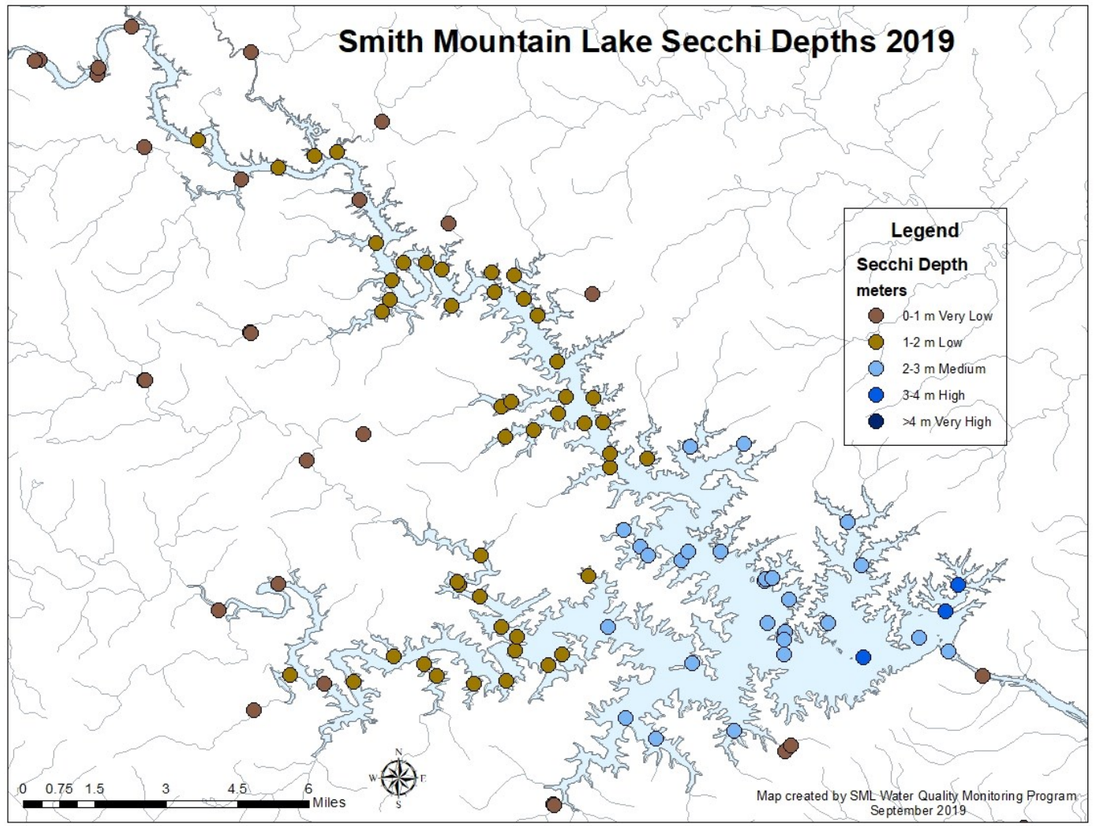
Smith Mountain Lake Water Quality Program

Secchi Depths

Secchi depth is a measure of water clarity, which is most affected by suspended sediment particles and algae. Secchi depths in the main channels in 2019 were virtually the same compared to 2018 readings (1.83 m to 1.77 m) and continues a declining trend from 2015 when readings averaged 2.3 m. The map shows the clear trend that water entering the lake has poor clarity due to suspended particles. Closer to the dam, most of the suspended solids along with nutrients have been deposited as sediment. Since there are fewer suspended solids and fewer algae near the dam, this is where the larger average Secchi depths are observed.



