

# Alabama Coastal Bird Stewardship Program: 2023 Report

Published February 2024; available online at [www.alaudubon.org/research](http://www.alaudubon.org/research)

Contact:  
Alabama Audubon  
P.O. Box 130819  
Birmingham, Alabama 35213  
T: (205) 719-3678  
E: [info@alaudubon.org](mailto:info@alaudubon.org)  
W: [www.alaudubon.org](http://www.alaudubon.org)

*The Alabama Coastal Bird Stewardship Program is a comprehensive conservation and research program focused on protecting shorebirds and their habitats along the Alabama Gulf Coast funded with Deepwater Horizon natural resource damage settlement funds provided by the Alabama Trustee Implementation Group. This project is further supported by the National Audubon Society through funding from the Alabama Department of Conservation and Natural Resources. Additional support was provided by the USFWS Northern Gulf Coastal Program.*

*Founded in 1946 as the Birmingham Audubon Society, Alabama Audubon has since grown to become the state's leading nonprofit promoting conservation and a greater knowledge of birds, their habitats, and the natural world. While we work closely with our partners at the National Audubon Society, we are an independent 501(c)(3) organization with staffed offices in Birmingham and on the Gulf Coast.*

Recommended citation: Morpeth, O., R. Rolland, K. Gray, C. Weatherby, C. Frosch, L. Koczur, and F. Batchelor. 2024. Alabama Coastal Bird Stewardship Program: 2023 Report.

## Table of Contents

<b>Acknowledgments</b> .....	<b>4</b>
<b>2023 AT A GLANCE</b> .....	<b>5</b>
<b>Stewardship &amp; Outreach</b> .....	<b>6</b>
Stewardship .....	6
Outreach .....	6
<b>Beach Nesting Bird Monitoring</b> .....	<b>9</b>
Survey Methods .....	12
Snowy Plover .....	12
American Oystercatcher.....	16
Wilson’s Plover .....	17
Black Skimmer .....	18
Least Tern.....	21
Gull-billed Tern .....	23
Reddish Egret.....	24
Caspian Tern, Royal Tern, Sandwich Tern .....	24
Killdeer & Common Nighthawk .....	27
<b>Predator and Disturbance Surveys</b> .....	<b>27</b>
Predator Surveys.....	27
<b>Disturbance</b> .....	<b>35</b>
Alabama Point.....	36
Graveline Bay.....	38
<b>Audubon Coastal Bird Surveys</b> .....	<b>41</b>
<b>Coastal Waterbird Species Richness</b> .....	<b>44</b>
<b>Priority Birds</b> .....	<b>46</b>
Habitat Use.....	46
<b>Banded Birds</b> .....	<b>48</b>
Noteworthy Resights .....	50
<b>Non-Breeding Season Surveys (NBS)</b> .....	<b>52</b>
Predator Surveys.....	58

## **Acknowledgments**

We would like to acknowledge the following organizations for their continued support: City of Orange Beach Coastal Resources Division, Alabama Coastal Foundation, American Bird Conservancy, Bon Secour National Wildlife Refuge, Fort Morgan State Historic Site, Gulf State Park, Alabama Chapter of The Nature Conservancy, The Town of Dauphin Island, Dauphin Island Park and Beach Board, and the U.S. Army Corps of Engineers. Further, we would like to thank Alabama Power and the coordinators and volunteers of the Mobile Division Chapter of the Alabama Power Service Organization for generously donating time and resources to help build chick shelters this spring. Many thanks to our dedicated volunteers including Drew Haffenden, Cindy Armour, Jim Brown, Shirley Brown, Eric Haskell, Jay Burdette, Cara Stallman, Jeanette Ruffles, Kim Miller, Edlyn Burch, Cynthia Freeman, Dee Scott, Tyler Weeks, Larry Gardella, Traci Newby, Angela Minish, and Madalyn Cargill for assisting with beach-nesting bird monitoring and Audubon Coastal Bird Surveys. We would also like to thank Jacob Barefoot, Kimberly Barefoot, Cassie Bates, Trent Burns, Shirley Brown, Jim Brown, Lyn Buchanan, Dorenda Doyle, Katie Emerson, Rebecca Farmer, Melody Board, Cynthia Freeman, Andrew Haffenden, Patric Harper, Gary Herritz, Mellonie Hollis, Anna Catherine King, Summer McGriff, April McGriff, Hayden Olive-Talley, Cassie Shuford, Carole Tebay for contributing time to education and nesting site stewardship during busy holiday weekends.



## 2023 AT A GLANCE

---

- Nest Monitoring
    - Active Sites: 15
    - Total Surveys: 837
    - Acres Surveyed: 1,074
    - Acres Fenced: 147
    - Volunteers: 5
    - Volunteer Hours: 77
  - Productivity (fledglings/pair):
    - American Oystercatcher: 1.14
    - Black Skimmer: 0.90
    - Caspian Tern: 0.99
    - Gull-billed Tern: 0.26
    - Least Tern: 0.17
    - Royal Tern: 0.39
    - Sandwich Tern: 0.41
    - Snowy Plover: 0.35
  - Stewardship:
    - Volunteers: 15
    - Volunteer Hours: 208.5
    - Staff Hours: 170.5
  - Outreach Events:
    - 41
  - Audubon Coastal Bird Survey:
    - Routes: 20
    - Miles: 19.4
    - Volunteers: 14
    - Volunteer Hours: 242.8
    - Species Recorded: 177
  - Banded Birds
    - Snowy Plover: 1
    - American Oystercatcher: 3
    - Brown Pelican: 10
- 

Alabama Audubon has been monitoring coastal bird populations and breeding success along the coast since the initiation of the Alabama Coastal Bird Stewardship Program in 2017. Our Coastal Bird Stewardship Program consists of three main components including stewardship, monitoring, and Audubon Coastal Bird Surveys. Prior to 2018 little data had been collected on the breeding population sizes and reproductive success of shorebirds in Alabama outside of occasional censusing. Due to this lack of information, the negative effects of the Deepwater Horizon oil spill on Alabama's coastal birds were difficult to quantify. During the past 6 years, we and our partners with the City of Orange Beach and American Bird Conservancy, have monitored coastal birds year-round to determine reproductive success and causes of failure, identify critical nesting and wintering areas, determine population sizes, and educate our coastal communities on the importance of these species and their continued conservation. Now, with a better understanding of our coastal bird communities, educated decisions on coastal management and resource allocation can be made with the proper evidence and information to best support birds in need.

## Stewardship & Outreach

### *Stewardship*

Symbolic fencing was used to protect ~147 acres of beach and island habitat at six sites, which had nesting snowy plovers, least terns, black skimmers, and gull-billed terns. Staff and volunteers conducted stewardship activities during Memorial Day and Fourth of July weekends and 4 additional days throughout the nesting season to reduce disturbance to nests and colonies, as well as educate beachgoers about beach nesting birds. These efforts were conducted at 4 sites throughout Mobile and Baldwin Counties. 208.5 hours of stewardship were conducted by 15 volunteers during April–August and 170.5 hours were conducted by staff. This was primarily an opportunity to educate beachgoers about beach nesting birds and raise awareness of ways the public can help protect these birds and their chicks while on the beach. These efforts resulted in 103 positive educational interactions with the public. There were 10 instances where staff/volunteers had the opportunity to intervene in a situation where disturbance to a nesting area was occurring. During colony disturbance surveys at Alabama Point, we had an additional 27 interactions with the public, 26 of them positive.

In 2022 Tern Island was one of Alabama’s largest colonial nesting islands, but in 2023 no nests were observed throughout the nesting season. We believe that the birds that would normally nest on Tern Island moved north to Graveline Bay where there were large colonies of black skimmers, least terns, royal terns, Caspian terns and sandwich terns present throughout the nesting season. The Graveline Bay restoration project was not carried out for the purpose of reestablishing beach nesting bird habitat but still provided ideal habitat that the birds capitalized on. Based on historical nesting trends we preemptively placed 60 signs around the perimeter of Tern Island, but soon realized the birds had moved to Graveline Bay and consequently placed another 60 signs along all the islets that showed nesting activity. Graveline was our busiest site for the season and most stewardship efforts took place at this location (Figures 1 and 2) due to the nesting density there compared to other nesting locations. Human disturbance events that occurred at this location included jet skis intentionally driving close to some of the islets with intent to flush the birds, people kayaking to and dragging kayaks across nesting islands despite them having signs on them, people getting onto the islands to fish from them, and people setting up on some of the islets to sunbathe. We placed 85 chick shelters, which are small “A” frame shelters made from wood (Figure 3), across islands that had nests and chicks. These shelters provided chicks with shade and protection from potential predators.

### *Outreach*

Alabama Audubon tabled at 12 public events, led 10 birding walks, gave seven presentations to local civic groups, participated in two beach clean-ups on Dauphin Island, and led six programs for local schools and summer camps. During Alabama Coastal Birdfest, Audubon staff taught four workshops, led four birding field trips with volunteers, and tabled at the Bird and Conservation Expo. This resulted in 390 outreach hours for the year by staff. A total of 14 volunteers contributed 48 hours towards outreach efforts in 2023. Orange Beach participated in three local festivals, two

weeks of field trips for school aged children, and one island clean-up; a total of two volunteers contributed 26 hours to outreach events in Orange Beach.



**Figure 1. Volunteer stewards at Graveline Bay.**



**Figure 2. Volunteer stewards at Graveline Bay.**



**Figure 3. Least tern chick under a chick shelter at Graveline Bay.**

### **Beach Nesting Bird Monitoring**

During the 2023 breeding season, Alabama Audubon coastal staff included two full-time Coastal Biologists, one full-time Coastal Outreach Manager, and two seasonal stewards. Volunteers Drew Haffenden and Cindy Armour also monitored several sites on Dauphin Island consistently throughout the season. Volunteers contributed a total of 61.82 hours to beach nesting bird monitoring in 2023. City of Orange Beach staff included one full-time Coastal Stewardship Coordinator. Orange Beach volunteers contributed a total of 51 hours to beach nesting bird monitoring in 2023.

We monitored 15 active nesting sites this year (Table 1; Figure 4). For site descriptions and maps, see ALCBSP Study Areas document, available at [alaudubon.org/research](http://alaudubon.org/research). Graveline Bay was a new site in 2023. This area is located just north of Dauphin Island. The restoration effort, funded by the National Fish and Wildlife Foundation Gulf Environment Benefit Fund, aimed to restore marsh habitat. Approximately 270,000 cubic yards of sand was dredged, made into mounds, and planted with native marsh grasses and the northernmost islands were covered with 600 cubic yards of oyster shells. This created ideal nesting habitat for shorebirds and seabirds (Figure 5).





Figure 4. Active nesting sites monitored during the 2023 breeding season.

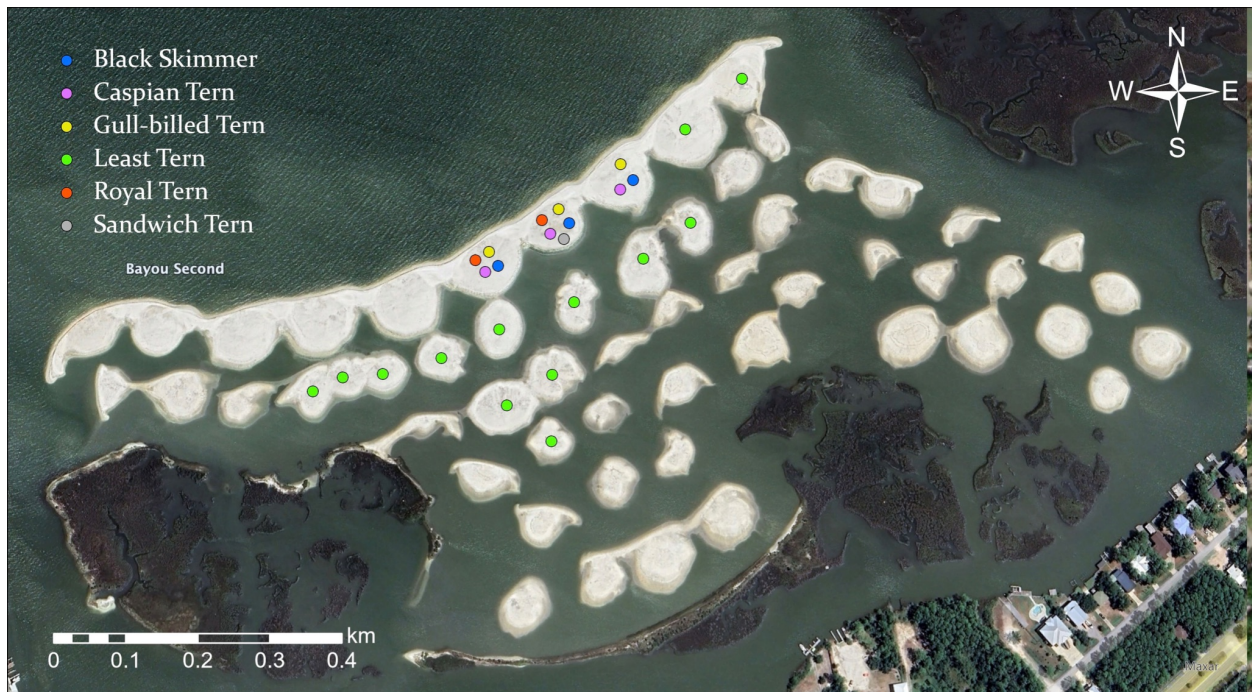


Figure 5. Graveline Bay restoration area, depicting species and locations of nesting activity in 2023.

**Table 1. Study sites and associated nesting species during the 2023 breeding season.**

<b>Mobile County</b>	<b>Species</b>
Pelican Island, Dauphin Island	Snowy plover
Public Beach West, Dauphin Island	Snowy plover
Pelican Hook, Dauphin Island	n/a
Pelican Bay, Dauphin Island	n/a
Public Beach East, Dauphin Island	n/a
West End, Dauphin Island	n/a
Katrina Cut, Dauphin Island	n/a
Far West End, Dauphin Island	Least tern, snowy plover
Graveline Bay, Dauphin Island	American oystercatcher, black skimmer, gull-billed tern, least tern
Little Dauphin Island	n/a
Cat Island, Portersville Bay	n/a
Cedar Point, Dauphin Island	American oystercatcher
Coffee Island, Portersville Bay	American oystercatcher, black skimmer, gull-billed tern, least tern
Marsh Island, Portersville Bay	American oystercatcher
Tern Island, Portersville Bay	n/a
Marsh Island, Grand Bay	American oystercatcher
Lightning Point, Coden	n/a
<b>Baldwin County</b>	<b>Species</b>
Alabama Point, Orange Beach	Least tern
Beach Club Resort and Spa, Fort Morgan	n/a
Bon Secour Fort Morgan Unit	Snowy plover
Bon Secour Perdue Unit	Least tern, snowy plover
Gulf Highlands, Fort Morgan	n/a
Gulf State Park, Gulf Shores	Snowy plover
No Fly Zone, Orange Beach	Least tern
Piggly Wiggly, Fairhope	n/a
Shallow Lot, Orange Beach	Least tern
Summer Salt, Orange Beach	Least tern

### *Survey Methods*

Mainland and barrier island sites with no breeding activity were surveyed every two weeks and sites with breeding activity were surveyed 1-2 times per week. Nearshore islands were surveyed approximately once per week, as weather and boat availability allowed. We conducted a total of 532 beach nesting bird surveys during February–August.

We began solitary nesting surveys (i.e., American oystercatcher, snowy plover) in early-February to search for adult birds displaying breeding behaviors. When breeding adults or active nests were found, we recorded the adults' behavior, number of eggs or chicks, number and location of roving chicks, and active disturbances and/or predator tracks within 50' of nests/chicks. If a nest failed, we determined the cause using evidence observed in or around the nest including predator tracks, eggshell fragments, wrack lines, or saturated substrate. If we were unable to determine the cause of failure, it was recorded as unknown. Similarly, if we were unsure if a nest hatched or failed, the nest fate was recorded as unknown.

We began colonial nesting surveys (i.e., black skimmer, least tern) in early-May. During colony surveys we recorded the number of adult birds, pairs (i.e., birds that were displaying breeding behaviors or actively incubating a nest), nests, chicks, fledglings, and any predator tracks and/or active disturbances within 50' of the colony. We categorized chicks as downy, feathered, or fledged. Internal surveys were conducted if it did not cause excess disturbance to the colony, however once chicks were present in a colony all surveys were external.

We calculated the overall productivity (fledglings/pair) across all sites for the solitary nesting species, and the productivity per site and overall across sites for the colonial nesting species. Two methods were used when calculating the overall productivity for colonial nesting species. Method 1 consisted of dividing the total fledgling estimate by the number of breeding pairs. Method 2 was dividing the maximum number of fledglings observed on a single day by the maximum number of nests observed on a single day (re-nesting attempts were included in highest day counts for Method 2). Method 2 is used by other researchers along the Gulf Coast and will allow us to compare productivity estimates.

### *Snowy Plover*

In 2023 we monitored 21 snowy plover nests on Dauphin Island (Table 2; Figure 6). Of those nests, one was on Pelican Island peninsula, eight were on Public Beach West, and 12 on the Far West End. The single nest on Pelican Island was assumed hatched based on adult behavior, but chicks were never seen and the associated adults left the area within one week. Of the eight nests on Public Beach West, three hatched a total of five chicks and two survived to fledge. The five other nests failed to ghost crab predation (n=1), avian/mammalian predation (n=1), flooding from storms (n=1), and unknown causes (n=2). All Public Beach West nests were laid by two pairs, four belonging to b/K:K/b and four to b/b:G/Y and b/K:K/G. Nests on Pelican Island and Public Beach West were laid in highly trafficked areas and all but one were symbolically fenced and signed



to keep the nests from being crushed by people or vehicles. Along with the eight nests, three dropped eggs were found in separate locations throughout the breeding season suggesting other nest attempts were made but abandoned.

Of the 12 nests on the Far West End, we placed electric fencing around six nests to reduce nest depredation from foxes. Predation has been a significant cause of nest and chick loss during the last 6 years. Over the course of 4 years, we observed ten nests lost to fox predation on Dauphin Island, and two additional nests that were strongly presumed lost to foxes. The fencing was set around nests that were at full clutch and in flat open areas with sparse to no vegetation and low chance of flooding. Two fence panels, each ~100' long, were attached to make a large circle around the nest. The panels had openings that were large enough to allow snowy plover adults and chicks to run in and out but would prevent larger animals from entering. We found that the fencing was effective in preventing mammalian predation of the nests; of the six nests that were fenced, four survived the incubation period. The two that failed were lost to storm overwash and inundation. We left the fencing up if chicks were observed in the area after hatching with hopes that they would use it for continued protection from threats. This likely occurred to some extent, as we saw tracks within the fenced area on subsequent surveys. The four nests that hatched produced eight chicks with three reaching fledge age. All six of the nests that were not fenced failed. Four were lost to predation by ghost crab (n=1), fox (n=2), and a tern and fox (n=1), and two failed for unknown reasons. We deployed one game camera at a nest this year, which captured the depredation event of a tern species taking an egg, and later that night a fox coming to eat the remaining eggs (Figures 7 and 8). Although only five chicks survived to fledging age on the island, that is the highest fledgling success rate in the past 6 years. During 2018-2022, only 3 fledglings total survived from the 41 nests that we monitored on Dauphin Island.

We monitored 20 snowy plover nests at Bon Secour National Wildlife Refuge; 15 on the Perdue Unit and five on the Fort Morgan Unit (Table 2; Figure 9). Nine of the 15 Perdue Unit nests hatched, producing 23 chicks, three of which fledged. Four of the nests were depredated; two by ghost crabs, one by coyote, and one by an unknown predator. While unconfirmed, the two remaining nests likely failed due to weather as a heavy storm had passed through the area at the time of the failures. Of the five Fort Morgan Unit nests, four hatched producing 11 chicks, however none survived to fledge. The remaining nest was lost to ghost crab depredation. We monitored one nest located in Gulf State Park. The nest had only one egg and successfully hatched on 01 June. The chick was observed on 02 June, and the next day the male plover was observed displaying chick protective behavior though the chick was not seen. No snowy plovers were observed at the site after that day and the fate of the chick is unknown.

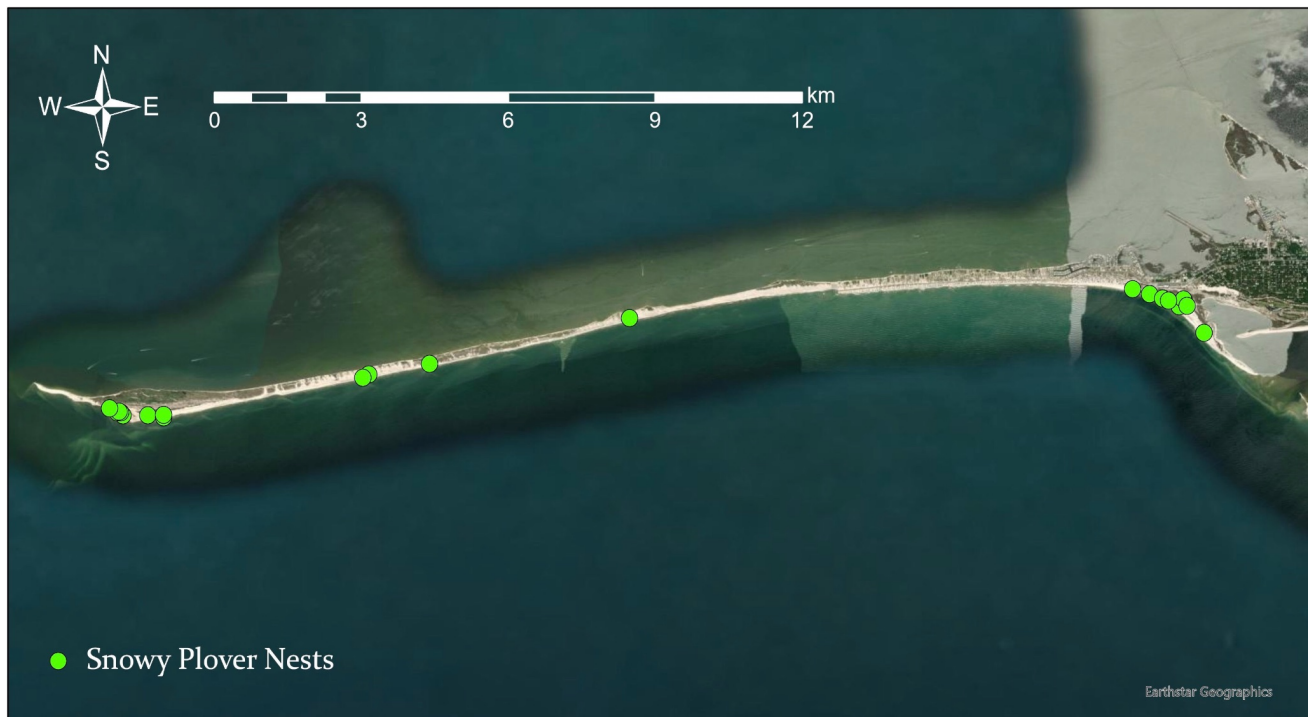
**Productivity across all sites was estimated to be 0.35 fledglings/pair. Only pairs with nests were included in calculating this estimate.**

**Table 2. Snowy plover breeding season metrics in 2023.**

Site	Pairs	Nests	Failed Nests	Chicks	Fledglings
Bon Secour Fort Morgan Unit	2	5	1	11	0
Bon Secour Perdue Unit	8	15	6	23	3
Gulf State Park	1	1	0	1	0
Pelican Island	1	1	0	3*	0
Public Beach West	2	8	5	5	2
Far West End	9	12	8	8**	3

\* Chicks were assumed hatched on adult behavior but were not observed.

