

Anna Cornell
Trout Lake
The Total Filtered Nitrogen (N)

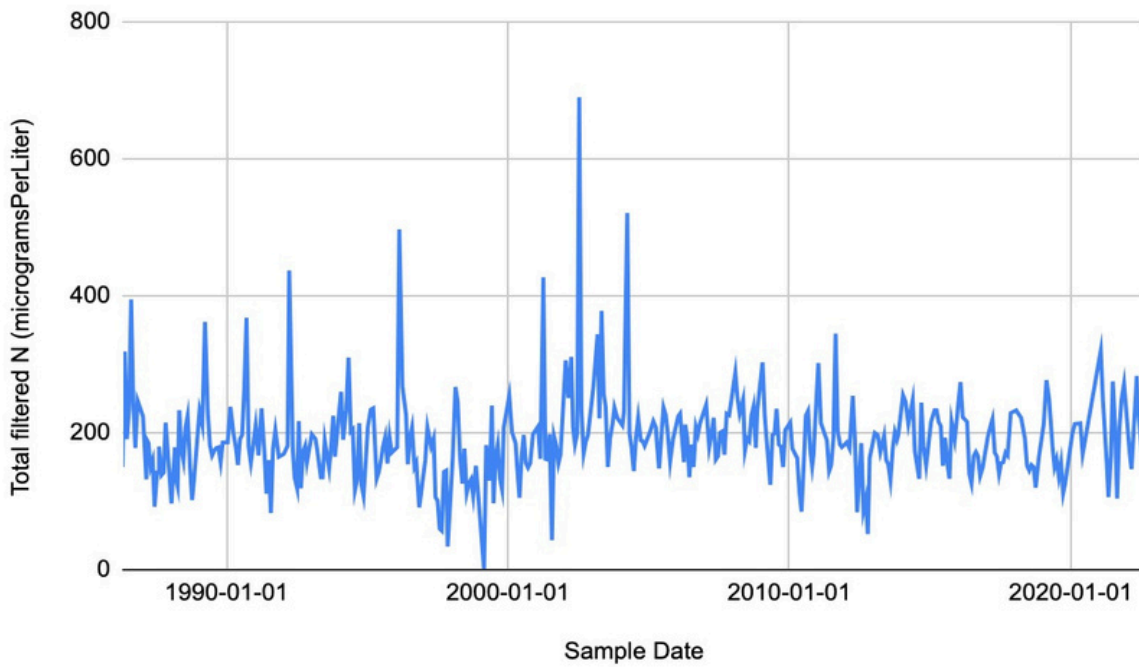


Figure 1: The Total Filtered Nitrogen (N) measured in mg/L over the years 1986 - 2022 at depth 0 meters in Trout Lake.

I omitted a sample of data taken from March 2017 which measured 1313 mg/L of total filtered N. Which is a complete outlier in the data set.

2011-03-17	1313
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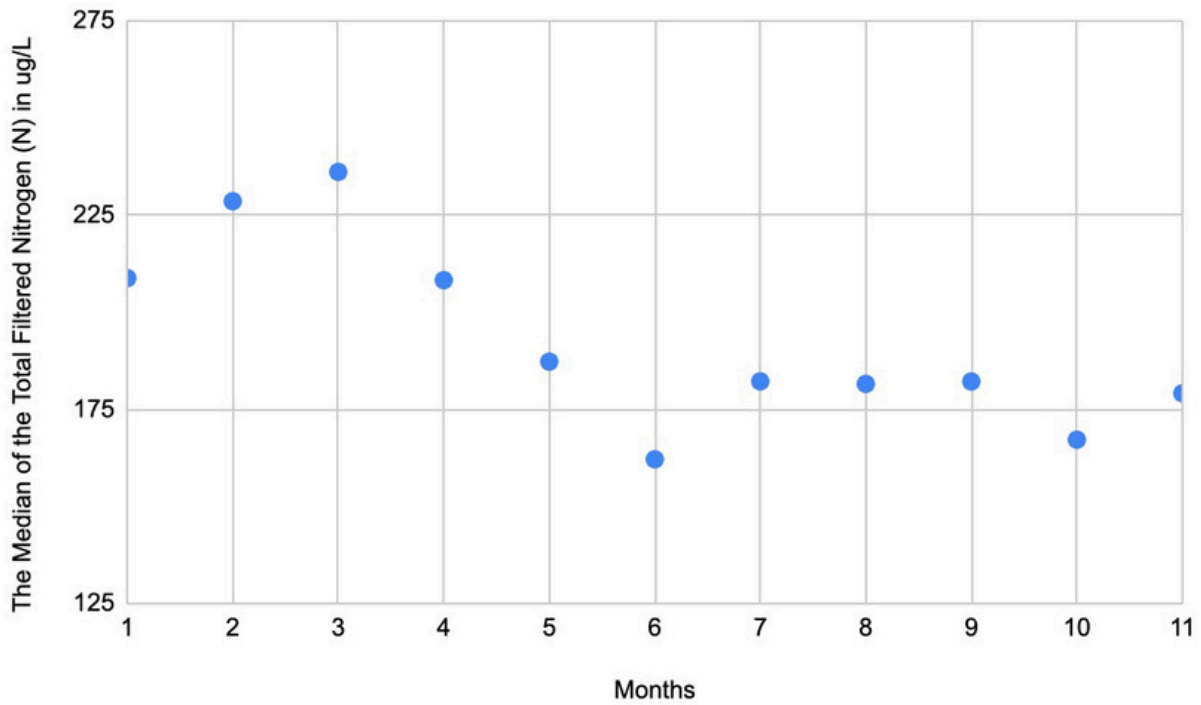