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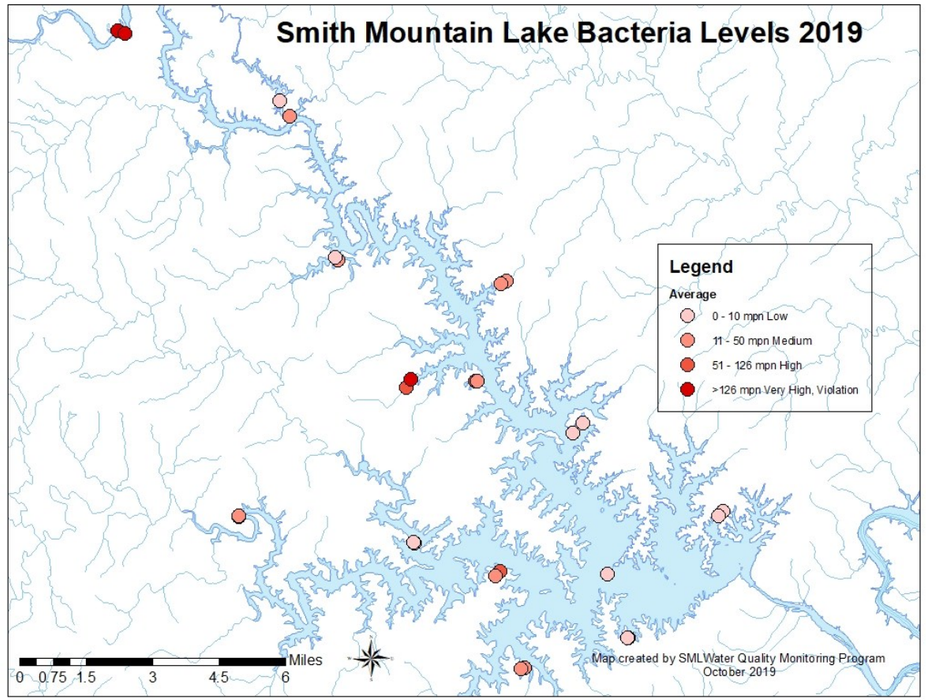
Smith Mountain Lake Water Quality Program

The Lake Monitor

Preliminary 2019 Results

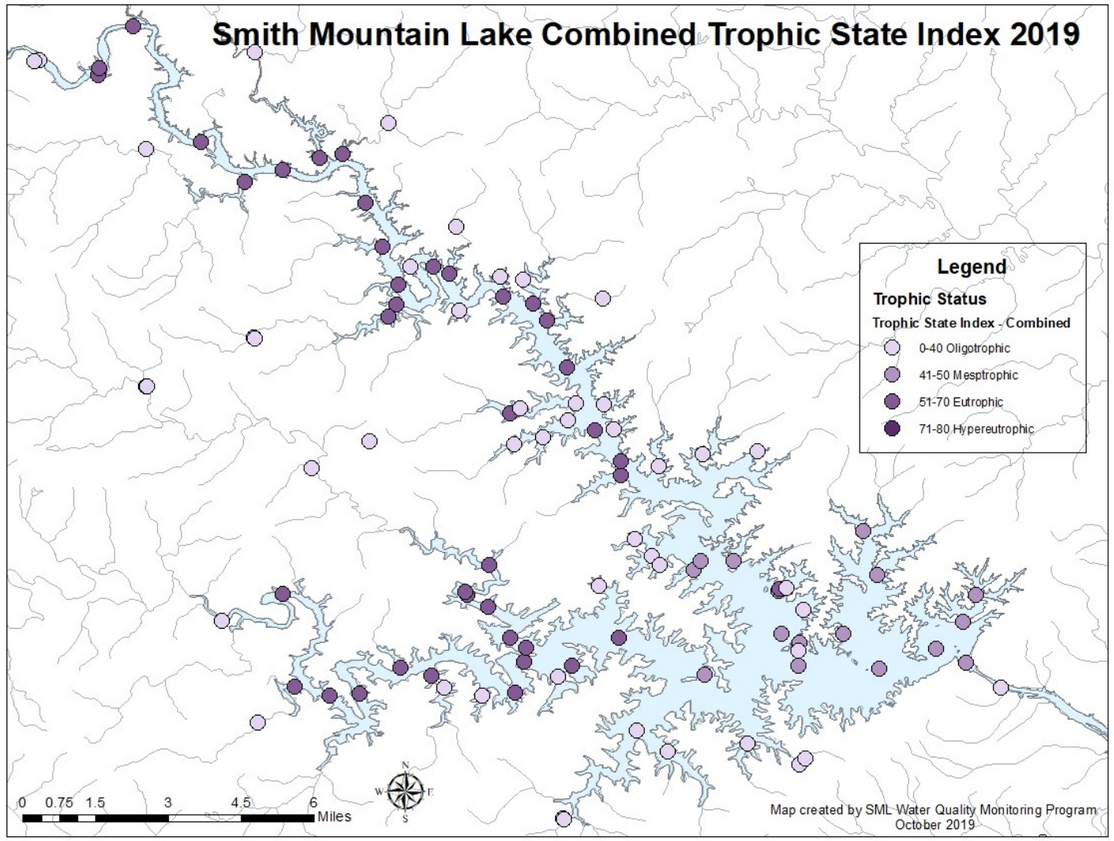
The Smith Mountain Lake Water Quality Program is releasing a summary report from our summer monitoring program. These results are an initial look at the data; the final version of The Lake Monitor and the full water quality report will follow later this year. This issue of The Lake Monitor includes maps of algal populations, bacteria, chlorophyll-*a* levels, Secchi depths, total nitrogen, total phosphorus, and Trophic State Index—Combined. All results are the averages of the data collected over the sampling dates.

