



Water Quality Monitoring, Fiscal Year 2020

Overview

The Cumberland Piedmont Network Inventory and Monitoring Network (CUPN) began long-term monitoring of water quality at Shiloh National Military Park (SHIL) in fiscal year 2004 (October 2003 through September 2004). Water quality is measured monthly for two years at nine sites: Owl Creek (OCOC), Tilghman Branch (TBTB), Shiloh Branch (SBSB), and Upper and Lower Dill Branches (UDDB, LDDB), Rhea and Shiloh Springs (RSRS and SSSS) and the Tennessee River at Pittsburg Landing (PLTR; see map on page 2). The Lick Creek site (LCLC) was added in FY19 following acquisition of new land. Two years of monthly sampling is followed by five years of inactivity. Based upon program requirements and findings of the water quality inventory, a set of parameters was chosen for long-term monitoring including the field measures of water temperature, specific conductance (SpC), pH, flow, and dissolved oxygen (DO). Samples were also analyzed for *Escherichia coli* (*E. coli*). This brief summarizes data collected from October 1, 2019 through September 30, 2020 (FY20). Sample collection was shortened in FY20 due to restrictions and limitations associated with COVID-19. Water quality data are available upon request to the Cumberland Piedmont Network and past reports are available at <https://www.nps.gov/im/cupn/monitoring-reports.htm>.

Significant Findings

Twelve violations of state water-quality standards were recorded in FY20. There were nine violations of the lower pH standard of 6.0 SU; once at Tilghman Branch, four at Rhea Springs, and four at Shiloh Springs (Figure 1). Low pH levels at Rhea Springs and Shiloh Springs are likely reflective of known normal conditions. From 2004 to 2020, atmospheric wet deposition in the region had a mean pH of 5.02 SU, below the Tennessee state standard of 6.0 SU (National Trends Network; measured 50 miles (80.5 kilometers) northwest of Shiloh National Military Park at Hatchie NWR Site TN14), while pH averaged 4.78 SU at Rhea Springs and 4.69 SU at Shiloh Springs (Figure 2). pH has been increasing at TN14 (Figure 3), and at Rhea Springs and Shiloh Springs. From 2004 to 2020, pH has increased an average of 0.64 SU at Rhea Springs and 0.35 SU at Shiloh Springs. In addition the *E. coli* limit of 487 MPN/100 mL was exceeded three times; once each Lower Dill Branch, Lick Creek, and Pittsburg Landing. Most Probable Number (MPN) is a statistical method of estimating bacteria colony density. Elevated *E. coli* levels at Lower Dill Branch and Pittsburg Landing were likely a result of runoff associated with increased precipitation the preceding week. The elevated *E. coli* measurement on Oct. 17 at Lick Creek was the only sample collected at this site in FY20 and was not associated with a runoff event.

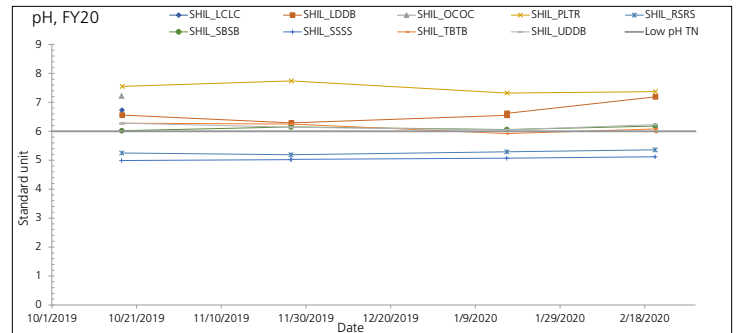


Figure 1. pH during fiscal year 2020. Gray line indicates TN state standard low pH of 6.0SU. LCLC=Lick Creek, SBSB=Shiloh Branch, LDDB=Lower Dill Branch, SSSS=Shiloh Springs, OCOC=Owl Creek, TBTB=Tilghman Branch, PLTR=Pittsburg Landing, UDDB=Upper Dill Branch, and RSRS=Rhea Springs.

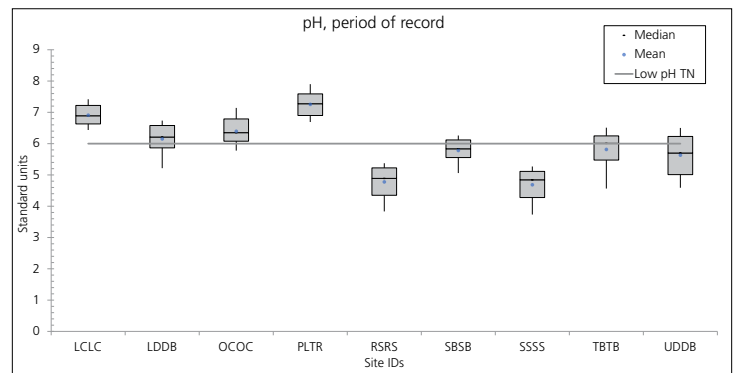


Figure 2. Boxplots of pH measurements for the period of record FY05 to FY20. Gray line indicates TN state standard low pH of 6.0 SU. LCLC=Lick Creek, SBSB=Shiloh Branch, LDDB=Lower Dill Branch, SSSS=Shiloh Springs, OCOC=Owl Creek, TBTB=Tilghman Branch, PLTR=Pittsburg Landing, UDDB=Upper Dill Branch, and RSRS=Rhea Springs.

