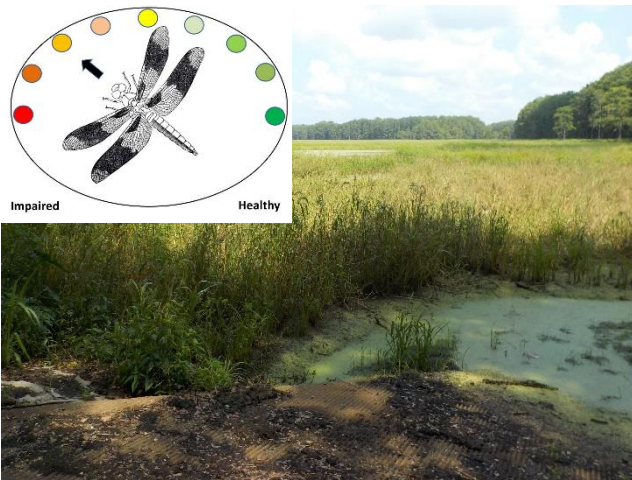


Lake Munson EcoSummary



Lake Munson is an approximately 288-acre, cypress-rimmed, nitrogen-limited lake located south of the City of Tallahassee. The lake is believed to have originally been a cypress swamp but has since been impounded and now functions as a shallow man-made lake. Lake Munson receives much of its water from the heavily altered Munson Slough and its tributaries. Lake outflow continues southward via Munson Slough and finally drains into Ames Sink. Dye trace studies have confirmed a direct connection between Ames Sink and Wakulla Springs.

The lake has a history of severe water quality and ecological problems including fish kills, algal blooms, exotic vegetation and snails, high nutrient and bacterial levels, low game fish productivity, sediment contamination, and depressed oxygen levels.

Approximately 54% of land use in the 38,790-acre Lake Munson basin is rangeland, transportation, utilities, urban or residential (as shown in **Figure 1**). Increases in stormwater runoff and waterbody nutrient loads can often be attributed to these types of land uses.

Background

Healthy, well-balanced lake communities may be maintained with some level of human activity, but excessive human disturbance may result in waterbody degradation.

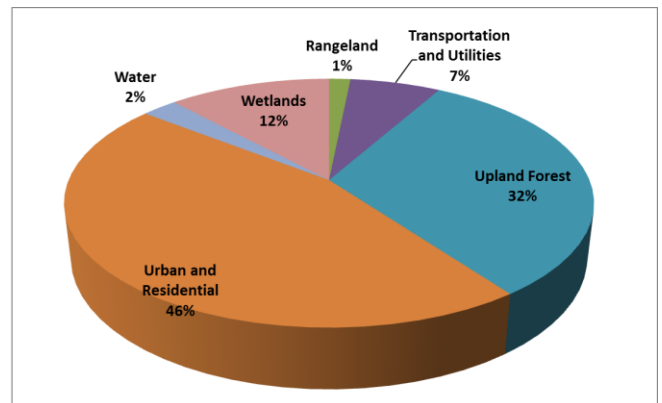


Figure 1. Lake Munson watershed land use.

Human stressors may include increased inputs of nutrients, sediments, and/or other contaminants from watershed runoff, adverse hydrologic alterations, undesirable removal of habitat or riparian buffer vegetation, and introduction of exotic plants and animals. State water quality standards are designed to protect designated uses of the waters of the state (e.g., recreation, aquatic life, fish consumption), and exceedances of these standards are associated with interference of the designated use.

Methods

Surface water samples are collected quarterly (as conditions allow), and sediment samples are collected annually. Leon County also conducts an annual vegetation survey to evaluate the health of floral (plant) communities in the County lakes. This information is used to evaluate the health of Leon County waterbodies and meets the requirements of the Florida Department of Environmental Protection (FDEP).

