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Natural Resource Stewardship and Science

Landbird Community Monitoring at Cape Lookout National Seashore

2012 Data Summary

Natural Resource Data Series NPS/SECN/NRDS—2016/1012



ON THE COVER
Sedge wren (*Cistothorus platensis*)
Photo courtesy of Rachel Holzman

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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.

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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Executive Summary

Birds are an important component of park ecosystems. Due to their high body temperature, rapid metabolism, and high ecological position in most food webs, birds are also good indicators of the effects of local and regional ecosystem changes. Patterns in the community composition, distribution, and occurrence of breeding birds provide a metric for assessing ecological integrity and sustainability in southeastern U. S. ecosystems. Further, trends in these attributes in relation to activities occurring at Cape Lookout National Seashore (e.g., management actions, natural disturbance, invasive-species treatment) will improve our understanding of the effects of various management actions and other stressors on the condition of seashore resources.

This report summarizes data collected during implementation of the SECN landbird community monitoring protocol (Byrne et al. 2014) at Cape Lookout National Seashore in 2012.

1. Automated recording devices collected bird detection/non-detection data from 26 out of 30 spatially balanced random locations at the seashore.
2. Approximately 1,600 minutes of recordings were collected May–June, to represent a closed population, and were evaluated to detect the presence of vocalizing birds.
3. Fifty-two species of birds were detected.
4. Monitoring efforts resulted in the addition of a new species to the official species list for the seashore: willow flycatcher.
5. Results suggest that bird species richness is high at the seashore.
6. Boat-tailed grackle, red-winged blackbird, and laughing gull were the most frequently occurring and widely distributed species, occurring at 70% or more of all sampling locations. Willet, eastern towhee, royal tern, Carolina wren, and common yellowthroat were also widely distributed across the seashore, occurring at 60% or more of all sampling locations.
7. One non-native species, house finch, was detected during the sampling effort.
8. The full dataset, and associated metadata, can be acquired from the NPS data store at the Integrated Resource Management Applications portal (https://irma.nps.gov/App/Portal/Home).

Introduction

Overview

Birds play several critical roles in park ecosystems. They occupy and interact with several trophic levels of the food web, including their role as both predator and prey. Among their many functions, birds regulate rodent populations (Ims and Andreassen 2000), regulate insect populations (Mols and Visser 2002), and scavenge dead animals (Pain et al. 2003). Some avian species aid in pollination of wild and cultivated crop plants (Stiles 1978) and provide mechanisms for seed dispersal (Howe and Smallwood 1982). Bird guano contains nutrients necessary for many vegetation communities (Wootton 1991). Management activities aimed at preserving habitat for bird populations (e.g., neotropical migrants) frequently have the added benefit of preserving entire ecosystems and their attendant ecosystem services (Karr 1991; Maurer and Heywood 1993).

A wide range of stressors affect bird communities, and birds often respond quickly to environmental stressors, perturbations, or changes. Therefore, characteristics of the bird community at a park are good indicators of the extent of the impact of those stressors on park lands. Many bird species have been extensively studied; their biology and life histories are well defined and their habitat-use patterns have been identified. Consequently, the composition, richness and diversity, and distribution of bird communities provide substantial insight into the ecological condition of park resources. Information about the landbird community also provides derivative information about other characteristics of the park and surrounding area (e.g., vegetation community types, extent of fragmentation).

Because many birds are primarily diurnal, visible and vocal, and attractive, they are a major point of interest for many park visitors and for the general public. Birds have a strong public appeal and are the recreational focus for many park visitors. Birdwatching has a substantial and positive impact on the U.S. economy, contributing well over $100 billion annually (Carver 2013), and it is one of the most popular recreational activities pursued by Americans (Cordell et al. 2007).

Over 400 species of birds, representing 61 families, use Southeast Coast Network (SECN) park units annually for breeding, wintering, or as a migratory stopover area. The high bird diversity in the Southeast Coast Network exists because of the juxtaposition of SECN parks within the Atlantic Flyway. Many SECN park units occur in a highly fragmented landscape, and because the network encompasses inland and coastal areas, it provides a wide range of bird habitat types.

This report summarizes data collected with the SECN landbird community monitoring Protocol (Byrne et al. 2014). Protocol objectives that are addressed in this report include:

a) Determine the species richness and diversity of the landbird community at each park,

b) Determine the frequency of detection of selected landbirds, and

c) Determine the distribution of landbirds within park lands.

Study Area

Cape Lookout National Seashore (CALO), located along the southern end of the Outer Banks, is largely undeveloped and accessible only by boat. Cape Lookout is primarily composed of three barrier islands covering 56 miles (90 kilometers [km]) of the central coast of North Carolina (Figure 1). Most of the seashore consists of North and South Core Banks, a 44-mile (71-km) long barrier system oriented in a southwest to northeast direction and separated by Ophelia Inlet. Cape Lookout extends into the Atlantic Ocean from its southern end. The other barrier system within the seashore, Shackleford Banks, extends westward from Cape Lookout.

Core Banks is a long, narrow expanse of low dunes and maritime grasslands, dominated by sea oats and extensive salt marsh cordgrass communities. Wax myrtle-dominated shrub communities border the grassland in many places, and a low maritime forest, characterized by Virginia live oak, occupies small areas of higher ground. The islands are generally 3 to 6 feet (0.9 to 1.8 meters) above sea level and 0.6 to 1.2 miles (1 to 2 km) wide. For the most part, these areas are open and treeless. The morphology of the northern end of Portsmouth Island differs from the remainder of the seashore and is characterized by large sand flats, approximately 0.6 miles (1 km) in width, located between the berm and the dunes of a series of marsh-fringed islands. Continuous dunes characterize the southwest side of Cape Lookout, with several small freshwater marshes present in depressions between the dunes. Some small remnant slash pine plantations from the 1970s occur at the seashore. A long spit extends from the western tip of Cape Lookout, where a jetty built in the early 1900s has encouraged accretion in this direction. Cape Lookout is one of the few barrier islands where natural wind-, tide-, and wave-driven processes of erosion, accretion, and overwash still occur and create a very dynamic environment for vegetation communities. Because the seashore consists of barrier islands with no road access, the influences of urban development are generally limited. However, runoff from mainland sources adds nutrients, fecal coliforms, and contaminants to the waters adjacent to the seashore.

Park managers actively attempt to curb illegal off-trail use by off-road vehicles to prevent the adverse impacts this activity has on barrier-island vegetation, dune formation, natural barrier-island processes, and wildlife (particularly nesting shorebirds). The seashore is year-round host to a wide variety of plants and wildlife, including several state- and federally listed species. Cape Lookout also plays a crucial role in providing nesting areas for sea turtles and shorebirds, stopover sites for migrating birds, and wintering grounds for birds.

Cape Lookout National Seashore has 266 known bird species (Appendix B-1; NPSpecies 2015).

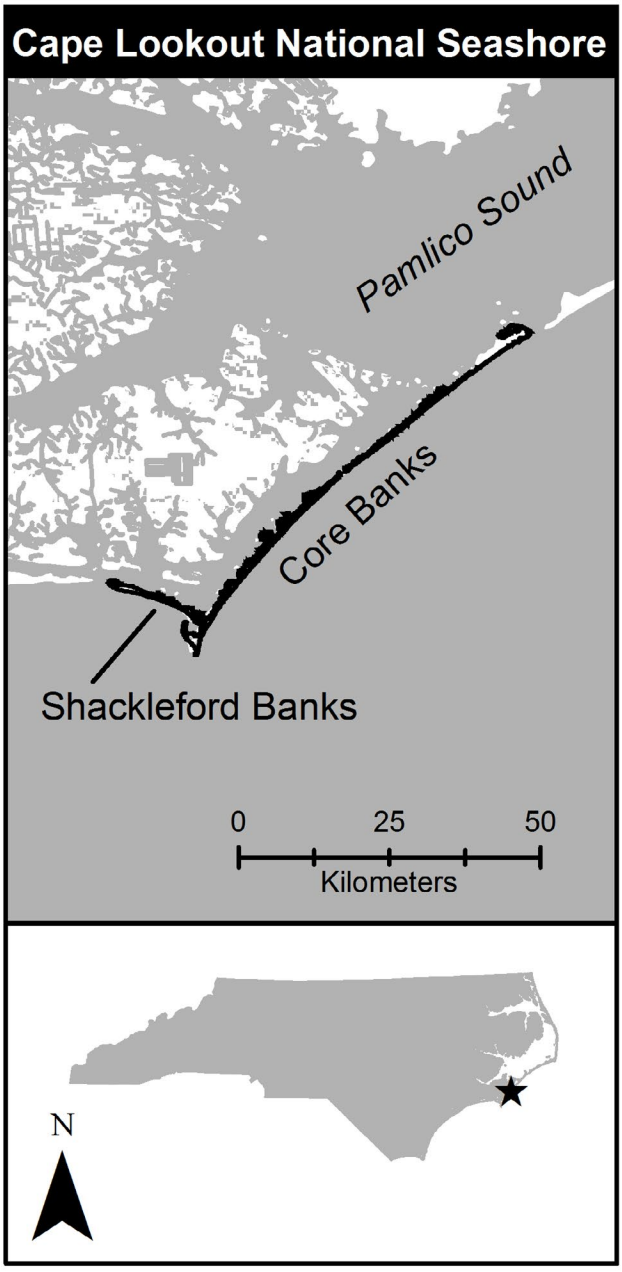


Figure 1. Location of Cape Lookout National Seashore.

Methods

Sampling Design

The sampling design and sampling-location selection is detailed in Appendix B of the SECN landbird community monitoring protocol (Byrne et al. 2014) and in the sampling-location selection standard operating procedure #1.1.01 (Byrne 2012). In summary, the administrative boundary was used as the sampling frame to allow for seashore-wide inference. The sampling frame was divided into a systematic 0.5-hectare (1.2 acre [ac])grid superimposed over the entire sampling frame (i.e., seashore boundary); the center point of each grid cell served as the potential sampling location. A spatially balanced sample was drawn from this grid using the Reversed Randomized Quadrant-Recursive Raster (RRQRR) algorithm (Theobald et al. 2007). Alternate points were used when specified selection criteria (e.g., safety issues, accessibility) were not met. A sample size of 30 was chosen based on consideration of the seashore size, hypothesized variability, and logistical issues; however, the final sample size was 26 due to the failure of two devices.

Taxonomic Standards

Taxonomy and nomenclature follow that are set forth in the Integrated Taxonomic Information System (ITIS; http://www.itis.gov/). The National Park Service uses the online application NPSpecies (https://irma.nps.gov/npspecies) to document "our knowledge about the occurrence and status of species on National Park Service lands," including maintenance of species lists for NPS properties. The taxonomy and nomenclature in NPSpecies is periodically updated with the most current ITIS catalog. As noted on the ITIS webpage, the system intends not to "serve as a forum for cutting-edge taxonomic classifications," but rather to use "classifications that have gained broad acceptance in the taxonomic literature and by professionals who work with the taxa."

All bird vocalizations are identified to the finest resolution possible in the taxonomic hierarchy. Only vocalizations identified to the species level are used in the analyses presented herein.

Data Collection

Automatic recording devices (ARDs) were deployed at 30 sampling locations March–June 2012. ARDs are deployed at the center point of each 0.5-hectare grid cell (i.e., the sampling location) and are programmed to record from 07:30–07:42 and 08:00–08:12 (i.e., 12 minutes) every five days for a period of 77 days (Byrne et al. 2014). This schedule results in 20 discrete sampling events for each sampling location. Species occurrences were derived from analyzing five recordings collected May–June at each sampling location, which represents a closed population.

Manual Evaluation of Recordings

Ambient / background noise influences detectability in auditory avian surveys (Alldredge et al. 2007, Simons et al. 2008, Pacifici et al. 2008, Simons et al. 2009). To minimize the impact of background noise on detectability, three strategies are applied to all recordings: (1) omit recordings with a background noise level above approximately 45 dB, if possible, (2) quantify background noise categorically, and (3) use existing software tools to remove or minimize the influence of frequency ranges that are exclusive to the background noise and outside the frequency range of target vocalizations (Byrne et al. 2014). In general, sounds with a sound pressure level greater than 45 dB preclude hearing birds located over 100 meters (328 foot [ft])from the observer. To provide a frame of reference, the approximate loudness of a watch or clock ticking is 20 dB, a quiet whisper is 30 dB, a steady and heavy rain is 50 dB, and normal conversation is 60 dB.

High levels of background noise can make it difficult to discern vocalizations, and this limits the researcher's ability to adequately detect and classify bird vocalizations. Therefore, the background noise level for each recording was classified a priori, and an index score ranging from one (low) to three (high) was assigned. Each three-minute segment (i.e., 0–3, 3–6, 6–9, and 9–12) of the recordings was a priori categorized according to background noise level (i.e., 1=low, 2=moderate, and 3=high), and an average noise score was calculated for the entire 12-minute recording. In general, the background noise level of the recording was defined as follows: (a) "low" characterizes a recording in which the vocalizations are clear and distinct, the vocalizations are the primary source of sound, and background noise is a low-volume muffle; (b) "moderate" characterizes a recording with uniform loudness of less than 45dB, in which vocalizations are identifiable and some are clear and distinct while others blend into the background noise, which may contain a low- to medium-speed wind or light rain, distant traffic, or rustling vegetation; or (c) "high" characterizes a recording in

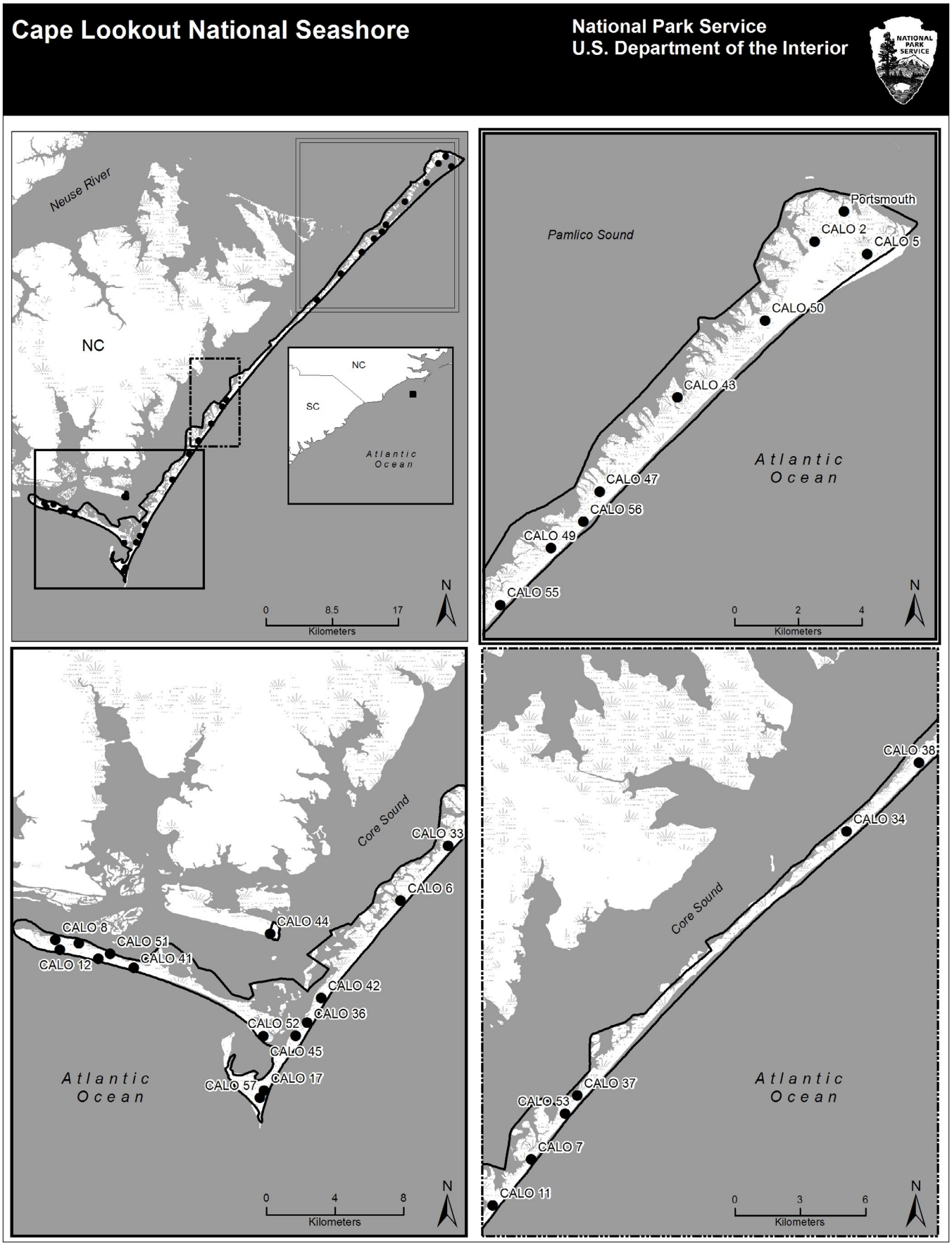


Figure 2. Landbird-community monitoring sampling locations at Cape Lookout National Seashore in 2012.

which background noise is the dominant sound, above 45dB, and some vocalizations are difficult to separate from the background noise.

Examples of background noise in recordings in the "high" category include proximate automobile traffic, high winds in vegetation, insects (e.g., cicadas), frog choruses, trains, heavy rain, or thunderstorms. If both the alternate and primary recordings have similar background noise issues, then the next consecutive sampling event (i.e., next day) is reviewed. This process continues until five monitoring events within the May to mid-June window with the lowest noise levels are selected for evaluation for each sampling location. If all recordings from a sampling location have a substantial amount of background noise, the required number of recordings to meet our analysis objectives will continue to be analyzed such that sample size and replicates are not lost, and background noise is categorized as previously mentioned to be later used as an explanatory variable when modeling detectability. The methodology, implemented as part of Byrne et al. (2014), was designed specifically to create an alternate recording for each day of monitoring. This facilitates the screening process and minimizes the influence of anomalous sound events that could impede or preclude species detection.

All recordings were evaluated by one trained observer, with several years of birding experience, astute at vocalization identification, whose skills were reviewed and tested. The observer performed the evaluation by listening to the recordings while simultaneously examining spectrograms in Song Scope software (Wildlife Acoustics, Inc.). The observer spent approximately one hour analyzing each 12-minute recording, including the time spent clarifying uncertain identifications with a digital library of vocalizations, online resources, or confirmation with other expert birders. All identifiable birds in each recording were documented. Some vocalizations were unidentifiable due to background noise or distance from the sampling location.

A total of 135 recordings from 26 sampling locations were evaluated (1,620 minutes total).

Data Analysis

Data in this report represent one year and are summarized in three general but closely linked categories: composition, richness, and distribution. Appendix B depicts all species detected by sampling location, and Appendix C depicts individual-species distribution maps.

Composition

Measures of community composition are often good indicators of abiotic variability, disturbance, or other stressors. Summaries related to composition include the total number of species detected (i.e., species richness) and naïve occupancy. Species richness is simply the number of native species detected, and is presented for the ARD method. Naïve occupancy is the percentage of the sampling locations where a species was detected at least once, without adjusting for probability of detection (i.e., detectability). Naïve occupancy is also referred to as frequency of occurrence. Naïve occupancy provides insight into the distribution of a species across a park and whether the species can be considered common or uncommon. Species with high values occur at more locations than those with low values.

Richness

Species richness is a major component of species diversity. Magurran (2004) defines diversity as "the variety and abundance of species in a defined unit of study." Diversity is a community property that is related to trophic structure, productivity, stability (McIntosh 1967, McNaughton 1977), immigration/emigration (Colwell and Lees 2000), and ecological condition (i.e., ecological integrity, as defined by Karr and Chu 1995). Species diversity consists of two components: the number of species (i.e., species richness) and the relative abundance of those species (i.e., species evenness/dominance) within a defined community (Margalef 1958, Lloyd and Ghelardi 1964, Pielou 1966). The methodology implemented by the Southeast Coast Network does not collect abundance data; therefore, the analysis focuses on species richness estimation of the landbird community. Further, the term community refers to the assemblage of species populations that occur together in space and time (Begon et al. 1986), and we consider the all taxa-species populations that occur at a park as the community, as per the conceptual ecological models presented in our monitoring plan (see Chapter 2 in DeVivo et al. 2008).

Species richness and diversity is presented in the form of indices. Because richness and diversity indices respond differently to various mechanisms that influence community change, several indices must be used to adequately characterize richness and diversity in SECN parks (Haedrick 1975, Boyle et al. 1984). Based on characteristics of the SECN dataset and careful appraisal of the advantages and disadvantages of several richness indices, the selected richness indices are presented in Table 1, including notes on value interpretation. Because observed species richness (i.e.,

S_{obs}) is an underestimate (i.e., influenced by detectability, observer error) of true species richness, richness indices more closely approximate true species richness for a defined area. In this analysis, richness estimates are based only on landbird observations identified to the species level, and detections/occurrences of non-native species were not included in the calculations.

Distribution

Understanding changes in the distribution of landbirds is integral to informed management of species and their requisite habitats. Changes in species distributions over time provide useful information at both the local and landscape scale regarding how species respond to large-scale influences such as changing land use, climate, hydrology, or habitat availability and condition. Shifting species distributions alter species interactions and the food-web structure, thereby producing cascading effects on ecosystem processes (Montoya and Raffaelli 2010). Distribution maps for all bird species detected are presented in Appendix C.

Table 1. Incidence-based species richness indices used in this analysis, corresponding symbol, community attribute that the index reflects, range of index values, and notes on each index.

Index	Symbol	Community Attribute	Index Citation	Notes
Native Species Richness	**S_{obs}**	Richness	n/a	Value is a positive integer that indicates the number of native species in the sample. Intuitive. Good discriminant ability if sampling effort is comparable; sensitive to sample size, the occurrence of rare species, or those with low detectability; does not account for relative abundances.
Chao 2	**Chao2**	Richness	Chao (1984) Chao (1987)	Values indicate an estimate of total species richness (including species not present in the sample); incidence-based estimate; works well with dataset containing several infrequent observations.
Incidence-based Coverage	**ICE**	Richness	Lee and Chao (1994) Chazdon et al. (1998)	Values indicate an estimate of total species richness (including species not present in the sample); incidence-based estimate.
Jackknife 1	**Jack1**	Richness	Burnham and Overton (1978) Burnham and Overton (1979) Heltshe and Forrester (1983)	Values indicate an estimate of total species richness (including species not present in the sample); incidence-based estimate; the higher the value the higher the species richness. This procedure requires no assumptions regarding the data distribution.
Jackknife 2	**Jack2**	Richness	Smith and van Bell (1984)	Values indicate an estimate of species richness; incidence-based estimate.
Bootstrap	**Boot**	Richness	Smith and van Bell (1984)	Values indicate an estimate of species richness; incidence-based estimate.

Results

Composition

Boat-tailed grackle, red-winged blackbird, and laughing gull were the most frequently occurring and widely distributed species, occurring at 70% or more of all sampling locations. Willet, eastern towhee, royal tern, Carolina wren, and common yellowthroat were also widely distributed across the seashore, occurring at 60% or more of all sampling locations. Several species were detected at only one sampling location, (i.e., uncommon) including: American robin, blue jay, Carolina chickadee, common grackle, downy woodpecker, eastern bluebird, great-black backed gull, house finch, indigo bunting, marsh wren, northern parula, osprey, red-bellied woodpecker, song sparrow, sora, white-eyed vireo, and willow flycatcher (Table 2). The house finch was the only non-native species detected. The occurrence of willow flycatcher was a new record for the seashore and will be added to the species list (Table 3).

Table 2. Naïve occupancy estimates (i.e., proportion of sampling locations in which a species was detected) for birds at Cape Lookout National Seashore in 2012.

Common Name	Scientific Name	Naïve Occupancy
Boat-tailed Grackle	*Quiscalus major*	0.80
Red-winged Blackbird	*Agelaius phoeniceus*	0.80
Laughing Gull	*Larus atricilla*	0.70
Willet	*Catoptrophorus semipalmatus*	0.67
Eastern Towhee	*Pipilo erythrophthalmus*	0.63
Royal Tern	*Sterna maxima*	0.63
Carolina Wren	*Thryothorus ludovicianus*	0.60
Common Yellowthroat	*Geothlypis trichas*	0.60
Eastern Meadowlark	*Sturnella magna*	0.50
Northern Cardinal	*Cardinalis cardinalis*	0.50
Seaside Sparrow	*Ammodramus maritimus*	0.43
Fish Crow	*Corvus ossifragus*	0.40
Orchard Oriole	*Icterus spurius*	0.37
Clapper Rail	*Rallus longirostris*	0.33
Least Tern	*Sterna antillarum*	0.33
Barn Swallow	*Hirundo rustica*	0.27
Blue Grosbeak	*Guiraca caerulea*	0.27
Brown Thrasher	*Toxostoma rufum*	0.27
Brown-headed Cowbird	*Molothrus ater*	0.27
Mourning Dove	*Zenaida macroura*	0.27
Prairie Warbler	*Dendroica discolor*	0.27
Great Crested Flycatcher	*Myiarchus crinitus*	0.23
Common Nighthawk	*Chordeiles minor*	0.17
Gray Catbird	*Dumetella carolinensis*	0.17
Killdeer	*Charadrius vociferus*	0.17
Painted Bunting	*Passerina ciris*	0.17
Eastern Kingbird	*Tyrannus tyrannus*	0.13
Purple Martin	*Progne subis*	0.13
American Oystercatcher	*Haematopus palliatus*	0.10
Greater Yellowlegs	*Tringa melanoleuca*	0.10
Northern Mockingbird	*Mimus polyglottos*	0.10
Chimney Swift	*Chaetura pelagica*	0.07
Forster's Tern	*Sterna forsteri*	0.07
Green Heron	*Butorides virescens*	0.07

Common Name	Scientific Name	Naïve Occupancy
Yellow-billed Cuckoo	*Coccyzus americanus*	0.07
American Robin	*Turdus migratorius*	0.03
Blue Jay	*Cyanocitta cristata*	0.03
Carolina Chickadee	*Poecile carolinensis*	0.03
Common Grackle	*Quiscalus quiscula*	0.03
Downy Woodpecker	*Picoides pubescens*	0.03
Eastern Bluebird	*Sialia sialis*	0.03
Great Black-backed Gull	*Larus marinus*	0.03
House Finch	*Carpodacus mexicanus*	0.03
Indigo Bunting	*Passerina cyanea*	0.03
Marsh Wren	*Cistothorus palustris*	0.03
Northern Parula	*Parula americana*	0.03
Osprey	*Pandion haliaetus*	0.03
Red-bellied Woodpecker	*Melanerpes carolinus*	0.03
Song Sparrow	*Melospiza melodia*	0.03
Sora	*Porzana carolina*	0.03
White-eyed Vireo	*Vireo griseus*	0.03
Willow Flycatcher	*Empidonax traillii*	0.03

Table 3. New bird species detected at Cape Lookout National Seashore during 2012 monitoring efforts and recommended NPSpecies classifications.

Common Name	Abundance	Residency	Nativity	Pest	Management Priority	Exploitation Concerns
Willow Flycatcher	Unknown	Unknown	Native	No	No	No

Richness

The native species richness for landbirds at Cape Lookout National Seashore in 2012 was 51. Species richness indices were based only on native species, and confidence intervals for each index were estimated with a bootstrap procedure. Richness indices ranged widely from 57.44 to 81.77 (Table 4). The high variability indicates characteristics in the dataset affected the estimates differently. Observed species richness differs from the estimated true species richness (i.e., all of the richness indices combined) by approximately 27%, suggesting that further surveys are necessary to estimate true species richness.

Distribution

Distribution maps for all species detected are presented in Appendix C (Figures C-1 – C-52), and indicate the sampling location(s) in which each species occurred. Boat-tailed grackle, red-winged blackbird, and laughing gull were the most frequently occurring and widely distributed species, occurring at 70% or more of all sampling locations. Willet, eastern towhee, royal tern, Carolina wren, and common yellowthroat were also widely distributed across the seashore, occurring at 60% or more of all sampling locations. Approximately 80% of species detected occurred at four or fewer locations.

Table 4. Species richness indices for birds at Cape Lookout National Seashore in 2012.

Index	Symbol	Value	Lower 95% CI	Upper 95% CI	Value Interpretation
Native Spp. Richness	**S_{obs}**	51.00	42.41	59.59	Number of native species detected; Species richness at the park is considered to be moderate
Chao 2	**Chao2**	81.77	59.55	161.73	Estimated true species richness; Considered to be moderate; Large confidence interval (variability)
Incidence-based Coverage	**ICE**	68.14	64.73	71.55	Estimated true species richness; Considered to be moderate
Jackknife 1	**Jack1**	66.38	52.78	79.98	Estimated true species richness; Considered to be moderate
Jackknife 2	**Jack2**	77.61	74.34	80.88	Estimated true species richness; Considered to be moderate
Bootstrap	**Boot**	57.44	55.93	58.95	Estimated true species richness; Considered to be moderate

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Appendix A—Species List

Table A-1. Birds known to occur at Cape Lookout National Seashore based upon records in NPSpecies (2015) and those detected during this sampling effort.

Order	Family	Scientific Name	Common Name	NPSpecies	ARD 2012
Accipitriformes	Accipitridae	*Accipiter cooperii*	Cooper's Hawk	X	
Accipitriformes	Accipitridae	*Accipiter striatus*	Sharp-shinned Hawk	X	
Accipitriformes	Accipitridae	*Buteo jamaicensis*	Red-tailed Hawk	X	
Accipitriformes	Accipitridae	*Buteo lagopus*	Rough-legged Hawk	X	
Accipitriformes	Accipitridae	*Buteo lineatus*	Red-shouldered Hawk	X	
Accipitriformes	Accipitridae	*Buteo platypterus*	Broad-winged Hawk	X	
Accipitriformes	Accipitridae	*Circus cyaneus*	Northern Harrier	X	
Accipitriformes	Accipitridae	*Elanoides forficatus*	Swallow-tailed Kite	X	
Accipitriformes	Accipitridae	*Haliaeetus leucocephalus*	Bald Eagle	X	
Accipitriformes	Cathartidae	*Cathartes aura*	Turkey Vulture	X	
Accipitriformes	Cathartidae	*Coragyps atratus*	Black Vulture	X	
Accipitriformes	Pandionidae	*Pandion haliaetus*	Osprey	X	X
Anseriformes	Anatidae	*Aix sponsa*	Wood Duck	X	
Anseriformes	Anatidae	*Anas acuta*	Northern Pintail	X	
Anseriformes	Anatidae	*Anas americana*	American Wigeon	X	
Anseriformes	Anatidae	*Anas clypeata*	Northern Shoveler	X	
Anseriformes	Anatidae	*Anas crecca*	Green-winged Teal	X	
Anseriformes	Anatidae	*Anas discors*	Blue-winged Teal	X	
Anseriformes	Anatidae	*Anas platyrhynchos*	Mallard	X	
Anseriformes	Anatidae	*Anas rubripes*	American Black Duck	X	
Anseriformes	Anatidae	*Anas strepera*	Gadwall	X	
Anseriformes	Anatidae	*Aythya affinis*	Lesser Scaup	X	
Anseriformes	Anatidae	*Aythya americana*	Redhead	X	
Anseriformes	Anatidae	*Aythya collaris*	Ring-necked Duck	X	
Anseriformes	Anatidae	*Aythya marila*	Greater Scaup	X	
Anseriformes	Anatidae	*Aythya valisineria*	Canvasback	X	
Anseriformes	Anatidae	*Branta bernicla*	Brant	X	
Anseriformes	Anatidae	*Branta canadensis*	Canada Goose	X	
Anseriformes	Anatidae	*Bucephala albeola*	Bufflehead	X	
Anseriformes	Anatidae	*Bucephala clangula*	Common Goldeneye	X	
Anseriformes	Anatidae	*Chen caerulescens*	Snow Goose	X	
Anseriformes	Anatidae	*Cygnus columbianus*	Tundra Swan	X	
Anseriformes	Anatidae	*Cygnus olor*	Mute Swan	X	
Anseriformes	Anatidae	*Lophodytes cucullatus*	Hooded Merganser	X	
Anseriformes	Anatidae	*Melanitta fusca*	White-winged Scoter	X	
Anseriformes	Anatidae	*Melanitta nigra*	Black Scoter	X	
Anseriformes	Anatidae	*Melanitta perspicillata*	Surf Scoter	X	
Anseriformes	Anatidae	*Mergus serrator*	Red-breasted Merganser	X	
Anseriformes	Anatidae	*Oxyura jamaicensis*	Ruddy Duck	X	
Anseriformes	Anatidae	*Somateria mollissima*	Common Eider	X	
Apodiformes	Apodidae	*Chaetura pelagica*	Chimney Swift	X	X
Apodiformes	Trochilidae	*Archilochus colubris*	Ruby-throated Hummingbird	X	
Caprimulgiformes	Caprimulgidae	*Caprimulgus carolinensis*	Chuck-will's-widow	X	
Caprimulgiformes	Caprimulgidae	*Chordeiles minor*	Common Nighthawk	X	X

Table A-1 (continued). Birds known to occur at Cape Lookout National Seashore based upon records in NPSpecies (2015) and those detected during this sampling effort.

