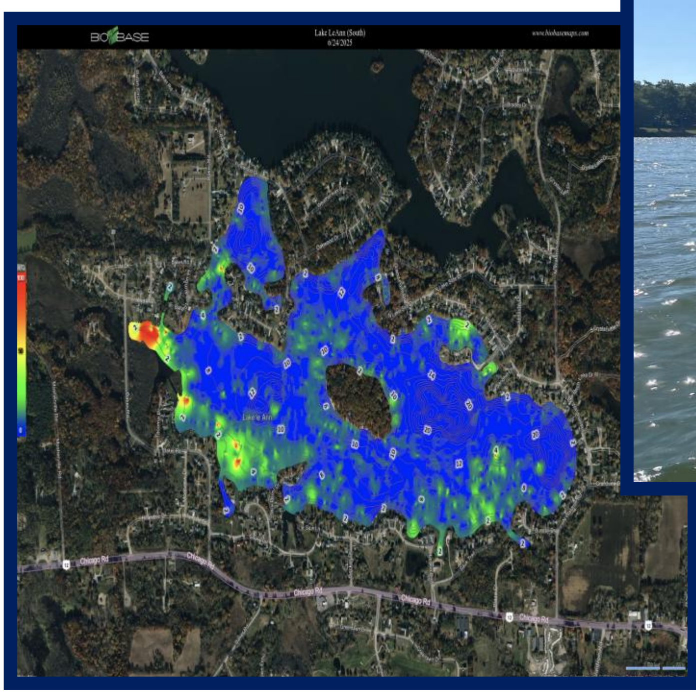
# Lake LeAnn 2025 Annual Report
# and
# 2026 Management Recommendations
# Hillsdale County, Michigan

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# Lake LeAnn 2025 Annual Report
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## 1.0 2025 EXECUTIVE SUMMARY

Lake LeAnn is located in Somerset Township in Hillsdale County, Michigan (T.5S, R.1W, sections 3,4,5,8,9, and 10; Figures 1 and 2). The north lake basin is comprised of 200 acres, and the south lake basin consists of 268 acres (RLS, 2019). The lake is a man-made impoundment with a dam located at the north end of the north basin with a second dam on the south lake. The north lake basin has 1 area of water influx which includes 1 drain, and the south lake basin has 3 drainage areas. The north lake basin has nearly 6.4 miles of shoreline and the south lake basin has nearly 7.3 miles of shoreline. The mean depth of the north lake basin is approximately 7.6 feet, and the mean depth of the south lake basin is approximately 9.7 feet. The maximum depth of the north lake basin is approximately 22.5 feet, and the maximum depth of the south lake basin is approximately 39.0 feet (RLS, 2024 bathymetric scan data; Figures 1 and 2). The north lake basin also has a fetch (longest distance across the lake) of around 0.8 miles, and the south lake basin has a fetch of around 1.2 miles (RLS, 2019). The north basin of Lake LeAnn has an approximate water volume of 1,927.3 acre-feet and the south lake basin has an approximate water volume of 2,555.7 acre-feet (RLS, 2022 bathymetric data).

The immediate watershed (which is the area directly draining into the lakes) differs for each basin with the north being approximately 3,582 acres and the south being approximately 1,515 acres. This is about 7.6 times the size of the lake, which is moderately large. Legal lake levels have been established for both lakes with the summer and winter levels for the north lake at elevations of 1041.25’ and 1040.50 feet, respectively, and summer and winter levels for the south lake at elevations of 1046.85’ and 1046.40 feet, respectively.

Based on the 2025 evaluation, Lake LeAnn contains 5 invasive aquatic plant species which includes the submersed hybrid Eurasian Watermilfoil (EWM), Curly-leaf Pondweed (CLP), and Starry Stonewort and the emergents Purple Loosestrife and Phragmites. Continued surveys and vigilance are needed to assure that additional invasives do not enter Lake LeAnn. Aquatic herbicide treatments are recommended on a spot-treatment basis to effectively reduce the invasives over time. In 2025, there was one large-scale herbicide treatment to address both the EWM and CLP. A mechanical harvest was recommended to remove CLP biomass to prevent accumulation on the lake bottom. Algaecides should only be used on green algal blooms since many treatments can exacerbate blue-green algae blooms.

The blue-green algae, *Microcystis* sp. was the most prevalent algae in the lake, which is an indicator of poor water quality. Cyanobacteria blooms have been prevalent in the lakes and thus in situ measurements of chlorophyll-a have been conducted to measure the changes in this algae with time. Previous treatments for blue-green algal blooms have included chelated copper, Phycomycin®, and peroxide-based products.

It may take years to reduce the prominent cyanobacterial blooms on Lake LeAnn, and a P-binding clay-based product (Eutrosorb®) was recommended and applied to the north basin in 2025. The lake is highly impaired with multiple nutrient sources that are difficult to reduce—including abundant septic systems, use of lawn fertilizers, numerous drains, and lack of shoreline emergent vegetation. RLS and the LLPOA have applied for permits through EGLE to place biochar filters in the key problematic drains, but they will not allow these filters in the drains that they have classified as wetlands, despite numerous data that show these drains are contributing nutrients to the lakes. Modifications to the placement of bottom-placed char filters implemented in late 2024 and early 2025.

RLS and the LLPOA are working diligently with Lake LeAnn property owners to reduce nutrient sources and assist with maximizing the efficacy of the current LFA program. It is important to realize that the external loading of nutrients ( from drains, septic systems, and lawn fertilizers) to Lake LeAnn has resulted in the condition of internal loading which is exacerbated by reduced dissolved oxygen concentrations in the deep basins. This is especially true for the north basin. Currently, only two locations in the south basin (#4 and #5) have dissolved oxygen depletion. The northern region of the north basin is experiencing nearshore internal loading from lawn fertilizers and septic leachate. RLS recommends that all of those properties cease the use of fertilizers or consider using special products designed to keep the nutrients locked in the root zones and not prone to runoff. Literature on those recommended products were provided to the LLPOA to disseminate to the public.

Although the LFA system has resulted in some declines in nutrients such as phosphorus and total inorganic nitrogen as well as increased dissolved oxygen, the water clarity has not improved, and the blue-green algal blooms are still high and unacceptable. In 2025, the LLPOA, with recommendations by RLS, decided to remove the existing LFA system in both lake basins in favor of a P-binding nutrient reduction program. There have also been significant improvements with reductions in invasive submersed milfoil and Curly-leaf Pondweed with targeted herbicide treatments. There have been modest reductions in the highest biovolume cover categories (60-80% and >80%) with time in both basins.

As stated in the 2025 Lake LeAnn Lake Management Plan report, reduction of nutrients from the CSA's is critical. In 2025, only CSA #1A, #1B, #2A, and #2B were flowing during sampling events and with low flow rates. Currently, due to low runoff conditions and some mitigation to these drains, the TP and TIN has declined in all of these four drains, which is favorable.


**Figure 1. Lake LeAnn (north basin) depth contour map (RLS, 2025).**

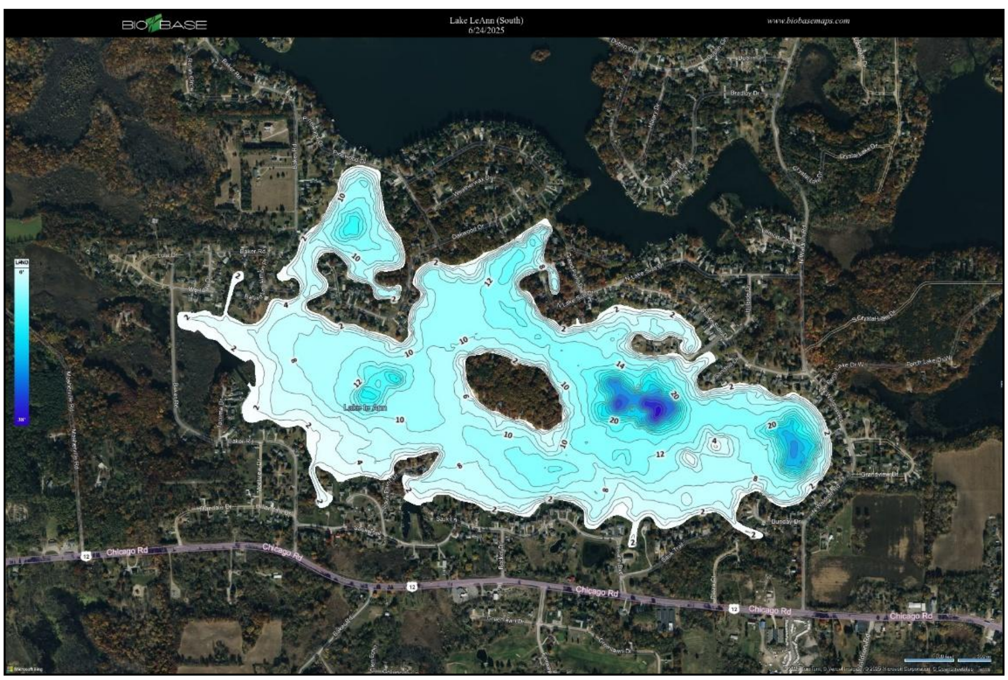


**Figure 2. Lake LeAnn (south basin) depth contour map (RLS, 2025).**

## 1.1 Summary of Lake LeAnn Aeration Operations:

This report provides data for the determination of aeration efficacy for the lake. This sampling guidance protocol is required by the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE). This report represents a statistical analysis of the first set of baseline data for 2019 and Year 1 (2021) as well as 2022-2025. This sampling occurs once in April/May, June/July, and August/September of each year. One sampling location per 50 acres of surface area is recommended in stratified basins and sampling at mid-depth in basins with shallow depths (< 10 feet). The sampling consists of the physical water quality parameters, water depth (measured in 0.5-meter increments), water temperature (measured in °C), dissolved oxygen (measured in mg/L), pH (measured in Standard Units), specific conductivity (measured in mS/cm), and secchi disk transparency (in feet). Additionally, at each site, chemical water quality parameters are included: total and ortho-phosphorus (mg/L), total Kjeldahl nitrogen and total inorganic nitrogen (both in mg/L), total suspended solids (in mg/L), and chlorophyll-a in micrograms per liter. In lakes such as Lake LeAnn with high surface blue-green algae blooms, the use of an *in situ* fluorimeter is much more accurate than a composite chlorophyll-a sampler and thus that metric is used to measure chlorophyll-a in hyper-eutrophic waters as an additional method. The in situ method was used in 2023-2025 to measure the changes in the surface blooms.

## 1.2 Summary of Aeration Operation Purpose/Goals:

Lake LeAnn is a well-recreated lake and is utilized by many for fishing, swimming, boating, and waterfront living. In recent years, the lake has become dominated by aggressive invasive aquatic vegetation such as Curly-leaf Pondweed and Eurasian Watermilfoil. In addition, the lake has become mucky in many areas and is also experiencing toxic cyanobacteria blooms and watershed inputs of nutrients and solids. The residents have desired a more holistic approach to addressing both the aquatic plant and algae issues as well as the muck reduction. The residents desired a lake restoration strategy that would make the lake healthier and accomplish the following objectives:

The primary objectives of the implemented LFA/bioaugmentation system for Lake LeAnn include:

1) Reduction of nuisance toxic cyanobacteria algae throughout the lake.
2) Increase in water clarity/transparency
3) Increase in water column dissolved oxygen
4) Reduction of muck in problem areas.
5) Reduction of nuisance rooted submersed aquatic vegetation such as Eurasian Watermilfoil and Curly-leaf Pondweed.
6) Reduction of lake water column nutrients

## 2.0 LAKE LEANN 2025 SAMPLING METHODS & PARAMETERS

Restorative Lake Sciences sampled 10 locations in 2025 (5 in the south basin and 5 in the north basin) as well as the drains entering both basins. The sampling scope in 2025 was reduced with physical parameters such as depth, water temperature, dissolved oxygen, pH, conductivity, and Secchi transparency that were collected at 0.5-meter increments and throughout the water column profile. Chemical water quality parameters such as total phosphorus, total inorganic nitrogen, and in situ chlorophyll-a measured in all N=10 locations of the north and south basins. A bottom hardness scan and biovolume scan was conducted for both basins.

In July and September of 2025, Chl-a readings had to be analyzed in the laboratory since the in situ meter became dysfunctional and the company no longer makes those instruments. In spring of 2025, RLS measured nearshore water temperature, dissolved oxygen, and total phosphorus nearshore in the north basin to determine if there was a difference in internal loading nearshore versus in the deeper waters. That data is discussed at the end of this report relative to recommendations for continued dosing of Eutrosorb® in the north and south basins.

Additionally, all CSA's were evaluated for flow and sampled for all physical parameters including flow as well as total phosphorus, ortho-phosphorus, total inorganic nitrogen, total Kjeldahl nitrogen, and total suspended solids.

The basin samples and the CSA samples were collected on June 9, 2025, July 10, 2025, and September 9, 2025. All sampling location maps for the lake basins and drains are shown below in Figures 3-4.

All chemical water samples were collected at the specified depths (one each at the top, middle, and bottom depths of the deep basin sampling sites and at mid-depth for shallow sites) using a 4-liter VanDorn horizontal water sampler with weighted messenger (Wildco® brand). Water quality physical parameters (such as water temperature, dissolved oxygen, conductivity, and pH) were measured with a calibrated Eureka Manta 2® multi-probe meter as a profile through the water column at the sampling sites. All water samples were maintained on ice in a large cooler prior to being placed into the laboratory fridge. Total phosphorus was titrated and analyzed in the laboratory according to method SM 4500-P E. Ortho-phosphorus was titrated and analyzed in the laboratory according to method SM 4500-P E. Total suspended solids were analyzed for each sample using SM 2540 D-97. All the aforementioned chemical parameters were analyzed at Trace Analytical Laboratories in Muskegon, Michigan.

Chlorophyll-*a* was analyzed in situ with a calibrated Turner Designs® fluorimeter used to measure algal pigment in lakes with blue-green algal blooms. This gives a more accurate assessment of the actual Chl-a versus a profile reading that may skew Chl-a results to a much lower concentration.

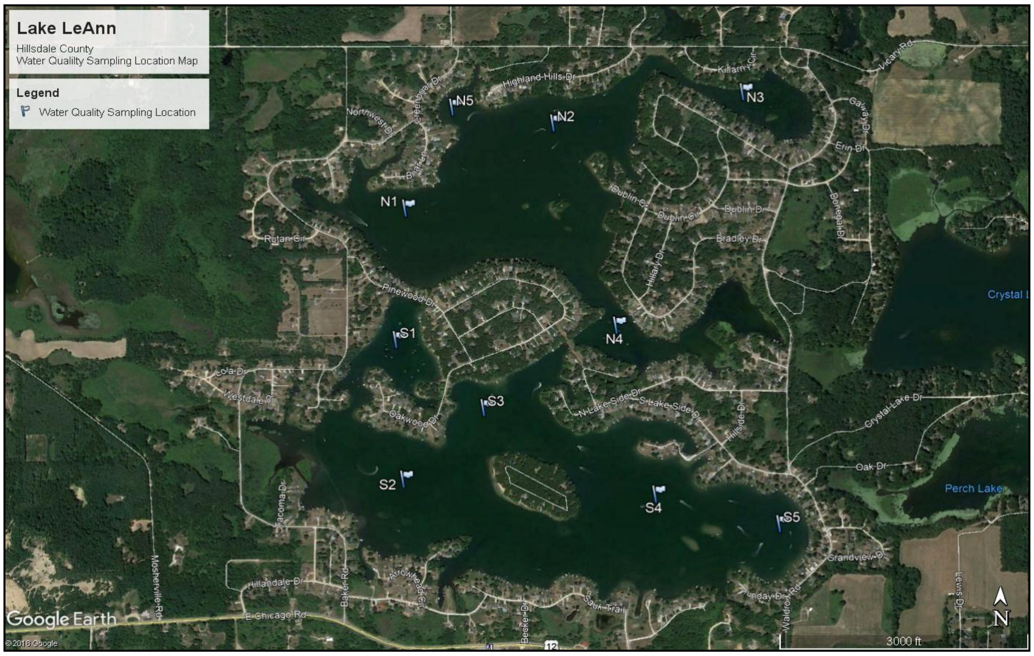


**Figure 3. 2021-2025 water quality sampling locations on Lake LeAnn.**

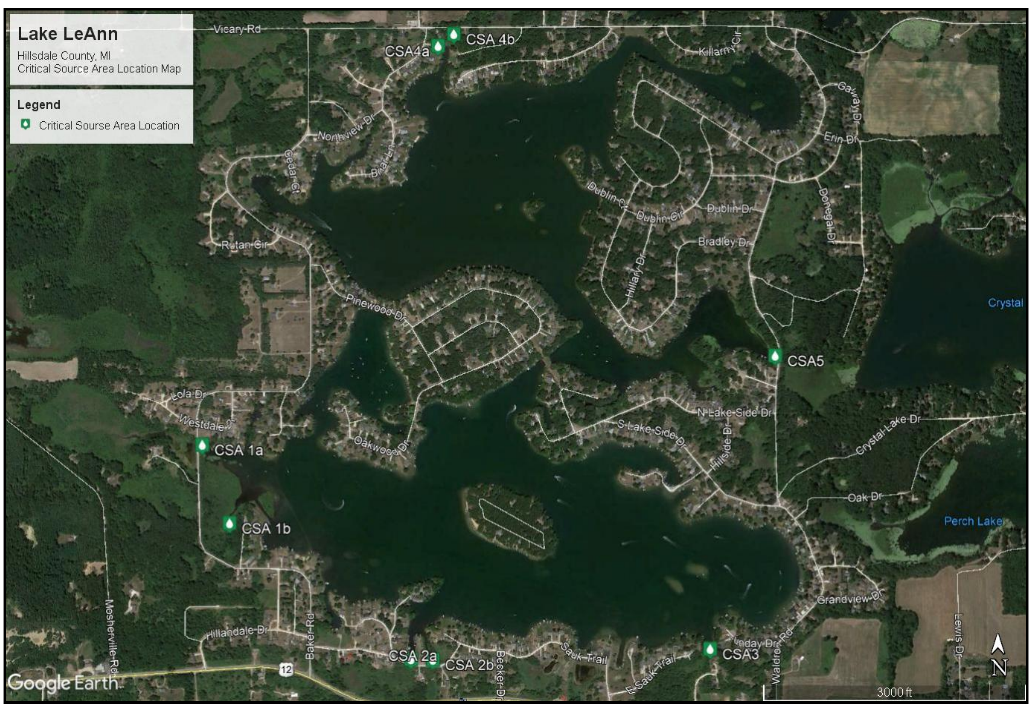


**Figure 4. 2019-2025 drain sampling locations on Lake LeAnn.**

## 3.0 LAKE LEANN 2025 WATER QUALITY SAMPLING RESULTS

All 2025 deep basin physical water quality data is shown in Tables 1-6. 2025 chemical water quality data is shown in Tables 7-12. 2025 CSA drain physical and chemical water quality data is shown below in Tables 13-15. NOTE: Drain sampling is not usually required as a condition of the LFA permit; however, the data is being collected to evaluate current and future measurements to determine mitigation implementation efficacy.