\*\* Two chicks assumed hatched but not observed.



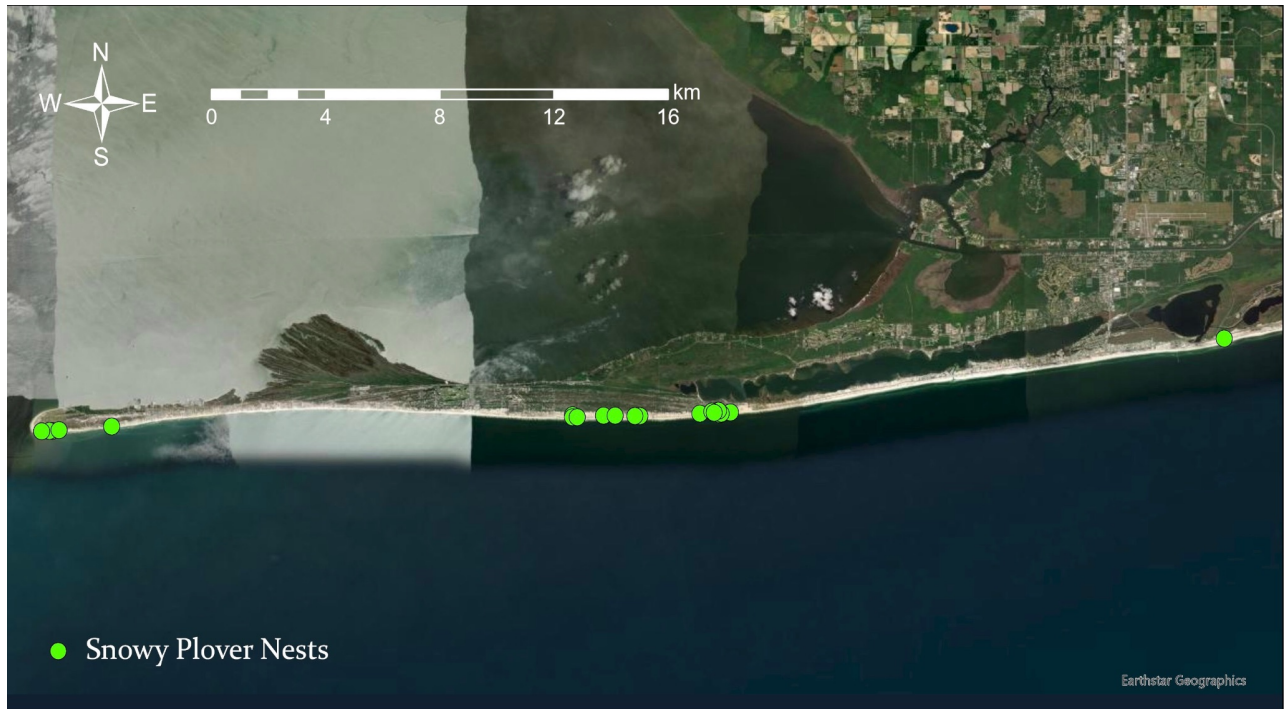
**Figure 6. Locations of snowy plover nests on Dauphin Island in 2023.**



Figure 7. Tern species presumably eating a snowy plover egg on the far west end.



Figure 8. Red fox eating the remaining snowy plover eggs at the nest on the far west end.



**Figure 9. Locations of snowy plover nests in Baldwin County in 2023.**

#### *American Oystercatcher*

We monitored seven American oystercatcher nests; five on Coffee Island, and two on Marsh Island in Portersville Bay (Table 3; Figure 10). One of the nests on North Coffee hatched and fledged one chick, and the other nest was lost to overwash. On the main Coffee Island beach, two hatched but chicks were not seen on following visits, and one was lost due to overwash. A banded male oystercatcher (maroon CO) produced two of the Coffee Island nests, neither of which were successful. The two nests on Marsh Island were likely lost to laughing gull predation as the island hosted a very large breeding colony. Three additional nests were found after hatching. Three chicks, ~2 days old, were found on Graveline Bay on 22 April and were monitored and then banded before fledging. On 03 May, we found three ~12-day old chicks on Marsh Island in Grand Bay, all of which reached fledging age. Lastly, two chicks at ~6 days old were found on Cedar Point, one chick survived to fledging.

**The productivity across all sites was estimated to be 1.14 fledglings/pair. Only pairs that had nests were included in calculating the productivity estimate.**



**Table 3. American oystercatcher breeding season metrics in 2023.**

Site	Pairs	Nests	Failed Nests	Chicks	Fledglings
Graveline Bay**	1	1	0	3	3
Coffee Island	3	5	2	9***	1
Marsh Island, Grand Bay**	1	1	0	3	3
Marsh Island, Portersville Bay*	1	2	2	0	0
Cedar Point**	1	1	0	2	1

\*Pairs were observed at these sites with presumed nests, though nests were not seen.

\*\*Nests were not found until after hatch.

\*\*\*Five chicks were not directly observed, however they were presumed hatched as nests were empty at the estimated hatch date and adults were displaying chick protective behavior.



**Figure 10. American oystercatcher nest locations during the 2023 breeding season.**

*Wilson's Plover*

No Wilson's plover nests were found this season. One was observed at Lightning Point in March but was not re-sighted on following visits. Others were observed at Pelican Beach, Far West End and on the islands in Portersville Bay starting in late May and continuing through migration but were not in suitable nesting areas or exhibiting territorial behavior.

### *Black Skimmer*

Black skimmers nested at Coffee Island and Graveline Bay (Table 4; Figure 11). We used different methods to best estimate the total nest, chick, and fledgling counts for each island and calculated productivity estimates for each and across all sites. Methods used were based on the frequency of monitoring and ability to obtain accurate counts on the different islands.

The estimated nest count for Coffee Island was the highest one-day internal count (57) plus two, ten, and five additional nests observed 14, 31, 58 days later, respectively. Our estimated chick count was 28 (highest one day count), which is less than the estimated number of fledglings (46; highest one day count). This chick estimate is likely underestimated as smaller downy and feathered chicks were in the middle of the colony and were not visible among the high density of skimmers, terns, and pelicans. Chicks were more visible and easily counted as they reached fledgling age and began loafing along the shoreline. We presume that the total number of chicks is equal to or greater than the number of estimated fledglings, which is reflected in Table 4.

The estimated nest count for Graveline Bay was the highest one-day internal count (173) with an additional 47 renests. The chick estimate was the highest one-day count (198) plus 6 downy chicks observed ~15 days later, and the fledgling estimate was the highest one-day count. We conducted an internal survey on the islands after nesting had concluded and found eight deceased skimmer chicks, seven deceased fledglings, and two deceased adults.

Causes for nest and chick loss included overwash, avian predation, interspecies and intraspecies aggression, and entanglement in fishing line. Some nests on Coffee Island were observed close to the high tide and may have been lost to storm driven high tides. At Graveline Bay we observed black skimmers chasing and harassing other skimmer chicks. The high density of nesting birds may have also led to interspecies aggression and predation, though no direct instances were observed with skimmers. We found three deceased juvenile black skimmers entangled in fishing line, and one chick was found with evidence of great horned owl depredation.

A Reconyx® Hyperfire 2 Cellular Professional 4G LTE game camera was placed within a black skimmer colony on one of the northernmost islands to capture evidence of predation and/or disturbances. The camera was charged via solar panels and photos were sent directly to our phones. Aside from the initial deployment, we did not have to disturb the colony to change batteries and SD cards. The camera was set ~10 m from nests to minimize disturbance to incubating birds. There was one photo of a laughing gull flying away with a skimmer chick, but we did not capture any other photos of depredation or disturbance on the game camera. We obtained several photos of adults brooding chicks (Figure 12) and feeding chicks during nocturnal hours (Figure 13).

**Using method 1, overall productivity across the three sites was estimated as 0.85-0.95 fledglings/pair. With method 2 we calculated an overall productivity of 0.95 fledglings/pair.**

**Table 4. Black skimmer breeding season metrics in 2023.**

Site	Pairs	Nests	Chicks	Fledglings	Productivity
Coffee Island	57	74	≥46	46	0.81
Graveline Bay	173-200	220	204	173	0.87-1.00
<b>Total</b>	<b>230-257</b>	<b>294</b>	<b>≥250</b>	<b>219</b>	<b>0.85-0.95</b>



**Figure 11. Black skimmer colony locations during the 2023 breeding season.**



Figure 12. Black skimmer adult and chick at Graveline Bay.



Figure 13. Black skimmer adult feeding a chick at Graveline Bay.



### *Least Tern*

We monitored least tern colonies at three sites in Mobile County: one on Dauphin Island, one at Graveline Bay, and one on Coffee Island (Table 5; Figure 14). We monitored five sites in Baldwin County: one on Bon Secour National Wildlife Refuge, and four in Orange Beach (Table 5; Figure 15). We calculated the productivity of each site as well as overall productivity using Methods 1 and 2.

For most of the colonies, we were able to gather direct nest and chick counts as they were relatively small. However, due to the large size of the colony on Graveline Bay we used different methods to estimate nest, chick, and fledgling numbers. The nest count estimate for Graveline Bay was the highest one day internal count of nests (548) plus an additional 456 incubating adults observed ~33 days later. The chick estimate was the highest one day count (164) plus downy counts every 10+ days, assuming that all downy chicks observed are new. The fledgling count was the highest one day count.

Orange Beach staff tracked nests across Orange Beach sites in order to better understand nest fates and hatch rates across the colonies. 374 nests were tracked across Alabama Point East, No Fly Zone, Shallow Lot, and Summer Salt. 25.6% of those nests hatched, 7.1% were depredated, 9.6% failed due to unknown causes and 57.7% had unknown fates. Ghost crabs were the primary cause of known depredations, though many nests were observed with eggshell fragments and yolk-stained sand with no other evidence as to cause of failure.

**Productivity using both methods was 0.21 fledglings/pair for Mobile County sites.**

**Productivity was 0.07-0.11 for Baldwin County sites using Method 1.**

**Productivity was 0.16-0.17 across all sites using Method 1.**

Causes for nest and chick loss included avian predation, human disturbance, and weather events. The small colony located on Dauphin Islands Far West End was split into two sections, three nests behind a few tide pools closer to the dunes, and two on the beachfront. The nests located on the beach front were likely lost to overwash as the sand in the area was found saturated during the subsequent survey. The nests toward the dunes did not have any signs of clear depredation, but human and dog tracks were found throughout the area. Two nests located on Bon Secour NWR Perdue Unit were likely lost to ghost crab depredation as tracks were observed in empty nest scrapes. Large numbers of nests at Graveline Bay were likely lost to overwash and avian predation. During internal surveys at the beginning of the season we observed nests made on or just above the high tide and wrack lines. While the small islands were well protected from wave action, the site did see some days of unusually high tides. We also observed a high density of gull and tern tracks on empty islands where least terns were nesting the week prior.

**Table 5. Least tern breeding season metrics for 2023.**

Site	Pairs	Nests	Chicks	Fledglings	Productivity
<b>Mobile County</b>					
Far West End	5	5	0	0	0.00
Coffee Island	6	9	6	6	1.00
Graveline Bay	548	1004	214	113	0.21
<b>Baldwin County</b>					
Bon Secour Perdue Unit	3	4	4	1	0.33
Alabama Point	325	323	62	11-19	0.03-0.06*
No Fly Zone	22	16	6	5-6	0.31-0.38*
Shallow Lot	28	17	5	3	0.18*
Summer Salt	15	18	13	8-11	0.53-0.73
<b>Total</b>	<b>952</b>	<b>1,396</b>	<b>306</b>	<b>147-159</b>	<b>0.16-0.17**</b>

\*Productivity was estimated using number of nests rather than number of pairs, as some pairs were unassumed not to be nesting.

\*\*Overall productivity was calculated using 933 pairs.



**Figure 14. Least tern colony locations in Mobile County during the 2023 breeding season.**



**Figure 15. Least tern colony locations in Baldwin County during the 2023 breeding season.**

*Gull-billed Tern*

We monitored gull-billed tern colonies at two sites, Coffee Island and Graveline Bay (Table 6; Figure 16). The colonies were relatively small, with Graveline Bay producing the most fledglings. We estimated productivity using the same methods as above for each island, as well as across all sites.

Coffee Island's nest count for gull-billed terns was the highest one-day nest count (39). This survey was conducted internally thus the nest numbers are an exact count. Subsequent surveys at the site were all conducted externally, and counts may be underrepresented. Chick (6) and fledgling (3) counts were the highest one day counts for each. Many nests were located along the wrack line or close to the high tide line so low productivity for the site is likely a result of overwash.

Graveline Bay's nest count for gull-billed terns was the highest one-day count (23) with an additional seven re-nests. This survey was conducted externally on 07 June while the highest internal survey count on 01 June was 18 nests. All surveys from 07 June forward were conducted externally and re-nesting was observed. Chicks (25) and fledgling (13) were the highest one day counts for each. Due to the high density of nesting birds at Graveline it is possible many chicks were lost to interspecies aggression and predation.

**Overall productivity with Method 1 and 2 was 0.26 fledglings/pair. Using Method 2, productivity across all sites was 0.25 fledglings/pair.**

**Table 6. Gull-billed tern breeding season metrics in 2023.**

Site	Pairs	Nests	Chicks	Fledglings	Productivity
Coffee Island	39	39	6	3	0.08
Graveline Bay	23	23	25	13	0.57
<b>Total</b>	<b>62</b>	<b>62</b>	<b>31</b>	<b>16</b>	<b>0.26</b>



**Figure 16. Gull-billed tern colony locations during the 2023 breeding season.**

### *Reddish Egret*

We did not find any reddish egret nests this season; however, we did consistently observe them on the Far West End, Pelican Island peninsula, and Tern Island throughout the breeding season. We recorded reddish egrets loafing on Coffee Island on a few occasions as well. Coffee Island, along with Marsh Island, provide suitable nesting habitat for wading birds as we observed nesting colonies of white ibis, great egrets, snowy egrets, cattle egrets, and tricolored herons. Much of those areas are either inaccessible or difficult to reach, so it is possible that reddish egrets nested within the colonies, and we were simply unable to see them.

### *Caspian Tern, Royal Tern, Sandwich Tern*

Caspian, royal, and sandwich terns nested on Cat Island (Figure 17), Coffee Island, and Graveline Bay (Figure 18) (Table 7). Estimates were made for the number of nests, chicks, and fledglings using similar methods as described above.

Productivity for caspian terns using method 1 was 0.99 fledglings/pair, and using method 2 was 0.49 fledglings/pair.

Productivity for sandwich terns was 0.41 fledglings/pair using both methods.

Productivity for royal terns was 0.39 fledglings/pair using method 1, and 0.38 fledglings/pair using method 2.

**Table 7. Breeding season metrics for caspian terns, royal terns, and sandwich terns in 2023.**

Site	Species	Pairs	Nests	Chicks	Fledglings	Productivity
Cat Island	Caspian tern	3	3	0	0	0.00
Cat Island	Royal tern	850	850	800	300	0.35
Cat Island	Sandwich tern	100	100	100-200	25	0.25
Coffee Island	Caspian tern	85	149	162	105	1.24
Coffee Island	Royal tern	14	17	≥13	13	0.93
Coffee Island	Sandwich tern	86	86	25	47	0.55
Graveline Bay	Caspian tern	70	80	66	52	0.74
Graveline Bay	Royal tern	194	254	≥99	99	0.51
Graveline Bay	Sandwich tern	17	23	≥11	11	0.65





**Figure 17. Royal tern adults and chicks on Cat Island.**



**Figure 18. Mixed-species tern colony at Graveline Bay.**

### *Killdeer & Common Nighthawk*

We also monitored killdeer and common nighthawk nests that were found during surveys. Nine killdeer nests were monitored, three at Beach Club Resort and Spa, one at Gulf Highlands, two on Public Beach West, two at Lightning Point, and one at the Intercoastal Boat Launch. Five of the nests hatched an estimated 10+ chicks, however the number that survived to fledge is unknown. Two nests had unknown fates, and two nests failed due to depredation; one from coyotes and one from domestic dogs. Six common nighthawk nests were monitored, three on Bon Secour Perdue East and three on Perdue West. Three nests hatched a total of six chicks, though the fates of the chicks are unknown. Two nests were lost due to ghost crab depredation, and one was lost to unknown causes.

## **Predator and Disturbance Surveys**

### *Predator Surveys*

Standardized predator surveys were conducted at various sites throughout Mobile and Baldwin Counties to understand predation pressure to breeding shorebirds. We randomly selected locations along a breeding bird survey route to conduct the predator track surveys. We recorded all predator and human tracks within a 10m diameter of the point. Ghost crab tracks and holes are denoted as GHCR-T, GHCR-H, respectively. Other data points that were recorded included: substrate type (packed sand, loose sand, soft mud, hard mud, shell hash), ground saturation (dry, moist, saturated, puddled), beach zone (forebeach, backbeach, foredunes, interdunes, backdunes, tidal flat/salt flat), and ground cover. We also noted any recent wind and rain within 24 hours.

### Mobile County

We conducted predator track surveys along six routes on Dauphin Island: Far West End, Katrina Cut, Public Beach East, Public Beach West, Pelican Bay, and Pelican Island. One to two surveys were conducted during each site visit except for Far West End where three surveys were conducted per visit. We conducted 71 predator surveys including 14 on Pelican Bay, six on Public Beach East, 20 on Pelican Island, 15 on Public Beach West, three on Katrina Cut, and 14 on Far West End (Figures 19-24).

Fox tracks were recorded on all sites except for Pelican Bay and were most prevalent on Katrina Cut and Far West End occurring in 100% and 64% of surveys respectively. Evidence of ghost crabs, including tracks and/or holes, were recorded on all sites and occurred in over half of surveys conducted on each beach zone. Human footprints were also recorded on each site and were most prevalent on Public Beach East and Public Beach West occurring in 100% and 87% of surveys, respectively. Other tracks recorded include coyote, heron, domestic cat, domestic dog, and opossum. Two predator surveys were conducted within 100m of active snowy plover nests, both located on the Far West End on 11 July. Ghost crab holes were the only predator tracks recorded in both surveys.

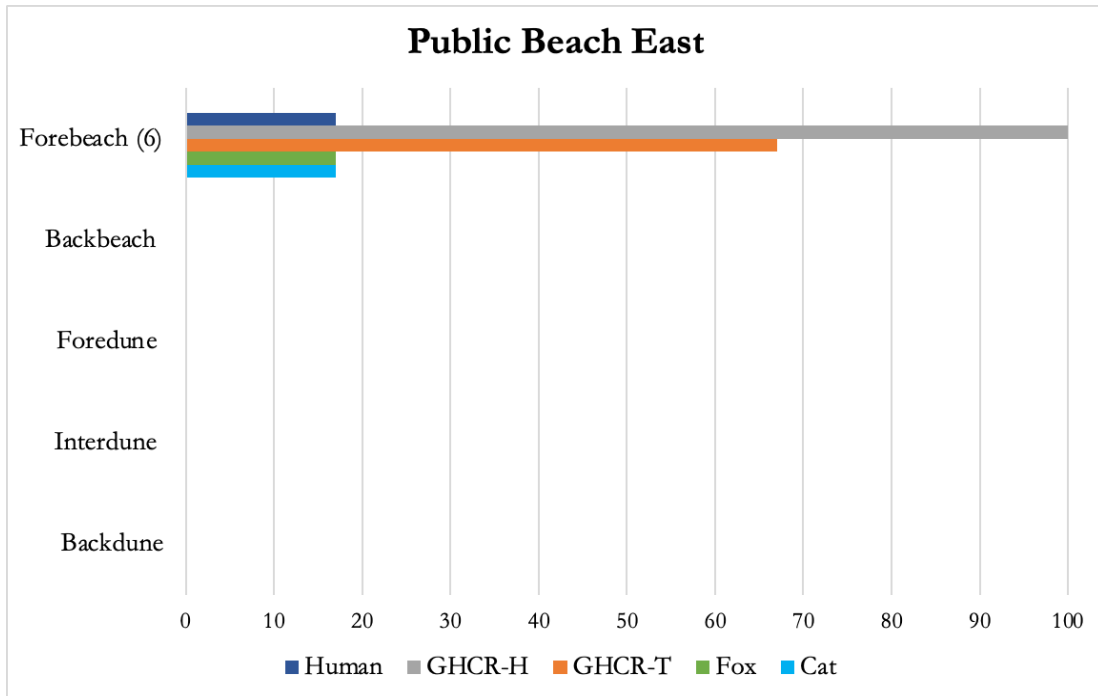


Figure 19. Percentages of high priority predator presence documented on Public Beach East. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

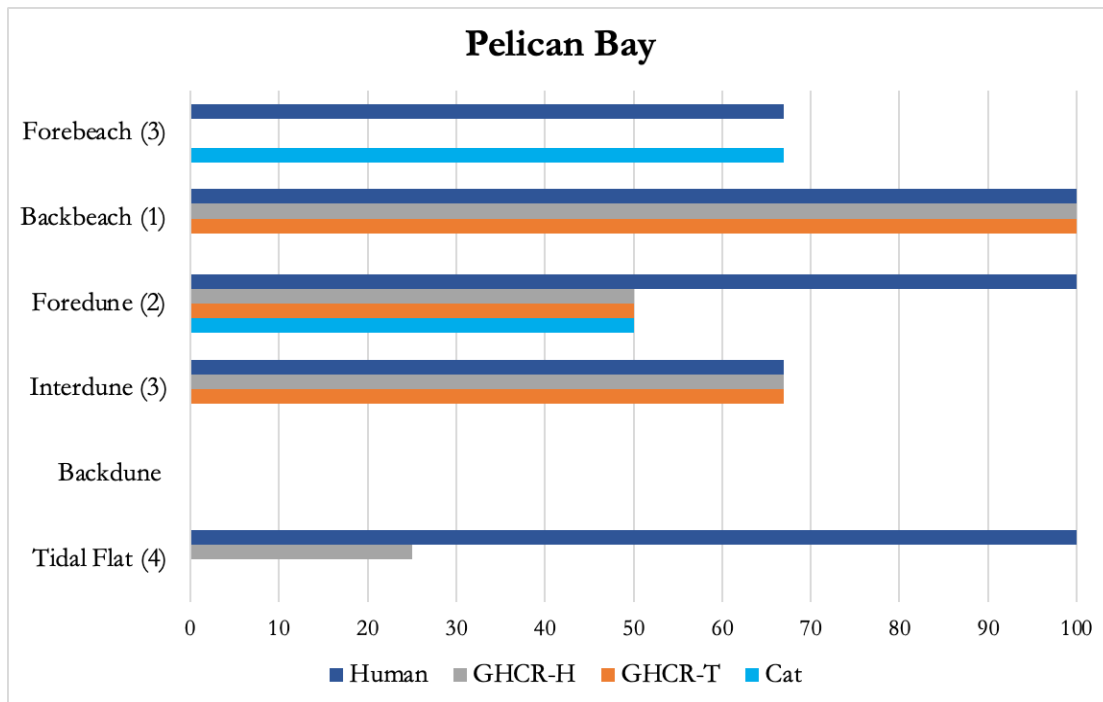


Figure 20. Percentages of high priority predator presence documented on Pelican Bay. Numbers next to the beach zone are the total number of circle surveys conducted at the site.