Order	Family	Scientific Name	Common Name	NPSpecies	ARD 2012
Charadriiformes	Alcidae	*Alca torda*	Razorbill	X	
Charadriiformes	Alcidae	*Alle alle*	Dovekie	X	
Charadriiformes	Charadriidae	*Charadrius melodus*	Piping Plover	X	
Charadriiformes	Charadriidae	*Charadrius semipalmatus*	Semipalmated Plover	X	
Charadriiformes	Charadriidae	*Charadrius vociferus*	Killdeer	X	X
Charadriiformes	Charadriidae	*Charadrius wilsonia*	Wilson's Plover	X	
Charadriiformes	Charadriidae	*Pluvialis squatarola*	Black-bellied Plover	X	
Charadriiformes	Haematopodidae	*Haematopus palliatus*	American Oystercatcher	X	X
Charadriiformes	Laridae	*Anous stolidus*	Brown Noddy	X	
Charadriiformes	Laridae	*Chlidonias niger*	Black Tern	X	
Charadriiformes	Laridae	*Larus argentatus*	Herring Gull	X	
Charadriiformes	Laridae	*Larus atricilla*	Laughing Gull	X	X
Charadriiformes	Laridae	*Larus delawarensis*	Ring-billed Gull	X	
Charadriiformes	Laridae	*Larus fuscus*	Lesser Black-backed Gull	X	
Charadriiformes	Laridae	*Larus glaucoides*	Iceland Gull	X	
Charadriiformes	Laridae	*Larus hyperboreus*	Glaucous Gull	X	
Charadriiformes	Laridae	*Larus marinus*	Great Black-backed Gull	X	X
Charadriiformes	Laridae	*Larus minutus*	Little Gull	X	
Charadriiformes	Laridae	*Larus philadelphia*	Bonaparte's Gull	X	
Charadriiformes	Laridae	*Rissa tridactyla*	Black-legged Kittiwake	X	
Charadriiformes	Laridae	*Rynchops niger*	Black Skimmer	X	
Charadriiformes	Laridae	*Sterna anaethetus*	Bridled Tern	X	
Charadriiformes	Laridae	*Sterna antillarum*	Least Tern	X	X
Charadriiformes	Laridae	*Sterna caspia*	Caspian Tern	X	
Charadriiformes	Laridae	*Sterna dougallii*	Roseate Tern	X	
Charadriiformes	Laridae	*Sterna forsteri*	Forster's Tern	X	X
Charadriiformes	Laridae	*Sterna fuscata*	Sooty Tern	X	
Charadriiformes	Laridae	*Sterna hirundo*	Common Tern	X	
Charadriiformes	Laridae	*Sterna maxima*	Royal Tern	X	X
Charadriiformes	Laridae	*Sterna nilotica*	Gull-billed Tern	X	
Charadriiformes	Laridae	*Sterna sandvicensis*	Sandwich Tern	X	
Charadriiformes	Recurvirostridae	*Himantopus mexicanus*	Black-necked Stilt	X	
Charadriiformes	Recurvirostridae	*Recurvirostra americana*	American Avocet	X	
Charadriiformes	Scolopacidae	*Actitis macularia*	Spotted Sandpiper	X	
Charadriiformes	Scolopacidae	*Arenaria interpres*	Ruddy Turnstone	X	
Charadriiformes	Scolopacidae	*Bartramia longicauda*	Upland Sandpiper	X	
Charadriiformes	Scolopacidae	*Calidris alba*	Sanderling	X	
Charadriiformes	Scolopacidae	*Calidris alpina*	Dunlin	X	
Charadriiformes	Scolopacidae	*Calidris bairdii*	Baird's Sandpiper	X	
Charadriiformes	Scolopacidae	*Calidris canutus*	Red Knot	X	
Charadriiformes	Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	X	
Charadriiformes	Scolopacidae	*Calidris fuscicollis*	White-rumped Sandpiper	X	
Charadriiformes	Scolopacidae	*Calidris himantopus*	Stilt Sandpiper	X	
Charadriiformes	Scolopacidae	*Calidris maritima*	Purple Sandpiper	X	
Charadriiformes	Scolopacidae	*Calidris mauri*	Western Sandpiper	X	
Charadriiformes	Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper	X	

Table A-1 (continued). Birds known to occur at Cape Lookout National Seashore based upon records in NPSpecies (2015) and those detected during this sampling effort.

Order	Family	Scientific Name	Common Name	NPSpecies	ARD 2012
Charadriiformes	Scolopacidae	*Calidris minutilla*	Least Sandpiper	X	
Charadriiformes	Scolopacidae	*Calidris pusilla*	Semipalmated Sandpiper	X	
Charadriiformes	Scolopacidae	*Catoptrophorus semipalmatus*	Willet	X	X
Charadriiformes	Scolopacidae	*Gallinago gallinago*	Common Snipe	X	
Charadriiformes	Scolopacidae	*Limnodromus griseus*	Short-billed Dowitcher	X	
Charadriiformes	Scolopacidae	*Limnodromus scolopaceus*	Long-billed Dowitcher	X	
Charadriiformes	Scolopacidae	*Limosa fedoa*	Marbled Godwit	X	
Charadriiformes	Scolopacidae	*Limosa haemastica*	Hudsonian Godwit	X	
Charadriiformes	Scolopacidae	*Numenius americanus*	Long-billed Curlew	X	
Charadriiformes	Scolopacidae	*Numenius phaeopus*	Whimbrel	X	
Charadriiformes	Scolopacidae	*Phalaropus fulicaria*	Red Phalarope	X	
Charadriiformes	Scolopacidae	*Phalaropus lobatus*	Red-necked Phalarope	X	
Charadriiformes	Scolopacidae	*Phalaropus tricolor*	Wilson's Phalarope	X	
Charadriiformes	Scolopacidae	*Philomachus pugnax*	Ruff	X	
Charadriiformes	Scolopacidae	*Scolopax minor*	American Woodcock	X	
Charadriiformes	Scolopacidae	*Tringa flavipes*	Lesser Yellowlegs	X	
Charadriiformes	Scolopacidae	*Tringa melanoleuca*	Greater Yellowlegs	X	X
Charadriiformes	Scolopacidae	*Tringa solitaria*	Solitary Sandpiper	X	
Charadriiformes	Scolopacidae	*Tryngites subruficollis*	Buff-breasted Sandpiper	X	
Charadriiformes	Stercorariidae	*Stercorarius longicaudus*	Long-tailed Jaeger	X	
Charadriiformes	Stercorariidae	*Stercorarius parasiticus*	Parasitic Jaeger	X	
Charadriiformes	Stercorariidae	*Stercorarius pomarinus*	Pomarine Jaeger	X	
Columbiformes	Columbidae	*Zenaida asiatica*	White-winged Dove	X	
Columbiformes	Columbidae	*Zenaida macroura*	Mourning Dove	X	X
Coraciiformes	Alcedinidae	*Megaceryle alcyon*	Belted Kingfisher	X	
Cuculiformes	Cuculidae	*Coccyzus americanus*	Yellow-billed Cuckoo	X	X
Falconiformes	Falconidae	*Falco columbarius*	Merlin	X	
Falconiformes	Falconidae	*Falco peregrinus*	Peregrine Falcon	X	
Falconiformes	Falconidae	*Falco sparverius*	American Kestrel	X	
Galliformes	Odontophoridae	*Colinus virginianus*	Northern Bobwhite	X	
Galliformes	Phasianidae	*Phasianus colchicus*	Ring-necked Pheasant	X	
Gaviiformes	Gaviidae	*Gavia immer*	Common Loon	X	
Gaviiformes	Gaviidae	*Gavia stellata*	Red-throated Loon	X	
Gruiformes	Rallidae	*Fulica americana*	American Coot	X	
Gruiformes	Rallidae	*Gallinula chloropus*	Common Moorhen	X	
Gruiformes	Rallidae	*Laterallus jamaicensis*	Black Rail	X	
Gruiformes	Rallidae	*Porzana carolina*	Sora	X	X
Gruiformes	Rallidae	*Rallus elegans*	King Rail	X	
Gruiformes	Rallidae	*Rallus limicola*	Virginia Rail	X	
Gruiformes	Rallidae	*Rallus longirostris*	Clapper Rail	X	X
Passeriformes	Bombycillidae	*Bombycilla cedrorum*	Cedar Waxwing	X	
Passeriformes	Cardinalidae	*Cardinalis cardinalis*	Northern Cardinal	X	X
Passeriformes	Cardinalidae	*Guiraca caerulea*	Blue Grosbeak	X	X
Passeriformes	Cardinalidae	*Passerina ciris*	Painted Bunting	X	X
Passeriformes	Cardinalidae	*Passerina cyanea*	Indigo Bunting	X	X
Passeriformes	Cardinalidae	*Pheucticus ludovicianus*	Rose-breasted Grosbeak	X	

Table A-1 (continued). Birds known to occur at Cape Lookout National Seashore based upon records in NPSpecies (2015) and those detected during this sampling effort.

Order	Family	Scientific Name	Common Name	NPSpecies	ARD 2012
Passeriformes	Certhiidae	*Certhia americana*	Brown Creeper	X	
Passeriformes	Corvidae	*Corvus brachyrhynchos*	American Crow	X	
Passeriformes	Corvidae	*Corvus ossifragus*	Fish Crow	X	X
Passeriformes	Corvidae	*Cyanocitta cristata*	Blue Jay	X	X
Passeriformes	Emberizidae	*Ammodramus maritimus*	Seaside Sparrow	X	X
Passeriformes	Emberizidae	*Ammodramus savannarum*	Grasshopper Sparrow	X	
Passeriformes	Emberizidae	*Calcarius lapponicus*	Lapland Longspur	X	
Passeriformes	Emberizidae	*Chondestes grammacus*	Lark Sparrow	X	
Passeriformes	Emberizidae	*Junco hyemalis*	Dark-eyed Junco	X	
Passeriformes	Emberizidae	*Melospiza georgiana*	Swamp Sparrow	X	
Passeriformes	Emberizidae	*Melospiza lincolnii*	Lincoln's Sparrow	X	
Passeriformes	Emberizidae	*Melospiza melodia*	Song Sparrow	X	X
Passeriformes	Emberizidae	*Passerculus sandwichensis*	Savannah Sparrow	X	
Passeriformes	Emberizidae	*Passerella iliaca*	Fox Sparrow	X	
Passeriformes	Emberizidae	*Pipilo erythrophthalmus*	Eastern Towhee	X	X
Passeriformes	Emberizidae	*Plectrophenax nivalis*	Snow Bunting	X	
Passeriformes	Emberizidae	*Spizella pallida*	Clay-colored Sparrow	X	
Passeriformes	Emberizidae	*Spizella passerina*	Chipping Sparrow	X	
Passeriformes	Emberizidae	*Spizella pusilla*	Field Sparrow	X	
Passeriformes	Emberizidae	*Zonotrichia albicollis*	White-throated Sparrow	X	
Passeriformes	Emberizidae	*Zonotrichia leucophrys*	White-crowned Sparrow	X	
Passeriformes	Fringillidae	*Carduelis pinus*	Pine Siskin	X	
Passeriformes	Fringillidae	*Carduelis tristis*	American Goldfinch	X	
Passeriformes	Fringillidae	*Carpodacus mexicanus*	House Finch	X	X
Passeriformes	Fringillidae	*Carpodacus purpureus*	Purple Finch	X	
Passeriformes	Fringillidae	*Coccothraustes vespertinus*	Evening Grosbeak	X	
Passeriformes	Hirundinidae	*Hirundo rustica*	Barn Swallow	X	X
Passeriformes	Hirundinidae	*Petrochelidon pyrrhonota*	Cliff Swallow	X	
Passeriformes	Hirundinidae	*Progne subis*	Purple Martin	X	X
Passeriformes	Hirundinidae	*Riparia riparia*	Bank Swallow	X	
Passeriformes	Hirundinidae	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow	X	
Passeriformes	Hirundinidae	*Tachycineta bicolor*	Tree Swallow	X	
Passeriformes	Icteridae	*Agelaius phoeniceus*	Red-winged Blackbird	X	X
Passeriformes	Icteridae	*Dolichonyx oryzivorus*	Bobolink	X	
Passeriformes	Icteridae	*Icterus galbula*	Baltimore Oriole	X	
Passeriformes	Icteridae	*Icterus spurius*	Orchard Oriole	X	X
Passeriformes	Icteridae	*Molothrus ater*	Brown-headed Cowbird	X	X
Passeriformes	Icteridae	*Quiscalus major*	Boat-tailed Grackle	X	X
Passeriformes	Icteridae	*Quiscalus quiscula*	Common Grackle	X	X
Passeriformes	Icteridae	*Sturnella magna*	Eastern Meadowlark	X	X
Passeriformes	Mimidae	*Dumetella carolinensis*	Gray Catbird	X	X
Passeriformes	Mimidae	*Mimus polyglottos*	Northern Mockingbird	X	X
Passeriformes	Mimidae	*Toxostoma rufum*	Brown Thrasher	X	X
Passeriformes	Motacillidae	*Anthus rubescens*	American Pipit	X	
Passeriformes	Paridae	*Baeolophus bicolor*	Tufted Titmouse	X	
Passeriformes	Paridae	*Poecile carolinensis*	Carolina Chickadee	X	X

Table A-1 (continued). Birds known to occur at Cape Lookout National Seashore based upon records in NPSpecies (2015) and those detected during this sampling effort.

Order	Family	Scientific Name	Common Name	NPSpecies	ARD 2012
Passeriformes	Parulidae	*Dendroica caerulescens*	Black-throated Blue Warbler	X	
Passeriformes	Parulidae	*Dendroica castanea*	Bay-breasted Warbler	X	
Passeriformes	Parulidae	*Dendroica coronata*	Yellow-rumped Warbler	X	
Passeriformes	Parulidae	*Dendroica discolor*	Prairie Warbler	X	X
Passeriformes	Parulidae	*Dendroica dominica*	Yellow-throated Warbler	X	
Passeriformes	Parulidae	*Dendroica fusca*	Blackburnian Warbler	X	
Passeriformes	Parulidae	*Dendroica magnolia*	Magnolia Warbler	X	
Passeriformes	Parulidae	*Dendroica palmarum*	Palm Warbler	X	
Passeriformes	Parulidae	*Dendroica palmarum*	Palm Warbler	X	
Passeriformes	Parulidae	*Dendroica pensylvanica*	Chestnut-sided Warbler	X	
Passeriformes	Parulidae	*Dendroica petechia*	Yellow Warbler	X	
Passeriformes	Parulidae	*Dendroica pinus*	Pine Warbler	X	
Passeriformes	Parulidae	*Dendroica striata*	Blackpoll Warbler	X	
Passeriformes	Parulidae	*Dendroica tigrina*	Cape May Warbler	X	
Passeriformes	Parulidae	*Dendroica virens*	Black-throated Green Warbler	X	
Passeriformes	Parulidae	*Geothlypis trichas*	Common Yellowthroat	X	X
Passeriformes	Parulidae	*Icteria virens*	Yellow-breasted Chat	X	
Passeriformes	Parulidae	*Mniotilta varia*	Black-and-white Warbler	X	
Passeriformes	Parulidae	*Oporornis agilis*	Connecticut Warbler	X	
Passeriformes	Parulidae	*Parula americana*	Northern Parula	X	X
Passeriformes	Parulidae	*Protonotaria citrea*	Prothonotary Warbler	X	
Passeriformes	Parulidae	*Seiurus aurocapillus*	Ovenbird	X	
Passeriformes	Parulidae	*Seiurus noveboracensis*	Northern Waterthrush	X	
Passeriformes	Parulidae	*Setophaga ruticilla*	American Redstart	X	
Passeriformes	Parulidae	*Vermivora celata*	Orange-crowned Warbler	X	
Passeriformes	Parulidae	*Vermivora peregrina*	Tennessee Warbler	X	
Passeriformes	Parulidae	*Vermivora pinus*	Blue-winged Warbler	X	
Passeriformes	Parulidae	*Vermivora ruficapilla*	Nashville Warbler	X	
Passeriformes	Parulidae	*Wilsonia canadensis*	Canada Warbler	X	
Passeriformes	Parulidae	*Wilsonia citrina*	Hooded Warbler	X	
Passeriformes	Parulidae	*Wilsonia pusilla*	Wilson's Warbler	X	
Passeriformes	Passeridae	*Passer domesticus*	House Sparrow	X	
Passeriformes	Polioptilidae	*Polioptila caerulea*	Blue-gray Gnatcatcher	X	
Passeriformes	Regulidae	*Regulus calendula*	Ruby-crowned Kinglet	X	
Passeriformes	Regulidae	*Regulus satrapa*	Golden-crowned Kinglet	X	
Passeriformes	Sittidae	*Sitta canadensis*	Red-breasted Nuthatch	X	
Passeriformes	Sittidae	*Sitta pusilla*	Brown-headed Nuthatch	X	
Passeriformes	Sturnidae	*Sturnus vulgaris*	European Starling	X	
Passeriformes	Thraupidae	*Piranga ludoviciana*	Western Tanager	X	
Passeriformes	Thraupidae	*Piranga olivacea*	Scarlet Tanager	X	
Passeriformes	Thraupidae	*Piranga rubra*	Summer Tanager	X	
Passeriformes	Troglodytidae	*Cistothorus palustris*	Marsh Wren	X	X
Passeriformes	Troglodytidae	*Cistothorus platensis*	Sedge Wren	X	
Passeriformes	Troglodytidae	*Thryothorus ludovicianus*	Carolina Wren	X	X
Passeriformes	Troglodytidae	*Troglodytes aedon*	House Wren	X	
Passeriformes	Troglodytidae	*Troglodytes troglodytes*	Winter Wren	X	

Table A-1 (continued). Birds known to occur at Cape Lookout National Seashore based upon records in NPSpecies (2015) and those detected during this sampling effort.

Order	Family	Scientific Name	Common Name	NPSpecies	ARD 2012
Passeriformes	Turdidae	*Catharus fuscescens*	Veery	X	
Passeriformes	Turdidae	*Catharus guttatus*	Hermit Thrush	X	
Passeriformes	Turdidae	*Catharus minimus*	Gray-cheeked Thrush	X	
Passeriformes	Turdidae	*Catharus ustulatus*	Swainson's Thrush	X	
Passeriformes	Turdidae	*Hylocichla mustelina*	Wood Thrush	X	
Passeriformes	Turdidae	*Sialia sialis*	Eastern Bluebird	X	X
Passeriformes	Turdidae	*Turdus migratorius*	American Robin	X	X
Passeriformes	Tyrannidae	*Contopus virens*	Eastern Wood-Pewee	X	
Passeriformes	Tyrannidae	*Empidonax virescens*	Acadian Flycatcher	X	
Passeriformes	Tyrannidae	*Myiarchus crinitus*	Great Crested Flycatcher	X	X
Passeriformes	Tyrannidae	*Sayornis phoebe*	Eastern Phoebe	X	
Passeriformes	Tyrannidae	*Tyrannus dominicensis*	Gray Kingbird	X	
Passeriformes	Tyrannidae	*Tyrannus tyrannus*	Eastern Kingbird	X	X
Passeriformes	Tyrannidae	*Tyrannus verticalis*	Western Kingbird	X	
Passeriformes	Vireonidae	*Vireo flavifrons*	Yellow-throated Vireo	X	
Passeriformes	Vireonidae	*Vireo griseus*	White-eyed Vireo	X	X
Passeriformes	Vireonidae	*Vireo olivaceus*	Red-eyed Vireo	X	
Passeriformes	Vireonidae	*Vireo philadelphicus*	Philadelphia Vireo	X	
Passeriformes	Vireonidae	*Vireo solitarius*	Blue-headed Vireo	X	
Passeriformes	Vireonidae	*Vireo solitarius*	Blue-headed Vireo	X	
Pelecaniformes	Ardeidae	*Ardea alba*	Great Egret	X	
Pelecaniformes	Ardeidae	*Ardea herodias*	Great Blue Heron	X	
Pelecaniformes	Ardeidae	*Botaurus lentiginosus*	American Bittern	X	
Pelecaniformes	Ardeidae	*Bubulcus ibis*	Cattle Egret	X	
Pelecaniformes	Ardeidae	*Butorides virescens*	Green Heron	X	X
Pelecaniformes	Ardeidae	*Egretta caerulea*	Little Blue Heron	X	
Pelecaniformes	Ardeidae	*Egretta rufescens*	Reddish Egret	X	
Pelecaniformes	Ardeidae	*Egretta thula*	Snowy Egret	X	
Pelecaniformes	Ardeidae	*Egretta tricolor*	Tricolored Heron	X	
Pelecaniformes	Ardeidae	*Ixobrychus exilis*	Least Bittern	X	
Pelecaniformes	Ardeidae	*Nyctanassa violacea*	Yellow-crowned Night-Heron	X	
Pelecaniformes	Ardeidae	*Nycticorax nycticorax*	Black-crowned Night-Heron	X	
Pelecaniformes	Pelecanidae	*Pelecanus erythrorhynchos*	American White Pelican	X	
Pelecaniformes	Pelecanidae	*Pelecanus occidentalis*	Brown Pelican	X	
Pelecaniformes	Threskiornithidae	*Eudocimus albus*	White Ibis	X	
Pelecaniformes	Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	X	
Piciformes	Picidae	*Colaptes auratus*	Northern Flicker	X	
Piciformes	Picidae	*Dryocopus pileatus*	Pileated Woodpecker	X	
Piciformes	Picidae	*Melanerpes carolinus*	Red-bellied Woodpecker	X	X
Piciformes	Picidae	*Melanerpes erythrocephalus*	Red-headed Woodpecker	X	
Piciformes	Picidae	*Picoides pubescens*	Downy Woodpecker	X	X
Piciformes	Picidae	*Sphyrapicus varius*	Yellow-bellied Sapsucker	X	
Podicipediformes	Podicipedidae	*Podiceps auritus*	Horned Grebe	X	
Podicipediformes	Podicipedidae	*Podiceps grisegena*	Red-necked Grebe	X	
Podicipediformes	Podicipedidae	*Podilymbus podiceps*	Pied-billed Grebe	X	
Procellariiformes	Procellariidae	*Calonectris diomedea*	Cory's Shearwater	X	

Table A-1 (continued). Birds known to occur at Cape Lookout National Seashore based upon records in NPSpecies (2015) and those detected during this sampling effort.

Order	Family	Scientific Name	Common Name	NPSpecies	ARD 2012
Procellariiformes	Procellariidae	*Puffinus griseus*	Sooty Shearwater	X	
Procellariiformes	Procellariidae	*Puffinus lherminieri*	Audubon's Shearwater	X	
Strigiformes	Strigidae	*Asio flammeus*	Short-eared Owl	X	
Strigiformes	Strigidae	*Bubo virginianus*	Great Horned Owl	X	
Strigiformes	Tytonidae	*Tyto alba*	Barn Owl	X	
Suliformes	Fregatidae	*Fregata magnificens*	Magnificent Frigatebird	X	
Suliformes	Phalacrocoracidae	*Phalacrocorax auritus*	Double-crested Cormorant	X	
Suliformes	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	X	
Suliformes	Sulidae	*Morus bassanus*	Northern Gannet	X	

Appendix B—Species Detection Matrix

Table B-1. Species detected at each sampling location at Cape Lookout National Seashore, 2012. Refer to Figure 2 for labeled sampling locations.

Species	02	05	06	08	11	12	15	17	24	33	34	36	38	41	42	43	44	45	47	49	50	51	53	55	56	EXT
American Oystercatcher															X						X				X	
American Robin																	X									
Barn Swallow				X	X	X				X	X						X			X					X	
Blue Grosbeak				X		X	X			X	X	X	X	X												
Blue Jay																	X									
Boat-tailed Grackle	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X	X
Brown Thrasher	X	X		X								X			X			X							X	X
Brown-headed Cowbird	X	X		X				X					X			X	X			X						
Carolina Chickadee																	X									
Carolina Wren	X			X		X	X	X	X	X	X	X		X		X	X	X	X	X		X		X		X
Chimney Swift																	X									X
Clapper Rail			X		X					X		X				X		X	X	X	X					X
Common Grackle																	X									
Common Nighthawk			X									X			X			X					X			
Common Yellowthroat	X	X	X	X	X			X		X	X	X			X	X		X	X	X			X	X	X	X
Downy Woodpecker																	X									
Eastern Bluebird																	X									
Eastern Kingbird	X															X									X	X
Eastern Meadowlark	X	X		X	X	X	X			X		X		X	X			X	X	X	X				X	
Eastern Towhee	X	X	X	X	X			X		X	X	X		X	X	X	X	X	X	X				X	X	X
Fish Crow	X		X	X				X		X						X	X	X		X		X			X	X
Forster's Tern												X			X											
Gray Catbird	X	X														X	X									X
Great Black-backed Gull	X																									
Great Crested Flycatcher	X			X			X	X	X								X									X
Greater Yellowlegs	X																				X		X			
Green Heron	X																									X
House Finch																	X									
Indigo Bunting								X																		
Killdeer				X		X	X											X				X				
Laughing Gull	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X	X			X	X	X		X	X

Species	02	05	06	08	11	12	15	17	24	33	34	36	38	41	42	43	44	45	47	49	50	51	53	55	56	EXT
Least Tern			X	X	X						X					X				X	X		X	X	X	
Marsh Wren																X										
Mourning Dove	X					X	X	X	X							X	X	X								
Northern Cardinal		X	X	X	X	X	X	X	X	X				X			X	X				X		X	X	
Northern Mockingbird	X											X			X											
Northern Parula									X																	
Orchard Oriole	X	X								X			X			X		X	X	X				X	X	X
Osprey	X																									
Painted Bunting				X					X					X					X			X				
Prairie Warbler	X							X			X					X				X				X	X	X
Purple Martin							X		X								X	X								
Red-bellied Woodpecker																	X									
Red-winged Blackbird	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Royal Tern	X	X		X	X	X			X	X	X	X		X		X		X	X	X	X	X	X		X	X
Seaside Sparrow		X	X		X					X	X	X			X	X			X	X	X		X		X	
Song Sparrow					X																					
Sora										X																
White-eyed Vireo																										X
Willet	X	X	X	X	X					X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Willow Flycatcher												X														
Yellow-billed Cuckoo									X													X				

Appendix C—Species Distribution Maps

Ordered alphabetically by common name

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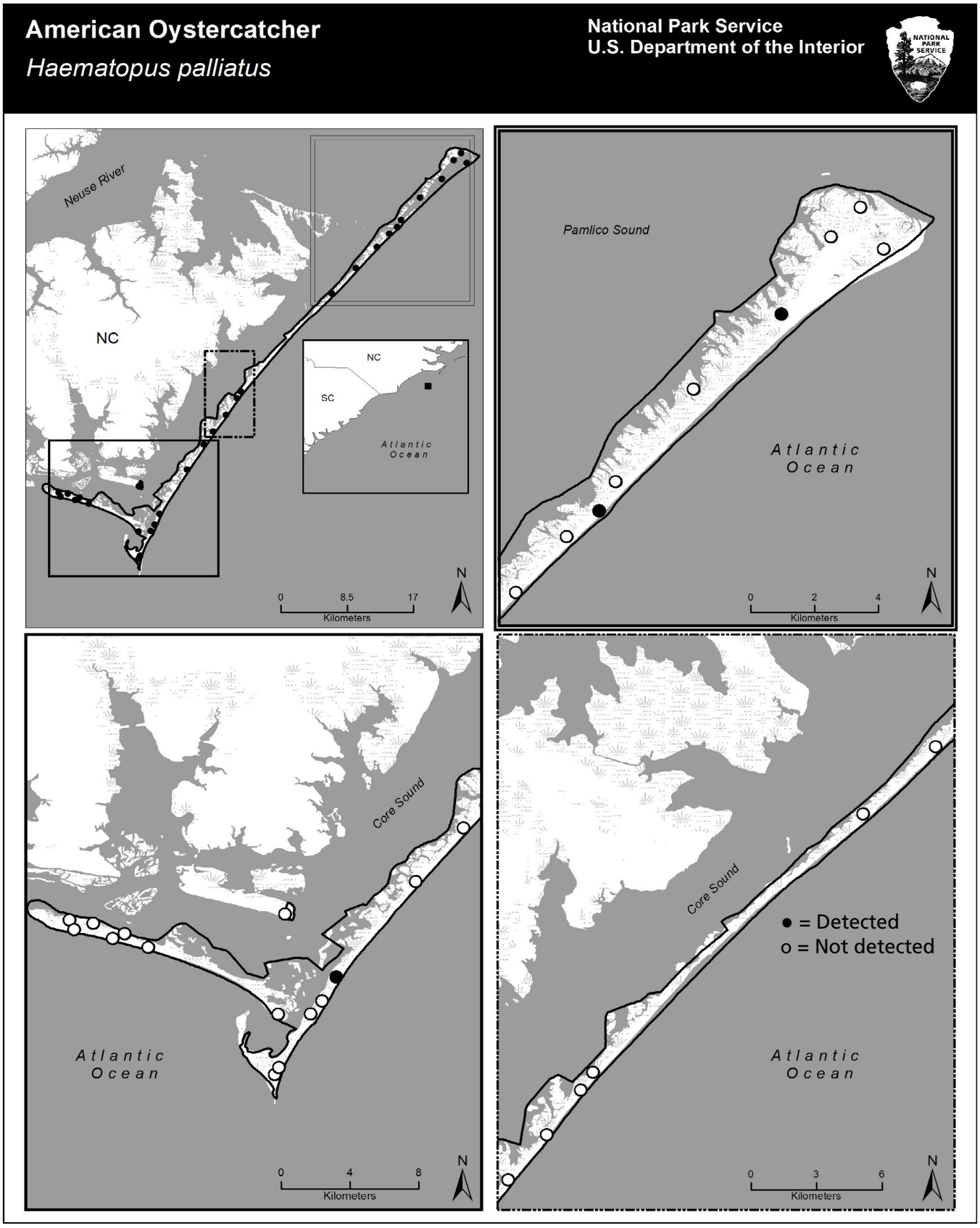


Figure C-1. Sampling locations where American oystercatcher (*Haematopus palliatus*) was detected at Cape Lookout National Seashore, 2012.

