.

J.D.B. Harrison.

Forestry Branch
14-0-31

-- Interdepartmental Committee on Forest Spraying Operations --

In accordance with your minute of April 23rd, I enclose a letter prepared for signature, if suitable, in reply to the letter received from the Deputy Minister of Fisheries, on the above subject.

2. Since Mr. Clark's letter makes no reference to representation on the committee from the Canadian Wildlife Service, Mr. Beall has been in touch with the official of the Fisheries Department who prepared Mr. Clark's letter. The omission of reference to the Wildlife Service was entirely due to oversight, and the official requested that the reply be drafted along the lines enclosed.

3. Additional copies of this memorandum and the draft reply are attached hereto in case you wish to refer them to Mr. Coleman.

J.D.B.H.

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, CANADA

April 29, 1958.

Mr. [illegible],
Chief, Forest Biology Division,
[illegible], Ontario.

Re: Insecticides versus Forest Insects
[illegible] Spruce Budworm Project
New Brunswick, 1958

Critical to the proposed insecticide trials as outlined to the Inter-departmental Committee was the availability of areas which would fulfill the requirements of all parties concerned. These requirements are:-

(1) A forest type which can and does support a spruce budworm infestation of moderate intensity;

(2) Small watersheds of 2,000 acres, or less, which support young balsam; the watersheds to be of a size which can be completely sprayed within the described plot;

(3) The areas must be reasonably accessible by road so that a minimum of woods travel for biological checking would be necessary;

(4) The areas must not have been previously treated with insecticide.

With the above definitions in mind, an exploration trip was arranged and included Doctors Morewill and Nixon of the Defence Research Board staff, Dr. F.R.Webb of the Fredericton Forest Biology Laboratory, Mr. A.J.Kendall and Dr. J.J.Fettes of the Forest Biology Chemical Control Section. The trip took place April 21-23, 1958.

Suitable areas were found in the watershed of the Richibucto river along Highway #8 between Rexton and Harcourt, Kent Co., N.B. The areas were small tributaries emptying into the estuary of the Richibucto river and accessible by road or highway. The spruce budworm infestation was moderate, the forest type was mixed but with enough balsam and spruce content to be acceptable as moderately budworm susceptible forest. The areas range from 750 to 1500 acres. The roads in the area were in their worst spring condition and only the main highways were passable. Many more suitable areas will probably become available when the side roads become passable. Five or six spray areas will be located within 15 miles of Rexton, N.B., where it is expected that room and board will be available for staff members. At the time of examination, the tributaries were at the height of spring run-off and it was difficult or impossible to assess them for fish population. Conversations with local residents indicated that salmon had been caught in most of the streams examined. The Fisheries Research Board officers will make a more detailed study of the small streams at a later date when water levels are more normal. It was the feeling of all concerned that this area would certainly provide plots wherein conditions would be acceptable for the joint project.

Information from Forest Protection Limited indicated that there is a small airstrip in the vicinity of Rexton, N.B., which could be made operable for small spray planes with a minimum of bulldozer work. A report on this airstrip is forthcoming from R.J.Irving of Forest Protection Limited.

J. J. Fettes

James J.Fettes
Head, Chemical Control Section.

JJF/M.

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, CANADA

April 30, 1958

MEMORANDUM TO:
Dr. A.L. Pritchard,
Dr. J.L. Nash,
Mr. P.M. Blair,
Mr. H.F. Heald.

Following the meeting of the Interdepartmental Committee on Forest Spraying Operations, April 14, Dr. Pettes and Mr.Randall, of the Chemical Control Section, Ottawa, and Dr. F.E. Webb, of our Fredericton laboratory met with Drs. Morswill and Elsen, in the Kent County area of New Brunswick, April 21-23. Dr. Pettes has summarized the result of the field examination in the accompanying memorandum of April 29.

On the strength of this encouraging report on the availability of suitable areas for joint field studies by Fisheries and Forest biologists, I have set up a request to the Department of Agriculture to authorize certain unanticipated expenditures in the present fiscal year. From preliminary discussions, I expect that the Department will fully support our proposals and that an answer may be at hand in a day or two.

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

MLP:e

14-0-31

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

FOREST BIOLOGY DIVISION

CANADA

OTTAWA, CANADA

QUOTE FILE

May 12, 1958.

MEMORANDUM TO:

Dr. A.L. Pritchard,
Mr. J.L. Kask,
Mr. W.W. Mair,
Mr. H.W. Neall.

To supplement my memorandum of April 30th, this will let you know that the Deputy Minister of Agriculture has approved the request for unforeseen funds for staff, materials and services required in the joint field studies of insecticides in relation to the spruce budworm and salmon populations.

A number of tributary streams of the Richibucto River in Kent County, New Brunswick, appear to satisfy the requirements, both of the fisheries biologists and the forest biologists. Accordingly, detailed plans are now being made for initiation of the field studies. It is expected that preparatory field work will begin later this week under the direction of Dr. Fettes.

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

MLP/df

c.c. Dr. J.J. Fettes

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, CANADA

July 2, 1958.

MEMORANDUM TO:

Dr. A.L. Pritchard
Dr. J.L. Nash
Mr. K.R. Mair
Mr. H.B. Small

On May 12 I informed you that under authorization from the Deputy Minister of Agriculture the Chemical Control Section of this Division would be proceeding with experimental spray operations in the Richibucto area of New Brunswick in collaboration with Fisheries biologists.

