



Water Quality Monitoring 2020 Data Summary

Overview

The Gulf Coast Network (GULN) Water Quality Monitoring Program began in September 2007. The program monitors 54 sites across seven parks which are sampled on 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.

The network began long-term monitoring of water quality at Padre Island National Seashore (PAIS) with continuous autonomous sampling in May 2008 and monthly grab sampling in October 2010. Two sites in the Upper Laguna Madre, South Bird Island and Baffin Bay (see map on next page), are located on Texas Coastal Oceanic Observation Network structures and are operated through a task agreement with the Conrad Blucher Institute at Texas A&M University-Corpus Christi (referred to as cooperators). Autonomous measures, collected every 15 minutes, include water temperature, specific conductance (SpC), pH, dissolved oxygen (DO), and turbidity. Grab samples are collected for a common suite of nutrients standard to the Gulf of Mexico Alliance, a state-led network of partners working on priority issues along the Gulf Coast. These data are integrated into our routine seagrass monitoring program to better understand estuary health.

This brief summarizes data collected from January 1, 2020, through December 31, 2020. Calendar year 2020 was a trying year for sampling frequency and opportunities due to the COVID19 pandemic outbreak. GULN staff and cooperators sampled as frequently as possible while taking into consideration public health decisions, but the total number of samples collected in this particular year for many monitoring programs are reduced compared to other years. Our sampling schedule at PAIS survived entirely intact. 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) (<https://www.nps.gov/im/guln/monitoring-reports.htm>). Continuous real-time data are available at <http://lighthouse.tamucc.edu/qc/170> and <http://lighthouse.tamucc.edu/qc/171>.

Significant Findings

Highlights of Calendar Year 2019 Monitoring

The Upper Laguna Madre is seemingly removed from direct human influence aside from a maintained channel (Gulf Intracoastal Waterway) and a scattering of fishing camps. While this estuary is considered pristine, our data show that water quality parameters typically exceed state water quality standards. In 2020, there were multiple violations within the Upper Laguna Madre for chlorophyll-*a*, and ammonia.

Ammonia

Ammonia violations were similarly elevated to previous years (2017–2019). Ammonia exceeded water quality limits for the entire year of 2020 at both sampling locations (Figure 1). While ammonia is the preferred form of nitrogen for biological uptake by plants and phytoplankton, it is found in lower proportions to nitrate and nitrite due to conversion processes by bacteria and preferential uptake/utilization. Sources for ammonia include waste products by animals (direct deposition and fertilizer runoff), domestic waste sources, and

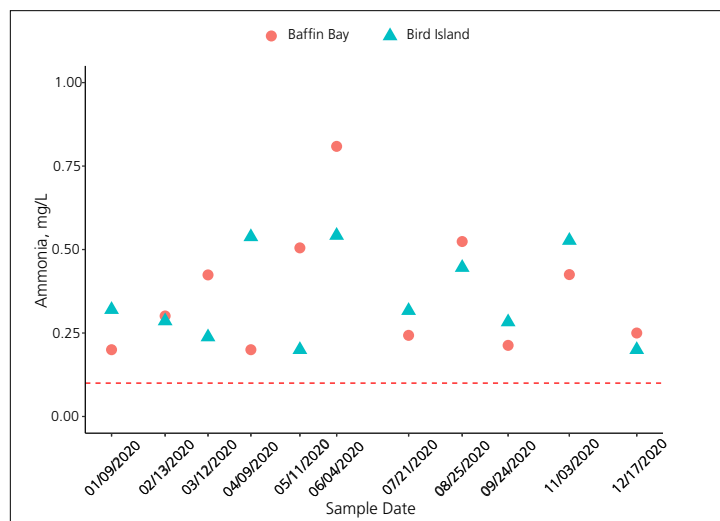


Figure 1. Ammonia measurements for 2020. Ammonia continues to be in exceedance of state nutrient criteria and has been over the past few years beginning in late 2016 and continuing through 2020. The water quality standard provided by the state is represented by the dashed red line.

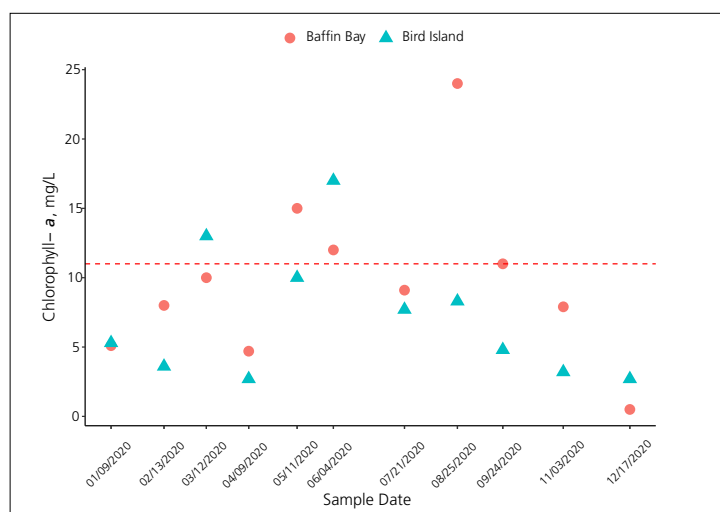


Figure 2. Chlorophyll-*a* measurements at both monitoring site within the Laguna Madre at Padre Island National Seashore. Chlorophyll-*a* exceeded state water quality criteria between May and August of 2020 denoted by the red dashed line on the figure.

