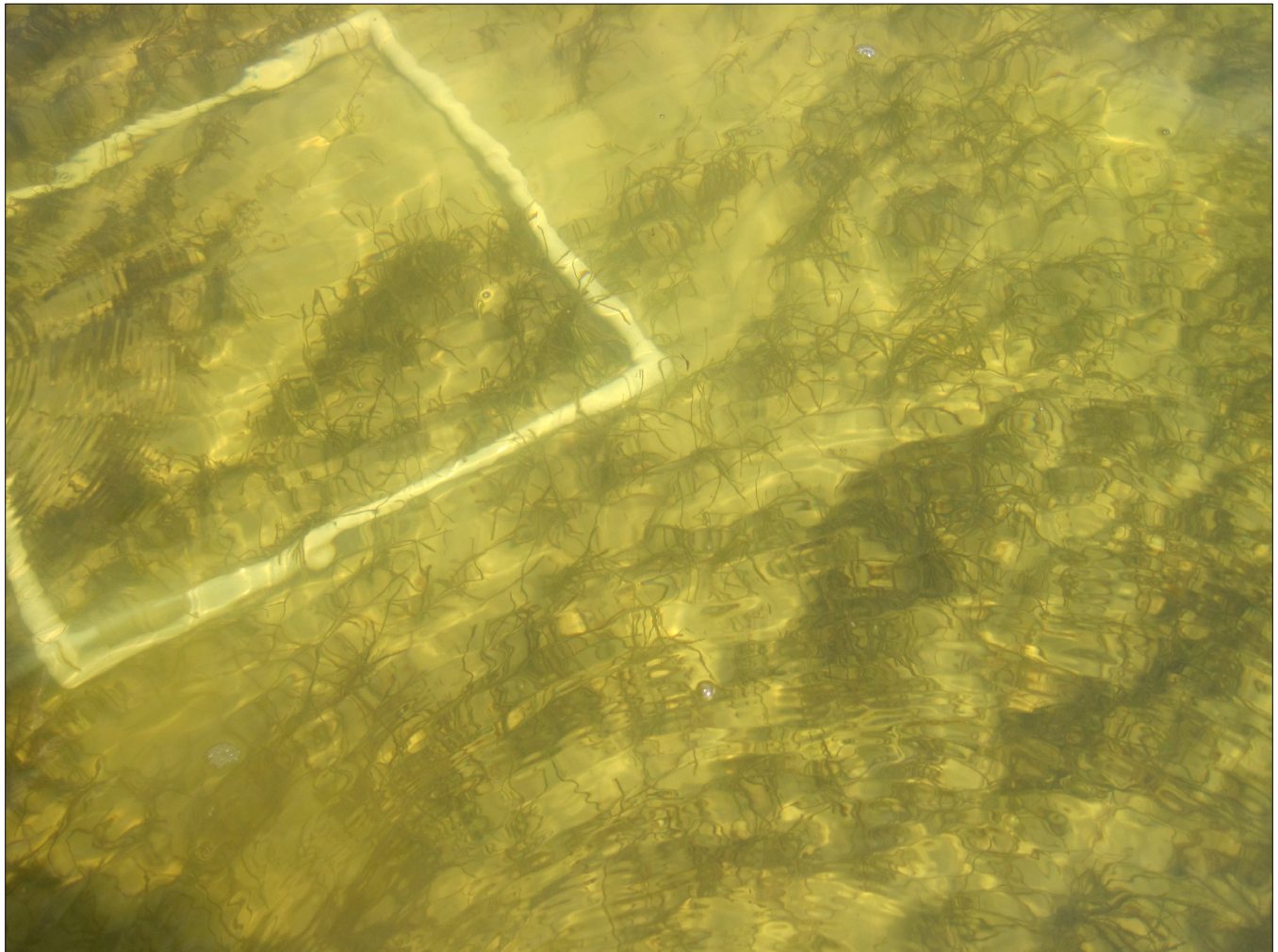




Monitoring Seagrass in National Parks of the Gulf Coast Network

Data Quality Standards

Natural Resource Report NPS/GULN/NRR—2019/1970



ON THE COVER

Halodule wrightii, Gulf Islands National Seashore.

