SPRAYING OPERATION FOR CONTROL OF THE BLACK-HEADED BUDWORM[1], VANCOUVER ISLAND, BRITISH COLUMBIA, 1957

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During June, 1957, 196,000 acres of western hemlock on northern Vancouver Island, British Columbia, were sprayed to protect stands severely defoliated for two consecutive years by the black-headed budworm. These stands, out of a total outbreak area of about two million acres, were considered to be in critical condition. Surveys indicated that they could expect to receive damaging defoliation in 1957. Although it was dwarfed by the extensive control programs in the western United States and eastern Canada there are some special features about the project that are worth relating.

Organization

As this was the first large control operation attempted in British Columbia, an organization was needed to plan and direct the project and to provide a legal body for entering into commitments with governmental and private agencies. As a result the British Columbia Loggers' Association formed a permanent Pest Control Committee for this purpose. Representatives from the British Columbia Forest Service and the Forest Biology Laboratory serve on the Committee in an advisory capacity, but since this Association is composed of most of the logging companies in British Columbia, it can be considered that the project was directed by industry. The Forest Biology Laboratory was responsible for spray and biological assessment.

The Committee drew heavily on the experience acquired by other agencies in large-scale operations in the western United States and eastern Canada, but local conditions necessitated modification of some procedures followed elsewhere. We now have an organization and a soundly established pattern tailored to British Columbia conditions for handling future forest insect control problems.

Spray Equipment and Chemicals

The spraying was done by four converted TBM Gruman Avengers. This was the first time these aircraft have been used for spraying forests in Canada. They were selected because the rugged terrain, the radius of action, and the uncertain weather conditions likely to prevail indicated that a larger aircraft than the conventional Stearman was needed. In our opinion their performance with respect to pay load and spray pattern was impressive. As a result, several of these aircraft have been purchased by a Canadian firm and have been used against the spruce budworm in eastern Canada.

Since it was possible that the infestation could collapse at any time from natural causes, resulting in the cancellation of the operation, raw materials were stored and mixed as needed. Mixing and loading were done at the air base, where a mixing plant was constructed. The plant had a daily manufacturing capacity of about 30,000 gallons of spray and a storage capacity of about 35,000 gallons. Spray was loaded into the aircraft directly from the mixing plant.

The spray consisted of DDT in Standard base oil diluted with diesel oil to yield a solution containing 1 pound of DDT per U.S. gallon with an emulsifier content of 1.64 per cent. The emulsifier was Atlox 2082A. The use of an emulsifier in 1956 (Brown *et al.*, 1958) gave such satisfactory results that it was incorporated into the operational formulation in 1957.

Efforts were made to compare the effectiveness of the operational spray with three other formulations. How-

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ever, in a pressing mixing and flying schedule it proved unpractical to exercise the precise control essential for experimental tests. Results indicated that as low as one-half pound of DDT per gallon per acre was as effective as the operational solution. Results with diesel oil without emulsifier were inconclusive and plans to experiment with water instead of an oil diluent were cancelled altogether.

Timing

Black-headed budworm larvae develop more slowly than spruce budworm larvae and therefore provide a longer period for effective spraying. In 1956 it was found that all the larval stages were susceptible to the spray. Spraying can be started when roughly 50 per cent of the larvae are in the second instar and, for maximum effect, should be completed before the appearance of fifth-instar larvae. In 1956 and 1957 this allowed a period of about one month for treatment. Spraying in 1957 commenced on June 10, and despite delays caused by poor weather, was completed on June 20.

Control Achieved

The operation achieved its principal objective (Lejeune *et al.*, 1957). Biological assessment plots showed that the budworm was completely controlled where the spray deposit was adequate (over 10 drops per cm.^{2} or .20 gal. per acre). Data obtained indicated that the spray deposit in general ranged from light to medium (1 to 20 drops per cm.^{2}). Deposits were lighter in areas skip-sprayed to avoid lakes, streams, cut-over areas and cedar swamps, and heavier where avoidance of specific landmarks was not required. The indicated average control of about 90 per cent, based on data from five sample plots, was sufficient to prevent serious defoliation in 1957.

