Lake Oakland

Oakland County, 03N/09E/Section 2
Clinton River watershed, last surveyed 2021

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Environment

Lake Oakland is a 255-acre lake located in central Oakland County (Figure 1), split between Waterford and Independence townships, in the Lake Erie Management Unit (LEMU). There are three basins in the lake, all of which have steep side slopes (Figure 2). The western-most and deepest basin has a maximum depth of 64 feet, whereas the central and eastern-most basins reach maximum depths of 27 feet and 20 feet, respectively. Several bays and shoals also provide a substantial amount of shallow-water habitat; about 52% of the lake's total area is less than five feet deep (Figure 2). There are several small islands in the bays, most of which are covered by wetland vegetation, including cattails and various dogwood species. Lake Oakland is irregularly shaped and has a shoreline perimeter of 9.4 miles. The riparian zone surrounding the lake is highly developed (45 dwellings per mile of shoreline) and about 73% of the shoreline is armored. Lake Oakland contains a large number of docks, with about 48 small docks (can moor 1-2 boats) and one large dock (can moor three or more boats) per mile of shoreline. Public access is gained through a Michigan Department of Natural Resources (MDNR) boating access site located along the southern shoreline of the lake (Figure 2).

The geology of the area surrounding Lake Oakland is characterized as glacial outwash and is primarily comprised of sand and gravel. This type of geology is typically well-drained and associated with good infiltration to ground water. Lake Oakland's catchment area is about 50% urban, 22% forest, 15% wetland, and 13% other cover types, including water, agriculture, and grassland (Figure 3; Fry et al. 2011). The population of Oakland County is around 1.25-million people (U.S. Census Bureau, 2019), which contributes to the relatively high level of urban development.

Lake Oakland is part of the upper Clinton River watershed. The river first flows through Woodhull Lake, about 1.5 river miles upstream, enters Lake Oakland from the west, and then exits to the southeast, where there are two dams that regulate water levels in the lake (Figure 2). Both Woodhull and Oakland Lakes have a legal established lake level elevation of 957.5 feet, which allows a close and consistent connection that permits fish to move freely between the lakes.

The most recent water temperature and dissolved oxygen profile was collected at the deepest part of Lake Oakland on August 16, 2021 (Figure 4). This profile was intended to identify possible stratification zones throughout the water column and their associated temperatures and dissolved oxygen levels. Lake stratification occurs when surface warming causes a density gradient between warmer upper and colder lower waters. When this density gradient is large enough, it prevents wind currents from mixing the entire water column (Wehrly et al. 2015). The epilimnion is the well-mixed, upper layer of warm water with uniform temperatures and dissolved oxygen levels, the metalimnion is the middle layer of cool water where temperatures change rapidly with depth, and the hypolimnion is the bottom layer of cold water where mixing does not occur and temperatures decrease slowly with depth. In the lower zones with no mixing, dissolved oxygen is not replenished over time, except for situations where phytoplankton produce oxygen through photosynthesis (Kalff 2002). The most recent profile of Lake Oakland indicated

the epilimnion extended from the surface to a depth of 17 feet, whereas the metalimnion and hypolimnion were observed from depths of 17-34 feet and 34-62 feet (bottom), respectively. The thermocline is the location of greatest temperature change and was observed at a depth of 23 feet. Most fish species in Michigan require dissolved oxygen levels of 3.0 mg/L or higher for suitable habitat (Schneider 2002). By this definition, dissolved oxygen levels in Lake Oakland were only suitable from the surface to a depth of 20 feet. Thus, it is likely that only about one-third of the water column provides suitable habitat for fish during the period of peak summer stratification, which usually occurs sometime between the months of July and August.

History

The dams that regulate water levels in Lake Oakland were constructed in 1915 (Francis and Haas 2006) and are responsible for creating the shallow bays and shoals found throughout the lake. Currently, these shallow-water areas are highly vegetated, but historically, they contained numerous tree stumps. In 1987, the Oakland County Drain Commission was issued a permit to lower the water level in Lake Oakland by four feet to remove many of these stumps, some of which were a safety concern for navigation and swimming. Because of the important habitat they provide for fish, MDNR, Fisheries Division worked with the Oakland County Drain Commission to protect some of the stumps. However, an excessive number of stumps were removed, including many that were designated to remain. Fisheries Division sought mitigation for the loss of fish habitat but there are no records indicating the work was ever completed.

Homogenous stands of invasive aquatic vegetation contribute to habitat degradation for fish communities (Larkin et al. 2018), and Lake Oakland has a long history of chemical herbicide treatments targeting multiple invasive species. A Department of Environment, Great Lakes, and Energy (EGLE) permit is required for chemical application to surface waters in Michigan. Herbicide treatments applied to Lake Oakland in the past were primarily for control of algae, Eurasian watermilfoil, starry stonewort, and invasive pondweeds. Treatment locations and coverage areas were dependent on the chemical used and target species. Currently, a variety of algaecide and herbicide treatments are applied to Lake Oakland at various times throughout the year, all of which are reported on EGLE's MiEnviro website (https://mienviro.michigan.gov/ncore/external/home). Requests to use fluoridone, which is a whole lake treatment, were denied by EGLE in 2003 and 2004. Mechanical vegetation removal is also used as part of a multi-pronged approach to remove aquatic nuisance plants in Lake Oakland.

Fisheries management activities on Lake Oakland date back to the 1930s, when numerous species were stocked, including bluegill, black crappie, largemouth and smallmouth bass, yellow perch, and an unrecorded crayfish species (Table 1). It is uncommon to stock these species today as they are typically self-sustaining and present almost everywhere throughout the state. Stocked fish can easily move between Woodhull Lake (upstream) and Lake Oakland (downstream) through the Clinton River, and Woodhull Lake has a stocking history similar to Lake Oakland, except that it did not receive smallmouth bass. Walleye were stocked into Lake Oakland by MDNR during the 1980s, but a fishery never developed, and the walleye program was subsequently cancelled. To introduce a larger panfish, MDNR also stocked redear sunfish into the lake in 2004, although this program was also discontinued to allow the species to naturally reproduce. The Lake Oakland Lake Association tried stocking walleye again from 2008 through 2014, but stocking was ceased due to lack of funding. To benefit the panfish fishery and provide additional forage fish, the lake association also periodically stocked redear sunfish from 2008 through 2012 and golden shiners in 2008, respectively.