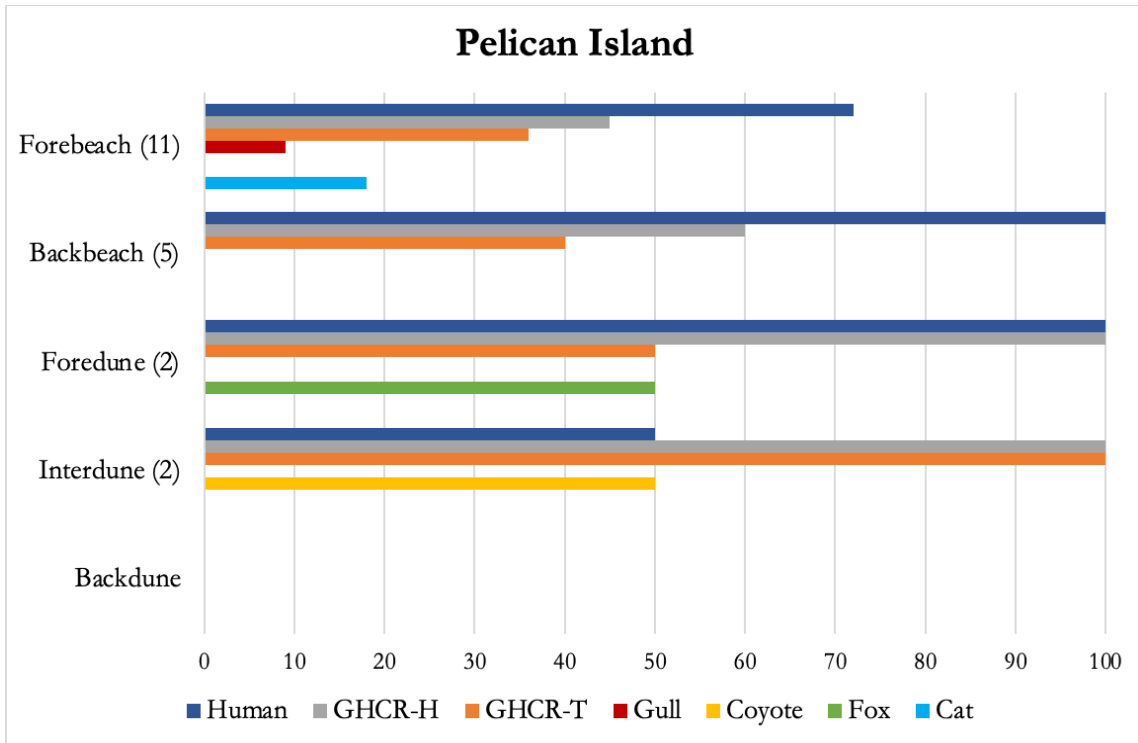


Figure 21. Percentages of high priority predator presence documented on Pelican Island. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

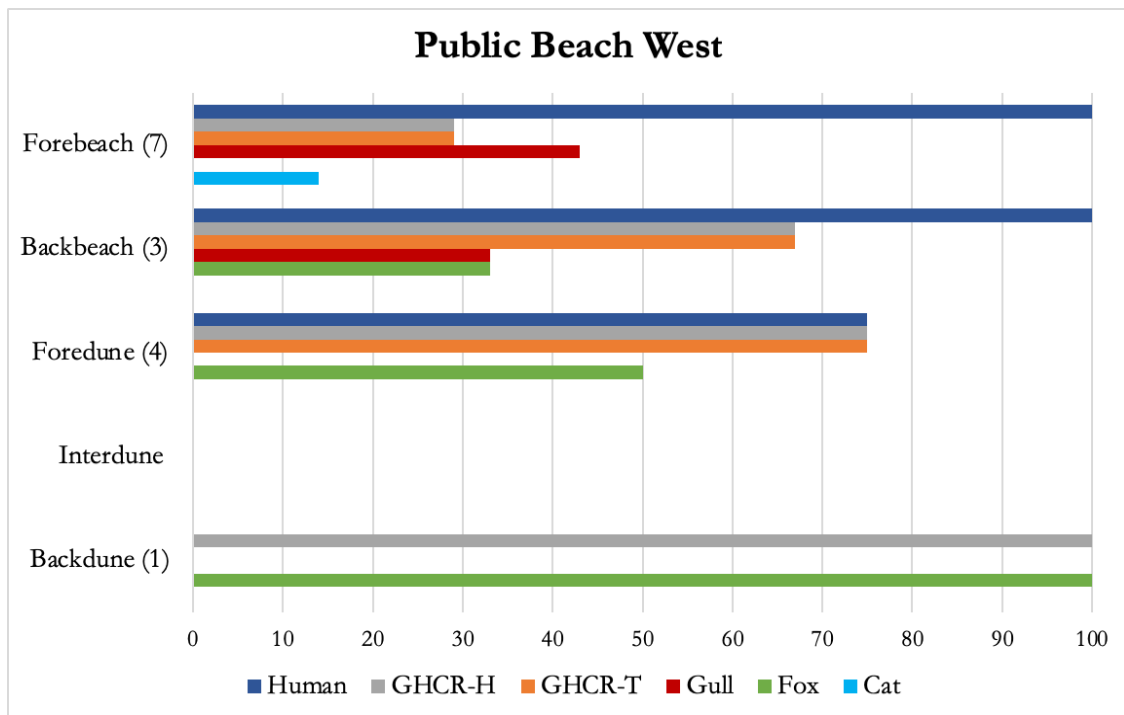


Figure 22. Percentages of high priority predator presence documented on Public Beach West. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

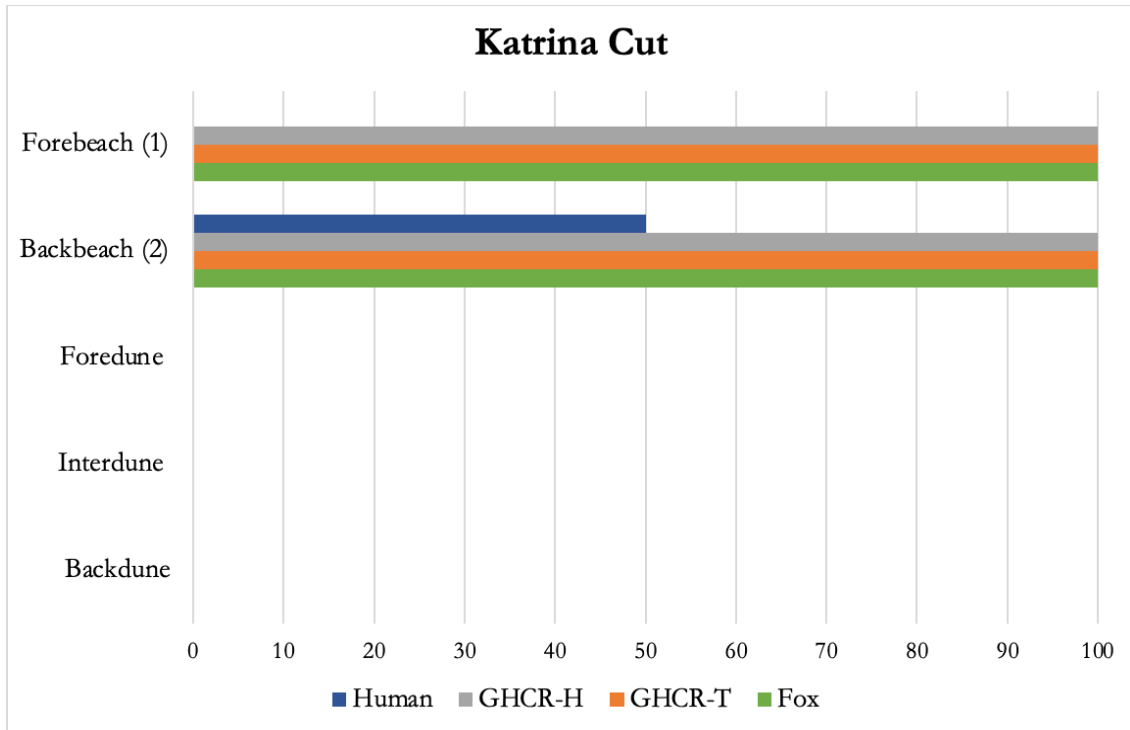


Figure 23. Percentages of high priority predator presence documented on Katrina Cut. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

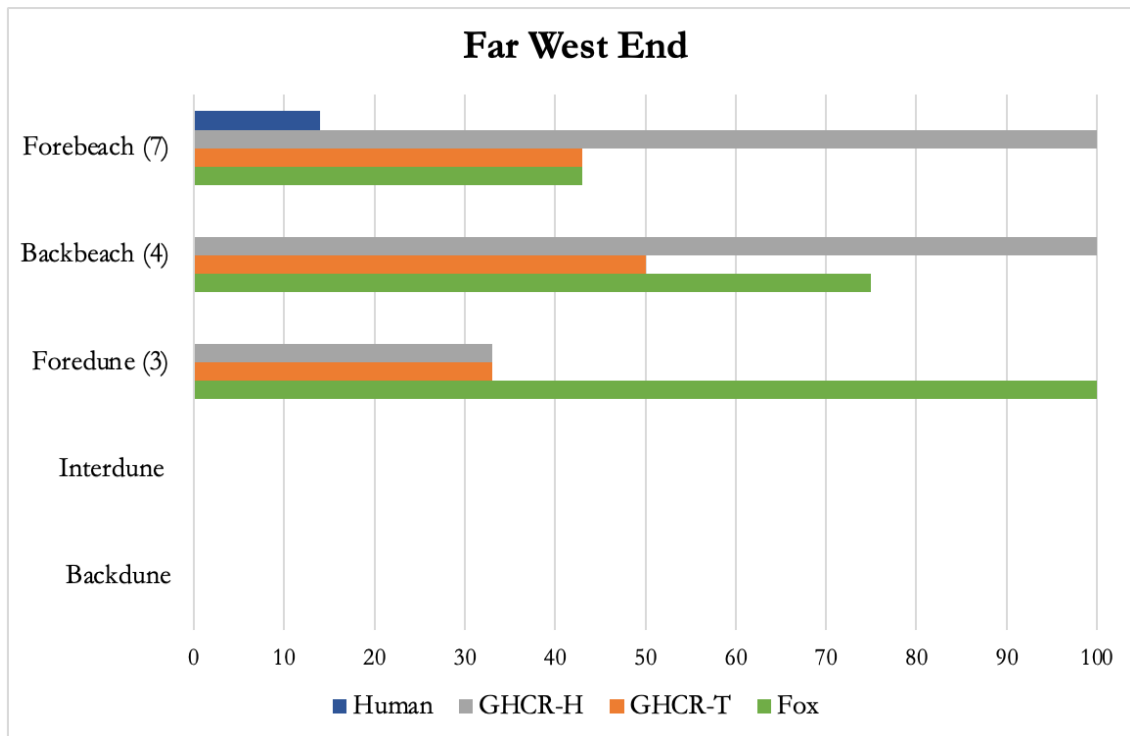


Figure 24. Percentages of high priority predator presence documented on Far West End. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

Baldwin County

We conducted 68 predator surveys including 20 at Gulf State Park, 24 at BSNWR Fort Morgan Unit, 16 at BSNWR Perdue Unit, and eight at Gulf Highlands (Figures 25-28). Two to three surveys were conducted per site visit. The beaches at Gulf State Park are subject to beach raking during summer months which could lead to underrepresented predator activity on the forebeach and back beach zones where raking occurs.

Coyote tracks were recorded at each site and were most prevalent on BSNWR Fort Morgan Unit (71%) and Gulf Highlands (63%). Across all sites they were most prevalent on the foredunes occurring in 79% of surveys conducted in that beach zone. They were also recorded in over half of surveys conducted in the interdunes (57%) and backdunes (50%). Evidence of ghost crabs were recorded at all sites and occurred in over 90% of surveys conducted on the forebeach, back beach, foredunes, and backdunes. We recorded human footprints in all beach zones with the most prevalence in the forebeach (95%) and back beach (90%). Other tracks observed include heron, opossum, and snake.

Two surveys were conducted within 100m of active snowy plover nests, both on Bon Secour Fort Morgan Unit. The first was conducted on 04 April and contained coyote tracks, ghost crab tracks and holes, and human footprints. The second was on 04 May and contained ghost crab tracks and holes, human footprints, and opossum tracks.

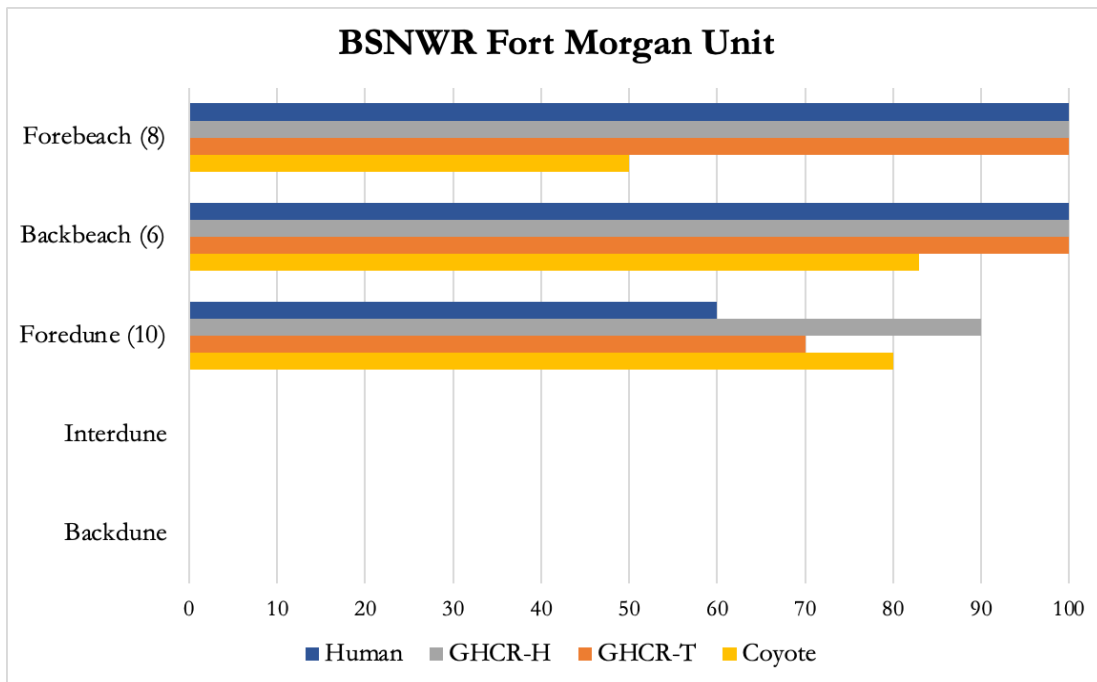


Figure 25. Percentages of tracks documented on BSNWR Fort Morgan Unit. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

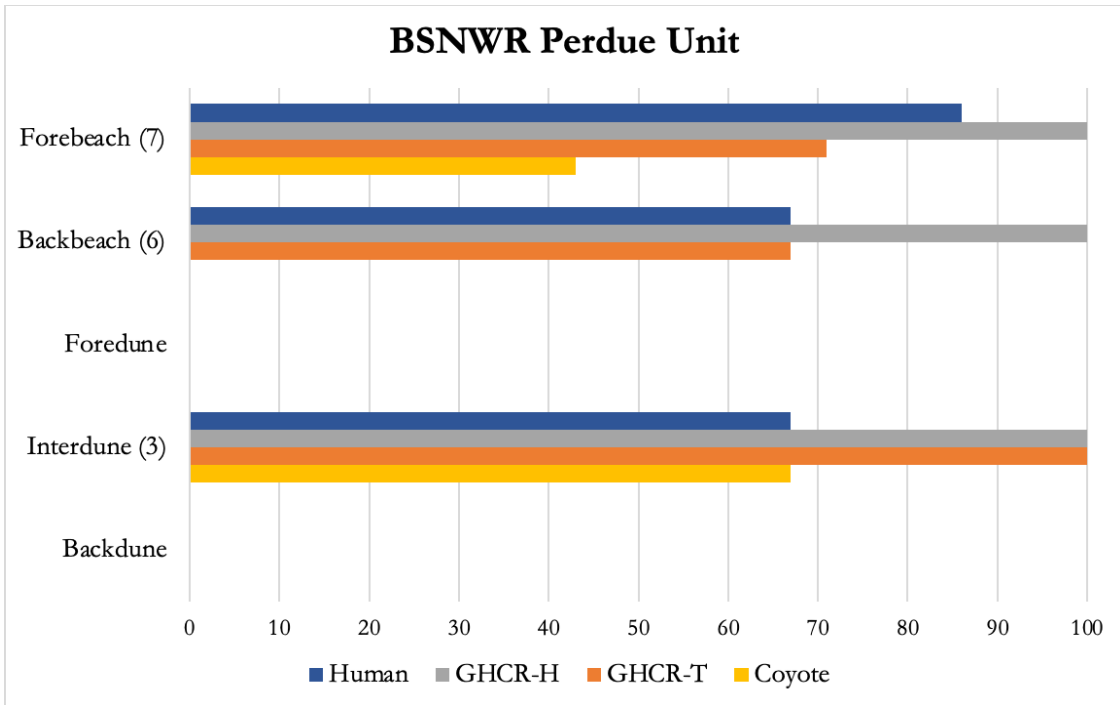


Figure 26. Percentages of tracks documented on BSNWR Perdue Unit Numbers next to the beach zone are the total number of circle surveys conducted at the site.

