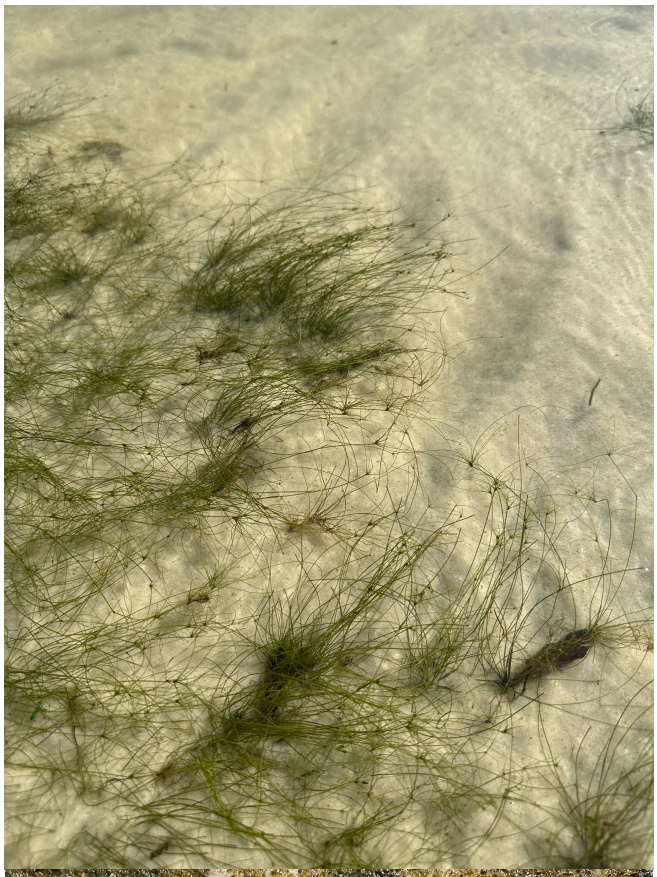
White Lake Report to Town Board
September 2024

Diane Lauritsen, Ph.D. LIMNOSCIENCES

This month's report provides a summary of lake level information, and the summary section from the 2023 White Lake Monitoring Report, which has been posted to the White Lake Watch web site.

The clarity of the lake improved in August and temperatures have come down a bit compared to July, which is due to the high rainfall earlier in August.

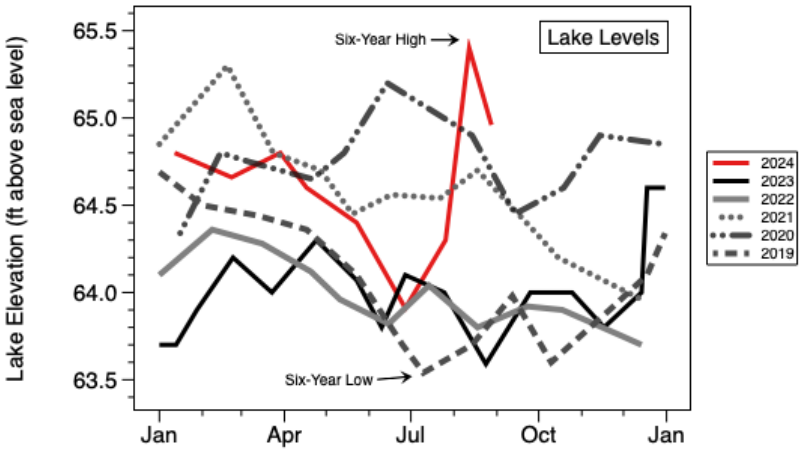
At the Lake Place condos, it is possible to see the rooted vegetation that is typically found in the deeper portions of the lake, rooted and growing along the lake shore.



Spikerush is normally found growing in the deeper portion of the lake—fragments are at times seen floating on the lake surface. It can grow from seeds or fragments. The grass beds in the deeper portion of the lake are great habitat for fish.

Gelatinous balls containing tiny cyanobacterial cells can also be seen in this area—they are also growing at the lake bottom in deeper water. The cells contain structures that scavenge phosphate from the water, making them good competitors in the battle for nutrients. This material was seen last year at this time as well.

