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Shorebird Monitoring and Management at Cape Lookout National Seashore

2024 Annual Report

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Photo 1. Photo of Old Drum black skimmer colony taken through scope. NPS photo.

Acknowledgments

We would like to thank our field staff members Lauren McCaslin, Emily Woodard, Mary Bresnihan, Sarah Rines, Jess Elliott, and Anna Cecil for their tenacious efforts monitoring and protecting shorebirds at Cape Lookout National Seashore.

Introduction

Cape Lookout National Seashore (CALO) was established to preserve the natural resources of a natural barrier island system off the North Carolina coast from Ocracoke Inlet to Beaufort Inlet. CALO's 56 miles of shoreline is informally divided into three management units and the configuration of these units is subject to ocean overwash and inlet formation. North Core Banks (NCB) is approximately 23 miles long extending from Ocracoke Inlet to Ophelia Inlet. In 2024, NCB was divided into two islands by Evergreen Inlet at mile 3. These two islands are included together as part of the NCB management unit for data collection and analysis purposes. South Core Banks (SCB) extends southward from Ophelia Inlet almost 24 miles to Barden Inlet. Core Banks, NCB and SCB, have a northeast to southwest orientation and exhibit a low-profile landscape. The Atlantic Ocean is to the east of Core Banks and Core Sound and Pamlico Sound are to the west. The third unit, Shackleford Banks (SB), is 9 miles long and has an east-west orientation with a higher dune system and larger areas of vegetation. The Atlantic Ocean is to the south of SB and Back Sound is to the north.

CALO contains ecologically important habitats, such as sand flats, beaches, intertidal zones, and marshes that are critical to shorebirds. These habitats support the piping plover (*Charadrius melodus*) and red knot (*Calidris cantus rufa*), both species federally listed as threatened (USFWS, 1985; USFWS, 2014). Habitats also support the gull-billed tern (*Gelochelidon nilotica*), a species listed as threatened by the North Carolina Wildlife Resources Commission (NCWRC), and NCWRC special concern species including the American oystercatcher (*Haematopus palliates*) and colonial waterbirds (royal terns [*Thalasseus maxima*], sandwich terns [*Thalasseus elegans*], least terns [*Sterna antillarium*], common terns [*Sterna hirundo*], and black skimmers [*Rynchops niger*]) (NCWRC, 2014). CALO was designated a Globally Important Bird Area by the American Bird Conservancy in 2001 in recognition of the value CALO provides to bird migration, breeding, and wintering (Audubon, 2017).

CALO is also a popular recreation destination and attracts hundreds of thousands of visitors annually. Recreational activities include fishing, shelling, hunting, wildlife viewing, boating, beach recreation, surfing, photography, nature study, and off-road vehicle (ORV) use on the beaches. Shorebirds are affected by human disturbances, habitat loss, and predation. Human disturbance, both direct and indirect, may result in nest or chick loss. Depredation by mammals, birds, and ghost crabs have influenced the breeding success of nests and broods at CALO, as well. CALO monitors and manages shorebirds, habitat, and predators to promote successful reproduction to achieve population recovery of declining species. Shorebird nesting and foraging areas are protected with closures, buffers, and regulations.

Cape Lookout National Seashore Off-road Vehicle Management Plan

The 2016 Cape Lookout National Seashore Off-road Vehicle Management Plan (ORV Plan) establishes ORV management practices and procedures and provides requirements on monitoring and

managing protected species at CALO (NPS, 2016). The ORV Plan includes establishment of temporary nesting closures, buffer distances, and wildlife protection zones. The ORV Plan also outlines a required monitoring schedule for the protected species of concern. In 2021, CALO established a paid permit requirement for ORV users to drive on the beach. ORV users must sign the permit attesting to their understanding of the ORV routes, rules, and management for protected species.

Resource Protection Areas

Resource protection areas include nesting closures and wildlife protection zones. Nesting closures protect current and potential shorebird breeding habitat from human disturbances and are established prior to breeding activity where nesting has occurred in the past five years or as new breeding activity is discovered according to species. These areas are temporarily closed to public entry during the nesting season. The closures provide a disturbance free area for birds to establish territories and nest in optimal habitat. The closures are adjusted to meet disturbance buffer requirements as needed. Wildlife protection zones are established during the brood rearing phase around nesting and foraging areas to protect birds from direct and indirect human sources of recreational vehicle use mortality. Outside of the breeding season there are general resource closures to protect migrating and wintering piping plovers and their habitats.

Predator Management

Since 2017, CALO has entered into annual interagency agreements with the United States Department of Agriculture's (USDA) Wildlife Services to conduct predator removal targeting coyotes and raccoons to benefit nesting shorebirds and sea turtles. In 2024, WS trapped on SCB and SB in the months of April and May, removing one coyote and eight raccoons. Three additional coyotes were captured, affixed with tracking collars, and released as part of a North Carolina State University research project. No trapping occurred on NCB in 2024. A total of 49 coyotes and 197 raccoons have been removed from CALO by USDA Wildlife Services between 2017 and 2024. No ghost crab trapping occurred in 2024.

Resource Violations

Resource management staff record resource violations they observe throughout the breeding season. In 2024, staff recorded a total of 107 violations. Sixty-four were on NCB and 43 were on SCB (see Appendix A, Map A1). Staff recorded 37 pedestrians in bird closures, 17 vehicles in bird closures, 15 vehicles in turtle closures, 15 dogs off leash, 20 vehicles operating out of bounds, two incidents of excessive littering, and one incident of turtle sign vandalization. Resource staff corrected 22 of these observations and severe offenses were reported to law enforcement. Resource staff are unable to correct violations that are observed after-the-fact by the presence of tire tracks or footprints within closed areas.

Piping Plover (*Charadrius melodus*) Management and Monitoring

Background

The piping plover is listed as a federally threatened species by the U.S. Fish and Wildlife Service (USFWS, 1985). Piping plover monitoring at CALO began with a baseline study in 1989 (Fraser et al., 1990). Monitoring has continued annually by CALO staff since 1992. The park is a significant nesting area, containing approximately 80% of the nesting pairs in the state of North Carolina (Johnson, 2024). CALO also serves as a wintering and migratory site. There are three designated wintering critical habitat units within the CALO boundary (USFWS, 2008). Monitoring focuses on documenting reproductive success, implementing methods to increase the productivity of this threatened species, and non-breeding use surveys. This report contains a summary of monitoring results for 2024, comparisons to results from previous years, and discussions based on long-term monitoring of piping plovers at CALO.

Methods

Monitoring

The ORV Plan contains management guidelines and monitoring protocols (NPS, 2016). Following these protocols, park staff conducted daily surveys of posted nesting habitat beginning in April. Potential habitat outside posted areas was monitored and posted as necessary. Breeding territories and pairs were identified based on observed breeding behavior. Behavior such as territorial displays, elliptical flights, nest scraping, high stepping, and copulation was recorded. Nests were located and monitored daily until they hatched or were lost.

Once nests were identified, the locations of the nests were recorded using a Geographic Information System (GIS). Nest locations were marked inconspicuously with onsite objects like sticks or shells to facilitate follow-up checks. The number of eggs in the nest were monitored to determine nest initiation and full clutch completion. Full time incubation starts at clutch completion and averages 27 days. An estimated hatch date is assigned to each nest. If the nest is found at full clutch then the estimated hatch date is 25 days from nest discovery. Information about the habitat type was noted. Adults were surveyed for bands and any band codes were recorded. Motion-triggered trail cameras were installed at some exclosed nests to aid in monitoring.

Nests were checked every one to three days to monitor the status of incubation and document losses. Nest checks were recorded in the GIS. When nests were lost, CALO staff would check the area for signs of predation or other causes of nest failure. Nests that near their estimated hatch date were monitored daily for hatching. When a nest hatched, broods were monitored daily until they fledged or were lost. The number of chicks and location were recorded daily in the GIS. The last know location of broods were checked daily and if broods were not seen at that location, then the search expanded to other possible foraging locations in the area. Unaccounted for broods were searched for for seven days after the last sighting to be certain of the fate. Fledging occurs from 25-35 days after hatch. The fledge date is recorded when chicks are capable of strong sustained flight. Monitoring stops once chicks are fledged.

Counts of wintering and migrating piping plovers were made monthly from August to March during the non-breeding season. The counts were made near the 15th of each month. The ocean beach, inlets and soundside sandy beaches of each island were surveyed. Due to staffing constraints, additional searches for banded birds outside of the monthly non-breeding survey was limited.

Management

Nesting Closures

Management actions for piping plovers included closing nesting habitat, closing ocean beach foraging zones for chicks, predator exclosures for nests, predation management, and banding. Bird Sanctuary signs were used to close all known piping plover habitat to pedestrian and vehicular entry by April 1. Portsmouth Flats, Kathryn-Jane Flats, Swash Inlet, the ponds at Mile, Mile 14, Mile 15, Old Drum Inlet, New Drum Inlet, Ophelia Spit, Plover Inlet, Cape Point, and Power Squadron Spit were posted by April 1. These areas include the upper beach, dunes, sand flats, and mud flats. The active ocean beach in front of the nesting areas is not a part of the nesting habitat closure and are open for recreational use with some limitations. Additional closures were posted during the breeding season for new breeding activity at Mile 16 and Mile 18 on NCB.

In accordance with the ORV Plan, the northern mile of SCB at the Plover Inlet site is closed to vehicles once chicks hatch. The ocean beach is exceptionally narrow at this nesting site and chicks can quickly move to the oceanside. All other locations require chick presence on the beach to trigger an ocean beach foraging protection zone closure. These protection zones close sections of the ocean beach to vehicles to maintain the required 600-foot buffer between chicks and vehicle traffic. Pedestrian traffic is allowed in these foraging protection zones. NPS administrative use vehicles are allowed in the ocean beach closures to meet work requirements. Broods were monitored daily, and closed sections of beach were re-opened once all chicks were either lost or fully fledged with strong flight observed.

Predator Management

In addition to regular predator removal activities, CALO staff protected some nests with predator exclosures if the topography of the location was suitable for exclosures and the location was accessible by vehicle. Exclosures were circular, 10 feet in diameter, made of 4”x 2” mesh wire fence anchored with steel rebar and were topped with ¾” mesh bird netting. Use of predator exclosures and monitoring adhered to the Piping Plover (*Charadrius melodus*) Atlantic Coast Population Revised Recovery Plan (USFWS, 1996).

Banding

CALO staff recorded band re-sights of individuals and nesting pairs at CALO throughout the year. Research staff from the Virginia Tech Shorebird Laboratory were permitted to band breeding pairs and chicks in past seasons, but no banding occurred in 2024. Banding allows researchers to track population demographics, breeding patterns, habitat requirements, and survival. It also allows CALO staff to track individual nesting patterns and movements of birds throughout the park.

Results

Productivity

A total of 27 piping plover breeding pairs were confirmed nesting at CALO in 2024. Twenty-two pairs nested on NCB and five pairs on SCB. One additional pair was on territory for the entire season on NCB but a nest was never located. This pair was located on the north side of Evergreen Inlet in an area irregularly monitored. This unconfirmed pair is not included in productivity calculations. Birds nested in 10 distinct areas (Table 1). There were 34 documented nesting attempts made in 2024. The earliest nest initiation was on April 21 and the latest was on June 30. Twenty-eight nests were on NCB and six were on SCB. Of the 34 nests, seven were re-nests. Twenty-one nests hatched and two chicks fledged from two different broods. A total of 116 eggs were documented with an average clutch size of 3.41 eggs. Field staff observed 38 hatched chicks but estimated an additional 21 chicks likely hatched but were lost before being observed. Productivity for CALO was 0.07 chicks fledged per breeding pair, compared to an average productivity of 0.53 over the previous 24 seasons. Table 2 contains nesting success data from 2000 to 2024. Figure 1 illustrates the number of pairs and chicks fledged from 1989 to 2024. Refer to Appendix A, Map A2 for a detailed map of nests and nest sites and Appendix B, Tables B1 and B2 for individual nest productivity data for 2024.

Table 1. Piping plover reproductive success data by nesting site in 2024.

Island	Nesting Area	Number of Pairs	Hatch Success	Fledge Success (chicks/pair)
North Core Banks	Portsmouth Flats	3	0.75	0.00
North Core Banks	Kathryn-Jane Flats	6	0.33	0.17
North Core Banks	Swash Inlet	2	1.00	0.5
North Core Banks	Mile 10	1	0.50	0.00
North Core Banks	Mile 15	1	1.00	0.00
North Core Banks	Mile 16	1	1.00	0.00
North Core Banks	Old Drum Inlet	4	0.4	0.00
North Core Banks	New Drum Inlet	2	1.00	0.00
North Core Banks	Ophelia Spit	2	0.5	0.00
South Core Banks	Plover Inlet	5	0.83	0.00

Table 2. Summary of piping plover reproductive success data at CALO from 2000 to 2024.

