National Park Service
U.S. Department of the Interior

Inventory and Monitoring Division
Cumberland Piedmont Network

Water Quality Monitoring, Fiscal Year 2024

Overview

The Cumberland Piedmont Network Inventory and Monitoring Program (CUPN) began long-term water quality monitoring at Abraham Lincoln Birthplace National Historical Park (ABLI) in fiscal year 2004 (FY04). Water quality is measured every other month on alternate years at four sites (see map on page 2): North Branch of Knob Creek (NBKC), Knob Creek at the Boyhood Home Unit (KCKC), and Sinking Spring (SSTS) at the Birthplace Unit. Howell Spring (HSSS; just outside the Birthplace Unit) was added in FY16 to give a better understanding of nitrates found at Sinking Spring. Based upon program requirements and findings of the water quality inventory, a set of parameters was chosen for long-term monitoring. These parameters include the field measures of water temperature, specific conductance, pH, and dissolved oxygen. Samples undergo laboratory analysis for *Escherichia coli* (*e. coli*) and nitrate.

This brief summarizes data collected from November 2003 through September 2024, highlighting November 9, 2023 through September 12, 2024. Water quality data are available upon request to the Cumberland Piedmont Network.

Significant Findings

There were two violations of the Kentucky dissolved oxygen warm water standard of 4.0 mg/L in FY24. Both were at North Branch Knob Creek and both occurred at times of very low flow; once when flow was interstitial (water flowing through stream bed material) and once when the creek was reduced to isolated pools. While there have been violations of the *E. coli* standard of 576 MPN, there were no violations in FY24 (Figure 1). Most Probable Number (MPN) is a statistical method of estimating bacteria colony density.

Nitrate levels at Howell and Sinking Spring remain elevated but below the EPA recommended limit of 90 mg/L for freshwater aquatic life (Figure 2). We know by groundwater tracing that Sinking Spring is fed in part by Howell Spring and both springs have higher nitrate concentrations than the surface streams, North Branch Knob Creek and Knob Creek.

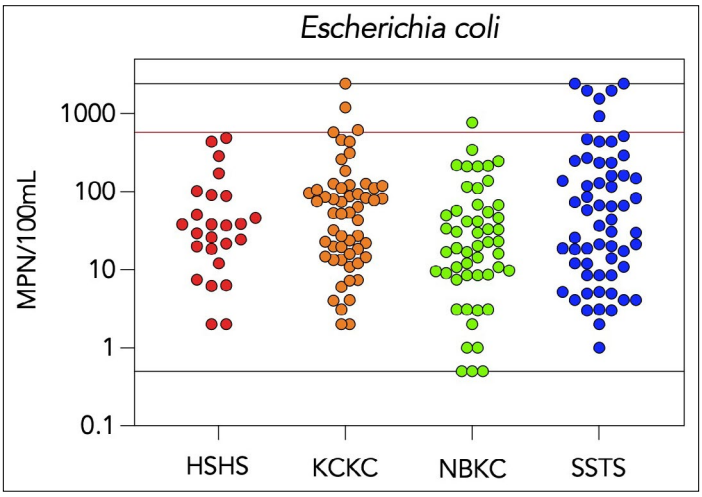


Figure 1. *Escherichia coli* levels at Abraham Lincoln Birthplace NHP November 2005 through September 2024. The red line represents the Kentucky standard of 576 MPN/100mL. The lower black line is set at 0.5 and represents values below the detection limit of 1 MPN/100mL. The upper black line is set at 2420 MPN/100mL representing all values above the detection limit. Howell Spring has a smaller sample size because the site was added in November 2015. [HSSS=Howell Spring at the Birthplace Unit; KCKC=Knob Creek at the Boyhood Home Unit; NBKC=North Branch at Knob Creek; SSTS=Sinking Spring at the Birthplace Unit]. NPS / CUPN

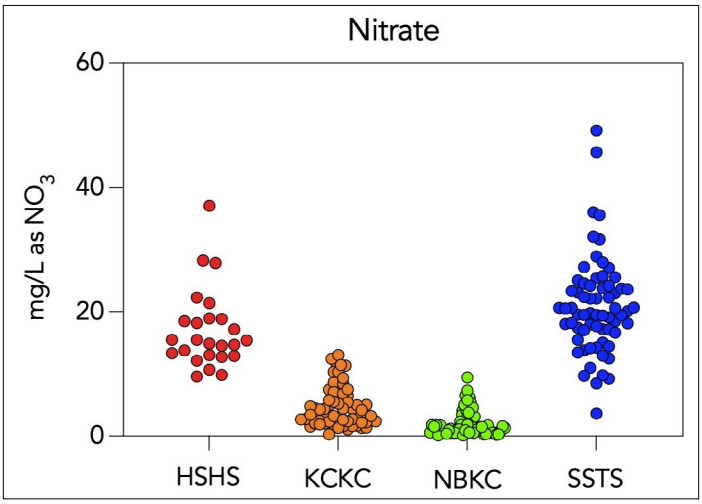


Figure 2. Nitrate concentrations at Abraham Lincoln Birthplace NHP November 2003 through September 2024. While not used as a drinking water source today, it is interesting that Sinking Spring sometimes exceeds the EPA drinking water standard of 44 mg/L as NO_3. [HSSS=Howell Spring at the Birthplace Unit; KCKC=Knob Creek at the Boyhood Home Unit; NBKC=North Branch at Knob Creek; SSTS=Sinking Spring at the Birthplace Unit]. NPS / CUPN

