Cass Lake
T2-3N, R9E, Secs. 2,3,4,9,10,11,33,34,35
Clinton River, 2018

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Environment

Cass Lake is a 1,280-acre natural lake located in central Oakland County, a few miles southwest of Pontiac. It is the largest and deepest lake in the Lake Erie Management Unit (LEMU) and has a volume of 33,062 acre-feet. Cass Lake has a perimeter of 28.6 miles, containing numerous bays, canals, and islands. The lake has four major basins; the maximum depth (121 feet) occurs in the main body of the lake (Figure 1). Despite the great depths, almost 40% of the lake is less than 10 feet deep with much of this shallow area only sparsely vegetated. Most of the aquatic vegetation is present in bays and canals or where drop-offs to deeper water occur. These depth changes are usually rapid with the steeply sloping bottom quickly reaching disphotoic depths. The main body of the lake has primarily marl and sand substrate, while the bays and canals are dominated by pulpy peat with some marl and muck. The Clinton River enters the lake from the northwest and exits out the northeast through a water level control structure to Otter Lake (Figure 1).

The surface geology of the surrounding area is glacial outwash sand, gravel and end moraines of course-textured till. This type of geology is well drained and allows good movement of groundwater. The land cover for the surrounding area and portion of the watershed upstream of Cass Lake is mostly urban (54%) with some forest (17%), wetland (14%), and additional lakes or streams (10%) (Fry et al. 2011). The population of Oakland County is around 1.25 million people according to the US Census Bureau (2019), further supporting the high urbanization percentage. Much of the shoreline is developed into residential units and 60% (17 miles) of the shoreline is armored with seawalls or artificial riprap. Cass Lake has about 39 dwellings per mile of shoreline and 44 docks per mile of shoreline. There are two public areas on Cass Lake. The first at Dodge No. 4 State Park contains one mile of shoreline, two fishing piers and a concrete boat launch with 80 parking spaces available. The second public area is West Bloomfield's Marshbank Park, which has a kayak/canoe launch along with a fishing pier. There are also three private marinas on Cass Lake.

Water temperature and dissolved oxygen profiles have been collected sporadically in nine different years in Cass Lake since 1947. The data were collected at variable intervals among the years. Each profile was collected in the deepest portion of the main basin, intended to identify the stratification zones established throughout the water column along with the associated temperatures and dissolved oxygen levels, and were used to develop the following averages for Cass Lake, 1947-2018. Lake stratification occurs where the water density gradient, caused by warming of the upper waters, is large enough that it prevents wind currents from mixing waters throughout the water column (Wehrly et al. 2015). The epilimnion in Cass Lake had an average depth of 19.4 feet (standard error: SE = 2.3) among the years. In Cass Lake, the metalimnion averaged from 22.5 feet (SE = 2.1) to 36.5 feet (SE = 1.7). In Cass Lake, the hypolimnion began at an average depth of 40.0 feet (SE = 2.1). The thermocline in Cass Lake was at an average depth of 27.6 feet (SE = 1.6). Most fish species found in Michigan require dissolved oxygen levels of 3.0 mg/L or higher for suitable habitat (Schneider 2002). Dissolved oxygen levels in Cass Lake were often found

suitable well into the hypolimnion, however some years (1976, 1977, and 1992) had less than suitable levels as shallow as the thermocline.

On September 9, 2016, and August 17, 2018, water temperature and dissolved oxygen measurements were taken in the deepest section of Cass Lake (Figure 1). Temperature and dissolved oxygen profiles were similar in 2016 and 2018 with the metalimnion spanning from 22 to 37 feet and 18 to 37 feet respectively (Figure 2). The thermocline was at 27 feet in 2016 and 25 feet in 2018 (Figure 2). Dissolved oxygen remained above 3.0 mg/L well into the hypolimnion to a depth of 67 feet in 2016 and to 110 feet in 2018 (Figure 2). This drastic difference could be mainly due to the depletion of dissolved oxygen over the course of stratification since the 2016 profile was captured 3 weeks later in the year. Even with that difference, more than 89% of the lake volume is suitable for fish when there are suitable dissolved oxygen levels down to 67 feet deep.

In addition to the temperature and dissolved oxygen profiles collected in 2018, water chemistry samples were also collected to measure alkalinity, nitrogen, phosphorus, and chlorophyll a. In-line lakes typically have a higher total alkalinity, especially in LEMU (Wehrly et al. 2015). Cass Lake had a total alkalinity of 160 mg/L, which is considered high for Michigan lakes (Table 1). Both nitrogen (634 µg/L) and phosphorus (6.8 µg/L) were in the normal range for Michigan lakes, though nitrogen was on the upper end and phosphorus was on the lower end of that range (Table 1). The chlorophyll-a level in 2018 (1.99 µg/L) was typical for lakes in Michigan. Secchi disc readings were collected during each fish sampling day (May 21 thru June 5, 2018) with an average reading of 22 feet; the summer reading on August 17 was 18 feet. Fuller and Taricska (2012) determine the trophic status of a lake using various metrics (Secchi depth, chlorophyll a, and total phosphorus) to calculate a modified Carlson's trophic state index. Using those metrics, collected in 2018, Cass Lake is identified as an oligotrophic lake, suggesting there is low primary productivity and low algal production, often with high water clarity and quality.

History

Cass Lake has a rich history of fisheries management with the first investigation into the fish community on record in 1890. As a prominent waterbody in Oakland County, Cass Lake has been the focus of many trial stockings to provide ample fishing opportunities for residents and visitors. Even prior to any introduced species, Cass Lake supported a very diverse fish community and that continues today (Table 2).