### 3.1 Lake LeAnn 2025 Deep Basin Chemical Water Quality Data Tables:

**Table 1. Lake LeAnn <u>north basin</u> May 1, 2025 physical water quality data.**

| Site | Depth (m) | Temp °C | DO (mg/L) | pH (S.U.) | Cond (mS/cm) |
|---|---|---|---|---|---|
| 1 North | 0 | 17.4 | 7.7 | 9.3 | 518 |
| | 0.5 | 17.3 | 9.2 | 9.3 | 518 |
| | 1 | 17.3 | 9.9 | 9.3 | 518 |
| | 1.5 | 17.2 | 10.4 | 9.3 | 518 |
| | 2 | 16.9 | 10.6 | 9.3 | 518 |
| | 2.5 | 16.9 | 10.7 | 9.3 | 518 |
| | 3 | 16.8 | 10.7 | 9.3 | 518 |
| | 3.5 | 16.7 | 10.6 | 9.3 | 518 |
| 2 North | 0 | 17.1 | 6.5 | 9.1 | 518 |
| | 0.5 | 17.1 | 7.2 | 9.2 | 517 |
| | 1 | 17.1 | 8.2 | 9.2 | 517 |
| | 1.5 | 17.1 | 9.1 | 9.2 | 517 |
| | 2 | 17.1 | 9.5 | 9.3 | 517 |
| | 2.5 | 17.1 | 9.9 | 9.3 | 517 |
| | 3 | 17.1 | 10.1 | 9.3 | 517 |
| | 3.5 | 17.1 | 10.3 | 9.3 | 517 |
| | 4 | 17.1 | 10.4 | 9.3 | 517 |
| 3 North | 0 | 16.9 | 9.6 | 9.0 | 554 |
| | 0.5 | 16.9 | 9.4 | 9.0 | 553 |
| | 1 | 16.9 | 9.2 | 9.0 | 553 |
| | 1.5 | 16.9 | 9.1 | 9.0 | 553 |
| | 2 | 16.8 | 9.0 | 9.0 | 553 |
| | 2.5 | 16.7 | 9.0 | 9.0 | 553 |
| | 3.0 | 16.7 | 9.0 | 9.0 | 553 |
| | 3.5 | 16.7 | 8.8 | 8.8 | 553 |

| | | | | | |
|---|---|---|---|---|---|
| 4 North | 0 | 17.6 | 6.4 | 9.2 | 517 |
| | 0.5 | 17.5 | 8.1 | 9.3 | 516 |
| | 1 | 17.2 | 9.9 | 9.3 | 516 |
| | 1.5 | 17.1 | 10.6 | 9.3 | 516 |
| | 2 | 17.0 | 10.8 | 9.3 | 514 |
| | 2.5 | 16.7 | 11.1 | 9.3 | 514 |
| | 3 | 16.6 | 11.2 | 9.2 | 516 |
| | 3.5 | 16.4 | 9.6 | 8.6 | 516 |
| 5 North | 0 | 17.5 | 9.4 | 9.3 | 331 |
| | 0.5 | 17.5 | 10.3 | 9.3 | 331 |
| | 1 | 17.5 | 10.6 | 9.3 | 331 |
| | 1.5 | 17.4 | 10.7 | 9.3 | 331 |
| | 2 | 17.4 | 10.8 | 9.3 | 330 |
| | 2.5 | 17.4 | 10.9 | 9.3 | 331 |
| | 3 | 17.2 | 11.0 | 9.3 | 331 |
| | MEAN | 17.1 | 9.6 | 9.2 | 492 |
| | STD DEV | 0.3 | 1.2 | 0.2 | 76 |

**Table 2. Lake LeAnn south basin May 2, 2025 physical water quality data.**

| Site | Depth (m) | Temp °C | DO (mg/L) | pH (S.U.) | Cond (mS/cm) | TDS (mg/L) |
|---|---|---|---|---|---|---|
| 1 South | 0 | 17.5 | 9.13 | 8.95 | 545.9 | 349.1 |
| | 0.5 | 17.4 | 9.11 | 8.97 | 545.5 | 349.0 |
| | 1 | 17.3 | 9.06 | 8.99 | 545.2 | 349.0 |
| | 1.5 | 17.3 | 8.99 | 9.00 | 545.1 | 348.9 |
| | 2 | 17.3 | 8.96 | 9.00 | 545.1 | 348.9 |
| | 2.5 | 17.3 | 8.95 | 9.00 | 5.45.1 | 348.8 |
| | 3 | 17.3 | 8.93 | 9.01 | 544.9 | 348.7 |
| | 3.5 | 17.3 | 8.91 | 9.01 | 544.9 | 348.7 |
| | 4 | 17.2 | 8.91 | 9.02 | 544.7 | 348.6 |
| | 4.5 | 17.2 | 8.92 | 9.01 | 544.7 | 348.6 |
| | 5 | 17.2 | 8.92 | 8.99 | 545.2 | 349.0 |
| | 5.5 | 17.1 | 8.91 | 8.96 | 545.5 | 349.1 |
| | 6 | 14.3 | 7.80 | 8.24 | 555.4 | 355.5 |
| | 6.5 | 13.9 | 6.10 | 8.00 | 559.5 | 358.3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **2 South** | **0** | **16.8** | **9.60** | **8.95** | **553.6** | **354.3** |
| | **0.5** | **16.8** | **9.47** | **8.99** | **553.8** | **354.4** |
| | **1** | **16.7** | **9.28** | **9.00** | **553.7** | **354.3** |
| | **1.5** | **16.7** | **9.13** | **9.00** | **553.5** | **354.2** |
| | **2** | **16.7** | **9.08** | **8.99** | **553.3** | **354.1** |
| | **2.5** | **16.6** | **9.02** | **8.99** | **553.8** | **354.3** |
| | **3** | **16.5** | **8.99** | **8.97** | **553.9** | **354.4** |
| | **3.5** | **16.5** | **6.60** | **8.75** | **539.2** | **344.6** |
| **3 South** | **0** | **16.7** | **9.5** | **8.69** | **553.6** | **354.5** |
| | **0.5** | **16.7** | **9.1** | **8.69** | **553.6** | **354.5** |
| | **1** | **16.6** | **8.8** | **8.71** | **553.6** | **354.5** |
| | **1.5** | **16.5** | **8.8** | **8.71** | **553.6** | **354.5** |
| | **2** | **16.5** | **8.8** | **8.71** | **553.6** | **354.5** |
| | **2.5** | **16.5** | **7.1** | **8.92** | **553.6** | **354.5** |
| | **3** | **16.5** | **5.1** | **8.92** | **553.6** | **354.5** |
| **4 South** | **0** | **16.7** | **9.6** | **8.88** | **553.4** | **351.1** |
| | **0.5** | **16.7** | **9.3** | **8.97** | **553.1** | **353.9** |
| | **1** | **16.7** | **9.2** | **8.98** | **553.1** | **354.0** |
| | **1.5** | **16.7** | **9.1** | **8.99** | **553.0** | **353.9** |
| | **2** | **16.7** | **9.0** | **9.00** | **553.0** | **353.9** |
| | **2.5** | **16.7** | **9.0** | **9.00** | **552.9** | **353.9** |
| | **3** | **16.6** | **9.0** | **9.00** | **553.0** | **354.0** |
| | **3.5** | **16.6** | **8.9** | **9.01** | **553.0** | **353.9** |
| | **4** | **16.6** | **8.9** | **9.01** | **553.0** | **353.9** |
| | **4.5** | **16.6** | **8.9** | **9.01** | **553.0** | **353.9** |
| | **5** | **16.6** | **8.9** | **9.01** | **552.9** | **353.8** |
| | **5.5** | **16.6** | **8.9** | **9.01** | **552.8** | **353.8** |
| | **6** | **16.6** | **8.8** | **9.01** | **553.0** | **353.8** |
| | **6.5** | **16.6** | **8.8** | **9.00** | **562.9** | **353.9** |
| | **7** | **16.6** | **8.8** | **8.99** | **553.0** | **354.1** |
| | **7.5** | **15.7** | **8.6** | **8.88** | **554.1** | **354.5** |
| | **8** | **13.3** | **8.0** | **8.57** | **558.2** | **356.7** |
| | **8.5** | **12.2** | **7.7** | **8.35** | **559.8** | **358.6** |
| | **9** | **11.7** | **5.9** | **8.14** | **561.3** | **359.1** |
| | **9.5** | **11.6** | **4.1** | **8.10** | **561.8** | **359.5** |
| | **10** | **11.5** | **3.2** | **8.06** | **567.8** | **360.2** |
| | **10.5** | **11.4** | **2.1** | **8.04** | **564.7** | **361.3** |
| **5 South** | **0** | **16.7** | **8.80** | **8.97** | **553.3** | **354.0** |
| | **0.5** | **16.7** | **8.88** | **9.00** | **553.2** | **354.0** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **16.7** | **8.89** | **9.02** | **553.0** | **354.0** |
| | **1.5** | **16.7** | **8.9** | **9.02** | **553.2** | **354.1** |
| | **2** | **16.7** | **8.89** | **9.03** | **553.0** | **353.9** |
| | **2.5** | **16.6** | **8.89** | **9.03** | **553.1** | **353.9** |
| | **3** | **16.6** | **8.88** | **9.02** | **553.3** | **354.0** |
| | **3.5** | **16.6** | **8.88** | **9.02** | **553.4** | **354.1** |
| | **4** | **16.6** | **8.87** | **9.02** | **553.4** | **354.1** |
| | **4.5** | **16.5** | **8.86** | **9.02** | **553.5** | **354.2** |
| | **5** | **16.5** | **8.85** | **9.01** | **553.5** | **354.2** |
| | **5.5** | **16.5** | **8.83** | **9.00** | **553.6** | **354.3** |
| | **6** | **16.0** | **8.68** | **8.94** | **554.5** | **354.8** |
| | **6.5** | **13.0** | **8.34** | **8.72** | **557.7** | **356.9** |
| | **7** | **11.7** | **7.76** | **8.49** | **559.4** | **358.0** |
| | **7.5** | **11.4** | **6.51** | **8.22** | **562.6** | **360.1** |
| | **8** | **11.1** | **5.22** | **8.07** | **565.9** | **362.3** |
| | **8.5** | **10.5** | **3.03** | **7.99** | **570.3** | **365.0** |
| | **MEAN** | **15.9** | **8.3** | **8.8** | **554** | **354** |
| | **STD DEV** | **1.9** | **1.6** | **0.3** | **6** | **4** |

**Table 3. Lake LeAnn <u>north basin</u> July 10, 2025 physical water quality data.**

| Site | Depth (m) | Temp °C | DO (mg/L) | pH (S.U.) | Cond (mS/cm) | TDS (mg/L) |
|---|---|---|---|---|---|---|
| 1 North | 0 | 28.2 | 7.93 | 9.24 | 489.7 | 313.4 |
| | 0.5 | 28.0 | 7.86 | 9.24 | 490.2 | 313.7 |
| | 1 | 27.8 | 7.85 | 9.20 | 490.2 | 313.7 |
| | 1.5 | 27.7 | 7.77 | 9.17 | 490.3 | 313.8 |
| | 2 | 27.6 | 7.65 | 9.17 | 490.2 | 313.7 |
| | 2.5 | 27.5 | 7.47 | 9.14 | 490.3 | 313.8 |
| | 3 | 27.5 | 7.36 | 9.14 | 490.5 | 313.7 |
| | 3.5 | 27.4 | 7.24 | 9.16 | 489.7 | 313.4 |
| | 4 | 27.0 | 7.08 | 8.91 | 494.0 | 316.3 |
| 2 North | 0 | 28.1 | 7.79 | 9.16 | 490.4 | 313.9 |
| | 0.5 | 28.1 | 7.35 | 9.15 | 490.5 | 313.7 |
| | 1 | 28.1 | 7.33 | 9.15 | 490.4 | 313.8 |
| | 1.5 | 27.9 | 7.30 | 9.09 | 490.7 | 314.1 |
| | 2 | 27.8 | 7.09 | 9.05 | 491.1 | 314.3 |
| | 2.5 | 27.8 | 6.88 | 9.05 | 490.9 | 314.2 |
| | 3 | 27.7 | 6.71 | 9.05 | 496.1 | 314.2 |
| | 3.5 | 27.7 | 6.43 | 9.01 | 491.5 | 314.4 |
| | 4 | 27.6 | 6.26 | 8.91 | 492.7 | 315.2 |
| | 4.5 | 27.5 | 5.93 | 8.67 | 494.8 | 316.5 |
| 3 North | 0 | 28.3 | 8.39 | 9.21 | 330.8 | 291.7 |
| | 0.5 | 28.2 | 8.19 | 9.22 | 468.7 | 299.7 |
| | 1 | 28.0 | 8.18 | 9.18 | 468.0 | 299.5 |
| | 1.5 | 27.8 | 8.16 | 9.15 | 468.0 | 299.2 |
| | 2 | 27.7 | 8.04 | 9.12 | 467.2 | 299.1 |
| | 2.5 | 27.6 | 7.96 | 8.90 | 469.2 | 300.1 |
| 4 North | 0 | 28.4 | 7.65 | 9.10 | 493.9 | 316.0 |
| | 0.5 | 28.2 | 7.56 | 9.06 | 494.5 | 316.5 |
| | 1 | 28.1 | 7.37 | 9.03 | 494.5 | 316.5 |
| | 1.5 | 27.8 | 7.24 | 8.96 | 494.6 | 316.5 |
| | 2 | 27.7 | 7.20 | 8.98 | 495.5 | 317.2 |
| | 2.5 | 27.6 | 7.14 | 8.70 | 496.4 | 317.7 |
| | 3 | 27.4 | 6.50 | 8.58 | 497.4 | 318.4 |
| 5 North | 0 | 28.0 | 7.69 | 9.17 | 490.5 | 313.9 |
| | 0.5 | 28.1 | 7.52 | 9.17 | 490.5 | 313.8 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **27.8** | **7.48** | **9.16** | **490.6** | **314.0** |
| | **1.5** | **27.8** | **7.43** | **9.16** | **490.6** | **314.1** |
| | **2** | **27.8** | **7.41** | **9.12** | **490.2** | **313.7** |
| | **2.5** | **27.7** | **7.17** | **9.09** | **490.7** | **314.0** |
| | **3** | **27.6** | **6.99** | **9.14** | **491.7** | **314.2** |
| | **MEAN** | **27.8** | **7.4** | **9.1** | **485** | **312** |
| | **STD DEV** | **0.3** | **0.5** | **0.2** | **27** | **6.3** |

**Table 4. Lake LeAnn south basin July 10, 2025 physical water quality data.**

| Site | Depth (m) | Temp °C | DO (mg/L) | pH (S.U.) | Cond (mS/cm) | TDS (mg/L) |
|---|---|---|---|---|---|---|
| 1 South | 0 | 29.3 | 9.66 | 9.14 | 517.6 | 331.1 |
| | 0.5 | 29.4 | 9.89 | 9.14 | 517.9 | 331.4 |
| | 1 | 28.4 | 10.18 | 9.12 | 516.8 | 330.8 |
| | 1.5 | 28.3 | 10.11 | 9.14 | 516.4 | 330.5 |
| | 2 | 28.1 | 10.21 | 9.18 | 514.9 | 329.5 |
| | 2.5 | 27.9 | 10.28 | 9.17 | 515.8 | 329.5 |
| | 3 | 27.77 | 10.30 | 9.10 | 516.0 | 330.1 |
| | 3.5 | 27.6 | 10.11 | 8.98 | 517.8 | 313.4 |
| | 4 | 27.5 | 9.55 | 8.78 | 520.0 | 332.6 |
| 2 South | 0 | 28.6 | 9.67 | 9.13 | 531.4 | 340.0 |
| | 0.5 | 28.5 | 10.15 | 9.14 | 531.2 | 340.0 |
| | 1 | 28.6 | 10.19 | 9.15 | 531.4 | 340.0 |
| | 1.5 | 28.2 | 10.24 | 9.16 | 529.9 | 339.2 |
| | 2 | 27.4 | 10.44 | 9.10 | 529.8 | 339.1 |
| | 2.5 | 27.2 | 10.03 | 8.96 | 533.6 | 341.8 |
| | 3 | 27.0 | 8.45 | 8.86 | 535.1 | 347.7 |
| | 3.5 | 26.9 | 8.28 | 8.90 | 535.1 | 342.8 |
| | 4 | 26.7 | 8.18 | 8.80 | 538.8 | 344.8 |
| | 4.5 | 26.7 | 7.79 | 8.80 | 538.5 | 344.7 |
| | 5 | 26.6 | 7.52 | 8.65 | 543.3 | 347.3 |
| | 5.5 | 26.5 | 5.77 | 8.36 | 549.2 | 351.5 |
| | 6 | 26.4 | 4.63 | 8.25 | 551.1 | 352.8 |
| 3 South | 0 | 28.48 | 9.33 | 9.04 | 532.9 | 217.0 |
| | 0.5 | 28.35 | 9.50 | 9.07 | 532.7 | 340.8 |
| | 1 | 28.16 | 9.55 | 9.08 | 532.0 | 340.5 |
| | 1.5 | 27.92 | 9.62 | 9.05 | 533.1 | 344.1 |
| | 2 | 27.79 | 9.47 | 9.02 | 533.1 | 341.2 |
| | 2.5 | 27.7 | 9.05 | 8.96 | 534.5 | 342.1 |
| | 3 | 27.6 | 8.75 | 8.91 | 534.1 | 341.9 |
| | 3.5 | 27.38 | 8.38 | 8.84 | 535.1 | 342.5 |
| 4 South | 0 | 28.7 | 9.14 | 9.16 | 533.0 | 341.1 |
| | 0.5 | 28.7 | 9.42 | 9.15 | 533.0 | 341.2 |
| | 1 | 28.7 | 9.62 | 9.15 | 533.1 | 341.2 |
| | 1.5 | 28.7 | 9.69 | 9.16 | 532.7 | 341.0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **2** | **28.6** | **9.73** | **9.16** | **532.7** | **340.6** |
| | **2.5** | **28.4** | **9.76** | **9.16** | **532.4** | **340.7** |
| | **3** | **28.2** | **9.81** | **9.12** | **532.4** | **340.7** |
| | **3.5** | **27.8** | **9.55** | **9.02** | **533.1** | **341.1** |
| | **4** | **27.6** | **8.79** | **8.99** | **533.2** | **341.2** |
| | **4.5** | **27.5** | **8.70** | **9.02** | **532.7** | **340.9** |
| | **5** | **27.4** | **8.64** | **8.92** | **535.1** | **342.3** |
| | **5.5** | **27.3** | **8.09** | **8.88** | **536.4** | **343.3** |
| | **6** | **26.0** | **6.52** | **8.36** | **547.2** | **350.2** |
| | **6.5** | **23.8** | **4.65** | **8.21** | **556.2** | **356.1** |
| | **7** | **19.2** | **2.67** | **8.15** | **532.7** | **359.7** |
| | **7.5** | **17.3** | **1.62** | **8.10** | **565.6** | **361.7** |
| | **8** | **15.9** | **0.86** | **8.09** | **571.1** | **365.6** |
| | **8.5** | **15.2** | **0.55** | **8.05** | **575.5** | **368.4** |
| | **9** | **14.9** | **0.34** | **8.03** | **579.2** | **370.6** |
| | **9.5** | **14.4** | **0.21** | **7.96** | **583.9** | **373.4** |
| | **10** | **14.1** | **0.13** | **7.91** | **587.9** | **376.3** |
| | **10.5** | **14.1** | **0.08** | **7.92** | **588.2** | **376.4** |
| | **11** | **13.9** | **0.06** | **7.86** | **592.4** | **379.1** |
| | **11.5** | **13.7** | **0.05** | **7.81** | **596.9** | **382.1** |
| | **12** | **13.5** | **0.04** | **7.57** | **627.2** | **401.3** |
| **5 South** | **0** | **28.9** | **9.49** | **9.14** | **532.9** | **341.1** |
| | **0.5** | **28.9** | **9.57** | **9.14** | **533.1** | **341.2** |
| | **1** | **28.9** | **9.63** | **9.14** | **533.1** | **341.1** |
| | **1.5** | **28.9** | **9.65** | **9.14** | **533.0** | **341.1** |
| | **2** | **28.9** | **9.67** | **9.15** | **533.0** | **341.1** |
| | **2.5** | **28.9** | **9.67** | **9.15** | **532.6** | **340.9** |
| | **3** | **28.6** | **9.71** | **9.14** | **532.5** | **340.8** |
| | **3.5** | **28.2** | **9.79** | **9.07** | **533.1** | **341.1** |
| | **4** | **27.8** | **9.36** | **8.98** | **533.4** | **341.5** |
| | **4.5** | **27.7** | **8.86** | **8.90** | **535.0** | **342.4** |
| | **5** | **27.3** | **8.18** | **8.61** | **541.6** | **346.5** |
| | **5.5** | **26.3** | **6.69** | **8.26** | **550.1** | **351.2** |
| | **6** | **22.2** | **4.97** | **8.14** | **561.3** | **359.5** |
| | **6.5** | **19.6** | **3.05** | **8.06** | **564.7** | **361.1** |
| | **7** | **16.8** | **1.61** | **8.02** | **569.4** | **363.5** |
| | **7.5** | **15.3** | **0.93** | **7.93** | **576.4** | **368.7** |
| | **8** | **14.6** | **0.43** | **7.86** | **588.7** | **376.7** |
| | **8.5** | **14.0** | **0.25** | **7.79** | **599.3** | **383.6** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **MEAN** | **25.0** | **7.2** | **8.7** | **544** | **346** |
| | **STD DEV** | **5.3** | **3.7** | **0.5** | **24** | **22** |

