
Continuous monitoring of biological and nutrient data at reservoir and tail water sites in central Kentucky

A Data Management Plan created using DMPTool

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Continuous monitoring of biological and nutrient data at reservoir and tail water sites in central Kentucky

1. Project and Contact Information

Title: Continuous and discrete monitoring of biological and nutrient parameters at lake and tail water sites in Central Kentucky

Partners: U.S. Army Corps of Engineers (Water-Quality Division)

Account number(s): GR17NF00001WQ00/ GR17NF00001WL00/ GR17NF0000015000/ GR17NF0000015L00

Agreement number: W22W9K52670156

USGS Center: Indiana-Kentucky Water Science Center, Louisville District Office, 9818 Bluegrass Pkwy, Louisville Kentucky 40299, Office (502) 403-1900

Background:

Nolin River Lake and Rough River Lake are popular lakes for recreational activities including swimming, boating, hunting, and fishing. All of these designated uses potentially may be affected by cyanobacteria (also known as blue-green algae) and associated cyanotoxins. In 2014, the U.S. Army Corps of Engineers (USACE) and the Kentucky Division of Water (KDOW) confirmed the presence of cyanobacteria at levels exceeding recommended safety thresholds at both lakes.

Determining the causative factors for algae blooms is complex, because the production of algae is affected by a complex set of physical, chemical, biological, hydrological, and meteorological conditions, including excessive nutrients such as nitrogen and phosphorus. The role of anthropogenic nutrient enrichment is the most frequently proposed hypothesis relating to increased HABs in freshwater. Anthropogenic nutrient enrichment occurs when human activities introduce excessive nutrients into a body of water. Historically, researchers have relied on discrete sampling at limited intervals and laboratory analyses alone to understand water quality in waterbodies. This low-frequency data may miss major high or low points; thus, limiting the data for important management decisions relative to rapid changes in constituent concentrations.

Purpose:

The continuous gaging stations at Nolin River Lake (and tailwater), Rough River Lake (and tailwater), tailwater at Green river Lake and tailwater at Barren River Lake will provide data so resource managers, U.S. Army Corps. of Engineers (USACE), the ability to make timely decisions on lake resources concerning harmful biological parameters, dissolved oxygen, and nutrients. Dissolved oxygen information is used to manage for downstream ecological flows. The lake biological and nutrient information will be used by the USACE to provide timely advisories on dangerous conditions and guide their discrete sampling efforts. The USGS will use the information to understand the dynamics of factors that influence the dynamics of nutrients and biological factors in Nolin River Lake and Rough River Lake.

2015-12-01

2017-12-31

Objectives and Scope:

Upgrade the existing USGS gaging station at Nolin River Lake near Kyrock, KY (03310900) and Rough River Lake near Falls of Rough, KY (03318005) with:

1. continuous nitrate, phycocyanin, chlorophyll, water temperature, specific conductance, dissolved oxygen, and turbidity sensors in the reservoir epilimnion (near-surface level), and:
2. Continuous phycocyanin, chlorophyll, water temperature and dissolved oxygen in the reservoir metalimnion or hypolimnion (lower level).

This gaging station will provide continuous water-quality information on lake conditions at the intake tower near the dam.

Upgrade the existing USGS gaging station at Nolin River at Kyrock, KY (03311000) and Rough River near Falls of Rough, KY (03318010) with continuous nitrate, phycocyanin, chlorophyll, dissolved oxygen, and turbidity. Continuous water temperature already exists at this site. Currently, this site is stage-only, but will be upgraded to include discharge in the near future. This gaging station will provide continuous water-quality information and discharge in the reservoir tailwater.

Project Timeline:

Year 1 (December 2015 to December 2016)

- Procure equipment
- Install infrastructure and equipment at Rough and Nolin

- Operate and maintain the continuous monitors
- Collect discrete samples during the recreation season (May to October)

Year 2 (December 2016 to December 2017)

- Transfer the floating dock at Rough to Nolin
- Operate and maintain the continuous monitors
- Collect discrete samples during the recreation season (May to October)
- Develop a methods report

Main Point of Contact: Mac A Cherry - Project Chief, Hydrologist, 9818 Bluegrass Pkwy, Louisville Kentucky 40299, Office (502) 403-1912, macherry@usgs.gov

Alternative Contacts: Stone, Supervisory Hydrologist, Indiana-Kentucky Water Science Center, (317) 600-2786, wwstone@usgs.gov

Angela Crain, Hydrologist, Supervisory Hydrologist, Indiana-Kentucky Water Science Center, (502) 493-1943, ascrain@usgs.gov

Partner: U.S. Army Corps. Of Engineers (water quality)

Partner Point of Contact: Jade Young/Jennifer Thomason

2. Plan and Acquire

Data from this project will be newly collected.