Total Maximum Daily Load (TMDL)

Lake Munson is verified as impaired for nutrients, dissolved oxygen (linked to nutrients and five-day biological oxygen demand), and turbidity. The lake received a TMDL by FDEP in 2013. The TMDL requires the lake to meet the dissolved oxygen criterion and nutrient TMDL concentrations. Based on mean concentrations from the 2004-2008 period, achieving the TMDL will require a 50% reduction for Biochemical Oxygen Demand (BOD), a 32.5% reduction for Total Nitrogen (TN), a 76.7% reduction for Total Phosphorus (TP), and a 31.9% reduction in turbidity.

Lake Sediments and Drawdowns

Organic and nutrient-rich sediments in Lake Munson may be negatively impacting the water quality in the lake. At one time, it was thought that sediment removal was the best way to improve the lake's water quality. Since then, technologies and management techniques continue to change and evolve as new and better information becomes available. Sediment removal in Lake Munson is now known to pose more risk than benefit and would be ecologically harmful and logistically very difficult. Alternatively, periodic, and routine drawdowns are proven, natural mitigation method that mimic the natural drying and refilling cycle of a lake. Drawdowns are expected to result in de-watering, compaction, and partial oxidation of sediments thus creating a sediment "cap", improving water quality and simultaneously generating suitable habitat for fish spawning.

To ensure the long-term health of Lake Munson, Leon County has conducted two drawdowns. On April 27, 2010, the Leon County Board of County Commissioners directed staff to implement a drawdown as recommended by the Leon County Science Advisory Committee (SAC). The drawdown began on October 18,

2010, and continued until June 14, 2011. Leon County conducted another drawdown in coordination with the State of Florida beginning November 1, 2022, originally anticipated to end Spring 2023, but extended to May 17, 2024. The latest drawdown, a new Invasive Exotic Vegetation Management Program, future reoccurring drawdowns every 5-10 years, and more, are included in the County's ongoing and long-term [Action Plan](#) to protect and preserve Lake Munson both now and into the future.

At the March 21, 2023, Board of County Commission meeting, the Board approved modifications to the Action Plan, including extending the drawdown through Spring of 2024 due to higher than anticipated winter rainfall. In anticipation of Hurricane Idalia, the drawdown was temporarily suspended in August 2023 but quickly resumed after the storm moved through the area. The drawdown continued until December 2023 when the drawdown was temporarily suspended a second time after frequent rainfall in late November. When conditions were appropriate, the drawdown resumed and continued until May 17, 2024.

During the March 21, 2023 meeting, the Board also approved the addition of a Drawdown Water Quality Study to the Lake Munson Action Plan. The Study supplements the County's quarterly water chemistry sampling with additional sampling to attain monthly water quality data in Munson Slough both immediately upstream and downstream of Lake Munson for the remaining duration of the drawdown. The samples provide information on the water chemistry concentrations entering and leaving Lake Munson and provide insight into how the lake is reacting during the drawdown. The results of the Drawdown Study are included in the Munson Slough EcoSummary.

Results

Due to the ongoing drawdown and an oftentimes dry lake bottom throughout 2023 no water quality samples were collected in Lake Munson in 2023; therefore, the following results are based on 2022 data. Water quality sampling in Lake Munson will resume in June 2024, following conclusion of the drawdown, as conditions allow.

Water quality samples were collected from the Munson Slough stations in 2023 and are discussed in the Munson Slough EcoSummary.

Nutrients

The nutrient thresholds and results are found in **Table 1**. There have been several instances where nutrient and chlorophyll-a values exceeded the state criteria.

The State of Florida uses Numeric Nutrient Criteria (NNC) to evaluate nutrients in waterbodies. NNC thresholds are set based on waterbody-specific characteristics and are used to determine if a waterbody meets water quality standards. The results of the four quarterly samples from a single year are used to calculate the annual geometric mean. According to FDEP requirements, the NNC threshold cannot be exceeded more than once in a three-year period.

Geometric means of chlorophyll-a, Total Nitrogen, and Total Phosphorus exceeded the state criteria several times over the sampling period. The geometric mean for chlorophyll-a in 2013 (85.0 µg/L) was the highest reading on record. However, starting in 2017 there was a substantial drop in chlorophyll-a values. While Total Phosphorus values still exceeded the NNC values in 2017 and 2019, Total Phosphorus, Total Nitrogen, and chlorophyll-a values continue to drop over time. The 2020 and 2021 phosphorus and nitrogen NNC results are among

the lowest levels recorded by Leon County staff. Staff believe that a combination of upstream nutrient reduction and the re-establishment of aquatic vegetation are contributing to the reduction of chlorophyll-a and water column nutrients.