**Table 5. Lake LeAnn north basin September 9, 2025 physical water quality data.**

| Site | Depth (m) | Temp °C | DO (mg/L) | pH (S.U.) | Cond (mS/cm) | TDS |
|---|---|---|---|---|---|---|
| 1 North | 0 | 19.8 | 9.82 | 9.51 | 481.5 | 308.2 |
| | 0.5 | 19.8 | 9.95 | 9.53 | 481.5 | 308.1 |
| | 1 | 19.8 | 9.99 | 9.52 | 481.4 | 308.1 |
| | 1.5 | 19.8 | 10.03 | 9.52 | 481.5 | 308.2 |
| | 2 | 19.8 | 10.06 | 9.52 | 481.5 | 308.1 |
| | 2.5 | 19.8 | 10.07 | 9.53 | 481.6 | 308.2 |
| | 3 | 19.8 | 10.05 | 9.53 | 481.6 | 308.3 |
| 2 North | 0 | 20.0 | 9.45 | 9.41 | 481.9 | 308.4 |
| | 0.5 | 20.0 | 9.56 | 9.42 | 482.0 | 308.4 |
| | 1 | 20.0 | 9.61 | 9.43 | 482.0 | 308.5 |
| | 1.5 | 19.9 | 9.62 | 9.42 | 482.1 | 308.5 |
| | 2 | 19.9 | 9.61 | 9.42 | 481.9 | 308.4 |
| | 2.5 | 19.9 | 9.55 | 9.39 | 482.4 | 308.7 |
| | 3 | 19.8 | 9.47 | 9.33 | 483.1 | 309.2 |
| | 3.5 | 19.7 | 9.34 | 9.26 | 483.3 | 309.3 |
| | 4 | 19.7 | 8.98 | 9.20 | 484.2 | 309.9 |
| | 4.5 | 19.6 | 8.2 | 9.11 | 484.9 | 310.5 |
| 3 North | 0 | 19.6 | 9.96 | 9.55 | 479.2 | 306.6 |
| | 0.5 | 19.6 | 9.97 | 9.53 | 479.1 | 306.6 |
| | 1 | 19.6 | 10.01 | 9.53 | 479.1 | 306.6 |
| | 1.5 | 19.6 | 10.02 | 9.52 | 479.0 | 306.5 |
| | 2 | 19.6 | 10.04 | 9.52 | 479.3 | 306.7 |
| | 2.5 | 19.6 | 10.05 | 9.52 | 479.4 | 306.8 |
| 4 North | 0 | 19.9 | 9.70 | 9.36 | 483.7 | 309.6 |
| | 0.5 | 19.9 | 10.00 | 9.53 | 488.3 | 312.4 |
| | 1 | 19.8 | 10.45 | 9.52 | 488.2 | 312.4 |
| | 1.5 | 19.8 | 10.52 | 9.51 | 488.0 | 312.3 |
| | 2 | 19.7 | 10.49 | 9.51 | 488.5 | 312.7 |
| | 2.5 | 19.7 | 10.42 | 9.38 | 490.2 | 313.6 |
| | 3 | 19.5 | 10.19 | 9.15 | 501.1 | 320.6 |
| 5 North | 0 | 19.9 | 7.14 | 9.46 | 483.1 | 309.1 |
| | 0.5 | 19.9 | 8.24 | 9.41 | 483.0 | 309.1 |
| | 1 | 19.9 | 8.80 | 9.47 | 483.1 | 309.1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **1.5** | **19.9** | **9.05** | **9.48** | **483.0** | **309.1** |
| | **2** | **19.9** | **9.19** | **9.49** | **482.7** | **308.8** |
| | **2.5** | **19.8** | **9.33** | **9.51** | **482.5** | **308.8** |
| | **3** | **19.8** | **9.43** | **9.48** | **483.3** | **309.2** |
| | **3.5** | **19.8** | **9.70** | **9.36** | **483.7** | **309.6** |
| | **MEAN** | **19.8** | **9.6** | **9.4** | **483** | **309** |
| | **STD DEV** | **0.1** | **0.7** | **0.1** | **4** | **2.6** |

**Table 6. Lake LeAnn south basin September 9, 2025 physical water quality data.**

| Site | Depth (m) | Temp °C | DO (mg/L) | pH (S.U.) | Cond (mS/cm) | TDS (mg/L) |
|---|---|---|---|---|---|---|
| 1 South | 0 | 20.5 | 9.52 | 9.37 | 521.9 | 334.0 |
| | 0.5 | 20.4 | 9.65 | 9.38 | 521.4 | 333.9 |
| | 1 | 20.4 | 9.70 | 9.38 | 521.7 | 333.9 |
| | 1.5 | 20.3 | 9.77 | 9.40 | 521.3 | 333.6 |
| | 2 | 20.3 | 9.81 | 9.41 | 521.2 | 333.5 |
| | 2.5 | 20.2 | 9.85 | 9.42 | 521.0 | 333.5 |
| | 3 | 20.2 | 9.89 | 9.43 | 520.9 | 333.4 |
| | 3.5 | 20.2 | 9.92 | 9.44 | 520.9 | 333.4 |
| | 4 | 20.1 | 9.94 | 9.42 | 521.1 | 333.5 |
| | 4.5 | 20.0 | 9.81 | 9.39 | 523.0 | 334.6 |
| | 5 | 20.0 | 9.29 | 8.47 | 529.1 | 338.2 |
| 2 South | 0 | 20.3 | 9.61 | 9.33 | 534.2 | 341.8 |
| | 0.5 | 20.3 | 9.94 | 9.36 | 533.9 | 341.7 |
| | 1 | 20.2 | 9.98 | 9.37 | 534.2 | 341.7 |
| | 1.5 | 20.1 | 10.02 | 9.39 | 533.5 | 341.5 |
| | 2 | 19.9 | 9.99 | 9.39 | 535.0 | 341.5 |
| | 2.5 | 19.8 | 9.98 | 9.40 | 533.7 | 341.6 |
| | 3 | 19.6 | 9.93 | 9.40 | 534.2 | 341.7 |
| | 3.5 | 19.3 | 9.99 | 9.27 | 537.6 | 344.0 |
| 3 South | 0 | 20.2 | 9.67 | 9.39 | 533.4 | 341.2 |
| | 0.5 | 20.2 | 9.74 | 9.41 | 533.3 | 341.3 |
| | 1 | 20.1 | 9.78 | 9.40 | 533.3 | 341.3 |
| | 1.5 | 20.1 | 9.82 | 9.40 | 532.9 | 341.0 |
| | 2 | 19.9 | 9.84 | 9.38 | 533.1 | 341.2 |
| | 2.5 | 19.8 | 9.83 | 9.39 | 533.4 | 341.3 |
| | 3 | 19.8 | 9.78 | 9.39 | 533.4 | 341.4 |
| | 3.5 | 19.7 | 9.79 | 9.38 | 534.0 | 341.8 |
| 4 South | 0 | 20.1 | 8.62 | 9.36 | 539.2 | 341.9 |
| | 0.5 | 20.1 | 9.03 | 9.35 | 534.0 | 341.8 |
| | 1 | 20.1 | 9.14 | 9.36 | 534.2 | 341.9 |
| | 1.5 | 20.1 | 9.27 | 9.37 | 534.0 | 341.7 |
| | 2 | 20.0 | 9.34 | 9.37 | 533.8 | 341.6 |
| | 2.5 | 20.0 | 9.45 | 9.37 | 533.8 | 341.6 |
| | 3 | 19.9 | 9.55 | 9.37 | 533.8 | 341.6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **3.5** | **19.9** | **9.58** | **9.35** | **533.9** | **341.7** |
| | **4** | **19.7** | **9.59** | **9.33** | **534.1** | **341.8** |
| | **4.5** | **19.6** | **9.57** | **9.30** | **534.7** | **342.2** |
| | **5** | **19.6** | **9.46** | **9.28** | **534.8** | **342.3** |
| | **5.5** | **19.5** | **9.37** | **9.30** | **535.8** | **342.9** |
| | **6** | **19.5** | **9.26** | **9.30** | **535.6** | **342.8** |
| | **6.5** | **19.5** | **9.20** | **9.30** | **535.4** | **342.7** |
| | **7** | **19.5** | **9.16** | **9.31** | **535.2** | **342.5** |
| | **7.5** | **19.5** | **9.13** | **9.27** | **535.8** | **342.9** |
| | **8** | **19.4** | **9.10** | **9.23** | **537.2** | **343.8** |
| | **8.5** | **19.4** | **9.03** | **9.21** | **537.3** | **343.9** |
| | **9** | **19.4** | **8.92** | **9.19** | **539.2** | **345.0** |
| | **9.5** | **19.2** | **8.86** | **9.04** | **542.9** | **347.5** |
| **5 South** | **0** | **20.1** | **9.66** | **9.34** | **534.1** | **341.9** |
| | **0.5** | **20.1** | **9.70** | **9.34** | **534.1** | **341.8** |
| | **1** | **20.0** | **9.70** | **9.36** | **534.1** | **341.7** |
| | **1.5** | **20.0** | **9.70** | **9.36** | **534.0** | **341.9** |
| | **2** | **20.0** | **9.70** | **9.38** | **534.3** | **341.8** |
| | **2.5** | **20.0** | **9.72** | **9.36** | **533.3** | **342.0** |
| | **3** | **19.5** | **9.58** | **9.32** | **534.3** | **342.0** |
| | **3.5** | **19.58** | **9.30** | **9.30** | **535.0** | **342.3** |
| | **4** | **19.5** | **9.25** | **9.31** | **534.9** | **342.1** |
| | **4.5** | **19.4** | **8.97** | **9.30** | **535.4** | **342.6** |
| | **5** | **19.4** | **8.91** | **9.29** | **536.5** | **343.9** |
| | **5.5** | **19.3** | **8.82** | **9.17** | **538.2** | **344.3** |
| | **6** | **19.3** | **8.68** | **9.17** | **538.2** | **344.3** |
| | **6.5** | **19.3** | **8.57** | **9.16** | **538.6** | **344.7** |
| | **7** | **19.3** | **8.53** | **9.07** | **538.8** | **344.5** |
| | **MEAN** | **19.8** | **9.5** | **9.3** | **533** | **341** |
| | **STD DEV** | **0.4** | **0.4** | **0.1** | **5** | **3** |

### 3.2 Lake LeAnn 2025 Deep Basin Chemical Water Quality Data Tables:

**Table 7. Lake LeAnn <u>north basin</u> May 1, 2025 chemical water quality data.**

| SITE | Secchi (ft) | Chl-a (µg/L) | SITE | TP (mg/L) | TIN (mg/L) | TKN (mg/L) | NH3 (mg/L) | NO3 (mg/L) | NO2 (mg/L) |
|---|---|---|---|---|---|---|---|---|---|
| 1 North | 7'0" | 6.23 | 1 North Top | 0.014 | 0.34 | <1.0 | 0.056 | 0.29 | <0.1 |
| 2 North | 6'10" | 1.78 | 1 North Mid | 0.036 | 0.27 | 1.1 | 0.066 | 0.2 | <0.1 |
| 3 North | 6'5" | 8.01 | 1 North Bot | 0.024 | <0.21 | 1.3 | 0.078 | 0.11 | <0.1 |
| 4 North | 4'10" | 14.2 | 2 North Top | 0.022 | 0.38 | <1.0 | 0.075 | 0.30 | <0.1 |
| 5 North | 8'10" | 6.23 | 2 North Mid | 0.030 | 0.41 | <1.0 | 0.080 | 0.33 | <0.1 |
| **MEAN** | **6.8** | **7.3** | 2 North Bot | 0.050 | 0.45 | <1.0 | 0.080 | 0.38 | <0.1 |
| **STD DEV** | **1.4** | **0** | 3 North Mid | 0.032 | <0.21 | <1.0 | 0.027 | <0.1 | <0.1 |
| | | | 4 North Mid | 0.032 | <0.21 | 1.0 | 0.057 | <0.1 | <0.1 |
| | | | 5 North Mid | 0.020 | 0.31 | 1.2 | 0.070 | 0.24 | <0.1 |
| | | | **MEAN** | **0.029** | **0.307** | **1.1** | **0.065** | **0.228** | **0.100** |
| | | | **STD DEV** | **0.0** | **0** | **0.1** | **0.0** | **0** | **0** |

**Table 8. Lake LeAnn south basin May 2, 2025 chemical water quality data.**

| SITE | Secchi (ft) | Chl-a (µg/L) | SITE | TP (mg/L) | TIN (mg/L) | TKN (mg/L) | NH3 (mg/L) | NO3 (mg/L) | NO2 (mg/L) |
|---|---|---|---|---|---|---|---|---|---|
| 1 South | 5’0” | 2.67 | 1 South Top | 0.014 | 0.22 | <0.50 | 0.078 | 0.14 | <0.1 |
| 2 South | 4’7” | 0.89 | 1 South Mid | 0.018 | <0.21 | 0.65 | 0.078 | 0.13 | <0.1 |
| 3 South | 4’11” | 3.56 | 1 South Bot | 0.090 | 0.21 | 1.3 | 0.21 | <0.1 | <0.1 |
| 4 South | 5’3” | 4.45 | 2 South Top | 0.012 | <0.21 | 0.55 | 0.11 | <0.1 | <0.1 |
| 5 South | 6’3” | 3.56 | 2 South Mid | 0.022 | <0.21 | 0.76 | 0.13 | <0.1 | <0.1 |
| **MEAN** | **5.2** | **3.0** | 2 South Bot | 0.016 | <0.21 | 0.53 | 0.12 | <0.1 | <0.1 |
| **STD DEV** | **0.6** | **0** | 3 South Mid | 0.024 | 0.41 | 0.79 | 0.12 | 0.29 | <0.1 |
| | | | 4 South Top | 0.014 | <0.21 | <0.50 | 0.12 | <0.1 | <0.1 |
| | | | 4 South Mid | 0.024 | <0.21 | 0.65 | 0.13 | <0.1 | <0.1 |
| | | | 4 South Bot | 0.044 | 0.59 | 1.4 | 0.59 | <0.1 | <0.1 |
| | | | 5 South Top | <0.010 | <0.21 | <1.0 | 0.12 | <0.1 | <0.1 |
| | | | 5 South Mid | 0.018 | <0.21 | <1.0 | 0.13 | <0.1 | <0.1 |
| | | | 5 South Bot | 0.026 | 0.49 | 1.2 | 0.49 | <0.1 | <0.1 |
| | | | **MEAN** | **0.026** | **0.271** | **0.8** | **0.187** | **0.120** | **0.100** |
| | | | **STD DEV** | **0.0** | **0** | **0.3** | **0.2** | **0** | **0** |

**Table 9. Lake LeAnn north basin July 10, 2025 chemical water quality data.**

| SITE | Secchi (ft) | SITE | TP (mg/L) | TIN (mg/L) | TKN (mg/L) | NH3 (mg/L) | NO3 (mg/L) | NO2 (mg/L) |
|---|---|---|---|---|---|---|---|---|
| 1 North | 3'2" | 1 North Top | 0.025 | <0.21 | 0.79 | <0.010 | <0.1 | <0.1 |
| 2 North | 3'8" | 1 North Mid | 0.025 | <0.21 | 0.71 | <0.010 | <0.1 | <0.1 |
| 3 North | 2'3" | 1 North Bot | 0.032 | <0.21 | 0.78 | <0.010 | <0.1 | <0.1 |
| 4 North | 3'5" | 2 North Top | 0.026 | <0.21 | 0.96 | <0.010 | <0.1 | <0.1 |
| 5 North | 3'10" | 2 North Mid | 0.036 | <0.21 | 0.79 | <0.010 | <0.1 | <0.1 |
| MEAN | 3.3 | 2 North Bot | 0.028 | <0.21 | 0.68 | <0.010 | <0.1 | <0.1 |
| STD DEV | 0.6 | 3 North Mid | 0.030 | <0.21 | 0.87 | <0.010 | <0.1 | <0.1 |
| | | 4 North Mid | 0.022 | <0.21 | 0.65 | <0.010 | <0.1 | <0.1 |
| | | 5 North Mid | 0.026 | <0.21 | 0.7 | <0.010 | <0.1 | <0.1 |
| | | MEAN | 0.028 | 0.2 | 0.8 | 0.010 | 0.100 | 0.100 |
| | | STD DEV | 0.0 | 0 | 0.1 | 0.0 | 0 | 0 |

Note: In Situ Chl-a could not be read due to faulted meter. RLS contacted Turner Designs, but they no longer made this instrument.

**Table 10. Lake LeAnn south basin July 10, 2025 chemical water quality data.**

| SITE | Secchi (ft) | SITE | TP (mg/L) | TIN (mg/L) | TKN (mg/L) | NH3 (mg/L) | NO3 (mg/L) | NO2 (mg/L) |
|---|---|---|---|---|---|---|---|---|
| 1 South | 2'9" | 1 South Top | 0.016 | <0.21 | 0.64 | 0.041 | <0.1 | <0.1 |
| 2 South | 2'9" | 1 South Mid | 0.020 | <0.21 | 0.62 | 0.040 | <0.1 | <0.1 |
| 3 South | 2'7" | 1 South Bot | 0.020 | <0.21 | 0.57 | 0.060 | <0.1 | <0.1 |
| 4 South | 3'2" | 2 South Top | 0.016 | <0.21 | 0.58 | 0.043 | <0.1 | <0.1 |
| 5 South | 2'6" | 2 South Mid | 0.024 | <0.21 | 0.73 | 0.049 | <0.1 | <0.1 |
| MEAN | 2.9' | 2 South Bot | 0.020 | 0.30 | 1.1 | 0.30 | <0.1 | <0.1 |
| STD DEV | 0.2 | 3 South Mid | 0.020 | <0.21 | 0.61 | 0.092 | <0.1 | <0.1 |
| | | 4 South Top | 0.012 | <0.21 | 3.5 | 0.053 | <0.1 | <0.1 |
| | | 4 South Mid | 0.010 | <0.21 | 0.69 | 0.18 | <0.1 | <0.1 |
| | | 4 South Bot | 0.028 | 1.8 | 2.4 | 1.8 | <0.1 | <0.1 |
| | | 5 South Top | 0.018 | <0.21 | 0.58 | 0.049 | <0.10 | <0.1 |
| | | 5 South Mid | 0.014 | 0.31 | 0.88 | 0.31 | <0.1 | <0.1 |
| | | 5 South Bot | 0.028 | 0.61 | 1.0 | 0.61 | <0.1 | <0.1 |
| | | MEAN | 0.019 | 0.371 | 1.1 | 0.279 | 0.100 | 0.100 |
| | | STD DEV | 0.0 | 0 | 0.9 | 0.5 | 0 | 0 |

Note: In Situ Chl-a could not be read due to faulted meter. RLS contacted Turner Designs, but they no longer made this instrument.

