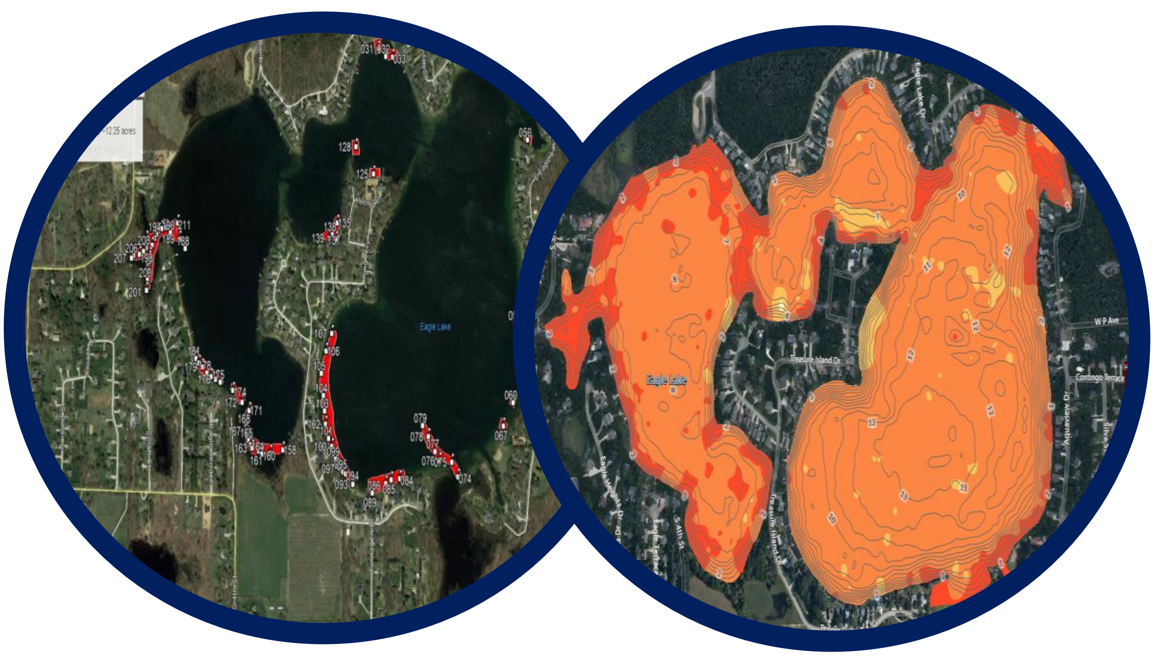
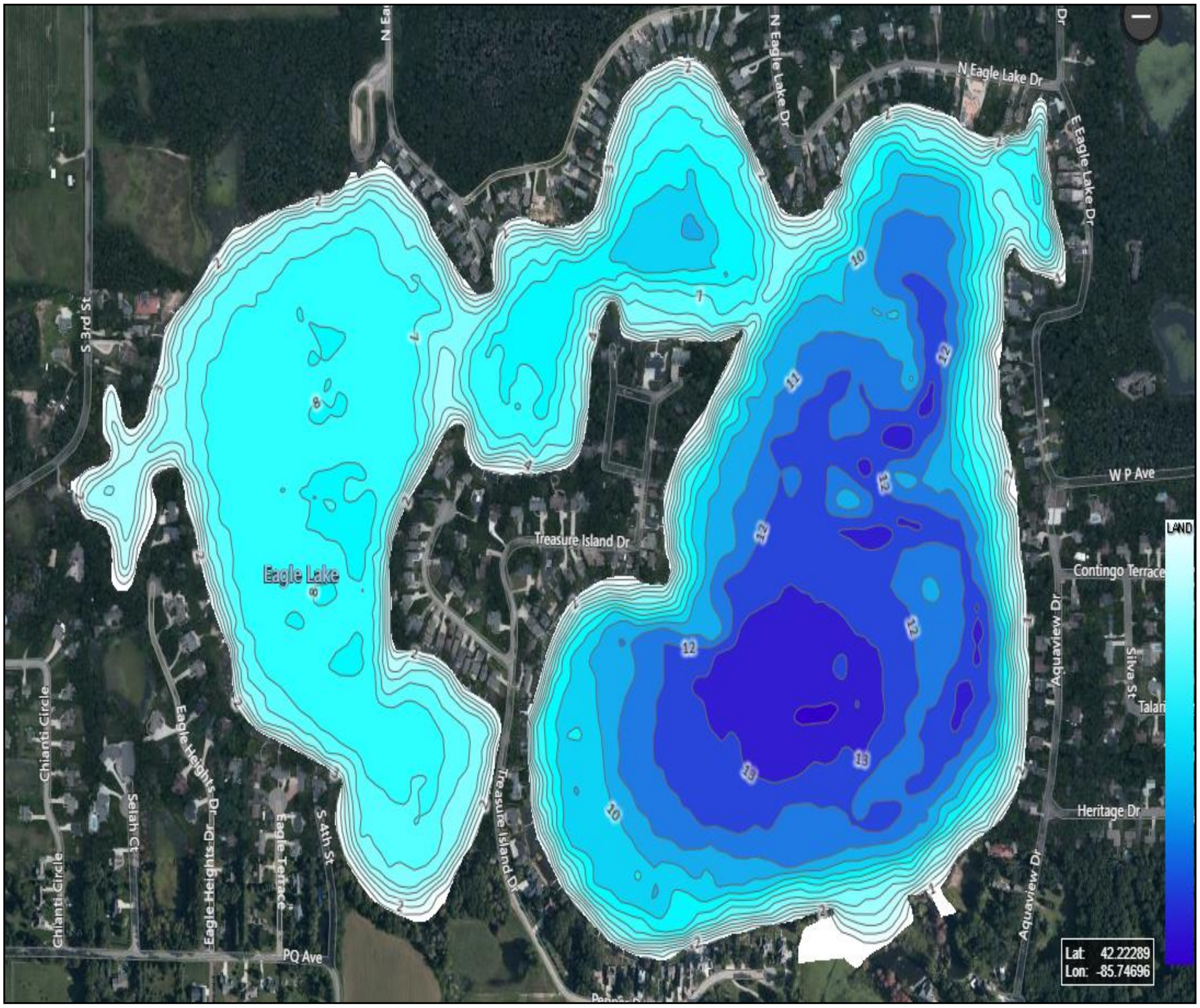
Eagle Lake “State of the Lake” (2020) Report & 2021 Management Recommendations



November 2020

Eagle Lake "State of the Lake" Report



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Section

1

Eagle Lake "State of the Lake" Summary

The following information is a summary of key lake findings collected during the spring and summer of 2020.