As shown in **Figures 2 - 6**, past levels of BOD, Total Nitrogen, Total Phosphorus, and turbidity were consistently above the TMDL limits, but levels are slowly dropping. Algal blooms, represented by chlorophyll-a (**Figure 6**), continue to be a problem in Lake Munson, but values continue to drop.

Chlorophyll-a

Water quality samples collected by Leon County are analyzed by Pace Analytical Services – Ormond Beach (Pace), with the analysis results provided back to the County for submission to FDEP. In June 2022, FDEP conducted a routine audit of the chlorophyll-a data. This audit revealed that from October 2014 through December 2020, the chlorophyll-a data was reported as “uncorrected chlorophyll-a” and not “corrected chlorophyll-a”, as it should have been. Pace has since rectified this error and beginning in January 2021, the chlorophyll-a data were properly reported as “corrected chlorophyll-a”. The laboratory also provided Leon County with the “correct chlorophyll-a” data from the affected dates and the information in **Table 1** of this year’s Report has been changed to reflect this.

Fish Consumption Advisory

The Florida Department of Health (FDOH) has issued consumption limit advisories for certain fish in Lake Munson due to elevated levels of mercury.

[Click here for more information about fish consumption advisories.](#)

Previous advisories have included consumption limits for polychlorinated biphenyls (PCBs); however, in 2019 state agencies collected fish tissue samples and in 2021 FDOH determined that PCB levels in fish tissues were at very low levels and that the current mercury advisories would be protective of human health.

Table 1. NNC thresholds and results for Lake Munson. Results in bold signify exceedances of the State criteria.

Clear Lakes, High Alkalinity	Chlorophyll- a 20 µg/L	TN Threshold 1.05-1.91 mg/L	TP Threshold 0.03-0.09 mg/L
2004	3.6	0.35	0.06
2005	13.8	0.62	0.11
2006	12.4	1.38	0.19
2007	10.9	1.49	0.30
2008	13.1	0.76	0.20
2009	5.5	0.88	0.17
2010	8.7	1.07	0.16
2011*	-	-	-
2012	39.0	1.08	0.18
2013	85.0	1.51	0.24
2014	13.0	1.27	0.24
2015	25.4	1.37	0.22
2016	16.4	0.70	0.15
2017	5.8	0.50	0.11
2018	6.4	0.60	0.09
2019	7.7	0.52	0.11
2020	3.3	0.38	0.05
2021	1.4	0.49	0.06
2022	12.7	0.70	0.09
2023*	-	-	-

* Due to low water conditions because of the drawdown, staff could not collect the appropriate number of samples and thus could not determine the NNC for 2011 or 2023.

Floral Assessment

No floral assessment was conducted in 2023 due to the ongoing lake drawdown. The following

floral assessment was conducted in 2022. Staff anticipate conducting a post drawdown assessment in 2024.

The 2022 Lake Vegetation Index (LVI) score for Lake Munson was 30, placing the lake’s vegetative community in the Impaired category. This score is a substantial decline from the previous years’ score of 43 (2021) and 53 (2020).

Thirty-eight species were found in 2022 versus the fifty species found in 2021 and the sixty-six species that were found in 2020. Units surveyed can vary from year to year, potentially resulting in slight changes to the number of plant species, or taxa; however, the decline in Lake Munson over the past three years is substantial. While the drop in taxa in 2022 contributed to the lower LVI score, the type and dominance of more (or less) sensitive taxa may be the main contributor in the LVI score decline.

