

Rough River Lake (2018)

Water Quality Takeaways

- High potential for harmful algal blooms
- No exceedances of state water quality criteria
- Does not possess selective withdrawal capabilities

General Information and Water Quality

Rough River Lake (RRR) is located in Breckinridge, Hardin, and Grayson counties in Kentucky. The dam was built by the Louisville District of the US Army Corps of Engineers (LRL) for the primary purpose of flood control. At summer pool, the surface area of RRR is 5,100 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 (2RRR10000; Figure 1). However, RRR did exceed the USEPA's recommended criteria for total phosphorus, total nitrogen, and turbidity. This is common among KY lakes but can contribute to harmful algal blooms.

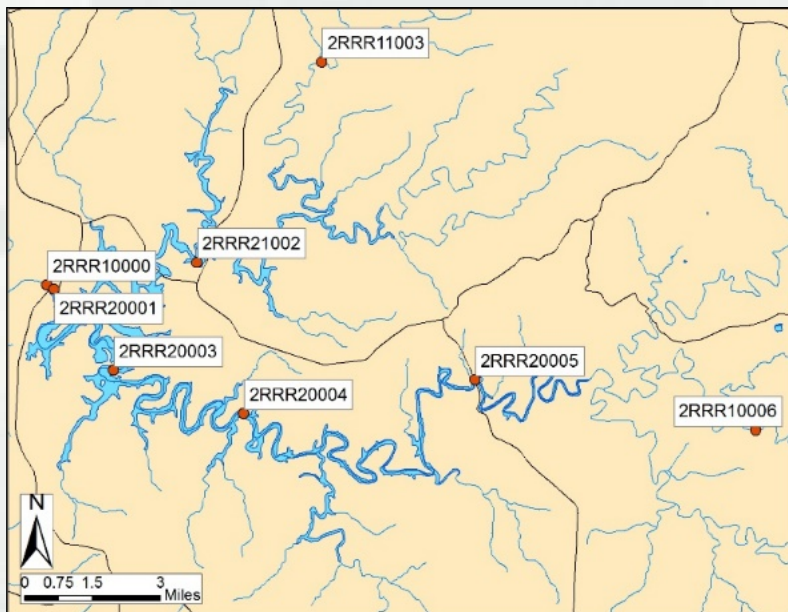


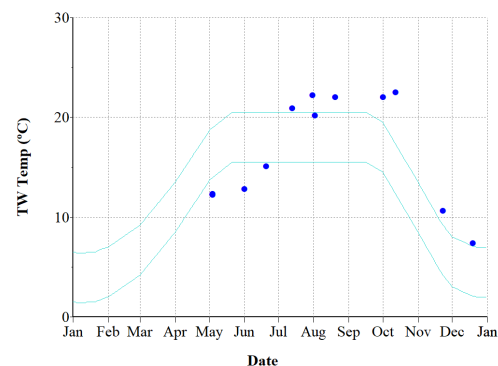
Figure 1. RRR sample sites in 2018 for field and chemical data.

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 established by each lake's Water Control Plan (WCP) and state criteria. Figure 2a shows a time series graph of the 2018 tailwater (2RRR10000; Figure 1) water temperature compared with the guide curve from the lake's WCP. RRR did not closely follow 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). The tailwater met established water quality criteria for DO.

Tailwater Conditions

a) RRR: TW Water Temperature, 2018



b) RRR: TW Dissolved Oxygen, 2018

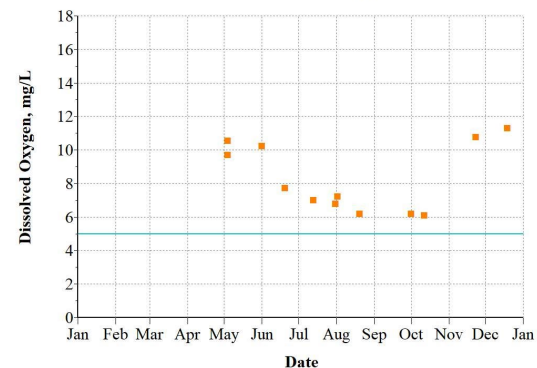


Figure 2. RRR time series data collected from the tailwater (2RRR10000; Figure 1): a) water temperature; and b) dissolved oxygen.