**Table 11. Lake LeAnn north basin September 9, 2025 chemical water quality data.**

| SITE | Secchi (ft) | Chl-a (µg/L) | SITE | TP (mg/L) | TIN (mg/L) | TKN (mg/L) | NH3 (mg/L) | NO3 (mg/L) | NO2 (mg/L) |
|---|---|---|---|---|---|---|---|---|---|
| 1 North | 3.0’ | 18.7 | 1 North Top | 0.012 | 0.011 | <0.50 | 0.011 | <0.1 | <0.1 |
| 2 North | 3’3” | 16.9 | 1 North Mid | 0.012 | <0.010 | <0.50 | 0.0099 | <0.1 | <0.1 |
| 3 North | 3.0’ | 8.01 | 1 North Bot | 0.024 | 0.012 | 0.79 | 0.012 | <0.1 | <0.1 |
| 4 North | 3’4” | 20.5 | 2 North Top | 0.020 | 0.010 | <0.50 | 0.010 | <0.1 | <0.1 |
| 5 North | 3.0’ | 24.9 | 2 North Mid | 0.022 | 0.012 | <0.50 | 0.012 | <0.1 | <0.1 |
| MEAN | 3.1 | 17.8 | 2 North Bot | 0.028 | 0.087 | 0.72 | 0.087 | <0.1 | <0.1 |
| STD DEV | 0.2 | 0 | 3 North Mid | 0.030 | 0.014 | 0.61 | 0.014 | <0.1 | <0.1 |
| | | | 4 North Mid | 0.024 | 0.026 | 0.70 | 0.026 | <0.1 | <0.1 |
| | | | 5 North Mid | 0.020 | 0.011 | <0.50 | 0.011 | <0.1 | <0.1 |
| | | | MEAN | 0.021 | 0.021 | 0.6 | 0.021 | 0.100 | 0.100 |
| | | | STD DEV | 0.0 | 0 | 0.1 | 0.0 | 0 | 0 |

**Note: Since in situ meter was not functional in July, RLS submitted Chl-a samples to the laboratory for analysis.**

**Table 12. Lake LeAnn south basin September 9, 2025 chemical water quality data.**

| SITE | Secchi (ft) | Chl-a (µg/L) | SITE | TP (mg/L) | TIN (mg/L) | TKN (mg/l) | NH3 (mg/L) | NO3 (mg/L) | NO2 (mg/L) |
|---|---|---|---|---|---|---|---|---|---|
| 1 South | 3’2” | 4.45 | 1 South Top | <0.010 | 0.047 | <0.50 | 0.047 | <0.1 | <0.1 |
| 2 South | 4’1” | 3.51 | 1 South Mid | <0.010 | 0.042 | <0.50 | 0.042 | <0.1 | <0.1 |
| 3 South | 5’1” | 7.12 | 1 South Bot | 0.020 | 0.12 | <0.50 | 0.12 | <0.1 | <0.1 |
| 4 South | 5’4” | 5.10 | 2 South Top | 0.014 | 0.043 | <0.50 | 0.043 | <0.1 | <0.1 |
| 5 South | 5’3” | 4.45 | 2 South Mid | <0.010 | 0.042 | <0.50 | 0.042 | <0.1 | <0.1 |
| MEAN | 4.6 | 4.9 | 2 South Bot | <0.010 | 0.016 | <0.5 | 0.016 | <0.1 | <0.1 |
| STD DEV | 0.9 | 0 | 3 South Mid | <0.010 | 0.023 | <0.50 | 0.023 | <0.1 | <0.1 |
| | | | 4 South Top | <0.010 | 0.022 | <0.50 | 0.022 | <0.1 | <0.1 |
| | | | 4 South Mid | 0.012 | 0.022 | <0.50 | 0.012 | <0.1 | <0.1 |
| | | | 4 South Bot | 0.040 | 0.13 | <0.50 | 0.13 | <0.1 | <0.1 |
| | | | 5 South Top | <0.010 | 0.013 | <0.50 | 0.013 | <0.1 | <0.1 |
| | | | 5 South Mid | <0.010 | 0.036 | <0.50 | 0.036 | <0.1 | <0.1 |
| | | | 5 South Bot | 0.014 | 0.045 | 1.0 | 0.045 | <0.1 | <0.1 |
| | | | MEAN | 0.014 | 0.046 | 0.030 | 0.045 | 0.100 | 0.100 |
| | | | STD DEV | 0.0 | 0 | 0.1 | 0.0 | 0 | 0 |

## 3.3 Lake LeAnn 2025 CSA (Drain) Physical & Chemical Water Quality Data Tables:

Previous analyses demonstrated that the CSA's around the lake contribute nutrient and sediment loads to the lake which lead to water quality degradation over time. Such degradation has currently resulted in the occurrence of internal loading within the lake. The LLPOA has partnered with the Hillsdale County Conservation District for drain improvements. Additionally, the Hillsdale County Road Commission addressed a road issue at Baker and Northview roads during the spring of 2023 to reduce sediment loads to the lake.

### CSA Water Quality Parameters Measured:

Water quality parameters such as dissolved oxygen, water temperature, pH, conductivity, total suspended solids, total phosphorus, ortho-phosphorus, total inorganic nitrogen (specifically ammonia, nitrate, and nitrite), and total Kjeldahl nitrogen were measured at each of the CSA areas under flowing conditions. Samples consisted of preserved grab bottles which were placed on ice and transported to the NELAC-certified laboratory for analysis. The data for the CSA's are discussed below and are presented in tables 13-15 with descriptive statistics. Samples and water quality measurements were collected on June 9, 2025, July 10, 2025, and September 9, 2025. Measurements were taken with a calibrated Eureka Manta II® multi-parameter probe. A discussion of each parameter and how they are collected and measured follows. Any drains not listed below could not be sampled due to a lack of flow.

**Table 13. Lake LeAnn Flowing CSA Drain Water Quality Data (June 9, 2025).**

| CSA | Temp °C | DO (mg/L) | pH (S.U.) | Cond (mS/cm) | TP (mg/L) | SRP (mg/L) | TIN (mg/L) | NH3 (mg/L) | NO3 (mg/L) | NO2 (mg/L) | TKN (mg/L) | TSS (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2A** | 18.62 | 8.46 | 8.31 | 722.3 | 0.012 | <0.010 | 0.019 | 0.019 | <0.1 | <0.1 | <0.50 | 10 |
| **2B** | 17.62 | 8.67 | 8.17 | 716.2 | 0.026 | <0.010 | 0.024 | 0.024 | <0.1 | <0.1 | <0.50 | <10 |
| **1A** | 15.24 | 8.82 | 8.66 | 438.2 | 0.068 | <0.010 | 0.13 | 0.13 | <0.1 | <0.1 | 1.2 | 22 |
| **MEAN** | **17.2** | **8.7** | **8.4** | **626** | **0.035** | **0.01** | **0.058** | **0.058** | **0.1** | **0.1** | **0.7** | **14** |
| **STD DEV** | **1.7** | **0.2** | **0.3** | **162** | **0.029** | **0** | **0.1** | **0.1** | **0** | **0** | **0.4** | **7** |

**Note: Only flowing drains could be adequately sampled.**

**Table 14. Lake LeAnn Flowing CSA Drain Water Quality Data (July 10, 2025).**

| CSA | Temp °C | DO (mg/L) | pH (S.U.) | Cond (mS/cm) | TP (mg/L) | SRP (mg/L) | TIN (mg/L) | NH3 (mg/L) | NO3 (mg/L) | NO2 (mg/L) | TKN (mg/L) | TSS (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2A** | 21.87 | 8.13 | 9.05 | 710.5 | 0.022 | <0.010 | 0.42 | <0.010 | 0.42 | <0.1 | <0.50 | 14 |
| **2B** | 19.94 | 8.34 | 8.28 | 701.7 | 0.022 | 0.017 | 0.93 | 0.024 | 0.90 | <0.1 | <0.50 | <10 |
| **MEAN** | **20.9** | **8.2** | **8.7** | **706** | **0.022** | **0.014** | **0.675** | **0.017** | **0.660** | **0.1** | **0.5** | **12** |
| **STD DEV** | **1.4** | **0.1** | **0.5** | **6.2** | **0** | **0.0** | **0.4** | **0.0** | **0.3** | **0** | **0** | **2.8** |

**Note: Only flowing drains could be adequately sampled.**

**Table 15. Lake LeAnn Flowing CSA Drain Water Quality Data (September 9, 2025).**

| CSA | Temp °C | DO (mg/L) | pH (S.U.) | Cond (mS/cm) | TP (mg/L) | SRP (mg/L) | TIN (mg/L) | NH3 (mg/L) | NO3 (mg/L) | NO2 (mg/L) | TKN (mg/L) | TSS (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2A | 18.33 | 9.31 | 8.50 | 668.2 | <0.010 | <0.010 | 0.027 | 0.027 | <0.1 | <0.1 | <0.5 | 18 |
| 2B | 15.72 | 9.23 | 8.41 | 711.2 | 0.010 | <0.010 | 0.025 | 0.025 | <0.1 | <0.1 | <0.5 | <10 |
| 1A | 20.11 | 9.20 | 7.88 | 543.0 | 0.012 | <0.010 | 0.062 | 0.062 | <0.1 | <0.1 | <0.5 | 14 |
| **MEAN** | **18.1** | **9.2** | **8.3** | **641** | **0.011** | **0.01** | **0.038** | **0.021** | **0.1** | **0.1** | **0.5** | **14** |
| **STD DEV** | **2.2** | **0.1** | **0.3** | **87** | **0.0** | **0** | **0.0** | **0.009** | **0** | **0** | **0** | **4** |

**Note: Only flowing drains could be adequately sampled.**

## 3.4 Lake LeAnn Aquatic Vegetation Biovolume Data (June 24, 2025)

A whole-lake scan of the aquatic vegetation in Lake LeAnn was conducted on June 24, 2025 with a WAAS-enabled Lowrance HDS 9 GPS with variable frequency transducer. Points were uploaded into a cloud software program to reveal maps that displayed depth contours, sediment hardness, and aquatic vegetation biovolume (Figures 5-6). On these maps, the color blue refers to areas that lack vegetation. The color green refers to low-lying vegetation. The colors red/orange refer to tall-growing vegetation. There are many areas around the littoral (shallow) zone of the lake that contain low-growing plants like Chara. In addition, any emergent canopies or lily pads will show as red color on the map. For this reason, the scans are conducted in conjunction with a whole lake GPS survey to account for individual species identification of all aquatic plants in the lake. Tables 16-17 show the biovolume categories by plant cover during the June 24, 2025 scan and survey.

The Point-Intercept Survey method is used to assess the presence and percent cumulative cover of submersed, floating-leaved, and emergent aquatic vegetation within and around the littoral zones of inland lakes. With this survey method, sampling locations are geo-referenced (via GPS waypoints) and assessed throughout the entire lake to determine the species of aquatic macrophytes present and density of each macrophyte which are recorded onto a data sheet.

Each separate plant species found in each sampling location is recorded along with an estimate of each plant density. Each macrophyte species corresponds to an assigned number. There are designated density codes for the aquatic vegetation surveys, where a = found (occupying < 2% of the surface area of the lake), b = sparse (occupying 2-20% of the surface area of the lake), c = common, (occupying 21-60% of the surface area of the lake), and d = dense (occupying > 60% of the surface area of the lake).

In 2025, the June and September surveys of the north basin of Lake LeAnn consisted of 154 sampling locations around the littoral zone and the survey of the south basin consisted of 193 sampling locations. Additional follow-up post treatment surveys were conducted later in the season to confirm treatment efficacy. A pre-treatment survey was conducted in May to record EWM and CLP locations for treatment. Data were placed in a table showing the relative abundance of each aquatic plant species found and a resultant calculation showing the frequency of each plant, and cumulative cover.

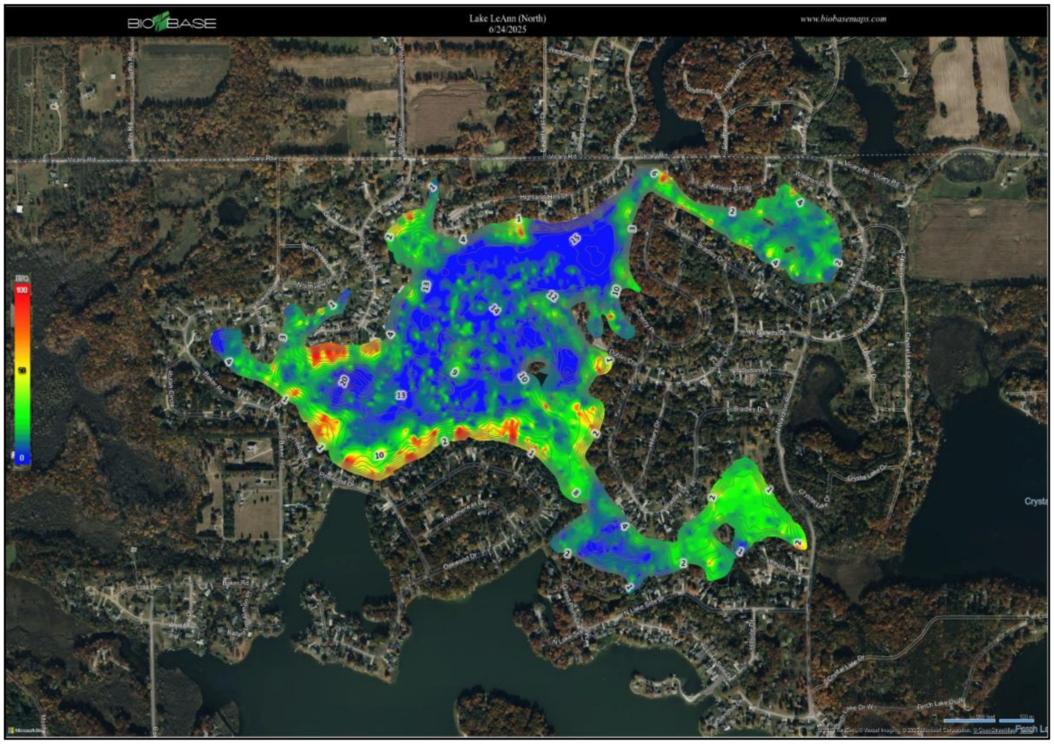


**Figure 5. Aquatic plant biovolume of all aquatic plants in north Lake LeAnn, Hillsdale County, Michigan (June 24, 2025). Note: Red color denotes high-growing aquatic plants, green color denoted low-growing aquatic plants, and blue color represents a lack of aquatic vegetation.**

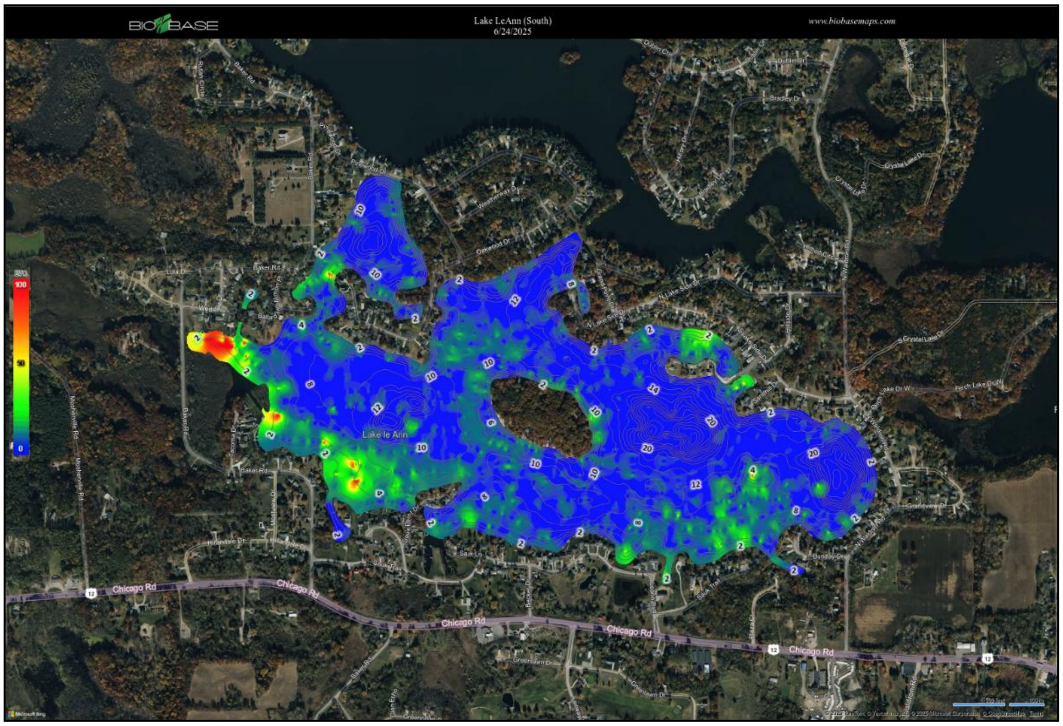


**Figure 6. Aquatic plant biovolume of all aquatic plants in south Lake LeAnn, Hillsdale County, Michigan (June 24, 2025). Note: Red color denotes high-growing aquatic plants, green color denoted low-growing aquatic plants, and blue color represents a lack of aquatic vegetation.**

**Table 16. Lake LeAnn north basin aquatic vegetation biovolume by category percent cover (relative cover on June 24, 2025).**

| Biovolume Cover Category | % Relative Cover of Bottom by Category |
|---|---|
| **<5%** | 5.0 |
| **5-20%** | 70.7 |
| **20-40%** | 15.2 |
| **40-60%** | 5.1 |
| **60-80%** | 0.7 |
| **>80%** | 3.3 |

**Table 17. Lake LeAnn south basin aquatic vegetation biovolume by category percent cover (relative cover on June 24, 2025).**

| Biovolume Cover Category | % Relative Cover of Bottom by Category |
|---|---|
| **<5%** | 4.0 |
| **5-20%** | 90.8 |
| **20-40%** | 3.6 |
| **40-60%** | 0.7 |
| **60-80%** | 0.2 |
| **>80%** | 0.7 |

During the June 24, 2025 whole-lake species inventory survey, the north basin of Lake LeAnn contained 7 native submersed, 2 floating-leaved, and 2 emergent aquatic plant species, for a total of 11 native aquatic macrophyte species (Table 18). The south basin of Lake LeAnn contained 8 native submersed, 2 floating-leaved, and 1 emergent aquatic plant species, for a total of 11 native aquatic macrophyte species (Table 19). The dominant native aquatic plants in the north basin of the lake included Chara (48.1% of the sampling sites), and Elodea (14.9% of the sampling sites). The dominant native aquatic plants in the south basin of the lake included Chara (31.6% of the sampling sites), and the Elodea (9.8% of the sampling sites).

An additional late-season comprehensive inventory of both lakes was conducted on September 9, 2025. The north basin of Lake LeAnn contained 9 native submersed, 2 floating-leaved, and 1 emergent aquatic plant species, for a total of 12 native aquatic macrophyte species (Table 20). The south basin of Lake LeAnn contained 10 native submersed, 2 floating-leaved, and 2 emergent aquatic plant species, for a total of 14 native aquatic macrophyte species (Table 21).

The dominant native aquatic plants in the north basin of the lake included Chara (74.0% of the sampling sites), and Wild Celery (40.3% of the sampling sites). The dominant native aquatic plants in the south basin of the lake included the Chara (69.4% of the sampling sites), and Wild Celery (38.9% of the sampling sites). RLS discourages the treatment of any native submersed aquatic plants as the lake needs those species in the absence of invasive cover by milfoil and Curly-leaf Pondweed. All invasives should be treated however, as continued growth leads to spread and further loss of native submersed aquatic plant species. Figures 7-15 below display the treatment areas in 2025 where targeted treatments of invasive species were needed to reduce milfoil and Curly-leaf Pondweed.

