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# HIGGINS LAKE WATER ANALYSIS

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Report #3 Sixth year



JULY 23, 2023  
RAVEN ANALYTICAL  
104 First Street

# Higgins Lake Report

The Higgins Lake Property Owners Association (HLPOA) approached Raven Analytical Laboratory in Roscommon, Michigan in 2018 to provide water testing on Higgins Lake. This was to be a multi year evaluation of the chemistry of the Lake and any changes over time.

This testing began as a project in concert with the Roscommon high school chemistry students (teacher). Raven personnel trained students with all the procedures and testing protocols necessary to complete this study. The actual testing took place in our EPA certified laboratory under the direct supervision of our staff. In this way we help reinforce the chemistry the students are learning and make the community aware of the concern for the total ecology of Higgins Lake.

Because of the Covid pandemic restrictions, water testing on Higgins Lake was performed by Raven Analytical personnel for 2022. As the previous effort on this project was in concert with the Roscommon High School, a meeting was held with the school Superintendent. She whole heartily supported this project and working with the students and chemistry teacher to continue this “very valuable real life education”.

A first introduction meeting was held with the chemistry students at the high school. They were very excited and were looking forward to begin training and start testing the lake. This group of students performed their first round of training and testing on May 25<sup>th</sup>. A picture and list of students and grades is provided in Appendix A.

This report covers the first round of water test results on Higgins Lake on May 25, June 23, and July 21, 2023.

Based on the data provided for testing from USGS suggestions and the concern(s) about the water quality on Higgins Lake, the following testing protocols are suggested.

Water Tests:

1. Phosphorus
  - a. Total phosphorus is reported in milligrams/liter (mg/L)
2. Nitrate
  - a. Nitrate is reported in milligrams/liter (mg/L)
3. Nitrite
  - a. Nitrite is reported in milligrams/liter (mg/L)
4. pH
  - a. pH is measured on a 1 to 14 scale with pure water being a pH of 7.0
5. Dissolved Oxygen
  - a. Dissolved oxygen is reported in milligrams/liter (mg/L)
6. Total dissolved solids (TDS)
  - a. measured in parts per million
7. Conductivity
  - a. Conductivity is reported in microsiemens per centimeter (uS/cm)
8. Water Temperature
  - a. Measured in degrees Centigrade
9. Air Temperature
  - a. Measured in degrees Centigrade
10. Beach Plate Count; MPN
  - a. Most probable number (MPN) is measured in colonies per 100 milliliters of cultured water
11. Beach Plate count: E-coli
  - a. E-coli is measured in colonies per 100 milliliters of cultured water

All water analysis was performed at Raven Analytical Laboratory in Roscommon using EPA approved test methods. This lab is an EPA certified water analysis laboratory (#9954) and has two certified water sanitarians on staff at Roscommon.

The listing of testing areas, such as high human concentration, lagoons, both state parks and boat launches along with the marinas and suggestions from the Team resulted in the following test sites:

1. Water quality tests were performed at:

	Site #		
<b>Gerrish Township Marina</b>	<b>1</b>	44.428433	-84.701303
<b>South State Park</b>	<b>2</b>	44.425523	-84.684881
<b>Cut river</b>	<b>3</b>	44.433023	-84.669963
<b>Sam-O-Set</b>	<b>4</b>	44.465303	-84.739635
<b>DNR boat launch</b>	<b>5</b>	44.477728	-84.778012
<b>Gold Coast</b>	<b>6</b>	44.466471	-84.767884
<b>North State Park</b>	<b>7</b>	44.511663	-84.758545
<b>B&amp;B Marina</b>	<b>8</b>	44.511237	-84.742792
<b>Camp Cornelia</b>	<b>9</b>	44.496694	-84.699217
<b>Treasure Island – 1</b>	<b>10</b>	44.477461	-84.727788
<b>Treasure Island – 2</b>	<b>11</b>	44.482555	-84.722664
<b>Kennedy Beach</b>	<b>12</b>	44.457288	-84.670740
<b>Flag Point</b>	<b>13</b>	44.471165	-84.696090

Data collected:

Although there are no maximum limits on Phosphorus and nitrogen for pond and lake waters, as a reference, the EPA regulations for drinking water standards for these are 1 mg/L for Phosphorus and 10 ppm for nitrogen.

Swimming beaches should be tested for water quality before the swimming season begins to get a baseline of contamination resulting from natural wildlife or run-off and tested thereafter until the season ends. Beaches may be regulated by local ordinances or local health standards. The standards developed for the Great Lakes in Michigan and may be used for inland beaches are:

- If the E. coli count is greater than 1000 MPN/100 mL, the beach is closed.
- If the E. coli count is greater than 235 MPN/100 mL but less than 1000 MPN/100 mL, an advisory is issued.
- If the E. coli count is under 235 MPN/100 mL, the beach has no advisories or warnings issued.

The data collected from the thirteen sites in the fourth round of testing on July 21, 2023 is shown in Table 1 below.

