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Shorebird Monitoring and Management at Cape Lookout National Seashore

2025 Annual Report

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Photo 1. Newly hatched piping plover chick sitting in a nest bowl. NPS photo.

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Introduction

Cape Lookout National Seashore (CALO) was established to preserve the natural resources of an undeveloped 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 2025, 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. In 2025, the landform known as Shark Island connected to Cape Point on SCB. Shark Island is not part of Cape Lookout National Seashore and shorebird productivity from that area is not included in this report. 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 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. Predation 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 2025, WS trapping efforts were focused on SCB and 10 coyotes were trapped and removed from that island. No trapping occurred on NCB or SB. A total of 59 coyotes and 197 raccoons have been removed from CALO by USDA Wildlife Services between 2017 and 2025. In addition, 2025 marked the conclusion of a multi-year North Carolina State University study investigating coyote movement, habitat use, and demographics at CALO and neighboring areas.

Resource Violations

Resource management staff record resource violations they observe throughout the breeding season. In 2025, staff recorded a total of 87 violations. Sixty-seven were on SCB and 20 were on NCB (see Appendix A, Map A1). Staff recorded 34 vehicles in bird closures, 19 dogs of leash, 16 pedestrians in bird closures, 4 vehicles in turtle closures, 13 vehicles otherwise out of bounds, and one instance of metal detector use. Resource staff corrected 36 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 2025, 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 were observed. 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.

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 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 are typically made monthly from August to March during the non-breeding season. However, in 2025 non-breeding surveys were not performed in January, February, March, or October due to staffing shortages and a lapse of funding in October. 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 10, Mile 14, Mile 15, Mile 16, Old Drum Inlet, New Drum Inlet, Ophelia Spit, Plover Inlet, 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 is open for recreational use with some limitations.

In accordance with the ORV Plan, the northern mile of SCB at the Plover Inlet site is closed to vehicles once chicks hatch. 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.

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 2025. 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 25 piping plover pairs were identified at CALO in 2025. Eight chicks were fledged, resulting in an overall productivity of 0.32 chicks per pair. Twenty-two pairs were confirmed by nesting attempts, while three pairs held territories during the nesting season, but no nests were found.

It is unclear if these three unconfirmed pairs had undetected nests or simply did not nest. However, it is assumed that any potential undetected nests did not produce fledglings. All 25 pairs that held territories, confirmed and unconfirmed, are included in productivity estimates.

Three pairs nested on SCB, and 22 pairs held territories on NCB. Birds nested in 10 distinct areas (Table 1). There were 29 documented nesting attempts made in 2025. The earliest nest initiation was on April 10 and the latest was on July 9. Twenty-four nests were on NCB and five were on SCB. Of the 29 nests, seven were re-nests. Eighteen nests hatched and eight chicks fledged from four different broods. A total of 89 eggs were documented with an average clutch size of 3.07 eggs. Field staff observed 32 hatched chicks but estimated an additional 17 chicks likely hatched but were lost before being observed. Productivity for CALO was 0.32 chicks fledged per pair, compared to an average productivity of 0.51 over the previous 25 seasons. Table 2 contains nesting success data from 2000 to 2025. Figure 1 illustrates the number of pairs and chicks fledged from 1989 to 2025. Refer to Appendix A, Map A2 for a detailed map of nest and territory sites and Appendix B, Tables B1 and B2 for individual nest productivity data for 2025.

Table 1. Piping plover reproductive success data by nesting site in 2025. Asterisked pair counts include an unconfirmed pair.

Island	Nesting Area	Number of Pairs	Hatch Success	Fledge Success (chicks/pair)
North Core Banks	Portsmouth Flats	4*	0.25	0.25
North Core Banks	Kathryn Jane Flats	5	0.57	0.00
North Core Banks	Swash Inlet	2	0.67	0.00
North Core Banks	Mile 10	2	1.00	0.50
North Core Banks	Mile 15	1	1.00	3.00
North Core Banks	Mile 16	1	1.00	0.00
North Core Banks	Old Drum Inlet	3*	0.33	0.00
North Core Banks	New Drum Inlet	3*	1.00	1.0
North Core Banks	Ophelia Spit	1	1.00	0.00
South Core Banks	Plover Inlet	3	0.6	0.00

Table 2. Summary of piping plover reproductive success data at CALO from 2000 to 2025.

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
2025	29	25	89	18	62%	49	55%	8	16%	0.32

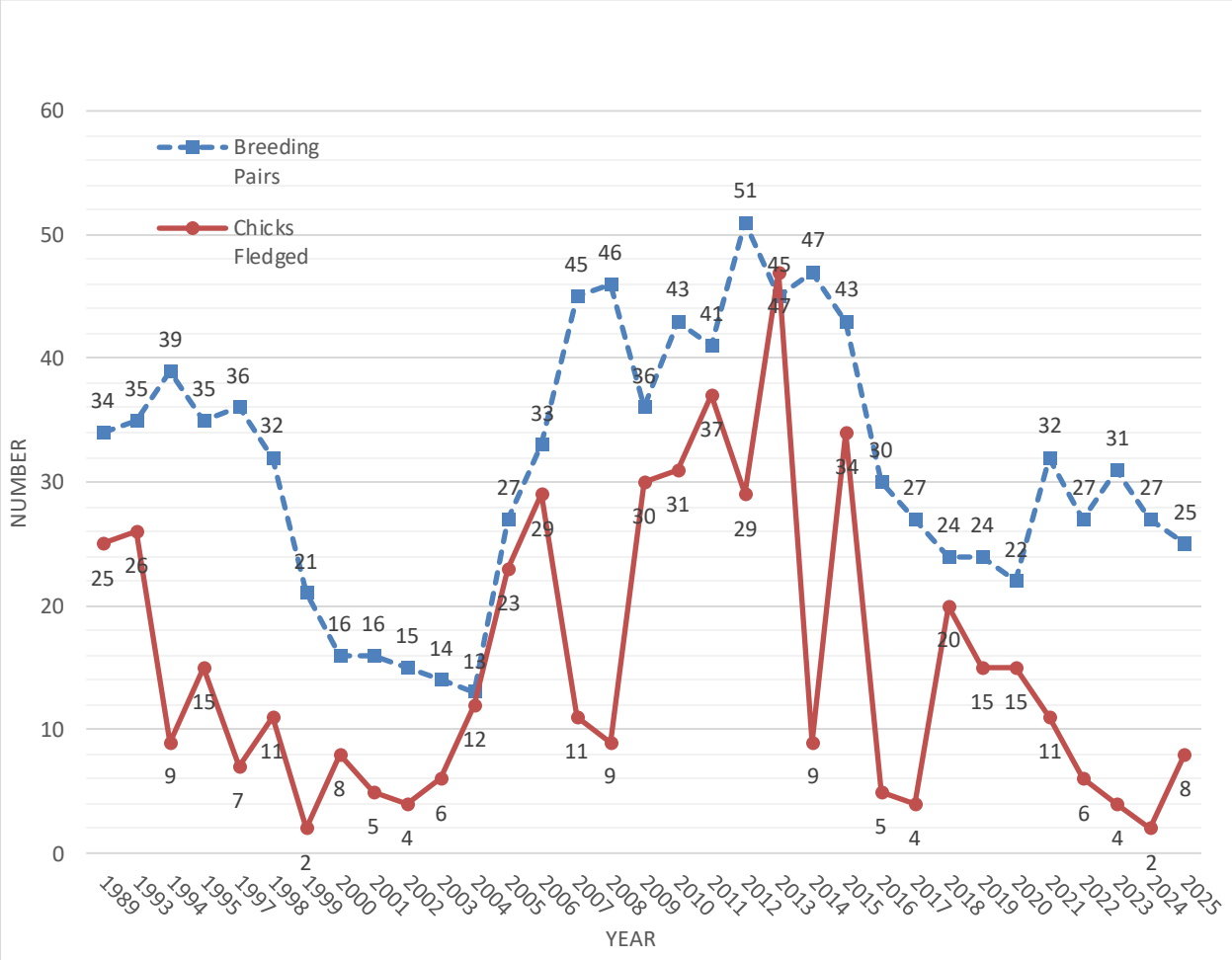

Figure 1. The number of piping plover breeding pairs and number of chicks fledged by year at CALO from 1989 to 2025.

Nest Failures and Chick Mortality

In 2025, predator exclosures were used to protect 16 (55%) nests. Of the nests with exclosures, 12 (75%) hatched. The cause of nest failure was unknown for the four exclosed nests that did not hatch. Predator exclosures were not used on 13 (45%) nests and six of these nests hatched (46%). In total, 11 nests did not hatch; eight were lost for unknown reasons and three were predated (Table 3). Coyote, ghost crab, and an unidentified mammalian predator caused the failure of the three predated nests.

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 49 chicks hatched in 2025 and eight of those survived to fledging (16%). Fourteen of the hatched nests suffered complete brood loss. All 41 chick losses were classified as unknown.

Table 3. Causes of piping plover nest failure in 2025.

Nesting Site	Nests	Total Lost	Predation	Unknown
Portsmouth Flats	4	3	0	3
Kathryn Jane Flats	7	3	0	3
Swash Inlet	3	1	1	0
Miles 10	2	0	0	0
Mile 15	1	0	0	0
Mile 16	1	0	0	0
Old Drum Inlet	3	2	0	2
New Drum Inlet	2	0	0	0
Ophelia Spit	1	0	0	0
Plover Inlet	5	2	2	0
Total	**29**	**11**	**3**	**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, colonial waterbird chicks, and sea turtle hatchlings from approximately May 28 to July 19. This area was closed to recreational ORVs and only NPS monitors were allowed to operate vehicles in this area. Piping plover chicks were present at Ophelia Inlet from May 29, when the first nest hatched, to July 2, when the last brood failed. No broods were observed using the ocean beach on NCB and no ORV closures were established for piping plovers on that island in 2025.

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 2025, brood locations were

recorded in a GIS to track brood movements and foraging 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 averaged 1.42 acres and ranged from 0.92 to 1.70 acres (see Appendix A, Map A3). Broods stayed relatively close to nesting locations in 2025, with the farthest distance traveled from a nest being only 0.15 miles. Brood range analysis was not conducted for one fledged chick as the chick was only observed after it had fledged.

Migrating and Wintering Piping Plovers

Park wide non-breeding piping plover surveys were conducted monthly in August, September, November, and December in 2025. Surveys were not conducted in January, February, March, or October due to staff shortages and a lapse in government funding. A total of 393 piping plovers were documented during non-breeding surveys from 120 separate observations (see Appendix A, Map A4; Appendix C). The highest number of piping plovers seen during non-breeding surveys was 262 in August throughout CALO (Table 4).

Of the 393 birds observed, 293 (75%) were recorded as unbanded and 31 (8%) were recorded as banded. Of the 31 observations of banded birds, field staff obtained full band combinations for 20. Sixty-nine (18%) 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 four observations totaling 129 piping plovers during 2025. These were typically opportunistic sightings and did not follow any survey protocol.

Table 4. Number of non-breeding piping plover individuals observed during non-breeding surveys each month of 2025.

Island	January	February	March	August	September	October	November	December
NCB	-	-	-	168	41	-	1	3
SB	-	-	-	7	7	-	18	12
SCB	-	-	-	87	30	-	8	11
Total	**No survey**	**No survey**	**No survey**	**262**	**78**	**No survey**	**27**	**26**

Banding

Of the 50 breeding individuals at CALO, 24 (48%) were banded, 25 (50%) were unbanded, and one (2%) had an unknown banding status. Four (16%) pairs were completely unbanded while 20 (80%) pairs had at least one individual banded. Of note, one of these banded birds, GF(0M6), has nested at CALO during nine nesting seasons and has fledged a total of four chicks. No additional adults or chicks were banded at CALO during the 2025 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. No eggs were floated at CALO in 2025.

Discussion

Piping plover productivity at CALO was below average in 2025. Although the total number of chicks fledged increased relative to recent years, the number of breeding pairs declined. Nest success was slightly above average, with 62% of nests hatching; however, chick survival remained critically low. Only 16% of chicks estimated to hatch survived to fledging, with most losses occurring within the first week post-hatch. There were no direct observations of chick mortality, but the abrupt and targeted disappearance of chicks suggests avian predation as the primary cause. Broods that successfully fledged were observed foraging in smaller, vegetated areas with immediate access to cover, rather than the expansive open flats typically used at CALO, possibly where they are less vulnerable to avian predators.