Cass Lake has been stocked with a variety of species, dating back to 1933 when stocking warmwater fish such as bluegill and bass was common. Records show that even crayfish were stocked into Cass Lake from 1938-1940 to provide forage for largemouth bass and smallmouth bass. Fisheries managers found these species, which naturally occurred in the lake, were self-sustaining and stocking them would not improve the fishery. In the 1950s, stocking efforts were focused on coldwater fish species including kokanee salmon, rainbow trout, brown trout, lake trout and splake. The intention of these stocking programs was to create a two-story fishery with both warmwater and coldwater species in the lake. Some of the species, like kokanee salmon and rainbow trout, were stocked to also create a seasonal fishery in the Clinton River. These programs ended due to poor survival and lack of angler interest. There was a one-time stocking of northern pike in 1983, and redear sunfish were stocked in 1995 and 1996 to establish a population in Cass Lake. One of the local associations on the lake holds a fishing derby each spring where they stock 100-150 rainbow trout the day of the event. The single ongoing stocking

program is for walleye, which have been stocked regularly since 1982 (Table 3), except for 2006-2010 when the walleye rearing program was suspended across the state due to virus concerns.

There have been multiple fisheries surveys conducted on Cass Lake that ranged from targeting the whole fish community using multiple gear types to single species surveys using a single gear type. Over the years Cass Lake has consistently been reported to provide quality panfish, bass, walleye and northern pike fisheries while also supporting a diverse fish community (Francis 2010). From 1992 through 2001 there was an observed decline in average length and Schneider's Index (Schneider 1990) of bluegill though they remained at a satisfactory level. The walleye population seems to be exclusively supported by the stocking program and in 2008 the population size was estimated at 664 walleye (0.5 fish/acre) with observed growth rates exceeding the statewide average growth rates, similar to prior surveys (Francis 2010). The northern pike population has been consistent through the years and in 2008 the population size was estimated at 1,078 northern pike (0.8 fish/acre) with growth rates lower than the statewide average (Francis 2010). Largemouth bass and smallmouth bass have consistently been observed in good numbers and quality size, though growth rates were less than state average. Cass Lake is one of the few lakes in southeast Michigan that supports a population of cisco (Latta 1995), a state threatened species (Derosier et al. 2015). The Clinton River influence on Cass Lake contributes not only to fish community diversity, but also leads to a fair mussel community that includes snuffbox, a state and federally listed endangered species (Carman and Goforth 2000).

Angler surveys conducted in 1986 (Waybrant and Thomas 1988), 1988 (Schneider et al. 1989), and 2016 (Harris 2018) indicated that Cass Lake supports a quality fishery for bass, panfish and walleye, however, anglers are deterred during the summer months by heavy recreational boating on the lake. Overall angler effort declined from the 1980s to 2016, however catch rates were much higher in 2016, going from 0.45 fish/hour to 3.07 fish/hour, respectively. In 2016, bass were the most commonly targeted species followed by panfish, walleye and northern pike. Though bass were the most targeted species, bluegill was the most harvested species, as 99% of the bass caught in 2016 were released (Harris 2018). Most of the fishing effort comes from local anglers though some anglers came from other US states and Canada (Harris 2018). Since 2016, all bass fishing tournaments were required report to the MDNR. Cass Lake consistently finished in the top 60 for the total number of tournaments on a waterbody and averages 14 tournaments a year. Conflicting use of the lake between anglers and recreational boaters has been reported as far back as 1946 and continues today. Daily closures of the state park limit anglers from accessing the lake in the early morning or late night when recreational boating is light to absent.

Cass Lake has had multiple special fishery regulations over the years. From 1948 to 1951 anglers could target cisco, whitefish, and carp with spears and artificial lights during the period of October 15 to December 31. Additionally, in 1950 and 1951, anglers were permitted to use gill nets to harvest cisco from November 15 to December 10. In 1988, a special regulation allowed anglers to target bass for catch and release fishing only on Cass Lake from April 1st to Memorial Day weekend, which is when the statewide possession season opened. This regulation continued until 2015 when a statewide regulation for year-round catch and immediate release went into effect. There were no observed impacts on the smallmouth bass or largemouth bass fisheries as a result of the extended catch and immediate release regulation.

The main basin of Cass Lake has sparse vegetation on the vast flats but in some of the canals and bays, vegetation abundance has been declared to be at nuisance levels by the riparian property owners. Aquatic

nuisance control treatments have occurred on select portions of Cass Lake since 2000 (https://miwaters.deq.state.mi.us) though much of the lake has been left untreated. Some treatments in recent years have targeted invasive plant species as well as perceived nuisance native vegetation. Invasive species such as zebra mussels have been reported in Cass Lake since the 1990s and new invaders have been observed as recent as 2015 when water clover was first found in one of the canals. Other invasive algae/plant species found in Cass Lake include starry stonewort, Eurasian water milfoil, flowering rush and phragmites. Chemical control treatments have been used to target some of these plants though the invasive species reported continue to persist in isolated areas.

Current Status

A fish community survey was conducted on Cass Lake in May and June of 2018 as part of the random sampling for the Status and Trends Program (Wehrly et al. in press). A variety of sampling gear was used, including four large-mesh fyke nets, three small-mesh fyke nets, three experimental gill nets, a 25-foot small-mesh seine and an electrofishing boat. During the week of May 21, 2018, both types of fyke nets and experimental gill nets were deployed, with large-mesh fyke nets spanning 4 net nights and small-mesh fyke nets and gill nets set 3 net nights. On June 5, 2018, six seine hauls were conducted during the daylight hours and 3 electrofishing transects were conducted after dark for 10 minutes each. The objective of the survey was to evaluate the current status of the fish community and future management needs for the fishery.

