

Southeast Coast Network Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior

Inventory and Monitoring Division
Southeast Coast Network



Estuarine Water-Quality Monitoring—Synoptic Coastal Assessment

Overview

Estuaries are semi-enclosed coastal water bodies with free connection to the open sea, wherein sea water and fresh water mix. As a key defining feature, estuaries are at the interface of sea water and fresh water, which come together in a dynamic relationship created by ocean tides. Estuaries contain critical habitat for a variety of fish and wildlife species. They serve as nursery habitats for fish, crustaceans, and shellfish and foraging habitat for birds and mammals, while providing a multitude of recreational opportunities such as boating, fishing, and bird watching.

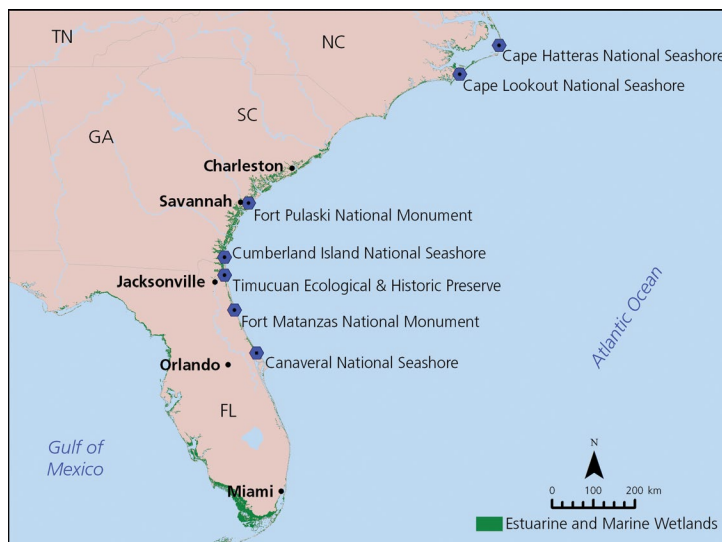
Estuarine ecosystems are vulnerable to impacts from various sources, including urban and industrial development and dredging. Severe impacts include alterations to hydrodynamic processes, exposure to levels of chemical contaminants that cause mortality, altered growth and reduced reproduction, and exposure to more frequent and severe hypoxia.

Water resources are important to park management from ecological, regulatory, and visitor experience perspectives; therefore, estuarine water quality in and around parks was selected as one of several vital signs to be monitored by the National Park Service (NPS) Inventory and Monitoring (I&M) Division. Data collected as a part of this effort are intended to foster a better understanding of water resources in and around parks and contribute to a better understanding of park ecological processes and physical systems.

Approach and Objectives

The network has implemented a two-pronged monitoring approach to effectively evaluate estuarine water quality, consisting of collecting data from continuously recording fixed stations located in each park and collecting periodic discrete water samples for nutrient analysis. When combined, these approaches give a more complete picture of physical processes, diurnal and seasonal variations, and spatial patterns of water quality during critical portions of the year.

The network has initiated estuarine water quality and sediment monitoring at seven parks. For each park, the network randomly selects 30 sites which are monitored following methods developed by the Environmental Protection Agency (EPA) as part of the National Coastal Assessment Program. Laboratory analysis measured chlorophyll *a* and total and dissolved concentrations of nitrogen and phosphorous in samples taken from each site. Field measurements collected in at each site included water temperature, pH, dissolved oxygen, and salinity. Water clarity, which requires a Secchi depth measurement, is calculated when possible. All measured parameters are rated as good, fair, or poor based on thresholds set by the EPA.



The network has implemented estuarine water-quality and sediment monitoring in the vicinity of seven SECN coastal parks.

Monitoring objectives addressed by the estuarine water-quality program include:

- Determine status and spatial variability of water and nutrient chemistry conditions at five-year intervals.
- Determine status and spatial variability of benthic sediment quality (organic contaminants, carbon, and metal levels) in estuarine waters at 10-year intervals.

Physical Parameters

Conditions are evaluated using categorical assessments (e.g., good, fair, poor) of chlorophyll *a*, nutrients, dissolved oxygen, and water clarity and are intended to characterize acutely degraded water-quality conditions. The assessments do not consistently identify sites that experience occasional or infrequent hypoxia, nutrient enrichment, or decreased water clarity. Therefore, a rating of poor for the water-quality index means that the site likely exhibited consistently poor conditions before or after the assessment period.