Lake Oakland was bathymetrically mapped in 1944 and the first survey to inventory the fish community was conducted in 1956. Six additional fisheries surveys were conducted between 1956 and 2021, all of which found a diverse community comprised primarily of panfish, including bluegill, pumpkinseed, rock bass, black crappie, redear sunfish, and green sunfish. Large predators observed in these surveys included largemouth bass, northern pike, smallmouth bass, bowfin, and longnose gar. Table 2 provides a detailed list of all fish species observed in Lake Oakland since it was first surveyed in 1956 and their status.

Since 2016, MDNR has collected data related to bass tournaments on all public waters in the state, and these data indicate that Lake Oakland is a popular bass fishing lake. From 2016 through 2021, there were a total of 76 tournament reports (average 12.7 tournaments per year) for Lake Oakland. The lake averaged about 22 anglers or 13 boats and 42 fish measured per tournament. Largemouth bass comprised 98% of fish measured in tournaments, followed by smallmouth bass, which comprised the remaining 2%.

Current Status

The most recent fish community surveys conducted on Lake Oakland were completed during spring and fall in 2021. The first of these surveys was completed during spring with the objectives of updating the MDNR fish community inventory for the lake and evaluating the potential need for stocking by the Lake Oakland Lake Association. Given the broad connection and shared fish community, Woodhull Lake was sampled simultaneously during the spring survey. The second of these surveys was completed during fall with the objective of gathering data on largemouth and smallmouth bass population dynamics and only included Lake Oakland.

The spring survey was conducted using a variety of gears, including large- and small-mesh fyke nets, a 25-foot seine, an electrofishing boat, and an experimental gill net. During the week of May 10th, both large- and small-mesh fyke nets and an experimental gill net were deployed. Large- and small-mesh fyke nets were set for three net nights and two net nights, respectively, whereas the experimental gill net was set for two net nights. This survey also included two seine hauls and two 10-minute boat electrofishing transects, both of which were conducted on June 17th. The two seine hauls were completed during daylight hours, whereas the two electrofishing transects were completed after dark.

Collectively, the 2021 spring survey captured 1,441 fish representing 20 different species. Panfish, such as bluegill, pumpkinseed, rock bass, black crappie, and redear sunfish, comprised 91% of the catch by number, whereas large predators, such as largemouth bass, bowfin, northern pike, smallmouth bass, and longnose gar, comprised 4% of the catch by number (Table 3). Other species only comprised 5% of the catch by number (Table 3) but accounted for 47% of the observed species diversity. Forage species, such as bluntnose minnow, blacknose shiner, brook silverside, blackchin shiner, golden shiner, and logperch, were all observed in low numbers (Table 3).

Bluegill was the most abundant species observed in the spring survey and comprised 76% of the catch by number (Table 3). Bluegill sizes ranged 1-8 inches and averaged 4.1 inches; 94% of bluegill were smaller than five inches, which suggested the population was heavily skewed towards smaller sizes (Table 4). Bluegill ages ranged 1-7 years and 89% were ages-1-5 (Table 5). The mean growth index (MGI) for bluegill was -1.2, which suggested that growth rates were substantially lower in Lake Oakland compared to the state-wide average. Average catch-per-effort (CPE) of bluegill was 21.9 fish/minute in

electrofishing efforts and 72.5 fish/net lift and 104.0 fish/net lift for large- and small-mesh fyke nets, respectively (Table 6).

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. The index is based on a relative scale that ranges from one to seven, with one being poor quality and seven being high quality. Metrics used in the index include catch data from specific gears (e.g., large-mesh fyke nets) and the MGI. For example, bluegill captured in large-mesh fyke nets averaged 5.4 inches, with 13.6% larger than six inches, 3.5% larger than seven inches, and 0.2% larger than eight inches. The overall Schneider's Index for bluegill in Lake Oakland was 2.2, which indicated poor size structure.

Pumpkinseed was the second most abundant species observed in the spring survey and comprised 9% of the catch by number (Table 3). Pumpkinseed sizes ranged 1-8 inches and averaged 5.4 inches (Table 4). Average CPE of pumpkinseed was 3.8 fish/minute in electrofishing efforts and 8.8 fish/net lift and 1.0 fish/net lift for large- and small-mesh fyke nets, respectively (Table 6). Other minor panfish species comprised less than 6% of the catch by number and included rock bass, black crappie, redear sunfish, and hybrid sunfish.

Largemouth bass was the most abundant large predator observed in the spring survey and comprised 3% of the catch by number (Table 3). Largemouth bass sizes ranged 5-18 inches and averaged 9.3 inches (Table 4). Of the 47 largemouth bass captured, 28% were larger than the state-wide 14-inch minimum size limit (MSL; 2023 Michigan Fishing Guide). Largemouth bass ages ranged 3-7 years and 62% were ages-3-4 (Table 5). Average CPE of largemouth bass was 1.6 fish/minute in electrofishing efforts and 2.7 fish/net lift for large-mesh fyke nets (Table 6). Other large predators comprised less than 2% of the catch by number and included bowfin, longnose gar, northern pike, and smallmouth bass.

The fall survey targeted largemouth bass and was conducted after sunset over three nights during October 11-13, 2021. Each night, MDNR electrofishing crews completed a single pass of the nearshore zone (depths less than six feet) along the entire perimeter of Lake Oakland. Catches from electrofishing efforts were then used to estimate a catch curve-based total annual mortality rate and complete a Chapman-Petersen mark-recapture population estimate specifically for largemouth bass (Ricker 1975). Relative size distribution (RSD) values were also calculated (Zale and Sutton 2012). RSD values refer to the proportion of a population that is longer than specific, pre-defined length values. Lenth cut-offs used for largemouth bass in Lake Oakland were the 14-inch MSL (RSD14), 17 inches (RSD17), and 20 inches (RSD20), with the latter two categories indicating the average length of bass for reported tournaments on Lake Oakland and trophy-class fish, respectively.

