

# CJ Brown Dam and Reservoir (CBR) Water Quality Summary

## Summary of 2020 Water Quality Results

CJ Brown Reservoir had no exceedances of OH's water quality criteria at the tailwater (CBR10000). 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 hypereutrophic, indicating a very high level of biological activity. Finally, our sampling showed cyanobacteria cell counts over 100,000 cells/mL in all samples, and cell counts over 1,000,000 cells/mL in 6 out of 7 samples at the time of sampling. Cell counts over 100,000 cells/mL are potentially indicative of HAB conditions. The elevated nutrient levels and hypereutrophic classification indicate there is a high potential for HAB development in the lake.

## 2020 Activities

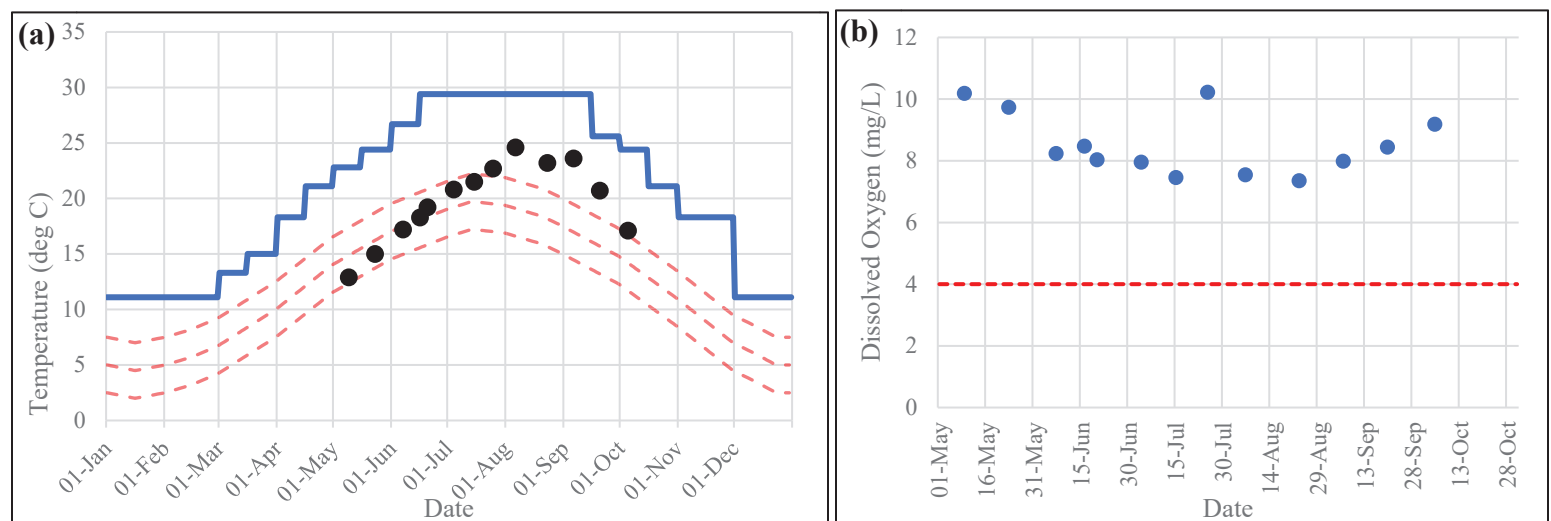
In 2020, one sampling event was conducted at CJ Brown Reservoir. Field data and chemical samples were collected at all seven sites (Figure 1). Chlorophyll and phytoplankton were collected at 2 sites, and zooplankton samples were collected at the damsite (CBR20001).