Year	Total Nests	Breeding Pairs	Total Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (Chicks/pair)
				#	%	#	%	#	%	
2000	18	16	65	12	67%	43	66%	8	19%	0.5
2001	19	16	64	8	42%	24	38%	5	21%	0.31
2002	20	15	65	13	65%	43	66%	4	9%	0.27
2003	15	14	55	7	47%	23	42%	6	26%	0.43
2004	13	13	44	11	85%	37	84%	12	32%	0.92
2005	31	27	105	24	77%	69	66%	23	33%	0.85

2006	37	33	125	29	78%	87	70%	29	33%	0.88
2007	58	45	173	29	50%	79	46%	11	14%	0.24
2008	57	46	179	31	54%	88	49%	9	10%	0.20
2009	45	36	145	24	53%	83	57%	30	36%	0.83
2010	58	43	204	34	59%	98	48%	31	32%	0.72
2011	48	41	157	35	73%	102	65%	37	36%	0.90
2012	66	51	207	36	54%	98	47%	29	30%	0.57
2013	52	45	173	30	58%	97	56%	47	48%	1.04
2014	57	47	190	28	49%	88	46%	9	10%	0.19
2015	56	43	209	32	57%	105	50%	34	32%	0.79
2016	41	30	133	13	32%	23	17%	5	22%	0.17
2017	44	27	104	13	30%	27	26%	4	15%	0.15
2018	30	24	105	19	63%	56	53%	20	36%	0.83
2019	33	24	112	20	61%	65	58%	15	23%	0.62
2020	30	22	103	21	70%	65	63%	15	23%	0.68
2021	41	32	142	22	54%	68	47%	11	16%	0.34
2022	43	27	138	16	37%	38	28%	6	16%	0.22
2023	44	31	117	15	34%	43	37%	4	9%	0.13
2024	34	27	116	21	62%	59	51%	2	3%	0.07

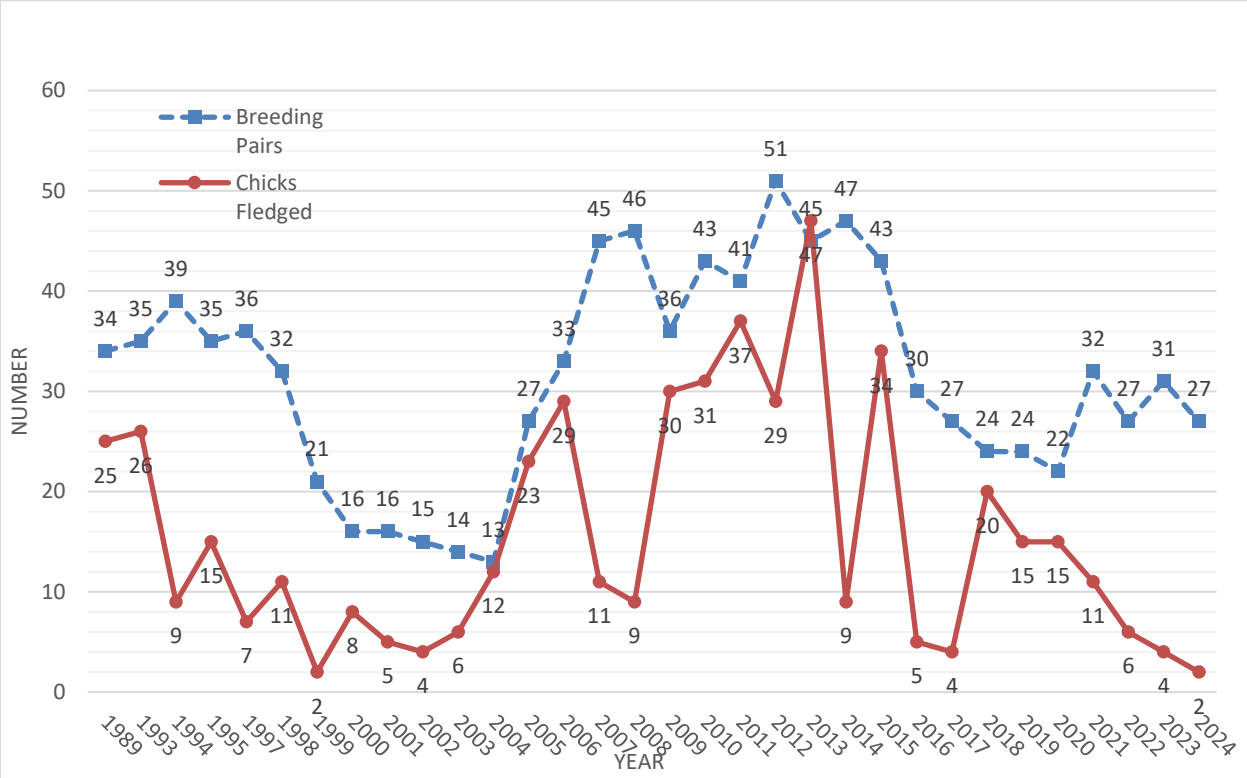

Figure 1. The number of piping plover breeding pairs and number of chicks fledged by year at CALO from 1989 to 2024.

Nest Failures and Chick Mortality

In 2024, predator exclosures were used to protect 18 (53%) nests. Of the nests with exclosures, fifteen (83%) hatched. Three exclosed nests did not hatch; two were lost of unknown reasons and one was lost to ghost crab predation. Predator exclosures were not used on 16 (47%) nests and six of these nests hatched 38%). In total, 13 nests did not hatch; 8 were lost to unknown reasons, four were predated, and one never hatched due to the egg being unviable (Table 3). Of the four predated nests, three were by ghost crab and one was by an undetermined predator.

Due to the mobile nature of precocial chicks and lack of prolonged observations, the cause of chick mortality is largely unknown. Park staff estimated that 59 chicks hatched in 2024 and two of those survived to fledging (3%). Nineteen of the hatched nests suffered complete brood loss. All 57 chick losses were classified as unknown.

Table 3. Causes of piping plover nest failure in 2024.

Nesting Site	Nests	Total Lost	Predation	Unviable Egg	Unknown
Portsmouth Flats	4	1	0	0	1
Kathryn-Jane Flats	9	6	2	1	3
Swash Inlet	2	0	0	0	0
Miles 10	2	1	1	0	0
Mile 15	1	0	0	0	0
Mile 16	1	0	0	0	0
Old Drum Inlet	5	3	0	0	3
New Drum Inlet	2	0	0	0	0
Ophelia Spit	2	1	1	0	0
Plover Inlet	6	1	0	0	1
Total	**34**	**13**	**4**	**1**	**8**

Beach Protection Zones and Brood Foraging

The area between Ophelia Inlet and mile 25, 1.8 mile in length, was established as a protection zone for piping plover, American oystercatcher, and colonial waterbird chicks from approximately June 1 to August 2. This area was closed to recreational ORV's and only NPS monitors were allowed to operate vehicles in this area. Piping plover chicks were present at Ophelia Inlet from June 6, when the first nest hatched, to July 21st, when the last brood failed. On NCB, two broods of chicks used the ocean beach and initiated ORV closures. The beach was closed at mile 19.00 from May 29 to June 6 while a brood was using the ocean beach. A separate closure was installed at mile 16.85 from June 11 to June 17 for chicks on the ocean beach. Both NCB ORV closures were removed after the broods were confirmed to have failed.

Chicks from all broods foraged on soundside beaches, sand flats, mudflats, ponds, and ephemeral pools in areas off-limits to vehicles and, in most cases, all entry. In 2024, brood locations were recorded in a GIS to track brood movements and home ranges. Foraging ranges were calculated for

broods that fledged at least one chick using the Minimum Bounding Geometry tool in ArcGIS Pro. Brood foraging ranges for the two broods that fledged were 0.67 acres and 4.34 acres (see Appendix A, Map A3). The farthest distance traveled away from the nest for all brood observations was 0.30 miles in which a brood at mile 16 traveled along the ocean shoreline from their nest location to another foraging pond to the north.

Migrating and Wintering Piping Plovers

Park wide non-breeding piping plover surveys were conducted monthly January through March and August through December in 2024. A total of 762 piping plovers were documented during non-breeding surveys from 156 separate observations (see Appendix A, Map A4; Appendix C). The highest number of non-breeding piping plovers were recorded in August with 279 birds seen at CALO (Table 4).

Of the 762 birds observed, 428 (56%) were recorded as unbanded and 80 (10%) were recorded as banded. Of the 80 observations of banded birds, field staff obtained full band combinations for 60. Two-hundred and fifty-four (33%) birds were recorded as unknown banding status. Staff recorded banded birds from both the Atlantic Coast and Great Lakes piping plover populations.

In addition to monthly surveys, staff recorded an additional 25 observations totaling 80 piping plovers during 2024. These were typically opportunistic sightings, some occurring during the breeding season, and did not follow any survey protocol.

Table 4. Number of non-breeding piping plover individuals observed during non-breeding surveys each month of 2024.

Island	January	February	March	August	September	October	November	December
NCB	15	24	84	184	128	23	12	0
SB	17	2	2	25	0	6	13	2
SCB	20	32	50	70	13	25	9	6
Total	**52**	**58**	**136**	**279**	**141**	**54**	**34**	**8**

Banding

Of the 53 individuals nesting at CALO, 28 (53%) were banded, 24 (45%) were unbanded, and one (2%) had an unknown banding status. One banded female nested with two different males. Three (11%) pairs were completely unbanded while 24 (85%) pairs had at least one individual banded. Of note, one of these banded birds, GF(0M6), has nested at CALO during eight nesting seasons and has fledged a total of four chicks. No additional adults or chicks were banded at CALO during the 2024 season. See Appendix B for nesting pair band combinations.

Egg Floating

When nests are found at full clutch the stage the incubation is unknown. Egg floating can be used to estimate the incubation age of the nest. Trained CALO staff may float eggs for certain nests that are

found at full clutch when management decisions need to be based on estimated hatch dates or when suitability for trapping needs to be assessed. In 2024, CALO staff floated three eggs from two nests.

Discussion

With a productivity of only 0.07 chicks per breeding pair, the 2024 season had the lowest piping plover productivity recorded at CALO. Low productivity in 2024 was primarily driven by extremely low chick survival. While an above average 62% of nests hatched, producing an estimated 59 chicks, only 2 (3%) of these survived to fledge. This is the lowest chick survival recorded at CALO. Most broods failed within the few days or week of hatching. While the direct loss of chicks was not observed, it is suspected that avian predation is the main threat to chicks due to the targeted nature of their disappearance. The only two chicks that survived foraged in smaller vegetated areas with quick access to cover, compared to typically large open flats used for foraging at CALO, supporting the hypothesis that chicks are being targeted by avian predators.

The pattern of nest and egg losses was also unique in 2024. There were no documented nest losses due to weather and mammalian predation in 2024, typically two driving factors. In addition, partial clutch loss, when a nest loses eggs during the incubation period, but viable eggs remain, has become common and complicates data collection and reporting. For example, one nest lost two eggs to overwash and then eventually the last egg to ghost crab predation. The loss of this nest was categorized as lost to ghost crab predation, while the complete picture is more complicated. In another example, a nest lost two eggs to ghost crab predation before the remaining eggs hatched. This was categorized as a hatched nest. CALO staff may need to re-evaluate how nest losses are recorded and evaluated to get a better picture of the cause of nest and egg losses. Losses may need to be evaluated and categorized at the individual egg level instead of nest level.

Staffing limitations continue to impact piping plover management and protection at CALO. Staff must balance piping plover management with the management duties of other species. In 2024, limited staff time precluded the ability to implement management interventions such as ghost crab trapping and game camera deployment. In addition, it is extremely difficult to detect piping plover nests in novel or atypical areas. In 2024, two piping plover nests were found outside of established bird closures, one being in an ORV traffic area. Similarly, it is difficult to monitor and tracks broods across many sites with limited staff. Two broods utilized the ocean beach on NCB in 2024 and were temporarily exposed to ORV traffic between brood checks. These two broods triggered large, unplanned, and controversial beach closures that can be difficult to manage.

Piping plover non-breeding counts were down compared to the previous two record high years, though 2024 non-breeding counts remain consistent with long term trends. Lower survey efforts and detection may have also contributed to lower counts in 2024.

CALO continues to see a downward trend in piping plover productivity over the past decade, with 2024 being the worst year on record despite pair counts remaining stable since 2016. Poor chick survival was clearly the driving factor in poor productivity in 2024 and little is known about the cause of chick loss. More intensive research and management may be required to correct this negative trend. However, piping plover monitoring and management is time intensive and only

accounts for a fraction of the duties for biological monitors on Core Banks. In addition, brief observations of broods are not informative of the cause of chick loss. An increase in staffing levels would not only allow technicians to detect nests and broods outside of protected areas sooner but also implement management interventions like ghost crab and camera trapping. In addition, collaboration with research institutions to answer questions about chick survival, population trends, impacts of climate change, and predator dynamics could better inform piping plover management at CALO.

American Oystercatcher (*Haematopus palliates*) Management and Monitoring

Background

American oystercatchers are ground-nesting shorebirds that are native to North Carolina. They are common nesters throughout CALO, particularly on the ocean beach. They have been listed since 2008 as a North Carolina Special Concern species by the NCWRC (NCWRC, 2014). Their choice of nesting habitat makes them particularly vulnerable to disturbance by park visitors and off-road vehicles.

Monitoring American oystercatcher nesting at CALO began in 1995. A researcher from Duke University studied nesting on SCB and found low reproductive success (Novick, 1996). The research documented chick mortality caused by off-road vehicles. Researchers from North Carolina State University (NCSU) and CALO staff have also recorded vehicle traffic chick mortality (Schulte and Simons, 2015). Between 1997 and 2015, NCSU and CALO staff have conducted censuses, monitored nesting success, and banded American oystercatchers primarily on the Core Banks. Between 2016 and 2024, solely CALO staff conducted American oystercatcher monitoring. Monitoring and management are conducted following CALO's ORV Plan. Data in this summary report are presented from the last 21 breeding seasons, 2004 to 2024, during which all barrier island habitat at CALO was monitored regularly.

Methods

Monitoring

The ORV Plan contains management guidelines and monitoring protocols (NPS, 2016). Following this protocol, park staff conducted surveys of SB for nesting birds twice a week beginning in April. Daily surveys of nesting habitat on NCB and SCB also began in April and breeding monitoring continued seven days per week until the end of the nesting season. All ocean habitat and accessible interior and soundside habitat was monitored for breeding activity. Marsh islands were not monitored or included in this report.

Once nests were identified, the locations of the nests were recorded using a GIS. Nest locations were marked inconspicuously with either a stake or objects like sticks or shells to facilitate follow-up checks. Information about the habitat type was also noted. Adults were surveyed for bands and any band codes were recorded.

Nests were checked every 1 to 3 days to monitor the status of incubation and document losses. Daily nest checks were recorded in the GIS. When a nest was lost, CALO staff would check the area for signs of predation or other causes of nest failure. When a nest hatched, chicks were monitored daily until they fledged or were lost. For reporting purposes, chicks were considered fledged at 35 days old based on a standard established by the American Oystercatcher Working Group in 2010. For management purposes, chicks were considered fledged when strong flight was observed.

Management

Nesting Closures

Management actions for oystercatchers on Core Banks included closing a 20' by 20' area around a nest with "Bird Sanctuary" signs if the nest was in danger of being run over by off-road vehicles or stepped on by pedestrians. Generally, nests found in the dunes were not posted. There is concern that predators might learn to associate posts with nests. Small posted areas may also unnecessarily attract curious park visitors and cause disturbance.

In addition to the closure around the nest, a 600-foot buffer was established around each nest to reduce disturbance. McGowan and Simons (2006) found evidence that human recreational disturbance can alter incubation behavior. This buffer allowed vehicle and pedestrian traffic to pass by on the lower beach by the ocean shoreline, but prevented stopping, parking, or camping near the nest that could reduce nest attendance by parents. The buffer zone was defined by two sets of 18" by 18" yellow signs placed on each side of a nest. Nests located in interior areas and within previously established wildlife closures did not receive buffer signs.

One day before the expected time of hatch, the ocean beach in that area was closed to vehicles with traffic routed to the backroad, a sand trail behind the primary dunes. In areas where there is no backroad, signs were installed that lowered the speed limit to 15mph and warned ORV operators of the presence of chicks in the area. In all areas, broods were monitored daily and closed sections of beach were re-opened once all chicks were either lost or fully fledged with strong flight observed.