Collectively, the 2021 fall survey captured 698 bass, with largemouth bass (99%) dominating the catch, followed by smallmouth bass (1%). Largemouth bass sizes ranged 2-19 inches and averaged 10.3 inches (Table 7), whereas ages ranged from young-of-year (age-0) to age-7 (Table 8). Although most age-classes were well-represented, age-2 fish comprised a substantial proportion (41%) of the population. The MGI for largemouth bass was -0.8, which suggested that growth rates were lower in Lake Oakland compared to the state-wide average (Table 9). Average CPE of largemouth bass was 1.0 fish/minute in electrofishing efforts. The estimated total annual mortality rate for largemouth bass was 39.8%, whereas the estimated population size was 3,726 (± 606) fish, which corresponded to a lake-wide density of about 14.6 fish/acre. RSD values were RSD14 = 27.3, RSD17 = 3.2, and RSD20 = 0.0, which suggested that

about one-third of the population exceeded the MSL and the population contained few, if any, trophy-class fish. Smallmouth bass sizes ranged 6-19 inches and averaged 13.5 inches (Table 7), whereas ages ranged 1-8 years (Table 8).

In addition to the previously described 2021 fish community surveys, a more recent creel survey to evaluate ice fishing effort on Lake Oakland was conducted during January-March, 2023. Passive angler counts were completed using a Plotwatcher (Day 6 Outdoors LLC) camera focused on the MDNR boating access site (Figure 2). This camera was set to capture images every five seconds from daylight until dark each day. MDNR staff then used GameFinder (Day 6 Outdoors LLC) software to view the images as a time lapse video. This method captured a total of 284 ice fishing trips averaging about 3.1 hours each, which suggested an estimated fishing rate of 3.5 hours/acre during the winter of 2022.

Analysis and Discussion

Lake Oakland supports a diverse fish community dominated by native, warm-water species. Collectively, the two most recent surveys captured 20 different species, only two of which, common carp and redear sunfish, were not native to the lake. The number of species observed in Lake Oakland is slightly higher than average for other lakes in the LEMU (18 species) and substantially higher than the state-wide median (14 species; Wehrly et al. 2015). About 75% of native fish species historically found in Lake Oakland (28 Total) were observed during survey efforts in 2021, and it is likely the remaining 25% have persisted but were not captured. The diversity of prey fish species (panfish and forage species) and large predator species, along with high catch rates for species like bluegill and largemouth bass, suggests the predator-prey balance is sufficient. However, slow growth and limited numbers of larger fish in the bluegill population suggests that Lake Oakland could benefit from additional large predators.

The panfish community in Lake Oakland appears to be very abundant, with catch rates exceeding regional (LEMU) and state-wide averages for all gears for bluegill and all but small-mesh fyke nets for pumpkinseed (Table 5). In 2021 survey efforts, the bluegill population was dominated by smaller fish and the Schneider's Index of 2.2 was less than half the value of 4.8 estimated when the same population was previously surveyed in 2001 (Francis 2005). Growth of bluegill has also declined since the 2001 survey; an MGI of -0.6 estimated from the 2001 data indicated two-fold faster growth than the value of -1.2 estimated from the 2021 data. It is unclear what is causing reduced growth and size structure in the bluegill population, but high catch rates compared to other Michigan lakes suggest that increased predation could benefit the population by reducing abundance of smaller fish. Growth of pumpkinseed was not captured in the 2021 data, but the observed size structure was similar to that in the 2001 survey.

In the 2021 spring fish community survey, catch rates for largemouth bass were greater than LEMU averages for all gears and even reached the 75th percentile for large-mesh fyke nets (Table 5), which suggests the population in Lake Oakland is relatively abundant for the region. The density estimate of 14.6 fish/acre from the corresponding 2021 fall electrofishing survey reinforces that there are a substantial number of largemouth bass in Lake Oakland, although there are few similar density estimates available for comparison. Largemouth bass in Lake Oakland were found to be slow growing when compared to state average growth, with a fair RSD14 (27.3), low RSD17 (3.2), and no RSD20. These RSD values indicate there are good numbers of largemouth bass for anglers to target but not many larger fish. This may be a result of limited longevity (maximum age of seven years) and slow growth (MGI = -0.8) or potential bias in our sampling methods, which did not capture older, larger fish. The total annual

mortality rate of 39.8% estimated for largemouth bass from the fall survey data was more than 10% lower than the average rate of 57% for lakes across the United States (Allen et al. 2008).

Lake Oakland is a popular bass fishing lake with an average of nearly 13 tournaments per year since 2016. The lake consistently ranks within the top 20 in the LEMU and within the top 60 state-wide for number of tournaments held annually. Most of the tournaments on Lake Oakland occur during summer through fall, which indicates that event organizers are avoiding the spring spawning season, when catch and immediate release fishing is open. MDNR staff have observed no adverse effects from these tournaments. Ice fishing effort during the winter of 2022 was relatively low compared to other lakes in southeast MI. For example, Lakeville Lake (Oakland County) received an estimated 9.2 hours/acre during the winter of 2021 (Harris 2022a), whereas Maceday Lake (Oakland County) averaged 4.9 hours/acre during the winters of 2020 and 2021 (Harris 2022b). In southeast MI, the majority of ice anglers target panfish and the relatively small panfish size structure in Lake Oakland may have resulted in more limited effort compared to other lakes.

Water temperatures and dissolved oxygen levels in Lake Oakland are primarily suitable for warmwater fish species. As previously mentioned, suitable dissolved oxygen levels were only present from the surface to depths of 20 feet when the most recent water temperature and dissolved oxygen profile was collected on August 16, 2021. Corresponding water temperatures at these depths ranged 68-77ºF, which suggests limited cool and coldwater habitat during periods of peak summer stratification. Thus, abundance of cool and coldwater fish species, such as smallmouth bass and northern pike, may ultimately be limited by suitable habitat area. The dominance of warmwater fish species, such as bluegill and largemouth bass, in the 2021 spring fish community survey supports this hypothesis.