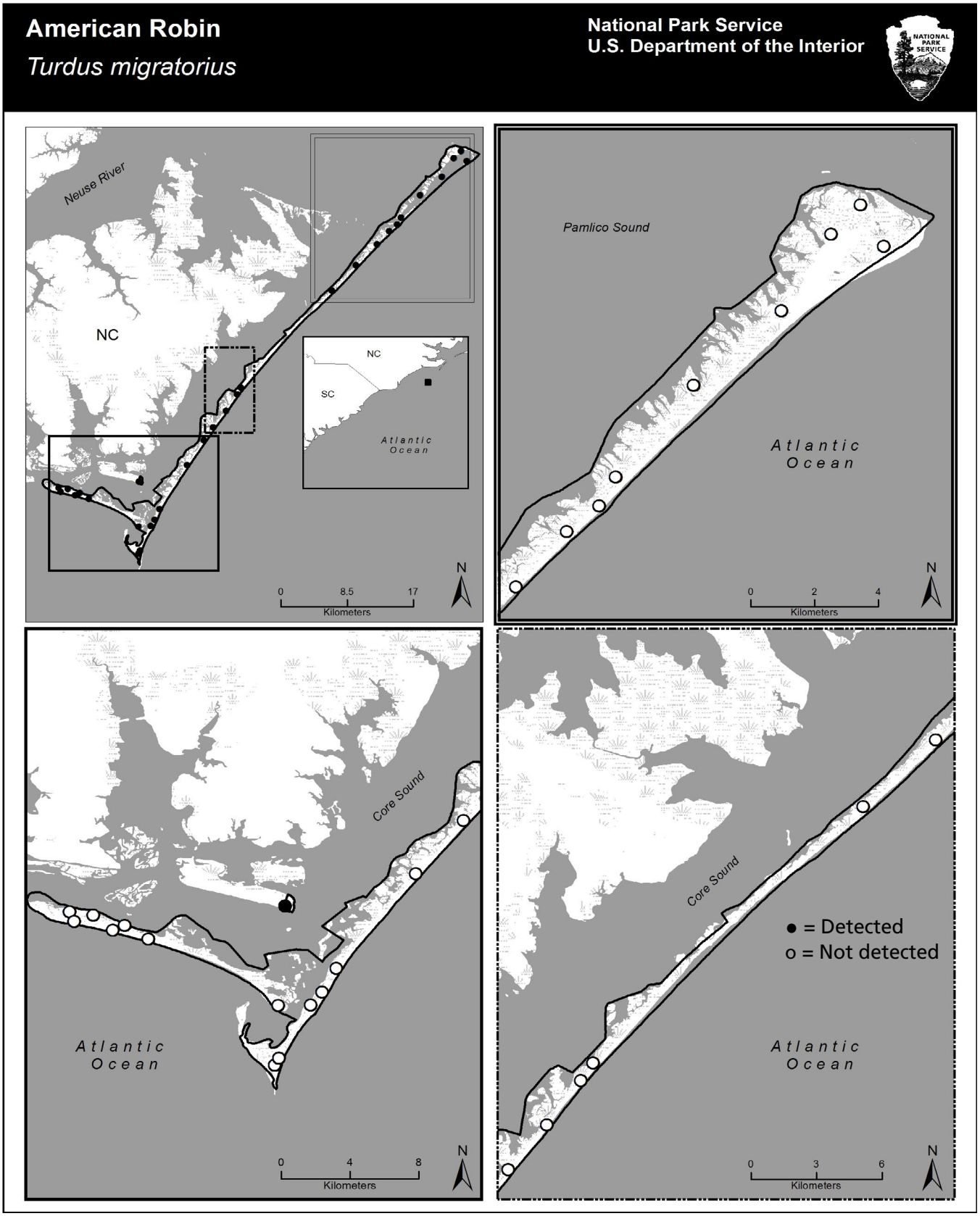


Figure C-2. Sampling locations where American robin (*Turdus migratorius*) was detected at Cape Lookout National Seashore, 2012.

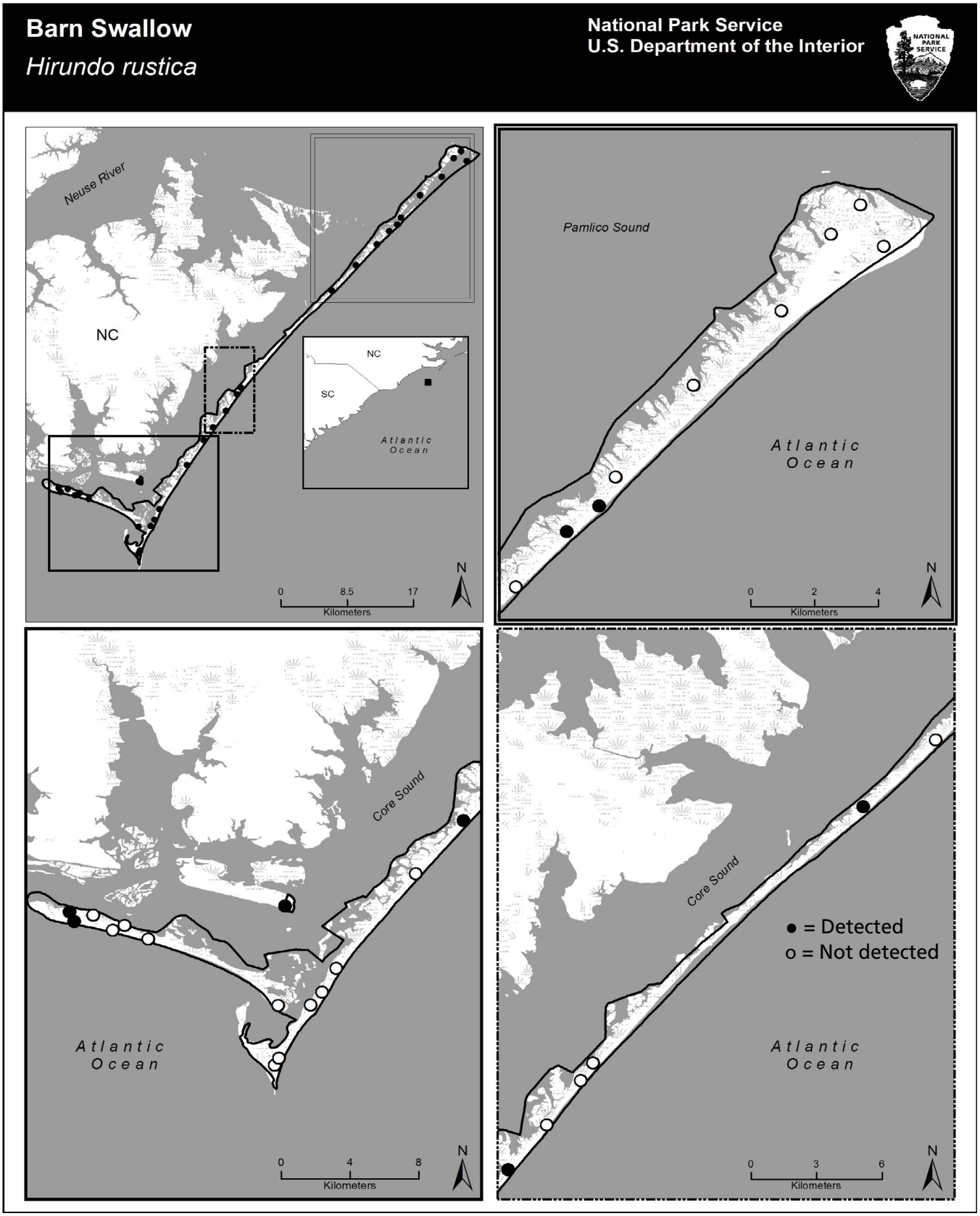


Figure C-3. Sampling locations where barn swallow (*Hirundo rustica*) was detected at Cape Lookout National Seashore, 2012.

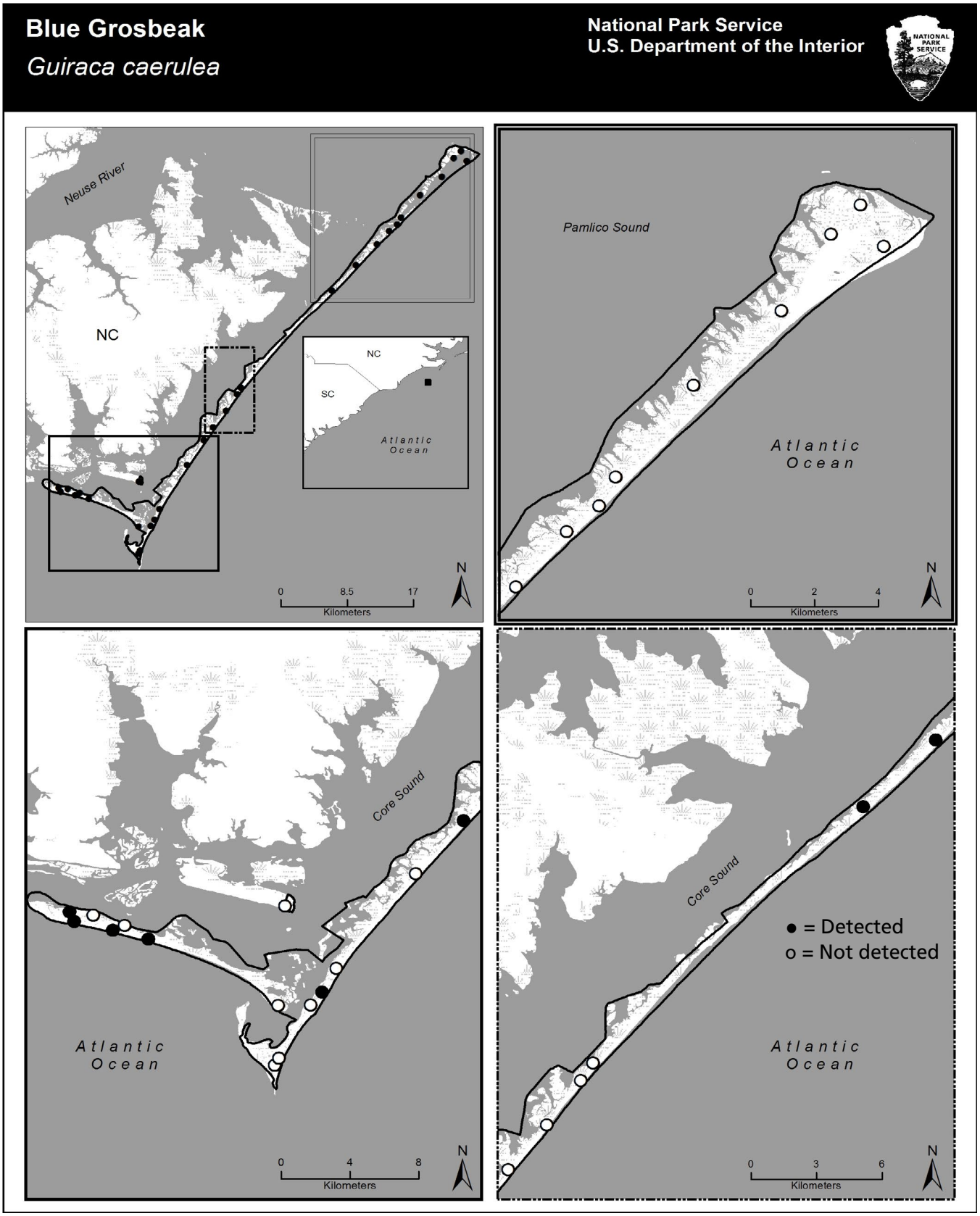


Figure C-4. Sampling locations where blue grosbeak (*Guiraca caerula*) was detected at Cape Lookout National Seashore, 2012.

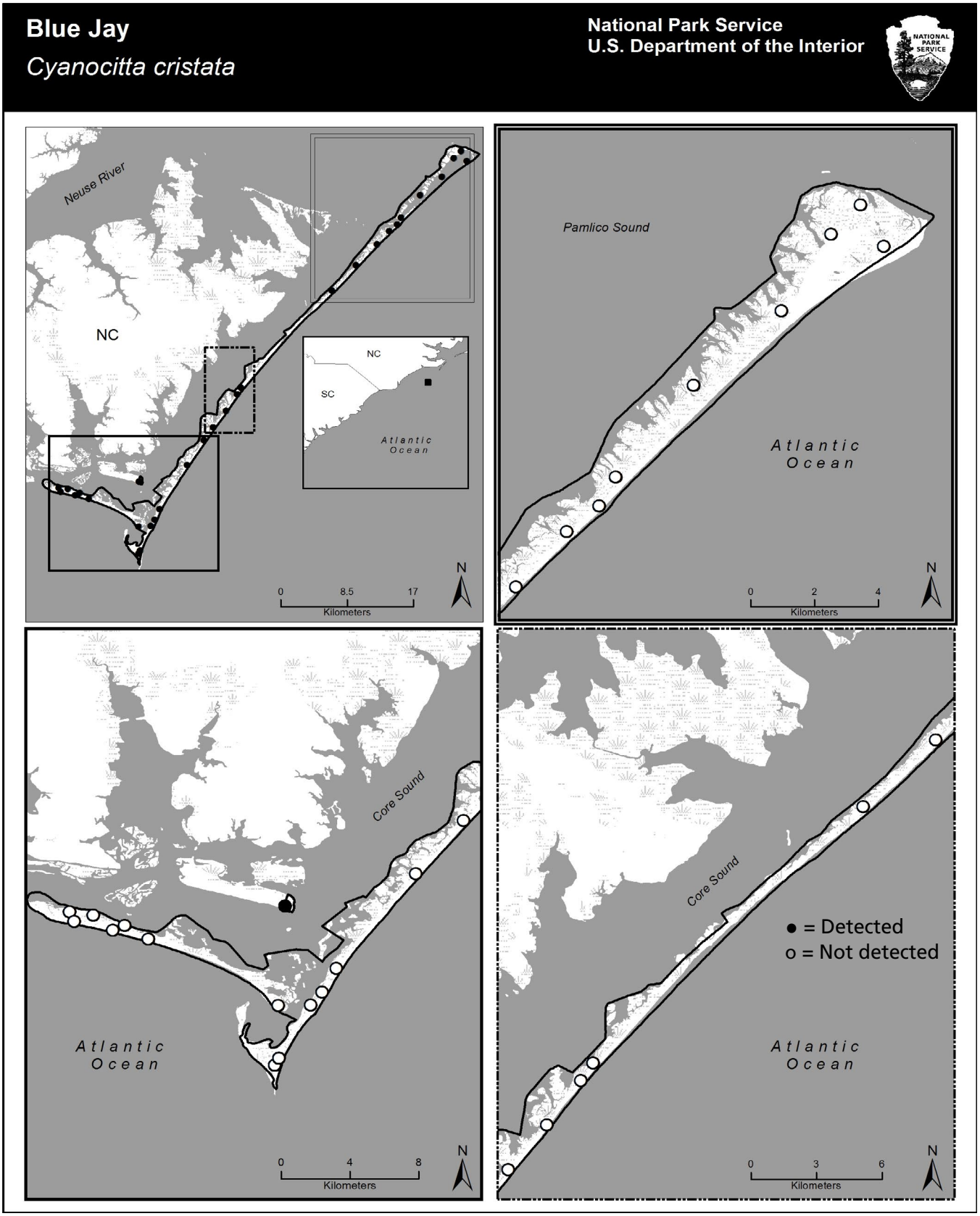


Figure C-5. Sampling locations where blue jay (*Cyanocitta cristata*) was detected at Cape Lookout National Seashore, 2012.

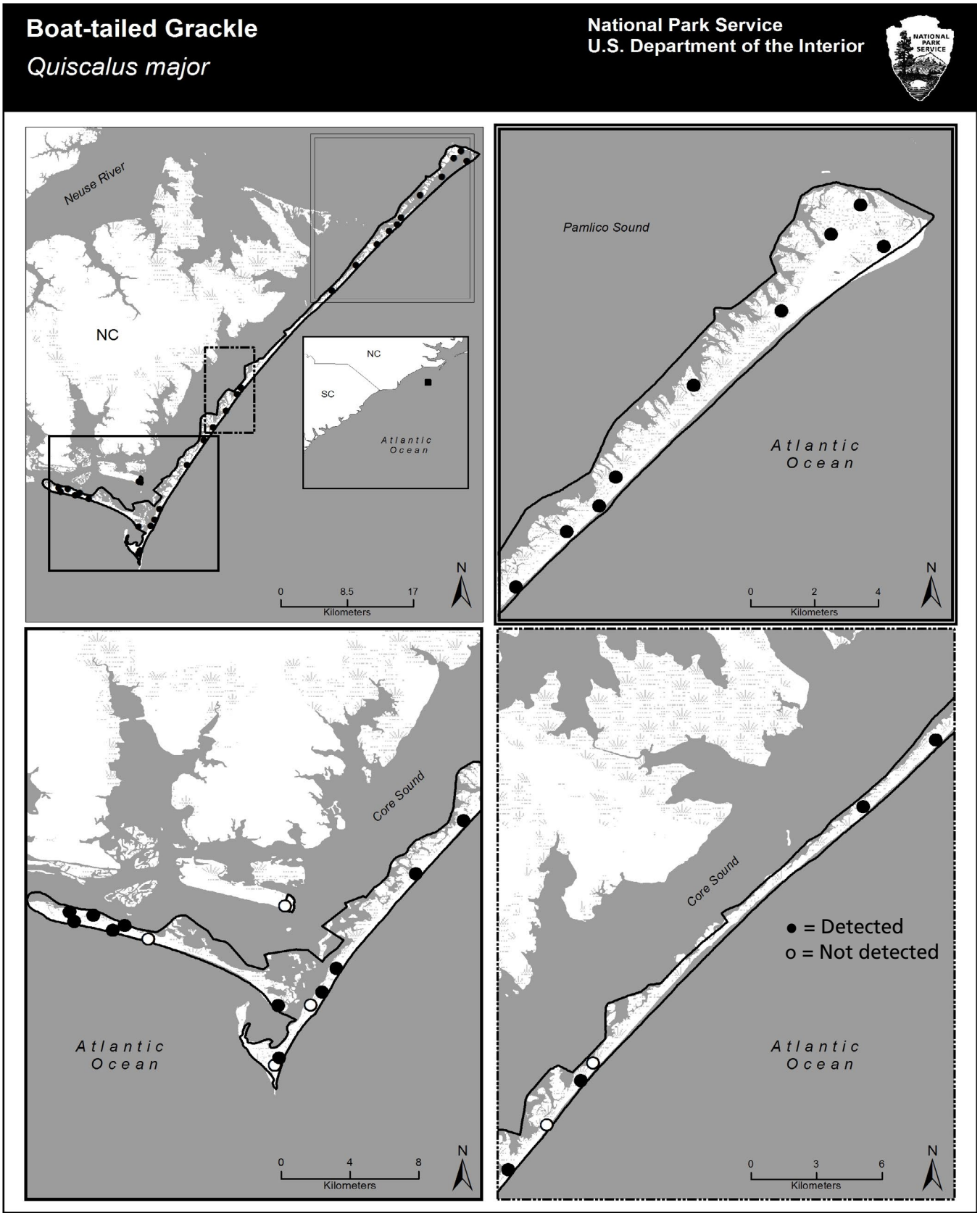


Figure C-6. Sampling locations where boat-tailed grackle (*Quiscalus major*) was detected at Cape Lookout National Seashore, 2012.

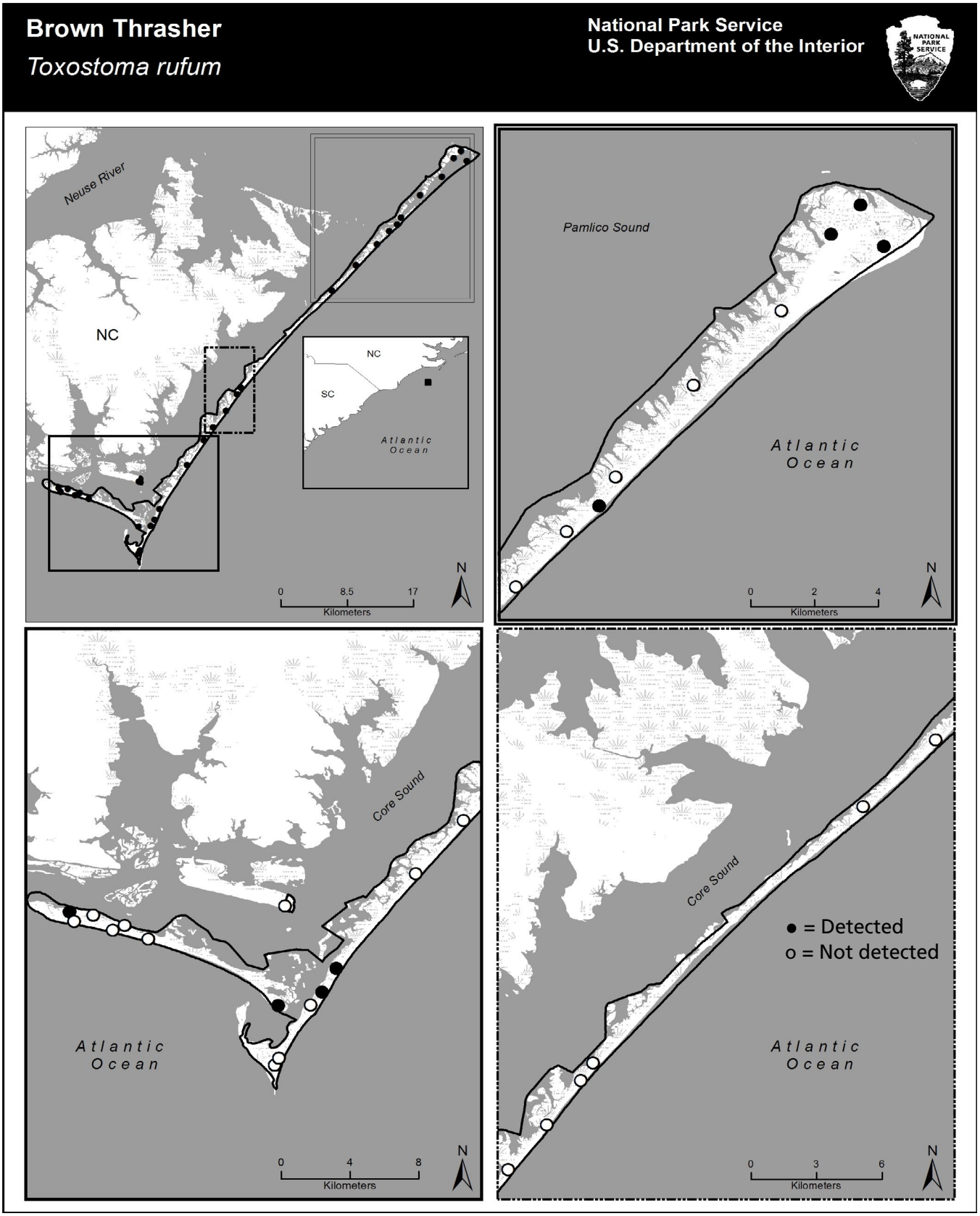


Figure C-7. Sampling locations where brown thrasher (*Toxostoma rufum*) was detected at Cape Lookout National Seashore, 2012.

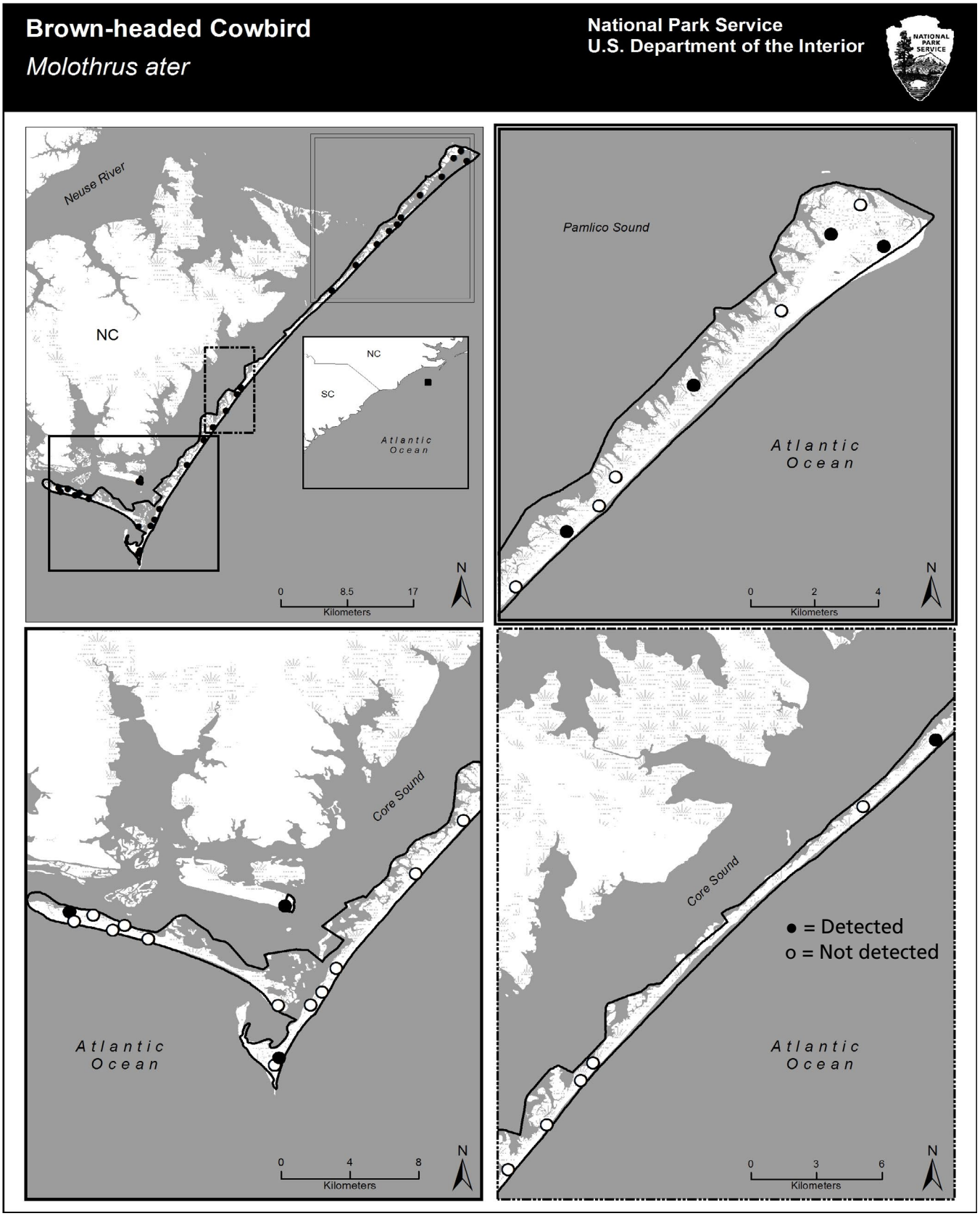


Figure C-8. Sampling locations where brown-headed cowbird (*Molothrus ater*) was detected at Cape Lookout National Seashore, 2012.

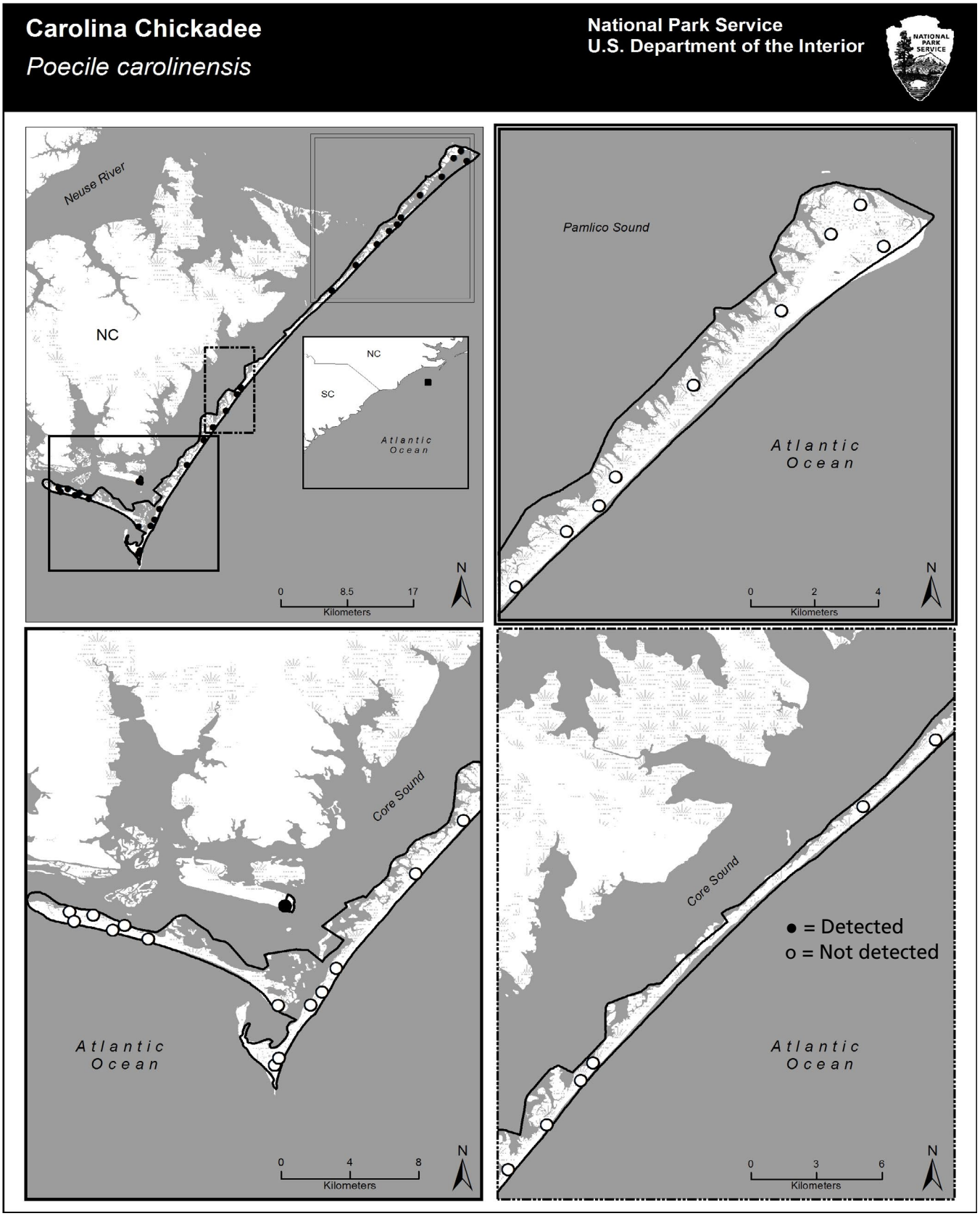


Figure C-9. Sampling locations where Carolina chickadee (*Poecile carolinensis*) was detected at Cape Lookout National Seashore, 2012.

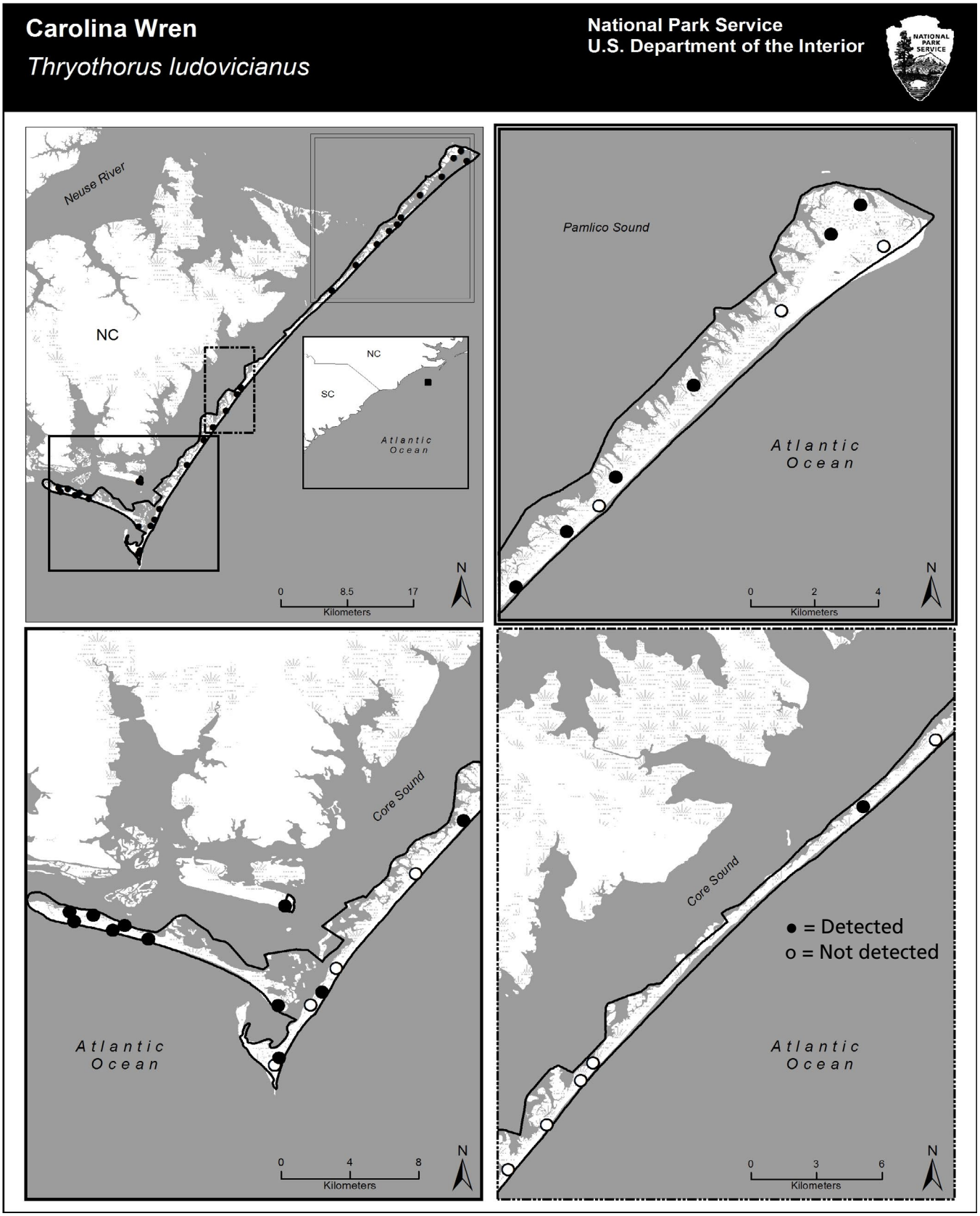


Figure C-10. Sampling locations where Carolina wren (*Thryothorus ludovicianus*) was detected at Cape Lookout National Seashore, 2012.

