William H. Harsha Lake (EFR) Water Quality Summary

Summary of 2020 Water Quality Results

Harsha Lake had several exceedances of OH's water quality criteria for temperature at the tailwater (EFR10000). 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 5 out of 16 samples. 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 Harsha Lake in 2020.

2020 Activities

In 2020, one sampling event was conducted at Harsha Lake. Field data and chemical samples were collected at eight sites, and only field data were collected at three sites (Figure 1). Chlorophyll, phytoplankton, and zooplankton were collected at four sites.

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 late December.

Exceedances of OH State Water Quality Criteria

There were several exceedance events of OH state water quality criteria for temperature at the tailwater, based on provisional USGS gage data. These events occurred intermittently July 16 through July 29 and on August 3, September 16, and September 17. There were no other exceedances of OH state WQ criteria.
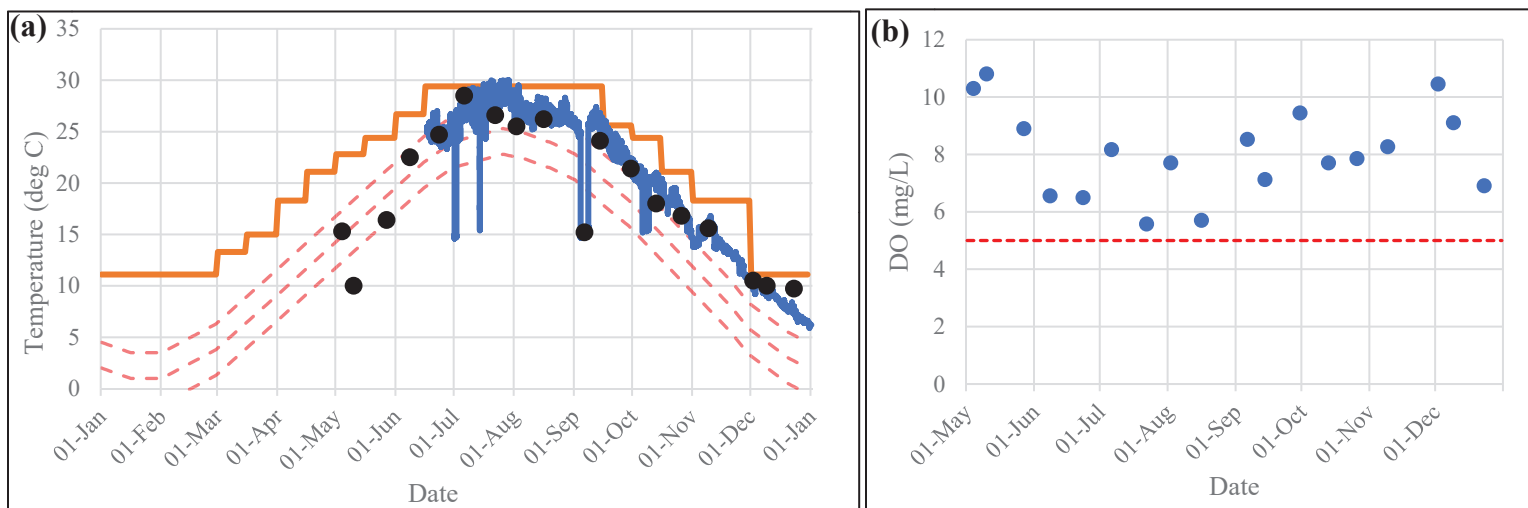
Tailwater Temperature and DO Conditions

