



Water Quality Summary, Fiscal Year 2016

Overview

The Cumberland Piedmont Network Inventory and Monitoring Program began long-term water-quality monitoring at Abraham Lincoln Birthplace National Historical Park in fiscal year 2004. Water quality is measured every other month on alternate years at three sites: North Branch of Knob Creek, Knob Creek at the Boyhood Home Unit, and Sinking Spring at the Birthplace Unit. Howell Spring (Birthplace Unit) was included in fiscal year 2016 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 (SpC), pH, and dissolved oxygen (DO). Samples were also analyzed for *Escherichia coli* (*E. coli*) and nitrate.

This brief summarizes data collected from 1 October 2015 through 30 September 2016. Water quality data are available upon request to the Cumberland Piedmont Network. See <http://science.nature.nps.gov/im/units/cupn/about.cfm> for more information.



Figure 1. North Branch Knob Creek, 5 May 2016. Image by Brenda Wells.

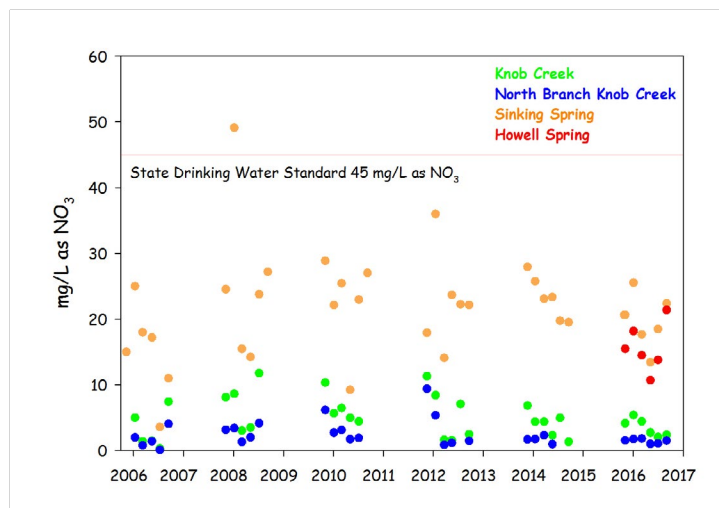


Figure 2. Nitrate at Abraham Lincoln Birthplace National Historical Park FY05-FY16.

Significant Findings

Highlights of Fiscal Year 2016 Monitoring

There were three violations of water quality standards documented during FY16. Sinking Spring exceeded the USEPA recommended single sample limit of 576 MPN/100ml for *E. coli* one time. Most Probable Number (MPN) is a statistical method of estimating bacteria colony density. This sample, measuring 1,986 MPN, was taken outside the routine program as a response to a runoff event that caused discoloration to the spring's water. Additionally, the dissolved oxygen concentration at North Branch of Knob Creek dropped below the state standard of 4.0 mg/L twice. This occurred in the summer when flow was reduced to disconnected pools.

While below the USEPA recommended limit of 90 mg/L for freshwater aquatic life, nitrate concentrations are found to be consistently elevated at Sinking Spring. To better understand its nitrate source Howell Spring (approximately 50 meters south of Sinking Spring) was added in FY16. Groundwater dye tracing has shown that Howell Spring contributes flow to Sinking Spring. Sampling results show that nitrate concentrations at Howell Spring, while elevated, were slightly lower than those of Sinking Spring (Figure 2). As Howell Spring is a tributary to Sinking Spring and not its sole source, and as Howell Spring has slightly lower nitrate concentrations, the nitrate source must be common to both springs.

Water Quality Standards

The streams of the Boyhood Home Unit are designated “Warm Water Aquatic Habitat (WW)” while Sinking Spring is classified as “Cold Water Aquatic Habitat (CW).” By virtue of being within a national park unit, all streams are considered “Outstanding Resource Waters.” This designation limits discharges of pollutants within the watersheds. The state currently does not impose a standard for *E. coli* bacteria, so based on the lack of recreational use we have adopted the USEPA recommendations for “Single Sample Infrequently Used Full Contact Recreation” of 576 MPN/100ml. We also use the USEPA freshwater aquatic life recommendation for nitrate of 90 mg/L. The state drinking water standard for nitrates is 45 mg/L.

