



Seagrass Monitoring Program Summary

Network Parks Where Monitoring Occurs

Gulf Islands National Seashore (GUIS) and Padre Island National Seashore (PAIS).

Importance and Monitoring Objectives

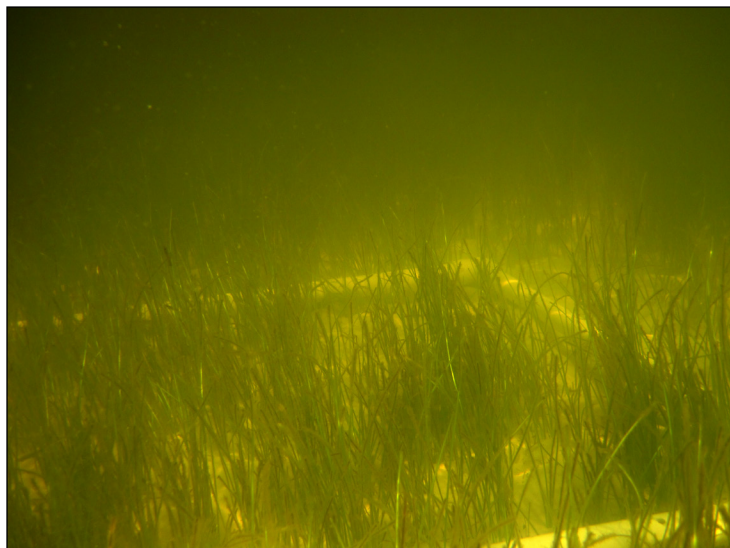
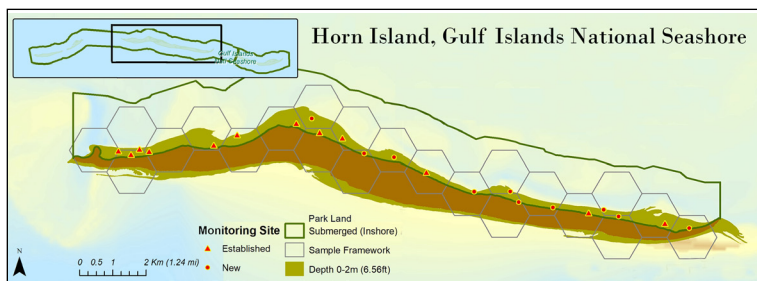
Seagrass beds in the northern Gulf estuaries of Gulf Islands and Padre Island National Seashores are high-productivity habitats that support diverse marine lifeforms, including many fish and crustacean species that are commercially important. Seagrasses also improve water quality through transpiration of oxygen and help stabilize the sea floor. Worldwide, seagrass beds are declining in both extent and density due to physical disturbance and water quality degradation caused by watershed development. The Gulf Coast Network therefore collects long-term data on seagrasses in its parks, with the primary objective of monitoring changes in seagrass percent cover, community species composition, and leaf length. A secondary objective involves recording ancillary data (e.g., water transparency, salinity) to test for associations with seagrass metrics over time. The final objective is to participate in regional seagrass monitoring when fiscally possible.



Field technician sampling a seagrass bed at Gulf Islands National Seashore.

Basic Approach

The Gulf Coast Network monitors seagrass at 170 permanent stations: 64 at PAIS, 60 in GUIS-Florida and 46 in GUIS-Mississippi. Station locations were selected using hexagonal grids overlaid on known seagrass beds. Each grid cell was assigned one random point within its seagrass area, to maximize spatial coverage (example map below). The stations are not physically marked but are located using GPS. Parks are sampled once every three years. When visiting each station, the crew measures % cover per species and leaf length within four 0.5 x 0.5 m plots and then averages data over the four plots. Ancillary data are also collected on-site: water temperature, salinity, dissolved oxygen, photosynthetically active radiation (used with depth to measure water transparency), pH, chlorophyll *a* and total suspended solids.



Seagrasses with submerged frame for estimating percent cover.

Seagrass Species as Ecological Indicators

Five species of seagrasses are found in Gulf Islands National Seashore and Padre Islands National Seashore: shoal grass (*Halodule wrightii*), manatee grass (*Syringodium filiforme*), widgeon grass (*Ruppia maritima*), turtle grass (*Thalassia testudinum*) and star grass (*Halophila engelmannii*). These species can co-occur in seagrass beds throughout the region, and the extent and density of these beds are valuable indicators of ecosystem health because they respond rapidly to environmental stressors and changes. Important natural stressors include temperature, salinity, sea level rise, rainfall and wave action; relevant anthropogenic stressors include boat propellor scrapes, agricultural runoff, aquaculture, hydrologic modification and development. By measuring percent cover, community composition, mean length of each seagrass species and ancillary data, the network can track the condition of the resource over time. Using thresholds by Congdon et al. (2018), the network summarizes results using an Ecological Integrity Scorecard, as shown on the next page.



Thalassia testudinum at Gulf Islands National Seashore.

Ecological Integrity Scorecard, Example

The thresholds for each variable are from Congdon et al. (2018). For variables where % change is monitored, change is measured as $((\text{variable time}_1 - \text{variable time}_0) / \text{variable time}_0) \times 100$, with two years passing between the two measurements. Variables are park (PAIS) or unit-wide (GUIS-FL, GUIS-MS) averages.

Variable: Thresholds, Best to Worst	Excellent/ Good	Fair	Poor
Seagrass % Cover , % Change in % Cover: If plots dense (>50%): 0-25, < -25, >-25%. If plots sparse: < -10, NA, > -10	green		
Seagrass Species Composition , Measured as Change in Species Dominance Index: 0, < -0.25, > -0.25		orange	
Shoot Allometry , Measured as % Change in Canopy Height per Plot by Species: <10, 10-25, >25%		orange	
Phytoplankton Biomass , Measured as ug/L Chlorophyll a Concentration: <10, 10-25, >25		orange	
Water Transparency , Measured as % Surface Irradiance of the Water: >30, 30-20, <20%	green		
Sediment Load , Measured as mg/L of Total Suspended Solids: <15, 15-25, >25		orange	



Left: *Syringodium filiforme* at Padre Island National Seashore.

Above: View over a seagrass bed at Padre Island National Seashore. Photos by Joe Meiman/NPS.

Citation: Congdon, V.M., K.H. Dunton, J. Brenner, K.L. Goodin, and K.W. Ames. 2018. Ecological Resilience Indicators for Seagrass Ecosystems. In Goodin, K.L. et al., Ecological Resilience Indicators for Five Northern Gulf of Mexico Ecosystems. NatureServe, Arlington, Virginia.

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:

1. Determine the status and trends in selected indicators of the condition of park ecosystems,
2. Provide early warning of abnormal conditions,
3. Provide data to better understand the dynamic nature and condition of park ecosystems,

4. Provide data to meet certain legal and congressional mandates, and
5. Provide a means of measuring progress towards performance goals.

Effective long-term management and stewardship of natural resources begins with baseline knowledge of these resources and a scientifically-rigorous understanding of how they change over time. In collaboration with park staff and other stakeholders, the Gulf Coast Network strives to meet this need for the eight parks in its region. The network’s geographic region encompasses portions of Florida, Alabama, and Tennessee, all of Mississippi and Louisiana, and the southeastern quarter of Texas.

For more information

GULN Home Page:
<https://www.nps.gov/im/guln/index.htm>

About the NPS Inventory & Monitoring Division:
<https://www.nps.gov/im/index.htm>