Birch Lake

Antrim County, T29N/R9W
Last surveyed 2021

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Environment

Birch Lake is a 326-acre lake (Figure 1.) located in southern Antrim County, near the town of Kewadin in Milton Township. Birch Lake is situated near Lake Michigan just north of Elk Lake, and close to Torch Lake (Figure 2). The surrounding topography is fairly flat and wooded with mostly sandy soils, which are likely remnant dune sands. There are no inlets to Birch Lake, but there is one small unnamed outlet that connects Birch Lake to Lake Michigan. Birch Lake is moderately developed with homes and cottages, though much of the surrounding shoreline has been left unarmored. Aquatic vegetation (Potamogeton spp.) is present in limited amounts on the north end of the lake. A few scattered reed beds can be found on the south end. The littoral nearshore areas of the lake are predominately sandy, particularly in 1 to 10 feet of water. The inshore shoal areas are comprised of 75% sand and 25% fine gravel (Kalish 2004). The substrate beyond the littoral zone is made of organic material or an organic and marl combination. The lake reaches a maximum depth of approximately 50 feet.

There is one public boat launch on the northeastern shore of Birch Lake. The launch is unpaved with a single skid pier, and the access site has one vault toilet and parking for up to five vehicles and trailers. This facility is owned by the State of Michigan and is located off Birch Lake Road, a recreation passport is required for access.

There is one lake association, the Birch Lake Association (BLA), which is very active within the Birch Lake watershed. The BLA has been instrumental in protecting critical spawning marshes, installing a sanitary sewer system, and conducting water quality monitoring over the years.

History

Stocking
The first documented fish stocking on Birch Lake occurred in 1909, when 3,000 fingerling Largemouth Bass were stocked by the Michigan Department of Conservation (precursor to today's Michigan Department of Natural Resources) (Table 1). No additional fish were stocked until 1934, and over the course of the subsequent decade various life-stages of Smallmouth Bass, Bluegill, and Yellow Perch were added to the lake.

In more recent history, only Northern Pike and Walleye have been stocked into Birch Lake. Northern Pike fingerlings were stocked in 1980, 1981, 1985, 1986, and 1987. These pike stocking efforts were the result of a cooperative pike rearing marsh situated adjacent to the lake and operated in conjunction with property owners, the BLA, and the Elk Lake Sportsman's Club. Difficulties maintaining water levels plagued the effort, mainly due to a low water cycle in the Great Lakes region which began in the late 1980's. As a result, Northern Pike stocking ceased in Birch Lake, as did many of these types of rearing programs across the state.

Due to the interest in creating a recreational fishery, and because of concerns that the panfish populations in Birch Lake were becoming stunted, a Walleye stocking program was implemented. Spring fingerling Walleye were first stocked into Birch Lake in 1998, and then more were stocked in 1999 and 2001.

Research

In 1931 a Yellow Perch tagging study was conducted on Birch Lake (Hubbs 1932). Yellow Perch were collected by seine at Elk Rapids, tagged, then released into Birch Lake. A total of 2,000 Yellow Perch were released: 1,000 on the south end of the lake near Kewadin, and 1,000 in the northwest bay of the lake near the roadside park. In the study, plans were made for the local Conservation Officer to post signage to alert anglers to the tagged fish, and for the officer to collect any tagged fish data that he might encounter while checking anglers. The study plan also included an effort to net and seine fish in the summer of 1932. It is unclear what the results of this effort may have been, as no data or analysis was included in the 1932 report.

In August of 1982, the MDNR Water Quality Division (precursor to today's Department of Environment, Great Lakes, and Energy (EGLE)) conducted a water chemistry survey on Birch Lake. Measurements were collected in five-foot intervals starting at the surface and ending in 50 feet of water. According to the report (Kenaga 1982), the temperature data revealed a strong thermocline between 29 feet9 and 32 feet10 meters, and the lake was nearly devoid of oxygen below the thermocline (0.1 mg/l). Collectively, total surface phosphorous (9 ug/l), chlorophyll a (2.8 ug/l), and secchi disk readings (11 feet3.38 m) were used to calculate a trophic state index (TSI), classifying Birch Lake as a low mesotrophic lake.