Banding

Park staff recorded band re-sights of individuals and nesting pairs at CALO throughout the breeding season. In addition, trained biologists and technicians captured and banded American oystercatcher adults and chicks under a current USGS banding permit. Banding allows researchers to track population demographics, breeding patterns, habitat requirements, and survival. It also allows CALO staff to track individual nesting patterns and movements of birds throughout the park. Band re-sights and banding efforts are tracked and shared with partners through the American Oystercatcher Band Database. Details on American oystercatcher band combinations can be found at the website: http://www.amoywg.org/banding-re-sighting/.

Results

Productivity

In 2024, 54 pairs of American oystercatchers nested at CALO, 31 pairs on NCB and 23 pairs on SCB (Table 5, Appendix A, Map A5; Appendix D). There was no breeding activity documented on SB. Counts were for pairs on or near the ocean beach and did not include marsh islands. The first nest of the season was found on April 4 and the last nest was found on June 15.

Eighty-seven nests were documented at CALO; 38 on NCB and 49 on SCB. Hatch success was 63% for NCB and 20% for SCB. NCB produced 1.23 chicks per nesting pair while SCB produced 0.70 chicks per breeding pair. A total of 34 nests hatched at CALO and fledged 54 chicks producing an overall fledge rate of 1.00 for the seashore. (Table 5). Since 2004, fledge rates have ranged from 0.00 to 1.17 per pair with a mean rate of 0.52 from 2004-2024 (Table 6, Figure 2).

Table 5. American oystercatcher reproductive success by island in 2024.

Island	Breeding Pairs	Total Nests	Nests Hatched	Chicks Fledged	Fledge Rate
South Core Banks	23	49	10	16	0.70
North Core Banks	31	38	24	38	1.22
Shackleford Banks	0	0	0	0	N/A
Total	**54**	**87**	**34**	**54**	**1.00**

Table 6. Summary of American oystercatcher reproductive success data at CALO from 2004-2024.

Year	Total Nests	Nests Hatched	Breeding Pairs	Chicks Fledged	Fledge Rate
2004	71	38 (54%)	52	45	0.86
2005	66	26 (39%)	54	18	0.33
2006	70	23 (33%)	52	26	0.50
2007	99	21(21%)	61	31	0.51
2008	91	17 (19%)	57	15	0.26
2009	83	20(24%)	61	21	0.34
2010	113	28 (25%)	62	34	0.55
2011	114	29 (25%)	62	37	0.60
2012	99	31 (31%)	58	42	0.72
2013	104	32 (31%)	63	25	0.40
2014	87	39 (37%)	65	40	0.62
2015	112	37 (33%)	66	50	0.76
2016	121	17 (14%)	70	17	0.24
2017	133	5 (4%)	70	0	0.0
2018	123	28 (23%)	69	39	0.57
2019	84	33 (39%)	58	32	0.55
2020	85	28 (33%)	49	27	0.55
2021	74	40 (54%)	54	63	1.17
2022	81	20 (25%)	46	7	0.15
2023	89	18 (20%)	54	17	0.31
2024	87	34 (39%)	54	54	1.00

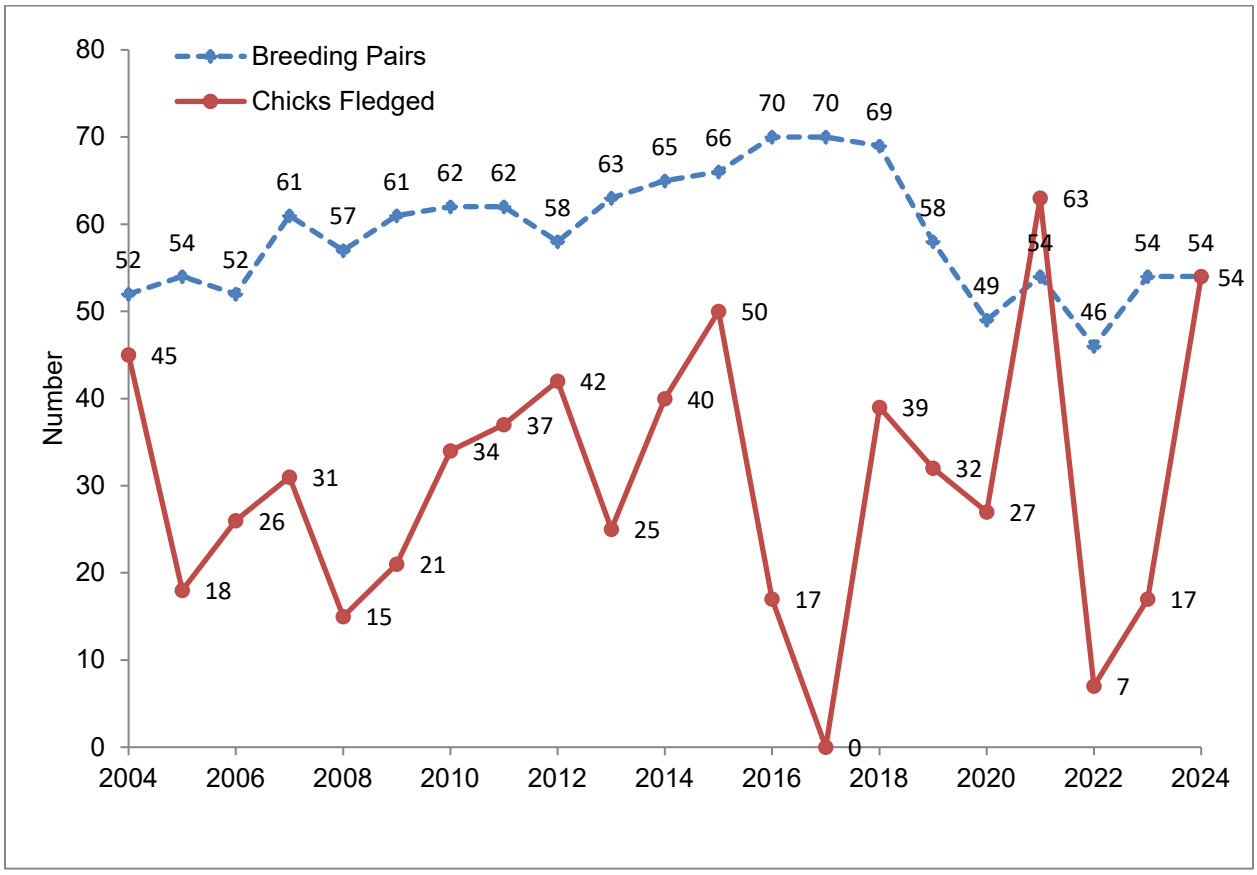

Figure 2. The number of American oystercatcher breeding pairs and number of chicks fledged by year at CALO between 2004 and 2024.

Nest Failures

Fifty-three nests failed in the 2024 breeding season. Twenty-six (49%) were lost due to predation, 23 (43%) were due to unknown causes, and four (8%) were abandoned (Table 7). Coyote was the primary predator in 2024, accounting for 16 nest loses (Table 8). Six additional nests were predated by an unidentified predator, one by an avian predation, one by a cat, one by a ghost crab, and one by a raccoon. Four nests were abandoned by the adults due to unknown reasons. Causes of American oystercatcher nests failures from 2013 to 2024 are described in Table 9.

Table 7. Causes of American oystercatcher nest failure in 2024.

Island	Predation	Abandoned	Unknown
South Core Banks	21	1	17
North Core Banks	5	3	6
Total	**26**	**4**	**23**

Table 8. Recorded American oystercatcher nest predators in 2024.

Island	Coyote	Raccoon	Ghost crab	Avian	Cat	Unidentified Predator
South Core Banks	15	0	0	1	0	5
North Core Banks	1	1	1	0	1	1
Total	**16**	**1**	**1**	**1**	**1**	**6**

Table 9. Causes of American oystercatcher nest failure, 2013-2024.

Year	Total Nests	Nests Lost	Predation	Flooding/ Storms	Human Interaction	Abandoned	Unknown
2013	104	72 (69%)	21 (29%)	3	1	1	46
2014	87	49 (56%)	15 (30%)	6	0	1	27
2015	112	75 (67%)	41 (54%)	0	0	4	30
2016	121	104 (86%)	68 (65%)	2	2	2	30
2017	133	128 (96%)	76 (59%)	16	1	7	33
2018	123	95 (77%)	51 (54%)	3	2	3	36
2019	84	51 (61%)	25 (49%)	0	0	3	23
2020	85	57 (67%)	18 (32%)	2	1	3	30
2021	74	34 (46%)	15 (44%)	2	2	3	12
2022	81	61 (75%)	20 (33%)	17	1	6	17
2023	89	70 (77%)	34 (49%)	9	0	4	23
2024	87	53 (61%)	26 (49%)	0	0	4	23

Chick Mortality and Movement

CALO staff observed 76 chicks from 34 hatched nests. However, chicks are often difficult to detect and can be lost before technicians are able to observe them. CALO staff estimates that 84 chicks likely hatched. Fifty-four of these 84 chicks successfully fledged, with a chick survival probability of 64%. Six of the hatched nests suffered complete brood loss. Due to the mobile nature of precocial chicks and the lack of prolonged observations, the cause of chick loss is largely unknown.

In 2024, brood locations were recorded in the GIS when chicks were spotted by observers. Brood ranges, the entire area used by the chicks from hatching until fledging, were calculated for all broods that fledged at least one chick using the Minimum Bounding Geometry tool in ArcGIS Pro. Brood range sizes extended from 0.54 acres to 54.26 acres, with an average size of 10.05 acres (See Appendix A, Map A6). The farthest distance a brood traveled from their nest site was 0.71 miles.

Banding

Forty-nine chicks on Core Banks were captured by CALO staff and banded with individual field readable codes in 2024. Of the 108 individuals nesting at CALO, 79 (73%) were banded, and 29

(27%) were unbanded. All nesting pairs had at least one adult banded. See Appendix D for nesting pair re-sight data and 2024 chick bands.

Discussion

American oystercatchers were very successful at CALO in 2024, producing 54 fledglings at a rate of 1.00 chicks per pair, the second highest year on record. Factors thought to drive this success was lack of storm related impacts and very low levels of mammalian predation on NCB. There was only one documented loss to raccoon predation on NCB. It's unclear why raccoon presence and/or predation pressure was so low on NCB in 2024. This is thought to be a main contributing factor to high hatch success. NCB also had high chick survival due to unknown reasons.

American oystercatcher productivity was above average in 2024, driven primarily by fledge success on NCB. Productivity on NCB was 1.22 chicks per pair, which is higher than the 20-year average of 0.52 chicks per pair. NCB only experienced two mammalian predation nest losses. In contrast, SCB suffered 15 nest losses attributed to coyote predation. Though productivity was still above average with 0.70 chicks per pair. All SCB fledged chicks were from nests north of Great Island camp and coyote activity was greater south of camp. Coyotes are also suspected predators of American oystercatcher chicks, though this has yet to be confirmed by field observations. SB had no breeding activity. Coyote pressure is suspected to be the main factor precluding American oystercatcher nesting on SB. It's unclear why coyotes will target American oystercatcher nests more in some years and less in others.

CALO is currently partnering with NCSU to study coyote populations and movements throughout the seashore. This study should inform managers on population size, density, age structure as well as describing how coyotes utilize the islands. In addition, CALO continues to partner with USDA Wildlife Services to continue the trapping and removal of coyotes. The NCSU study is expected to inform USDA Wildlife Services trapping efforts to improve coyote management at CALO. Pro-active and regular predator management, primarily focused on coyotes, will be necessary to maintain American oystercatcher nesting populations at CALO.

Colonial Waterbird Monitoring and Management

Background

The inlet spits, sandflats, inshore islands, and the point at CALO provide nesting habitat for several species of colonial waterbirds. The least tern (*Sternula antillarum*), common tern (*Sterna hirundo*), gull-billed tern (*Gelochelidon nilotica*), black skimmer (*Rynchops niger*), sandwich tern (*Thalasseus elegans*) and royal tern (*Thalasseus maxima*) nest at CALO in single species and mixed species colonies.

Methods

Management

Historical nesting sites were signed and closed to pedestrian and vehicle entry by April 1. Reoccurring nesting sites include Morgan Island, Power Squadron Spit, Cape Point, Ophelia Inlet, New Drum Inlet, Old Drum Inlet, Kathryn-Jane Flats, and Portsmouth Flats. In addition to reoccurring nesting sites, all additional potential nesting habitat at CALO was monitored and closures were installed once breeding activity was observed.

Closures were adjusted and expanded throughout the breeding season to maintain a 150-ft buffer between the closure boundary and the nearest nest. If chicks were present on the lower beach vehicles were restricted and/or detoured to avoid flightless chicks. Closures were removed when breeding activity ended.

Monitoring

Colonies on Core Banks were monitored daily to ensure protection within closure boundaries. Colony counts were conducted weekly. Breeding pairs were counted by either a perimeter count of incubating pairs or a total number adult count. Total adult counts were then divided by two to ascertain the number of breeding pairs. No correction factor was employed in the results. The assumption being that all birds present within the breeding colony site are there as breeders. When observed, the number of nests, chicks, and fledges was also recorded. Point locations were obtained for the center of each colony and recorded in a GIS. Fledge success for each colony was observationally rated as high, medium, low, none, or unknown.

CALO participated in the state-wide annual least tern census from May 15 to June 4. CALO staff counted all colonies that were active on Core Banks during the window and results were shared with state biologists.

Results

In 2024, 27 colonial waterbird colonies were observed at CALO (Table 10). Fifteen colonies were on NCB, 11 were on SCB, and one was on Morgan Island (Appendix A, Map A7). There were no colonies on SB. Of the 27 colonies, 21 were single species colonies and six were multi-species colonies. Six species of colonial waterbird nested at CALO that included the least tern, black skimmer, common tern, sandwich tern, royal tern, and gull-billed tern. Twenty-two colonies occupied reoccurring nesting sites that were posted at the beginning of the season. Five colonies were observed outside of the posted areas and were subsequently posted. Eight colonies were rated as low success, seven were rated as no success, six were rated as medium success, and 6 were rated as high success.

Five hundred and forty-five pairs of least terns were counted at CALO during the annual least tern census window (Figure 3). In addition, 99 gull-billed tern, 54 common tern, and 52 black skimmer pairs were counted during the census window.

Mixed colonies at Plover Inlet on SCB and Old Drum Inlet on NCB were highly successful and produced large numbers of chicks. Peak counts of 45 common tern, 38 gull-billed tern, and 70 black

skimmer chicks were observed at Plover Inlet. Peak counts of 263 black skimmer, 28 gull-billed tern, 27 least tern, and 10 common tern chicks were observed at Old Drum inlet colonies. In collaboration with North Carolina Audubon, 62 black skimmer chicks were banded at the Old Drum colonies on NCB and 63 black skimmer chicks were banded at the Ophelia Inlet colonies on SCB.

Table 10. Summary of colonial waterbird colonies at CALO in 2024 from north to south. LETE=least tern, BLSK= black skimmer, COTE= common tern, GBTE= gull-billed tern, ROTE = royal tern, SATE = sandwich tern.

