

# Alabama Coastal Bird Stewardship Program

## 2017-2020 Report

Published December 2020; available online at [alaudubon.org/reports](http://alaudubon.org/reports)

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The Alabama Coastal Bird Stewardship Program was funded by the National Fish and Wildlife Foundation's Gulf Environmental Benefit Fund with additional support from Alabama State Lands Division of the Department of Conservation and Natural Resources.

*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.*

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Recommended citation: Koczur, L. M., S. D. Cobb, O. A. Morpeth, N. Love. 2020. Alabama Coastal Bird Stewardship Program: 2017-2020 Report. 45 pp.

# Table of Contents

Acknowledgements .....	4
Summary .....	5
Introduction .....	6
Stewardship of Important Bird Populations and Habitats.....	6
Nest stewardship and monitoring .....	6
Signage & Symbolic Fencing .....	6
Habitat Monitoring .....	6
Nest Success Data .....	14
Surveys and data collection .....	14
Wilson’s Plover .....	18
Snowy Plover.....	18
Least Tern .....	22
Black Skimmer.....	26
American Oystercatcher .....	26
Reddish Egret.....	26
Other Colonial-Nesting Species .....	27
Trainings to Support Nesting Colony Stewardship .....	27
Outreach and Communication to Support Nesting Colony Stewardship .....	28
Priority Species .....	29
2018.....	29
2019.....	29
2020.....	30
Band Resights.....	36
Audubon Coastal Bird Surveys.....	37
Training to Support ACBS.....	37
Volunteer Effort.....	37
Important Roosting and Loafing Areas.....	38
Habitat stewardship.....	40
Outreach and Education .....	40
Adaptive Management Plan .....	44
Data synthesis and analysis.....	44
Adapt strategic plan/modify .....	44
Literature Cited .....	45

## **Acknowledgements**

We would like to acknowledge the following organizations for their 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, Mississippi Audubon, National Audubon Society (particularly Kara (Lankford) Fox), USFWS Alabama Ecological Services Field Office, Alabama Chapter of The Nature Conservancy, The Town of Dauphin Island, Dauphin Island Park and Beach Board, Gulf Shores and Orange Beach Tourism, City of Gulf Shores, Alabama Department of Marine Resources, Moffat and Nichol, Mobile Bay Audubon Society, and the U.S. Army Corps of Engineers.

We would also like to thank the many partners and volunteers that contributed to survey, outreach, and data collection efforts including Drew Haffenden, Jimbo Meador, Dr. John Dindo, Roger Clay, Claudia Frosch, Michael Hardy, Shirly Hardy, Thomas Rossman, Dee Scott, Eric Haskell, Larry Gardella, and Jay Burdette.

The following former staff members were instrumental to the creation and establishment of this program: Suzanne Langely, Andy Coleman, Katie Barnes, Emma Rhodes, Mozart Dedeaux, and Chris Sykes.

## Summary

2017: Alabama Audubon (formerly Birmingham Audubon Society) hired coastal staff, set up an office in Mobile, and developed protocols for the program. Staff started Audubon Coastal Bird Surveys (ACBS) and trained volunteers to lead those surveys.

2018: Alabama Audubon coastal staff used the 2018 breeding season to survey as much of the coast as possible and determine where the majority of nesting activity was taking place. We used symbolic fencing to protect 81 acres of active nesting habitat. Staff and volunteers monitored seven snowy plover,  $\geq 825$  least tern,  $\geq 165$  black skimmer, and two American oystercatcher nests. Nonbreeding season work consisted of ACBS and priority bird data collection.

2019: Breeding season consisted of more focused monitoring efforts at 19 sites, with each mainland site surveyed 2-3 times per week. We also began surveying nearshore islands in 2019. We used symbolic fencing to protect 76 acres of nesting habitat. Staff and volunteers monitored 40 snowy plover, 938 least tern, 276 black skimmer, four American oystercatcher, and one reddish egret nest. Nonbreeding season work consisted of ACBS and priority bird data collection.