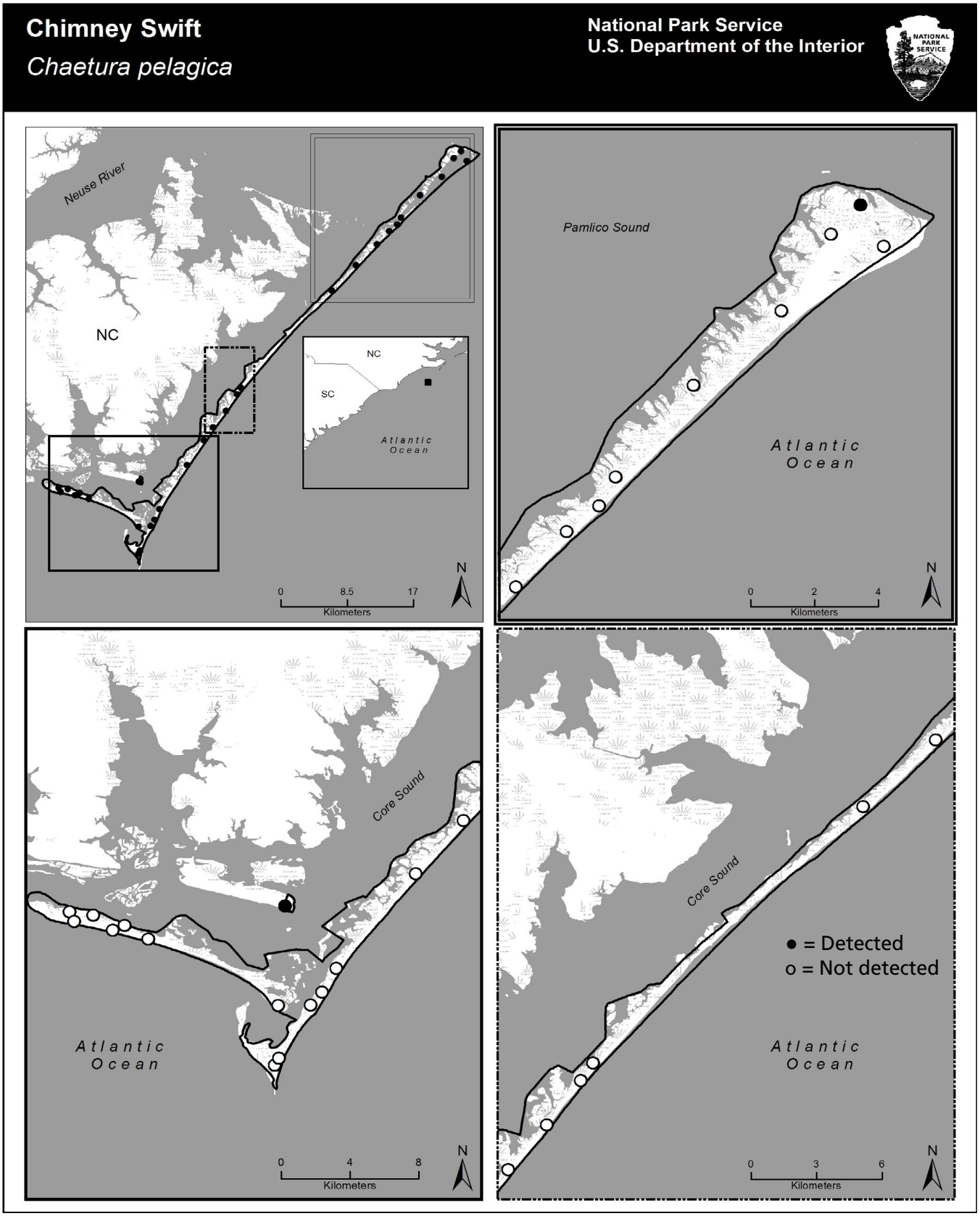


Figure C-11. Sampling locations where chimney swift (*Chaetura pelagica*) was detected at Cape Lookout National Seashore, 2012.

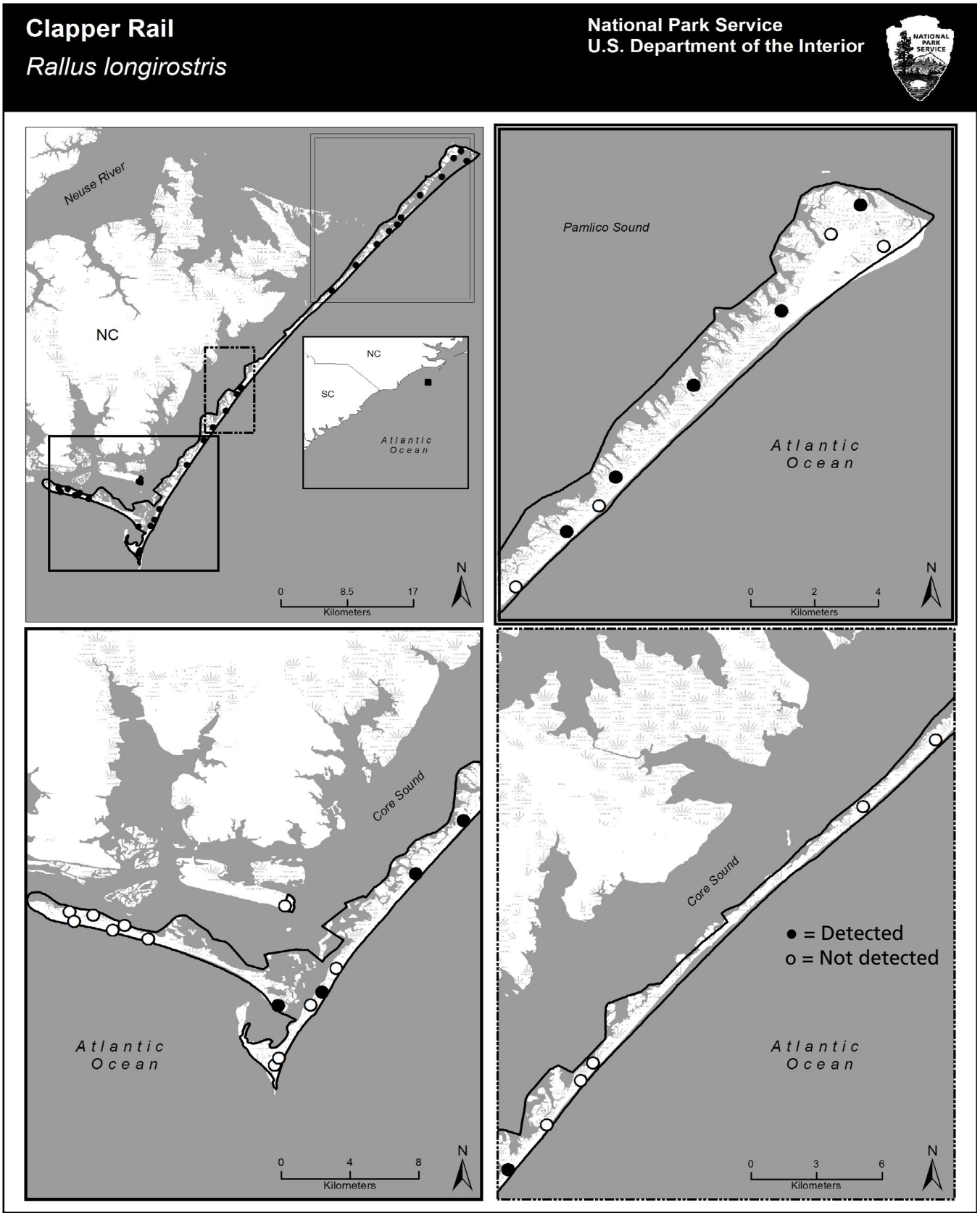


Figure C-12. Sampling locations where clapper rail (*Rallus longirostrus*) was detected at Cape Lookout National Seashore, 2012.

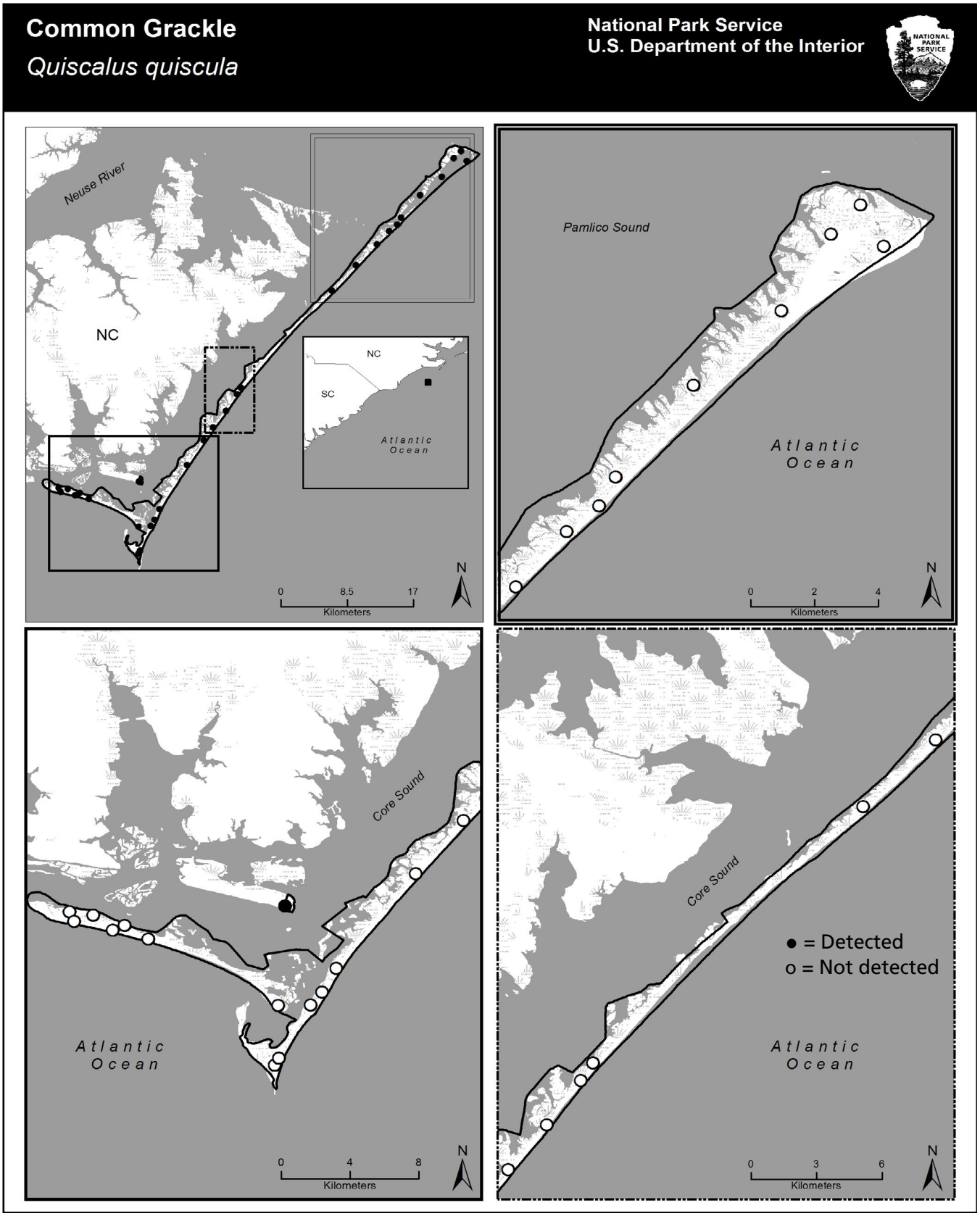


Figure C-13. Sampling locations where common grackle (*Quiscalus quiscula*) was detected at Cape Lookout National Seashore, 2012.

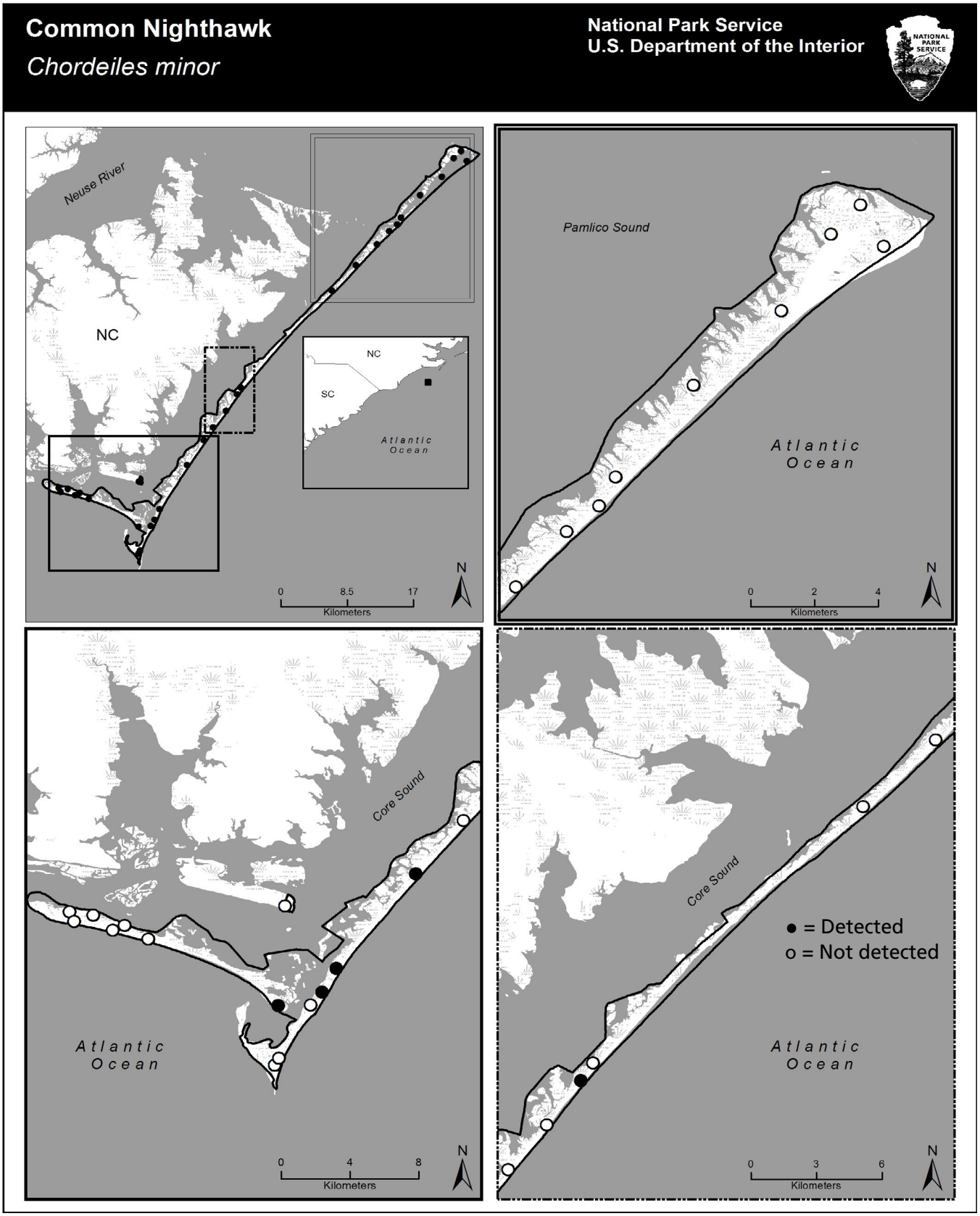


Figure C-14. Sampling locations where common nighthawk (*Chordeiles minor*) was detected at Cape Lookout National Seashore, 2012.

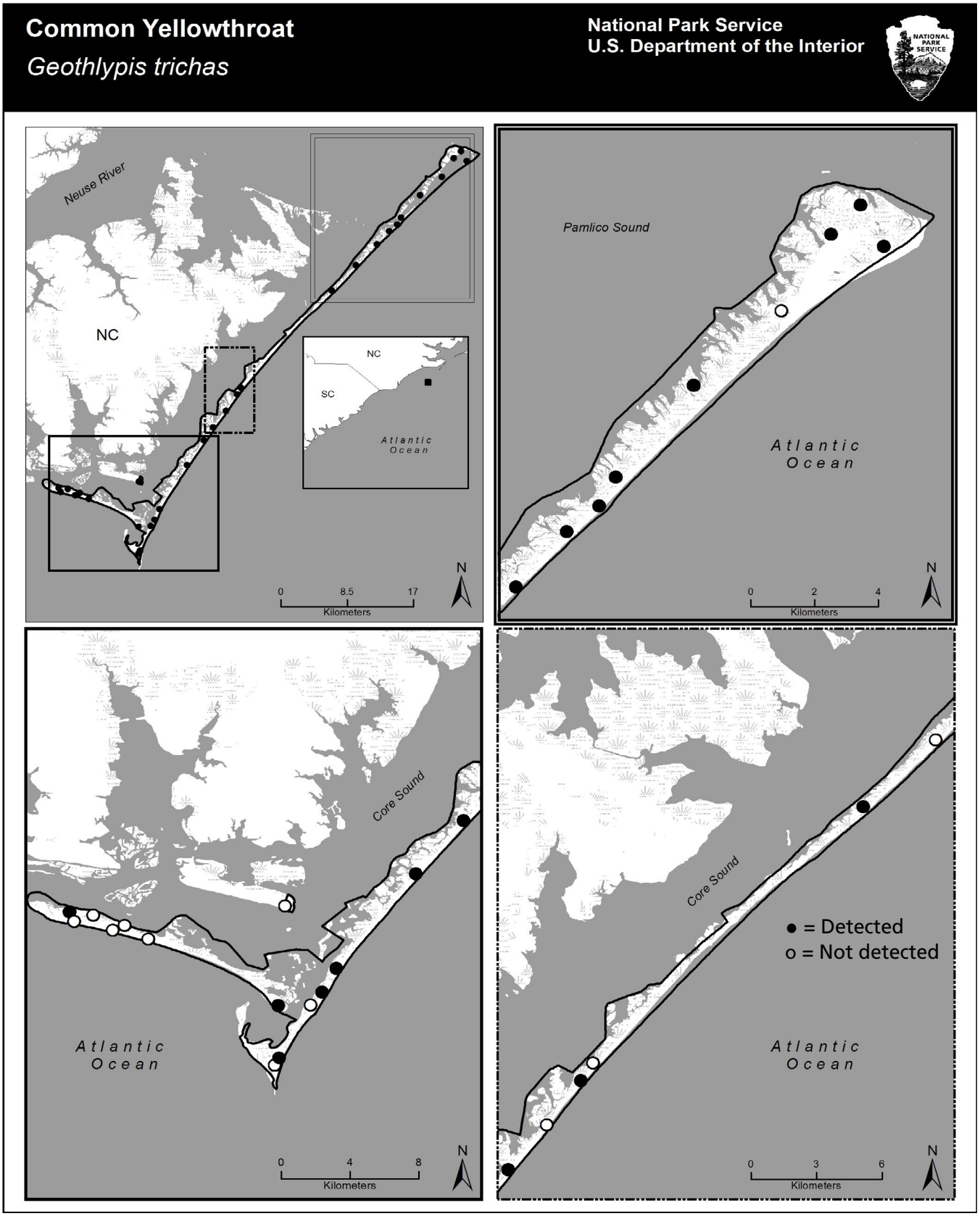


Figure C-15. Sampling locations where common yellowthroat (*Geothlypis trichas*) was detected at Cape Lookout National Seashore, 2012.

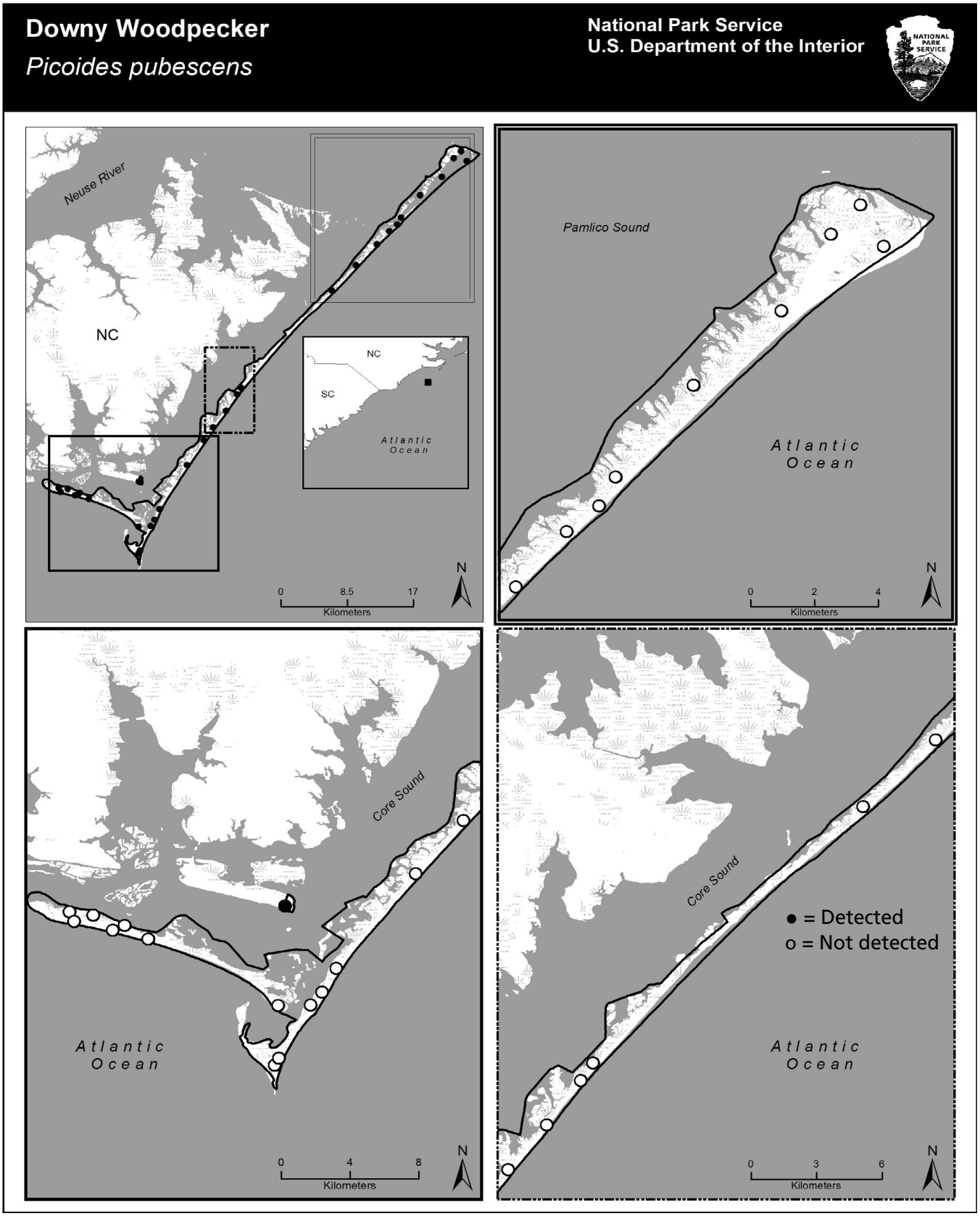


Figure C-16. Sampling locations where downy woodpecker (*Picoides pubescens*) was detected at Cape Lookout National Seashore, 2012.

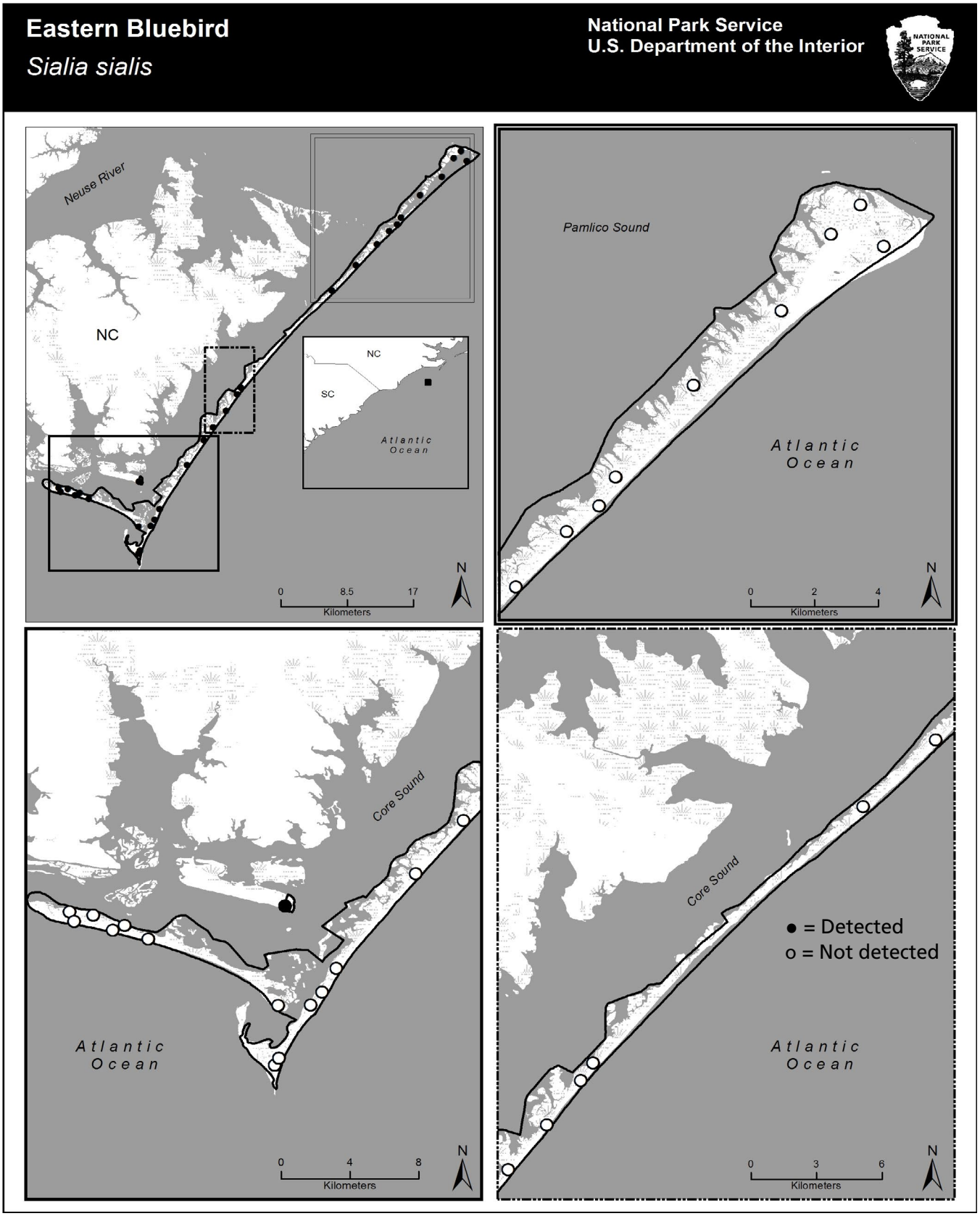


Figure C-17. Sampling locations where eastern bluebird (*Sialia sialis*) was detected at Cape Lookout National Seashore, 2012.

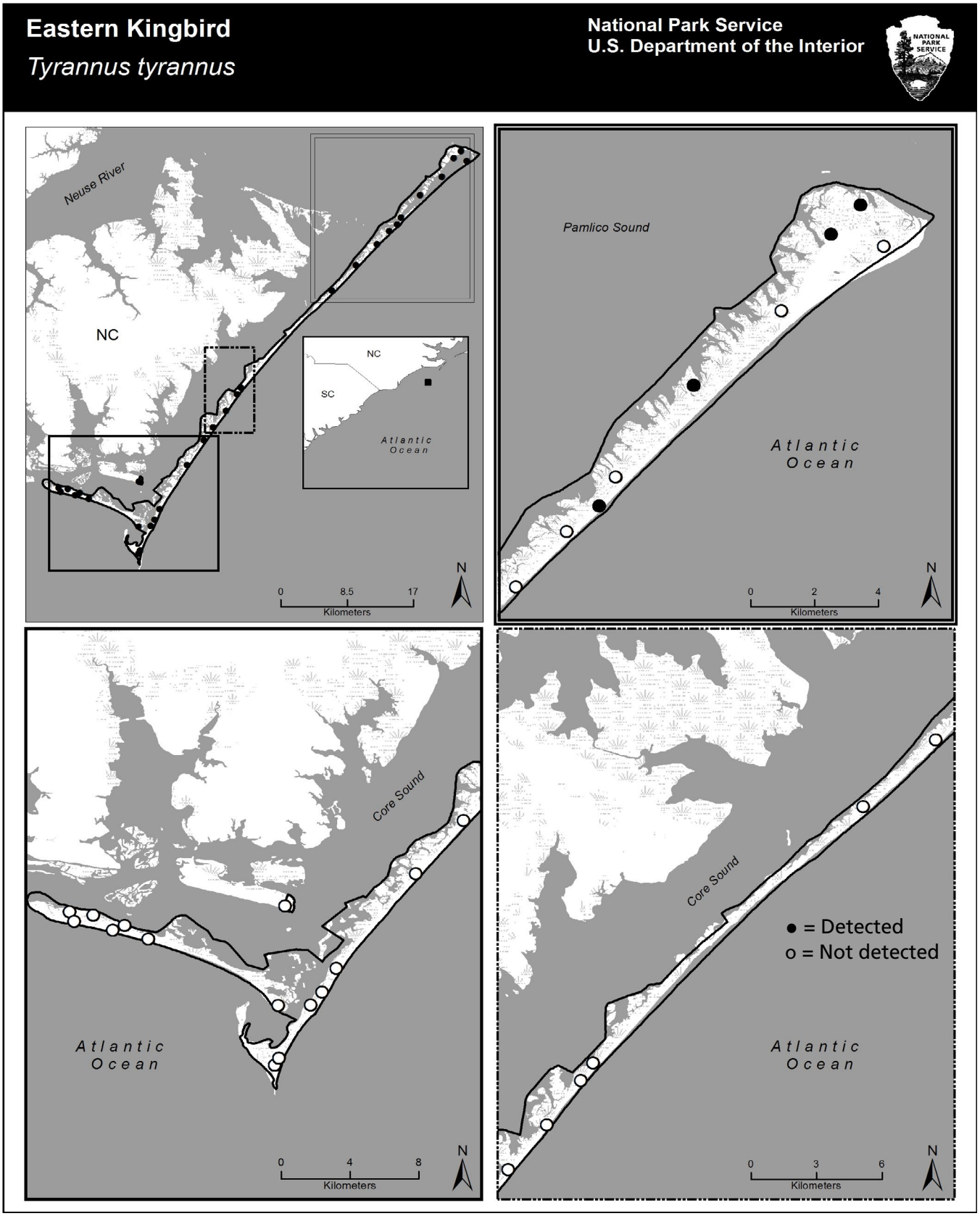


Figure C-18. Sampling locations where eastern kingbird (*Tyrannus tyrannus*) was detected at Cape Lookout National Seashore, 2012.