All sampling gears combined captured 1,958 fish, weighing about 449.4 pounds. Panfish (black crappie, bluegill, pumpkinseed, rock bass, and warmouth) composed 42% of the catch by number and 32% of the catch by weight (Table 4). Large predators (largemouth bass, longnose gar, northern pike, smallmouth bass, and walleye), composed 7% of the total catch by number and 49% by weight (Table 4). Minnows and darters (blackchin shiner, bluntnose minnow, Iowa darter, lake chubsucker, logperch, sand shiner, and spotfin shiner) made up 47% of the catch by number but only 1% of the catch by weight due to the small size of these species. Sand shiners were the most abundant species (538 fish).

Bluegill was the second most abundant species overall and the most abundant panfish, composing 23% of total catch by number and 15% of the catch by weight (Table 4). Bluegill ranged from 1 to 9 inches and averaged 5.4 inches overall, with 26% larger than seven inches (Table 5). Bluegill ages ranged from 1 to 6 years old and 68% aged were 3 to 5 years old (Table 6). The mean growth index (MGI) for bluegill in Cass Lake was +0.2, suggesting the growth rate for bluegill is near average compared to populations around the state. The catch per unit effort (CPE) of bluegills in large-mesh fyke nets was 16 fish per net night and 10.4 fish per net night in small-mesh fyke nets (Table 7).

One way to classify the quality of a bluegill population is to use Schneider's Index (Schneider 1990), which provides a relative measure of the quality of bluegill size in a lake. It is based on a relative scale from one to seven with seven being the best. Metrics used in the index include catch data from specific gear types (i.e. large-mesh fyke nets) and the MGI described above The average size of bluegill caught in large-mesh fyke nets was 6.6 inches and 65% of that catch were larger than six inches, 46% were seven inches or larger and 22% exceeded eight inches. The Schneider's Index (Schneider 1990) for Cass Lake was 4.8, indicating bluegill size structure that was satisfactory to good.

Other abundant panfish included rock bass, which was the third most abundant species captured, and pumpkinseed, which was the sixth most abundant species overall (Table 4). Rock bass ranged in size

from 1 to 11 inches, with an average length of 6.3 inches (Table 4) and 38% were seven inches long or larger. The CPE for rock bass caught in large-mesh fyke nets was 13.3 fish/net night. Pumpkinseed ranged in size from one to nine inches, with an average length of 4.5 inches and 20% were seven inches long or larger. Pumpkinseed CPE was highest in small-mesh fyke nets (5.1 fish/net night) and large-mesh fyke nets (3.8 fish/net night) (Table 7). Age structures were collected for pumpkinseed but not rock bass. . Pumpkinseed ages ranged from one to seven, though most (99%) were four years old or younger; growth rates were near the state average based on the MGI of +0.4. Other panfish (black crappie, longear sunfish, redear sunfish, and warmouth) were caught in low numbers (Table 4).

Largemouth bass and smallmouth bass made up a total of 2% of the overall catch by number but 11% by weight. Both species had low CPEs, with the large-mesh fyke net catch higher than electrofishing CPE (Table 7). Largemouth bass ranged in size from 3 to 15 inches, averaging 10.9 inches (Table 4). Though few largemouth bass were caught, 29% were larger than the minimum size limit (MSL) of 14 inches (Table 5). Largemouth bass ages ranged from 2 to 6 years old, which showed annual recruitment to the population (Table 6). Smallmouth bass were also caught in low numbers and ranged in length from < 1 (young-of-year) to 19 inches (Table 4). Smallmouth bass length averaged 13.3 inches and 76% were larger than the 14-inch MSL. Smallmouth bass ages, not including the young-of-year, ranged from 3 to 8 years, also indicating annual recruitment to the population (Table 6).

Walleye were caught in similar abundance to smallmouth bass (Table 4). Walleye lengths ranged from 9 to 24 inches and averaged 16.9 inches. Fifty-nine percent of the walleye caught exceeded the walleye MSL of 15 inches. Walleye ages ranged from 1 to 13 years and 63% were older than 5 years (Table 6). All the walleye year classes observed coincide with a stocked year.

Forage species including sand shiner, bluntnose minnow and logperch were captured in high numbers relative to the other species. These three species were in the top five species by number and made up 44% of the catch (Table 4). All three are smaller-bodied fish species but can reach sizes larger than observed during this survey. Sand shiners and bluntnose minnows captured ranged in size from 1 to 2 inches while logperch up to 4 inches were collected.

Analysis and Discussion

Cass Lake continues to support a diverse fish community and quality fishery. During the 2018 survey there were 29 total fish species observed including three non-natives (redear sunfish, common carp, walleye. This high number of species is above average for lakes in LEMU (18 species) and twice that of the state median (14 species) found through the status and trends program (Wehrly et al. 2015). 74% of the native fish species historically found in Cass Lake were observed and most of the 35 native species not in past records are likely still present in the lake (Table 2). The predator and prey ratio appears to be in good balance with a high number of forage species, good panfish size structure and a fair number of large predators.