2020: Breeding season consisted of more focused monitoring and outreach efforts; however, monitoring efforts were limited due to COVID-19 restrictions and safety protocols. We used symbolic fencing to protect 69 acres of nesting habitat. Staff and volunteers monitored five snowy plover, 140 least tern, and five black skimmer nests. Nonbreeding season work consisted of ACBS and priority bird data collection.

## Introduction

The Alabama Coastal Bird Stewardship Program was initiated in 2017 with funding from the National Fish and Wildlife Foundation's Gulf Environmental Benefit Fund and additional support from Alabama State Lands Division of the Department of Conservation and Natural Resources. During 2017-2020, we focused on monitoring and protecting Alabama's beach-nesting birds, including snowy plovers (*Charadrius nivosus*), Wilson's plovers (*C. wilsonia*), least terns (*Sternula antillarum*), black skimmers (*Rynchops niger*), American oystercatchers (*Haematopus palliatus*), and reddish egrets (*Egretta rufescens*). Furthermore, we collected data on nonbreeding piping plovers (*C. melodus*), sanderlings (*Calidris alba*), brown pelicans (*Pelecanus occidentalis*), short-billed dowitchers (*Limnodromus griseus*), and red knots (*C. canutus*). We collected baseline data on reproductive success, conducted stewardship activities to protect nesting birds, implemented education and outreach in support of the program, and participated in the Gulf-wide effort to collect data through ACBS.

## Stewardship of Important Bird Populations and Habitats

### Nest stewardship and monitoring

#### *Signage & Symbolic Fencing*

We utilized symbolic fencing (posts, paracord rope, and signs) to protect nesting colonies of least terns and black skimmers, and individual nests of snowy plovers. Symbolic fencing alerts people to the presence of nesting birds and minimizes the amount of human disturbance within the posted areas. We protected ~780 least tern nests, four snowy plover nests, and 15 black skimmer nests with fencing in 2018, with fenced areas totaling 81 acres. In 2019, we protected 849 least tern nests, three snowy plover nests, and 31 black skimmer nests, totaling 76 acres. In 2020, we protected 88 least tern nests, one snowy plover nest, and one black skimmer nest, totaling 69 acres.

#### *Habitat Monitoring*

In 2018, we recorded any disturbance (or potential cause of disturbance) seen within 200' of individuals, colonies, and nests. Signs of disturbance included presence of coyotes (*Canis latrans*), red foxes (*Vulpes vulpes*), raccoons (*Procyon lotor*), ghost crabs (*Ocypode quadrata*), laughing gulls (*Leucophaeus atricilla*), fish crows (*Corvus ossifragus*), other avian species, humans, and dogs, or the presence of their tracks in the sand. We recorded a disturbance and/or tracks during 62% of solitary surveys and 78% of colonial-nesting bird surveys in 2018. The most common disturbances were humans, coyotes, and ghost crabs for both solitary (Figure 1) and colonial-bird surveys (Figure 2). In 2019 and 2020, we adapted our protocol and documented disturbances within 50' of individual birds/colonies and their nests. In 2019, we recorded evidence of disturbance during 16% of solitary-nesting bird surveys with ghost crabs, humans, and coyotes accounting for the majority (Figure 3). We documented disturbances during 66% of colonial-nesting bird surveys, with human disturbance accounting for nearly half of all disturbances recorded (Figure 4). In 2020, we documented potential disturbances during 6% of solitary-nesting bird surveys, with foxes and humans accounting for more than half of the records (Figure 5). The number of records is likely much lower than in 2018 and 2019 because we did not monitor Bon Secour National Wildlife Refuge (NWR) in 2020, surveys were limited due to COVID-19 restrictions, and there were fewer pairs of nesting snowy plovers. We recorded disturbances during 78% of colonial-nesting bird surveys in 2020, with humans and avian species accounting for the majority (Figure 6).

Although we cannot be certain that a person walking at 50' from an individual, nest, or colony caused a disturbance if we did not directly witness it, we assumed this proximity could potentially cause a bird to flush, exhibit defensive behavior, or be otherwise disturbed. The presence of people near individuals/colonies and their nests was prevalent across most sites. Although symbolic fencing appeared to minimize the amount of people that walk too close to nesting birds, it did not completely eliminate that disturbance as we saw footprints through roped off areas on several occasions. Symbolic fencing in conjunction with targeted outreach will help increase awareness about the importance of giving nesting birds space. Future efforts should focus on documenting disturbance events and the responses of birds to those disturbances.