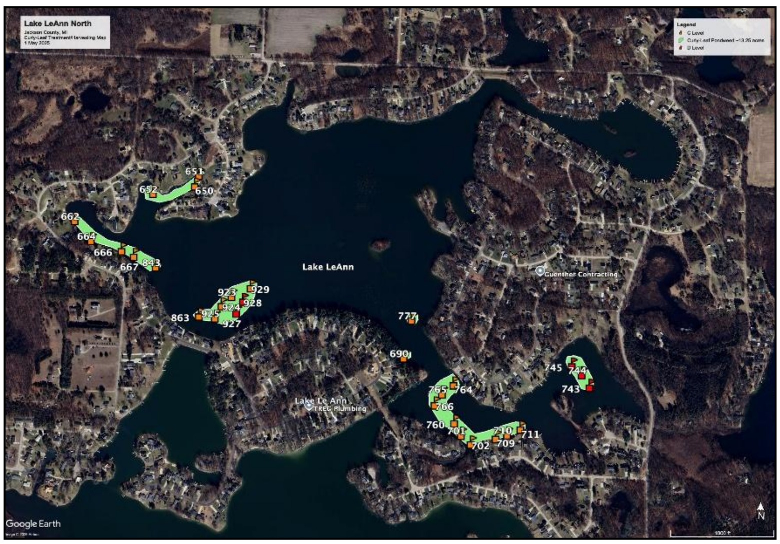


**Figure 7. North Lake LeAnn May 2025 CLP treatment map.**


**Figure 8. South Lake LeAnn May 2025 CLP treatment map.**

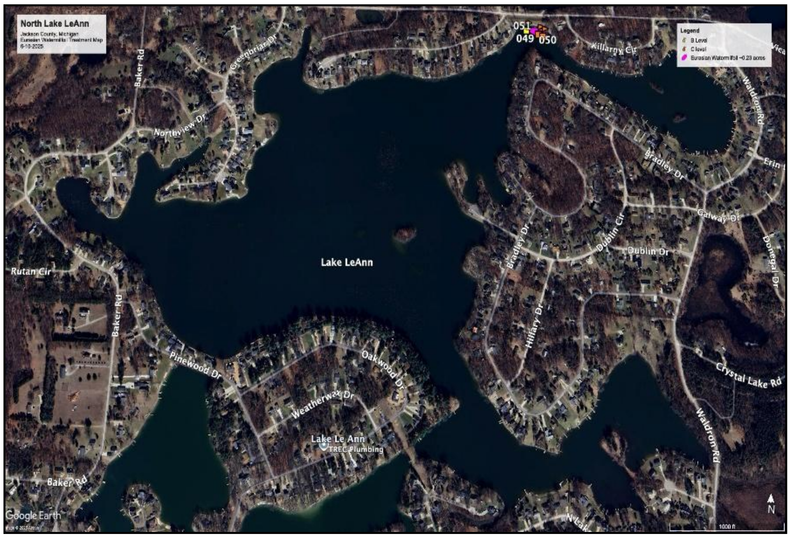


**Figure 9. North Lake LeAnn June 2025 EWM treatment map.**

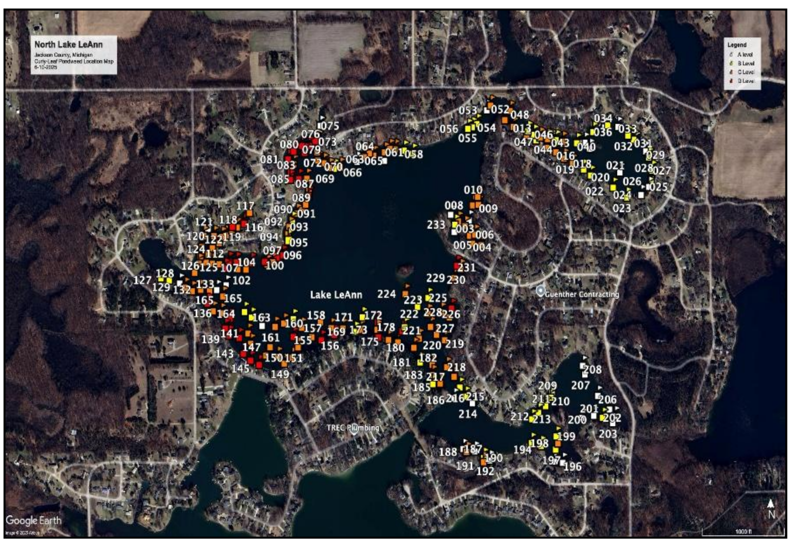


**Figure 10. South Lake LeAnn June 2025 CLP treatment map.**

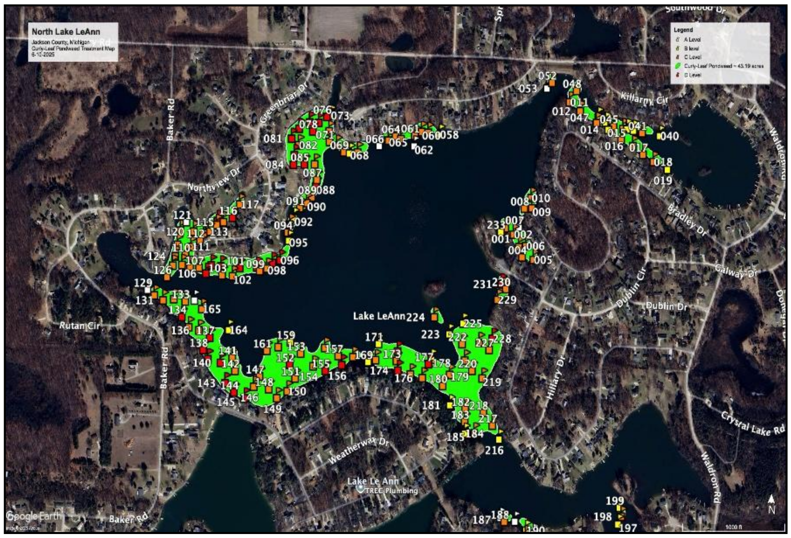


**Figure 11. North Lake LeAnn June 2025 CLP treatment map.**


**Figure 12. North Lake LeAnn August 2025 Algae treatment map.**

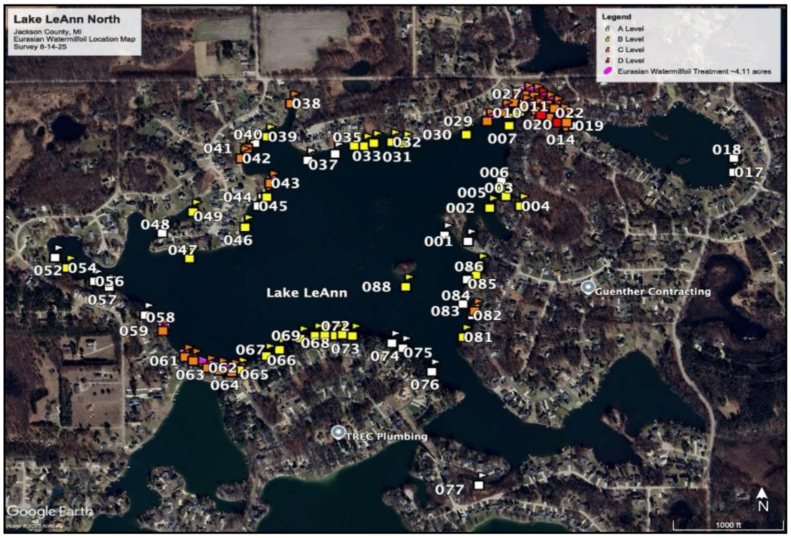


**Figure 13. North Lake LeAnn August 2025 EWM treatment map.**


**Figure 14. South Lake LeAnn August 2025 EWM treatment map.**

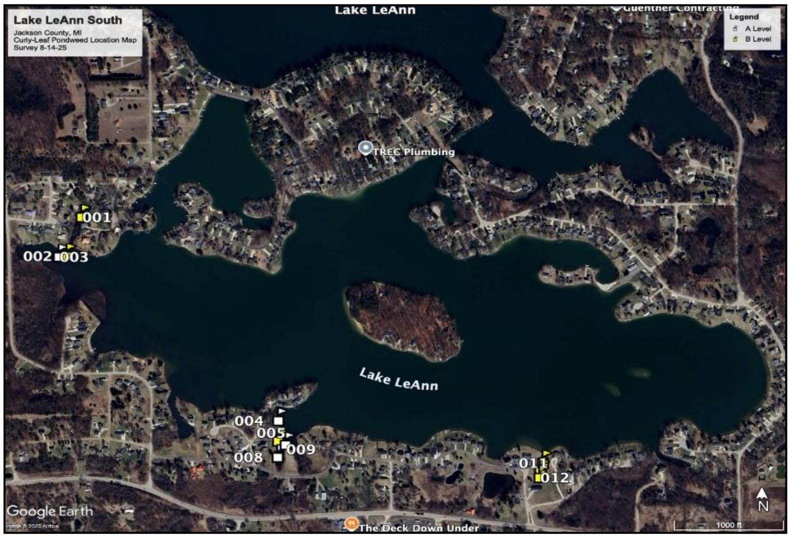


**Figure 15. South Lake LeAnn August 2025 CLP treatment map.**

**Table 18. Lake LeAnn <u>north basin</u> native aquatic plants (June 24, 2025).**

| Aquatic Plant Common Name | Aquatic Plant Latin Name | A level | B level | C level | D level | % Sites Found |
|---|---|---|---|---|---|---|
| Muskgrass | *Chara vulgaris* | 62 | 9 | 2 | 1 | 48.1 |
| Flat-stem Pondweed | *Potamogeton zosteriformis* | 5 | 3 | 0 | 0 | 5.2 |
| Illinois Pondweed | *Potamogeton illinoensis* | 8 | 5 | 1 | 0 | 9.1 |
| Large-leaf Pondweed | *Potamogeton amplifolius* | 6 | 3 | 1 | 0 | 6.5 |
| Coontail | *Ceratophyllum demersum* | 11 | 4 | 1 | 0 | 10.4 |
| Southern Naiad | *Najas guadalupensis* | 5 | 1 | 1 | 0 | 4.5 |
| Common Waterweed | *Elodea canadensis* | 9 | 13 | 1 | 0 | 14.9 |
| White Waterlily | *Nymphaea odorata* | 10 | 1 | 0 | 0 | 7.1 |
| Yellow Waterlily | *Nuphar variegata* | 6 | 2 | 0 | 0 | 5.2 |
| Cattails | *Typha latifolia* | 5 | 0 | 0 | 0 | 3.2 |
| Iris | *Iris* spp. | 1 | 0 | 0 | 0 | 0.6 |

**Table 19. Lake LeAnn <u>south basin</u> native aquatic plants (June 24, 2025).**

| Aquatic Plant Common Name | Aquatic Plant Latin Name | A level | B level | C level | D level | # Sites Found |
|---|---|---|---|---|---|---|
| Muskgrass | *Chara vulgaris* | 43 | 16 | 2 | 0 | 31.6 |
| Flat-stem Pondweed | *Potamogeton zosteriformis* | 3 | 1 | 0 | 0 | 2.1 |
| Large-leaf Pondweed | *Potamogeton amplifolius* | 5 | 2 | 0 | 0 | 3.6 |
| Illinois Pondweed | *Potamogeton illinoensis* | 6 | 4 | 2 | 0 | 6.2 |
| Bladderwort | *Utricularia vulgaris* | 4 | 2 | 1 | 1 | 4.1 |
| Common Waterweed | *Elodea canadensis* | 11 | 6 | 2 | 0 | 9.8 |
| Southern Naiad | *Najas guadalupensis* | 4 | 1 | 1 | 0 | 3.1 |
| Northern Watermilfoil | *Myriophyllum sibiricum* | 1 | 3 | 0 | 0 | 2.1 |
| White Waterlily | *Nymphaea odorata* | 2 | 1 | 0 | 0 | 1.6 |
| Yellow Waterlily | *Nuphar variegata* | 5 | 1 | 0 | 0 | 3.1 |
| Cattails | *Typha latifolia* | 2 | 7 | 0 | 0 | 4.7 |

**Table 20. Lake LeAnn <u>north basin</u> native aquatic plants (September 9, 2025).**

| Aquatic Plant Common Name | Aquatic Plant Latin Name | A level | B level | C level | D level | % Sites Found |
|---|---|---|---|---|---|---|
| Muskgrass | *Chara vulgaris* | 71 | 41 | 2 | 0 | 74.0 |
| Illinois Pondweed | *Potamogeton illinoensis* | 32 | 2 | 2 | 0 | 23.4 |
| Common Waterweed | *Elodea canadensis* | 9 | 1 | 0 | 0 | 6.5 |
| Wild Celery | *Vallisneria americana* | 55 | 6 | 1 | 0 | 40.3 |
| Southern Naiad | *Najas guadalupensis* | 6 | 2 | 1 | 0 | 5.8 |
| Sago Pondweed | *Stuckenia pectinata* | 17 | 6 | 0 | 0 | 14.9 |
| Bladderwort | *Utricularia vulgaris* | 6 | 0 | 0 | 0 | 3.9 |
| Large-leaf Pondweed | *Potamogeton amplifolius* | 5 | 1 | 1 | 0 | 4.5 |
| Coontail | *Ceratophyllum demersum* | 22 | 5 | 1 | 0 | 18.2 |
| White Waterlily | *Nymphaea odorata* | 17 | 3 | 0 | 0 | 13.0 |
| Yellow Waterlily | *Nuphar variegata* | 4 | 4 | 0 | 0 | 5.2 |
| Cattails | *Typha latifolia* | 2 | 1 | 0 | 0 | 1.9 |

**Table 21. Lake LeAnn south basin native aquatic plants (September 9, 2025).**

| Aquatic Plant Common Name | Aquatic Plant Latin Name | A level | B level | C level | D level | # Sites Found |
|---|---|---|---|---|---|---|
| Muskgrass | *Chara vulgaris* | 121 | 5 | 8 | 0 | 69.4 |
| Illinois Pondweed | *Potamogeton illinoensis* | 43 | 2 | 0 | 0 | 23.3 |
| Flat-stem Pondweed | *Potamogeton zosteriformis* | 4 | 2 | 0 | 0 | 3.1 |
| Floating-leaf Pondweed | *Potamogeton natans* | 4 | 4 | 1 | 0 | 4.7 |
| Large-leaf Pondweed | *Potamogeton amplifolius* | 9 | 2 | 0 | 0 | 5.7 |
| Southern Naiad | *Najas guadalupensis* | 4 | 0 | 1 | 0 | 2.6 |
| Wild Celery | *Vallisneria americana* | 69 | 2 | 4 | 0 | 38.9 |
| Sago Pondweed | *Stuckenia pectinata* | 5 | 4 | 0 | 0 | 4.7 |
| Coontail | *Ceratophyllum demersum* | 2 | 1 | 0 | 0 | 1.6 |
| Common Waterweed | *Elodea canadensis* | 9 | 4 | 0 | 0 | 6.7 |
| White Waterlily | *Nymphaea odorata* | 5 | 0 | 0 | 0 | 2.6 |
| Yellow Waterlily | *Nuphar variegata* | 1 | 1 | 0 | 0 | 1.1 |
| Cattails | *Typha latifolia* | 2 | 0 | 0 | 0 | 1.1 |
| Bulrushes | *Schoenoplectus acutus* | 2 | 0 | 0 | 0 | 1.1 |

### 3.5 Lake LeAnn Bottom Hardness Scan and Data:

A bottom sediment hardness scan was conducted of the entire lake bottom on June 24, 2025. The bottom hardness maps show (Figures 16-17) that most of the lake bottom consists of fairly consolidated sediment throughout the lake with a few areas with soft organic bottom. This is not surprising given the amount of sandy loams in the region which contribute to lake geology. Tables 22-23 below show the categories of relative bottom hardness with 0.0-0.1 referring to the softest and least consolidated bottom and >0.4 referring to the hardest, most consolidated bottom for the two lake basins. This scale does not mean that any of the lake contains a truly "hard" bottom but rather a bottom that is more cohesive and not flocculent.

**Table 22. Lake LeAnn north basin relative hardness of the lake bottom by category or hardness and percent cover of each category (relative cover).**

| Lake Bottom Relative Hardness Category | # GPS Points in Each Category | % Relative Cover of Bottom by Category |
|---|---|---|
| **0.0-0.1** | 28 | 0.5 |
| **0.1-0.2** | 839 | 16.0 |
| **0.2-0.3** | 3143 | 59.8 |
| **0.3-0.4** | 1246 | 23.7 |
| **>0.4** | 1 | 0.0 |

**Table 23. Lake LeAnn south basin relative hardness of the lake bottom by category or hardness and percent cover of each category (relative cover).**

| Lake Bottom Relative Hardness Category | # GPS Points in Each Category | % Relative Cover of Bottom by Category |
|---|---|---|
| **0.0-0.1** | 48 | 0.8 |
| **0.1-0.2** | 1895 | 33.2 |
| **0.2-0.3** | 2310 | 40.6 |
| **0.3-0.4** | 1423 | 25.0 |
| **>0.4** | 20 | 0.4 |

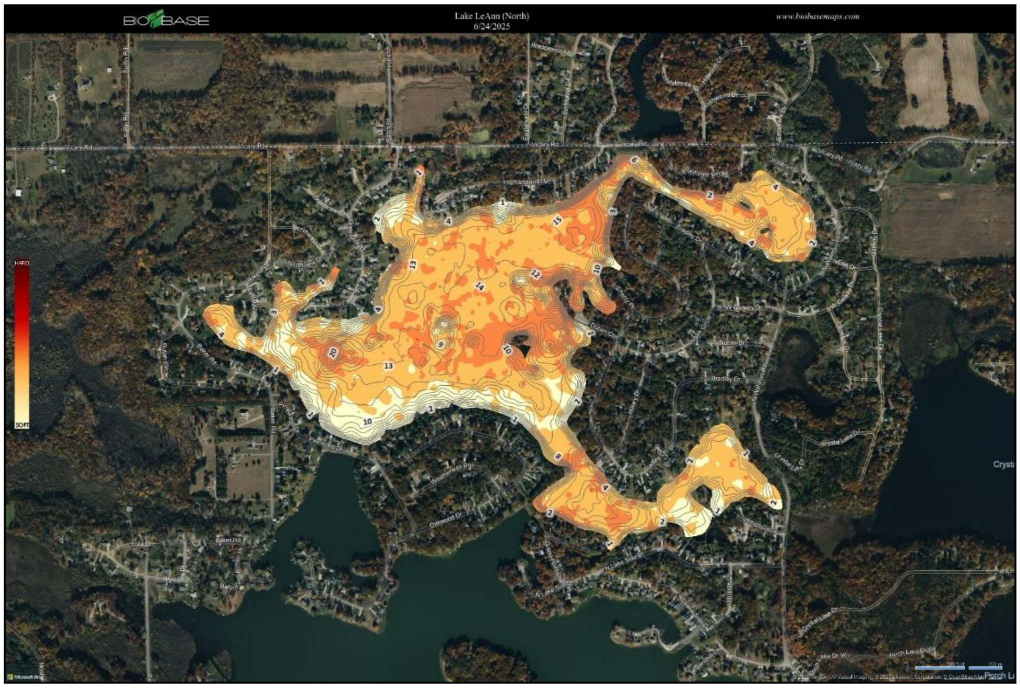


**Figure 16. Lake LeAnn <u>north basin</u> sediment relative hardness map (June 24, 2025).**

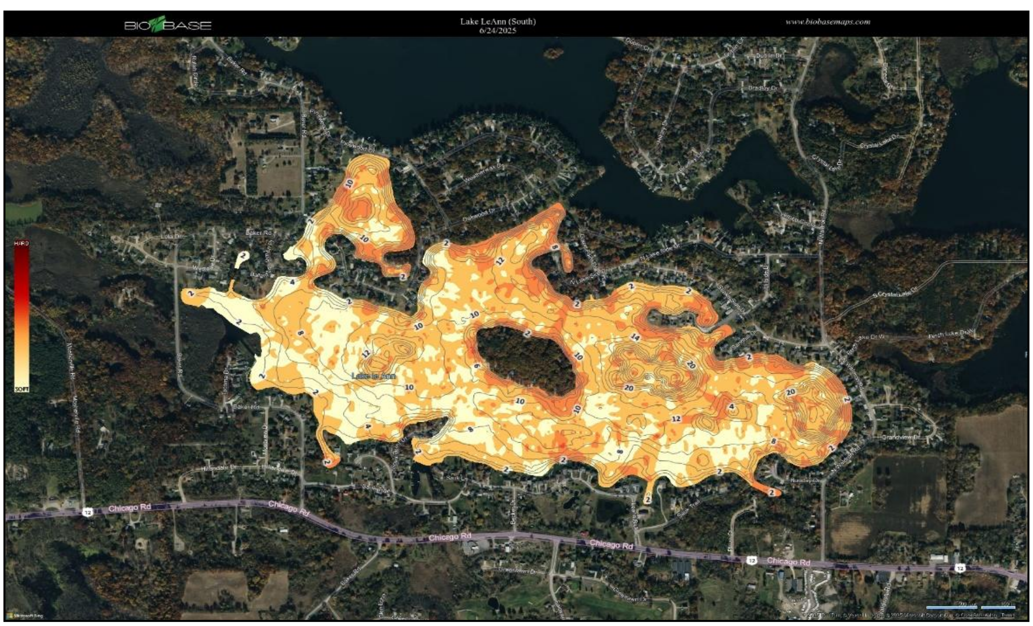


**Figure 17. Lake LeAnn <u>south basin</u> sediment relative hardness map (June 24, 2025)**

# 4.0 LAKE LEANN 2019-2025 CONCLUSIONS AND RECOMMENDATIONS FOR 2026

The continued implementation of the LFA technology and concomitant use of bioaugmentation (beneficial bacteria and enzymes) in Lake LeAnn occurred in 2021 and 2023 with reduced efficacy of the bioaugmentation relative to blue-green algae reduction and reductions in nutrients. In 2024, the use of Timberchar® biochar was implemented beginning on June 8, 2024 in both basins to reduce water column nutrients. In 2025, Eutrosorb was used in the north basin to reduce internal loading of P in the lake basin by reduced sedimentary release of P. RLS recommends continued application of this product to the north basin and also to the south basin with continued monitoring.