Figure 2. Harsha 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 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.
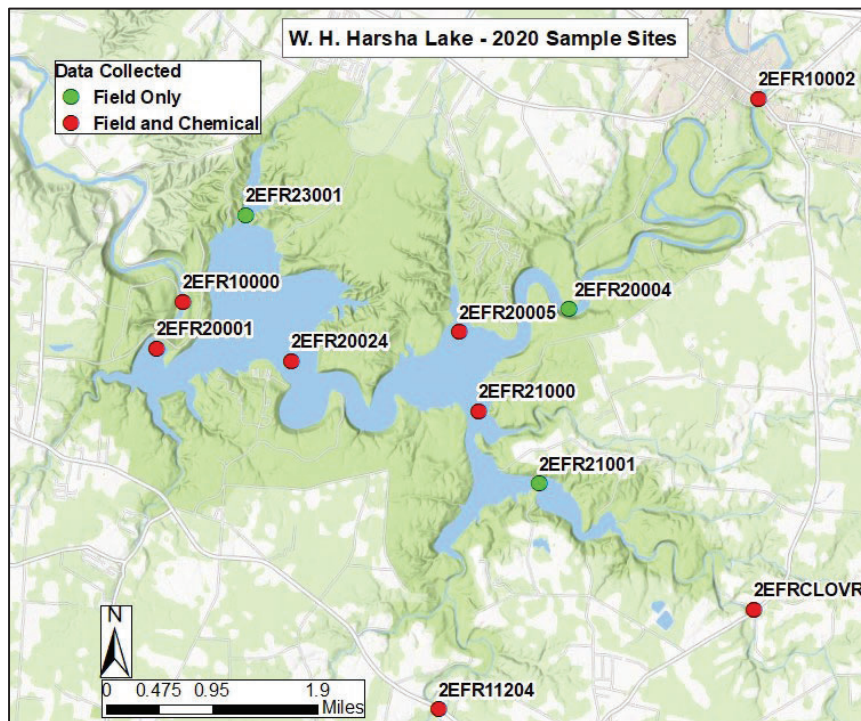
Tailwater data was compared to OH state water quality criteria for temperature and to the Louisville District's temperature guide curve for Harsha Lake (Figure 2a). According to the provisional USGS data, tailwater temperature exceeded the state criteria for temperature intermittently July 16 through July 29 and on August 3, September 16, and September 17. These exceedances occurred while the lake was stratified; therefore, there were opportunities to better utilize selective withdrawal gates to reduce tailwater temperature to meet criteria. Also, tailwater temperatures fell outside the guide curve in early May, intermittently early June through early September, and most of the time mid-September through the end of the year. 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 (Figure 2b) did not exceed state criteria at any time throughout the year.