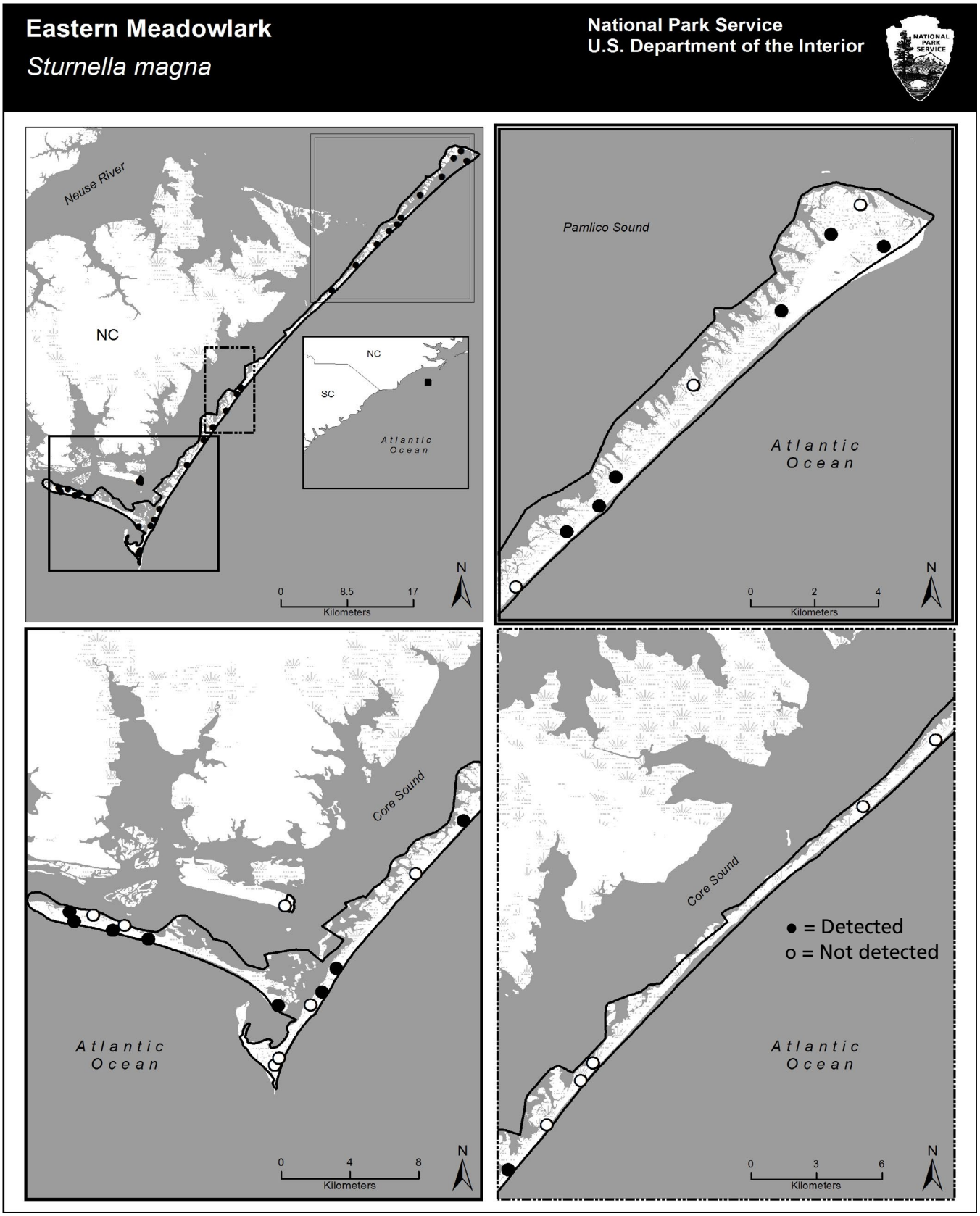


Figure C-19. Sampling locations where eastern meadowlark (*Sturnus magnella*) was detected at Cape Lookout National Seashore, 2012.

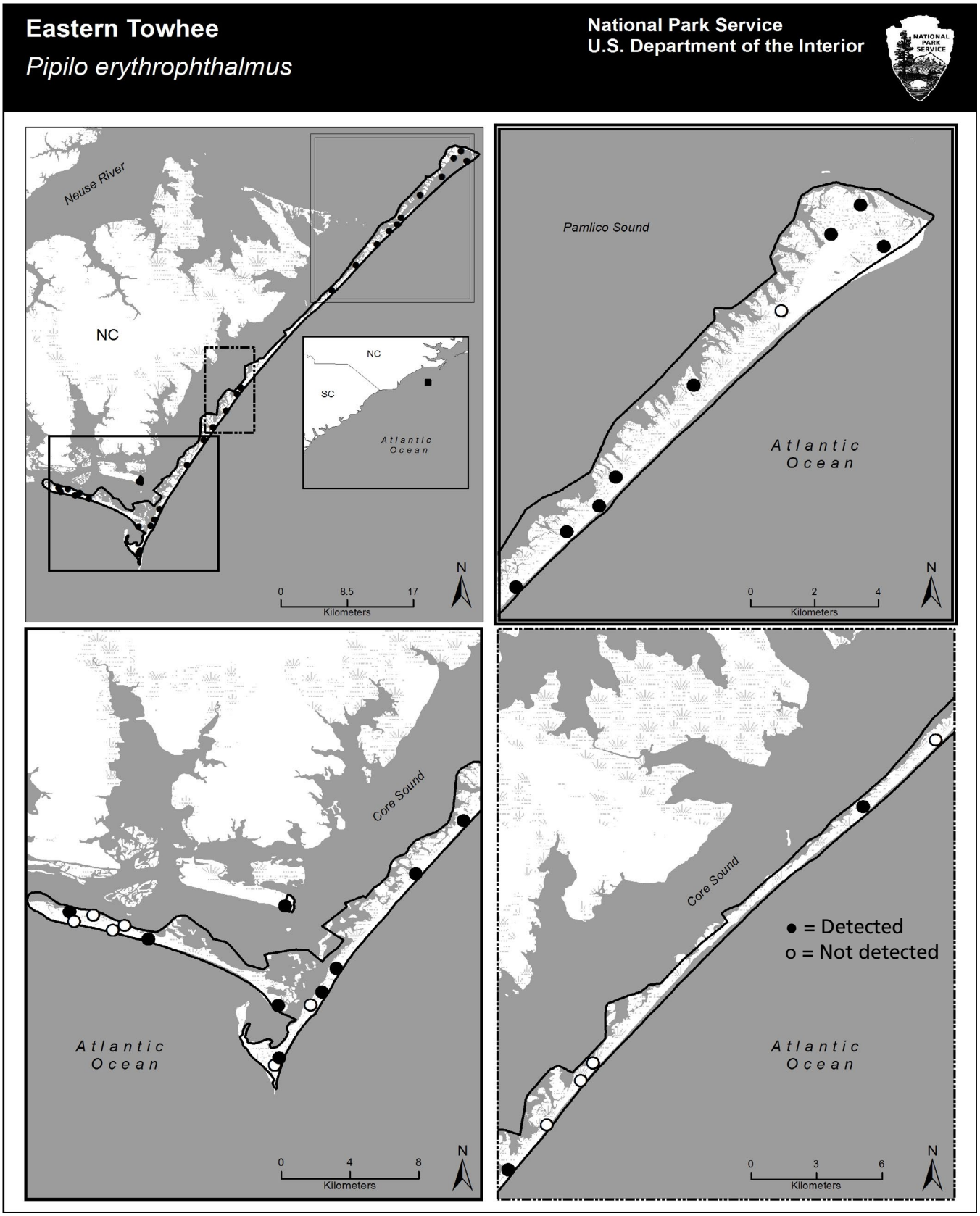


Figure C-20. Sampling locations where eastern towhee (*Piplio erythrophtalmus*) was detected at Cape Lookout National Seashore, 2012.

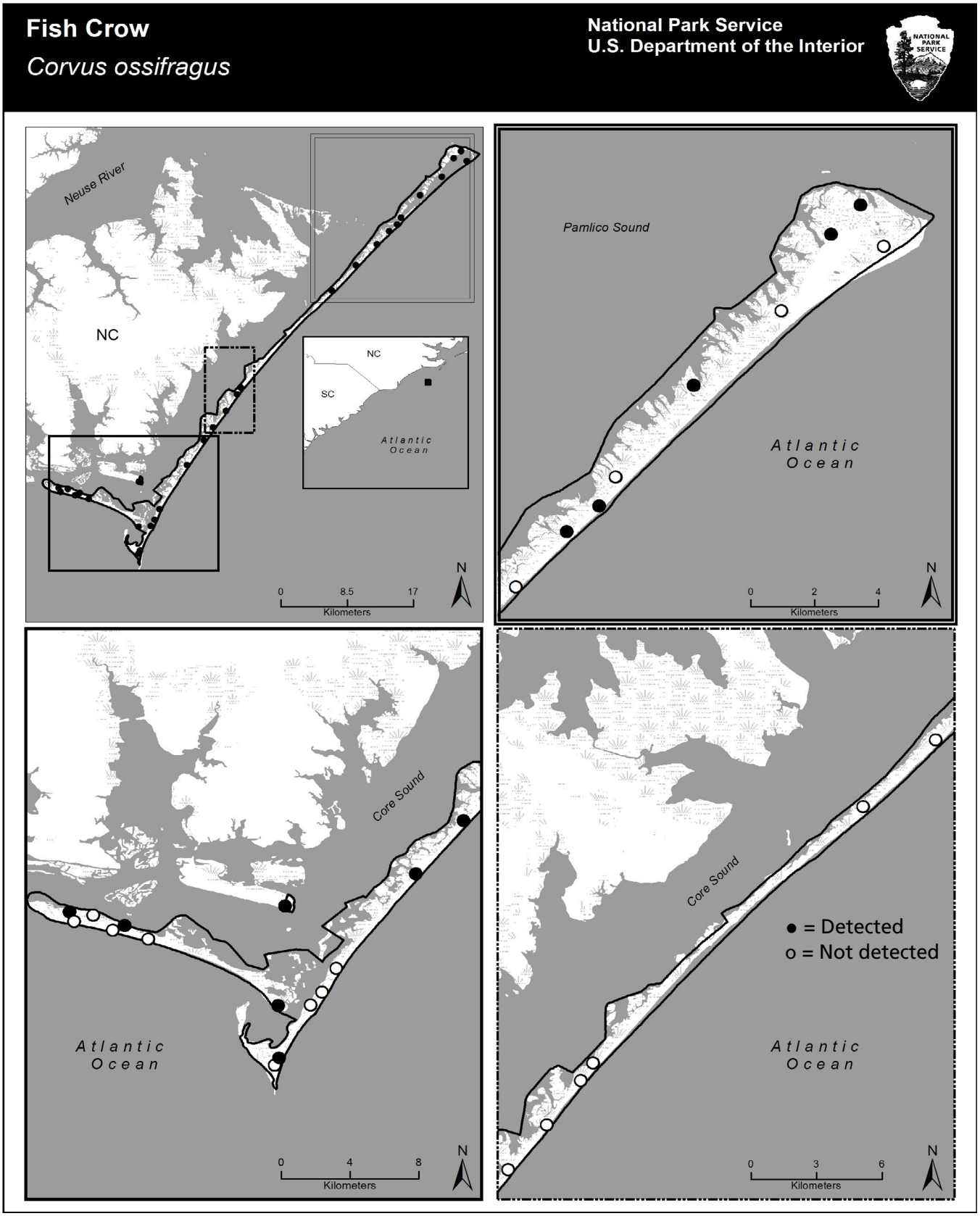


Figure C-21. Sampling locations where fish crow (*Corvus ossifragus*) was detected at Cape Lookout National Seashore, 2012.

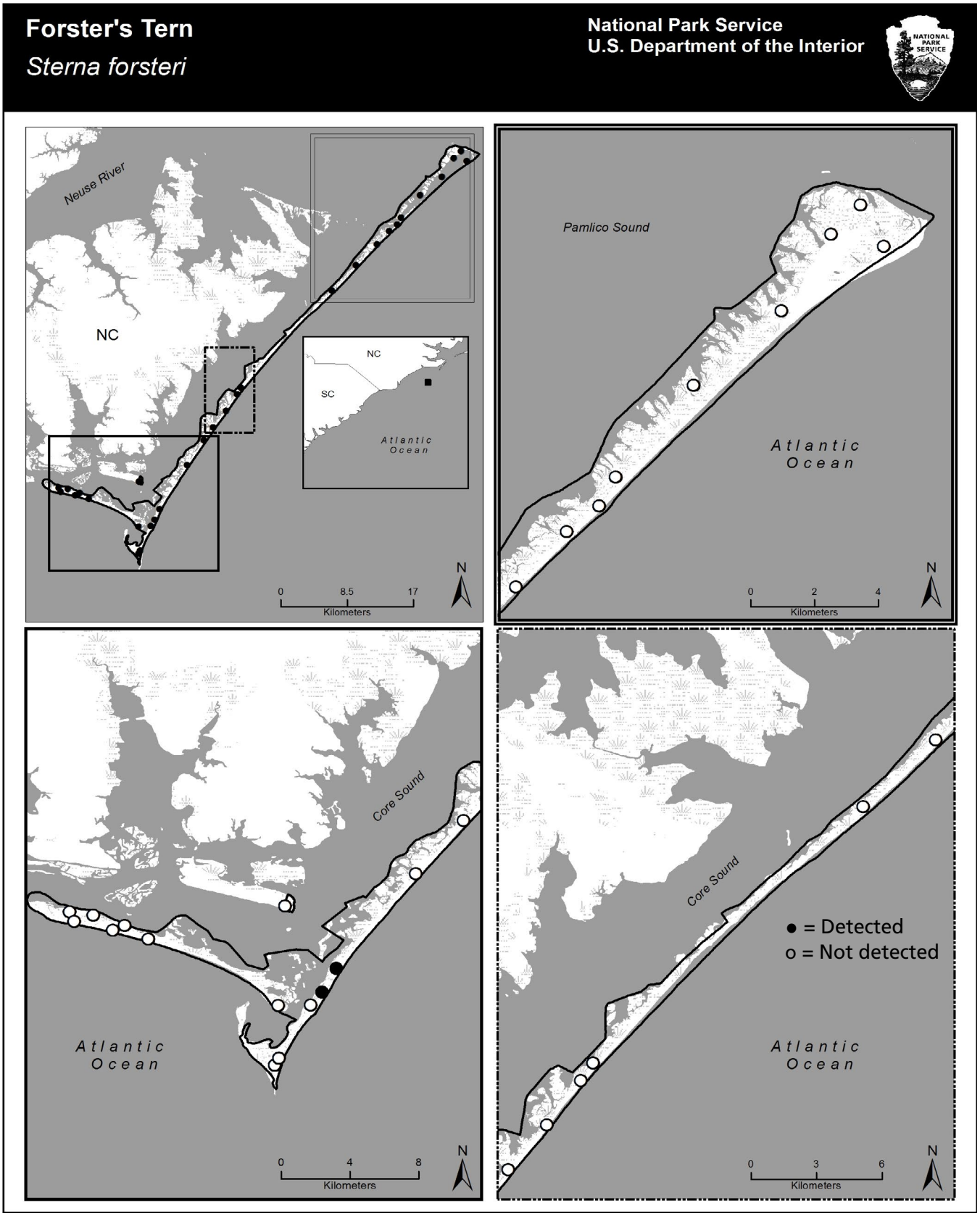


Figure C-22. Sampling locations where Forster's tern (*Sterna forsteri*) was detected at Cape Lookout National Seashore, 2012.

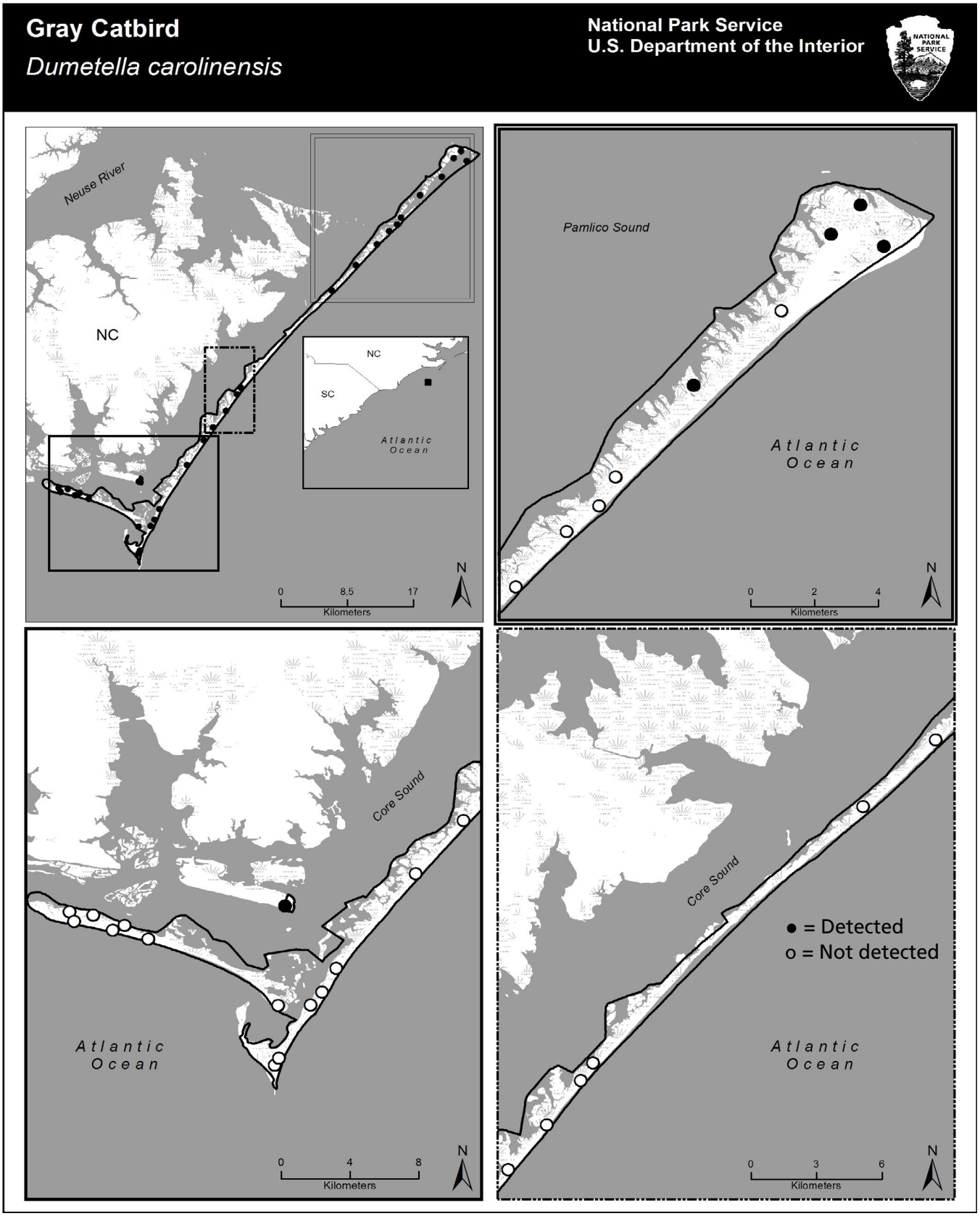


Figure C-23. Sampling locations where gray catbird (*Dumetella carolinensis*) was detected at Cape Lookout National Seashore, 2012.

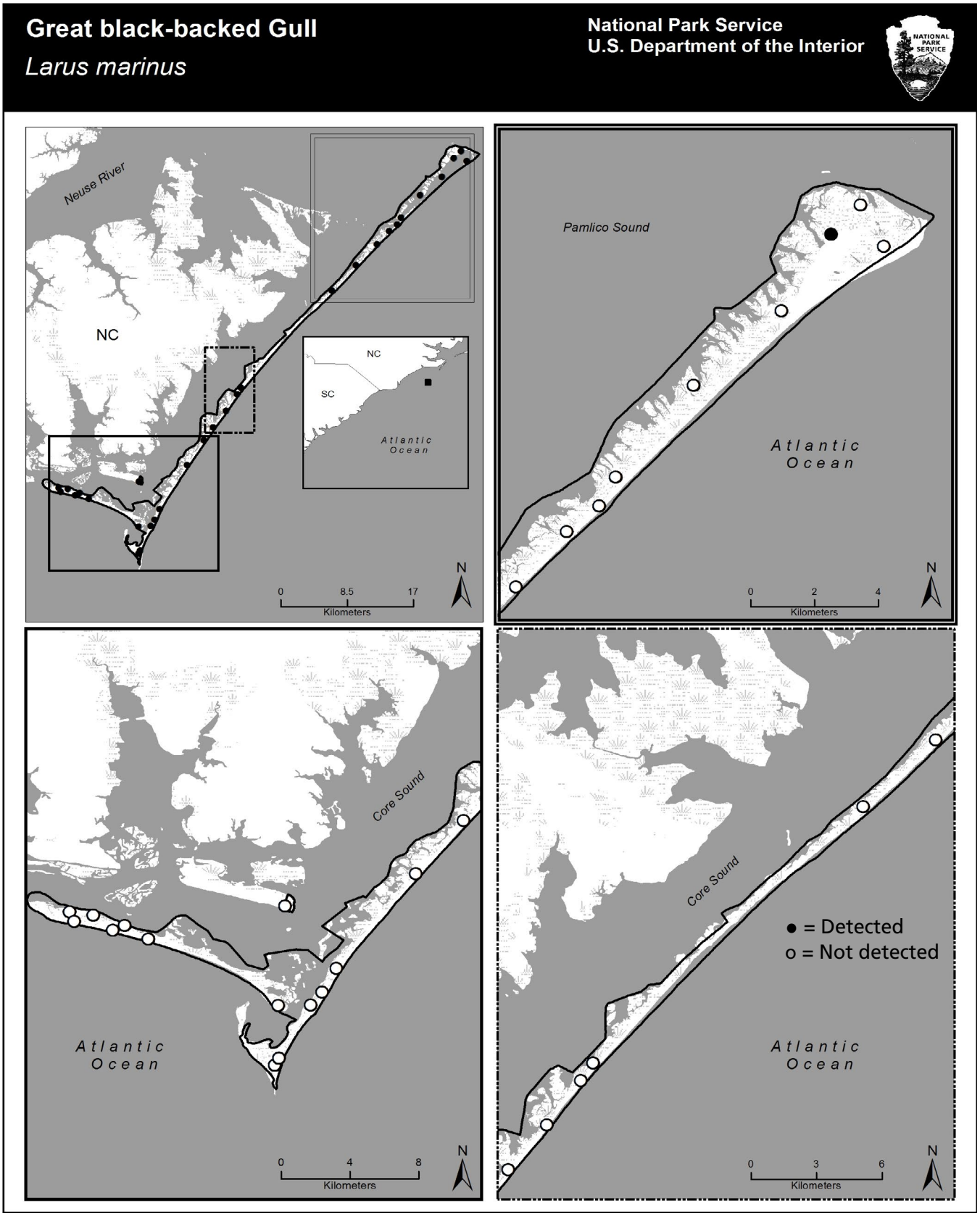


Figure C-24. Sampling locations where great black-backed gull (*Larus marinus*) was detected at Cape Lookout National Seashore, 2012.

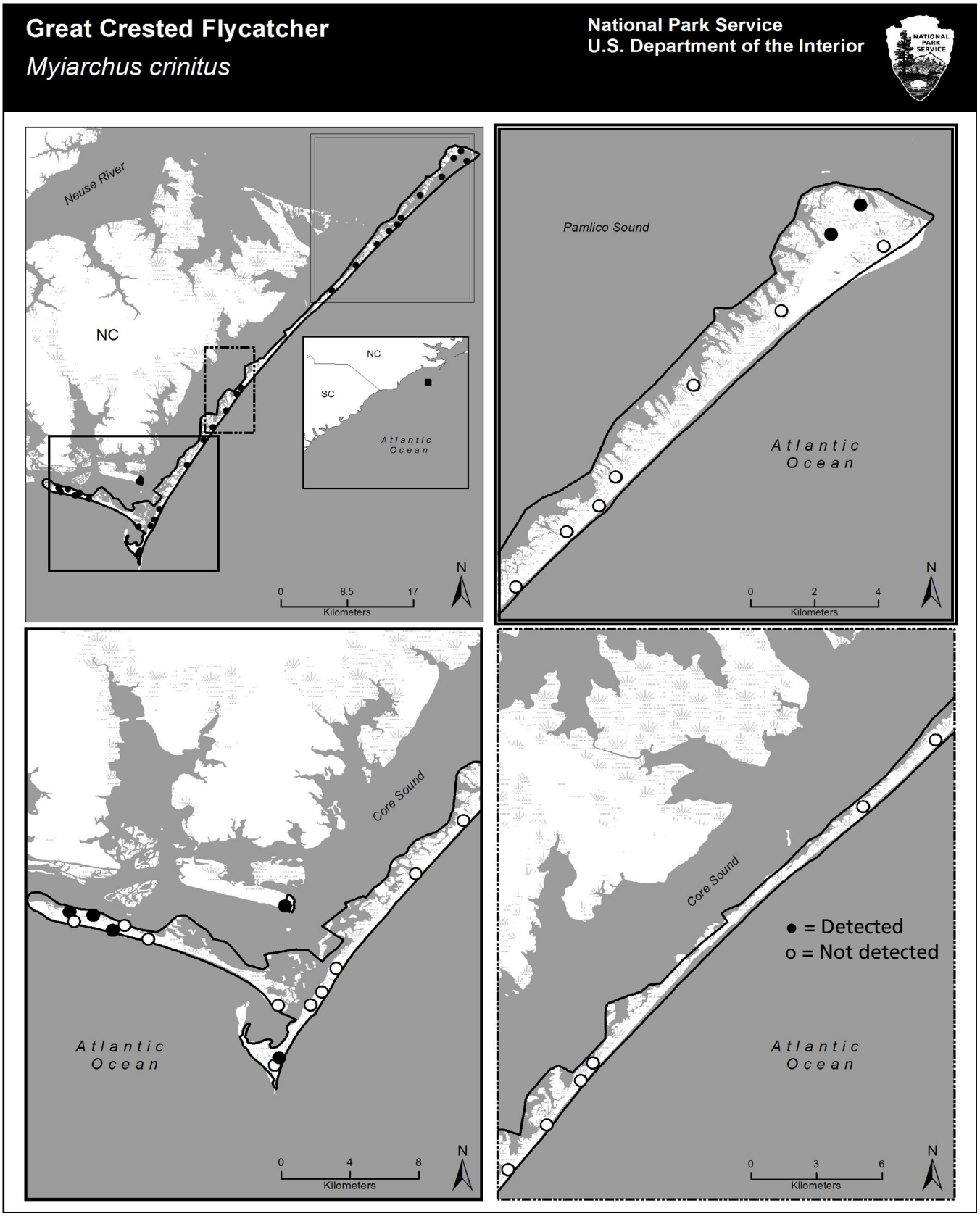


Figure C-25. Sampling locations where great crested flycatcher (*Myiarchus crinitus*) was detected at Cape Lookout National Seashore, 2012.

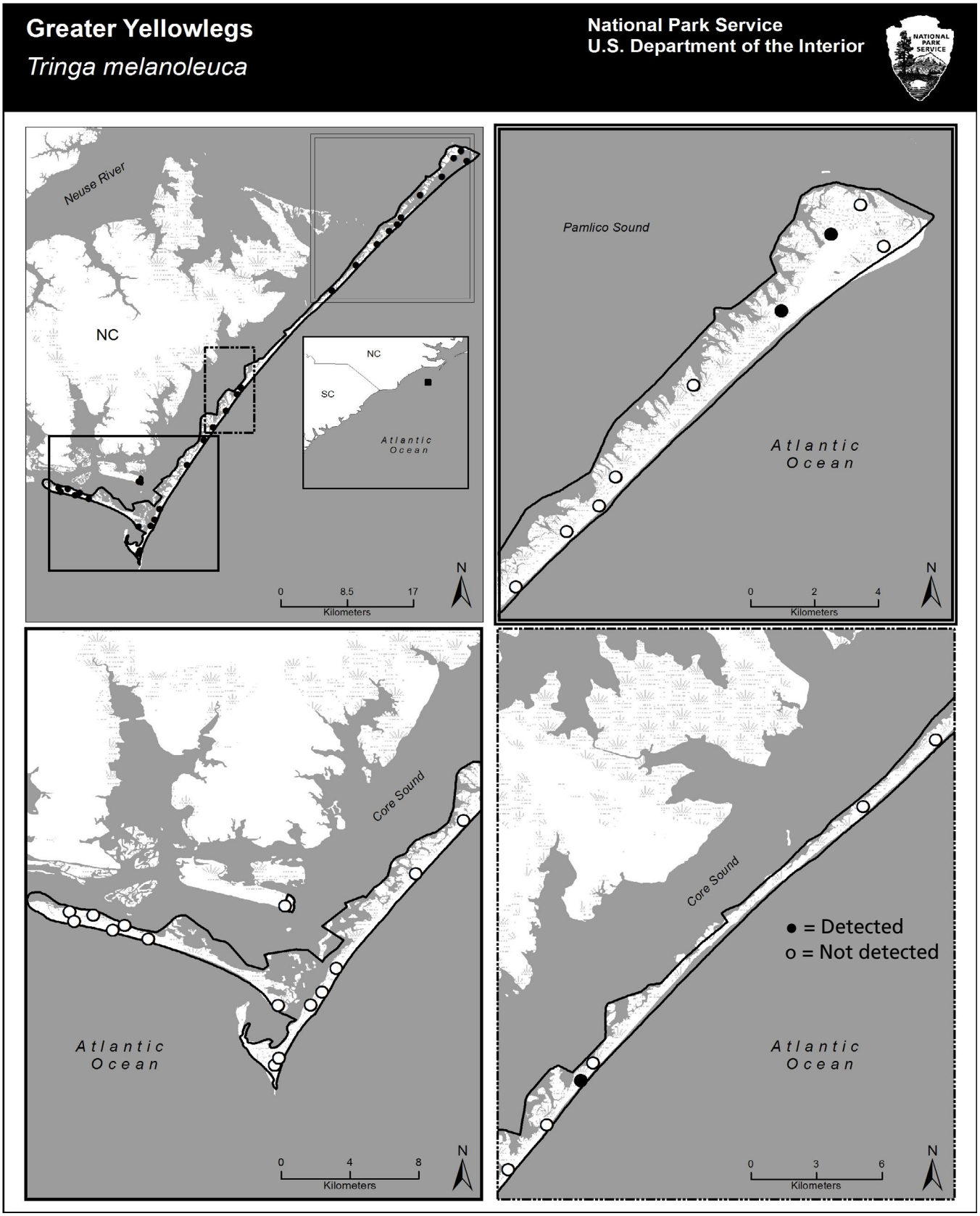


Figure C-26. Sampling locations where greater yellowlegs (*Tringa melanoleuca*) was detected at Cape Lookout National Seashore, 2012.

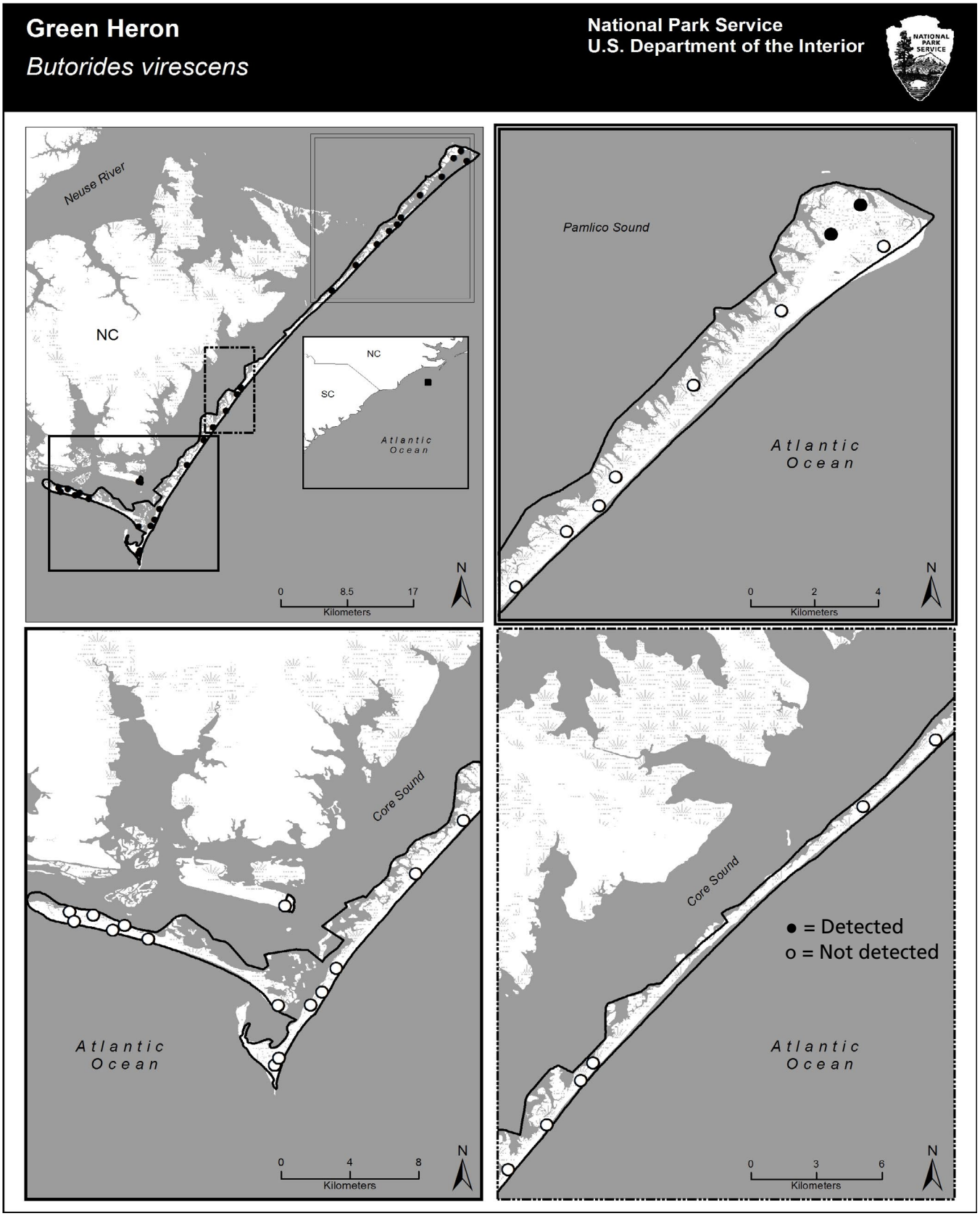


Figure C-27. Sampling locations where green heron (*Butorides virescens*) was detected at Cape Lookout National Seashore, 2012.