Cass Lake offers a quality panfish fishery with a variety of species for anglers to target. Since 2001, Master Angler awards have been issued for two bluegill, two rock bass, one black crappie and one pumpkinseed caught out of Cass Lake. Bluegill is one of the dominant species in Cass Lake and is the most harvested by anglers according to the 2016 angler survey (Harris 2018). All metrics for the bluegill population suggests a good quality fishery. Bluegill CPE levels are below the LEMU median but in the

normal range (between 25th and 75th percentile) for lakes in Michigan (Table 7). The Schneider's Index (Schneider 1990) and average catch from fyke net efforts were higher than in 2001, reversing the downward trend observed from 1992 through 2001 (Table 8). Bluegill growth has remained near average over the years, as evidenced by the MGI remaining near zero since 1992 (Table 8). Rock bass, pumpkinseed and black crappie contribute to the quality panfish fishery as well. Rock bass and pumpkinseed were captured at a quality rate, whether comparing statewide or regionally, and rock bass had a higher CPE in the survey than bluegill (Table 7). Results from the 2016 angler survey suggest rock bass are underutilized because they not targeted, and few are harvested by anglers. Black crappie were not well represented in the 2018 fisheries survey but were the second most harvested species during the 2016 angler survey. It is not clear why so few were captured in 2018, but that is likely not representative of the population. Redear sunfish have never been documented in high abundance following the initial stockings in 1995 and 1996. Although redear sunfish persist in Cass Lake, they seem to remain at a low population level, unlike what has been observed in other southern Michigan Lakes that were stocked (Braunscheidel and Towns 2017).

Largemouth bass and smallmouth bass are the most targeted species by anglers in Cass Lake though the 2018 survey suggests their relative abundance is lower than the median for LEMU lakes. Since 2001, four master angler awards (three smallmouth bass and one largemouth bass) have been issued for bass caught out of Cass Lake. Both species were captured at rates lower than the LEMU average for given gear types. When compared statewide, Largemouth bass CPE was lower than the 25th percentile for electrofishing and small-mesh fyke nets (Table 7). Smallmouth bass CPE was at the low end of the normal range for electrofishing and large-mesh fyke nets (Table 7). Given the large number of bass caught in the 2016 creel survey, te 2018 fisheries survey may not have adequately sampled the bass population and further investigation into the population dynamics for both species is warranted.

The walleye population in Cass Lake provides a fair fishery and has good growth rates. Previous fishery surveys on Cass Lake reported walleye MGI at +1.0 indicating that they are growing at a significantly faster rate than state average. This was supported by the surveys conducted in 2018, where walleye captured were larger than the state average length-at-age. Fyke net catch rates in 2018 were higher than the LEMU median for fyke nets (Table 7). However, the gill net catch rate in 2018 (0.2 walleye/net night) was lower than the LEMU median for experimental gill nets and lower than the statewide 25th percentile (Table 7). It was encouraging that six age-1 walleye were captured, likely indicating survival from the stocking efforts in 2017. The walleye population remains similar to that observed in the 2008 fisheries survey (Francis 2010). Cass Lake provides suitable habitat throughout the metalimnion for walleye, as measured in the 2016 and 2018 temperature and dissolved oxygen profiles.

Though very few northern pike were captured during the 2018 fisheries survey, this may not be representative of the true population level. The population estimate produced from the 2008 fisheries survey is likely more representative of the northern pike population existing in Cass Lake today since it was a targeted survey focused on northern pike and walleye. Fishing pressure for northern pike was high during the ice fishing season (40% of the targeted efforts) but low during the open water fishing season (2% of the targeted efforts), which lasts much longer (Harris 2018). Overall harvest of northern pike was low, with only 4% of the catch being harvested (Harris 2018) and corresponds to low fishing mortality. Though the lake is highly developed, there are still many areas of connected wetland and emergent vegetation that provide quality spawning habitat for northern pike.

Cisco is a state threatened species that requires cold water, less than 68°F. We observed a single cisco during the 2018 fisheries survey and five during the 2001 survey. Although the population dynamics of cisco in Cass Lake are unclear, they continue to persist. The temperature and dissolved oxygen profiles in 2016 and 2018 indicate that suitable habitat extends into the hypolimnion when the lake is stratified, providing ample habitat. The fact that Cass Lake continues to be categorized as an oligotrophic lake is encouraging for the cisco population since the greatest threat to inland cisco populations is eutrophication (Jacobson et al. 2008; Latta 1995).

While Cass Lake is highly impacted by human development, there is also sufficient quality habitat. When compared regionally, the 38.9 dwellings/mile and 44.0 docks/mile found on Cass Lake is higher than the LEMU averages of 35.9 dwellings/mile and 38.9 docks/mile. This dense development is likely the reason for so few submersed trees (2.7 trees/mile) compared to the LEMU average (13.8 trees/mile). O'Neal and Soulliere (2006) reported that alterations or development of the shoreline that is higher than 25% can have detrimental effects on a lake's nearshore ecosystem through habitat degradation and loss of woody material. There remains vestiges of natural shoreline including wetland complexes that are beneficial for the aquatic community. The deep, well oxygenated portions of Cass Lake also contribute to the quality aquatic habitat available.

Management Direction

Cass Lake provides a quality fishery for many species that is partly due to the natural shorelines that remain and the high lake volume that supports suitable dissolved oxygen levels in the lake. Efforts should be made to protect the remaining natural shoreline around Cass Lake as it benefits many fish species. Since Cass Lake is an oligotrophic lake with sparse vegetation, nuisance control treatments should be limited to isolated areas where invasive species need to be controlled. When the opportunity exists, riparian owners wanting new or to repair exisiting armored shorelines should be made aware of shoreline softening options that could be more beneficial to the aquatic community when compared to hard armoring.

The walleye stocking program was successful and provided a successful fishery in Cass Lake. It is recommended to continue the stocking program at the prescribed rate of 75 spring fingerling walleye per acre (96,000 walleye per stocking) on an alternate year basis because the system has inadequate natural reproduction.

Bass fishing is popular on Cass Lake. While there have been many fisheries surveys conducted on this waterbody, there is still limited information about the population dynamics of largemouth bass and smallmouth bass. Future surveys should be directed to measure bass population dynamics to provide information to aid bass management in Cass Lake.

