

Green River Lake (2018)

Water Quality Takeaways

- High potential for harmful algal blooms
- No exceedances of state water quality criteria
- Operated closely to the established temperature guide curve

General Information and Water Quality

Green River Lake (GRR) is located in Adair and Taylor counties in Kentucky. The dam was built by the Louisville District of the US Army Corps of Engineers (LRL) and began operation in June 1969. The primary purpose of the lake is flood control. At summer pool, the surface area of GRR is 8,210 acres.

Water Quality (WQ) in the tailwater is assessed by analyzing 2018 data for exceedances of WQ criteria established by KDOW. No criteria were exceeded in the tailwater (2GRR10000; Figure 1). However, GRR exceeded the USEPA's recommended criteria for total phosphorus and turbidity. This is common among KY lakes but can contribute to harmful algal blooms.

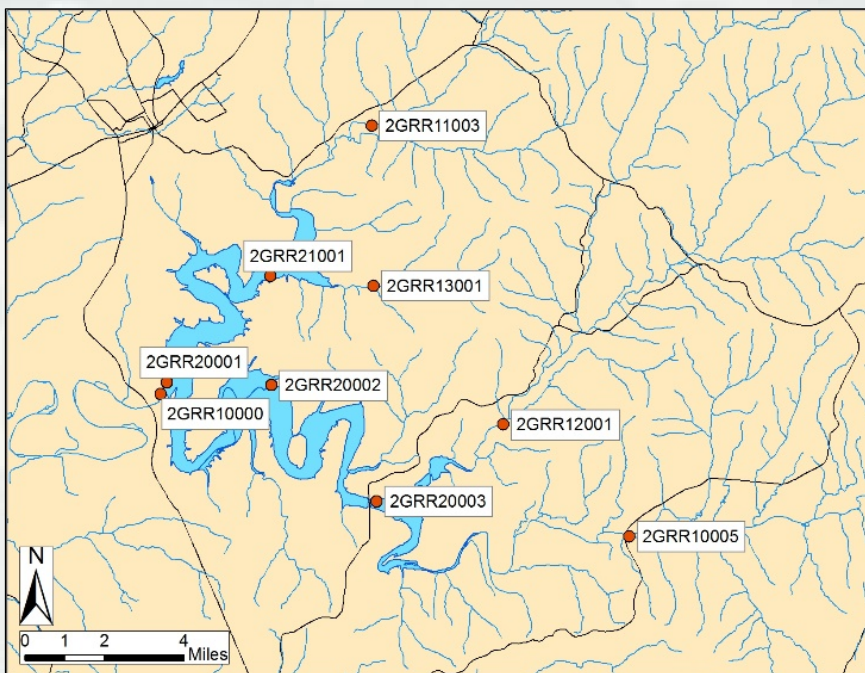


Figure 1. GRR sample sites in 2018 for field and chemical data.

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 water quality (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 (2GRR10000; Figure 1) water temperature compared with the guide curve from the lake's WCP. GRR operated relatively closely to the established temperature guide curve, although, temperatures were slightly too cold in the spring and too warm in the fall. Figure 2b shows a 2018 time series graph of the lake's tailwater DO data with the applicable state criteria (blue line). GRR met the state's criteria for dissolved oxygen.

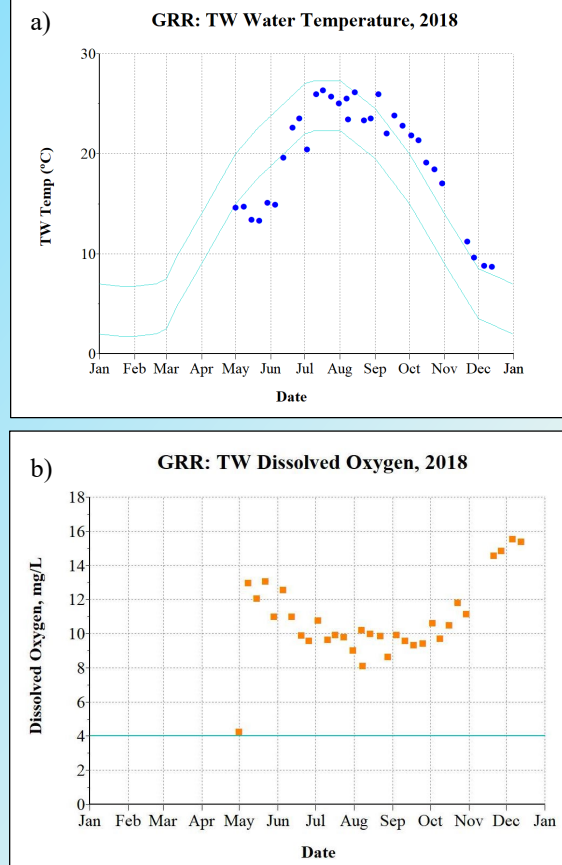


Figure 2. GRR time series data collected from the tailwater (2GRR10000; Figure 1): a) water temperature; and b) dissolved oxygen