Photo credit: Joe Meiman, NPS GULN

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Data Quality Standards

Natural Resource Report NPS/GULN/NRR—2019/1970

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Introduction and Summary

The purpose of this report is to document the standards used by the Gulf Coast Network for activities related to the collection, processing, storage, analysis, and publication of monitoring data as described in *Monitoring Seagrass in National Parks of the Gulf Coast Network: Protocol Narrative* (Meiman and Segura 2019). This report and the associated quality assurance plan (QAP; forthcoming) are meant to serve as a single source, independent of the protocol, for understanding how data are collected, processed, reviewed, subjected to quality control, stored and presented—and to what standards of accuracy—so that any associated datasets can be analyzed and reported on correctly. The plan also serves as a programmatic guide and resource for identifying publications and other literature that describe associated techniques and requirements in more detail. Additional information on the overall purpose of this document and the QAP are provided in the National Inventory & Monitoring Division Quality Management Plan (in development).

Protocol Overview

During network vital signs selection, both Gulf Islands National Seashore (GUIS) and Padre Island National Seashore (PAIS) recognized the importance of monitoring seagrass meadows, both as indicators of ecosystem health (Segura et al. 2007) and to further ongoing cooperative efforts of state and federal agencies to monitor seagrass communities that began in 1999 (Dunton et al. 2011).

Gulf Islands National Seashore (GUIS) consists of a group of islands and associated coastal waters that lie south of Gulfport and Pascagoula, Mississippi; and south and east of Pensacola, Florida. Padre Island National Seashore (PAIS) consists of a 112.6-kilometer (70.2-mile [mi]) barrier island protecting the Laguna Madre southeast of Corpus Christi, Texas. Both parks contain significant aquatic resources, including extensive seagrass meadows, which have been identified as key resources for monitoring by the network (Segura et al. 2007).

Monitoring seagrass not only provides crucial information on the species themselves, but can also be indicative of habitat changes with the parks' estuaries. These data will also contribute to regional and national databases that further our understanding of seagrass condition. Seagrass meadows exhibit high productivity and contribute valuable ecosystem functions and services to coastal waters (Hemminga and Duarte 2000). Seagrass meadow extent and densities are declining worldwide due to direct physical disturbance and indirect effects of watershed development resulting in water quality degradation (Orth et al. 2006; Waycott et al. 2009). Waycott et al. (2009) estimated that 29% of the global seagrass habitat has disappeared over the past 100 years. Recognition of these losses has led to a proliferation of seagrass monitoring efforts around the world (Neckles et al. 2012).

The Northern Gulf estuaries of Gulf Islands and Padre Island National Seashores range from the hypersaline Upper Laguna Madre of south Texas through the Mississippi Sound to the lagoons and sounds of west Florida. These estuaries support five species of seagrasses, providing habitat for primary production trophic levels up through top end predators. Seagrasses also change the physiochemical characteristics of estuarine waters through transpiration of oxygen.

The primary objective for monitoring seagrass at Gulf Islands and Padre Island National Seashores is to monitor changes in seagrass percent cover, community species composition, and leaf length. The secondary objective is to collect ancillary data (physio-chemical measurements of the water column) in order to determine relationships between seagrass percent cover, species composition, and leaf length and the ancillary data. An additional programmatic objective is to participate in regional seagrass monitoring when fiscally possible.

The protocol is based on implementing methods used in the Texas statewide seagrass monitoring program (Dunton et al. 2011). Dunton et al. (2011) is, in large part, an application of the rationale and methods detailed in Kopp and Neckles (2009) and Neckles et al. (2012), establishing a three-tiered monitoring program: Tier 1 is remotely sensed mapping of seagrass extent, Tier 2 is broad scale rapid assessment using repeated visits to fixed stations to collect field indicators of seagrass condition and water quality; and Tier 3 entails detailed subsampling of transects to determine cause of changes to seagrass condition. The GULN protocol consists of Tier 2 monitoring.