ID	Island	Mile	Site	Census Pairs Count	Peak Pairs Count	Success
NC13	NCB	2.00	North Portsmouth	11 LETE	19 LETE	High
NC05	NCB	2.95	Mid Portsmouth	37 LETE, 5 BLSK	56 LETE, 15 BLSK	High
NC04	NCB	3.89	South Portsmouth	9 LETE	9 LETE	Medium
NC07	NCB	5.94	North Kathryn Jane	18 LETE	18 LETE	Low
NC09	NCB	6.69	South Kathryn Jane	54 LETE	54 LETE	Medium
NC15	NCB	9.39	Swash Inlet	-	6 LETE	Low
NC11	NCB	11.12	Mile 11	10 LETE	20 LETE	Medium
NC10	NCB	16.84	Mile 16	-	3 LETE	None
NC01	NCB	18.64	North Old Drum	40 LETE	45 LETE, 126 BLSK, 28 GBTE. 21 COTE	High
NC08	NCB	19.10	South Old Drum	125 LETE, 4 COTE	100 LETE, 94 BLSK, 5 GBTE, 2 COTE	High
NC06	NCB	21.68	North New Drum	18 LETE	18 LETE	Low
NC03	NCB	21.86	North New Drum Flats	3 LETE	3 LETE	Low
NC02	NCB	22.00	South New Drum Flats	26 LETE	66 LETE	High
NC12	NCB	22.74	North Ophelia	6 LETE	8 LETE	Low
NC14	NCB	23.35	South Ophelia	5 LETE	16 LETE	None
SC08	SCB	23.50	North Plover Inlet	10 LETE	24 LETE	None
SC04	SCB	24.00	West Plover Inlet	52 LETE, 47 BLSK, 50 COTE, 99 GBTE	52 LETE, 47 BLSK, 50 COTE, 99 GBTE	High
SC10	SCB	24.00	Mid North Plover Inlet	-	4 LETE	None
SC01	SCB	24.70	Mid South Plover Inlet	74 LETE	80 LETE	Low
SC03	SCB	24.86	South Plover Inlet	21 LETE	21 LETE	None
SC02	SCB	25.30	Mile 25	9 LETE	24 LETE	Medium
SC11	SCB	26.00	Mile 26.00	3 LETE	3 LETE	Low
SC07	SCB	26.60	Mile 26.60	2 LETE	2 LETE	None
SC09	SCB	27.30	Mile 27	-	12 LETE	Medium
SC06	SCB	34.22	Mile 34	6 LETE	15 LETE	Medium
SC05	SCB	44.00	Cape Point	6 LETE	35 LETE	Low
MI01	MI		Morgan Island	No count	No count	None

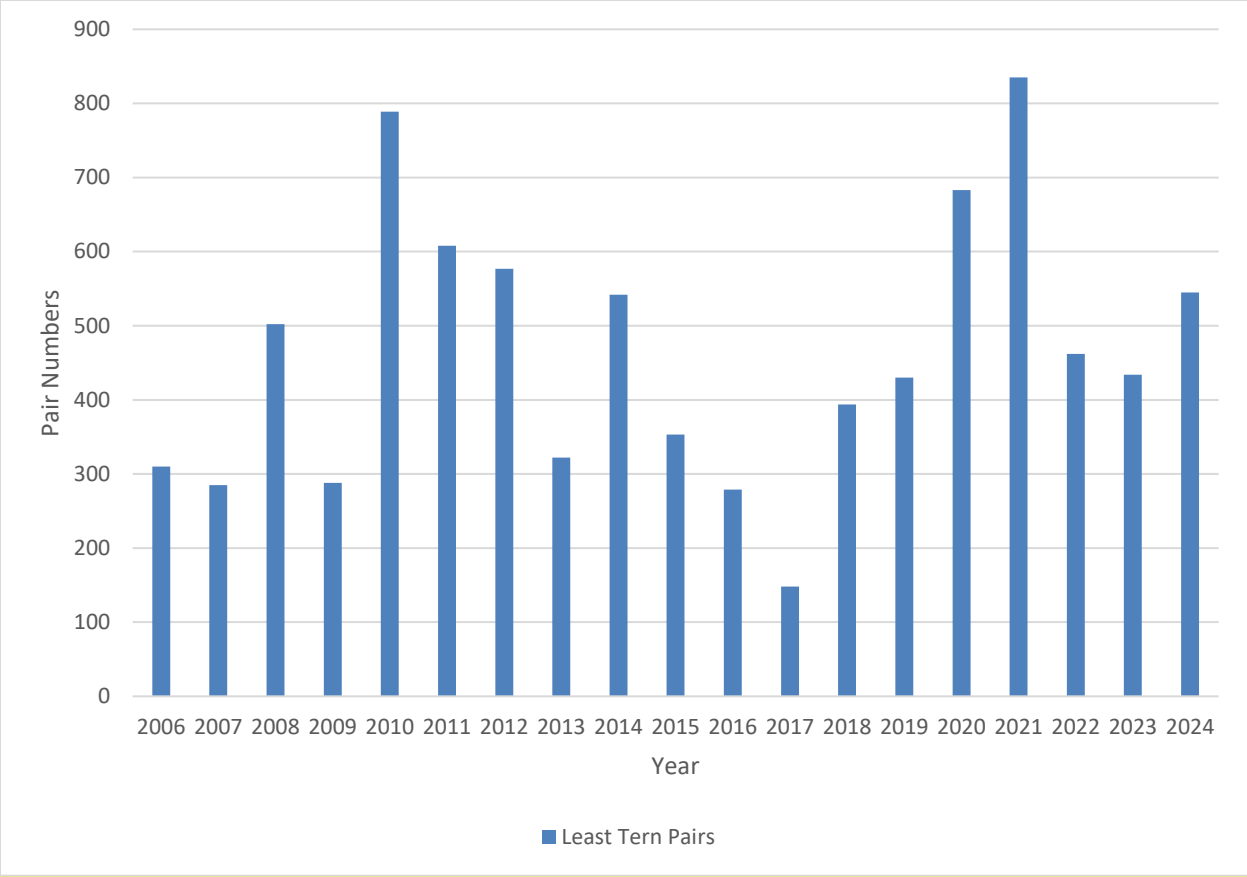

Figure 3. Least tern window census counts at CALO from 2006 to 2024.

Discussion

In 2024, the mixed colony at Old Drum continued to be successful. The Old Drum colony is one the largest black skimmer colony in North Carolina, though pair counts are difficult to determine state-wide due to the asynchronous nature of nesting and movement between sites. The 2024 black skimmer census pair count (52 pairs) was lower than average (105 pairs) and thought to be an undercount of actual pairs. There was some predation disturbance at the Plover Inlet colony and birds did move to the Old Drum colony. Gull-billed terns saw the highest census pair count in the last 18 breeding seasons with 99 pairs. Well above the average of 27 pairs per year. Similarly common terns increased to 54 pairs above the 18-year average of 33 pairs. Though current monitoring protocols at CALO do not allow for the calculation of quantitative productivity estimates, CALO staff did observe high numbers of black skimmer chicks, gull-billed terns chicks, and common terns chicks that were presumed to have fledged.

Least tern pairs were up compared to 2022 and 2023, but still below the all-time high in 2021. However, the 2024 pair count of 545 pairs is above average with the average of 462 from the previous 18 seasons.

Red Knot (*Calidris canutus rufa*) Monitoring

Background

Serious declines in the population of red knots (*Calidrus canutus rufa*) led the U.S. Fish and Wildlife Service to provide protection under the Endangered Species Act. In December 2014, the red knot was designated as a threatened species (USFWS, 2014). Red knots use CALO as a stopover site in spring and fall migration. While not as important as some other coastal sites, CALO may still contribute to the survival of this species.

Previous monitoring of red knots at CALO was limited to surveys as part of a broader shorebird study in 1992 and 1993 (Dinsmore et al., 1998). NCB had greater numbers of red knots than anywhere else in the Outer Banks and reported a relative density of 34 birds per kilometer, but surveys in that study did not include any of the areas south of New Drum Inlet.

Methods

Surveys for red knots were made of the ocean beach on Core Banks, NCB and SCB, beginning in mid-March through the end of October. Survey frequency and timing followed the International Shorebird Census guidelines for spring and fall. Counts were done near the 5th, 15th, and 25th of the month from March 15 to June 5 and from July 15 to October 25. In 2024, the two-mile section of beach between Ocracoke Inlet to Evergreen was not included in surveys due to irregular access across Evergreen Inlet.

Surveys were conducted by the park biologist or biological science technicians who have experience identifying shorebirds. Surveys were at different times of day, tides and weather conditions. Monitors recorded the number of red knots observed, the mile location, the latitude and longitude, the amount of human disturbance, tide level, and the accuracy of the count in a GIS.

Results

Spring migration counts peaked on May 15 with 2,634 birds counted across the Core Banks (Figure 4). Fall migration peaked on August 15 with 144 red knots counted across the Core Banks. Spring migration from March 15 to June 5 averaged 718 birds across both islands. The fall migration from July 15 to October 25 averaged 57 birds across both islands.

NCB averaged 187 birds per survey throughout the survey period. SCB averaged 185 birds per survey. NCB had the highest count of 1,378 birds on May 15, with a relative abundance of 43 birds per kilometer (Table 11). SCB had the highest count of 1,256 red knots on May 15, with a relative abundance of 33 birds per kilometer. Red knots were distributed over the length of Core Banks from 2006 to 2024 (Figure 5; Appendix A, Map A8).

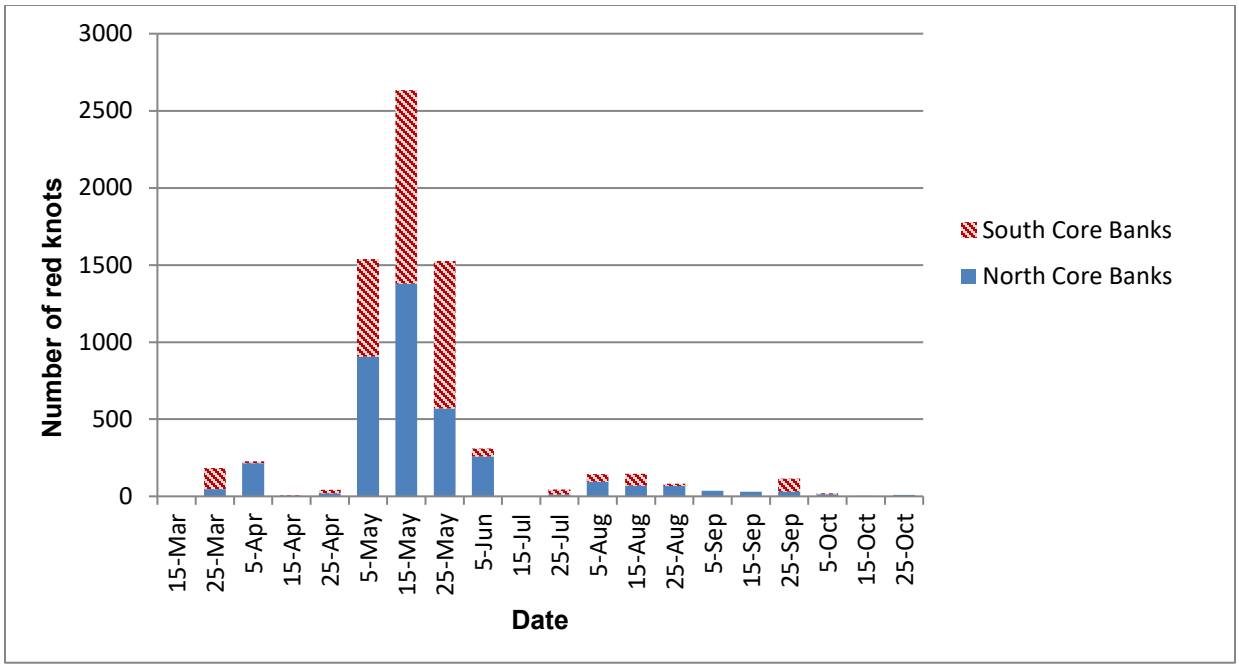

Figure 4. Number of red knots counted at CALO in 2024.

Table 11. Red knot relative abundance on NCB from 1992-2024.

Year	Date	Peak Count	Kilometers	Relative Abundance
1992-1993	-	-	34	34
2006	May 5	618	30.3	20
2007	May 15	718	30.6	23
2008	Apr 15	1287	30.6	42
2009	May 25	525	36	14
2010	May 15	927	36	26
2011	May 15	648	36	18
2012	April 25	1370	29.8	46
2013	May 25	854	29.8	29
2014	May 15	2666	29.8	89
2015	May 15	2201	29.8	74
2016	May 15	2124	29.8	71
2017	May 15	1741	29.8	58
2018	May 25	1710	36	48
2019	May 5	395	36	11
2020	May 5	999	25.7	39
2021	May 15	954	25.7	37
2022	May 25	2210	32	69
2023	May 25	1459	32	46
2024	May 15	1378	32	43

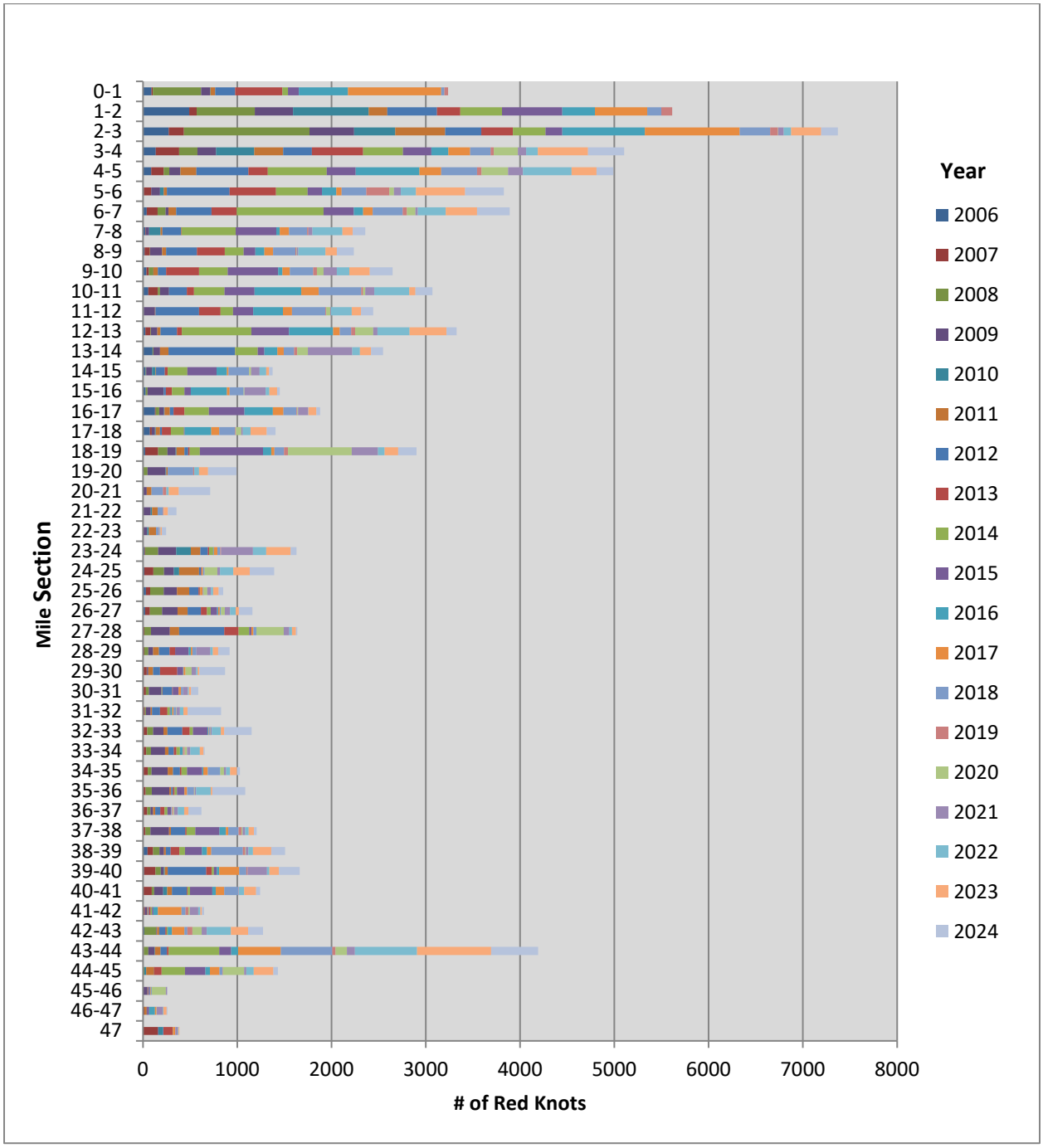

Figure 5. Total number of red knots counted in each mile section from 2006 to 2024.

