



Landbird Community Monitoring 2016: Data Summary

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Overview

Birds play several critical roles in park ecosystems, where they occupy and interact with multiple levels of the food web. Predatory birds regulate prey species populations, notably helping to control rodents and insects. Scavenging species remove dead animals from the environment. Many other bird species act as important pollinators or seed dispersers. Because many avian species are associated with specific habitat types and ecosystem services, we can gain insights about the condition of specific habitat components in a park by monitoring what birds are present and where in the landscape they occur.

Many active members of the recreational birding community enjoy opportunities to engage in bird and wildlife watching in protected park settings. Birds contribute beauty and song to the natural setting and provide great appeal to the public. Birding has become one of the most popular outdoor recreational activities pursued by Americans. Birders substantially contribute to local economies while pursuing their hobby.

The Southeast Coast Network (SECN) parks in Alabama, Florida, Georgia, South Carolina, and North Carolina are located within the Atlantic Flyway, and host high bird diversity. More than 400 avian species use SECN parks while breeding, wintering, or stopping over during migration (NPS 2023). Surrounded by human-altered landscapes in a region of increasing urbanization and land conversion, the inland and coastal parks of the Southeast Coast Network represent important, ecologically-intact areas that contain a multitude of habitat types important to the conservation of wildlife diversity.

Bird communities respond quickly to environmental stressors. Changes in avian species composition, richness, and distribution on the landscape may indicate changes in the underlying ecological condition of park resources. Shifting species distributions alter species interactions and the food-web structure, producing cascading effects on ecosystem processes (Montoya and Raffaelli 2010). Long-term monitoring projects can detect trends in breeding bird populations and use them to assess ecosystem integrity and sustainability. Park managers can use monitoring data as a tool to inform land management decisions.



Laughing gull (*Leucophaeus atricilla*), one of many species detected during monitoring in 2016. NPS photo (NPgallery).

Objectives

This report summarizes data collected with the SECN landbird community monitoring protocol (Byrne et al. 2014) to address the following Vital Signs Monitoring Program objectives:

1. Evaluate landbird community species richness in the park during the breeding season.
2. Assess landbird occupancy and spatial distribution in the park during the breeding season.

We use the term “community” herein to refer to an assemblage of species populations occurring together in time and space (Begon et al. 1986). We consider the landbird species assemblage within the park as a *de facto* community (Byrne et al. 2014).

Significant Results

This brief summarizes data collected in 2016 at Cape Lookout National Seashore during implementation of the Southeast Coast Network’s landbird community monitoring protocol (Byrne et al. 2014).

- Automated recording devices (ARDs) captured landbird vocalizations from April 12 to July 4 at 28 spatially-balanced random sampling locations.
- A subset of 1,656 minutes of audio derived from 138 recordings was analyzed and all discernable bird vocalizations were reviewed and classified to species.
- We detected 50 species of native landbirds in 2016. Additionally, we detected three introduced species: ring-necked pheasant (*Phasianus colchicus*), Eurasian collared-dove (*Streptopelia decaocto*), and house finch (*Haemorhous mexicanus*). Eurasian collared-dove was previously undocumented on the park’s species list.

Significant Results (continued)

- Naïve occupancy was greatest for laughing gull (*Leucophaeus atricilla*), royal tern (*Thalasseus maximus*), Carolina wren (*Thryothorus ludovicianus*), and red-winged blackbird (*Agelaius phoeniceus*), which were each detected at greater than or equal to 82% ($n \geq 23$) of sampling locations.
- Landbird communities at this park were resampled in 2021.

