Water Quality Monitoring 2022 Data Summary

Overview

The Gulf Coast Network (GULN) Water Quality Monitoring Program began in September 2007. The program monitors 54 sites across seven parks on a set rotation. The GULN Water Quality Monitoring Program was designed to provide an integrated assessment of the spatial and temporal distribution of general water quality conditions of stream and estuary water in relation to hydrologic conditions and major sources.

Spanning 710 kilometers (441 miles), the Natchez Trace Parkway (NATR) is crossed by a multitude of streams. Streams of the parkway are transient and commonly bisect the park for only a few hundred meters. Some streams that cross into the park boundaries are nearly pristine, while others fail to meet state designated use standards. The network began long-term monitoring of water quality at Natchez Trace Parkway in March 2010 with quarterly sampling of 27 core sites. Six additional sites were included in this quarterly sampling on a rotation of every other year. Beginning in 2021 the Gulf Coast Network dropped the rotating design and began sampling all 33 sites (Figure 1) within Natchez Trace Parkway every year. Physical measurements taken at each site include water temperature, specific conductance (SpC), pH, dissolved oxygen (DO), turbidity and nitrate. In addition to the physical parameters collected, water samples are collected for *Escherichia coli* (*E. coli*).

This brief summarizes data collected from January 1 through December 31, 2022. Water quality data are available upon request to the Gulf Coast Network. Past water quality reports and briefs are available on the Gulf Coast Network website (https://www.nps.gov/im/guln/monitoring-reports.htm).

Significant Findings

Highlights of Calendar Year 2022 Monitoring

E. coli was elevated at creeks in all three states the Natchez Trace Parkway crosses (Figure 2). Additionally, elevated nitrogen was detected at several sites within the waterways of Natchez Trace Parkway (Figure 3). While the values for *E. coli* and nitrogen were noted to be elevated, many of the other parameters were found to be indicative of quality freshwater streams and were not of concern during CY2022 monitoring.

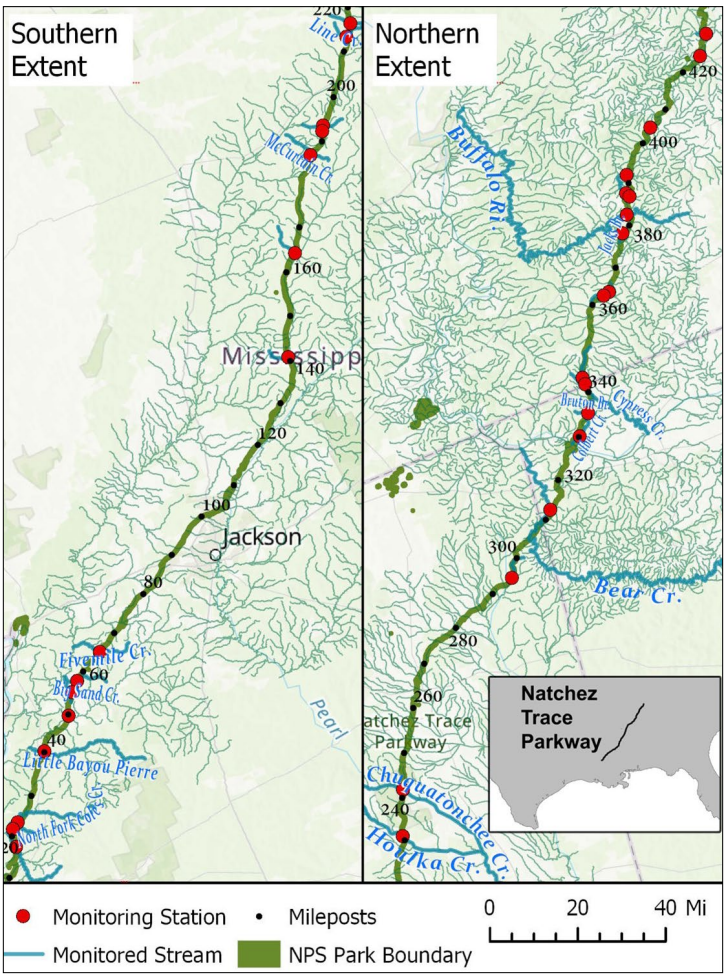


Figure 1. Map of Natchez Trace Parkway water-quality monitoring sites. On the regional inset map, the solid black line shows the full length of the parkway.

