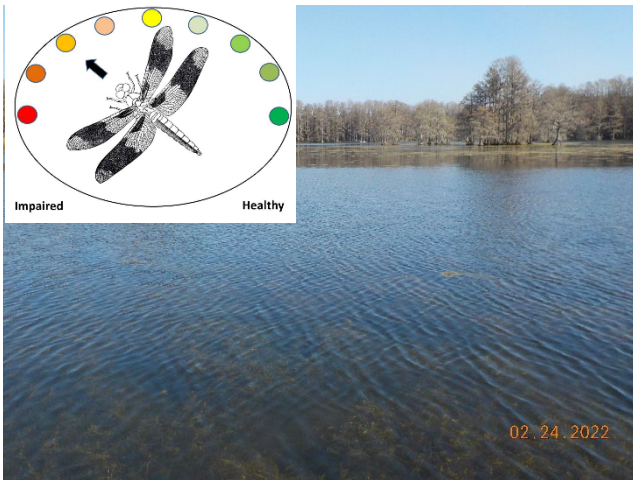


Lake Munson EcoSummary



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.

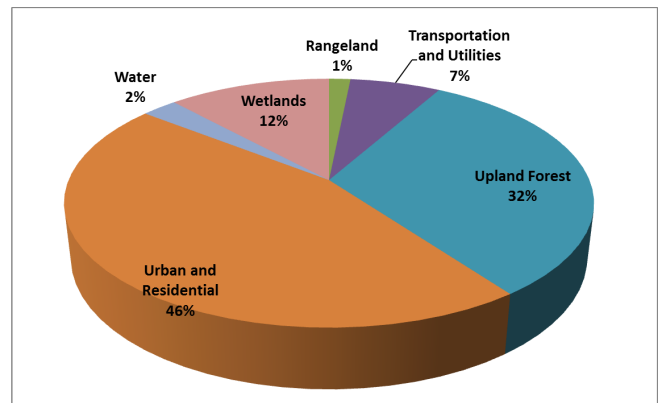


Figure 1. Lake Munson watershed land use.

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 determine the health of Leon County waterbodies and meets the requirements of the Florida Department of Environmental Protection (FDEP).

Total Maximum Daily Load (TMDL)

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 are contributing to the poor water quality. 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 have changed and evolved 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. The lake drawdowns are expected to result in de-watering, compaction, and partial oxidation of sediments thus creating a sediment "cap" that would serve to improve water quality and simultaneously generate suitable habitat for fish spawning.

On April 27, 2010, the Leon County Board of County Commissioners (BOCC) directed staff to implement a drawdown as recommended by the Leon County Science Advisory Committee. The drawdown began on October 18, 2010 and continued until June 14, 2011. On October 11, 2022 the BOCC approved the implementation of the 2022-2023 Lake Munson Action Plan, including a drawdown that began on November 1, 2022 and is anticipated to run through the

spring of 2024. Future drawdowns are expected to occur every 5-10 years.

Results

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.

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

* 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.

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.

Floral Assessment

The 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 primrosewillow (*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 hoped 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 and would form a “cap” on the sediment to reduce nutrients leaving the sediment while allowing sediment denitrification.

Leon County plans to implement an Invasive Exotic Vegetation Management Program to supplement the State’s treatment efforts on Lake Munson. The Invasive Exotic Vegetation Management Program will be an in-lake mitigation tool the County can utilize as a long-term strategy to manage area lakes. This program will be implemented for Lake Munson following the drawdown and anticipated to be expanded county-wide in the future.

