Worchester (Wolf) Lake
Schoolcraft County, T47N/16W/S22
Watershed: Marsh Creek, Last Surveyed: 2017

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Environment

Worchester or "Wolf" Lake (hereinafter referred to as "Worchester Lake") is a shallow, medium-sized 120-acre lake located in northwestern Schoolcraft County (Figure 1). In Alger County, the towns of Shingleton resides to the southwest and in Schoolcraft County, Seney resides to the southeast.

Worchester Lake is located within the Prairie Du Chien bedrock group (MDNR 2001) formed during the early Ordovician period of the Peleozoic Era (USGS 2019). The surrounding landscape of Worchester Lake is largely forest (52.2%) or wetland (46.3), with urban, water, and grassland making up less than 2% of land cover. The surficial geology of the Worchester Lake shoreline is comprised mostly (82%) of course textured substrate and untextured materials (e.g., organic matter). These course textured materials result in greater amount of groundwater or springs which helps support aquatic life in lakes similar in depth to Worchester Lake. Topsoil of Worchester Lake is comprised largely of Carbondale, Lupton, and Tawas sands (USDA 2017).

Worchester Lake is located near the headwater region of Marsh Creek which serves as a tributary to the Main Branch of the Manistique River. There are two unnamed streams which flow into the northern region Worchester Lake. Marsh Creek, located at the south end of the lake, serves as the sole outflow of the lake. Worchester Lake is positioned on a north-northwest to south-southeast axis and has the shallow range in depth from one to six feet. Approximately 50% of the lake is less than 3 feet in depth while 100% of the lake is less than 6 feet in depth. Aquatic vegetation present in Worchester Lake includes bulrush, Potamogeton, White Water Lily, Watersheild, Vallisneria, and milfoil. Additional features of Worchester Lake include a description of the chemical, physical and biological parameters which help to define available habitat.

Chemical parameters measured in Worchester Lake include alkalinity, nitrogen, phosphorus, and dissolved oxygen. On 14 August 2017, alkalinity in Worchester Lake was 54 mg/L (medium) which is similar to alkalinity recorded in 1986 (52 mg/L) and comparable to waterbodies across the region (Wehrly et al. 2015). On 14 August 2017, total phosphorus levels were measured in Worchester Lake and were reported to be 0.0329 mg/L (high). Total nitrogen in Worchester Lake was measured 14 August 2017 and was reported to be 1.517 mg/L (high). By comparison, Worchester Lake has nearly double the nitrogen and phosphorus compared to similar sized waterbodies in the region. This high level of nutrients may be a result of the large amount of decaying organic matter that exists in the lake bottom. Dissolved oxygen was measured at 3 feet depth on 24 August 1977 and on 26 March 1986 and was reported to be 7.0 and 10.4 mg/L, respectively. Therefore, sufficient oxygen to support aquatic life in deeper areas (e.g., >3 foot) of the lake exist in Worchester Lake. That said, the shallow depth and high nutrient load of the lake likely limits oxygen availability in unsampled reaches ultimately effecting fish populations (e.g., summerkill, winterkill).

Physical characteristics measured in Worchester Lake include those associated with residential development such as dwelling density, boat dock abundance, shoreline armoring, and the number of submerged trees along the shoreline. The number of dwellings per mile along the shoreline of Worchester Lake was measured 14 August 2017 and was reported to have 1.17 dwellings per mile (low), which suggests that Worchester Lake is relatively undeveloped. The number of docks in Worchester Lake was measured 14 August 2017 and was reported to be 0.60 docks per shoreline mile (low). The number of docks per mile for medium sized shallow lakes in the Worchester Lake region is 2.1 docks per mile, which suggests that the Worchester Lake shoreline is largely intact. The amount of shoreline armoring was measured in Worchester Lake 14 August 2017 and was reported to be zero (Low) which is comparable to similar sized waterbodies in the region. The amount of large woody debris in Worchester Lake was measured 14 August 2017 and was reported to be 10.0 submerged logs per shoreline mile (low). The average amount of large woody debris in similar sized waterbodies in the Worchester Lake region in 205 per mile, which suggests that Worchester has less immediate shoreline habitat available.

Biological characteristics measured in Worchester (Wolf) Lake include those associated with lake productivity such as chlorophyll-a and trophic status. The concentration of chlorophyll-a in Worchester Lake was measured 14 August 2017 and is reported to be 3.38 ug/L (medium). The average chlorophyll-a concentration for nearby similar sized waterbodies is 5.6 ug/L which suggests that Worchester Lake has less nutrients for phytoplankton to utilize in the water. On 14 August 2017, the total phosphorus, Secchi depth, and chlorophyll-a values were reported to be 32.9 ug/L, 3.0 ft, and 3.4 ug/L, respectively (Average TSI = 52.5, eutrophic) which can be used to classify a lake's level of productivity (Fuller 2016).

