



Water Quality Monitoring 2019 Data Summary

Overview

The Gulf Coast Network (GULN) Water Quality Monitoring Program began collecting samples in September 2007. The program was developed primarily from protocols of the U. S. Geological Survey (USGS) National Water Quality Assessment Program and the Texas Commission of Environmental Quality's (TCEQ) Surface Water Quality Monitoring Program. The GULN program monitors 54 sites across seven parks which are sampled on a set rotation.

The GULN Water Quality Program was designed to provide an integrated assessment of the spatial and temporal distribution of general water-quality conditions and the transport of major inorganic constituents of stream and estuary water in relation to hydrologic conditions and major sources.

The network began long-term monitoring of water quality at Big Thicket National Preserve with quarterly sampling in October 2007. Quarterly sampling continued from October 2007 to September 2013. Beginning in October 2013 and lasting until September 2017, sampling shifted from quarterly to monthly. In October 2017 monitoring was decreased from monthly to every other month sampling at the following sites: Menard Creek, Big Sandy Creek, Little Pine Island Bayou, Turkey Creek, Village Creek at McNeely Bridge and Village Creek State Park (Figure 1). Field measures include water temperature, specific conductance (SpC), pH, dissolved oxygen (DO) and turbidity. Samples are collected for *Escherichia coli* (*E. coli*), chloride, sulfate, total suspended solids, alkalinity, ammonia, nitrate, and nitrite.

This brief summarizes data collected from January 1, 2019 through December 31, 2019. 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/water-quality.htm) (<https://www.nps.gov/im/guln/water-quality.htm>).



Above: Village Creek at State Park. NPS photo.

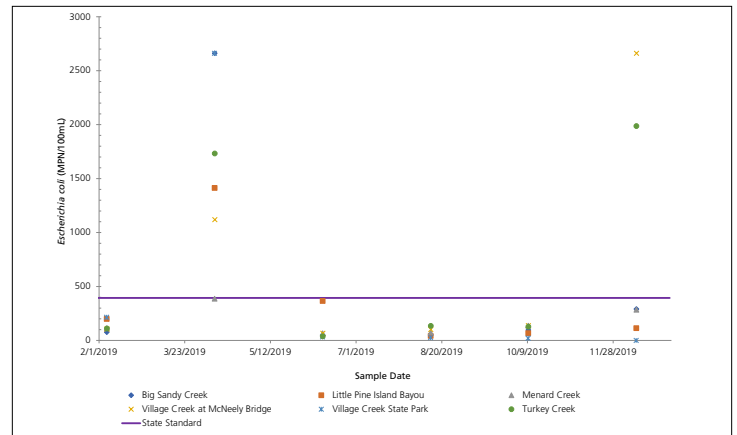


Figure 1. *E. coli* measurements for Big Thicket National Preserve. Purple horizontal line represents state standard for exceedance of bacterial detection (394 MPN/100 mL) with several sampling sites exceeding the state standard.

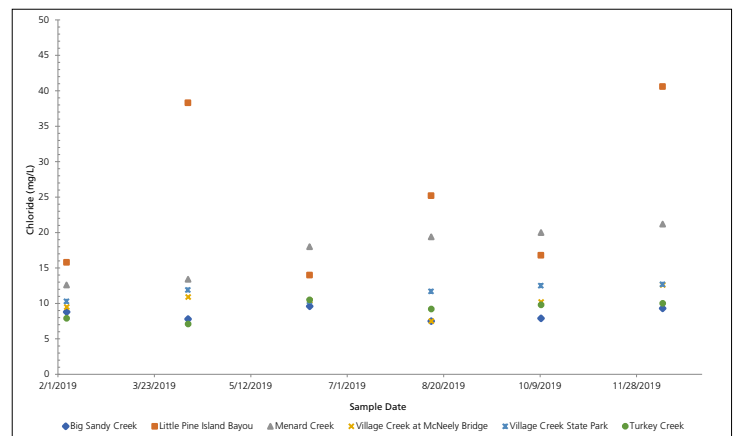


Figure 2. Chloride values at all sites in Big Thicket. Values are not in exceedance of state standards, but are elevated at Little Pine Island Bayou compared to historical data.

Significant Findings

Highlights of Calendar Year 2019 Monitoring

There were eighteen violations of state water quality standards and screening limits documented during 2019. *E. coli* was detected above the state criteria seven times with violations occurring at all sites except Turkey Creek (Figure 1). High turbidity was documented six times total over the course of the sampling year with violations at Big Sandy, Village Creek at McNeely Road, Village Creek at McNeely Bridge, and Little Pine Bayou (three times). The pH of two samples were below the lower limit of 6.0 SU; however, low pH is natural to all wadeable streams of the preserve and thus does not constitute an actual violation. DO concentrations below the limit of 3.0 mg/L were reported at Little Pine Island Bayou at Lance Rosier three times in 2019. The state's proposed screening limit for ammonia was exceeded once at Little Pine Island Bayou.