In 2020, the native species coontail (*Ceratophyllum demersum*) and pond cypress (*Taxodium ascendens*) were the most dominant species in the lake, but several invasive exotic plants were quickly establishing themselves in the water. The two most prevalent exotic plants were hydrilla (*Hydrilla verticillata*) and water hyacinth (*Eichhornia crassipes*). Leon County staff were concerned with the rapid proliferation of these and other exotics, so in the latter part of 2020, the Florida Fish and Wildlife Conservation Commission (FWC) was contacted about the overabundance of exotic vegetation in the lake. In October 2020, FWC teams applied herbicides to the emergent and submersed invasive exotics in Lake Munson. A substantial amount of exotic plants were treated, and it was hoped that natives would continue to proliferate in the water column. Unfortunately, the Category I Invasive Exotic hydrilla quickly reestablished in early

2021. Due to the rapid proliferation of hydrilla, the 2021 survey showed that the native coontail and the exotic hydrilla were now either the dominant or codominant species found in the lake. Consequently, the 2021 LVI score was substantially lower than in past years.

During the 2022 survey, it was found that hydrilla and the native coontail continued to be the most dominant plants in Lake Munson, with hydrilla continuing to overwhelm most native species. Further contributing to the 2022 LVI decline, the Category I Invasive Exotics wild taro (*Colocasia esculenta*), water hyacinth (*Eichhornia crassipes*), the previously mentioned hydrilla (*Hydrilla verticillata*), Peruvian primrose willow (*Ludwigia peruviana*), and Chinese tallow (*Sapium sebiferum*) were found in the lake. The Category II Invasive Exotic alligator weed (*Alternanthera philoxedroides*) and exotic water spangles (*Salvinia minima*) were also found.

It is anticipated that the aforementioned lake drawdown will help address the algal, nutrient, and aquatic vegetation challenges in the lake. The drawdown would kill the hydrilla and algae in the lake, allowing growth of native species and the ability to manage invasive exotic aquatic vegetation when the lake is refilled.

To promote the growth of native vegetative species, Leon County developed an Invasive Exotic Vegetation Management Program to supplement the State's treatment efforts on Lake Munson, beginning following conclusion of the drawdown. The Program can be expanded in future years and utilized as an in-lake mitigation tool and long-term lake management strategy on other County-managed lakes.

More information concerning the Lake Munson vegetative community can be found [here](#).

Conclusions

Water quality samples and an LVI were not collected for Lake Munson in 2023 due to the ongoing drawdown at the time. While there was an uptick of nutrient and chlorophyll-a values in 2022, levels did not exceed NNC limits. Staff believe that a combination of upstream nutrient reduction and the re-establishment of aquatic vegetation are contributing to the reduction of chlorophyll-a and water column nutrients.

The 2022 LVI score for Lake Munson was 30, placing the lake's vegetative community in the Impaired category. This score is a substantial decline from the previous years' score of 43 (2021) and 53 (2020). It is anticipated that the lake drawdown, followed by the implementation of the Invasive Exotic Vegetation Management Program will help address the algal, nutrient, and aquatic vegetation challenges in the lake.

Thank you for your interest in maintaining the quality of Leon County's water resources. Please feel free to contact us if you have any questions.

Contact and Resources for More Information

www.LeonCountyWater.org

[Click here to access the results for all water quality stations sampled in 2022.](#)

[Click here for a map of the watershed – Sample Sites LMU7 and LMU8.](#)