Fish Mortality

When it was decided in the fall of 1956 to proceed with a spraying operation in 1957, it was anticipated that some commercial and game fish might be killed. Accordingly the decision was made known to the Federal and Provincial fisheries authorities, who were invited to have representatives at all subsequent meetings of the Committee.

In co-operation with the Committee, plans were drawn up by the fisheries organizations to assess mortality of fish and fish food organisms. The main concern was for the fry of cohoe salmon and steelhead trout, which would be in the streams during the spray period. To minimize contamination of waters, pilots were instructed to shut off the spray when flying over rivers and lakes, streams were not to be used as boundaries of spray blocks and, where feasible, pilots were to spray parallel to the course of major streams keeping one swath width away. Fisheries representatives, who were present on all flights made by the observation aircraft, were satisfied that a sincere effort was made to implement these measures, but spray drift hit some lakes and streams and fish were killed.

The effects of spraying were measured in nine of the ten major salmon streams in the area (Crouter and Vernon, 1959). Results obtained indicated a large variation in the mortality of cohoe fry, ranging from zero to almost complete annihilation. Losses were severe in four of the major streams, not only to cohoe but also to trout, steelhead yearlings, and possibly alevins of trout and steelhead.

The reduction of aquatic insects paralleled the loss of cohoe fry and the productivity of several streams may not return to adequate proportions for several years.

The effects of spraying varied with each stream but some trends were noted. Fish mortality was high in large streams in flat terrain with dense forest cover, which made the streams difficult to see from low flying aircraft, and in large streams flowing through steep-walled valleys. Mortality was low in streams in well-defined but not particularly steep-walled valleys and in small streams with a dense overhanging canopy.

In June, 1957, 156,000 acres of western hemlock were sprayed to control the black-headed budworm. The operational spray consisted of DDT in Standard base oil diluted with diesel oil to yield a solution containing 1 pound of DDT per gallon with an emulsifier of 1.64 per cent. Spray was applied at the rate of 1 gallon per acre. The indicated average control of about 90 per cent was sufficient to prevent serious defoliation in 1957. Fish populations, particularly cohoe fry, and fish food organisms in some streams were severely depleted.

Summary

Although there were a number of puzzling inconsistencies in results obtained from the assessment of fish mortality, it is clear that under the conditions of the operation, fish and fish food populations in some streams were severely depleted.

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THE DISTRIBUTION OF THE WHEAT MIDGE, SITODIPLOSIS MOSELLANA (Gehin), IN BRITISH COLUMBIA

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The wheat midge, *Sitodiplosis mosellana* (Gehin), was first reported in the Pacific Northwest in 1904 at Chilliwack, B.C. Since that time it appears to have spread through the province. It was listed as an important pest of grain in the lower Fraser Valley in 1905. In 1921 serious damage was reported in the Salmon Arm district. A wheat field was damaged by this pest near Lumby in 1936 when there was also serious damage on Vancouver Island and in coastal districts. Light damage was recorded at Merritt in 1951 and at Nelson in 1953. In 1954 infestations were reported from Larkin, Armstrong and Enderby. Damage occurred on spring wheat at Revelstoke, Grindrod, Enderby and Salmon Arm in 1955.

In 1957 a heavy infestation was examined in a field of Garnet wheat at Kersely, south of Quesnel. According to the farmer this field had been similarly infested in 1956. In 1958 several fields were infested in the Kersely area and serious damage occurred. This infestation appears to be so severe that unless it subsides it is questionable whether the farmers in the area can continue profitably to grow grain. The farmers report that fall wheat and barley as well as spring wheat have been attacked. In the literature, these grains as well as oats are listed as hosts of the pest.

Since the wheat midge has become so well established at Kersely, it seems reasonable to assume that it may eventually move into the Peace River area.

References

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