Surveys

MDNR Fisheries Division first surveyed Birch Lake in May of 1962, and again in May of 1963 with seines to evaluate the fish community. Bluegill and Yellow Perch were the most abundant species collected and were growing slightly below State average. The age class distribution was also disproportionally skewed towards small younger fish during both surveys. Only three-year classes of Bluegill were collected, and only one year class of Yellow Perch was collected in 1962. In 1963, five-year classes of Bluegills (90% were Age-2 or -3) were collected and two-year classes of Yellow Perch were collected. Ninety-one percent of the Bluegills (1,517 collected) and 100% of the perch (1,531) collected in 1963 were six inches in length or less. Largemouth and Smallmouth Bass were growing above State average in both survey years, with fair recruitment. Ninety-two percent of Largemouth Bass collected and 72% of Smallmouth Bass collected in 1963 were of legal size (12 inches). Very few Northern Pike (15 in 1962 and 17 in 1963) were collected in the survey, and the ones that were collected were growing nearly 3 inches below State average.

Fisheries Division surveyed Birch Lake again in October of 1976 with trap and gill nets to evaluate the fish community. In this survey Yellow Perch were the most abundant species collected by number and had an 8.3-inch average length collectively. Their growth averaged 2.1 inches above State average, and eight-year classes were collected. The other species collected (in decreasing order of abundance by number) were Northern Pike (18.4-inch average length), Rock Bass (6.7-inch average length), Bluegill (5.8-inch average length), and Pumpkinseed Sunfish (6.3-inch average length). All these species exhibited above average growth in comparison to the State averages. Minimal numbers of Bluegills, Pumpkinseed, and Rock Bass were collected.

Fisheries Division surveyed Birch Lake twice in 1977 (May 18-20 and Oct. 26-28) with trap and gill nets to evaluate the fish community. The number of Bluegill and Pumpkinseed collected was low (eight in Oct. and 36 in May) compared to other species, so data on recruitment and growth was limited for Bluegill. However, 94% of the Bluegill and Pumpkinseed collected in May were larger than 6 inches. Largemouth Bass (14.4-inch average length) and Smallmouth Bass (13.9-inch average) comprised 33% of the total catch by weight in the May survey. Growth and recruitment of these species was determined to be excellent at the time. Northern Pike (18.8-inch average) and Yellow Perch (9.9-inch average) comprised the majority of the catch by number in the October survey. Six age classes were represented by both species. Other species collected in lower numbers in May and October were Rock Bass, White Sucker, Brown Bullhead, Longnose Gar, and Common Carp.

In February of 1989 a hook and line survey was conducted by Fisheries Division staff. Not much is known about the reasoning for the survey or the details surrounding it, however the crew collected one Northern Pike, and 23 Yellow Perch. The one pike collected was Age-2, and the perch were Ages 2-4 and collectively growing +0.2 inches above State average.

In late May and early June of 1996 Fisheries Division surveyed Birch Lake with trap, gill, and fyke nets in a general survey to evaluate the fish community. Fish collected included three Walleye (23-25 inches), five Largemouth Bass (17-19 inches), 11 Northern Pike (12-31 inches), 19 White Sucker (11-23 inches), 19 Steelhead (16-32 inches), 62 Bluegill (2-6 inches), 62 Pumpkinseeds (3-6 inches), 175 Rock Bass (2-8 inches), 77 Smallmouth Bass (3-20 inches), and 89 Yellow Perch (3-8 inches). Pumpkinseed, Rock Bass, and Yellow Perch were growing below State averages, but within acceptable ranges. Bluegill were growing 1.3 inches below State average, and Smallmouth Bass were growing 0.2 inches above State average. Only three Bluegill age-classes were collected, and 45% were Age-3. At the time it was observed that the Bluegill population was slow growing and could possibly be stunted.

In September of 2001 a Serns Index (Serns 1982) survey was conducted to evaluate the survival of the 2001 Walleye stocking effort. A Serns Index survey is conducted in the fall using an electrofishing boat to evaluate and estimate natural reproduction or stocking survival of Age -0 Walleye. In the 2001 survey, a total of 610 young of the year (yoy)Age-0 Walleye were collected at a rate of 203 fish per mile. Based on the size variations of the yoy Age-0 fish collected, it was determined that naturally reproduced Walleye were also present in the Walleye population.