Discussion

Monitoring in 2024 confirmed CALO as a stopover site for red knots, particularly during the spring migration with a peak count of 2,634 birds seen on May 15. Though not a record year, 2024 was consistent with the average relative abundance since monitoring began in 1992. Interestingly, higher

red knot numbers were recorded on SCB rather than NCB. Evergreen Inlet precluded the surveying of the northern two miles of NCB, so large flocks of red knots that have traditionally been observed near Ocracoke Inlet were not recorded. Red knots were more evenly distributed throughout the seashore in 2024. This data highlights the importance of CALO as a stopover site for migrating red knots. Although the Outer Banks may not be as important as some other sites in the region such as Delaware Bay, it still provides habitat that may be important for the recovery and long-term survival of red knots.

Wilson's Plover (*Charadrius wilsonia*) Management and Monitoring

Wilson's plover pairs were surveyed annually at the same time as the piping plover window census of June 1 to June 9 from 2007 to 2016. Wilson's plovers are now surveyed at a minimum of every three years in line with the NCWRC coast wide survey, with additional annual surveys conducted when time allows. A park-wide survey was conducted in 2024 and recorded a total of 114 pairs and 9 singles (Table 12). Pairs were counted in the same nesting areas as piping plovers and any additional habitat throughout the park. Nests and broods were recorded when found or observed opportunistically, but nest and brood fates were not tracked. Twelve nests and two broods were recorded during the 2024 season. Though pair numbers were down from a record high in 2021, Wilson's plover pairs appear stable to increasing at CALO since 2007 (Figure 6).

Table 12. Wilson's plover census results June1-9, 2024.

Island	Nesting Area	Number of Pairs	Singles
North Core Banks	Ocracoke Inlet	0	0
North Core Banks	Portsmouth Flats	12	3
North Core Banks	Kathryn-Jane Flats	3	1
North Core Banks	Old Drum Inlet	8	0
North Core Banks	Miles 21	1	0
North Core Banks	New Drum Inlet	9	0
North Core Banks	Ophelia Island/Spit	3	0
South Core Banks	Plover Inlet	56	4
South Core Banks	Cape Point	0	0
South Core Banks	Power Squadron Spit	11	0
Shackleford Banks	Barden Inlet	2	0
Shackleford Banks	Corral Area	3	0
Shackleford Banks	Mile 50	1	0
Shackleford Banks	Whale Creek Bay	3	0
Shackleford Banks	Wade Shore	0	1
Shackleford Banks	Beaufort Inlet	2	0

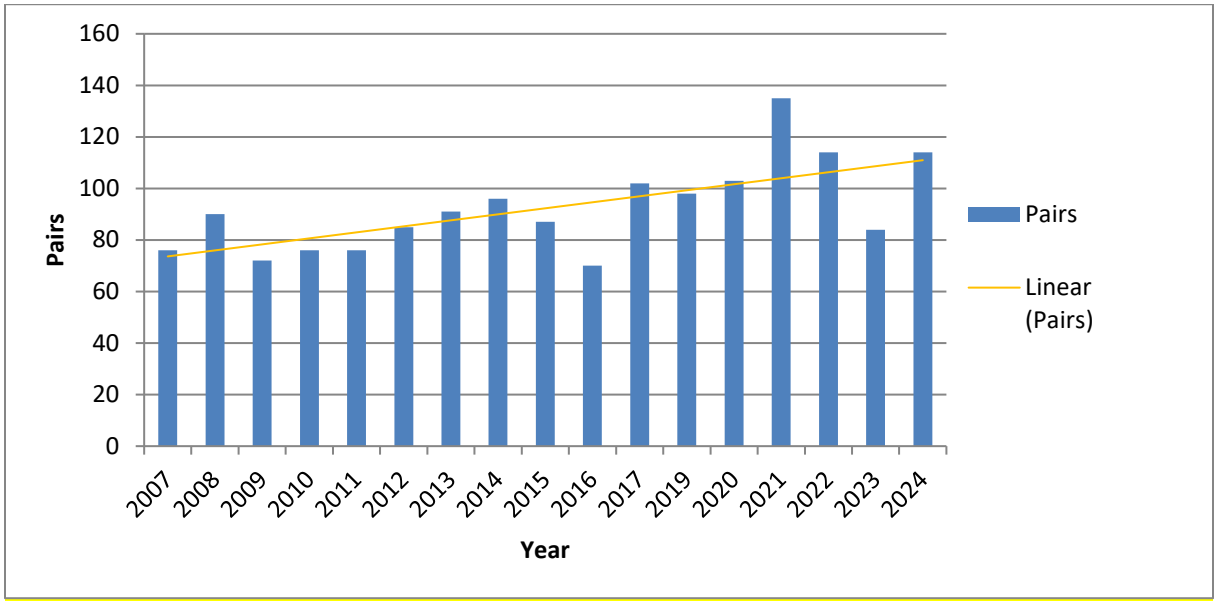

Figure 6. Number of Wilson's plover counted at CALO 2007- 2024.

Conclusions and Recommendations

Results for shorebird and colonial waterbird productivity at CALO in 2024 were mixed. The highlight of the season was the Old Drum mixed colony, being one of the largest black skimmer colony in the state and producing relatively high numbers of black skimmer, common tern, and gull-billed tern chicks. Wilson's plovers, red knot, and least tern numbers were consistent with long term monitoring averages. American oystercatcher productivity was the second highest on record. However, piping plover productivity was below average in 2024, resulting in the worst productivity on record.

For piping plovers, the cause of low productivity is not clear and likely a combination of several factors. As most nest failures were due to unknown causes in 2024, is it recommended that trail cameras continue to be installed on piping plover nests to try to fill this data gap. In addition, a randomized study on ghost crab trapping to determine the efficacy of this intervention at CALO could inform managers if trapping is a beneficial way to spend limited resources. Targeted research is needed to understand piping plover population dynamics at CALO and to determine the source of poor chick survival and productivity. It is recommended that CALO partner with a research institution to attempt to answer these questions. An increase in monitoring staff would allow for more accurate monitoring, including of new nesting areas created by Hurricane Dorian, and more effective management interventions such as trail camera installation, ghost crab trap installation, and the management responses to brood movements.

Lastly, shorebird banding programs should continue across Core Banks. Banded individuals allows for the accurate monitoring of breeding birds and productivity thus improving the quality of data

collected at CALO. Since Virginia Tech began piping plover banding in 2015, pair movement between nesting sites along Core Banks, pair movement between CALO and Cape Hatteras National Seashore, and movement between Atlantic states has been documented. There is more to learn about the piping plover breeding population such as survivorship and site fidelity that require multiple years of study. In addition, banded non-breeding piping plovers can be used to study migratory and winter use of CALO. It appears that NCB is a major migratory use area, and it should continue to be studied to determine the details and duration of use in relation to the greater Atlantic flyway. Banding of American oystercatcher and black skimmer chicks and adults should also be continued to assist CALO management efforts and long-term population monitoring.

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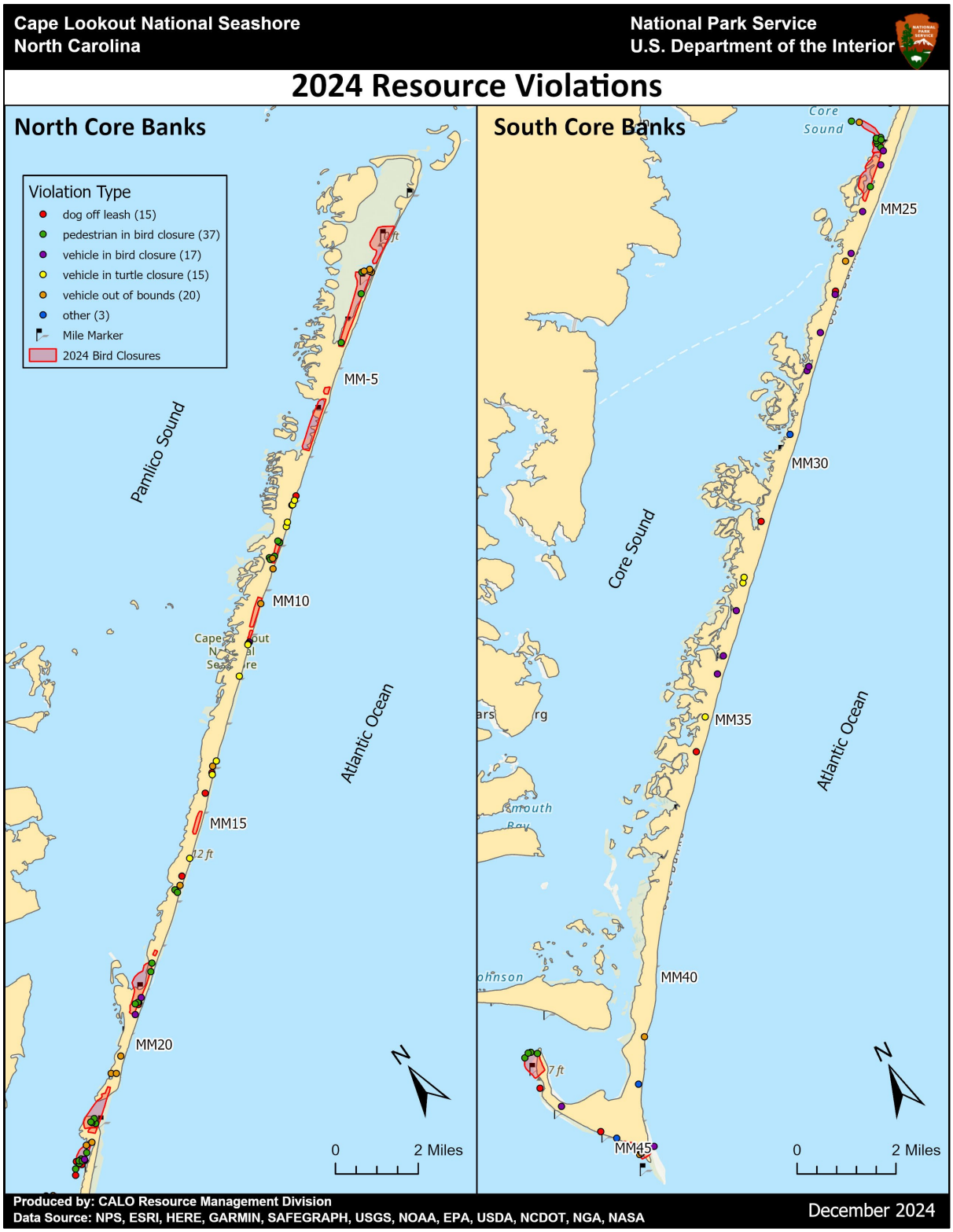
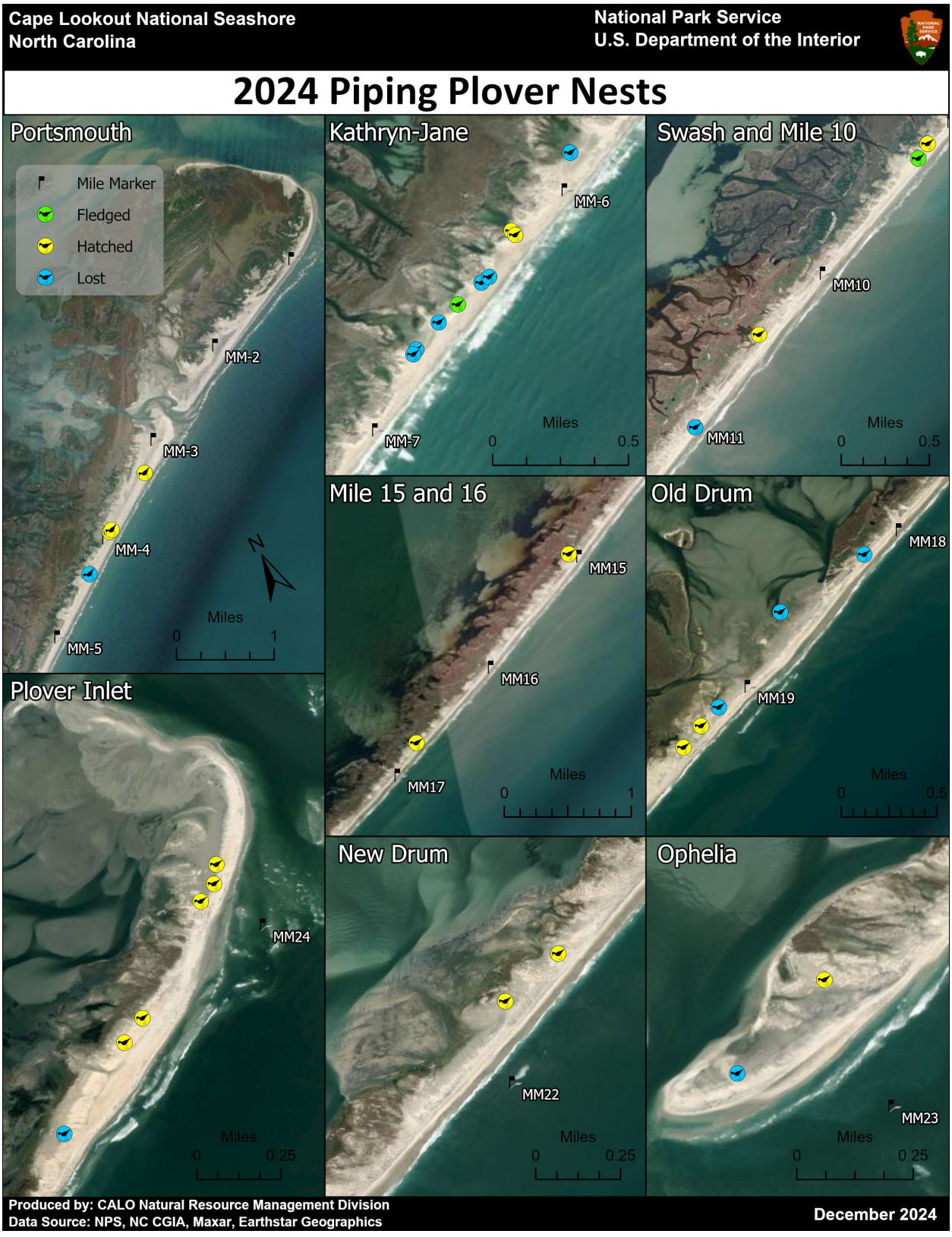
Appendix A. Maps