E. coli and Nitrogen

E. coli increases are generally associated with increased precipitation events resulting in runoff from nearby terrestrial sources. Agricultural practices, and soil types near Natchez Trace Parkway play a role in influencing inputs during precipitation events. Large increases in *E. coli* are sometimes found during precipitation events primarily from runoff of animal waste from either livestock or native animal populations. Precipitation also results in increased overland flow and loss of exposed soils from agricultural fields and drives erosional processes of loess soils common in the central and southern reaches of the parkway, which may contribute to increases in nitrogen and turbidity during rain events.

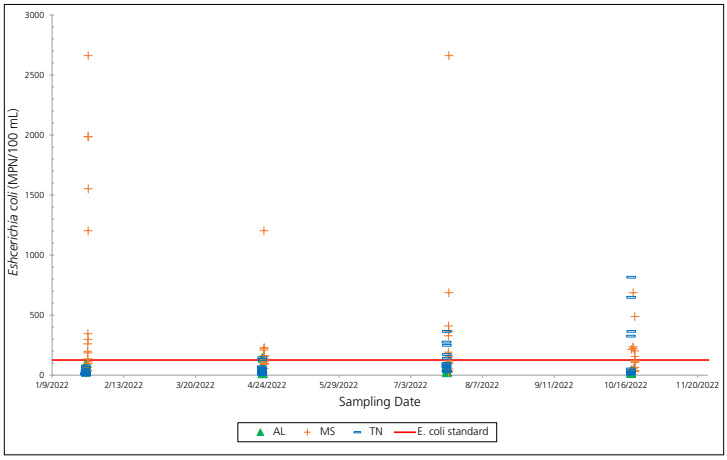


Figure 2. *E. coli* measurements by state location. *E. coli* standards vary between states. Violations are difficult to assess as many states have moved to monitoring on geometric means (5 samples in a 30-day window at ≥ 12 hours apart) or values in exceedance of a specified value in a set percent of total samples with minimum numbers greater than our current sampling frequency.

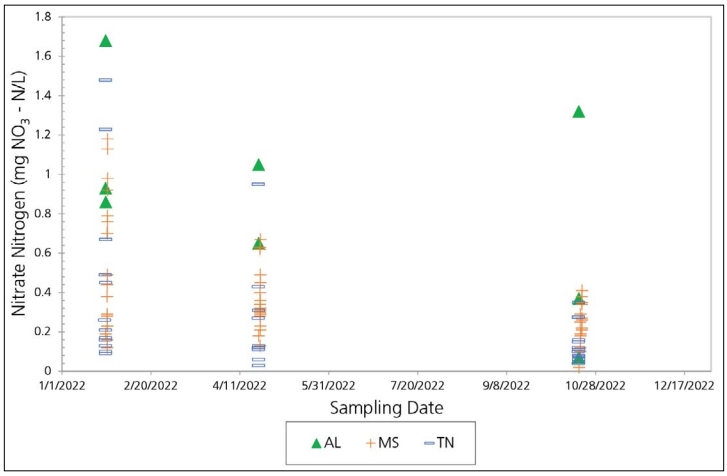


Figure 3. Nitrate (mg N/L) separated by state location. Nitrogen sensor failure in July of 2022 prevented collection of nitrate data. Values have a broad range within most states excluding Alabama sites which were consistently elevated. Areas with increased nitrogen are potentially near agricultural areas that exist outside the park boundaries.

Water Quality Standards

Each stream is assigned a designated use by the state that reflects how the water is used, contact recreation or fish and wildlife for examples. These designated uses are the basis of water-quality standards (Table 1). Note, not all states have developed standards for all parameters.

Table 1. Water quality standards of each state the parkway crosses.

Parameter	Alabama	Mississippi	Tennessee
Water temperature (°C)	< 32.0	< 32.2	< 30.5
Dissolved oxygen (mg/L)	> 5.0	> 5.0	> 5.0
pH (range)	6.0–8.5	6.0–9.0	6.0–9.0
Specific conductance (SpC, µS/cm)	NA	NA	< 1000
E. coli (MPN/100 mL, geometric means)	< 126	< 126	< 126
Turbidity	> 50	> 50	NA

Future Monitoring

Water quality sampling will continue with quarterly sampling through 2023.

About the Gulf Coast 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 ecosystems,
- 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 toward performance goals.

Gulf Coast Network Website
(https://www.nps.gov/im/guln/index.htm)
Gulf Coast Network Reports and Publications
(https:// www.nps.gov/im/guln/reports-publications.htm)
About the NPS Inventory & Monitoring Program
(https://www.nps.gov/im/index.htm)
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