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

Conclusions

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 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 hoped that the lake drawdown, followed by the implementation of an 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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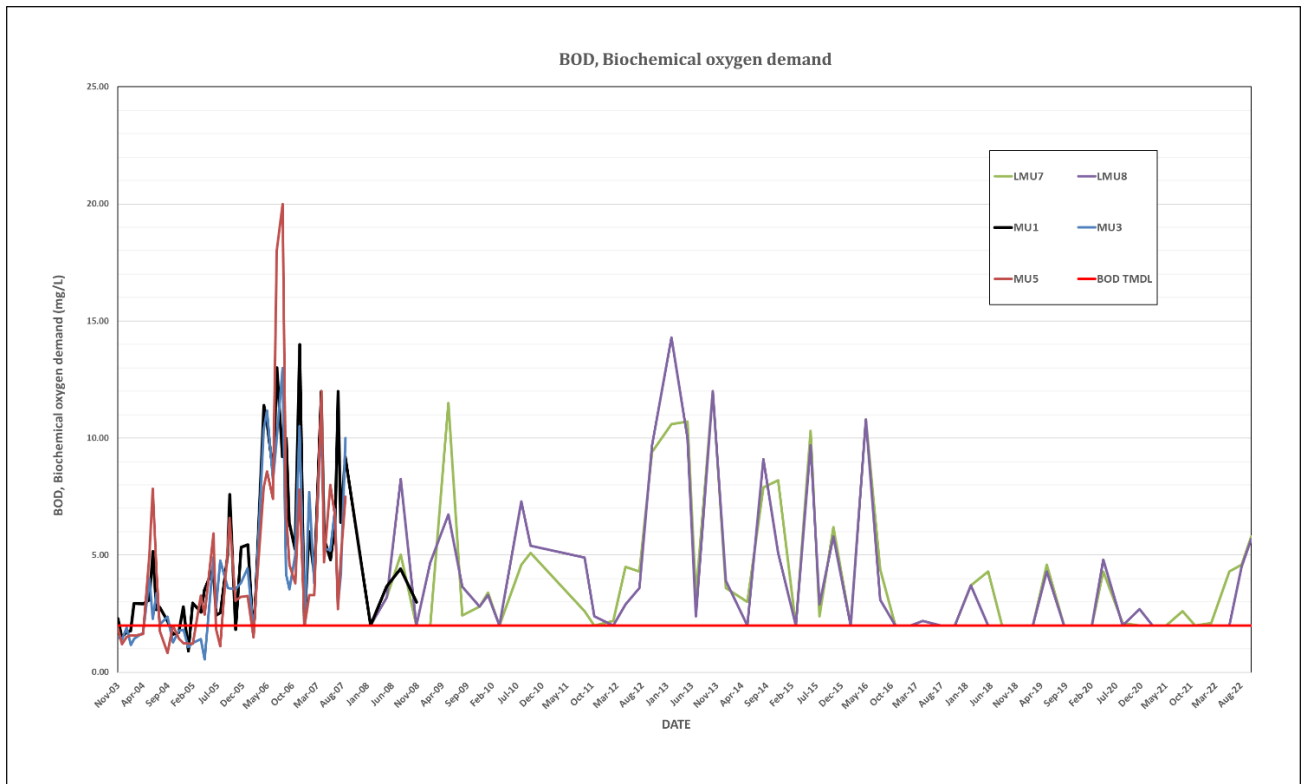


Figure 2. BOD results for Lake Munson.