In September of 2003 a second Serns index was conducted to evaluate natural reproduction of Walleye in Birch Lake. No Walleye were stocked in Birch Lake in 2003, yet 20 yoy Age-0 Walleye per mile were collected in the survey. According to the Serns Index less than 45 fingerling Walleye per mile indicates a poor year class, however for lakes in Michigan, year-class strength is considered poor if juvenile densities are lower than 11 ageAge-0 fish per acre (Ziegler and Schneider 2000).

A general survey aimed at evaluating the fish community in Birch Lake was conducted in May of 2004. This survey used trap nets, inland gill nets, fyke nets, and nighttime electrofishing to collect information. Species collected included Black Crappie, Black Bullhead, Bluegill, Bluntnose Minnow, Brown Bullhead, Common Shiner, White Sucker, Emerald Shiner, Largemouth Bass, Longnose Gar, Northern Pike, Pumpkinseed, Rock Bass, Smallmouth Bass, Yellow Perch, and Walleye. A total of 132 Walleye ranging in size from 3.3 to 20.3 inches in length and representing Ages 1-6 were collected.

In November of 2012, a Serns Index survey was once again conducted. It was conducted in similar fashion to the 2001 and 2003 surveys. The entire shoreline was sampled using a boom electrofishing unit. Shocking occurred after dark, and all fish collected were released. A total of 15 scale samples were collected from Walleye ranging in size from 6 to 22 inches. The Serns calculations showed a catch rate of 1.39 Walleye per mile of shoreline sampled, a year class strength estimate of 106.0 Walleye, and a Sern's Index of 0.325 Walleye per surface acre.

In November of 2017, another Serns Index survey was performed. It was conducted in an identical manner as the 2012 survey. The entire shoreline was sampled using a boom electrofishing unit. Shocking occurred after dark and covered approximately 2.88 miles of shoreline. During the survey stunned fish were collected from the front of the boat using long handled dip nets. Fish were kept in the boat's live-well until the end of the survey when they were identified, measured, and recorded. Scale and spine samples were collected from Walleye only. All fish collected (86 total Walleye) were released. A total of 76 scale and spine samples were collected from Walleye ranging in size from 4 to 19 inches.

The most recent Serns Index survey was conducted in November of 2020 (Table 2). The entire shoreline was sampled using a boom electrofishing unit. Shocking occurred after dark and covered approximately 2.88 miles of shoreline. During the survey stunned fish were collected from the front of the boat using long handled dip nets. Fish were kept in the boats live-well until the end of the survey when they were identified, measured, and recorded. Scale and spine samples were collected from Walleye only. All fish collected (146 total Walleye) were released. A total of 62 scale and spine samples were collected from Walleye ranging in size from 3 to 16 inches.

For comparison, all of the historic Serns Index survey estimates can be found in Table 3.

Current Status

In May and June of 2021 Fisheries Division surveyed Birch Lake with trap net, experimental gill nets, large mesh fyke nets, small mesh fyke nets, seines, and an electrofishing boat in a discretionary survey to evaluate the fish community, with an emphasis on Walleye. From May 17 to May 21 fish were collected using one small mesh fyke nets set for three net nights, two experimental gill nets set for three net nights each, two trap nets set for four net nights each, and four large mesh fyke nets set for four net nights each. On June 14 two beach seine hauls were conducted, and the entire shoreline (2.82 miles) was sampled using a boom electrofishing boat. On August 18 and 19 a temperature and oxygen profile was created in the deepest basin of the lake (50.0 feet), and shoreline sampling which includes the counting of small docks (113), homes/cabins (136), submerged wood (60), and percentage of shoreline armoring (41% average), was completed.

Analysis and Discussion

During the 2021 survey a total of 755 fish representing 13 species were collected (Table 4). Game species that were observed during the survey included Northern Pike, Rainbow Trout (Steelhead), Rock Bass, Smallmouth Bass, Walleye, and Yellow Perch. Only the larger (23 inch) Rainbow Trout was aged, the other four were less than 12 inches and clearly juvenile fish. The trout was Age-4 (Table 5), and most likely entered the lake through its outlet looking to spawn in the spring. A total of 20 Northern Pike were aged, representing year classes from Ages 1-5, -7, and -8, collectively growing at 2.0 inches above State average. Smallmouth Bass also were found to be growing above average (+1.4 inches) and were

represented by Ages 1-10. Yellow Perch Ages 1-4 were found to be growing at 1.2 inches above average based on 28 fish that were aged. Overall, the game species collected from Birch Lake exhibited good numbers and above average growth rates.