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Reservoir Conditions and Operations

Below (Figures 3a and b) are time series contour plots of GRR profile data collected at the damsite (2GRR20001; Figure 1) in 2018. The figures show the progression of temperature and dissolved oxygen availability in the lake throughout the year. The GRR 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 (Figure 2a). While Figure 3b indicates that the reservoir may have dissolved oxygen limitations later in the summer and fall, actual data from the tailwater indicates that it is adequately oxygenated.

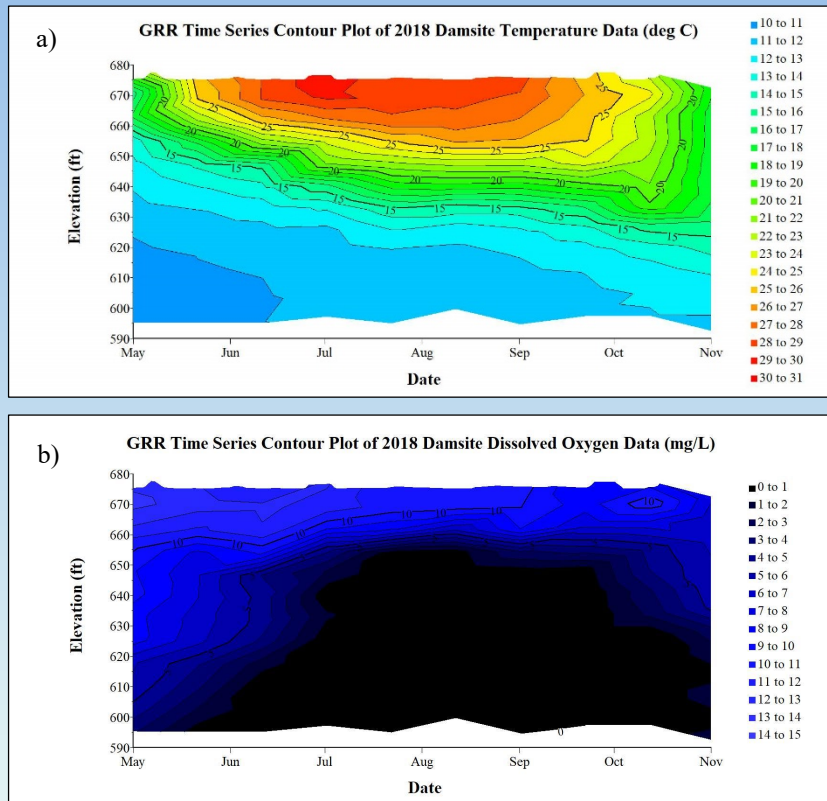


Figure 3. GRR time series data collected from the damsite (2GRR20001; Figure 1) during 2018: a) water temperature; and b) dissolved oxygen.

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 the 2018 data. The results shown in Table 1 suggest that GRR is eutrophic (TSI score from 51-69). This means that GRR 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 GRR in 2018.

Site	TSI Score	Trophic State
2GRR20001	63	Eutrophic
2GRR20002	63	Eutrophic
2GRR20003	68	Eutrophic
2GRR21001	67	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 over-abundance of cyanobacteria.

2018 Phytoplankton Phyla by Density at 2GRR20001

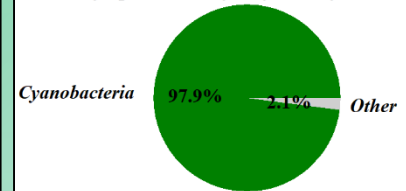


Figure 4. 2018 phytoplankton community at 2GRR20001.

Figure 4 illustrates the abundance of cyanobacteria relative to the other types of phytoplankton collected from the damsite in summer 2018. The chart shows that cyanobacteria dominated the phytoplankton community in density (cells/L). These results indicate that HABs have the potential to be problematic at GRR.

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.

