



Water Quality Summary, Fiscal Year 2019

Overview

The Cumberland Piedmont Network Inventory and Monitoring Program began long-term water quality monitoring at Ninety Six National Historic Site in fiscal year 2004 (October 2003 through September 2004). Water quality is measured quarterly on alternate years at four sites; Star Fort Lake, Tolbert Branch, and the east and west boundary crossings of Henley Creek (see map and Figure 1). Based upon program requirements and findings of the water quality inventory, parameters were chosen for long-term monitoring; including the field measures of water temperature, specific conductance (SpC), pH, and dissolved oxygen (DO). Samples were also collected for *Escherichia coli* (*E. coli*) analysis.

This brief summarizes data collected from October 1, 2018 through September 30, 2019 (FY19). Water quality data are available upon request to the Cumberland Piedmont Network.



Figure 1. Outflow of Star Fort Lake, February 12, 2019. Flow conditions were above normal. Image by Johnathan Jernigan.

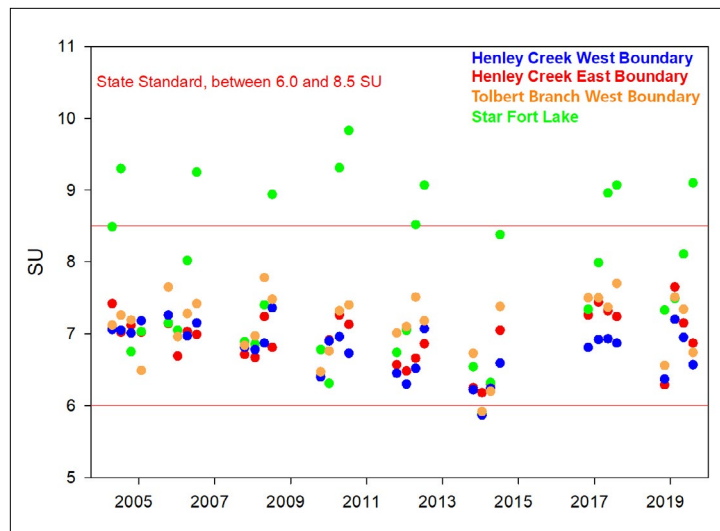


Figure 2. pH at Ninety Six National Historical Site FY04–FY19. High pH at Star Fort Lake is common in the summertime as algae consume more CO₂ than can be supplied by the atmosphere.

Significant Findings

Highlights of Fiscal Year 2019 Monitoring

Water quality standards were exceeded seven times in FY19. The upper pH and temperature limits at Star Fort Lake (once), and *E. coli* at Tolbert Branch (twice) and Henley Creek (once)—where the streams enter the western boundary of the park. The *E. coli* standard was also exceeded in two of the four samples at Henley Creek as it exits the park on the eastern boundary.

Elevated pH (above the state standard of 9.0) in Star Fort Lake is common during warmer weather (Figure 2). The increased pH is a product of photosynthesis of algae in the lake. If photosynthesis consumes more CO₂ than can be atmospherically in-gased into the lake, the end result is the production of hydroxyl ions, which raise the pH. *E. coli* exceeded the USEPA single sample for infrequent recreational contact standard of 576 MPN per 100 mL at both Henley Creek and the lone Tolbert Branch sites. Most Probable Number (MPN) is a statistical method of estimating bacteria colony density. Elevated *E. coli* at Tolbert Branch and Henley Creek is common as these streams drain agricultural land (livestock) before they enter the park. The lake was two degrees above the state limit of 32.2°C during the August sample.

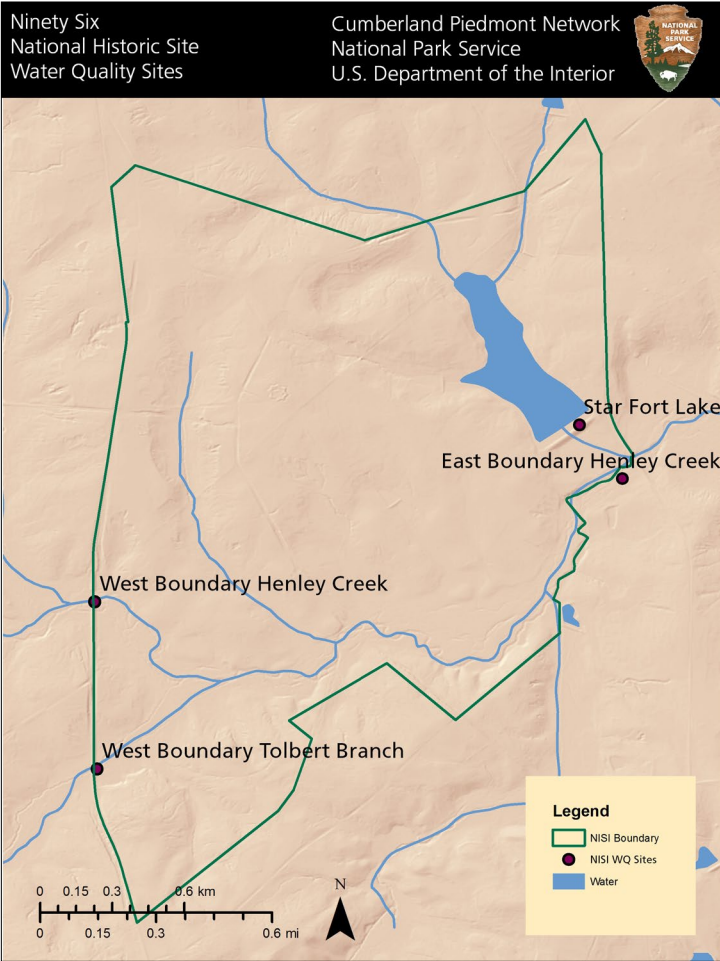
Water Quality Standards

All Ninety Six National Historical Site waters are considered “South Carolina Outstanding Resource Waters,” the highest standards under the Clean Water Act as promulgated by the state. The state currently does not impose a standard for E. coli bacteria so we have adapted the USEPA recommendations for “Single Sample Infrequently Used Full Contact Recreation.” Specific Conductance (SpC) is without a state standard or federal guidelines but is useful in interpreting water quality results.

Parameter	Standard
Water Temperature	Less than 32.2°C
Dissolved Oxygen	Greater than 4.0 mg/L
pH	Between 6.0 and 8.5 SU
<i>Escherichia coli</i>	Less than 576 MPN/100 mL
SpC	No standard

Future Monitoring

Water quality sampling is scheduled to resume in fiscal year 2021.



Water-quality monitoring sites at Ninety Six National Historic Site in FY 2019.

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://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:
<http://irma.nps.gov>