White Lake: 2019-2024 Lake Level



Tropical Storm Idalia 8/29-30/2023, 7" rain, +6" lake level
Nor'easter storm 12/17/2023, 7" rain, +7.2" lake level
Tropical Storm Debby 8/7-8/2024, 10" rain (19" over a 10-day period)

Annual Lake Elevations, High and Low

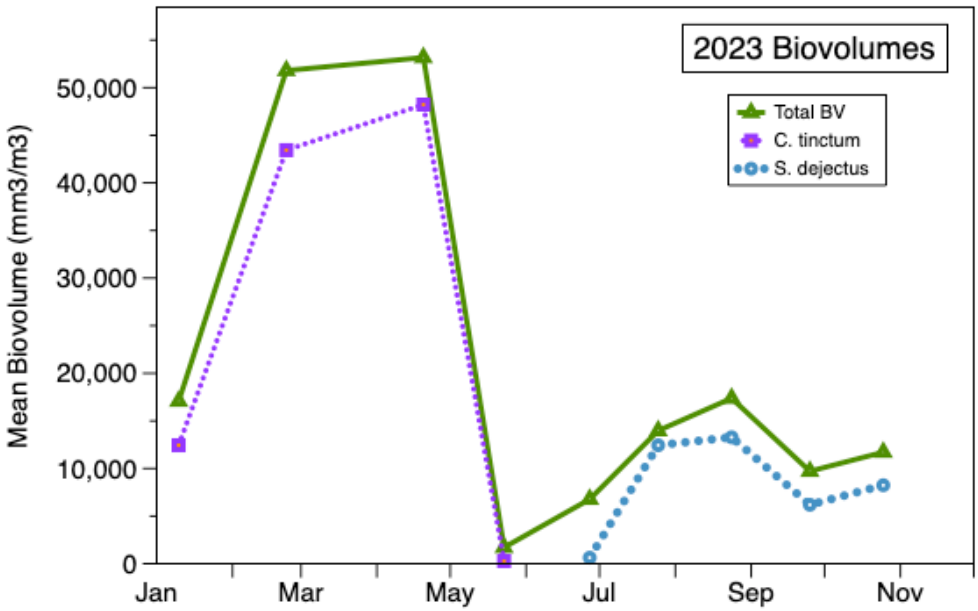
2019 High (January 25): 64.6 Ft NAVD 88
2020 High (June 16): 65.2 Ft NAVD 88
2021 High (February 19): 65.3 Ft NAVD 88
2022 High (January 17): 64.3 Ft NAVD 88
2023 High (December 18): 64.6 Ft NAVD 88
2024 High (August 12): 65.4 Ft NAVD88

2019 Low (July 9): 63.5 Ft NAVD 88
2020 Low (January 1): 64.3 Ft NAVD 88
2021 Low (November 29): 63.9 Ft NAVD 88
2022 Low (May, Oct-Dec.): 63.7 Ft NAVD 88
2023 Low (August 28): 63.6 Ft NAVD 88
2024 Low (July 5): 63.7 Ft NAVD 88

2019 Lake Level Variation (High to Low): 12.7 Inches
2020 Lake Level Variation (High to Low): 10.3 Inches
2021 Lake Level Variation (High to Low): 16.8 Inches
2022 Lake Level Variation (High to Low): 7.2 Inches
2023 Lake Level Variation (High to Low): 12.0 Inches
2024 Lake Level Variation between July 5 and August 12: 20.4 inches

Variation (Highest-Lowest) Over the Six-Year Period 2019-2024: 22.8 Inches
Six-Year Mean High-Water Level (as of Aug. 30, 2024): 64.9 Feet NAVD 88

From the 2023 White Lake Monitoring Report:



This figure helps explain why the lake typically becomes very clear in May—the volume of phytoplankton in the water column is low, as the community changes from one species, which dominates in the cooler months, to others as the summer progresses. Both of the species which were dominant in 2023 (purple and blue lines) are desmids—an algae group that has been characteristic of the lake and makes it quite special.

Summary from the 2023 White Lake Monitoring Report:

1. While total annual rainfall was only slightly above normal, there were several months with little rain and two very large rainfall events in 2023. As a result, the total annual variation (low to high) in lake level was very similar to what has been seen historically.