At this moment there are no plans to acquire data from an existing database.

Approach:

Three continuous water-quality monitors will be deployed and maintained according to USGS approved methods. Two water-quality monitor sites [lake (upper water column) and tailwater] will have of a Hach Nitratax (nitrate), and a YSI EXO2 multi-sonde (optical DO, pH, conductivity, turbidity, total algae (chlorophyll and phycocyanin), and water temperature). The third water-quality site will be located at a second lower lake level, and will have optical DO, and water temperature. Measurements will be recorded every 15 minutes. While the sensors provide unprecedented information, fouling can be an issue, particularly during productive warmer periods. The site will be serviced every 3 to 4 weeks to clean the instruments and check for drift in the sensor measurements. Discrete sample data will be used to validate the nitrate, and total algae *in-situ* measurements. Discrete nitrate samples will be analyzed by the USGS National Water-Quality Laboratory. Discrete cyanobacteria enumeration sample analysis will be performed at BSA Environmental Services, Inc., or other USGS approved laboratory.

The monitors at Nolin River Lake and Rough River Lake will be attached to the intake tower and supported from a floating dock, respectively. Samples will be collected when monitors are calibrated to evaluate the technology and validate the continuous data.

NOTE: After December 2016, the sites at Rough River will be discontinued. The floating platform at Rough will be transported to Nolin and used there. The continuous monitor at the bottom of Nolin Lake will be replaced with a YSI EXO2 with the following parameters: (optical DO, pH, conductivity, turbidity, total algae (chlorophyll and phycocyanin), and water temperature).

A Project Management Plan for Nolin Lake and tail water was submitted to the USACE on 10/16/15. The Project Management Plan was reviewed and approved.

The size of all the data and associated data will be in low GBs.

Once the data is approved according to the USGS Fundamental Science Practice guidelines, it will be static and will not change.

Personnel (per year):

- Project Management/Data Review/Data Release/Report Development: Hydrologist GS-09, 0.20 Full-Time Equivalent (FTE)
- Installation: Hydrologic Technician GS-11, GS-08, Hydrologist GS-09, 0.02 FTE
- Gage Operation /Water-Quality sampling: Hydrologic Technician GS-07; Hydrologic Technician GS-06, 0.18 FTE

3. Describe/Metadata and Manage Quality

- Continuous and discrete biological and nutrient data at Rough River Lake and Tail Water, 2016.
- Continuous and discrete biological and nutrient data at Nolin Lake and Tail Water, 2016.
- Continuous and discrete biological and nutrient data at Nolin Lake and Tail Water, 2017.

Continuous and discrete data will be stored and publicly available in the U.S. Geological Survey National Water Information System (NWIS) database. All approved data can be exported from NWIS in .csv format.

Data will be viewed and analyzed with Microsoft Excel and R statistical environment.

Main Point of Contact:

Mac A Cherry - Project Cheif, Hydrologist, 9818 Bluegrass Pkwy, Louisville Kentucky 40299, Office (502) 403-1912, macherry@usgs.gov

Metadata will be created according to USGS standards endorsed by the Federal Geographic Data Committee (FGDC).

All data will be collected according to USGS methods. The projects will be reviewed by the Midwest Water Science Field Team to ensure compliance with Office of Surface Water, Office of Ground Water, and Office of Water Quality guidelines. Guidance is additionally outlined in the USGS INKY Surface Water and Water-Quality Plans.

4. Backup/Secure and Preserve

In the short-term, data collected by field personnel will back up their hard drives daily with portable drives. Data from field computers are stored on the District Directory once back from the field. The district directory and hard drives of the field computers are backed-up on a bi-week basis. Additional guidance is outlined in the in the USGS IN-KY WSC Center-Wide Data Management Plan (2014).

The data will be secured according to guidelines established in the USGS IN-KY WSC Center-Wide Data Management Plan (2014).

There are no plans to place restrictions on the data.

The data will be stored and archived according to the USGS Open Access Plan and all data will be available for the future in a machine-readable format.

The data will be stored and available in the U.S. Geological Survey National Water Information System (NWIS) database. Metadata will be available on Science Base.

Metadata will be preserved and made available on Science Base.

5. Publish and Share

No release policies have been established at this point.

There are no plans to place restrictions on the data.

There are no plans to place restrictions on the data.

Methods report is planned. Other reports are "to-be-determined".

Metadata will be stored on Science Base.

A DOI will be provided when the data is released.