Visit the NPS data store at the Integrated Resource Management Application portal for:

- [Data Summary Brief](https://irma.nps.gov/DataStore/Reference/Profile/2294570) (<https://irma.nps.gov/DataStore/Reference/Profile/2294570>)
- [Species Distribution Maps](https://irma.nps.gov/DataStore/Reference/Profile/2294569) (<https://irma.nps.gov/DataStore/Reference/Profile/2294569>)
- [Full Dataset and Metadata](https://doi.org/10.57830/2305163) (<https://doi.org/10.57830/2305163>)

Study Area

Cape Lookout National Seashore comprises the southern portion of the North Carolina Outer Banks and preserves approximately 90 kilometers (56 miles) of mostly undeveloped barrier islands between Ocracoke Inlet and Beaufort Inlet (Figure 1). The 11,430-hectare (28,243-acre) National Seashore consists of three major islands (called “banks”): Shackleford Banks, South Core Banks, and North Core Banks. Portsmouth Island, formerly the northern tip of North Core Banks, was largely cut off from North Core Banks by a large breach caused by Hurricane Dorian in 2019. The park headquarters is on the east end of Harkers Island, North Carolina. Harkers Island is connected to the mainland via a bridge. Access to the barrier islands from the mainland is limited to boats.

The Core Banks are low-lying. Most of their area is less than 2 meters (6 feet) above sea level and subject to overwash during intense storms. In the lee of the dunes are found mostly marine grasslands and wetlands of varying sizes. Nearer the sound side of the islands, shrub thickets and small patches of maritime forest fringe an extensive marsh zone extending into the sound (McManamay 2017). The National Seashore is a very dynamic environment, with wind and water causing regular erosion and accretion events across the expanse of the islands. Shackleford Banks also has additional grazing pressures from over 100 non-native horses present on the island.

Cape Lookout National Seashore had 287 previously documented landbird species when sampling occurred in 2016 (NPS 2023). A table listing avian species previously documented on NPSpecies (NPS 2023), as well as avian species documented during SECN’s 2016 monitoring, is available from the NPS data store at [Full Dataset and Metadata](https://doi.org/10.57830/2305163) (<https://doi.org/10.57830/2305163>).

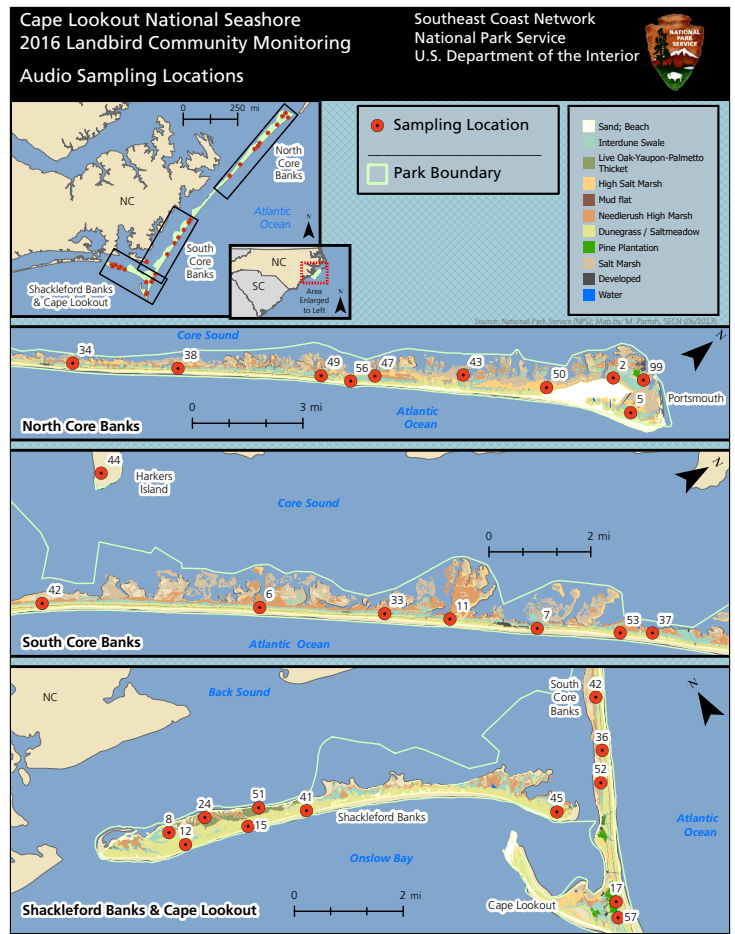


Figure 1. Permanent audio sampling locations ($n = 29$) at Cape Lookout National Seashore. Sampling location ID numbers are indicated at each point.