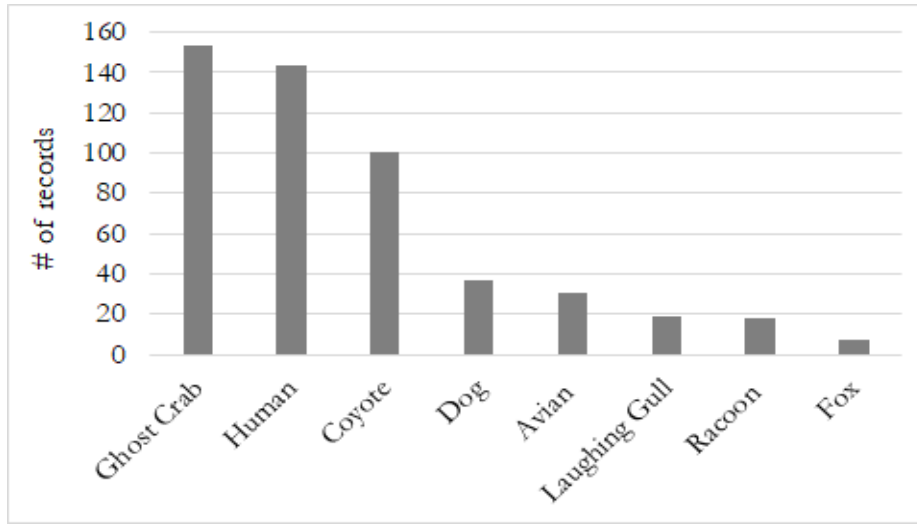


Figure 1. Disturbances recorded within 200' of solitary-nesting individuals and/or their nests during 2018 (avian may include laughing gulls with other species).

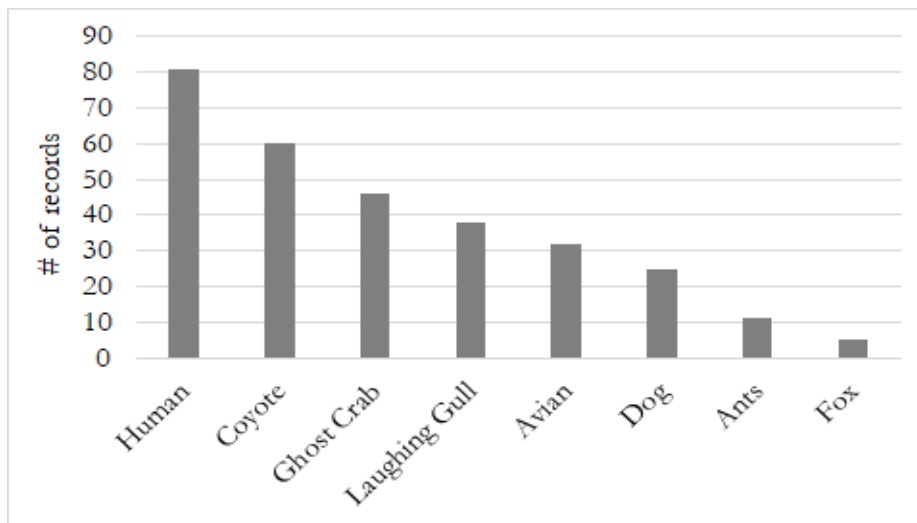


Figure 2. Disturbances recorded within 200' of colonial-nesting individuals and/or nesting colonies during 2018 (avian may include laughing gulls with other species).