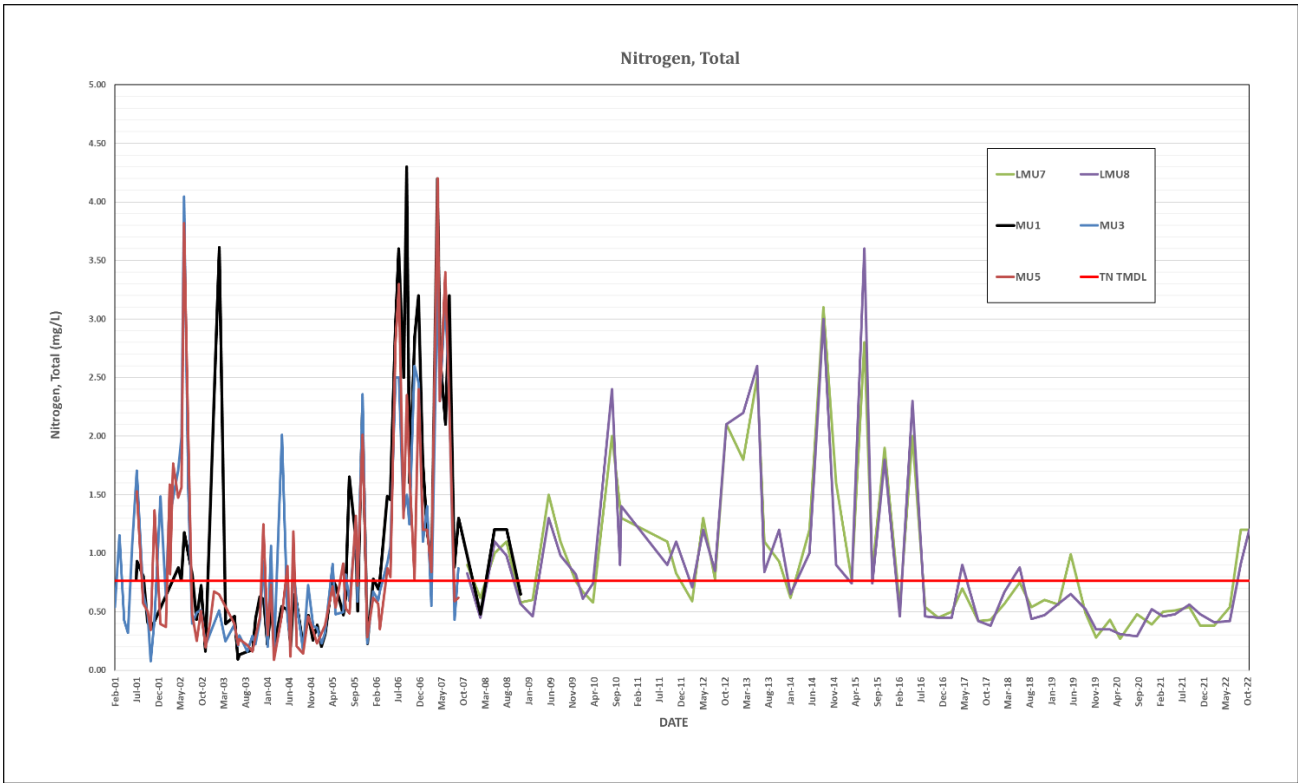


Figure 3. Total Nitrogen results for Lake Munson.