Rough River Lake (2018)

Reservoir Conditions and Operations

Below (Figures 3a and b) are time series contour plots of RRR profile data collected at the dams site (2RRR20001; Figure 1) in 2018. The figures show the progression of temperature and dissolved oxygen availability in the lake throughout the year. The RRR temperature profile data collected in 2018 (Figure 3a) as well as the tailwater temperatures shown in Figure 2a are typical of a reservoir that does not have selective withdrawal capabilities such as RRR. Figure 3b indicates that the reservoir is adequately oxygenated.

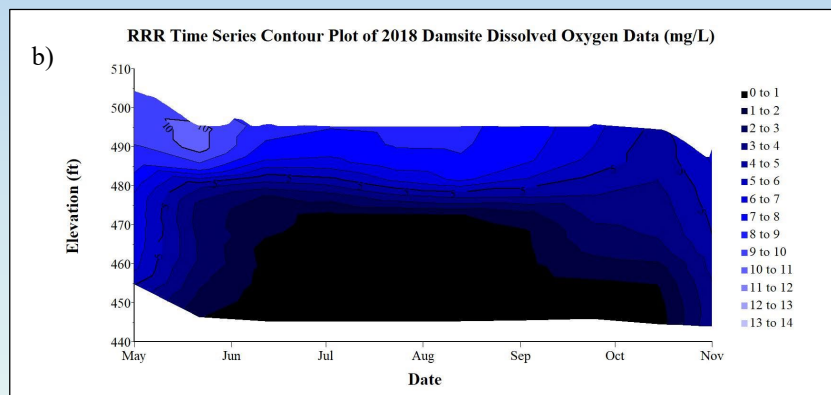
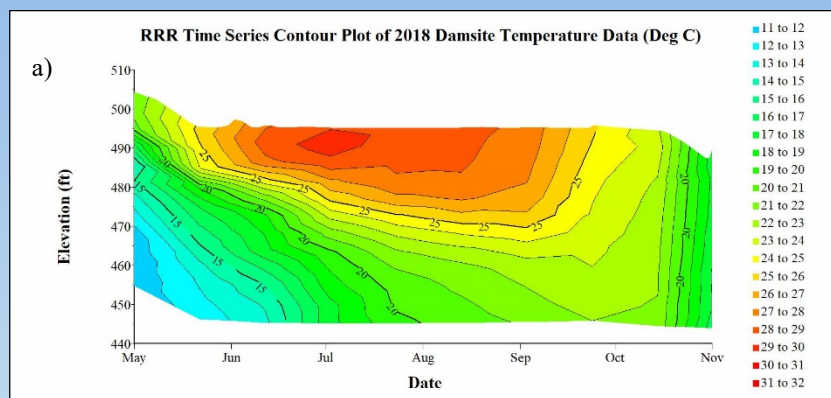


Figure 3. RRR time series data collected from the dams site (2RRR20001; Figure 1) in 2018: a) water temperature; and b) dissolved oxygen.

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

Site	TSI Score	Trophic State
2RRR20001	56	Eutrophic
2RRR20003	57	Eutrophic
2RRR20004	62	Eutrophic
2RRR20005	65	Eutrophic
2RRR21002	58	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 2RRR20001

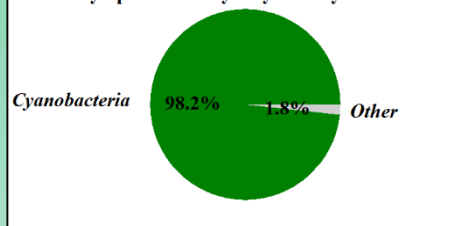


Figure 4. 2018 phytoplankton community at 2RRR20001.

Figure 4 illustrates the abundance of cyanobacteria relative to the other types of phytoplankton collected from the dams site 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 RRR.

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.