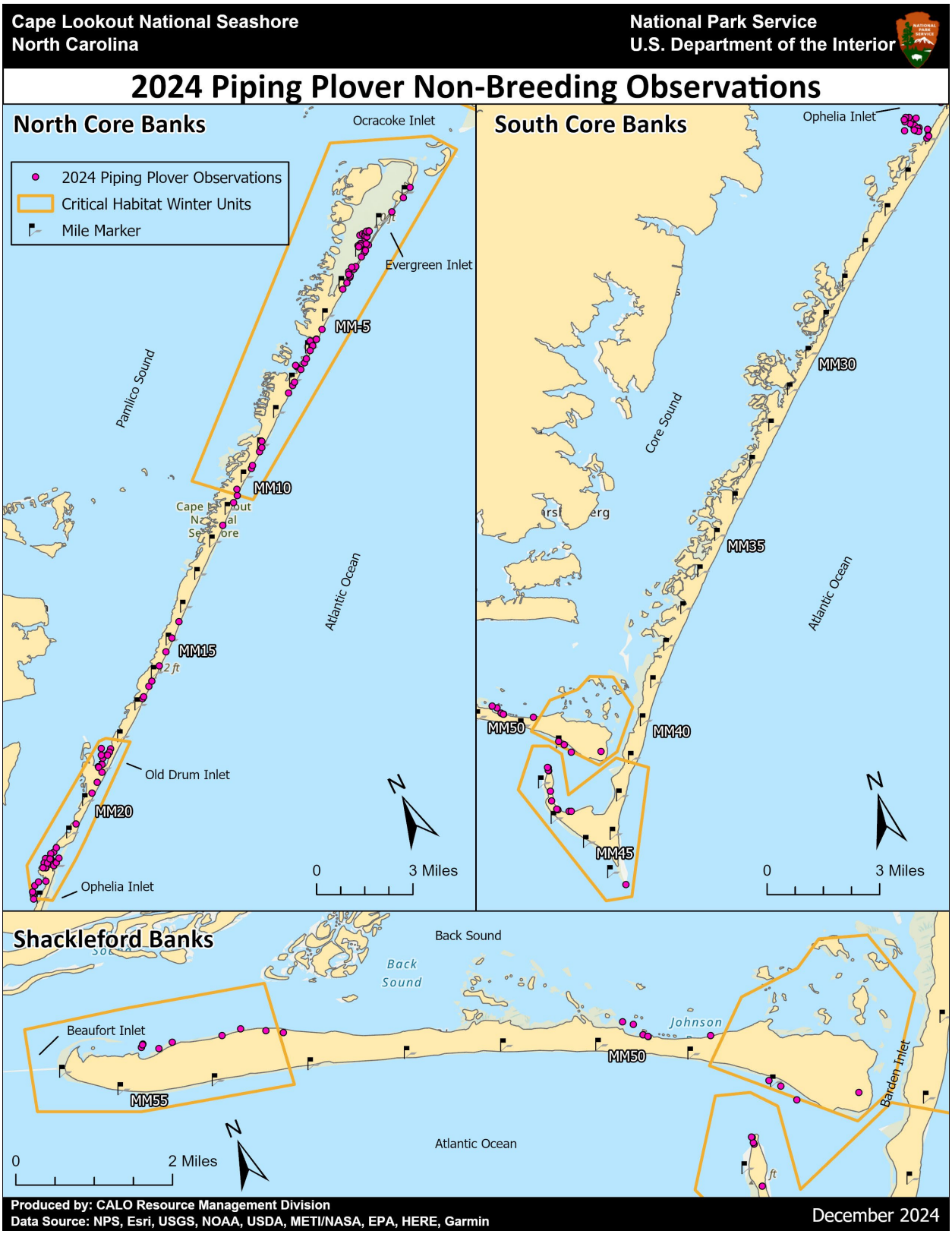


Map A1. Resource violations at CALO in 2024.

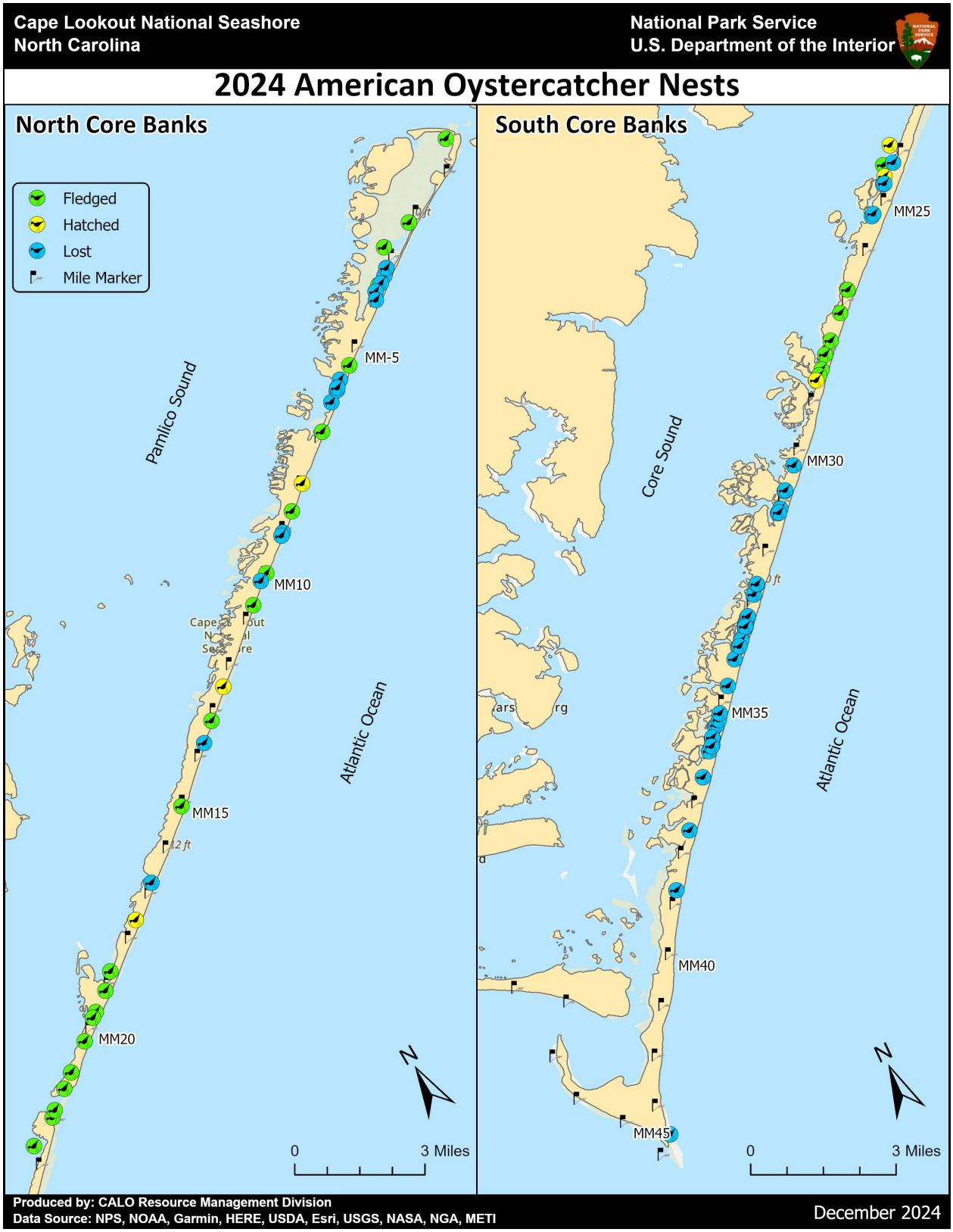


Map A2. Piping plover nest locations at CALO in 2024.

Map A3. Piping plover chick foraging ranges for broods that fledges at least one chick at CALO in 2024.



Map A4. Non-breeding piping plover locations at CALO in 2024.



Map A5. American oystercatcher nests at CALO in 2024.

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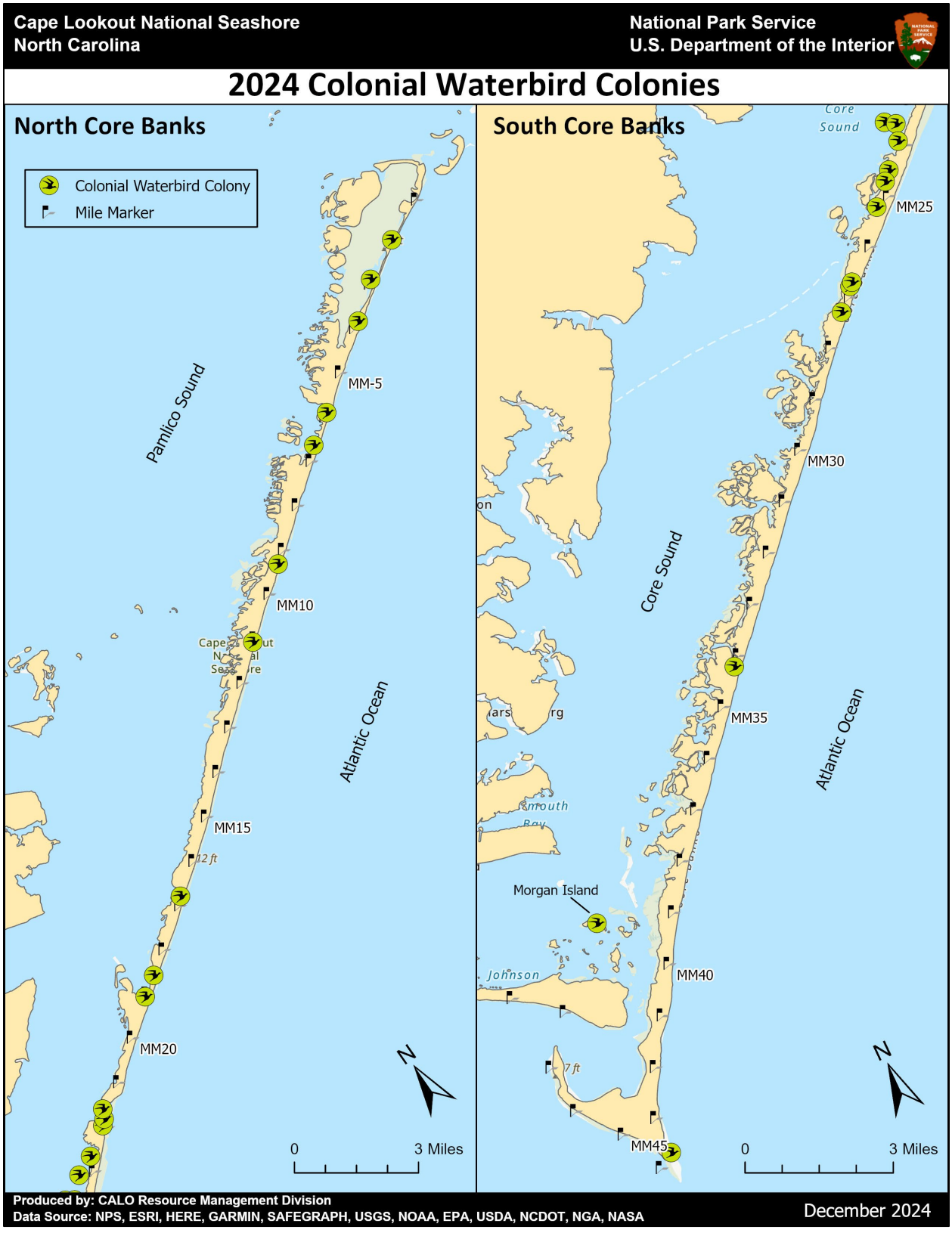
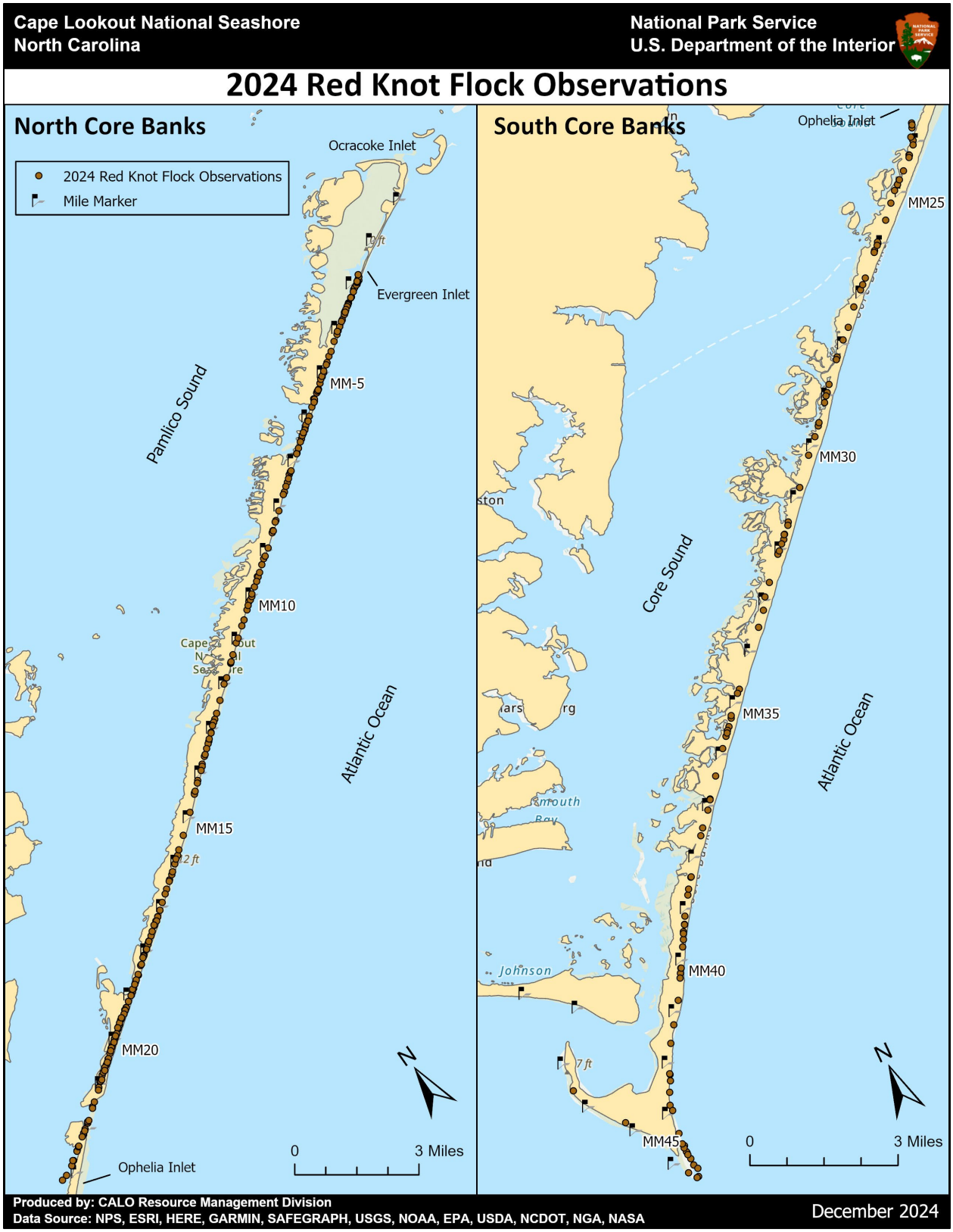
Map A6. American oystercatcher brood foraging ranges for a subset of broods that fledged at least one chick at CALO in 2024. Not all fledged broods are shown.