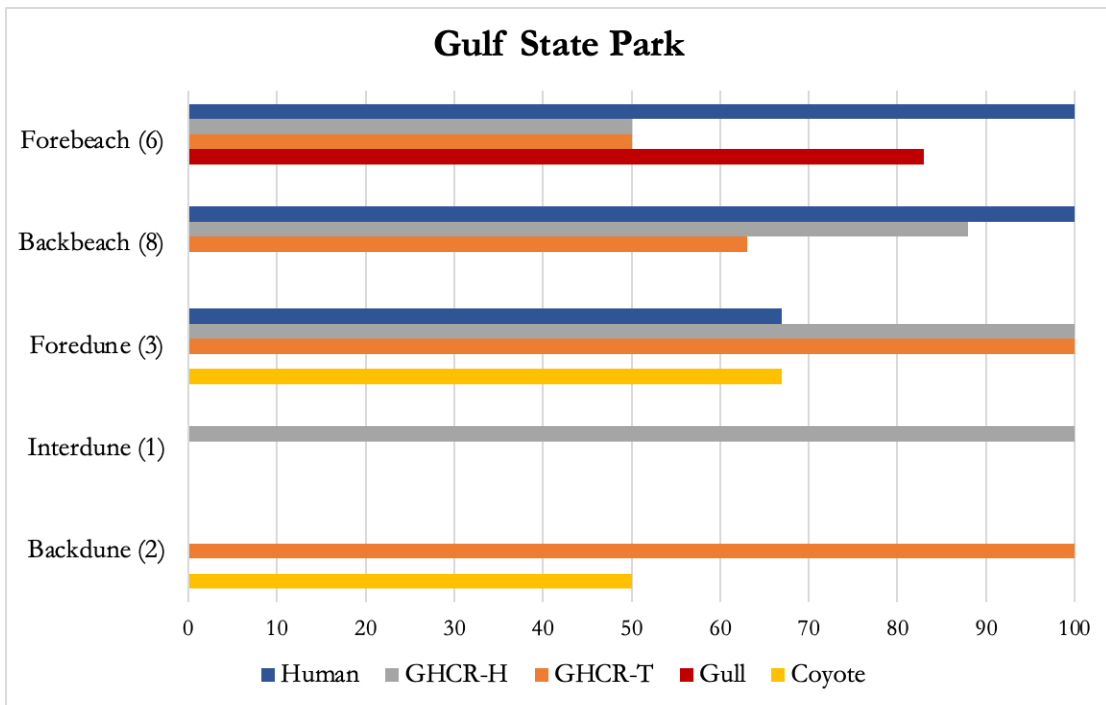
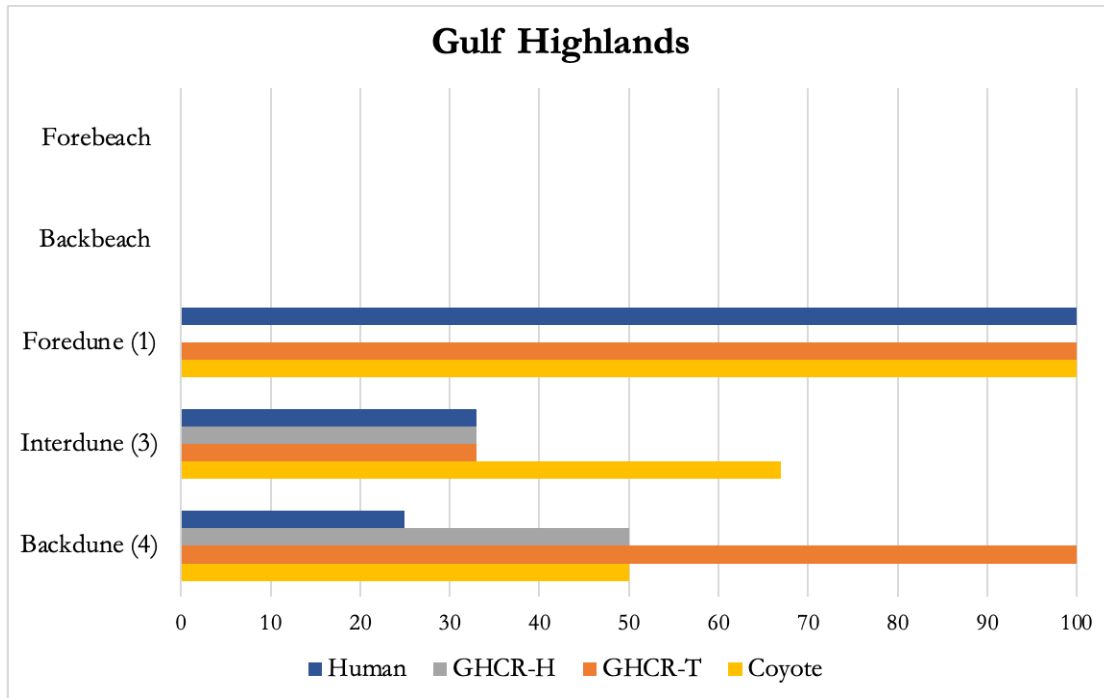


Figure 27. Percentages of tracks documented on Gulf State Park. Numbers next to the beach zone are the total number of circle surveys conducted at the site.



**Figure 28. Percentages of tracks documented on Gulf Highlands. Numbers next to the beach zone are the total number of circle surveys conducted at the site.**

### Orange Beach

Orange Beach staff conducted 42 predator circle surveys including 24 on Alabama Point East, two on Alabama Point West, seven on No Fly Zone, and nine on Shallow Lot (Figures 29-31). One survey was conducted per site visit for Alabama Point West, No Fly Zone, and Shallow low, and three were conducted per site visit to Alabama Point East.

Coyote tracks were recorded at all sites except Shallow Lot and were most prevalent on Alabama Point West (100%) and No Fly Zone (57%). Fox tracks were recorded on Alabama Point East in 13% of surveys. Gull tracks and evidence of ghost crabs were observed at all sites except Alabama Point West, with gull tracks being most prevalent on No Fly Zone (57%) and ghost crabs most prevalent on Alabama Point East (29%). Human footprints were recorded in 100% of surveys conducted at each site. Other tracks observed include owl and heron.

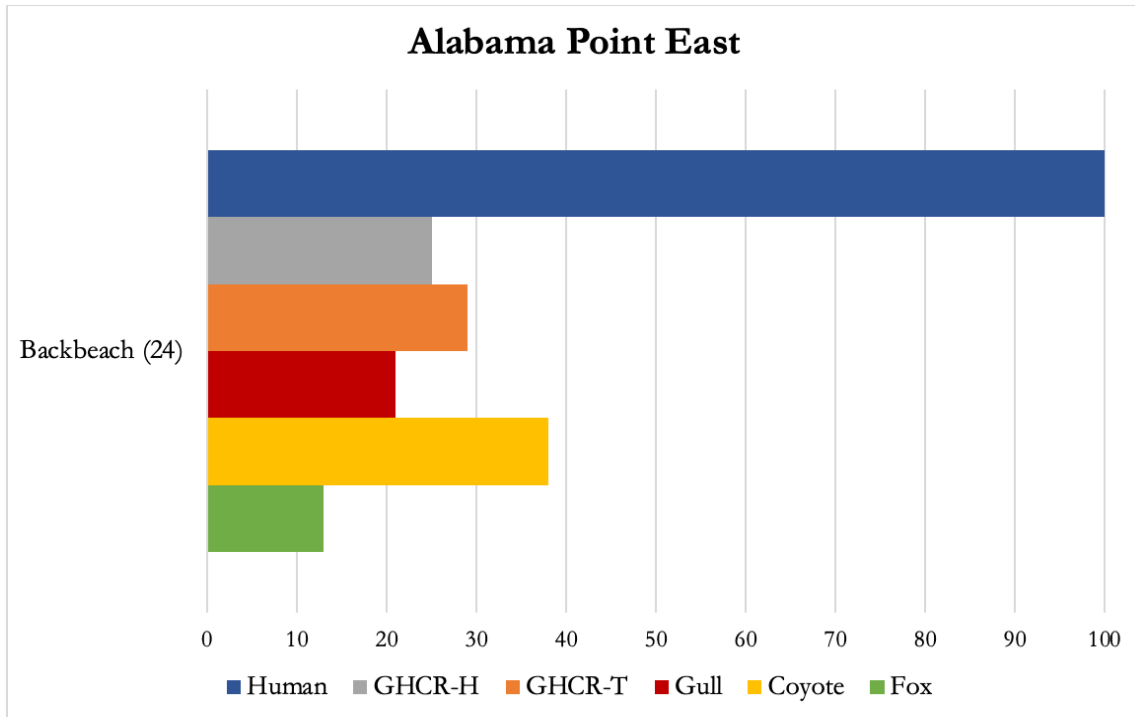


Figure 29. Percentages of tracks documented on Alabama Point East. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

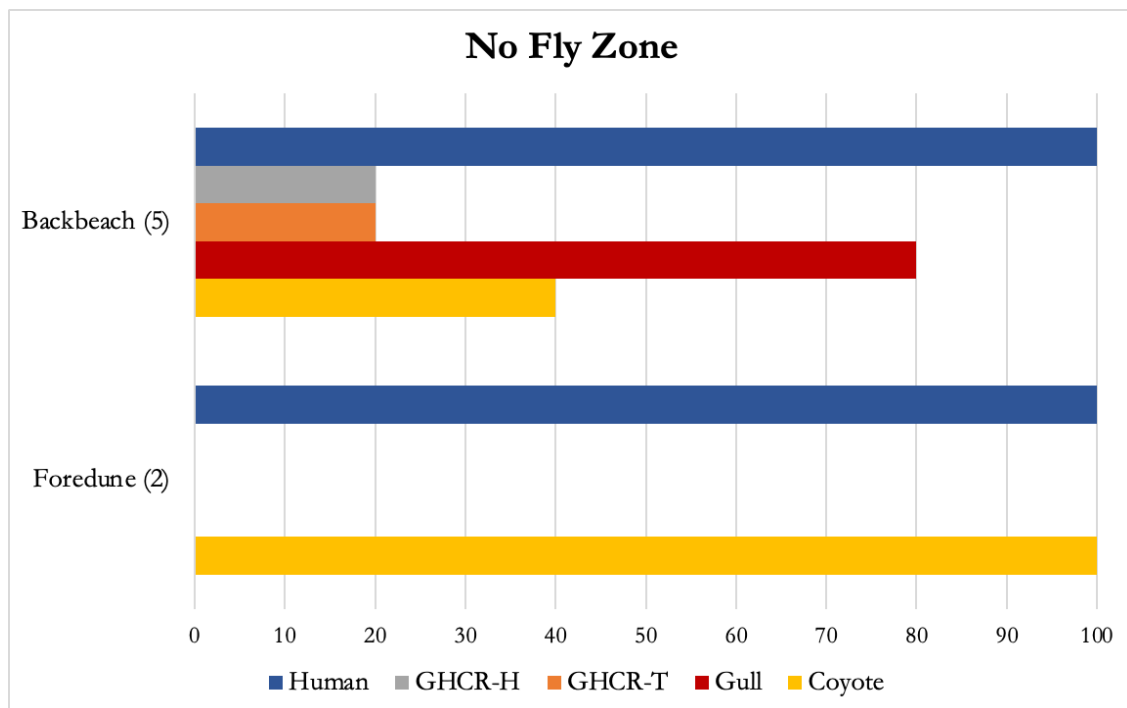
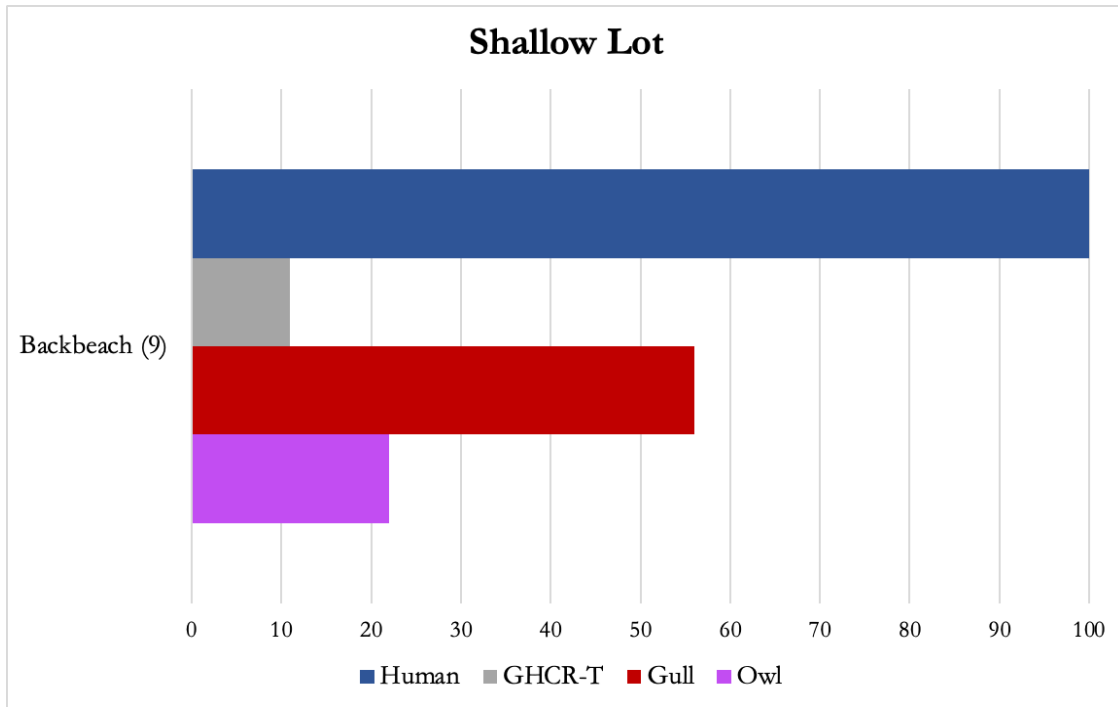


Figure 30. Percentages of tracks documented on No Fly Zone. Numbers next to the beach zone are the total number of circle surveys conducted at the site.



**Figure 31. Percentages of tracks documented on Shallow Lot. Numbers next to the beach zone are the total number of circle surveys conducted at the site.**

## Disturbance

Beginning in May of 2023, we began collecting data focused on understanding the types and amounts of disturbances to nesting and loafing birds. Data was collected at two sites: Alabama Point in Baldwin County, and Graveline Bay in Mobile County. We collected data on numbers of adult birds and their behavior, number of chicks and fledglings, number of people present on the beach, number of leashed and unleashed dogs present on the beach, and disturbances to nesting and loafing birds. We also conducted education and outreach to beachgoers, and occasionally intervened when the public was acting in a way that disturbed the birds continuously.

When a disturbance occurred, we recorded the reaction of the birds. These reactions included defensive (physically dive bombing or chasing the source), flushing (leaving the nest), alert (shifting into the upright and aware position) or no reaction at all (remaining in the same position prior to the disturbance). In the case that birds of multiple species were disturbed by the same cause, we recorded these as separate events with unique data for each species affected. At Graveline Bay, we separated the islands into four quadrants to aid in data organization, so in the case that multiple quadrants were disturbed by the same cause, each was recorded as a separate disturbance with unique data, even when members of the same species were affected in two different quadrants. We documented 8 kinds of disturbance to birds including: people walking too close to the birds/colony

(**WALK**), use of beach toys (e.g., drones, kites, balls, etc.) (**TOY** or **KITE**), vehicles (e.g., law enforcement trucks, lifeguard ATV/UTVs) (**VEH**), aircrafts (e.g., low-flying planes) (**AIRCR**), kayaks and paddleboards coming too close to colonies (**PADDLE**), harassment to birds (e.g., throwing things, swatting) (**HARASS**), boats or jet skis coming too close (**BOAT**) and other birds seen as a threat to the colony (**GULL, OSPR, GBHE, etc.**).

Last season, our coastal stewards suggested recording times when birds did not react to a possible disturbance. This year we added this to our data collection by recording when a common cause of disturbance happened within 10 meters of a colony, but 100% of birds did not react. These are not included in our colony disturbance data but are analyzed separately.

### *Alabama Point*

Least terns have nested at Alabama Point since monitoring began in 2018. Data was collected on one section of the least tern colony that nested at this beach. Sixteen surveys were conducted from 08 May–12 July. Two major categories of disturbances were seen: bird disturbances and human disturbances, with human being more prevalent (Figure 32). Gulls caused 78.4% of the bird disturbances, followed by ospreys (7.8%) and great blue herons (8.6%). Royal terns contributed 2.6% to disturbances, crows were 1.7%, and common grackles were 0.7%. People walking near the colony caused 81.6% of the human disturbances, followed by low-flying aircraft (11.4%), and vehicles driving on the beach (3.2%). Toys caused 2.2% of the disturbances, kites 1.1%, and harassment 0.5%.

In each of the disturbance events we recorded, some portion of the colony displayed a reaction (i.e., there were no disturbance events where 100% of the colony did not react, see *Possible Disturbance* for data on these events). There were few events where 100% of the colony exhibited the same reaction; there were eight events where the whole colony flushed. Of the 315 disturbance events, some portion of the colony exhibited defensive behavior 155 of those.

The average colony reaction to disturbance is shown in Figure 33. On average, over half of the colony did not react to disturbances. Typically, when a disturbance occurred, only the least terns that were closest to the source of disturbance showed any reaction, leaving most of the colony without any reaction at all. 4.1% of the time least terns were defensive towards the disturbance. This usually involved one to 15 least terns dive-bombing or pushing off an intruder. 25.1% of the time least terns reacted by flushing and moving into the alert position 9% of the time.

The number of disturbances increased over the month of May but didn't necessarily correspond to an increase in human presence (Figure 34), as the number of people observed on the beach remained high during late-May through mid-June while disturbances decreased. However, there was a peak in both number of people and disturbances on one day during late-June.



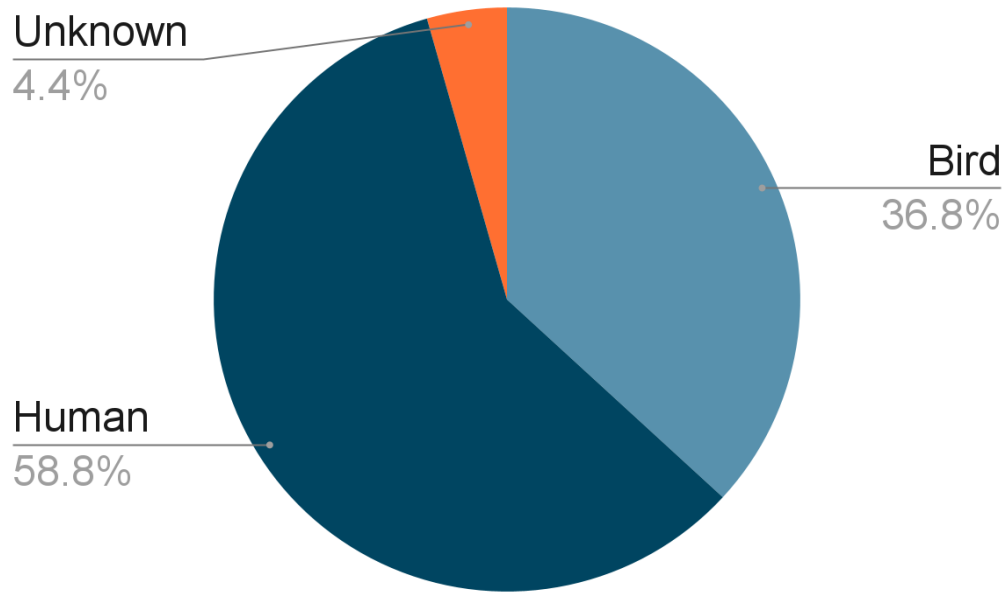


Figure 32. Percentages of major categories of disturbances at Alabama Point.

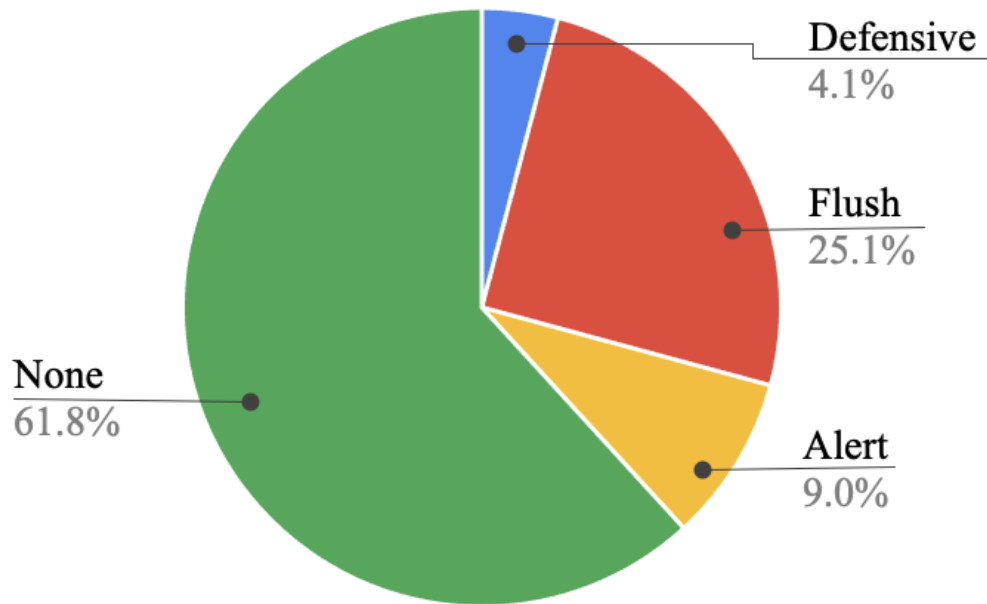
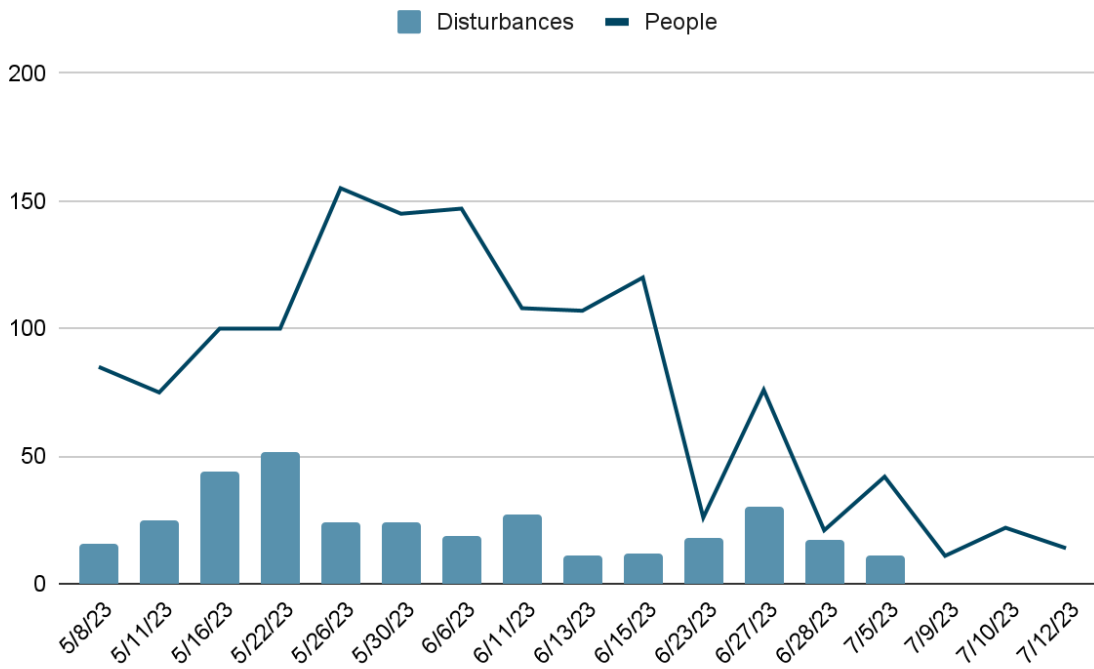


Figure 33. Average percentage of the least tern colony reaction to a disturbance.