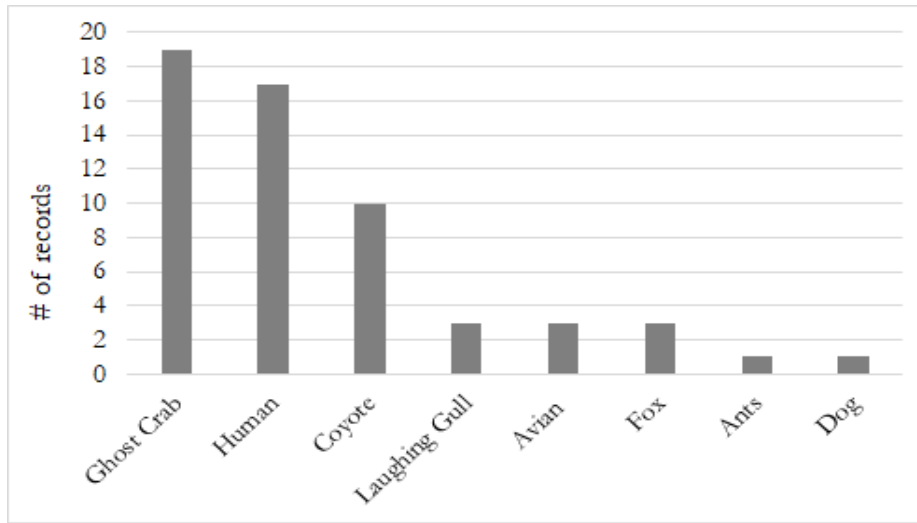


Figure 3. Disturbances recorded within 50' of solitary-nesting individuals and/or their nests during 2019 (avian may include laughing gulls with other species).

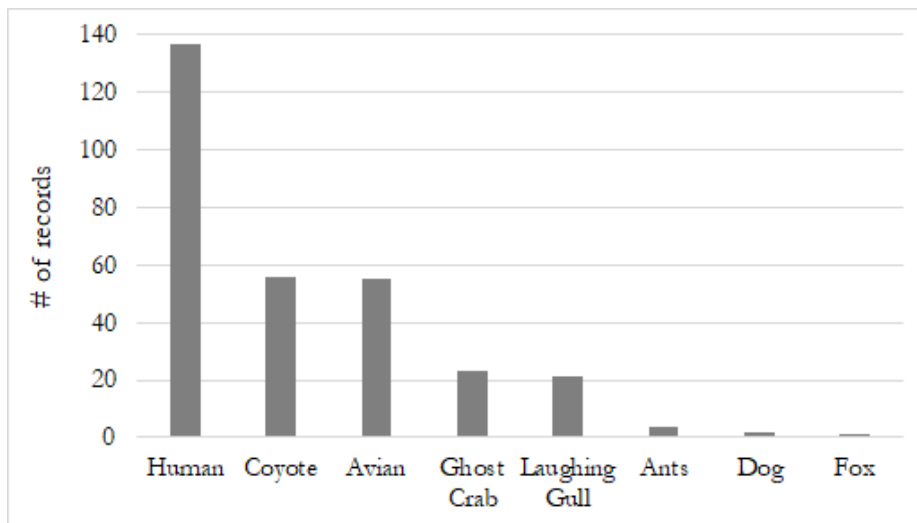
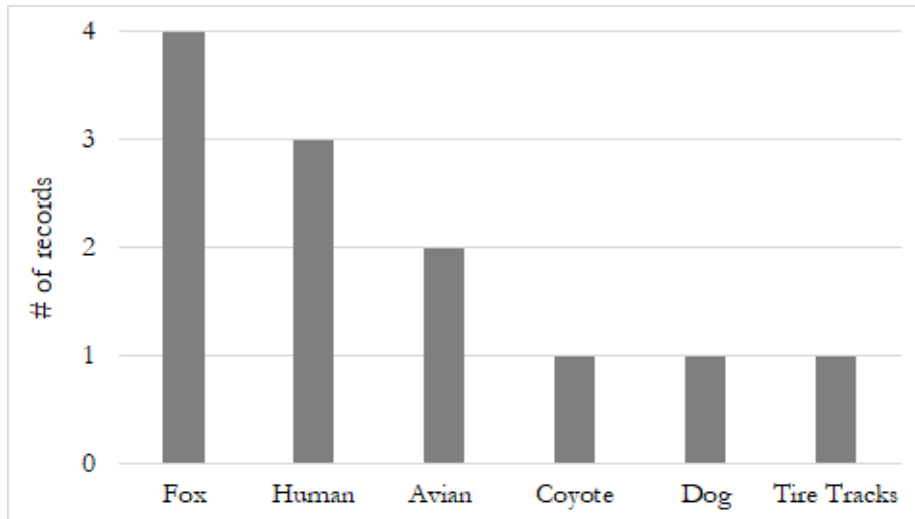
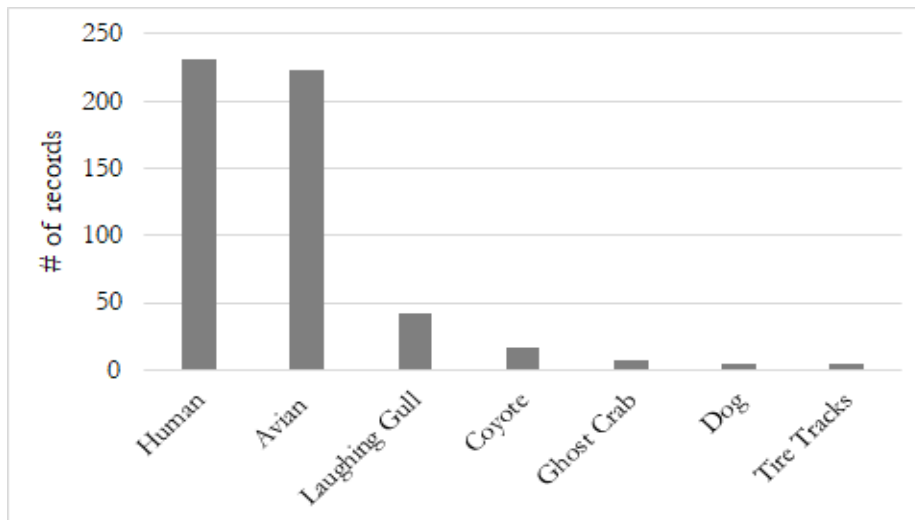


