

Cave Run Lake (2018)

Water Quality Takeaways

- High potential for harmful algal blooms
- One exceedance of state water quality criteria (dissolved oxygen)
- Did not operate closely to the established temperature guide curve

General Information and Water Quality

Cave Run Lake (CRR) is located in Bath, Rowan, Morgan, and Menifee counties, Kentucky. The dam was built by the Louisville District of the US Army Corps of Engineers (LRL) for the primary purpose of flood control and secondarily water supply. At summer pool, the surface area of CRR is 8,270 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). CRR's tailwater (2CRR10000; Figure 1) exceeded the state criteria for dissolved oxygen (Figure 2b). Also, CRR 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.

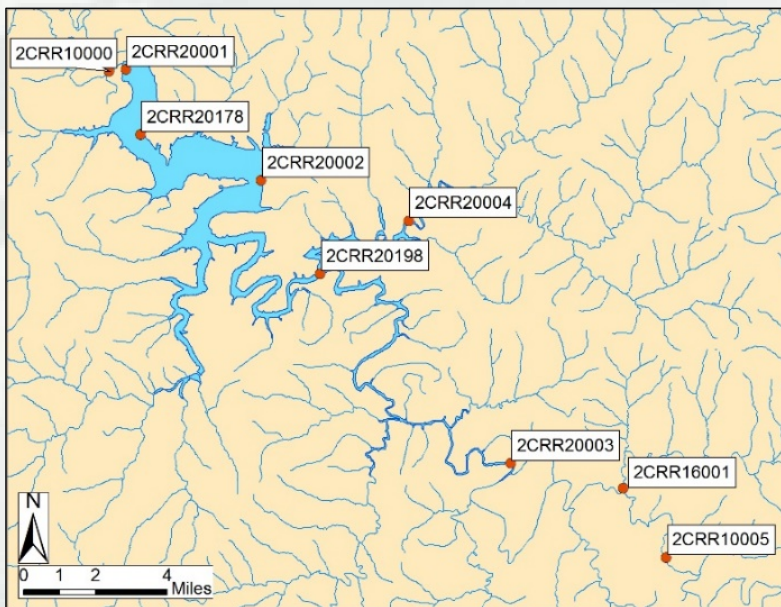


Figure 1. CRR sample sites in 2018 for field and chemical data.

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 (2CRR10000; Figure 1) water temperature compared with the guide curve from the lake's WCP. Due to several factors, CRR did not operate closely to the established temperature guide curve in 2018. Figure 2b shows a 2018 time series graph of the lake's tailwater dissolved oxygen data with the applicable state criteria (blue line). CRR had one exceedance of dissolved oxygen state criteria in July of 2018. This condition was immediately corrected with a change in operations.

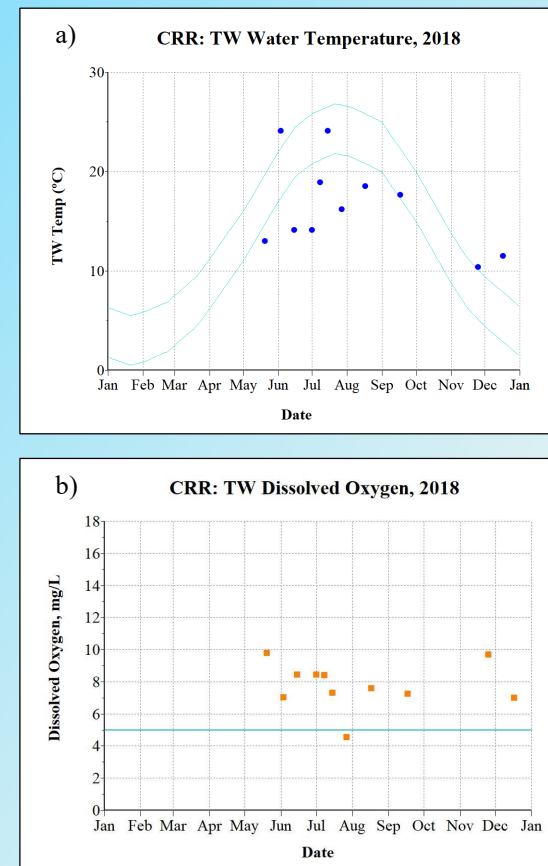


Figure 2. CRR time series data collected from the tailwater (2CRR10000; Figure 1): a) water temperature; and b) dissolved oxygen.



