

Cecil M. Harden Lake (2018)

Water Quality Takeaways

- High potential for harmful algal blooms
- No exceedances of state water quality criteria
- Closely followed downstream water quality targets

General Information and Water Quality

Cecil M. Harden Lake (CHL) is located in Parke and Putnam counties in Indiana. The dam 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 CHL is 2,110 acres.

Water quality (WQ) in the tailwater is assessed by analyzing 2018 data for exceedances of WQ criteria established by the IN Department of Environmental Management (IDEM). No criteria were exceeded in the tailwater (2CHL10000; Figure 1). However, CHL exceeded the USEPA's recommended criteria for total phosphorus, total nitrogen, and turbidity. This is common among IN lakes but can contribute to harmful algal blooms.

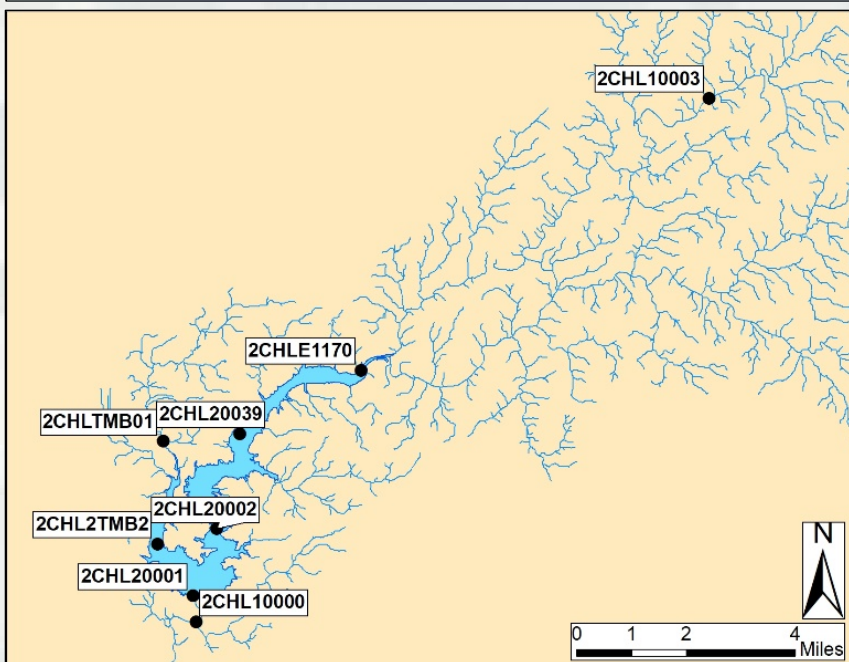


Figure 1. CHL sample sites in 2018 for field and chemical data.

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 (2CHL10000; Figure 1) water temperature compared with the guide curve from the lake's WCP. CHL closely followed 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). CHL met the state's criteria for dissolved oxygen.

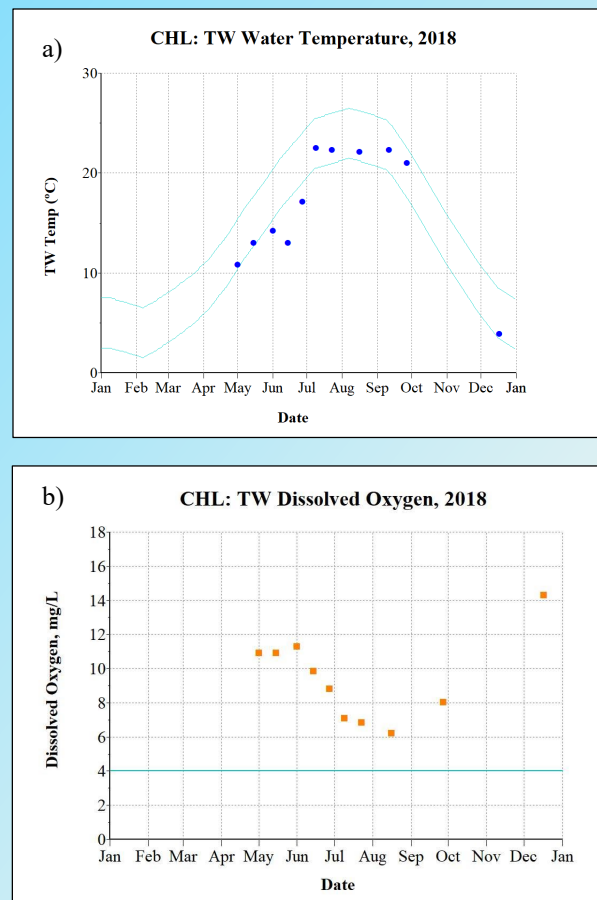


Figure 2. CHL time series data collected from the tailwater (2CHL10000; Figure 1): a) water temperature; and b) dissolved oxygen.