This is to let you know that the experiments have proceeded according to plan. Plots were established in a number of streams flowing into Richibucto river and have been sprayed with DDT at one-quarter pound, one-half pound and one pound per acre and with DDD at one-quarter and one-half pound per acre. On these five plots and the corresponding streams in each case, studies are being carried out on spray deposit, insecticide concentration in the water at successive intervals after the spraying and on populations of the budworm, fish and the aquatic insects. In addition, two other insecticides (Sevin and Korlan) are being tested at one-half pound per acre on two forest plots separated from streams and the studies are concerned exclusively with budworm populations.

Check plots have, of course, been established for studies of undisturbed populations of the budworm, fish and aquatic insects.

I expect that a preliminary report on the results of these trials will be available by September. A complete report will be available later, after the very extensive chemical analyses of water samples have been completed.

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

MLP:MPG

c.c. Dr. J.M. Daggart
c.c. Dr. E.W. Neatby
c.c. Dr. J.J. Fettes

GOVERNMENT OF CANADA

ACTION REQUEST

P. P. & S. Cat. 3433

TO (*Mr., Mrs Miss*)

LOCATION

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:.....

REMARKS:

.....

.....

.....

FROM (*Mr., Mrs., Miss*)	PHONE	LOCATION	DATE

14-0-31

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, CANADA

July 30, 1958.

Dr. A.L.Pritchard,
Director, Conservation & Development Service,
Fisheries Department,
West Block,
Ottawa, Ontario.

Dr. J.L.Kask,
Chairman,
Fisheries Research Board,
Fisheries Department,
West Block,
Ottawa, Ontario.

Mr. W.W.Nair,
Chief, Canadian Wildlife Service,
Northern Affairs & National Resources Dept.,
Norlite Bldg.,
Ottawa, Ontario.

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

This is to keep you informed on a completely unexpected development in the Stanley Park area at Vancouver. Under date of July 25th, I was informed by our Victoria Laboratory that heavy populations of the hemlock looper, and another species of looper, were reported defoliating hemlock. The Park Superintendent and authorities of the Park Board were very anxious to avoid the risk of tree mortality or severe stripping and, therefore, on the basis

of information supplied by our staff, arranged for an aerial spraying operation to be carried out by Skyway Air Services on July 26th. The area to be sprayed is about 600 acres. I have no information on the formulation proposed to be used but I suspect it was DDT in oil solvent. The feeding period of these insects was approaching its maximum intensity, therefore, apparently the Park authorities wished to lose no time in having the spraying carried out.

I have no knowledge of any particular hazard to fish that might result from this spraying operation, but Mr. Lejeune has pointed out that a representative of the Fisheries Department in Vancouver was notified as soon as the situation was recognized.

M.L.Prebble
Chief, Forest Biology Division.

MLP/M

14-0-31

HWB/MJ

OTTAWA, August 13, 1958.

Dr. M.L. Prebble,
Chief, Forest Biology Division,
Department of Agriculture,
O t t a w a, Ontario.

Dear Dr. Prebble:

Thank you for your letter of August 12th regarding the Interdepartmental Committee on Forest Spraying Operations.

Your suggestion for a meeting during the third or fourth week of September is entirely satisfactory to me.

Yours very truly,

H. W. Beall,
Chief.

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14-0-31

CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, CANADA

August 12, 1958.

Dr. A.L. Pritchard
Dr. J.L. Kask

Mr. H.W. Beall
Mr. W.W. Hair

Subject: Interdepartmental Committee on Forest Spraying Operations

I have written to all Forest Biology Laboratories in Canada concerned with forest insect investigations to learn their views on any insect outbreaks that may require direct control action in 1959 (or 1960). I expect to have at least preliminary replies in the first week of September and it might be convenient to call a meeting of the Interdepartmental Committee during the 3rd or 4th week of September.

If a meeting can be called at that time other topics to be considered are results of the cooperative studies of insecticides in relation to the spruce budworm and young salmon carried out in 1958 and a forecast of any extension of such studies into 1959. I realize that complete reports on the 1958 studies cannot be expected by the 4th week of September but preliminary results may be available that would be adequate for general planning of any further work in 1959. In this connection, Dr. Fettes has indicated that the main conclusions of his laboratory studies at Ottawa and his field studies in New Brunswick would be available in time for a meeting in the 3rd or 4th week of September should a meeting be desirable at that time.

I do not know whether the Fisheries Research Board groups at St. Andrews and Nanaimo could possibly have any preliminary results before the end of September. Therefore, I am leaving it to Dr. Kask to look into this and to let me know whether a meeting should be anticipated before the end of September.

The reason for this suggestion of an early meeting arises from reasons of preparing estimate provisions for additional work that might be undertaken in 1959. The Forest Biology Division is making general provision for somewhat more work than is usually undertaken by the Chemical Control Section in order to avoid the necessity of extraordinary budgetary arrangements such as had to be made in the late spring of 1958. Naturally, such provision has to be in

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very general terms until more definite plans might be laid for work in 1959. I mention this point for the information of other members of the Committee who may have been embarrassed in 1958 by lack of budgetary arrangements for the work undertaken this year.