Management Direction

Active management, primarily aquatic vegetation control treatments, is ongoing in Lake Oakland and it is unclear what impact these activities or the dense clusters of invasive species, such as starry stonewort and curly leaf pondweed, have on the fish community. Although the fish community appears to be resilient and has maintained species diversity over time, future surveys will be required to assess any changes in both species diversity and population demographics. Limnological and fish community surveys of Lake Oakland should be conducted on a 15-year basis. Should additional funding become available in the future, Lake Oakland would also be a suitable candidate for studies targeted at identifying the effects of aquatic vegetation control treatments on warmwater fish communities or individual species.

The bluegill population in Lake Oakland appears to be abundant but also demonstrates below average growth and relatively poor size structure compared to other lakes throughout the state. Because bluegill dominated both panfish and total catches in the most recent fish community survey, the overall panfish fishery is likely poor, as most anglers prefer larger fish. Lakes with dense vegetation, such as Lake Oakland, can require above average predator densities to positively impact bluegill size structure (Schneider 1999). The largemouth bass population in Lake Oakland (14.6 fish/acre) would be considered moderately dense compared to other Michigan lakes, which have densities as high as 27 fish/acre (Schneider 1999) and stocking an additional predator could improve bluegill size structure (Schneider and Lockwood 1997). Stocking walleye was previously pursued by both MDNR and the Lake Oakland Lake Association with unsuccessful outcomes in both cases. Lake Oakland is also a Type 1 lake (less than 500 acres) and does not meet minimum stocking requirements prescribed in the Michigan Walleye Management Plan (Herbst et al. 2021). Additionally, walleye is considered a coolwater species, with

optimum growth occurring from 52-77°F, and temperatures above this range are not suitable (Hansen et al. 2019). For example, surface water temperatures in Lake Oakland were monitored during April-November in 2021 and there were a recorded 47 days with a daily average water temperature greater than 77°F. Other, more warmwater tolerant predator species, such as channel catfish, could be considered in the future, although impacts to connected waters and their fish communities should be considered prior to stocking.

With the highly developed shoreline and aquatic nuisance control treatments of Lake Oakland, there is a need to protect the remaining wetlands, emergent vegetation, and submersed woody material (e.g., trees and root wads). These natural features provide quality spawning and juvenile habitat for multiple fish species, such as northern pike and yellow perch. Because of the high percentage of armored shoreline (73%), opportunities to encourage a natural or soft engineered shoreline should also be pursued. Additionally, aquatic nuisance control treatments should focus on removing or limiting invasive species, while preserving and restoring native species, rather than completely eliminating all aquatic vegetation from treatment areas throughout the lake.

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Table 1. Stocking history of Lake Oakland (N/A = data not available).

Year	Species	Stage of Development	Number Stocked	Total Weight (lbs.)	Mean Length (in.)
1933	Bluegill	Fall fingerling	1,750	N/A	N/A
1934	Yellow Perch	Fall fingerling	3,000	N/A	N/A
1934	Yellow Perch	Yearling	1,600	N/A	N/A
1934	Bluegill	Fall fingerling	6,000	N/A	N/A
1935	Largemouth bass	Fall fingerling	500	N/A	N/A
1935	Yellow perch	Fall fingerling	5,000	N/A	N/A
1935	Bluegill	Fall fingerling	4,500	N/A	N/A
1936	Largemouth bass	Fall fingerling	700	N/A	N/A
1936	Yellow perch	Fall fingerling	6,000	N/A	N/A
1936	Bluegill	Fall fingerling	2,000	N/A	N/A
1937	Largemouth bass	Fall fingerling	2,550	N/A	N/A
1937	Walleye	Fry	130,000	N/A	N/A
1937	Perch	Fall fingerling	10,000	N/A	N/A
1937	Bluegill	Fall fingerling	4,000	N/A	N/A
1937	Crayfish	NA	1,429	N/A	N/A
1938	Largemouth bass	Fall fingerling	600	N/A	N/A
1938	Bluegill	Fall fingerling	10,000	N/A	N/A
1939	Largemouth bass	Fall fingerling	2,300	N/A	N/A
1939	Yellow perch	Fall fingerling	1,500	N/A	N/A
1939	Bluegill	Fall fingerling	19,00	N/A	N/A
1940	Largemouth bass	Fall fingerling	2,900	N/A	N/A
1940	Bluegill	Fall fingerling	50,000	N/A	N/A
1941	Largemouth bass	Fall fingerling	1,500	N/A	N/A
1941	Bluegill	Fall fingerling	13,000	N/A	N/A
1942	Smallmouth bass	Fry	400	N/A	N/A
1942	Largemouth bass	Fall fingerling	3,600	N/A	N/A
1942	Bluegill	Fall fingerling	23,200	N/A	N/A
1943	Smallmouth bass	Fall fingerling	2,000	N/A	N/A
1943	Bluegill	Fall fingerling	16,800	N/A	N/A
1944	Smallmouth bass	Fall fingerling	1,200	N/A	N/A
1944	Bluegill	Fall fingerling	5,000	N/A	N/A
1945	Largemouth bass	Fall fingerling	4,000	N/A	N/A
1945	Bluegill	Fall fingerling	4,800	N/A	N/A
1955	Walleye	Fry	200,000	N/A	N/A
1956	Walleye	Fry	675,000	N/A	N/A
1983	Walleye	Fall fingerling	6,000	30.0	N/A
1983	Walleye	Spring fingerling	7,590	22.9	N/A
1984	Walleye	Fall fingerling	5,680	28.4	3.1
1984	Walleye	Spring fingerling	8,320	21.8	2.0
1986	Walleye	Spring fingerling	15,200	41.9	1.9
2004	Redear Sunfish	Fall fingerling	200	1.5	2.5
2008	Golden Shiner	Adult	4,800	58.9	3.5
2008	Redear Sunfish	Yearling	900	12.7	3.0

Table 1 continued.

