CONTROL MEASURES FOR LOG POND MOSQUITOES IN DOUGLAS COUNTY, OREGON

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Recent expansion of the lumbering industry in Oregon has focused attention on mosquito problems in the vicinity of lumber mills and associated processing plants. In 1956, the Oregon State Board of Health estimated that there were 10,000 acres of log ponds and sloughs in Oregon that were used for log storage and handling. In 1959, this estimate was increased to 15,000 acres. The importance of mosquito production in these ponds is enhanced by the proximity of the ponds to population centers that provide manpower for the mills and associated industries. Frequently, the pest mosquito problem becomes so great as to cause work stoppage at the mills and to exert a very serious impact on the health and welfare of human populations concentrated near the mills.

Extensive use has been made of insecticides to control both mosquito adults and larvae in log pond areas. However, results of these repetitive control measures have been erratic and unpredictable. To compound the control problem, field observations by Buehler (1955) indicated that mosquito larvae in a log pond at Oakridge, Oregon were resistant to DDT. This resistance was corroborated by Eddy *et al.* (1958). Hoffman and Yates (1956) reported on experiments conducted on log ponds over a period of several years. They showed that DDT emulsions applied at rates of 0.04 to 0.2 ppm gave high initial reductions of *Culex tarsalis* and *Culiseta inornata* populations, and that wettable powder treatments of DDT were much less effective. Surface oils were found to provide a good initial kill, but reinfestation occurred more rapidly than with emulsions. Control of *C. tarsalis, Culex pipiens,* and *Culiseta incidens* mosquitoes was obtained with as little as 0.25 pound of DDT or EPN emulsion per acre. The authors indicated, however, that this dosage was probably too little for practical application since reinfestation occurred within 2 weeks.

Field tests by the Entomology Research Division, USDA (Eddy, 1959, and McDuffie *et al.,* 1959) showed that Guthion gave 100 percent initial control but exhibited no residual effect. Parathion granules applied at the rate of 0.25 pound per acre and Dylox at 0.63 pound per acre were less effective.

METHODS. During 1956, the Technology Branch of the Communicable Disease Center, U. S. Public Health Service, initiated cooperative studies with the Douglas County Health Department and the Oregon State Board of Health to evaluate the usefulness of selected organic insecticides as residual and temporary larvicides on log ponds in Douglas County, Oregon. In May, five log ponds were given residual larvicidal treatment with DDT, heptachlor, and dieldrin. Two other ponds were given temporary larvicidal treatments with Dipterex [3] and cresylic acid. Table 1 shows the log ponds that were treated, the area of each, insecticide used, rate of application, and total amount of finished insecticide applied to each pond. Mosquito larvae were present in all of the ponds when the insecticides were applied.

The dieldrin, heptachlor, Dipterex, and cresylic acid emulsions were applied at a tank pressure of 350 psi with a hydraulic-type power sprayer equipped with 200 feet of hose and an adjustable orchard-type spray gun. During the first application of

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[3] Use of trade names is for identification purposes only and does not constitute endorsement by the Public Health Service.

TABLE 1.—Summary of larvicidal treatments applied to log ponds in Douglas County, Oregon, during 1956

Name and size of log pond	Chemical formulation used and Type of Treatment	Toxicant per acre	Amount of finished insecticide applied
Dodd Lumber Co.; 0.5 acre	25% granular heptachlor; Residual larvicide	5 pounds	20 pounds
Nyberg Lumber Co.; 2.0 acres	Heptachlor emulsifiable concentrate containing 2 lb./gallon; Residual larvicide	5 pounds	150 gallons
Round Prairie Lumber Co.; 4.3 acres	DDT emulsifiable concentrate containing 2 lb. DDT/gallon; Residual larvicide	1st treatment: 10 pounds. 2nd treatment: 11.1 pounds	1st treatment: 245 gallons 2nd treatment: 350 gallons
Lee Preston Lumber Co.; 1.3 acres	10% granular DDT 20–30 mesh attaclay; Residual larvicide	10 pounds	130 pounds
Jay Mark Lumber Co.; 3.0 acres	Dieldrin emulsifiable concentrate containing 1.5 lb. dieldrin/gallon; Residual larvicide	3 pounds	200 gallons
Ten Mile; 1.2 acres	50% water-wettable Dipterex; Temporary larvicide	0.25 pound	100 gallons
Keystone Lumber Co.; 7.0 acres	Cresylic acid (5% phenol coefficient); Temporary larvicide	7.1 gallons	300 gallons

TABLE 2.—Summary of larval mosquito sampling in treated and untreated log ponds in Douglas County, Oregon, 1956

	Average number of larvae and pupae per dip						Percent species composition in untreated ponds			
Larvicide	Dield. emul.	DDT emul.	DDT gran.	Hepta. emul.	Hepta. gran.	Six untreated control ponds	*Culex tarsalis*	*Culex peus*	*Culex pipiens*	*Culiseta incidens*
Date treated	5/26	5/25 & 7/28	5/26	5/26	5/28					
Toxicant, lb./acre	3	10	10	5	5					
Pretreat.	5	19	2	3	*	*				
Week Ending 6/2	—	—	—	—	0	1				
6/9	0	0	0	0	—	1	73	5	4	18
6/16	0	0	0	0	0	1				
6/23	0	0	0	0	0	2	59	0	0	41
6/30	0	0	0	0	0	1				
7/7	0	0	0	0	0	10	53	0	18	29
7/14	0	*	0	*	0	2				
7/21	0	*	4	*	0	13	65	0	12	23
7/28	0	2	4	1	0	15				
8/4	0	0	2	1	*	43	38	30	25	7
8/11	*	0	9	2	*	24				
8/18	0	0	7	4	0	87	14	50	25	11
8/25	*	2	7	2	0	21				
9/1	1	—	3	*	2	81	22	78	0	0

