



Fixed-Station Water-Quality Monitoring at Canaveral National Seashore

2013-2014 Data Summary

Natural Resource Data Series NPS/SECN/NRDS—2017/1136



ON THE COVER

Indian River (Intracoastal Waterway) October 2016 during vegetation accuracy assessment at Canaveral National Seashore. Photo courtesy of Eric Starkey.

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Wendy Wright

National Park Service
135 Phoenix Road
Athens, Georgia 30605

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U.S. Department of the Interior
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The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Data Series is intended for the timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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The Southeast Coast Network wishes to acknowledge the dedicated work conducted by the St. Johns River Water Management District staff, and thank them for their assistance incorporating the District's water-quality data into this report.

Summary and Key Findings

In 2007 the National Park Service (NPS) Southeast Coast Network (SECN) began collecting water-quality data in the estuarine waters of Canaveral National Seashore as part the NPS Vital Signs monitoring program. The scope of the monitoring program includes Mosquito Lagoon and is comprised of continuous water-quality monitoring conducted by the network at one site and is augmented with monthly data collected at five stations by St. Johns River Water Management District (SJRWMD).

The continuous-monitoring data station is located at the Canaveral National Seashore visitor center dock and collects pH, dissolved oxygen, temperature, salinity, turbidity, and water-level data every 30 minutes. The five stations located throughout Mosquito Lagoon are sampled by Volusia County for the SJRWMD as part of the District's Indian River Lagoon Water-Quality Monitoring Network; data at these five stations include monthly measurements of water-clarity conditions, nutrients, and chlorophyll *a* levels.

Both the network and the SJRWMD programs use methods adapted from, or compatible with, the water-quality monitoring program established by the National Estuarine Research Reserve Program (Wenner and Geist 2001). The Canaveral National Seashore fixed-station water-quality monitoring site is part of the SECN estuarine water- and sediment-quality monitoring efforts, which routinely collects data in the vicinity of seven park units along the southeastern U.S. coast (DeVivo et al. 2008; Gregory et al. 2013). Information collected by this monitoring program will be used to help managers make better-informed decisions by understanding trends and variability related to water-quality conditions in park waters.

A summary of 2013 and 2014 data is presented below.

- Continuous data were collected at one fixed-station site (CANAvctr) by the Southeast Coast Network.
- Mean monthly dissolved oxygen levels were good to fair throughout 2013–2014, ranging from a low of 4.2 mg/L in September 2014 to a high of 7.9 mg/L in January 2014. Individual dissolved oxygen readings ranged from 0.4 mg/L in June 2014 to 11.4 mg/L in June 2013.
- Mean monthly pH values ranged from a low of 7.6 in September 2014 to a high of 8.5 in June 2013. Individual pH readings ranged from 7.4 in September and October

2014 to 8.8 in June 2013.

- Monthly mean turbidity values ranged from 2.8 NTU in February 2013 to 13.0 NTU in August 2013. Individual turbidity readings ranged from 0.4 FNU in December 2014 to 51.9 FNU in May 2014.
- Mean monthly water temperatures ranged from 15.7°C (60.3°F) in January 2014 to 30.7°C (87.3°F) in August 2013. Individual temperature readings ranged from 10.9°C (51.6°F) in January 2014 to 33.9°C (93.0°F) in July 2013.
- The tidal range for Canaveral National Seashore in 2013–2014 was approximately 0.77 meters (2.5 feet).

Discrete Data

Monthly water-quality data collected during 2013–2014 at the St. Johns Water Management District sites near Canaveral National Seashore are shown in Table 6. Condition categories generally correspond to those used by the EPA in the National Coastal Condition Report IV (2012) and detailed in Table .4

- Water clarity (eighty-four total measurements) was mostly good (seventy-seven visits), with six measurements rated as fair and one as poor.
- One hundred twenty samples were tested for chlorophyll *a* concentrations. The results ranged from 1.1 µg/L to 41.9 µg/L. Seventy samples were rated as good, thirty-six as fair, and fourteen as poor.
- Ninety-one samples had values available to calculate dissolved inorganic nitrogen (DIN). Concentrations ranged from below detection limits to 0.292 mg/L. Concentrations for eighty-six samples were rated as good, and five were fair.
- One hundred twenty samples were tested for dissolved inorganic phosphorus (DIP). Concentrations ranged from below detection limits to 0.0317 mg/L. Eighty-seven samples were rated as good, and thirty-three as fair.

Canaveral National Seashore Significant Waters

Southeast Coast Network
National Park Service
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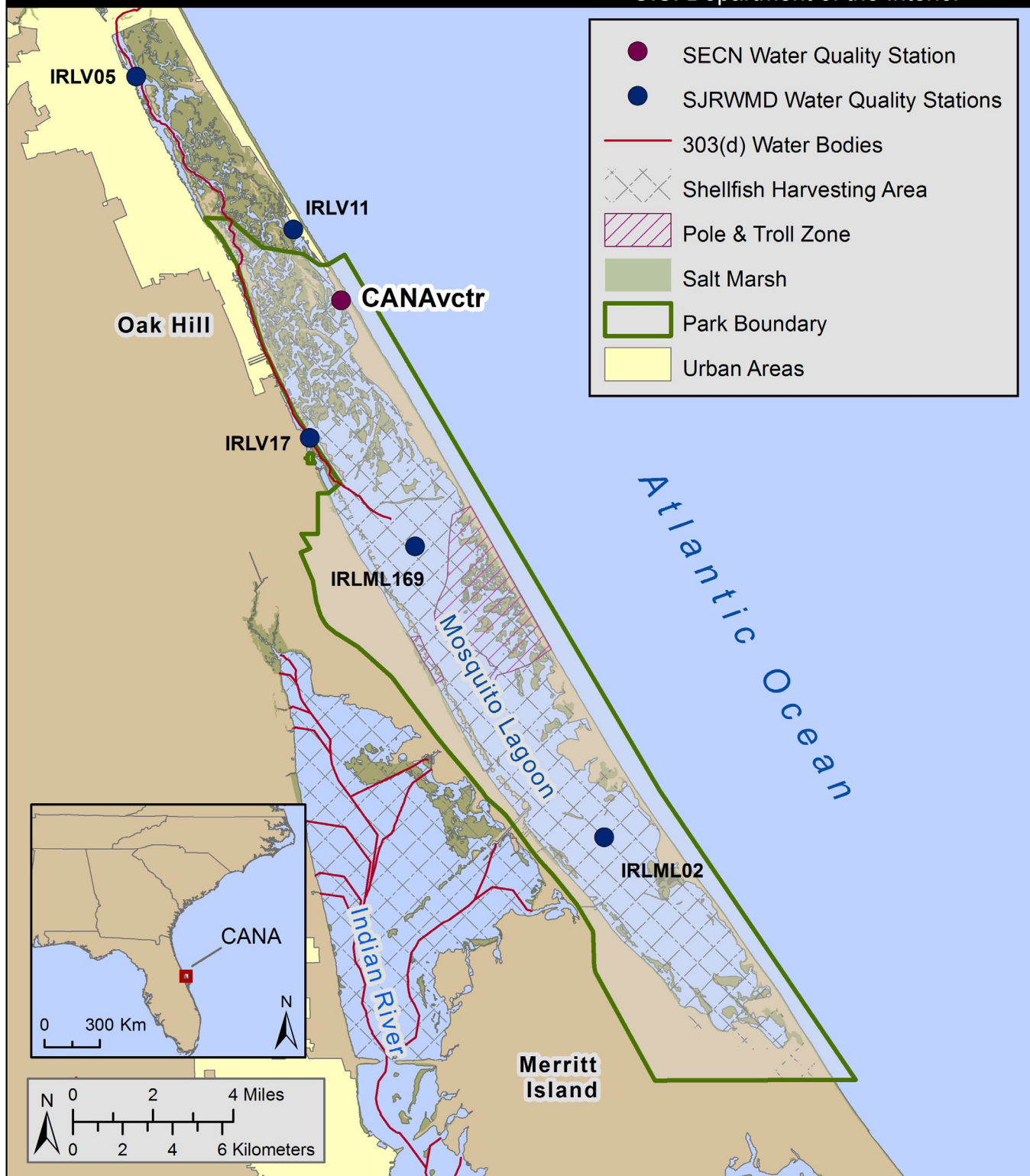


Figure 1. Estuarine and marine water resources in the vicinity of Canaveral National Seashore in Florida. Indicated are areas of salt marsh (USFWS 2013), 303(d) water bodies (EPA 2017), and shellfish harvesting areas and pole and troll zones (FDEP 2011).

Introduction

Due to the importance of water resources to park management from ecological, regulatory, and visitor experience perspectives, estuarine water quality in and around parks was selected as one of several Vital Signs to be monitored by the I&M program (DeVivo et al. 2008). Data collected as a part of this effort are intended to foster a better understanding of water resources in and in the vicinity of park units, and contribute to a better understanding of park ecological processes and physical systems in the region (Gregory et al. 2013).

To effectively monitor diverse and dynamic estuarine water resources, the Southeast Coast Network has implemented a two-pronged monitoring approach which consists of collecting data from continuously recording fixed stations located in each park unit and also collecting periodic discrete water samples for analysis (Gregory et al. 2013). When combined, these two approaches provide a more complete understanding of physical processes, diurnal and seasonal variations, and spatial patterns during critical portions of the year than either could if implemented singularly.

The Southeast Coast Network has identified four specific monitoring objectives for which data are collected and analyzed as part of this effort (Gregory et al. 2013). The contents of this report address objectives 1 and 2 below:

1. Determine daily and seasonal water-quality patterns for five core parameters (dissolved oxygen, salinity, temperature, pH, and turbidity) at fixed monitoring stations using continuous data loggers.
2. Determine monthly and seasonal patterns in nutrients (nitrogen, phosphorus, and chlorophyll *a*) at fixed monitoring stations by collecting discrete water samples.
3. Determine status and spatial variability of water and nutrient chemistry conditions in estuarine waters every five years.
4. Determine status and spatial variability of benthic sediment quality (organic contaminants, carbon, and metal levels) every ten years in estuarine waters.

This report provides an annual summary of data collected at Canaveral National Seashore during 2013–2014 and places these values in context of current water-quality criteria

suggested by the U.S. Environmental Protection Agency (EPA 2012), as well as concurrent regional climatic conditions that may influence local water-quality conditions. This report is intended to provide park resource managers and partners with information on the short-term variability and seasonal trends in water quality across Canaveral National Seashore.