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

HLP:MPG

14-0-31

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

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CANADA

FOREST BIOLOGY DIVISION

QUOTE FILE

OTTAWA, CANADA
September 5, 1958

Northern Forest Research Centre
SEP 9 1958
Library

MEMORANDUM TO:

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

Subject: Interdepartmental Committee on Forest Spraying Operations

The replies I have received to my circular memorandum of August 12 and the response from the Forest Biology Laboratories for specific information on forest insect problems justify the holding of a meeting of the Interdepartmental Committee late in September. September 26 will suit the convenience of certain members and therefore this date is set for the forthcoming meeting. Most of the members are located in the Parliament Hill area therefore I suggest that we meet in Dr. Pritchard's office at 9:00 A.M.

Topics suggested for discussion are as follows:

(a) Review of forest insect infestations in relation to possible spraying operations in 1959.

(b) Results of experimental studies with insecticides against the spruce budworm and young salmon under laboratory and field conditions in 1958.

(c) Whether or not the joint experimental studies referred to in (b) should be continued in 1959.

It is realised that final reports will not be available by September 26 on the experimental studies carried out in 1958, nevertheless, from information at hand, it appears that preliminary appraisals of the 1958 studies will probably be sufficient

..... 2.

Memo. to:
Drs. A.L.Pritchard and Kask, Messrs. Beall and Mair Ottawa, Sept.5/58

to determine whether joint studies should be planned for 1959. Above all, we wish to avoid the necessity of reaching decisions under emergency conditions at the last minute such as had to be done in 1958.

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

MLP/KF

cc: Dr. J. J. Fetter

HWB/MJ

MEMORANDUM • GOVERNMENT OF CANADA

TO : FOR FILE

YOUR FILE No:

FROM :

OUR FILE No: 14-0-31

SUBJECT: Effect of Budworm Spraying on Salmon in New Brunswick,1958. DATE: Sept.12/58.

During his visit to this office this morning, Mr. B.W. Flieger mentioned that the run of salmon in New Brunswick rivers this summer has been extremely good. This situation is very encouraging since this year's run of grilse would be mainly fingerlings in 1954, while the adult salmon would be small parr in 1954. Thus, fish in the size classes most susceptible to harmful effects from D.D.T. in a year when heavy spraying took place have evidently been able to sustain the population of larger fish very well on returning from the sea.

2. The usefulness of the experiments carried out in the Richibucto River area this summer in an effort to determine the effect of various dosages of insecticide on budworm and on fish, is evidently still open to question. This mainly results from the fact that the fish population in the area chosen turned out to be very scarce and it was necessary to do a considerable amount of artificial stocking.

3. Mr. Flieger said that Forest Protection Limited probably spent more on this experiment than the Science Service and the Fisheries Department combined. However, he did not think that the company would press for repayment but would be willing to assume this part of the cost as a contribution to a better understanding of the problem.

4. Although the autumn report of the Forest Biology Division on the status of the budworm in New Brunswick has not yet been issued, it is likely that the budworm population in that Province will be so low in 1959 that it may not be possible to find a heavy enough infestation to use for experimental spraying in further studies of the relative effect of insecticides on budworm and on fish.

H.W.B.

CGSB Standard 6-GP-22; P P & S Cat. No. 3590

14-0-51
HWB/2J.

Taken from
WASHINGTON LOOKOUT
Page 10
American Forests June 1958

A STUDY OF THE EFFECTS OF INSECTICIDES, HERBICIDES AND FUNGICIDES upon fish and wildlife may be authorized this year. The Senate Committee on Interstate and Foreign Commerce has reported favorably on S.2447, a bill to authorize and direct the Secretary of the Interior to undertake continuing studies "for the purpose of preventing losses of those invaluable natural resources following spraying and to provide basic data on the various chemical controls so that forests, crop-lands and marshes can be sprayed with minimum losses of fish and wildlife."

REVIEW OF FOREST SPRAYING OPERATIONS 1958

Spraying operations were carried out in New Brunswick and Quebec in 1958 to an estimated total acreage of approximately three million acres. The only other spraying operations of which we are aware were small-scale operations against the Bruce span worm on range land in Alberta and against the hemlock looper and associate species in Stanley Park, Vancouver.

A forecast of spraying operations against forest insects in Canada in 1959 is as follows:

New Brunswick and Quebec - little or no spraying against the spruce budworm because of very extensive decline of the destructive populations in recent years. From the results of egg surveys completed to date, the only areas of high population forecast for 1959 are in the vicinity of Fredericton, New Brunswick, representing quite small acreages. It is dubious whether this will require spraying next year.

The only other forecast of spraying operations in 1959 is the possibility that private range-land owners in Alberta may carry out spraying operations against the Bruce span worm in aspen park lands.

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

OTTAWA,
September 26, 1958.

14-0-31

HWB/MJ

OTTAWA, September 26, 1958.