The Shingleton and Seney areas are recreational destinations which offer outdoor activities (e.g., camping, fishing, hunting, ORVing, hiking, ice fishing, and snowshoeing). Worchester Lake has a significant proportion of the shoreline accessible via public access through either State of Michigan or through the Commercial Forest Land access program. The northern shore of Worchester Lake is largely held in private ownership. While there is no public boat launch on Worchester Lake, a two-track located on the east shore provides carry-in access.

Based upon the chemical, physical, and biological parameters measured, Worchester Lake is characterized as being a shallow, undeveloped, medium-sized eutrophic lake where accumulation of organic flocculent material may result in periodic natural fish kills. While the natural shoreline of Worchester Lake is largely intact, fish production is limited due to the depth of the lake.

History

Fisheries management of Worchester Lake has been limited but began during the early 1930s when Walleye, Bluegill, and Yellow Perch were stocked. It is unknown what the fish community may have been comprised of prior to that time. No stocking has occurred in Worchester Lake since 1939, which is likely due to the poor return of those species stocked during the 1930s. The shoreline and bottom contours of Worchester Lake were mapped in 1937.

The Institute of Fisheries Research conducted a general biological inventory of Worchester Lake in 1959 and determined that Northern Pike and Yellow Perch were abundant. Angling reports during the 1950s and 1960s were consistent stating that Northern Pike were abundant but small, while Yellow

Perch and Bluegill fishing was often `good'. In 1959 specifically, anglers reported that large or `jumbo' Yellow Perch could be caught at times in Worchester Lake.

In 1977, the Michigan Department of Conservation (now the Michigan Department of Natural Resources or MI DNR) conducted a general assessment of Worchester Lake to gather fish community information. Two gill nets were set for a total of four net nights and a total of 35 fish were captured including twenty-five Northern Pike and ten Yellow Perch. Yellow Perch averaged 8.5 inches (range 6.0 to 16 inches) while Northern Pike captured averaged 15.5 inches (range 10 to 22 inches).

Fisheries management in Worchester Lake has historically been limited due to the shallow nature of the lake and likelihood that winter and summer fishkills occur often. Although no fishkill events have been documented researchers and managers have suspected that this lake experiences these events due to the shallow depth of the lake. These fishkill events are part of a natural process yet make long-term management of these shallow waterbodies difficult.

Current Status

A Status and Trends survey conducted in May of 2017 was used to determine the current status of the Worchester Lake water quality, habitat and fishery. Fish community data were gathered from 22 May to 25 May 2017 using seine hauls, as well as small- and large-mesh fyke nets. Lake habitat data and water quality samples were collected 14 August 2017. Lake depth and access precluded the use of electrofishing or gill nets during this survey effort.

A total of 610 fish weighing 167.5 pounds were captured during the May 2017 Status and Trends survey which included 8 species (Table 1). The forage base of Worchester Lake included Blacknose Shiner, Fathead Minnow, Golden Shiner, Iowa Darter, and Northern Redbelly Dace which cumulatively constituted less than one percent of the total biomass captured.

A total of 91 Northern Pike averaging 19.9 inches comprised 14.9 percent of the catch by number and more than 99 percent of the catch by biomass (Table 1). Northern Pike sized ranged from 9.0 to 28.0 inches in total length and 3.0 percent of the total catch met the minimum size for harvest (i.e., greater than or equal to 24 inches). Age analysis indicated that Northern Pike are growing more than 3.0 inches below state average. Additionally, the average total length for ages 3-, 4- and 5-year-old Northern Pike is below the State of Michigan 25th percentile for each age group. All Northern Pike were captured in large mesh fyke nets. The catch per unit effort (CPUE) for Northern Pike captured in large mesh fyke nets in Worchester Lake is 7.6 fish per net night. Field notes from this survey indicate that cannibalism among Northern Pike was observed.

A total of 8 Yellow Perch averaging 4.5 inches comprised 1.3 percent of the catch by number and less than one percent of the catch by biomass. Yellow Perch sized ranged from 2.0 to 6.0 inches and there were zero fish that met the minimum preferred size for harvest (i.e., greater than or equal to six inches). Capture rates of Yellow Perch in large and small mesh fyke nets were 0.17 and 1.5 fish per net night, respectively.