Monitoring Event Reports will be produced (within six months from data submittal from cooperator or contractor) for each park sampled in a given year describing the sampling effort and the summary metrics, and containing maps described in SOP SEA07 *Data Analysis and Reporting—Version 1.0* (Carlson and Meiman 2019). The network will summarize data and compare to ecological integrity assessment points as described in Congdon et al. (2018). Each ecological integrity metric is assigned a rating (described in SOP SEA07 *Data Analysis and Reporting—Version 1.0*). Seagrass Change Analysis Reports will be produced for each park after three sampling events and compare results over the full data collection period, exploring patterns and correlations over time involving the ancillary data and focal seagrass metrics (described in SOP SEA07 *Data Analysis and Reporting—Version 1.0*).

Protocol Activities and Modules

Data are collected or derived as a part of *Monitoring Seagrass in National Parks of the Gulf Coast Network: Protocol Narrative* (Meiman and Segura 2019) in six different activities or modules (Table 1).

Table 1. Protocol activity matrix for *Monitoring Seagrass in National Parks of the Gulf Coast Network: Protocol Narrative* (Meiman and Segura 2019).

Activity Category	Activity number	Activity detail	Description
Field Observations	1	General sampling event documentation	Date, time, location, and environmental conditions including temperature, estimated wind speed, cloud cover, and notes of any pertinent observations.
	2	Site observational data	Water depth at station using survey rod, and Secchi depth.
	3	Quadrat data	At four 0.25 m ² quadrats, identify species present (5 species known in the northern Gulf of Mexico). Measure percent cover for each species present. Measure average (n=5) shoot length of each species present.
Sensor Data	4	Water quality data	Photosynthetically Active Radiation (PAR) using LI-COR or equivalent. Instantaneous measures of water temperature, dissolved oxygen, pH, salinity, and chlorophyll <i>a</i> . Field collection of water sample for total suspended solids (TSS).
Laboratory Data	5	Total suspended solids	Use USEPA Method 160.2.
Derived Data	6	Averaged site data	Average of percent cover by species from the 4 quadrats, and average of the 5 shoot lengths per quadrat measured for each species.

Sampling Design

Information regarding the sampling design is provided in Table 2.

Table 1. Activity-level sample design matrix for *Monitoring Seagrass in National Parks of the Gulf Coast Network: Protocol Narrative* (Meiman and Segura 2019) [m—meters].

Activity Category	Activity number	Activity Detail	Sampling Design	Revisit Design
Field Observations	1	General sampling event documentation	Probability-based survey design using a grid of tessellated hexagons (750 m edges) with a randomly chosen geospatial coordinate that denotes each cell's permanent station and that produces a set of spatially balanced stations. Randomly chosen station must be sampleable (no more than 2 m deep and within seagrass areas at PAIS, and no more than 2 m deep and within park boundaries at GUIs).	Points are sampled every three years.
Field Observations	2	Site observational data	Same as Activity 1	Same as Activity 1
Field Observations	3	Quadrat data	At the sites used in Activity 1, four quadrats are systematically placed 2-4 m from the boat (bow-starboard, bow-port, stern-starboard, and stern-port).	Same as Activity 1
Sensor Data	4	Water quality data	Same as Activity 1	Same as Activity 1
Laboratory Data	5	Total suspended solids	Same as Activity 1	Same as Activity 1

Data Quality Objectives

Data quality values and standards for implementation are provided in Table 3 through Table 7.

Table 3. Data Quality Values (DQVs) for *Monitoring Seagrass in National Parks of the Gulf Coast Network: Protocol Narrative* (Meiman and Segura 2019).