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Reservoir Conditions and Operations

Below (Figures 3a and b) are time series contour plots of CHL profile data collected at the damsite (2CHL20001; Figure 1) in 2018. The figures show the progression of temperature and dissolved oxygen availability in the lake throughout the year. The CHL temperature profile data collected in 2018 (Figure 3a) indicates that the reservoir thermally stratifies and stores an adequate amount of cold water. Additionally, Figure 3b indicates that the reservoir is adequately oxygenated.

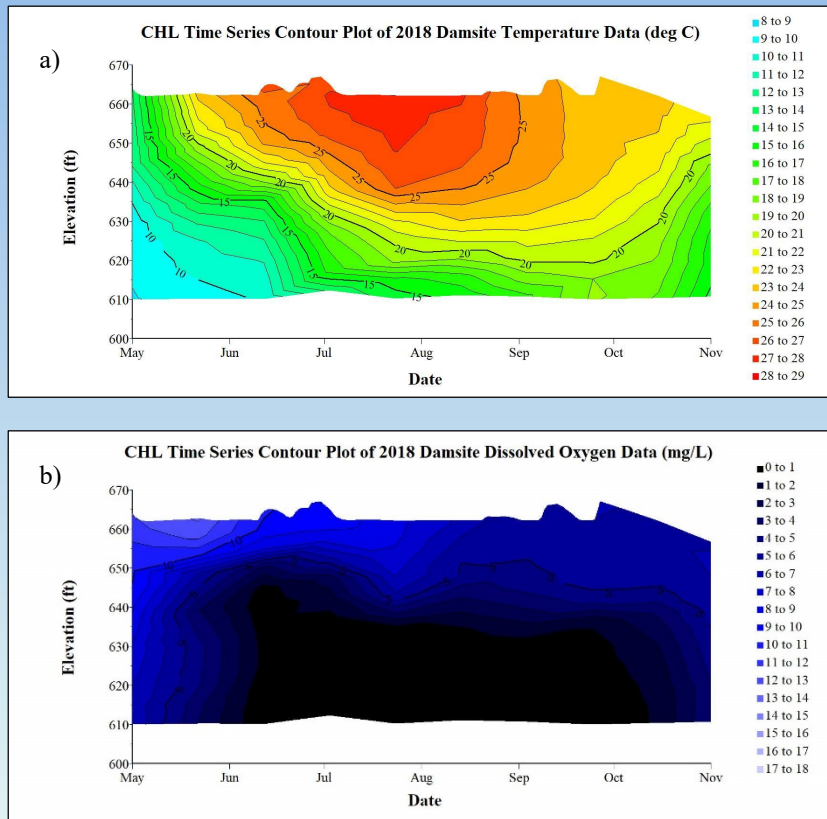


Figure 3. CHL time series data collected from the damsite (2CHL20001; Figure 1) in 2018: a) water temperature; and b) dissolved oxygen.

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 CHL is at a minimum eutrophic (TSI score from 51-69). This means that CHL 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 CHL in 2018.

Site	TSI Score	Trophic State
2CHL20001	69	Eutrophic
2CHL20002	70	Hyper-eutrophic
2CHL20039	71	Hyper-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 2CHL20001

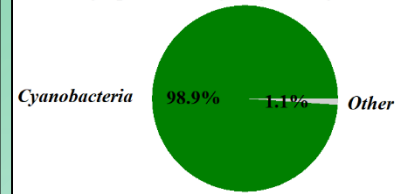


Figure 4. 2018 phytoplankton community at 2CHL20001.

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 CHL.

Harmful Algal Blooms (HABs) in IN are addressed by the IN Department of Natural Resources (IDNR) and the IN Department of Environmental Management (IDEM) in the IDNR HAB Response Standard Operating Procedure. The LRL WQ Program supports the state agencies efforts by reporting visual HAB indicators via the IN State Department of Health Algal Bloom Notification Form.