Inside this issue:



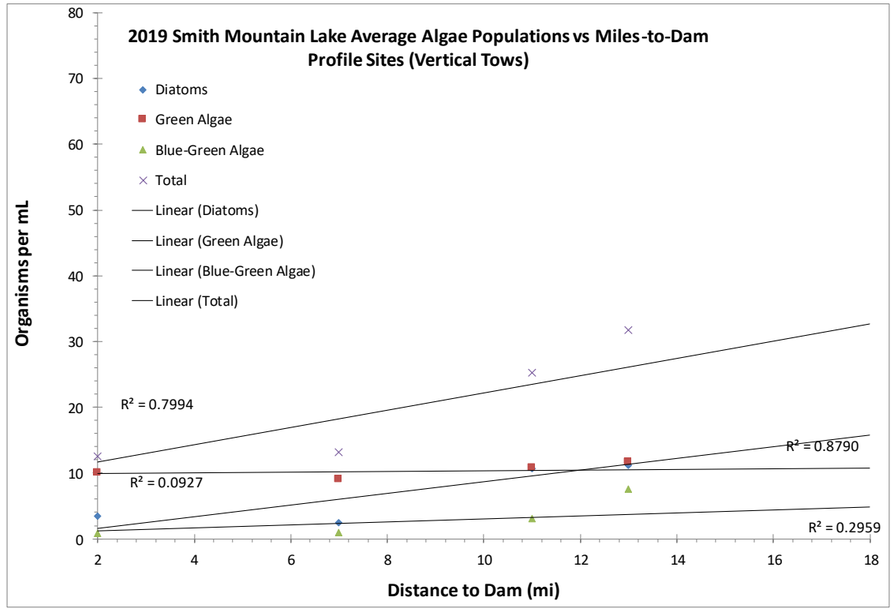
The average bacteria populations, specifically *Escherichia coli* (*E. coli*), in Smith Mountain Lake were much higher in 2019 then in 201 (57.4 MPN to 37 MPN). Six of the seasonal averages were in the "High" or "Very High" range compared to four in 2018. Three of the dates and five of the 14 sites sampled had *E. coli* values that exceeded the Virginia Health Department standard. A comparison of marinas, headwaters, and non-marinas in 2019 showed a notable difference in *E. coli* values between the headwaters and the other sites (marina and non-marina).

