



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 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 San Antonio Missions National Historical Park in October 2008. Water quality is measured bi-monthly at four park sites—Acequias Espada, Acequias San Juan, Piedras Creek, and the San Antonio River at San Juan Mission—through a contract with the San Antonio River Authority. Monitoring is conducted concurrently with that of the Upper San Antonio River Texas Clean Rivers Program (CRP). Parameters are the same as the Upper San Antonio River and include standard field measures (water temperature, specific conductance [SpC], dissolved oxygen [DO] and pH) and laboratory analysis for key ions and nutrients.

In a semiarid land like south-central Texas, the spring-fed San Antonio River has been a cultural oasis for centuries. The importance of this water is evident throughout the 334 hectares (826 acres) of San Antonio Missions National Historical Park. Indeed, the Missions would not have been built if not for the river. Missionaries and the Coahuiltecan irrigated their fields via an intricate system of acequias. Acequias are gravity-driven ditches tapped into the river above low-head dams. Missions also held large grazing areas, heavily reliant on surface water, including Mission Espada's Rancho de las Cabras, located about 80 kilometers (50 miles) downstream at the confluence of Picoso Creek and the San Antonio River.



Figure 1. A San Antonio River Authority hydrologist records water-quality data at Piedras Creek under the Acequia Espada aqueduct, June 22, 2016. Image by San Antonio River Authority.

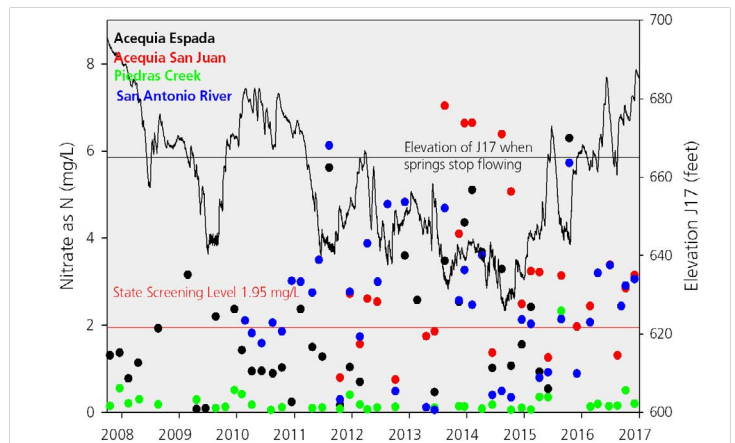


Figure 2. Relationship between nitrate at San Antonio Missions National Historical Park and the elevation of Edwards Aquifer Authority J17 2007-2016.

Few other parks in the country have experienced as much alteration, modification, or development of the watershed and surrounding area as the San Antonio Missions National Historical Park. The park is bounded by a metropolitan area with nearly every conceivable land use present. The 2010 U.S. Census reports populations of 1.3 million in San Antonio and 1.7 million in Bexar County. The park receives urban and highway runoff as well as drainage from countless other non-point sources.

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

Significant Findings

Highlights of Calendar Year 2016 Monitoring

Water was an essential feature in the location of any mission or presidio and a major factor in establishing Mission San Antonio de Valero, the first of five missions along the spring-fed San Antonio River, in 1718. Today this relationship has changed. Water is extracted from the aquifer to such a point where these same springs don't always flow, although the river does. The Upper San Antonio River is supplemented by the addition of reuse water (highly treated sewage plant effluent) and at times, this internationally famous water course is 100% reuse water.

While water managers have done an outstanding job at improving water quality by reducing runoff, there are still times when water quality exceeds state standards. Bi-monthly sampling of our four routine sites found 36 exceedances of state limits in 2016. Sixteen times the nitrate screening level of 1.95 mg/L was surpassed—including each sample from the San Antonio River and Acequia Espada. Each site exceeded the state standard for *Escherichia coli* three times. These samples were all associated with runoff events following rainfall. Dissolved oxygen was below the state standard in Acequia Espada on each occasion reflecting the poorly aerated conditions of the ditch.

Significant Findings (continued)

Relationship between Nitrate and Water Table Elevation

As the elevation of the Edwards Aquifer water table drops (as monitored by the Edwards Aquifer Authority at well J17), nitrates rise in the San Antonio River and its acequias (Figure 2). When the aquifer drops below 665' elevation at J17 the river's headwater springs cease to flow and the river must be supplemented by reuse water if flow is to be sustained. Reuse water is considerably higher in nutrients such as nitrate compared to that of native spring water. As the water table rises above 665' the flow returns to the springs and nitrate levels decrease. Note that Piedras Creek, which is not supplemented by reuse water, does not show this pattern.

Water Quality Standards

Parameter	Criteria
Ammonia*	Screening < 0.33 mg/L
Chloride	Screening < 150 mg/L
Dissolved oxygen	> 5.0 mg/L
Nitrate	< 1.95 mg/L
pH	Between 6.5 and 9.0 SU
Sulfate	< 150 mg/L
Water temperature	< 32.2°C

*proposed state screening level

Future Monitoring

Bi-monthly water quality sampling will continue throughout fiscal year 2017.



Figure 3. Map of San Antonio Missions National Historical Park water-quality monitoring sites.

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 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>