



Introduction

Hardwood Lake is a 172 acre lake located in Richland Township, T21N, 4E, Sec 6. The lake is located about 2 miles south of M55 in Ogemaw County, roughly 4 miles northeast of the village of Skidway Lake. There is a MDNR public access site located on the south end of the lake. The access site has a concrete ramp, dock, pit toilet, and parking for 15 cars and trailers. The lake has local watercraft control on high-speed boating and waterskiing and permits these activities only from 11 AM to 7:30 PM. There is also a Township campground located immediately to the east of the access site. The lake was mapped in 1943 by the Department of Conservation.

Shoreline and physical features

Numerous cabins and residences surround the lake. Hardwood Lake has a maximum depth of 35 feet, but over 75% of the lake is less than 15 feet. The shoreline drops off steeply along the northern shore, and more gradually everywhere else. The surrounding countryside has some farms, hills, forests, and swamps. The immediate shoreline is wooded and hilly. The outlet is located in the extreme west end and drains to Boughner Lake; to Long Lake, and via Silver Creek in to the Rifle River. There is one inlet on the northeast end of the lake. The water color of Hardwood Lake has always been recorded as being dark brown, probably resulting from the swamps it drains that are rich in nutrients and tannins. The bottom is a mixture of sand, pulpy peat, and detritus. Files indicate that weed control has been an issue at Hardwood Lake for many years.

Limnological Parameters

The Department of Environmental Quality surveyed Hardwood Lake in April and August of 2004 (table 1). Dissolved oxygen, temperature, specific conductance, and pH was recorded at depths ranging from the surface to the bottom. In April, the temperature was a uniform 11.5C. The dissolved oxygen ranged from 9.7 to 10.5 mg/l. The pH ranged from 7.9 at the bottom to 8.1 at the surface. Specific conductance was measured as 298 uS/cm at the bottom. In August the lake warmed and stratified. Temperatures ranged from 13.5C to 21C. A thermocline established around 21 feet. The pH in August ranged from 8.3 on the surface to 6.6 on the bottom. Specific conductance also varied more and ranged from 324 uS/cm to 419 uS/cm.

Table 1. Sampling Parameters from MDEQ's Limnological surveys, 2004

Sampling Date	April 20, 2004	August 17, 2004
Sampling depth feet	27	26
Secchi depth meters	9	6
Ammonia and organic N mg/l	2.1	5.9
Ammonia Water mg/l	.194	4.3
Nitrate and Nitrite mg/l	.209	< .01
Phosphorus mg/l	.075	.13
Chlorophyll ug/l	36	42
Hardness mg/l CaCO3`	151 at 15 feet	

The temperature and oxygen both declined below 21 feet, and the dissolved oxygen was less than 4 ppm below 21 feet, a condition insufficient to support fish. Critical dissolved oxygen levels (the level where zooplankton can't survive, or < 0.5) were found at 24 feet and below.

Habitat

Hardwood Lake has abundant aquatic vegetation, and weed control has been practiced by the lake association for some time. A recent vegetation survey in 1999 indicated that Eurasian watermilfoil was the dominant submerged plant species. Wild celery was also present. Very few other native species were present. In the shallows, yellow and white lily were common emergents, and cattails, bulrush, iris, watershield, and pickerelweed were all recorded. Since then, a sonar treatment was recommended and completed. Densities and species composition may have changed. Vegetation was not well established during the 2004 survey, and the water appeared very darkly stained making plant identification difficult.

Docks from the residences and drop-offs provide additional habitat for the fish.

Past Fisheries Management

An early fish survey in 1954 showed Hardwood Lake to have abundant yellow perch, bullheads, black crappie, and largemouth bass. Bluegill, pumpkinseed sunfish, and northern pike were rated as fair in abundance. The panfish were described as being on the small side. Northern pike, bass, and crappie were considered average. There was documentation of beaver problems in the lake's outlet.



