

Nolin River Lake (2018)

Water Quality Takeaways:

- High potential for harmful algal blooms
- No exceedances of state water quality criteria

General Information and Water Quality

Nolin River Lake (NRR) is located in Edmonson, Grayson, and Hart counties in Kentucky. The dam was built by the Louisville District US Army Corps of Engineers (LRL) and began operation in 1963. The primary purpose of the lake is flood control. At summer pool, the surface area of NRR is 5,795 acres.

Water quality (WQ) in the tailwater is assessed by analyzing 2018 data for exceedances of WQ criteria established by the KY Division of Water (KDOW). No criteria were exceeded in the tailwater (2NRR10000; Figure 1). However, NRR did exceed the USEPA's recommended criteria for total phosphorus and turbidity. This is common among KY lakes but can contribute to harmful algal blooms.

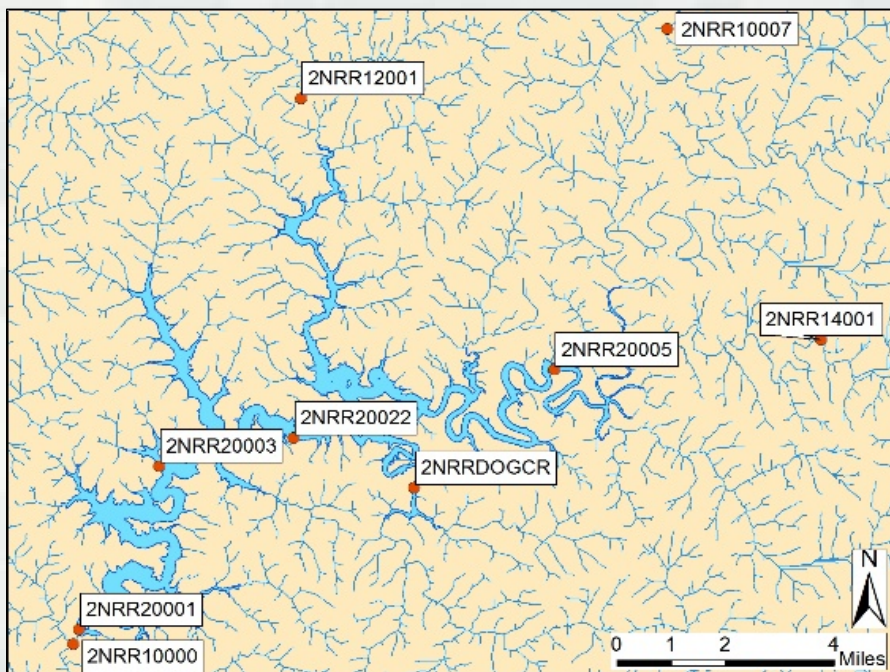


Figure 1. NRR sample sites in 2018 for field and chemical data.

Tailwater Conditions

Temperature and dissolved oxygen (DO) profile data are regularly collected from LRL lakes and tailwaters. This data informs water control engineers on how to best use existing selective withdrawal capabilities to meet downstream WQ targets. WQ targets are established by each lake's Water Control Plan (WCP) and state criteria.

Figure 2a shows a time series graph of the 2018 tailwater (2NRR10000; Figure 1) water temperature compared with the guide curve from the lake's WCP. NRR operated relatively closely to the established temperature guide curve. Figure 2b shows a 2018 time series graph of the lake's tailwater DO data with the applicable state criteria (blue line). NRR met the state's criteria for dissolved oxygen.

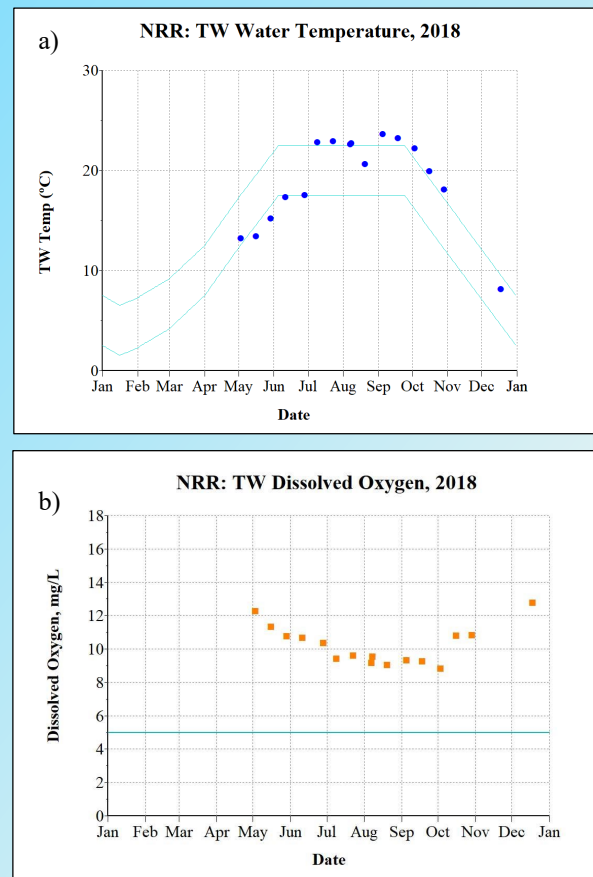


Figure 2. NRR time series data collected from the tailwater (2NRR10000; Figure 1): a) water temperature; and b) dissolved oxygen.