In addition to low chick survival, limited recruitment of new breeding pairs continues to constrain piping plover productivity at CALO. Unpublished research indicates that recent storm events have increased the availability of nesting habitat; however, this expansion has not resulted in a consistent increase in the number of breeding pairs. While plovers have colonized new nesting areas created by Hurricane Dorian in 2019, many traditional nesting sites have experienced declines in occupancy. For example, New Drum Inlet supported seven breeding pairs in 2018 but only three pairs in 2025. Similarly, Portsmouth Flats declined from seven pairs in 2018 to four pairs in 2025. These patterns suggest that storm-created habitat is primarily redistributing existing pairs rather than recruiting additional breeders. This lack of recruitment may reflect poor productivity in recent years or there may be other unidentified limiting factors.

Staffing limitations continue to impact piping plover monitoring and management at CALO. In 2025, breeding pairs were distributed across ten nesting sites, compared to approximately five sites prior to the 2020 nesting season. This increased spatial dispersion, combined with the cryptic nature of nesting plovers at CALO, limited the ability of staff to consistently monitor all territories. Three pairs were observed holding territories throughout the breeding season, but nests were not located, making it unclear whether nesting attempts failed before detection or did not occur. Additionally, three broods were detected for nests that were never found. Lastly, broods that survived to fledge proved to be difficult to monitor in 2025. One brood only had a single chick observed during the chick rearing stage until an additional two chicks appeared with the family group after fledging. Another fledge was detected only after fledging through association with known banded breeding adults. Notably, broods that successfully fledged tended to remain concealed and infrequently observed, a behavior that may also have contributed to their reduced predation risk.

Staffing constraints not only reduced confidence in productivity estimates but also limited the implementation of proactive management strategies. In 2025, staff were unable to conduct elective management actions such as ghost crab trapping and camera-based nest monitoring. Although no

nests or broods were documented outside protected areas, limited monitoring capacity increases the likelihood that such events could go undetected prior to disturbance or loss. Furthermore, brief brood observations provide little insight into the mechanisms driving chick mortality. Increasing field staffing levels would allow for more intensive monitoring, improved productivity estimates, and expand management actions. In addition, collaboration with research institutions to address questions related to chick survival would further strengthen 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 2025, 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 22 breeding seasons, 2004 to 2025, 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 2025, 70 pairs of American oystercatchers nested at CALO; 42 pairs on NCB, 26 pairs on SCB, and 2 pairs on SB (Table 5, Appendix A, Map A5; Appendix D). 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 9 and the last nest was found on July 1.

One hundred and twenty-four nests were documented at CALO; 55 on NCB, 67 on SCB, and two on SB. Hatch success was 53% for NCB, 1% for SCB, and 0% for SB. One nest on NCB hatched but it was unknown if the brood fledged or failed. NCB produced 0.69 chicks per breeding pair, SCB produced 0.04 chicks per breeding pair, and SB produced 0 chicks. A total of 30 nests hatched at CALO and fledged 30 chicks producing an overall fledge rate of 0.43 (Table 5). Since 2004, fledge rates have ranged from 0.00 to 1.17 per pair with a mean rate of 0.52 from 2004-2025 (Table 6, Figure 2).

Table 5. American oystercatcher reproductive success by island in 2025.

Island	Breeding Pairs	Total Nests	Nests Hatched	Chicks Fledged	Fledge Rate
South Core Banks	26	55	1	1	0.04
North Core Banks	42	67	29	29	0.69
Shackleford Banks	2	2	0	0	0.00
Total	**70**	**124**	**30**	**30**	**0.43**

Table 6. Summary of American oystercatcher reproductive success data at CALO from 2004-2025.

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
2025	124	30 (24%)	70	30	0.43

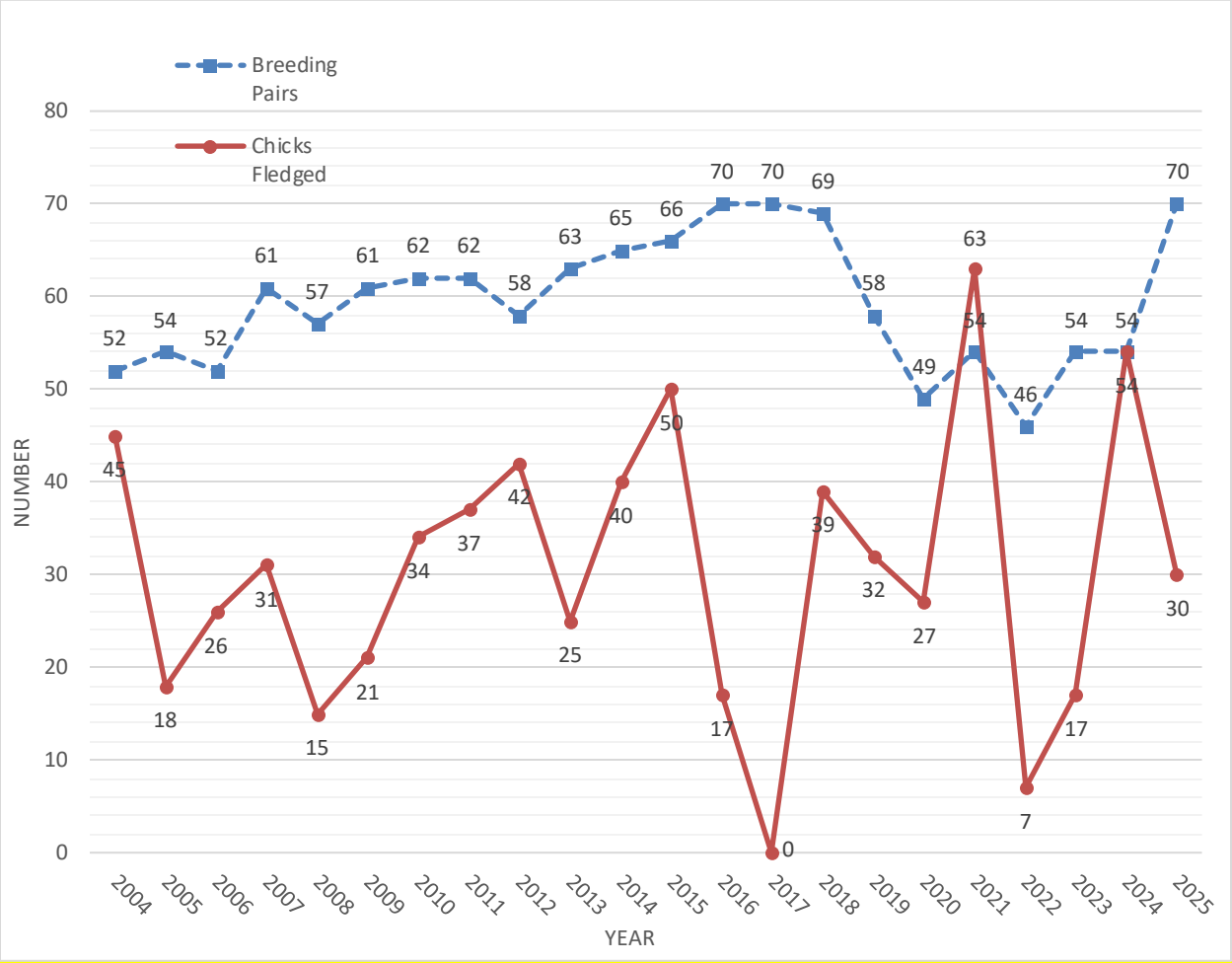

Figure 2. The number of American oystercatcher breeding pairs and number of chicks fledged by year at CALO between 2004 and 2025.

Nest Failures

Ninety-four nests failed in the 2025 breeding season. Forty-nine (52%) were lost due to unknown causes, 39 (41%) were due to predation, four (4%) were abandoned, one (1%) was washed out, and one (1%) had unviable eggs that never hatched (Table 7). Coyote was the primary predator in 2025, accounting for 27 nest loses (Table 8). Six additional nests were predated by an unidentified predator, two by avian predators, two by raccoons, one by nutria, and one by ghost crab. The cause of abandonment of four nests is unknown. Causes of American oystercatcher nests failures from 2013 to 2025 are described in Table 9.

Table 7. Causes of American oystercatcher nest failure in 2025.

Island	Predation	Abandoned	Flooding	Unviable eggs	Unknown
South Core Banks	31	1	1	0	33
North Core Banks	8	3	0	1	14
Shackleford	0	0	0	0	2
Total	**39**	**4**	**1**	**1**	**49**

Table 8. Recorded American oystercatcher nest predators in 2025.

Island	Coyote	Raccoon	Ghost crab	Avian	Nutria	Unidentified Predator
South Core Banks	26	0	1	2	0	2
North Core Banks	1	2	0	0	1	4
Shackleford	0	0	0	0	0	0
Total	**27**	**2**	**1**	**2**	**1**	**6**

Table 9. Causes of American oystercatcher nest failure, 2013-2025.

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
2025	124	94 (75%)	39 (41%)	1	0	4	49

Chick Mortality and Movement

CALO staff observed 63 chicks from 30 hatched nests. However, chicks are often difficult to detect and can be lost before technicians are able to observe them. CALO staff estimates that 72 chicks likely hatched. Thirty of these 72 chicks successfully fledged, with a chick survival probability of 42%. Eleven of the hatched nests suffered complete brood loss and the fate of chicks from one nest was not determined. The cause of chick loss was unknown for nine of the broods. Field staff observed all three chicks from one brood crushed by ORVs in an area open to driving where a vehicle detour was not possible. Two chicks from a second brood were found dead inside an active waterbird colony with wounds consistent with interspecies aggression.

In 2025, 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 1.49 acres to 26.57 acres, with an average size of 9.22 acres (See Appendix A, Map A6). The farthest distance a brood traveled from their nest site was 0.41 miles.

Banding

Twenty-two chicks on Core Banks were captured by CALO staff and banded with individual field readable codes in 2025. Of the 139 adults nesting at CALO, 91 (65%) were banded, 44 (32%) were unbanded, and four had unknown banding status. One individual, DG(CNC), swapped mates midseason and was part of two separate pairs. Four pairs had both adults unbanded. See Appendix D for nesting pair re-sight data and 2025 chick bands.

Discussion

The 2025 American oystercatcher breeding season was marked by an increase to 70 breeding pairs, matching peak counts previously documented in 2016 and 2017. The number of breeding pairs on NCB increased by 35% from 2024, while SCB experienced a more modest increase of 13%. Nesting activity also resumed on SB after no nesting was documented there in 2024. This increase in breeding pairs may reflect recruitment from the highly productive 2021 breeding season, which produced a record 63 fledglings that are now reaching breeding age; however, this hypothesis requires confirmation through examination of band and resight data.

Productivity and the factors influencing it varied substantially by island. On NCB, 52% of nests survived to hatch, and 41% of chicks survived to fledge. While productivity was overall good on this island, interactions with ORVs were a concern. Since Hurricane Dorian in 2019 destroyed much of the island's backroad, large areas of continuous open habitat now connect the oceanside and soundside of the island. American oystercatcher broods use all portions of this habitat, and there are limited opportunities to route vehicles away from active broods. Three chicks from a single brood were confirmed to have been struck and killed by ORVs in an area where a vehicle detour was not possible. Several additional broods were observed in areas open to vehicle traffic, and vehicles were documented violating closures in areas where chicks were present. Some of these broods survived to fledge, while others suffered partial or complete brood losses.

On SCB, poor productivity continues to be driven primarily by coyote predation. Coyotes were documented predating 26 nests, and they were likely responsible for additional nest losses where tracks were obscured by wind or rain and causes were classified as unknown. Most nests were predated within the first week of incubation, suggesting the presence of a specialist predator. Only one of 67 nests on SCB survived to hatch, producing a single fledgling.