Walleye are a heavily targeted fish in Birch Lake, so recent survey efforts have centered around gaining a better understanding of natural reproduction that occurs in the lake. Seventy-one of the Walleye collected during the 2021 discretionary survey had scales or spines collected for aging. Of those, 26 were Age-1, eight were Age-2, seven were Age-3, seven were Age-4, 14 were Age-5, four were Age-6, and one was Age-7. These fish were found to be growing at 0.3 inches below the State average length at age. Additionally, 62 Walleye collected during the 2020 Serns Index survey were also aged. Of those, 38 were Age-0, eight were Age-1, eight were Age-2, five were Age-3, and three were Age-5. These fish were found to be growing at 1.8 inches below the State average. Overall, the Walleye in Birch Lake are growing well, despite being below the State average. Generally, most naturally reproducing walleye lakes in northern Michigan see growth rates significantly below the State average, so to have growth rates near the State average for Birch Lake is considered good.

Serns Index surveys (Serns 1982) are designed to target Age-0 and Age-1 Walleye. Collecting 38 Age-0 Walleye in the 2020 survey and several other year classes of adult Walleye in both the 2020 and 2021 surveys indicates some natural reproduction is occurring in Birch Lake. The Serns calculations showed a catch rate of 13.19 Walleye per mile of shoreline sampled, a year class strength estimate of 1,006.5 Walleye, and a Sern's Index of 3.09 Walleye per surface acre. While Sern's Indices are good ways to assess the potential size of Walleye year classes the model should be used with caution due to the differences in water chemistry and lake morphology between Michigan lakes and the Wisconsin lakes used to create the model (Ziegler and Schneider 2000). For example, the Sern's model in the 2020 survey considers Walleye reproduction to be poor (3.09/surface acre), adjusted for Michigan lakes these results may be average or above average. Even while taking this into consideration, the natural reproduction of Walleye in Birch Lake should continue to be monitored as there can be significant angling pressure on the lake at times.

The results of the 2012 and 2003 Serns Index surveys were much lower than those of the 2001 survey. The collection of 610 Age-0 Walleye in 2001 is directly attributed to a mixture of both stocking and natural reproduction, while Age-0 Walleye collected in the 2003, 2012, 2017, and 2020 Serns Index surveys are solely indicative of natural reproduction. While these surveys support the fact that natural reproduction is occurring in Birch Lake, additional Serns surveys should be completed to develop a better long-term idea of the consistency of natural reproduction. Once this is established, a data informed decision on whether or not to supplement the Walleye fishery through stocking can be made.

Management Direction

A Serns Index electroshocking survey should be conducted every second or third year in the fall to monitor natural reproduction and walleye year-class strength. Serns surveys are relatively low effort sampling events, and the use of these surveys will allow Fisheries Division to monitor the Walleye population in Birch Lake, determine natural reproduction levels, and to determine whether or not to resume a stocking program.

Fisheries Division staff should continue to work with local anglers and the Birch Lake Association to collect observational data on the fishery in Birch Lake.

While Birch Lake is only moderately developed along its shoreline, efforts should be made to protect remaining riparian wetlands from development in order to maintain the healthy aquatic ecosystem that currently exists. This can be achieved by reviewing Department of Environment, Great Lakes, and Energy (EGLE) permit applications and working with the Birch Lake Association.

A comprehensive fisheries survey should be conducted again on Birch Lake within the next ten years in order to assess the fish community as a whole.

References

Hubbs, Carl L. 1932. Perch tagging experiment in Birch Lake, Antrim County. Institute for Fisheries Research Report No. 154, Ann Arbor.

Kalish, Todd. 2004. Inland lake survey: Birch Lake, 2004. Michigan Department of Natural Resources, Traverse City.

Kenaga, David. 1982. A survey of the water chemistry of Birch Lake, Antrim County. Michigan Department of Natural Resources, Water Quality Division.

Serns, S. L. 1982. Relationship of Walleye fingerling density and electrofishing catch per effort in northern Wisconsin lakes. North American Journal of Fisheries Management 2:38-44. Wehrly, K. E., D. B. Hayes, and T. C. Wills. 2010. Status and Trends of Michigan Inland Lake Resources 2002-2007. Michigan Department of Natural Resources and Environment Special Report. Ann Arbor.