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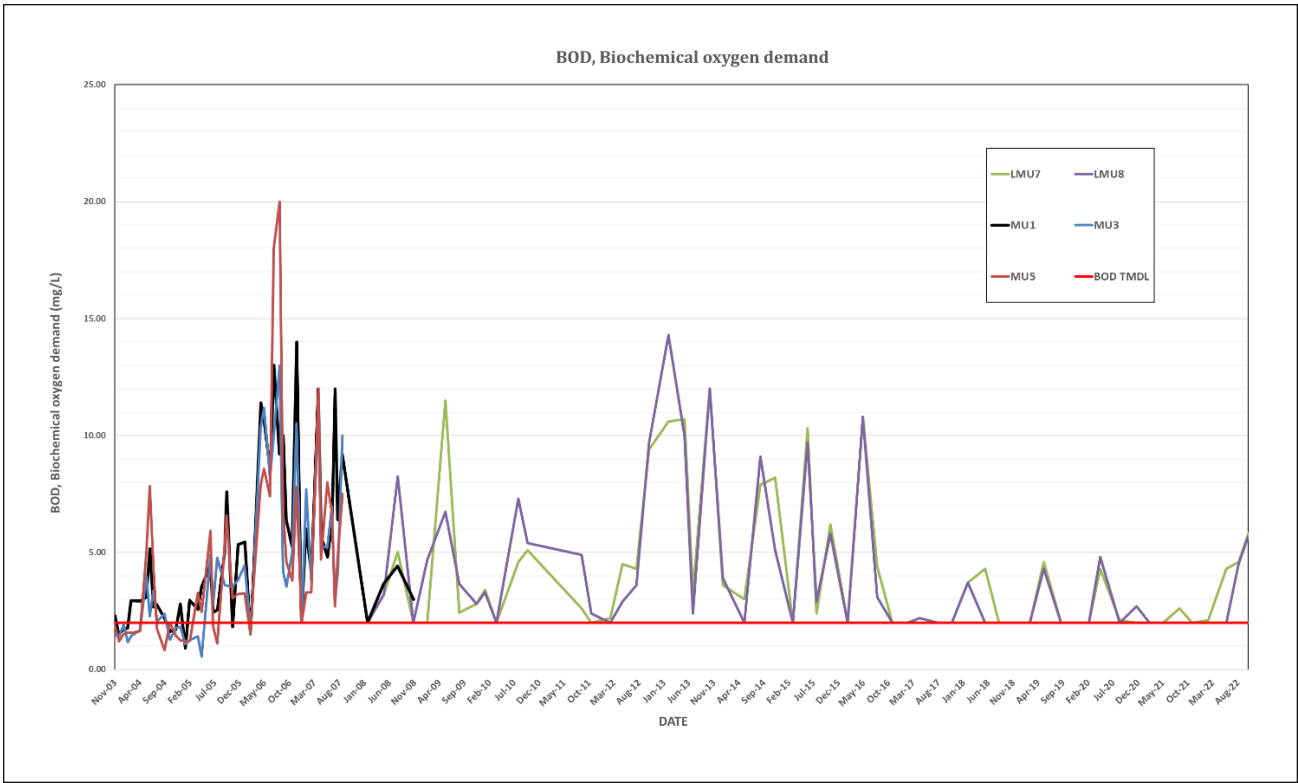


Figure 2. BOD results for Lake Munson.