The removal of ten coyotes between April and July 2025 did not result in improved American oystercatcher productivity. This may be due, in part, to the timing of removals, as five coyotes were

removed in July, after most nesting attempts had already failed. Recent unpublished research indicates that individual coyotes can traverse the entire island in a single day, meaning that a single individual or small group of specialized coyotes can continue to exert substantial predation pressure despite removal efforts.

Little is known about the fate of nesting attempts on SB due to their short duration, but coyote presence is suspected to be significantly limiting nesting success on that island as well.

Overall, CALO remains a productive site for American oystercatchers; however, breeding success varies considerably among islands and between years. Adaptive management approaches that can respond to shifting sources of nest loss and chick mortality are essential. Continued coyote removal on SCB is recommended, but additional management strategies should be explored to address persistent predation pressure. Given that complete eradication of coyotes at CALO is unlikely, a combination of management tools will likely be necessary to sustain American oystercatcher nesting populations on SCB and SB.

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, Ophelia Inlet, New Drum Inlet, Old Drum Inlet, Swash 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 colonies that were active on Core Banks during the window and results were shared with state biologists.

Results

In 2025, 34 colonial waterbird colonies were observed at CALO (Table 10). Seventeen colonies were on NCB, 16 were on SCB, and one was on Morgan Island (Appendix A, Map A7). There were no colonies on SB. Of the 34 colonies, 25 were single species colonies and nine 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 colonies occupied reoccurring nesting sites that were posted at the beginning of the season. Fourteen colonies were observed outside of the posted areas and were subsequently posted. Two colonies were rated as high success, seven were rated as medium success, 14 were rated as low success, and 10 were rated as having no success.

Mixed colonies at Old Drum Inlet on NCB were highly successful and produced large numbers of chicks. Peak chick counts of 158 black skimmer chicks, 6 gull-billed tern chicks, and 6 common tern chicks were observed at Old Drum Inlet on August 9. In collaboration with North Carolina Audubon, 30 black skimmer chicks were banded at this site.

Six hundred and twenty-three least tern pairs were counted at CALO during the annual least tern census window (Figure 3). In addition, 424 black skimmer pairs, 50 gull-billed tern pairs, and seven common tern pairs were counted during the census window. Census pair counts for least terns, black skimmers, and gull-billed terns were well above the 19-year averages.

Table 10. Summary of colonial waterbird colonies at CALO in 2025 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
NC12	NCB	2.00	North Portsmouth	10 LETE	10 LETE	low
NC10	NCB	2.61	North Evergreen	22 LETE	22 LETE	low
NC05	NCB	2.87	South Evergreen	142 LETE, 149 BLSK, 4 COTE	142 LETE, 149 BLSK, 4 COTE	medium
NC08	NCB	3.77	South Portsmouth	10 LETE	10 LETE	low
NC09	NCB	5.94	High Hills	5 LETE	16 LETE	none
NC15	NCB	6.40	Kathryn Jane Flats	12 LETE	52 LETE	low
NC13	NCB	9.23	Swash	10 LETE	31 LETE	medium

NC17	NCB	10.50	Mile 10	not active	6 LETE	low
NC16	NCB	17.50	Mile 17	13 LETE	31 LETE	medium
NC01	NCB	18.50	North Old Drum	54 LETE, 31 BLSK, 22 GBTE	42 LETE, 174 BLSK, 13 GBTE, 2 COTE	high
NC02	NCB	19.00	South Old Drum	171 LETE, 171 BLSK, 28 GBTE	171 LETE, 171 BLSK, 28 GBTE	high
NC14	NCB	21.25	Mile 21	14 LETE	14 LETE	low
NC03	NCB	21.55	North New Drum	24 LETE	66 LETE	medium
NC04	NCB	21.90	New Drum Flats	26 LETE	48 LETE	none
NC11	NCB	22.21	Mile 22	14 LETE	14 LETE	none
NC07	NCB	23.00	North Ophelia	23 LETE	32 LETE	low
NC06	NCB	23.25	South Ophelia	31 LETE	36 LETE, 93 BLSK, 12 GBTE	low
SC08	SCB	23.40	Plover Inlet A	73 BLSK, 3 COTE	12 LETE, 33 BLSK, 1 GBTE, 7 COTE	none
SC14	SCB	23.71	Plover Inlet B	Not active	17 LETE	none
SC07	SCB	23.88	Plover Inlet C	15 LETE	8 LETE, 2 BLSK, 2 COTE	low
SC01	SCB	24.34	Plover Inlet D	no count	32 LETE	low
SC05	SCB	24.83	Plover Inlet E	no count	12 LETE	none
SC04	SCB	25.40	Mile 25	3 LETE	3 LETE	none
SC02	SCB	27.70	Mile 27	2 LETE	3 LETE	None
SC10	SCB	30.78	Mile 31	no count	53 LETE	medium
SC11	SCB	34.35	Mile 34.35	6 LETE	12 LETE	medium
SC06	SCB	34.75	Mile 34.75	8 LETE	8 LETE	low
SC16	SCB	35.43	Mile 35.43	Not active	1 LETE	none
SC12	SCB	35.78	Mile 35.78	Not active	11 LETE	medium
SC09	SCB	35.96	Mile 36	Not active	1 LETE	none
SC13	SCB	38.62	Mile 38	Not active	17 LETE	low
SC03	SCB	43.87	Cape Point	8 LETE	168 LETE, 1 BLSK	low
SC15	SCB	47.61	Power Squadron Spit	Not active	35 LETE	low
MI01	MI		Morgan Island	No count	No count	Not monitored

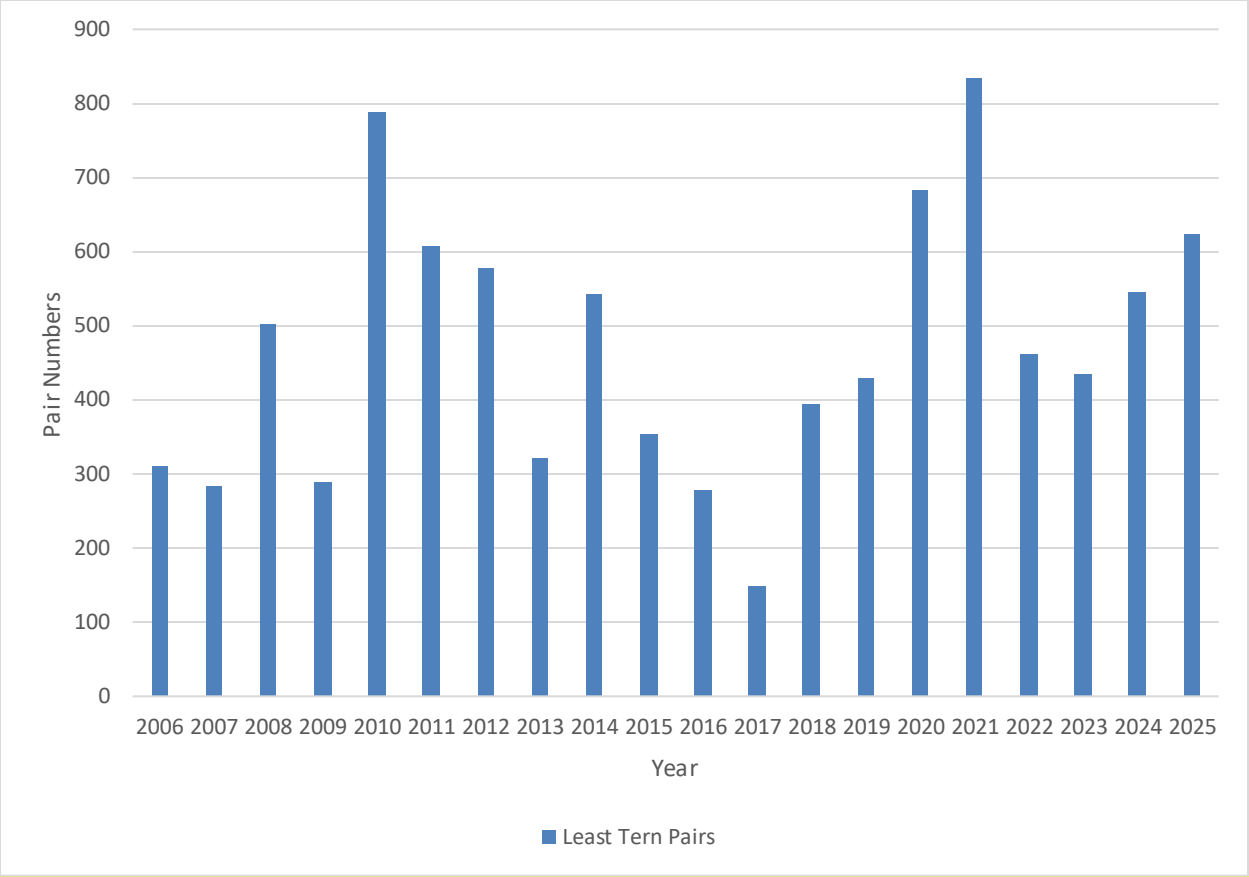

Figure 3. Least tern window census counts at CALO from 2006 to 2025.

Discussion

Highlights of the 2025 colonial waterbird season were the above average pair counts for least terns, black skimmers, and gull-billed terns. Four-hundred and twenty-four black skimmer pairs were counted during the 2025 census window, compared to an average count of 122 during the previous 19 seasons. However, this may be a reflection earlier nesting in 2025 compared to previous year when black skimmer nesting peaks occur after the census window, instead of a true increase in breeding pairs.

Old Drum continues to be a highly successful site to produce skimmer and tern chicks. Other sites including Portsmouth, New Drum, and various smaller upper beach colonies on SCB produced modest numbers of chicks. Large colonies at Plover Inlet and the Cape on SCB had low success, likely due to coyote predation.

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 late-April through the end of September. Surveys were not conducted in March or October due to staffing shortages and a lapse in government funding. Survey frequency and timing followed the International Shorebird Census guidelines for spring and fall. Counts were made near the 5th, 15th, and 25th of the month from April 15 to June 5 and from July 15 to September 25. In 2025, the two-mile section of beach between Ocracoke Inlet to Evergreen Inlet 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 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 1,584 birds counted across the Core Banks (Figure 4). Fall migration peaked on August 25 with 439 red knots counted across the Core Banks. Spring migration from April 15 to June 5 averaged 500 birds across both islands. The fall migration from July 15 to September 25 averaged 143 birds across both islands.

NCB averaged 170 birds per survey throughout the survey period. SCB averaged 126 birds per survey. NCB had the highest count of 1,292 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 40 birds per kilometer. Red knots were distributed over the length of Core Banks with higher concentrations at Portsmouth, Old Drum Inlet, Ophelia Inlet, and Cape Point (Appendix A, Map A8).

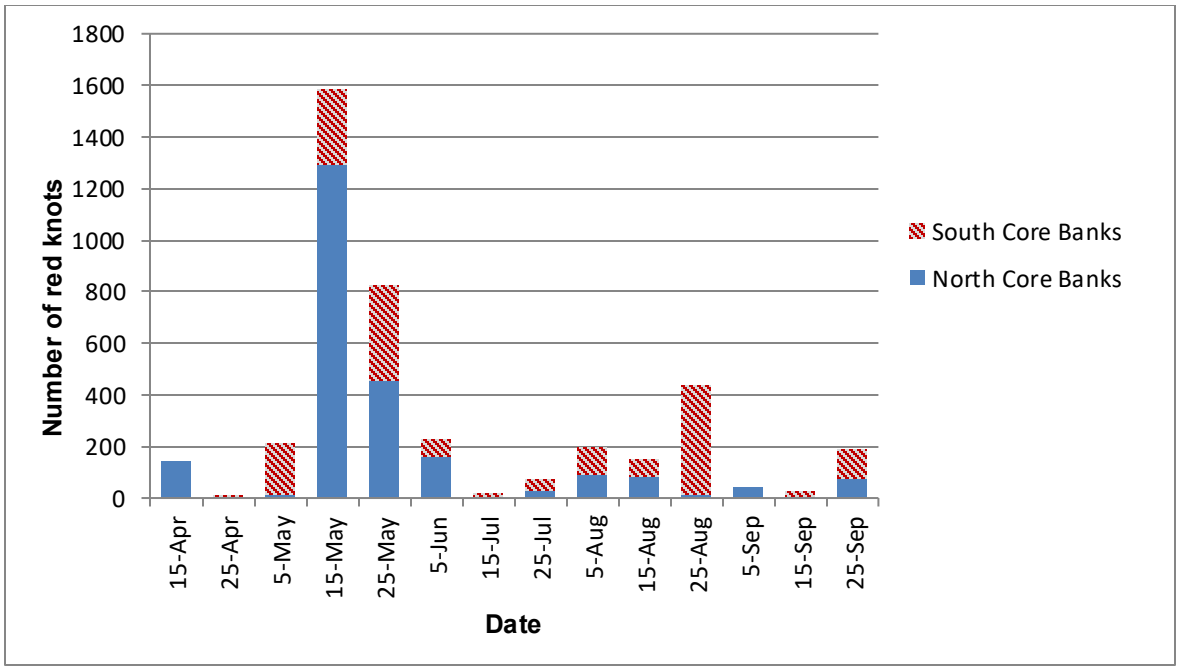

Figure 4. Number of red knots counted at CALO in 2025.