Ziegler, W. and J.C. Schneider. 2000. Guidelines for evaluating Walleye and muskie recruitment. Chapter 23 in Schneider, James C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

Table 1. Historic fish stocking in Birch Lake, Antrim County, 1909-present.

Year	Species	Number	Life Stage/Size
1909	Largemouth Bass	3,000	Fingerling
1934	Smallmouth Bass	300	4 months
	Bluegill	2,000	4 months
1935	Yellow Perch	125,000	6 months
	Bluegill	1,000	4 months
1936	Smallmouth Bass	800	5 months
1937	Smallmouth Bass	3,862	Adults
	Bluegill	5,000	3 months
1938	Smallmouth Bass	237	Adults
	Yellow Perch	20,000	6 months
	Bluegill	9,000	5 months
1939	Smallmouth Bass	85	Adults
	Bluegill	30,000	3 months
1940	Smallmouth Bass	196	Adults
	Bluegill	1,000	Yearlings
1941	Smallmouth Bass	127	Adults
	Bluegill	4,900	4 months
1942	Bluegill	2,500	4 months
1980	Northern Pike	5,000	3.23"
1985	Northern Pike	10,000	2.48"
1986	Northern Pike	27,000	2.48"
1987	Northern Pike	5,000	2.01"
1998	Walleye	27,500	1.18"
1999	Walleye	26,500	0.98"
2001	Walleye	25,230	1.57"

Table 2. 2020 Birch Lake Serns Index survey results.

			Miles of shoreline sampled:	2.88	
			Birch Lake acreage:	326	
			Serns Age-0 constant:	0.234	
			Serns Age-1 constant:	0.194	
Year Class	Age	# Walleye captured	Catch Rate (# Walleye/mile of shoreline sampled)	Year Class strength estimate	Serns Index (# Walleye/surface acre)
2020	0	38	13.19	1006.53	3.09
2019	1	8	2.78	211.90	0.65
2018	2	8	…	…	…
2017	3	5	…	…	…
2015	5	3	…	…	…

**No Serns constants exist for Walleye over Age 2

Table 3. Comparison of Birch Lake Serns Index survey data.

	# Walleye captured	Catch Rate (# walleye/mile of shoreline sampled)	Year Class strength estimate	Serns Index (# walleye/surface acre)
2001				
Age- 0	610	203.33	1,551.10	47.58
Age-1	0			
2003				
Age- 0	24	8.54	651.54	2.00
Age-1	14	4.98	380	1.16
2012				
Age- 0	4	1.39	106	0.325
Age-1				
2017				
Age- 0	27	9.38	715.16	2.19
Age-1	13	4.51	203.62	0.87
2020				
Age- 0	38	13.19	1,006.53	3.09
Age-1	8	2.78	211.90	0.65

Table 4. Number, weight, and length of fish collected from Birch Lake with large mesh fyke nets, seines, trap nets, inland gillnets, and electrofishing in May and June of 2021.

Species	Number	Percent by number	Weight (Pounds)	Percent by weight	Length range (inches)
Bluntnose Minnow	56	7.40%	0.3	0.10%	1-3
Brown Bullhead	3	0.40%	4.4	0.90%	14-15
White Sucker	4	0.50%	2.5	0.50%	1-18
Longnose Gar	7	0.90%	21.6	4.50%	20-36
Mimic Shiner	195	25.80%	1	0.20%	2-3
Central Mudminnow	1	0.10%	0	0.00%	2
Northern Pike	19	2.50%	54.1	11.40%	13-38
Rainbow Trout	5	0.70%	6.2	1.30%	8-23
Rock Bass	212	28.10%	163.9	34.50%	1-12
Sand Shiner	1	0.10%	0	0.00%	2
Smallmouth Bass	61	8.10%	148.5	31.30%	3-20
Walleye	129	17.10%	67.6	14.20%	4-21
Yellow Perch	62	8.20%	4.5	1.00%	3-12
Total	755	100.00%	474.6	100%	

Table 5. Average total weighted (inches) at age, and growth relative to the state average, for fish sampled from Birch Lake in 2021. Number of fish aged is given in parenthesis. A minimum of five fish per age group is statistically necessary for calculating a Mean Growth Index, which is a comparison to the State of Michigan average.

