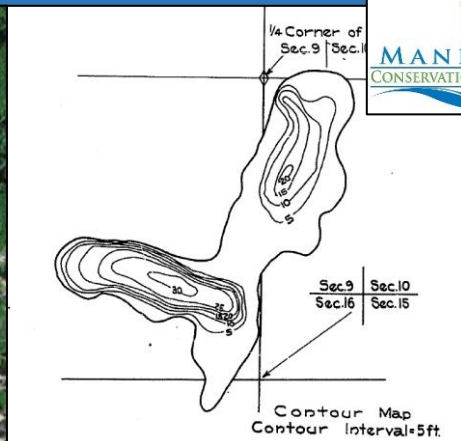
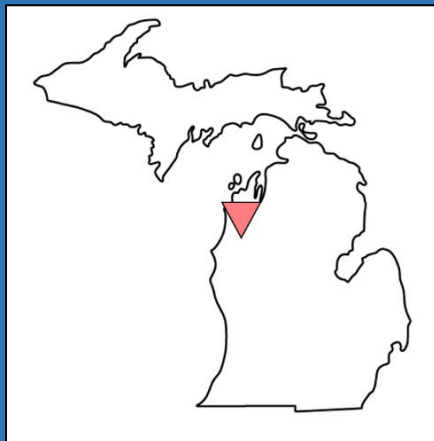
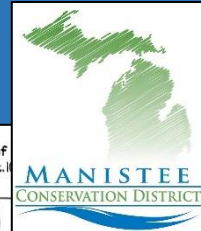


Elbow Lake

Water Quality Report – 2017



Michigan DNR bathymetric map

Overview:

Elbow Lake is located in the northwest portion of Michigan's Lower Peninsula, within the Manistee National Forest. It has a maximum depth of 30 feet and has a surface area of 46 acres. The land surrounding Elbow Lake is dominated by mixed hardwoods and cedar and the soil consists of mucky sand. Great Lakes Restoration Initiative funding was provided by the US Forest Service to complete this project. All data was collected using the Michigan Clean Water Corps' Cooperative Lakes Monitoring Program which enables citizen volunteers to monitor the health of their lakes. To learn more about the CLMP program or any of the water quality parameters used in this report, visit <https://micorps.net/lake-monitoring/>

We need your help. Collecting consistent data year after year is critical to ensuring the long-term health of Elbow Lake. We need the help of local volunteers to keep this monitoring going. To become a volunteer, contact the Manistee Conservation District 231-889-9666 or Chris Riley (USFS) 231-723-2211 x3122

Parameters:

Secchi Transparency refers to the depth to which a black and white Secchi disk can be seen in the lake water. Water clarity is affected by two primary factors, algae and suspended particulate matter.

Chlorophyll-a is the most dominant chlorophyll pigment in algae and is often used as a direct estimate of algal mass.

Phosphorus is an essential plant nutrient and most often controls aquatic plant growth. It is found in fertilizers, animal waste, and yard waste.

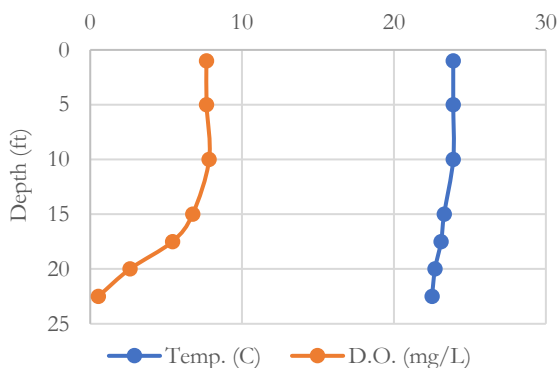
Dissolved Oxygen (DO) is the dissolved gaseous form of oxygen. It is essential for respiration of fish and other organisms. In general, a minimum of 7 mg/L is required to support cold-water fish and 5 mg/L is needed for warm-water fish.

Carlson TSI Score uses summer measurements of secchi transparency, total phosphorus, and chlorophyll-a to assign a trophic state index value to a lake. Values range from 0-100.

Summer 2017 Water Quality Results:

Parameter	# Readings	Min	Max	Average	St. Dev	Carlson TSI
Secchi Disk Transparency (feet)	9	10	17	13.9	2.1	39
Chlorophyll-a (parts per billion)	5	1	3	1.7	1.1	36
Spring Total Phosphorus (parts per billion)	1	3	3	3.0	NA	NA
Summer Total Phosphorus (parts per billion)	1	8	8	8.0	NA	34