Table 11. Red knot relative abundance on NCB from 1992-2025.

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
2025	May 15	1282	32	40

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 2025 and recorded a total of 75 pairs and 22 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. Five nests and ten broods were recorded during the 2025 season. Wilson's plover pair counts were below the average of 92 pairs from the previous 17 seasons (Figure 6). Counts at Portsmouth Flats, Old Drum Inlet, Plover Inlet, and Power Squadron spit were lower than the previous season, while counts on Shackleford Banks were higher.

Table 12. Wilson's plover census results June1-9, 2025.

Island	Nesting Area	Number of Pairs	Singles
North Core Banks	Ocracoke Inlet	1	0
North Core Banks	Portsmouth Flats	4	4
North Core Banks	Kathryn Kathryn Jane Flats	4	3
North Core Banks	Old Drum Inlet	3	3
North Core Banks	Miles 21	1	1
North Core Banks	New Drum Inlet	6	0
North Core Banks	Ophelia Island/Spit	3	0
South Core Banks	Plover Inlet	25	5
South Core Banks	Cape Point	0	1
South Core Banks	Power Squadron Spit	2	1
Shackleford Banks	Barden Inlet	2	2
Shackleford Banks	Corral Area	15	0
Shackleford Banks	Mile 50-54	5	2
Shackleford Banks	Whale Creek Bay	3	0
Shackleford Banks	Wade Shore	0	0
Shackleford Banks	Beaufort Inlet	1	0

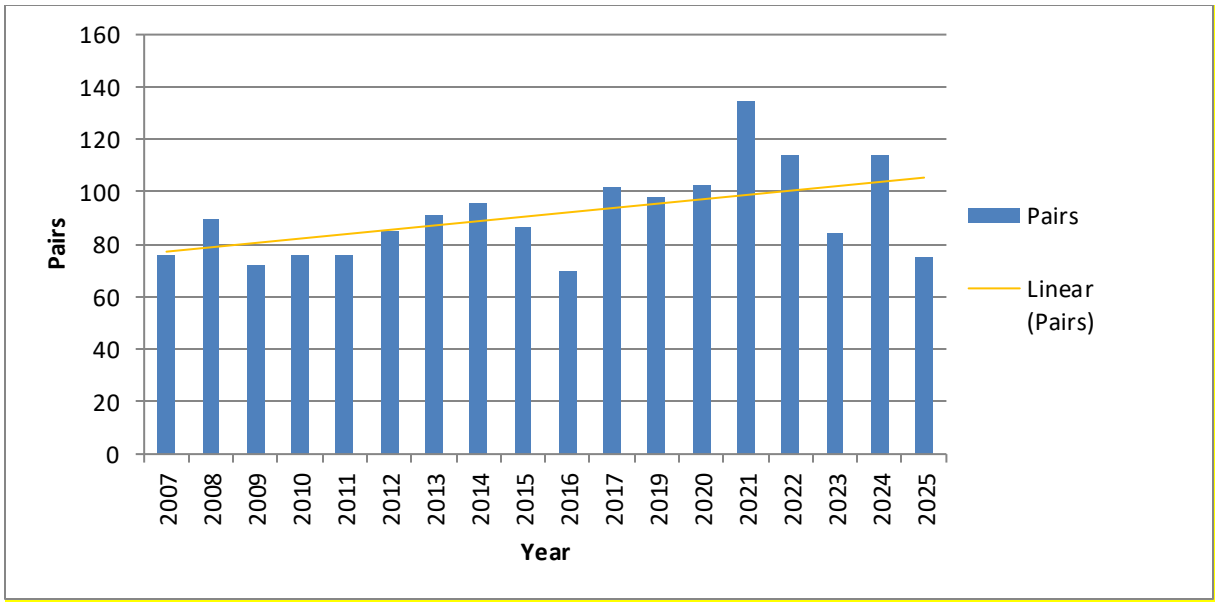

Figure 6. Number of Wilson's plover counted at CALO 2007- 2025.

Conclusions and Recommendations

The 2025 breeding season at CALO was characterized by strong spatial and species-specific variability in productivity, driven largely by predation pressure, habitat configuration, and management capacity. While some species and sites exhibited encouraging levels of productivity, persistent limiting factors—particularly chick survival, predator impacts, and staffing constraints—continue to challenge long-term breeding stability for multiple species.

Piping plover productivity remained below average despite above average hatch success. The continued decline in breeding pairs, coupled with critically low chick survival, indicates that post-hatch mortality is the primary constraint on productivity at CALO. Avian predation is hypothesized to be the dominant source of chick loss, particularly in large, open foraging habitats lacking cover. Storm-driven habitat creation appears to be redistributing existing breeding pairs rather than recruiting new ones, underscoring concerns about limited population recruitment. These challenges were exacerbated by increased spatial dispersion of breeding sites and limited staffing, which reduced monitoring confidence and limited the implementation of proactive management actions.

American oystercatcher breeding activity increased substantially in 2025, reaching levels comparable to historic peaks, suggesting recruitment from previously productive years. However, productivity varied widely among islands. On NCB, fledge success was relatively high but continued to be threatened by ORV interactions in areas where habitat connectivity limits options for effective vehicle routing. On SCB and SB, coyote predation remained the dominant factor limiting nesting success. Intensive coyote removal efforts in 2025 did not yield measurable improvements in productivity, likely due to the presence of specialist predators and the timing of removals relative to

nesting phenology. These findings highlight the need for more adaptive and integrated predator management strategies.

Colonial waterbirds exhibited above-average breeding pair counts in 2025, particularly for least terns, black skimmers, and gull-billed terns. While Old Drum continued to function as a highly productive colony site, productivity at several large colonies on SCB was low, likely due to coyote predation. Elevated black skimmer counts may partially reflect shifts in nesting timelines relative to census timing rather than true population increases, emphasizing the importance of interpreting annual counts for a single site cautiously.

Collectively, these results indicate that CALO continues to support important breeding populations of shorebirds and colonial waterbirds, but productivity is impacted by predation, human disturbance, and limited management capacity. To improve breeding outcomes, the following actions are recommended:

1. **Increase field staffing capacity** to eight qualified technicians to ensure compliance with ORV Plan monitoring and management requirements. Additional field staff would allow for more consistent monitoring and protection across dispersed nesting sites, improve productivity estimates, and enable proactive management actions such as ghost crab trapping and camera-based monitoring for piping plovers, as well as adaptive ORV closure management for American oystercatcher chicks.
2. **Establish research partnerships** to better understand the sources of poor productivity of piping plovers, with an emphasis on identifying the causes of chick mortality.
3. **Refine coyote management strategies**, particularly on SCB and SB, by ensuring removal takes place before the nesting season begins, as well as exploring other strategies such as deterrents and targeted removal of specialists to address the limitations of non-targeted removal alone.

Implementation of these recommendations will help sustain and improve breeding and migratory success of focal species at CALO in the coming years.