Site assessments were also made using an index that combines the ratings for each parameter into a site-specific water-quality index rating. This index allows for general comparisons between sites in a park and can be used to summarize overall conditions in the waters around a park. This rating also allows general comparisons between parks based on the percentage of sites that fall within the good, fair, or poor categories.

Reporting and Analysis

Samples are analyzed for chlorophyll *a* concentrations, total nitrogen and phosphorus concentrations, and dissolved inorganic nitrogen and dissolved inorganic phosphorus concentrations. Nutrient data are checked for quality assurance and quality control after they are received from the lab, and then entered into the SECN database.

Data are summarized in coastal water-quality data summaries, which are published in the Natural Resource Data Series of reports. These reports and resource briefs are available on the IRMA web portal at <https://irma.nps.gov/DataStore/>.

In the most recent five-year coastal assessment monitoring rotation (2012–2016), parks generally had fair to good conditions, with the exception of Cape Canaveral (Mosquito Lagoon), which has experienced well-documented water-quality issues over the last several years (Table 1).

Table 1. Overall water-quality status at each park in the previous cycle of coastal assessments (2012–2016, with 2016 being an off year in the rotation).

Park (No. of sites)	Year	Good	Fair	Poor
CAHA & CALO (30)	2015	29	1	0
CANA (31)	2013	2	8	21
CUIS (30)	2012	0	25	5
FOMA (31 ^a)	2012	14	10	6
FOPU (30)	2014	0	30	0
TIMU (30)	2013	9	20	1

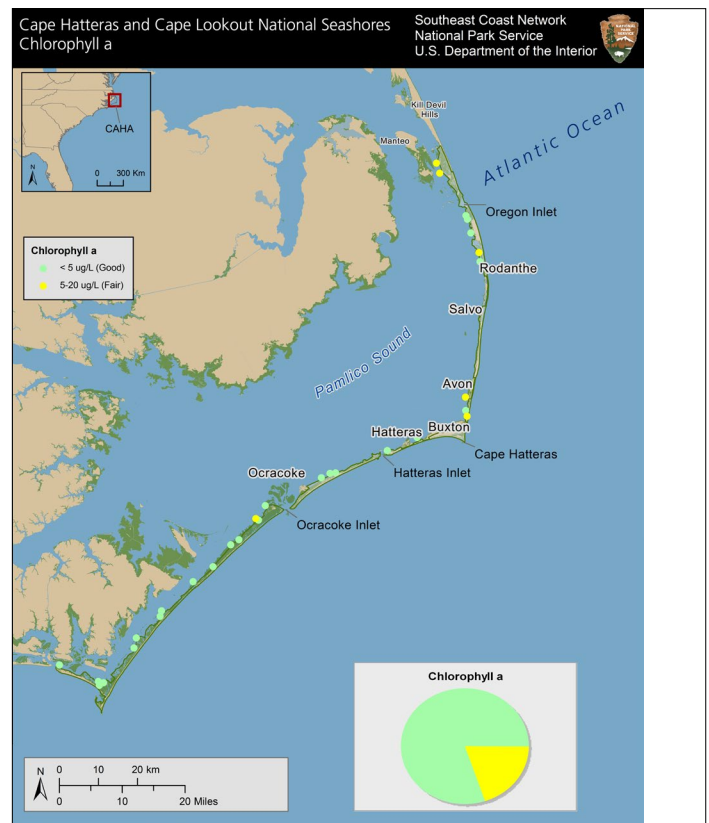
^a Missing data for one site

About the Southeast 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 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 toward performance goals.



Example parameter map in a coastal assessment data summary for CAHA/CALO showing fair to good chlorophyll *a* levels in 2015.

The Southeast Coast Network includes 20 parks, 17 of which contain significant and diverse natural resources. In total, SECN parks encompass more than 184,000 acres of federally-managed land across North Carolina, South Carolina, Georgia, Alabama, and Florida. The parks span a wide diversity of cultural and natural resource missions, as they include four national seashores, two national historic sites, two national memorials, seven national monuments, and two national military parks, as well as a national recreation area, a national battlefield, and an ecological and historic preserve. The park units range in size from slightly more than 20 to nearly 60,000 acres, and, when considered with non-federal lands jointly managed with NPS, the Southeast Coast Network encompasses more than 253,000 acres.

For More Information

SECN Home Page:

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

About the NPS Inventory & Monitoring Division:

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

Data Downloads via the Natural Resource Information Portal:

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