Cedar Lake

Alcona and Iosco counties
Lake Huron watershed, last surveyed 2011

Tim A. Cwalinski, Senior Fisheries Biologist

Environment

Cedar Lake is 1,075 acres in size and located in both Alcona and Iosco counties in the northern Lower Peninsula of Michigan (Figure 1). It is north of the town of Oscoda and south of Harrisville. The lake lies only a half-mile west of Lake Huron and is 5.9 miles long and averages 0.2 miles wide. The lake is split by a causeway on the southern half. Its maximum depth is approximately 12 feet south of the causeway, and 10 feet north of causeway. Most of the lake is less than five feet deep. The lake has a very small drainage area, which is primarily a lowland swamp west of the lake, and a small creek (Sherman) that drains it. The outlet of Cedar Lake flows through a fixed crest control structure and out a short distance to Lake Huron. Fish passage is not attained through this structure. The control structure was first built in 1954 which replaced a log dam structure of unknown age (Rex Vaughn, Cedar Lake Improvement Board, personal communication). The structure was built as a result of a Circuit Court Order establishing a legal lake level that same year. The structure was revised in 1979, repaired in 2012, and is currently scheduled for renovation in fall 2020. The fixed crest structure and overflow design establishes a legal lake level of 608.2 feet at high water. The structure is maintained under joint authority of the Alcona County Road Commission/drain commissioner and the Iosco County drain commissioner. The acting delegated authority is Alcona County.

The shoreline of Cedar Lake is heavily developed and mostly private. Much of the west shore development has prevented connection to wetlands. Shoreline armoring is significant in Cedar Lake and docks are prevalent. The shallow depth of this natural lake does not lend itself to thermal stratification. The bottom substrate is comprised of primarily sand, marl, and muck. Aquatic vegetation is abundant but tends to grow in pockets. A private applicator, on behalf the Cedar Lake Improvement Board, has applied for permits for 15 chemical treatments of nuisance aquatic vegetation in Cedar Lake since 2005 (Ryan Crouch, Department of Environment, Great Lakes, and Energy, personal communication). Treatments have focused on non-native milfoil and curly leaf pondweed predominantly, but some native vegetation has been targeted. Recent treatments have typically been completed in early June and are often 50-70 acres in size. Later summer treatments have also occurred.

A Department of Natural Resources (DNR) public boat launch exists along the east shore (Figure 2) and offers a paved boat launch and parking for 26 trailers. The standard set of Michigan's fishing regulations apply for Cedar Lake.

History

Historical stocking records for Cedar Lake are lacking and only begin after 1980 (Table 1). Tiger Muskellunge were stocked from 1980 through 1991 to promote increased predator numbers and reduce stunted panfish. This program produced limited results and was followed by a spring fingerling Walleye stocking program that continues today (Table 1). Redear Sunfish and hybrid sunfish were stocked by the Cedar Lake Association from 2010 through 2016.

Fish community surveys of Cedar Lake were first performed by the Department of Conservation (DOC) in 1956 and 1961. Effort included shoreline seining and gill netting. A total of 19 species were collected between the two survey efforts. Detailed catch data is missing for these surveys, but notes suggest collections of game fish such as Bluegill, Pumpkinseed, Yellow Perch, Rock Bass, Black Crappie, Smallmouth Bass, Largemouth Bass, Northern Pike, and Walleye. Also collected were Common, Golden, Mimic, and Sand shiners, Banded Killifish, Bluntnose Minnow, Johnny and Iowa darters, Tadpole Madtom, Central Mudminnow, Common Carp, and Brown Bullhead. Evaluation of the Cedar Lake water column showed no thermal stratification and dissolved oxygen suitable to fish throughout the water column.

A more extensive fish community survey was made by DNR in summer of 1970 with the use of fyke nets, trap nets, and alternate current electrofishing. The survey showed a diverse fish population both for panfish and predators while non-game rough fish were low in numbers. Five species of panfish were collected in good numbers (Table 2). Yellow Perch were the most abundant, but most were less than 8 inches and exhibited slow growth rates. Bluegill and Pumpkinseed were common with acceptable numbers of fish 8 inches or larger. Growth rates of these two species were average compared to statewide growth rates for both species. A normal distribution of age groups of Bluegill and Pumpkinseed was found (Table 3). Black Crappie ranged in length from 7-12 inches and demonstrated average growth rates and seven age-classes. Rock Bass were less common in Cedar Lake compared to other panfish.

The predator fish community was also diverse with both Smallmouth and Largemouth bass, Northern Pike, and Walleye. Largemouth Bass were the most abundant predator with fish up to 20 inches collected (Table 2). Ten age-classes of this species were found, and growth was average. Smallmouth Bass were also common and could attain large sizes (Table 2). This species was represented by seven age-classes and growth was slightly above the statewide average. Northern Pike and Walleye were less prolific as game fish. Northern Pike growth was average and only four year-classes were collected (Table 3). No young Walleye were collected in the 1970 survey, but older fish were captured. Growth of the few Walleye captured was categorized as excellent.

Non-game rough fish such as White Sucker, Common Carp, and bullheads comprised a relatively low 4% of the total catch by number compared to other regional waterbodies.

A follow-up fish community survey was completed by DNR in late-August 1982 at Cedar Lake in response to angler complaints regarding poor fishing. The survey would also allow evaluation of recent Tiger Muskellunge stocking efforts (Table 1). Sampling effort consisted of small- and large-mesh fyke nets, and experimental gill nets for a total of 54 net nights. A total of 1,802 fish were collected in the netting effort weighing an estimated 475 pounds (Table 4).