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 Harsha Lake were above the historical medians and near the top of or above the historical distribution at all but two
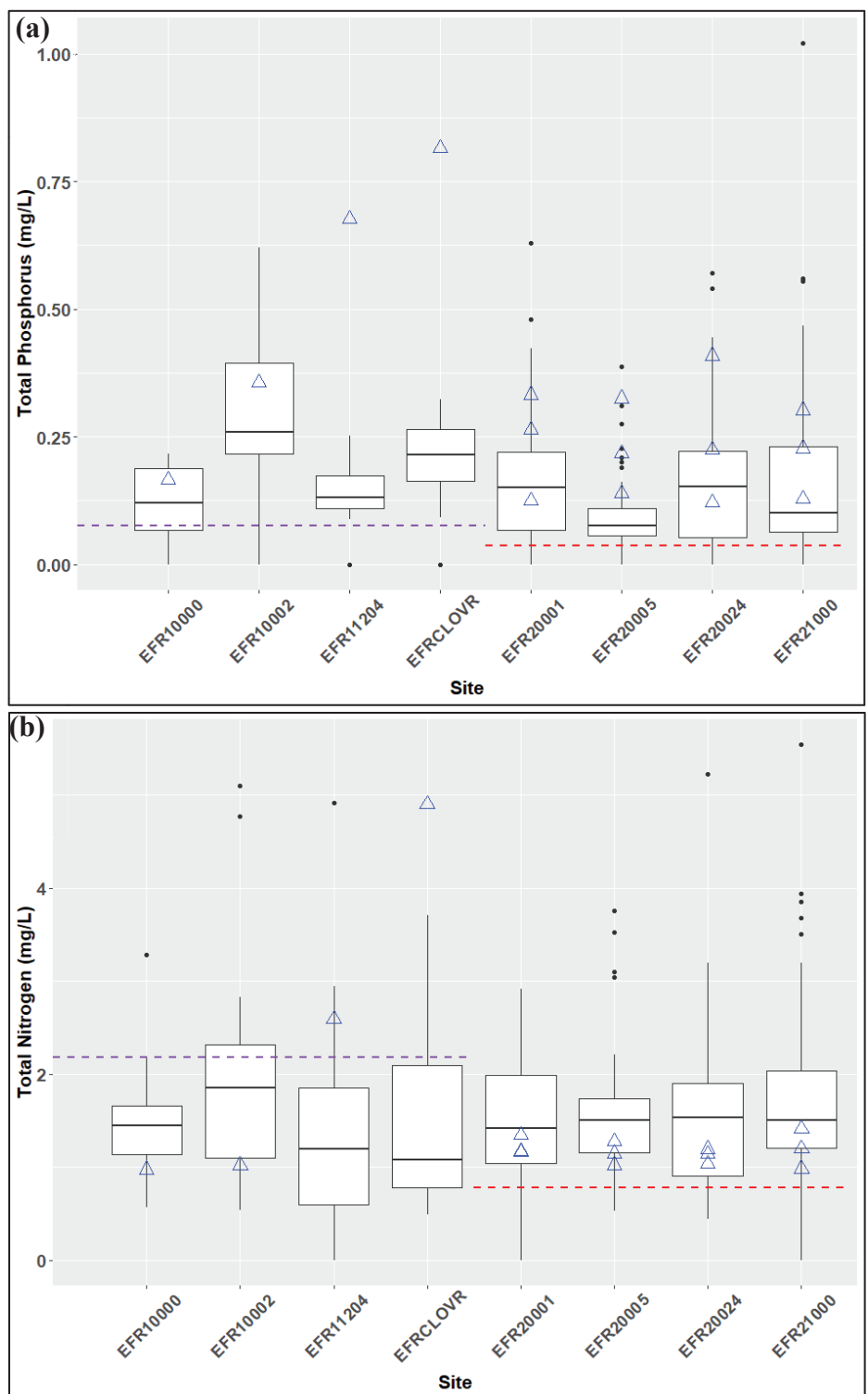

Figure 3. Comparison of 2020 Harsha Lake nutrient data to historical samples and nutrient criteria. Boxplots represent data collected in 2012-2019 and blue triangles represent 2020 data. Purple and red dotted lines represent USEPA recommended nutrient criteria for streams and reservoirs, respectively.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

sites. Also, 2020 TP levels at all sample sites were above the USEPA recommended nutrient criteria for the respective locations.

2020 TN values at Harsha Lake were near or below the historical medians at all but two sites. Also, 2020 TN levels at 14 out of 16 samples were above the USEPA recommended nutrient criteria for the respective locations.

Cyanobacteria Data, HABs, and Trophic State Index

Cyanobacteria Data

16 phytoplankton samples were collected at various depths from 4 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 5 of the samples collected from 4 of the sites. No samples exceeded 1,000,000 cells/mL. These results indicate Harsha Lake had cell 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. One potential HAB was reported to Ohio EPA on June 9, 2020 based on a visual observation by USACE operations staff at the reservoir. Ohio EPA did not issue any advisories for HABs at Harsha Lake.

TSI

The trophic state indices for Secchi depth [TSI(SD)], and total phosphorus [TSI(TP)] were calculated for seven reservoir sites at Harsha Lake (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 Harsha Lake.

	Mean Score (range)	Mean Category (Range)
TSI(SD)	69 (67-76)	**Hypereutrophic**
TSI(CHL)	79 (78-79)	**Hypereutrophic**
TSI(TP)	74 (73-75)	**Hypereutrophic**