**Figure 34. Human presence and disturbance trends throughout the 2023 breeding season at Alabama Point.**

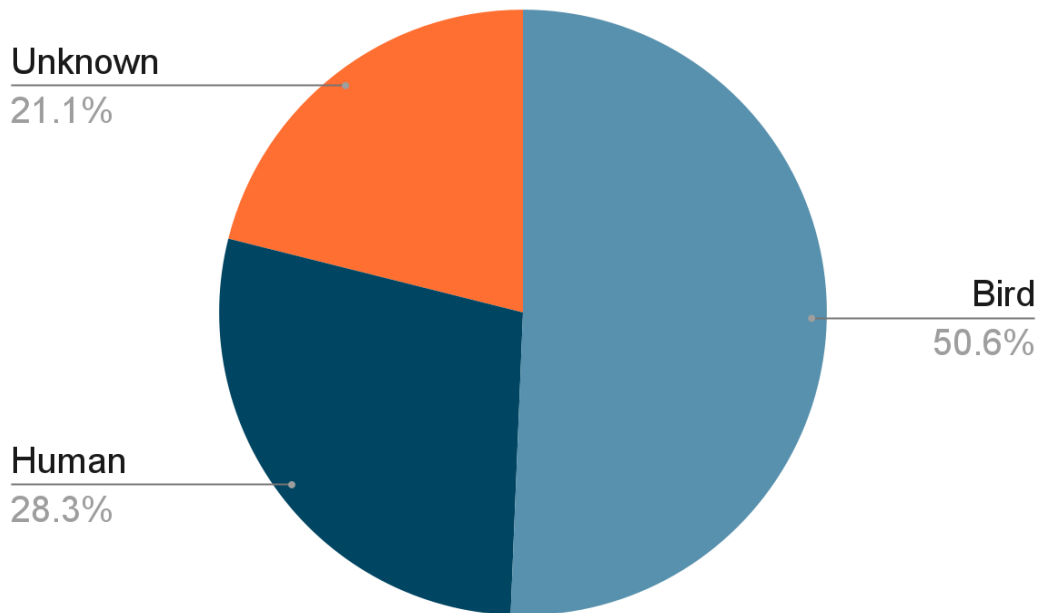
*Graveline Bay*

This was the first year shorebirds nested at this site, as the marsh restoration project was finished in 2022. These colonies included least terns, black skimmers, royal terns, Caspian terns, sandwich terns, and gull-billed terns. Fourteen surveys were conducted from 15 May–17 July. As with Alabama Point, there were two major categories of disturbances seen: bird and human; however, in this location bird disturbances were more prevalent (Figure 35). Gulls caused 41.6% of the bird disturbances, followed by ospreys (15.6%) and great blue herons (37.7%). Royal terns contributed 1.3% to disturbances, gull-billed terns were 2.6%, and black skimmers caused 1.3%. People walking near or through the colony caused only 11.6% of the human disturbances, the most prevalent cause of human disturbance was kayakers and paddleboarders coming too close to the colonies (32.6%) and harassing the birds (mostly jet skiers, 30.2%). Boats caused 21% of the disturbances, and aircraft caused 4.7%.

On average, just under half of the colony quadrant did not react to disturbances (Figure 36). Often the disturbance was contained to one or two islands, rather than the whole quadrant. The most frequent response to a disturbance at this site was flushing, which occurred 47.7% of the time. This last number may be underreported, since due to the size of the site it was not common to be close enough to the colony to see this nuanced behavior.

There was a slight trend with the number of people present in the area and the number of disturbances, with both being the highest early in the season (May) and showing a general decline over the next two months (Figure 37). However, there were instances where there was little correlation, such as human presence being recorded but with no disturbance events occurring (05 June), or high disturbances but little to no human presence (26 June, 17 July). It is important to note that disturbance events were categorized by quadrant of the bay for this site. In instances where one disturbance caused birds to react in multiple quadrants, it was recorded as multiple disturbances - one for each quadrant. Multiple disturbances were also recorded if one source caused disturbance to multiple species in the same quadrant. In this case, a disturbance would be recorded for each species disturbed. The only exception to this rule was in the case of the larger colonial terns (royal terns, Caspian terns, sandwich terns, and gull-billed terns) who nested in large numbers in comparatively small areas together, making it difficult to get exact counts for each species when flushing or defending. In this case, these birds were lumped together in disturbance events.

In each of the disturbance events we recorded, some portion of the colony displayed a reaction (i.e., there were no disturbance events where 100% of the colony did not react, see *Possible Disturbance* for data on these events). There were few events where 100% of the colony exhibited the same reaction; there were 17 events where the whole colony flushed. Of the 152 disturbance events, some portion of the colony exhibited defensive behavior 62 of those.



**Figure 35. Percentages of disturbance categories at Graveline Bay.**

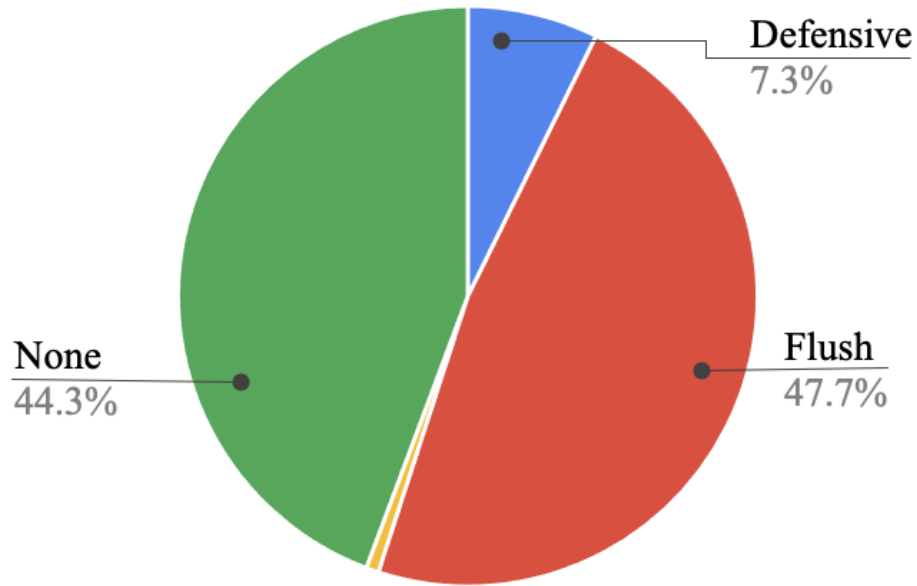


Figure 36. Average percentage of the least tern colony reaction to a disturbance.

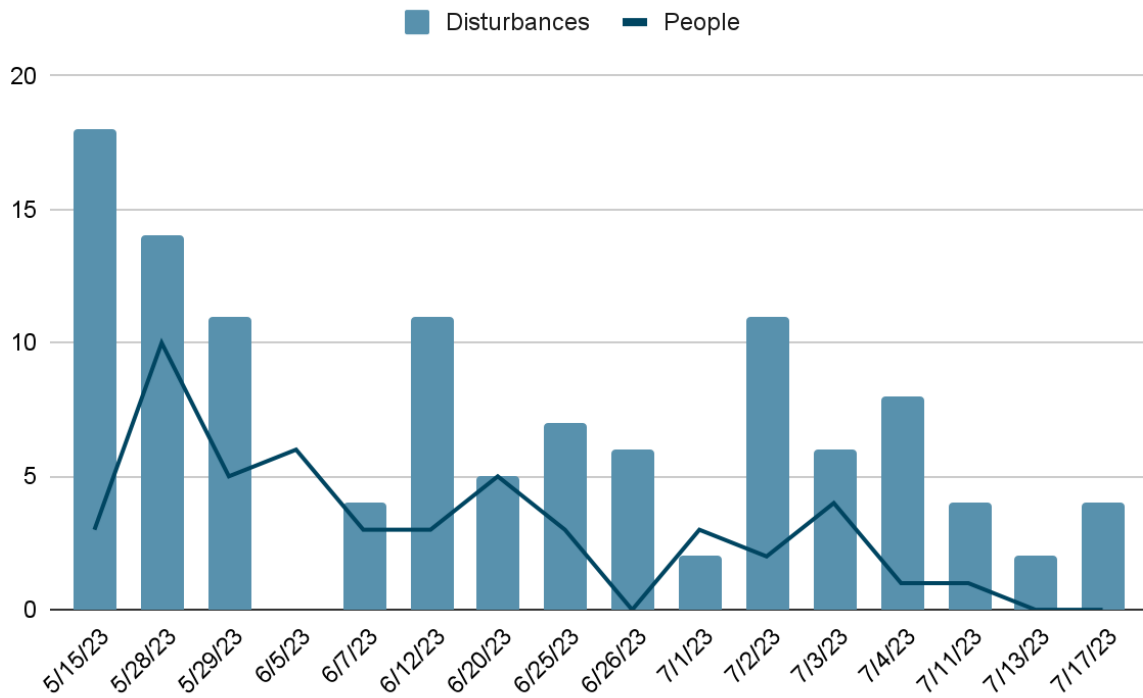


Figure 37. Human presence and disturbance trends throughout the season at Graveline Bay.

## Possible Disturbance Data

Possible disturbances were recorded as 100% none-behavior anytime a possible disturbance source came within 10 meters of the colony edge. We recorded 19 possible disturbances during our surveys, 18 at Alabama Point and one at Graveline Bay. This number could be underreported, as the area we observed from at Graveline Bay necessitated being far enough away from the islands themselves that it was difficult to see every possible disturbance that could have occurred. The majority of possible disturbances were from gulls flying through or beside the colony (52.6%). Walking too near the colony had 26.3%, and aircraft flying low had 10.5%. The last of the possible disturbances were from vehicles and great blue herons, which each had 5.3%.

## Audubon Coastal Bird Surveys

Audubon Coastal Bird surveys are standardized abundance surveys that are conducted every fall, winter, and spring along set routes. Surveys are conducted by walking the high tide line of each route and counting all birds that are seen and heard within a 0.25 miles radius. Metadata including trash, human activity, wrack lines, and weather conditions were also recorded for each survey. The fall and spring pulses consist of six surveys per site, taking place August-October and March-May, respectively. The winter pulse includes three surveys from January to February. Surveys were conducted in 10 to 14-day intervals. A total of 20 routes were included in the Audubon Coastal Bird Surveys during the Winter, Spring and Fall 2023 pulses, 9 of which were led by volunteers. Throughout 2023 volunteers conducted 120 ACBS surveys totaling 242.8 hours.

We documented 107 different species during the winter 2023 ACBS surveys including 47 landbird species, 14 shorebird species, 14 species of waterfowl and allies, eleven gull/tern species, eight wading bird species, seven raptor species, one pelagic species, and five marsh bird species. Bayfront Park had the highest average species richness ( $40.33 \pm 4.99$ ) for the Baldwin County sites, while Pelican Bay had the highest ( $28.33 \pm 1.89$ ) for Mobile County sites (Table 8).

144 species were documented during the Spring 2023 season including 71 landbird species, 21 shorebird species, 12 species of waterfowl and allies, 14 gull/tern species, 12 wading bird species, six raptor species, one pelagic species, and seven marsh bird species. Bayfront Park had the highest average number of species recorded ( $44.33 \pm 4.71$ ) for Baldwin County sites and Pelican Bay had the highest ( $31.00 \pm 5.29$ ) for Mobile County sites (Table 8).

136 total species were documented during the Fall 2023 season including 61 landbird species, 21 shorebird species, eight species of waterfowl and allies, 13 gull/tern species, 15 wading bird species, nine raptor species, two pelagic species, and seven marsh bird species. Bayfront Park had the highest average number of species recorded ( $37.33 \pm 8.98$ ) for Baldwin County sites and Far West End had

the highest ( $24.60 \pm 3.07$ ) for Mobile County sites (Table 8). A complete list of all species documented during 2023 ACBS is in Table 9.

**Table 8. Species richness values from 2023 ACBS surveys for routes surveyed in Mobile and Baldwin Counties.**

<b>Mobile County</b>	<b>Winter 2023</b>	<b>Spring 2023</b>	<b>Fall 2023</b>
Cat Island	$11.00 \pm 0.00$	$15.66 \pm 2.13$	$11.20 \pm 0.98$
Coffee Island	$13.00 \pm 2.00$	$24.83 \pm 4.18$	$22.40 \pm 2.06$
Tern Island	$8.00 \pm 3.00$	$18.75 \pm 4.60$	$22.00 \pm 0.00$
Dauphin Island West End	$13.33 \pm 1.25$	$14.00 \pm 2.00$	$11.83 \pm 2.85$
Far West End	$14.00 \pm 2.16$	$20.83 \pm 5.24$	$24.60 \pm 3.07$
Pelican Bay	$28.33 \pm 1.89$	$31.00 \pm 5.29$	$19.33 \pm 1.80$
Pelican Island	$14.50 \pm 2.50$	$15.83 \pm 4.02$	$13.50 \pm 1.61$
Public Beach East	$11.67 \pm 4.11$	$13.33 \pm 3.86$	$13.50 \pm 1.50$
Public Beach West	$9.50 \pm 6.50$	$15.83 \pm 3.98$	$20.83 \pm 4.63$
<b>Baldwin County</b>	<b>Winter 2023</b>	<b>Spring 2023</b>	<b>Fall 2023</b>
Alabama Point	$8.00 \pm 1.63$	$7.50 \pm 1.38$	$7.00 \pm 1.83$
Bayfront Park	$40.33 \pm 4.99$	$44.33 \pm 4.71$	$37.33 \pm 8.98$
Bird Island	$3.33 \pm 0.47$	$9.67 \pm 3.50$	$6.00 \pm 1.10$
Bon Secour NWR- Ft. Morgan	$19.00 \pm 1.63$	$20.17 \pm 6.54$	$19.00 \pm 5.60$
Bon Secour NWR- Perdue Unit	$9.33 \pm 1.25$	$11.83 \pm 3.89$	$11.83 \pm 1.77$
Fairhope Public Beach	$36.67 \pm 4.03$	$26.83 \pm 6.59$	$26.67 \pm 3.40$
Gulf State Park	$13.67 \pm 1.70$	$19.17 \pm 3.44$	$12.33 \pm 1.97$
May Day Park	$30.33 \pm 2.05$	$32.00 \pm 2.31$	$29.50 \pm 4.23$
Orange Beach	$6.00 \pm 1.41$	$4.50 \pm 1.89$	$4.67 \pm 1.25$
Robinson Island	$2.67 \pm 1.25$	$8.00 \pm 1.73$	$4.40 \pm 1.20$
Walker Island	$11.67 \pm 0.47$	$9.50 \pm 2.14$	$4.50 \pm 2.29$



**Table 9. All species observed during 2023 ACBS surveys.**

Landbirds		Shorebirds	Waterfowl & Allies	Gulls & Terns	Wading Birds	Raptors	
American Crow	Eastern Phoebe	Red-bellied Woodpecker	American Avocet	American Coot	Black Skimmer	American White Pelican	American Kestrel
American Goldfinch	Eastern Towhee	Red-breasted Nuthatch	American Golden-Plover	Black Scoter	Black Tern	Black-crowned Night Heron	Bald Eagle
American Redstart	Eastern Wood-Pewee	Red-eyed Vireo	American Oystercatcher	Black-bellied Whistling-Duck	Bonaparte's Gull	Brown Pelican	Broad-winged Hawk
American Robin	Eurasian Collared-Dove	Red-headed Woodpecker	Baird's Sandpiper	Blue-winged Teal	Caspian Tern	Cattle Egret	Cooper's Hawk
Bank Swallow	European Starling	Red-winged Blackbird	Black-bellied Plover	Bufflehead	Common Tern	Great Blue Heron	Merlin
Barn Swallow	Fish Crow	Rock Pigeon (Feral Pigeon)	Buff-breasted Sandpiper	Canada Goose	Forster's Tern	Great Egret	Northern Harrier
Belted Kingfisher	Gray Catbird	Rose-breasted Grosbeak	Dunlin	Common Loon	Franklin's Gull	Green Heron	Osprey
Blue Grosbeak	Gray Kingbird	Ruby-crowned Kinglet	Greater Yellowlegs	Domestic goose sp. (Domestic type)	Great Black-backed Gull	Little Blue Heron	Peregrine Falcon
Blue Jay	Great Crested Flycatcher	Ruby-throated Hummingbird	Killdeer	Double-crested Cormorant	Gull-billed Tern	Reddish Egret	Red-shouldered Hawk
Blue-gray Gnatcatcher	House Finch	Savannah Sparrow	Least Sandpiper	Greater Scaup	Herring Gull	Roseate Spoonbill	
Boat-tailed Grackle	House Sparrow	Scaly-breasted Munia	Lesser Yellowlegs	Hooded Merganser	Laughing Gull	Snowy Egret	<b>Marsh Birds</b>
Bobolink	House Wren	Song Sparrow	Marbled Godwit	Horned Grebe	Least Tern	Tricolored Heron	Black-necked Stilt
Brown Thrasher	Indigo Bunting	Summer Tanager	Pectoral Sandpiper	Lesser Scaup	Lesser Black-backed Gull	White Ibis	Clapper Rail
Brown-headed Cowbird	Loggerhead Shrike	Swamp Sparrow	Piping Plover	Mallard	Ring-billed Gull	Yellow-crowned Night Heron	Marsh Wren
Brown-headed Nuthatch	Mourning Dove	Tennessee Warbler	Ruddy Turnstone	Muscovy Duck (Domestic type)	Royal Tern		Mottled Duck
Carolina Chickadee	Northern Cardinal	Tree Swallow	Sanderling	Pied-billed Grebe	Sandwich Tern	<b>Pelagic</b>	Nelson's Sparrow
Carolina Wren	Northern Flicker	Tufted Titmouse	Semipalmated Plover	Red-breasted Merganser		Magnificent Frigatebird	Seaside Sparrow
Cedar Waxwing	Northern Mockingbird	Western Kingbird	Semipalmated Sandpiper	Redhead		Northern Gannet	Sedge Wren
Chimney Swift	Northern Parula	White-eyed Vireo	Short-billed Dowitcher	White-winged Scoter			Sora
Cliff Swallow	Northern Rough-winged Swallow	White-throated Sparrow	Snowy Plover	Wood Duck			Virginia Rail
Common Grackle	Orange-crowned Warbler	Wood Thrush	Spotted Sandpiper				Wilson's Snipe
Common Nighthawk	Orchard Oriole	Yellow Warbler	Western Sandpiper				
Common Yellowthroat	Palm Warbler	Yellow-bellied Sapsucker	Whimbrel				
Dark-eyed Junco	Pileated Woodpecker	Yellow-billed Cuckoo	Willet				
Downy Woodpecker	Pine Siskin	Yellow-rumped Warbler					
Eastern Bluebird	Pine Warbler	Yellow-throated Warbler					
Eastern Kingbird	Prairie Warbler						
Eastern Meadowlark	Purple Martin						

## Coastal Waterbird Species Richness

While species richness was highest at Bayfront Park and Pelican Bay, most of the species seen were landbirds, raptors or waterfowl that are not dependent on the coast. To better understand the use of ACBS sites by coastal waterbirds, all species determined not to be coastal waterbirds were excluded from the following species richness calculations. For this report, coastal waterbirds are defined as species that rely on either the dunes, beaches, or shorelines adjacent to coastal waters for a major migratory stop-over, the nonbreeding season, and/or breeding season. Species that can utilize other bodies of water or similar beach/shoreline habitats not related to the coast (i.e., belted kingfisher, cattle egret, American white pelican) were not included. Pelagic species that spend most of their life at sea were also excluded from the calculations. In total, 60 of the 177 species seen during the 2023 surveys were included.

We documented 34 different coastal waterbird species during the 2023 winter ACBS including fourteen shorebird species, one species of waterfowl and allies, eleven gull/tern species, seven wading bird species, and two marsh bird species. Bayfront Park had the highest average species richness ( $11.00 \pm 0.82$ ) for the Baldwin County sites, while Pelican Bay had the highest ( $14.00 \pm 1.63$ ) for Mobile County sites (Table 10).

Forty-eight coast-dependent species were documented during the spring season including twenty shorebird species, one species of waterfowl and allies, fourteen gull/tern species, 10 wading bird species, and three marsh bird species. Gulf State Park had the highest average number of species recorded ( $12.00 \pm 1.91$ ) for Baldwin County sites and Coffee Island had the highest ( $21.83 \pm 3.93$ ) for Mobile County sites (Table 10).

Fifty-two coast-dependent species were documented during the fall season including 21 shorebird species, one species of waterfowl and allies, 13 gull/tern species, 13 wading bird species, and four marsh bird species. Bayfront Park had the highest average number of species recorded ( $15.33 \pm 2.49$ ) for Baldwin County sites and Coffee Island had the highest ( $20.80 \pm 1.72$ ) for Mobile County sites (Table 10).

**Table 10. Species richness values for coast-dependent species in 2023.**

<b>Mobile County</b>	<b>Winter 2023</b>	<b>Spring 2023</b>	<b>Fall 2021</b>
Cat Island	10.0 ± 0.00	14.50 ± 2.14	9.80 ± 0.75
Coffee Island	11.50 ± 1.50	21.83 ± 3.93	20.80 ± 1.72
Tern Island	7.50 ± 2.50	17.25 ± 4.82	19.50 ± 0.50
Dauphin Island West End	12.00 ± 0.82	11.5 ± 1.71	9.00 ± 1.83
Far West End	10.67 ± 1.25	17.33 ± 4.19	19.00 ± 3.29
Pelican Bay	14.00 ± 1.63	18.00 ± 2.08	12.50 ± 1.12
Pelican Island	12.00 ± 2.00	12.17 ± 3.23	12.33 ± 1.49
Public Beach East	5.00 ± 1.63	8.17 ± 2.27	8.33 ± 1.60
Public Beach West	7.50 ± 4.50	13.00 ± 2.94	17.50 ± 4.43
<b>Baldwin County</b>	<b>Winter 2023</b>	<b>Spring 2023</b>	<b>Fall 2021</b>
Alabama Point	6.67 ± 1.70	6.33 ± 0.94	6.67 ± 1.60
Bayfront Park	11.00 ± 0.82	11.5 ± 3.35	15.33 ± 2.49
Bird Island	3.00 ± 0.82	7.67 ± 2.49	5.80 ± 1.17
Bon Secour NWR- Ft. Morgan	7.67 ± 0.47	10.00 ± 1.00	10.67 ± 1.89
Bon Secour NWR- Perdue Unit	6.67 ± 1.25	9.33 ± 2.75	9.83 ± 1.57
Fairhope Public Beach	6.67 ± 2.05	4.67 ± 0.75	6.50 ± 2.14
Gulf State Park	9.00 ± 0.82	12.00 ± 1.91	9.17 ± 1.07
May Day Park	7.00 ± 1.41	7.83 ± 1.57	10.83 ± 1.07
Orange Beach	4.67 ± 0.47	4.17 ± 1.57	4.17 ± 0.90
Robinson Island	2.00 ± 0.82	4.5 ± 1.38	3.80 ± 1.17
Walker Island	8.33 ± 0.47	6.17 ± 0.90	3.75 ± 1.48

## Priority Birds

Through Audubon Coastal Bird Surveys and beach-nesting bird monitoring, Alabama Audubon staff and volunteers are present on the coast year-round. This allows for valuable data to be collected showing how priority species utilize coastal habitats throughout the year. Our focal species included American oystercatcher, black skimmer, gull-billed tern, piping plover, reddish egret, red knot, short-billed dowitcher, snowy plover, and Wilson's plover. The GPS location, time, and behavior (i.e., loafing, foraging, flying) were recorded for each observation of an individual or group except for breeding birds during summer. From 01 January to 31 December, staff and volunteers recorded 809 observations of priority species (Table 11).

