

Taylorsville Lake (TAR) Water Quality Summary

Summary of 2020 Water Quality Results

Taylorsville Lake had no exceedances of KY's water quality criteria for temperature at the tailwater (TAR10000). Total phosphorus and total nitrogen levels at most sample locations exceeded the USEPA nutrient criteria. TSI for the three indices classified the lake as hypereutrophic, indicating very high levels of biological activity potential. Finally, our sampling showed there were six samples with cyanobacteria cell counts over 100,000 cells/mL at the time of the sampling event. The elevated nutrient levels and hypereutrophic TSI classification indicate there is a high potential for HAB development in the lake.

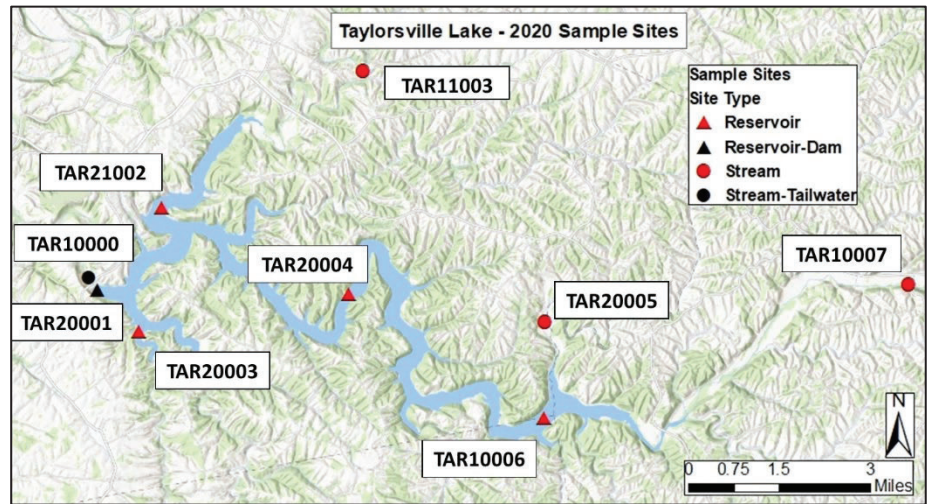


Figure 1. Water quality sampling locations for Taylorsville Lake in 2020.

2020 Activities

In 2020, one sampling event was conducted at Taylorsville Lake. Field data and chemical samples were collected at all nine sample locations (Figure 1). Chlorophyll and phytoplankton were collected at five sites, and zooplankton samples were collected at the damsite (TAR20001).

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

Exceedances of KY State Water Quality Criteria

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

Tailwater Temperature and DO Conditions

Tailwater data was compared to KY state water quality criteria for temperature and to the Louisville District's temperature guide curve for Taylorsville Lake (Figure 2a). Tailwater temperature did not exceed state water quality criteria in 2020; however, tailwater temperatures fell outside the guide curve most of the readings from early June through August and October through the end of the year. The WQ Program will use these findings to inform future

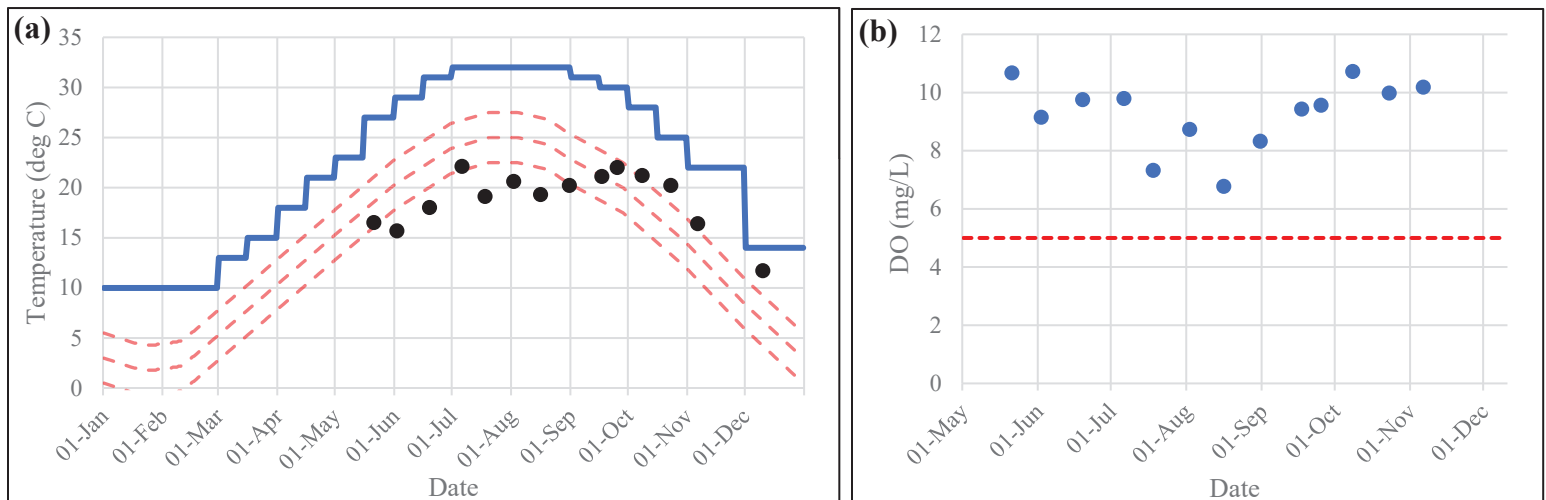


Figure 2. Taylorsville Lake tailwater temperature and DO data. (a) Tailwater temperature data collected by project staff in 2020 is represented by the black dots. The temperature guide curve is represented by the dashed red lines, and the blue line represents the KY water quality criteria for temperature.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

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 were higher than historical medians in all samples. Also, 2020 TP levels at all sites were above the USEPA recommended nutrient criteria for the respective locations.