Analysis and Discussion

Worchester Lake remains a medium-sized, shallow, eutrophic lake with an undeveloped shoreline which contains fish species typical of inland lakes in northern Michigan. Chemical (e.g., alkalinity) and biological parameters measure suggest that biological oxygen demand in Worchester Lake is high and likely results in periodic fish kills. Physical parameters measured (e.g., development) indicate that the Worchester Lake shoreline is largely intact. These habitat parameters may be characteristic of a remote headwater lake which serve as a nutrient source to nearby creeks and streams (i.e., Marsh Creek).

Species richness, the number of fish species in a lake, of Worchester Lake is typical of lakes which occur in the northern region of the state (Wehrly et al. 2015). There were no fish captured which are listed as Species of Greatest Conservation Need and there were no threatened or endangered species captured.

The Northern Pike population in Worchester Lake is slow-growing and high density. Michigan's Northern Pike Management Plan can be used to evaluate populations and guide managers towards regulation changes that may in turn improve density and size structure of a population (Smith et al. 2016). For example, a population of Northern Pike is determined to be slow growing when Age 3-, 4-, and 5-year-old fish are growing below the State's 25th percentile. Additionally, a population of Northern Pike is determined to be high-density when CPUE values for fyke net catches exceeds the State's 75th percentile. Based on the results of this survey, Worchester Lake is determined to have a slow growing, high density Northern Pike population where only three percent of the fish captured were legal size (i.e., 24 inches or greater). Therefore, a regulation change which serves to reduce over abundance, improve growth rate, while maximizing sustainable harvest would improve conditions for the Northern Pike population in Worchester Lake.

Yellow Perch capture rates in 1977 and creel data from the 1950s and 1960s suggest that Worchester Lake once provided a small attractive fishery for anglers. In 1977, average and maximum size of Yellow Perch far exceeded the sizes of fish captured during the 2017 survey. Given that Northern Pike currently comprise more than 99 percent of the total biomass, Yellow Perch may not survive long enough to reach historical sizes before they are preyed upon.

Current (2017) capture rates in large and small mesh fyke nets suggest that Worchester Lake Yellow Perch are also less abundant compared to other medium sized shallow waterbodies in the region. For example, medium size shallow waterbodies typically have capture rates more than four times higher compared to Worchester Lake. Therefore, a change in regulation which increases harvest of Northern Pike may in turn benefit Yellow Perch due to an increase in survival. Angler harvest may also explain the size and low abundance of Yellow Perch in Worchester Lake, however there are no recent angler reports that would support that harvest might be impacting the population.

Management Direction

Worchester Lake should be managed to provide a multi-season fishery for Northern Pike and Yellow Perch similar to that which existed during the 1950s and 1960s. Regulation changes for Northern Pike should serve to reduce the biomass of a top predator while improving size structure. A reduction in biomass of Northern Pike should also provide greater opportunity for Yellow Perch to reach a preferred as well as memorable or jumbo size.

1). The current regulation for Northern Pike in Worchester Lake is 24-inch minimum size limit, with a possession limit of 2 fish. This regulation should be changed to the "No minimum size limit with a possession limit of five fish (only 1 over 24 inches allowed). This regulation will allow anglers to take advantage of an abundance of slow growing undersized pike, while potentially reducing over abundance and improving population growth rates.

2).　A follow up spring survey using small and large mesh fyke nets should be conducted approximately 6 to 10 years following the Northern Pike regulation change.

References

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Table 1. Species, number (N) captured, weight (WGT), percent by WGT, total length (TL) range, average total length (TL) and percent legal sized fish captured during 2017 Status and Trends survey Worchester Lake, Schoolcraft County.

Species	N	WGT (lbs.)	% by WGT (lbs.)	TL Range	AVG TL	% Legal Size
Blacknose Shiner	183	0.3	0.2	0.0 to 2.0	1.8	100
Fathead Minnow	317	0.6	0.4	0.0 to 2.0	1.6	100
Golden Shiner	4	0.0	0.0	2.0 to 3.0	3.0	100
Iowa Darter	2	0.0	0.0	1.0 to 1.0	1.5	100
Northern Pike	91	166.0	99.1	9.0 to 28.0	19.9	3.0
Northern Redbelly Dace	1	0.0	0.0	1.0 to 1.0	1.5	100
Pumpkinseed	4	0.1	0.0	1.0 to 3.0	2.5	0.0
Yellow Perch	8	0.4	0.2	2.0 to 6.0	4.5	0.0

