Monroe Lake (2018)

Water Quality Takeaways

- High potential for harmful algal blooms
- One exceedance of state water quality criteria (total copper)
- Temperature guide curve closely followed

General Information and Water Quality

Monroe Lake (MNR) is located in Monroe, Brown, Jackson, and Lawrence 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 MNR is 10,750 acres.

Water quality (WQ) in the tailwater is assessed by analyzing data for exceedances of criteria established by IDEM. MNR's tailwater (2MNR10000; Figure 1) exceeded the state criteria for total copper. The total copper exceedance has been further investigated and is no immediate cause for concern. MNR did exceed the USEPA's recommended criteria for total phosphorus and turbidity. This is common among IN lakes but can contribute to harmful algal blooms.

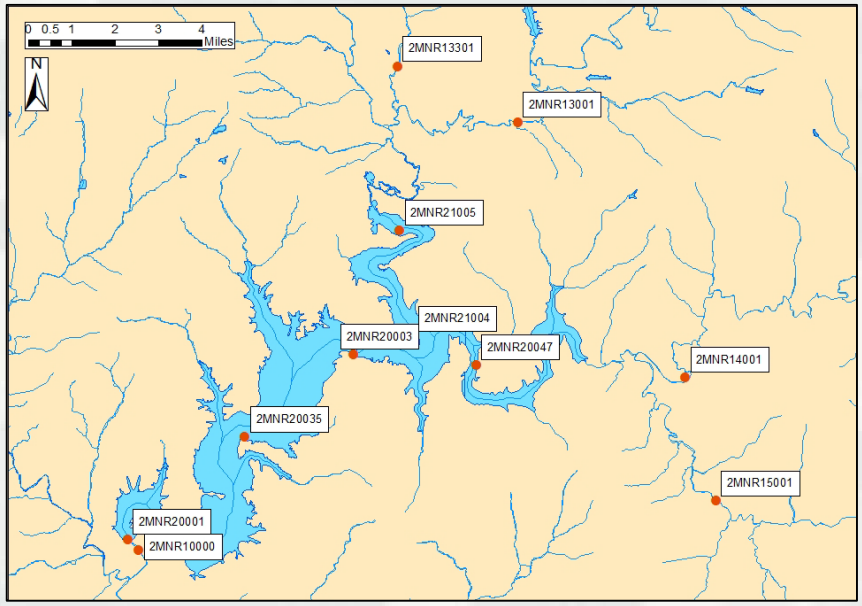

Figure 1. MNR sample sites in 2018 for field and chemical data.

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 (2MNR10000) water temperature compared with the guide curve from the lake's WCP. MNR 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). MNR met the state's criteria for dissolved oxygen.

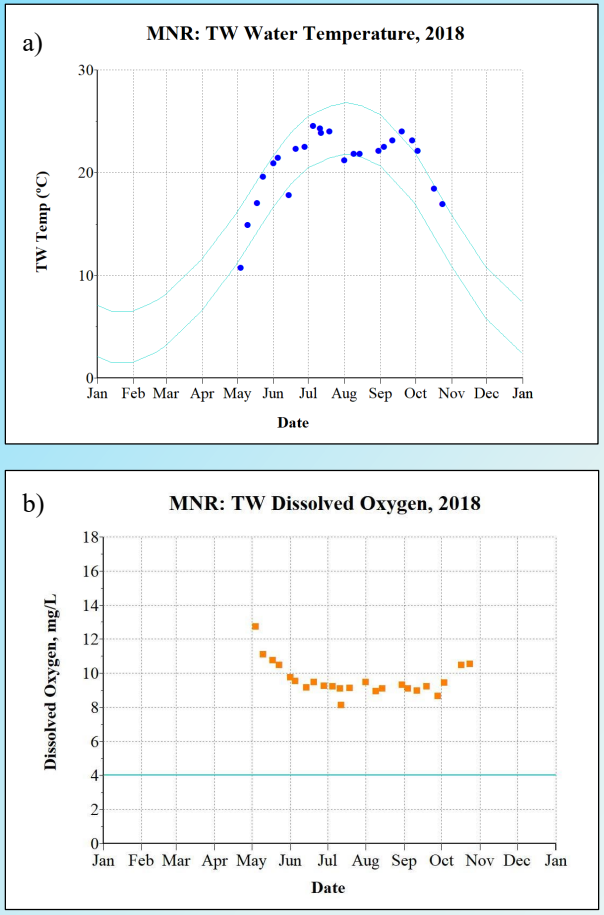

Figure 2. MNR time series data collected from the tailwater (2MNR10000; Figure 1): a) water temperature; and b) dissolved oxygen.

