

Brookville Lake (BVR) Water Quality Summary

Summary of 2020 Water Quality Results

Brookville Lake had no exceedances of Indiana’s water quality criteria at the tailwater (BVR10000). Total phosphorus and total nitrogen levels at most sample locations exceeded the USEPA nutrient criteria. The mean TSI category for all three indices classified the lake as eutrophic, indicating a high level of biological activity. Finally, our sampling showed cyanobacteria cell counts over 100,000 cells/mL in half of the samples at the time of sampling. The elevated nutrient levels and eutrophic classification indicate there is a high potential for HAB development in the lake.

2020 Activities

In 2020, one sampling event was conducted at Brookville Lake. Field data and chemical samples were collected at all seven sites (Figure 1). Chlorophyll and phytoplankton were collected at three sites, and zooplankton samples were collected at the damsite (BVR20001).

Additionally, temperature and dissolved oxygen (DO) profiles were collected by the project staff at the damsite and tailwater approximately every two weeks from late May through late December.

Exceedances of IN State Water Quality Criteria

There were no exceedances of IN state water quality criteria at the tailwater.

Tailwater Temperature and DO Conditions

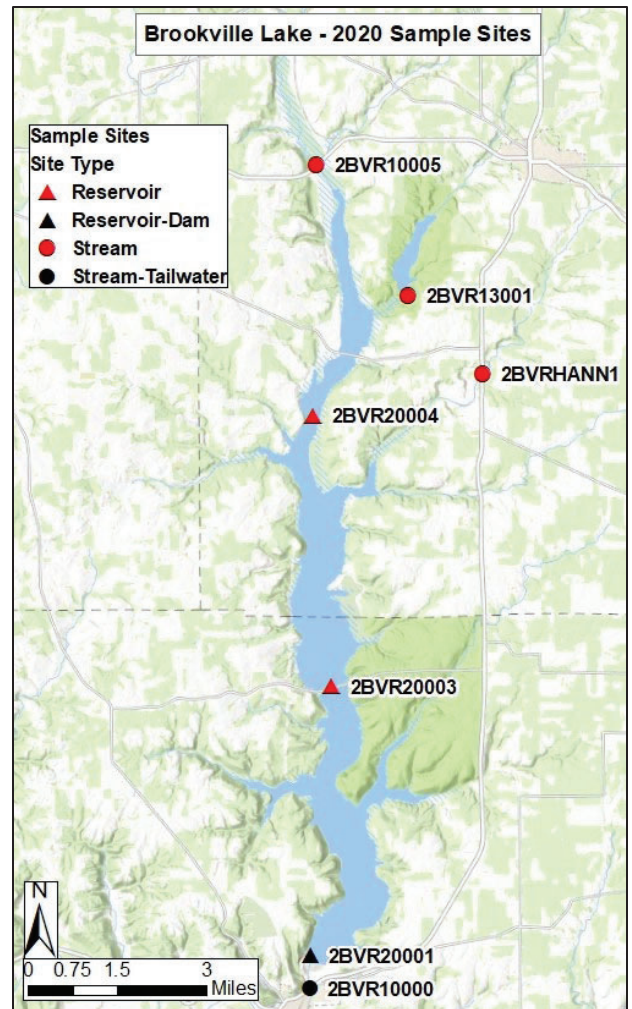


Figure 1. Water quality sampling locations for Brookville Lake in 2020.