	Age										
Species	1	2	3	4	5	6	7	8	9	10	Mean Growth Index
Northern Pike	14.94 (5)	18.36 (5)	19.65 (2)	23.25 (2)	24.25 (2)		29.70 (1)	35.95 (2)			+2.0
Rainbow Trout				23.80 (1)							N/A
Smallmouth Bass	3.93 (4)	9.66 (5)	12.0 (3)	13.60 (2)	15.65 (2)	16.71 (9)	17.74 (12)	18.40 (8)	19.18 (5)	19.70 (2)	+1.4
Walleye	5.23 (26)	11.30 (8)	14.46 (7)	15.55 (14)	16.63 (11)	18.38 (4)	21.00 (1)				-0.3
Yellow Perch	4.45 (21)	8.20 (2)	8.85 (4)	12.40 (1)							+1.2

Figure 1. Contour map of Birch Lake, Antrim County.

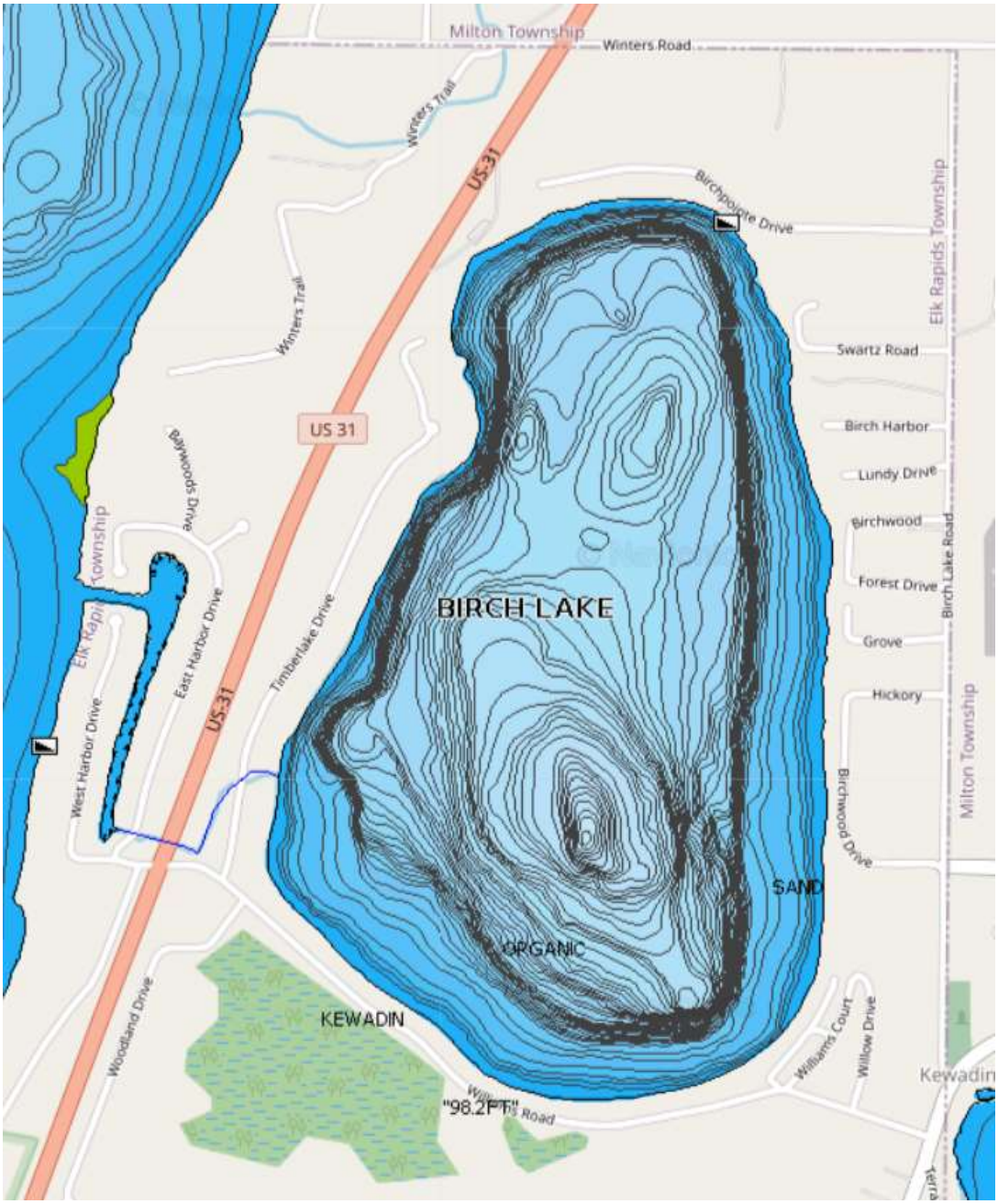
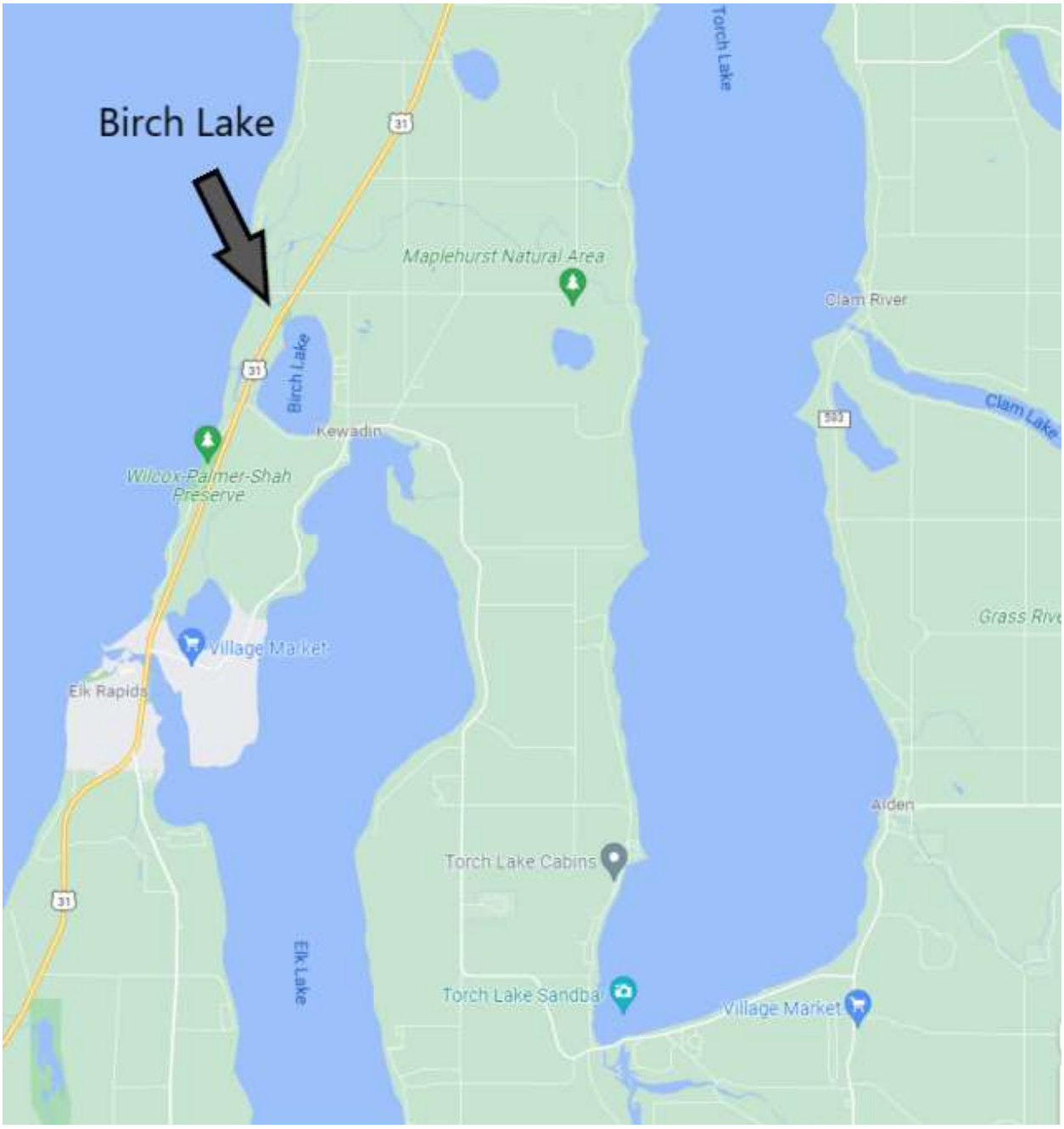


Figure 2. Location of Birch Lake, in proximity to Elk Rapids and Elk Lake.



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