Water Quality Standards

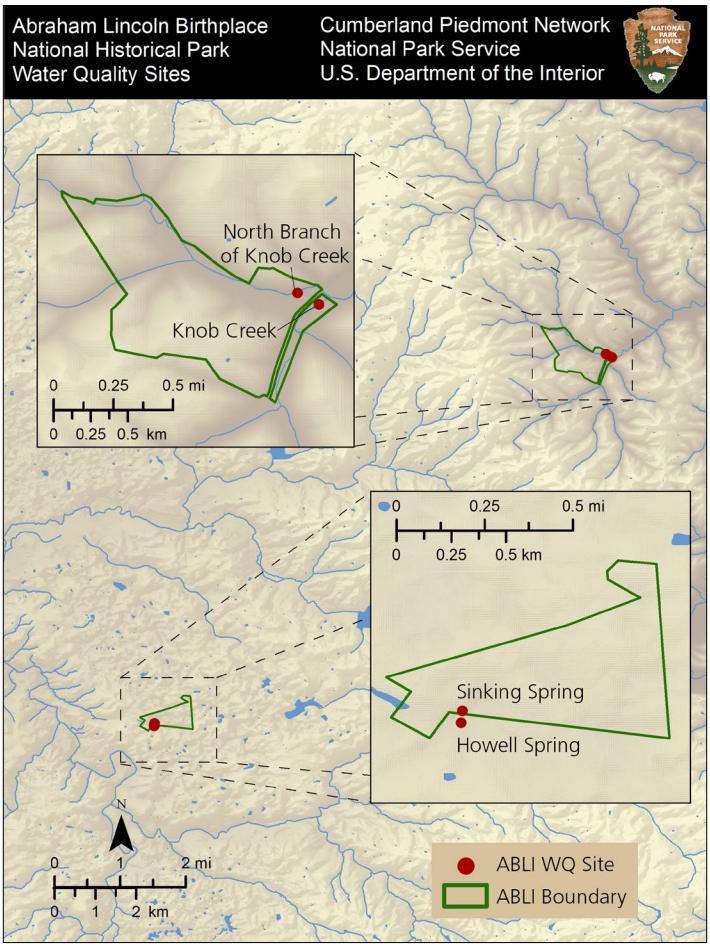
The park's surface streams are designated as "Warm Water Aquatic Habitat" while springs are classified as "Cold Water Aquatic Habitat." Being within a national park unit, North Branch Knob Creek, Knob Creek and Sinking Spring are considered "Outstanding Resource Waters," a designation that limits discharges of pollutants within the watersheds. Howell Spring is not within the park. The state does not impose a standard for *Escherichia coli*. Based on the lack of recreational use we have adopted the EPA recommendations for "Single Sample Infrequently Used Full Contact Recreation" of 576 MPN/100mL. We also use the EPA freshwater aquatic life recommendation for nitrate of 90 mg/L as NO_3.

Table 1. Parameters and Standards.

Parameter	Standard
Water temperature	Less than 31.7°C (89.1°F)
Dissolved oxygen	Greater than 4.0 mg/L (warm water)
	Greater than 5.0 mg/L (cold water)
pH	Between 6.0 and 9.0 SU
Escherichia coli	Less than 576 MPN/100 mL
Specific conductance	No standard
Nitrate	Less than 90 mg/L as NO_3

Future Monitoring

Water quality sampling is scheduled to resume in FY26.



Water-quality monitoring sites at Abraham Lincoln Birthplace National Historical Park in FY24. NPS / CUPN

North Branch Knob Creek (KBKC) on May 9, 2024. The watershed's steep terrain stream causes quick response to rainfall events. NPS / Brenda Wells.

About the CUPN

In 1999 the National Park Service initiated a long-term ecological inventory and monitoring program in more than 280 National Park Service units. This program monitors fundamental elements and processes in park ecosystems to help indicate the overall health or condition of park resources. Data generated allows us to better understand natural processes and the results of management actions, and help guide parks in the successful protection and use of park resources. Information gathered is shared widely through the production of technical reports, resource briefs, and journal publications.

The Cumberland Piedmont Inventory and Monitoring Network, one of 32 networks across the country, includes 14 parks that share geographic proximity and common natural resources. Parks within each of the networks work together to plan, design, and conduct inventories and long-term monitoring. The Cumberland Piedmont Network provides long-term monitoring for water quality, cave bats, crickets and meteorology, Allegheny woodrats, forest vegetation, ozone foliar damage, and invasive species.

For More Information

CUPN Home Page:
https://www.nps.gov/im/cupn/index.htm

CUPN Reports & Publications:
https://www.nps.gov/im/cupn/reports-publications.htm

About the NPS Inventory & Monitoring Program:
https://www.nps.gov/im/index.htm

Data Downloads via the Natural Resource Information Portal:
https://irma.nps.gov/Portal/

Contact

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North Branch Knob Creek (KBKC) on July 11, 2024. During periods of drought the stream is reduced to a trickle or completely dry. NPS / Brenda Wells.