Canaveral National Seashore

Natural resources at CANA (Figure 1) include a diverse assemblage of wildlife species, plant communities, geophysical features, and natural processes reflecting the complexity of the land/lagoon/sea interface of east central Florida. Throughout the seashore, the relationship between land and water is paramount. Unlike many barrier islands, Canaveral National Seashore has only a single dune ridge, averaging 12 feet (3.7 meters) in height. For the vast majority of its length the dune is quite stable, backed by a dense growth of saw palmetto (*Serenoa repens*) and several other species of hardy shrubs and grasses. Mosquito Lagoon, extending along the backside of Canaveral National Seashore's barrier island, is the northernmost part of the Indian River Lagoon. Containing the most diverse assemblage of aquatic species on the entire eastern seaboard, this 155-mile long lagoon has been designated as an Estuary of National Significance by the Environmental Protection Agency and an Outstanding Florida Water by the State of Florida. Commercial shell fishing is extremely important to the local economy; recreational fishing and shrimping in the lagoon support a multimillion-dollar tourist industry. The estuary also acts as an important nursery area for a number of commercially important ocean-going species such as flounder, mullet, black drum and shrimp.

Canaveral National Seashore faces a number of complex issues regarding water quality in Mosquito Lagoon. The water in Mosquito Lagoon is designated by the State of Florida as Class II, which is suitable for shellfish propagation and harvesting. As shellfish have been depleted along other portions of the Atlantic coast, harvesting pressure has increased significantly in Mosquito Lagoon. Additionally, the seashore has long been concerned about the impact of commercial harvesting on hard clams (*Mercenaria* spp.) and eastern oysters (*Crassostrea virginica*). Fishermen are coming into Canaveral National Seashore in increasing numbers due to the growing popularity of fly-fishing for redfish, causing harvesting concerns and potential problems related

to seagrass scarring by boat propellers. Oyster reefs along major boat channels have also been reported to be stressed or dying (J. Stiner, resource manager Canaveral National Seashore, personal communication). Currently, park waters are closed to shell fishing when rainfall exceeds 1.5 inches in a 72-hour period, due to high fecal coliform levels. Mosquito control is another issue at Canaveral National Seashore. In the designation of lands for NPS management, both NASA and the State of Florida stipulated that CANA must cooperate with the local mosquito control districts to control salt marsh mosquitoes (Walters et al. 2001).

Weather and Hydrologic Setting

Daily precipitation totals are included as an aid to interpreting water-quality results and were derived from data collected at the Titusville weather station near Canaveral National Seashore by the National Climatic Data Center. These data are presented as daily precipitation for 2013–2014 (NOAA-NCDC 2015; Figure 2).

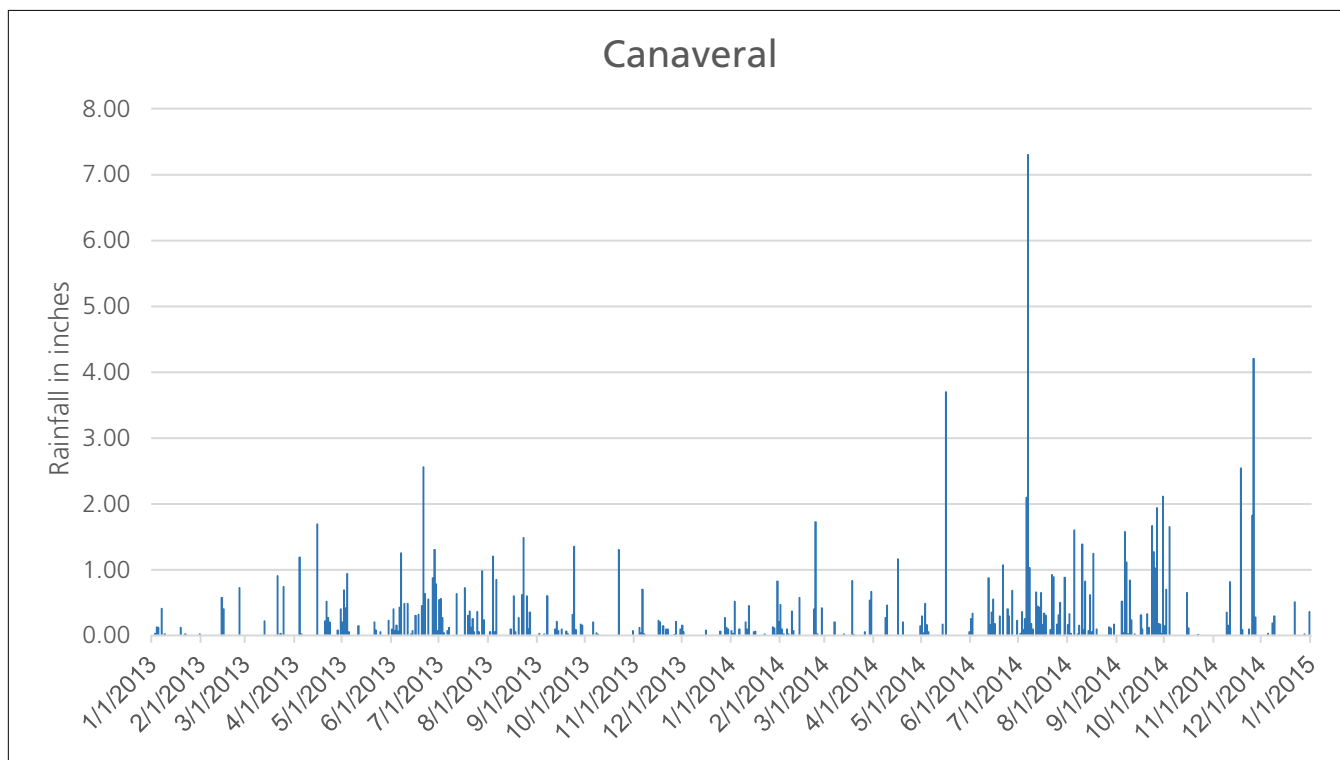


Figure 2. Daily precipitation at the Titusville weather station near Canaveral National Seashore, January 1 2013–December 31 2014. Data source: NOAA-NCDC (2015).

Methods

Monitoring data are collected using methods adapted from the NOAA National Estuarine Research Reserve Program (Wenner and Geist 2001) and protocols that are in compliance with Florida Department of Environmental Protection's standard operating procedures (SOPs; Florida Department of Environmental Protection 2008). Monitoring data for Objective 1 are collected from continuous monitoring of water-quality parameters using permanently deployed data sondes at near-shore locations selected to be representative of areas near parks, and monitoring data for Objective 2 are collected monthly at locations at or near the fixed-monitoring station. Detailed field and lab standard operating procedures and methods have been reported for the continuously collected data in Gregory et al. (2013), and for the monthly samples collection/analysis in two SJRWMD standard operating procedures (SJRWMD 2010a and 2010b). Methods for both are briefly summarized in the following sections.

Sampling Locations

The fixed station at Canaveral National Seashore is located on the visitor center dock, on the northeast side of Mosquito Lagoon. Primary emergent vegetation along the shoreline is salt marsh cordgrass (*Spartina alterniflora*) and black mangrove (*Avicennia germinans*). The area on either side of the dock is covered with rip-rap (broken pieces of concrete) to minimize erosion. Just landward of the emergent vegetation, groundsel (*Baccharis* spp.) is the dominant plant species. Boat traffic in the lagoon can be very heavy on weekends and moderate to light during the week. Occasionally boats will pull up to the dock where the monitoring station is located. The main boat ramp is just to

the north of the visitor center dock. No fishing or crabbing is allowed from the visitor center dock.

Water quality in this area is designated as Class II, which is suitable for shellfish propagation and harvesting. Normal tide fluctuation is only a matter of inches, and currents in the lagoon are primarily wind driven. The water in the lagoon can become highly saline for an estuary when freshwater inputs are low (daily average as high as 45 ppt. in 2012), and water temperatures can exceed 29° C (84.2° F) in summer months. Submerged vegetation consists primarily of manatee grass (*Syringodium filiforme*) and shoalweed (*Halode wrightii*). Oyster reefs and salt marsh islands are located nearby. Marsh species include saltgrass (*Distichlis spicata*), seashore paspalum (*Paspalum varigatum*), seashore dropseed (*Sporobolus virginicus*), saltwort (*Batis maritima*), glasswort (*Sarcocornia perennis*), annual glasswort (*Salicornia bigelowii*), and salt marsh cordgrass.

St. Johns River Water Management District has numerous sites in the vicinity of the Indian River and Mosquito Lagoon. The stations were originally selected to provide information on the long-term spatial and temporal trends of water quality and help discern the covariant or causal link between seagrass coverage (distribution/density) and water quality (Sigua et al. 1999). Five of these sites are in Mosquito Lagoon and are included in this report to help give resources managers at CANA a broader look at water quality issues that may affect park resources. Site locations are detailed in Table 1.

Table 1. Monitoring location names, descriptions, and responsible organization for stations in the Canaveral National Seashore water-quality monitoring network [SJWMD—St. Johns Water Management District; SECN—Southeast Coast Network]. Coordinates given in decimal degrees.

Site Name, Location and Description	Latitude	Longitude	Monitoring Organization
IRLV05. Located just south of New Smyrna Beach at channel marker 47 near the South Canal discharge	29.008056	-80.909444	SJRWMD
IRLV11. Located east of Cedar Island and west of Bethune Beach and just north of the northern boundary of Canaveral National Seashore; approximately 3 miles northeast of the Canaveral National Seashore visitor center.	28.952500	-80.844722	SJRWMD
CANA Visitor Center. Located on the northeast side of Mosquito Lagoon on the dock behind the Canaveral National Seashore visitor center.	28.926856	-80.825027	SECN
IRLV17. Located just south of channel marker 7 near Barlow's Crab Building and the Oak Hill dock.	28.876871	-80.838101	SJRWMD
IRLML169. Located midway between Gaines Island and Vanns Island	28.837492	-80.794820	SJRWMD
IRLML02. Located between Pardon Island and Cucumber Island; south of Haulover Canal	28.731915	-80.717235	SJRWMD



Figure 3. Continuous data collection platform used at Canaveral National Seashore. Photo shows sonde housing and locking cap. Photo by Pete Mockus, SECN staff.