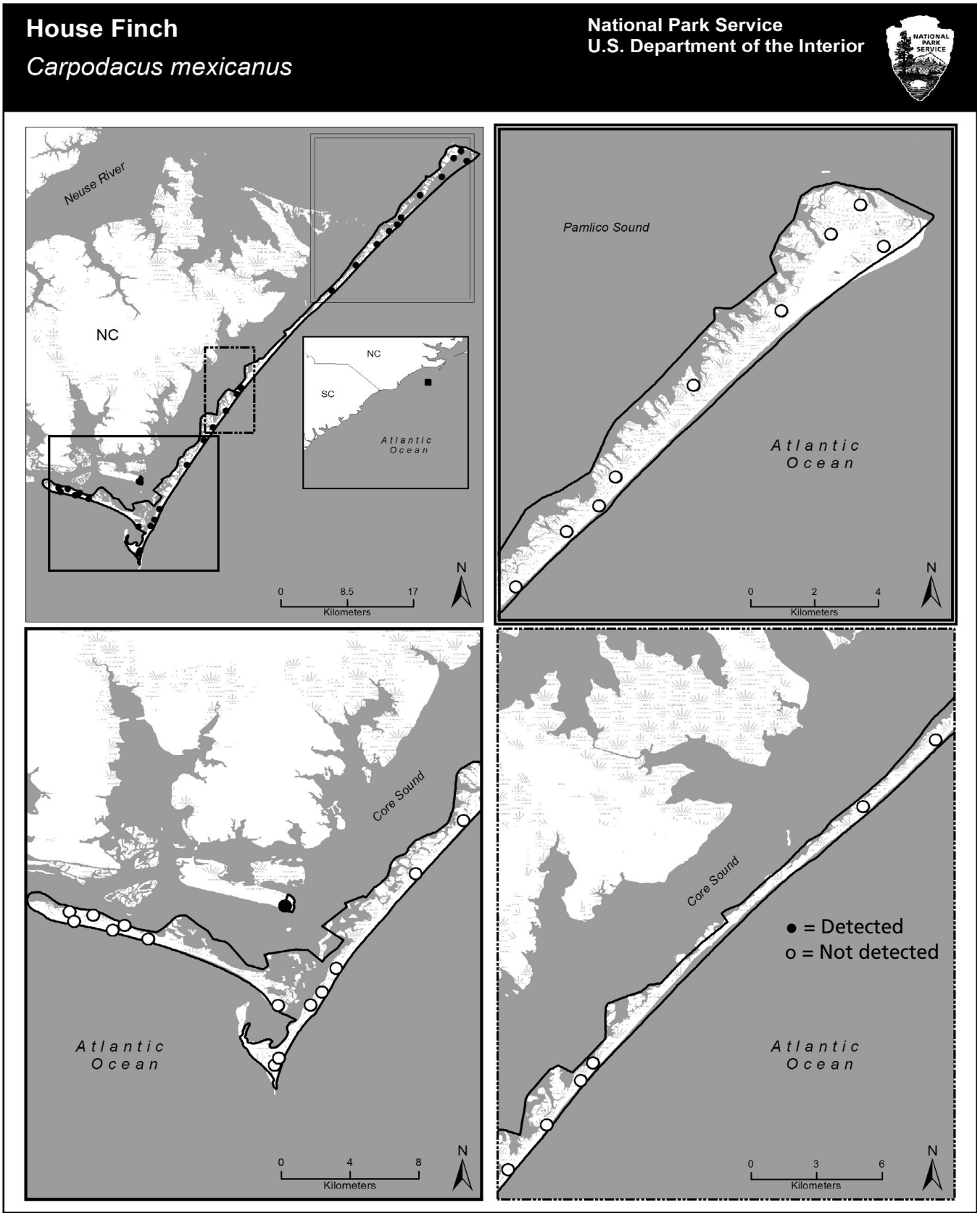


Figure C-28. Sampling locations where house finch (*Carpodacus mexicanus*) was detected at Cape Lookout National Seashore, 2012.

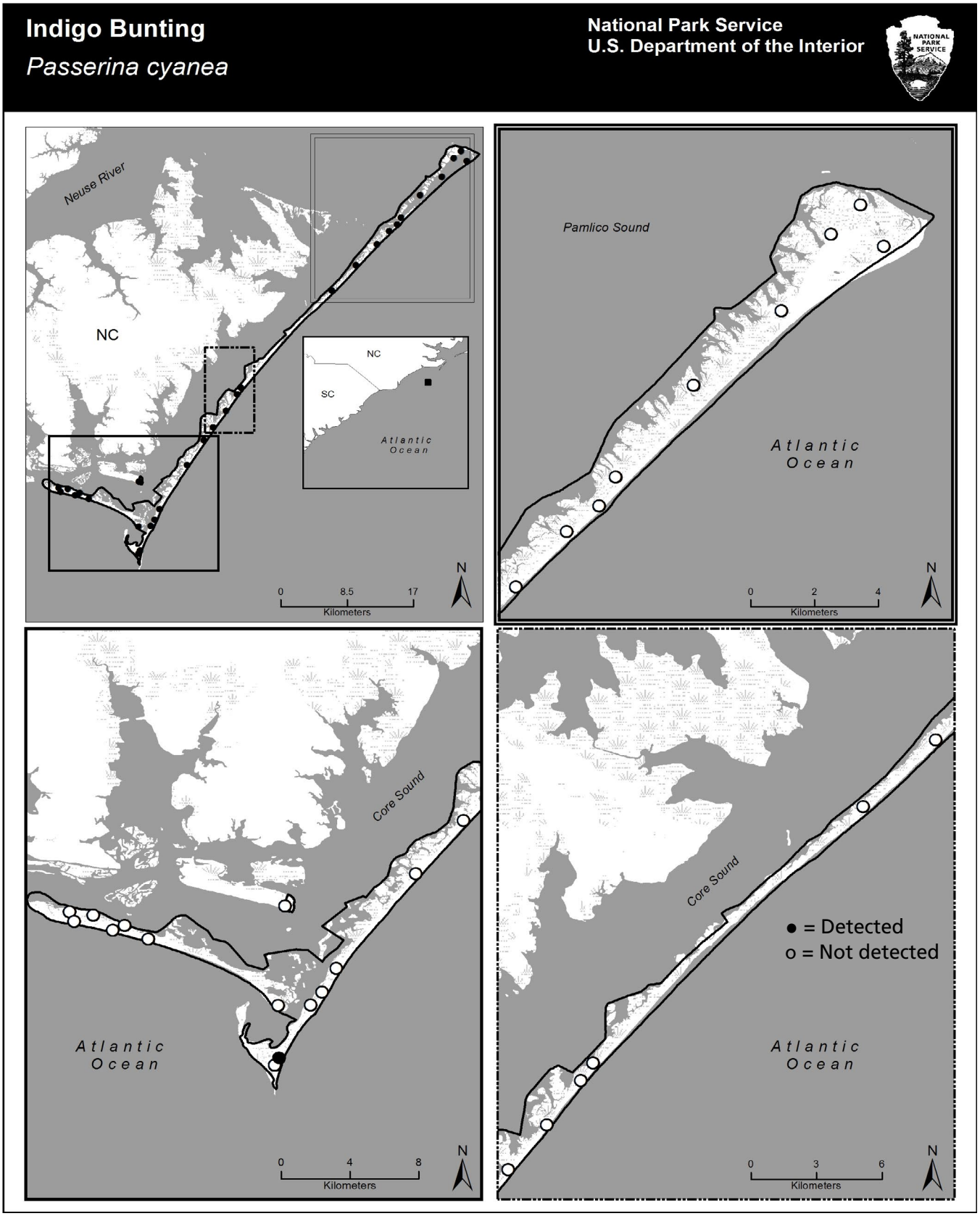


Figure C-29. Sampling locations where indigo bunting (*Passerina cyanea*) was detected at Cape Lookout National Seashore, 2012.

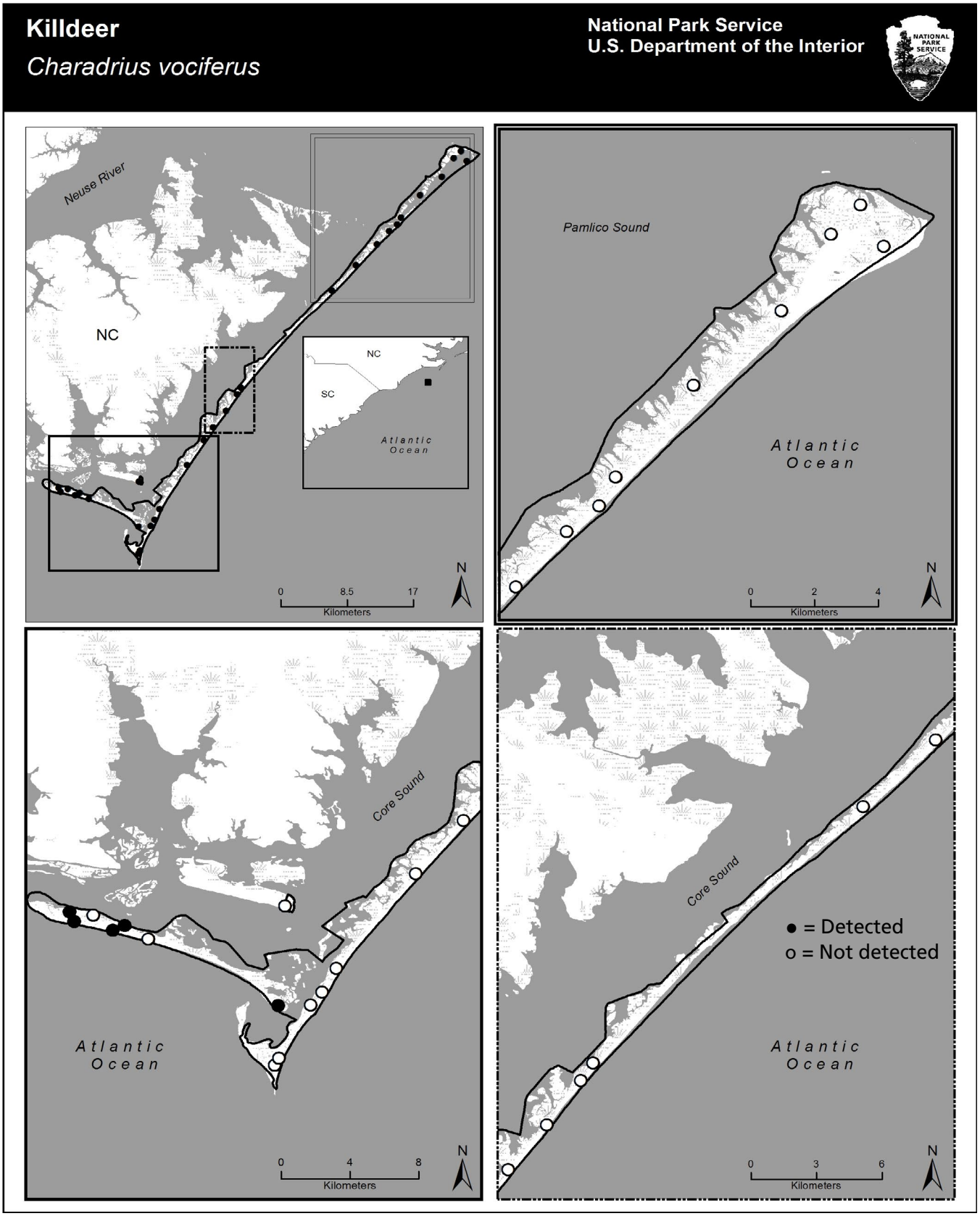


Figure C-30. Sampling locations where killdeer (*Charadrius vociferus*) was detected at Cape Lookout National Seashore, 2012.

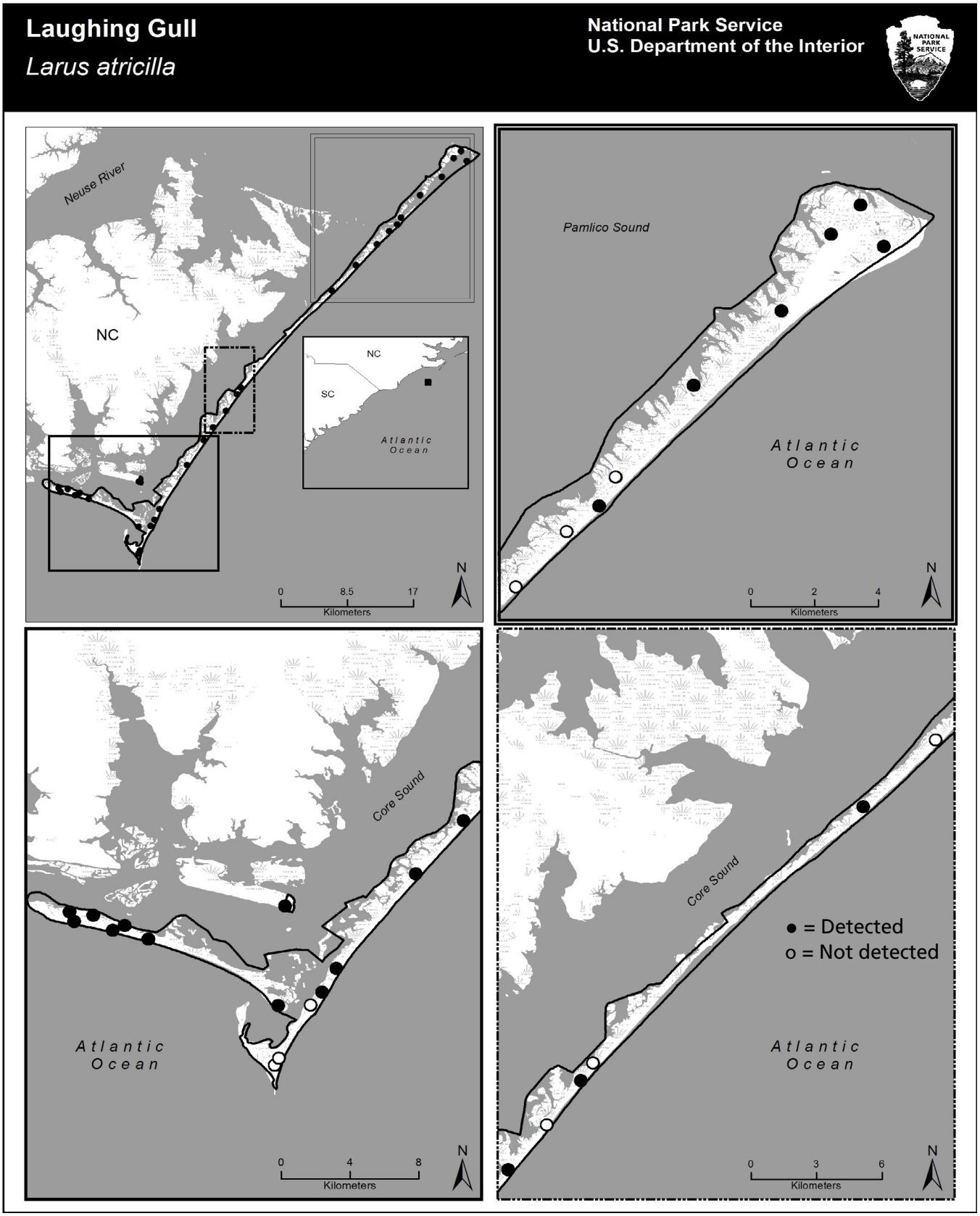


Figure C-31. Sampling locations where laughing gull (*Larus atricilla*) was detected at Cape Lookout National Seashore, 2012.

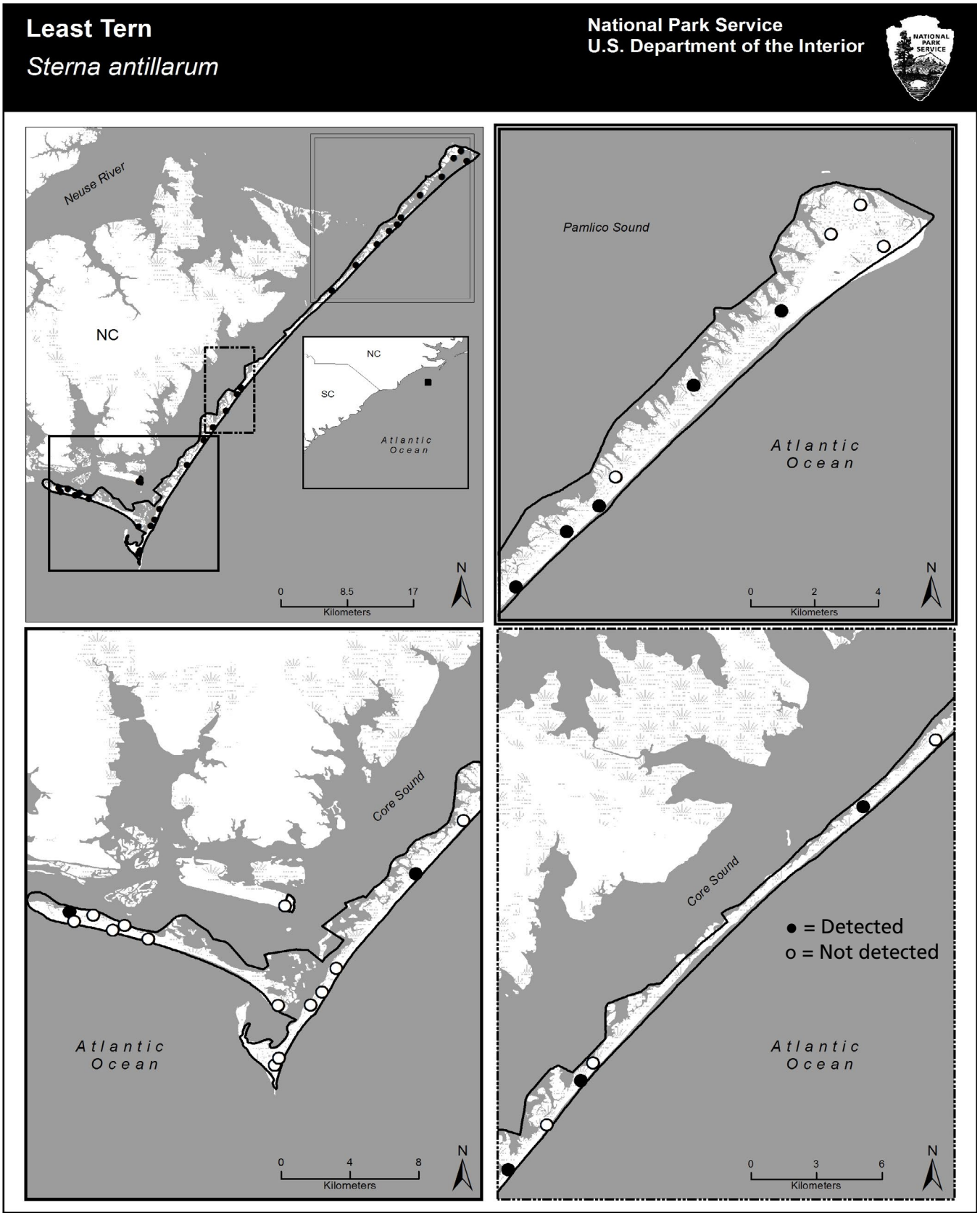


Figure C-32. Sampling locations where least tern (*Sterna antillarum*) was detected at Cape Lookout National Seashore, 2012.

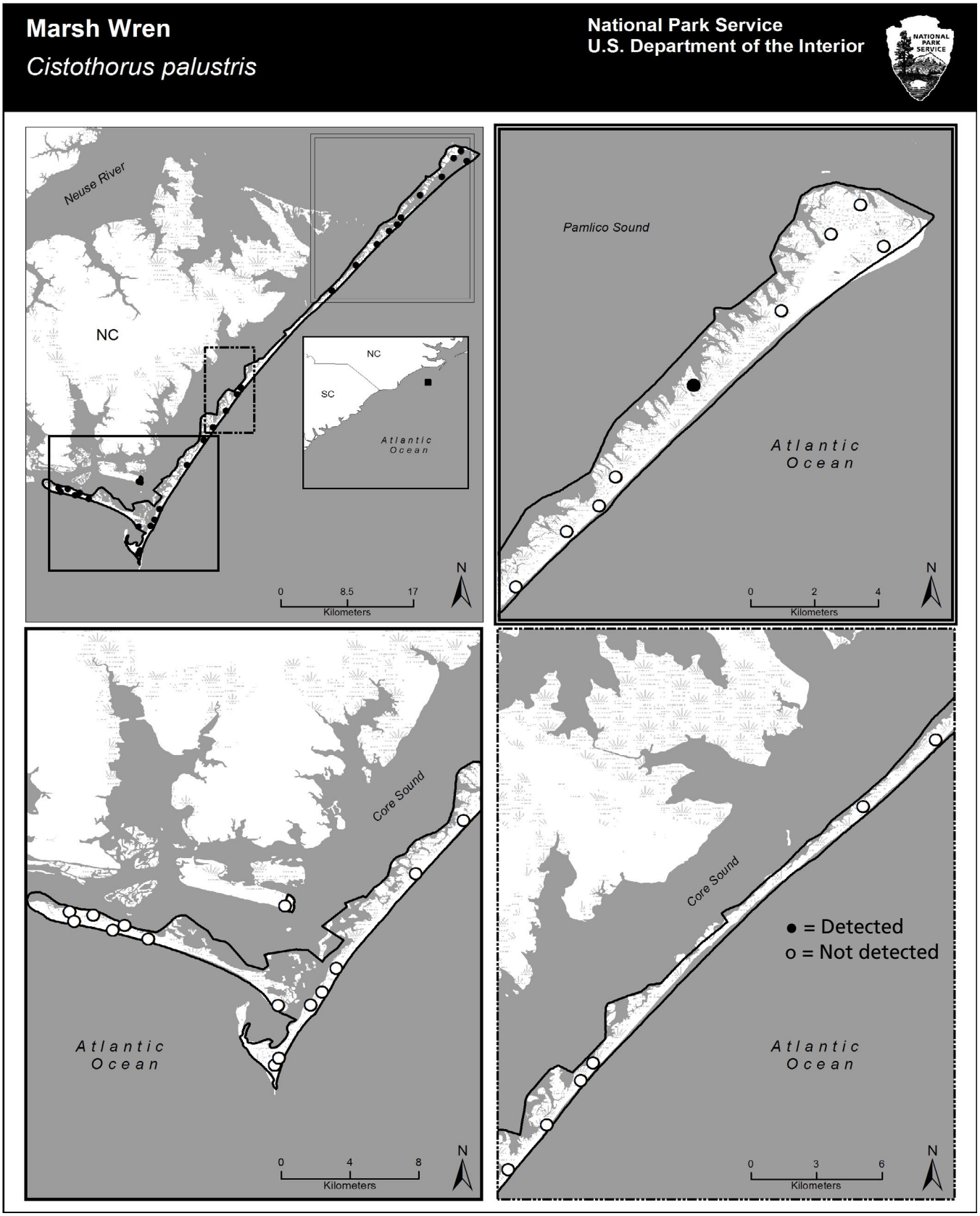


Figure C-33. Sampling locations where marsh wren (*Cistothorus palustris*) was detected at Cape Lookout National Seashore, 2012.

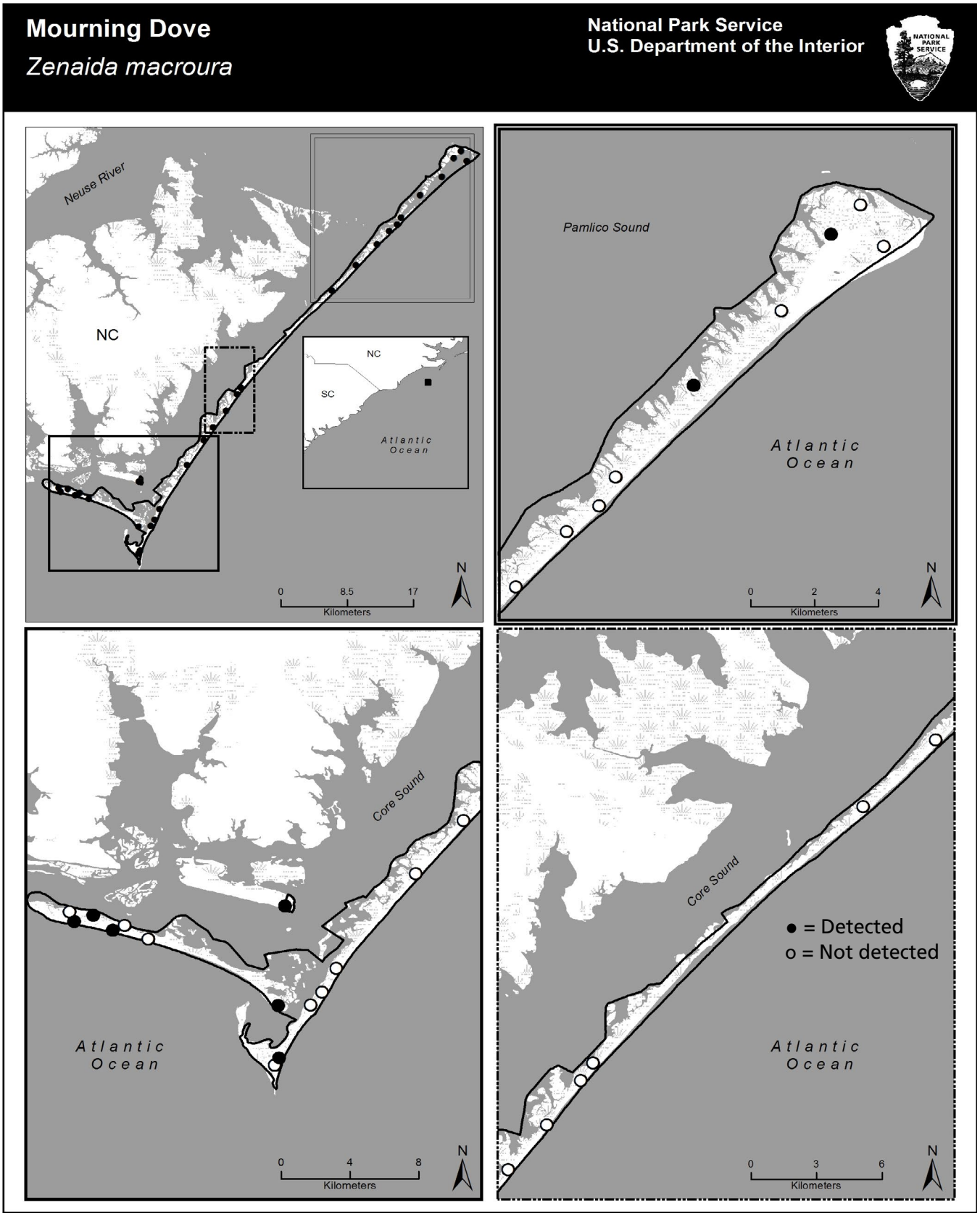


Figure C-34. Sampling locations where mourning dove (*Zenaida macroura*) was detected at Cape Lookout National Seashore, 2012.

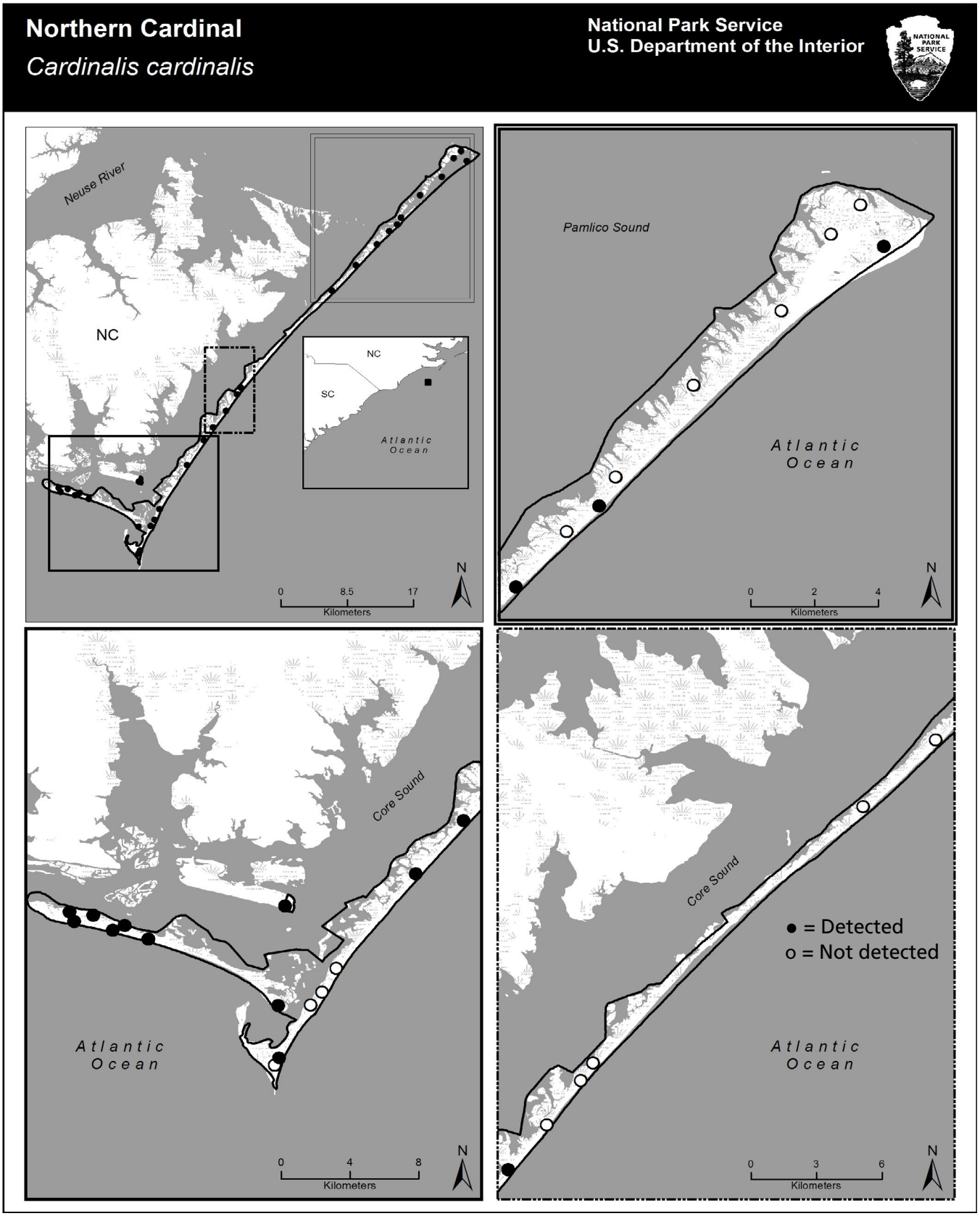


Figure C-35. Sampling locations where northern cardinal (*Cardinalis cardinalis*) was detected at Cape Lookout National Seashore, 2012.