The overall condition of Eagle Lake is ranked in the top 25% of developed lakes of similar size in the state of Michigan. In 2020, the water clarity was between 6.5-9.0 feet which was slightly lower than in recent years, presumably due to increased nutrients and associated algal growth. Eagle Lake experienced some depletion of dissolved oxygen with depth during 2020 and this may have been due to warmer water temperatures which hold less oxygen.

Additionally, the lake nutrients (phosphorus and nitrogen) have increased in 2020 and thus support abundant submersed aquatic plant growth which required two large-scale treatments on June 9 and June 18, 2020. Abundant milfoil was noted late in the 2020 season and may require aggressive treatment in the spring of 2021.

Protection of the 27 native aquatic plant species is paramount for the health of the lake fishery and these plants should not be managed unless they are a nuisance to lakefront property owners and possess navigational and recreational hazards (i.e. nuisance dense pondweed growth).

RLS recommends continued operation of the LFA system to reduce the nutrients as they were in pre-flooding years. Also, continued use of bioaugmentation is recommended to further reduce organic muck. Lastly, RLS has issued a professional opinion on the potential impacts of lowered water levels for both Eagle and Crooked Lakes. That opinion is included below:

Aquatic vegetation assumes three distinct forms including submersed (below the water), floating-leaved (on the water), and emergent (above the water). The responses of individual aquatic plant species differ both within and among individual sites. Both Crooked and Eagle Lakes (Kalamazoo County, Michigan) have robust aquatic plant communities of all growth forms. Excess invasive aquatic vegetation and nuisance native aquatic vegetation are treated annually in both lakes to enhance recreational and navigational activities.

Aquatic plants have evolved to adapt to low-light conditions which limits their distribution underwater, especially in turbid lakes. The water clarity of both Eagle and Crooked Lakes is very high and thus continued robust growth could be expected even with a modest increase in lake water levels. A decline in water levels could lead to further growth; however, the nutrients in the lakes would be more limiting for growth than the light given the current transparency depths for each lake. Wilcox and Meeker (1991) cited less structural diversity in aquatic vegetation communities in lakes with regulated water levels. However, the current diversity in both lakes is high and thus is not likely to be reduced without major (> 5 foot) water level changes that would further reduce available light to lower-growing aquatic plant species. Both lakes have low total and non-volatile solids (TSS and NVSS) which have been shown to contribute to light attenuation (Havens, 2003) so a decline in submersed aquatic vegetation is unlikely. Floating-leaved plants such as lily pads are able to adjust growth readily near the water surface during high water periods and emergent aquatic plants common in wetland areas (i.e. such as cattails, bulrushes) are adaptable to rising or falling water levels since they can tolerate significant fluctuations in saturation. Thus, it is unlikely that a modest increase or decline in water level will have notable impacts on the aquatic plant communities of both Crooked and Eagle Lakes.

Literature Cited:

Havens, K.A. 2003. Submersed aquatic vegetation correlations with depth and light attenuating materials in a shallow subtropical lake. Hydrobiologia 493:173-186.

Wilcox, D.A., and J. E. Meeker. 1991. Disturbance effects on aquatic vegetation in regulated and unregulated lakes in northern Minnesota. Canadian Journal of Botany 69(7):1542-1551.

Section 2

Eagle Lake Water Quality Data (2020)

Water Quality Parameters Measured

There are hundreds of water quality parameters one can measure on an inland lake, but several are the most critical indicators of lake health. These parameters include water temperature (measured in °F), dissolved oxygen (measured in mg/L), pH (measured in standard units-SU), conductivity (measured in micro-Siemens per centimeter-µS/cm), total alkalinity or hardness (measured in mg of calcium carbonate per liter-mg $CaCO_3$/L), total dissolved solids (mg/L), secchi transparency (feet), total phosphorus and total nitrogen (both in µg/L), chlorophyll-*a* (in µg/L), and algal species composition. Water quality was measured in 6 locations of Eagle Lake in at mid-depth in 2020 to evaluate the overall water quality. Table 1 below demonstrates how lakes are classified based on key parameters. Eagle Lake would be considered eutrophic (relatively productive) since it does contain ample phosphorus, nitrogen, and aquatic vegetation growth and has good water clarity and moderate algal growth. General water quality classification criteria are defined in Table 1. 2020 water quality data for Eagle Lake is shown below in Tables 2-7. Water sampling locations can be found in Figure 3.

Lake Trophic Status	*Total Phosphorus ($mg\ L^{-1}$)*	*Chlorophyll-a ($\mu g\ L^{-1}$)*	*Secchi Transparency (feet)*
Oligotrophic	**< 0.010**	**< 2.2**	**> 15.0**
Mesotrophic	**0.010 – 0.020**	**2.2 – 6.0**	**7.5 – 15.0**
Eutrophic	**> 0.020**	**> 6.0**	**< 7.5**

Table 1. Lake trophic classification (MDNR).