Continuous data

Continuously collected data include dissolved oxygen, pH, specific conductance, temperature, depth, and turbidity. Data were collected at 30-minute intervals using YSI datasondes (Model 6600) in 2013. In January 2014, the site was changed over to YSI EXO2 datasondes. The sondes are deployed for three- to five- week intervals depending on routine instrument maintenance schedules. The data collection platform (mount, Figure 3) consists of a 4-inch diameter PVC pipe attached vertically to a piling on the dock with the sonde suspended within. All mounts were designed to keep the sonde 0.5 meters above the bottom substrate, with a carriage bolt inserted through the housing at the submerged end to prevent instrument loss should the attachment hardware fail. A locking cap on the top of the PVC pipe prevents unwanted tampering. To extend development intervals and combat biofouling (growth of barnacles and algae), anti-fouling paint is applied to the PVC pipe (Figure 3). The sonde guard is covered with 0.25-inch

brass or plastic mesh to prevent fish, crabs, and detritus from entering the protective housing, as this intrusion could skew measurements or damage the instrument's probes. Additional details on initial site selection and installation procedures can be found in Gregory et al. (2013).

Prior to deployment, the data sonde is calibrated according to YSI recommendations for pH (two-point calibration), dissolved oxygen, specific conductance, depth, and turbidity (two-point calibration; YSI 2011) with additional instructions provided by Gregory et al. (2013). After instrument retrieval, data sondes are returned to the laboratory where post deployment readings are made using calibration standards to evaluate the accuracy and validity of the data collected for that deployment period. All pre-deployment and post-retrieval calibration information is recorded on calibration data sheets that are archived at the Southeast Coast Network office location in Athens, Georgia. After post-retrieval processing is complete, the sonde is cleaned, reconditioned, and readied for re-deployment with methods outlined by YSI (2011). Performance specifications of the YSI 6600 are shown in Table 2. Performance specifications of the YSI EXO 2 are shown in Table 3.

Data generated during the deployment periods are reviewed and certified by SECN staff prior to being made available to park staff or the public. During 2013, as the Southeast Coast Network transitioned continuous data management tasks to Aquarius (Aquatic Informatics Inc. 2015), all parameters were certified with undefined grades, and invalid (i.e. unusable) data were deleted from the data set.

Beginning in January 2014, turbidity, dissolved oxygen, specific conductance, and pH values were assigned grades of excellent, good, fair, or poor—and corrections to these values were made when appropriate—based on differences between pre-calibration and post-calibration measurement data based on guidance from USGS (Wagner et al. 2006). Temperature and depth data were neither graded nor corrected, but were assumed accurate unless post calibration data indicated a failure. As with previous years, invalid or unusable data were deleted from datasets prior to publication. Data sets are made available at the NPS Aquarius Web Data Portal at <https://irma.nps.gov/aqwebportal/>.

Table 2. Performance specifications of YSI 6600 EDS data loggers deployed at Canaveral National Seashore during 2013–2014 (YSI 2011).

Parameter	Range	Resolution	Accuracy
Dissolved Oxygen (% saturation)	0–500%	0.1 %	0 to 200%: +/- 2% of reading or 2% air saturation, whichever is greater.
Dissolved Oxygen (mg/L)	0–50 mg/L	0.01 mg/L	0 to 20 mg/L: +/- 2% of reading or 0.2 mg/L whichever is greater.
Conductivity	0–100 mS/cm	0.001 to 0.1 mS/cm; range dependent	+/- 0.5% of reading + 0.001 mS/cm
Temperature	-5 to +50 °C	0.01 °C	+/- 0.15 °C
pH	0 to 14 units	0.01 units	+/- 0.2 unit
Depth	0–9 m (0–30 ft)	0.001m (0.001ft)	+/- 0.018m (+/- 0.06 ft.)
Salinity	0–70 ppt	0.01 ppt	+/- 1% of reading or 0.1 ppt, whichever is greater.
Turbidity	0–1000 NTU	0.1 NTU	+/- 2% of reading or 0.3 NTU, whichever is greater.

Table 3. Performance specifications of YSI EXO2 datasondes deployed at Canaveral National Seashore during 2013–2014 (YSI 2014).

Parameter	Range	Resolution	Accuracy
Dissolved oxygen (% saturation)	0 to 500%	0.10%	0 to 200%: +1% reading or 1% air sat, whichever is greater 200 to 500%: +5% reading
Dissolved oxygen (mg/L)	0 to 50 mg/L	0.01 mg/L	0 to 20 mg/L: +1% of reading or 0.1 mg/L 20 to 50 mg/L: +5% of reading
Conductivity	0 to 200 mS/cm	0.0001 to 0.01 mS/cm range-dependent	0-100 mS/cm +0.5% of reading or 0.001 mS/cm, whichever is greater
Temperature	-5 to +50 °C	0.001 degrees Celcius	-5 to +35 °C: +0.01 °C 35 to 50 °C: +0.05 °C
pH	0 to 14	0.01 units	+0.1 pH units within +10 °C of calibration temperature; +0.2 pH units for entire temp range
Depth	Shallow: 0 to 33 feet (10 meters)	0.001 feet (0.001 meters)	Shallow: +0.04% FS (+0.013 feet or +0.004 meters)
Turbidity	0 to 4000 FNU	0 to 999 FNU: 0.01 FNU 1000 to 4000 FNU: 0.1 FNU	0 to 999 FNU: 0.3 FNU or 2% of reading, whichever is greater. 1000 to 4000 FNU: 0.1 FNU

Discrete data

Water sample collection for this project was conducted by SJRWMD according to their program's design and sampling protocols that are in compliance with Florida Department of Environmental Protection's (FDEP) SOPs. Site visits included the deployment of a multiparameter sonde to collect pH, conductivity, dissolved oxygen, and turbidity. Secchi depth was measured as an average of two readings using standard equipment. Water samples were collected as grabs in clean, field rinsed, sample containers. Filtration was conducted using a 0.45-micron filter within 15 minutes of sample collection and prior to acidification of any sample component. Samples were transported and shipped on wet ice. QA/QC field sampling included both field blanks and duplicates (Lasi et al. 2009). Filtered samples, unfiltered samples and chlorophyll filters were placed on ice prior to shipment for lab analyses. Original chain of custody paperwork accompanied all samples to the laboratory. Data collection SOPs are further documented in the St. Johns River Water Management District Field Standard Operating Procedures for Surface Water Sampling (Lasi et al. 2009).

Water-clarity conditions were derived from estimated light attenuation coefficients (k) using the equation: $k = a / Z_{\text{Secchi}}$ where Z is Secchi depth (in meters) and a is one of three values depending on the water bodies' naturally occurring clarity conditions (i.e., $a = 1.0$ for naturally turbid conditions, $a = 1.4$ for moderately turbid conditions, or $a = 1.7$ for clear water estuaries).

Canaveral National Seashore uses a coefficient of 1.0 for naturally turbid conditions. These constants were estimated for each water-clarity class based on values reported in the literature (Smith et al. 2006). Although this method of estimating water-clarity condition is generally used when information on light transmission properties of the water column are missing, the Southeast Coast Network is reporting derived values for data consistency among other SECN park units and recently collected datasets where water-column light transmission information was not collected.

Assessment Criteria

Water quality was assessed for each of the parameters following the East/Gulf Coast site criteria in the EPA's National Coastal Assessment IV Report (EPA 2012; Table 4) using data from the monthly samples. The categorical assessments (i.e., good, fair, and poor) use measurements of chlorophyll a , nutrients, dissolved oxygen, and water clarity and are intended to highlight a range of conditions including acutely degraded water-quality conditions. Light attenuation coefficients (k) were used to assess water-clarity conditions using criteria categories in Smith et al. (2006) which are equivalent to the EPA (2012) criteria for the assessed water bodies.

Table 4. Coastal water-quality monitoring condition criteria for water-quality parameters collected by the Southeast Coast Network. Based on thresholds set by the EPA (2012).

Rating	Water Clarity (k) ¹	Chlorophyll a ($\mu\text{g/L}$)	Dissolved Inorganic Nitrogen (DIN) (mg/L)	Dissolved Inorganic Phosphorus (DIP) (mg/L)	Dissolved Oxygen (mg/L)
Good	< 2.3	< 5	< 0.1	< 0.01	>5
Fair	2.3–2.99	5–20	0.1–0.5	0.01–0.05	2–5
Poor	> 2.99	> 20	> 0.5	> 0.05	<2

¹ Light attenuation coefficients (k) were used to assess water-clarity conditions using criteria categories in Smith et al. (2006) which are comparable to the USEPA (2012) criteria for the assessed water bodies.

Results

Continuous Data

Figures 4 through 9 depict the daily mean for each parameter for the 2013–2014 period. Relative water depth collected by SECN staff at the site (Figure 9) is included in this section as an aid to data interpretation because it includes information that shows daily tidal fluctuations.

Summary statistics (minimum, maximum, mean, and standard deviation) are provided in Table 5. The percentage-of-values field indicates the level of completeness of the monthly data sets used for calculating mean, maximum, and minimum statistics, and equals the number of valid data points collected (i.e., not missing or flagged) divided by the total number of expected points for a complete month of data. For those months where all of the data were either missing and/or flagged, the percentage of values is 0% and no statistics (mean, maximum, or minimum) are presented. When the percentage of values is low, the statistics (mean, maximum, and minimum) may be less accurate than months where all data were used in the calculation of summary statistics.

Continuous data were collected at one fixed-station site (CANAvctr) by the Southeast Coast Network.

Mean monthly dissolved oxygen levels were good to fair throughout 2013–2014, ranging from a low of 4.2 mg/L in September 2014 to a high of 7.9 mg/L in January 2014. Individual dissolved oxygen readings ranged from 0.4 mg/L in June 2014 to 11.4 mg/L in June 2013.

Mean monthly pH values ranged from a low of 7.6 in September 2014 to a high of 8.5 in June 2013. Individual pH readings ranged from 7.4 in September and October 2014 to 8.8 in June 2013.

Monthly mean turbidity values ranged from 2.8 NTU in February 2013 to 13.0 NTU in August 2013. Individual turbidity readings ranged from 0.4 FNU in December 2014 to 51.9 FNU in May 2014.

Mean monthly water temperatures ranged from 15.7 °C (60.3 °F) in January 2014 to 30.7 °C (87.3 °F) in August 2013. Individual temperature readings ranged from 10.9 °C (51.6 °F) in January 2014 to 33.9 °C (93.02 °F) in July 2013.

The tidal range for Canaveral National Seashore in 2013–2014 was approximately 0.77 meters (2.5 feet).

Discrete Data

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Ninety-one samples had values available to calculate dissolved inorganic nitrogen (DIN). Concentrations ranged from below detection limits to 0.292 mg/L. Concentrations for eighty-six samples were rated as good, and five were fair.