2. Flushing of the lake does not occur in the same way that it does in drainage lakes with significant surface inflow and outflow. Water loss is a result of evaporation and groundwater seepage (Shank and Zamora 2019) as groundwater flows through the lake (which can influence nitrogen dynamics, e.g., Stoliker et al. 2016). The small outlet at Turtle Cove should be maintained as a flood control device (which is why and how it was designed), as it does not serve to either regulate lake levels or facilitate flushing of the lake.

3. Natural processes can help regulate nutrient levels. Incorporation of nutrients into the aquatic food web—microscopic to macroscopic life—and chemical transformations such as denitrification (e.g., Qin et al. 2020) influence the availability of water column nutrients.

4. White Lake has always been a relatively productive lake, with most of the productivity associated with the lake bottom, as the sediments are a source of nutrients. Variability in the relative abundance of bottom algae/cyanobacteria and/or aquatic vegetation both seasonally and annually has been substantial both historically and recently. In 2022 and 2023, benthic/pelagic cyanobacterial flocs were abundant in the summer and fall, and this material may serve as a rich food supply for invertebrates such as grass shrimp, and fish.

5. White Lake nitrogen levels are substantially higher than historical levels (the same is true in Singletary Lake), and levels can vary considerably from month to month, with the lowest levels generally found in October. Rainfall is a significant source of both organic and inorganic nitrogen to the lake. Inorganic nitrogen fluxes to the biosphere from agricultural activities have increased five-fold in the past sixty years (Battye et al. 2017). The increase has been even more dramatic in the region around White Lake (as measured at the Clinton NADP monitoring station [NC35]). Using 2022 NADP data as an example, the annual deposition of DIN (NH_x and NO_x) in 2022 totaled 9.257 kg/ha (a map of ammonium wet deposition for 2022 is included in the appendix). So, for White Lake, at an area of 836.485 ha, this loading is equivalent to 7,743.3 kg of DIN to the lake from rainfall in 2022. Dry deposition of N can also be high in this region (e.g., Wiegand et al. 2022).

6. Water column phosphorus levels in White Lake are equivalent to historical levels, except during phytoplankton blooms (e.g., the 2017-2018 cyanobacteria bloom and the desmid bloom in Feb.-April 2021).

7. As a result of atmospheric nitrogen deposition, the N:P ratios in White Lake have changed substantially (this has been seen in many lakes around the world [e.g., Bergström and Jansson 2006, Li et al. 2016]) with P now the primary growth-limiting nutrient.

8. There are several natural means for sequestering P in White Lake: the P-binding capacity of aluminum found in the muddy sediments, and primary producers such as cyanobacteria, which have strategies for excess, or luxury P storage (e.g., Xiao et al. 2022). Very small cyanobacteria (picoplankton) are often numerically dominant in White Lake, and Canadian researchers have found that picocyanobacteria abundance is much higher in oligotrophic to mesotrophic lakes with lower total phosphorus levels (Lavallée and Pick 2002).

9. Other life forms in White Lake that are adapted to low-nutrient conditions include the carnivorous bladderwort *Utricularia purpurea* (which utilizes the nutrients in its prey) as well as the colonial cyanobacteria *Aphanothece stagnalis*. *(This is the name for the cyanobacterial in the gelatinous balls pictured on page 2 above)*

10. White Lake's phytoplankton community continues to be healthy and quite dynamic, with general trends including the dominance of desmids (different desmid taxa may dominate at different times), slight increases in phytoplankton diversity, and low filamentous cyanobacterial biovolume since the 2018 alum treatment.

11. Singletary Lake has higher levels of bioavailable phosphorus and nitrogen, and at times has more phytoplankton biovolume than does White Lake. It is a much less diverse system, however.

12. Lake clarity can at times be very good, although there are also times when the lake appears to be cloudy or green. Boating activity which stirs up the muddy sediments can influence the appearance of the water, and churned up vegetative matter and sediments can cause degraded conditions in places along the lake shore, particularly where there are seawalls. This has been a long-standing issue.

13. Stewardship actions which can improve nearshore conditions include removal of seawalls and first and foremost, responsible boating practices which can reduce the amount of material stirred up from the lake bottom.

14. Bass fishing tournaments attract many fishers, and boat/trailer inspections would help to ensure that invasive weeds such as hydrilla are not re-introduced into the lake. While no aquatic vegetation survey was conducted in 2023, the southern naiad was identified in the lake for the first time, generating concerns about accidental introductions.