Figure 4. Disturbances recorded within 50' of colonial-nesting individuals and/or nesting colonies during 2019 (avian may include laughing gulls with other species).





**Figure 5. Disturbances recorded within 50' of solitary-nesting individuals and/or their nests during 2020 (avian may include laughing gulls with other species).**



**Figure 6. Disturbances recorded within 50' of colonial-nesting individuals and/or nesting colonies during 2020 (avian may include laughing gulls with other species).**

We also examined the ground surface temperature at least tern colonies to better understand the threat of heat exposure to eggs and young. Prolonged exposure to extreme heat can cause mortality of eggs and chicks. Exposure can be caused by disturbance events; for example, if a person walks into a colony and flushes the adults from their nests, the eggs or chicks are left unprotected from heat and predators. We used chick shelters at several of our colony sites in order to provide shade for adults and young. In 2019, we conducted a small pilot study to determine the difference in surface temperatures between full sun and shade at two least tern colonies, a rooftop site (Piggly Wiggly) and a mainland site (Beach Club). We placed one Thermochron iButton (DS1921G, Embedded Data Systems) in full sun and one in the shade at each of the two sites. We programmed the iButtons to record temperature every 30 minutes. Once the colonies were no longer active, we collected the iButtons and downloaded data. We continued to monitor temperature at least tern colonies in 2020, and deployed iButtons at four colonies.

In 2019, there was a ~19-degree difference in the average day time (08:00–19:00) temperature at the Piggly Wiggly rooftop site between full sun and shade, and a more extreme difference in maximum temperature (Table 1, Figure 7). There was a 10-degree difference at the Beach Club site (Table 1, Figure 8).

In 2020, there was a ~17-degree difference in the average day time temperature at the Piggly Wiggly rooftop site between full sun and shade, and a greater difference in maximum temperature (Table 2, Figure 9). The Beach Club had a six-degree difference in average daytime temperatures and an 18-degree difference between maximum temperatures (Table 2, Figure 10). There was a four-degree difference during average daytime temperatures at Alabama Point, and a higher maximum temperature in the shade (Table 2, Figure 11). The higher value for the shaded area could have been attributed to positioning of the shade sensor when first deployed and accumulation of sand over the sun sensor. Two sun sensors were lost over the course of the breeding season at No Fly Zone resulting in a loss of data; therefore, average daytime temperatures below are representative of data collected from 3 June to 1 July (Table 2, Figure 12). There was a four-degree difference between average daytime temperatures and a nine-degree difference between maximum temperatures.

