TR 73-17

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Fisheries Division

Technical Report: No. 73-17

DREDGING LONG LAKE, MICHIGAN TO IMPROVE BOATING AND FISHING

Ronald J. Spitler, District Fisheries Biologist

SUMMARY

Long Lake, Oakland County, Michigan, had reached a state of advanced eutrophication by 1960. The 146-acre weed covered lake averaged 2.4 feet deep and had a maximum depth of seven feet. Recreational use was poor and property values had declined. A cutterhead hydraulic dredge was used during the period 1961-1965 to deepen the lake. After 4,000 hours of dredging and a cost of $185,000, over one million yards of spoils were removed from the lake. Spoil was placed on 55 acres of both private and public land. The lake now is 156 acres in size, has an average depth of 6.6 feet, and a maximum depth of 13 feet. Residents enjoy all water oriented recreation including good fishing. Property values have increased substantially.

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In 1960 Long Lake, in Commerce Township of Oakland County, Michigan, was dying. The eutrophication process was filling the lake with weeds and muck. In an article written for the Wall Street Journal, Taylor summed up conditions on Long Lake in 1961.

> "This lake, which is surrounded by 400 homes, in earlier years had a hard, sandy bottom some 18 feet below the water at the deepest points. Nature and man have taken their toll, the water today is less than three feet deep in most of the lake. Except in a few narrow channels, boating is restricted, swimming is unpleasant, and fishing is poor. The lake is almost completely filled with peat, weeds, and marl, the latter a mixture of clay and calcium. Lake dwellers tell with wry humor of people buying homes on the lake in winter, when the lake is frozen, and of their horror in the spring when they discover the lake is too shallow for swimming and boating."

Department records show that winterkill of fish occurred frequently. The first recorded substantial winter mortality was in late March, 1936, after conditions had created 20 inches of ice topped with 12 inches of snow. In a 156 square feet area, a fishery worker counted over 600 largemouth bass, 1,000 bluegills, and unnumbered other fish, all dead from oxygen starvation. An intermittent inlet from an adjacent lake later allowed reentry of most fish species.

In late winter of 1945 another severe winterkill occurred. The same species were killed in large numbers. This mortality was so severe that an extensive netting survey by fisheries workers a month later took only ten fish. Bass and panfish were later stocked to replace this loss and no significant winterkill has occurred since then.

In 1945, a hydrographic survey of Long Lake was conducted by the D.N.R. This survey showed the lake to have an area of 146 acres and a maximum depth of seven feet which occurred in several basins. Average depth for the entire lake was 2.4 feet.

In 1960, the Long Lake General Council was formed, consolidating the various smaller organizations on the lake. By voluntary subscription, the council raised enough money to contract Waterways Control and Development Corporation (now the Mucksuckers, Inc. of Lansing, Michigan) to hydraulically dredge the entire lake. For a total project cost of $185,000 some 990,000 cubic yards of material were to be removed. On this pilot project considerable amounts of donated equipment and supplies were anticipated. A permit to dredge Long Lake was secured from the State of Michigan and dredging began in May, 1961. The contractor

estimated project completion time to be one year. A 47-ton cutterhead dredge with 740-horsepower pumps was used to move up to 7,000 gallons per minute of water and bottom materials through a 12-inch diameter pipe. A spoils area was selected away from the lake.