MEMO FOR FILE:

Meeting of
Interdepartmental Committee on Forest Spraying Operations
September 26, 1958

Preliminary Reports were presented on both field and laboratory studies carried out during the summer of 1958 in an effort to determine the effect of various insecticide formulations on budworm and fish populations. None of the three new insecticides tried, namely DDD, Korlan and Sevin, showed a great deal of promise. All of them proved less toxic than DDT to both budworm and fish. In the case of Sevin the relative toxicity to the insect seems to be considerably higher than to salmon fry. Unfortunately the cost of this insecticide is so high that it would be quite impracticable to carry out an operational spray program with it against the budworm. Much more promising is the possibility of using different formulations and dosages of DDT to those previously employed. The past summer's experimental data indicate that DDT applied at the rate of ¼ pound per acre is just about as toxic to budworm as the ½ pound per acre dose, which has been employed for some years past. It is possible that even lower concentrations may be quite satisfactory. On the other hand, the ¼ pound per acre dose seems to be much less toxic to small salmon than the higher concentration, and the limited data available indicate that it is also somewhat less harmful to aquatic insects.

2. The results obtained this year, although very encouraging, were not regarded by the Committee as sufficiently conclusive to warrant its making any specific recommendations for future operational use. It was agreed that another season's study should be made, both in the field and laboratory, using DDT in dosages of ¼ pound per acre and less.

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3. Possible areas in which to carry out field experiments in 1959 were discussed. Dr. Prebble reported that evidence of drastic reductions in budworm population in New Brunswick and the Gaspe continues to accumulate. The latest hazard map shows a few small areas of high hazard mainly in the Fredericton region, but in view of the declining population trend, it is considered practically certain that no operational spraying will be carried out in New Brunswick or the Gaspe next year. The indications are that it will be at least three or four years before further spraying is required.

4. No forest insect spraying is anticipated in British Columbia in 1959. There is a sizable spruce budworm infestation in the Babine Lake area between Prince George and Prince Rupert, but neither the Province nor the industry considers spraying warranted at present. In fact, the only forest insect spraying operation in Canada, of any significance, that is expected next year is in Alberta where private-range land owners may carry out a spray program against the Bruce span worm in aspen park lands. The latter is not considered suitable for experimental purposes.

5. It was agreed to defer recommendations regarding next year's experimental work until Dr. Fettes had had an opportunity to confer with Dr. Webb and Dr. Kerswill in New Brunswick early next month.

6. If no operational spray program is carried out next year but an area suitable for experimental spraying can be found, the Forest Biology Division is prepared to hire the spray aircraft and make the necessary arrangements.

H.W.B.

the laboratory tests indicated that Sevin could be used effectively but that it would be much more expensive. In this connection Dr. Prebble pointed out that in order to get the same effect from Sevin, it would be necessary for the aircraft to cover the area 2½ to 3 times, as compared to DDT coverage.

Dr. Fettes then referred to the results of the budworm control tests using various concentrations of DDT. He pointed out that the results showed that effective control was attained using a dosage of ¼ lb. DDT/gal/acre, and at this concentration mortality to fish was very small. He stated, however, that to get this effective control you could not go below one gallon per acre even under good flying conditions. Dr. Pritchard enquired as to whether this was due to the insecticide itself or whether the solvent was the limiting factor. Dr. Fettes replied that the solvent was not the limiting factor but rather it was the amount of insecticide which actually reached the ground. He then referred to Plots 1, 4 and 5, in the table summarizing the Richibucto field trials, attached hereto, which showed that in the 3 concentrations of DDT tested, that is 1.0, 0.5, and 0.25 pounds per gallon per acre, the amount of insecticide which reached the ground was practically the same. He concluded by stating that the lower limit of DDT concentration for effective insect control had not been determined.

ITEM NO. 2 - Effect on Salmon Populations.

Dr. Kask explained that the report by Dr. Kerswill had only been received the day before. He had examined it but not in detail. The general results of the field tests indicated that at a DDT concentration of ¼ lb./gal/acre no significant immediate mortality occurred to the salmon smolts held in the cages. With reference to the aquatic insects a bloom of Chironomids developed following the ¼ lb./gal/acre spraying. This was the typical result of insecticide applications and might be of some concern. Dr. Fettes enquired whether any results had been obtained on the salmon fry used by Dr. Keenleyside. Dr. Pritchard replied that the holding cages for the fry had not proved suitable and they had all escaped before any results were secured. Dr. Prebble asked whether the results of the caged fish tests could be applicable to wild stock. Dr. Kask replied that he did not think the results would be comparable to wild stock, and that it would be very desirable to carry out tests using wild stock. Dr. Pritchard handed one copy of Dr. Kerswill's report to Dr. Prebble.

Dr. Pritchard then summarized the findings of the field tests as follows: - It had been established that DDT at ¼ lb./gal/acre could control the spruce budworm. The lower limit of DDT concentration had not been established. Regardless of the concentration of DDT it was considered essential that the dosage of the formulation be kept at 1 gallon per acre. It was shown that ¼ lb./gal/acre did not show any initial serious effects on Atlantic salmon smolts. The field tests on aquatic insects showed that at ¼ lb./gal/acre, a marked bloom of Chironomids developed which was a typical result of

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insecticide application. He stated that it was his opinion, therefore, that the tests should be continued in order to establish the lowest concentration of DDT which would be effective against the spruce budworm.

With reference to Dr. Fettes statement that at a concentration of $\frac{1}{4}$ lb./gal/acre ideal flying conditions were required, Dr. Kask inquired whether such conditions would be necessary if higher concentrations of DDT were used. Dr. Fettes stated that you still need ideal conditions regardless of the concentration.