2008	Walleye	Fall fingerling	300	20.1	6.0
2009	Redear Sunfish	Yearling	872	12.3	3.0
2009	Walleye	Fall fingerling	201	13.6	6.0
2010	Redear Sunfish	Fall fingerling	955	13.4	3.0
2010	Walleye	Fall fingerling	215	14.4	6.0
2011	Redear Sunfish	Fall fingerling	1,000	16.7	3.1
2011	Walleye	Fall fingerling	111	7.1	5.9
2012	Redear Sunfish	Fall fingerling	1,000	16.7	3.1
2012	Walleye	Fall fingerling	50	3.2	5.9
2014	Walleye	Fall fingerling	1,000	67.5	6.0

Table 2. Fish species historically observed in Lake Oakland. Origin: N = Native and I = Introduced; Status: P = Present and U = Unknown; X indicates the species was caught in recent fisheries surveys during 2021.

Common name	Family	Scientific Name	Origin	Status	2021
Black Bullhead	Ictaluridae	*Ameiurus melas*	N	P	
Black Crappie	Centrarchidae	*Pomoxis nigromaculatus*	N	P	x
Blackchin Shiner	Cyprinidae	*Notropis heterodon*	N	P	x
Blacknose Shiner	Cyprinidae	*Notropis heterolepis*	N	P	x
Bluegill	Centrarchidae	*Lepomis macrochirus*	N	P	x
Bluntnose Minnow	Cyprinidae	*Pimephales notatus*	N	P	x
Bowfin	Amiidae	*Amia calva*	N	P	x
Brook Silverside	Atherinidae	*Labidesthes sicculus*	N	P	x
Brown Bullhead	Ictaluridae	*Ameiurus nebulosus*	N	P	x
Channel Catfish	Ictaluridae	*Ictalurus punctatus*	I	U	
Common Carp	Cyprinidae	*Cyprinus carpio*	I	P	x
Golden Shiner	Cyprinidae	*Notemigonus crysoleucas*	N	P	x
Grass Pickerel	Esocidae	*Esox americanus*	N	P	
Green Sunfish	Centrarchidae	*Lepomis cyanellus*	N	P	
Lake Chubsucker	Catostomidae	*Erimyzon sucetta*	N	P	
Largemouth Bass	Centrarchidae	*Micropterus salmoides*	N	P	x
Logperch	Percidae	*Percina caprodes*	N	P	x
Longnose Gar	Lepisosteidae	*Lepisosteus osseus*	N	P	x
Northern Pike	Esocidae	*Esox lucius*	N	P	x
Pumpkinseed	Centrarchidae	*Lepomis gibbosus*	N	P	x
Redear Sunfish	Centrarchidae	*Lepomis microlophus*	I	P	x
Rock Bass	Centrarchidae	*Ambloplites rupestris*	N	P	x
Smallmouth Bass	Centrarchidae	*Micropterus dolomieu*	N	P	x
Walleye	Percidae	*Sander vitreus*	I	U	
Warmouth	Centrarchidae	*Lepomis gulosus*	N	P	
White Sucker	Catostomidae	*Catostomus commersonii*	N	P	
Yellow Bullhead	Ictaluridae	*Ameiurus natalis*	N	P	x
Yellow Perch	Percidae	*Perca flavescens*	N	P	x

Table 3. Catch summary for the Lake Oakland spring fishery survey, May 10–17, 2021. Total weights are estimated (N/A = data not available).

Species	Total Caught	Total Weight (lbs.)	Length Range (in.)	Mean Length (in.)
Bluegill	1,093	68.3	1–8	4.1
Pumpkinseed	130	20.7	1–8	5.4
Largemouth Bass	47	46.7	5–18	11.2
Rock Bass	44	10.2	1–9	6.0
Brown Bullhead	27	18.5	8–13	11.2
Black Crappie	16	6.7	6–11	8.9
Hybrid Sunfish	15	3.7	3–8	6.5
Yellow Perch	15	0.4	2–5	3.8
Redear Sunfish	8	2.2	2–9	6.6
Bluntnose Minnow	7	0.1	1–3	2.6
Bowfin	7	33.1	21–25	23.6
Northern Pike	7	28.4	20–31	25.8
Yellow Bullhead	7	4.0	9–12	10.5
Blacknose Shiner	5	N/A	1–2	1.9
Common Carp	5	43.6	17–30	25.9
Brook Silverside	2	N/A	3	3.5
Smallmouth Bass	2	6.6	17–19	18.5
Blackchin Shiner	1	N/A	2	2.5
Golden Shiner	1	0.2	8	8.5
Longnose Gar	1	0.9	22	22.5
Logperch	1	N/A	3	3.5
Total	1,441			

Table 4. Number per inch group of select species collected with all gears combined during the Lake Oakland spring fishery survey, May 10–17, 2021.

Inch Group	Black Crappie	Bluegill	Pumpkinseed	Redear Sunfish	Largemouth Bass	Smallmouth Bass	Northern Pike
1		106	1				
2		148	13	1			
3		286	13				
4		193	25	1			
5		289	26	1	5		
6	2	53	28		3	1	
7	2	16	23	3	4		
8	5	2	1	1	7		
9	4			1	1	1	
10	1				3		
11	2				3		
12					6	1	
13					2		
14					2	1	
15					4		
16					3		
17					3	1	
18					1	1	
19						2	
20							1
22							1
23							1
26							1
27							1
28							1
31							1
Total	16	1,093	130	8	739	8	7

Table 5. Mean length-at-age of select species collected with all gears combined during the Lake Oakland spring fishery survey, May 10–17, 2021.

Species	Age	Number Aged	Length Range (in.)	Mean Length (in.)	State Average Length (in.)
Black Crappie	3	3	6.4–7.4	7.1	7.5
	4	7	6.8–11.9	8.9	8.6
	5	7	8.7–11.10	9.4	9.4
	6	2	9.2–10.2	9.8	10.2
Bluegill	1	18	1.5–2.2	1.7	1.8
	2	17	2.2–3.1	2.6	3.8
	3	15	3.2–3.6	3.4	5
	4	11	4.2–8.6	5.1	5.9
	5	27	4.5–8.1	5.2	6.7
	6	8	4.8 7.1	5.5	7.3
	7	1	7.7	7.7	7.8
Largemouth Bass	3	10	5.2–12.2	7.4	9.4
	4	19	5.5–12.9	9.5	11.6
	5	8	8.5–15.4	12.6	13.2
	6	8	13.5–17.5	16.2	14.7
	7	2	6.3–18.4	17.4	16.3
Northern Pike	1	1	7.4	7.4	11.7
	3	3	22.1 – 26.8	24.2	20.8
	5	2	27.4–28.0	27.7	25.5
	6	1	31.9	31.9	27.3
Redear Sunfish	1	1	2.0	2.0	1.9
	3	7	4.6–9.5	7.3	6.2
Smallmouth Bass	5	1	17.2	17.2	14.4
	7	1	19.1	19.1	16.3

Table 6. Comparison of catch-per-effort (CPE) for select species in Lake Oakland with state-wide and Lake Erie Management Unit (LEMU) CPE generated from the Status and Trends Program (Wehrly et al. 2015). CPE for electrofishing is number of fish/minute. CPE for Large-mesh fyke, small-mesh fyke, and experimental gill nets is number of fish/lift.