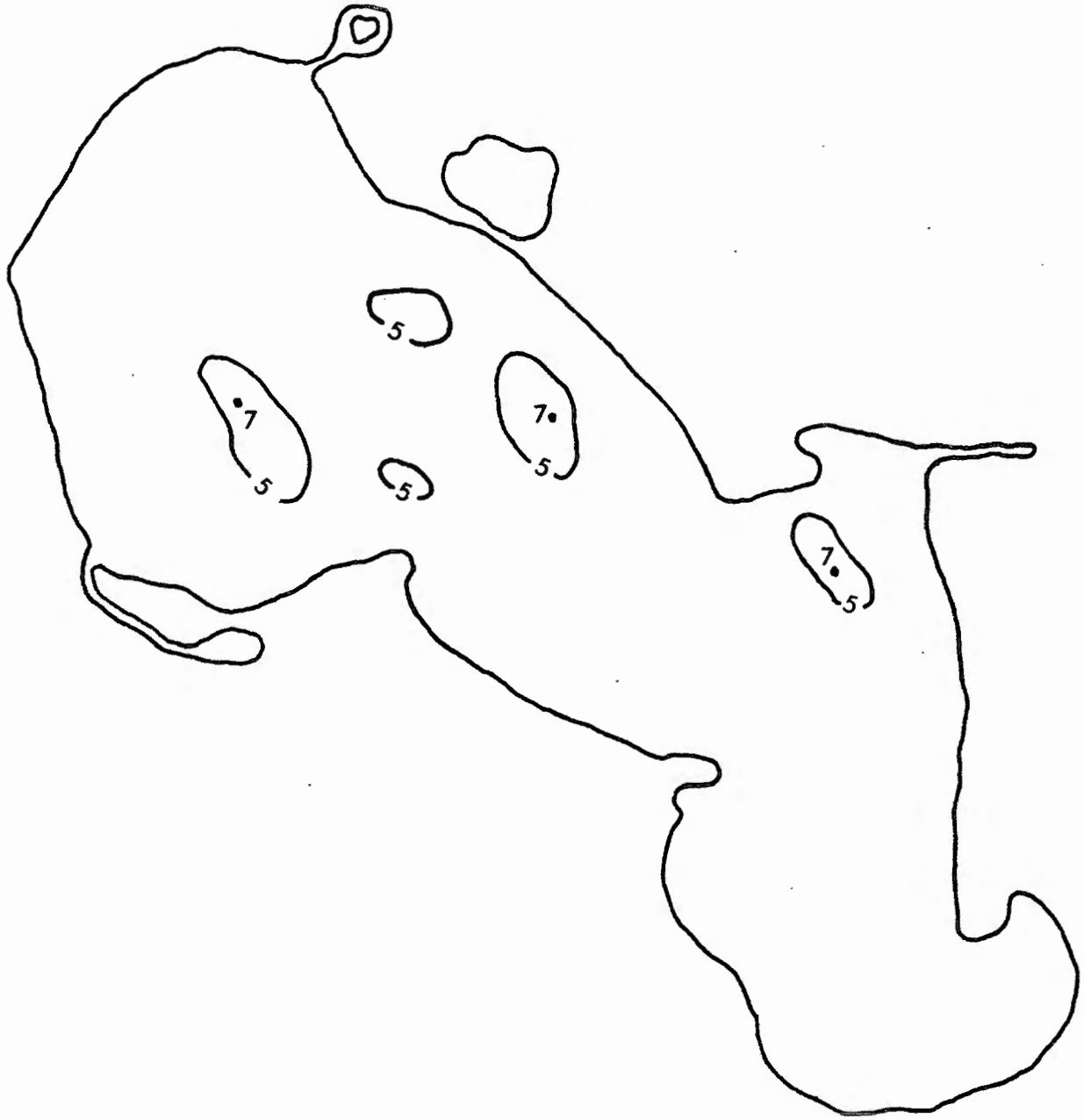
Once the dredging began it appeared that deepening the lake would not be too difficult; spoil disposal became a limiting factor. At first, 15 acres of private land was used. It was apparent that the slurry would not separate well, preventing removal of semidried materials to other areas. This plus an alleged conflict with the land owner forced a search for more spoils area. An agreement with the D.N.R. allowed some five acres of adjacent State land to be used. Retaining dikes failed at least six times resulting in many hours of water and slurry losses before discovery was made and repairs effected. Various complications with spoils areas, equipment breakdowns, supplies and money shortages prolonged the project. The contractor ceased activity in 1963 and 1964 due to those frustrations. Others were brought in to attempt completion of the work, but only 50,000 contract yards were removed during this period. Finally the original contractor was summoned back to the lake, the problems were ironed out, and work completed in 1965, after almost four years (and 4,000 hours operating time).