Mr. Mair referred to the data on droplet size and inquired whether this was the same in every case. Dr. Fettes stated that since the data were lumped this could not be established. He pointed out, however, that droplet size is most important and an attempt should be made to determine what concentration of DDT with the smallest droplet is effective.

ITEM NO. 3 - Laboratory Trials of Insecticides Against Spruce Budworm.

With reference to the laboratory tests, Dr. Fettes submitted a preliminary report of these tests (attached hereto as Appendix II). Referring to this report he pointed out that an emulsifier had been used on one-half the tests and it had been found that a lower degree of control resulted. He emphasized however that these results had been obtained in the laboratory only. The laboratory tests also showed that Sevin was a little better insecticide than Korlan. He also pointed out that the laboratory tests could not simulate air spray tests. He described the laboratory technique used and explained that the droplet count per square centimeter is much higher than in the field. He concluded by stating that in his opinion the laboratory tests should be repeated now that the technique had been established.

Mr. Cuerrier inquired whether wettable DDT and water could be used in the air spray operations. Dr. Fettes explained that the evaporation rate of water was too high, and that as a consequence only DDT dust would reach the ground. He then reviewed the relationship between the amount of solvent used and the droplet size pointing out that the smaller the droplet the longer it takes to fall. This factor was very important since if it takes too long to reach the ground the problem of application is extremely difficult. There was some discussion by the group on this factor.

ITEM NO. 4 - Bio-assay Tests - Nanaimo.

Dr. Kask reviewed the results of the bio-assay tests that had been carried out at the Nanaimo Station. He pointed out that the comparative toxicities to fish of the 4 insecticides tested were in approximately the same order as that established by the laboratory tests on the spruce budworm carried out by Dr. Fettes, that is DDT was the most toxic, followed by DDD, Korlan and Sevin.

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In referring to this report Dr. Pritchard pointed out that the tests showed that Coho salmon and Atlantic salmon were equally sensitive to the insecticides. This had been most fortunate since it had enabled the tests to be carried out on Coho salmon only thereby eliminating the necessity of shipping large numbers of Atlantic salmon eggs to Nanaimo.

Dr. Fettes, in referring to the comparative results, pointed out that DDT is 18 times more toxic to fish than Sevin which costs $10.00 per gallon whereas DDT was only 45 cents per gallon. He stated that this factor alone indicated the advantage of trying to establish the lowest concentration of DDT which would effectively control the spruce budworm.

The meeting agreed that the best approach would be along these lines.

Dr. Kask inquired whether the Science Service could recommend to the spraying companies the concentration which should be used. Dr. Prebble commented on this matter pointing out that if double sprayings were required as a result of using lower concentrations this would not be acceptable to the operators.

With reference to the degree of mortality which is considered to be effective control, Dr. Fettes stated that an 85 per cent kill is required. If this can be accomplished by lower concentrations then the operators would be satisfied.

The meeting agreed that even though the first field tests had shown that $\frac{1}{4}$ lb. DDT/gal/acre could provide effective control, additional tests would be required before it would be possible to recommend a reduction in concentration.

ITEM NO. 5 - Control Operations 1959.

Dr. Prebble reviewed the present picture of infestations in Canada and stated that so far as could be determined at the present time no spraying would be required in New Brunswick or Quebec in 1959.

Dr. Pritchard inquired as to whether the spruce budworm infestation might have been controlled naturally with no serious consequence on the timber stand if aerial spraying had not been carried out. Dr. Prebble stated that members of the Forest Biology Division were convinced that had there been no spraying in the Maritime Region very serious timber mortality would have resulted, striking evidence of this being shown in the check areas that had been reserved from spraying. He stated that there may be some need for some mop-up spraying operations in the Fredericton area. He also explained that even though the outbreak had now collapsed, this did not mean that the forests were no longer susceptible to further infestation. This was due to the fact that the high concentration of mature stands of balsam and fir were still

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present. In this regard Mr. Beall stated that stumpage rates for softwoods charged to Crown timber licence holders in New Brunswick had recently been reduced. This should have the effect of encouraging the utilization of mature softwood timber.

As far as other areas of the country are concerned Dr. Prebble stated that some minor operations may be carried out in the foothill country for control of aspen defoliaters. With reference to British Columbia, he advised that no control operations were proposed for 1959. He referred to outbreaks of spruce budworm in the Babine Lake area, but indicated that conditions were not serious enough to warrant control measures. The infestation in the Harrison Lake--Lillooet area was presently declining. He also reported on the spruce budworm outbreak in the Prince George area. He explained, however, that this insect had a two-year cycle so that there was some regeneration of foliage during the year in which the larvae did not feed extensively. As a result of this the infestation was not considered serious enough to warrant spraying at the present time. He also mentioned that there probably would be some minor spraying operations in certain plantation areas in Ontario.

Dr, Kask in commenting on Dr. Prebble's report stated that the situation in the Maritimes area was very good news indeed. He referred to the Miramichi River in particular and stated that this was one of the most important streams in the Maritimes and that it had been hit particularly hard by the spraying operations. Although the returns to the river had been good this year, the return of adults from those runs which had been affected by the spraying were not expected until 1960 and 1961. At that time serious repercussions would no doubt occur. The fact that no sprayings were contemplated in 1959 and possibly in future would then enable rehabilitation of the runs to proceed.