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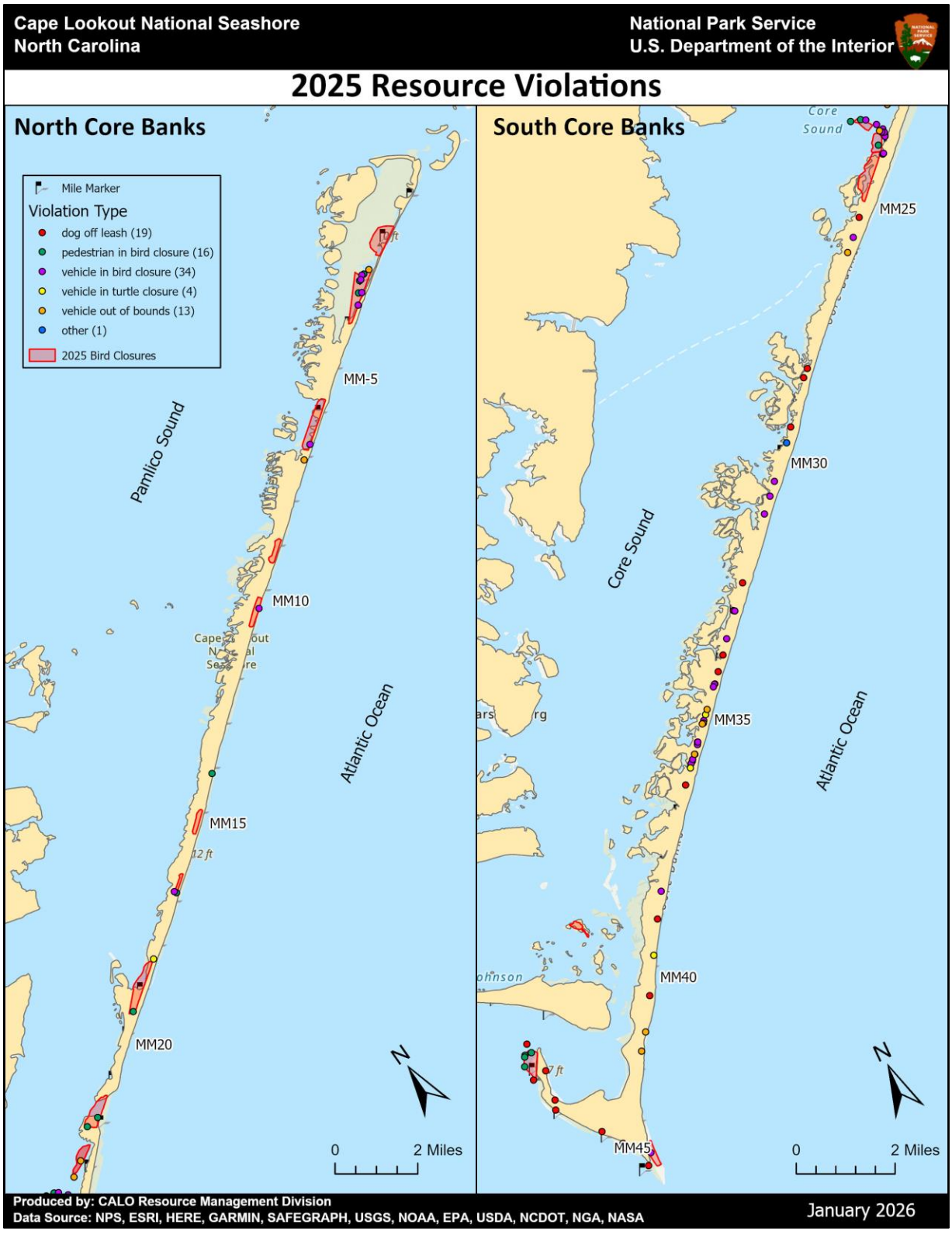
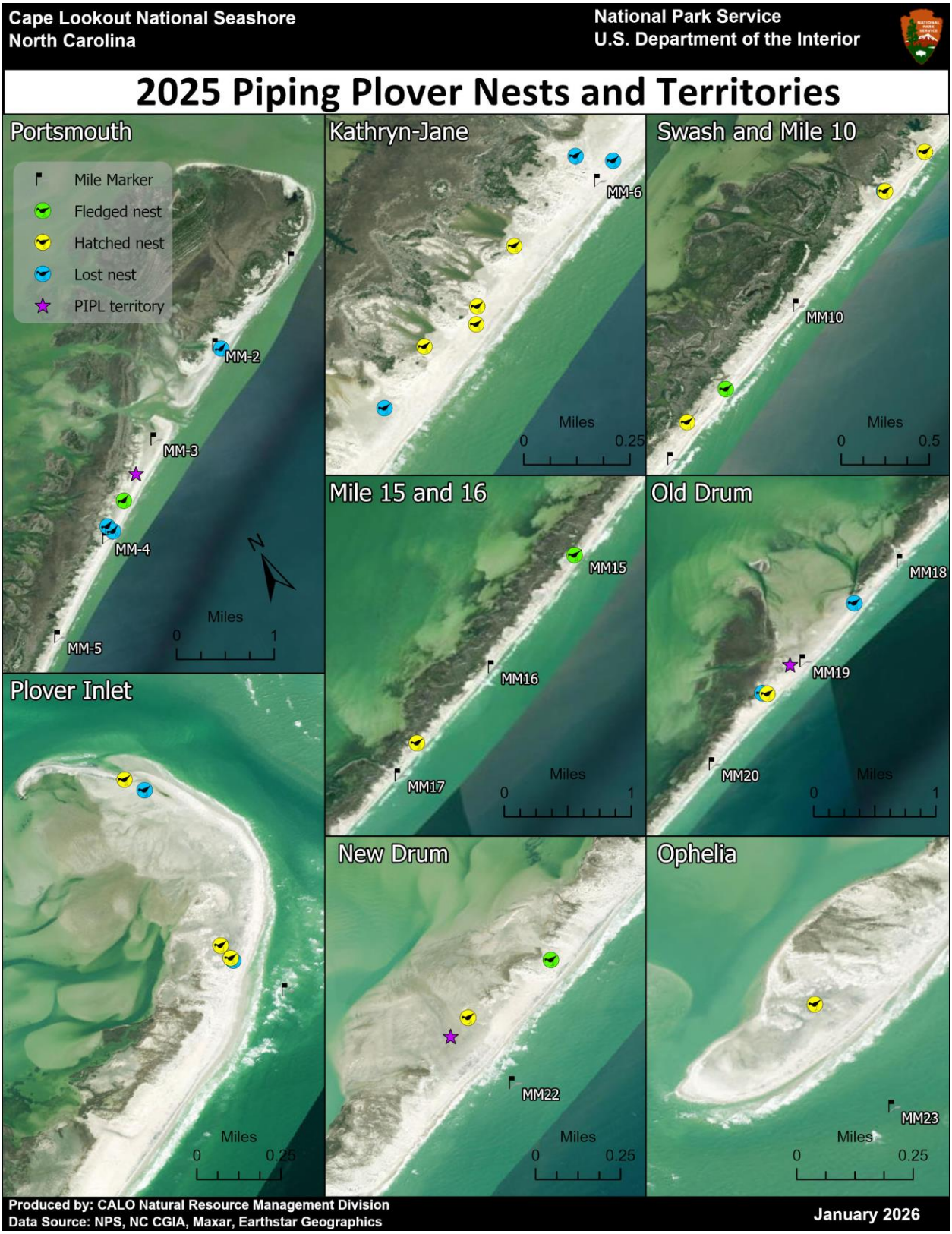
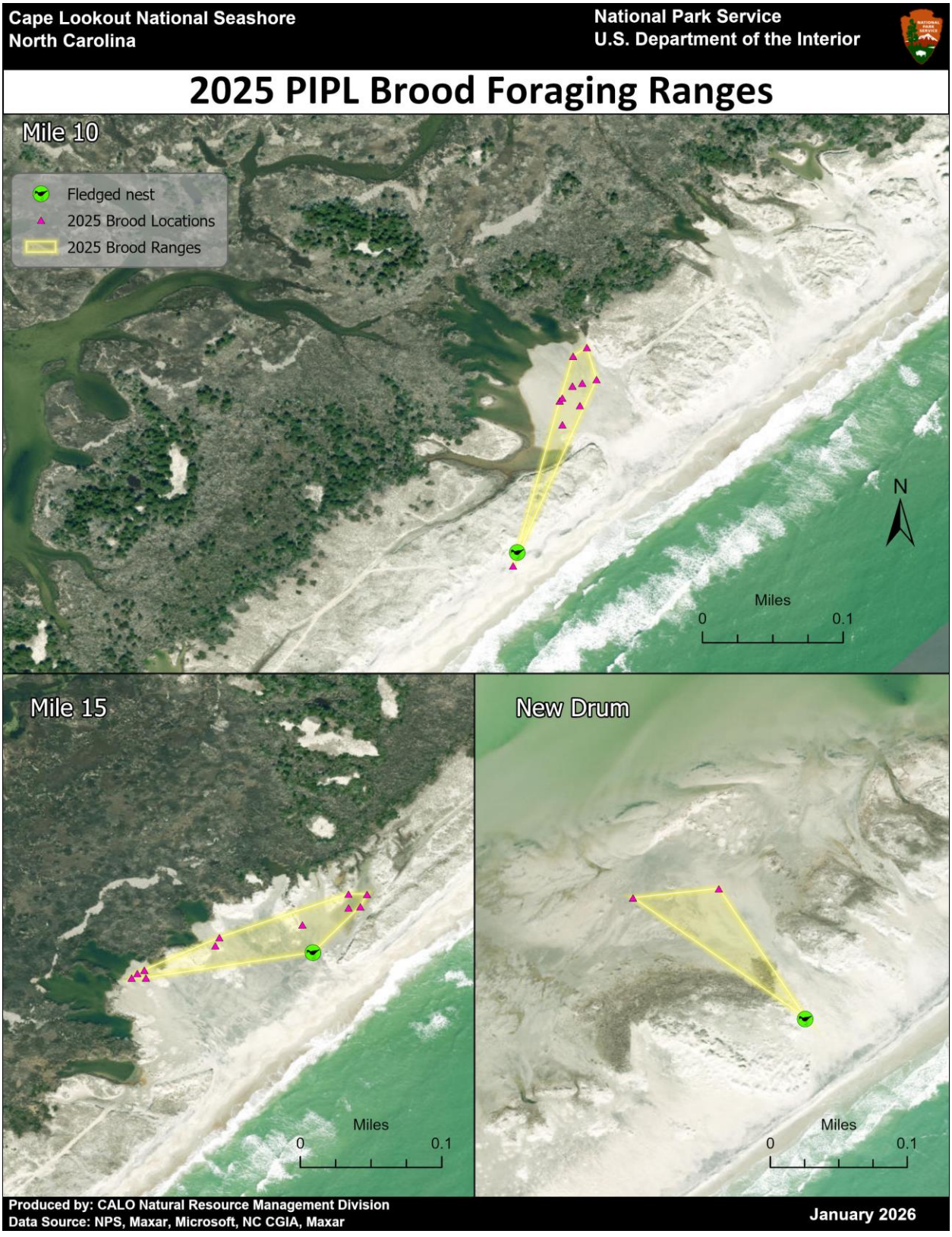
Appendix A. Maps



Map A1. Resource violations at CALO in 2025.

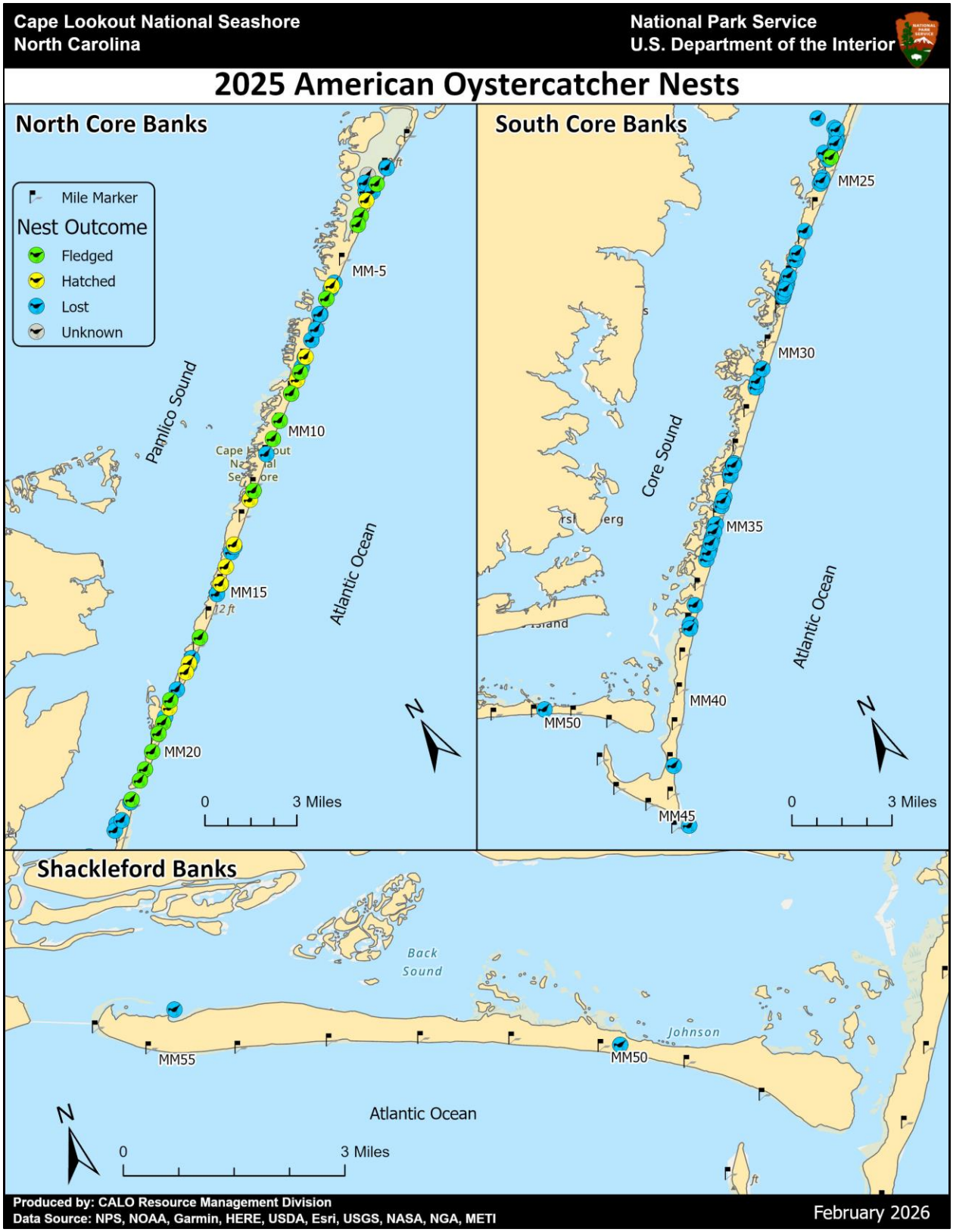


Map A2. Piping plover nest and territories locations at CALO in 2025. Territories are only identified for pairs where nests were not located.