Methods

Sampling Design

We established a randomly-selected, spatially-balanced set of sample locations ($n = 29$) during an initial field season in 2012 (Figure 1). Our sample size was chosen based on considerations including park size, hypothesized variability in wildlife populations, and logistics. Sample locations are permanent and revisited on a three-year rotation. More details regarding study design, data collection, and data analyses are in the SECN Landbird Community Monitoring Protocol (Byrne et al. 2014). This report pertains to 2016 sampling only.

Data Collection

In 2016, we deployed automated recording devices (ARDs) at 29 permanent sampling locations (Figure 1) between April 12 and July 4. One unit (sample location 037) experienced failure in the field due to environmental damage, reducing our final sample size to $n = 28$. We programmed each ARD to record audio from 08:00 to 08:12, every other day, for a period of 82 days. Forty-one recordings were captured on each unit during the sampling period. The ARDs were collected from the field after recordings were completed and downloaded to a computer for classification and analyses.

Methods (continued)

Manual Classification of Recordings

We systematically selected recordings from the following dates: April 15, April 30, May 15, May 30, and June 15. Loud ambient noise (e.g., traffic, surf, insect droning, or wind) in recordings negatively affects discernment of wildlife vocalizations. Thus, recordings made on the above dates were initially screened using the software package Kaleidoscope Pro (Wildlife Acoustics, Inc. 2024) to assess clarity and determine whether background noise was disruptive to the listener's ability to interpret bird sounds. If recording quality was poor on a given date, we systematically evaluated and selected for analysis alternate recordings from proximate dates.

Selected recordings were methodically reviewed by an experienced technician with strong familiarity with the vocalizations of birds of the southeastern U.S. The technician evaluated recordings using Kaleidoscope Pro, which allowed them to view spectrograms (graphical representations of vocalizations) and to manipulate playback on the fly to maximize acoustical clarity. The technician classified all vocalizations identifiable to the species level, a process requiring from one-half to two hours per 12-minute recording depending on the complexity of the captured soundscape. A wildlife biologist later reviewed the technician's classifications for data quality assurance and control.

Taxonomic Standards

Our use of taxonomic nomenclature followed the Integrated Taxonomic Information System (ITIS 2023). The National Park Service maintains the online database NPSpecies (NPS 2023), which documents the occurrence and status of species found in parks.

Data Analysis

Our focus for this effort was limited to the analysis of species richness and related characteristics, including occupancy and spatial distribution of the park's breeding-season landbird community. Five sampling locations experienced intermittent poor recording quality and only yielded four recordings adequate for our subsample; one additional sampling location furnished only three discernible recordings. Rather than omit six sites, we chose to include all possible species detections at those sites. We derived results from our manual evaluation of 1,656 minutes of audio from 138 recordings across 28 sample locations. We only included in analyses detections of birds that were identified to the species level. We calculated metrics separately for native versus non-native species, as managers may consider the latter a special consideration.

Species Richness and Composition

Using the SpadeR package (Chao et al. 2016) in program R, we calculated species richness for the park as well as mean species richness per sample location at the sample location scale, as well as at the park scale. Species richness was defined as the number of unique species detected at the scale of interest.

Field methods for sampling species richness (e.g., point-counts or audio sampling) inherently produce incomplete counts, due to



A willet (*Tringa semipalmata*), one of many species detected during monitoring in 2016. NPS photo (NPGallery).

imperfect detection of cryptic species that may be present but are difficult to record during surveys. Observed species richness, therefore, is expected to be an underestimate of true species richness, though it offers utility as an index of the true diversity of a sample unit. Various methods exist to adjust incidence data to provide an estimated species richness that may be closer to the true value. We used the SpadeR package in R to calculate the *iChao2* estimator of species richness with an associated 95% confidence interval (Chiu et al. 2014). The *iChao2* estimator uses the detection frequencies of rarely-detected species to adjust the observed richness upward to account for species that may be present but not detected. The *iChao2* estimator is expected to perform well for communities that are highly heterogeneous with regard to species incidence or occupancy (Chiu et al. 2014).