Panfish catches from the 1982 survey comprised 76% of the total catch number and 75% by weight. Panfish diversity remained high. Growth rates of panfish were average for all species, except for Black Crappie which showed excellent growth. Most panfish were less than 8 inches in length (Table 5) with the exception of Black Crappie which provided some larger specimens. All panfish were generally short-lived with no specimens older than age 6 collected (Table 3).

Predator diversity remained high based on the 1982 survey catch with Smallmouth and Largemouth bass, and Northern Pike collected (Table 4). In addition, five juvenile Tiger Muskellunge were collected from recent stocking efforts. In contrast to the 1970 survey, Smallmouth Bass were significantly more abundant than Largemouth Bass with multiple sizes collected (Table 5). Despite this, few age-classes of Smallmouth Bass were found (Table 3). Northern Pike remained relatively low in abundance but could attain lengths up to 30 inches. Few age-classes of pike were found (Table 3). No Walleye were collected in the 1982 survey.

It appeared the theme of the 1982 survey was elevated catches of panfish and slightly higher catches of non-game rough fish, along with reduced predator densities. In addition, nearly all species of game fish exhibited a limited number of age-classes. A recommendation from the survey was to increase predator densities. This management suggestion was followed, and Tiger Muskellunge would continue to be stocked through the 1980s until the program was discontinued statewide in the early 1990s. In addition, managers began to prescribe spring fingerling Walleye stocking efforts at the end of the 1980s (Table 1). Stocking efforts were made to increase predator abundance and reduce perceived stunted panfish populations in Cedar Lake.

Another fish community survey was made at Cedar Lake by the DNR in October 1990. The purpose was to evaluate recent stocking efforts of predators while evaluating responses by the rest of the fish community. Weather conditions were noted as poor for the survey and were thought to have highly influenced catch rates. Total sampling effort was 61 net nights with gear including small and large-mesh fyke nets, mini fyke nets, and experimental gill nets.
Panfish again dominated the 1990 survey catch (Table 6), including the species Bluegill, Rock Bass, Pumpkinseed, and Yellow Perch. As in past surveys, most panfish were small and their populations were considered stunted. Black Crappie were present but in low abundance, though some large specimens were collected. Growth rates of most panfish were near or below the statewide average. No panfish older than age-7 were collected with the exception of Black Crappie.

Predators that were captured included both Smallmouth and Largemouth bass, Northern Pike, Tiger Muskellunge, and Walleye. With the exception of Walleye, predators were collected in low numbers compared to previous surveys. Five age-classes of Walleye were collected, despite Walleye being stocked only in 1989 (Table 1). The yearling catch was well represented and nearly legal size (15 inches) after just two growing seasons. Adult Walleye were collected up to 25 inches and growth was considered excellent. Four small Tiger Muskellunge were collected from the 1990 stocking event (Table 1). No yearling or older Tiger Muskellunge were collected despite a decade of stocking efforts.

The rough fish community was comprised of bullheads, White Sucker, and Common Carp and made up 8% of the total catch by number and 48% by weight. Species diversity of rough fish remained similar to previous fish surveys.

Recommendations from the 1990 survey were to continue Walleye stocking in order to build a reliable fishery and to reduce panfish densities (while increasing panfish growth) through increased predation. The Tiger Muskellunge stocking program was discontinued at Cedar Lake due to questionable results.

A private consultant was hired by the Cedar Lake Association in the early 1990s to investigate water quality, fisheries, and bottom sediments of Cedar Lake. The fisheries examined were primarily a review

of the 1990 DNR survey data (Affiliated Researchers 1990). Summaries from the morphological and chemical surveys of the lake suggested: 1) Water quality of Cedar Lake was good, though the lake does experience naturally high summer water temperatures which potentially limits the growth or survival of some species, while promoting aquatic vegetation.; 2) Nutrient levels are not high in Cedar Lake; 3) Total suspended solids were slightly higher in Cedar Lake, but this may be a result of relatively high recreational use on such a shallow waterbody; and 4) Water quality parameters such as dissolved oxygen, conductivity, pH, and water clarity were within acceptable levels.

Walleye stocking efforts continued periodically through the 1990s at Cedar Lake and would be the primary focal point for future surveys. A stocking rate of 30 spring fingerlings per acre was prescribed by DNR managers in 1989 and 1994 (Table 1). The first of many juvenile Walleye assessments was completed by DNR with fall shoreline electrofishing gear in late-September 1994. Two hours of electrofishing were completed. A high catch rate of 22 age-0 Walleye per hour were caught in the 1994 fall effort (Table 7). This indicated a good year class of Walleye in 1994 and likely a result of the stocking effort. A similar sampling effort was completed the fall of 1998 which found similar results (Table 7).

Fish community surveys had been completed in Cedar Lake in 1970, 1982, and 1990. A fourth survey was conducted by the DNR in late-May 1999 with the emphasis on evaluating Walleye stocking efforts. Effort consisted of small and large-mesh fyke nets, and experimental gill nets. Total effort included 24 net nights. Relatively low numbers of fish (n=414) were collected in the survey (Table 8).

Species composition of the 1999 survey was similar to past surveys. Panfish numbers were low and dominated by Bluegill and Rock Bass. As in past survey, most panfish were less than 8 inches in length. Predator diversity was again good, but Northern Pike, Smallmouth and Largemouth bass catches were low (Table 8). Walleye were collected in much higher numbers compared to past surveys and made up 9% of the total catch number. Walleye ranged in length from 7-22 inches and were represented by the stocked years of 1994, 1996, and 1998. No Walleye from non-stocked years were collected, indicating a reliance on stocking. Walleye growth rates were good. One Tiger muskellunge from previous stocking efforts was collected.