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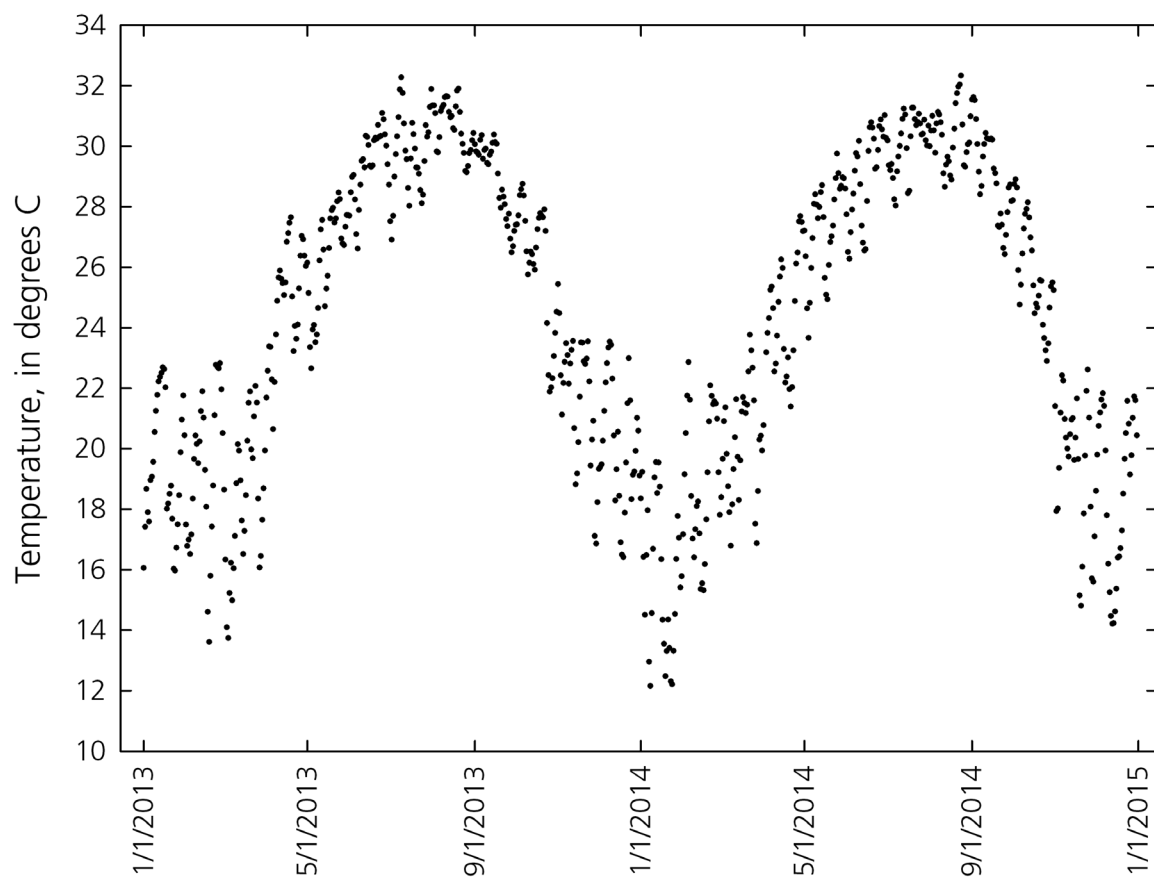


Figure 4. Mean daily water temperature at Canaveral National Seashore during 2013–2014. Breaks in data record indicate missing and/or flagged data.

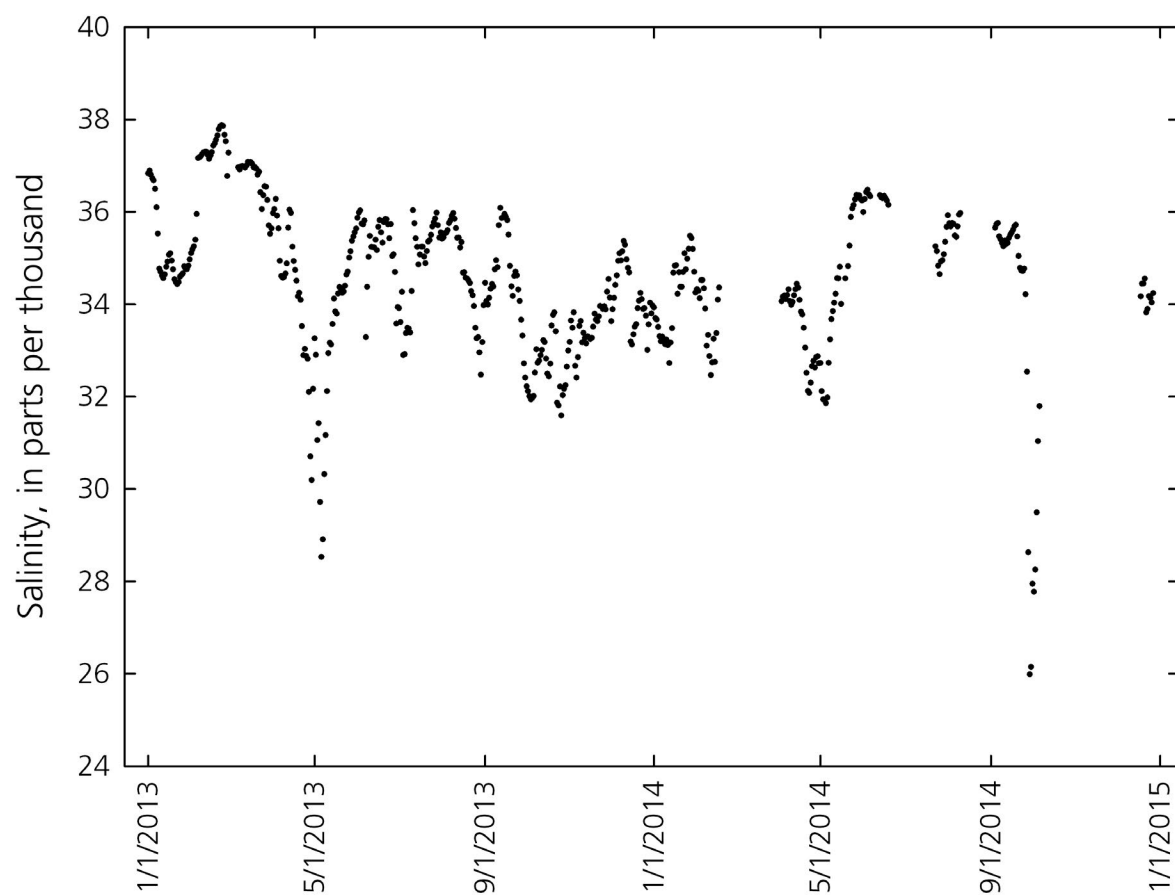


Figure 5. Mean daily values for salinity at Canaveral National Seashore during 2013–2014. Breaks in data record indicate missing and/or flagged data.

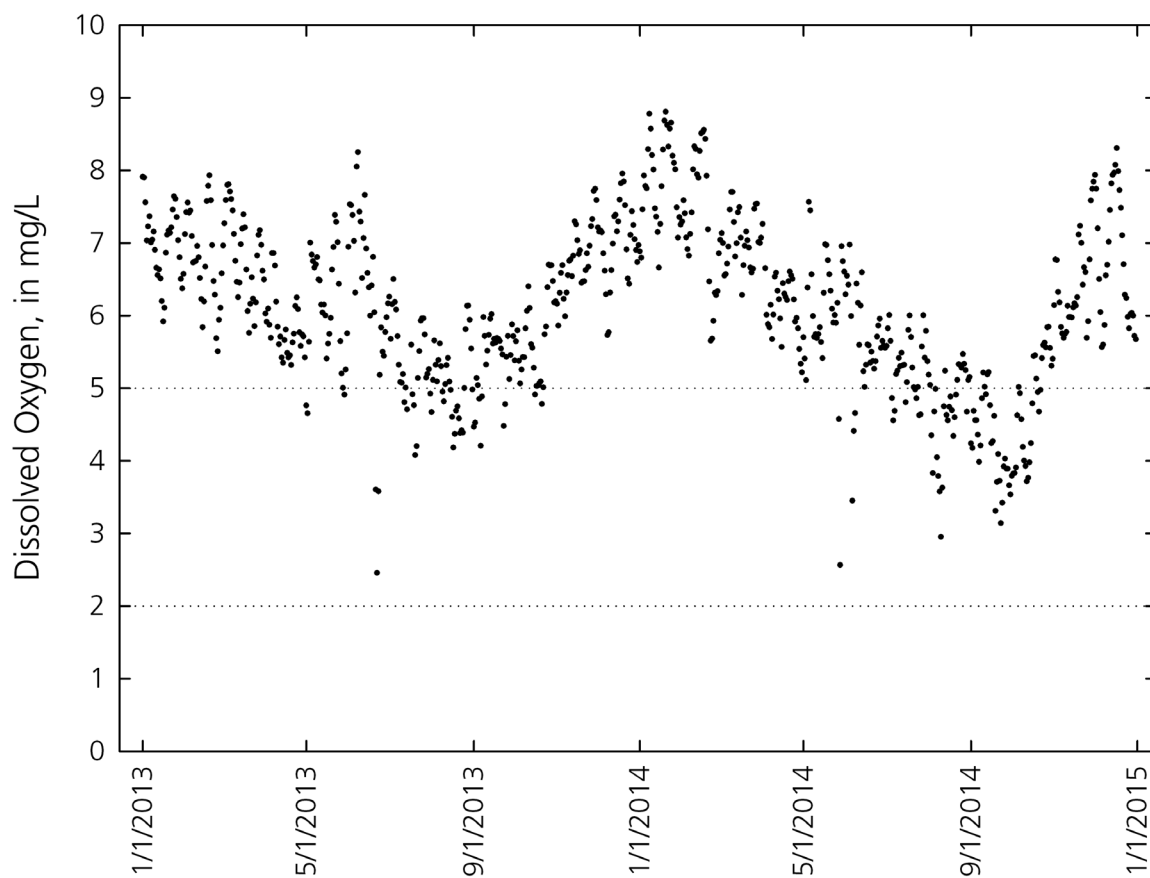


Figure 6. Mean daily values for dissolved oxygen at Canaveral National Seashore during 2013–2014. Breaks in data record indicate missing and/or flagged data. Dotted lines indicate minimum value for a rating of good (5 mg/L) and fair (2 mg/L)(USEPA 2012).