### *Habitat Use*

We categorized observations of our nine priority species, as well as sanderling, brown pelican, and least tern, across habitat types using data collected from Audubon Coastal Bird Surveys (Table 12). Habitat types included mainland beaches, barrier island beaches, nearshore islands, and bayfront. In 2023, ACBS routes covered ~6.5 linear miles of mainland beaches, 9.4 miles of barrier island beaches, 2.5 miles along Mobile Bay, and 1.92 miles of nearshore island beaches.

American oystercatchers were primarily observed on barrier islands and nearshore islands, with few sightings on mainland beaches. During winter surveys, 80% of oystercatcher observations were on barrier island beaches. This shifted during spring when 70% of sightings were on nearshore islands, which were their primary nesting locations this year. Observations during fall surveys were 51% on barrier island beaches and 41% on nearshore islands. We observed a similar trend with black skimmers with most observations being on the barrier island beaches and nearshore islands. 76% of skimmer observations in the spring were on the nearshore islands; however, in the fall 30% were on nearshore islands and 69% on barrier island beaches. Piping plovers were primarily observed on barrier island beaches, with 100% in the winter, 73% in spring, and 89% in fall. Other spring observations were on nearshore islands and fall observations on mainland beaches. Snowy plovers were most observed on mainland and barrier island beaches, with an increase of sightings on nearshore islands in the fall. Observations were relatively even between mainland and barrier island sites in the winter (54% and 46%), and spring (52% and 47%). In the fall, 32% of sightings were on mainland beaches, 55% on barrier islands beaches, and 13% on nearshore islands.

**Table 11. Observations of Tier 1 priority species recorded during 01 January – 31 December 2023.**

Species	Observations	Count	Max individuals/observation
American oystercatcher	192	382	10
Black skimmer	116	1104	65
Gull-billed tern	55	111	8
Piping plover	77	172	8
Reddish egret	60	64	2
Red knot	4	7	3
Short-billed dowitcher	112	2899	250
Snowy plover	180	405	11
Wilson’s plover	13	13	1

**Table 12. Observations of priority species by habitat type in 2023 during ACBS.**

	Winter 2023				Spring 2023				Fall 2023			
	Mainland	Barrier Island	Nearshore Island	Bayfront	Mainland	Barrier Island	Nearshore Island	Bayfront	Mainland	Barrier Island	Nearshore Island	Bayfront
AMOY	0	16	4	0	0	9	21	0	5	35	28	0
BLSK	0	3	1	0	3	174	551	0	10	459	200	1
BRPE	300	496	363	88	904	843	623	152	1073	1502	6081	764
GBTE	0	0	0	0	1	22	21	0	0	0	0	0
LETE	0	0	0	0	506	115	194	2	0	203	7	0
PIPL	0	17	0	0	0	22	8	0	1	8	0	0
REEG	0	1	1	0	0	2	5	0	0	10	3	0
REKN	0	0	0	0	0	0	0	0	0	0	0	0
SAND	184	360	221	0	727	1055	752	4	620	759	206	0
SBDO	0	1	6	0	0	124	582	0	0	22	202	1
SNPL	25	21	0	0	45	40	1	0	39	68	16	0
WIPL	0	0	0	0	0	0	0	0	0	0	0	0

## Banded Birds

We banded one snowy plover (Figure 38), three American oystercatchers (Figure 39), and ten brown pelicans this year. The adult snowy plover was banded as b/K:K/Y on the Far West End on 19 July. On 10 May, three American Oystercatcher chicks were banded on Graveline Bay as AAY, AAF, and AA3. AA3 was resighted along the Florida panhandle in early October (Figure 40). We partnered with the Orange Beach Wildlife Rehabilitation Center and Management Program to band rehabilitated brown pelicans before their release. The pelicans received an orange colored band on the left leg, each with its own code. From 01 January to 31 December, staff and volunteers recorded 575 band resights of 59 individuals (Table 13).



**Figure 38. Snowy plover b/K:K/Y on the Far West End of Dauphin Island.**





**Figure 39. Banding American oystercatcher chicks at Graveline Bay.**



**Figure 40. American oystercatcher AA3 in Florida, October 2023. Photo by J. Birkel.**

### *Noteworthy Resights*

We banded an American oystercatcher when it was a flightless chick in 2019 (band code JB). It was resighted in Florida several months later after fledging. In 2022, we saw it back in Alabama in May with another bird making nest scrapes, although we never found a nest. It was resighted back in Florida in September. In 2023 JB returned and was seen with an adult and second-year bird but was never seen scraping.

Another American oystercatcher, V82, was seen in Alabama beginning in March 2023. V82 was banded in Citrus County, Florida, in 2021 as a chick. After being sighted with other oystercatchers from March until May, V82 was sighted on Petit Bois Island, MS, in May and marked as a confirmed breeding adult. V82 was seen back in Alabama on 30 July with a group of other adults.

A herring gull with red band W6E was observed on Public Beach West on 09 January. This bird was banded as a chick on 09 July 2022 in Hancock County, Maine.

Seven banded brown pelicans were resighted across the Portersville Bay islands in July and August. There were three blue banded birds with codes AHP, ACJ, and AFO, three yellow banded birds AXO, BJ1, and AUO, and one light pink banded bird 68J. AHP and AFO were banded on Gaillard Island in 2018, and ACJ was banded on Cat Island, AL, in 2017. AXO, BJ1 and AUO were banded in Jefferson Parish, LA, in 2019. 68J (Figure 41) was banded in Plaquemines Parish, LA, in 2011.

A banded sandwich tern (-/Y,Y:--/W,X) was seen on the Far West End of Dauphin Island on 16 August 2023.

In January we continued to see a piping plover (UL: orange flag LL: green-orange-green, yellow UR: federal LR: yellow). Every fall for the past six years we have observed this bird, who was banded in 2018 in Michigan, on Dauphin Island where it overwinters before heading north to its breeding grounds in the spring. Unfortunately, this bird, whom we affectionately called Gogy for his band combination, was presumed killed by a Merlin on the breeding grounds in Michigan. The movements of this individual, recorded through band resights, helped to better understand the species' movements and critical habitats.



**Table 13. Banded bird resights during 01 January – 31 December.**

Species	Resights	Individuals
American oystercatcher	102	8
Brown Pelican	8	8
Herring Gull	1	1
Piping Plover	16	6
Sandwich Tern	1	1
Snowy Plover	447	35



**Figure 41. Brown pelican 68J was banded in Plaquemines Parish, LA, in 2011, and was resighted this year on Cat Island.**

## Non-Breeding Season Surveys (NBS)

Nonbreeding Season (NBS) Surveys began in November of 2022 and concluded in March 2023, and were used to monitor the habitat use and movements of wintering birds along Alabama's coast. NBS surveys were conducted along twelve of the existing ACBS routes and 1 BNB route. Five of these routes were in Baldwin County (BSFM-W, BSPU-E, GSPE, ORBE, and ALPO), while the remaining eight were in Mobile County (LIPO, PBEA, PEBA, PELI, PBWE, DIWE, KACU, and FAWE). Surveys were conducted weekly at nine sites (BSFM-W, ALPO, PBEA, PEBA, PELI, PBWE, DIWE, KACU, and FAWE) and bi-weekly at four (BSPU-E, GSPE, ORBE, LIPO) as weather conditions and availability of staff allowed. All species of coastal waterbirds (species that rely on either the dunes, beaches, or shorelines adjacent to coastal waters for a major migratory stop-over, their non-breeding, or breeding season) and raptors within a quarter mile of the route were identified by sight or call and counted. Surveys were conducted at different times of day and were categorized as "early" (start time 06:00-10:00) or "late" (start time 10:00-14:00). Additional information was collected on priority bird species and banded individuals including exact location, time, and behavior data. We focused on nine priority species during NBS monitoring: American Oystercatcher, Black Skimmer, Wilson's Plover, Snowy Plover, Piping Plover, Red Knot, Reddish Egret, Short-Billed Dowitcher, and Gull-Billed Tern. The GPS coordinates, time, and behavior were recorded for each observation of those species.

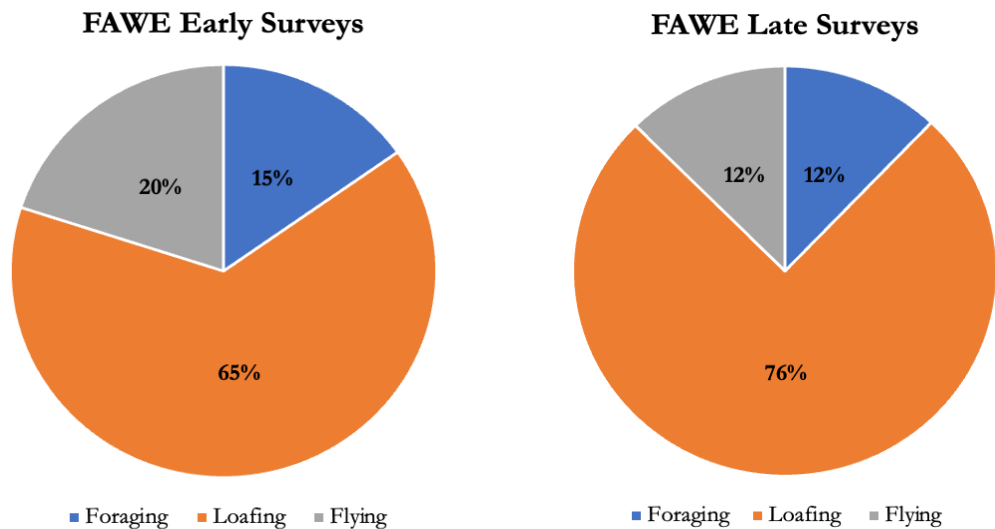
Across all sites, the average number of species recorded did not vary significantly from early surveys ( $11.45 \pm 5.18$ ) to late surveys ( $11.38 \pm 5.51$ ; Table 14). The average number of birds recorded per survey was higher for late surveys (236.53) compared to early surveys (183.40). Pelican Bay had the highest species diversity for early surveys (19.55) while Far West end had the highest for late surveys (18.00). Far West End also had the highest average bird count for late surveys (845.13). Bon Secour Fort Morgan West had the highest average number of birds recorded during early surveys (666.56); however, this calculation includes a single observation of 3,500 cormorants. With that outlier not included, the average decreases to 207.88, leaving Far West End with the highest average for early surveys (388.9).

During these surveys we also recorded the behaviors of coastal waterbirds and raptors that were observed. This can give us a better understanding on how these birds utilize the habitat and if their use changes during different times of day. Across all but two sites (DIWE, PBWE) the percentages of birds recorded as loafing increased from early surveys to late surveys (Figures 42-54). At all but one site (PBWE) the percentages of birds flying decreased from early to late surveys. Far West End and Public Beach East had high percentages of loafing birds during both early (67%, 74%) and late surveys (76%, 85%). Bon Secour Fort Morgan and Perdue Units had the highest percentages of flying birds during early (89%, 86%) and late surveys (55%, 78%).

**Table 14. Average number of species and individuals observed during each survey in categories of “early” and “late” surveys, by site.**

Site Name	Avg. # species “early”	Avg. # species “late”	Avg. total bird count “early”	Avg. total bird count “late”
FAWE	14.82	18.00	388.90	845.13
KACU	5.67	6.88	15.60	25.63
DIWE	4.70	5.75	26.30	19.88
PBWE	12.06	12.00	134.78	192.33
PELI	14.19	14.14	120.00	269.14
PEBA	19.55	16.67	192.82	96.17
PBEA	7.82	7.50	120.09	107.17
LIPO	12.50	16.22	47.14	347.11
BSFM-W	10.44	8.25	207.88	98.25
BSPU-E	11.14	9.50	166.14	83.50
GSPE	9.50	8.25	57.50	117.25
ORBE	9.50	9.67	141.75	130.00
ALPO	12.60	11.50	139.00	105.83

\* Excluding outlier



**Figure 42. Behaviors recorded at the Far West End during early and late surveys.**

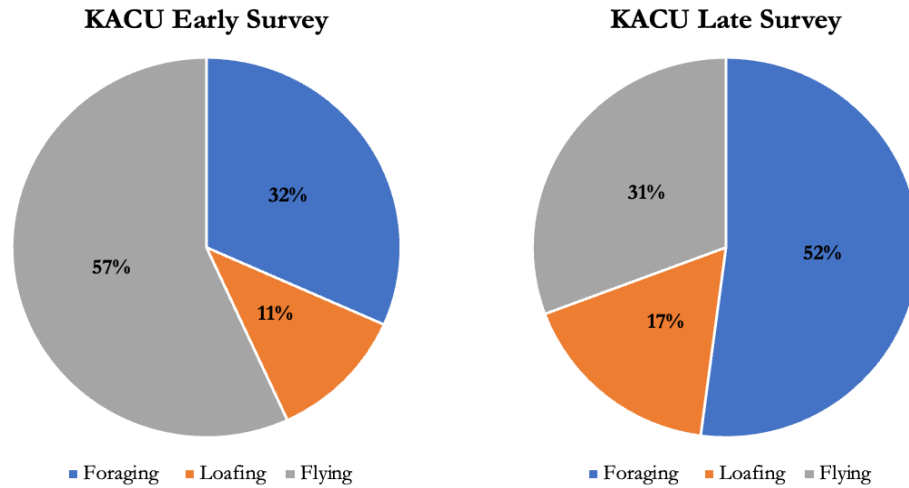


Figure 43. Behaviors recorded at Katrina Cut during early and late surveys.

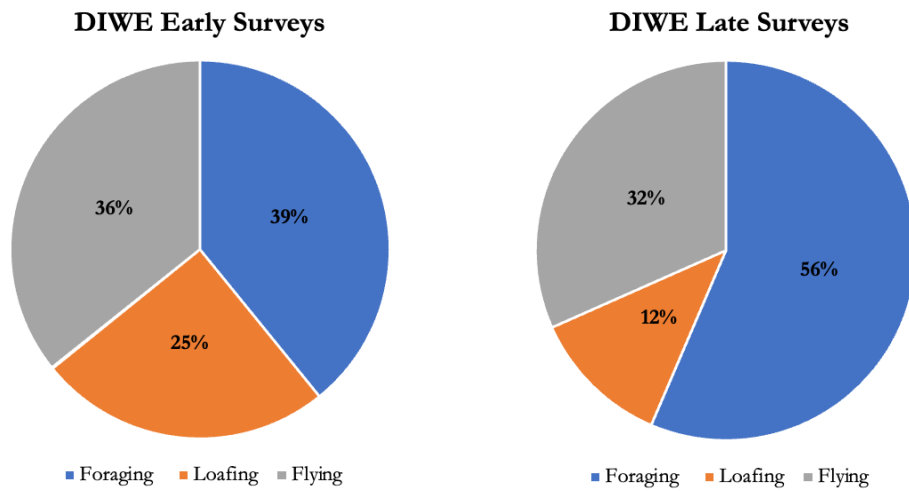


Figure 44. Behaviors recorded at Dauphin Island West End during early and late surveys.

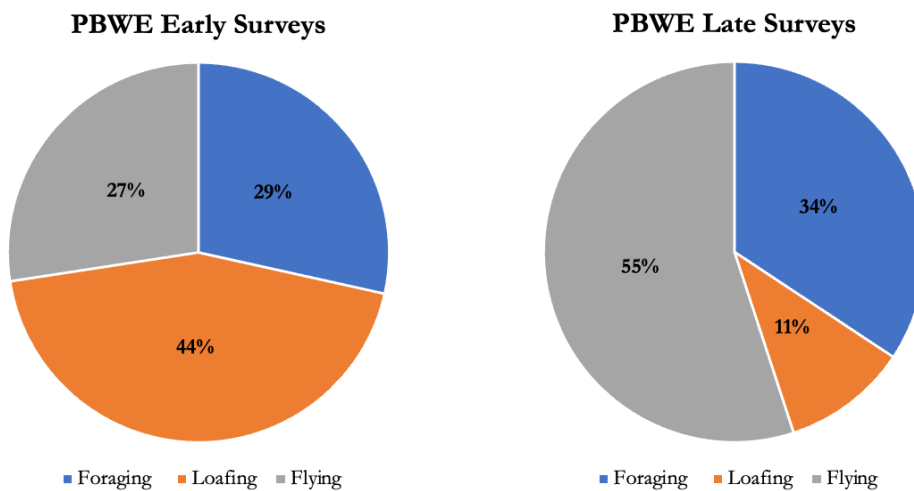


Figure 45. Behaviors recorded at Public Beach West during early and late surveys.



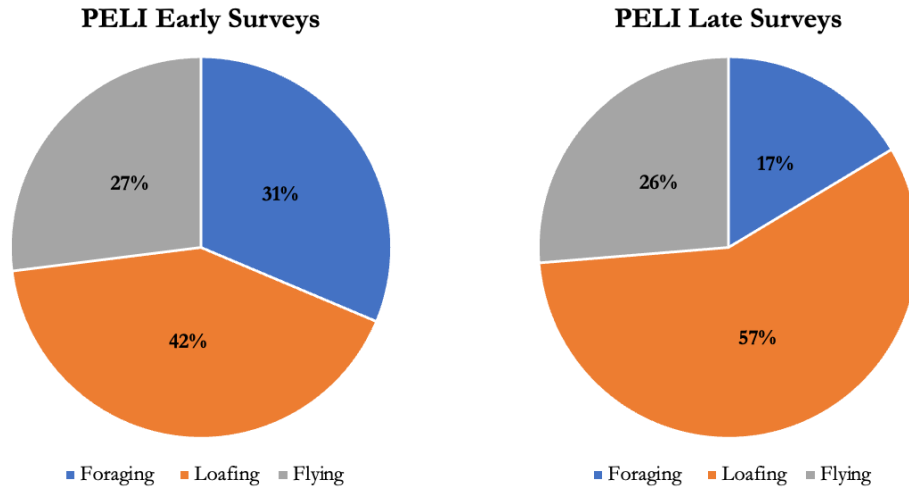


Figure 46. Behaviors recorded at Pelican Island during early and late surveys.

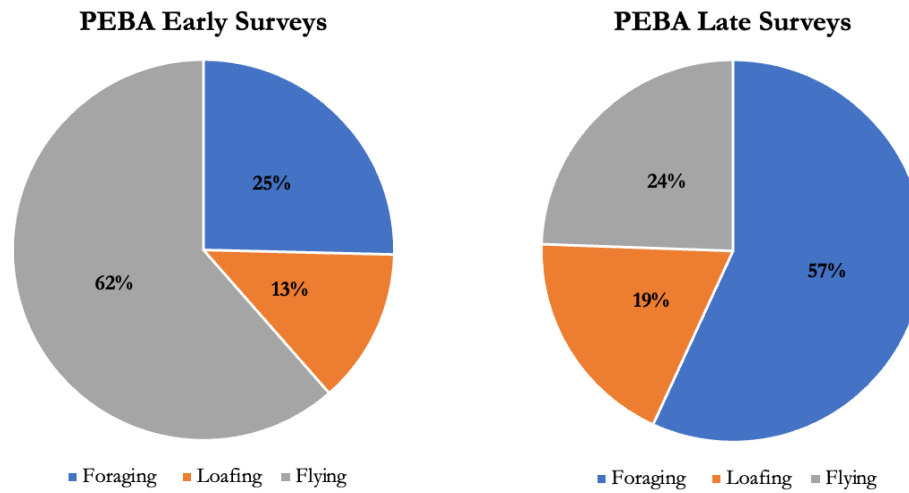


Figure 47. Behaviors recorded at Pelican Bay during early and late surveys.

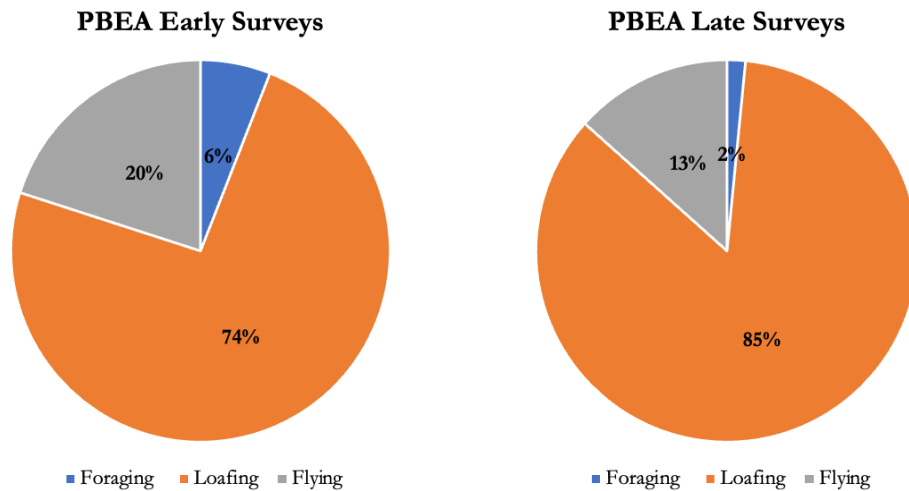


Figure 48. Behaviors recorded at Public Beach East during early and late surveys.