Current Status

Walleye stocking continued at Cedar Lake into the next century (Table 1) and stocking rates of spring fingerlings were increased significantly. Fall juvenile assessments were completed in the stocking years 2001, 2003, and 2008. Sampling effort was two-hours of night electrofishing of the shoreline for one night each year. High catch rates of age-0 Walleye were collected in each sampling event (Table 7), indicating good survival of stocked fish. Large numbers of adult Walleye were also collected in the 2003 assessment. A sub-sample (n=30) of age 0 Walleye were sacrificed from the 2003 survey event and analyzed for the antibiotic oxytetracycline (OTC) mark. Fingerlings from the 2003 stocking event were internally "marked" with this antibiotic prior to stocking. Eighty percent of the sample tested positive for OTC, again indicating high reliance of the population on stocking.

The Cedar Lake Improvement Board employed private consultants in 2008 to evaluate and document the use of the small lake tributary Sherman Creek and its associated wetland complex by spawning Northern Pike. Adults were observed in the creek and wetland during the spring spawning run, and pike fry emergence and survival was documented (Aquest Corporation 2009). Consultants found that the creek and wetland complex continued to serve as an important spawning refuge for Cedar Lake Northern

Pike, and that the natural production from that location continues to provide an abundant and sustainable source of pike fry. They also suggested that fry emigration to Cedar Lake was premature due to wetland water loss. Thus, the full potential of fry development to fingerling stage was hindered due to rapidly lowering wetland levels through the spring. Recommendations from the study included protection of the wetland complex and Sherman Creek drainage (Aquest Corporation 2009).

The fifth and most recent fish community survey was completed by DNR at Cedar Lake in early-June 2011. Sampling effort was spread out across the entire lake and directed at general fish community collections. Sampling was done under the DNR Fisheries Division Status and Trends sampling protocol where effort is a product of lake size. In addition, effort consisted of a variety of gear types and sizes to gather a more complete view of the fish community. Total survey effort consisted of 18 fyke-net nights (small and large mesh), 4 trap net nights, 7 experimental gill-net lifts, 6 shoreline seine hauls, and 30 minutes of nighttime electrofishing.

A total of 1,540 fish weighing 594 pounds were collected (Table 9). Panfish made up 63% of the catch number and 28% by weight. Predator game fish were 10% by number and 55% by weight. Non-game rough fish were 4% by number and 16% by weight. The fish community was similar in terms of species collected compared to past years with the exception that neither Black Crappie nor Tiger Muskellunge were collected. The balance of prey/predators/rough fish was considered satisfactory and healthy.

Predominant panfish captured were Bluegill, Yellow Perch, and Rock Bass, while Pumpkinseed were less common. As in previous surveys, most panfish were less than 8 inches in length (Table 10). Growth rates for these species were generally slow compared to the statewide averages for each species (Table 3). Bluegill and Pumpkinseed were represented by a relatively low number of year classes. This was generally true for Yellow Perch, although a few older perch were collected.

Predator game fish were better represented in the 2011 survey compared to past surveys. Walleye and Northern Pike were common, while Smallmouth and Largemouth bass were less common. Smallmouth Bass were still the dominant black bass species in the lake and some large specimens were collected (Table 10). Growth rates of this species were average, and nine year-classes were collected. Though less abundant, Largemouth Bass exhibited seven year-classes (Table 3). Most Northern Pike were in the 21-22-inch size range while 24% of the catch were legal-size (24 inches or larger). This was an acceptable percentage. Growth of Northern Pike in Cedar Lake from the 2011 survey was slightly below the statewide average (Table 3). Based on growth data, it takes a pike five years to reach legal size. The Walleye population demonstrated the greatest increase for predators from the 2011 survey. This could be attributed to consistent stocking efforts. Walleye ranged in length from 7-22 inches with very acceptable numbers of legal-size (15 inches or larger) fish. A healthy eight year-classes of Walleye were captured with good representation from most cohorts (Table 3). This was particularly true from stocked years in 2005, 2006, and 2008. Growth rates of Cedar Lake Walleye were average compared to statewide growth rates. Most Walleye recruit to legal harvest size between ages 3 and 4.

Morphological measurements were also taken at Cedar Lake on August 16, 2011 as part of the Status and Trends sampling protocol. Water clarity was 6 feet based on the secchi-disk reading. Total alkalinity was normal at 102ppm. Chlorophyll-a measurements indicated low levels in the water column. Temperature and dissolved oxygen profiles in 9 feet of depth found no thermal stratification while dissolved oxygen was suitable to fish throughout the water column (Table 11). The pH of the water was

relatively high compared to most northern Michigan lakes, ranging from 8.0 at the surface to a surprisingly high 9.5 near the lake bottom.

Two different types of discretionary (non-community) surveys were conducted in Cedar Lake in 2018. The first was to evaluate recent private stocking efforts of Redear Sunfish, the second was to investigate summer reports of dying bass. Redear Sunfish had been stocked by the Cedar Lake Association under a permit from DNR on six occasions since 2010 (Table 1). The purpose of the stocking was to improve the panfish community while finding an "ecologically aggressive way to treat the invasion of zebra mussels" through predation (Northpointe Fisheries Management LLC 2018). Consultants surveyed the lake with fyke nets for 18 net nights in September. No Redear Sunfish were collected in the survey effort and recommendations were made to either terminate sunfish stocking efforts, or to increase stocking rates. Since this effort, this species has not been stocked by the Cedar Lake Association. Other species captured in the effort were common to the lake and caught in previous surveys (Northpointe Fisheries Management LLC 2018).

