

Cape Lookout National Seashore

National Park Service
U.S. Department of the Interior

Inventory & Monitoring Program
Southeast Coast Network



Fixed-Station Water-Quality Monitoring Data Summary, 2012

Vital Sign Overview

In 2007, the National Park Service (NPS) Southeast Coast Network (SECN) Inventory and Monitoring Program began a partnership with the North Carolina National Estuarine Research Reserve (NCNERR) to collect water-quality data in the estuarine waters near Cape Lookout National Seashore (CALO). Two continuous monitoring stations were operational during 2012 at the Shackleford Banks Dock and the Middle Marshes area. Stations collected pH, dissolved oxygen, water temperature, salinity, turbidity and water-level data at 15-minute intervals. Additional water-quality measurements were made by NCNERR staff and include monthly measurements of water-clarity conditions, nutrients, and chlorophyll *a* levels. This monitoring program was designed to collect data so that managers are able to make better-informed decisions by understanding trends and variability of water-quality conditions in park waters.

Significant Findings

Discrete water-quality samples collected monthly at both sites indicated *good* conditions with respect to water clarity with one *fair* reading in February at CALOshak. Chlorophyll *a* readings were also *good* throughout the year (where data were available), with one *fair* reading in October at CALOshak. Dissolved inorganic nitrogen and phosphorus levels were *good* at CALOshak. Orthophosphate levels were slightly elevated (*fair*) at the CALOshak2 site during November (Table 1).

Mean monthly dissolved oxygen levels were similar at the sites ranging from 8.8 mg/L to 5.4 mg/L at CALOshak and from 9.0 mg/L to 6.1 mg/L at CALOshak2. The annual lows at each site occurred during the summer months; however, individual readings below 5.0 mg/L were common at CALOshak2 occurring between March and October. Mean daily dissolved oxygen levels never dropped below 5.0 mg/L at CALOshak2, but dropped below this threshold at CALOshak for six days in August.

Mean monthly turbidity values were similar at the two sites. Both CALOshak and CALOshak2 never exceeded 8.0 NTUs for any month. Mean daily turbidity values at CALOshak did not exceed 36 NTUs, and CALOshak2 values did not exceed 26 NTUs.

Salinity values at the two stations were comparable throughout the year. Individual and monthly mean low readings at CALOshak occurred in November at 25.8 ppt and 39.9 ppt respectively, compared to individual and monthly mean lows at CALOshak2 in September, which were 22.2 ppt and 27.8 ppt, respectively. Conversely, individual and monthly high readings at CALOshak were 36.9 ppt and 36.2 ppt respectively in May, whereas individual and monthly high readings at CALOshak2 were 38.4 ppt and 35.6 ppt respectively in July.

Monthly mean pH values were similar between sites with values ranging from 8.0 to 8.1 at CALOshak and from 7.9 to 8.1 at CALOshak2.

Status of Conditions

Table 1. Median measurements and ratings of monthly water-quality data from sampling stations at CALO. Numbers in brackets indicate the number of months in 2012 when water-quality measurements indicated a *poor* rating. Green (■) = *good*; yellow (■) = *fair*; red (■) = *poor*. The light attenuation coefficient (*k*) was used as a relative measure of water clarity.

Site ID	Water Clarity (<i>k</i>)	Chlorophyll <i>a</i> (µg/L)	Dissolved Oxygen (mg/L)	Dissolved Inorganic Nitrogen (mg/L)	Dissolved Inorganic Phosphorus (mg/L)
CALOshak	0.80 [0]	3.28 [0]	8.20 [0]	0.0059 [0]	0.0032 [0]
CALOshak2	1.34 [0]	2.71 [0]	7.30 [0]	0.0094 [0]	0.0102 [0]

Sampling Area

Cape Lookout National Seashore is along the southern end of the Outer Banks and is largely undeveloped and accessible only by boat. Cape Lookout is made up of three barrier islands covering 56 miles of the central coast of North Carolina (Figure 1). Most of the Seashore consists of North and South Core Banks, a 44-mile long barrier system oriented in a southwest to northeast direction and separated by New Drum Inlet. CALO extends into the Atlantic Ocean from its southern end. The other barrier system within the Seashore, Shackleford Banks, extends westward from Cape Lookout.

Specific issues of concern to CALO include off-road vehicle use and associated impacts to dunes, threatened and endangered species, commercial fishing, military over-flights, and non-native species. Additionally, the Back Sound off Shackleford Banks at Cape Lookout drains the populated areas of Morehead City and Beaufort. Numerous water bodies in the vicinity of the Seashore have been 303(d)-listed for water-quality violations (Figure 1). For example, the marine waters both north and south of Cape Lookout—as well as those off Cape Lookout itself—have been listed for elevated mercury in fish and elevated bacteria levels.

Areas in the Core and Bogue Sounds have also been listed for elevated pathogen levels which have caused shell fishing areas to be closed or only conditionally approved.



Figure 1. Locations of water-quality monitoring stations at Cape Lookout National Seashore used in this report.

About the Southeast Coast Network

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 missions also, including four national seashores, two national historic sites, two national memorials, seven

national monuments, two national military parks, as well as a national recreation area, national battlefield and an ecological and historic preserve. The parks 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 Network encompasses more than 253,000 acres.

About the Inventory & Monitoring Program

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 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 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.

For More Information

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

SECN Reports & Publications: <http://science.nature.nps.gov/im/units/SECN/reports.cfm>

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Data Downloads via the Natural Resource Information Portal: <http://nrinfo.nps.gov/Home.mvc>

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