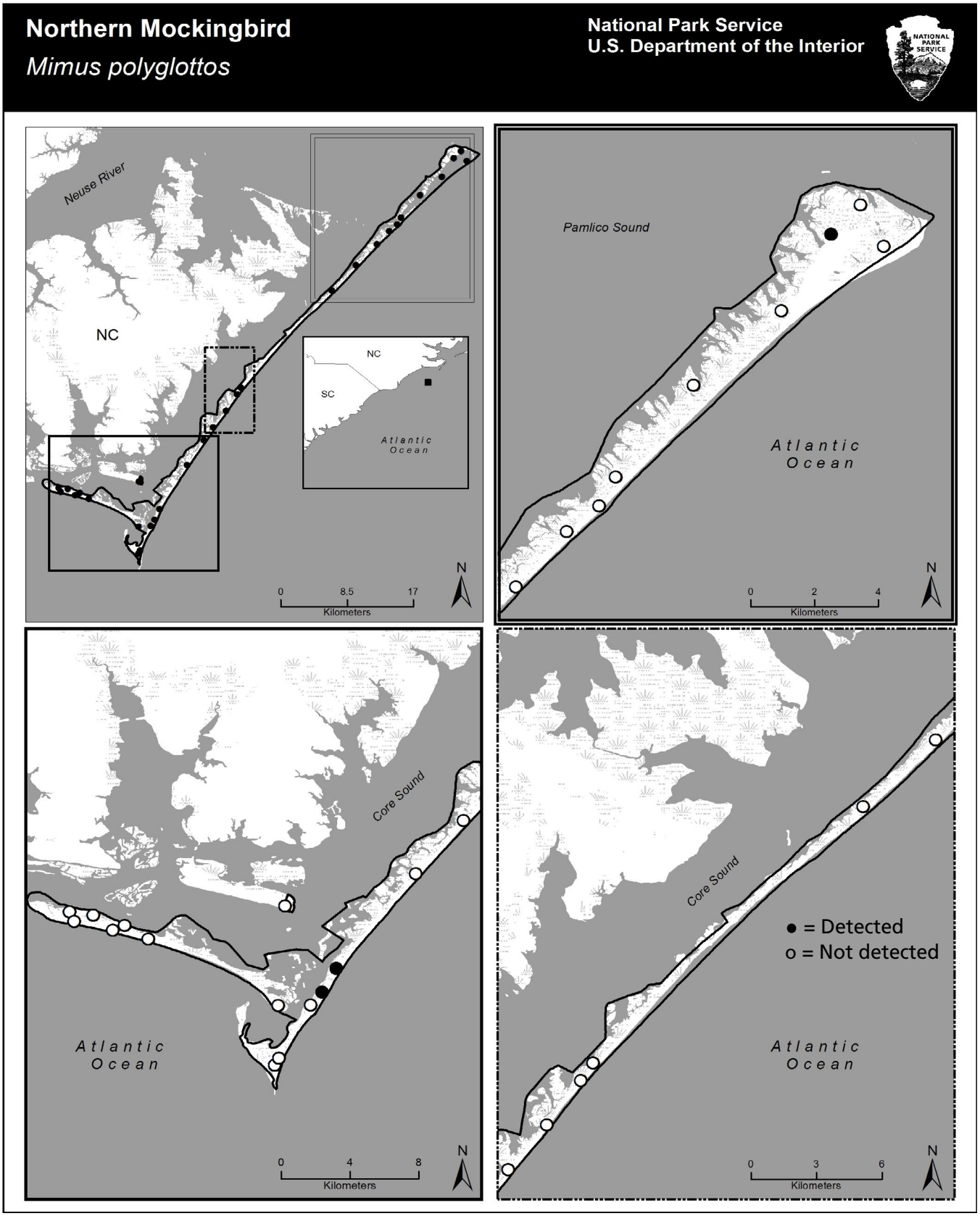


Figure C-36. Sampling locations where northern mockingbird (*Mimus polyglottos*) was detected at Cape Lookout National Seashore, 2012.

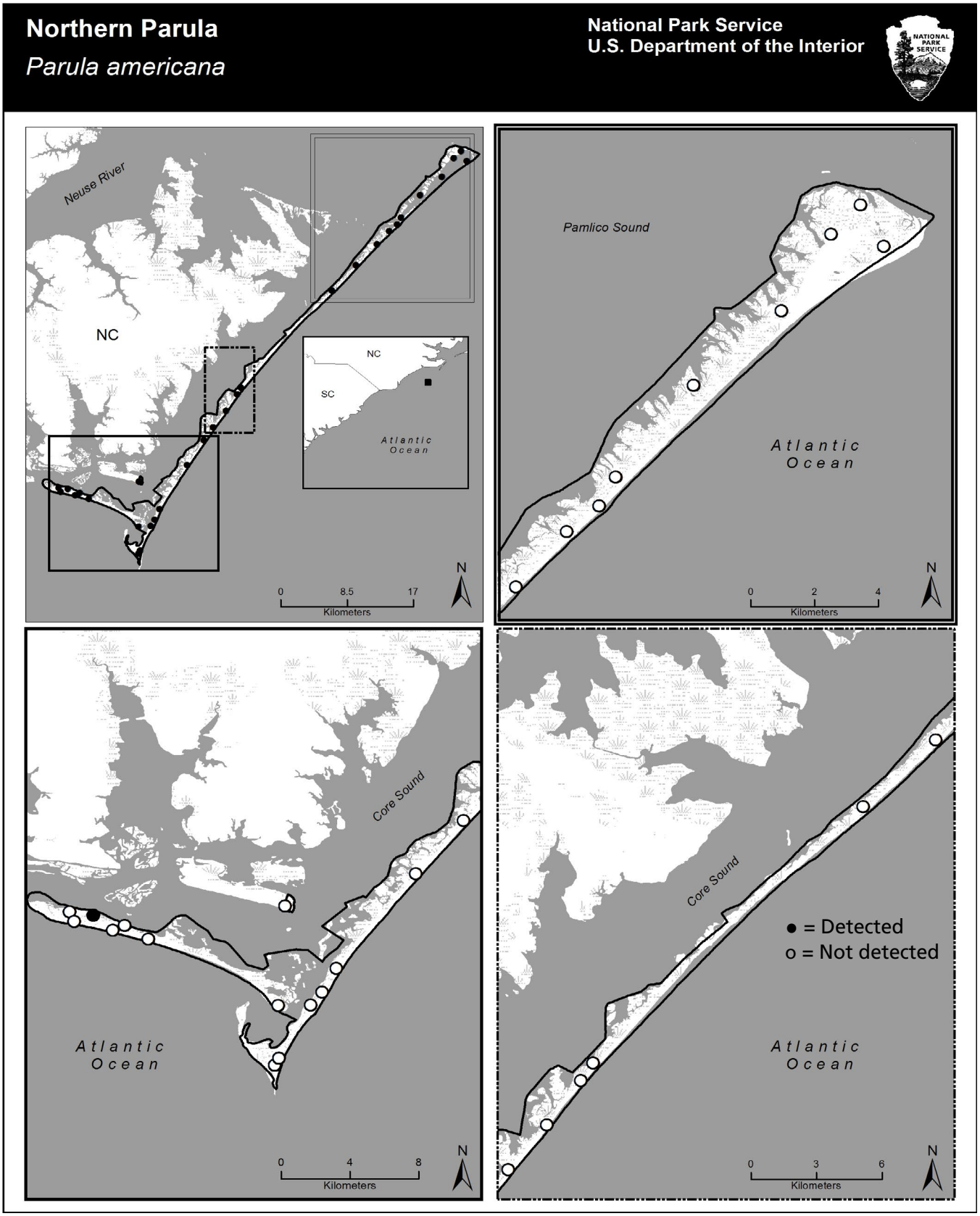


Figure C-37. Sampling locations where northern parula (*Parula americana*) was detected at Cape Lookout National Seashore, 2012.

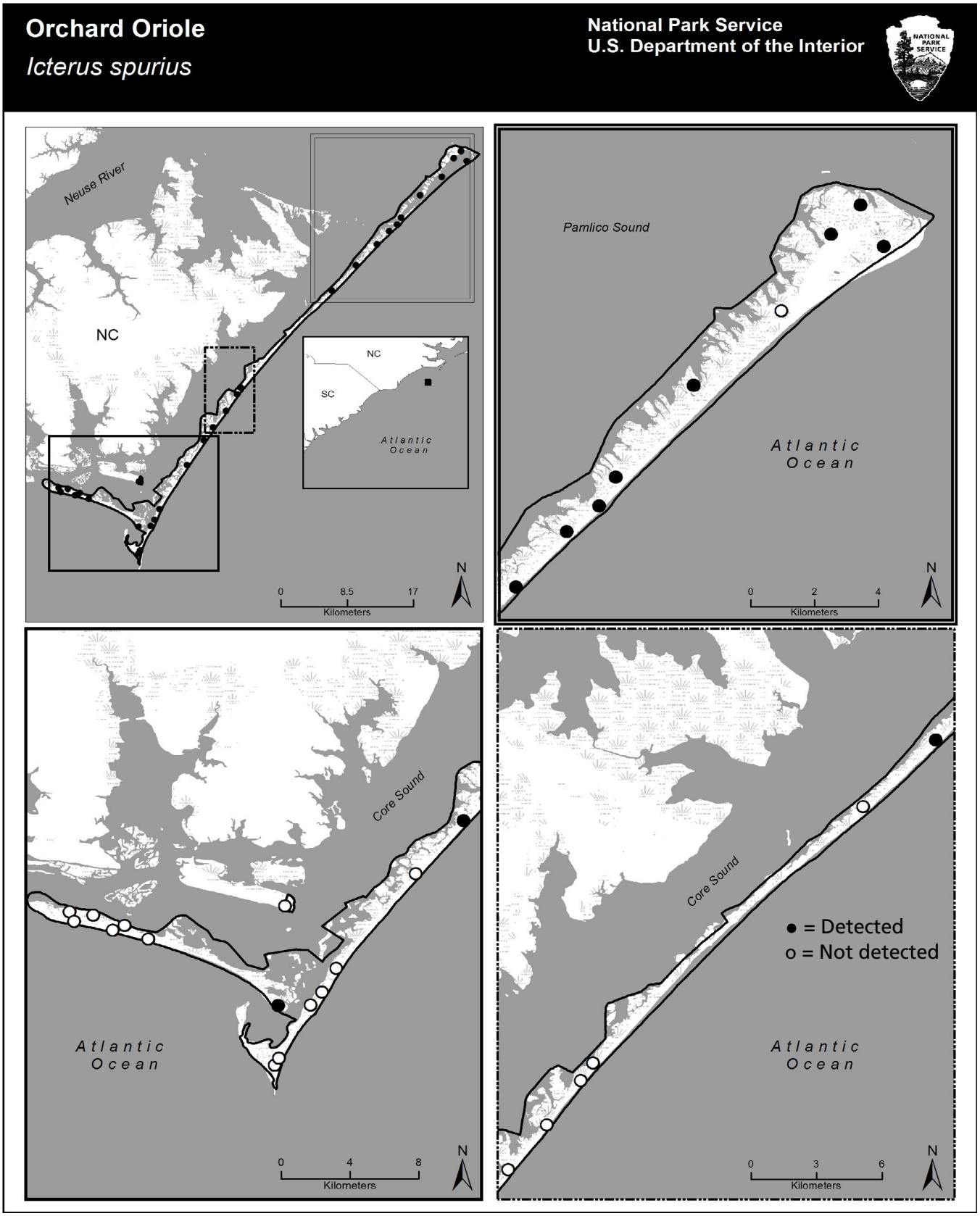


Figure C-38. Sampling locations where orchard oriole (*Icterus spurius*) was detected at Cape Lookout National Seashore, 2012.

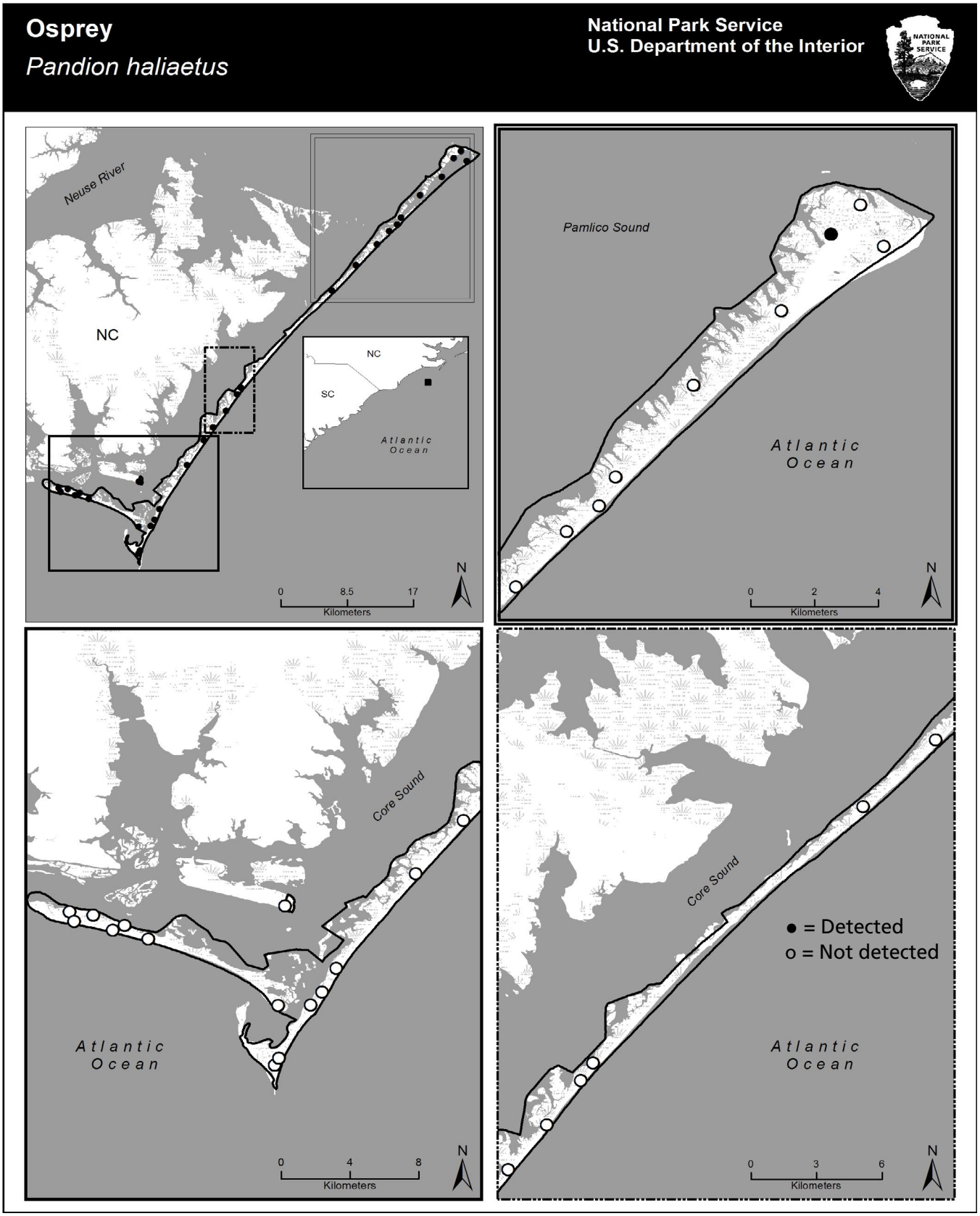


Figure C-39. Sampling locations where osprey (*Pandion haliaetus*) was detected at Cape Lookout National Seashore, 2012.

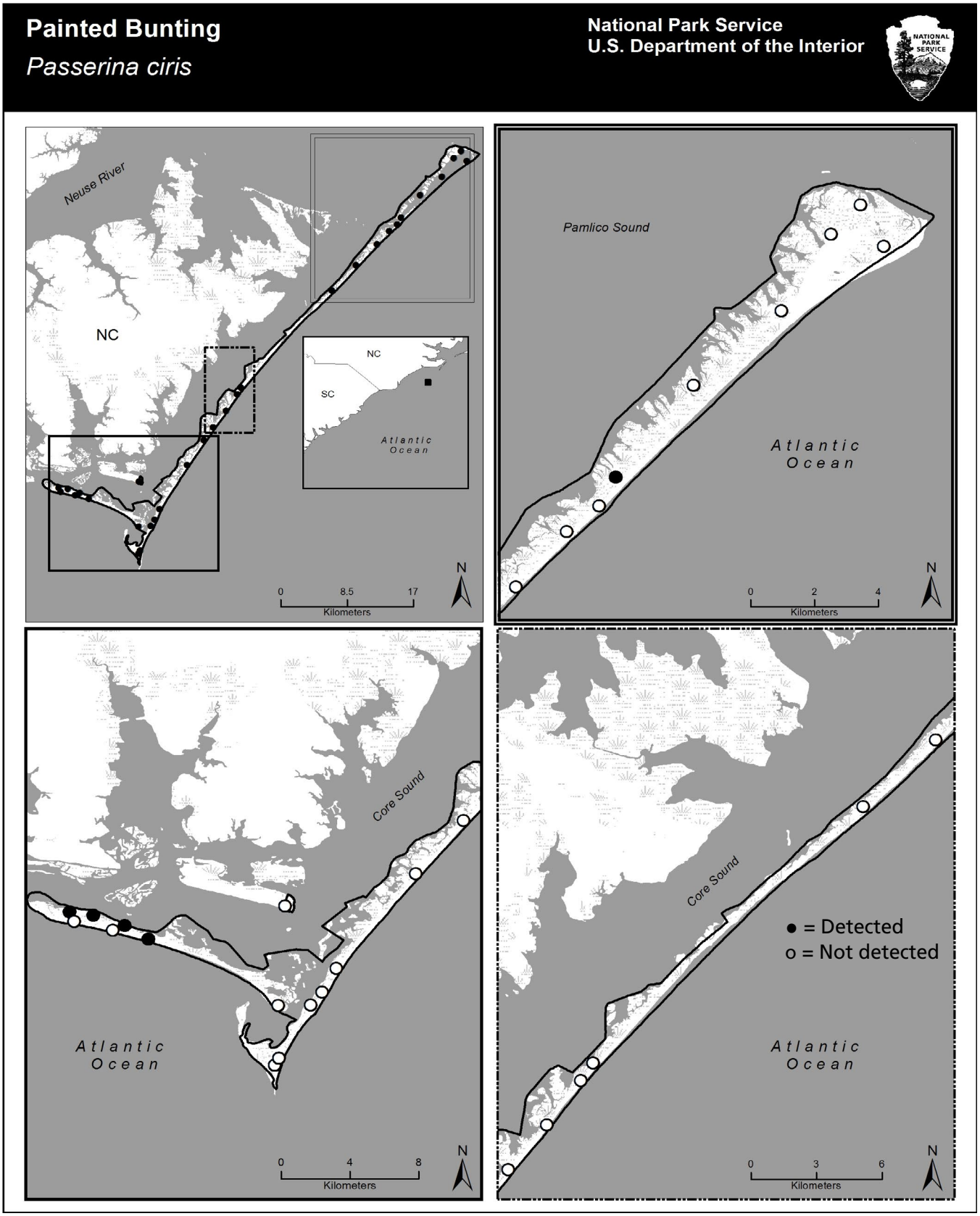


Figure C-40. Sampling locations where painted bunting (*Passerina ciris*) was detected at Cape Lookout National Seashore, 2012.

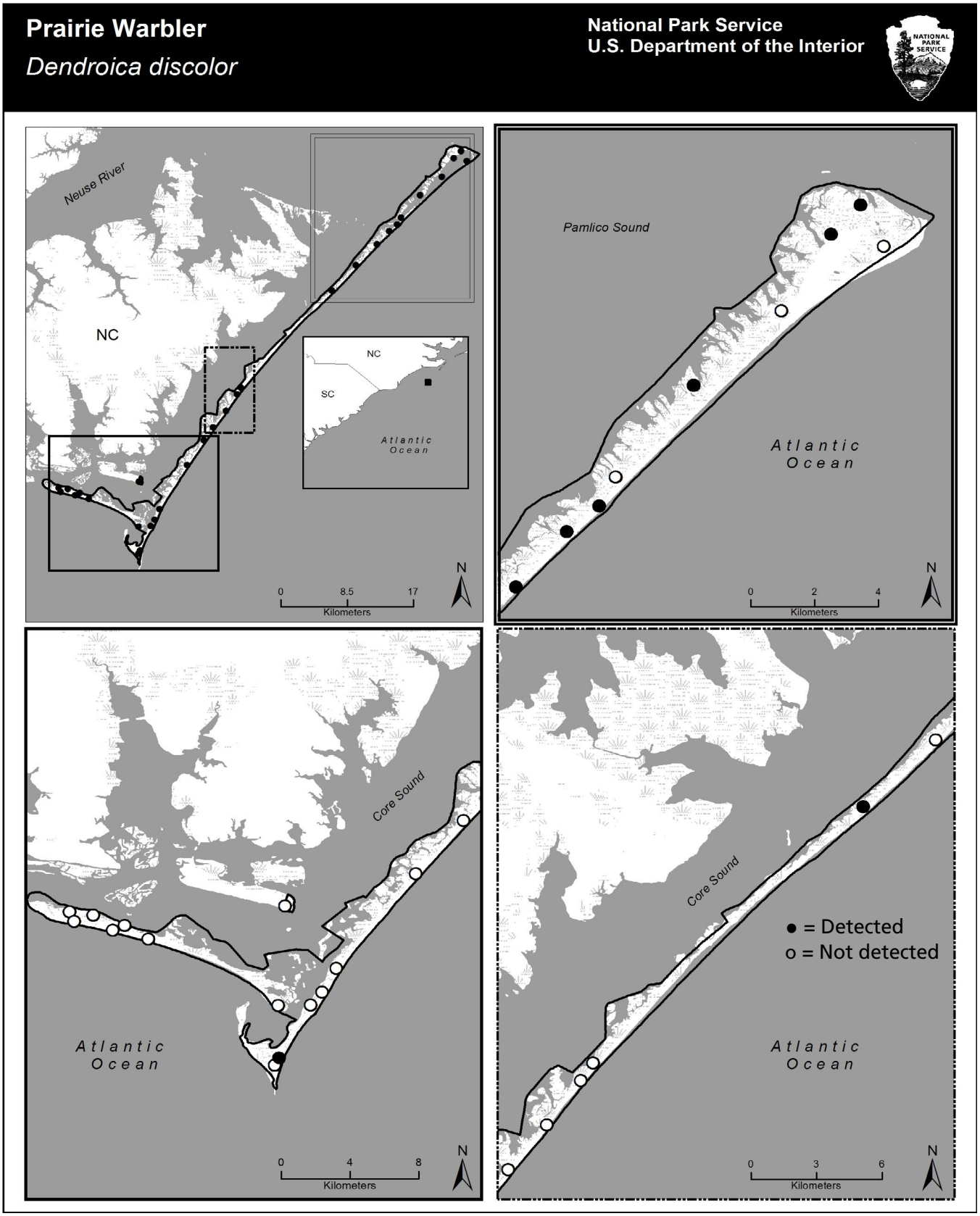


Figure C-41. Sampling locations where prairie warbler (*Dendroica discolor*) was detected at Cape Lookout National Seashore, 2012.

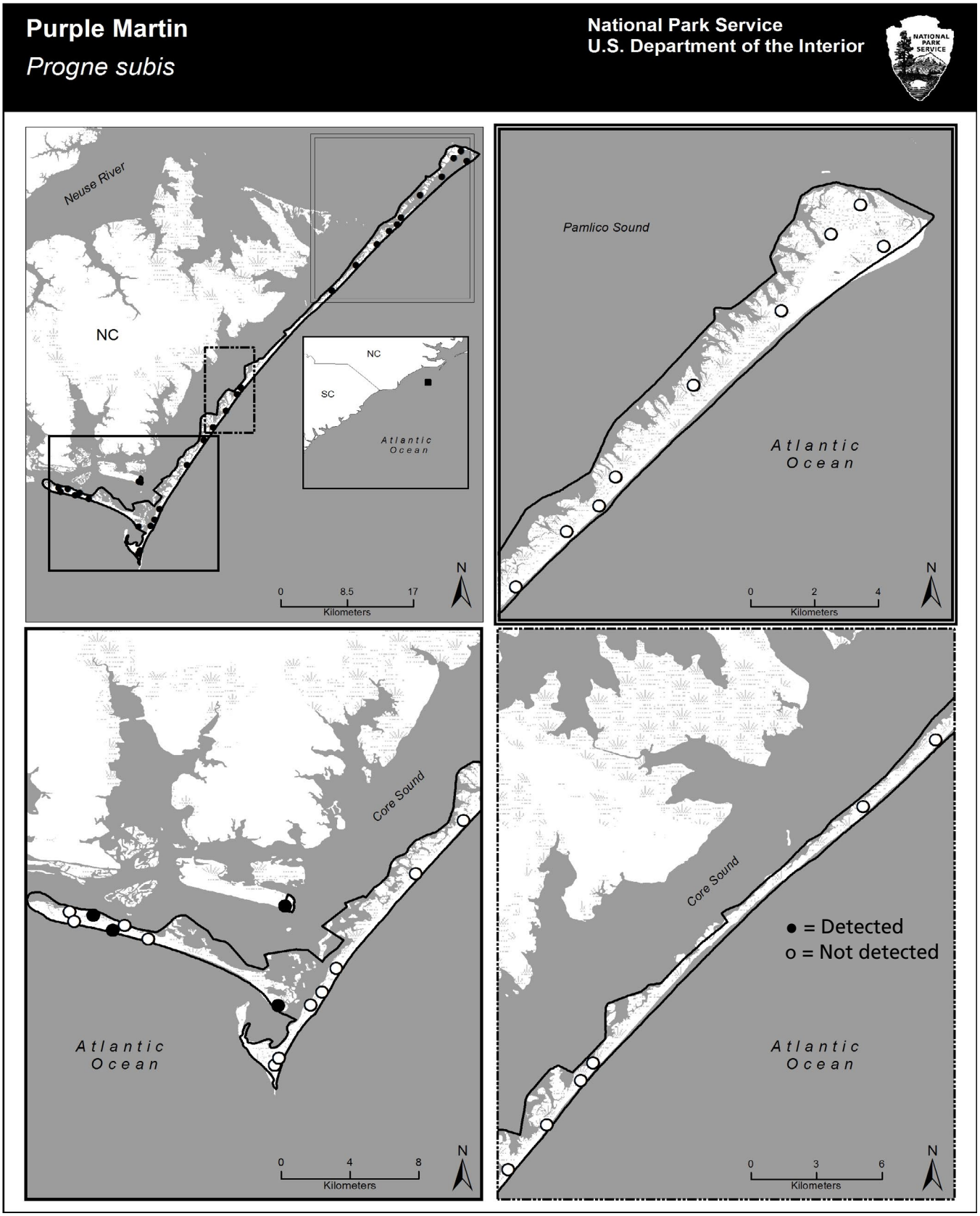


Figure C-42. Sampling locations where purple martin (*Progne subis*) was detected at Cape Lookout National Seashore, 2012.

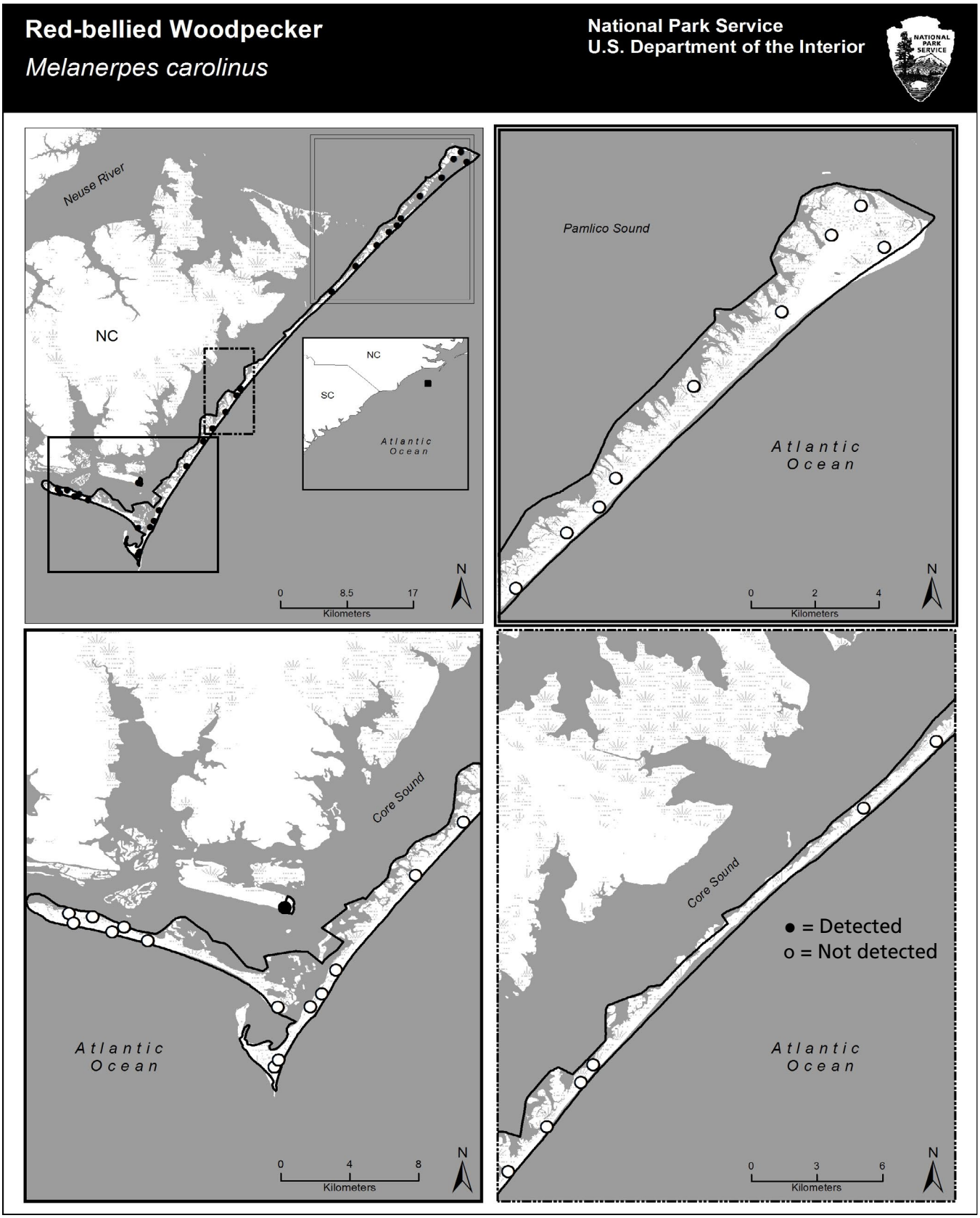


Figure C-43. Sampling locations where red-bellied woodpecker (*Melanerpes carolinus*) was detected at Cape Lookout National Seashore, 2012.

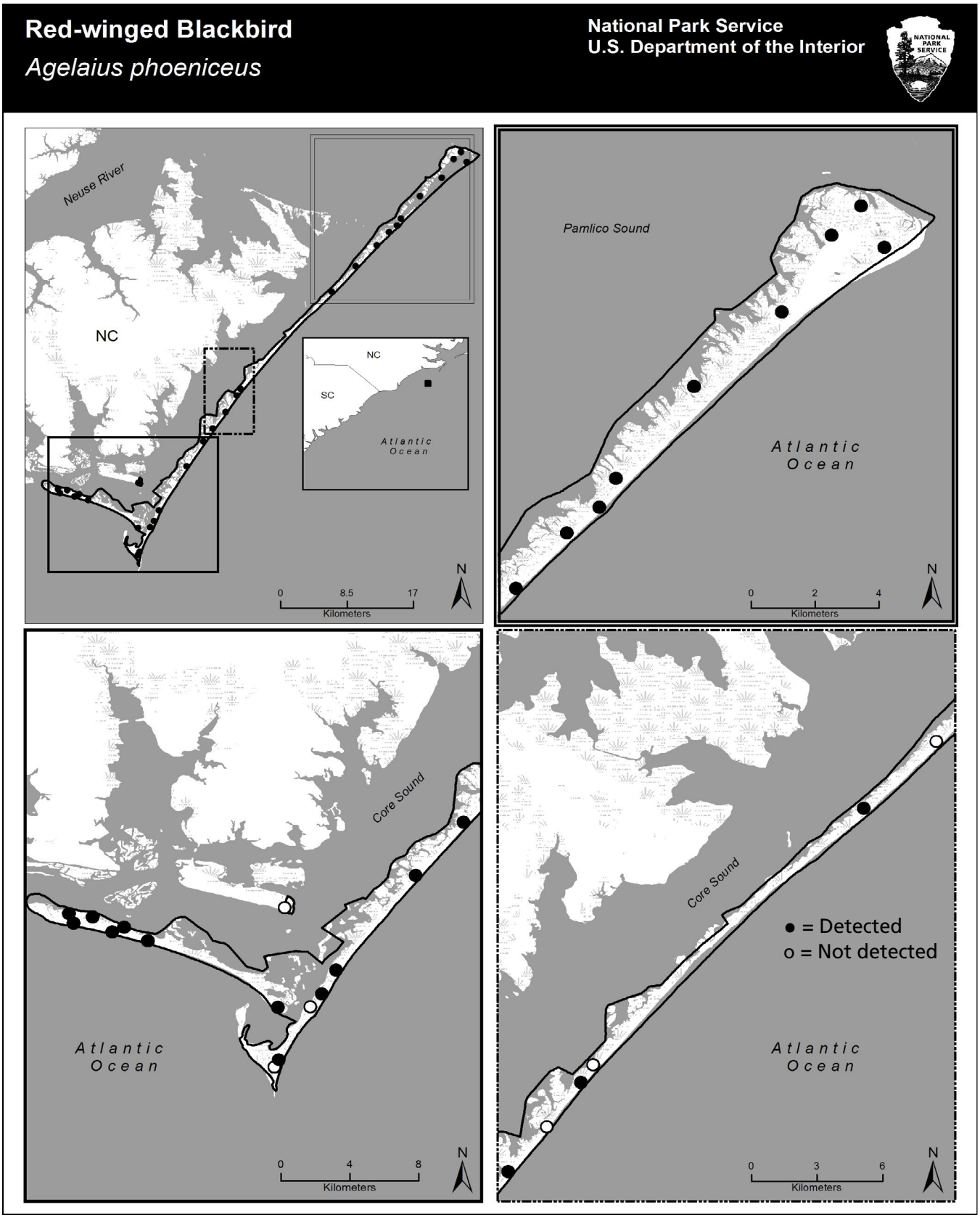


Figure C-44. Sampling locations where red-winged blackbird (*Agelaius phoeniceus*) was detected at Cape Lookout National Seashore, 2012.