Angler reports of sick and dying "bass" were also common during the summer of 2018 and reported to the DNR on multiple occasions. These reports came on the heels of very high summer water temperatures and previous chemical applications to treat aquatic vegetation. The DNR electrofished the lake for one-hour on August 22 to look for dying or dead bass. Unfortunately, most specimens were too badly decomposed for analysis, or had previous been picked at by predators or buried by lake residents. Despite this, two recently dead Largemouth Bass were collected along with 6 apparently healthy specimens. Pathological examinations of these eight specimens by Michigan State University found all the fish were carriers of a natural bass virus known as Largemouth Bass virus (LMBV). This included the healthy and live collected specimens. At the time, this was the first known occurrence of this virus in northern Michigan (the virus is more common in the southern states and southern Michigan). Since this event, the virus has been found in other regional lakes of the northeastern Lower Peninsula.

Analysis and Discussion

The Cedar Lake fish community and limnology can be characterized as having the following: 1) A diverse but slow growing panfish community consisting primarily of Bluegill, Rock Bass, Yellow Perch and Pumpkinseed. Panfish are dominated by smaller size groups with few individuals growing to desirable sizes. Many of the panfish do not attain older ages, which may be a result of low lake productivity. Efforts to reduce abundant and slow growing panfish through predator stocking have done little to accomplish this objective; 2) A predator population consisting of Smallmouth and Largemouth Bass, Northern Pike, and Walleye. Walleye and Northern Pike are relatively common and can reach large sizes and produce a fishery. Northern Pike are sustained through natural reproduction, both in the wetland complex adjacent to the lake and from in-lake spawning areas. The Walleye population is thought to be sustained predominantly from periodic spring fingerling stocking efforts. Black bass, including Smallmouth and Largemouth, are both found in Cedar Lake but in relatively lower abundance. This is likely a result of the lake not offering optimal habitat for either species. These species might be lower in abundance in recent years due to a documented virus affecting the fish in Cedar Lake; 3) a non-game fish community of sucker species, bullhead species, and Common Carp that are at acceptable and normal levels when compared to other regional waterbodies; 4) a lake chemistry profile which is typical for warm water species, and indicates the lake does not thermally stratify in the summer; 5) aquatic vegetation that at times is prolific but vital to the base of the food chain for Cedar Lake.

The fish community of Cedar Lake is typical for a northern Michigan waterbody, particularly when compared to inland lakes in the region. Most of the species present are found throughout Michigan, and non-game rough fish are not prolific. There are certain morphological attributes for this lake that limit what species may or may not proliferate and create a fishery. These natural limitations are water depth and high summer temperatures. Another limitation is high shoreline development and isolation from historically connected adjacent wetlands.

Spot treatments of aquatic vegetation at Cedar Lake have been ongoing by private contractors for nearly 15 years. Coupling vegetative chemical treatments with shallow warm water can have hidden impacts on fish communities. This can be in the form of mortality of small fish in nursery areas or stress on older fish as may have been the case in 2018.

Management Direction

1. The standard State of Michigan fishing regulations (bag limits and size limits) for game fish are appropriate for Cedar Lake.

2. Walleye stocking efforts with spring fingerlings have been successful at creating a population and fishery in Cedar Lake. This is verified through recent surveys and angler reports. Spring fingerling Walleye should continue to be stocked at Cedar Lake by DNR every second or third year at rates of 50/acre.

3. Efforts should be made by the State of Michigan EGLE to survey the current aquatic vegetation community of the lake to gather a comprehensive list and distribution of plants in the lake, both for native and invasive species. Some of the treatment of non-native milfoil may be warranted. However, native vegetation, both submergent and emergent should be protected as they form the base of the food chain that is vital in a naturally sterile and shallow waterbody where marl and sand dominate the substrate. Best management practices need to be applied to chemical treatments to reduce stress on all sizes of fish. No applications should be made in the lake when temperatures approach 75F, and spring applications near spawning and nursery zones should be scrutinized. Some lake residents have expressed a desire to improve pike spawning in the Sherman Creek wetland complex. This is a noble idea however it is important to understand that pike can also utilize in-lake vegetation for spawning. Continued elimination of in-lake vegetation (particularly native species) may hinder pike populations as well.

4. Anglers should share information regarding their catches with fisheries managers as it helps us better understand Cedar Lake. This is particularly true for the Walleye fishery. Currently, very few anglers who fish this lake do this, which makes it more difficult to make informed management decisions.

References

Affiliated Researchers. 1993. Initial investigations of water quality, fisheries, and lake bottom sediments of Cedar Lake, Iosco and Alcona Counties, Michigan. Affiliated Researchers.

Aquest Corporation and Superior Environmental & Aquatic Services LLC. 2009. 2008 Evaluation of the spawning migration of the Northern Pike of Cedar Lake. Flint, MI, Ann Arbor, MI.

Northpoint Fisheries Management LLC. 2018. Cedar Lake Redear Sunfish stocking evaluation, September 25-28, 2018. Northpoint Fisheries Management LLC, Grayling, MI.

Figure 1. Location of Cedar Lake in Alcona and Iosco counties.