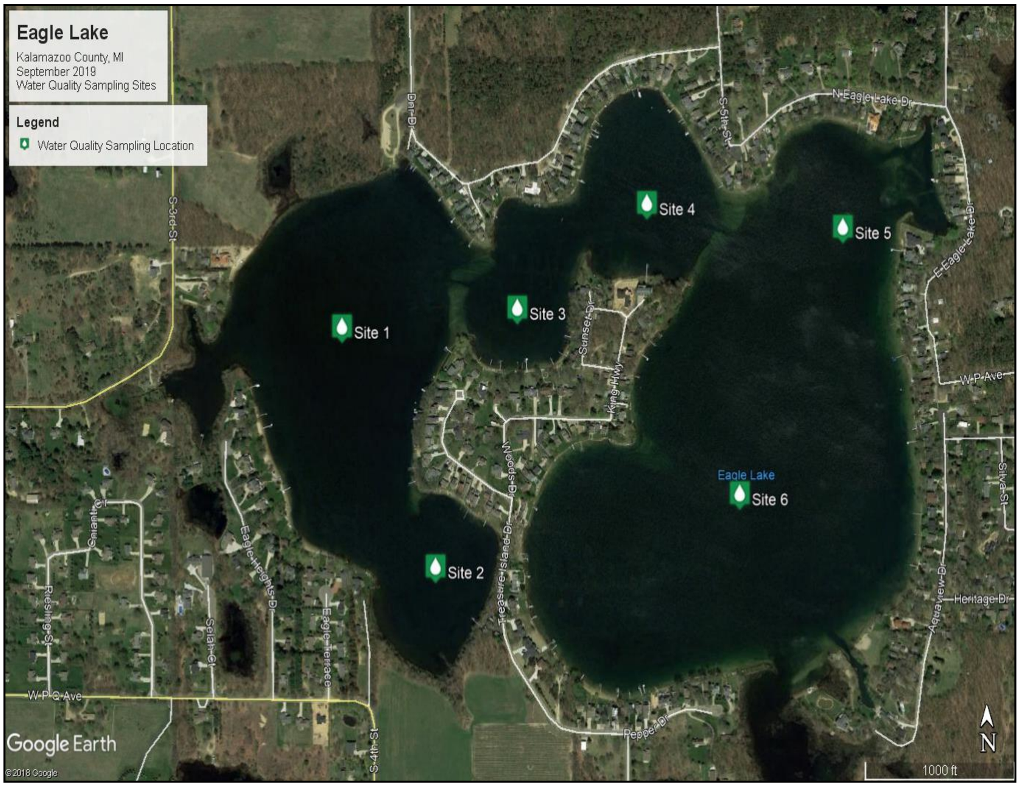

Figure 3. Eagle Lake water quality sampling location map (July 28, 2020).

Depth ft.	*Water Temp ºC*	*DO mg L^{-1}*	*pH S.U.*	*Cond. µS cm^{-1}*	*Turb. NTU*	*Total Kjeldahl Nitrogen mg L^{-1}*	*Total Alk. mgL^{-1} $CaCO_3$*	*Total Phos. mg L^{-1}*
0	27.2	8.3	8.1	200	2.2	--	80	--
9.0	27.0	7.0	8.0	197	2.9	0.8	81	0.023

Table 2. Eagle Lake water quality parameter data collected in Site #1 (July 28, 2020).

Depth ft.	*Water Temp ºC*	*DO mg L^{-1}*	*pH S.U.*	*Cond. µS cm^{-1}*	*Turb. NTU*	*Total Kjeldahl Nitrogen mg L^{-1}*	*Total Alk. mgL^{-1} $CaCO_3$*	*Total Phos. mg L^{-1}*
0	27.3	8.0	8.2	232	2.3	--	81	--
8.5	27.0	6.9	8.1	238	3.1	0.9	81	0.026

Table 3. Eagle Lake water quality parameter data collected in Site #2 (July 28, 2020).

Depth ft.	*Water Temp ºC*	*DO mg L^{-1}*	*pH S.U.*	*Cond. µS cm^{-1}*	*Turb. NTU*	*Total Kjeldahl Nitrogen mg L^{-1}*	*Total Alk. mgL^{-1} $CaCO_3$*	*Total Phos. mg L^{-1}*
0	28.0	8.3	8.1	240	1.9	--	83	--
10	27.9	6.1	8.1	238	3.3	0.9	81	0.025

Table 4. Eagle Lake water quality parameter data collected in Site #3 (July 28, 2020).

Depth ft.	*Water Temp ºC*	*DO mg L^{-1}*	*pH S.U.*	*Cond. µS cm^{-1}*	*Turb. NTU*	*Total Kjeldahl Nitrogen mg L^{-1}*	*Total Alk. mgL^{-1} $CaCO_3$*	*Total Phos. mg L^{-1}*
0	27.9	8.2	8.3	213	2.2	--	85	--
11	27.7	5.4	8.1	210	2.7	0.9	84	0.025

Table 5. Eagle Lake water quality parameter data collected in Site #4 (July 28, 2020).

Depth ft.	*Water Temp ºC*	*DO mg L^{-1}*	*pH S.U.*	*Cond. µS cm^{-1}*	*Turb. NTU*	*Total Kjeldahl Nitrogen mg L^{-1}*	*Total Alk. mgL^{-1} $CaCO_3$*	*Total Phos. mg L^{-1}*
0	27.9	7.4	8.5	197	1.5	--	83	--
12.5	20.4	4.5	8.5	195	3.8	0.9	83	0.018

Table 6. Eagle Lake water quality parameter data collected in Site #5 (July 28, 2020).

Depth ft.	*Water Temp ºC*	*DO mg L^{-1}*	*pH S.U.*	*Cond. µS cm^{-1}*	*Turb. NTU*	*Total Kjeldahl Nitrogen mg L^{-1}*	*Total Alk. mgL^{-1} $CaCO_3$*	*Total Phos. mg L^{-1}*
0	28.1	7.8	8.1	196	2.3	--	85	--
15.0	27.5	4.1	8.1	194	3.6	0.9	84	0.021

Table 7. Eagle Lake water quality parameter data collected in Site #6 (July 28, 2020).

Water Clarity (Transparency) Data

Elevated Secchi transparency readings allow for more aquatic plant and algae growth. The transparency throughout Eagle Lake was adequate (6-9.5 feet) to allow abundant growth of algae and aquatic plants in the majority of the littoral zone of the lake. Secchi transparency is variable and depends on the number of suspended particles in the water (often due to windy conditions of lake water mixing) and the amount of sunlight present at the time of measurement. Other parameters such as turbidity (measured in NTU's) and Total Dissolved Solids (measured in mg/L) are correlated with water clarity and show an increase as clarity decreases. The turbidity and total dissolved solids in Eagle Lake were higher in 2020 than in previous years at ≤3.8 NTU's and ≤120 mg/L, respectively during the July 28, 2020 sampling event which is lower than in 2019.