Parameter	Standard
Water temperature	Less than 31.7°C
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
<i>Escherichia coli</i>	Less than 576 MPN/100 mL
Specific conductance	No standard
Nitrate	Less than 90 mg/L

Future Monitoring

Water quality sampling is scheduled to resume in fiscal year 2018.

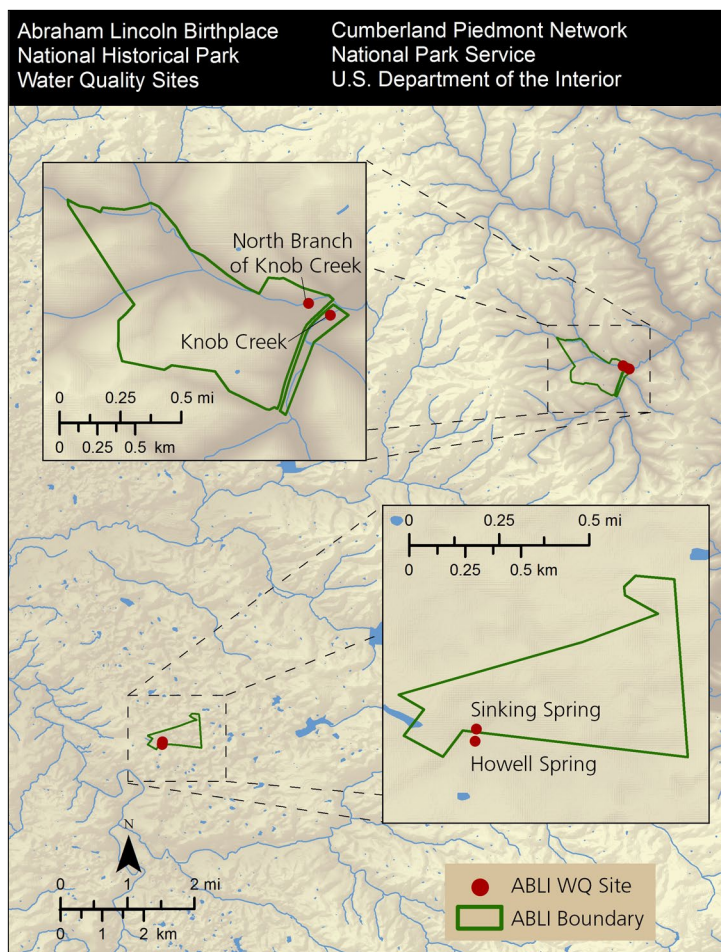


Figure 3. Water-quality monitoring sites at Abraham Lincoln Birthplace National Historical Park in FY 2016.

About the Cumberland Piedmont Network

In 1999, the National Park Service initiated a long-term ecological monitoring program, known as “Vital Signs Monitoring,” to provide the minimum infrastructure to allow more than 270 national park system units to identify and implement long-term monitoring of their highest-priority measurements of resource condition. The overarching purpose of natural resource monitoring in parks is to develop scientifically sound information on the current status and long-term trends in the composition, structure, and function of park ecosystems, and to determine how well current management practices are sustaining those ecosystems.

The NPS Vital Signs Monitoring Program addresses five goals for all parks with significant natural resources:

- Determine the status and trends in selected indicators of the condition of park ecosystem,
- Provide early warning of abnormal conditions,
- Provide data to better understand the dynamic nature and condition of park ecosystems,
- Provide data to meet certain legal and Congressional mandates, and
- Provide a means of measuring progress towards performance goals.

Effective long-term management and stewardship of natural resources in the Cumberland Piedmont Network begins with baseline knowledge of these resources. To acquire this knowledge, an inventory program was established by the National Park Service with the goals of acquiring baseline information for a variety of resources, from bibliographic information to species occurrence and distribution.

For More Information

CUPN Home Page:

<http://science.nature.nps.gov/im/units/cupn/index.cfm>

CUPN Reports & Publications:

<http://science.nature.nps.gov/im/units/CUPN/publications.cfm>

About the NPS Inventory & Monitoring Program:

<http://science.nature.nps.gov/im/index.cfm>

Data Downloads via the Natural Resource Information Portal:

<http://irma.nps.gov>