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Reservoir Conditions and Operations

Below (Figures 3a and b) are time series contour plots of CRR profile data collected at the damsite (2CRR20001; Figure 1) in 2018. The figures show the progression of temperature and dissolved oxygen availability in the lake throughout the year. The CRR temperature profile data collected in 2018 (Figure 3a) indicates that the reservoir contained the adequate water temperatures necessary to meet the temperature guide curve shown in Figure 2a. While a do exceedance was documented, Figure 3b indicates that the reservoir was adequately oxygenated for most of 2018.

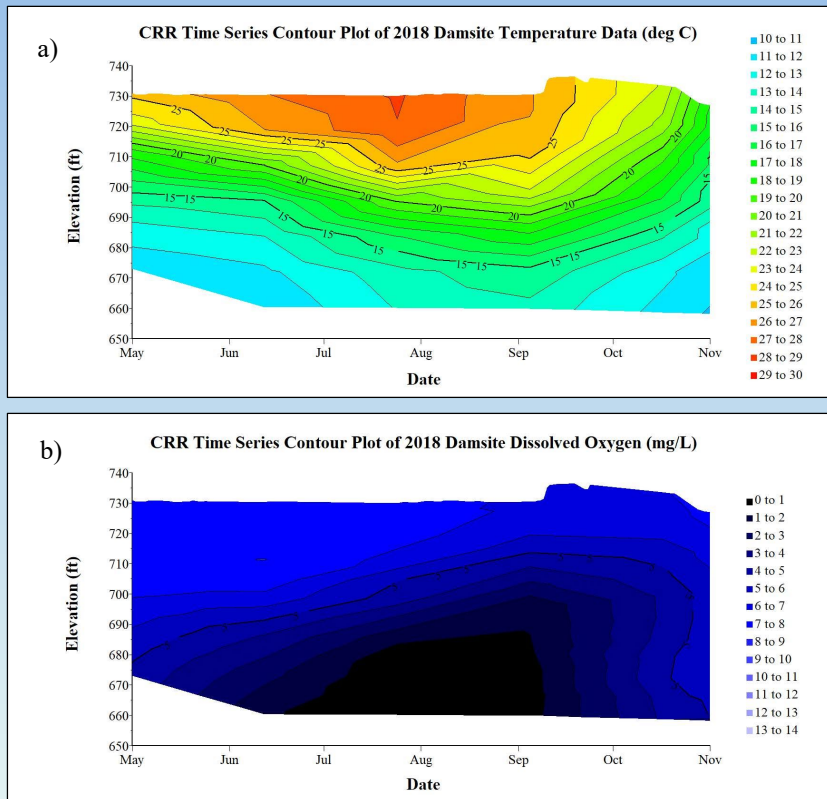


Figure 3. CRR time series data collected from the damsite (2CRR20001; Figure 1) during 2018: a) water temperature; and b) dissolved oxygen.

Reservoir Biological Conditions

Trophic State Index (TSI) was calculated using the data 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 CRR is eutrophic (TSI score from 51-69). This means that CRR 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 CRR in 2018.

Site	TSI Score	Trophic State
2CRR20001	53	Eutrophic
2CRR20002	55	Eutrophic
2CRR20003	68	Eutrophic
2CRR20004	58	Eutrophic
2CRR20178	57	Eutrophic
2CRR20198	60	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 2CRR20001

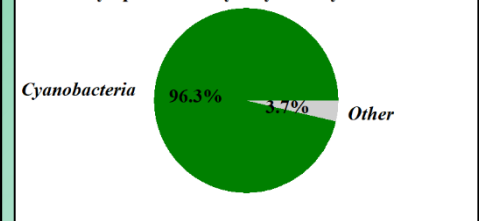


Figure 4. 2018 phytoplankton community at 2CRR20001.

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 CRR.

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 coordinates with, complies with, and supports the state agency's efforts to implement a statewide HAB response plan.