Significant Findings (continued)

Elevated Chloride

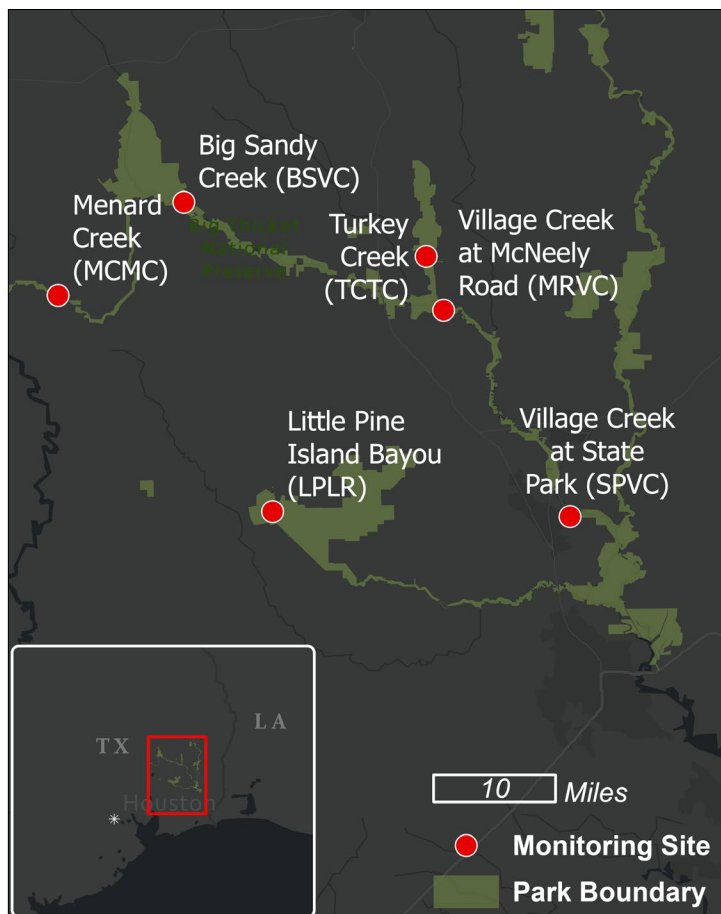
We previously observed elevated chloride at Little Pine Island Bayou and at Menard Creek. In 2019, chloride was still elevated at Little Pine Bayou, but not at Menard Creek. Specific conductance was also found to be elevated. While neither the chloride values nor the specific conductance reported exceed state standards, they are elevated compared to historical data for water samples within the park. High chloride is likely from brines, a byproduct of hydrocarbon exploration/extraction. The preserve previously notified the Texas Railroad Commission (the state authority pertaining to oil and gas), regarding water quality issues potentially related to industry work near the park boundaries. If chloride values exceed state standards GULN staff will work with park staff to identify the source of contamination.

Future Monitoring

Water-quality sampling will continue every other month through 2020.

Water Quality Standards

The state of Texas designates the waters of the Preserve as “High Aquatic Life Use”. Village Creek is further designated as “Primary Contact Recreation” and as a public water supply, while the rest of the streams are designated “Secondary Contact Recreation” (low likelihood of ingesting water). Designated uses are used to set water quality standards. Temperature and sulfate standards are different for Pine Island Bayou (LPLR) than the remaining five sites on Village and Menard Creeks. DO has a higher standard in the spring than the rest of the year.



Map of Big Thicket National Preserve water quality monitoring sites.

Below: Field measurements and state standards.

Field Measurements	State Standard
Ammonia as N	Screening < 0.33 mg/L
Chloride	< 150 mg/L
Specific conductance	No state standard
Dissolved oxygen	> 3.0 mg/L Spring season: > 4.5 mg/L
<i>E. coli</i>	< 394 MPN/100 mL
Nitrite as N	Screening < 1.95 mg/L
pH	Between 6.0 and 8.5 SU
Phosphorous, total	Screening < 0.69 mg/L
Sulfate	< 50 mg/L (Little Pine Island Bayou), < 75 mg/L (Village and Menard Creek)
Total Dissolved Solids	< 300 mg/L
Water temperature	< 35°C (Little Pine Island Bayou) < 32.2°C (Village and Menard Creek).

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 towards 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>

Data Downloads via the Natural Resource Information Portal:

<https://irma.nps.gov>