Overall, the lake needs more low-growing, native submersed aquatic vegetation, less invasive aquatic plant species, less cyanobacteria, and less nutrients in order to have clearer water. The nutrient concentrations in the lake are indicative of eutrophic waters with elevated phosphorus, nitrogen, and chlorophyll-a. Additional impairments include low dissolved oxygen with depth in non-aerated locations (2 basins in the South Basin), and reduced water clarity through low secchi transparency readings. The Sections below (I-VI) display the 2019 mean baseline data set and the post-LFA mean data sets (2021-2025). The following sub-sections below summarize an analysis of all collected data from 2019 and 2021-2025 with comparisons. All data collected has been analyzed and are summarized below with descriptive statistic tables that include means and standard deviations.

Management recommendations for 2026 are listed last and mentioned in Section VII below.

**Statistical Summary of Baseline (2019) and Year 1 (2021) and Years 2-4 (2022-2025) Lake LeAnn LFA Data**

**I. <u>Lake Basins:</u>**

The tables below (24-29) display the means and standard deviations for both lake basins in 2019 (baseline) and 2021-2025 (Years 1-5 of LFA operation). Figures 18-23 display the trends in key water quality parameters for both basins along with trend lines. This analysis allowed for a seasonal comparison of baseline to post-LFA conditions for all water quality parameters. Based on this complete and comprehensive data analysis, the following conclusions can be made:

**<u>North Basin:</u>**

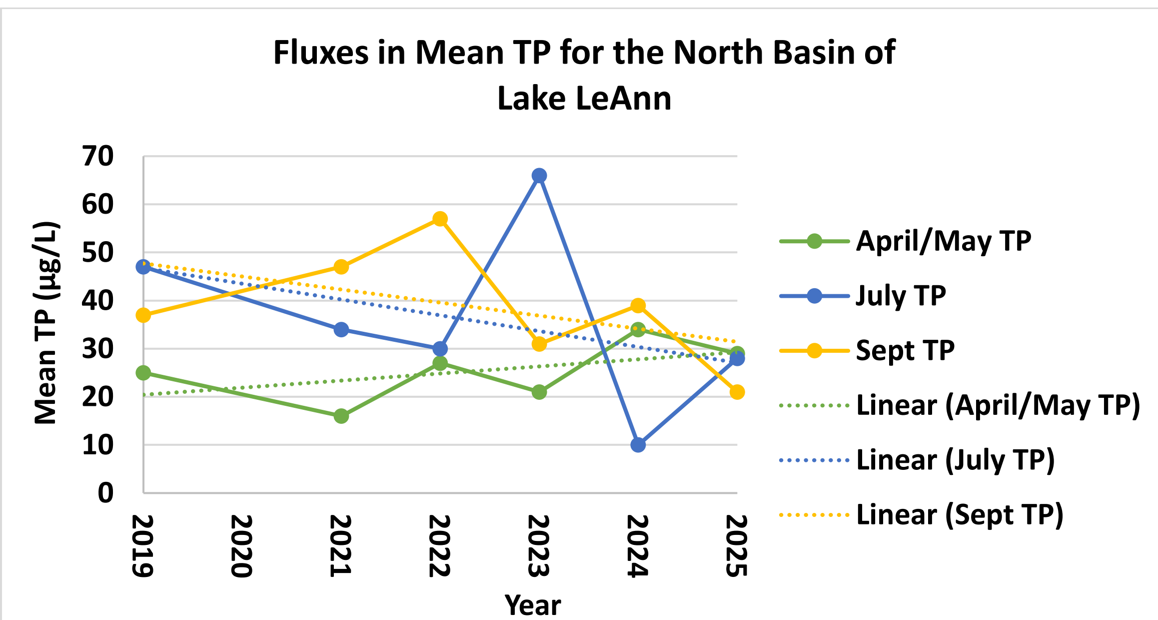


**Figure 18. Flux in Mean TP for the <u>north basin</u> of Lake LeAnn (2019-2025).**

The mean TP has increased in the spring (April/May) but decreased in July and September which is favorable. Spring concentrations may be increasing due to runoff being higher in the spring months. In 2025, the TP was just above the eutrophic threshold in July. Continued reduction of these concentrations should reduce the occurrence of blue-green algal blooms.

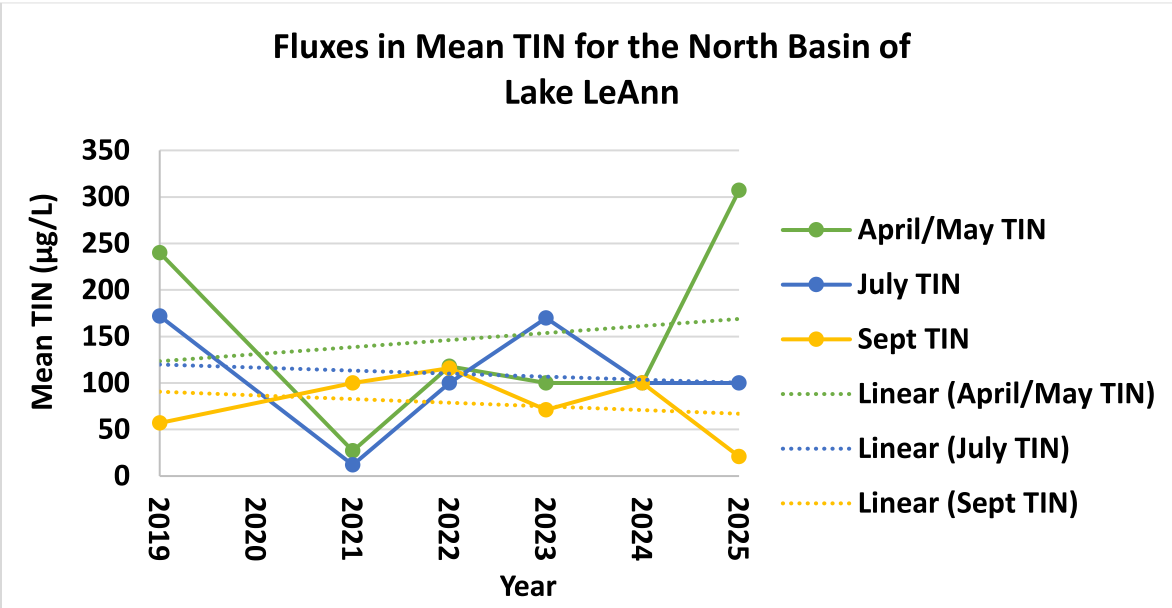


**Figure 19. Flux in Mean TIN for the <u>north basin</u> of Lake LeAnn (2019-2025).**

The mean TIN has increased in the spring (April/May) but declined in July and in September. All of the values remain favorable.

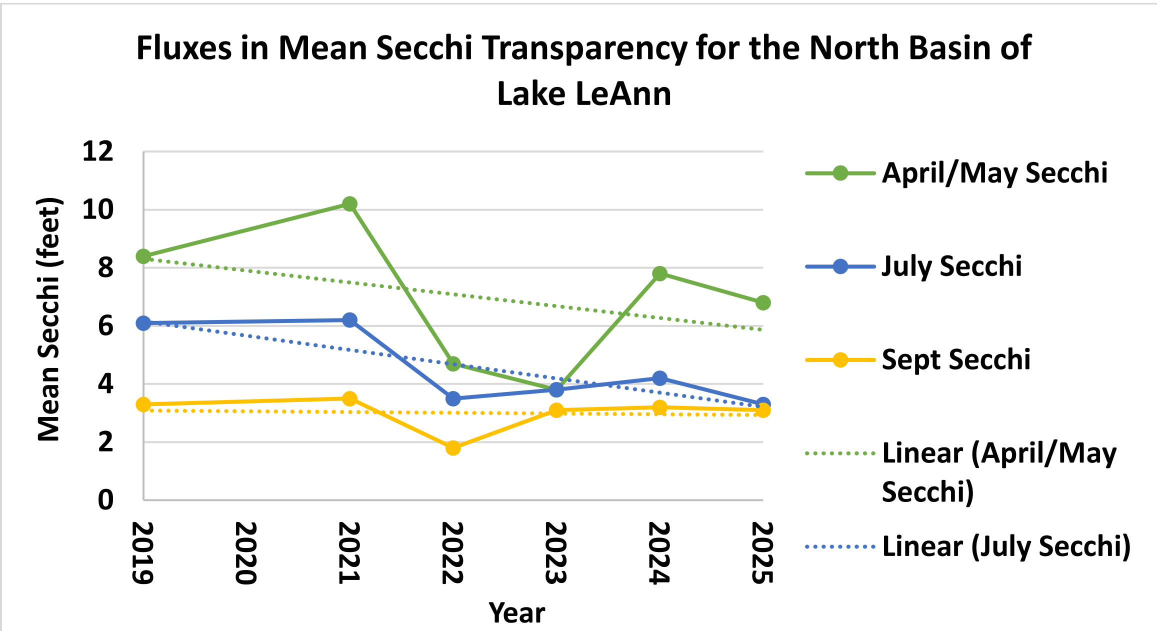


**Figure 20. Flux in Mean Secchi Transparency for the <u>north basin</u> of Lake LeAnn (2019-2025).**

The mean Secchi transparency has decreased in the spring (April/May) and summer (July) and remained consistently low in September. This is due to the abundance of phytoplankton in the water column since most of the TP concentrations remain well above the eutrophic threshold. A further reduction in TP is needed.

**<u>South Basin:</u>**

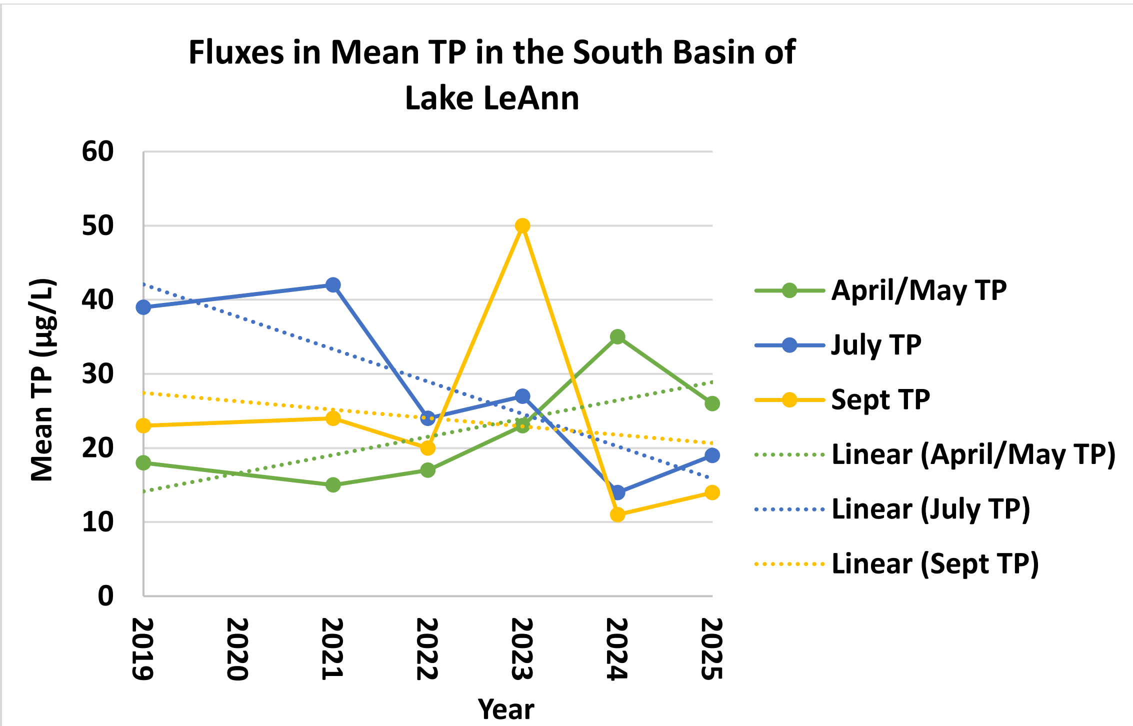


**Figure 21. Flux in Mean TP for the <u>south basin</u> of Lake LeAnn (2019-2025).**

The mean TP has increased in the spring (April/May) but has declined in July and September In 2024, all but the spring TP concentrations were below the eutrophic threshold which means the LFA and biochar combination are effectively reducing the TP to acceptable concentrations. Note that the spring data was collected prior to application of Eutrosorb® in 2025.

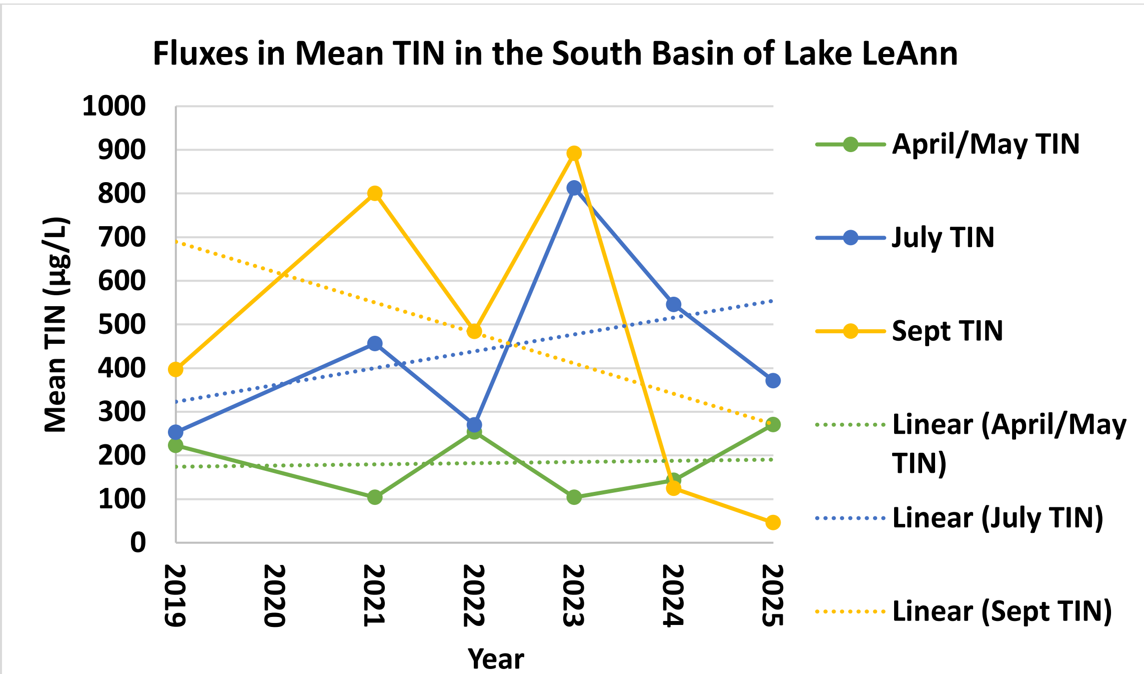


**Figure 22. Flux in Mean TIN for the south basin of Lake LeAnn (2019-2025).**

The mean TIN in the South Basin of Lake LeAnn decreased in September but increased sharply in July. This could be attributed to septic leachate and/or the use of nitrogen-rich lawn fertilizers. This is especially true since biochar readily decreases TIN.

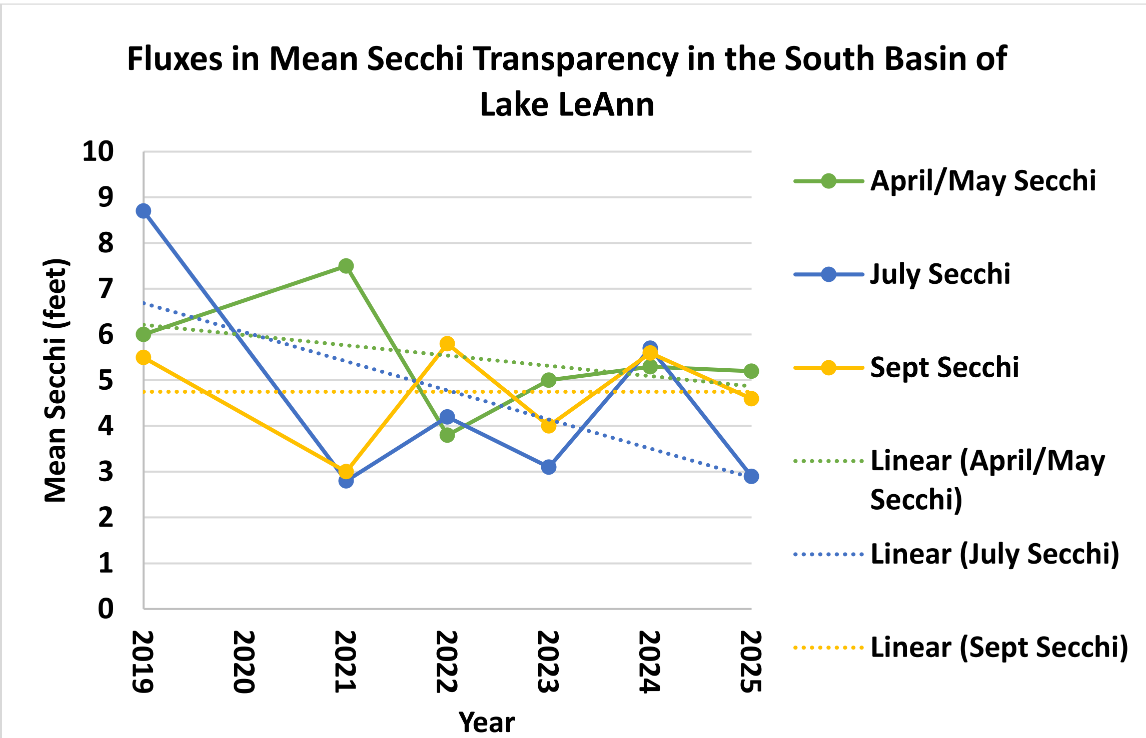


**Figure 23. Flux in Mean Secchi Transparency for the south basin of Lake LeAnn (2019-2025).**

The Secchi transparency has declined in spring and summer but remained consistent in late summer/early fall. This would align with the observed early and mid-season blue-green algal blooms.