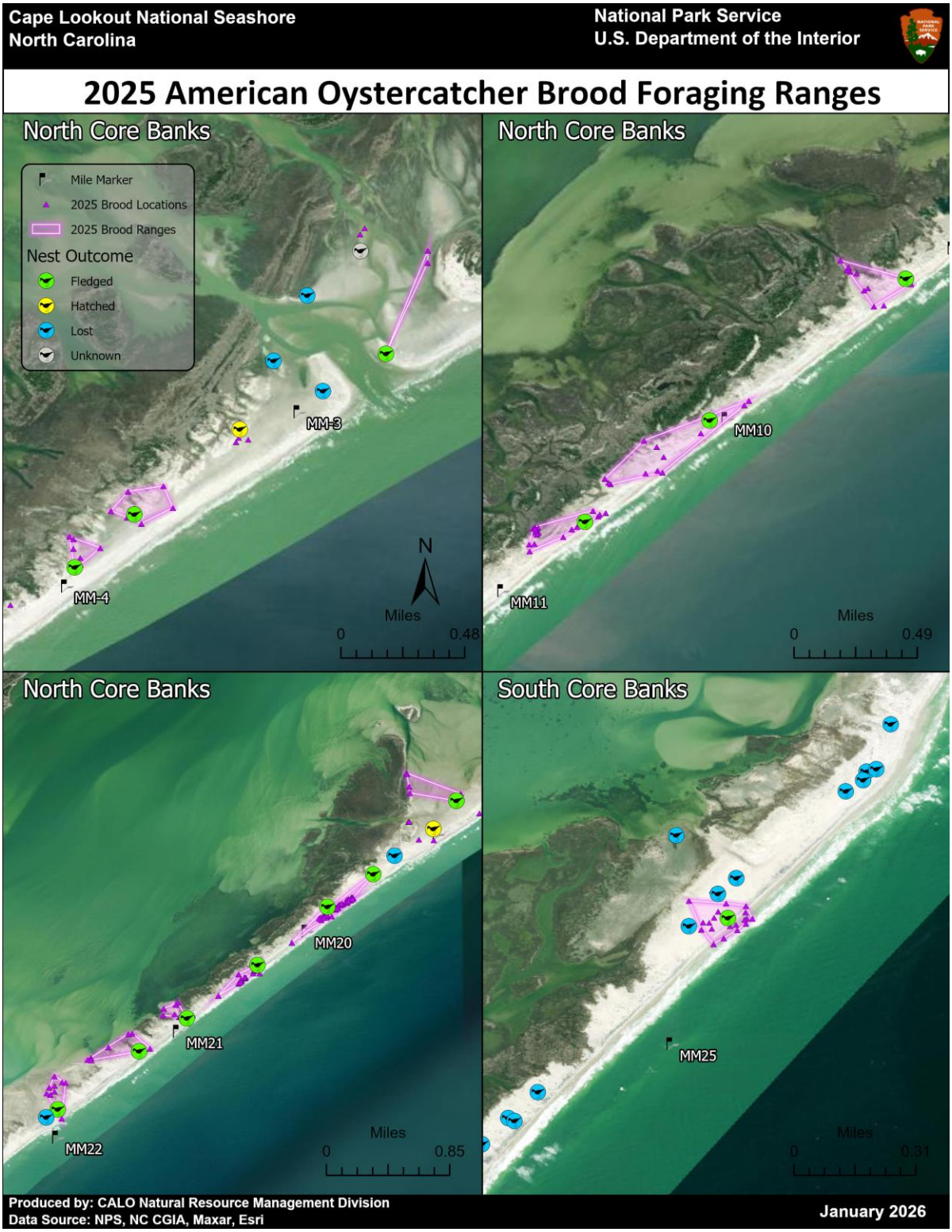
Map A3. Piping plover chick foraging ranges for three broods that fledges at least one chick at CALO in 2025.

Map A4. Non-breeding piping plover locations at CALO in 2025.

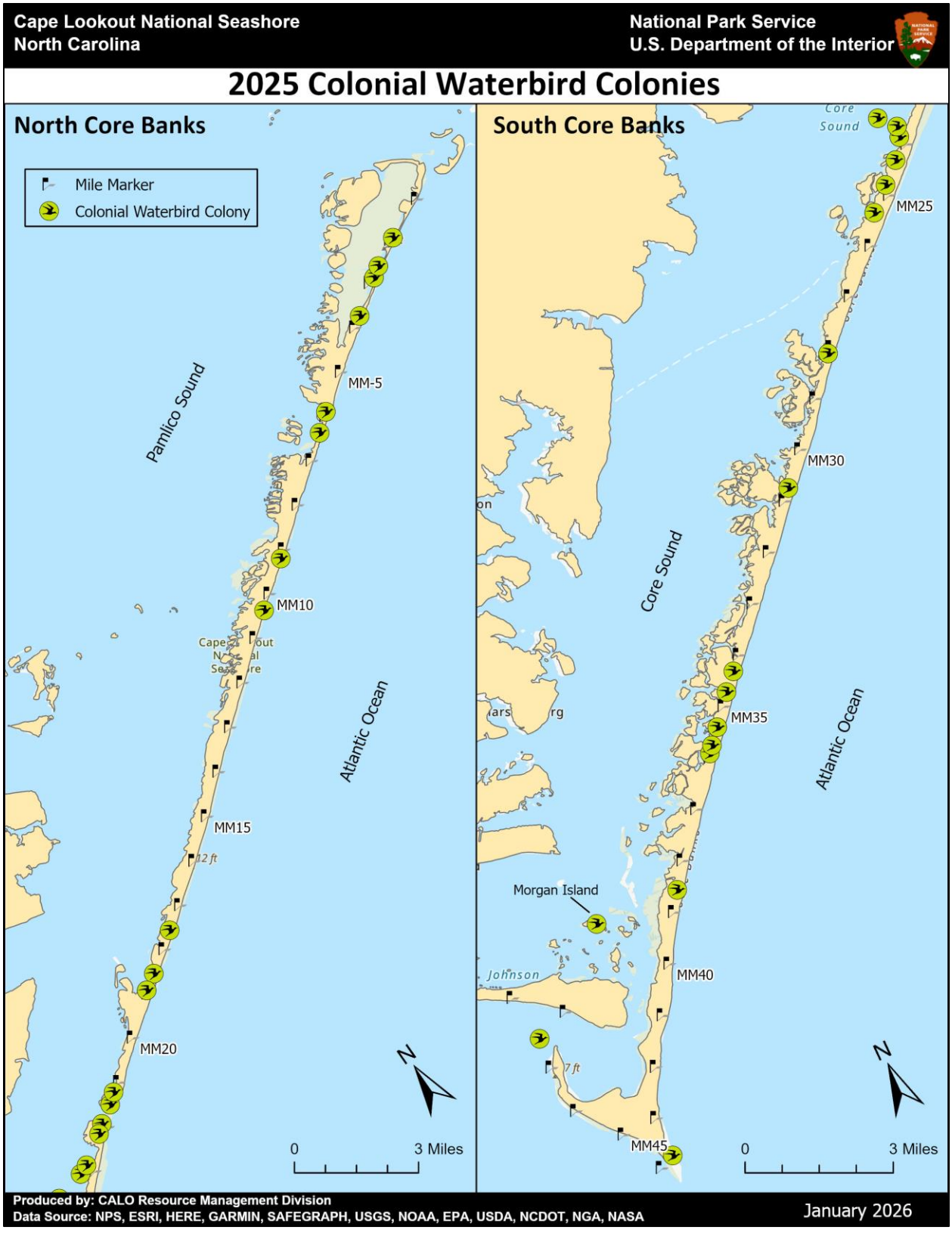


Map A5. American oystercatcher nests at CALO in 2025.

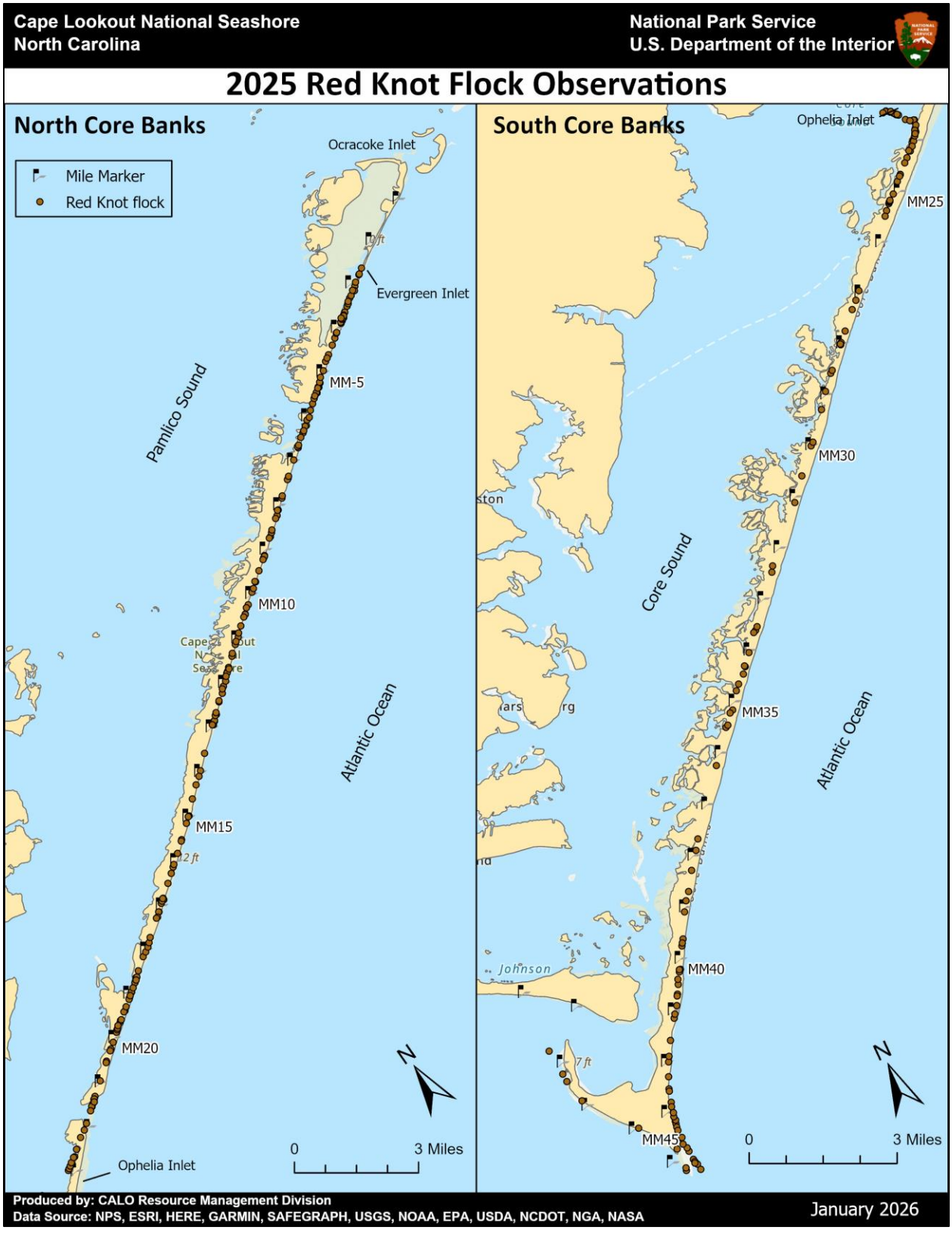
.



Map A6. American oystercatcher brood foraging ranges for a subset of broods that fledged at least one chick at CALO in 2025. Not all fledged broods are shown.



Map A7. Colonial waterbird colony locations at CALO in 2025.



Map A8. Red knot flock observations at CALO in 2025.

Appendix B. 2025 Piping Plover Nesting Data

Table B1. North Core Banks nesting data for 2025. North Core Banks totals: 19 confirmed nesting pairs, 24 total nests, 15 hatched nests, 8 fledged chicks.