Since eutrophication is one of the largest threats to cisco (Jacobson et al. 2008; Latta 1995), emphasis should be put on reducing or eliminating sources of nutrient loading in the catchment area. Public properties in the catchment area should incorporate best management practices such as wetland protection, buffer strips and vegetation treatment processes that address nutrient loading. When residents in the catchment area are engaged, the importance of using best management practices should be conveyed to protect the lake against eutrophication. These actions will help maintain the quality fisheries on Cass Lake.

Public boat access for Cass Lake is limited to the open hours of Dodge #4 State Park, limiting how early many anglers can fish the lake. Consideration should be given to extending the open hours for this access point in seasons when boating traffic is high. An extension of open hours would allow anglers more time to fish in low traffic times, often found in the early morning.

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Figures

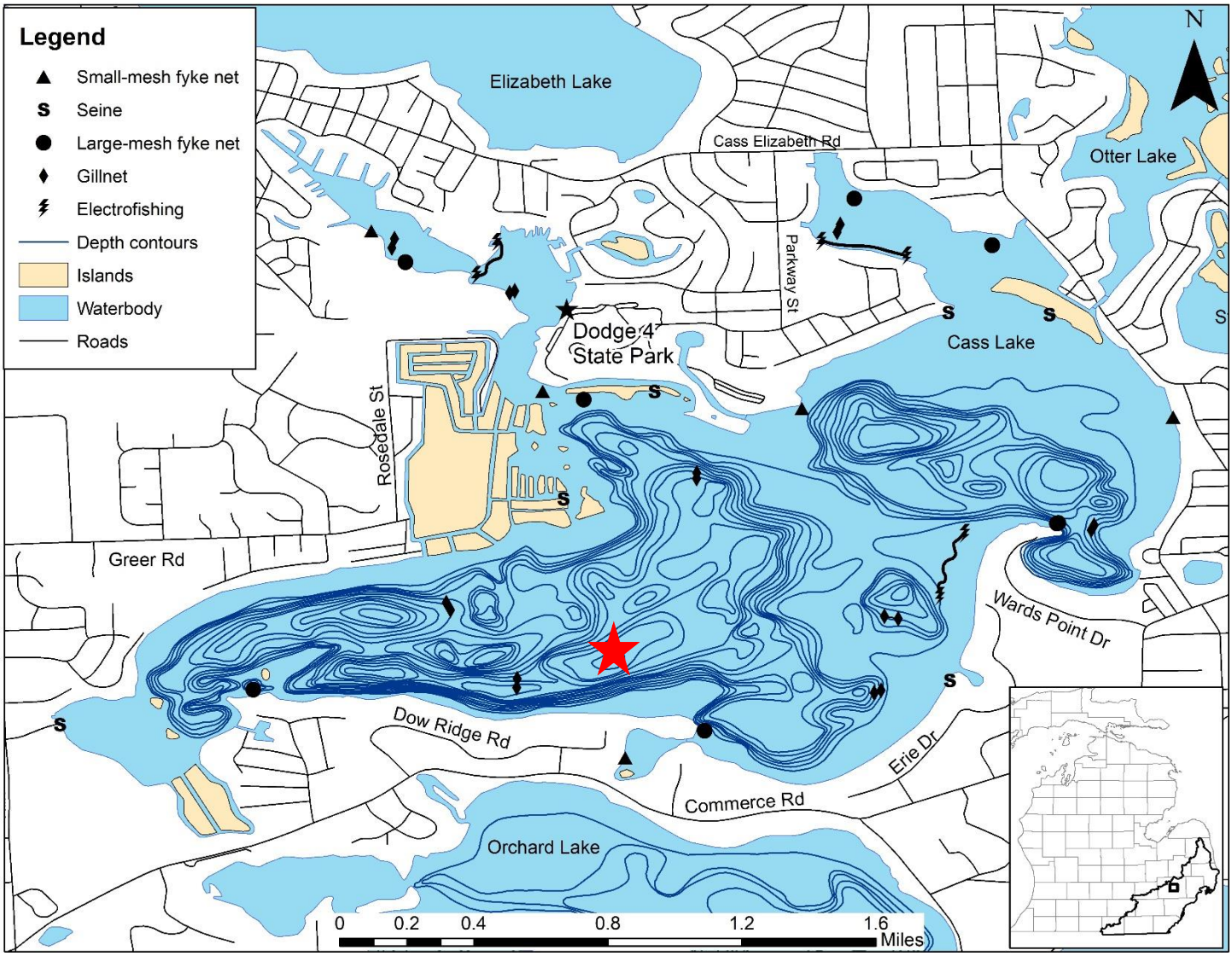

Figure 1. Map of Cass Lake, Oakland County with gear effort indicators for the fisheries survey conducted, May 21 through June 5, 2018. Dark blue lines represent contour lines at 5 feet increments. The red star represents the sampling location of the water temperature and dissolved oxygen profiles.