Blue-green algae are increasing globally due to atmospheric enrichment of $CO_2$ which then is utilized by cyanobacteria for accelerated growth and may have increased in the northern US due to wildfires and atmospheric deposition. If the LFA is to achieve continued local lake improvement, then all residents should assist the LLPOA with nutrient reductions by annually cleaning and inspecting all septic systems and drain fields, avoiding the use of all lawn fertilizers or considering only specific formulas low in nutrients, and supporting the LLPOA efforts to reduce nutrients coming into the lake from the CSA drains.

**Table 24. Descriptive statistics of all water quality parameters in the north basin of Lake LeAnn for LFA parameters collected in April/May of 2019, 2021, 2022, 2023, 2024, and 2025. NOTE: In situ chlorophyll-a analysis was used in 2023-2025, however, the in situ meter was not operational in July and September of 2025 and thus lab samples were collected.**

| Water Quality Parameter | 2019 Baseline April/May Means ± SD | 2021 Year 1 April/May Means ± SD | 2022 Year 2 April/May Means ± SD | 2023 Year 3 April/May Means ± SD | 2024 Year 4 April/May Means ± SD | 2025 Year 5 April/May Means ± SD |
|---|---|---|---|---|---|---|
| **Water temp (°C)** | 12.9±0.9 | 13.2±0.6 | 15.3±0.9 | 11.0±0.6 | 18.2±0.4 | 17.1±0.3 |
| **pH (S.U.)** | 8.3±0.1 | 8.5±0.1 | 8.1±0.1 | 8.6±0.1 | 9.0±0.1 | 9.2±0.2 |
| **Dissolved oxygen (mg/L)** | 10.1±0.6 | 11.6±0.9 | 9.9±0.4 | 11.5±0.7 | 11.0±0.0 | 9.6±1.2 |
| **Conductivity (mS/cm)** | 509±3.6 | 502±9.0 | 557±176 | 1088±364 | 503±15 | 492±76 |
| **Secchi transparency (ft)** | 8.4±1.6 | 10.2±2.4 | 4.7±0.9 | 3.8±0.6 | 7.8±2.1 | 6.8±1.4 |
| **Chlorophyll-a (µg/L)** | 0.134±0.3 | 0.606±0.4 | 0.700±1.6 | 11.0±0.0 | 3.2±0.0 | 7.3±0.0 |
| **Total Kjeldahl nitrogen (mg/L)** | 0.6±0.1 | 0.5±0.1 | 1.0±0.3 | NA | NA | 1.1±0.1 |
| **Total inorganic nitrogen (mg/L)** | 0.240±0.0 | 0.027±0.0 | 0.118±0.0 | 0.100±0.0 | 0.100±0.0 | 0.307±0.0 |
| **Ammonia nitrogen (mg/L)** | 0.073±0.0 | 0.027±0.0 | 0.042±0.0 | 0.014±0.0 | 0.028±0.0 | 0.065±0.0 |
| **Nitrate nitrogen (mg/L)** | 0.166±0.0 | 0.100±0.0 | 0.113±0.0 | 0.100±0.0 | 0.100±0.0 | 0.228±0.0 |
| **Nitrite nitrogen (mg/L)** | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 |
| **Total phosphorus (mg/L)** | 0.025±0.0 | 0.016±0.0 | 0.027±0.0 | 0.021±0.0 | 0.034±0.0 | 0.029±0.0 |
| **Ortho-phosphorus (mg/L)** | 0.010±0.0 | 0.010±0.0 | 0.010±0.0 | NA | NA | NA |
| **Total suspended solids (mg/L)** | 25±12 | 10.0±0.0 | 10.2±2.0 | NA | NA | NA |

**Table 25. Descriptive statistics of all water quality parameters in the north basin of Lake LeAnn for LFA parameters collected in July of 2019, 2021, 2022, 2023, 2024, and 2025. NOTE: In situ chlorophyll-a analysis was used in 2023-2025, however, the in situ meter was not operational in July and September of 2025 and thus lab samples were collected.**

| Water Quality Parameter | 2019 Baseline July Means ± SD | 2021 Year 1 July Means ± SD | 2022 Year 2 July Means ± SD | 2023 Year 3 July Means ± SD | 2024 Year 4 July Means± SD | 2025 Year 5 July Means ± SD |
|---|---|---|---|---|---|---|
| Water temp (°C) | 21.2±2.6 | 25.5±0.4 | 25.9±0.3 | 26.2±1.0 | 25.0±0.3 | 27.8±0.3 |
| pH (S.U.) | 8.5±0.1 | 8.5±0.2 | 8.0±0.3 | 8.5±0.1 | 8.8±0.3 | 9.1±0.2 |
| Dissolved oxygen (mg/L) | 7.3±2.1 | 9.4±1.2 | 7.7±1.2 | 9.0±1.4 | 8.7±0.8 | 7.4±0.5 |
| Conductivity (mS/cm) | 584±75 | 425±86 | 720±134 | 503±17 | 486±6.0 | 485±27 |
| Secchi transparency (ft) | 6.1±0.1 | 6.2±0.6 | 3.5±1.1 | 3.8±0.5 | 4.2±0.2 | 3.3±0.6 |
| Chlorophyll-a (µg/L) | 0.340±0.7 | 3.8±2.5 | 1.8±2.4 | 11.4±1.7 | 5.8±0.0 | NA |
| Total Kjeldahl nitrogen (mg/L) | 1.2±0.9 | 0.5±0.0 | 0.7±0.3 | NA | NA | 0.8±0.1 |
| Total inorganic nitrogen (mg/L) | 0.172±0.4 | 0.012±0.0 | 0.100±0.0 | 0.170±0.2 | 0.100±0.0 | 0.200±0.0 |
| Ammonia nitrogen (mg/L) | 0.172±0.4 | 0.012±0.0 | 0.029±0.0 | 0.107±0.2 | 0.010±0.0 | 0.010±0.0 |
| Nitrate nitrogen (mg/L) | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 |
| Nitrite nitrogen (mg/L) | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 |
| Total phosphorus (mg/L) | 0.047±0.0 | 0.034±0.0 | 0.030±0.0 | 0.066±0.1 | 0.010±0.0 | 0.028±0.0 |
| Ortho-phosphorus (mg/L) | 0.026±0.0 | 0.010±0.0 | 0.011±0.0 | NA | NA | NA |
| Total suspended solids (mg/L) | 10.5±1.4 | 10.0±0.0 | 14.2±7.3 | NA | NA | NA |

**Table 26. Descriptive statistics of all water quality parameters in the north basin of Lake LeAnn for LFA parameters collected in September of 2019, 2021, 2022, 2023, 2024, and 2025. NOTE: In situ chlorophyll-a analysis was used in 2023-2025, however, the in situ meter was not operational in July and September of 2025 and thus lab samples were collected.**

| Water Quality Parameter | 2019 Baseline Sept Means ± SD | 2021 Year 1 Sept Means ± SD | 2022 Year 2 Sept Means ± SD | 2023 Year 3 September Means ± SD | 2024 Year 4 September Means ± SD | 2025 Year 5 September Means ± SD |
|---|---|---|---|---|---|---|
| **Water temp (°C)** | 22.6±1.2 | 23.7±0.8 | 22.5±1.0 | 20.5±0.3 | 21.1±0.4 | 19.8±0.1 |
| **pH (S.U.)** | 8.4±0.2 | 8.6±0.1 | 8.5±0.2 | 8.9±0.0 | 9.1±0.2 | 9.4±0.1 |
| **Dissolved oxygen (mg/L)** | 8.2±2.2 | 9.0±1.1 | 10.1±1.5 | 9.2±0.3 | 9.9±0.8 | 9.6±0.7 |
| **Conductivity (mS/cm)** | 472±13 | 480±1.8 | 477±5.2 | 484±9.0 | 479±5.0 | 483±4.0 |
| **Secchi transparency (ft)** | 3.3±0.1 | 3.5±0.5 | 1.8±0.2 | 3.1±0.2 | 3.2±0.7 | 3.1±0.2 |
| **Chlorophyll-a (µg/L)** | 0.0±0.0 | 2.8±2.0 | 14.2±6.9 | 5.4±2.0 | 6.0±0.0 | 17.8±0.0 |
| **Total Kjeldahl nitrogen (mg/L)** | 1.0±0.3 | 1.0±0.5 | 1.3±0.3 | NA | NA | 0.6±0.1 |
| **Total inorganic nitrogen (mg/L)** | 0.057±0.1 | 0.100±0.0 | 0.116±0.0 | 0.071±0.0 | 0.100±0.0 | 0.021±0.0 |
| **Ammonia nitrogen (mg/L)** | 0.057±0.1 | 0.036±0.0 | 0.025±0.0 | 0.014±0.0 | 0.035±0.0 | 0.021±0.0 |
| **Nitrate nitrogen (mg/L)** | 0.100±0.0 | 0.100±0.0 | 0.113±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 |
| **Nitrite nitrogen (mg/L)** | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 |
| **Total phosphorus (mg/L)** | 0.037±0.0 | 0.047±0.0 | 0.057±0.0 | 0.031±0.0 | 0.039±0.0 | 0.021±0.0 |
| **Ortho-phosphorus (mg/L)** | 0.010±0.0 | 0.013±0.0 | 0.013±0.0 | NA | NA | NA |
| **Total suspended solids (mg/L)** | 10.6±1.9 | 21.0±10.0 | 10.7±2.0 | NA | NA | NA |

**Table 27. Descriptive statistics of all water quality parameters in the south basin of Lake LeAnn for LFA parameters collected in April/May of 2019, 2021, 2022, 2023, 2024, and 2025. NOTE: In situ chlorophyll-a analysis was used in 2023-2024 however, the in situ meter was not operational in July and September of 2025 and thus lab samples were collected.**

| Water Quality Parameter | 2019 Baseline April/May Means ± SD | 2021 Year 1 April/May Means ± SD | 2022 Year 2 April/May Means ± SD | 2023 Year 3 April/May Means ± SD | 2024 Year 4 April/May Means ± SD | 2025 Year 5 April/May Means ± SD |
|---|---|---|---|---|---|---|
| **Water temp (°C)** | 12.7±1.1 | 12.6±1.1 | 14.1±1.9 | 11.2±0.8 | 16.8±2.6 | 15.9±1.9 |
| **pH (S.U.)** | 8.4±0.1 | 8.4±0.1 | 8.3±0.1 | 8.5±0.1 | 8.8±0.3 | 8.8±0.3 |
| **Dissolved oxygen (mg/L)** | 10.3±0.7 | 10.3±0.7 | 10.5±1.6 | 11.2±1.2 | 8.5±2.0 | 8.3±1.6 |
| **Conductivity (mS/cm)** | 544±5.3 | 541±4.6 | 711±150 | 957±361 | 555±6.0 | 554±6.0 |
| **Secchi transparency (ft)** | 6.0±0.9 | 7.5±0.5 | 3.8±0.5 | 5.0±0.5 | 5.3±0.8 | 5.2±0.6 |
| **Chlorophyll-a (µg/L)** | 1.8±2.5 | 0.8±0.8 | 1.6±1.7 | 3.8±0.8 | 2.2±0.0 | 3.0±0.0 |
| **Total Kjeldahl nitrogen (mg/L)** | 0.5±0.0 | 0.5±0.1 | 0.7±0.2 | NA | NA | 0.8±0.3 |
| **Total inorganic nitrogen (mg/L)** | 0.223±0.1 | 0.104±0.1 | 0.254±0.3 | 0.104±0.0 | 0.143±0.0 | 0.271±0.0 |
| **Ammonia nitrogen (mg/L)** | 0.035±0.0 | 0.104±0.1 | 0.045±0.1 | 0.026±0.0 | 0.092±0.1 | 0.187±0.2 |
| **Nitrate nitrogen (mg/L)** | 0.191±0.1 | 0.100±0.0 | 0.173±0.2 | 0.101±0.0 | 0.100±0.0 | 0.120±0.0 |
| **Nitrite nitrogen (mg/L)** | 0.100±0.0 | 0.100±0.0 | 0.133±0.1 | 0.100±0.1 | 0.100±0.0 | 0.100±0.0 |
| **Total phosphorus (mg/L)** | 0.018±0.0 | 0.015±0.0 | 0.017±0.0 | 0.023±0.0 | 0.035±0.0 | 0.026±0.0 |
| **Ortho-phosphorus (mg/L)** | 0.010±0.0 | 0.010±0.0 | 0.010±0.0 | NA | NA | NA |
| **Total suspended solids (mg/L)** | 16.1±11.0 | 10.0±0.0 | 12.4±4.9 | NA | NA | NA |

**Table 28. Descriptive statistics of all water quality parameters in the south basin of Lake LeAnn for LFA parameters collected in July of 2019, 2021, 2022, 2023, 2024, and 2025. NOTE: In situ chlorophyll-a analysis was used in 2023-2025, however, the in situ meter was not operational in July and September of 2025 and thus lab samples were collected.**

| Water Quality Parameter | 2019 Baseline July Means ± SD | 2021 Year 1 July Means ± SD | 2022 Year 2 July Means ± SD | 2023 Year 3 July Means ± SD | 2024 Year 4 July Means ± SD | 2025 Year 4 July Means ± SD |
|---|---|---|---|---|---|---|
| **Water temp (°C)** | 23.9±4.8 | 22.4±5.0 | 23.1±5.5 | 22.9±5.4 | 22.8±4.0 | 25.0±5.3 |
| **pH (S.U.)** | 8.5±0.1 | 8.1±0.4 | 8.0±0.3 | 8.2±0.2 | 8.3±0.6 | 8.7±0.5 |
| **Dissolved oxygen (mg/L)** | 6.7±3.5 | 6.8±4.2 | 6.2±3.3 | 6.9±3.3 | 6.6±3.4 | 7.2±3.7 |
| **Conductivity (mS/cm)** | 494±49 | 536±25 | 552±45 | 554±25 | 541±32 | 544±24 |
| **Secchi transparency (ft)** | 8.7±1.0 | 2.8±0.2 | 4.2±0.6 | 3.1±0.3 | 5.7±0.5 | 2.9±0.2 |
| **Chlorophyll-a (µg/L)** | 0.5±0.6 | 2.5±2.3 | 1.1±1.1 | 5.6±1.8 | 3.4±0.0 | NA |
| **Total Kjeldahl nitrogen (mg/L)** | 1.1±1.2 | 1.0±0.7 | 1.0±0.7 | NA | NA | 1.1±0.9 |
| **Total inorganic nitrogen (mg/L)** | 0.253±0.8 | 0.456±0.8 | 0.270±0.5 | 0.813±1.5 | 0.546±0.0 | 0.371±0.0 |
| **Ammonia nitrogen (mg/L)** | 0.253±0.8 | 0.456±0.8 | 0.239±0.5 | 0.808±1.5 | 0.491±0.9 | 0.279±0.5 |
| **Nitrate nitrogen (mg/L)** | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 |
| **Nitrite nitrogen (mg/L)** | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 |
| **Total phosphorus (mg/L)** | 0.039±0.1 | 0.042±0.0 | 0.024±0.0 | 0.027±0.0 | 0.014±0.0 | 0.019±0.0 |
| **Ortho-phosphorus (mg/L)** | 0.012±0.0 | 0.010±0.0 | 0.010±0.0 | NA | NA | NA |
| **Total suspended solids (mg/L)** | 13.7±11.0 | 10.0±0.0 | 10.0±0.0 | NA | NA | NA |

**Table 29. Descriptive statistics of all water quality parameters in the south basin of Lake LeAnn for LFA parameters collected in September of 2019, 2021, 2022, 2023, 2024, and 2025. NOTE: In situ chlorophyll-a analysis was used in 2023-2025, however, the in situ meter was not operational in July and September of 2025 and thus lab samples were collected.**

| Water Quality Parameter | 2019 Baseline Sept Means ± SD | 2021 Year 1 Sept Means ± SD | 2022 Year 2 Sept Means ± SD | 2023 Year 3 Sept Means ± SD | 2024 Year 4 Sept Means ± SD | 2025 Year 5 Sept Means ± SD |
|---|---|---|---|---|---|---|
| **Water temp (°C)** | 21.2±2.6 | 21.9±3.4 | 20.8±3.4 | 19.7±3.1 | 20.7±1.7 | 19.8±0.4 |
| **pH (S.U.)** | 8.4±0.1 | 8.3±0.5 | 8.2±0.4 | 8.6±0.4 | 8.9±0.5 | 9.3±0.1 |
| **Dissolved oxygen (mg/L)** | 7.1±2.5 | 7.7±3.1 | 7.6±3.0 | 8.0±3.1 | 8.8±1.4 | 9.5±0.4 |
| **Conductivity (mS/cm)** | 570±74 | 526±42 | 544±37 | 535±45 | 521±36 | 533±5.0 |
| **Secchi transparency (ft)** | 5.5±2.2 | 3.0±0.2 | 5.8±0.3 | 4.0±0.2 | 5.6±0.9 | 4.6±0.9 |
| **Chlorophyll-a (µg/L)** | 0.0±0.0 | 6.2±7.8 | 1.7±1.8 | 8.2±1.6 | 4.2±0.0 | 4.9±0.0 |
| **Total Kjeldahl nitrogen (mg/L)** | 1.1±1.0 | 1.9±2.2 | 1.2±1.3 | NA | NA | 0.5±0.1 |
| **Total inorganic nitrogen (mg/L)** | 0.397±1.0 | 0.800±1.6 | 0.484±1.2 | 0.892±2.2 | 0.125±0.0 | 0.046±0.0 |
| **Ammonia nitrogen (mg/L)** | 0.397±1.0 | 0.700±1.6 | 0.433±1.2 | 0.892±2.2 | 0.067±0.1 | 0.045±0.0 |
| **Nitrate nitrogen (mg/L)** | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 |
| **Nitrite nitrogen (mg/L)** | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 | 0.100±0.0 |
| **Total phosphorus (mg/L)** | 0.023±0.0 | 0.024±0.0 | 0.020±0.0 | 0.050±0.1 | 0.011±0.0 | 0.014±0.0 |
| **Ortho-phosphorus (mg/L)** | 0.012±0.0 | 0.010±0.0 | 0.011±0.0 | NA | NA | NA |
| **Total suspended solids (mg/L)** | 10.0±0.0 | 60.0±136 | 10.8±1.9 | NA | NA | NA |

## II. Drains/CSA's

RLS developed trend graphs to demonstrate the changes in key parameters such as total phosphorus (TP) and total inorganic nitrogen (TIN) for the two most significant contributing drains (Figures 24-26). The mean TP in CSA 1A peaked in 2025 but TIN has declined over time. The mean TP and TIN in 2A has declined over time. Continued mitigation of these CSA drains is recommended.