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

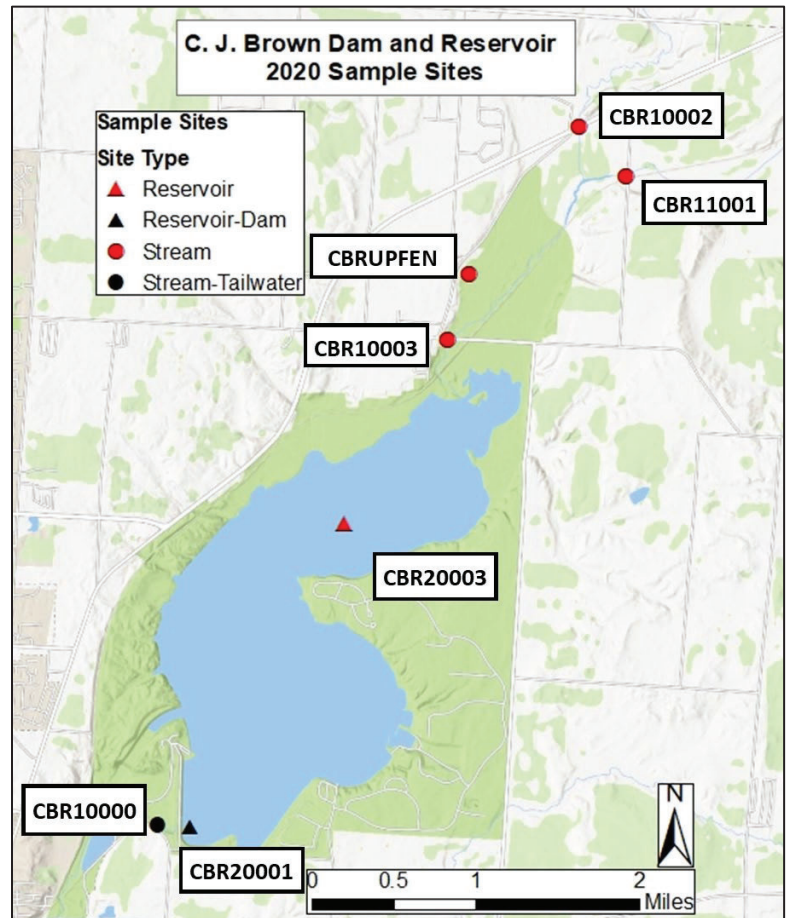
## Exceedances of OH State Water Quality Criteria

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

## Tailwater Temperature and DO Conditions



**Figure 2. CJ Brown Reservoir tailwater temperature and DO data. (a) Tailwater temperature data collected by project staff in 2020 is represented by the black dots. The temperature guide curve is represented by the dashed red lines, and the blue line represents the OH water quality criteria for temperature. (b) Tailwater dissolved oxygen data collected in 2020 is represented by the blue dots. The OH water quality criteria for DO is represented by the dashed red line.**



**Figure 1. Water quality sampling locations for CJ Brown Reservoir in 2020.**

Tailwater data was compared to OH state water quality criteria for temperature and to the Louisville District's temperature guide curve for CJ Brown Reservoir (Figure 2a). Tailwater temperature did not exceed the state criteria for temperature at any time; however, tailwater temperatures fell outside the guide curve late July through early October. 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 all sites at CJ Brown Reservoir were above the historical medians and historical distributions, and above the USEPA recommended nutrient criteria for the respective locations.