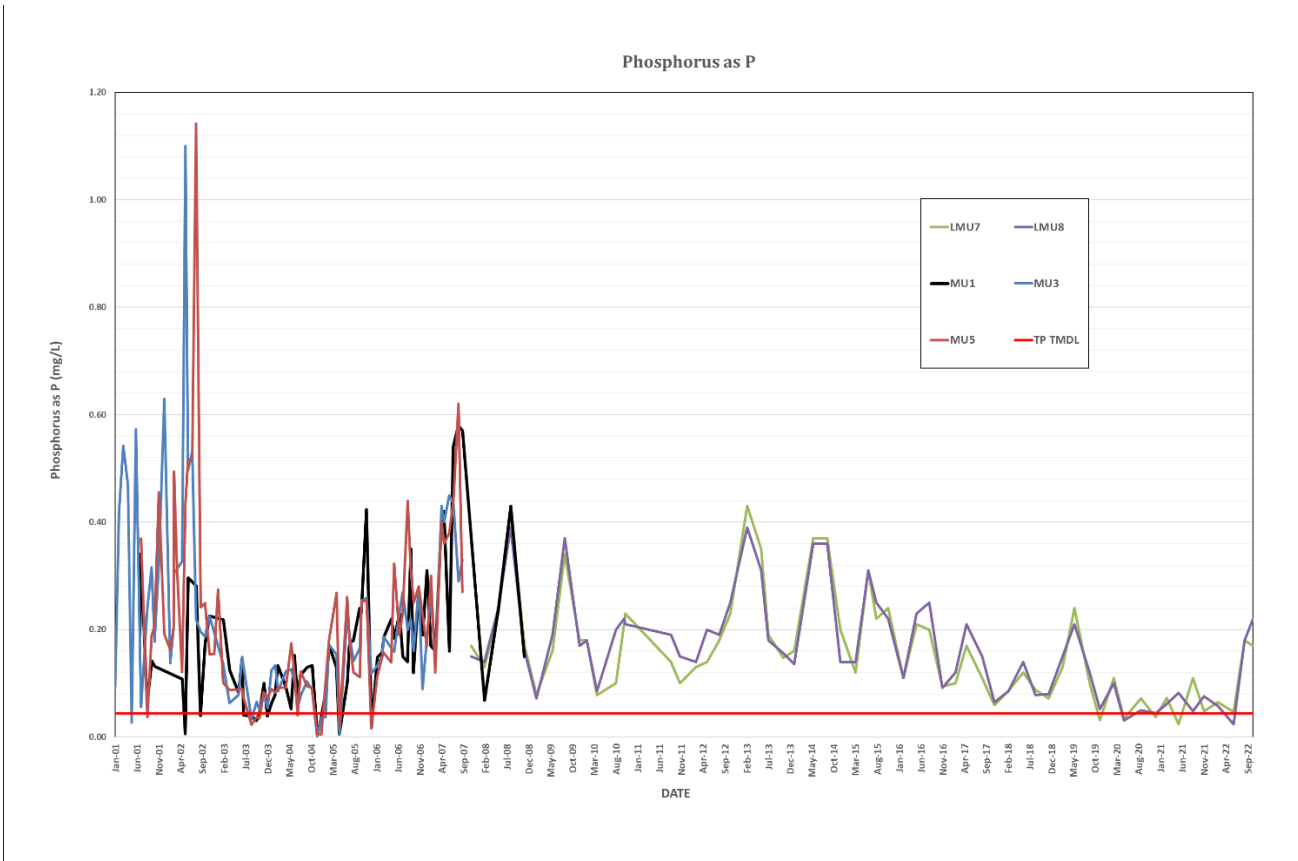


Figure 4. Total Phosphorus results for Lake Munson.