Combined Trophic State Index



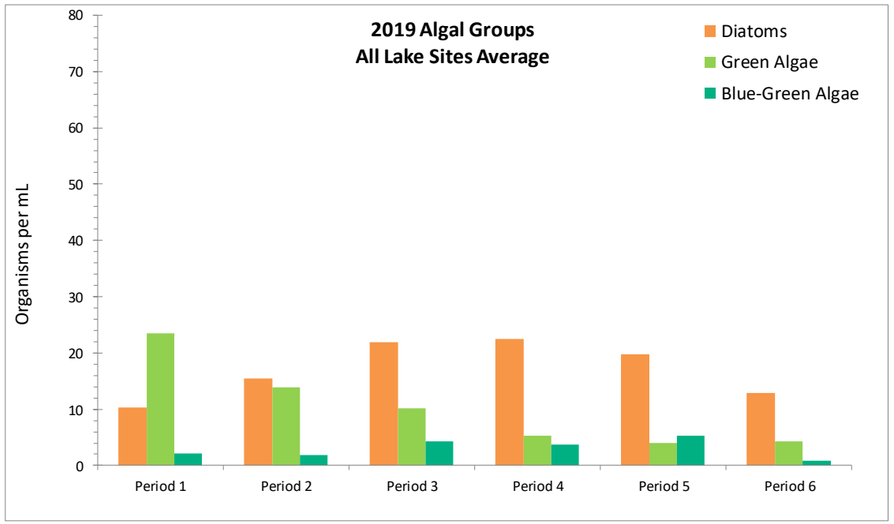
The Combined Trophic State Index examines total phosphorus, chlorophyll-*a* and Secchi depth together in order to provide an overall look at the trophic status of a water body. In 2018 the water closest to the dam can be classified predominantly as mesotrophic while waters in the upper channels were mainly eutrophic. This is typical of the differences between the more river-like characteristics of the upper channels of Smith Mountain Lake and the lake-like characteristics of the main basin, which is closer to the dam. The Combined Trophic State Index for Smith Mountain Lake in 2018 was 54.1 which is indicative of eutrophic status. As was the case last year, no areas on the lake were identified as hypereutrophic.

Algal Populations cont.

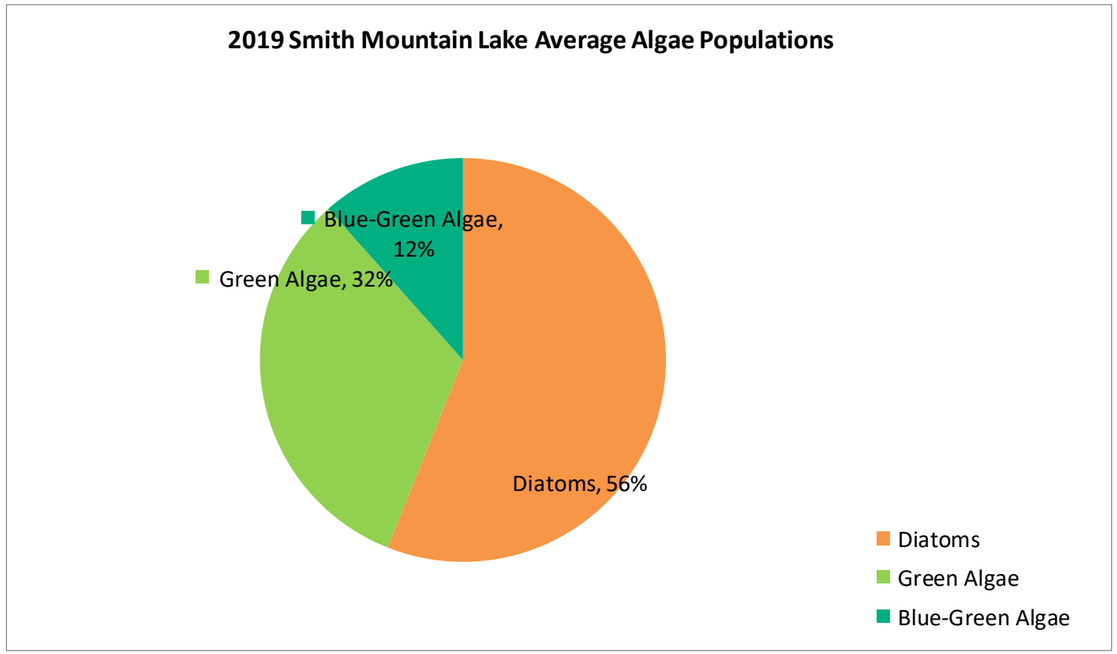


As in previous years, the abundance of all algal types is higher in the headwaters of the channels or as you move further from the dam.