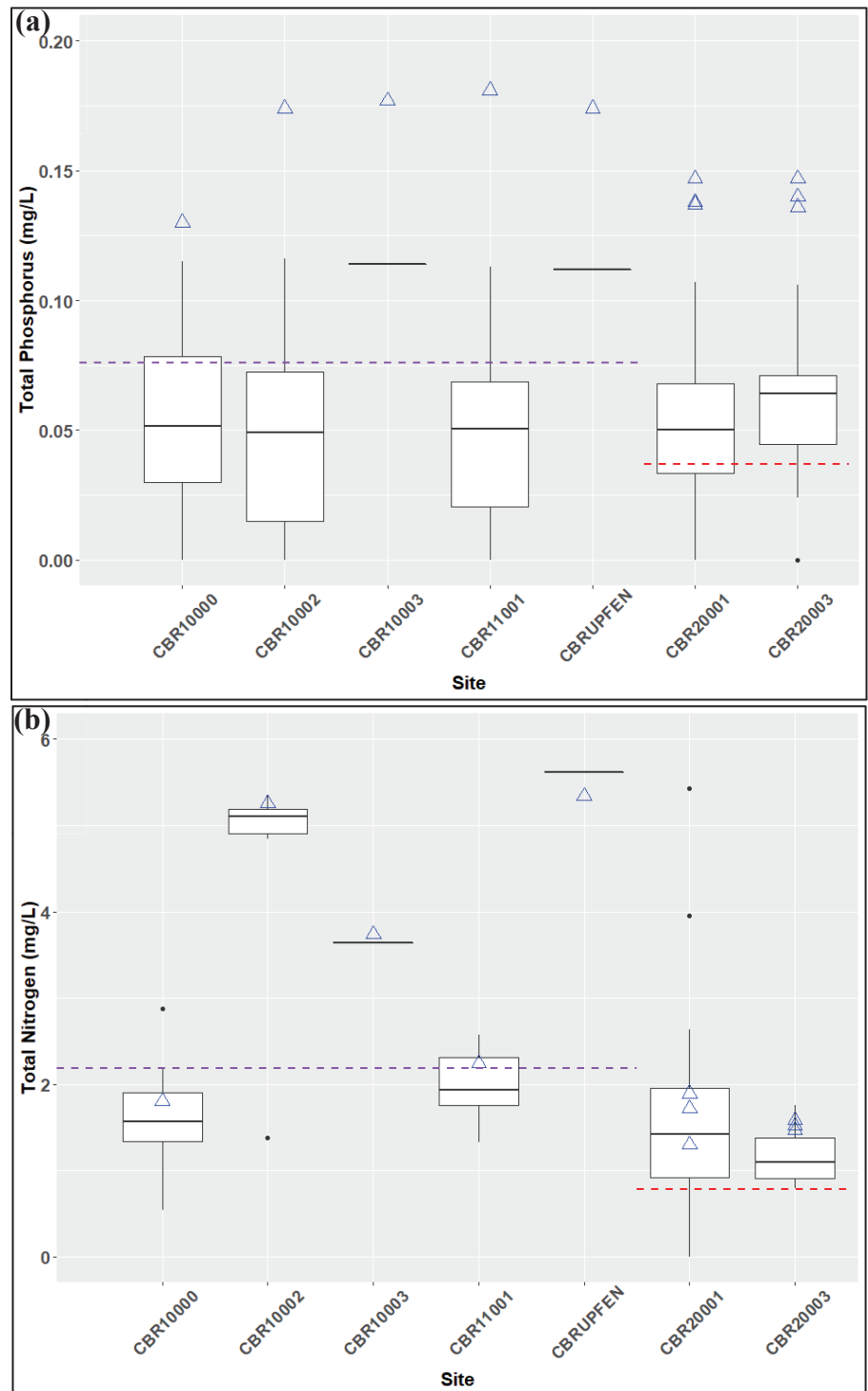
#### Total Nitrogen

2020 TN values at CJ Brown Reservoir were near or below the historical medians and distributions at all sites. However, 2020 TN levels in 10 out of 11 samples were above the USEPA recommended nutrient criteria for the respective locations.

### Cyanobacteria Data, HABs, and Trophic State Index

#### Cyanobacteria Data

7 phytoplankton samples were collected from various depths at 2 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 all 7 samples collected. 6 out of 7 of these samples exceeded 1,000,000 cells/mL. These results indicate CJ Brown Reservoir had cell



**Figure 3. Comparison of 2020 nutrients data to historical samples and nutrient criteria. 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. One outlier (value = 0.275 mg/L) was excluded to make plot easier to interpret. (b) Comparison of total nitrogen data. One outlier (value = 7.7 mg/L) was excluded to make plot easier to interpret.**

count levels potentially indicative of a HAB at the time of sampling.

### Harmful Algal Bloom (HAB) Response

Ohio EPA is the lead agency for HAB response in Ohio. Ohio EPA did not issue any advisories for HABs at CJ Brown Reservoir.

### TSI

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

***Table 1. Summary of calculated trophic state indices at CJ Brown Reservoir.***

	<b>Mean Score (range)</b>	<b>Mean Category</b>
<b>TSI(SD)</b>	68 (68-68)	<b>Hypereutrophic</b>
<b>TSI(CHL)</b>	76 (76-76)	<b>Hypereutrophic</b>
<b>TSI(TP)</b>	76 (75-79)	<b>Hypereutrophic</b>