ITEM NO. 6 - Possible Continuation of Joint Field and Laboratory Investigations.

With reference to this item, Dr. Kask read the following section from a memorandum that had been received from Dr. Needler at the Nanaimo Biological Station -

"Regarding further work in 1959, I attach a copy of a letter of September 3 from Dr. Fettes to Dr. Waldichuk which has a bearing on future program. I have discussed plans for 1959 with Brett, Alderdice and Waldichuk and we agree with Fettes that no promising substitute for DDT is in view, and that the logical next step is to try to discover a formulation which will make the DDT effectively available to insects but reduce its availability to fish. This may be mainly a physico-chemical problem - i.e. the attempt to devise formulations which do not put DDT into solution. We doubt, therefore, whether bio-assays of the sort for which we are particularly well equipped would make a great contribution in 1959. We believe that concentration of our efforts

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on pulp-mill effluents, in which we are associating bio-assays with chemical research in a fundamental study, should have top priority. Some other special local problems are also urgent. We suggest therefore that our efforts on forest-spray insecticides be curtailed in 1959. If new insecticides or even promising new formulations are found which are shown to be possible substitutes for present DDT formulations in insect control, we might re-enter the picture profitably."

Dr. Fettes commented that if the Committee were satisfied that the tolerance limits have been established then further tests would not be required. If changes in formulations were developed, however, further tests would be necessary. It was Dr. Kask's opinion that these tolerance limits had been established and the Committee therefore agreed that further bio-assay tests would not be required unless new formulations or products appeared.

Dr. Kask then referred to Dr. Kerswill's comments on the matter of future operations pointing out that he was concerned about locating a proper place to carry out further tests. It was Dr. Kerswill's opinion that it will require at least a year to locate such an area. Dr. Fettes commented that he probably never would locate an ideal area. He added that if budworm areas were located in New Brunswick the tests should be carried out even if it was necessary to use streams which had already been sprayed. He agreed that natural fish populations were certainly desirable but that disturbed ones should be used if they were the only ones available. In this regard Dr. Prebble also added that it would be most desirable to continue the tests since the ground check crews would still be available. This might not be the case if the tests were deferred for any period of time.

Dr. Pritchard stated that the problem was one of deciding whether the project was worth continuing under the present circumstances. Dr. Prebble stated that it might only be a matter of establishing minimum DDT concentrations for insect control knowing that any reduction in concentration would be a benefit to fish. Dr. Fettes expressed the opinion that the results of $\frac{1}{4}$ lb. DDT should be rechecked. He also felt that if this was retested the effects on fish should also be retested.

The Committee agreed that the whole matter of retesting should be discussed by Dr. Fettes and Dr. Kerswill and if proper experiments can be set up for 1959 then every effort should be made to continue the program if this could be done without serious damage to existing programs. Dr. Fettes advised that he was meeting with Dr. Kerswill in St. Andrews on October 6.

ITEM NO. 7 - Other Matters.

Dr. Pritchard made reference to certain spraying operations that had been carried out in Labrador and the Northwest Territories by the Department of National Defence. He reported on his discussions of the matter with Mr. Winmill, entemologist in charge of such operations, and suggested

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that he should be advised of any of the findings regarding the effect of the spraying operations on live fish. The Committee agreed that such information could be forwarded to Mr. Winmill.

With reference to the Minutes of the Committee Meetings, the Committee agreed that they should have fairly restricted circulation. Any published reports, however, could be distributed at the discretion of the Committee members.

Dr. Kask inquired regarding the effect of the spray operations on bird life. Mr. Mair pointed out that although there was evidence of bird kill, the areas are quickly repopulated. He also stated that although birds may not be killed by the spray, there was some evidence that their reproductivity was affected.

In connection with the publication of reports Dr. Fettes stated that he had discussed the matter with Dr. Kerswill and they had agreed that it would be desirable to have all reports published under one cover. The Committee agreed.

Dr. Prebble also stated that the Committee should try to keep other interested groups such as the B.C. Loggers Association informed on progress of investigations. He felt that some type of mailing list should be established for this purpose. The Committee agreed.

The meeting adjourned at : 12:00 Noon.

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

O t t a w a,
October 9, 1958.

APPENDIX I

Results of Airplane Spray Trials - Kent Co., N. B.

1 9 5 8

Comparing Four Insecticides against the Spruce Budworm

(A preliminary report)

The primary purpose of the program was to investigate the possibilities of controlling the spruce budworm and lessening the hazard to aquatic life. Four insecticides were tested: DDD, DDT, Korlan and Sevin. Only DDT and DDD were tested for effect on water fauna. Seven plots were sprayed. Five of them included entire small watersheds in order to approximate the contamination of water likely to be experienced in large scale control programs. The accompanying map presents the plot layout. Plots 1 to 5 encompass watersheds. Plots 8 and 9 were sprayed for budworm response only.

Spruce budworm population samples were taken throughout the larval period. Two check plots were sampled concurrently. A preliminary estimate of the effects of the treatments is presented in the attached table.

