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THE EFFECT OF APPLICATIONS OF PELLETIZED 2,4-D UPON THE BOTTOM FAUNA OF KENT LAKE, OAKLAND COUNTY, MICHIGAN

By

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Grigsby, Hamilton and Smith (1956) succeeded in controlling water milfoil (Myriophyllum exalbescens) in Kent Lake, Oakland County, Michigan, by applying pelletized 2,4-D to the lake ice in late winter. Since their report appeared, a number of companies have started to manufacture and market 2,4-D pellets for the control of aquatic weeds. Since this chemical is applied as a solid which presumably sinks to the lake bottom, large concentrations might be expected to develop in the mud-water interphase and such treatment might be hazardous to the bottom invertebrates inhabiting this stratum. Some preliminary and qualitative benthos collections from plots used by Grigsby, Hamilton and Smith in their successful experiment in 1955 indicate that little bottom fauna was present in the treated area. Clearly, some evaluation of the effect of chemical preparations of this type upon fish-food resources should be made before they are widely used in fishing waters.

Experimental procedures: Rectangular 1/2-acre plots were marked with metal stakes. These plots were located in a small bay near the upper end of Kent Lake near the 50' x 50' plot used by Grigsby, Hamilton and Smith in their earlier trial (Figure 1). Bottom sampling stations were selected within each of two experimental plots and at a control site. These stations were marked with metal stakes (Stations 1, 2, and control, Figure 1). On December 23, shortly

Figure 1.--Upper portion of Kent Lake, Oakland County, showing location of 2,4-D test plots.

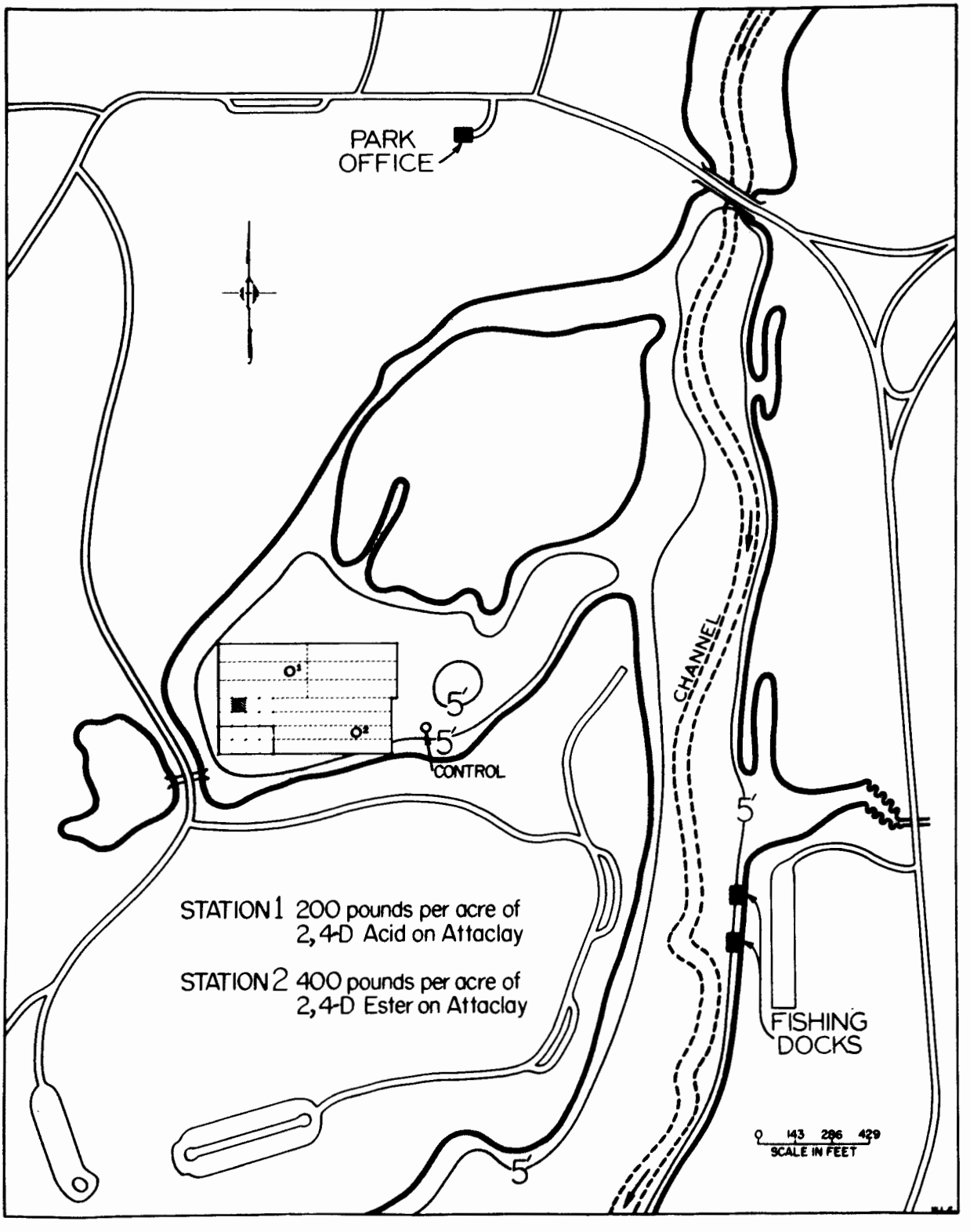
PARK
OFFICE
CHANNEL
5'
5'
CONTROL
5'
5'
STATION 1 200 pounds per acre of
2,4-D Acid on Attaclay
STATION 2 400 pounds per acre of
2,4-D Ester on Attaclay
FISHING
DOCKS
143 286 429
SCALE IN FEET