Past files also indicate that the lake may have a history of winterkill. A 1960 survey showed numerous small panfish and predators, but no large ones. Growth was noted as good, possibly recovering from winterkill. In 1978, there was a boomshocking survey to investigate another report of winterkill (1976-77). Again, abundant panfish were found and growth looked good. Bass and crappie were scarce, and no pike were taken. At this time management recommended stocking largemouth bass and operating a pike marsh. Pike were stocked as indicated in the table below.

Stocking History

County	Water Site (Town Range Section)	Species Strain	Date	Number	Avg. Length (in.)	Operation	Fin Clips, Marks, Tags
Ogemaw	Hardwood Lake HARDWOOD LAKE (21N 04E 06)	Largemouth bass	6/27/1979	50	8.52	Transplant of Wild Fish	none
Ogemaw	Hardwood Lake HARDWOOD LAKE (21N 04E 06)	Northern pike	4/7/1981	115,000	0.56	State Plant	none
Ogemaw	Hardwood Lake HARDWOOD LAKE (21N 04E 06)	Northern pike	8/27/1981	1,761	2.96	Marsh & Rearing Pond Release	none
Ogemaw	Hardwood Lake HARDWOOD LAKE (21N 04E 06)	Northern pike	5/14/1985	15,000	3.4	State Plant	none
Ogemaw	Hardwood Lake HARDWOOD LAKE (21N 04E 06)	Northern pike	5/29/1986	11,500	3.64	State Plant	none
Ogemaw	Hardwood Lake HARDWOOD LAKE (21N 04E 06)	Northern pike	5/19/1988	2,896	3.72	State Plant	none
Ogemaw	Hardwood Lake HARDWOOD LAKE (21N 04E 06)	Northern pike	5/15/1990	11,500	3.6	State Plant	none
Ogemaw	Hardwood Lake HARDWOOD LAKE (21N 04E 06)	Northern pike	5/27/1999	1,000	1.72	Private Plant (under permit)	none

In 1980, a survey using 3 nets showed that the panfish population had exploded and represented 89% of all fish caught, 8% were bullheads, and only 3 % were predators. Panfish growth slowed. Management began to focus efforts on thinning the panfish population through manual removals. Manual removals were conducted in 1982, 1983, 1984, and in 1985. Timing was late for the first few years, and numbers removed were somewhat lower than desired.

- 1982—1300 lbs. (7.5 lbs./acre)
- 1983—3218 lbs. (19 lbs./acre)
- 1984 – 4571 lbs. (26.6 lbs./acre)
- 1985 – 2413 lbs. (14.0 lbs./acre)
- 1986 – 1339 lbs. (7.8 lbs. /acre)



The conclusions following these removals were that the lake was extremely rich and very productive, and that it may not be possible to reduce the panfish population. A survey in 1990 showed that the population of the lake remained largely unchanged. Growth of predators and panfish was improved, and was now above state average. Few northern pike were collected and again management suggested stocking additional pike.

No prescription was renewed when the stocking request expired. Records do indicate one private plant of pike in 1999. No additional work was done at Hardwood Lake in the 1990's.

Hardwood Lake was treated with Sonar in 2000 to control the large amount of milfoil in the lake. A follow-up treatment in 2001 was denied.

Several riparian residents called with concerns over the Hardwood Lake fishery. This prompted a general survey, which was conducted in 2001. This survey showed that the fish population was in excellent balance with bluegills being the most numerous species caught in the survey. Black crappies and largemouth bass populations also appeared to be very good. All panfish and predators were growing above State average. For more specifics, see the 2001 survey report.

Methods

In 2004 Hardwood Lake was surveyed as part of the statewide status and trends program. This program allows for similar lakes to be compared, and utilizes many types of gear to try to get a representative sample of many species of fish. Hardwood Lake was surveyed using a variety of gear types set forth in the new protocol. Efforts included seining, boomshocking, trap netting, fyke netting, and limnology. The netting and boomshocking was conducted from 6/1/04 and 6/29/04 respectively. Water temperatures during the netting averaged around 63F. Each gear type is subject to certain biases and these must be considered when reviewing the survey catch. Trap and fyke nets were used to sample fish moving through the littoral zone. Experimental gill nets are designed to net fish in the deeper areas. Seine hauls collect fish in the shallows and nursery areas, primarily targeting young fish and some minnow species. Night electrofishing is designed to catch fish moving into the shallows at night, and typically samples both small and large fish. Collectively, the catch from all these gears allows for reasonable interpretation of the fish community.