Nest ID	Pair	Mile	Site	Adult 1	Adult 2	Found Date	Exclosure Date	Eggs Laid	Nest Fate	Outcome Summary
PIPLNCB01	1	10.55	Mile 10	UNB	UNB	4/21/2025	4/29/2025	3	Fledged	Fledged 1 UNB chick on 6/19/2025 at 31 days old.
PIPLNCB02	2	9.31	Swash	GF(0M6)	UNB	4/26/2025	N/A	3	Lost	Nest failed 5/2/2025 due to predation by undetermined predator.
PIPLNCB03	3	19.39	Old Drum	GF(9KT)	KG:RY	4/27/2025	4/28/2025	4	Hatched	Brood failed by 9 days old on 5/23/2025.
PIPLNCB04	4	6.38	Kathryn Kathryn Jane	GF(EET)	UNB	4/27/2025	N/A	2	Hatched	Brood failed by 5 days old on 5/31/25.
PIPLNCB05	5	15.03	Mile 15	GF(58X)	UNB	4/28/2025	4/29/2025	3	Fledged	Fledged 3 UNB chicks on 6/19/25 at 32 days old
PIPLNCB06	6	9.01	Mile 9	GF(P6A)	UNB	5/1/2025	5/10/2025	3	Hatched	Brood failed by 13 days old on 5/30/25.
PIPLNCB07	7	21.68	New Drum	UNB	UNB	5/4/2025	5/6/2025	4	Fledged	Fledged 3 UNB chicks on 6/28/25 at 32 days old.
PIPLNCB08	8	22.92	Ophelia	KY,-:CO,-	UNB	5/5/2025	5/9/2025	4	Hatched	Brood failed by 3 days old on 6/2/2025.
PIPLNCB09	9	2.05	Portsmouth Flats	GF(U9J)	GF(C2A)	5/8/2025	N/A	3	Lost	Nest failed by 6/4/25 due to unknown cause.
PIPLNCB10	10	6.22	Kathryn Jane	GF(CE3)	UNB	5/8/2025	5/17/2025	4	Hatched	Brood failed by 5 days old on 6/14/25.
PIPLNCB11	11	10.83	Mile 10	GF(938)	UNB	5/12/2025	5/17/2025	4	Hatched	Brood failed by 16 days old on 6/19/25.
PIPLNCB12	12	6.00	High Hills	UNB	UNK	5/17/2025	N/A	3	Lost	Nest failed on 5/23/25 due to unknown cause.
PIPLNCB13	13	3.93	Portsmouth	GF(2H7)	UNB	5/18/2025	N/A	4	Lost	Nest failed on 5/24/25 due to unknown cause.
PIPLNCB14	14	16.77	Mile 16	GF(4M3)	UNB	5/21/2025	N/A	2	Hatched	Brood failed by 10 days old on 6/28/25.
PIPLNCB15	15	18.48	Old Drum	GF(AMT)	UNB	6/4/2025	6/9/2025	3	Lost	Nest failed 6/27/25 due to unknown cause.
PIPLNCB16	16	21.92	New Drum	UNB	UNB	6/12/2025	6/21/2025	4	Hatched	Brood failed by 6 days old on 7/17/25.
PIPLNCB17	6	9.30	Swash	GF(P6A)	UNB	6/14/2025	6/16/2025	4	Hatched	Brood failed by 6 days old on 7/12/25.
PIPLNCB18	17	6.66	Kathryn Jane	UNB	UNB	6/14/2025	6/15/2025	4	Lost	Nest failed 7/14/25 due to unknown cause.
PIPLNCB19	3	19.40	Old Drum	GF(9KT)	KG,-:RY,-	6/16/2025	6/21/2025	3	Lost	Nest failed 7/19/25 due to unkown cause.
PIPLNCB20	10	5.96	High Hills	GF(CE3)	UNB	6/22/2025	6/30/2025	3	Lost	Nest failed 7/21/25 due to unknown cause.
PIPLNCB21	18	10.48	Mile 10	GF(6JN)	UNB	6/28/2025	N/A	1	Fledged	Fledged 1 UNB chick around 6/25/25 at unknown age.
PIPLNCB22	19	6.50	Kathryn Jane	GF(CXM)	GF(T0L)	6/3/2025	N/A	1	Hatched	Brood failed by 6/11/25 due to unknown cause.

PIPLNCB23	13	3.94	Portsmouth	GF(2H7)	UNB	7/9/2025	N/A	1	Lost	Nest failed by 7/19/25 due to unknown cause.
PIPLNCB24	19	6.41	Kathryn Jane	GF(CXM)	GF(T0L)	7/12/2025	N/A	3	Hatched	Brood failed 7/17/25 at 4 days old.

Table B2. South Core Banks nesting data for 2025. South Core Banks totals: 3 confirmed nesting pairs, 5 total nests, 3 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	23.95	Plover Inlet	GF(JHY)	UNB	4/28/2025	N/A	4	Lost	Nest failed 5/5/2025 due to ghost crab predation.
PIPLSCB02	2	23.90	Plover Inlet	OY,-:KO,-	UNB	4/28/2025	5/7/2025	3	Hatched	Brood failed 6/04/2025 due to unknown cause.
PIPLSCB03	3	23.40	Ophelia Inlet	GF(7KM)	UNB	5/10/2025	5/22/2025	4	Hatched	Brood failed by 6/4/2025 due to unknown cause.
PIPlSCB04	3	23.90	Ophelia Inlet	GF(7KM)	UNB	6/15/2025	N/A	3	Lost	Nest failed 6/19/2025 due to coyote predation.
PIPLSCB05	1	23.97	Plover Inlet	GF(JHY)	UNB	6/19/2025	N/A	2	Hatched	Brood failed by 7/3/25 due to unknown cause.

Appendix C. Monthly Counts of Non-Breeding Piping Plovers 2008-2025

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 2025.

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
August-25	168	87	7	262
September-25	41	30	7	78
November-25	1	8	18	27
December-25	3	11	12	26

Appendix D. 2025 American Oystercatcher Productivity Data

Table D1. North Core Banks productivity data for 2025. North Core Banks totals: 42 breeding pairs, 55 total nests, 29 hatched nests, 29 fledged chicks.

Nest	Pair	Mile	Adult 1	Adult 2	Found Date	Eggs	Outcome Summary
AMOYNCB01	1	15.16	DG(EKH)	UNB	4/9/2025	3	Brood failed 5/5/25 due to unknown cause.
AMOYNCB02	2	19.48	DG(M0)	UNB	4/10/2025	3	Fledged 3 chicks. DG(E4X), DG(E5P), DG(E4U) on 6/23/25 at 48 days old.
AMOYNCB03	3	10.06	DG(EH6)	UNB	4/10/2025	3	Fledged 2 chicks. DG(E95) on 7/21/25 at 75 days old and DG(E96) on 8/4/25 at 89 days old.
AMOYNCB04	4	5.96	DG(CMP)	DG(C7T)	4/10/2025	3	Nest failed 4/21/25 due to unknown reason.
AMOYNCB05	5	17.61	DG(EU6)	UNB	4/14/2025	3	Brood failed 5/31/25 due to unknown reason.
AMOYNCB06	6	14.50	DG(EN0)	DG(EP3)	4/14/2025	4	Brood failed 5/17/25 due to unknown reason.
AMOYNCB07	7	10.66	DG(CE1)	DG(T3)	4/14/2025	3	Fledged 3 chicks. DG(E98), DG(E99), UNB on 6/17/25 at 38 days old.
AMOYNCB08	8	8.40	DG(CA)	UNB	4/14/2025	3	Nest failed 4/24/25 due to raccoon predation.
AMOYNCB09	9	19.80	R(AUN)	UNB	4/14/2025	3	Fledged 2 chicks. DG(E9X) on 6/21/25 at 41 days old and UNB on 7/12/25 at 62 days old.
AMOYNCB10	10	21.98	DG(EH0)	UNB	4/15/2025	2	Nest failed 5/25/25 due to eggs being unviable.
AMOYNCB11	11	16.83	DG(EKN)	UNB	4/15/2025	3	Fledged 1 chick. DG(CCU) on 6/21/25 at 40 days old.
AMOYNCB12	12	20.40	DG(C93)	UNB	4/16/2025	3	Fledged 1 chick. DG(E9U) on 6/23/25 at 41 days old.
AMOYNCB13	13	21.90	DG(TF)	UNB	4/16/2025	3	Fledged 2 chicks. DG(E93) and DG(E94) on 6/27/25.
AMOYNCB14	14	9.21	DG(WF)	DG(CK0)	4/16/2025	3	Fledged 1 chick. DG(E9Y) on 6/28/25 at 48 days old.
AMOYNCB15	15	12.53	DG(CY6)	DG(C5W)	4/16/2025	2	Brood failed 6/2/25 due to unknown cause.
AMOYNCB16	16	8.77	DG(EKT)	DG(ENH)	4/17/2025	1	Brood failed 5/20/25 due to unknown reason.
AMOYNCB17	17	13.94	DG(C6R)	DG(CML)	4/18/2025	3	Brood failed 5/18/25 due to human interaction, chicks crushed by ORV.
AMOYNCB18	18	6.27	DG(CE3)	UNB	4/18/2025	3	Fledged 2 chicks. DG(E90) and UNB on 6/22/25 at 40 days old.
AMOYNCB19	19	3.70	DG(CY)	UNB	4/18/2025	2	Fledged 2 chicks. DG(E9F) and UNB fledged 6/24/25 at 43 days old.
AMOYNCB20	20	2.70	DG(EWL)	UNB	4/19/2025	3	Fledged 1 chick. UNB on 6/26/25 at 48 days old.
AMOYNCB21	21	2.11	UNB	UNB	4/19/2025	3	Nest failed 5/8/25 due to unknown reason.
AMOYNCB22	22	8.06	DG(C0H)	DG(EFA)	4/20/2025	2	Brood failed 5/20/25 due to unknown reason.
AMOYNCB23	23	3.95	DG(EKJ)	UNB	4/20/2025	3	Fledged 1 chick. DG(E9P) on 6/26/25 at 39 days old.

AMOYNCB24	24	3.21	DG(EE2)	DG(C45)	4/20/2025	2	Brood failed 5/24/25 due to unknown reason.
AMOYNCB25	25	18.81	DG(TN)	UNB	4/21/2025	3	Fledged 1 chick. DG(E5L) on 7/11/25 at 64 days old.
AMOYNCB26	26	20.92	DG(C08)	DG(C07)	4/21/2025	3	Fledged 2 chicks. DG(E9W) and DG(EWM) on 6/27/25 at 48 days old.
AMOYNCB27	27	22.70	DG(EJ9)	UNB	4/21/2025	3	Nest failed 4/26/25 due to unknown reason.
AMOYNCB28	28	19.30	DG(EN4)	DG(CEL)	4/23/2025	3	Nest failed 5/15/25 due to unknown reason.
AMOYNCB29	29	11.11	DG(EP1)	DG(EUC)	4/24/2025	3	Nest failed 5/18/25 due to unknown reason.
AMOYNCB30	30	21.28	DG(C96)	UNB	4/24/2025	3	Fledged 1 chick. UNB on 7/7/25 at 48 days old.
AMOYNCB31	31	17.29	UNB	UNB	4/24/2025	2	Nest failed 5/17/25 due to raccoon predation.
AMOYNCB32	32	6.72	DG(C6F)	UNB	4/26/2025	3	Nest failed 5/2/25 due to unknown reason.
AMOYNCB33	33	12.24	DG(ELW)	DG(EK9)	4/27/2025	2	Fledged 2 chicks. DG(E9K) and DG(E9L) on 7/2/25 at 38 days old.
AMOYNCB34	34	19.02	DG(ENL)	UNB	4/28/2025	2	Brood failed 6/13/25 due to CWB aggression.
AMOYNCB35	35	18.43	DG(EK6)	UNB	4/28/2025	3	Nest failed 5/15/25 due to unknown reason.
AMOYNCB36	4	5.88	DG(CMP)	DG(C7T)	4/29/2025	3	Brood failed 6/8/25 due to unknown reason.
AMOYNCB37	36	14.14	DG(EPA)	UNB	5/3/2025	3	Nest abandoned 5/15/25 due to unknown reason.
AMOYNCB38	37	2.95	DG(EKK)	UNB	5/7/2025	3	Nest failed 5/17/25 due to undetermined mammal predation.
AMOYNCB39	8	8.54	DG(CA)	UNB	5/8/2025	3	Fledged 2 chicks. UNB and UNB on 7/12/25 at 39 days old.
AMOYNCB40	38	2.55	DG(EKU)	UNK	5/8/2025	2	Unknown outcome. 1 chick last seen on 6/26/25 at 23 days in area with irregular monitoring.
AMOYNCB41	27	22.90	DG(EJ9)	UNB	5/10/2025	2	Nest failed 6/1/25 due to undetermined predation.
AMOYNCB42	39	7.60	DG(EU0)	UNB	5/10/2025	3	Nest failed 6/9/25 due to unknown reason.
AMOYNCB43	40	22.51	DG(EN2)	DG(EPU)	5/14/2025	3	Nest failed 6/9/25 due to unknown reason.
AMOYNCB44	32	6.77	DG(C6F)	UNB	5/17/2025	3	Nest failed 63/25 due to undetermined predation.
AMOYNCB45	22	8.10	DG(C0H)	DG(EFA)	6/1/2025	2	Nest failed 6/27/25 due to suspected raccoon predation.
AMOYNCB46	21	2.15	UNB	UNB	6/4/2025	2	Nest failed 6/26/25 due to unknown reason.
AMOYNCB47	37	2.77	DG(EKK)	UNB	6/4/2025	2	Nest failed 6/15/25 due to unknown reason.
AMOYNCB48	1	15.46	DG(EKH)	UNB	6/6/2025	1	Nest failed 6/8/25 due to undetermined predation.
AMOYNCB49	41	17.67	DG(EKE)	UNB	6/7/2025	2	Nest failed 6/16/25 due to nutria predation.
AMOYNCB50	17	14.97	DG(C6R)	DG(CML)	6/10/2025	2	Nest failed 7/11/25 due to nonviable eggs failing to hatch.
AMOYNCB51	1	15.13	DG(EKH)	UNB	6/12/2025	2	Nest failed 6/18/25 due to unknown reason.
AMOYNCB52	4	5.76	DG(CMP)	DG(C7T)	6/20/2025	2	Nest failed 6/23/25 due to unknown reason.
AMOYNCB53	37	2.91	DG(EKK)	UNB	6/22/2025	1	Nest abandoned 6/28/25 due to unknown reason.
AMOYNCB54	42	7.22	UNB	UNK	6/27/2025	2	Nest abandoned 7/4/25 due to unknown reason

AMOYNCB55	41	17.89	DG(EKE)	UNB	7/1/2025	2	Brood failed 8/18/25 due to unknown reason.