Total Phosphorus and Kjeldahl Nitrogen

Total phosphorus (TP) is a measure of the amount of phosphorus (P) present in the water column and was analyzed in a NELAC-certified laboratory using method EPA 200.7, Rev 4.4. Phosphorus is the primary nutrient necessary for abundant algae and aquatic plant growth. TP concentrations are usually higher at increased depths due to higher release rates of P from lake sediments under low oxygen (anoxic) conditions. Phosphorus may also be released from sediments as pH increases. Fortunately, even though the TP levels in Eagle Lake are moderate, the dissolved oxygen levels are good enough at the bottom to not cause release of phosphorus from the bottom. TP concentrations ranged between 0.018-0.026 mg L^{-1} from the surface to the bottom on July 28, 2020 for all sites, which was slightly higher than in 2019.

Total Kjeldahl nitrogen (TKN) is a measure of the amount of TKN present in the water column and was analyzed in a NELAC-certified laboratory using method EPA 351.2, Rev 2.0. Total Kjeldahl Nitrogen (TKN) is the sum of nitrate (NO_3^-), nitrite (NO_2^-), ammonia (NH_4^+), and organic nitrogen forms in freshwater systems. Much nitrogen (amino acids and proteins) also comprises the bulk of living organisms in an aquatic ecosystem. Nitrogen originates from atmospheric inputs (i.e. burning of fossil fuels), wastewater sources from developed areas (i.e. runoff from fertilized lawns), agricultural lands, septic systems, and from waterfowl droppings. It also enters lakes through groundwater or surface drainage, drainage from marshes and wetlands, or from precipitation (Wetzel, 2001). In lakes with an abundance of nitrogen (N: P > 15), phosphorus may be the limiting nutrient for phytoplankton and aquatic macrophyte growth. Alternatively, in lakes with low nitrogen concentrations (and relatively high phosphorus), the blue-green algae populations may increase due to the ability to fix nitrogen gas from atmospheric inputs. Lakes with a mean TKN value of 0.66 mg L^{-1} may be classified as oligotrophic, those with a mean TKN value of 0.75 mg L^{-1} may be classified as mesotrophic, and those with a mean TKN value greater than 1.88 mg L^{-1} may be classified as eutrophic. Eagle Lake contained moderately low consistent values for TKN at all sites (0.8-0.9 mg L^{-1}) which was slightly higher than in 2019.

Total Alkalinity

Total alkalinity is measured in mg L^{-1} of $CaCO_3$ and was analyzed with method SM 2320 B-11. Lakes with high alkalinity (> 150 mg L^{-1} of $CaCO_3$) are able to tolerate larger acid inputs with less change in water column pH. Many Michigan lakes contain high concentrations of $CaCO_3$ and are categorized as having "hard" water. Total alkalinity may change on a daily basis due to the re-suspension of sedimentary deposits in the water and respond to seasonal changes due to the cyclic turnover of the lake water. The alkalinity of Eagle Lake is moderate and indicates a lake that is neither hard nor soft water but may be considered in-between the two categories.

Total Dissolved Solids and Turbidity

Total dissolved solids (TDS) was measured in mg L^{-1} with a calibrated Eureka Manta II® multi-parameter sonde. Total dissolved solids (TDS) are the measure of the amount of dissolved organic and inorganic particles in the water column. Particles dissolved in the water column absorb heat from the sun and raise the water temperature and increase conductivity. Total dissolved solids are often measured with the use of a calibrated meter in mg L^{-1}. Spring values are usually higher due to increased watershed inputs from spring runoff and/or increased planktonic algal communities. The TDS ranged from 87-120 mg L^{-1} for the deep basins which is moderate for an inland lake and lower than in 2019.

Turbidity is a measure of the loss of water transparency due to the presence of suspended particles and was measured with a calibrated Lutron® turbidity meter in NTU's. The turbidity of water increases as the number of total suspended particles increases. Turbidity may be caused by erosion inputs, phytoplankton blooms, stormwater discharge, urban runoff, re-suspension of bottom sediments, and by large bottom-feeding fish such as carp. Particles suspended in the water column absorb heat from the sun and raise water temperatures. Since higher water temperatures generally hold less oxygen, shallow turbid waters are usually lower in dissolved oxygen. The World Health Organization (WHO) requires that drinking water be less than 5 NTU's; however, recreational waters may be significantly higher than that. The turbidity of Eagle Lake was higher in 2020 and ranged from 1.5-3.8 NTU's during the sampling event.

pH

pH is a measure of the acidity or basicity of waters and was measured in standard units (S.U.) with a calibrated Eureka Manta II® multi-parameter sonde. Most Michigan lakes have pH values that range from 6.5 to 9.5. Acidic lakes (pH < 7) are rare in Michigan and are most sensitive to inputs of acidic substances due to a low acid neutralizing capacity (ANC). Eagle Lake is considered "slightly basic" on the pH scale. The pH of Eagle Lake ranged from 8.0-8.5 S.U. which is ideal for an inland lake.

Specific Conductivity

Specific conductivity is a measure of the number of mineral ions present in the water, especially those of salts and other dissolved inorganic substances and was measured in micro-siemens per centimeter (µS/cm) with a calibrated Eureka Manta II multi-parameter sonde. Specific conductivity generally increases as the amount of dissolved minerals and salts in a lake increases, and also increases as water temperature increases. The specific conductivity values for Eagle Lake were quite low and ranged from 194-240 µS/cm. Severe water quality impairments do not occur until values exceed 800 µS/cm and are toxic to aquatic life around 1,000 µS/cm.