The objective of this survey was to update Fisheries Division files on the present status of the Fishery. Hardwood Lake was selected as an example of a medium size, deep lake to test sampling procedures and fish dynamics for statewide comparisons as part of the Resource Inventory Program—Status and Trends monitoring.

Survey Results

A total of 998 fish represented by 12 species and a hybrid were captured during the survey.

Bluegills were the most numerous fish other than minnow species caught in the survey. 141 bluegills were captured during the survey, which was 14.1 % of the total survey catch by number. Sixty-seven percent of the bluegill caught were of desirable size (>=6 inches). Bluegills ranged from 1 to 8 inches and averaged 6.3 inches. One way to analyze the size structure of the bluegill population is by applying the Schneider index (Schneider, 1990). This uses trap net data, and measures several parameters including average size and size structure.

Table 2. Schneider Index for classifying bluegill lakes using trap net gear.

Sample date	6/1/04	
Sample size	18	
Water temp.	63F	
Ave. length (in.)	7.1"	6
% >= 6 inches	94	6
% >= 7 inches	65	6
% >= 8 inches	5.9	5
Index score	5.75	
Rank	Good-excellent	

The Schneider index came out to 5.75, which is rated as good to excellent. This is on the scale from 1 to 7 with 1 being the worst.



This is a good score for lakes in this area. Bluegill growth is presently +0.4 above state average. Six year classes of bluegill were aged for this analysis. The growth rates have remained similar to what they were in the survey of 2001.

Only 11 pumpkinseeds and 3 bluegill/pumpkinseed sunfish hybrids were captured during the survey. They ranged from 2 to 7 inches, and averaged 5.9 inches. Sixty-four % of the pumpkinseed sunfish were of desirable size (≥ 6 inches).

Black Crappie were the second most abundant gamefish species caught in the survey. The 59 caught represented 5.9% of the survey by number. They ranged from 5 to 11 inches. They averaged 7.3 inches. Forty-four percent of the black crappies were considered of desirable size (≥ 7 inches). Black crappie are growing -0.8 inches below state average. Five year classes of crappie were collected in the survey catch. Growth declined slightly from 2001.

Thirty-four largemouth bass were captured which represents 3.4% of the survey catch by number (27% by weight). They ranged from 3 to 19 inches, and averaged 15.1 inches. Eighty-two percent of the bass were legal size (≥ 14). Seven year classes of largemouth bass were represented in the survey catch, and they are growing slightly above state average (+0.2 inches), down slightly from 2001..

Twenty-three northern pike were collected. They ranged from 16-30 inches and averaged 23.3 inches in length. Forty-three percent the pike collected were legal size (≥ 24 inches). Six year classes of northern pike were represented in the survey catch. Northern pike are experiencing growth below state average, -0.8 inches. This is down significantly from 2001.

Yellow bullheads and brown bullheads appear to be fairly numerous. Together, the 104 collected represent 10 % of the survey catch by number. The sizes of the bullhead are large. They ranged from 6 to 13 inches, and averaged 10 inches in length. They do not appear stunted, overpopulated, or slow growing.

Minnnows sampled during the survey include bluntnose minnows, fathead minnows, northern redbelly dace and golden shiners.

Two grass pickerel were also captured during the survey.

Management

Fisheries Management of Hardwood Lake should continue to concentrate on warmwater species with emphasis on bluegill, black crappie, largemouth bass, and northern pike. Future assessments should be scheduled to monitor these fisheries.

References

Schneider, J.C. 1990. Classifying bluegill populations from lake survey data. Michigan Department of Natural Resources, Fisheries Technical Report No. 90-10. Ann Arbor.