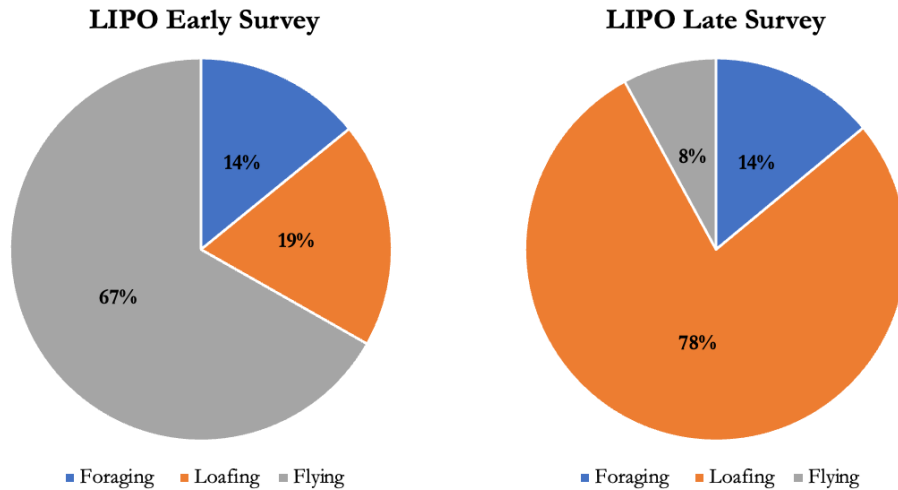


Figure 49. Behaviors recorded at Lightning Point during early and late surveys.

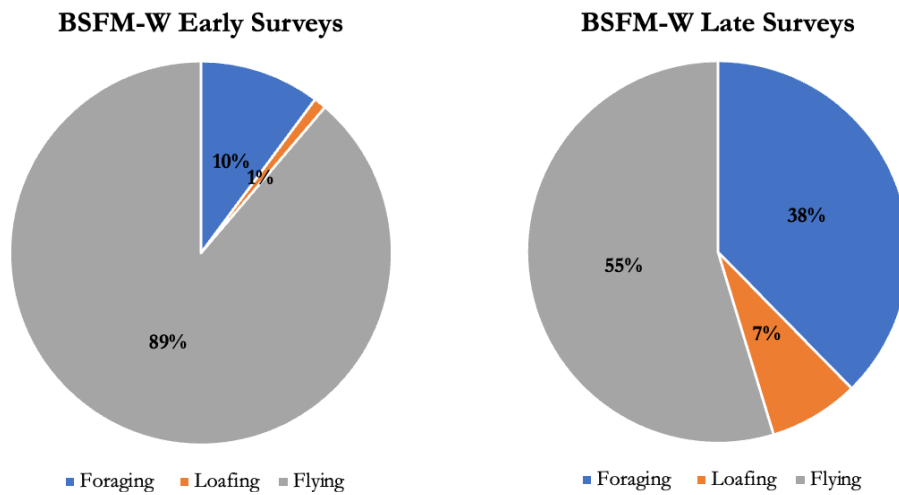


Figure 50. Behaviors recorded at Bon Secour Fort Morgan West during early and late surveys.

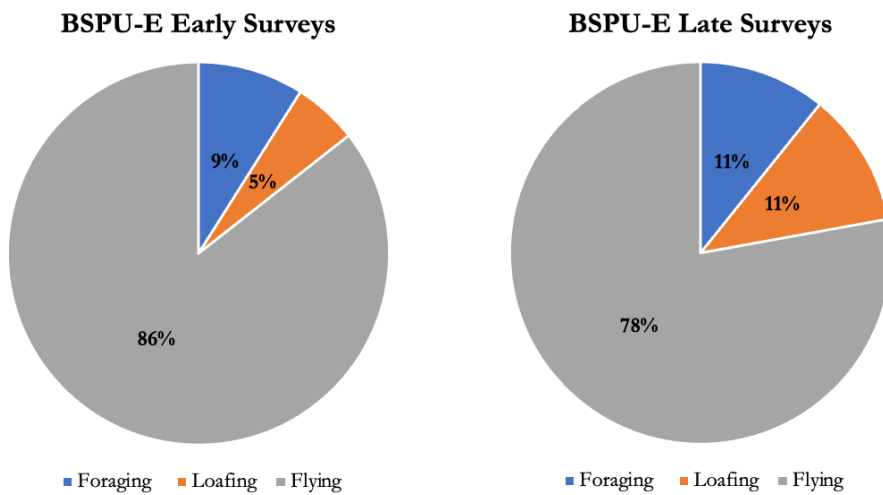


Figure 51. Behaviors recorded at Bon Secour Perdue East during early and late surveys.

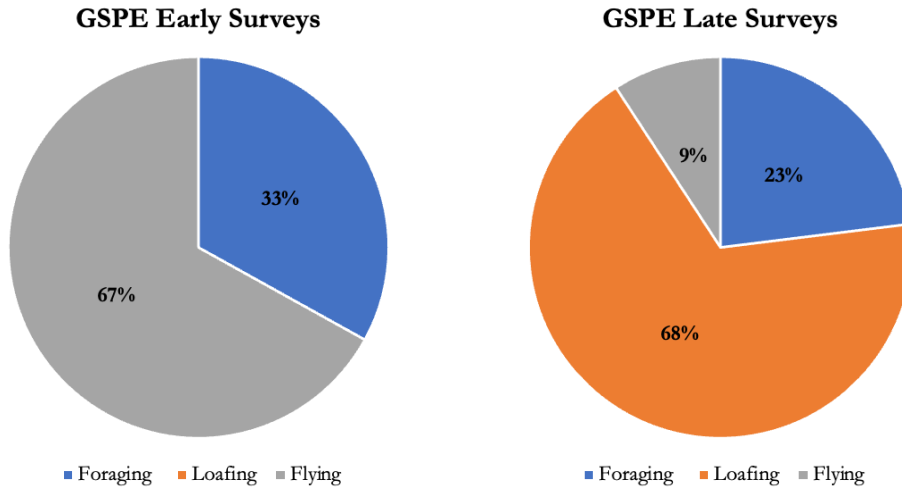


Figure 52. Behaviors recorded at Gulf State Park East during early and late surveys.

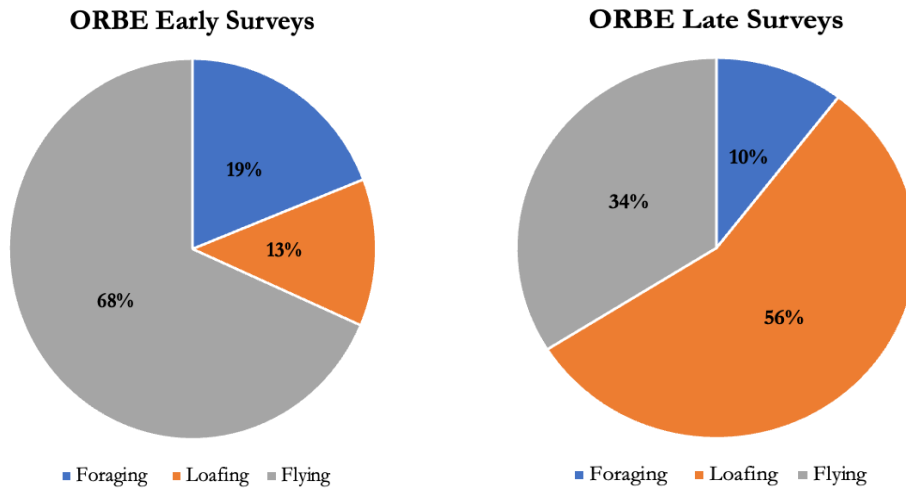


Figure 53. Behaviors recorded at Orange Beach during early and late surveys.

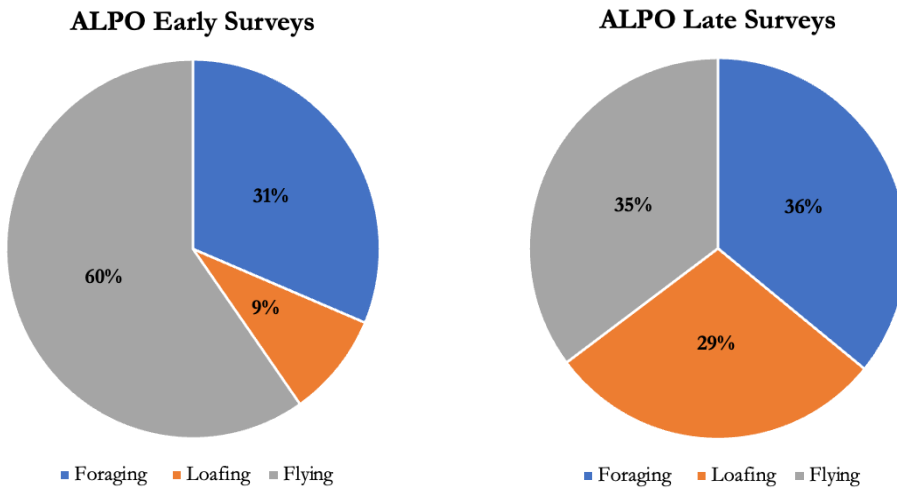


Figure 54. Behaviors recorded at Alabama Point during early and late surveys.

### Predator Surveys

Standardized predator circle surveys were conducted along all NBS routes (excluding LIPO) to better understand predation pressures faced by loafing and nesting birds. Survey points were randomly selected along each NBS route based on route length and average duration. For most sites, two surveys were conducted per visit (ALPO, PEBA, PELI, BSPU-E, BSFM-W, ORBE, GSPE). On shorter routes only one survey was conducted per visit (PBEA, PBWE.) DIWE, KACU, and FAWE were surveyed together at one time via UTV, and three surveys were conducted during each visit, falling randomly among the three routes.

During the 2022-2023 NBS season, we conducted 73 predator circle surveys at six sites in Mobile County: 17 at FAWE, two at KACU, nine at PBEA, 11 at PBWE, 17 at PEBA, and 17 at PELI (Figures 55-60). Since the surveys fell randomly between the three sites when we surveyed DIWE, KACU, and FAWE we did not conduct any predator circle surveys on DIWE. Fox tracks were observed in 18% of surveys and three out of six sites. However, this species may have been underreported due to the allowance of domestic dogs on Dauphin Island beaches, whose tracks often look similar to a fox and in any case where a track could not be definitively identified they were assumed to belong to a domestic dog. Fox tracks were most prevalent on FAWE occurring in 52% of surveys. Ghost crab tracks/holes were recorded in 41% of surveys and on all sites. Other tracks observed include domestic dog, heron, and bike/tire tracks.

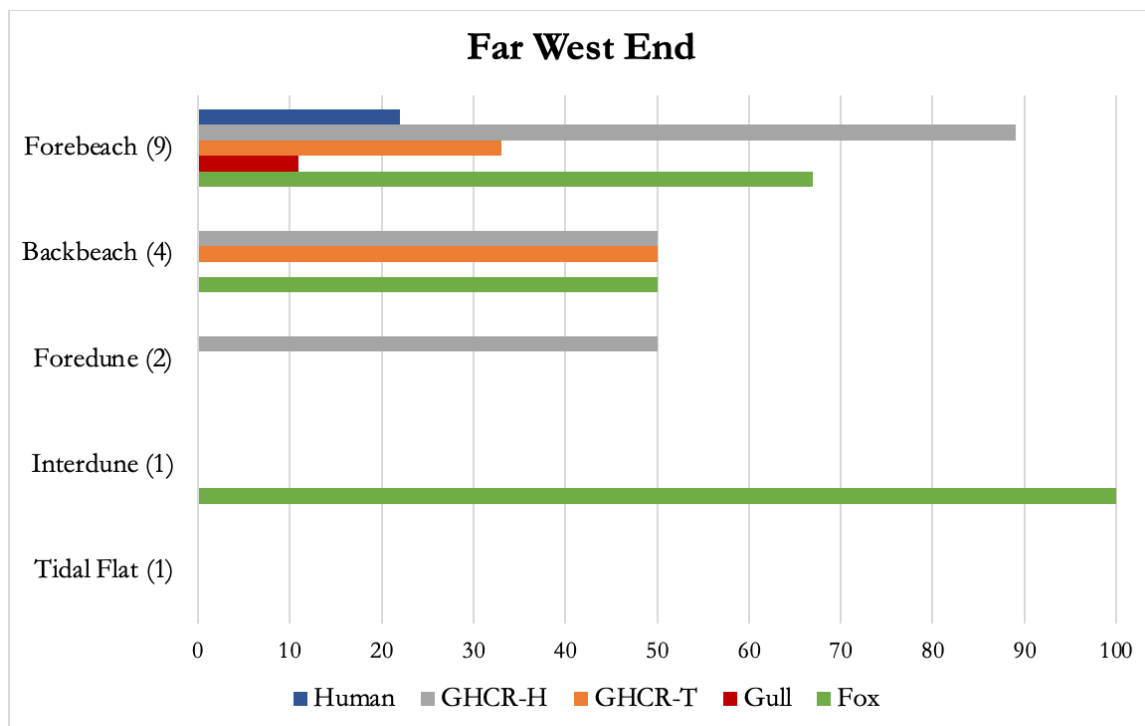


Figure 55. Percentages of tracks documented on Far West End during NBS surveys. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

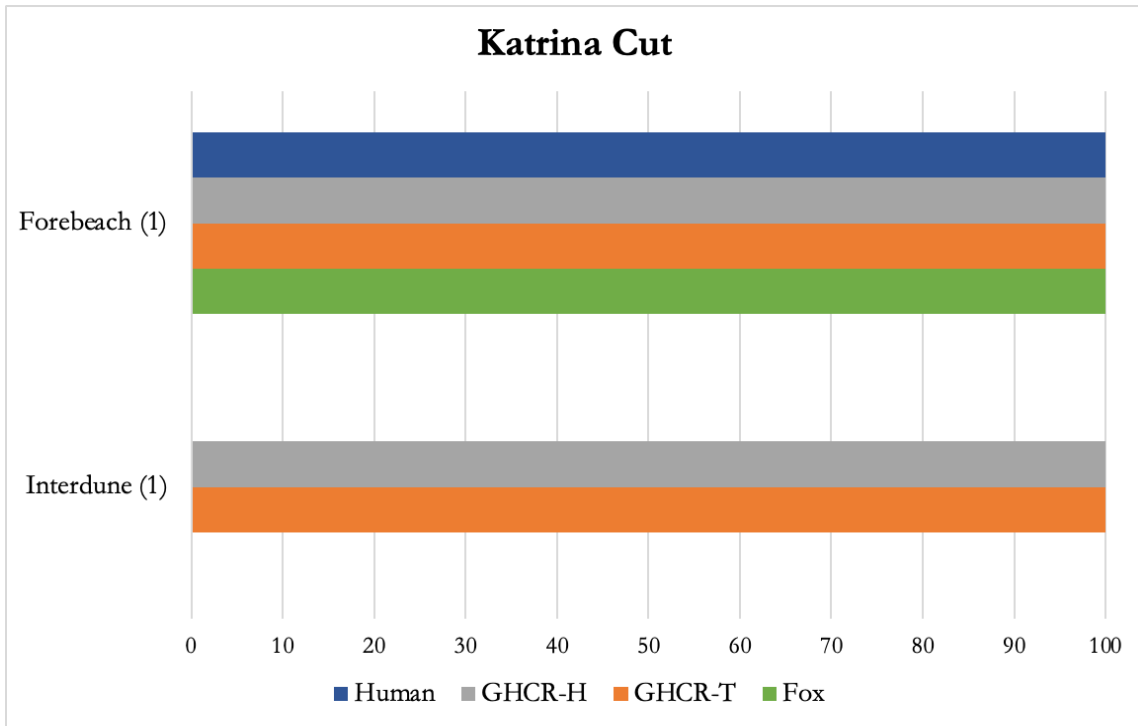


Figure 56. Percentages of tracks documented on Katrina Cut during NBS surveys. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

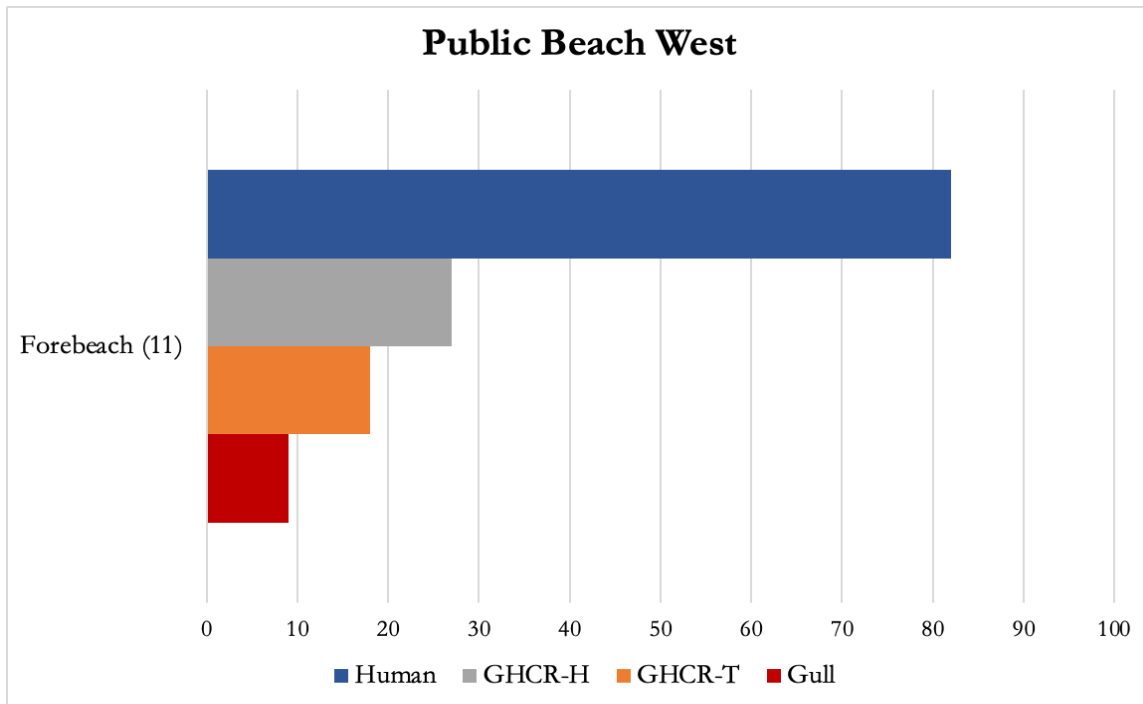


Figure 57. Percentages of tracks documented on Public Beach West during NBS surveys. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

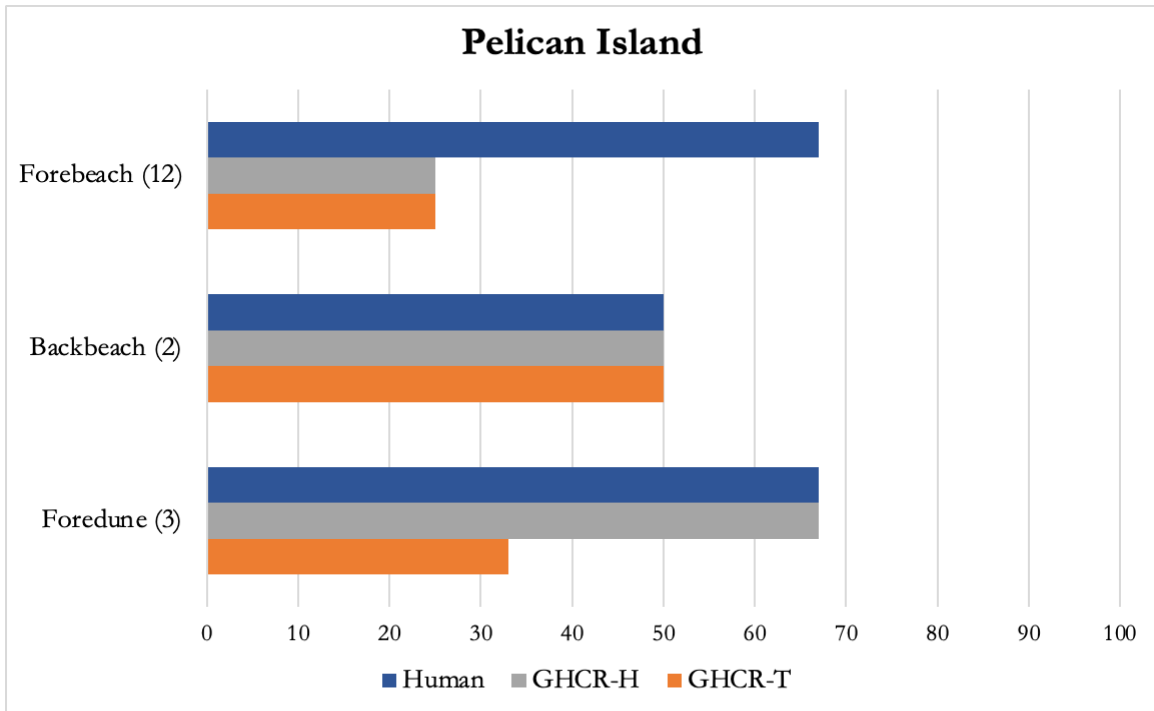


Figure 58. Percentages of tracks documented on Pelican Island during NBS surveys. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