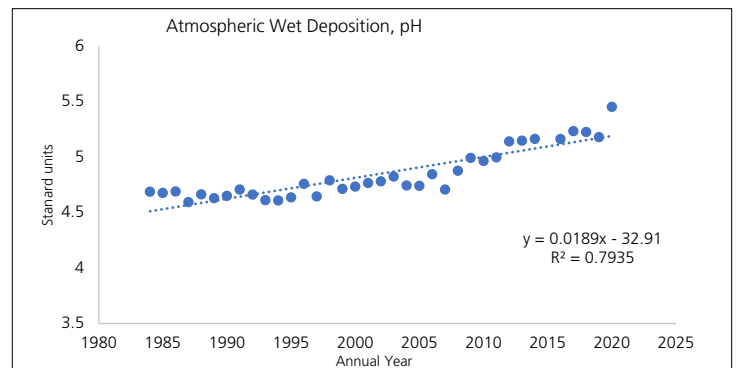


Figure 3. pH of Atmospheric wet deposition from 1984 to 2020. Data acquired from the National Trends Network site TN14. LCLC=Lick Creek, SBSB=Shiloh Branch, LDDB=Lower Dill Branch, SSSS=Shiloh Springs, OCOC=Owl Creek, TBTB=Tilghman Branch, PLTR=Pittsburg Landing, UDDB=Upper Dill Branch, and RSRS=Rhea Springs.

Water Quality Standards

All park waters are designated as “Fish and Wildlife” under the Clean Water Act as promulgated by the state of Tennessee, with exception of the Tennessee River, which is classified as “Recreational.” The Cumberland Piedmont Network uses the Tennessee Recreational standard for *E. coli*, 487MPN/100 mL. There are no state or federal standards for SpC or flow but they are useful in interpreting water quality results.

Parameter	Standard
Water temperature	Less than 30.5°C
Dissolved oxygen	Greater than 5.0 mg/L
pH	Between 6.0 and 8.5 SU
<i>Escherichia coli</i>	Less than 478 MPN/100 mL
Specific conductance	No standard

Future Monitoring

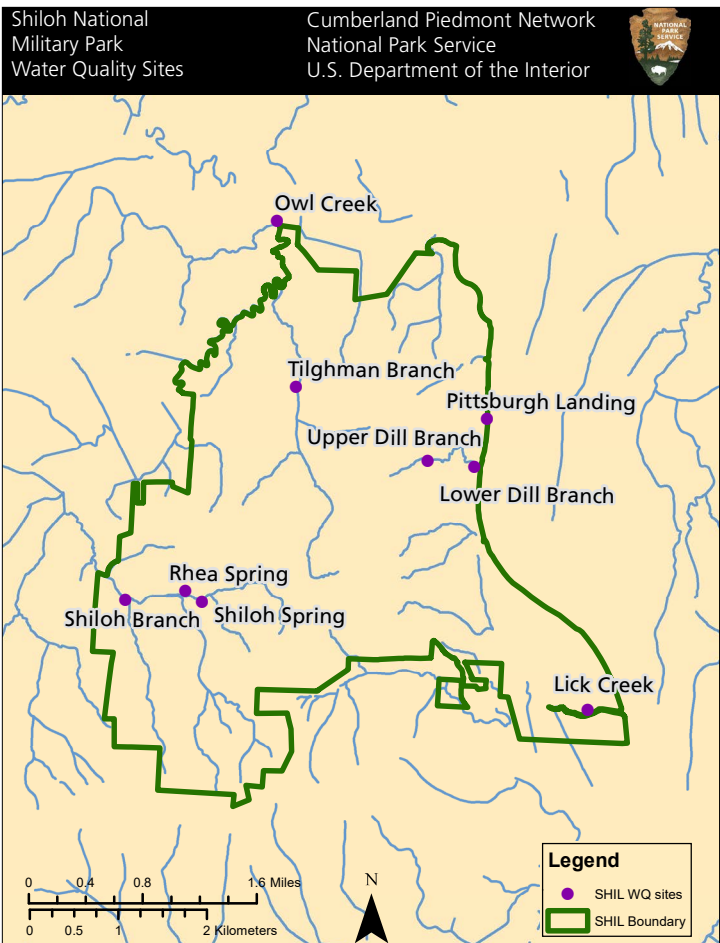
Water quality sampling is scheduled to resume in fiscal year 2026.

About the CUPN

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 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.



Water-quality monitoring sites at Shiloh National Military Park in FY 2020.

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/>

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