Dissolved Oxygen/Temperature



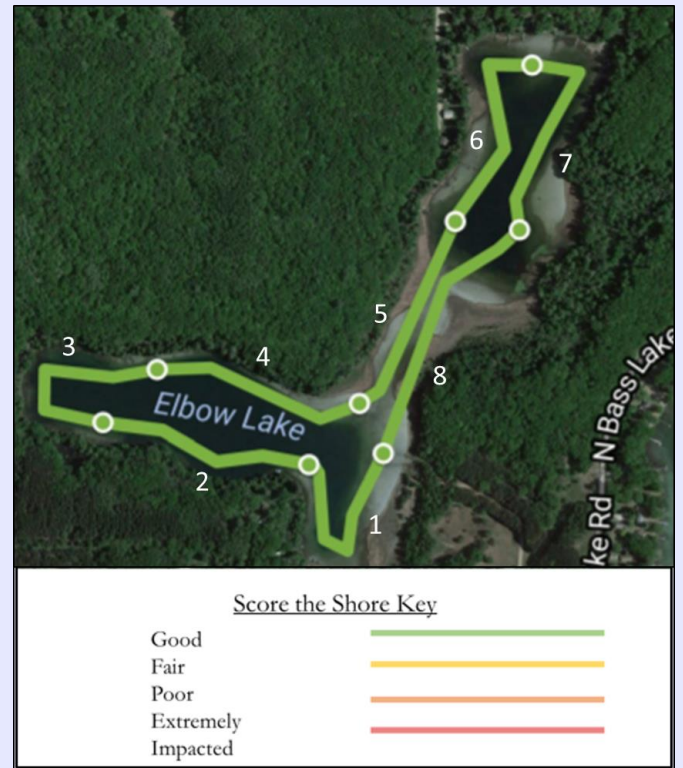
Summary:

With an **average TSI score of 36** based on secchi transparency, chlorophyll-a, and summer total phosphorus, this lake is rated between the oligotrophic and mesotrophic classification. This lake leans slightly more oligo than meso. This classification is characterized by having low nutrient content, low levels of algae, and clear water with high quality. The low level of nutrients in the lake results in dissolved oxygen being available throughout most of the water column for the entire summer. Overall, water quality in Elbow Lake is good but long-term monitoring is necessary for establishing a baseline and investigating trends.

Score the Shore:

Shorelines are the primary habitat for many animals that live on or near a lake. Healthy shorelines are vital for preventing erosion, maintaining water quality, and slowing and filtering rain runoff. Shorelines are threatened by excessive development including construction of lawns, beaches, and sea walls. Using MiCorps' Score the Shore assessment, each 1000' section of the lake was rated based on three categories: littoral (aquatic) zone, riparian zone (land near shore), and shoreline erosion control practices. All eight of Elbow Lake's shoreline sections were rated as 'Good'. To learn more about shoreline health, visit <http://www.mishorelinepartnership.org/>

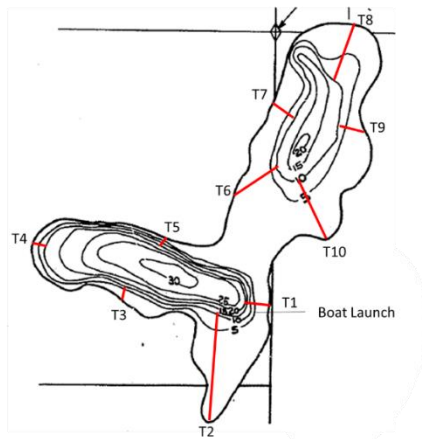
Section	Littoral Zone Score	Riparian Zone Score	Erosion Control Score	Overall Section Score	Section Rating
1	87	91	100	93	Good
2	81	100	100	94	Good
3	93	100	100	98	Good
4	87	100	100	96	Good
5	62	100	100	87	Good
6	81	73	100	85	Good
7	75	91	100	89	Good
8	87	100	100	96	Good



Aquatic Plant Mapping:

The 2017 Elbow Lake plant survey resulted in 10 native plant species and only one invasive species (non-native Phragmites; T5). Aquatic plants are an essential part of the lake and provide many services including holding sediments in place, reducing erosion and maintaining stability. They also provide habitat and food for many organisms. Overall, Elbow Lake supports a healthy community of native plant species and should be protected from new invasions of potentially harmful invasives.

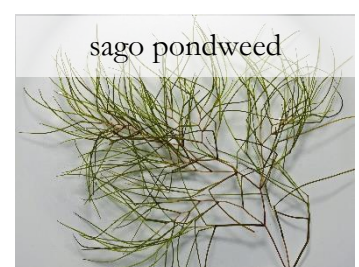
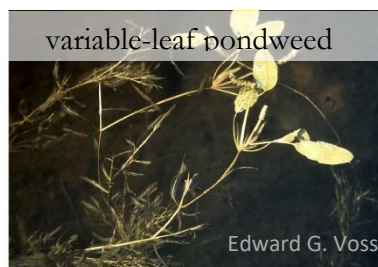
Learn more: michiganlakes.msue.msu.edu/uploads/files/WQ-55-1.pdf



Species	Density	Density Rating
chara	2.83	Moderate
naiad	2.17	Moderate
sago pondweed	1.10	Sparse
variable-leaf pondweed	0.63	Found
white water lily	0.53	Found
native milfoil	0.40	Found
cattail	0.40	Found
bulrush	0.20	Found
elodea	0.13	Found
swamp loosestrife	0.07	Found
non-native Phragmites	0.03	Found

Plant Density Rating

Density	Rating
4 - 5	Dense
3 - 4	Heavy
2 - 3	Moderate
1 - 2	Sparse
0 - 1	Found



Edward G. Voss