There are several pertinent observations which may be drawn from the data:

1. All dosages of DDT (1.0, 0.5 and 0.25 lb./gal/acre) produced similar effects, suggesting that a 2.5% solution of DDT is as lethal as a 10% solution providing the coverage is adequate.

2. Nominal or emitted dose does not appear to be closely related to deposited insecticide. These variations are the result of different meteorological conditions at time of emission. Careful choice of spraying conditions would provide good control using a minimum of insecticide.

3. Comparing the effects of the insecticides, an arbitrary rating of the four tested would be: DDT = 1.0. Korlan = 0.5
DDD = 0.6. Sevin = 0.4
The rating indicates that DDT is by far the most effective of the four. The others could only compete if amounts great enough to control the spruce budworm did not in turn create serious hazards to fish. The ratings are in the same sequence as those presented for the fish tolerance tests but differ in magnitude. DDT is 2.5 times as toxic to budworm larvae as Sevin but is some 18 times more toxic to salmon fry.

4. The lower limit of concentration of DDT at 1 gal/acre which would be adequately toxic to budworm larvae has not been determined. Furthermore, the upper limits for DDD, Korlan and Sevin are unknown.

5. From the results of the 1958 tests, no substitute for DDT has been proven.

James J. Fettes,
Chemical Control Section,
Ottawa - September 25, 1958.

SUMMARY DATA OF RICHIBUCTO, N.B., FIELD TRIALS, 1958.

Plot No.	Date Sprayed	Nominal Insecticide and Dosage	Sampling Lane	Insecticide Deposited			Corrected Per Cent Control
				Drops/Cm^2	Gals/Acre	Active Ingredient Lb./Acre	
1	18 June '58	DDT 0.5 lb./gal/acre	A	6.64	0.30	0.15	96.4
			B	10.80	0.28	0.14	98.6
2	21 June '58	DDD (Rhothane) 0.25 lb./gal/acre	A	7.98	0.16	0.04	46.1
			B	16.93	0.28	0.07	0.0
3	20 June '58	DDD (Rhothane) 0.5 lb./gal/acre	A	15.31	0.52	0.26	53.6
			B	16.65	0.66	0.33	59.7
4	19 June '58	DDT 0.25 lb./gal/acre	A	14.70	0.57	0.14	94.3
			B	21.70	0.92	0.23	99.3
5	12 June '58	DDT 1.0 lb./gal/acre	A	8.24	0.27	0.27	88.5
			B	9.46	0.31	0.31	94.5
8	20 June '58	KORLAN 0.5 lb./gal/acre	A	13.21	0.34	0.17	27.8
			B	7.82	0.19	0.09	43.6
9	19 June '58	SEVIN 0.5 lb./gal/acre	A	30.68	1.15	0.57	90.1
			B	29.44	1.04	0.52	92.4

APPENDIX II

Laboratory studies on the toxicity of DDT, DDD, Korlan and Sevin to the larvae of the spruce budworm (*Choristoneura fumiferana* Clem.)

(A preliminary report)

Oil formulations of DDT, DDD, Korlan and Sevin, were sprayed on field collected larvae and the insecticidal effects of each group of insecticides analyzed and compared.

Variability of the test population from shipment to shipment was reflected in the survival of the control population and the response of the larvae to the various toxicants. The larvae showed not only different levels of susceptibility to the various insecticides but also a different relationship between dosage and response. With the exception of Korlan, the addition of an emulsifier (Atlox 2082A) appeared to depress the toxic effects of the insecticidal formulations.

In all tests, the insecticidal activity of the DDT formulations were greater than that of the other toxicants, with the order of toxicity being DDT-A, DDT-B, Korlan-B, DDD-A, Sevin-A, DDD-A, and Korlan-A. (A-formulated without emulsifier, B-formulated with Atlox 2082). The AR-50 fuel/oil solvent appeared to show a very slight toxicity to the larvae.

The attached chart presents the preliminary analysis of the experimental laboratory data.

A. P. Randall,
Chemical Control Section,
Ottawa - September 25, 1958.

APPENDIX II

- 2 -

MORTALITY OF SPRUCE BUDWORM LARVAE SPRAYED WITH VARIOUS INSECTICIDAL SOLUTIONS, 48 HOURS, AND FIVE DAYS AFTER SPRAYING.

Insecticide	Per Cent Active Ingredient in Solution	Calculated Dosage lb. active Ingredient/Acre	Per Cent Mortality	
			48 Hours After Treatment	5 Days After Treatment
			Corrected *	Corrected **
DDT-A	12.50	0.90 ± 0.07	73.0	100
		0.82 ± 0.11	95.0	99
		0.98 ± 0.10	70.0	98.6
	6.25	0.53 ± 0.04	55.1	89.1
	1.25	0.076 ± 0.01	72.0	92.9
		0.109 ± 0.09	82.0	83.1
	0.25	0.021 ± 0.002	17.9	26.0
DDT-B	12.50	1.03 ± 0.11	42.4	76.5
	6.25	0.66 ± 0.05	28.7	83.0
	1.25	0.115 ± 0.015	31.3	20.9
DDD-A	12.50	1.10 ± 0.08	89.0	93.8
	6.25	0.44 ± 0.01	42.4	48.0
	1.25	0.103 ± 0.018	49.0	62.8
DDD-B	12.50	1.02 ± 0.10	33.0	45.4
	6.25	0.49 ± 0.054	5.0	36.6
	1.25	0.082 ± 0.030	2.3	3.2
KORLAN-A	12.50	1.36 ± 0.09	83.0	90.6
	6.25	0.79 ± 0.16	13.3	31.6
	1.25	0.084 ± 0.009	13.0	18.4
KORLAN-B	12.5	0.72 ± 0.08	77.0	83.4
	6.25	0.40 ± 0.06	68.6	75.1
	1.25	0.113 ± 0.009	4.2	41.9
SEVIN-A	12.5	0.94 ± 0.34	87.1	86.0
	1.25	0.071 ± 0.013	21.5	28.5
SEVIN -B	1.25	0.092 ± 0.022	14.4	6.5
SOLVENT-A	0	1.13 (G.p.a.)	8.5	8.6
	0	1.14 (G.p.a.)	0.0	9.2
SOLVENT-B	0	1.15 (G.p.a.)	1.1	8.9