Map A7. Colonial waterbird colony locations at CALO in 2024.



Map A8. Red knot flock observations at CALO in 2024.

Appendix B. 2024 Piping Plover Productivity Data

Table B1. North Core Banks productivity data for 2024. North Core Banks totals: 22 breeding pairs, 28 total nests, 16 hatched nests, 2 fledged chicks.

Nest ID	Pair	Mile	Site	Adult 1	Adult 2	Found Date	Exclosure Date	Eggs Laid	Nest Fate	Outcome Summary
PIPLNCB01	1	19.45	Old Drum	GF(9KT)	KG:RY	4/21/2024	N/A	4	Hatched	Brood failed by 5/31/24 at 6 days old.
PIPLNCB02	2	6.23	Kathryn Jane	GF(CE3)	UNB	5/8/2024	5/29/2024	4	Hatched	Brood failed by 6/16/24 at 6 days old.
PIPLNCB03	3	16.78	Mile 16	CL:GC	UNB	5/10/2024	5/17/2024	4	Hatched	Brood failed by 6/15/24 at 6 days old.
PIPLNCB04	4	15.10	Mile 15	GF(58X)	UNB	5/10/2024	5/19/2024	4	Hatched	Brood failed by 6/21/24 at 11 days old.
PIPLNCB05	5	10.48	Mile 10	GF(54N)	UNB	5/10/2024	5/13/2024	4	Hatched	Brood failed by 6/8/24 at 2 days old.
PIPLNCB06	6	3.96	Portsmouth Flats	GF(2H7)	UNB	5/10/2024	5/29/2024	4	Hatched	Brood failed by 6/23/24 at 14 days old.
PIPLNCB07	7	21.85	New Drum	GF(LYJ)	UNB	5/11/2024	5/12/2024	4	Hatched	Brood failed by 6/10/24 at 4 days old.
PIPLNCB08	8	18.20	Old Drum	UNB	UNB	5/11/2024	N/A	3	Lost	Nest failed 5/30/24 due to unknown cause.
PIPLNCB09	9	6.73	Kathryn Jane	GF(X79)	GF(T0L)	5/12/2024	5/31/2024	3	Lost	Nest failed 6/8/24 due to unknown cause.
PIPLNCB10	10	6.44	Kathryn Jane	GF(EET)	UNB	5/12/2024	N/A	3	Lost	Nest failed 5/16/24 due to unknown reason.
PIPLNCB11	11	19.19	Old Drum	GF(938)	UNB	5/13/2024	N/A	3	Lost	Nest failed 5/31/24 due to unknown cause.
PIPLNCB12	12	6.61	Kathryn Jane	GF(K4E)	UNB	5/13/2024	N/A	4	Lost	Nest failed 7/19/24 due to egg being unviable.
PIPLNCB13	13	6.54	Kathryn Jane	GF(CXM)	UNB	5/25/2024	5/29/2024	4	Fledged	Fledged 1 UNB chick on 7/19/24 at 28 days old.
PIPLNCB14	14	21.68	New Drum	UNB	UNB	5/26/2024	N/A	4	Hatched	Brood failed by 7/5/24 at 11 days old.
PIPLNCB15	15	23.00	Ophelia	GG:YR	UNB	5/27/2024	6/5/2024	3	Lost	Nest failed 6/26/24 due to ghost crab predation.
PIPLNCB16	16	5.91	Kathryn Jane	UNB	UNB	5/30/2024	N/A	4	Lost	Nest failed 6/23/24 due to ghost crab predation.
PIPLNCB17	17	19.31	Old Drum	GF(2P2)	UNB	5/31/2024	6/2/2024	3	Hatched	Brood failed by 7/5/24 at 8 days old.
PIPLNCB18	10	6.39	Kathryn Jane	GF(EET)	UNB	5/31/2024	N/A	2	Lost	Nest failed 6/13/24 due to unknown cause.
PIPLNCB19	18	9.18	Swash	GF(P6A)	GF(4M3)	6/2/2024	N/A	2	Hatched	Brood failed by 6/8/24 at 2 days old.
PIPLNCB20	19	4.39	Portsmouth Flats	GF(5VN)	GF(UUM)	6/8/2024	N/A	2	Lost	Nest failed 6/27/24 due to unknown cause.
PIPLNCB21	20	3.37	Portsmouth Flats	GF(5JM)	GF(XK2)	6/14/2024	N/A	4	Hatched	Brood failed by 6/30/24 at 7 days old.
PIPLNCB22	21	22.91	Ophelia	KY:CO	UNB	6/21/2024	N/A	3	Hatched	Brood failed by 7/11/24 at 4 days old.
PIPLNCB23	2	6.23	Kathryn Jane	DG(CE3)	UNB	6/23/2024	7/7/2024	4	Hatched	Brood failed by 7/24/24 at 2 days old.

PIPLNCB24	9	6.74	Kathryn Jane	GF(X79)	GF(T0L)	6/23/2024	N/A	3	Lost	Nest failed 7/19/24 due to predation by undetermined predator.
PIPLNCB25	8	18.67	Old Drum	UNB	UNB	6/24/2024	N/A	3	Lost	Nest failed 7/8/24 due to unknown cause.
PIPLNCB26	5	11.03	Mile 10	DG(54N)	UNB	7/4/2024	N/A	3	Lost	Nest failed on 7/9/24 due to ghost crab predation.
PIPLNCB27	22	9.27	Swash	GF(0M6)	GF(7KM)	7/6/2024	7/7/2024	3	Fledged	Fledged one UNB chick by 82/25/24 at 35 days old.
PIPLNCB28	6	3.96	Portsmouth Flats	GF(2H7)	UNB	7/7/2024	N/A	4	Hatched	Brood failed by 8/11/24 at 18 days old after Tropical Storm Debby.

Table B2. South Core Banks productivity data for 2024. South Core Banks totals: 5 breeding pairs, 6 total nests, 5 hatched nests, 0 fledged chicks.

Nest ID	Pair	Mile	Site	Adult 1	Adult 2	Found Date	Exclosure Date	Eggs Laid	Nest Fate	Outcome Summary
PIPLSCB01	1	24.73	Plover Inlet	OY:KO	UNB	5/1/2024	5/10/2024	3	Lost	Nest failed 6/2/24 due to unknown cause.
PIPLSCB02	2	24.48	Plover inlet	UNB	UNK	5/6/2024	5/13/2024	4	Hatched	Brood failed on 6/7/24 at 1 day old.
PIPLSCB03	3	24.00	Plover Inlet	GF(JHY)	UNB	5/7/2024	5/10/2024	4	Hatched	Brood failed on 6/12/24 at 8 days old.
PIPLSCB04	4	23.90	Plover Inlet	GF(PEU)	UNB	5/9/2024	5/13/2024	3	Hatched	Brood failed on 6/7/24 at 3 days old.
PIPLSCB05	5	24.43	Plover Inlet	GF(7KM)	UNB	5/22/2024	5/24/2024	4	Hatched	Brood failed on 6/16/24 at 13 days old.
PIPLSCB06	3	24.00	Plover Inlet	GF(JHY)	UNB	6/22/2024	7/6/2024	3	Hatched	Brood failed on 7/21/24 at 2 days old.

Appendix C. Monthly Counts of Non-Breeding Piping Plovers 2008-2024

Table C1. Total number of non-breeding plovers observed on North Core Banks, South Core Banks, and Shackleford Banks during each monthly survey from 2008 to 2024

Date	North Core Banks	South Core Banks	Shackleford banks	CALO Total
January-08	0	2	11	13
February-08	0	6	10	16
March-08	6	6	10	22
August-08	41	28	17	86
September-08	16	20	10	46
October-08	25	9	20	54
November-08	11	4	9	24
December-08	9	7	8	24
January-09	6	18	13	37
February-09	2	9	12	23
March-09	10	17	-	27
August-09	83	26	2	111
September-09	144	33	10	187
October-09	22	19	13	54
November-09	18	12	12	42
December-09	12	14	23	49
January-10	17	8	11	36
February-10	8	5	11	24
March-10	-	10	6	16
August-10	125	23	4	152
September-10	70	32	17	119
October-10	35	13	4	52
November-10	8	19	9	36
December-10	4	3	6	13
January-11	6	2	7	15
February-11	7	0	8	15
March-11	12	8	13	33
August-11	81	26	0	107
September-11	29	8	20	57
October-11	26	19	6	51
November-11	7	3	11	21
December-11	2	4	11	17
January-12	0	2	5	7

February-12	0	2	10	12
March-12	5	1	-	6
August-12	82	32	4	118
September-12	112	7	9	128
October-12	0	3	12	15
November-12	3	7	5	15
December-12	6	6	2	14
January-13	-	4	3	7
February-13	4	0	10	14
March-13	5	9	4	18
August-13	93	6	15	114
September-13	115	15	23	153
October-13	17	-	-	17
November-13	6	5	5	16
December-13	12	3	4	19
January-14	0	12	0	12
February-14	0	0	9	9
March-14	7	42	4	53
August-14	98	44	9	151
September-14	69	12	1	82
October-14	12	12	0	24
November-14	13	6	4	23
December-14	4	14	3	21
January-15	2	9	4	15
February-15	-	-	-	-
March-15	-	21	19	40
August-15	95	15	15	125
September-15	42	20	8	70
October-15	17	3	14	34
November-15	0	4	8	12
December-15	5	18	2	25
January-16	10	16	9	35
February-16	15	13	9	37
March-16	2	15	8	25
August-16	-	-	10	10
September-16	30	17	25	72
October-16	10	31	3	44
November-16	2	20	1	23
December-16	0	2	1	3
January-17	7	0	2	9

February-17	-	-	-	-
March-17	-	-	-	-
August-17	46	0	8	54
September-17	68	2		70
October-17	24	22	14	60
November-17	8	1	11	20
December-17	11	4	10	25
January-18	0	0	0	0
February-18	9	1	0	10
March-18	-	-	-	-
August-18	161	19	2	182
September-18	31	3	0	34
October-18	40	0	9	49
November-18	3	0	8	11
December-18	0	2	5	7
January-19	-	-	-	-
February-19	4	22	13	39
March-19	23	11	9	43
August-19	127	-	-	127
September-19	7	34	2	43
October-19	4	16	6	26
November-19	11	7	3	21
December-19	0	3	13	16
January-20	-	-	-	-
February-20	8	0	3	11
March-20	1	7	0	8
August-20	220	46	7	273
September-20	79	37	2	118
October-20	16	14	0	30
November-20	14	26	3	43
December-20	5	8	18	31
January-21	12	20	7	39
February-21	15	13	10	38
March-21	12	5	1	18
August-21	78	53	20	151
September-21	135	44	25	204
October-21	54	27	27	108
November-21	30	3	2	35
December-21	29	3	1	33
January-22	4	14	1	19

February-22	3	2	0	5
March-22	40	1	2	43
August-22	381	91	9	481
September-22	117	304	6	427
October-22	34	51	8	93
November-22	21	20	11	52
December-22	34	51	3	88
January-23	23	24	3	50
February-23	8	0	0	8
March-23	49	30	37	116
August-23	163	156	35	354
September-23	140	82	19	241
October-23	58	82	6	146
November-23	23	28	0	51
December-23	15	27	9	51
January-24	15	20	17	52
February-24	24	32	2	58
March-24	84	50	2	136
August-24	184	70	25	279
September-24	128	13	0	141
October-24	23	25	6	54
November-24	12	9	13	34
December-24	0	6	2	8

Appendix D. 2024 American Oystercatcher Productivity Data

Table D1. North Core Banks productivity data for 2024. North Core Banks totals: 31 breeding pairs, 38 total nests, 24 hatched nests, 38 fledged chicks.

