

Patoka Lake (2018)

Water Quality Takeaways

- High potential for harmful algal blooms
- No exceedances of state water quality criteria
- Problems meeting tailwater temperature targets exist due to infrastructure limitations

General Information and Water Quality

Patoka Lake (PRR) is located in Dubois, Crawford, and Orange counties in Indiana. The dam was built by the Louisville District of the US Army Corps of Engineers (LRL) for the primary purpose of flood control and became operational in February 1978. At summer pool, the surface area of PRR is 8,880 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 (2PRR10000; Figure 1). However, PRR exceeded the USEPA's recommended criteria for total phosphorus, which is common among IN lakes but can contribute to harmful algal blooms.

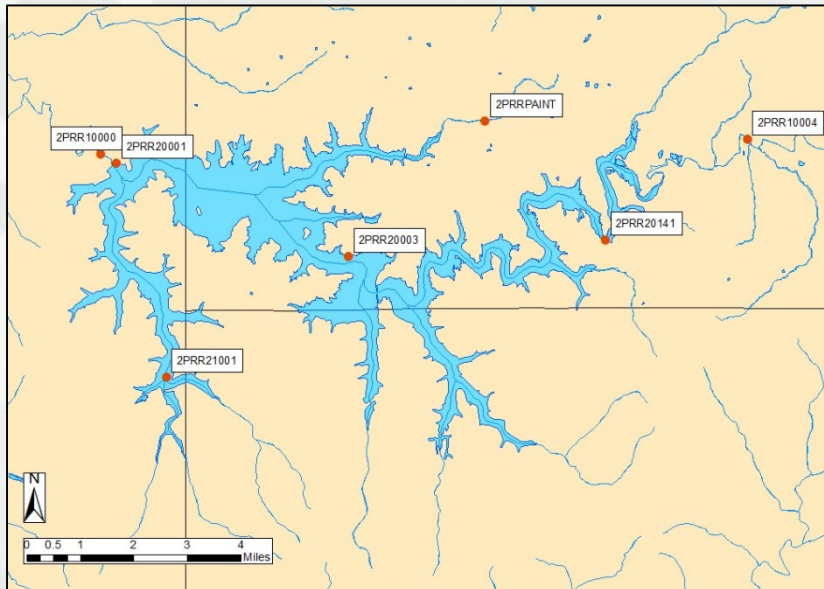


Figure 1. PRR sample sites in 2018 for field and chemical data.

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 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 (2PRR10000, Figure 1) water temperature compared with the guide curve from the lake's WCP. PRR did not follow the established temperature guide curve closely in 2018 due to a partially inoperable bypass system. Figure 2b shows a 2018 time series graph of the lake's tailwater DO data with the applicable state criteria (blue line). PRR met state criteria for DO.

Tailwater Conditions

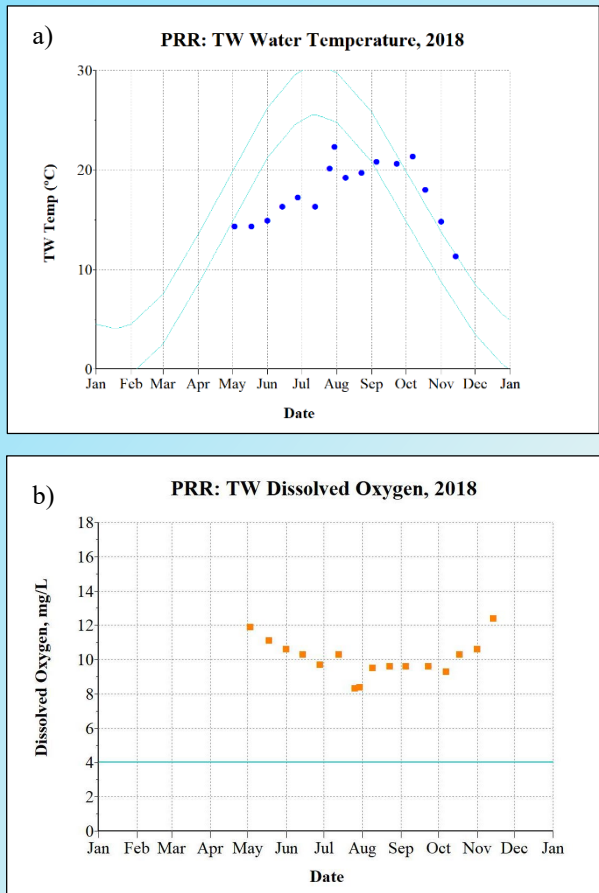


Figure 2. PRR time series data collected from the tailwater (2PRR10000; Figure 1): a) water temperature; and b) dissolved oxygen.