Table 1

May 24,2023

<u>Site</u>	1	2	3	4	5	6	7
<b>Phosphorus</b>	0.79	0.25	0.12	0.17	0.36	0.51	0.37
<b>Nitrogen (Nitrate)</b>	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
<b>Nitrogen (Nitrite)</b>	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
<b>Beach Plate Count; MPN</b>	378	361	344	328	238	298	228
<b>Beach Plate Count; e-coli</b>	17	24	35	26	22	23	41
<b>pH</b>	7.37	7.16	7.04	7.24	7.37	7	6.7
<b>Dissolved Oxygen</b>	6	5	5	7	5	5	4
<b>Total Dissolved Solids</b>	149	144	142	141	140	146	142
<b>Water Temperature; C</b>	16.7	16.7	16.7	16.7	16.7	16.7	16.7
<b>Air Temperature; C</b>	11.1	11.1	11.1	11.1	11.1	11.1	11.1
<b>Conductivity; uS</b>	296	287	283	278	274	277	280

<u>Site</u>	8	9	10	11	12	13
<b>Phosphorus</b>	0.66	0.61	0.34	0.42	0.63	0.18
<b>Nitrogen (Nitrate)</b>	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
<b>Nitrogen (Nitrite)</b>	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
<b>Beach Plate Count; MPN</b>	201	298	238	260	328	238
<b>Beach Plate Count; e-coli</b>	14	30	45	38	49	34
<b>pH</b>	6.81	6.85	6.8	6.65	7.75	6.95
<b>Dissolved Oxygen</b>	5	6.6	4	6.6	3.25	6
<b>Total Dissolved Solids</b>	142	138	140	140	176	144
<b>Water Temperature; C</b>	16.7	16.7	16.7	16.7	16.7	16.7
<b>Air Temperature; C</b>	11.1	11.1	11.1	11.1	11.1	11.1
<b>Conductivity; uS</b>	281	277	282	284	360	275

June 22,2023

<u>Site</u>	1	2	3	4	5	6	7
<b>Phosphorus</b>	0.11	1.52	0.05	0.02	0.01	0.01	0.01
<b>Nitrogen (Nitrate)</b>	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
<b>Nitrogen (Nitrite)</b>	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
<b>Beach Plate Count; MPN</b>	39	25.8	54.1	42.3	33.8	48.3	46
<b>Beach Plate Count; e-coli</b>	0	0	0	0	1	1	1
<b>pH</b>	7.42	7.36	7.29	7.24	7.12	7.12	6.89
<b>Dissolved Oxygen</b>	6.3	7.1	7.2	7.3	7.9	6.6	7.5
<b>Total Dissolved Solids</b>	161	143	142	142	142	142	145
<b>Water Temperature; C</b>	19.4	23	24.4	24.3	23.8	23.9	23.2
<b>Air Temperature; C</b>	15.5	15.5	15.5	15.5	15.5	15.5	15.5
<b>Conductivity; uS</b>	321	285	285	284	284	284	285

<u>Site</u>	8	9	10	11	12	13
<b>Phosphorus</b>	0.01	0.02	0.01	0.07	0.18	0.02
<b>Nitrogen (Nitrate)</b>	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
<b>Nitrogen (Nitrite)</b>	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
<b>Beach Plate Count; MPN</b>	50	41.6	40.1	47.2	44.4	56.5
<b>Beach Plate Count; e-coli</b>	0	0	2	0	0	0
<b>pH</b>	6.67	6.87	7.16	7.16	7.18	7.19
<b>Dissolved Oxygen</b>	6.6	7.4	6.9	7.3	7.6	7.3
<b>Total Dissolved Solids</b>	143	142	142	142	142	142
<b>Water Temperature; C</b>	22.8	22.8	23.6	23.3	23.1	23.9
<b>Air Temperature; C</b>	15.5	15.5	17.7	17.7	17.7	17.7
<b>Conductivity; uS</b>	284	284	281	283	283	275

July 20,2023

<u>Site</u>	1	2	3	4	5	6	7
<b>Phosphorus</b>	0.87	0.81	1.48	0.93	1.29	0.27	0
<b>Nitrogen (Nitrate)</b>	N.D.	N.D.	N.D.	0.1	0.7	0.08	N.D.
<b>Nitrogen (Nitrite)</b>	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
<b>Beach Plate Count; MPN</b>	1011	1011	1011	960	1011	1011	1011
<b>Beach Plate Count; e-coli</b>	1	1	0	0	1	3	0
<b>pH</b>	7.75	7.12	8.04	7.96	7.5	7.53	7.65
<b>Dissolved Oxygen</b>	6.6	6.5	6.9	6.8	6.5	5.7	6.3
<b>Total Dissolved Solids</b>	184	144	140	154	229	218	143
<b>Water Temperature; C</b>	19.6	20.4	20.5	20.3	20.4	20.1	20.7
<b>Air Temperature; C</b>	11.7	11.7	11.7	11.7	13	13	13
<b>Conductivity; uS</b>	351	319	277	307	446	435	290

<u>Site</u>	8	9	10	11	12	13
<b>Phosphorus</b>	0.03	0.02	0	0	0	0.01
<b>Nitrogen (Nitrate)</b>	N.D.	1.15	N.D.	N.D.	N.D.	N.D.
<b>Nitrogen (Nitrite)</b>	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
<b>Beach Plate Count; MPN</b>	1011	914	1011	1011	961	1011
<b>Beach Plate Count; e-coli</b>	3	2	1	4	1	0
<b>pH</b>	7.71	7.63	7.52	7.53	7.49	7.56
<b>Dissolved Oxygen</b>	6.9	6.9	6.1	6.2	6.4	5
<b>Total Dissolved Solids</b>	143	141	144	140	140	141
<b>Water Temperature; C</b>	20.5	20.8	20.4	20.4	20.6	19.3
<b>Air Temperature; C</b>	13	13	16	16	16	16
<b>Conductivity; uS</b>	286	283	286	276	272	281

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Kevin Kessler, HLPOA member.

Submitted by:

John Blizzard

CEO

QuadSil/Raven Analytical



Appendix A



## Appendix A

2023		Grade
Jason	Beckwith	10
Rielly	Chever	10
Matt	Coffey	10
Bo	Collins	10
Gabby	Gray	11
Logan	Hasting	11
Andre	Janisse	11
Josh	Mayes	10
Isabell	McCourt	10
Jazmine	Rees	11
Corbin	Tyler	11
Jacob	Ziebell	10

Life is about



Testing the waters

**Roscommon High School**