Table D2. South Core Banks productivity data for 2025. South Core Banks totals: 26 breeding pairs, 67 total nests, 1 hatched nest, 1 fledged chick.

Nest	Pair	Mile	Adult 1	Adult 2	Found Date	Eggs	Outcome Summary
AMOYSCB01	1	34.54	DG(J0)	DG(CUL)	4/11/2025	2	Nest failed 4/14/2025 due to unknown cause.
AMOYSCB02	2	37.61	DG(R8)	R(5F)	4/14/2025	3	Nest failed 04/21/2025 due to coyote predation.
AMOYSCB03	3	36.30	R(AJH)	UR-R	4/14/2025	3	Nest failed 04/16/2025 due to coyote predation.
AMOYSCB04	4	33.92	DG(YP)	DG(AP)	4/14/2025	3	Nest failed 04/23/2025 due to coyote predation.
AMOYSCB05	5	33.60	DG(K0)	UNB	4/14/2025	3	Nest failed 04/16/2025 due to predation by undetermined predator.
AMOYSCB06	6	28.35	DG(CLM)	UNB	4/16/2025	3	Nest failed 04/24/2025 due to coyote predation.
AMOYSCB07	7	31.36	DG(CL9)	UNB	4/16/2025	3	Nest failed 4/24/2025 due to coyote predation.
AMOYSCB08	8	35.35	DG(EK2)	DG(CAN)	4/16/2025	2	Nest failed 04/21/2025 due to coyote predation.
AMOYSCB09	9	25.38	DG(CFA)	DG(EMN)	4/17/2025	3	Nest failed 04/25/2025 due to coyote predation.
AMOYSCB10	10	24.78	DG(33)	DG(EP4)	4/18/2025	3	Nest failed 04/26/2025 due to coyote predation.
AMOYSCB11	11	23.90	DG(EKM)	UNB	4/21/2025	3	Nest failed 04/28/2025 due to unknown cause.
AMOYSCB12	12	30.83	DG(CK1)	UNB	4/22/2025	3	Nest failed 04/30/2025 due to coyote predation.
AMOYSCB13	13	28.65	UNB	UNB	4/22/2025	3	Nest failed 05/03/2025 due to coyote predation.
AMOYSCB14	14	28.59	DG(YM)	UNB	4/23/2025	3	Nest failed 05/03/2025 due to coyote predation.
AMOYSCB15	1	34.61	DG(J0)	DG(CUL)	4/23/2025	3	Nest failed 05/07/2025 due to unknown cause.
AMOYSCB16	15	24.60	DG(CNC)	UNB	4/25/2025	3	Nest failed 05/05/2025 due to unknown cause.
AMOYSCB17	16	35.68	DG(EEK)	DG(EPE)	4/27/2025	3	Nest failed 05/12/2025 due to coyote predation.
AMOYSCB18	17	24.25	DG(AL)	DG(CTE)	4/28/2025	4	Nest failed 05/05/2025 due to unknown cause.
AMOYSCB19	3	36.00	R(AJH)	UR-R	4/28/2025	3	Nest failed 05/10/2025 due to unknown cause.
AMOYSCB20	5	33.60	DG(K0)	UNB	4/28/2025	2	Nest failed 05/01/2025 due to coyote predation.
AMOYSCB21	18	26.82	DG(CEF)	DG(C77)	4/30/2025	3	Nest failed 05/14/2025 due to unknown cause.
AMOYSCB22	9	25.42	DG(CFA)	DG (EMN)	5/6/2025	3	Nest failed 05/13/2025 due to coyote predation.
AMOYSCB23	19	23.32	DG(EKP)	DG(EKX)	5/6/2025	2	Nest failed 05/08/2025 due to unknown cause.
AMOYSCB24	20	28.22	DG(C69)	DG(CJR)	5/6/2025	3	Nest failed 05/18/2025 due to coyote predation.

AMOYSCB25	7	31.17	DG(CL9)	UNB	5/6/2025	3	Nest failed 05/19/2025 due to coyote predation.
AMOYSCB26	21	42.21	UNB	UNK	5/6/2025	2	Nest failed 05/08/2025 due to unknown cause.
AMOYSCB27	15	24.62	DG(CNC)	UNB	5/7/2025	3	Nest failed 05/16/2025 due to unknown cause.
AMOYSCB28	6	28.33	DG(CLM)	UNB	5/8/2025	3	Nest failed 05/16/2025 due to coyote predation.
AMOYSCB29	14	28.54	DG(YM)	UNB	5/14/2025	2	Nest failed 05/18/2025 due to coyote predation.
AMOYSCB30	22	27.66	DG(CRK)	UNB	5/14/2025	2	Nest failed 05/16/2025 due to unidentified predator.
AMOYSCB31	23	24.07	DG(EMP)	UNB	5/14/2025	3	Nest failed 05/19/2025 due to avian predation.
AMOYSCB32	13	28.74	UNB	UNB	5/14/2025	2	Nest failed 05/16/2025 due to coyote predation.
AMOYSCB33	10	24.69	DG(33)	DG(EP4)	5/15/2025	3	Fledged one chick, DG(E9J), on 07/17/2025 at 37 days.
AMOYSCB34	12	30.80	DG(CK1)	UNB	5/15/2025	2	Nest failed 05/20/2025 due to unknown cause.
AMOYSCB35	5	33.53	DG(K0)	UNB	5/15/2025	3	Nest failed 05/21/2025 due to unknown cause.
AMOYSCB36	4	33.61	DG(YP)	DG(AP)	5/16/2025	2	Nest failed 05/21/2025 due to avian predation.
AMOYSCB37	2	38.14	DG(R8)	R(F5)	5/17/2025	2	Nest failed 05/21/2025 due to unknown cause.
AMOYSCB38	1	34.49	DG(J0)	DG(CUL)	5/17/2025	2	Nest failed 05/20/2025 due to unknown cause.
AMOYSCB39	14	28.59	DG(YM)	UNB	5/20/2025	1	Nest failed 05/22/2025 due to coyote predation.
AMOYSCB40	9	25.28	DG(CFA)	DG(EMN)	5/22/2025	2	Nest failed 05/28/2025 due to unknown cause.
AMOYSCB41	13	28.69	UNB	UNB	5/23/2025	1	Nest failed 05/27/2025 due to overwash.
AMOYSCB42	1	34.76	DG(J0)	DG(CUL)	5/23/2025	1	Nest failed 05/27/2025 due to unknown cause.
AMOYSCB43	16	35.76	DG(EEK)	DG(EPE)	5/23/2025	3	Nest failed 05/31/2025 due to unknown cause.
AMOYSCB44	3	36.00	R(AJH)	UR-R	5/23/2025	2	Nest failed 05/31/2025 due to unknown cause.
AMOYSCB45	8	35.30	DG(EK2)	DG(CAN)	5/25/2025	2	Nest failed 05/31/2025 due to unknown cause.
AMOYSCB46	22	27.48	DG(CRK)	UNB	5/27/2025	1	Nest abandoned 5/29/2025 due to unknown cause.
AMOYSCB47	24	28.42	DG(CMU)	UNB	5/29/2025	2	Nest failed 06/03/2025 due to unknown cause.
AMOYSCB48	4	33.83	DG(YP)	DG(AP)	5/30/2025	3	Nest failed 06/19/2025 due to unknown cause.
AMOYSCB49	2	38.15	DG(R8)	R(5F)	5/31/2025	1	Nest failed 06/03/2025 due to coyote predation.
AMOYSCB50	17	24.23	DG(AL)	DG(CTE)	6/4/2025	2	Nest failed 06/10/2025 due to unknown cause.
AMOYSCB51	25	24.56	DG(C60)	DG(CNC)	6/4/2025	2	Nest failed 06/19/2025 due to unknown cause.
AMOYSCB52	20	28.12	DG(C69)	DG(CJR)	6/4/2025	2	Nest failed 06/06/2025 due to coyote predation.
AMOYSCB53	1	34.63	DG(J0)	DG(CUL)	6/4/2025	2	Nest failed 06/07/2025 due to unknown cause.
AMOYSCB54	9	25.34	DG(CFA)	DG(EMN)	6/10/2025	3	Nest failed 06/18/2025 due to ghost crab predation.
AMOYSCB55	13	28.69	UNB	UNB	6/10/2025	1	Nest failed 06/12/2025 due to coyote predation.
AMOYSCB56	3	36.12	R(AJH)	UR-R	6/11/2025	2	Nest failed 06/16/2025 due to unknown cause.

AMOYSCB57	26	44.15	DG(UL)	DG(CNK)	6/11/2025	2	Nest failed 06/18/2025 due to unknown cause.
AMOYSCB58	8	35.52	DG(EK2)	DG(CAN)	6/12/2025	2	Nest failed 06/19/2025 due to unknown cause.
AMOYSCB59	14	28.61	DG(YM)	UNB	6/13/2025	2	Nest failed 06/17/2025 due to coyote predation.
AMOYSCB60	5	33.53	DG(K0)	UNB	6/16/2025	2	Nest failed 06/17/2025 due to unknown cause.
AMOYSCB61	17	24.23	DG(AL)	DG(CTE)	6/19/2025	3	Nest failed 07/10/2025 due to unknown cause.
AMOYSCB62	11	23.96	DG(EKM)	UNB	6/19/2025	2	Nest failed 06/24/2025 due to coyote predation.
AMOYSCB63	2	28.29	DG(R8)	R(5F)	6/19/2025	2	Nest failed 06/23/2025 due to unknown cause.
AMOYSCB64	24	28.50	DG(CMU)	UNB	6/20/2025	2	Nest failed 07/08/2025 due to unknown cause.
AMOYSCB65	25	24.28	DG(C60)	DG(CNC)	6/26/2025	2	Nest failed 07/03/2025 due to unknown cause.
AMOYSCB66	5	33.59	DG(K0)	UNB	6/26/2025	1	Nest failed 07/02/2025 due to unknown cause.
AMOYSCB67	3	35.85	R(AJH)	UR-R	6/28/2025	1	Nest failed 07/14/2025 due to coyote predation.

Table D3. Shackleford Banks productivity data for 2025. North Core Banks totals: 2 breeding pairs, 2 total nests, 0 hatched nests, 0 fledged chicks.

Nest	Pair	Mile	Adult 1	Adult 2	Found Date	Eggs	Outcome Summary
AMOYSB01	1	55.00	R(1J)	UNK	5/14/2025	3	Nest failed 6/5/25 due to unknown cause.
AMOYSB02	2	49.86	UNB	UNB	6/5/2025	1	Nest failed 6/13/25 due to unknown cause.