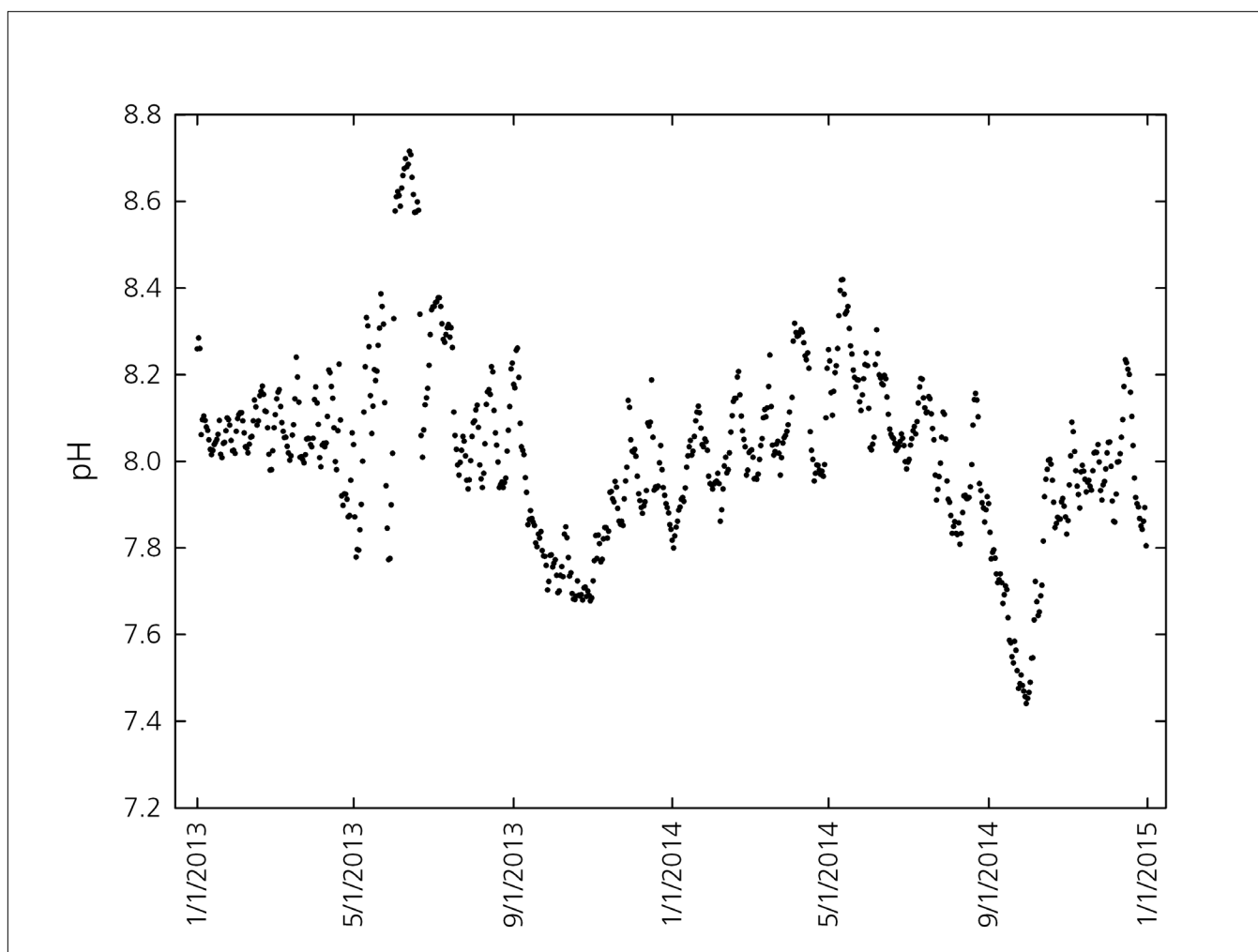


Figure 7. Mean daily pH at Canaveral National Seashore during 2013–2014. Breaks in data record indicate missing and/or flagged data.

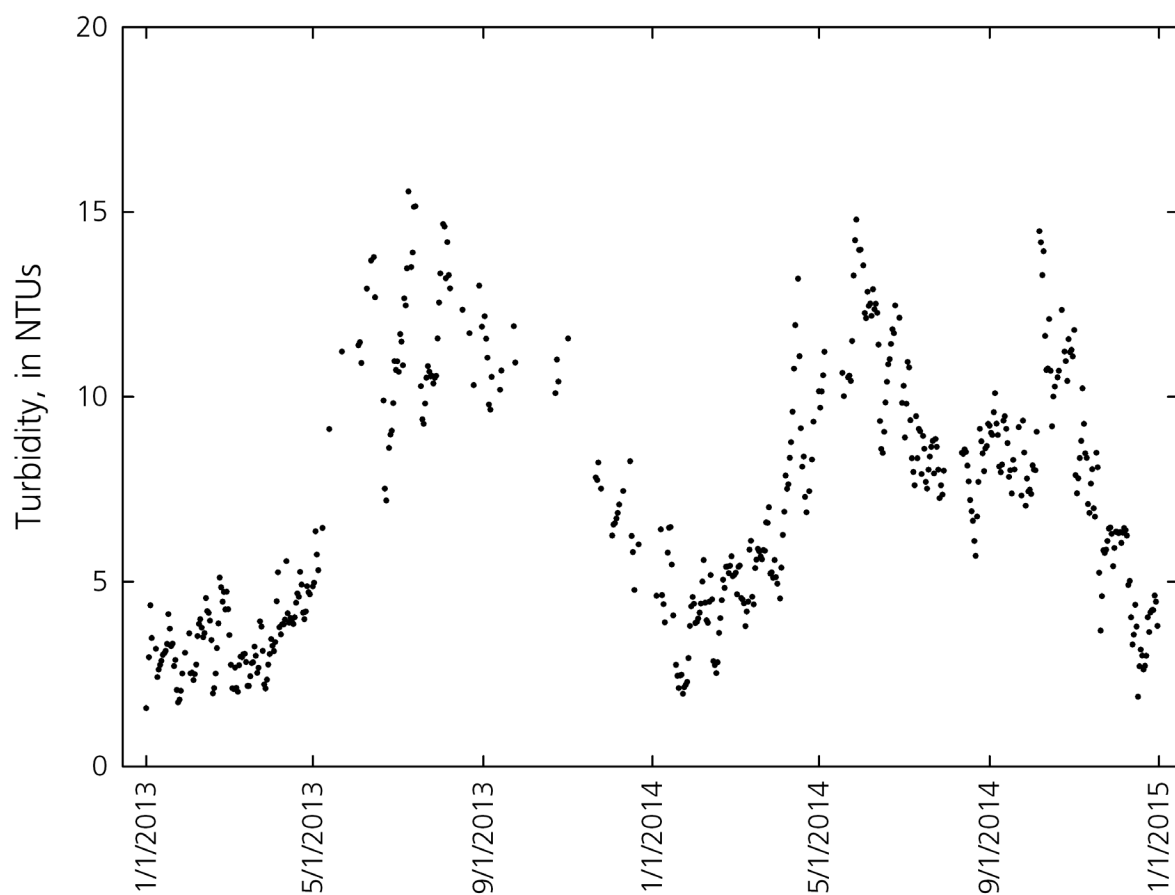


Figure 8. Mean daily turbidity (NTUs; switched to FNU in February 2014) at Canaveral National Seashore during 2013–2014. Breaks in data record indicate missing and/or flagged data.

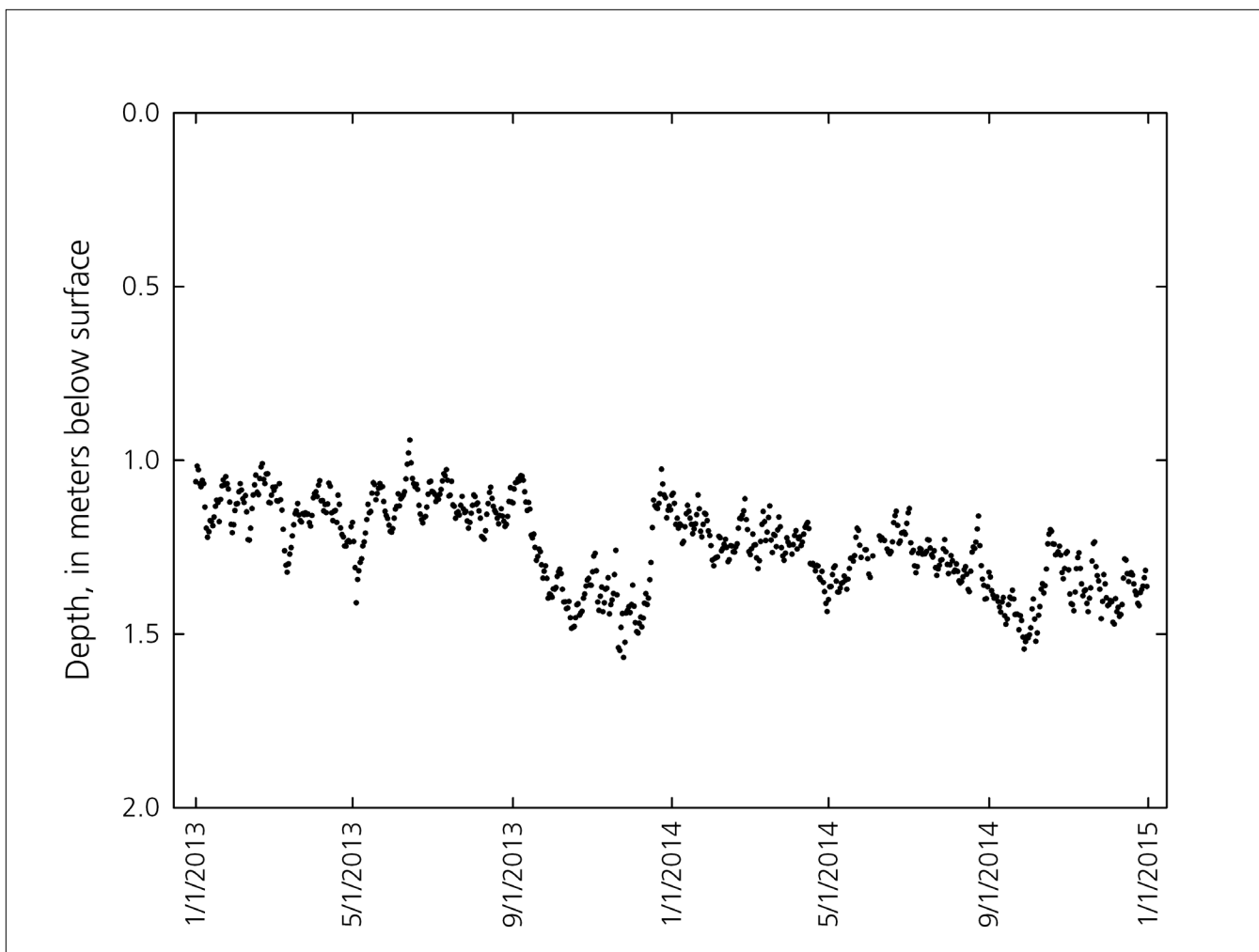


Figure 9. Mean daily depth at Canaveral National Seashore during 2013–2014. Breaks in data record indicate missing and/or flagged data.