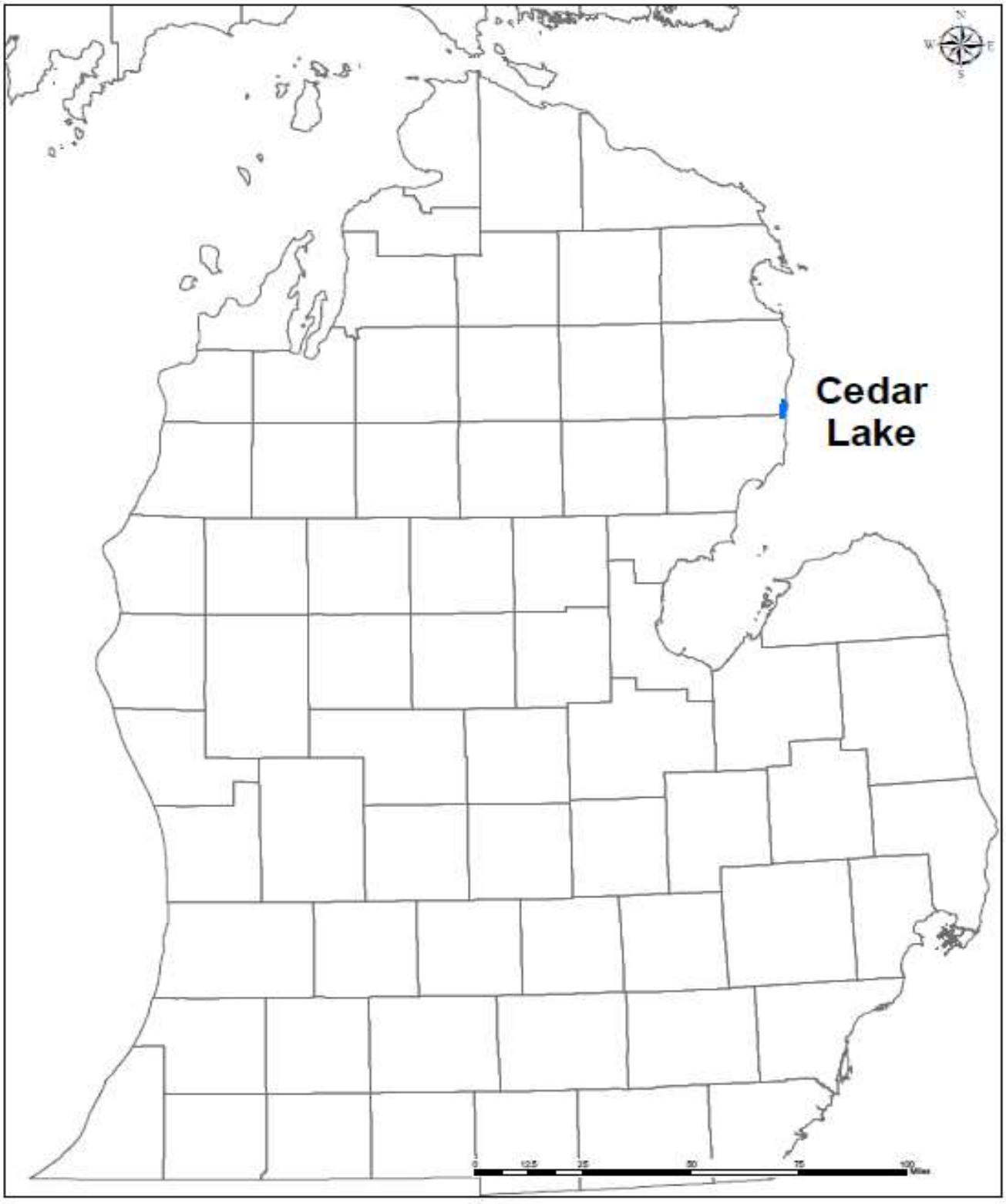

Figure 2. General surrounding area of Cedar Lake and lake bathymetry in feet.