Figure 2: The Median of the Total Filtered Nitrogen (N) in micrograms/L at depth 0 meters recorded over the years 1986 - 2022 in Trout Lake plotted over each month of the year.

Website:

<https://lter.limnology.wisc.edu/core-datasets/>

URL to google sheet:

https://docs.google.com/spreadsheets/d/1HeialCmEiJcf6NiId8v7Z16bfmXpdBlg_36KEdpe2Gc/edit?usp=sharing

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Trout Lake, spanning 3,864 acres, is located in Vilas County in Northern Wisconsin within the Northern Highlands Lake District. This region covers over 225,000 acres and is characterized by a diverse landscape of forests, wetlands, and prairies. This area contains approximately 2,500 lakes within a 50-kilometer radius. Trout Lake has a maximum depth of 117 feet and is classified as oligotrophic, indicating low levels of nutrients, such as phosphorus and nitrogen. The Trout Lake watershed is primarily located in a forested area, with little agriculture directly within the watershed. The lake is used for recreation including boating and fishing, with ice fishing and snowmobiling popular in the winter months.

Figure 2 depicts the median of the Total Filtered Nitrogen (N) concentration in micrograms/L for Trout Lake, recorded annually from 1986 to 2022, plotted by month. The graph illustrates the total filtered nitrogen (N) values rise in the winter and spring months and then decrease in the summer and fall months. The highest values recorded were during the early spring months of February and March, with high values also recorded in January and April. The lowest values were recorded in June and October, with a generally lower trend in observed values throughout the summer and fall months. These values are relatively low compared to other observed lakes in Wisconsin.

Nitrogen concentrations are influenced by a variety of factors, including external drivers such as seasonal weather patterns, as well as internal biological processes within the lake. External factors, such as runoff from precipitation plays a significant role in nitrogen loading. Snowmelt and spring rain in early spring months can increase runoff from the watershed. Agriculture is an important source of nitrogen due to the runoff of fertilizers. This runoff often contains excess nutrients, particularly nitrogen. Although there is little agriculture in the watershed of Trout Lake, concentrations are most likely still affected by these processes.

The lower nitrogen levels during the summer months are due to the biological uptake by algae and plants. This nitrogen assimilation by algae and plant growth lowers the available nitrogen in the water. In the colder months, there is a decrease in biological activity and a decrease in runoff. Nitrogen may be released into the water column as organic matter breaks down. Followed by spring, where the ice melts and the lake mixes. This results in the lake mixing, which can increase the concentration of nitrogen in the water, as these nutrients are then used by algae and other aquatic organisms, leading to a spike in nutrient levels.

Trout Lake's trophic state is oligotrophic, meaning it has low concentrations of nutrients like nitrogen and phosphorus. This indicates high oxygen levels and limited algae growth. In an oligotrophic lake, the dynamics of nutrient cycling are often less intense. Therefore, would not experience the same nutrient loading or rapid increases in nitrogen concentrations as in a eutrophic system. In a eutrophic system, high nutrient inputs could lead to frequent and large-scale algal blooms (Smith et al., 1999).

Wisconsin Department of Natural Resources. (n.d.). *Trout Lake (WBIC: 2331600)*. Retrieved November 21, 2024, from <https://apps.dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2331600>

Environmental Data Initiative. (n.d.). *ILTER - North Temperate Lakes: Water temperature and dissolved oxygen (1981-current)*. Retrieved November 21, 2024, from <https://dex.edirepository.org/dex/profile/15633>

Smith, V. H., et al. (1999). Eutrophication and nitrogen limitation in coastal marine ecosystems. *Limnology and Oceanography*, 44(3), 642-648.