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FISHERIES DIVISION

TECHNICAL REPORT

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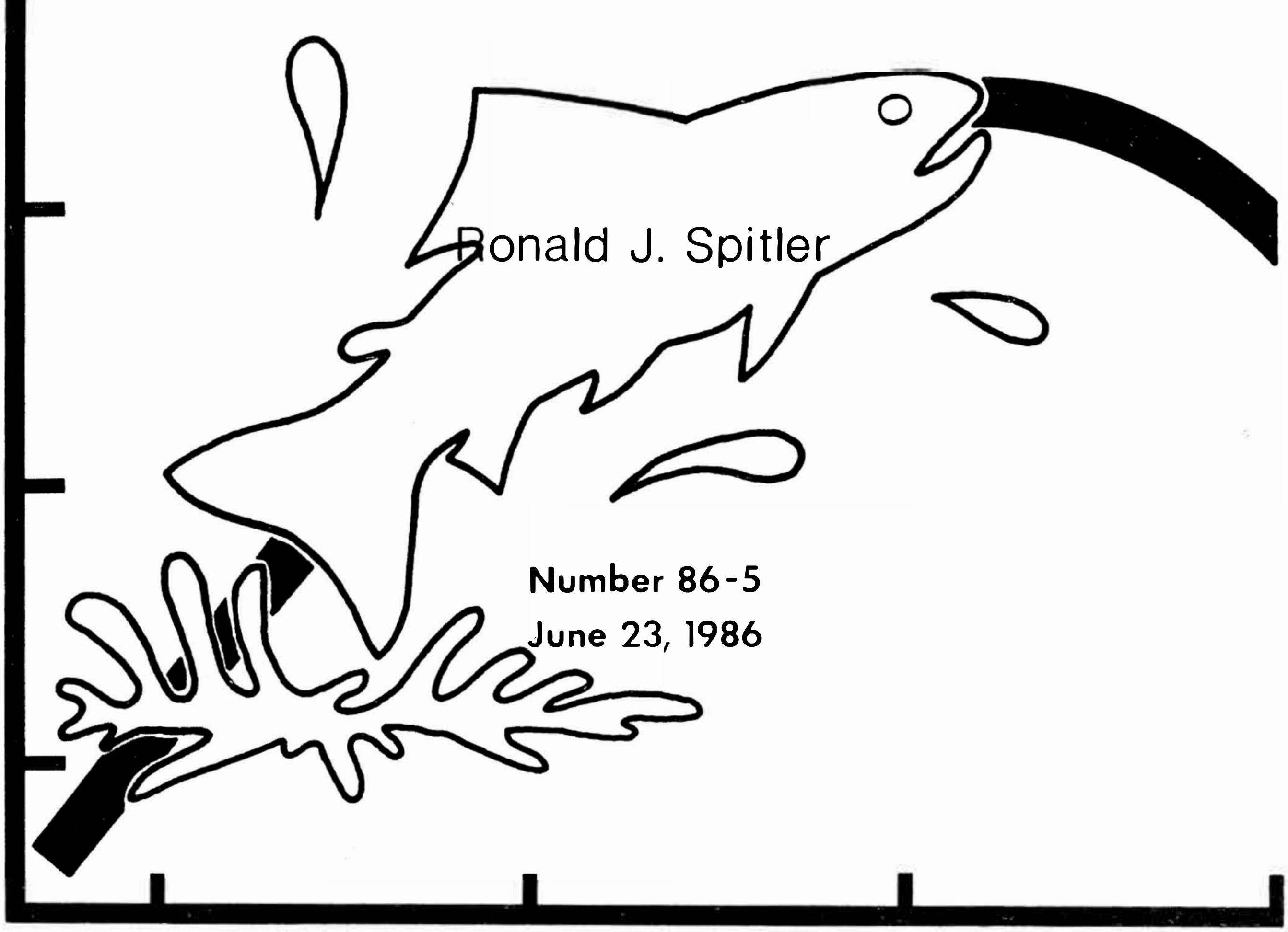

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EVALUATION OF ICE-COLD WATER ROTENONE TREATMENT OF TIPSICO LAKE

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ABSTRACT

Tipsico Lake, a 301-acre warmwater lake in Oakland County, Michigan, was chemically reclaimed with rotenone on December 11, 1980. Air temperature was 8°F overnight just prior to the treatment, changing the previously open-water lake to completely ice covered. Three boats plowed through the ice for 5 hours to apply 1,210 gallons of synergized rotenone at a concentration of 1 part per million. By the end of the day, the air temperature was 20°F and ice thickness was 1.5 inches. The lake remained ice covered and toxic until late March. Too few fish carcasses were found after the thaw to justify a dead fish cleanup. Test netting, followed by annual surveys, indicated a total kill. A population of stocked species existed until unauthorized plants of other species apparently occurred several years later.