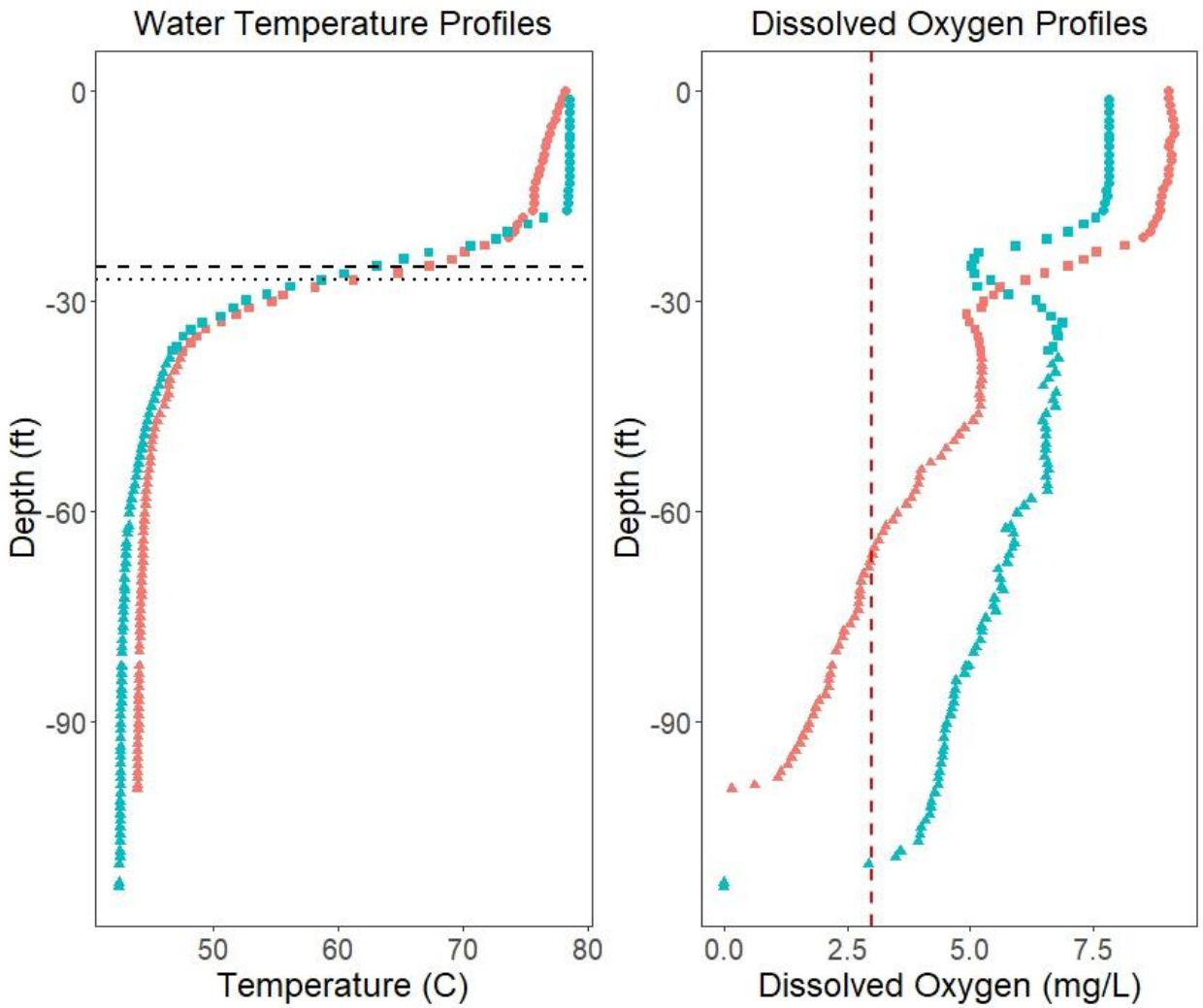

Figure 2. Temperature and dissolved oxygen profiles collected from the deepest basin of Cass Lake, collected on September 9, 2016 (orange points) and August 17, 2018 (blue points). The horizontal black dashed line represents the thermocline found August 17, 2018 and the horizontal black dotted line represents the thermocline found September 9, 2016. The vertical red line is where dissolved oxygen is at 3.0 mg/L.

Tables

Table 1. Cass Lake water chemistry results from samples collected on August 27, 2018, along with the statewide median, 25th percentile, and 75th percentile for each parameter. Results at a level between the 25th percentile and 75th percentile are considered typical.

Parameter	Result	Statewide Median[1]	Statewide 25th Percentile[1]	Statewide 75th Percentile[1]
Chlorophyll a	1.99 µg/L	2.8 µg/L	1.6 µg/L	5.15 µg/L
Total Kjeldahl nitrogen	634 µg/L	522 µg/L	393 µg/L	681 µg/L
Total phosphorus	6.8 µg/L	14 µg/L	8 µg/L	23 µg/L
Total alkalinity	160 mg/L	111 mg/L	48 mg/L	143 mg/L

[1]Based off chemistry results from 233 lakes statewide.

Table 2. Fish species historically found in Cass Lake. Origin: N = Native, I = Introduced; Status: P = Present, O = Extirpated, U = Unknown (followed by year it was last collected in the lake); 2018: an X indicates the species was caught in the most recent fisheries survey during 2018.