Occupancy

We calculated naïve occupancy (i.e., frequency of occurrence) as the percent of sampling locations where a species was detected in one or more reviewed recordings. We did not adjust occupancy estimates for probability of detection (i.e., detectability). Species with greater naïve occupancy occur at more locations than those with low values.

Spatial Distribution

We mapped species detections in the park to provide a means of visually assessing spatial distributions of vocal birds. An understanding of landbird distribution is crucial for informed management of species and their requisite habitats. Following future park visits, we plan to examine species records across time to identify trends in community makeup and species distribution. This has potential to provide insights into influences on park diversity (e.g., land use change and habitat condition, climate issues, and hydrological processes).

Results

Species Richness

Observed species richness of native breeding landbirds at the park in 2016 was 50 (Table 1). Mean $\pm$ SD observed species richness of native birds per sample location was 14.64 ± 4.73 (range: 6–23; Figure 2, Table 1). Additionally, we detected three introduced species: ring-necked pheasant (*Phasianus colchicus*), Eurasian collared-dove (*Streptopelia decaocto*), and house finch (*Haemorhous mexicanus*). Eurasian collared-dove was not previously included on the park's NPSpecies taxa list (Table 2; NPS 2023). The *iChao2* species richness estimate for native species in the park was 62.2 (95% CI: 55.3, 77.7).

Table 1. Species detections (indicated with “X”) and observed species richness at each sampling location ($n = 28$) for landbirds at Cape Lookout National Seashore in 2016. Refer to Figure 1 to view labeled sampling locations. Ø = No data collected due to equipment failure.