This project was unique in that: (1) one-half the usual amount of toxicant was used, yet a total kill was achieved; (2) ice breaking was required, and accomplished by the boats to apply the chemical; (3) dead fish estimates were done through the ice by observation; (4) no fish cleanup was required; (5) the lake remained toxic over 3 months; (6) a population of desired species was established; and (7) it was accomplished at less than one-half the cost and effort of a normal fall treatment.

INTRODUCTION

Tipsico Lake is a 301-acre natural lake on the western edge of Oakland County, Michigan. It is in moranic till, surrounded by rolling hills, and has a small outlet containing a water level control structure. Permanent homes and summer cottages dot the shoreline, and a state-owned public launching ramp is located on the west shore.

Maximum depth of the lake is 27 feet with fish-sustaining dissolved oxygen levels to 20 feet in midsummer. Total alkalinity is in the low range for this area (68–95 mg/L), and the pH averages 8.5. Water clarity is good, with secchi disk readings to 10 feet, but extensive weed beds dominate the lake wherever it is less than 15 feet deep.

Numerous fishery surveys and angler complaints indicated a population of stunted panfish and small yellow bullheads. Five-inch yellow bullheads (Ictalurus natalis) constituted 91% of the catch (2,700 out of 2,976 fish handled) in a 1976 netting survey. Bluegills (Lepomis macrochirus) averaged only 5 inches in length and were over an inch below state average growth. Largemouth bass (Micropterus salmoides) exhibited similar growth and were not very abundant.

Approval to chemically reclaim Tipsico Lake was acquired in the fall of 1980. A typical project takes place in the fall, with the surface water temperature at 60–65°F. Two parts per million rotenone is applied, followed by extensive and costly dead fish cleanup. Detoxification occurs within a month or two, and a satisfactory, but less than total, kill of fish usually results.

Rotenone remains toxic longer in cold water. The objectives of this study were to determine if the extended toxicity would result in a complete kill of fish from one-half the usual amount of chemical, and if the fish would decay under the ice sufficiently to avoid fish pickup.

METHODS AND MATERIALS

Because of the anticipated cold weather, the plan was to have three boats apply the toxicant; two to discharge chemical into the propeller wash and one to spray the shallow shoreline and marsh areas. Sixteen-foot Polarcraft flat-bottom work boats, powered by 15- and 25-horsepower outboard motors, were used. A stake-rack truck hauled the 22 barrels of rotenone and a front-end loader was available to transfer the barrels from the truck to the boats. Wooden cradles held two barrels of chemical in each boat. The barrels were elevated and angled to provide gravity flow through PVC pipe to the propeller wash. Valves on the barrels controlled the rate of flow of the toxicant. Warm clothes, life jackets, rain gear, and gloves were used for safety precautions. The treatment was planned for December 11.

Inspection of the lake the day before the scheduled treatment revealed that the lake was free of ice and the water level had dropped 6 inches or more so that no water was leaving the lake. However, the air temperature fell to 8°F overnight and, upon arrival on site at 9 A.M. the next morning, the lake was completely ice covered. The project was nearly abandoned, but a boat with a outboard motor was launched at the ramp, and surprisingly, the boat easily, but noisily, plowed through the inch-thick ice.

Rotenone application began at 10 A.M. Since the spray rig was now useless, all three boats were used to meter toxicant into the propeller wash. The lake was divided into thirds for the three boats, and each operator treated approximately 100 acres.

The day was cloudy but bright; the ice and water very clear, and each boat's treatment pattern could be seen easily by noting the broken ice lanes. The chemical was obviously evenly applied. Even without wind or wave action, the rotenone quickly dispersed under the ice. The white cloudy "contrail" was plainly visible after each boat pass, only to disappear 15 minutes later. Shortly after application the surface refroze in the boat lanes.

The 1,210 gallons of chemical were applied in 5 hours. At 3 P.M. the air temperature was 20°F, and ice thickness had reached 1.5 inches in many areas—thick enough to support an adult.

Sick and dying fish were observed within hours after the treatment began. Because of the ice cover and quick refreezing where the boats had passed, no dead fish were exposed to the air. Since there was no wind or current activity to concentrate the carcasses, they stayed where they died, either just under the ice or on the lake bottom. This presented the unique opportunity to observe the distribution of a fish population in a lake.