Value	Definition	Protocol Considerations
Accuracy	Measurements reflect the true value of the parameter being observed. This applies to measures (length, width, position) or classes (species, types, or categories). Includes components of precision and bias.	Before each sampling season, seagrass project leader will conduct a training session for surveyors in the laboratory, followed by in-field training in order to standardize cover estimation, species identification, and other measures. All seagrass are properly identified to the species level for all observations. All water quality parameters are within calibration standards.
Representativeness	Measurements represent conditions at the time of sampling. Combined with accuracy, leads to repeatable data collection.	Sample sites are randomly selected within hexagonal grid sampling domain. Placement of quadrats is haphazard and conducted without respect to seagrass. Although they are not randomly placed, the quadrat data are representative of seagrass at the sites.
Comparability	The degree to which data can be compared among sample locations, data sources, or periods of time.	All sample locations are monitored following the schedule and methods outlined within Meiman and Segura (2019). Samples are collected at the same locations every three years. Sample design and data collection follow the same procedures and standards of the Texas statewide seagrass monitoring program so all data are comparable on a broad scale.
Timeliness / Currency	How recent the data need to be to be considered valid for their intended use. Data represents conditions and/or is available and in a format for use at the appropriate time in the decision-making process.	Data entry occurs within six months of sampling. After data verification, a data summary report and resource brief are created (see also Data Management SOP, Granger and Meiman 2019 and Data Analysis SOP, Meiman 2019).
Completeness	All data and measures required to evaluate accuracy and representativeness are present; incomplete data sets (either at a location, across sampling locations, or over time) lose utility or relevance. Data records contain values as planned across the period of record.	The sampling is always conducted during peak seagrass biomass (late summer/early fall). All sampling locations are monitored following the methods described in Meiman and Segura (2019). Data summaries and analyses being used can adjust for and/or are robust to occasional missing data.

Table 3 (continued). Data Quality Values (DQVs) for Monitoring Seagrass in National Parks of the Gulf Coast Network: Protocol Narrative (Meiman and Segura 2019).

Value	Definition	Protocol Considerations
Consistent Representation	Use of standard definitions when describing data quality or resource quality based on data	Data quality is defined as “fit for analysis” or “not fit for analysis.” Data collection occurs during similar dates each year to reduce effect of seasonal variation on data collection.
Data Accessibility: Secure	Access to data, products, and systems limited to appropriate audiences.	All certified (QA/QCed) data and products generated from this monitoring effort will be available to the public via IRMA, NPStoret and EPA Storet.

Table 4. Measurement Quality Objectives for *Monitoring Seagrass in National Parks of the Gulf Coast Network: Protocol Narrative* (Meiman and Segura 2019) [m—meters; cm—centimeters; mg/L—milligram per liter; µg/L—micrograms per liter].

Activity detail and number	Indicator	Quality objective
Field Observations (1-3)	Location accuracy	± 10 m of established waypoint (accuracy of GPS unit).
	Taxonomic resolution	Identification made to the species level (100% accuracy).
	Seagrass percent cover	Within 5%
	Macroalgae cover	Cover estimates by independent observers are the same 95% of the time
	Seagrass canopy height	± 1.0 cm for overall canopy height estimate using independent observers
	Water depth	± 1 cm
	Water temperature	± 0.15 °C
	pH	± 0.2 Standard Units
	Dissolved Oxygen	± 0.5 mg/L
	Salinity	± 0.1
	Secchi Depth	± 1 cm
	Chlorophyll <i>a</i>	± 0.1 µg/L

Table 5. Laboratory Measurement Quality Objectives for *Monitoring Seagrass in National Parks of the Gulf Coast Network: Protocol Narrative* (Meiman and Segura 2019) [mg/L—milligram per liter].

Activity detail and number	Indicator	Quality objective
Laboratory Data (5)	Total Suspended Solids	10% of result

Table 6. Taxonomic standards to be used in Monitoring Seagrass in National Parks of the Gulf Coast Network: Protocol Narrative (Meiman and Segura 2019).

Activity detail and number	Standard to be used	Reference/Authority
Quadrat data (3), collection of observational data	Scientific Publication	Weakley 2015 ¹
Quadrat data, reporting of observational data (3)	–	ITIS

¹ TCEQ 2018a is used for field identification.

Table 7. Data Protection standards for *Monitoring Seagrass in National Parks of the Gulf Coast Network: Protocol Narrative* (Meiman and Segura 2019). With the exceptions noted, all data collected are to be made publicly available in a timely fashion.

Type of Data	Level of Protection	Rules for Dissemination
Resource Data and Information Raw and Provisional Data	Operationally protected	Provided upon request only.
Personally-Identifiable Information Non-NPS Staff Information	Legally protected	All but first name and last initial redacted from public release.

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