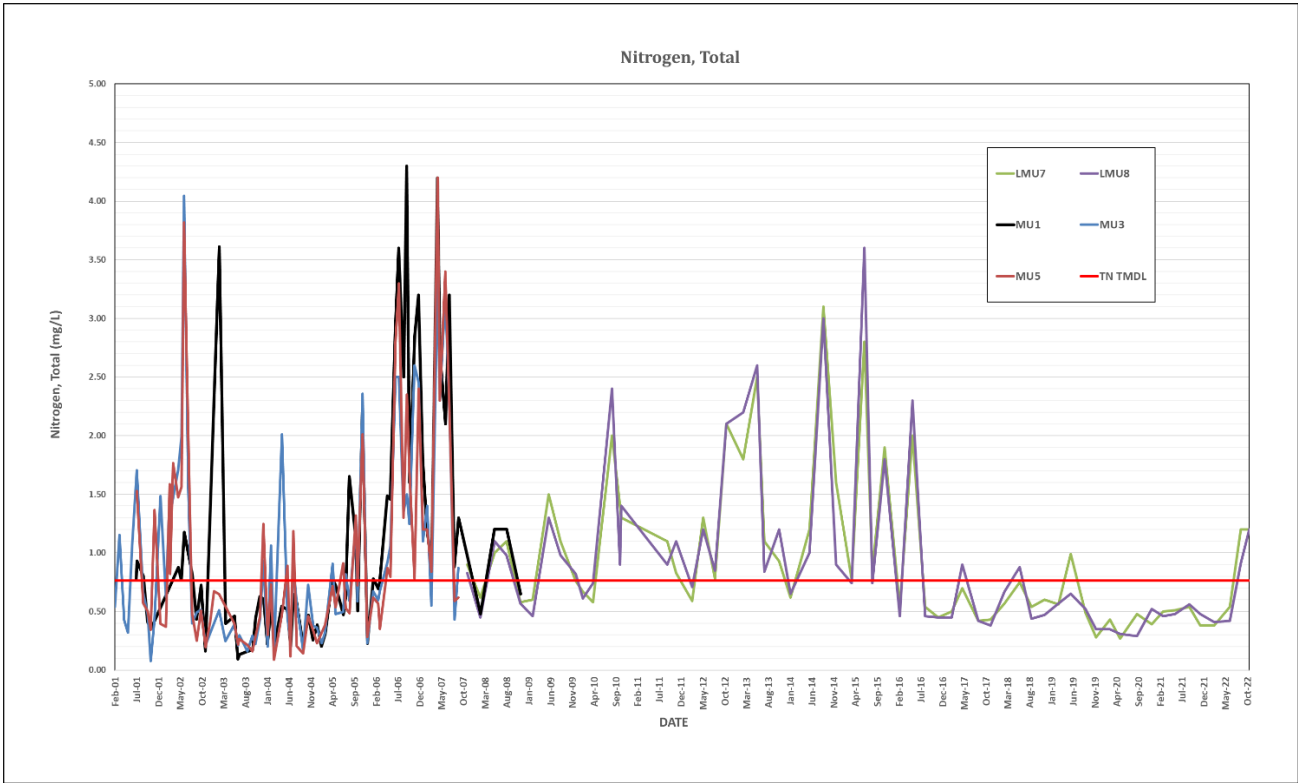


Figure 3. Total Nitrogen results for Lake Munson.