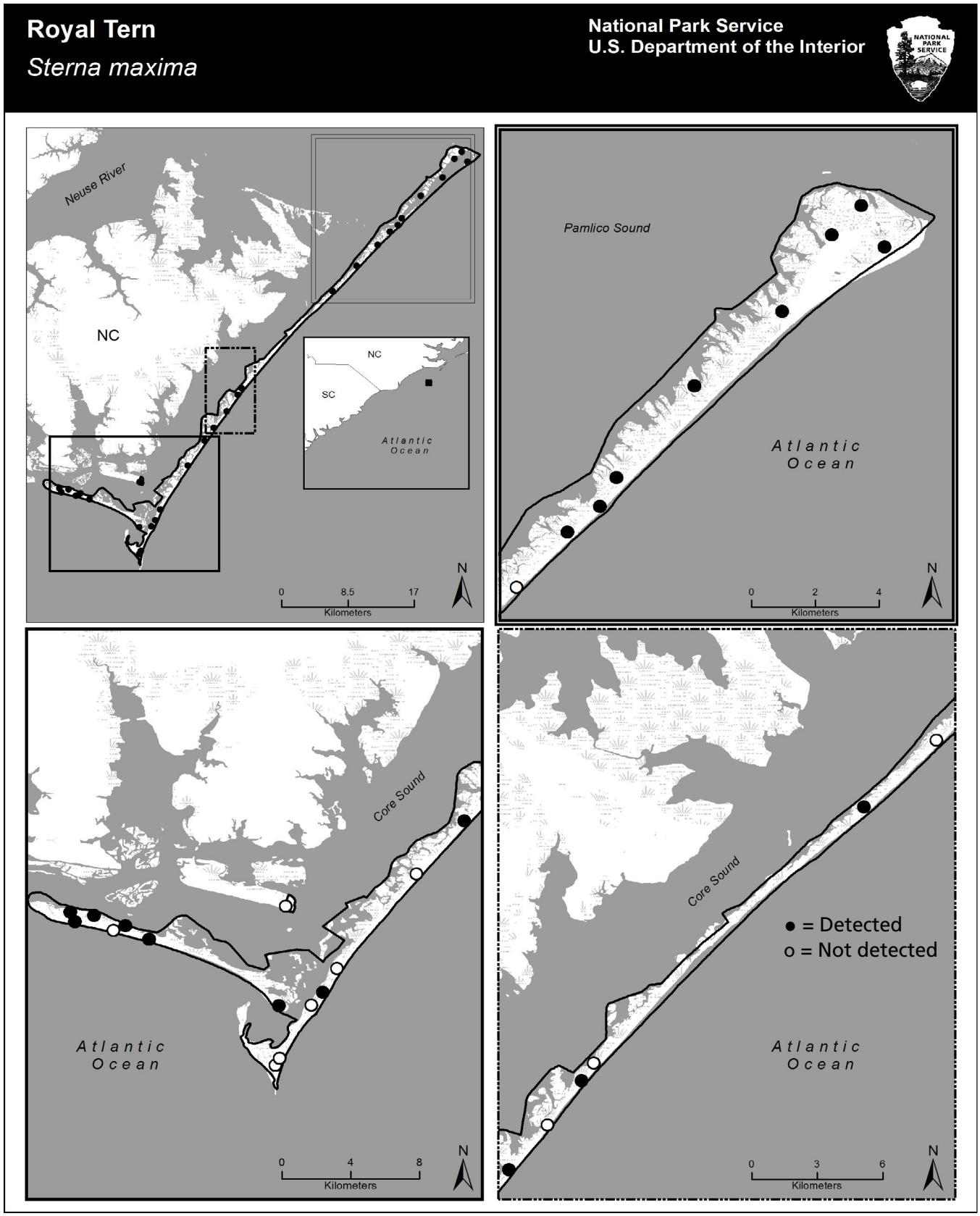


Figure C-45. Sampling locations where royal tern (*Sterna maxima*) was detected at Cape Lookout National Seashore, 2012.

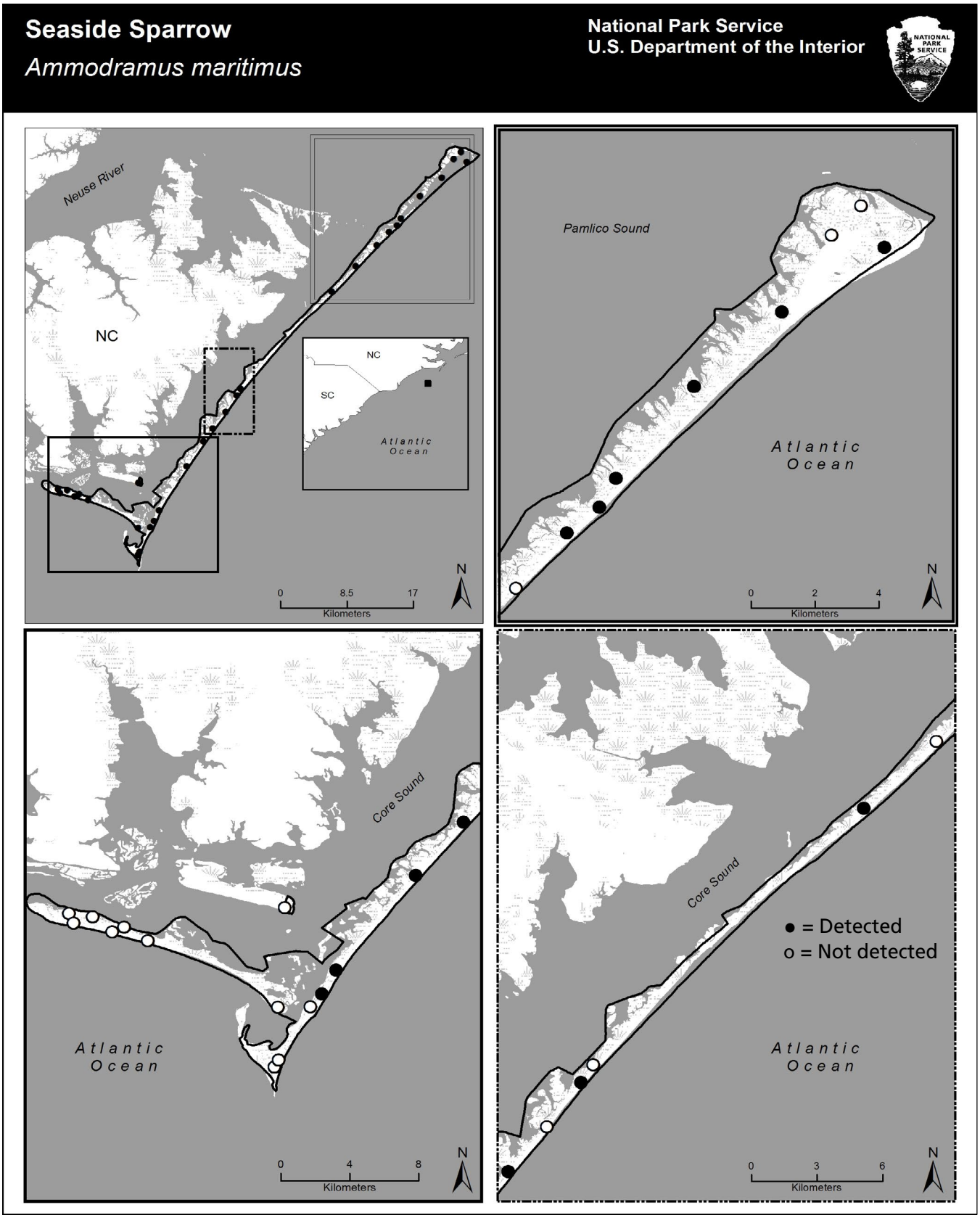


Figure C-46. Sampling locations where seaside sparrow (*Ammodramus maritimus*) was detected at Cape Lookout National Seashore, 2012.

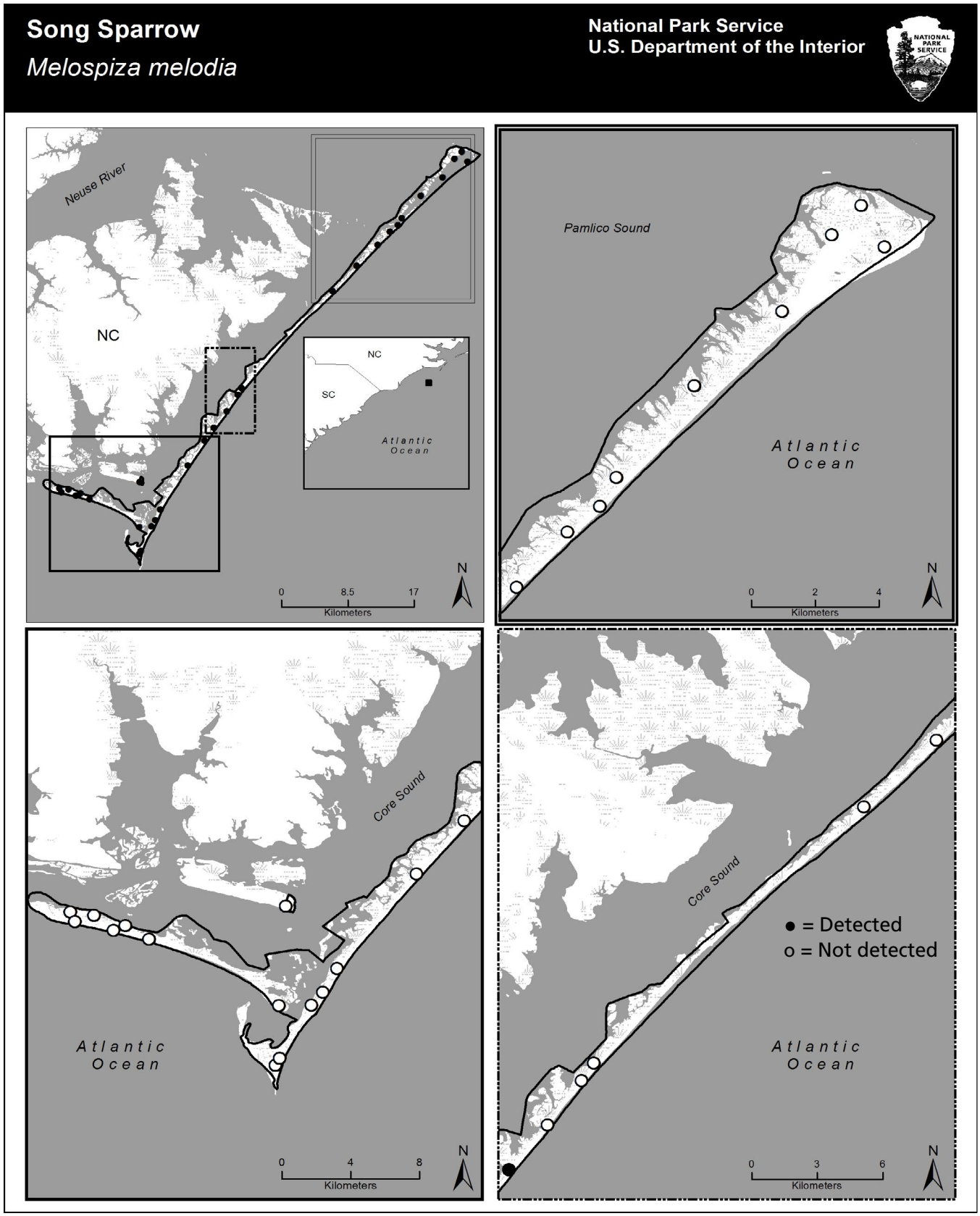


Figure C-47. Sampling locations where song sparrow (*Melospiza melodia*) was detected at Cape Lookout National Seashore, 2012.

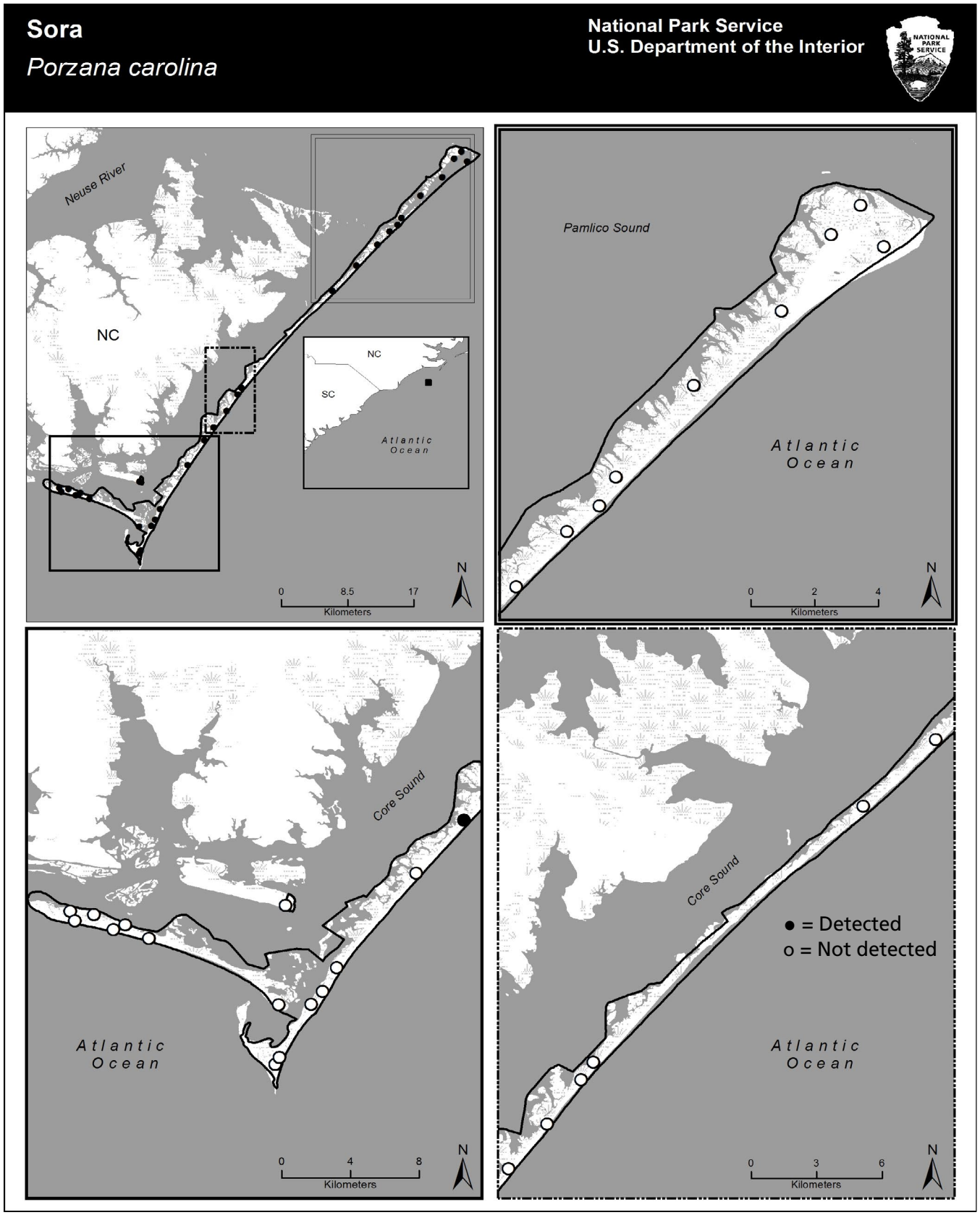


Figure C-48. Sampling locations where sora (*Porzana carolina*) was detected at Cape Lookout National Seashore, 2012.

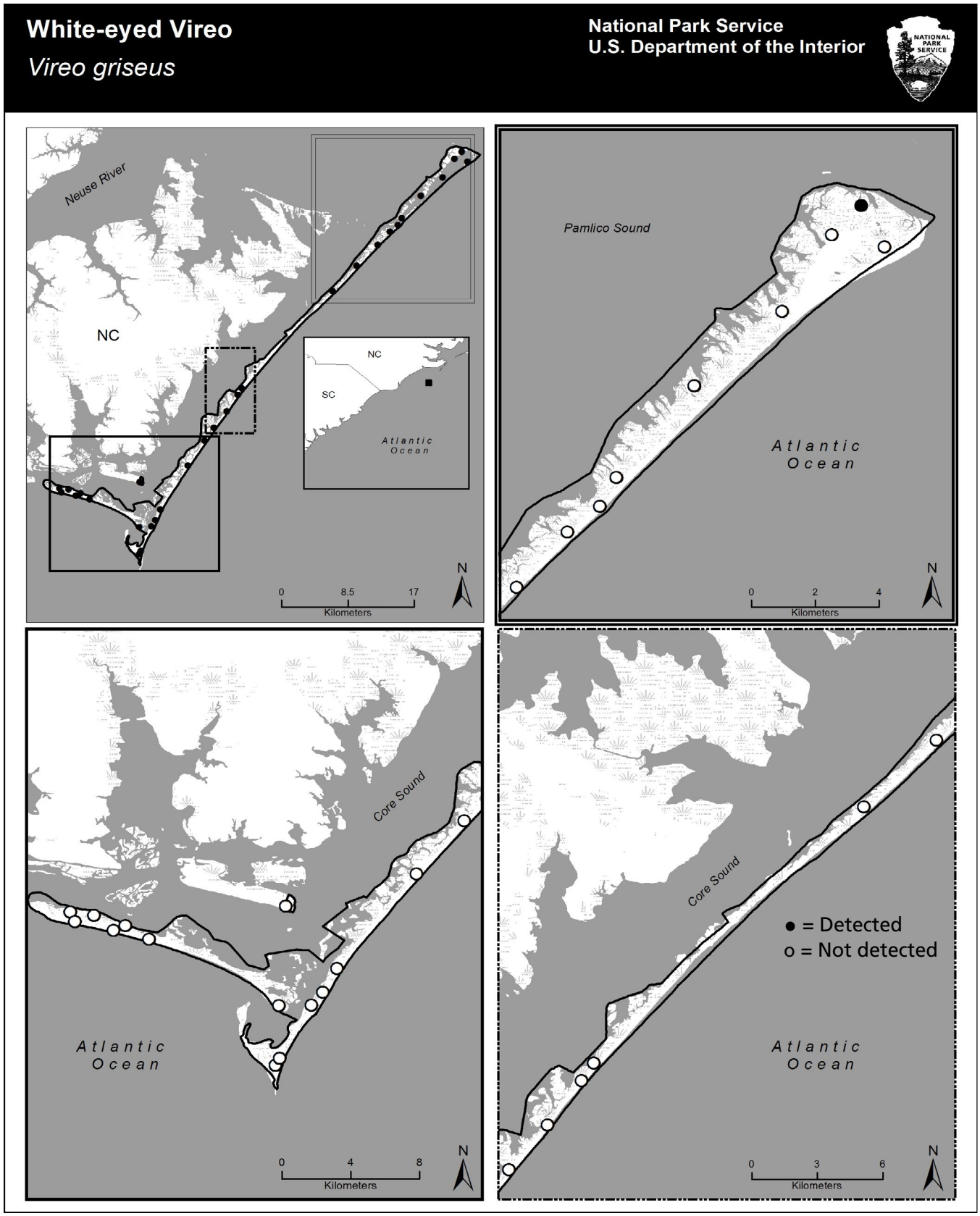


Figure C-49. Sampling locations where white-eyed vireo (*Vireo griseus*) was detected at Cape Lookout National Seashore, 2012.

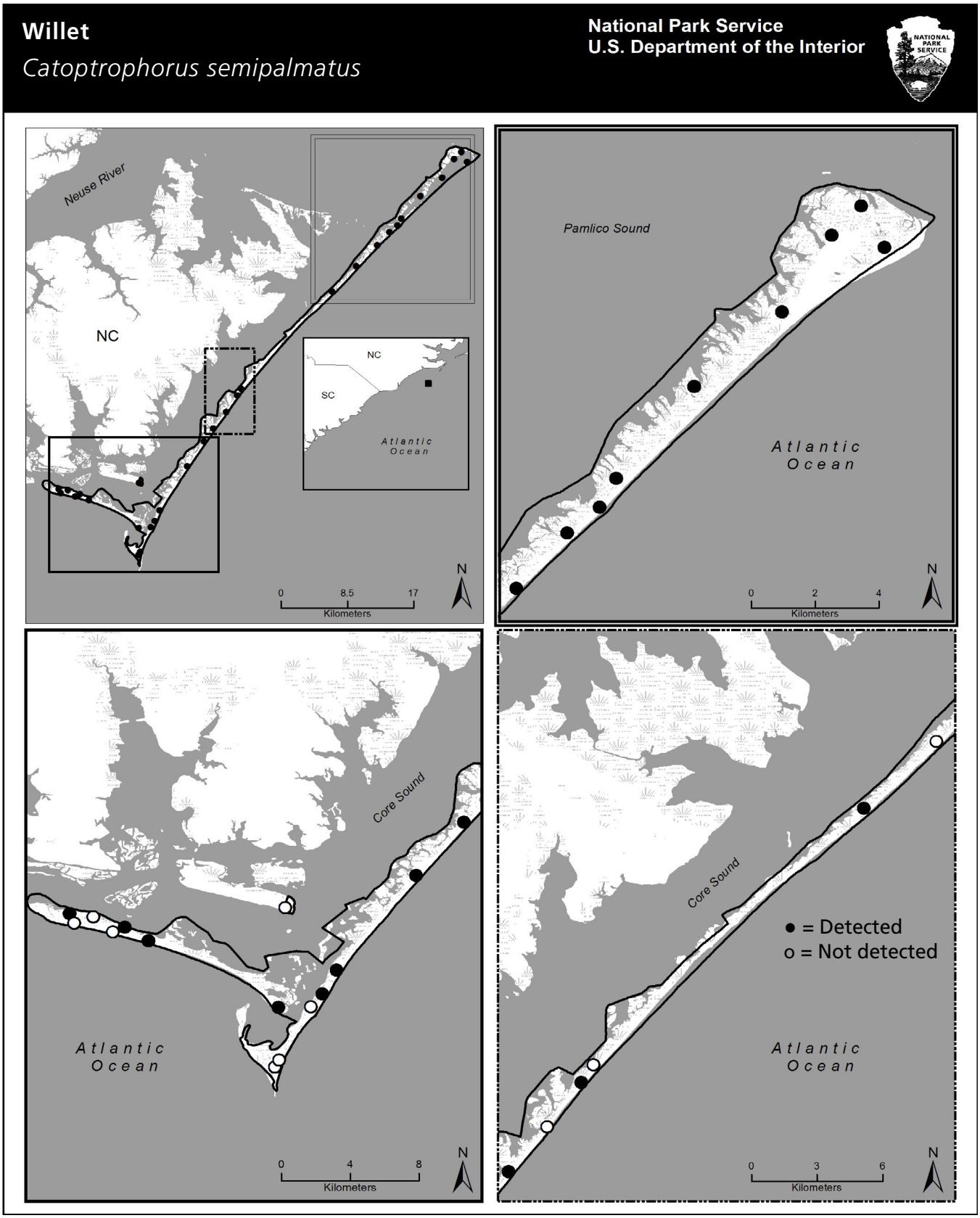


Figure C-50. Sampling locations where willet (*Catoptrophorus semipalmatus*) was detected at Cape Lookout National Seashore, 2012.

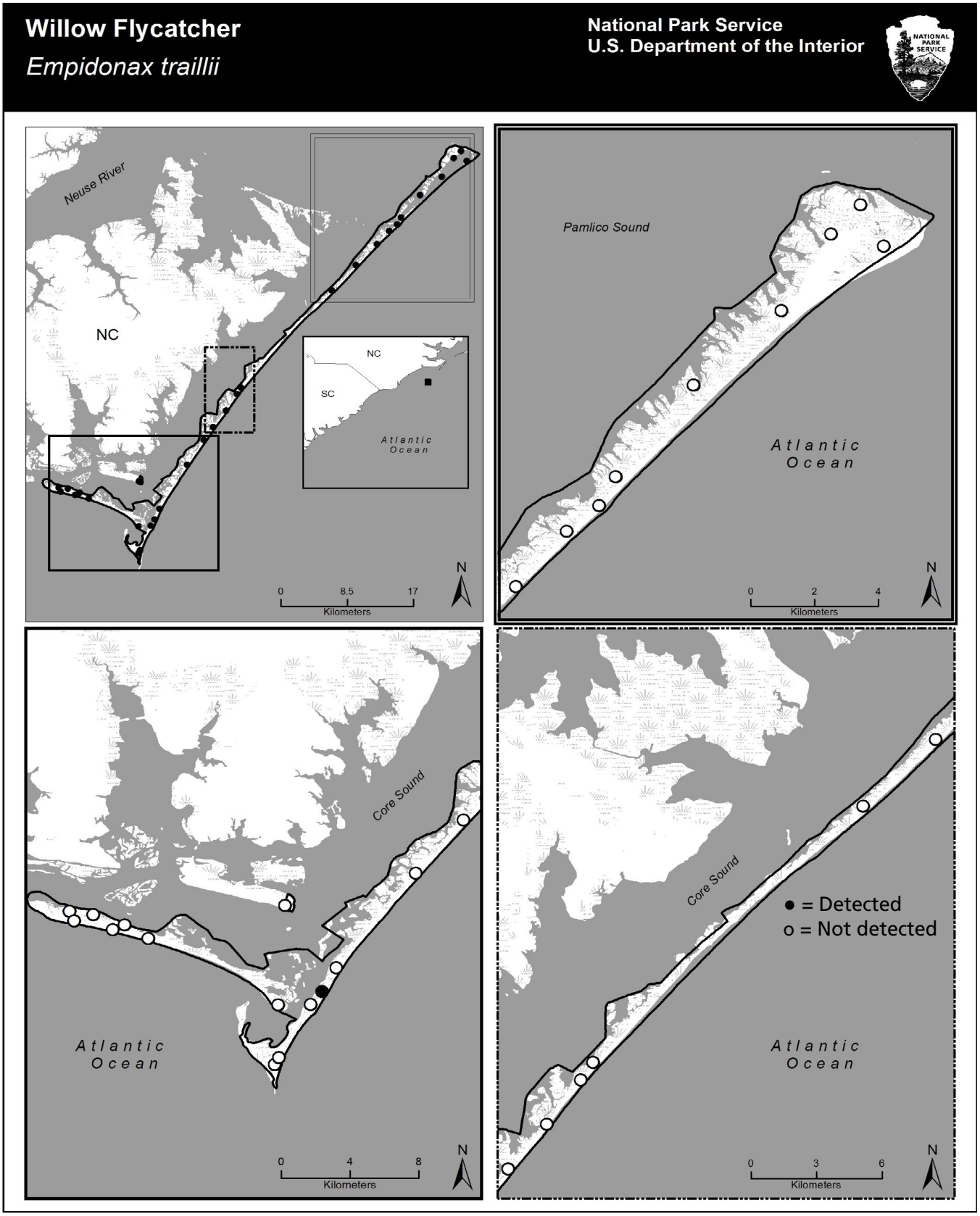


Figure C-51. Sampling locations where willow flycatcher (*Empidonax traillii*) was detected at Cape Lookout National Seashore, 2012.

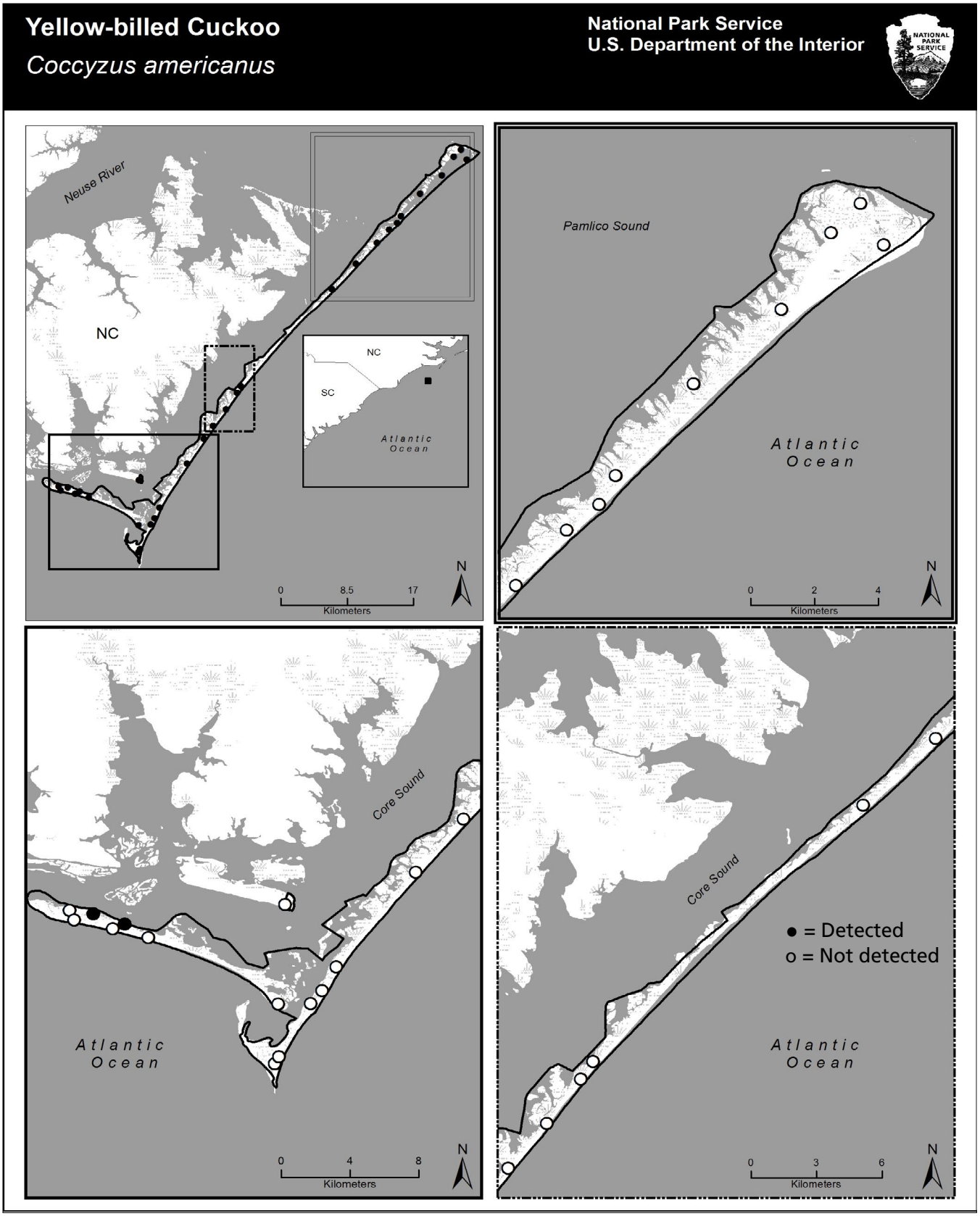


Figure C-52. Sampling locations where yellow-billed cuckoo (*Coccyzus americanus*) was detected at Cape Lookout National Seashore, 2012.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 623/132193, March 2016

National Park Service
U.S. Department of the Interior

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