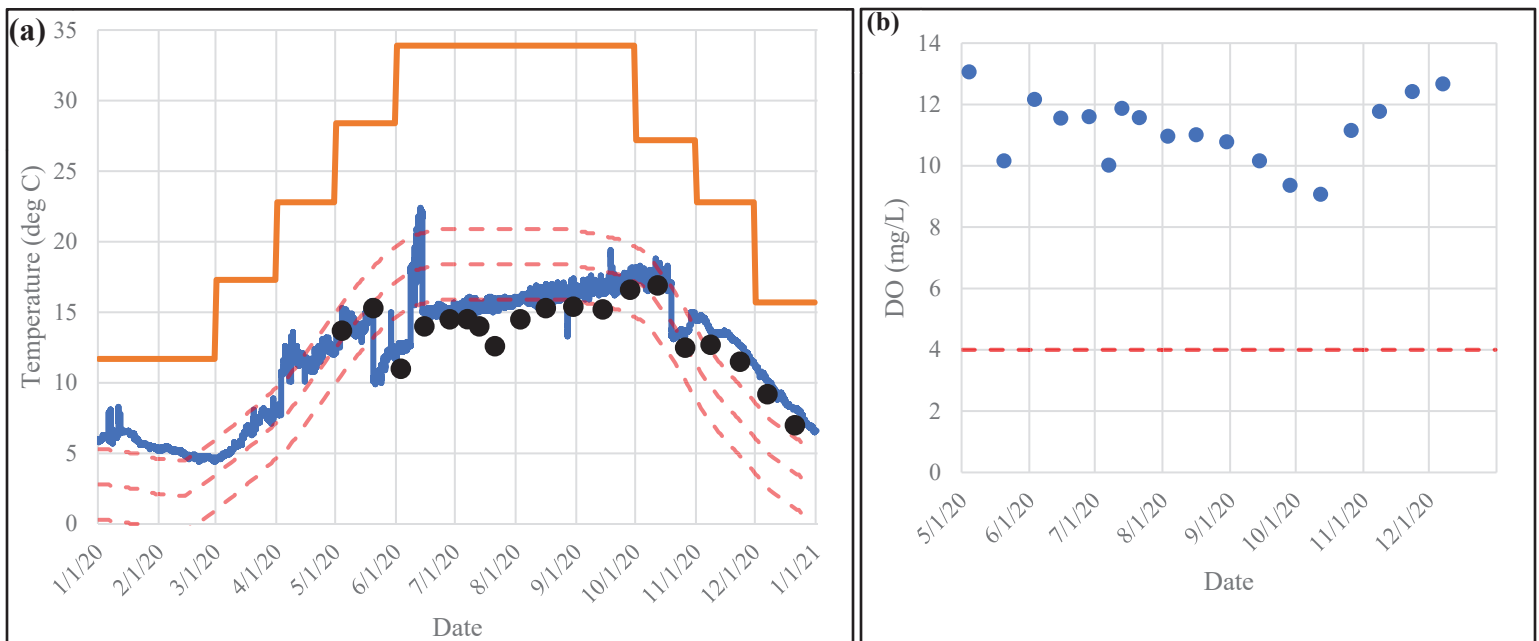


Figure 2. Brookville Lake tailwater temperature and DO data. (a) Tailwater temperature data collected by project staff in 2020 is represented by the black dots. The blue line represents USGS gage data (provisional) from a gage downstream from the project. The temperature guide curve is represented by the dashed red lines, and the orange line represents the IN water quality criteria for temperature. (b) Tailwater dissolved oxygen data collected in 2020 is represented by the blue dots. The IN water quality criteria for DO is represented by the dashed red line.

Tailwater data was compared to IN state water quality criteria for temperature and to the Louisville District's temperature guide curve for Brookville Lake (Figure 2a). Tailwater temperature did not exceed the state criteria for temperature at any time. However, tailwater temperatures fell outside the guide curve late-May through July and November through December. The WQ Program will use these findings to inform future operational decisions to improve performance of downstream temperature management wherever possible. Tailwater dissolved oxygen levels did not exceed state criteria at any time throughout the year (Figure 2b).

Nutrient Analyses

Nutrient data, including total nitrogen (TN) and total phosphorus (TP) data, were collected at all sample sites in 2020. The 2020 TP and TN values were compared to historical data from 2012 through 2019 (Figure 3). The TP and TN values at each site were compared to their respective USEPA recommended criteria. Nutrient levels are an area of concern because elevated nutrients can lead to high biological activity, especially with respect to HABs.

Total Phosphorus

2020 TP values at Brookville Lake were above the historical medians and were near the top or above the historical distributions in all but two sites. Also, 2020 TP levels in 11 out of 13 samples were above the USEPA recommended nutrient criteria for the respective locations.

Total Nitrogen

2020 TN values at Brookville Lake were near or below the historical medians at all sites, and 2020 values fell within or below the historical distribution. Also, 2020 TN levels in 12 out of 13 samples collected were above the USEPA recommended nutrient criteria for the respective locations.