Cusino
Lake

Wolf Lake Rd

Worchester
(Wolf)
Lake

Wolf Lake Rd

Marsh Creek

N

N
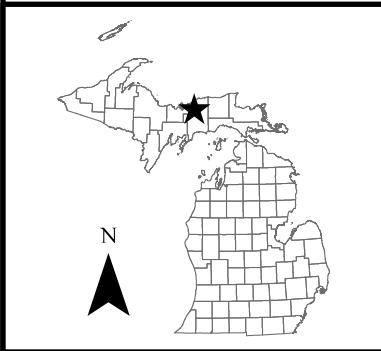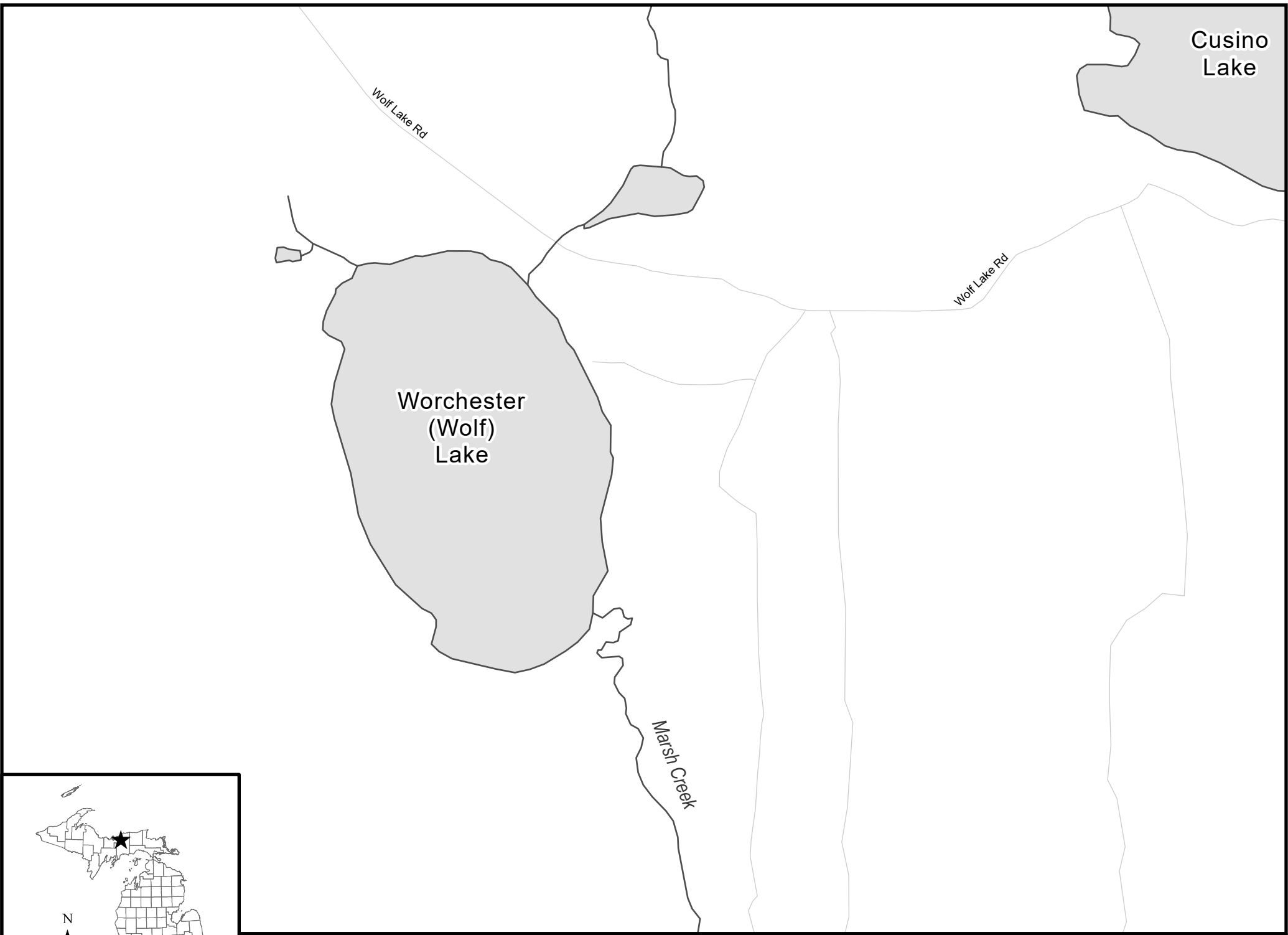
Mapped by Michigan DNR
9/23/2019

0   0.25   0.5 Miles