		State-Wide CPE				
Species	Gear	25th Percentile	Median (50th Percentile)	75th Percentile	**Lake Oakland**	LEMU Median CPE
Bluegill	Spring Electrofishing	1.2	3.9	7.6	**21.9**	8.4
	Large-Mesh Fyke	2.5	11.7	31.9	**72.5**	21.8
	Small-Mesh Fyke	2.3	8.5	36.5	**104.0**	25.5
Pumpkinseed	Spring Electrofishing	0.2	0.4	1.0	**3.8**	0.2
	Large-Mesh Fyke	0.7	1.9	5.5	**8.8**	1.7
	Small-Mesh Fyke	0.5	2.3	8.0	**1.0**	1.3
Largemouth Bass	Spring Electrofishing	0.3	0.8	1.6	**1.6**	0.9
	Fall Electrofishing	N/A	N/A	N/A	**1.0**	N/A
	Large-Mesh Fyke	0.5	1.4	2.7	**2.7**	1.6

Table 7. Number per inch group for largemouth and smallmouth bass collected during the Lake Oakland fall fishery survey, October 11–13, 2021.

Inch Group	Largemouth Bass	Smallmouth Bass
2	2	
3	1	
4	22	
5	39	
6	42	1
7	94	
8	93	
9	69	1
10	53	
11	50	
12	52	1
13	44	
14	55	1
15	47	
16	16	
17	10	
18	2	1
19	1	1
Total caught	692	6
Total Weight (lbs.)	520.9	10.3
Mean length (in.)	10.3	13.5

Table 8. Weighted mean length and age composition of select species collected during the Lake Oakland fall fishery survey, October 11–13, 2021.

Species	Age	Number aged	Length range (in.)	Weighted mean length (in.)	State average length (in.)
Largemouth Bass	0	2	2.3 – 2.5	2.4	4.2
	1	19	3.9 – 6.7	5.0	7.1
	2	45	4.1 – 10.8	7.5	9.4
	3	11	8.9 – 13.1	11.0	11.6
	4	18	10.7 – 14.8	12.6	13.2
	5	13	11.0 – 18.5	14.8	14.7
	6	12	14.0 – 19.9	16.7	16.3
	7	7	16.7 – 18.0	17.4	17.4
Smallmouth Bass	1	2	6.3 – 9.5	7.9	7.5
	3	2	12.2 – 14.1	13.2	12.6
	8	2	18.1 – 19.8	19.0	18.1

