

Buckhorn Lake (2018)

Water Quality Takeaways

- High potential for harmful algal blooms
- No exceedances of state water quality criteria
- Inadequate cold water storage caused by infrastructure limitations

General Information and Water Quality

Buckhorn Lake (BHR) was built by the Louisville District US Army Corps of Engineers (LRL) for the primary purpose of flood control. At summer pool, the surface area of BHR is 1,230 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 (2BHR10000; Figure 1). However, BHR 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.

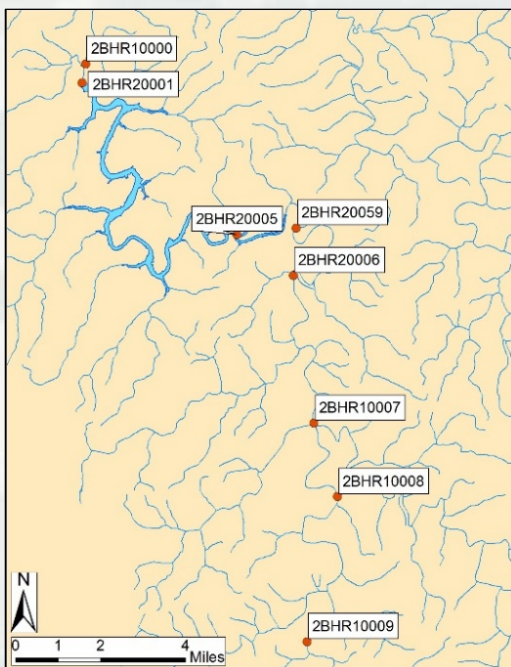


Figure 1. BHR 2018 water quality sample sites.

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 2018 tailwater (2BHR10000; Figure 1) water temperature compared with the guide curve from the lake's WCP. BHR 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.

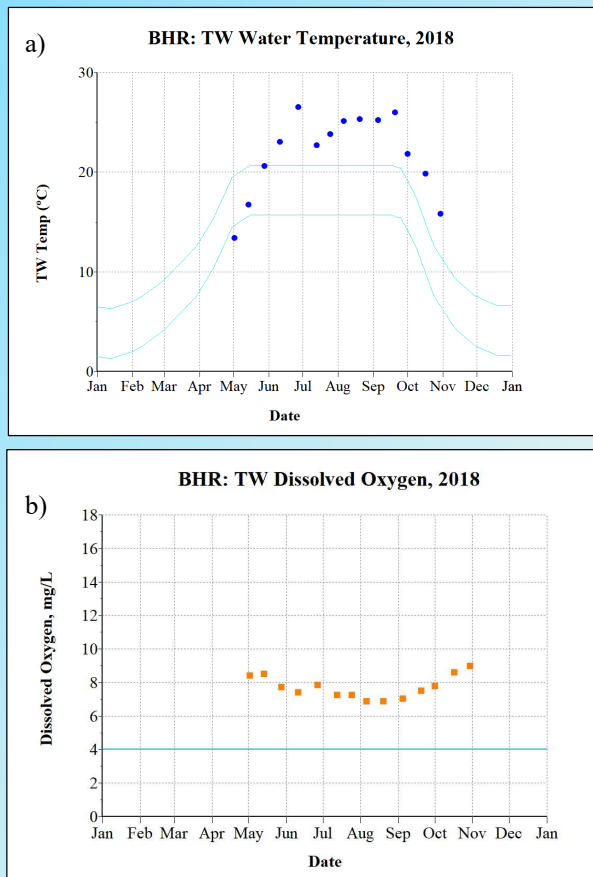


Figure 2. BHR time series data collected from the tailwater (2BHR10000; Figure 1): a) water temperature; and b) dissolved oxygen.



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Reservoir Conditions and Operations

Below (Figures 3a and b) are time series contour plots of BHR profile data collected at the dams site (2BHR20001; Figure 1) in 2018. The figures show the progression of temperature and dissolved oxygen availability in the lake throughout the year. Figure 3a shows that BHR was thermally stratified from approximately June through October. Figure 3b indicates that the reservoir is adequately oxygenated.

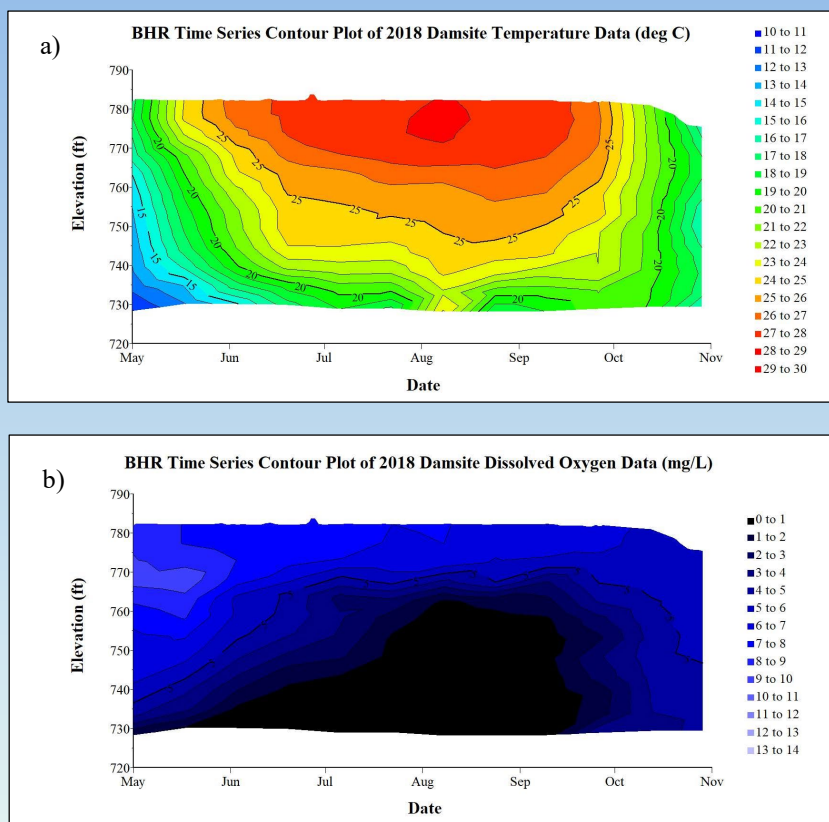


Figure 3. BHR time series data collected from the dams site in 2018 (2BHR20001; Figure 1): a) water temperature; and b) dissolved oxygen.

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 BHR is eutrophic (TSI score from 51-69). This means that BHR 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 BHR in 2018.

Site	TSI Score	Trophic State
2BHR20001	57	Eutrophic
2BHR20005	61	Eutrophic
2BHR20006	61	Eutrophic
2BHR20059	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 over-abundance of cyanobacteria.

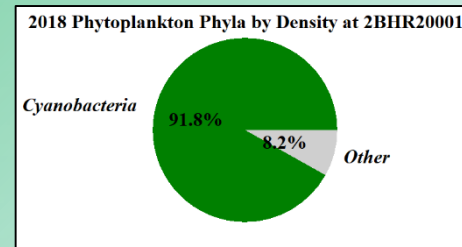


Figure 4. 2018 phytoplankton community at 2BHR20001.

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

Harmful Algal Blooms (HABs) in KY are addressed by the KDOW. 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 at locations as specified by the KDOW.