Chlorophyll-*a* and Algal Species Composition

Chlorophyll-*a* is a measure of the amount of green plant pigment present in the water, often in the form of planktonic algae and was measured with a Turner Designs® *in situ* fluorimeter. High chlorophyll-*a* concentrations are indicative of nutrient-enriched lakes. Chlorophyll-*a* concentrations greater than 6 µg L^{-1} are found in eutrophic or nutrient-enriched aquatic systems, whereas chlorophyll-*a* concentrations less than 2.2 µg/L are found in nutrient-poor or oligotrophic lakes. The chlorophyll-*a* concentrations ranged from 2.0-4.0 µg L^{-1} which is favorable and slightly higher than in 2019. A few occurrences of cyanobacteria were also noted in nearshore areas during the summer months. This may be due to the increased nutrients from the land.

The algal genera were determined from composite water samples collected over the 6 deep basins of Eagle Lake in 2020 were analyzed with a compound bright field microscope. The genera present included the Chlorophyta (green algae): *Chlorella* sp., *Rhizoclonium* sp., *Mougeotia* sp., *Spirogyra* sp., *Scenedesmus* sp., *Radiococcus* sp., *Haematococcus* sp., *Gleocystis* sp., *Chloromonas* sp., *Pediastrum* sp., *Pandorina* sp.; The Cyanophyta (blue-green algae): G*leocapsa* sp. and *Microcystis* sp.; the Bascillariophyta (diatoms)*:* *Synedra* sp. *Navicula* sp., *Fragilaria* sp., and *Cymbella* sp. The aforementioned species indicate a diverse algal flora and represent a good diversity of alga with an abundance of diatoms that are indicative of great water quality.

Section

3

Aquatic Vegetation Data & Sediment Hardness (2020)

Status of Native Aquatic Vegetation in Eagle Lake

The native aquatic vegetation present in Eagle Lake is essential for the overall health of the lake and the support of the lake fishery. The May 26, 2020 survey of 213 GPS locations determined that there were a total of 27 native aquatic plant species in Eagle Lake. These include 17 submersed species, 4 floating-leaved species, and 6 emergent species. This indicates a very high biodiversity of aquatic vegetation in Eagle Lake. The overall % cover of the lake by native aquatic plants is low relative to the lake size and thus these plants should be protected unless growing near swim areas at nuisance levels.

The most common aquatic plant species included White-stem Pondweed, Leafless Watermilfoil, and Fern-leaf Pondweed. White-stem Pondweed has long, green leaves that grow along a whitish-green stem. The plant grows tall into the water column and forms a seed head on the lake surface during summer. Leafless water milfoil forms a dense “sod” on the lake bottom and unlike other native milfoils, has very short, erect leaves that appear as tiny stalks. Fern-leaf Pondweed resembles small ferns that lie on the lake bottom. This plant appears brownish in color and creates a mat on the lake bottom. All three species are beneficial fish forage habitat.

A list of all native aquatic plants found in Eagle Lake in 2020 can be found below in Table 8.

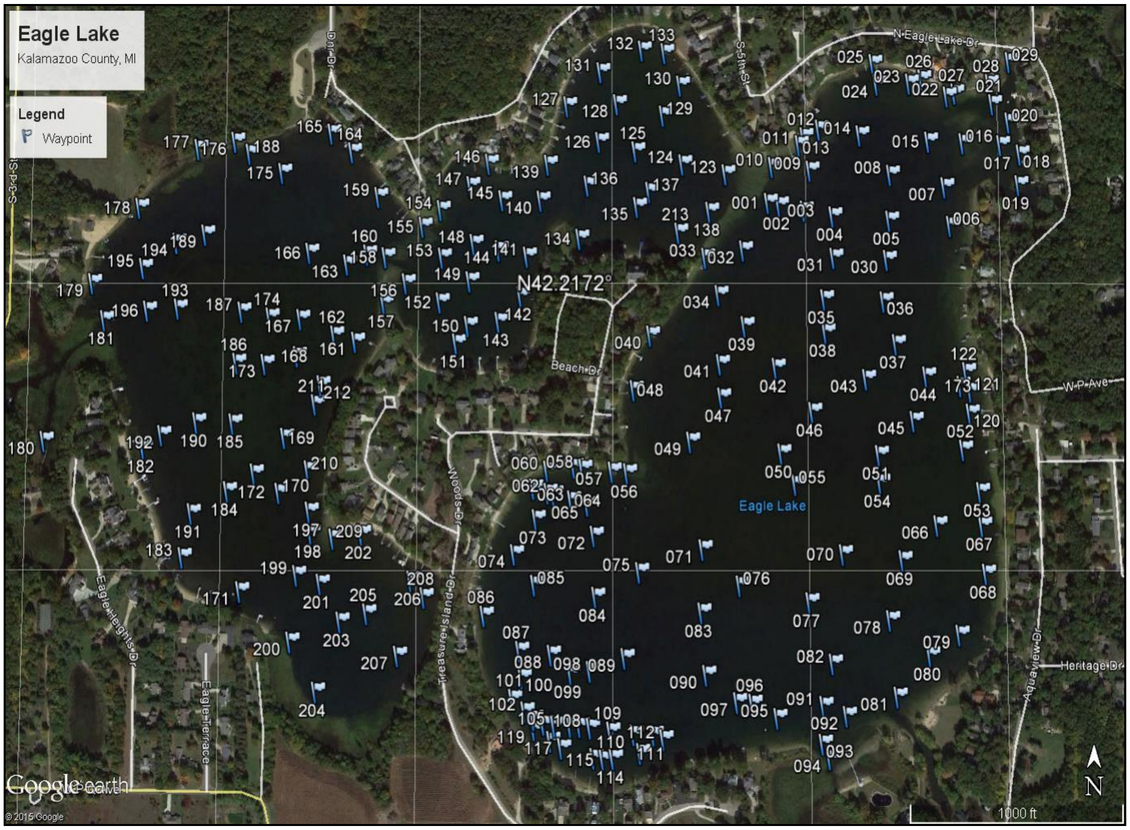

Figure 4. Aquatic vegetation sampling sites in Eagle Lake, Kalamazoo County (2020).