Common Name	02	05	06	07	08	11	12	15	17	24	33	34	36	37	38	41	42	43	44	45	47	49	50	51	52	53	56	57	99
Ring-necked pheasant ¹	–	–	–	–	–	–	–	–	–	–	X	–	–	Ø	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Eurasian collared-dove ¹	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–
Mourning dove	X	X	–	–	–	–	–	–	X	X	–	–	–	Ø	–	–	–	X	X	X	–	–	–	–	–	–	X	–	–
Yellow-billed cuckoo	–	–	–	–	–	–	–	–	X	X	–	–	–	Ø	X	–	–	–	X	X	–	–	–	X	–	–	–	–	–
Common nighthawk	–	–	X	X	–	X	–	X	X	–	–	–	X	Ø	–	–	X	–	X	X	–	–	–	X	–	–	–	–	–
Chimney swift	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	–	X	–	–	–	–	–	–	–	–	X
Clapper rail	X	–	X	X	–	X	–	–	–	–	X	–	X	Ø	X	–	X	X	–	X	X	X	X	–	–	–	–	–	X
American oystercatcher	–	–	–	X	–	X	–	X	–	–	–	–	–	Ø	–	X	–	X	–	–	–	–	–	–	–	–	X	–	–
Black-bellied plover	X	–	–	–	–	–	–	–	–	–	–	–	X	Ø	X	–	X	–	–	X	–	–	–	–	X	–	–	–	–
Killdeer	–	–	–	X	X	X	X	X	–	–	–	–	–	Ø	–	X	X	X	–	X	–	–	–	–	X	–	–	–	–
Lesser yellowlegs	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–
Willet	X	X	X	X	X	X	X	–	–	–	X	X	X	Ø	X	X	X	X	–	X	X	X	X	–	X	X	X	–	X
Greater yellowlegs	X	–	X	–	–	X	–	–	–	–	–	–	–	Ø	X	–	–	–	–	–	X	–	–	–	–	–	X	X	–
Laughing gull	X	–	X	X	X	X	X	X	X	X	X	X	X	Ø	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Least tern	–	–	–	X	–	X	–	–	X	–	X	–	X	Ø	X	X	X	X	–	X	–	X	X	–	–	–	–	–	–
Royal tern	–	–	X	X	X	X	X	X	X	X	X	X	X	Ø	X	X	X	X	–	X	X	X	X	X	X	X	X	–	X
Great blue heron	X	–	–	–	–	–	–	–	–	X	–	–	–	Ø	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Downy woodpecker	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–
Great crested flycatcher	X	–	–	–	–	–	–	–	X	X	–	–	–	Ø	–	–	–	–	X	–	–	–	–	–	–	–	–	–	X
Eastern kingbird	X	X	–	X	–	–	–	–	–	–	–	X	–	Ø	–	–	–	X	–	–	–	–	–	–	–	–	X	–	X
White-eyed vireo	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X
Blue jay	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–
American crow	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–
Fish crow	X	–	–	–	X	–	–	–	–	–	–	–	–	Ø	X	–	–	–	X	X	–	–	–	–	–	–	–	X	–
Carolina chickadee	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	X	–	–	X	–	–	–	–	–	–	–
Purple martin	–	–	–	–	–	–	–	–	–	X	–	–	–	Ø	X	–	–	–	–	–	–	–	–	X	–	–	–	–	–
Barn swallow	–	–	–	–	–	X	–	X	X	–	–	–	X	Ø	–	–	–	X	X	–	–	–	X	–	–	–	X	X	X
Sedge wren	–	–	–	–	–	–	–	–	–	–	–	X	–	Ø	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Marsh wren	X	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–
Carolina wren	X	X	–	X	X	X	X	X	X	X	X	–	X	Ø	X	X	X	X	X	–	X	X	–	X	X	–	X	X	X
Gray catbird	X	X	–	–	–	–	–	–	–	–	–	–	–	Ø	X	–	–	X	X	–	–	X	–	–	–	–	–	–	X

¹ Non-native, introduced species.

Table 1 (continued). Species detections (indicated with “X”) and observed species richness at each sampling location ($n = 28$) for landbirds at Cape Lookout National Seashore in 2016. Refer to Figure 1 to view labeled sampling locations. Ø = No data collected due to equipment failure.

Common Name	02	05	06	07	08	11	12	15	17	24	33	34	36	37	38	41	42	43	44	45	47	49	50	51	52	53	56	57	99
Brown thrasher	–	–	–	X	–	–	–	–	–	–	–	–	X	Ø	–	–	–	X	–	X	–	–	–	–	–	–	–	–	–
Northern mockingbird	–	–	–	–	–	–	–	–	X	–	–	X	–	Ø	–	X	–	X	X	–	X	X	–	–	–	–	–	X	–
Eastern bluebird	–	–	–	–	–	–	–	–	X	–	–	–	–	Ø	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Swainson's thrush	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X
American robin	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–
House finch ¹	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–
American goldfinch	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X
Seaside sparrow	–	–	X	–	–	X	–	–	–	–	–	X	–	Ø	–	–	X	X	–	–	X	X	X	–	–	–	–	–	–
Eastern towhee	X	X	X	X	–	–	–	–	X	–	X	X	X	Ø	X	–	X	X	X	X	X	X	X	–	–	X	–	X	X
Yellow-breasted chat	–	–	–	–	–	–	–	–	–	–	X	–	–	Ø	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Eastern meadowlark	X	X	X	X	–	X	X	X	–	–	X	X	X	Ø	X	X	X	–	–	X	X	X	X	–	–	X	X	X	–
Orchard oriole	–	X	–	–	X	–	–	–	–	–	–	–	–	Ø	X	–	–	X	–	X	–	–	–	–	–	–	–	X	–
Red-winged blackbird	X	X	X	X	X	X	X	–	–	X	X	X	X	Ø	X	X	X	X	–	X	X	X	X	–	X	X	X	–	X
Brown-headed cowbird	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	X	–	–	X	–	–	–	–	–	–	–	–	–	–	X
Common grackle	X	–	–	–	–	X	–	–	X	X	–	–	X	Ø	X	–	X	–	X	X	–	–	–	–	–	–	–	–	X
Boat-tailed grackle	X	X	X	X	–	X	–	–	X	–	–	–	X	Ø	X	–	X	X	X	X	X	X	X	–	X	–	–	–	–
Prothonotary warbler	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–
Common yellowthroat	X	X	X	X	–	X	–	–	X	–	X	X	X	Ø	X	–	X	X	–	X	X	X	X	–	X	X	X	X	X
Prairie warbler	X	X	–	–	–	–	–	–	X	–	–	X	X	Ø	X	–	–	X	–	–	X	X	–	–	X	–	X	X	X
Northern cardinal	X	–	X	X	X	X	X	X	X	X	X	–	–	Ø	X	X	X	–	X	X	–	–	–	X	X	–	–	X	–
Blue grosbeak	–	–	X	–	X	–	–	X	X	X	–	–	–	Ø	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–
Painted bunting	–	–	–	–	–	X	–	–	–	X	–	–	–	Ø	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Observed Native Species Richness	21	12	14	17	10	19	8	10	18	13	12	12	17	Ø	23	11	17	23	20	21	14	17	11	7	12	6	13	13	19