Table 5. Monthly minimum, maximum, and mean values for parameters collected by the YSI datasondes at Canaveral National Seashore during 2013–2014. Percent of values for each month indicates the number of data points collected during one calendar month of data collection / total number of expected points for a complete month of data [PPT—parts per thousand; mg/L—milligrams per liter; m—meter; NTU—nephelometric turbidity unit; SD—standard deviation].

Month / Expected count	Metric	Temperature, °C	Salinity, PPT	Dissolved Oxygen, mg/L	Depth, meters	pH	Turbidity, NTU
January 2013 (Expected count 1488)	Actual Count	1488	1488	1488	1488	1488	1248
	Minimum	14.8	34	4.8	0.93	8	1.1
	Maximum	23.6	36.5	8.7	1.34	8.5	8.1
	Mean	19.4	36	7	1.12	8.1	2.9
	Standard Deviation	2.2	0.4	0.7	0.1	0.08	1.1
	Percent	100%	100%	100%	100%	100%	84%
February 2013 (Expected count 1344)	Actual Count	1344	1344	1344	1344	1344	1229
	Minimum	12.3	36.3	4.3	0.92	7.9	1.3
	Maximum	24.4	38.4	8.8	1.36	8.3	7.3
	Mean	19.3	37.3	6.8	1.1	8.1	3.5
	Standard Deviation	2.6	0.5	0.8	0.1	0.06	1.1
	Percent	100%	100%	100%	100%	100%	91%
March 2013 (Expected count 1488)	Actual Count	1488	1488	1488	1488	1488	1428
	Minimum	12.6	37.1	4.6	0.98	7.9	1.4
	Maximum	23	40.4	8.4	1.42	8.3	6.7
	Mean	18.2	38.6	6.9	1.17	8.1	2.8
	Standard Deviation	2.4	0.8	0.7	0.1	0.07	0.8
	Percent	100%	100%	100%	100%	100%	96%
April 2013 (Expected count 1440)	Actual Count	1441	1441	1434	1441	1441	1237
	Minimum	19.1	34.6	3.7	0.91	7.8	2.3
	Maximum	28.8	41.1	8.2	1.38	8.3	9.4
	Mean	24.8	37.9	5.8	1.15	8	4.2
	Standard Deviation	2	1.9	0.8	0.1	0.12	1
	Percent	100%	100%	100%	100%	100%	86%
May 2013 (Expected count 1488)	Actual Count	1488	1488	1488	1488	1488	831
	Minimum	21.7	17.5	2.3	0.96	7.6	3.2
	Maximum	30.2	37	9.7	1.53	8.6	47.4
	Mean	26.3	32.3	6.1	1.18	8.1	9.5
	Standard Deviation	1.9	3.7	1.2	0.1	0.21	6.3
	Percent	100%	100%	100%	100%	100%	56%
June 2013 (Expected count 1440)	Actual Count	1440	1440	1440	1440	1440	1083
	Minimum	24.9	34.6	1	0.86	7.9	4.9
	Maximum	32.8	42.6	11.4	1.32	8.8	26
	Mean	29.4	39.8	6.3	1.1	8.5	11.2
	Standard Deviation	1.4	1.5	1.9	0.1	0.24	3
	Percent	100%	100%	100%	100%	100%	75%

Table 5 (continued). Monthly minimum, maximum, and mean values for parameters collected by the YSI datasondes at Canaveral National Seashore during 2013–2014. Percent of values for each month indicates the number of data points collected during one calendar month of data collection / total number of expected points for a complete month of data [PPT—parts per thousand; mg/L—milligrams per liter; m—meter; NTU—nephelometric turbidity unit; SD—standard deviation].

Month / Expected count	Metric	Temperature, °C	Salinity, PPT	Dissolved Oxygen, mg/L	Depth, meters	pH	Turbidity, NTU
July 2013 (Expected count 1488)	Actual Count	1488	1488	1444	1488	1488	1189
	Minimum	26.1	32.3	2.2	0.94	7.8	7.7
	Maximum	33.9	41.9	8.3	1.32	8.4	26.1
	Mean	29.8	37.7	5.4	1.12	8.2	11.7
	Standard Deviation	1.6	1.8	1.2	0.1	0.17	2.6
	Percent	100%	100%	97%	100%	100%	80%
August 2013 (Expected count 1488)	Actual Count	1488	1488	1488	1488	1488	1008
	Minimum	28	33.3	2.2	0.93	7.6	7.6
	Maximum	33.3	40.7	8.1	1.32	8.3	40.7
	Mean	30.7	37	5.1	1.15	8.1	13
	Standard Deviation	1.1	1.9	1.2	0.1	0.11	3.9
	Percent	100%	100%	100%	100%	100%	68%
September 2013 (Expected count 1440)	Actual Count	1440	1440	1440	1440	1440	811
	Minimum	25.9	34.7	2.5	0.94	7.6	7.2
	Maximum	32	40	7.8	1.46	8.4	18.8
	Mean	29	37.9	5.4	1.2	7.9	11.1
	Standard Deviation	1.4	1.1	1	0.1	0.16	2.3
	Percent	100%	100%	100%	100%	100%	56%
October 2013 (Expected count 1488)	Actual Count	1488	1486	1488	1488	1488	321
	Minimum	20.7	33.2	2.3	1.23	7.5	7.2
	Maximum	29.9	36.6	7.7	1.58	7.9	16.4
	Mean	26.2	34.6	5.7	1.4	7.7	10.2
	Standard Deviation	2.1	0.6	0.9	0.1	0.06	1.7
	Percent	100%	100%	100%	100%	100%	22%
November 2013 (Expected count 1440)	Actual Count	1440	1440	1440	1440	1440	751
	Minimum	16.2	32.1	4.9	1.16	7.6	4.5
	Maximum	26.6	35.4	8.5	1.63	8.2	25
	Mean	21.7	33.4	6.8	1.41	7.9	9.1
	Standard Deviation	2.2	0.8	0.7	0.1	0.1	3.1
	Percent	100%	100%	100%	100%	100%	52%
December 2013 (Expected count 1488)	Actual Count	1488	1488	1488	1488	1488	1035
	Minimum	14.8	31.6	4.9	0.9	7.8	3
	Maximum	24.3	34.5	8.7	1.59	8.2	15.4
	Mean	20.2	33.4	7	1.28	8	7
	Standard Deviation	2.1	0.8	0.7	0.2	0.09	1.9
	Percent	100%	100%	100%	100%	100%	70%

Table 5 (continued). Monthly minimum, maximum, and mean values for parameters collected by the YSI datasondes at Canaveral National Seashore during 2013–2014. Percent of values for each month indicates the number of data points collected during one calendar month of data collection / total number of expected points for a complete month of data [PPT—parts per thousand; mg/L—milligrams per liter; m—meter; NTU—nephelometric turbidity unit; SD—standard deviation].

Month / Expected count	Metric	Temperature, °C	Salinity, PPT	Dissolved Oxygen, mg/L	Depth, meters	pH	Turbidity, NTU
January 2014 (Expected count 1488)	Actual Count	1489	1459	1489	1489	1489	1239
	Minimum	10.9	33	5.5	0.96	7.8	1.6
	Maximum	20.5	36	9.7	1.38	8.2	13.5
	Mean	15.7	34.5	7.9	1.18	8	4
	Standard Deviation	2.5	0.7	0.7	0.1	0.1	2
	Percent	100%	98%	100%	100%	100%	83%
February 2014 (Expected count 1344)	Actual Count	1344	1339	1344	1344	1344	1245
	Minimum	14	33.2	4.8	0.98	7.7	1.8
	Maximum	23.7	35.5	9.4	1.4	8.3	9.3
	Mean	19	34.2	7.3	1.23	8	4.3
	Standard Deviation	2.4	0.5	1	0.1	0.1	1.3
	Percent	100%	100%	100%	100%	100%	93%
March 2014 (Expected count 1488)	Actual Count	1488	1456	1488	1488	1488	1385
	Minimum	15.7	31.8	5.6	1.04	7.7	3
	Maximum	25.2	36.1	8.6	1.41	8.3	12.5
	Mean	20.2	34.2	7	1.23	8	5.3
	Standard Deviation	2	1.4	0.6	0.1	0.08	1.3
	Percent	100%	98%	100%	100%	100%	93%
April 2014 (Expected count 1440)	Actual Count	1415	52	1415	1415	1415	1158
	Minimum	19.1	32	4.1	1.05	7.9	3.1
	Maximum	29	32.8	8.9	1.52	8.4	18.2
	Mean	24.3	32.3	6.1	1.28	8.1	8.2
	Standard Deviation	2.1	0.2	0.8	0.1	0.14	2.7
	Percent	98%	4%	98%	98%	98%	80%
May 2014 (Expected count 1488)	Actual Count	1487	0	1487	1428	1487	946
	Minimum	22.2	NA	0.6	1.09	8	6.5
	Maximum	31.1	NA	9.2	1.52	8.5	51.9
	Mean	27.3	NA	6	1.31	8.2	11.8
	Standard Deviation	1.7	NA	1.3	0.1	0.1	4.1
	Percent	100%	0%	100%	96%	100%	64%
June 2014 (Expected count 1440)	Actual Count	1440	591	1440	1248	1440	1260
	Minimum	25.3	31.8	0.4	1.04	7.9	6.3
	Maximum	32.5	39.2	8.9	1.46	8.4	24.2
	Mean	29	37.3	5.6	1.23	8.1	11.5
	Standard Deviation	1.7	0.9	1.5	0.1	0.09	2.3
	Percent	100%	41%	100%	87%	100%	88%

Table 5 (continued). Monthly minimum, maximum, and mean values for parameters collected by the YSI datasondes at Canaveral National Seashore during 2013–2014. Percent of values for each month indicates the number of data points collected during one calendar month of data collection / total number of expected points for a complete month of data [PPT—parts per thousand; mg/L—milligrams per liter; m—meter; NTU—nephelometric turbidity unit; SD—standard deviation].