Two to six feet of soft muck covered 41 acres of State land, killing all vegetation. The spoils remained unsafe for walking for two years. Once the soil stabilized, the dikes were leveled and regrowth of vegetation began. In 1973, eight years after the project, many dead trees still stand in the spoils area. The former marsh land portion retains a semblance of wet areas, but is of little value to waterfowl now. The previously forested area has a limited variety of undergrowth and poplar, but has probably been retarded 50 years in growth from the mature oak-maple forest that it was previously.

A new hydrographic survey was made by D.N.R. in the winter of 1972. It showed the dredged Long Lake to be 156 acres, ten acres larger than before dredging. The maximum depth is now 13 feet, average depth 6.6 feet, at normal water level conditions. (Table 1)

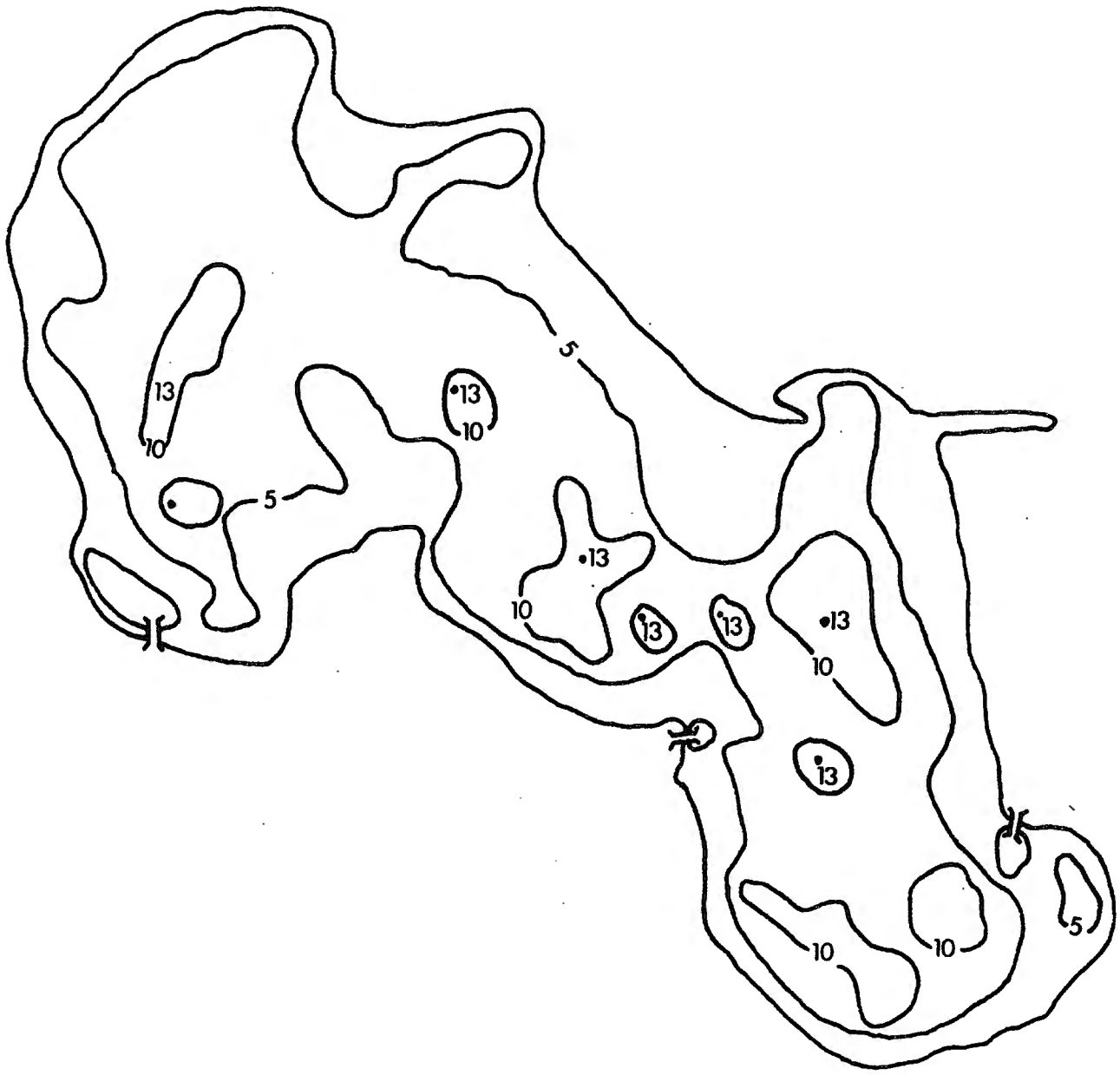
By comparing water volumes of the old and new surveys, I determined that 1,100,000 cubic yards of materials had been removed. As no bench marks from the first map were available, the exact water level at mapping time could not be determined. A six-inch difference in water depth would change the volume by (plus or minus) 150,000 cubic yards.