The treatment was evaluated on December 18. There were several inches of clear ice and only scattered light snow cover, allowing good visibility through the ice. Evaluation teams divided the lake surface into even parts and each team randomly selected plots to count and identify fish. The crew leader selected plots by tossing an object (broom, stick, or whatever was handy) over his shoulder. He then scored a 6-foot diameter circle on the ice at each plot, using two large nails tied to each end of a 3-foot piece of twine. The plot was cleared of snow cover. Then, within each circle, the leader identified dead fish by species, both just under the ice and on the bottom if visible. The numbers were tabulated for each of the 93 sites that were checked.

Schneider (1973) reviewed studies of recovery rates of fish killed by toxicants. Most authors reported recovery rates of 50% or less. However, recoveries are usually restricted to fish that surface and float into shore. Since fish could be observed on the bottom over much of Tipsico Lake, it seems reasonable that 50% of the fish were counted. Previous netting survey data were used for average size and weights of fish. Using these data, and the methods of Schneider (1978), the standing crop was estimated to be 126 pounds of fish per acre. Sixtythree pounds were bluegill and other sunfish (Lepomis spp.); 18 pounds were largemouth bass and northern pike (Esox lucius); 20 pounds were bullheads; and 25 pounds were bowfin (Amia calva), pickerel (Esox americanus), minnow (Cyprinidae), and other species.

Two sets of cages with live fish were placed from top to bottom in the deepest basins, in early and late January. All fish died within 48 hours. The ice disappeared on April 1, 1981, and test cages set on April 7 contained live fish after 72 hours. A strong southerly wind drifted several hundred dead fish to the north shore just after ice out, but all the carcasses disappeared within days. Eight gill nets, set for 3 nights (24 net nights), April 10–13, 1981, took no fish.

FISH PLANTING AND RESULTS

Throughout the 1981 field work season 1,268 adult bluegills; 104 adult black crappies (Promoxis nigromaculatus); 15,888 fingerling largemouth bass; 18 adult largemouth bass; 19,729 fingerling channel catfish (Ictalurus punctatus); 1,900 fingerling tiger muskellunge (Esox masquinongy x Esox lucius); and 50 pounds of minnows were stocked. Tiger musky plants continued on a semiannual basis.

Tipsico Lake was surveyed several times during the 3 years following the treatment. Survey effort consisted of many hours of electrofishing and 46 net nights of trap and fyke netting. Over 6,600 fish were handled and countless others were seen. Only 1 green sunfish (Lepomis cyanellus), 1 mudminnow (Umbra limi), and 21 pumpkinseed sunfish (Lepomis gibbosus) were found in addition to the species planted. The sunfish may have been mixed in with the panfish originally planted, although the quality control was believed good. The surveys and angler reports indicate that both the fish population and fishing are much better than before the treatment. The boat access site is filled with angler boat trailers each weekend during the fishing season, and a privately owned boat livery reports that business is good.

DISCUSSION

The success of the cold-water rotenone treatment of Tipsico Lake lies not solely in the fact that it was highly effective, but in several other aspects as well. Following is a comparison of this project with what would have been a normal fall treatment of the same lake, with estimates of effort required for clean-up and evaluation.

	Fall treatment	Cold-water treatment
Chemical ($13.25/gal)	$32,065 (2,420 gal)	$16,032 (1,210 gal)
Treatment ($80/man-day)	1,280 (16 man-days)	1,280 (16 man-days)
Evaluation ($80/man-day)	480 (6 man-days)	480 (6 man-days)
Clean-up ($80/man-day)	960 (12 man-days, est.)	0 (man-days)
Totals	$34,785	$17,792

The total estimated costs yield cost-per-acre comparisons of $116 (fall treatment) versus $59 (cold water). The savings on the Tipsico Lake project were approximately $16,000 in chemical costs and 12 man-days (±$1,000) in effort. Considering the additional savings in labor, expense, and inconvenience to the water front residents, the values are much greater. With the dead fish under the ice all winter, and many decomposed before spring, there were no windrowed carcasses littering the shoreline to arouse complaints.

Future fish reclamation projects of this type can be planned by monitoring air and water temperatures, relating them to weather projections, and attempting to predict when ice cover will occur. It is the manager's choice as to when to treat. If the chemical is applied in open water, but very close to ice cover, there is a risk of some dead fish cleanup, but chemical effectiveness is not in doubt. If the lake has first ice, there is always the possibility that the ice will be too thick to plow with the boats, in which case the project must be cancelled until the next season. There is no doubt that effective projects such as Tipsico Lake can be accomplished in the same manner with proper planning and careful temperature monitoring.

Considering the savings in cost and effort, chemical efficacy, and improved public relations, this seems to be a method to be tried.

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