During the 2019 sampling season, the overall average levels of algae were higher than in 2018 for all weeks.



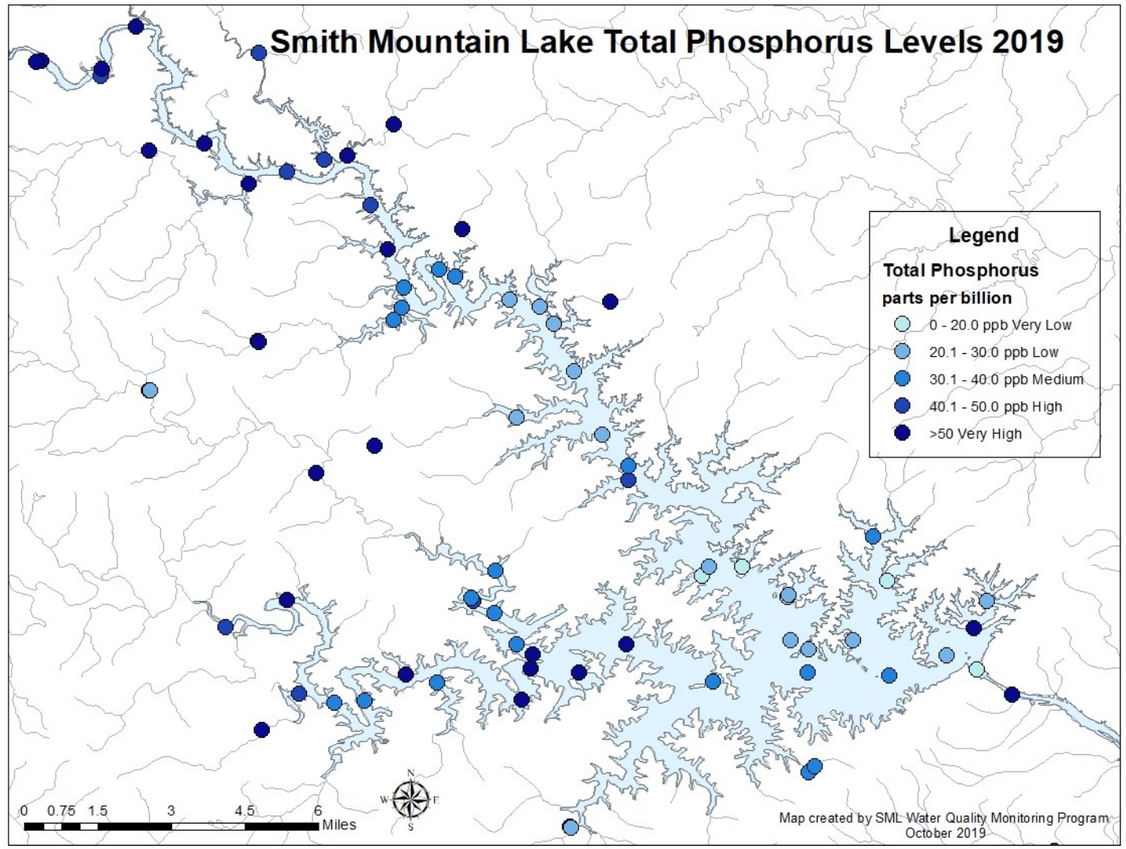
Algal Populations



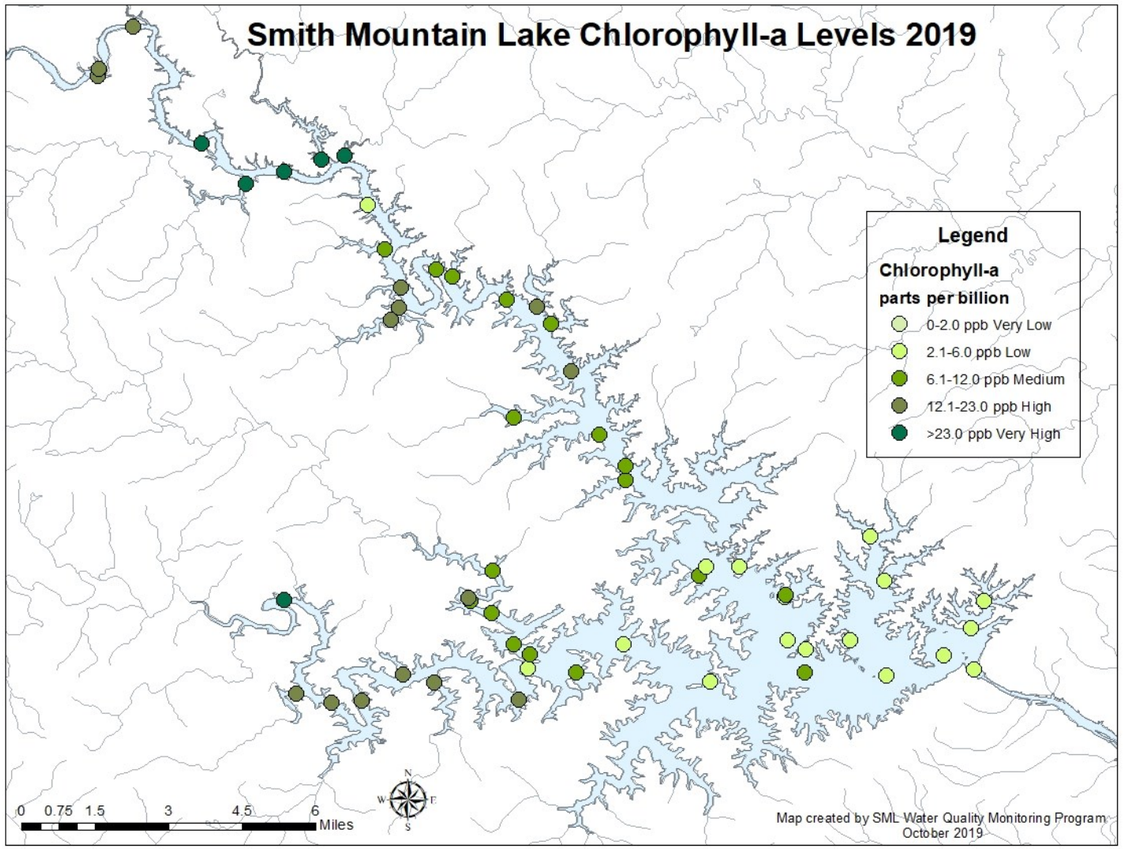
Blue-green algae made up 12% of the 2019 total samples compared with 18%of the 2018 samples.. This suggests that the potentially toxic blue-greens are still not a significant problem in Smith Mountain Lake. Diatom counts were the dominant algal type (56%) in 2019, a complete reverse of the situation in 2018 when Green Algae made up the majority of species found (56%).

Total Phosphorus Levels

Total phosphorus is strongly associated with clay particles that are present in the nutrient-rich waters that enter the lake from the Blackwater and Roanoke Rivers. As the water flow decreases, suspended clay particles settle to the bottom as sediment, carrying much of the phosphorus with them. At distances far from the dam, total phosphorus levels are at levels characteristic of eutrophic lakes. Closer to the dam, total phosphorus levels are more characteristic of oligotrophic lakes. In 2019, average total phosphorus levels were similar to those in 2018 (49.5 ppb to 41.3 ppb).