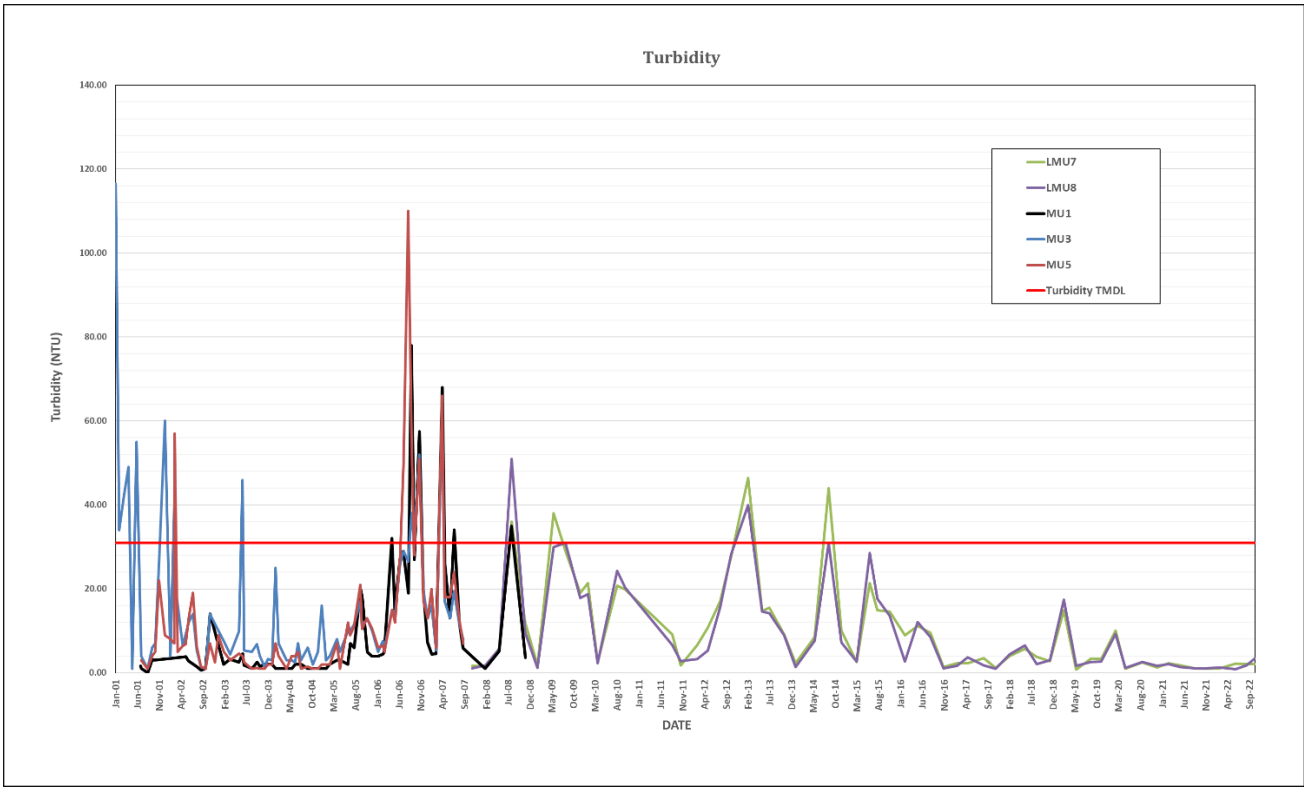


Figure 5. Turbidity results for Lake Munson.

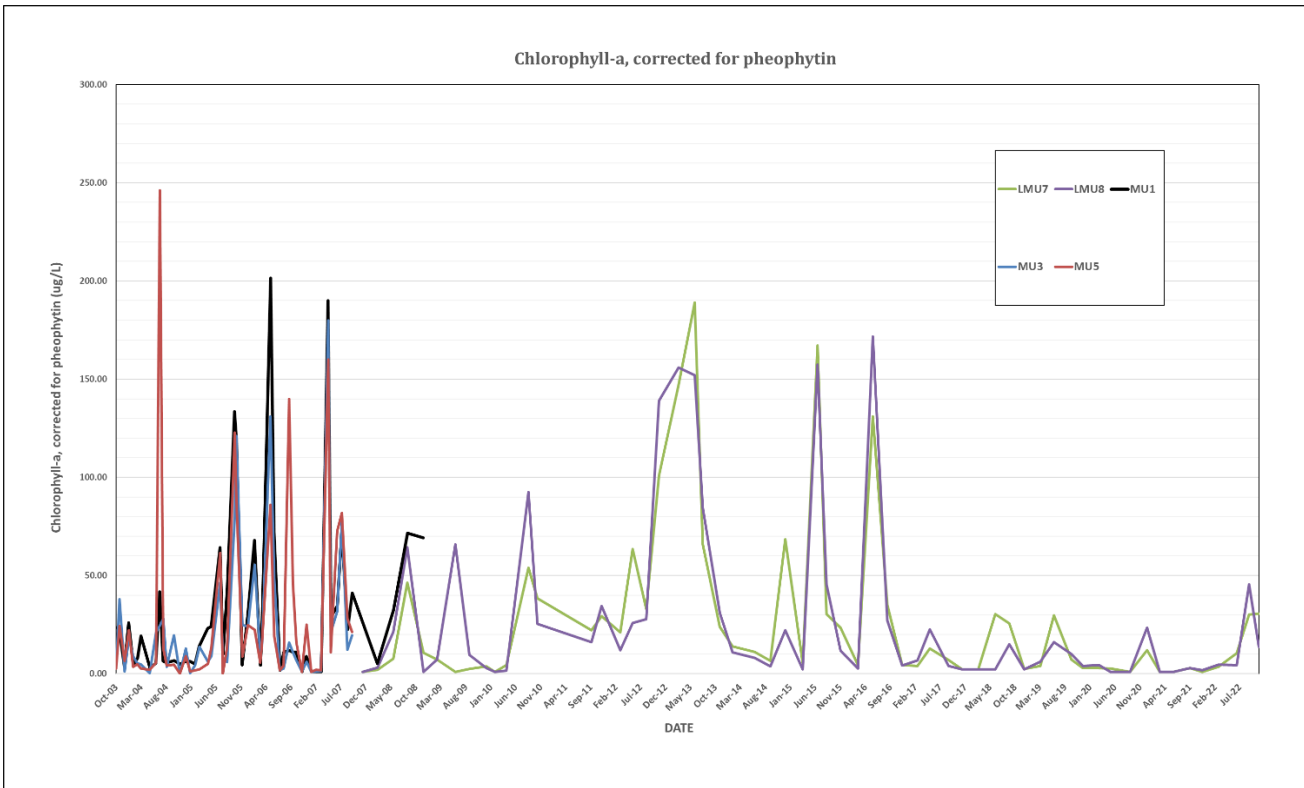


Figure 6. Chlorophyll-a results for Lake Munson.