* Corrected mortality figures using Abbott's formulae $\frac{x - y}{x} \times 100$

Where x = % survival in the controls.

y = % survival in the treatment.

** Corrected Natural Mortality Curve plus Abbott's formulae.

FILE NO. 702-1-10

14-0-31

CANADA

DEPARTMENT OF FISHERIES

OTTAWA

780422

October 16, 1958.

Mr. H. W. Beall, Chief,
Forestry Operations Division,
Forestry Branch,
Northern Affairs and National
Resources,
Motor Building, 238 Sparks St.,
O t t a w a, Ontario.

Dear Mr. Beall:

There is enclosed herewith copy of notes I prepared on the September 26th meeting. These have been circulated to those attending and it would be appreciated if you would examine them and advise of any corrections, additions, or deletions. Following the submission of any corrections, the notes will be amended and we will have them mimeographed for final distribution.

It would be appreciated if you would also advise of your requirements in this regard.

Yours very truly,

W. R. Hourston

W. R. Hourston,
Chief,
Fish Culture Development.

Encl. 1.

14-0-31

RMB/MJ

OTTAWA, October 17, 1958.

Mr.W. R.Houston,
Chief, Fish Culture Development,
Department of Fisheries,
O t t a w a, Ontario.

Dear Mr. Houston:

Thank you for your letter of October 16th enclosing the draft minutes of the September 26th meeting of the Inter-Departmental Committee on Forest Spraying Operations.

There are only two minor points on which I would suggest any change. These are as follows:

Page 4, Paragraph 2, 2nd Sentence: Possibly the word "approximately" should be inserted before the phrase "the same order" since the laboratory tests of insecticides indicated that in Formulation A Sevin was more toxic to the spruce budworm than Korlan.

Page 5, Paragraph 2, last Sentence: This statement was intended to apply only to New Brunswick, and perhaps I should have expanded it a little further. I would suggest that this sentence be replaced by the following:

"In this regard Mr. Beall stated that stumpage rates for softwoods charged to Crown timber licence holders in New Brunswick had recently been reduced. This should have the effect of encouraging the utilization of mature softwood timber."

...

It would be appreciated if three copies of the minutes could be supplied for the use of this Branch.

Yours very truly,

H. W. Beall,
Chief.

File 14-0-31

FILE No. 702-1-10

CANADA

DEPARTMENT OF FISHERIES

OTTAWA

October 23, 1958.

Northern Affairs and National Resources
FORESTRY
OCT 24 1958
BRANCH
Dept. of

Mr. H. W. Beall, Chief,
Forestry Operations Division,
Department of Northern Affairs
and National Resources,
Motor Bldg., 238 Sparks Street,
O t t a w a, Ontario.

Dear Mr. Beall:

I would acknowledge your recent letter submitting your comments on the draft report of the Meeting of the Interdepartmental Committee on Forest Spraying Operations.

Mr. Hourston will be in the Maritimes for ten days but these valuable comments will be referred to him immediately on his return.

It is assumed that it will then be possible to process the Minutes quickly and forward the copies which you require.

Yours very sincerely,

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

FILE No. 702-1-10

14-0-31

781302

CANADA

DEPARTMENT OF FISHERIES
OTTAWA

November 17, 1958.

Dept. of Northern Affairs and National Resources
FORESTRY
NOV 18 1958
BRANCH

Mr. H. W. Beall, Chief,
Forestry Operations Division,
Department of Northern Affairs
and National Resources,
Motor Building, 238 Sparks St.,
O t t a w a, Ontario.

Dear Mr. Beall:

Please find enclosed 3 copies of the report of the Meeting of the Interdepartmental Committee on Forest Spraying Operations which you requested in your recent letter.

Yours very truly,

W. R. Hourston

W. R. Hourston,
Chief,
Fish Culture Development.

Encls. 3.

14-0-31

HWB/MJ

OTTAWA, November 18, 1958.

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

Sir:

Enclosed is a copy of a report of a meeting of the Interdepartmental Committee on Forest Spraying Operations which was held in Ottawa on September 26th. This report indicates progress made to date in studies of the effect of several insecticides on populations of the budworm and on fish.

This is forwarded for your own information and that of Mr. Doyle, but is not intended for general circulation.

Yours faithfully,

H. W. Beall,
Chief.