



Water Quality Summary, 2016

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 and the Texas Commission of Environmental Quality's Surface Water Quality Monitoring Program. The GULN program monitors 54 sites across seven parks which are sampled on set rotation.

The GULN Water Quality Program is 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 Vicksburg National Military Park in August 2007. Water quality is measured by park or network staff every quarter at three sites: Durden Creek, Glass Bayou at Union Avenue, and Upper Mint Springs Bayou at Connecting Road above the falls. Field measures include water temperature, specific conductance (SpC), pH, dissolved oxygen (DO) and turbidity.

Vicksburg National Military Park drains via three small, perennial streams: Mint Spring Bayou, Glass Bayou, and Durden Creek, as well as numerous ephemeral and seasonal streams. Mint Spring and Glass Bayou drain into the Yazoo River while Durden Creek flows into Hatcher Bayou, which flows into the Mississippi River. Mint Spring Bayou is divided into the upper and lower reaches by a 10-meter high (33-foot) waterfall



Figure 1. Upper Mint Springs Bayou cascades over the lower falls, January 24, 2016. Image by Joe Meiman.

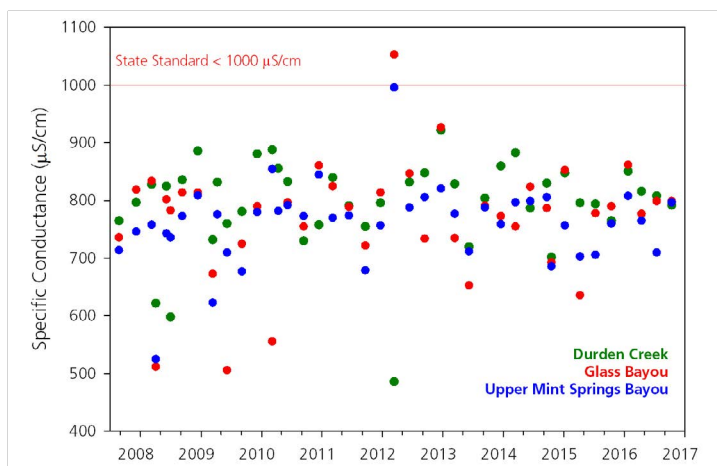


Figure 2. Specific conductance (SpC) at Vicksburg National Military Park 2007-2016.

(Figure 1). This waterfall, located adjacent to the Vicksburg National Cemetery, forms a natural impediment to upstream fish movement. Only one species of fish, the exotic fathead minnow (*Pimephales promelas*), exists above the falls. All park streams respond immediately to rainfall events which means clear base-flow gives way to extremely turbid storm flow as the steeply sloped loess terrain provides ample runoff.

This brief highlights data collected from January 1, 2016 through December 31, 2016. Water quality data are available upon request to the Gulf Coast Network or our website: <http://science.nature.nps.gov/im/units/guln/index.cfm>.

Significant Findings

Highlights of Calendar Year 2016 Monitoring

All monitored parameters were within acceptable levels during monitoring activities in 2016. Park streams are generally well-aerated and have high dissolved oxygen. Stream pH and turbidity have in previous years occasionally exceeded the state maximum of 9.0 standard units and 50 NTU respectively, but none were reported in 2016.

Carbon Dioxide Out-Gassing Forms Waterfall Tufa

Specific conductance of park streams is naturally high, as watersheds are predominantly underlain by Cenozoic limestone and groundwater highly influences stream chemistry. Limestone (CaCO_3) is dissolved by rainfall and thus increases the streams' ionic load (primarily calcium and bicarbonate ions), elevating SpC (Figure 2). This is a natural characteristic of park waters. The high dissolved load of CaCO_3 is manifested as tufa, a porous limestone formed by chemical precipitation of calcite, at the Upper Mint Springs Bayou site (Figure 1). As water saturated with CaCO_3 cascades over a limestone ledge it out-gasses CO_2 and becomes super saturated and precipitates calcite as tufa.

Water Quality Standards

The state of Mississippi has not assigned specific designated uses, which are used to set water quality standards, for park streams. By adapting the same rationale as used by the state, Mississippi Fish and Wildlife standards can be applied to park streams.

Parameter	Criteria
SpC	< 1,000 $\mu\text{S}/\text{cm}$
Dissolved oxygen	> 4.0 mg/L
pH	Between 6.0 and 9.0 SU
Turbidity	< 50 NTU
Water temperature	< 32.2°C

Future Monitoring

Quarterly water-quality sampling will continue through calendar year 2017.

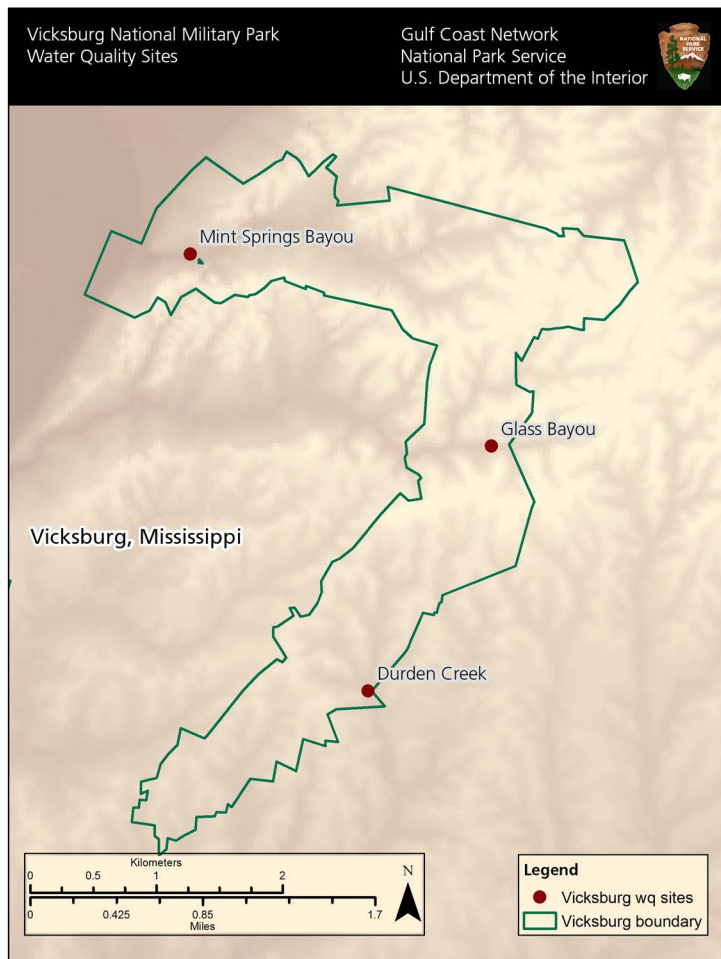


Figure 3. Map of Vicksburg National Military Park water-quality monitoring sites.

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 Gulf Coast 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

GULN Home Page:

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

GULN Reports & Publications:

<http://science.nature.nps.gov/im/units/guln/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>