¹ Non-native, introduced species.

Table 2. Species previously undocumented on NPSpecies at Cape Lookout National Seashore in 2016 using automated recording devices, with recommended NPSpecies classifications.

Common Name	Abundance	Residency	Native Status	Pest	Management Priority	Exploitation Concerns
Eurasian collared-dove	Undetermined	Resident	Non-native	No	No	No

Results (continued)

Occupancy and Spatial Distribution

Naïve occupancy was greatest for laughing gull (*Leucophaeus atricilla*), royal tern (*Thalasseus maximus*), Carolina wren (*Thryothorus ludovicianus*), and red-winged blackbird (*Agelaius phoeniceus*), each detected at greater than or equal to 82% ($n \geq 23$) of sampling locations (Table 1, Table 3). Approximately 45% of species were infrequently detected; 24 species were detected at less than or equal to 18% ($n \leq 5$) of sample locations (Table 3). Fourteen of the 24 species were detected at only one sample location each (Table 3).

Spatial Distribution Maps

Distribution maps for all detected species are available at [NPS Integrated Resource Management Applications portal](https://irma.nps.gov/DataStore/Reference/Profile/2294569) (<https://irma.nps.gov/DataStore/Reference/Profile/2294569>). The maps indicate the sampling location(s) where detections of each recorded species occurred.

Table 3. Landbird naïve occupancy estimates (i.e., percent of permanent sampling locations [$n = 28$] where a species was detected) at Cape Lookout National Seashore in 2016, ranked by descending percentage of sampling locations occupied.

Common Name	Scientific Name	Native Occupancy ¹
Laughing gull	<i>Leucophaeus atricilla</i>	96.4%
Royal tern	<i>Thalasseus maximus</i>	82.1%
Carolina wren	<i>Thryothorus ludovicianus</i>	82.1%
Red-winged blackbird	<i>Agelaius phoeniceus</i>	82.1%
Willet	<i>Tringa semipalmata</i>	78.6%
Common yellowthroat	<i>Geothlypis trichas</i>	75.0%
Eastern meadowlark	<i>Sturnella magna</i>	71.4%
Eastern towhee	<i>Pipilo erythrophthalmus</i>	67.9%
Northern cardinal	<i>Cardinalis cardinalis</i>	64.3%
Boat-tailed grackle	<i>Quiscalus major</i>	57.1%
Clapper rail	<i>Rallus longirostris</i>	50.0%
Prairie warbler	<i>Setophaga discolor</i>	46.4%
Least tern	<i>Sternula antillarum</i>	42.9%
Common nighthawk	<i>Chordeiles minor</i>	35.7%
Killdeer	<i>Charadrius vociferus</i>	35.7%
Barn swallow	<i>Hirundo rustica</i>	35.7%
Common grackle	<i>Quiscalus quiscula</i>	35.7%
Mourning dove	<i>Zenaida macroura</i>	28.6%
Northern mockingbird	<i>Mimus polyglottos</i>	28.6%
Seaside sparrow	<i>Ammodramus maritimus</i>	28.6%
Greater yellowlegs	<i>Tringa melanoleuca</i>	25.0%
Eastern kingbird	<i>Tyrannus tyrannus</i>	25.0%