Since $185,000 was pledged for removal of 990,000 cubic yards of material, the additional 110,000 yards removed was an added benefit to property owners. Based on cost/yard the original price was $0.19/yd. The additional materials removed lowered the real cost to $0.17/yd. Data on 49 lake dredging projects in the upper midwest varied from $0.10/yard to $1.32/yard of material removed (Pierce, 1970). Pierce stated that his data was difficult to obtain, in most cases was unreliable, and included many partial, rather than total lake dredging projects.



LONG LAKE
Area 146 Acres
1945

0' 400' 800'



LONG LAKE
Area 156 Acres
1972

0' 400' 800'

TABLE 1

Long Lake Data Comparisons

PARAMETER	BEFORE (1945)	AFTER (1965)
0-5' depth	139.0 acres	43 acres
5-10' depth	7.0 acres	100 acres
Greater than 10'	0.0 acres	13 acres
Total acreage	146.0 acres	156 acres
Gain in area	-	10 acres
Maximum depth	7.0 feet	13 feet
Average depth	2.4 feet	6.6 feet
Volume	357.3 acre feet	1,040 acre feet
Volume gained	-	683 acre feet
% gained	-	192 %
Boatable area (5'+)	7.0 acres	120 acres
Boatable area gained	-	113 acres
% gained	-	1,600 %

By increasing the average depth from 2.4 to 6.6 feet, the area of boatable water was increased from practically none to 120 acres. (The criterion used was an arbitrary five feet or deeper - to allow outboard motor or sailboat keel clearance.) Nearly every property owner at the lake has a sandy beach and good swimming conditions. There are few aquatic weed problems. Winterkill of fish no longer occurs, and fishermen report very good largemouth bass fishing and fair to good panfish angling. Recent netting and electroshocking surveys showed 11 species of panfish and game fish, and a variety of minnows (Table 2). Benthos and plankton were not sampled.

Before dredging, property values had declined. After dredging, values increased significantly. Cost sharing in the project was $500 per lakefront property. After dredging, many lakefront owners undertook improvements in their homes. This is considered to be a reflection of their renewed esteem for the lake. (J. L. Daily Realty Co., pers. comm., 1973.)

Most people related to this project said that it was highly successful in restoring Long Lake to usefulness. That 56 acres of private and State land was covered with spoils is now accepted as a temporary alteration.

The success of the Long Lake project created the beginning of a lake restoration industry in Michigan. In the future, this experience will help foster better planned projects as to the disposal of spoils, and retention of certain shoreline characteristics such as marshes.