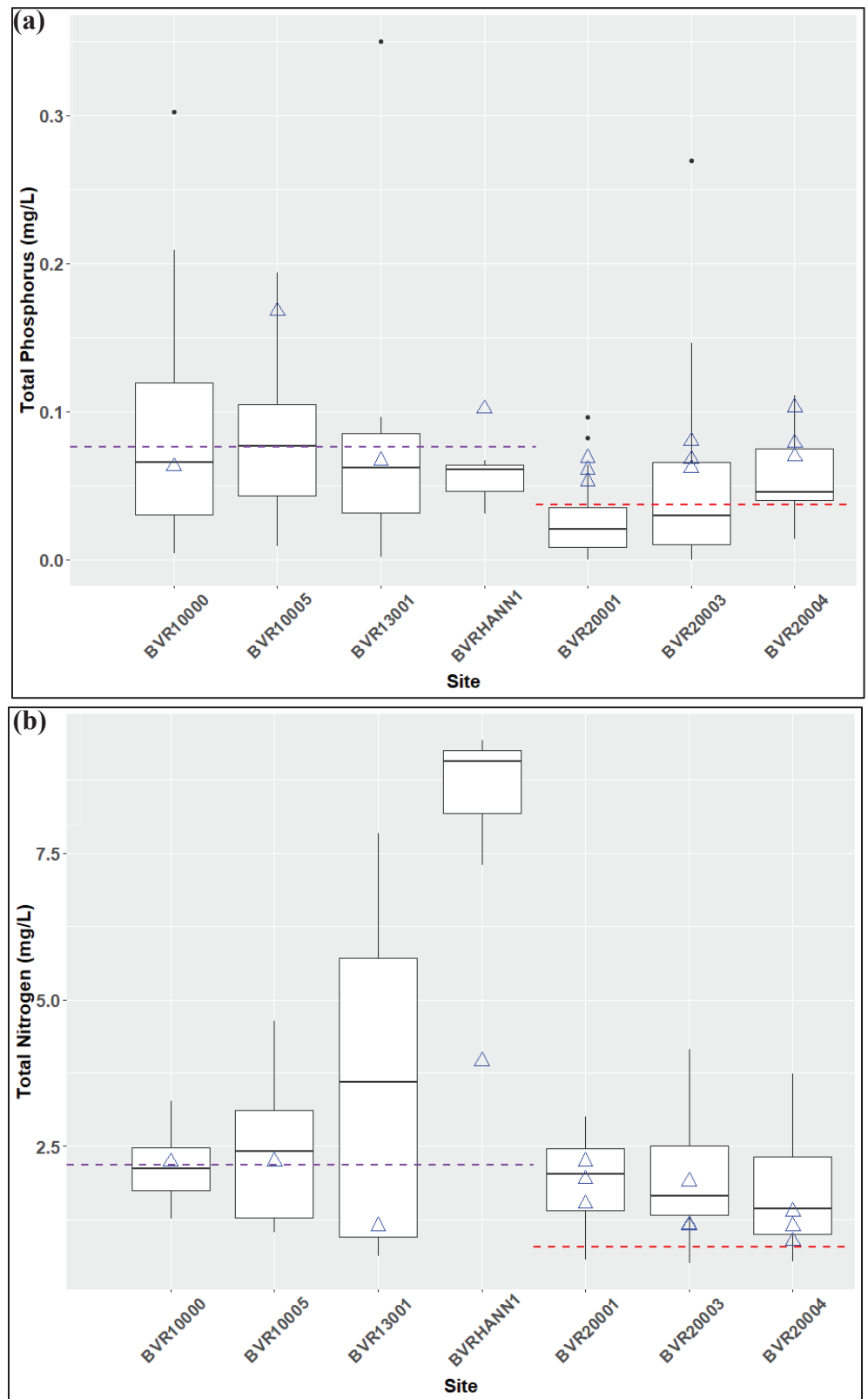


Figure 3. Comparison of 2020 nutrient data to historical samples. Boxplots represent data collected in 2012-2019 and blue triangles represent 2020 data. Purple and red dotted lines represent USEPA recommended nutrient criteria for streams and reservoirs, respectively. (a) Comparison of total phosphorus data. (b) Comparison of total nitrogen data.

Cyanobacteria Data, HABs, and Trophic State Index

Cyanobacteria Data

12 phytoplankton samples were collected at various depths from 3 sites. Total cyanobacteria cell counts exceeded 100,000 cells/mL (guideline value for moderate health risk from the World Health Organization's Guidelines for Safe Recreational Water Environments [2003]) in 6 out of 12 samples collected from 3 sites. None of these samples exceeded 1,000,000 cells/mL. These results indicate Brookville Lake had cell count levels potentially indicative of a HAB at the time of sampling in half the samples collected.

Harmful Algal Bloom (HAB) Response

Indiana Department of Environmental Management (IDEM) is the lead agency for HAB response in Indiana. IDEM samples State Recreation Areas (SRAs) biweekly during the recreation season and issues appropriate HAB alert levels based on the results. IDEM issued HAB Advisory alert levels at the Quakertown SRA from 6/19/20 through 6/26/20 and at Mounds SRA from 6/19/20 through 6/26/20. The Advisory alert level indicates that cell counts were over 100,000 cells/mL, but toxin levels did not meet thresholds for the Caution or Closed alert levels. At an Advisory alert level, the following precautions apply: swimming and boating permitted; avoid contact with algae; don't drink the water; and shower after you swim.

Trophic State Index

The trophic state indices for Secchi depth [TSI(SD)], chlorophyll-*a* [TSI(CHL)], and total phosphorus [TSI(TP)] were calculated for three reservoir sites at Brookville Lake (Table 1). The mean category of all three indices was eutrophic, indicating a high level of biological activity.

Table 1. Summary of calculated trophic state indices at Brookville

	Mean Score (range)	Mean Category (range)
TSI(SD)	56 (52-60)	Eutrophic (Moderately Eutrophic-Eutrophic)
TSI(CHL)	60 (53-68)	Eutrophic (Moderately Eutrophic-Hypereutrophic)
TSI(TP)	64 (61-67)	Eutrophic (Eutrophic-Hypereutrophic)