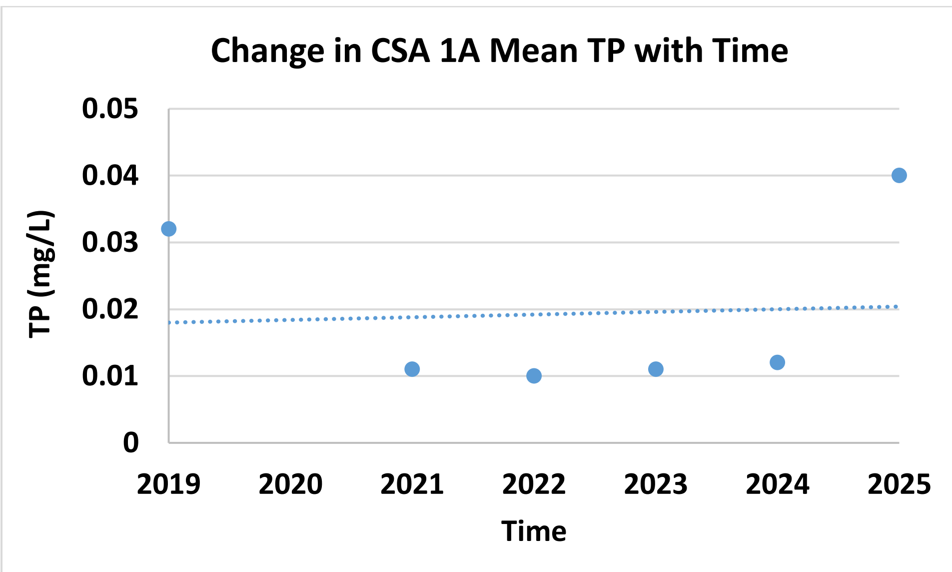


**Figure 24. Change in CSA 1A mean TP with time (2019-2025).**

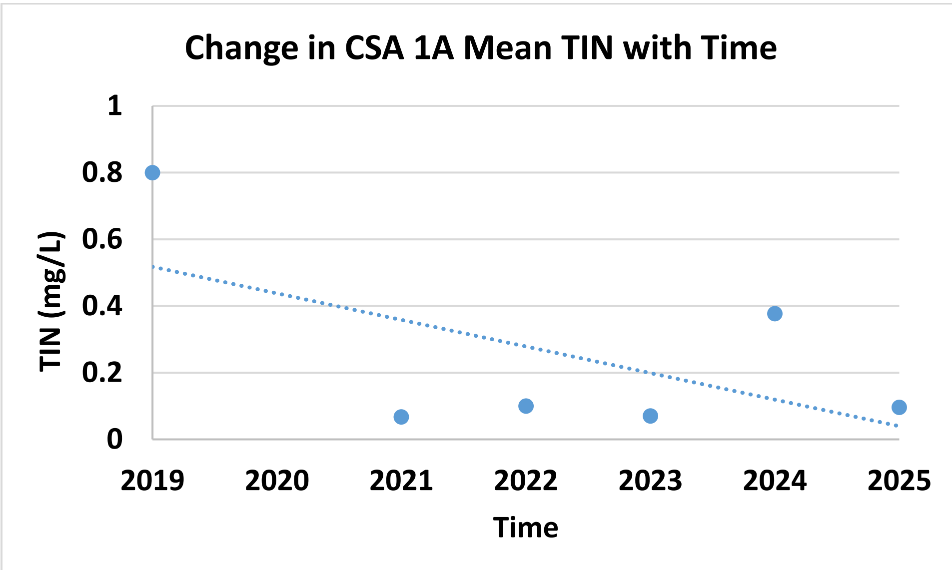


**Figure 25. Change in CSA 1A mean TIN with time (2019-2025).**

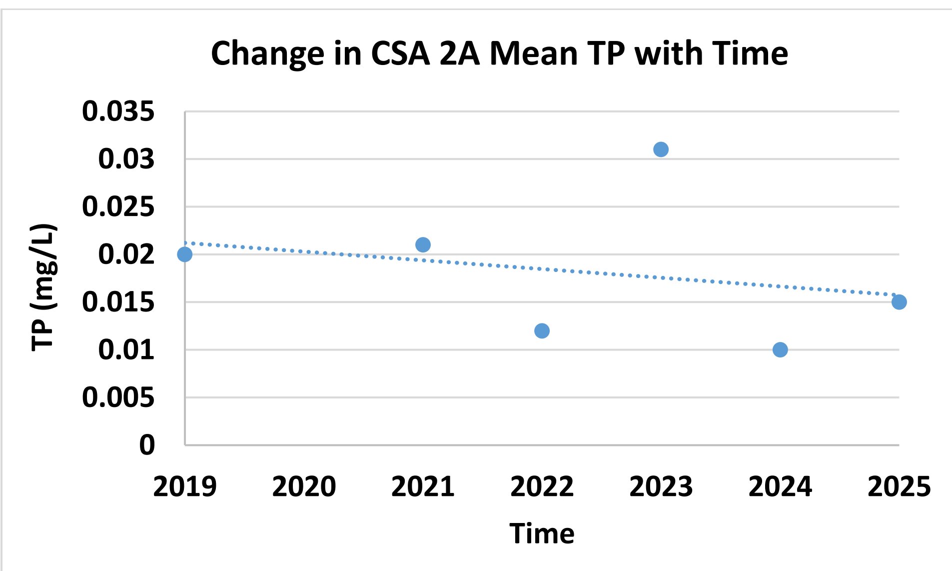


**Figure 26. Change in CSA 2A mean TP with time (2019-2025).**

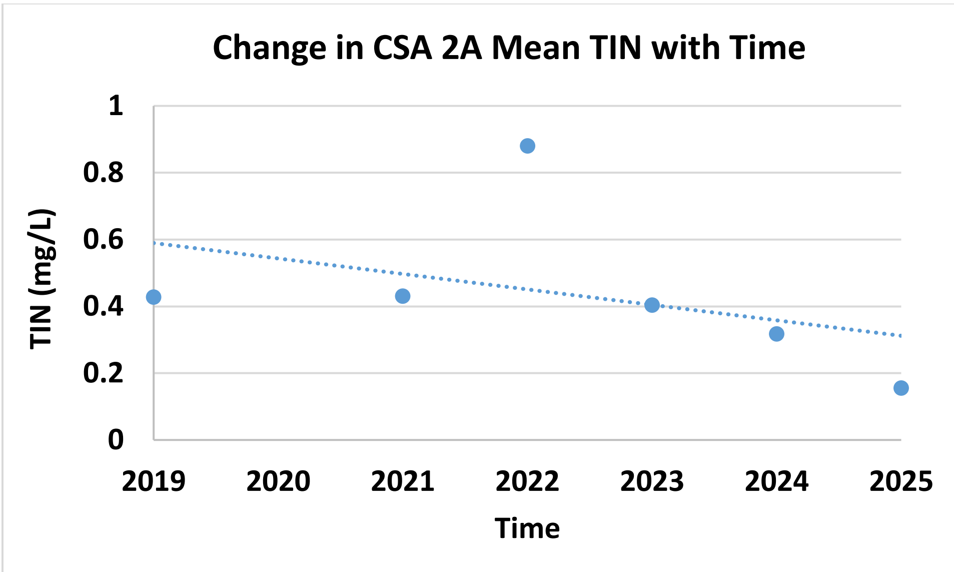


**Figure 27. Change in CSA 2A mean TIN with time (2019-2025).**

## III. Aquatic Vegetation Biovolume

There have been modest reductions in the highest biovolume cover categories (60-80% and >80%) with time in both basins (Tables 30-31). This could be attributed to intensive efforts to reduce canopy invasives such as Eurasian watermilfoil and Curly-leaf Pondweed. It is most beneficial to aim for a goal of increased low-growing cover that allows light to reach the bottom to encourage germination of favorable native aquatic plants. The majority of the biovolume should be in the lowest to moderate categories (≤ 20%) for optimum recreation and fishery habitat.

**Table 30. Lake LeAnn north basin aquatic vegetation biovolume by category percent cover of each category (relative cover 2019, 2021-2025).**

| Biovolume Cover Category | 2019 % Relative Cover by Category | 2021 % Relative Cover by Category | 2022 % Relative Cover by Category | 2023 % Relative Cover by Category | 2024 % Relative Cover by Category | 2025 % Relative Cover by Category |
|---|---|---|---|---|---|---|
| **<5%** | 59.7 | 32.1 | 56.6 | 43.1 | 54.1 | 5.0 |
| **5-20%** | 15.7 | 29.1 | 23.6 | 28.9 | 28.9 | 70.7 |
| **20-40%** | 9.9 | 19.8 | 12.6 | 15.0 | 14.7 | 15.2 |
| **40-60%** | 5.5 | 12.0 | 5.4 | 8.9 | 2.0 | 5.1 |
| **60-80%** | 3.4 | 2.0 | 0.7 | 1.5 | 0.2 | 0.7 |
| **>80%** | 5.7 | 4.3 | 1.1 | 1.5 | 0.1 | 3.3 |

**Table 31. Lake LeAnn south basin aquatic vegetation biovolume by category percent cover of each category (relative cover 2019, 2021-2025).**

| Biovolume Cover Category | 2019 % Relative Cover by Category | 2021 % Relative Cover by Category | 2022 % Relative Cover by Category | 2023 % Relative Cover by Category | 2024 % Relative Cover by Category | 2025 % Relative Cover by Category |
|---|---|---|---|---|---|---|
| **<5%** | 58.0 | 70.3 | 71.1 | 76.4 | 70.1 | 4.0 |
| **5-20%** | 22.3 | 22.7 | 22.1 | 19.4 | 22.7 | 90.8 |
| **20-40%** | 12.3 | 5.0 | 4.7 | 4.4 | 5.9 | 3.6 |
| **40-60%** | 3.2 | 1.0 | 1.3 | 1.6 | 1.0 | 0.7 |
| **60-80%** | 1.8 | 0.3 | 0.3 | 0.1 | 0.2 | 0.2 |
| **>80%** | 2.4 | 0.6 | 0.5 | 0.1 | 0.1 | 0.7 |

## IV. Sediment Relative Hardness:

There has been little change in the softest and firmest sediment categories throughout the years and this may be due to continuous contributions of organic matter from dense decaying aquatic vegetation that would allow for the middle categories to be dominant. The intermediate and most consolidated categories have remained relatively similar over the years.

**Table 32. Lake LeAnn north basin relative hardness of the lake bottom by category or hardness and percent cover of each category (relative cover).**

| Lake Bottom Relative Hardness Category | 2019 Relative Cover % | 2021 Relative Cover % | 2022 Relative Cover % | 2023 Relative Cover % | 2024 Relative Cover % | 2025 Relative Cover % |
|---|---|---|---|---|---|---|
| **0.0-0.1** | 0.7 | 0.3 | 0.2 | 0.07 | 0.0 | 0.5 |
| **0.1-0.2** | 18.4 | 6.5 | 5.4 | 1.70 | 0.5 | 16.0 |
| **0.2-0.3** | 48.4 | 63.6 | 61.5 | 56.23 | 66.2 | 59.8 |
| **0.3-0.4** | 32.5 | 29.4 | 32.7 | 41.98 | 33.3 | 23.7 |
| **>0.4** | 0.01 | 0.1 | 0.2 | 0.02 | 0.0 | 0.0 |

**Table 33. Lake LeAnn south basin relative hardness of the lake bottom by category or hardness and percent cover of each category (relative cover).**

| Lake Bottom Relative Hardness Category | 2019 Relative Cover % | 2021 Relative Cover % | 2022 Relative Cover % | 2023 Relative % Cover | 2024 Relative % Cover | 2025 Relative Cover % |
|---|---|---|---|---|---|---|
| **0.0-0.1** | 0.5 | 0.0 | 0.1 | 0.01 | 0.0 | 0.8 |
| **0.1-0.2** | 18.2 | 8.7 | 6.1 | 0.48 | 1.1 | 33.2 |
| **0.2-0.3** | 49.9 | 64.9 | 63.2 | 51.26 | 79.4 | 40.6 |
| **0.3-0.4** | 31.3 | 26.4 | 30.5 | 48.25 | 19.5 | 25.0 |
| **>0.4** | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.4 |

# V. Phytoplankton:

RLS has measured total chlorophyll-a with a calibrated in situ Turner Designs® fluorimeter. This method is EPA approved and is used to determine concentrations of chlorophyll-a at the surface, since most blue-green algae have gas vacuoles and are buoyant on the lake surface. RLS has found that even with proper sampling methods for chlorophyll-a laboratory methods, in situ numbers can be much higher.
This is because the laboratory chlorophyll-a method measures the pigment in a composite sample.
If the majority of the algae is at the surface and the samples are homogenized, then there is a higher chance that chlorophyll-a will remain undetected or low. The in situ data in Tables 33-34 clearly show an overall decline in chlorophyll-a over time since LFA began and especially post-biochar in 2024 but there was an increase in 2025 which led to a change in the program. Figures 28-29 show the trend in the in situ Chl-a with time in both basins.

**Table 34. Lake LeAnn north basin in situ chlorophyll-a concentrations (2021-2025).**

| Sampling Location | July 19 2021 | May 10 2022 | July 12 2022 | Sept 15 2022 | Apr 26 2023 | July 25 2023 | Sept 19 2023 | May 7 2024 | July 2 2024 | Sept 9 2024 | May 1 2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **North #1** | 28 | 3 | 12 | 6 | 11 | 13 | 5 | 3 | 5 | 5 | 12 |
| **North #2** | 20 | 3 | 12 | 9 | 11 | 9 | 6 | 3 | 6 | 4 | 9 |
| **North #3** | 25 | 2 | 17 | 9 | 11 | 13 | 6 | 3 | 8 | 10 | 11 |
| **North #4** | 20 | NA | 5 | 7 | 11 | 11 | 7 | 4 | 5 | 6 | 10 |
| **North #5** | 20 | 3 | 10 | 9 | 11 | 11 | 3 | 3 | 5 | 5 | 12 |
| **MEAN** | **22.6** | **2.8** | **11.2** | **8** | **11.0** | **11.4** | **5.4** | **3.2** | **5.8** | **6.0** | **10.8** |

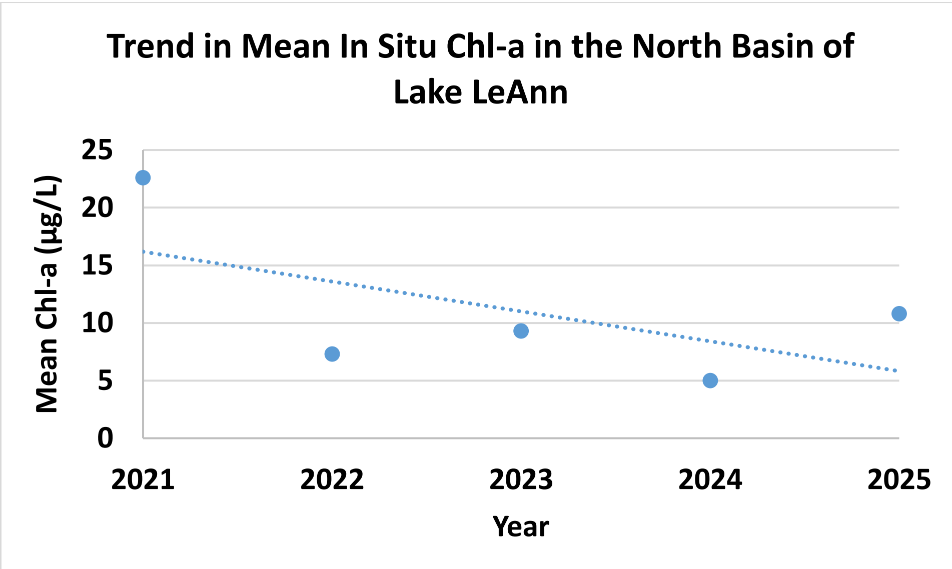


**Figure 28. Trend in mean in situ Chl-a in the north basin of Lake LeAnn (2021-2025).**

**Table 35. Lake LeAnn south basin in situ chlorophyll-a concentrations (2021-2025).**

| Sampling Location | July 19 2021 | May 10 2022 | July 12 2022 | Sept 15 2022 | Apr 26 2023 | July 25 2023 | Sept 19 2023 | May 7 2024 | July 2 2024 | Sept 9 2024 | May 1 2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **South #1** | 38 | 2 | 7 | 6 | 3.0 | 5.0 | 10.0 | 3 | 4 | 2 | 5 |
| **South #2** | 35 | 4 | 8 | 8 | 4.0 | 5.0 | 10.0 | 2 | 4 | 6 | 4 |
| **South #3** | 38 | 4 | 6 | 5 | 4.0 | 4.0 | 7.0 | 2 | 2 | 6 | 5 |
| **South #4** | 33 | 5 | 8 | 5 | 5.0 | 7.0 | 7.0 | 2 | 3 | 6 | 5 |
| **South #5** | 35 | 4 | 6 | 7 | 3.0 | 8.0 | 7.0 | 2 | 4 | 3 | 4 |
| **MEAN** | **35.8** | **3.8** | **7.0** | **6.2** | **3.8** | **5.8** | **8.2** | **2.2** | **3.4** | **4.6** | **4.6** |

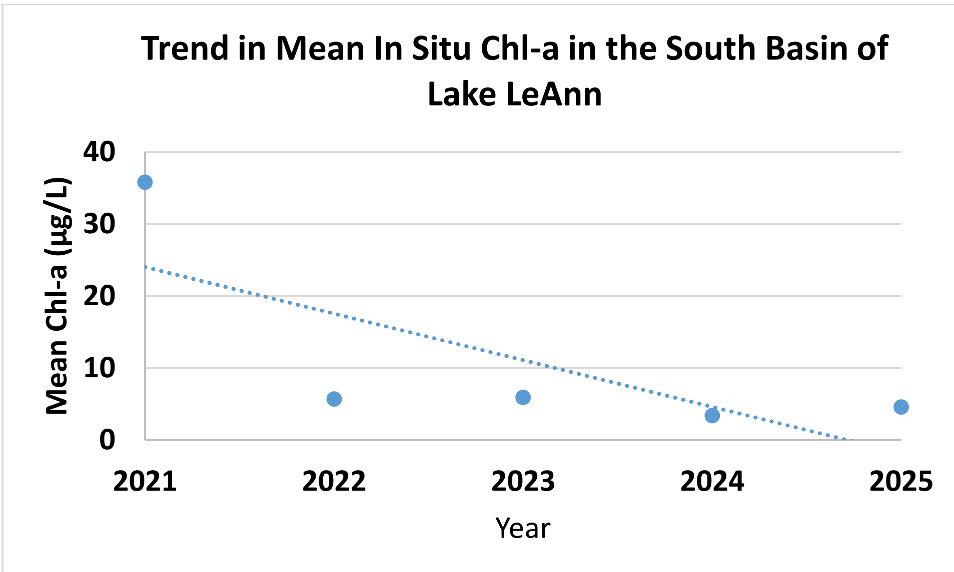


**Figure 29. Trend in mean in situ Chl-a in the south basin of Lake LeAnn (2021-2025).**

## VII. Management Recommendations for 2026 & Beyond:

Continued whole-lake surveys and targeted control of the invasive Eurasian Watermilfoil, Curly-leaf Pondweed, and Starry Stonewort are needed to allow for germination and colonization of native aquatic plant species to improve biodiversity in Lake LeAnn. Over the past three years, the new systemic herbicide ProcellaCOR® was used given its evaluated efficacy and longer-lasting control. RLS was present to oversee the herbicide applications with very little milfoil remaining at the end of 2025. Care must be taken to avoid removal of too much aquatic vegetation as this can exacerbate blue-green algal blooms by allowing for less competition from plants for nutrients. In 2025, RLS recommends leaving some of the Curly-leaf Pondweed to absorb some of the phosphorus and compete with the algae prevalent in the water column and thus mechanical harvesting is recommended for the removal of the CLP biomass. Due to the relative scarcity of favorable low-growing submersed aquatic vegetation in Lake LeAnn, there is a need to preserve as much cover as possible.

In past years, BioBlast® bioaugmentation methodology was used to attempt to effectively reduce blue-green algal blooms with little success. In 2024, Timberchar® Biochar was implemented in the lake basins to reduce nutrients associated with these blooms. This biochar has proven to be effective so far in further reducing the nutrients in the lakes. RLS recommends continuation with the biochar program. Due to the elevated blue-green algae blooms in the north basin and south basin, RLS recommends continued use of EutroSorb® in the north basin and application in the south basin to reduce these loads. Independent evaluation of this product is highly encouraged along with continued use of an EPA-certified laboratory to reduce conflicts of interest from the manufacturer.

As previously stated, RLS encourages the LLPOA to work with its residents to follow lakeshore best management practices (BMP's) such as proper annual inspection and pumping of septic systems and drain fields, protection of lakeshore emergent vegetation, preventing usage of lawn fertilizers and watering with lake water instead, and public education and outreach. If nutrient loads to the lake are not reduced, the efficacy of the lake restoration system will be reduced. Lastly, consideration should be given to avoiding the use of large wake boats on the lake. The lake is too irregular and shallow and sediment resuspension will continue to occur. This creates less clear water and also drives nutrients locked in the sediments into the water column that are then utilized by algae for increased growth. RLS will also be surveying the lake for possible carp dominance in 2026 to make possible recommendations for a carp cull that may be needed as these fish can contribute to turbid lake waters.