Month / Expected count	Metric	Temperature, °C	Salinity, PPT	Dissolved Oxygen, mg/L	Depth, meters	pH	Turbidity, NTU
July 2014 (Expected count 1488)	Actual Count	1486	936	1486	1486	1486	1337
	Minimum	26.9	28.6	3.4	1.03	7.8	4.7
	Maximum	32.8	34.7	8.2	1.44	8.3	15.3
	Mean	30.1	31.5	5.3	1.27	8.1	8.6
	Standard Deviation	1.2	0.9	0.9	0.1	0.09	2
	Percent	100%	63%	100%	100%	100%	90%
August 2014 (Expected count 1488)	Actual Count	1488	95	1488	1488	1488	918
	Minimum	27.4	28.5	1.8	1.05	7.7	3.6
	Maximum	33.8	29.6	7.2	1.48	8.2	14.1
	Mean	30.3	29.2	4.7	1.31	7.9	7.8
	Standard Deviation	1.2	0.2	1	0.1	0.11	1.9
	Percent	100%	6%	100%	100%	100%	62%
September 2014 (Expected count 1440)	Actual Count	1440	0	1440	1440	1440	1214
	Minimum	25.7	NA	2.4	1.23	7.4	3.1
	Maximum	32.8	NA	6.9	1.61	8	18
	Mean	29.1	NA	4.2	1.43	7.6	8.5
	Standard Deviation	1.6	NA	0.9	0.1	0.14	2
	Percent	100%	0%	100%	100%	100%	84%
October 2014 (Expected count 1488)	Actual Count	1488	0	1488	1488	1488	1245
	Minimum	21.4	NA	2.4	1.12	7.4	3.8
	Maximum	29.7	NA	7	1.62	8.1	22
	Mean	25.9	NA	4.8	1.34	7.8	10.8
	Standard Deviation	1.8	NA	1	0.1	0.18	2.7
	Percent	100%	0%	100%	100%	100%	84%
November 2014 (Expected count 1440)	Actual Count	1440	0	1440	1440	1439	1415
	Minimum	13.9	NA	4.6	1.12	7.8	3
	Maximum	24.1	NA	8.7	1.54	8.2	17.2
	Mean	19.4	NA	6.4	1.36	8	7.2
	Standard Deviation	2.4	NA	0.8	0.1	0.06	2.1
	Percent	100%	0%	100%	100%	100%	98%
December 2014 (Expected count 1488)	Actual Count	1488	506	1488	1488	1488	1464
	Minimum	13.1	29.9	4.8	1.22	7.7	0.4
	Maximum	22.4	31.2	9.3	1.57	8.3	9.5
	Mean	18.7	30.6	6.8	1.38	8	4.4
	Standard Deviation	2.6	0.4	1	0.1	0.13	1.7
	Percent	100%	34%	100%	100%	100%	98%

Water-quality data collected by St. Johns Water Management District at fixed sites in Canaveral National Seashore during 2013–2014 are shown in Table 6 below.

Table 6. Monthly water-quality data collected by St. Johns River Water Management District at fixed sites in Mosquito Lagoon during 2013–2014. Water clarity was assessed using light attenuation values (*k*) using a constant for estuarine water with naturally turbid conditions (Smith et al. 2006) and assessment categories that correspond to USEPA (2012). Condition of other assessed parameters based on USEPA (2012). [^aGreen—good; ^byellow—fair; ^cred—poor; *k*—light attenuation coefficient; µg/L—micrograms per liter; mg/L—milligrams per liter; -- data not collected; BDL—below detection limit].

Site	Date	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)	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)
IRLML02 (2013)	1/8/2013	1.11 ^a	3.60 ^a	7.1 ^a	0.123 ^b	0.0007 ^a	0.0371	0.961
	2/4/2013	0.71 ^a	3.28 ^a	7.6 ^a	--	0.0016 ^a	0.0574	1.010
	3/5/2013	--	4.46 ^a	8.4 ^a	0.047 ^a	0.0042 ^a	0.0441	0.888
	4/2/2013	0.63 ^a	2.64 ^a	6.4 ^a	0.135 ^b	0.0025 ^a	0.0562	1.035
	5/8/2013	1.43 ^a	13.86 ^b	8.1 ^a	--	0.0061 ^a	0.0448	0.807
	6/3/2013	2.00 ^a	39.38 ^c	7.4 ^a	--	0.0006 ^a	0.0824	1.576
	7/8/2013	2.50 ^a	24.83 ^c	6.6 ^a	0.051 ^a	0.0029 ^a	0.0394	1.318
	8/5/2013	2.00 ^a	23.55 ^c	4.5 ^b	--	0.0069 ^a	0.1001	1.883
	9/3/2013	1.67 ^a	14.45 ^b	5.0 ^b	--	0.0059 ^a	0.0861	1.749
	10/7/2013	1.05 ^a	7.21 ^b	5.0 ^b	0.043 ^a	0.0047 ^a	0.0490	1.455
	11/7/2013	1.25 ^a	9.48 ^b	7.2 ^a	0.031 ^a	0.0021 ^a	0.0532	1.398
	12/2/2013	0.83 ^a	4.97 ^a	7.2 ^a	0.119 ^b	0.0014 ^a	0.0448	1.081
IRLML02 (2014)	1/6/2014	--	1.47 ^a	8.1 ^a	0.044 ^a	0.0040 ^a	0.0447	0.848
	2/5/2014	0.63 ^a	2.38 ^a	7.0 ^a	0.090 ^a	0.0103 ^b	0.0484	0.804
	3/3/2014	0.71 ^a	2.18 ^a	7.3 ^a	0.055 ^a	0.0019 ^a	0.0431	0.812
	4/10/2014	0.77 ^a	2.43 ^a	6.2 ^a	0.188 ^b	0.0069 ^a	0.0646	1.005
	5/5/2014	0.77 ^a	3.12 ^a	6.5 ^a	0.292 ^b	0.0049 ^a	0.0309	1.174
	6/3/2014	1.00 ^a	9.15 ^b	6.2 ^a	0.037 ^a	0.0031 ^a	0.0421	1.062
	7/7/2014	0.54 ^a	1.39 ^a	5.6 ^a	0.075 ^a	0.0099 ^a	0.0376	1.055
	8/7/2014	--	2.85 ^a	6.0 ^a	0.031 ^a	0.0085 ^a	0.0549	1.151
	9/2/2014	0.56 ^a	2.61 ^a	6.3 ^a	0.009 ^a	0.0030 ^a	0.0100	1.204
	10/6/2014	1.00 ^a	6.51 ^b	6.7 ^a	0.011 ^a	0.0083 ^a	0.0707	1.329
	11/3/2014	1.25 ^a	8.60 ^b	7.7 ^a	0.007 ^a	BDL ^a	0.0300	1.201
	12/4/2014	1.11 ^a	8.28 ^b	8.2 ^a	0.018 ^a	0.0027 ^a	0.0371	0.897
IRLML169 (2013)	1/8/2013	0.48 ^a	3.55 ^a	7.6 ^a	0.043 ^a	0.0046 ^a	0.0373	0.342
	2/6/2013	--	1.98 ^a	7.9 ^a	--	0.0045 ^a	0.0353	0.355
	3/4/2013	0.48 ^a	2.11 ^a	7.5 ^a	--	0.0055 ^a	0.0546	0.526
	4/2/2013	--	1.15 ^a	--	--	0.0043 ^a	0.0513	0.533
	5/8/2013	0.71 ^a	4.97 ^a	8.4 ^b	--	0.0017 ^a	0.0422	0.448
	6/3/2013	2.50 ^a	36.53 ^c	9.6 ^b	--	0.0039 ^a	0.0996	1.309
	7/1/2013	2.00 ^a	36.40 ^c	6.2 ^b	0.063 ^a	0.0042 ^a	0.0676	1.545
	8/7/2013	2.00 ^a	30.81 ^c	7.5 ^b	0.035 ^a	0.0077 ^a	0.1024	1.681
	9/3/2013	1.25 ^a	19.36 ^b	6.9 ^b	--	0.0058 ^a	0.0911	1.592
	10/9/2013	1.25 ^a	17.14 ^b	6.4 ^b	BDL ^a	0.0071 ^a	0.0642	0.833
	11/6/2013	1.11 ^a	12.47 ^b	7.3 ^b	BDL ^a	0.0026 ^a	0.0652	0.996
	12/4/2013	0.59 ^a	4.03 ^a	7.7 ^b	BDL ^a	0.0047 ^a	0.0432	0.425

Table 6 (continued). Monthly water-quality data collected by St. Johns River Water Management District at fixed sites in Mosquito Lagoon during 2013–2014. Water clarity was assessed using light attenuation values (*k*) using a constant for estuarine water with naturally turbid conditions (Smith et al. 2006) and assessment categories that correspond to USEPA (2012). Condition of other assessed parameters based on USEPA (2012). [^aGreen—good; ^byellow—fair; ^cred—poor; *k*—light attenuation coefficient; µg/L—micrograms per liter; mg/L—milligrams per liter; -- data not collected; BDL—below detection limit].