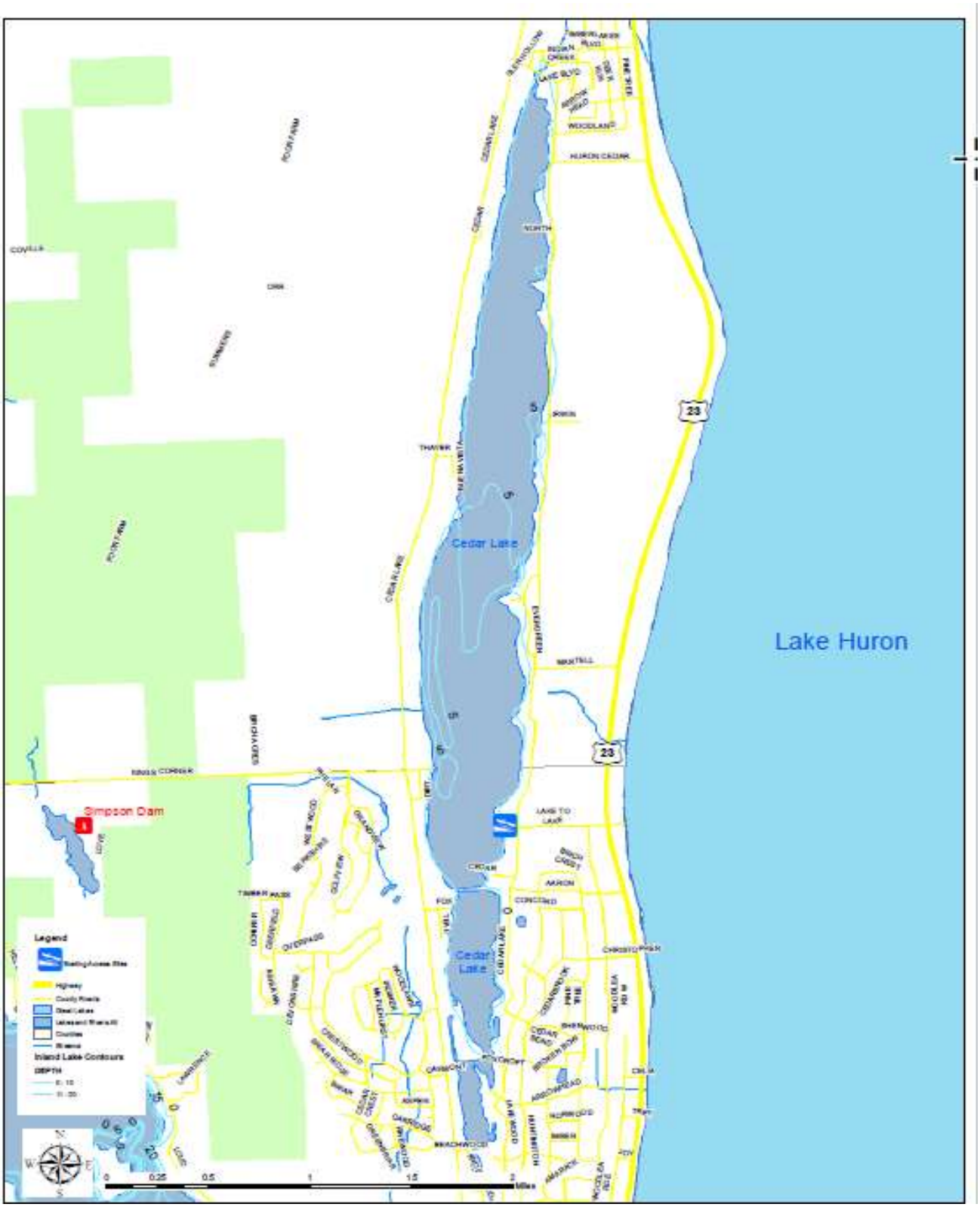

Table 1.-Recent stocking history of fish for Cedar Lake by the Department of Natural Resources or private sources. OTC is oxytetracycline.

Year	Source	Species	Strain	Length (in)	No. Stocked	Mark
1989	DNR	Walleye	Muskegon	1.7	30,012	--
1994	DNR	Walleye	Muskegon	1.7	31,298	--
1996	DNR	Walleye	Muskegon	1.4	78,680	--
1998	DNR	Walleye	Tittabawassee	2.0	21,632	OTC
2001	DNR	Walleye	Tittabawassee	1.8	74,487	OTC
2003	DNR	Walleye	Tittabawassee	1.2	62,255	OTC
2005	DNR	Walleye	Tittabawassee	1.7	61,000	OTC
2006	DNR	Walleye	Tittabawassee	1.9	62,880	OTC
2008	DNR	Walleye	Muskegon	2.1	59,928	--
2009	DNR	Walleye	Muskegon	1.5	80,753	--
2010	DNR	Walleye	Muskegon	2.0	50,195	--
2013	DNR	Walleye	Muskegon	2.0	53,235	--
2014	DNR	Walleye	Muskegon	1.8	70,784	--
2016	DNR	Walleye	Muskegon	1.9	53,919	--
2018	DNR	Walleye	Muskegon	1.8	50,470	--
1980	DNR	Tiger Muskellunge	--	8.5	5,000	--
1982	DNR	Tiger Muskellunge	--	5.8	9,600	--
1984	DNR	Tiger Muskellunge	--	6.9	1,900	--
1986	DNR	Tiger Muskellunge	--	6.4	5,000	--
1988	DNR	Tiger Muskellunge	--	9.3	5,000	--
1990	DNR	Tiger Muskellunge	--	9.4	5,236	--
1991	DNR	Tiger Muskellunge	--	9.3	9,600	--
2010	Private	Redear Sunfish	--	3.0	1,000	--
2011	Private	Redear Sunfish	--	5.0	1,000	--
2012	Private	Redear Sunfish	--	4.0	760	--
2014	Private	Redear Sunfish	--	3.5	2,500	--
2015	Private	Redear Sunfish	--	3.0	2,580	--
2016	Private	Redear Sunfish	--	3.5	4,170	--
2013	Private	Hybrid Sunfish	--	3.0	920	--

Table 2.-Catch by inch groups of fish from the summer 1970 netting survey at Cedar Lake.

Length group (in)	Bluegill	Pumpkin-seed	Black Crappie	Yellow Perch	Smallmouth Bass	Largemouth Bass	Northern Pike	Walleye
4.0-5.9	144	81	7	348	6	14		
6.0-7.9	98	82	3	136	1			
8.0-9.9	41	29	8	12			1	
10.0-11.9	1		24	2		5		
12.0-13.9			6		1	6		
14.0-15.9					4	4		
16.0-17.9					2	4		
18.0-19.9					2	1		
20.0-21.9						1		3
>=22							4	3

Table 3.-Comparison of mean length (inches) at age for prominent game fishes of Cedar Lake from 1970 to 2011. Number in parentheses represents number aged. The growth index is the growth for each species at Cedar Lake in 2011 compared to the statewide average for that species.

Species	Age group	July 1970	August 1982	June 2011	Growth Index (in)
Bluegill	I	3.0 (7)	2.9 (19)	--	-0.7
	II	4.3 (22)	4.4 (9)	--	
	III	5.6 (30)	5.2 (15)	4.2 (6)	
	IV	6.3 (22)	6.1 (7)	4.8 (21)	
	V	6.9 (17)	7.0 (14)	6.9 (10)	
	VI	6.9 (5)	7.4 (5)	7.6 (9)	
	VII	--	--	7.8 (1)	
	VIII	9.0 (1)	--	9.6 (1)	
Pumpkinseed	I	2.9 (1)	2.8 (2)	--	+0.3
	II	3.7 (2)	4.5 (8)	--	
	III	6.7 (3)	5.5 (19)	5.4 (18)	
	IV	5.9 (10)	6.5 (9)	7.0 (3)	
	V	6.7 (13)	7.2 (15)	8.2 (2)	
	VI	6.9 (6)	8.2 (5)	8.4 (1)	
	VII	7.8 (3)	--	--	
	VIII	8.4 (2)	--	--	
Black Crappie	I	4.5 (9)	5.6 (4)	--	--
	II	5.0 (1)	8.4 (10)	--	
	III	8.1 (4)	10.8 (18)	--	

Table 3.-Continued.