Native Aquatic Plant Species Name	***Aquatic Plant Common Name***	***Abundance in/around Eagle Lake***	***Aquatic Plant Growth Habit***
Chara vulgaris	Muskgrass	20.5	Submersed, Rooted
Potamogeton pectinatus	Thin-leaf Pondweed	4.5	Submersed, Rooted
Potamogeton amplifolius	Large-leaf Pondweed	6.0	Submersed, Rooted
Potamogeton gramineus	Variable-leaf Pondweed	8.8	Submersed, Rooted
Potamogeton robbinsii	Fern-leaf Pondweed	22.0	Submersed, Rooted
Potamogeton praelongus	White-stem Pondweed	39.7	Submersed, Rooted
Potamogeton pusillus	Small-leaf Pondweed	0.2	Submersed, Rooted
Potamogeton natans	Floating-leaf Pondweed	1.6	Submersed, Rooted
Potamogeton illinoensis	Illinois Pondweed	30.9	Submersed, Rooted
Myriophyllum tenellum	Leafless Watermilfoil	21.5	Submersed, Rooted
Myriophyllum verticillatum	Whorled Watermilfoil	0.5	Submersed, Rooted
Elodea canadensis	Common Waterweed	7.7	Submersed, Rooted
Utricularia vulgaris	Bladderwort	1.0	Submersed, Non-Rooted
Najas guadalupensis	Southern Naiad	5.6	Submersed, Rooted
Najas flexilis	Slender Naiad	0.1	Submersed, Rooted
Scirpus subterminalis	Submersed Bulrush	3.8	Submersed, Rooted
Drepanocladus revolvens	Water Scorpion-moss	1.0	Submersed, Non-Rooted
Nymphaea odorata	White Waterlily	0.4	Floating-Leaved, Rooted
Nuphar variegata	Yellow Waterlily	0.6	Floating-Leaved, Rooted
Brasenia schreberi	Watershield	0.5	Floating-Leaved, Rooted
Lemna minor	Duckweed	0.1	Floating-Leaved, Non-Rooted
Typha latifolia	Cattails	0.3	Emergent
Schoenoplectus acutus	Bulrushes	0.1	Emergent
Pontedaria cordata	Pickerelweed	0.1	Emergent
Polygonum amphibium	Water Smartweed	0.2	Emergent
Decodon verticillatus	Swamp Loosestrife	0.2	Emergent
Iris sp.	Wild Iris	0.1	Emergent

Table 8. 2020 Eagle Lake Native Aquatic Plant Species and Relative Abundance (May 26, 2020).

Invasive (Exotic) Aquatic Plant Species

The amount of Eurasian Watermilfoil (Figure 5) present in Eagle Lake varies each year and is dependent upon climatic conditions, especially runoff-associated nutrients. 2020 was the wettest year on record and many lakes experienced nuisance milfoil and algal outbreaks even given the two consecutive harsh winters. The May 26, 2020 survey revealed that approximately 12.3 acres of milfoil was found throughout the entire lake. On June 9th, 2020, the milfoil was treated with high dose diquat. The treatment was very successful overall but late in the season on August 20, 2020 some new growth emerged with approximately 26.7 acres of EWM. This was likely the result of seedbank re-emergence which is rare but can occur at any time as dormant seeds germinate due to environmental cues. On August 26, 2020 that EWM was treated with triclopyr and diquat. RLS was present as always, to oversee the lake treatments.

Fortunately, very little invasive Curly-leaf Pondweed (Figure 6) was found throughout the lake in 2020 and thus that treatment was not needed. Treatment maps for each of these areas are shown in the maps below in Figures 7-9.

Figure 5. Eurasian Watermilfoil

Figure 6. Curly-leaf Pondweed

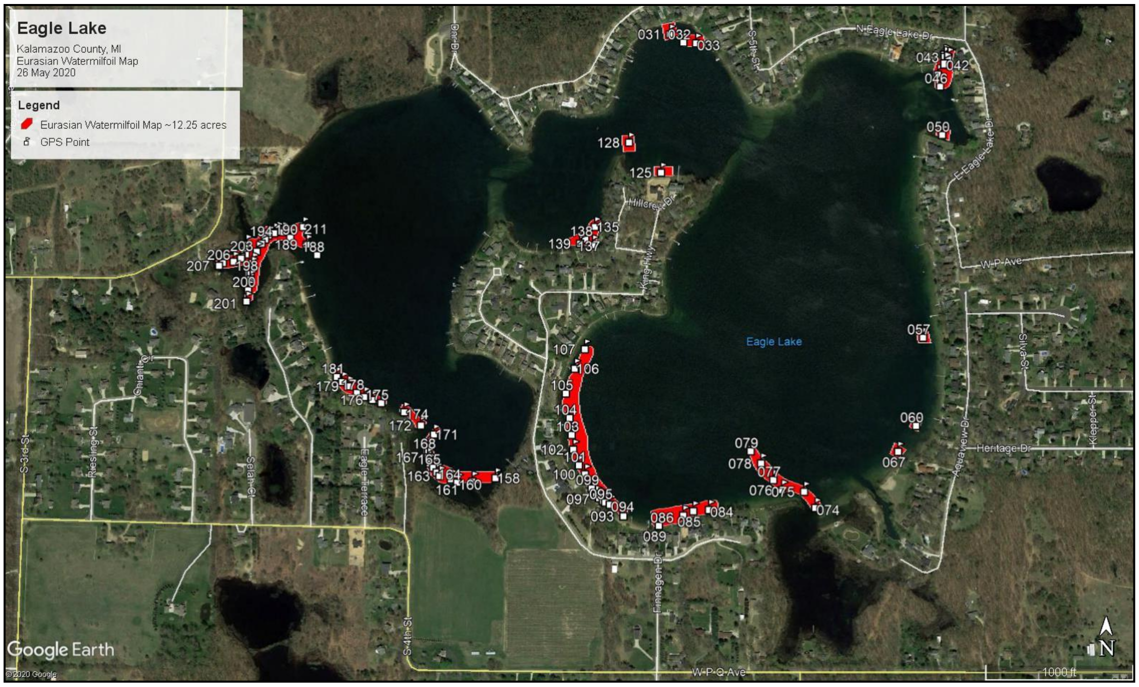

Figure 7. EWM Distribution in Eagle Lake (May 26, 2020).