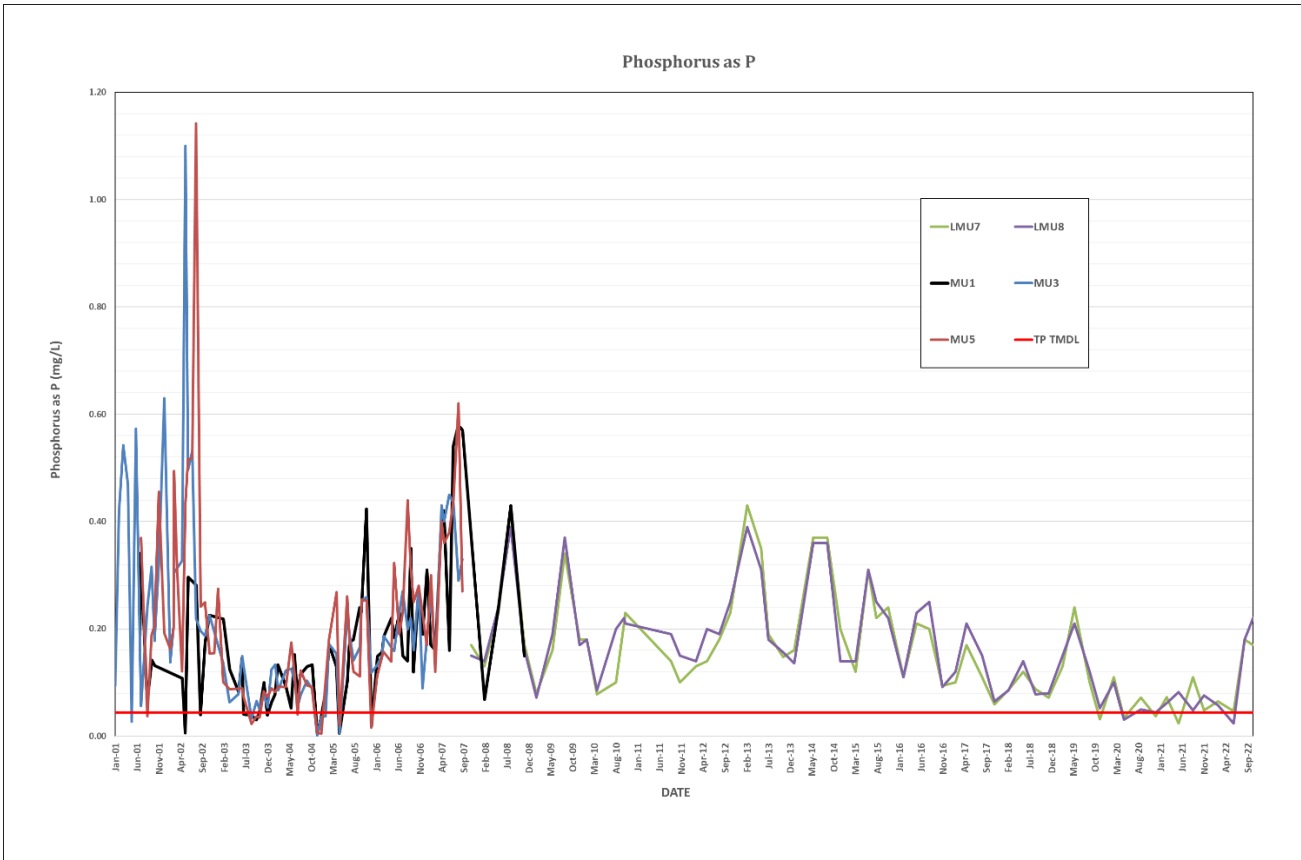


Figure 4. Total Phosphorus results for Lake Munson.

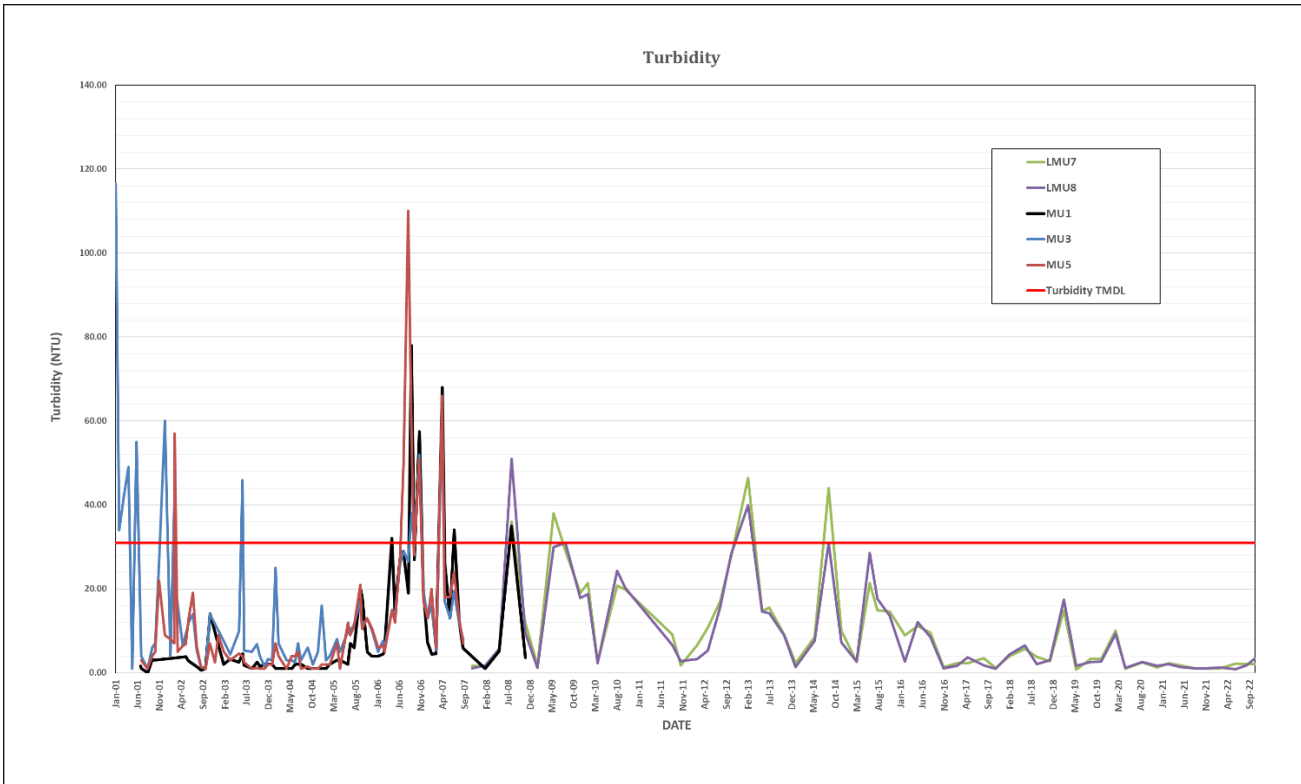


Figure 5. Turbidity results for Lake Munson.