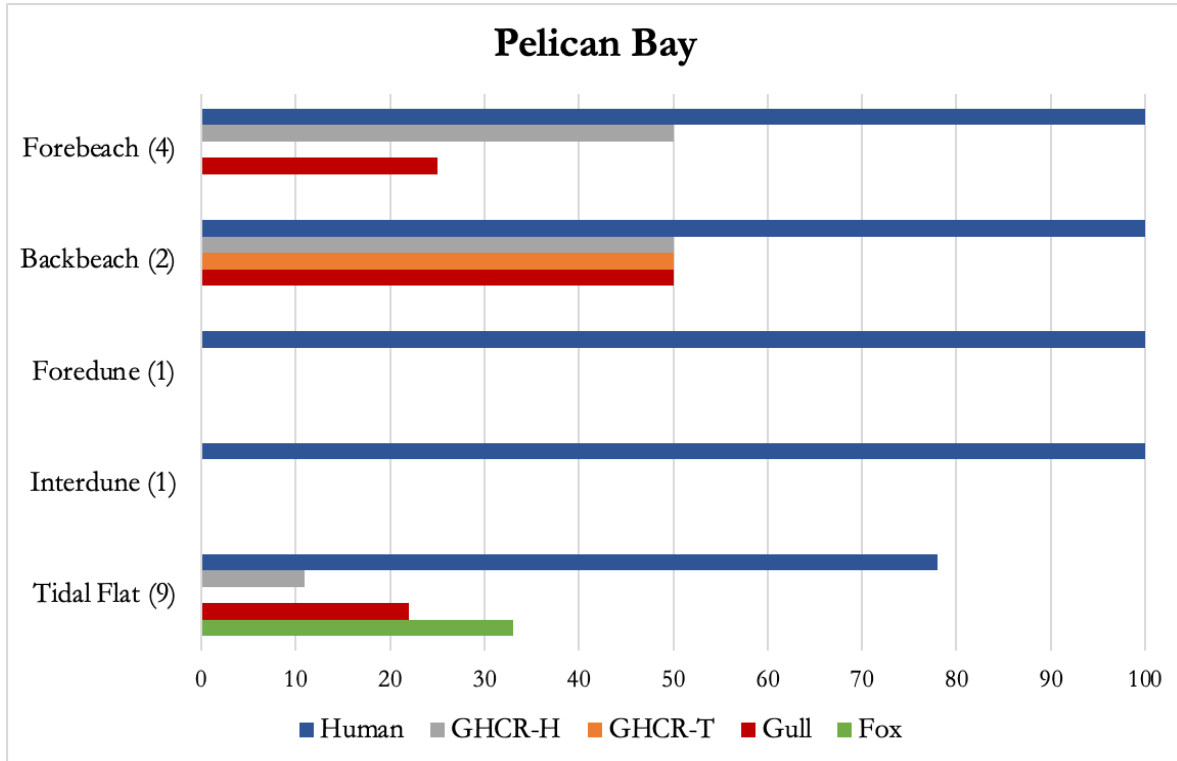
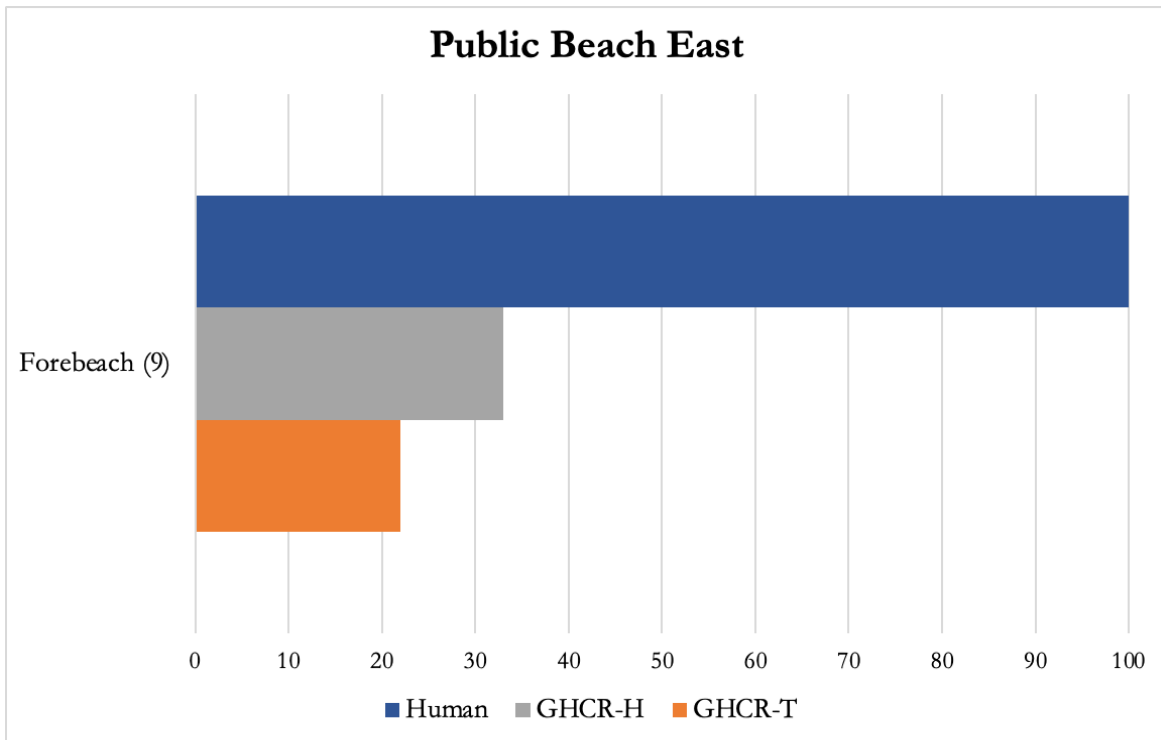


Figure 59. Percentages of tracks documented on Pelican Bay during NBS surveys. Numbers next to the beach zone are the total number of circle surveys conducted at the site.



**Figure 60. Percentages of tracks documented on Public Beach East during NSB surveys. Numbers next to the beach zone are the total number of circle surveys conducted at the site.**

In Baldwin County, we conducted 46 surveys at five sites: 11 at ALPO, 12 at BSFM, nine at BSPU, five at GSPE, and nine at ORBE (Figures 61-65). Coyote tracks were observed in 35% of surveys and were most prevalent on BSFM occurring in 83%. These numbers may have been underreported, however, because even though domestic dogs are not allowed on any beaches that we survey in Baldwin County, people often disobey this rule and surveyors may have misidentified tracks. Human tracks were observed at all sites and in 91% of surveys. Evidence of ghost crabs were observed at all sites and in 65% of surveys. Other tracks observed included domestic dog, heron, and tire (likely belonging to city/organization trucks and a few tracks that appeared to be from a bicycle).



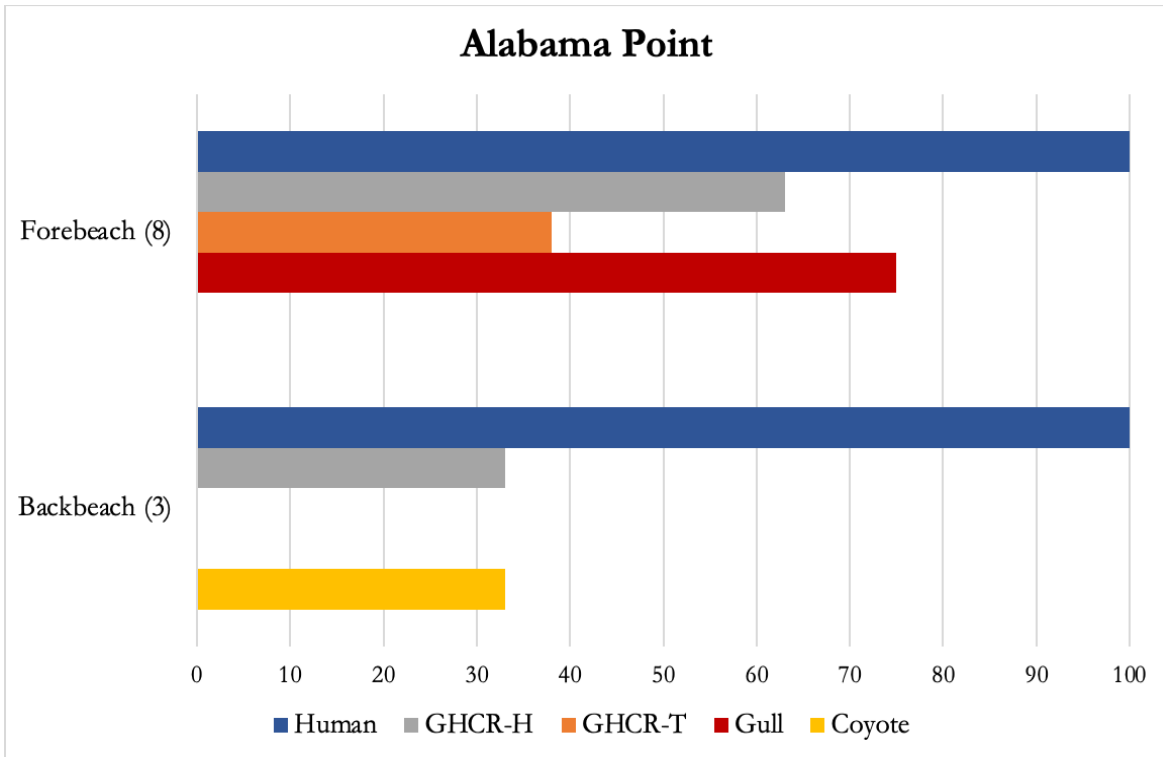


Figure 61. Percentages of tracks documented on Alabama Point during NSB surveys. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

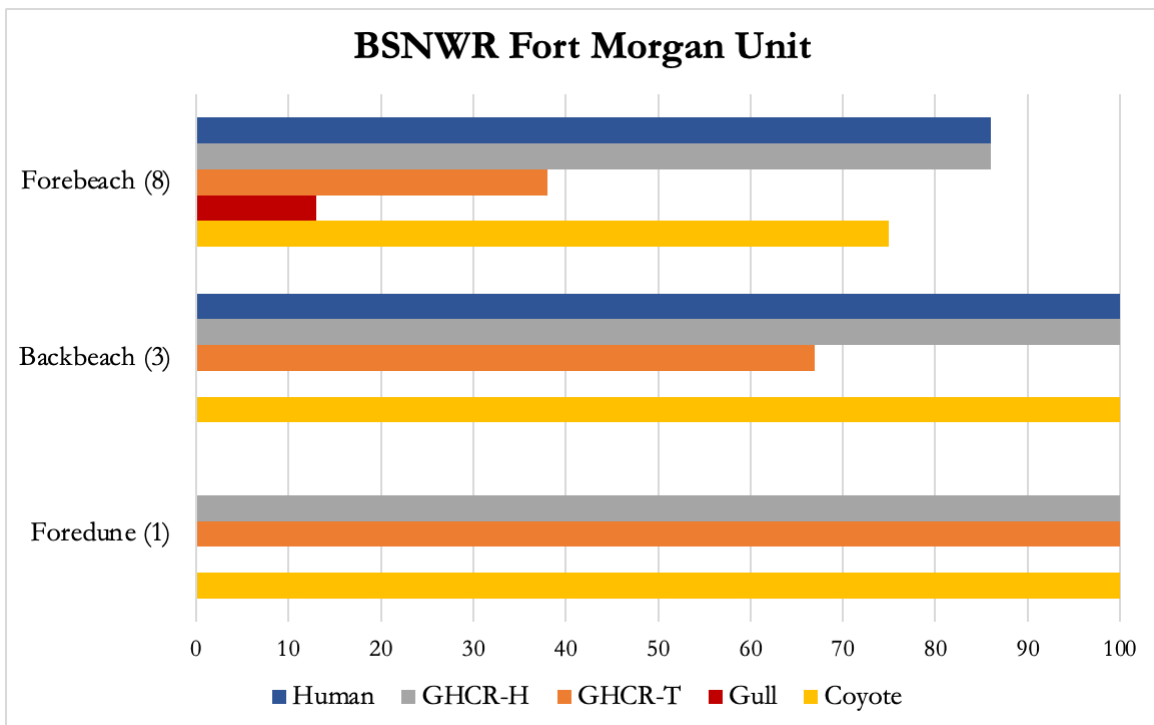


Figure 62. Percentages of tracks documented on BSNWR Fort Morgan Unit during NSB surveys. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

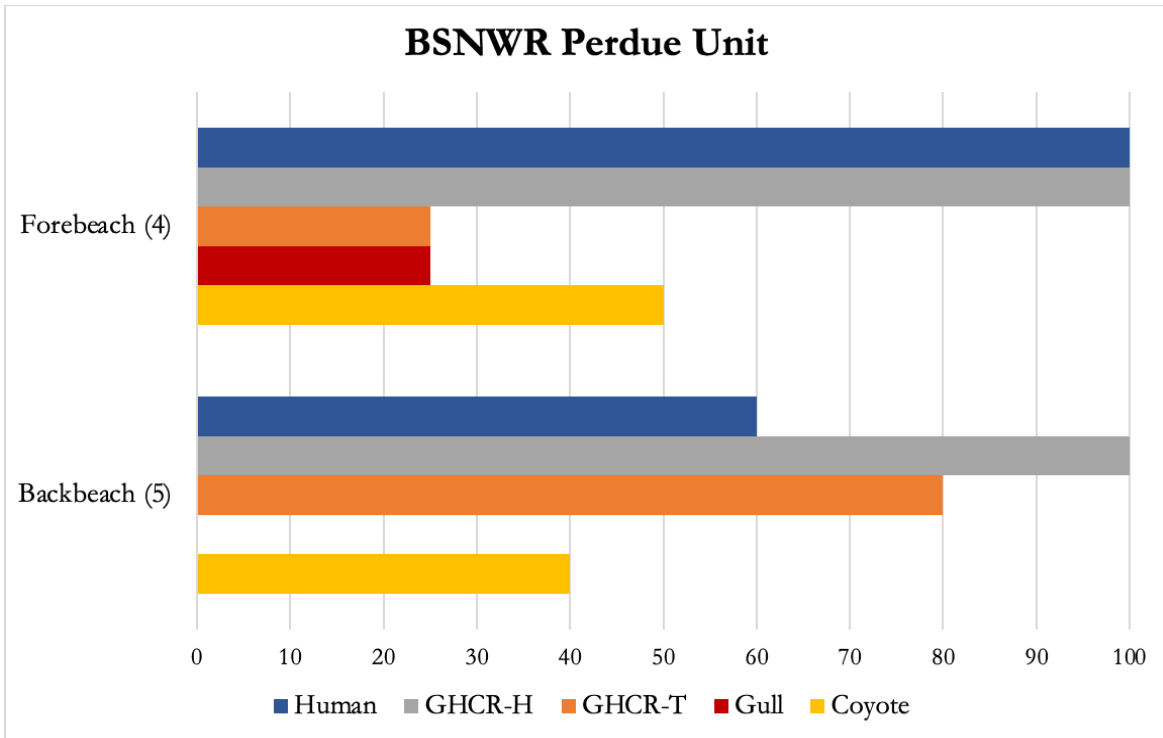


Figure 63. Percentages of tracks documented on BSNWR Perdue Unit during NSB surveys. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

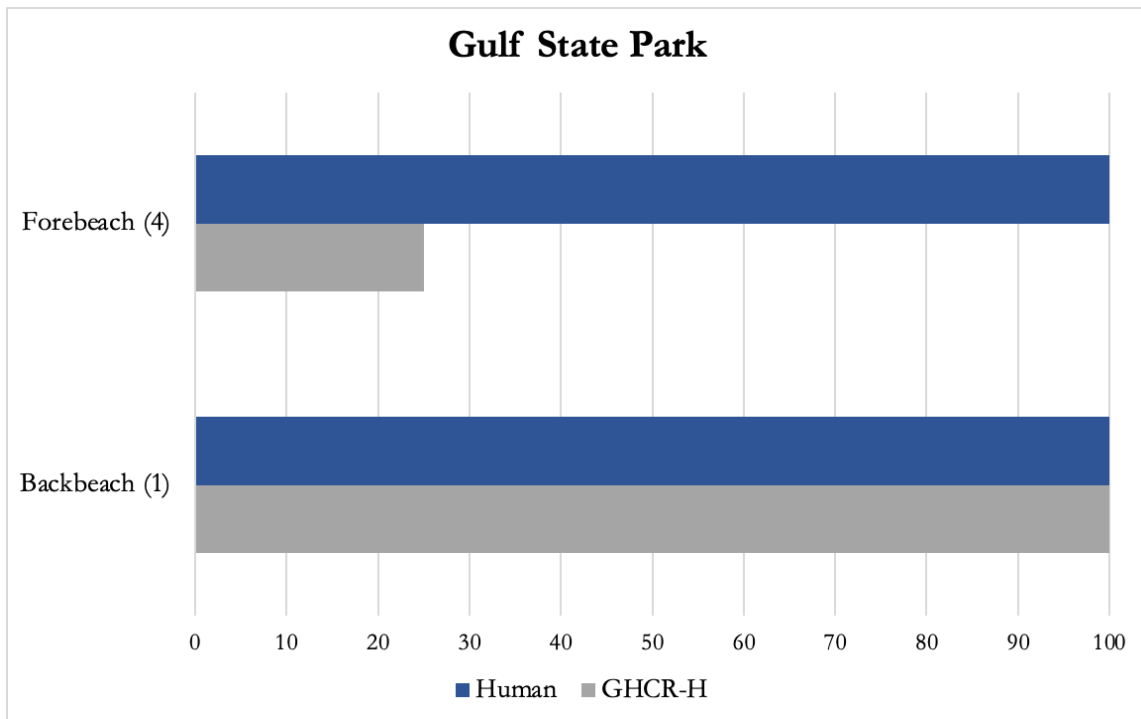


Figure 64. Percentages of tracks documented on Gulf State Park during NSB surveys. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

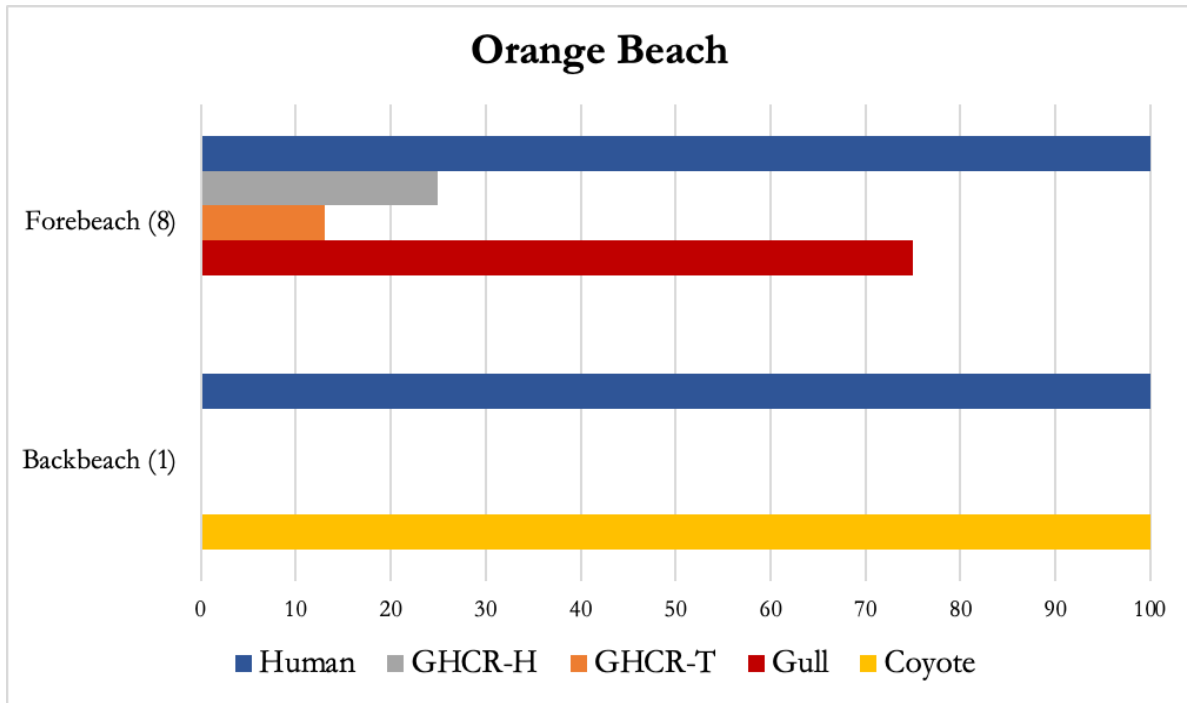


Figure 65. Percentages of tracks documented on Orange Beach during NSB surveys. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

**Common and scientific names of species mentioned in this document.**

American Oystercatcher	<i>Haematopus palliatus</i>
American White Pelican	<i>Pelecanus erythrorhynchos</i>
Belted Kingfisher	<i>Megasceryle alcyon</i>
Black Skimmer	<i>Rynchops niger</i>
Brown Pelican	<i>Pelecanus occidentalis</i>
Caspian Tern	<i>Hydroprogne caspia</i>
Cattle Egret	<i>Bubulcus ibis</i>
Common Grackle	<i>Quiscalus quiscula</i>
Common Nighthawk	<i>Chordeiles minor</i>
Crow sp.	<i>Corvus sp.</i>
Egret sp.	<i>Ardea/Egretta/Bubulcus sp.</i>
Gull-billed Tern	<i>Gelochelidon nilotica</i>
Great Blue Heron	<i>Ardea herodias</i>
Great Egret	<i>Ardea alba</i>
Great Horned Owl	<i>Bubo virginianus</i>
Gull sp.	<i>Larinae/Laridae sp.</i>
Heron sp.	<i>Ardeidae sp.</i>
Herring Gull	<i>Larus argentatus</i>
Killdeer	<i>Charadrius vociferus</i>
Laughing Gull	<i>Leucophaeus atricilla</i>
Least Tern	<i>Sternula antillarum</i>
Osprey	<i>Pandion haliaetus</i>
Piping Plover	<i>Charadrius melodus</i>
Raptor sp.	<i>Accipitriformes/Falconiformes sp.</i>
Reddish Egret	<i>Egretta rufescens</i>
Red Knot	<i>Calidris canutus</i>
Royal Tern	<i>Thalasseus maximus</i>
Sanderling	<i>Calidris alba</i>
Sandwich Tern	<i>Thalasseus sandvicensis</i>
Short-billed Dowitcher	<i>Limnodromus griseus</i>
Snowy Egret	<i>Egretta thula</i>
Snowy Plover	<i>Charadrius nivosus</i>
Tricolored Heron	<i>Egretta tricolor</i>
White Ibis	<i>Eudocimus albus</i>
Wilson's Plover	<i>Charadrius wilsonia</i>
Domestic Cat	<i>Felis catus</i>
Domestic Dog	<i>Canis familiaris</i>
Coyote	<i>Canis latrans</i>
Virginia Opossum	<i>Didelphis virginiana</i>
Red Fox	<i>Vulpes vulpes</i>
Atlantic Ghost Crab	<i>Ocyrode quadrata</i>