Common name	Family	Scientific name	Origin	Status	2018
Bowfin	Amiidae	*Amia calva*	N	P	X
Brook silverside	Atherinidae	*Labidesthes sicculus*	N	P	
White sucker	Catostomidae	*Catostomus commersonii*	N	P	X
Lake chubsucker	Catostomidae	*Erimyzon sucetta*	N	P	X
Northern hog sucker	Catostomidae	*Hypentelium nigricans*	N	U (1985)	
Rock bass	Centrarchidae	*Ambloplites rupestris*	N	P	X
Green sunfish	Centrarchidae	*Lepomis cyanellus*	N	P	
Pumpkinseed	Centrarchidae	*Lepomis gibbosus*	N	P	X
Warmouth	Centrarchidae	*Lepomis gulosus*	N	P	X
Bluegill	Centrarchidae	*Lepomis macrochirus*	N	P	X
Redear sunfish	Centrarchidae	*Lepomis microlophus*	I	P	X
Longear sunfish	Centrarchidae	*Lepomis peltastes*	N	P	X
Smallmouth bass	Centrarchidae	*Micropterus dolomieu*	N	P	X
Largemouth bass	Centrarchidae	*Micropterus salmoides*	N	P	X
Black crappie	Centrarchidae	*Pomoxis nigromaculatus*	N	P	X
Spotfin shiner	Cyprinidae	*Cyprinella spiloptera*	N	P	X
Common carp	Cyprinidae	*Cyprinus carpio*	I	P	X
Golden shiner	Cyprinidae	*Notemigonus crysoleucas*	N	P	X
Blackchin shiner	Cyprinidae	*Notropis heterodon*	N	P	X
Spottail shiner	Cyprinidae	*Notropis hudsonius*	N	P	
Sand shiner	Cyprinidae	*Notropis stramineus*	N	P	X
Mimic shiner	Cyprinidae	*Notropis volucellus*	N	P	
Bluntnose minnow	Cyprinidae	*Pimephales notatus*	N	P	X
Grass pickerel	Esocidae	*Esox americanus*	N	U (1988)	
Northern pike	Esocidae	*Esox lucius*	N	P	X
Black bullhead	Ictaluridae	*Ameiurus melas*	N	P	X
Yellow bullhead	Ictaluridae	*Ameiurus natalis*	N	P	X
Brown bullhead	Ictaluridae	*Ameiurus nebulosus*	N	P	X
Channel catfish	Ictaluridae	*Ictalurus punctatus*	N	P	
Tadpole madtom	Ictaluridae	*Noturus gyrinus*	N	P	X
Longnose gar	Lepisosteidae	*Lepisosteus osseus*	N	P	X
Iowa darter	Percidae	*Etheostoma exile*	N	P	X
Johnny darter	Percidae	*Etheostoma nigrum*	N	P	
Yellow perch	Percidae	*Perca flavescens*	N	P	X
Logperch	Percidae	*Percina caprodes*	N	P	X
Walleye	Percidae	*Sander vitreus*	I	P	X
Cisco	Salmonidae	*Coregonus artedi*	N	P	

Table 2. – Continued

Rainbow trout	Salmonidae	*Oncorhynchus mykiss*	I	U (1972)	
Kokanee	Salmonidae	*Oncorhynchus nerka*	I	O	
Brown trout	Salmonidae	*Salmo trutta*	I	O	
Splake	Salmonidae	*Salvelinus fontinalis x S. namaycush*	I	O	
Lake trout	Salmonidae	*Salvelinus namaycush*	I	O	
Central mudminnow	Umbridae	*Umbra limi*	N	P	X

Table 3. Walleye stocking history for Cass Lake, Oakland County, 1982-2017.

Year	Number Stocked	Number/acre	Average size (inches)
1982	16,098	12.6	3.0
1983	23,900	18.7	4.0
1985	32,000	25.0	2.6
1988	42,600	33.3	1.4
1990	22,110	17.3	3.8
1992	73,656	57.5	2.0
1994	44,782	35.0	2.2
1995	92,820	72.5	2.0
1997	116,672	91.2	1.5
1999	129,102	100.9	1.8
2001	94,604	73.9	1.6
2003	71,928	56.2	1.0
2005	174,844	136.6	1.2
2011	131,500	102.7	1.3
2012	12,537	9.8	2.0
2013	96,557	75.4	1.9
2015	102,250	79.9	1.5
2017	131,031	102.4	1.6

Table 4. Species catch and relative abundance of fish collected with all gear types combined during the Cass Lake fisheries survey, May 21 through June 5, 2018.

Species	Number	Weight (lbs.)	Length range (in.)	Average length (in.)
Sand shiner	538	2.4	1 - 2	2.4
Bluegill	453	69.5	1 - 9	5.3
Rock bass	235	52.8	1 - 11	6.3
Bluntnose minnow	176	0.8	1 - 2	2.3
Logperch	141	1.3	1 - 4	2.9
Pumpkinseed	115	16.3	1 - 9	4.5
Longnose gar	70	91.2	1 - 35	22.4
Blackchin shiner	43	0.1	1 - 2	1.9
Yellow perch	38	1.0	1 - 9	3.3
Iowa darter	24	0.0	1 - 2	1.8
Largemouth bass	24	21.3	3 - 15	10.9
Smallmouth bass	17	28.1	0 - 19	13.3
Walleye	16	32.9	9 - 24	16.9
Brown bullhead	14	10.7	1 - 13	11.1
Common carp	9	62.0	16 - 28	24.2
Bowfin	7	28.4	20 - 23	22.5
Yellow bullhead	7	3.2	8 - 10	9.8
Northern pike	6	18.6	20 - 30	23.5
Black crappie	4	1.6	5 - 11	8.3
Black bullhead	4	3.1	10 - 12	11.8
Tadpole madtom	4	0.0	1 - 2	2.3
Warmouth	4	0.5	4 - 6	5.3
Hybrid sunfish	3	0.2	3 - 4	4.2
White sucker	1	2.5	18	18.5
Lake chubsucker	1	0.2	7	7.5
Longear sunfish	1	0.0	3	3.5
Central mudminnow	1	0.0	2	2.5
Redear sunfish	1	0.7	9	9.5
Spotfin shiner	1	0.0	2	2.5
Total	1,958	449.4		

Table 5. Number per inch group of select species collected with all gears combined, during the Cass Lake fisheries survey, May 21 through June 5, 2018.