* Less than one larva per dip.

the DDT emulsion, 200 gallons were applied with a hydraulic power sprayer and 45 gallons with a Buffalo Turbine. The Buffalo Turbine was used to spray the middle section of the pond that could not be reached with a hydraulic sprayer. The second application of DDT emulsion was made with a hydraulic power sprayer equipped with a fire-fighting nozzle that would project a solid stream for a distance of approximately 50 feet. Granular DDT was broadcast by hand and with a crank-type seeder. The granular heptachlor was applied to approximately 75 percent of the log pond's surface with a Buffalo Turbine; the remaining area was treated with a hand seeder. Experiences with various methods of chemical application indicated the need for special equipment for applying insecticides to log ponds.

The log ponds were inspected for mosquito larvae with a one-pint white enamel dipper prior to treatment and each week thereafter, to evaluate the effectiveness and duration of the various treatments. During each inspection, ten dips were taken at 6 or more sampling sites in each pond. Wherever possible, the following three ecologically different areas in each pond were dipped: (1) open water, (2) surface litter and floating logs, and (3) marginal vegetation.

RESULTS. Results of the residual larvicidal treatment are summarized in Table 2. It was arbitrarily assumed that control was no longer effective when the average number of larvae per dip was 2 or more. Dieldrin emulsion and granular heptachlor were effective in controlling log pond mosquito larvae for periods of 14 and 13 weeks, respectively. Granular DDT, DDT emulsion, and heptachlor emulsion were effective for about 7, 8, and 10 weeks, respectively. Following retreatment of a log pond with DDT emulsion, no larvae were found during 3 consecutive weekly

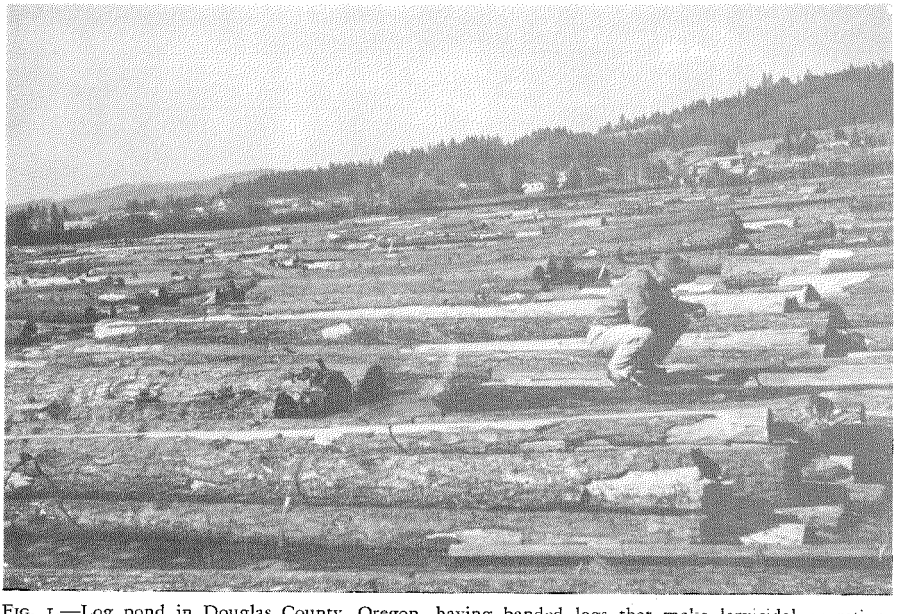

FIG. 1.—Log pond in Douglas County, Oregon, having banded logs that make larvicidal operations difficult.

inspections (Table 2). Dipterex was effective as a temporary larvicide, while cresylic acid gave no apparent reduction of mosquito larvae.

On May 29, five hundred pounds of BHC dust containing 2 percent gamma isomer were applied with a Buffalo Turbine to an 18-acre log pond as a combination adulticide-larvicide treatment. Larval inspection 24 hours after application of the BHC dust revealed that larvae in the far side of the pond had not been killed despite the fact that a cloud of insecticide dust passed over that portion of the pond during treatment. The portion of the pond that was not effectively larvicided was sprayed with BHC water-wettable powder by means of a hydraulic-type sprayer. The effective length of this combined treatment was only 23 days. The pond was retreated with BHC water-wettable powder on July 1. The effective period of the second treatment was only 11 days. The lack of residual effectiveness was due primarily to the difficulties in applying the insecticide to the larval mosquito habitats that were exceedingly well protected by surface litter, stored logs (some banded), luxuriant algal growths, and emergent vegetation (Figure 1).

SUMMARY. Heptachlor at 5 pounds per acre, DDT at 10 pounds per acre, and dieldrin at 3 pounds per acre were tested as residual larvicides; Dipterex at ¼ pound per acre and cresylic acid at 7 gallons per acre were tested as temporary larvicides for the control of log pond mosquitoes. Granular heptachlor and dieldrin emulsion were effective in controlling larvae of log pond mosquitoes for periods of 13 and 14 weeks, respectively. Granular DDT, DDT emulsion, and heptachlor emulsion were effective for about 7, 8, and 10 weeks, respectively. Dipterex proved to be an effective temporary larvicide, but cresylic acid gave no apparent reduction in larval mosquito populations. BHC dust had limited residual effectiveness.

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