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Reservoir Conditions and Operations

Below (Figures 3a and b) are time series contour plots of NRR profile data collected at the damsite (2NRR20001; Figure 1) in 2018. The figures show the progression of temperature and dissolved oxygen availability in the lake throughout the year. The NRR temperature profile data collected in 2018 (Figure 3a) indicates that the reservoir contained the adequate cold water necessary to meet the established temperature guide curve shown in Figure 2a. While Figure 3b indicates that the reservoir may have dissolved oxygen limitations in the summer and fall, actual data from the tailwater indicates that it is adequately oxygenated.

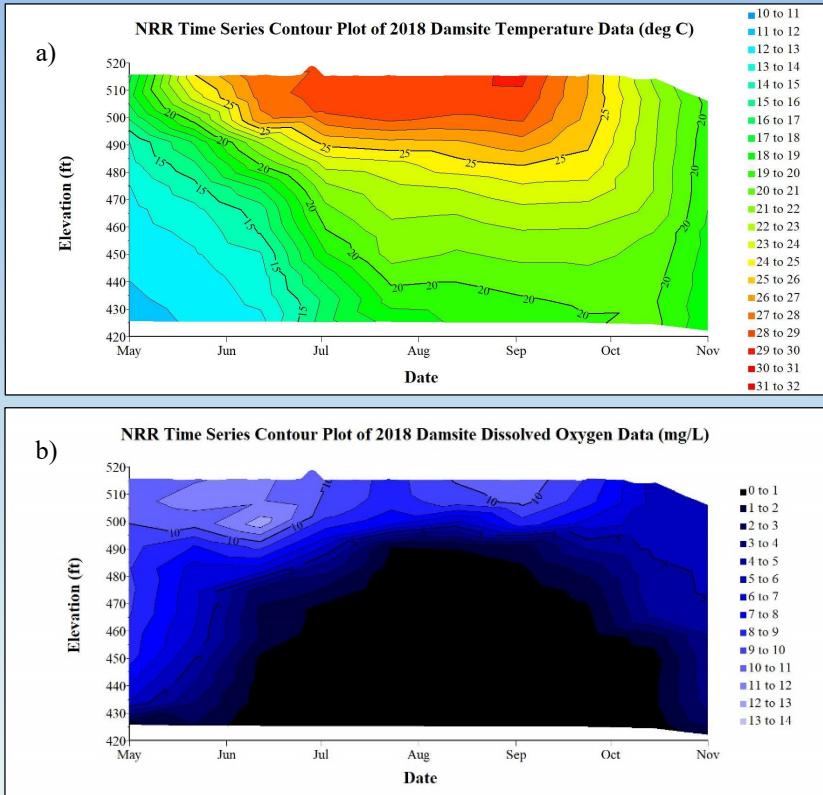


Figure 3. NRR time series data collected from the damsite (2NRR20001; Figure 1) in 2018: a) water temperature; and b) dissolved oxygen.

Reservoir Biological Conditions

Trophic State Index (TSI) was calculated using values from the Secchi Depth, Chlorophyll-a, and Total Phosphorus analyses. The TSI values below were calculated for multiple sites with 2018 data. The results shown in Table 1 suggest that NRR is eutrophic (TSI score from 51-69). This means that NRR has a high concentration of nutrients, which can be detrimental to life in the lake in multiple ways.

Table 1. TSI scores and trophic states for samples collected at NRR in 2018.

Site	TSI Score	Trophic State
2NRR20001	58	Eutrophic
2NRR20003	58	Eutrophic
2NRR20005	62	Eutrophic
2NRR20022	59	Eutrophic

Phytoplankton (algae and cyanobacteria) and green plants are the base of the food chain in aquatic ecosystems. Phytoplankton also have a large impact on humans via harmful algal blooms (HABs) which are caused by an overabundance of cyanobacteria.

2018 Phytoplankton Phyla by Density for 2NRR20001

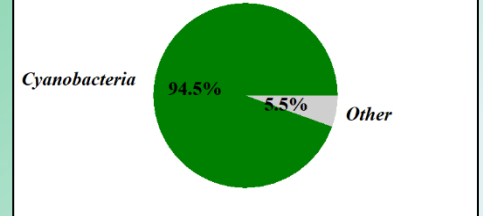


Figure 4. 2018 phytoplankton community at 2NRR20001.

Figure 4 shows that cyanobacteria dominated the phytoplankton community in density (cells/L). These results indicate that HABs have the potential to be problematic at NRR.

Harmful Algal Blooms (HABs) in KY are addressed by the KDOW as they are the lead agency for HAB response in the state. The KDOW has adopted HAB toxin sampling for posting public recreational advisories/cautions. The LRL WQ Program supports the state agency's efforts to implement a statewide HAB response plan. LRL assists the KDOW with implementation by reporting visual HAB indicators and collecting HAB toxin samples as specified by the KDOW.