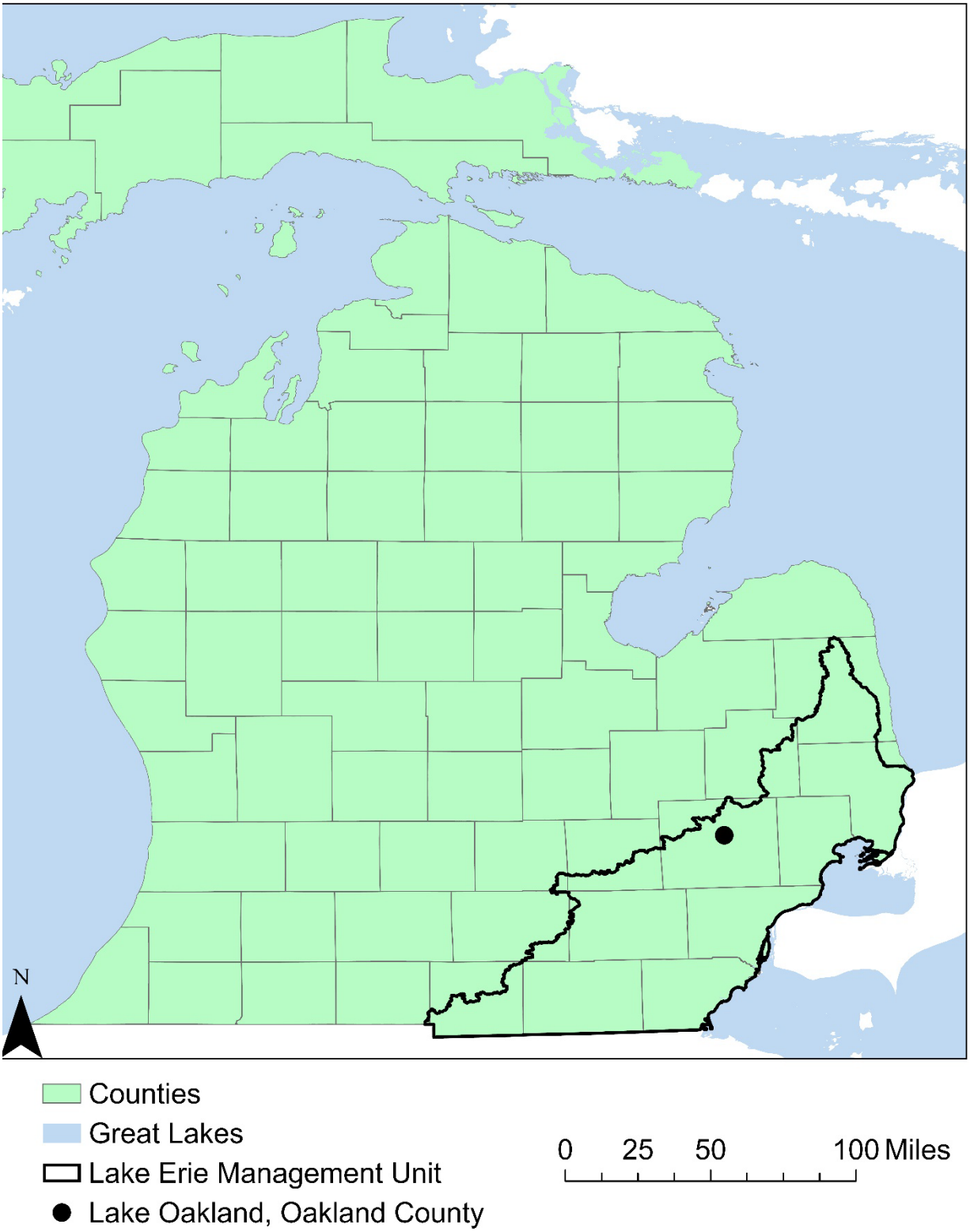

Figure 1. Location of Lake Oakland, Oakland County, Michigan, and the the Lake Erie Management Unit (LEMU).

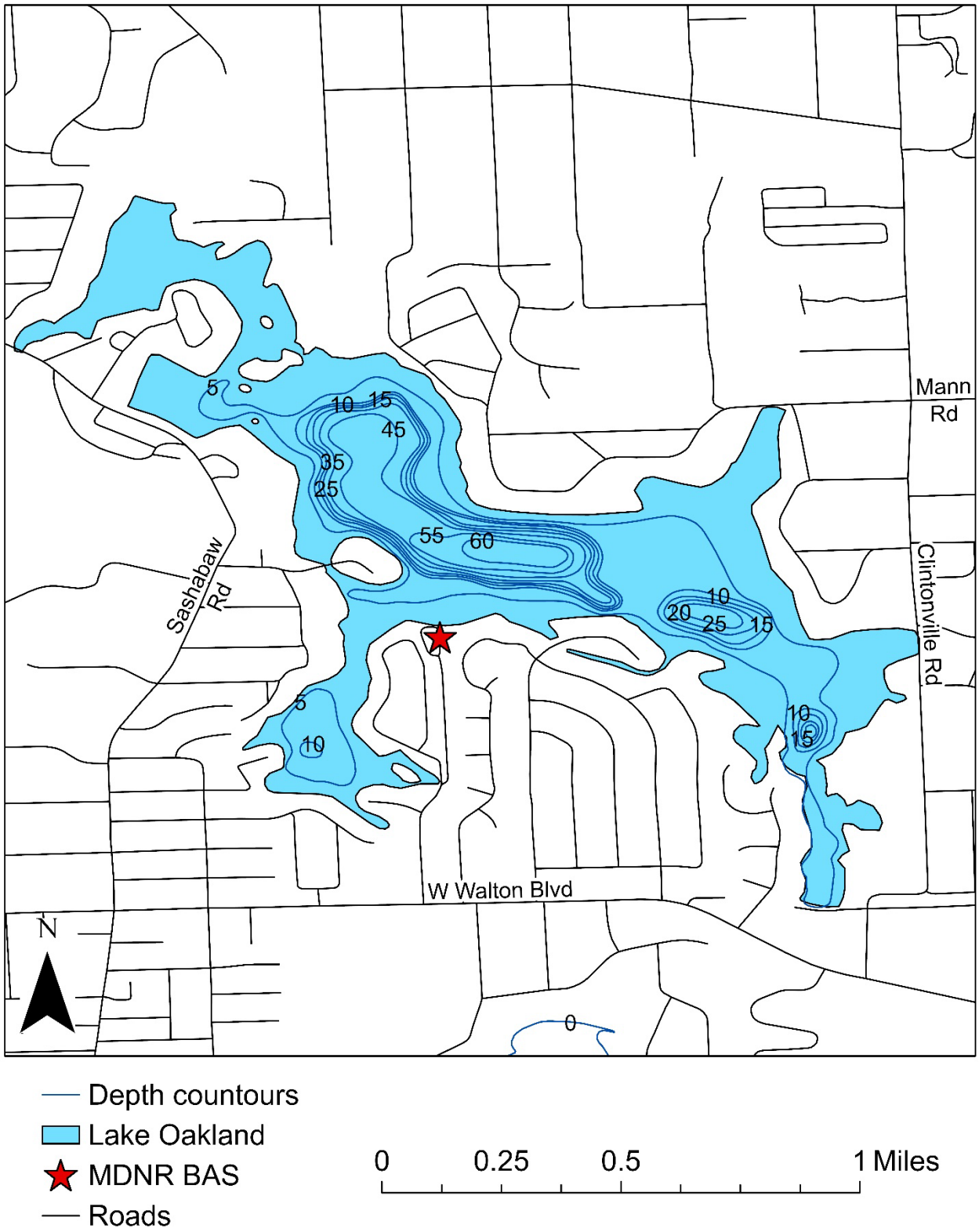

Figure 2. Map of Lake Oakland, Oakland County, Michigan, with depth countour lines (feet) and location of Michigan Department of Natural Resources (DNR) boating access site (BAS).