Site	Date	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)	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)
IRLML169 (2014)	1/9/2014	0.50 ^a	3.04 ^a	8.5 ^a	0.011 ^a	0.0047 ^a	0.0302	0.309
	2/4/2014	--	1.55 ^a	8.5 ^a	0.043 ^a	0.0104 ^b	0.0173	0.214
	3/5/2014	1.11 ^a	2.87 ^a	7.1 ^a	0.014 ^a	0.0038 ^a	0.0538	0.372
	4/10/2014	0.59 ^a	2.40 ^a	--	0.010 ^a	0.0057 ^a	0.0092	0.286
	5/7/2014	--	1.36 ^a	7.0 ^a	0.008 ^a	BDL ^a	0.0238	0.56
	6/4/2014	0.45 ^a	2.67 ^a	5.7 ^a	0.005 ^a	0.0039 ^a	0.0393	0.835
	7/9/2014	0.43 ^a	1.07 ^a	5.8 ^a	0.020 ^a	0.0075 ^a	0.041	0.777
	8/6/2014	--	1.84 ^a	6.2 ^a	0.035 ^a	0.0095 ^a	0.0368	0.787
	9/9/2014	0.50 ^a	8.57 ^b	7.5 ^a	0.007 ^a	0.0020 ^a	0.053	0.902
	10/8/2014	0.42 ^a	2.19 ^a	6.8 ^a	0.031 ^a	0.0275 ^b	0.0421	0.673
	11/4/2014	0.48	2.19 ^a	7.9 ^a	0.009 ^a	0.0035 ^a	0.0264	0.408
	12/2/2014	0.42 ^a	2.27 ^a	8.7 ^a	0.018 ^a	0.0093 ^a	0.0323	0.398
IRLV05 (2013)	1/8/2013	--	3.07 ^a	8.0 ^a	0.054 ^a	0.0060 ^a	0.0574	0.213
	2/6/2013	--	2.88 ^a	7.7 ^a	--	0.0078 ^a	0.0349	0.219
	3/4/2013	--	1.31 ^a	7.8 ^a	--	0.0095 ^a	0.0361	0.144
	4/2/2013	--	2.56 ^a	--	--	0.0060 ^a	0.0613	0.393
	5/8/2013	1.25 ^a	4.59 ^a	7.5 ^a	--	0.0060 ^a	0.0889	0.462
	6/3/2013	3.33 ^c	34.55 ^c	7.7 ^a	--	0.0022 ^a	0.1664	1.571
	7/1/2013	2.5 ^b	28.03 ^c	5.9 ^a	0.047 ^a	0.0046 ^a	0.0782	1.384
	8/7/2013	1.11 ^a	7.61 ^b	6.8 ^a	0.017 ^a	0.0114 ^b	0.0704	0.481
	9/3/2013	2.00 ^a	19.56 ^c	6.1 ^a	--	0.0069 ^a	0.1639	1.679
	10/9/2013	1.25 ^a	7.64 ^b	6.3 ^a	0.066 ^a	0.0218 ^b	0.0781	0.387
	11/6/2013	1.00 ^a	6.27 ^b	7.3 ^a	0.009 ^a	0.0111 ^b	0.0732	0.335
	12/4/2013	--	4.24 ^a	7.8 ^a	BDL ^a	0.0123 ^b	0.0611	0.292
IRLV05 (2014)	1/9/2014	--	2.83 ^a	8.3 ^a	BDL ^a	0.0151 ^b	0.0365	0.388
	2/4/2014	--	3.02 ^a	7.7 ^a	0.052 ^a	0.0214 ^b	0.0509	0.246
	3/5/2014	--	3.39 ^a	7.4 ^a	0.012 ^a	0.0115 ^b	0.0388	0.199
	4/10/2014	1.43 ^a	5.34 ^b	--	0.012 ^a	0.0140 ^b	0.0811	0.566
	5/7/2014	0.83 ^a	4.73 ^a	7.1 ^a	0.014 ^a	0.0020 ^a	0.0534	0.521
	6/4/2014	--	4.94 ^a	7.0 ^a	0.001 ^a	0.0049 ^a	0.0518	0.392
	7/9/2014	1.43 ^a	7.48 ^b	6.9 ^a	0.019 ^a	0.0148 ^b	0.0932	0.740
	8/6/2014	1.43 ^a	10.79 ^b	7.6 ^a	0.008 ^a	0.0072 ^a	0.1003	0.666
	9/9/2014	--	7.05 ^b	5.4 ^a	0.045 ^a	0.0252 ^b	0.08	0.512
	10/8/2014	1.00 ^a	4.89 ^a	6.0 ^a	0.057 ^a	0.0317 ^b	0.1002	0.666
	11/4/2014	0.83 ^a	4.51 ^a	7.7 ^a	0.014 ^a	0.0116 ^b	0.0682	0.290
	12/2/2014	1.11 ^a	3.95 ^a	7.6 ^a	0.081 ^a	0.0312 ^b	0.0654	0.499

Table 6 (continued). Monthly water-quality data collected by St. Johns River Water Management District at fixed sites in Mosquito Lagoon during 2013–2014. Water clarity was assessed using light attenuation values (*k*) using a constant for estuarine water with naturally turbid conditions (Smith et al. 2006) and assessment categories that correspond to USEPA (2012). Condition of other assessed parameters based on USEPA (2012). [^aGreen—good; ^byellow—fair; ^cred—poor; *k*—light attenuation coefficient; µg/L—micrograms per liter; mg/L—milligrams per liter; -- data not collected; BDL—below detection limit].

Site	Date	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)	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)
IRLV11 (2013)	1/8/2013	--	2.70 ^a	5.9 ^a	0.073 ^a	0.0098 ^a	0.0657	0.334
	2/6/2013	--	3.04 ^a	6.6 ^a	--	0.0104 ^b	0.0515	0.381
	3/4/2013	--	1.23 ^a	8.3 ^a	--	0.0128 ^b	0.0309	0.266
	4/2/2013	--	2.16 ^a	--	--	0.0063 ^a	0.0565	0.442
	5/8/2013	1.11 ^a	3.82 ^a	6.9 ^a	--	0.0058 ^a	0.0671	0.468
	6/3/2013	2.50 ^b	41.92 ^c	7.9 ^a	--	0.0230 ^c	0.0317	0.775
	7/1/2013	2.00 ^a	29.90 ^c	7.3 ^a	0.045 ^a	0.0045 ^a	0.0741	1.335
	8/7/2013	2.50 ^c	24.16 ^c	6.0 ^a	0.033 ^a	0.0070 ^a	0.1392	1.377
	9/3/2013	2.00 ^a	15.53 ^b	6.4 ^a	--	0.0060 ^a	0.1199	1.451
	10/9/2013	1.67 ^a	16.87 ^b	6.7 ^a	BDL ^a	0.0076 ^a	0.1052	0.732
	11/6/2013	1.11 ^a	5.24 ^a	6.6 ^a	0.008 ^a	0.0078 ^a	0.0797	0.497
	12/4/2013	0.91 ^a	2.40 ^a	7.0 ^a	0.004 ^a	0.0125 ^b	0.0539	0.448
IRLV11 (2014)	1/9/2014	--	1.36 ^a	8.7 ^a	0.015 ^a	0.0162 ^b	0.0383	0.235
	2/4/2014	1.00 ^a	1.91 ^a	7.6 ^a	0.054 ^a	0.0147 ^b	0.0411	0.271
	3/5/2014	--	2.46 ^a	6.8 ^a	0.019 ^a	0.0148 ^b	0.0515	0.280
	4/10/2014	1.25 ^a	4.59 ^a	--	0.006 ^a	0.0099 ^b	0.0778	0.619
	5/7/2014	1.67 ^a	5.42 ^b	7.2 ^a	0.007 ^a	0.0027 ^b	0.0665	0.664
	6/4/2014	1.25 ^a	5.69 ^b	6.2 ^a	0.003 ^a	0.0051 ^b	0.0666	0.665
	7/9/2014	1.11 ^a	5.39 ^b	6.1 ^a	0.034 ^a	0.0092 ^b	0.073	0.718
	8/6/2014	1.25 ^a	8.89 ^b	6.1 ^a	0.012 ^a	0.0077 ^b	0.0908	0.879
	9/9/2014	1.25 ^a	4.81 ^a	4.6 ^b	0.031 ^a	0.0156 ^b	0.0789	0.860
	10/8/2014	1.11 ^a	5.21 ^b	4.0 ^b	0.028 ^a	0.0158 ^b	0.0625	0.624
	11/4/2014	1.11 ^a	3.79 ^a	7.0 ^a	0.024 ^a	0.0120 ^b	0.0546	0.350
	12/2/2014	0.91 ^a	3.74 ^a	7.1 ^a	0.085 ^a	0.0218 ^b	0.0534	0.446
IRLV17 (2013)	1/8/2013	--	3.55 ^a	7.7 ^a	0.042 ^a	0.0077 ^a	0.0408	0.226
	2/6/2013	--	2.67 ^a	7.5 ^a	--	0.0054 ^a	0.052	0.380
	3/4/2013	--	1.87 ^a	7.8 ^a	--	0.0072 ^a	0.0459	0.306
	4/2/2013	--	1.90 ^a	--	--	0.0060 ^a	0.0608	0.541
	5/8/2013	--	4.94 ^a	7.2 ^a	--	0.0047 ^a	0.0594	0.561
	6/3/2013	2.50 ^c	38.23 ^c	8.2 ^a	--	0.0018 ^a	0.1304	1.338
	7/1/2013	2.00 ^b	29.37 ^c	7.3 ^a	0.051 ^a	0.0188 ^b	0.0792	1.527
	8/7/2013	2.00 ^b	22.21 ^c	5.6 ^a	0.025 ^a	0.0092 ^a	0.115	1.296
	9/3/2013	2.00 ^b	18.36 ^b	5.5 ^a	--	0.0077 ^a	0.1137	1.536
	10/9/2013	1.25 ^a	7.90 ^b	5.9 ^a	0.052 ^a	0.0182 ^b	0.0811	0.569
	11/6/2013	--	5.84 ^b	6.7 ^a	0.004 ^a	0.0035 ^a	0.0501	0.410
	12/4/2013	--	2.51 ^a	7.3 ^a	BDL ^a	0.0065 ^a	0.0532	0.380

Table 6 (continued). Monthly water-quality data collected by St. Johns River Water Management District at fixed sites in Mosquito Lagoon during 2013–2014. Water clarity was assessed using light attenuation values (*k*) using a constant for estuarine water with naturally turbid conditions (Smith et al. 2006) and assessment categories that correspond to USEPA (2012). Condition of other assessed parameters based on USEPA (2012). [^aGreen—good; ^byellow—fair; ^c red—poor; *k*—light attenuation coefficient; µg/L—micrograms per liter; mg/L—milligrams per liter; -- data not collected; BDL—below detection limit].

Site	Date	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)	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)
IRLV17 (2014)	1/9/2014	--	1.81 ^a	8.6 ^a	BDL ^a	0.0128 ^b	0.0359	0.186
	2/4/2014	--	1.52 ^a	8.2 ^a	0.065 ^a	0.0100 ^b	0.0282	0.223
	3/5/2014	--	3.20 ^a	6.8 ^a	0.012 ^a	0.0071 ^a	0.0519	0.259
	4/10/2014	1.25 ^a	4.84 ^a	--	0.011 ^a	0.0118 ^b	0.0215	0.255
	5/7/2014	--	2.16 ^a	7.2 ^a	0.010 ^a	0.0048 ^a	0.0250	0.442
	6/4/2014	1.25 ^a	6.12 ^b	6.7 ^a	0.005 ^a	0.0057 ^a	0.0842	0.790
	7/9/2014	1.11 ^a	4.78 ^a	6.1 ^a	0.014 ^a	0.0058 ^a	0.0570	0.663
	8/6/2014	0.91 ^a	9.97 ^b	6.2 ^a	0.013 ^a	0.0250 ^b	0.0842	0.928
	9/9/2014	1.11 ^a	10.95 ^b	5.4 ^a	0.016 ^a	0.0058 ^a	0.0849	0.901
	10/8/2014	1.25 ^a	6.46 ^b	5.1 ^a	0.024 ^a	0.0005 ^a	0.0672	0.803
	11/4/2014	1.11 ^a	5.15 ^b	7.6 ^a	0.005 ^a	0.0096 ^a	0.0513	0.371
	12/2/2014	--	3.98 ^a	8.3 ^a	0.064 ^a	0.0198 ^b	0.0415	0.467

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