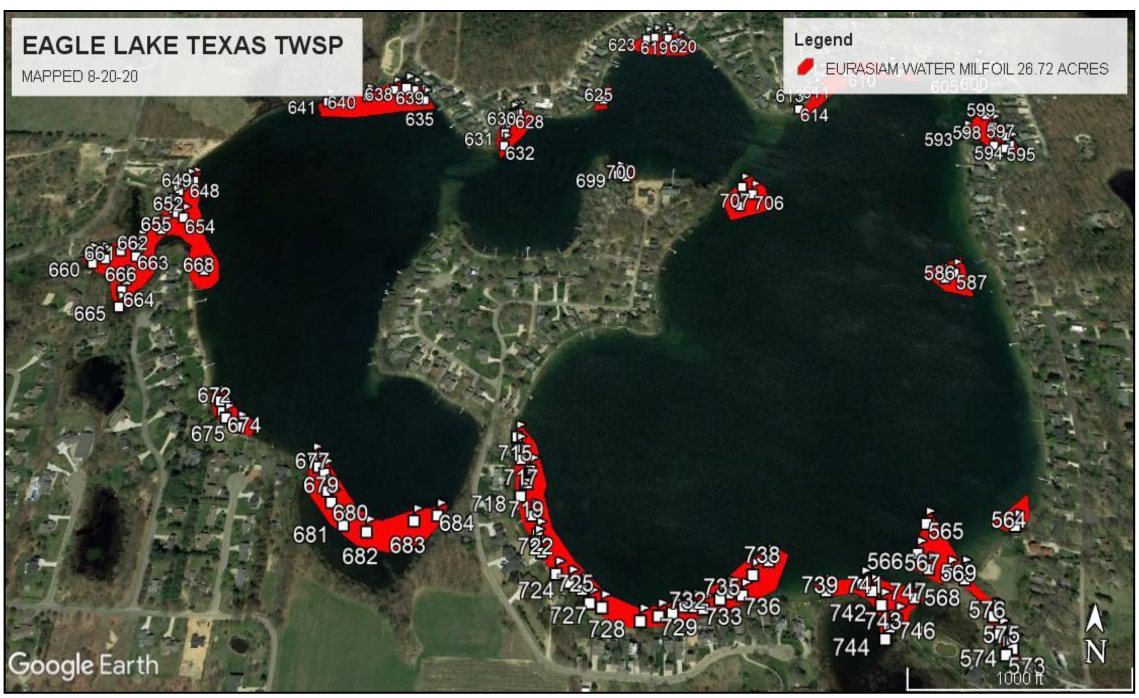

Figure 8. Late Season EWM Distribution in Eagle Lake (August 20, 2020).

Aquatic Vegetation Biovolume and Sediment Bottom Hardness Maps and Comparisons

A whole lake scan using a Lowrance HDS 8® sonar unit with GPS software was used to create an aquatic vegetation biovolume map (Figure 9) of the lake on October 25, 2020. The biovolume map below shows the relative aquatic vegetation biovolume in Eagle Lake. The blue areas represent no vegetation whereas green areas represent low-growing vegetation and red areas represent high-growing vegetation. An analysis of the biovolume data over the past six years can be found below in Table 9 below. In this data table, it is apparent that the overall biovolume has decreased over the past few years, but this is due to rigorous treatments and continued reduction of organic muck.

In addition to the biovolume scans, a concurrent sediment bottom hardness scan was also conducted on the same date (Figure 10) to evaluate the relative hardness of the lake bottom. With this data, it is often beneficial to compare seasonal data as organic matter tends to be lower in the spring and fall than during the summer months. This is because there is a lot more biological activity occurring during the summer which contributes organic matter to the lake bottom with decaying aquatic plants and dying aquatic life, in addition to extraneous material entering the lake from the immediate watershed (Table 10). Overall, there has been a reduction in soft organic muck and an increase in more consolidated sediments.

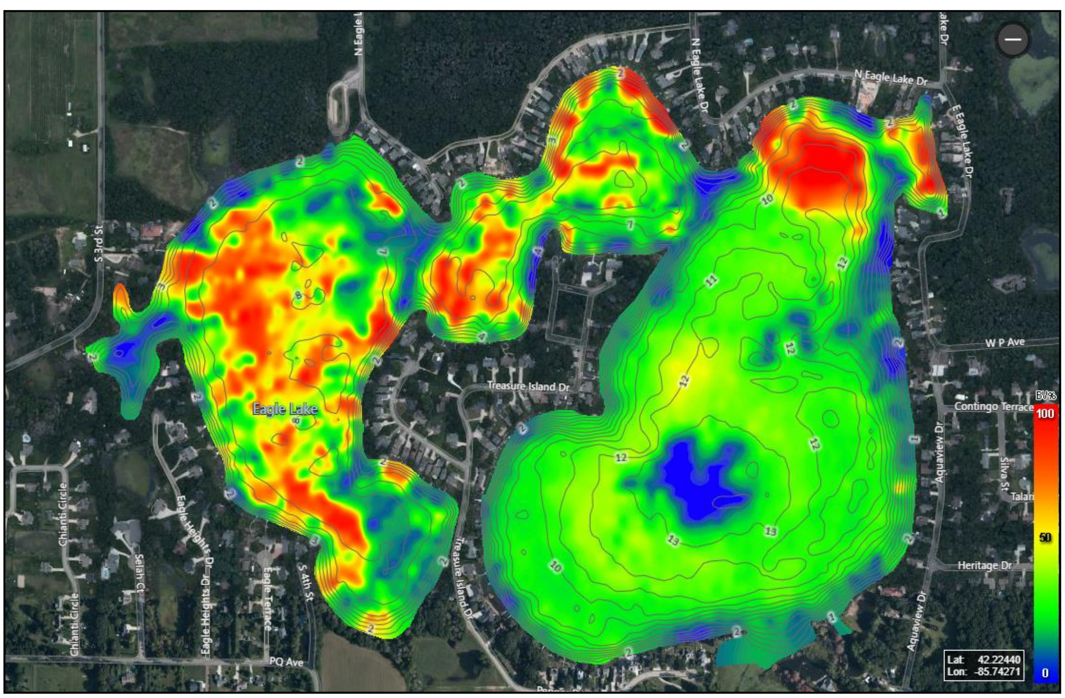

Figure 9. Aquatic vegetation biovolume map of Eagle Lake, Kalamazoo County, MI (October 25, 2020)