¹ Proportion of sampling locations where species was observed.

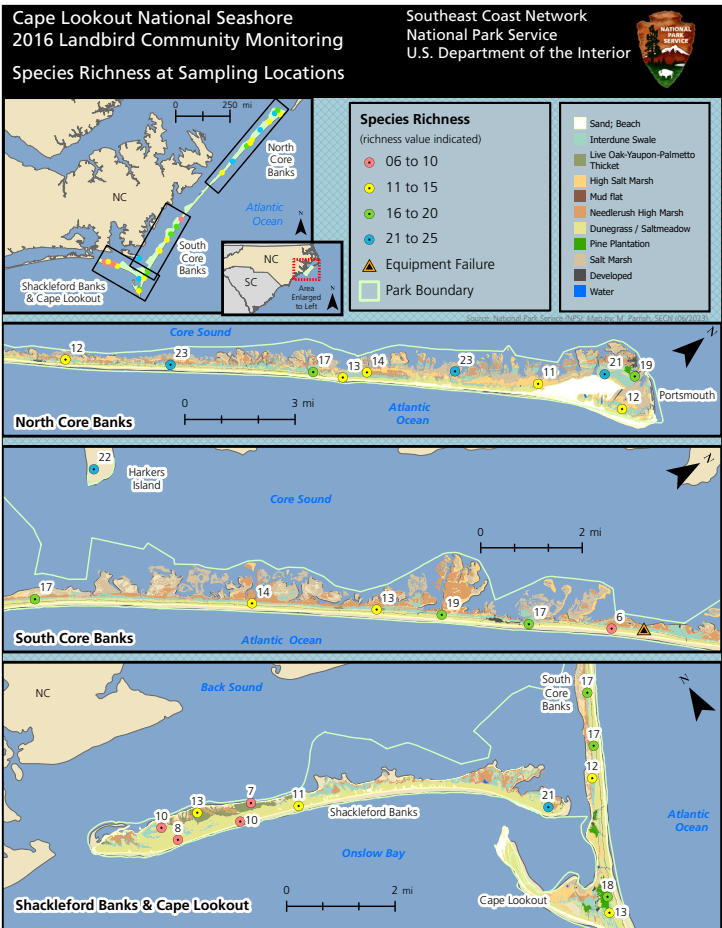


Figure 2. Landbird species richness at sampled locations ($n = 28$) at Cape Lookout National Seashore, based on audio recording detections in 2016. Richness value indicated at each point.

Table 3 (continued). Landbird naïve occupancy estimates (i.e., percent of permanent sampling locations [$n = 28$] where a species was detected) at Cape Lookout National Seashore in 2016, ranked by descending percentage of sampling locations occupied.

Common Name	Scientific Name	Native Occupancy ¹
Gray catbird	<i>Dumetella carolinensis</i>	25.0%
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	21.4%
American oystercatcher	<i>Haematopus palliatus</i>	21.4%
Black-bellied plover	<i>Pluvialis squatarola</i>	21.4%
Fish crow	<i>Corvus ossifragus</i>	21.4%
Orchard oriole	<i>Icterus spurius</i>	21.4%
Blue grosbeak	<i>Passerina caerulea</i>	21.4%
Great crested flycatcher	<i>Myiarchus crinitus</i>	17.9%
Brown thrasher	<i>Toxostoma rufum</i>	14.3%
Purple martin	<i>Progne subis</i>	10.7%

¹ Proportion of sampling locations where species was observed.