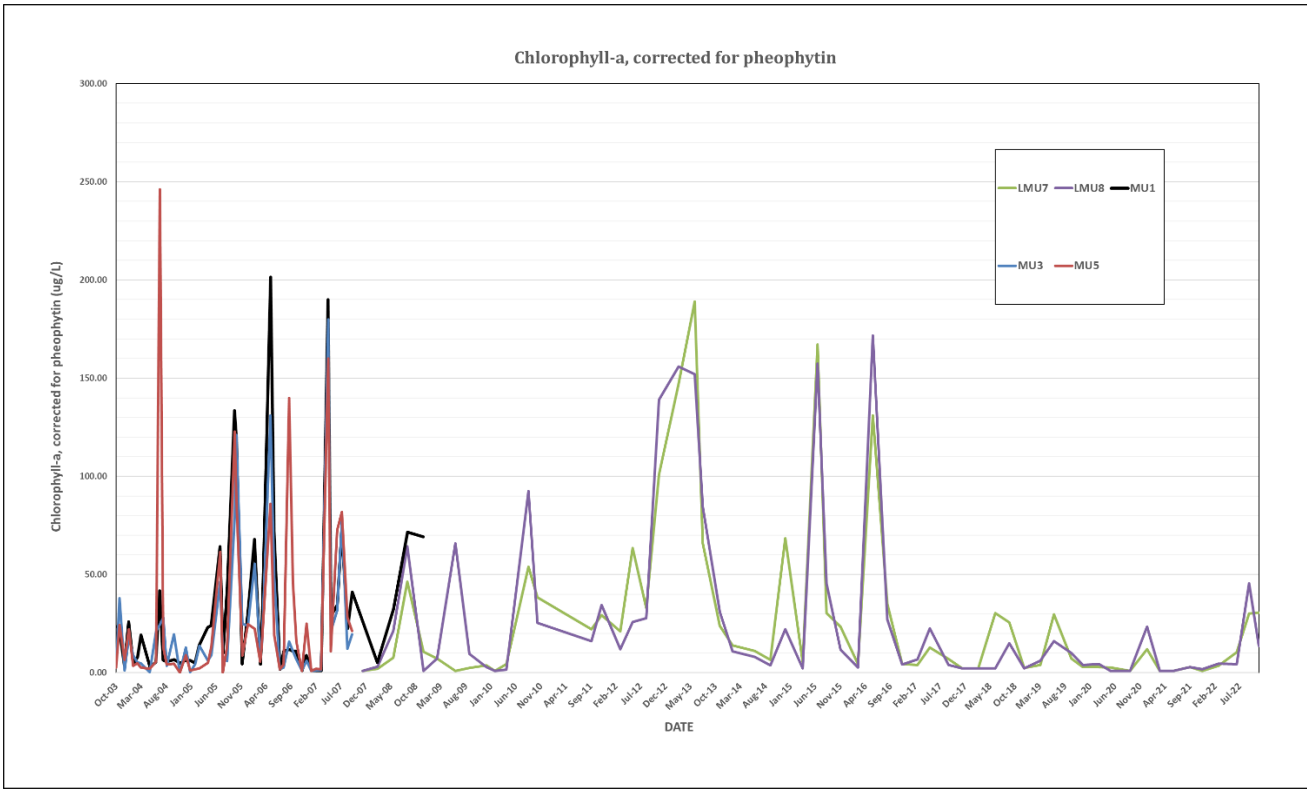


Figure 6. Chlorophyll-a results for Lake Munson.