Inch group	Bluegill	Largemouth bass	Pumpkinseed	Rock bass	Smallmouth bass	Walleye
0					2	
1	19		26	2		
2	54		20	5		
3	56	1	6	11		
4	89		13	36		
5	52	1	5	58		
6	62	3	22	34		
7	64	3	18	46		
8	54		4	36		
9	3	1	1	5	1	3
10		3		1	1	2
11		1		1		
12						1
13		4				
14		4			4	
15		3			4	
16					4	1
17						1
18						
19					1	2
20						1
21						1
22						2
23						1
24						1

Table 6. Weighted mean length and age composition of select species collected during the fisheries survey of Cass Lake, May 21 through June 5, 2018.

Species	Age	Number aged	Length range (in.)	State avg. length (in.)	Weighted mean length (in.)	Weighted age frequency	MGI*
Bluegill	I	24	1.1 – 2.6	1.8	2.0	9.6%	+0.2
	II	13	2.5 – 3.5	3.8	3.1	15.2%	
	III	20	3.5 – 6.8	5.0	4.5	31.4%	
	IV	17	5.6 – 8.6	5.9	6.6	17.5%	
	V	22	6.2 – 8.8	6.7	7.7	19.2%	
	VI	11	7.3 – 9.4	7.3	8.1	7.2%	
Largemouth bass	II	4	3.5 – 7.4	7.1	5.8	16.7%	--
	III	8	6.6 – 11.8	9.4	8.7	33.3%	
	IV	4	10.2 – 14.1	11.6	12.7	16.7%	
	V	4	14.1 – 15.4	13.2	14.9	16.7%	
	VI	4	13.0 – 15.3	14.7	14.2	16.7%	
Pumpkinseed	I	18	1.4 – 1.8	1.8	1.6	22.8%	+0.4
	II	22	2.0 – 4.8	3.8	3.0	25.6%	
	III	23	2.8 – 7.8	4.9	5.9	29.7%	
	IV	16	4.8 – 8.7	5.6	7.0	21.0%	
	VII	1	8.5	7.1	8.5	0.8%	
Smallmouth bass	III	3	9.4 – 10.8	10.8	10.1	13.3%	--
	IV	1	14.7	12.6	14.7	6.7%	
	V	1	15.0	14.4	15.0	6.7%	
	VI	6	14.7 – 19.0	15.3	15.8	40.0%	
	VII	2	14.5 – 16.1	16.3	15.3	13.3%	
	VIII	3	16.2 – 16.7	17.3	16.5	20.0%	
Walleye	I	6	9.1 – 12.0	7.1	10.00	31.3%	--
	V	4	16.6 – 20.1	17.6	18.3	25.0%	
	VI	3	19.1 – 22.1	19.2	20.9	18.8%	
	VII	1	22.5	20.6	22.5	6.3%	
	XIII	2	23.2 – 24.7	--	24.0	12.5%	

Table 7. Caparison of catch-per-effort (CPE) for select species in Cass Lake along with statewide and Lake Erie Management Unit CPE generated from the Status and Trends Program (Wehrly et al. In press). CPE for electrofishing is number of fish per minute. CPE for Large-mesh fyke, small-mesh fyke, and experimental gill nets is number of fish per lift. CPE for small-mesh seine is number of fish per haul. Gear are not listed for a select species if none were caught in that gear type.

		Statewide CPE				LEMU
Species	Gear	25th percentile	Median	75th percentile	**Cass Lake 2018**	Median CPE
Bluegill	Electrofishing	1.2	3.9	7.6	**4.1**	8.4
	Large-mesh fyke net	2.5	11.7	31.9	**16.0**	21.8
	Small-mesh fyke net	2.3	8.5	36.5	**10.4**	25.5
Pumpkinseed	Electrofishing	0.2	0.4	1.0	**0.1**	0.2
	Large-mesh fyke net	0.7	1.9	5.5	**3.8**	1.7
	Small-mesh seine	0.3	1.0	2.0	**2.7**	0.7
	Small-mesh fyke net	0.5	2.3	8.0	**5.1**	1.3
Rock bass	Electrofishing	0.1	0.3	0.7	**0.1**	0.6
	Experimental gill net	0.3	0.7	2.0	**0.2**	0.7
	Large-mesh fyke net	1.3	3.6	8.2	**13.3**	2.7
	Small-mesh seine	0.3	0.3	0.8	**0.2**	0.3
	Small-mesh fyke net	1.0	2.8	6.0	**2.3**	1.0
Largemouth bass	Electrofishing	0.3	0.8	1.6	**0.2**	0.9
	Large-mesh fyke net	0.5	1.4	2.7	**0.9**	1.6
	Small-mesh seine	0.3	0.6	1.5	**0.2**	0.5
	Small-mesh fyke net	0.5	1.0	2.8	**0.1**	0.88
Smallmouth bass	Electrofishing	0.1	0.2	0.4	**0.1**	0.1
	Experimental gill net	0.2	0.5	0.8	**0.2**	0.5
	Large-mesh fyke net	0.3	0.6	1.5	**0.4**	0.3
	Small-mesh seine	0.3	0.7	2.0	**0.3**	0.5
	Small-mesh fyke net	0.3	0.5	1.3	**0.3**	0.1
Walleye	Experimental gill net	0.5	1.0	2.6	**0.2**	1.0
	Large-mesh fyke net	0.1	0.4	0.8	**0.9**	0.4

Table 8. Schneider's Index (Schneider 1990) results for large-mesh trap net and large-mesh fyke net catches from fisheries surveys of Cass Lake, 1992 through 2018.

Year	Average Length (in.)	Schneider's Index	CPE	Growth Index
2018	6.6	4.8	16.0	+0.2
2001	6.4	4.2	8.5	+0.1
1996	6.6	5	6.6	+0.1
1992	7.0	6	6.4	-0.1