Nest	Pair	Adult 1	Adult 2	Mile	Found Date	Eggs	Closure	Outcome Summary
AMOYNCB01	1	DG(P5)	UNB	22.02	4/16/2024	3	interior	Fledged 3 chicks. DG(EU1) and DG(EU9) confirmed fledged and DG(EU3) last seen on 6/29/24 at 47 days old.
AMOYNCB02	2	DG(EJ9)	UNB	22.72	4/18/2024	3	interior	Fledged 2 chicks, DG (EWJ) and DG(EWT), on 6/24/24 at 48 days old.
AMOYNCB03	3	DG(EH6)	UNB	10.20	4/18/2024	3	600' buffer	Nest failed 4/27/24 due to raccoon predation.
AMOYNCB04	4	DG(CCE)	UNB	6.92	4/19/2024	3	600' buffer	Fledged 1 chick DG(E4Y) on 6/23/24 at 35 days old.
AMOYNCB05	5	DG(TN)	UNB	18.82	4/20/2024	3	interior	Fledged 3 chicks, DG(E4H), DG(E4R) and UNB, on 6/28/24 at 42 days old.
AMOYNCB06	6	DG(C93)	UNB	20.34	4/20/2024	3	600' buffer	Fledged 3 chicks, DG(E50), DG(E51) and DG(E52), on 7/2/24 at 45 days old.
AMOYNCB07	7	DG(C07)	DG(C08)	21.00	4/20/2024	3	600' buffer	Fledged 2 chicks, DG(E56) and UNB, on 6/24/24 at 37 days old.
AMOYNCB08	8	DG(M0)	UNB	19.74	4/21/2024	3	600' buffer	Fledged 3 chicks, DG(E53), DG(E54) and DG(E55), on 6/29/24 at 42 days old.
AMOYNCB09	9	DG(T3)	DG(CE1)	10.74	4/22/2024	3	600' buffer	Fledged 1 chick, DG(E4J), on 6/30/24 at 41 days old.
AMOYNCB10	10	DG(CMP)	DG(C7T)	5.81	4/22/2024	3	interior	Nest failed 5/6/24 due to cat predation.
AMOYNCB11	11	DG(CY)	UNB	3.50	4/22/2024	2	interior	Nest abandoned on 4/24/24 due to unknown reason.
AMOYNCB12	12	DG(CK0)	DG(WF)	9.14	4/24/2024	2	600' buffer	Nest failed on 5/16/24 due to unknown cause.
AMOYNCB13	13	DG(EKH)	UNB	15.14	4/24/2024	3	600' buffer	Fledged 2 chicks, DG(E58) and DG(E59), on 7/1/24 at 39 days old.
AMOYNCB14	14	DG(CY6)	DG(C5W)	12.51	4/24/2024	3	600' buffer	Brood failed on 6/5/24 due to unknown cause.
AMOYNCB15	15	DG(EKE)	UNB	17.67	4/25/2024	2	600' buffer	Brood failed on 6/20/24 due to unknown cause.
AMOYNCB16	16	DG(CA)	UNB	8.66	4/25/2024	3	600' buffer	Fledged 2 chicks, DG(E4K) and DG(E4L), on 6/30/24 at 37 days old.
AMOYNCB17	17	DG(TF)	UNB	21.91	4/26/2024	2	interior	Fledged 1 chick, DG(E57), on 6/29/24 at 41 days old.
AMOYNCB18	18	DG(CML)	DG(C6R)	13.27	4/26/2024	3	600' buffer	Fledged 2 chicks, DG(E4M) and DG(E4N), on 7/3/24 at 39 days old.
AMOYNCB19	19	DG(EKK)	UNB	3.00	4/28/2024	3	interior	Fledged 2 chicks, DG(E4T) and UNB, on 6/29/24 at 45 days old.
AMOYNCB20	20	DG(MA)	UNB	2.31	4/30/2024	2	interior	Fledged 1 chick, DG(E4P), on 7/9/24 at 45 days old.
AMOYNCB21	21	DG(CE3)	UNB	6.27	5/2/2024	3	interior	Nest failed on 5/30/24 due to unknown cause.
AMOYNCB22	22	DG(CUP)	DG(CEL)	19.23	5/3/2024	2	600' buffer	Fledged 2 chicks, DG(E5A) and DG(E5C), on 7/8/24 at 41 days old.
AMOYNCB23	23	DG(EKN)	UNB	16.84	5/3/2024	3	600' buffer	Nest abandoned on 5/13/24 due to unknown reason.

AMOYNCB24	11	DG(CY)	UNB	3.70	5/3/2024	2	interior	Nest failed on 5/20/24 due to ghost crab predation.
AMOYNCB25	24	DG(CE0)	UNB	3.86	5/4/2024	3	interior	Nest failed on 5/27/24 due to unknown cause.
AMOYNCB26	25	R(AUN)	UNB	19.84	5/4/2024	3	600' buffer	Fledged 1 chick, DG(E5H), on 7/14/24 at 45 days old.
AMOYNCB27	26	DG(C96)	UNB	21.42	5/4/2024	3	interior	Fledged 1 UNB chick on 7/5/24 at 39 days old. Banded chicks DG(E5E) and DG(E5F) last seen on 6/29 at 33 days old.
AMOYNCB28	27	DG(C0H)	DG(EFA)	8.04	5/6/2024	2	600' buffer	Brood failed by 6/8/24 due to unknown cause.
AMOYNCB29	28	DG(CL1)	UNB	0.31	5/9/2024	2	none	Fledged 1 UNB chick around 7/5/24 at 40 days old.
AMOYNCB30	3	DG(EH6)	UNB	10.03	5/10/2024	3	600' buffer	Fledged 2 chicks, DG(E5N) and DG(E5M), on 7/11/24 at 37 days old.
AMOYNCB31	29	DG(EC1)	UNB	13.75	5/12/2024	2	600' buffer	Nest abandoned on 6/8/24.
AMOYNCB32	30	DG(C00)	DG(EC4)	5.46	5/12/2024	2	600' buffer	Fledged 2 chicks, DG(E5K) and DG(E5J), on 7/19/24 at 38 days old.
AMOYNCB33	10	DG(CMP)	DG(C7T)	6.00	5/20/2024	3	interior	Nest failed on 5/23/24 due to unknown cause.
AMOYNCB34	31	DG(C45)	DG(EE2)	3.32	5/20/2024	2	interior	Nest failed on 7/4/24 due to predation by undetermined predator.
AMOYNCB35	12	DG(CK0)	DG(WF)	9.21	5/27/2024	2	600' buffer	Nest failed on 6/23/24 due to coyote predation.
AMOYNCB36	10	DG(CMP)	DG(C7T)	5.96	6/8/2024	2	interior	Nest failed on 6/27/24 due to unknown cause.
AMOYNCB37	11	DG(CY)	UNB	3.71	6/8/2024	2	interior	Fledged 1 chick, DG(E4W), on 8/5/24 at 41 days old.
AMOYNCB38	24	DG(CE0)	UNB	4.00	6/8/2024	2	600' buffer	Nest failed on 6/27/24 due to unknown cause.

Table D2. South Core Banks productivity data for 2024. South Core Banks totals: 23 breeding pairs, 49 total nests, 10 hatched nests, 16 fledged chick.

Nest	Pair	Adult 1	Adult 2	Mile	Found Date	Eggs	Closure	Outcome Summary
AMOYSCB01	1	DG(K0)	UNB	33.36	4/4/2024	3	600' buffer	Nest failed 4/11/24 due to coyote predation.
AMOYSCB02	2	DG(CUK)	DG(CJR)	28.14	4/10/2024	2	600' buffer	Fledged 2 chicks, DG(CJX) and DG(CKY), by 7/9/24 at 61 days old.
AMOYSCB03	3	DG(CUM)	DG(C3A)	28.42	4/10/2024	3	600' buffer	Fledged 1 chick, DG(C49), on 6/29/24 at 51 days old.
AMOYSCB04	4	DG(CL9)	UNB	31.29	4/11/2024	1	600' buffer	Nest failed 4/13/24 due to predation by an unknown predator.
AMOYSCB05	5	DG(CK1)	UNB	30.85	4/14/2024	3	600' buffer	Nest failed 4/22/24 due to unknown cause.
AMOYSCB06	6	DG(YM)	UNB	28.55	4/15/2024	3	600' buffer	Fledged 3 chicks, DG(EHW), DG(EJM), DG(EM2), on 6/26/24, at 43 days old.
AMOYSCB07	7	DG(AP)	DG(YP)	33.94	4/16/2024	3	600' buffer	Nest failed 4/21/24 due to unknown cause.
AMOYSCB08	8	DG(CAN)	DG(J0)	35.52	4/16/2024	2	600' buffer	Nest failed 4/26/24 due to predation by unknown predator.
AMOYSCB09	9	R(AHJ)	UR-Red	35.99	4/16/2024	3	600' buffer	Nest failed 4/20/24 due to unknown cause.
AMOYSCB10	10	DG(CUL)	DG(C53)	34.19	4/19/2024	1	600' buffer	Nest failed 4/19/24 due to unknown cause.

AMOYSCB11	1	DG(K0)	UNB	33.57	4/24/2024	3	600' buffer	Nest failed 4/27/24 due to coyote predation.
AMOYSCB12	10	DG(CUL)	DG(C53)	34.71	4/24/2024	2	600' buffer	Nest failed 4/26/24 due to unknown cause.
AMOYSCB13	11	DG(R8)	R(5F)	38.76	4/24/2024	2	600' buffer	Nest failed 4/28/24 due to coyote predation.
AMOYSCB14	12	DG(AL)	UNB	24.52	4/25/2024	3	interior	Fledged 1 chick, DG(CYM), on 7/9/24, at 52 days old.
AMOYSCB15	13	DG(CM0)	DG(CNC)	24.64	4/25/2024	2	interior	Brood failed on 5/28/24 at 9 days old due to unknown cause.
AMOYSCB16	14	DG(CFA)	DG(EMN)	25.40	4/25/2024	3	600' buffer	Nest failed 5/7/24 due to unknown cause.
AMOYSCB17	15	DG(CEF)	DG(EMP)	27.30	4/25/2024	3	600' buffer	Fledged 3 chicks, DG(CMR), DG(CNR), and DG(C1R), on 7/3/24 at 40 days old.
AMOYSCB18	16	DG(CRK)	DG(C0L)	27.85	4/26/2024	3	600' buffer	Fledged 3 chicks, DG(CWF), DG(CLW), and UNB, on 7/6/24 at 41 days old.
AMOYSCB19	17	DG(33)	DG(EP4)	24.76	4/27/2024	2	interior	Nest failed 5/6/24 due to unknown cause.
AMOYSCB20	18	DG(C77)	DG(UJ)	26.85	4/27/2024	3	600' buffer	Fledged 3 chicks, DG(C6U), DG(C52), and UNB, on 7/3/24 at 39 days old.
AMOYSCB21	19	DG(C02)	UNB	28.64	4/30/2024	3	600' buffer	Brood failed 6/7/24 at 7 days old due to unknown cause.
AMOYSCB22	7	DG(AP)	DG(YP)	33.79	5/1/2024	3	600' buffer	Nest failed 5/8/24 due to predation by undetermined predator.
AMOYSCB23	20	DG(EEK)	UNB	35.76	5/1/2024	3	600' buffer	Nest failed 5/11/24 due to predation by undetermined predator.
AMOYSCB24	9	R(AHJ)	UR-Red	36.52	5/1/2024	3	600' buffer	Nest failed 5/8/24 due to unknown cause.
AMOYSCB25	4	DG(CL9)	UNB	31.19	5/2/2024	3	600' buffer	Nest failed 5/11/24 due to coyote predation.
AMOYSCB26	5	DG(CK1)	UNB	30.84	5/3/2024	3	600' buffer	Nest failed 5/11/24 due to coyote predation.
AMOYSCB27	1	DG(K0)	UNB	33.47	5/6/2024	3	600' buffer	Nest failed 5/25/24 due to unknown cause.
AMOYSCB28	21	DG(EKM)	DG(CET)	24.00	5/11/2024	2	interior	Brood failed on 6/21/24 at 21 days old due to unknown cause.
AMOYSCB29	22	DG(C0W)	UNB	32.80	5/12/2024	2	600' buffer	Nest failed 5/20/24 due to coyote predation.
AMOYSCB30	8	DG(CAN)	DG(J0)	35.50	5/12/2024	3	600' buffer	Nest failed 5/15/24 due to unknown cause.
AMOYSCB31	11	DG(R8)	R(5F)	37.59	5/18/2024	2	600' buffer	Nest failed 5/18/24 due to crow predation.
AMOYSCB32	14	DG(CFA)	DG(EMN)	25.30	5/18/2024	2	600' buffer	Nest failed 5/26/24 due to unknown cause.
AMOYSCB33	7	DG(AP)	DG(YP)	33.70	5/19/2024	2	600' buffer	Nest failed 5/21/24 due to coyote predation.
AMOYSCB34	4	DG(CL9)	UNB	31.20	5/21/2024	2	600' buffer	Nest failed 5/25/24 due to unknown cause.
AMOYSCB35	5	DG(CK1)	UNB	30.36	5/21/2024	2	600' buffer	Nest failed 6/1/24 due to unknown cause.
AMOYSCB36	17	DG(33)	DG(EP4)	24.75	5/22/2024	2	interior	Nest failed 5/29/24 due to unknown cause.
AMOYSCB37	20	DG(EEK)	UNB	35.74	5/23/2024	3	600' buffer	Nest failed 5/31/24 due to coyote predation.
AMOYSCB38	9	R(AHJ)	UR-Red	35.40	5/27/2024	1	600' buffer	Nest failed 6/1/24 due to coyote predation.
AMOYSCB39	8	DG(CAN)	DG(J0)	35.38	5/29/2024	3	600' buffer	Nest failed 6/1/24 due to coyote predation.

AMOYSCB40	7	DG(AP)	DG(YP)	33.83	5/29/2024	2	600' buffer	Nest failed 6/1/24 due to coyote predation.
AMOYSCB41	23	DG(UL)	DG(CNK)	43.66	5/30/2024	2	600' buffer	Nest failed 6/1/24 due to coyote predation.
AMOYSCB42	22	DG(C0W)	UNB	32.70	5/31/2024	1	600' buffer	Nest failed 6/1/24 due to coyote predation.
AMOYSCB43	13	DG(CM0)	DG(CNC)	24.30	6/2/2024	2	interior	Nest failed 6/16/24 due to abandonment.
AMOYSCB44	22	DG(C0W)	UNB	32.70	6/3/2024	1	600' buffer	Nest failed 6/13/24 due to coyote predation.
AMOYSCB45	1	DG(K0)	UNB	33.30	6/5/2024	1	600' buffer	Nest failed 6/7/24 due to unknown cause.
AMOYSCB46	20	DG(EEK)	UNB	35.73	6/11/2024	2	600' buffer	Nest failed 6/19/24 due to predation by unknown predator.
AMOYSCB47	1	DG(K0)	UNB	33.54	6/13/2024	2	600' buffer	Nest failed 6/16/24 due to unknown cause.
AMOYSCB48	8	DG(CAN)	DG(J0)	35.25	6/13/2024	1	600' buffer	Nest failed 6/19/24 due coyote predation.
AMOYSCB49	9	R(AHJ)	UR-Red	35.80	6/15/2024	2	600' buffer	Nest failed 6/25/24 due to unknown cause.