Figure 1

after the ice formed on Kent Lake, four samples were collected with an Ekman dredge at each of the three stations. On February 3-5, Mr. James Smith of the Huron-Clinton Metropolitan Authority treated the plots with 2,4-D pellets. Pellets were spread on the ice in a manner similar to that employed by Grigsby, Hamilton and Smith in 1955. The plot at Station 1 received 200 pounds per acre of the acid form of 2,4-D adsorbed on pellets of attaclay. The plot at Station 2 received 400 pounds per acre of the ester form of 2,4-D adsorbed on attaclay. Mr. Smith believes that the pellets melted the ice and fell to the lake bottom soon after application. On April 25, shortly after the ice disappeared from Kent Lake, a second series of bottom samples were collected at the three stations. Bottom samples were sieved and then preserved in 10% formalin. Benthos was separated from debris in the laboratory by floatation and hand picking.

Results: Most of the types of invertebrates that were present before treatment appeared in samples collected after treatment. Although there were no odonata and caddis flies at Station 2 after treatment, these two groups also failed to appear in post-treatment samples from the control plot. These insects may have emerged before the spring samples were collected. The wet weight of bottom animals collected was considerably lower after treatment than before treatment at all three stations; however, the decrease in weights appears to have been greater at the control station than at the stations treated with 2,4-D (Table 1). Although a decrease in weight of benthos occurred at all stations, the total number of animals increased at Station 2 and the number of mayflies increased after treatment at all three stations. From examination of the samples, it was clear that the decrease in weight was largely due to the disappearance of large, mature larvae of several species of midges. On the

Table 1

Wet Weight and Number of Bottom Invertebrates at 3 Stations before (December 19, 1957) and after (April 23, 1958) 2,4-D Treatments (average of four 1/4 ft.^{2} dredge samples)

Station and Treatment		Weight (grams per 1/4 ft.^{2})	Number per 1/4 ft.^{2}						
			Total	Midges	May-flies	Odonata	Caddis flies	Tubificids	Other
Control	Before	0.72	505	438	34	9.5	2.5	...	21
(no treatment)	After	0.082	106	92	9.5	...	...	4.7	...
1. 200 lbs. per acre	Before	0.39	364	306	12	5.2	2.0	0.5	39
2,4-D Acid	After	0.10	166	129	29	4.5	2.2	1.5	...
2. 400 lbs. per acre	Before	0.30	144	111	20	5.8	3.2	1.2	3
2,4-D Ester	After	0.19	358	312	40	...	...	5.0	1

other hand, the increase in number of animals at Station 2 reflected the recruitment of large numbers of small midge larvae into the population.

Discussion: All of the population changes in the invertebrate fauna noted above appear to be normal, seasonal fluctuations resulting from emergence, reproduction and predation. Since changes in the control plot were similar in magnitude to changes in the experimental areas, there are no data indicating that 2,4-D had a deleterious effect upon the bottom fauna. However, there was little difference in the amount of weed growth on the control and experimental plots during the summer following this treatment. Hence, there is little or no evidence to indicate that the lake bottom received the dosage of chemical that was applied to the ice, and failure to note changes in the benthos population is not conclusive evidence that 2,4-D pellets, in the concentration used, are harmless to fish-food organisms. Further tests should be made to determine whether or not the pellets retain their 2,4-D while passing through the ice and water to the lake bottom.

Literature cited

Grigsby, B. H., R. H. Hamilton, and J. Smith

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