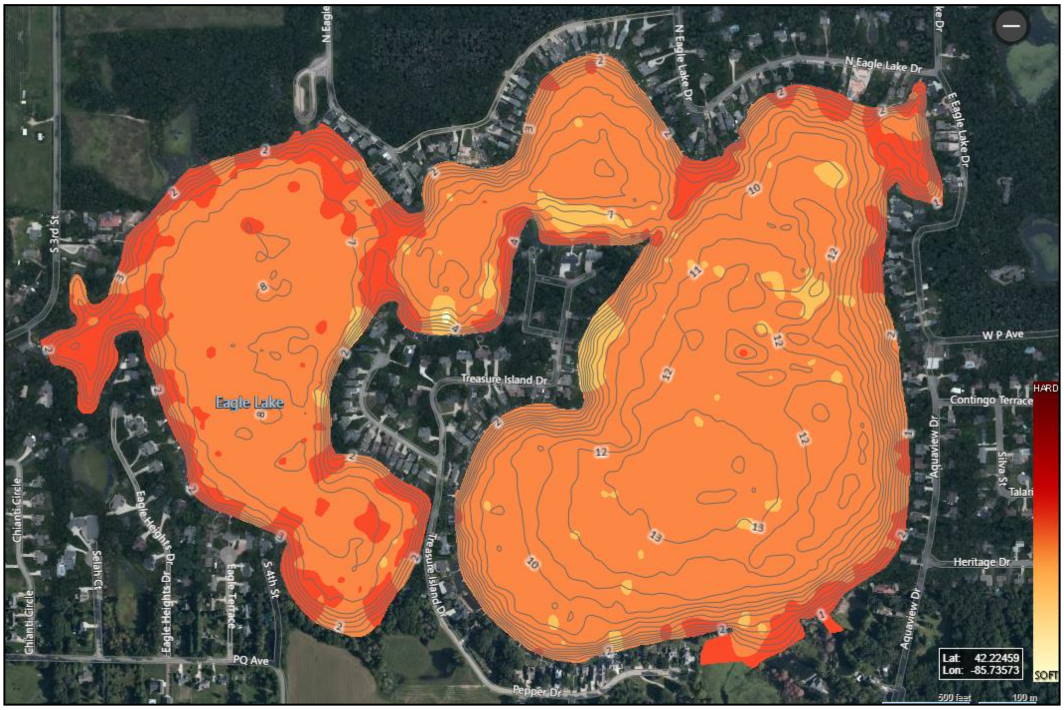

Figure 10. Sediment Bottom hardness map of Eagle Lake, Kalamazoo County, MI (October 25, 2020).

Biovolume Category	2014	2015	2016	2017	2018	2019	2020
0-5%	11.05	33.01	13.77	16.03	38.57	53.19	28.9
5-20%	12.65	20.97	7.16	8.02	4.04	5.28	9.0
20-40%	11.04	9.02	5.75	10.92	2.46	25.01	24.6
40-60%	9.34	6.39	6.32	9.96	2.92	13.78	11.3
60-80%	11.85	4.44	8.09	8.49	8.53	2.16	6.7
>80%	41.12	26.21	58.91	46.54	43.48	0.57	19.5

Table 9. Changes in annual aquatic vegetation biovolume in Eagle Lake, Kalamazoo County, MI (2014-2020).

Hardness Category	May 2017 %	Oct 2017 %	May 2018 %	October 2019 %	October 2020
<0.1	0.08	0.04	0.09	0.2	0.0
0.1-0.2	2.5	0.61	0.09	2.1	0.2
0.2-0.3	59.67	62.88	14.28	74.3	38.9
0.3-0.4	31.98	30.93	57.13	21.5	48.7
>0.4	5.78	5.54	28.41	1.9	12.1

Table 10. Eagle Lake sediment bottom hardness comparisons (2017-2020).

Section 4

Management Recommendations for 2021

Detailed, whole-lake aquatic vegetation surveys and scans are needed in 2021 to determine the precise locations of EWM, CLP, or other problematic invasives in and around Eagle Lake. These surveys should occur in late-May to early-June and again post-treatment in 2021 as needed.

The plan for 2021 includes the use of high dose systemic aquatic herbicides due to the genetically determined strains of hybrid milfoil that require such doses for effective treatment. Higher doses such as Sculpin G® at a dose of 250 lbs. per acre would be recommended offshore and a dose of 250 lbs. per acre for Renovate OTF® nearshore for effective control of the hybrid milfoil. Curly-leaf Pondweed may respond well to Aquathol-K® or diquat at 2-3 gallons per acre. Operation of the whole-lake laminar flow aeration (LFA) system is recommended in 2021 to reduce organic materials and nutrient loads if possible. The continued bioaugmentation (addition of microbes and enzymes) is also recommended as this has resulted in sustained reduction of organic sediment.

RLS will continue to evaluate any measured impacts of flooding on the lake ecosystem health. In 2020, the major impacts included elevated nutrient concentrations and a decline in dissolved oxygen along with periodic blue-green algae blooms. Water quality parameters in the lake should also be monitored to observe long-term trends in 2021 as in previous years.

In conclusion, Eagle Lake is a healthy lake with good aquatic plant biodiversity, good water clarity, moderate nutrients, and a healthy lake fishery. The flooding and abnormally high water levels have allowed for more organic material to be deposited in the lake sediments, as well as increased nutrients which are fueling increased submersed aquatic plant growth.