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Reservoir Conditions and Operations

Below (Figures 3a and b) are time series contour plots of PRR profile data collected at the dams site (2PRR20001; Figure 1) in 2018. The figures show the progression of temperature and dissolved oxygen availability throughout the year. PRR temperature profile data collected in 2018 (Figure 3a) indicates that the reservoir could be successfully operated to meet the established temperature guide curve if the bypass gates were repaired and available. Additionally, Figure 3b indicates that the reservoir possesses adequately oxygenated water to meet state criteria.

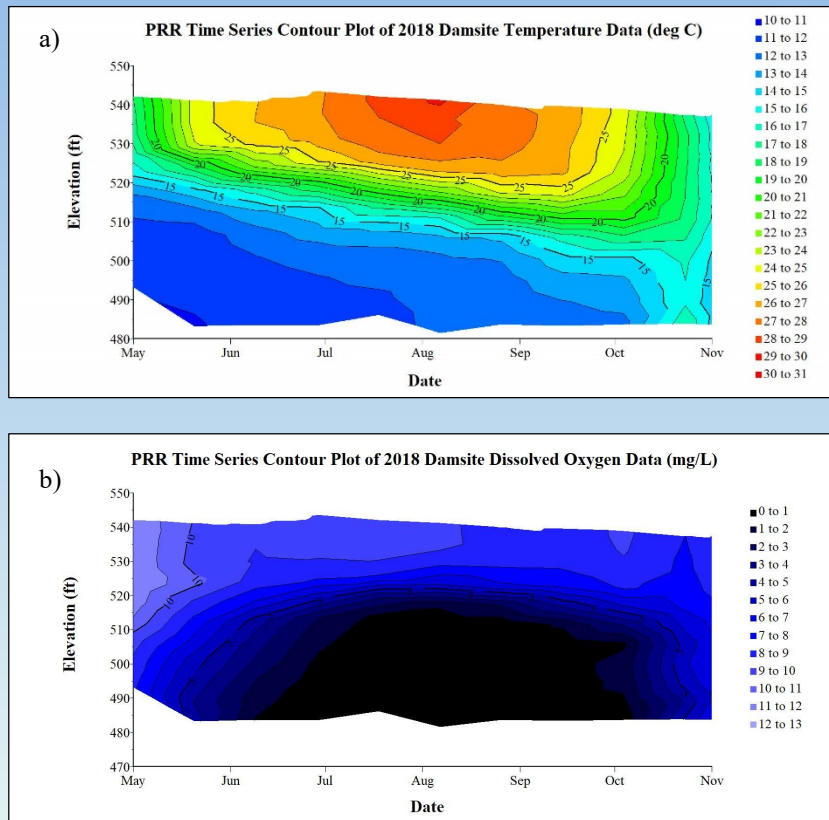


Figure 3. PRR time series data collected from the dams site during 2018 (2PRR20001; Figure 1): a) water temperature; and b) dissolved oxygen.

Reservoir Biological Conditions

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

| Site | TSI Score | Trophic State |
|-----------|-----------|---------------|
| 2PRR20001 | 53 | Eutrophic |
| 2PRR20003 | 54 | Eutrophic |
| 2PRR20141 | 66 | Eutrophic |
| 2PRR21001 | 62 | 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.

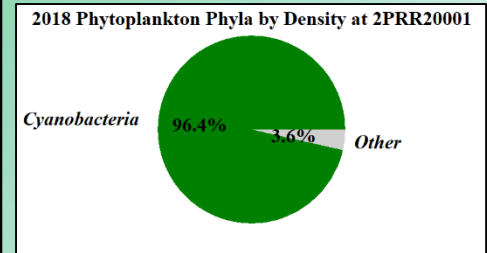


Figure 4. 2018 phytoplankton community at 2PRR20001.

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 PRR.

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.