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Reservoir Conditions and Operations

Below (Figures 3a and b) are time series contour plots of MNR profile data collected at the damsite (2MNR20001; Figure 1) in 2018. The figures show the progression of temperature and dissolved oxygen availability in the lake throughout the year. The MNR temperature profile data collected in 2018 (Figure 3a) indicates that the reservoir contained the adequate cold water necessary to meet the established temperature guide curve, which is shown in Figure 2a. Additionally, Figure 3b indicates that the reservoir is adequately oxygenated.

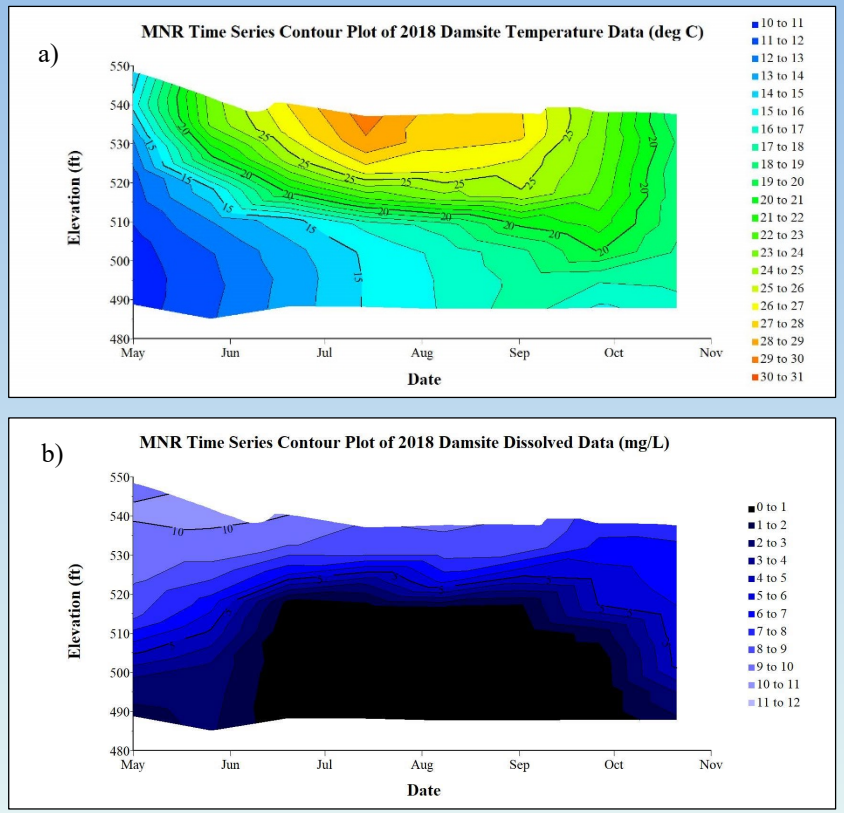

Figure 3. MNR time series data collected from the damsite (2MNR20001; Figure 1) in 2018: a) water temperature; and b) dissolved oxygen.

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

Site	TSI Score	Trophic State
2MNR20001	51	Eutrophic
2MNR20003	56	Eutrophic
2MNR20035	55	Eutrophic
2MNR21004	61	Eutrophic
2MNR21005	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.

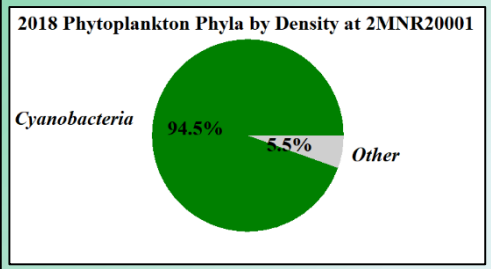

Figure 4. 2018 phytoplankton community at 2MNR20001.

Fig. 4 illustrates the abundance of cyanobacteria relative to the other types of phytoplankton collected. 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 MNR.

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.