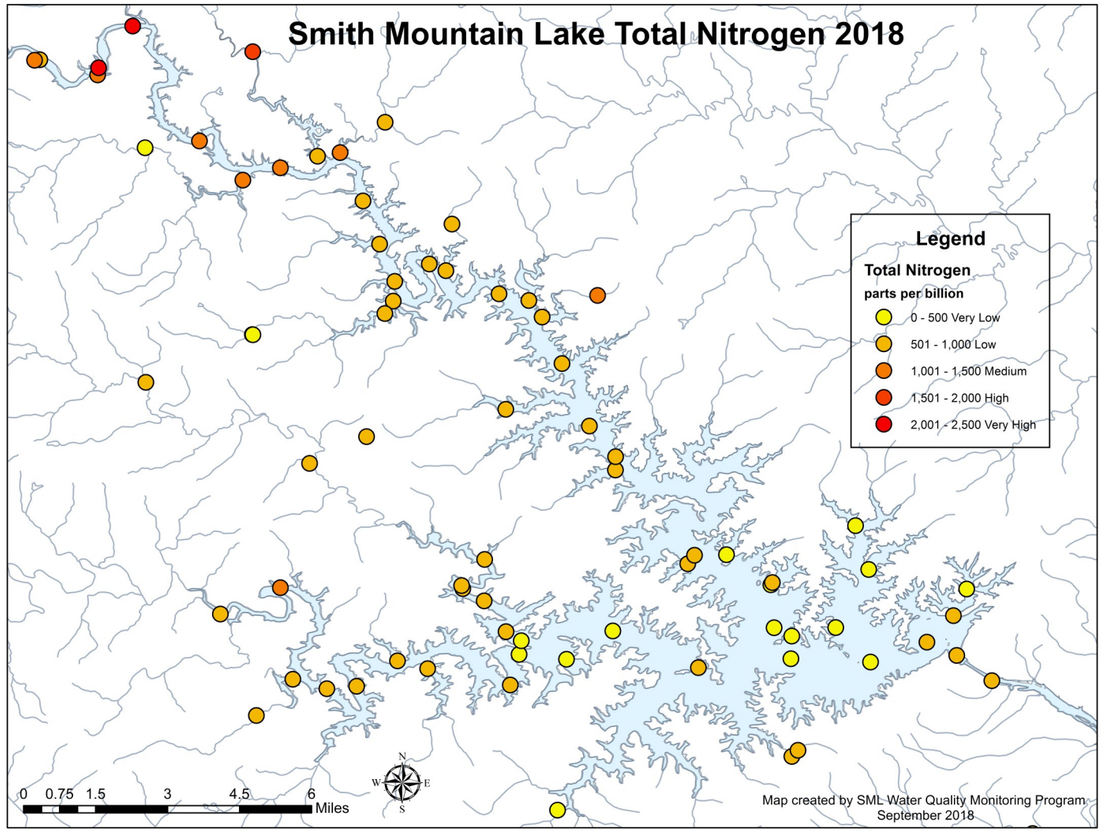


Chlorophyll-*a* Levels



In 2019 sixteen sample sites had average chlorophyll-*a* levels lower than 6 ppb, while nineteen stations had average chlorophyll-*a* levels between 6.01 and 12.0 ppb. Twenty one stations reported average chlorophyll-*a* concentrations above 23 ppb. This contributed to the average chlorophyll-*a* levels being slightly lower in 2019 than in 2018, 12.59 ppb to 13.37 ppb. The trend of increasing chlorophyll-*a* concentration with increasing distance to the dam still holds, and once again demonstrates the link between nutrients (total phosphorus) and algal growth.

Total Nitrogen



Nitrogen can enter the lake from several sources, including nitrogen fixation by bacteria in the lake and anthropogenic sources such as runoff from fertilizer. Nitrogen is not a limiting nutrient in Smith Mountain Lake since it is found at much higher concentrations than phosphorus, but high nitrogen concentrations can indicate areas of nutrient input in the lake. Unlike total phosphorus, total nitrogen levels are not strongly associated with distance from the dam, although most of the concentrations reported near the dam range from low to very low levels. In 2019 problems with the process of analyzing samples at such low levels proved too difficult to reliably proved results from week to week throughout the summer.

This will necessity discussions for future summers about both the need and feasibility of testing for Total Nitrogen in Smith Mountain Lake.