Species	Age group	July 1970	August 1982	June 2011	Growth Index (in)
Black Crappie	IV	9.2 (3)	12.0 (2)	--	
	V	9.9 (4)	13.5 (5)	--	
	VI	10.5 (7)	--	--	
	VII	10.7 (2)	--	--	
Yellow Perch	I	3.1 (15)	3.8 (17)	3.1 (4)	-0.9
	II	5.1 (13)	5.6 (22)	4.2 (13)	
	III	5.7 (22)	5.5 (19)	6.0 (7)	
	IV	6.9 (16)	6.5 (9)	7.4 (5)	
	V	6.9 (2)	--	8.2 (4)	
	VI	8.6 (2)	--	9.2 (1)	
	VII	--	--	11.5 (1)	
	VIII	--	--	10.9 (1)	

Table 3.-Continued.

Species	Age group	July 1970	August 1982	June 2011	Growth Index (in)
Northern Pike	0	--	10.6 (2)	--	-0.8
	I	--	--	13.0 (2)	
	II	21.6 (1)	22.1 (5)	19.0 (15)	
	III	20.4 (1)	26.8 (1)	21.2 (21)	
	IV	25.6 (1)	31.3 (2)	23.6 (9)	
	V	--	--	24.5 (9)	
	VI	--	--	29.3 (1)	
	VII	--	--	25.8 (1)	
	VIII	33.0 (1)	--	--	
	IX	--	--	--	
	X	--	--	33.0 (1)	
	XI	--	--	35.4 (1)	
Walleye	I	--	--	8.2 (1)	-0.1
	II	--	--	12.2 (3)	
	III	--	--	14.9 (10)	
	IV	--	--	16.4 (5)	
	V	--	--	17.6 (9)	
	VI	--	--	19.2 (7)	
	VII	20.8 (4)	--	20.3 (7)	
	VIII	21.8 (1)	--	--	
	IX	22.3 (1)	--	18.1 (1)	

Table 3.-Continued.

Species	Age group	July 1970	August 1982	June 2011	Growth Index (in)
Largemouth	0	--	2.9 (16)	--	--
Bass	I	3.5 (1)	7.6 (1)	--	
	II	7.3 (3)	--	9.5 (1)	
	III	10.8 (5)	11.3 (1)	9.8 (5)	
	IV	12.1 (5)	--	--	
	V	14.1 (3)	--	11.2 (1)	
	VI	13.9 (4)	--	14.5 (1)	
	VII	17.3 (2)	--	15.8 (1)	
	VIII	--	--	18.0 (1)	
	IX	--	--	18.5 (1)	
	X	19.7 (1)	--	--	
Smallmouth	0	--	3.0 (20)	--	-0.1
Bass	I	7.8 (1)	7.1 (23)	4.9 (5)	
	II	--	10.2 (14)	8.6 (5)	
	III	12.3 (1)	12.1 (7)	11.9 (1)	
	IV	13.8 (3)	14.0 914)	11.7 (2)	
	V	14.1 (2)	--	15.0 (5)	
	VI	15.2 (2)	--	17.2 (2)	
	VII	17.3 (1)	--	18.3 (2)	
	VIII	18.0 (1)	--	--	
	IX	--	--	20.4 (2)	
	X	--	--	--	
	XI	--	--	21.3 (1)	

Table 4.-Fish collected from Cedar Lake August 24-27, 1982 by DNR with small- and large-mesh fyke nets, and experimental gill nets. Weight was estimated from Michigan length-weight relationships.

Species	Total Catch	Percent by number	Weight (lbs)	Percent by weight	Length range (in)
Bluegill	557	30.9	60.5	12.7	2-8
Yellow Perch	359	19.9	8.4	1.7	2-9
Rock Bass	239	13.2	29.1	6.1	2-10
Smallmouth Bass	207	11.4	47.0	9.8	2-15
Pumpkinseed	176	9.7	37.3	7.8	2-8
Bullhead sp.	85	4.7	60.5	12.7	2-13
White Sucker	67	3.7	154.4	32.4	8-21
Black Crappie	41	2.2	26.7	5.6	5-13
Largemouth Bass	34	1.8	1.4	<1	2-11
Minnow sp.	21	1.1	0.0	<1	
Northern Pike	10	<1	27.6	5.8	10-32
Tiger Muskellunge	5	<1	7.5	1.5	8-23
Common Carp	1	<1	15.0	3.1	32
Total	**1,802**		**475.4**		

Table 5.-Length-frequency of certain fish collected during fyke- and gill-net surveys in Cedar Lake in August 1982.

Length group (in)	Bluegill	Pumpkin-seed	Black Crappie	Yellow Perch	Largemouth Bass	Smallmouth Bass	Northern Pike	Tiger Musk-ellunge
<5	209	15		314	32	95		
5-5.9	96	56	1	31				
6-6.9	132	53		7		40		
7-7.9	112	43		4	1	34		
8-8.9	8	9	10	3		4		2
9-9.9			3	1		1		
10-10.9			9			11	1	
11-11.9			9		1	4	1	
12-12.9			1			4		
13-13.9			5			7		
14-14.9						6		
15-15.9						1		
16-16.9								
17-17.9								
18-18.9								
19-19.9								
20-20.9							1	
21-21.9							1	1
22-22.9							1	
23-23.9							2	2
24.24.9								
25-25.9								
26-26.9							1	
27-27.9								
28-28.9								
29-29.9								
30-30.9							1	
31-31.9								
32-32.9							1	

Table 6.-Fish collected from Cedar Lake October 8-11, 1990 by DNR with small- and large-mesh fyke nets, maxi-mini fyke nets, and experimental gill nets. Weight was estimated from Michigan length-weight relationships.