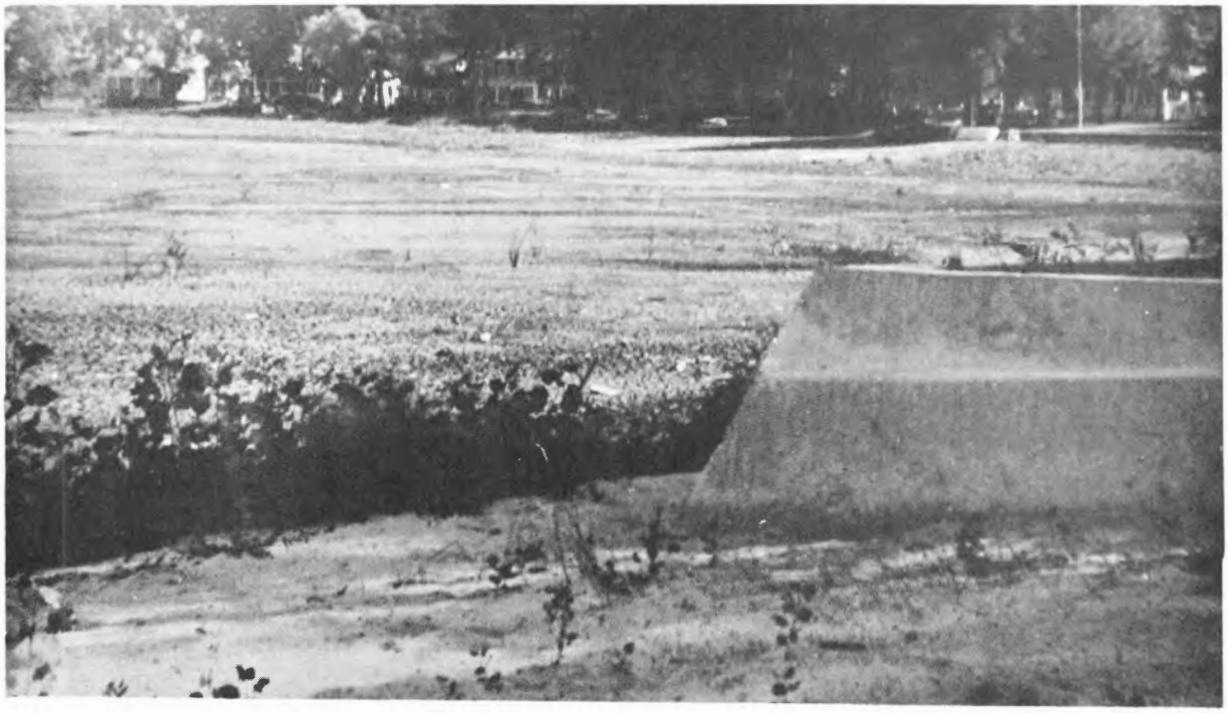
TABLE 2

LONG LAKE FISH SURVEY

RECORDS 1945-1969

Species	Apr. 17, 1945 2 Fyke and 7 Gill Nets		Aug. 29, 1966 Electrofishing 90 Minutes		Apr. 3-5, 1968 6 Fyke and 2 Gill Nets		Sept. 29, 1969 Electrofishing 90 Minutes	
	No.	Avg. Size (In.)	No.	Avg. Size (In.)	No.	Avg. Size (In.)	No.	Avg. Size (In.)
Bluegill sunfish			105	3.9	59	6.1	138	3.9
Pumpkinseed sunfish			101	4.3	12	6.3	38	3.9
Green sunfish			2	4.0	1	4.5	11	3.5
Black crappie			7	6.5	6	8.7	14	6.3
Rock bass							3	3.3
Largemouth bass			51	5.4	7	12.8	47	7.3
Northern pike					3	21.6		
Mud pike			4	7.0			7	5.0
Yellow perch	6	5.0	4	6.7	8	8.6	19	5.3
White sucker					6	11.1		
Yellow bullhead	2	8.1	12	6.0	3	9.1	7	7.4
Lake chubsucker			4	9.0	17	9.3	8	5.4
Golden shiner	2	6.5						
Other minnows sp.			(many)		(many)		(many)	

Scene 1: This area's summer water averaged 2' to 3' in depth, the muck, 1' deep at the shore. Without a beach or enough water to swim, the owners surrendered to the emergent shore line vegetation.



Scene 2: Long Lake was completely dry in 1929. On later occasions, shallowness, causing accelerated evaporation, permitted gardens to be grown along the shoreline. (Note flagpole in all pictures.)

Scene 3: Sand beaches lay below the shoreline muck. The dredge and the bulldozers working as a team removed the muck creating clean sand beaches and deep clear water as they progressed.

Scene 4: Deepening, cooled the lake and reduced the rate of evapotranspiration. Now the lake has sufficient water each spring to submerge this breakwall.

REFERENCES

Pierce, N. D., 1970 - "Inland Lake Dredging Evaluation," Wisc. Dept. Nat. Res. Tech. Bull. No. 46.

Taylor, F., 1961 - "Water Softener Man Switches to New Line: Saving 'Dying' Lakes," Wall St. Jour., June 21, p.1.