Total Nitrogen

2020 TN values were near or below historical medians all sample sites. 15 out of 17 TN values in 2020 exceeded the USEPA recommended nutrient criteria.

Cyanobacteria Data, HABs, and Trophic State Index

Cyanobacteria Data

17 phytoplankton samples were collected from various depths at 5 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 six samples from three sites on Taylorsville Lake. These results indicate Taylorsville Lake had cell count levels potentially indicative of a HAB at three sites at the time of sampling.

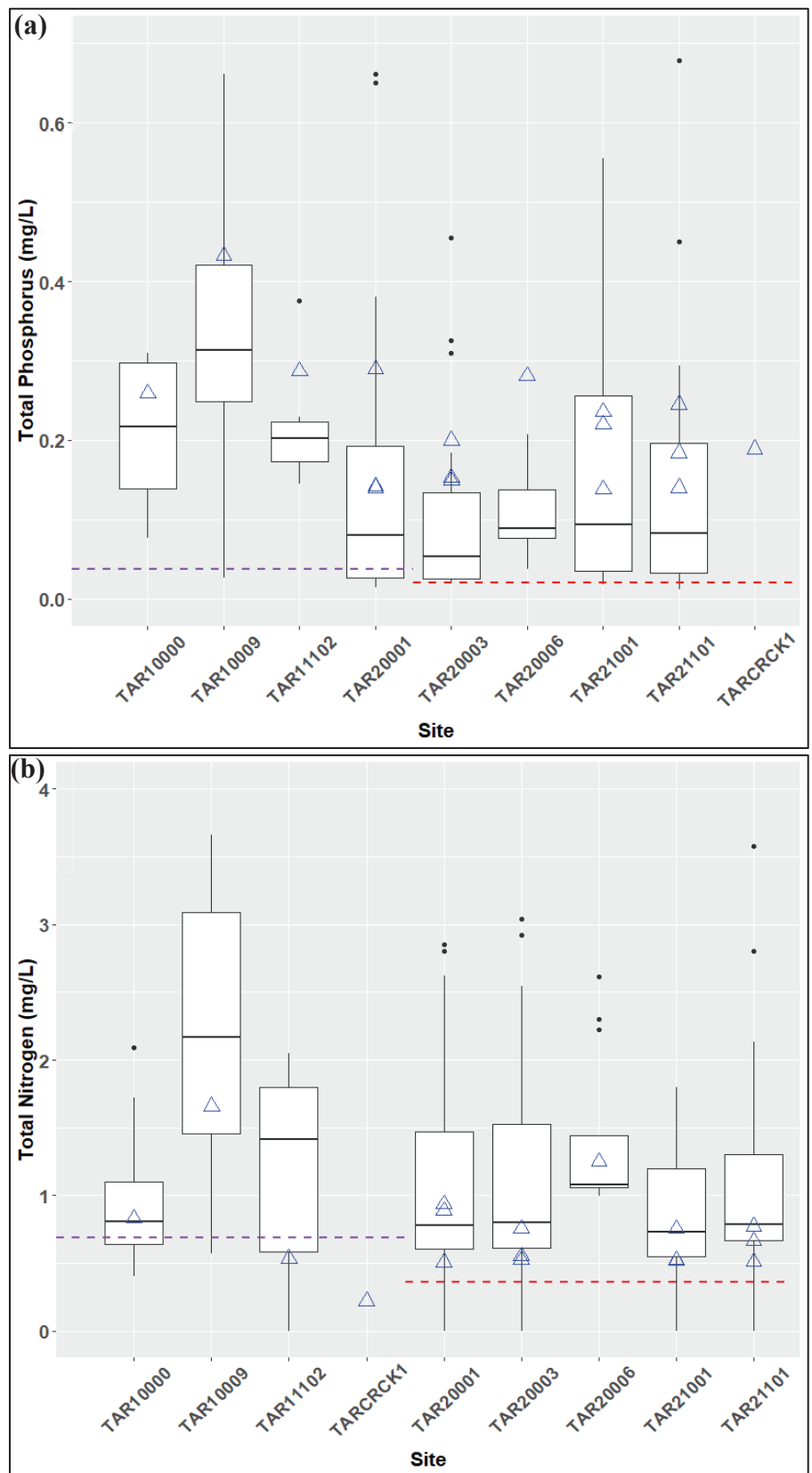


Figure 3. Comparison of Taylorsville Lake 2020 nutrients data to historical samples and nutrient criteria. Boxplots represent data collected in 2012-2019 and blue triangles represent 2020 data. Purple and red dotted lines represent USEPA recommended nutrient criteria for streams and reservoirs, respectively. (a) Comparison of total phosphorus data. Seven outliers (values ranging from 0.734 to 1.47 mg/L) were excluded to make graph easier to interpret. (b) Comparison of total nitrogen data. Two outliers (values of 4.24 and 9.37 mg/L) were excluded to make graph easier to interpret.

Harmful Algal Bloom (HAB) Response

The KY Division of Water (KDOW) is the lead agency for HAB response in Kentucky. KDOW did not issue any advisories for HABs at Taylorsville Lake in 2020.

TSI

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

Table 1. Summary of calculated trophic state indices at Taylorsville Lake.

	Mean Score (range)	Mean Category (Range)
TSI(SD)	68 (66-73)	Hypereutrophic
TSI(CHL)	74 (69-78)	Hypereutrophic
TSI(TP)	78 (75-85)	Hypereutrophic