Species	Total Catch	Percent by number	Weight (lbs)	Percent by weight	Length range (in)
Bluegill	432	47.9	57.7	19.9	2-8
Rock Bass	201	22.3	40.1	13.9	1-9
Pumpkinseed	65	7.2	11.6	4.0	4-8
Brown Bullhead	54	6.0	32.4	11.2	2-13
Yellow Perch	52	5.8	5.8	2.0	1-12
White Sucker	25	2.8	47.8	16.5	3-21
Walleye	22	2.4	47.5	16.4	14-25
Yellow Bullhead	17	1.9	11.8	4.1	7-12
Black Bullhead	12	1.3	10.6	3.7	--
Black Crappie	6	0.7	6.7	2.3	9-14
Smallmouth Bass	6	0.7	2.9	1.0	2-14
Tiger Muskellunge	4	0.4	1.3	0.4	10-12
Northern Pike	3	0.3	11.1	3.8	19-29
Largemouth Bass	2	0.2	2.2	0.8	2-16
Total	**901**		**289.5**		

Table 7.-Fall Walleye nighttime electrofishing assessments at Cedar Lake. Percent stocked determined in years when fingerling Walleye were marked with oxytetracycline prior to stocking, and samples of fish were analyzed during the electrofishing run. Sample size of age-0 fish tested is in parentheses.

Year	Date	Water Temp (F)	Hours shocked	Miles shocked	Age-0 Walleye	No. Age-0 per hour	Age-1+ Walleye	Percent stocked (n)
1994	9/29	55	2.0	--	45	22.5	1	--
1998	9/21	63	2.0	4.0	38	19.0	2	--
2001	9/18	63	2.0	5.3	154	77.0	24	--
2003	10/6	49	2.0	3.0	420	210.0	2	80 (30)
2008	9/17	64	2.0	3.6	77	38.5	0	--

Table 8.-Fish collected from Cedar Lake May 24-27, 1999 by DNR with small- and large-mesh fyke nets, and experimental gill nets. Weight was estimated from Michigan length-weight relationships.

Species	Total Catch	Percent by number	Weight (lbs)	Percent by weight	Length range (in)
Rock Bass	117	28.3	36.4	12.6	2-9
Bluegill	106	25.6	19.7	6.8	2-8
White Sucker	74	17.9	134.5	46.5	7-20
Walleye	39	9.4	38.7	13.4	7-22
Pumpkinseed	25	6.0	7.7	2.6	3-8
Yellow Bullhead	20	4.8	16.7	5.8	8-13
Brown Bullhead	13	3.1	13.3	4.6	11-13
Smallmouth Bass	11	2.7	3.4	1.2	4-15
Yellow Perch	3	0.7	0.4	0.1	2-7
Largemouth Bass	2	0.5	4.4	1.5	16-17
Northern Pike	2	0.5	5.5	1.9	23-25
Black Crappie	1	0.2	0.7	0.2	10
Tiger Muskellunge	1	0.2	7.8	2.7	31
Total	**414**		**289.1**		

Table 9.-Fish collected from Cedar Lake June 6-9, 2011 by DNR as part of a Status and Trends sampling protocol survey. Weight was estimated from Michigan length-weight relationships.

Species	Total Catch	Percent by number	Weight (lbs)	Percent by weight	Length range (in)
Bluegill	462	30.0	37.1	6.2	1-9
Rock Bass	347	22.5	118.0	19.9	1-12
Minnow sp.	297	19.3	0.0	0.0	2
Yellow Perch	120	7.8	7.8	1.3	2-12
Northern Pike	74	4.8	185.2	31.2	12-35
Walleye	50	3.2	89.1	15.0	7-22
Pumpkinseed	48	3.1	5.4	0.9	2-8
Yellow Bullhead	39	2.5	29.3	4.9	2-13
Smallmouth Bass	28	1.8	42.8	7.2	3-21
White Sucker	17	1.1	51.5	8.7	17-22
Johnny Darter	15	1.0	0.0	0.0	1-2
Bluntnose Minnow	14	0.9	0.1	0.0	2-3
Brown Bullhead	13	0.8	13.1	2.2	3-14
Largemouth Bass	11	0.7	13.8	2.3	9-18
Iowa Darter	3	0.2	0.0	0.0	1
Black Bullhead	1	0.1	1.1	0.2	13
Tadpole Madtom	1	0.1	0.0	0.0	2
Total	**1,540**		**594.3**		

Table 10.-Length-frequency of certain fish collected during the Status and Trends fish community survey in Cedar Lake in June 2011.

Length group (in)	Bluegill	Pumpkin-seed	Yellow Perch	Largemouth Bass	Smallmouth Bass	Northern Pike	Walleye
<5	288	27	88		4		
5-5.9	88	13	4		2		
6-6.9	51	3	15				
7-7.9	27	3	4				1
8-8.9	6	2	4		3		1
9-9.9	2		2	5	2		
10-10.9			1	1			
11-11.9			1	1	2		2
12-12.9			1		1	1	1
13-13.9					3	1	3
14-14.9				1	1		3
15-15.9				1	1		4
16-16.9					1	1	2
17-17.9					4	5	12
18-18.9				2	1	6	6
19-19.9					1	9	7
20-20.9						5	6
21-21.9					2	15	1
22-22.9						10	1
23-23.9						3	
24.24.9						6	
25-25.9						7	
26-26.9							
27-27.9							
28-28.9						2	
29-29.9						1	
30-30.9							
31-31.9							
32-32.9							
33.0-33.9						1	
34.0-34.9							
35.0-35.9						1	

Table 11.-Water temperature, dissolved oxygen, and pH profile for Cedar Lake, August 16, 2011.

Depth (ft)	Temperature (°F)	Dissolved Oxygen (ppm)	pH
Surface	73	10.5	8.0
1	73	10.0	8.2
2	72	10.2	8.6
3	72	10.3	8.9
4	72	10.3	9.0
5	72	10.2	9.2
6	72	10.2	9.4
7	72	10.2	9.5
8	72	10.2	9.5
9	72	10.1	9.5