Algae Monitoring of the Tellico Reservoir
Summary September 2023

Background

Thanks to a grant from the TVA a collaboration between WATeR (Watershed Association of the Tellico Reservoir) and the Microbiology Department at the University of Tennessee at Knoxville (UTK) was initiated in 2022 to conduct a study of the phytoplankton (algae) within the reservoir. The objectives were to see what specific organisms comprised the phytoplankton, and to try to identify environmental circumstances that would help in the understanding of how to manage the phytoplankton.

WATeR initiated sampling of the algae in the Tellico Reservoir in 2020 as several longtime members of WATeR believed the reservoir water was much greener than it had been in the past. A report of that study can be found at this WATeR website:
https://www.tellicowater.org/_files/ugd/3283f5_fa547378340c4cbf927e418497daf919.pdf

2022 Observations

Based on the 2022 observations, UTK researchers found there was a diverse assemblage of phytoplankton with several genera of algae. Blue-green algae (cyanobacteria) was the most prominent group of phytoplankton. Although there were some algal species of concern, they are in small quantities. A diverse assemblage is good and the reservoir can be classified as "healthy". The abundance of the phytoplankton was highest in a shallow cove not directly connected to the main channel. Phytoplankton abundance in one of the creeks entering the reservoir was a close second. The lowest abundance was found in the southern arm of the reservoir.

2023 Sampling Site Changes

This year, the first water samples for chemical, physical and biological analyses were taken April 20th and will continue, at three week intervals, for 10 sampling "runs" until October 24th. Last year there were 6 sampling locations, while this year there is an additional sampling site in the Toqua Boat Landing area at mile 22-23. Site 13a is the same site as last year,

which will be sampled 3 times and 13b will be sampled during each of the 10 runs. The reason for the addition of 13b was that UT researchers wanted to sample the main channel at this upstream location to have baseline data from a low development area to compare with downstream sites.

Additionally, last year's site R21 (at mile 12), which was mid-way between the cove with multiple houses (site Co6b) and the cove with no development (Co7), has been deleted. Samples are now taken at site R23 (mile 10) mid-way between Lotterdale Campground and Jackson Bend. This site was selected because nutrient and chlorophyll data from this site--which is downstream from Baker Creek, Bat Creek and Fork Creek--would be available for comparison with TVA data collected at Mile 15, which is upstream of these 3 major developed tributaries to Tellico Reservoir.

UT researchers stopped collecting algae using a plankton net because its primary use was to collect a large amount of algae so FlowCam runs would not take as long, as well as having images of a large variety of algae. The FlowCam measures physical dimensions of the algae cells which is later used to identify the algae cell as they pass through the instrument. UT researchers decided to just run the FlowCam for a longer amount of time, because it also can quantify abundances. Since we have been doing this for a long time, we also have enough images.

The major change over the 2022 sampling season is the use of a multi-probe detector mentioned below.

2022 and 2023 Comparative Observations

Most of the physical parameters are relatively the same compared to last year, especially water temperature, pH and dissolved oxygen. The new instrument (YSI Sonde multi-probe detector) allows us to rapidly measure additional parameters, and readings are taken at 1, 2 and 3 meters. Some of those include conductivity, chlorophyll *a* abundance as well as phycocyanin abundance. Phycocyanin is a blue-colored accessory photosynthetic pigment and is a marker for blue-green algae. This algae is the primary cause of harmful algae blooms (HABs) Conductivity remains about the same throughout the year, which means it is not an area of concern.

Comparisons thus far between the 2023 sample data with the data collected during 2022 found that, generally, the abundance of the phytoplankton is greater at a depth of about 3 meters than that at shallower depths.

Chlorophyll *a* is the primary marker for production of phytoplankton. Chlorophyll *a* increases over the course of the year. This is expected, since the water is getting warmer and conditions are better for growth. Abundances are increasing throughout the sampling season. This is also expected as for the reasons stated above. Both chlorophyll *a*, as well as phycocyanin, are increasing with depth quite substantially. This is not of concern. It is expected since clearer waters (with less debris or algae blocking the sunlight) make it the perfect zone for photosynthesis below the surface level of the water. When primary productivity rises to a concerning level, the increase in phytoplankton abundance will block themselves from sunlight, which, in turn results in the algae migrating to the surface. If the growth in this zone, also called photic zone, gets to a concerning point, the algae would rise to the surface of the water and be collected with our sampling methods.

UT researchers are working with a group at Georgia Tech who helps with the identification and classification of FlowCam images. They have completed the first round of samples and additional samples have been sent for processing. UT researchers are in the process of extracting DNA from our samples for sequencing analysis, and they will be sent to a collaborating lab once all the samples have been collected. After DNA analysis, the species of the cells can identified.

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