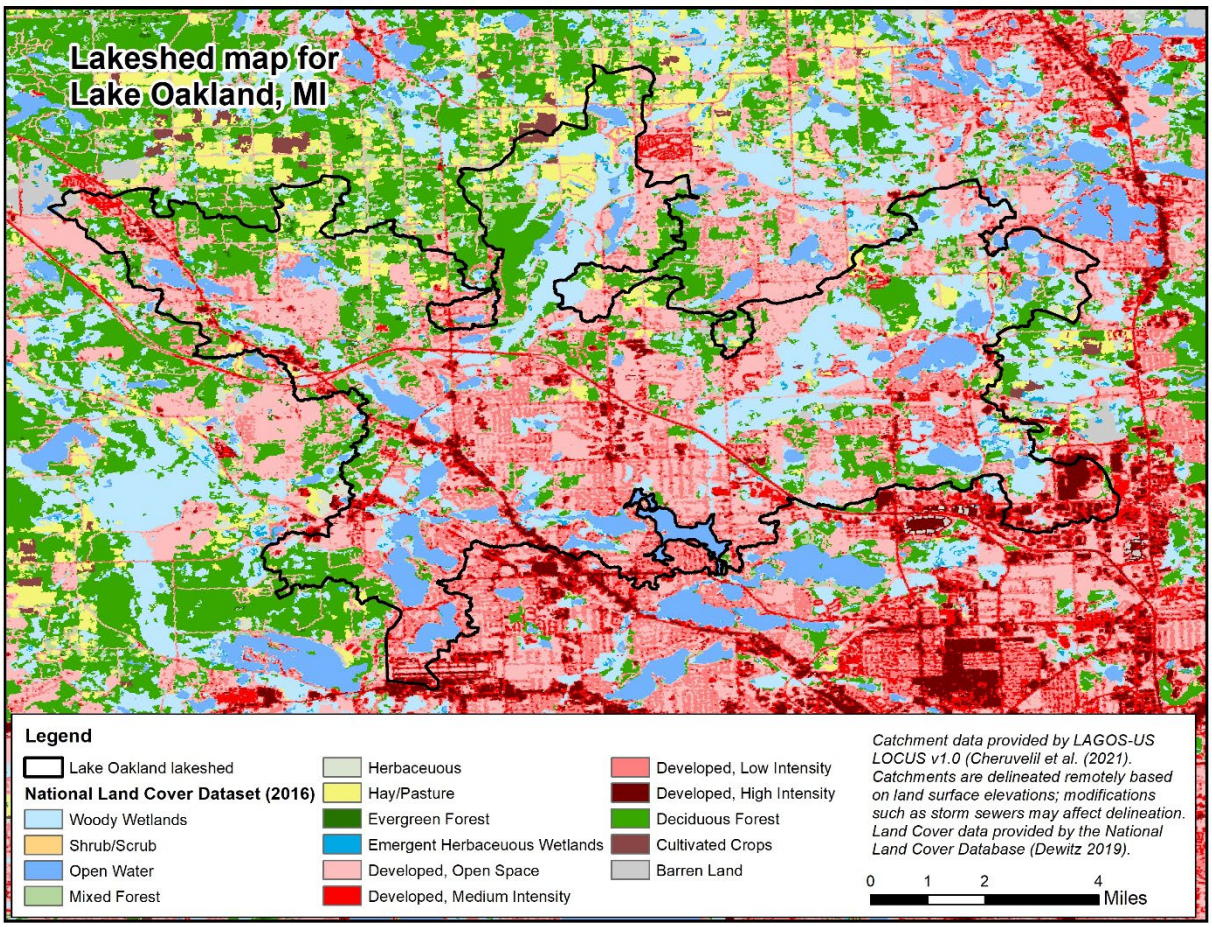

Figure 3. Lakeshed (catchement) map for Lake Oakland, Oakland County, Michigan, with land cover imagery.

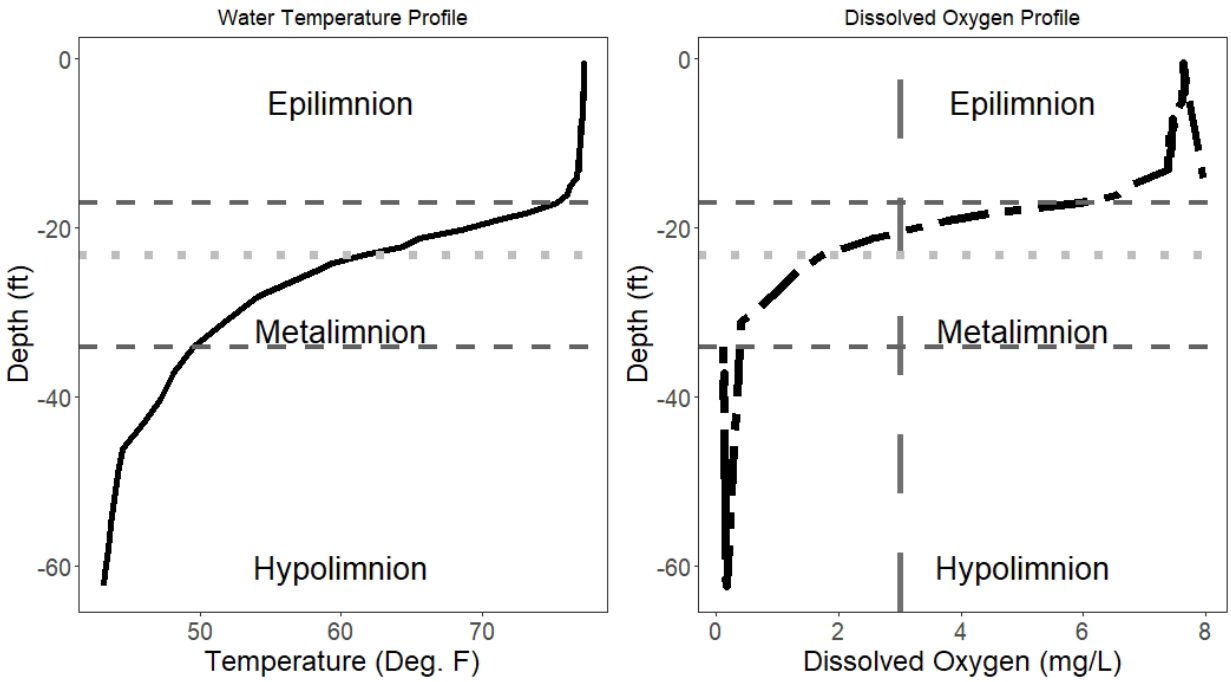

Figure 4. Water temperature (left panel) and dissolved oxygen (right panel) profiles for Lake Oakland collected August 16, 2021. In the left panel, the solid black line indicates water temperature, whereas the horizontal dashed lines indicate the upper and lower bounds of the metalimnion and the horizontal dotted line indicates the thermocline. In the right panel, the dashed black line indicates dissolved oxygen concentration, whereas the vertical dashed line represents the lower limit of suitable dissolved oxygen (3.0 mg/L); the horizontal dashed lines represent the upper and lower bounds of the metalimnion, whereas the horizontal dotted line indicates the thermocline.

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