Significant Findings (continued)

industrial or agricultural pollution. Unfortunately, ammonia is highly toxic to aquatic organisms and data collected from 2015 to 2020 may demonstrate a continued elevated level of ammonia occurring within the Laguna Madre near the monitoring sites.

Chlorophyll-a

Chlorophyll-a is a proxy measure of phytoplankton (microscopic plants, also generally referred to as algae) in the water column. Increased nutrient availability in a waterbody may result in increases in phytoplankton measurable as an increase in chlorophyll-a. Extensive increases in phytoplankton may become an algal bloom that results in damage to aquatic organisms, and potential health risks for people. There were five total violations occurring at Padre Island NS, split between our monitoring sites. All violations occurred between May and August when water temperatures are elevated providing additional energy for phytoplankton. Figure 2 shows chlorophyll-a levels at GULN sites at Padre Island National Seashore

Water Quality Standards

The state of Texas designates the Laguna Madre as “Exceptional/Oyster” waters. Although oysters are no longer found in the Upper Laguna Madre, the state gives this estuary the highest possible criteria. Designated uses are used to set water quality standards (below). Details and rationale can be found at Texas Administrative Code Chapter 307: Texas Surface Water Quality Standards §§307.1–307.10.

Below: Field measurements and state standards.

Field Parameters	Water Quality Standard
Ammonia as N	< 0.10 mg/L
Chlorophyll-a	< 11 mg/m³
Dissolved oxygen	> 5 mg/L
Nitrite as N	< 0.17 mg/L
pH	Between 6.5 and 9.0 SU
Phosphorous, total	< 0.21 mg/L
Water temperature	< 35°C

About the Gulf Coast Network

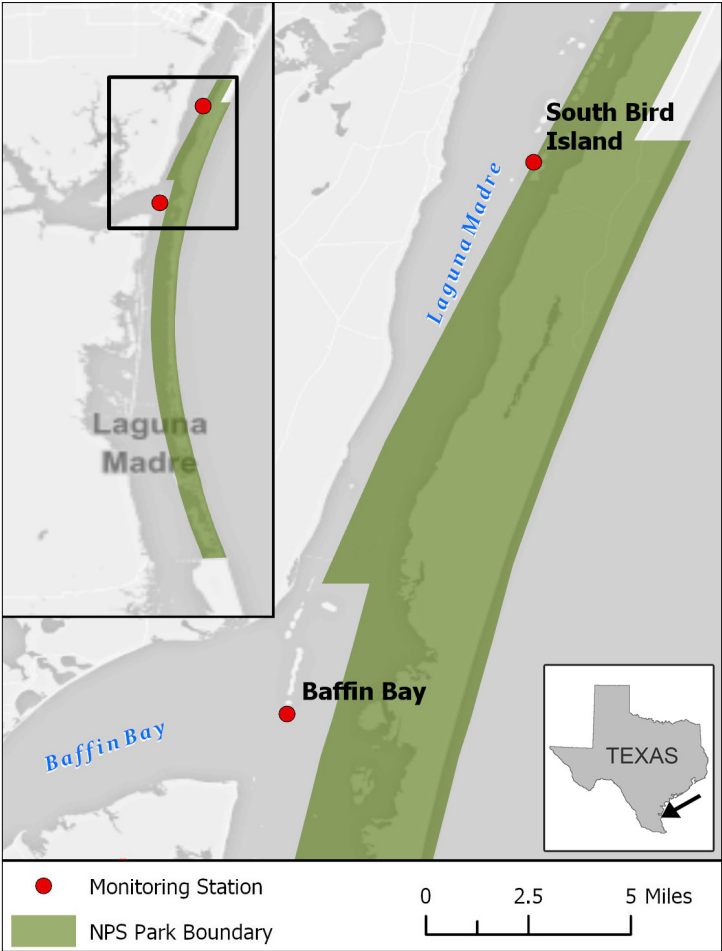
In 1999, the National Park Service initiated a long-term ecological monitoring program, known as “Vital Signs Monitoring,” to provide the minimum infrastructure to allow more than 270 national park system units to identify and implement long-term monitoring of their highest-priority measurements of resource 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,

Future Monitoring

Monthly water quality sampling will continue through 2021.



Map of GULN sampling sites at Bird Island and Baffin Bay and their locations within the Upper Laguna Madre near Padre Island in Texas.

- 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>