Table 3 (continued). Landbird naïve occupancy estimates (i.e., percent of permanent sampling locations [$n = 28$] where a species was detected) at Cape Lookout National Seashore in 2016, ranked by descending percentage of sampling locations occupied.

Common Name	Scientific Name	Native Occupancy ¹
Brown-headed cowbird	<i>Molothrus ater</i>	10.7%
Chimney swift	<i>Chaetura pelagica</i>	7.1%
Great blue heron	<i>Ardea herodias</i>	7.1%
Carolina chickadee	<i>Poecile carolinensis</i>	7.1%
Sedge wren	<i>Cistothorus platensis</i>	7.1%
Marsh wren	<i>Cistothorus palustris</i>	7.1%
Painted bunting	<i>Passerina ciris</i>	7.1%
Ring-necked pheasant ^N	<i>Phasianus colchicus</i>	3.6%
Eurasian collared-dove	<i>Streptopelia decaocto</i>	3.6%
Lesser yellowlegs	<i>Tringa flavipes</i>	3.6%
Downy woodpecker	<i>Dryobates pubescens</i>	3.6%
White-eyed vireo	<i>Vireo griseus</i>	3.6%
Blue jay	<i>Cyanocitta cristata</i>	3.6%
American crow	<i>Corvus brachyrhynchos</i>	3.6%
Eastern bluebird	<i>Sialia sialis</i>	3.6%
Swainson's thrush	<i>Catharus ustulatus</i>	3.6%
American robin	<i>Turdus migratorius</i>	3.6%
House finch ^N	<i>Haemorhous mexicanus</i>	3.6%
American goldfinch	<i>Spinus tristis</i>	3.6%
Yellow-breasted chat	<i>Icteria virens</i>	3.6%
Prothonotary warbler	<i>Protonotaria citrea</i>	3.6%

¹ Proportion of sampling locations where species was observed.
^N Non-native, invasive species.

Acknowledgements

We wish to thank the staff of Cape Lookout National Seashore for assistance with sampling logistics.



An eastern meadowlark (*Sturnella magna*), one of many species detected during monitoring in 2016. NPS photo / Macaulay Library, CLO, Yeray Seminaralo (NPGallery).

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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. Monitoring resources in parks develops scientifically sound information on the current status and long-term trends in the composition, structure, and function of park ecosystems, and determines 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.

The Southeast Coast Network (SECN) includes eighteen administrative areas containing twenty park units, fifteen 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 serve a wide diversity of cultural and natural resource missions and include: five national monuments, four national seashores, three national battlefield parks, two national historic parks, a national memorial, a national recreation area, an ecological and historic preserve, and a single national park. The parks range in size from slightly more than 20 acres to nearly 60,000 acres, and when considered with non-federal lands jointly managed with NPS, the network encompasses more than 253,000 acres.



A least tern (*Sternula antillarum*), one of many species detected during monitoring in 2016. NPS photo (NPGallery).



A red-winged blackbird (*Agelaius phoeniceus*), one of many species detected during monitoring in 2016. NPS photo / Gordon Dietzman (NPGallery).

For More Information

[SECN Home Page](https://www.nps.gov/im/secn/index.htm)

(<https://www.nps.gov/im/secn/index.htm>)

[SECN Reports and Publications](https://www.nps.gov/im/secn/reports-publications.htm)

(<https://www.nps.gov/im/secn/reports-publications.htm>)

[NPS Inventory and Monitoring Program](https://www.nps.gov/im/index.htm)

(<https://www.nps.gov/im/index.htm>)

Data Downloads via the [Natural Resource Information Portal](https://irma.nps.gov/portal/)

(<https://irma.nps.gov/portal/>)



An eastern towhee (*Pipilo erythrophthalmus*), one of many species detected during monitoring in 2016. NPS photo / Perry Doggrell (NPGallery).