Deploying chick shelters at least tern and black skimmer colonies is a simple management strategy that can mitigate the deleterious effects of heat exposure. The small, wooden structures provide shade, and potentially protection from avian predators, as many of the colony sites have little vertical structure for chicks to hide under. Least terns and black skimmers used chick shelters at all sites where we placed them, including the Piggly Wiggly rooftop (Figure 13) and Alabama Point (Figure 14).

**Table 1. Average daytime (08:00–19:00) and maximum temperatures (degrees F) at two least tern colony sites in full sun and shade during the 2019 breeding season.**

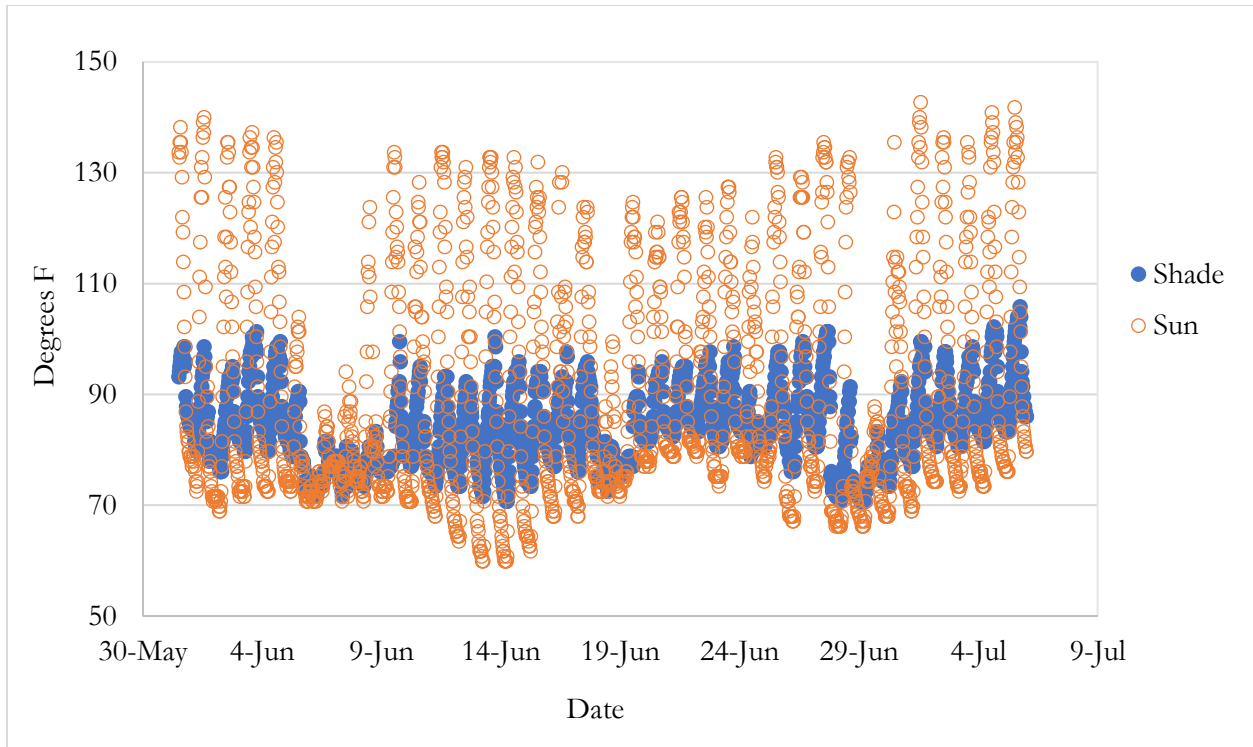
Site	Avg. sun	Avg. shade	Max. sun	Max. shade
Beach Club	101.1	91.8	128.3	104.9
Piggly Wiggly	107.0	88.4	142.7	105.8

**Table 2. Average daytime (08:00–19:00) and maximum temperatures (degrees F) at four least tern colony sites in full sun and shade during the 2020 breeding season.**

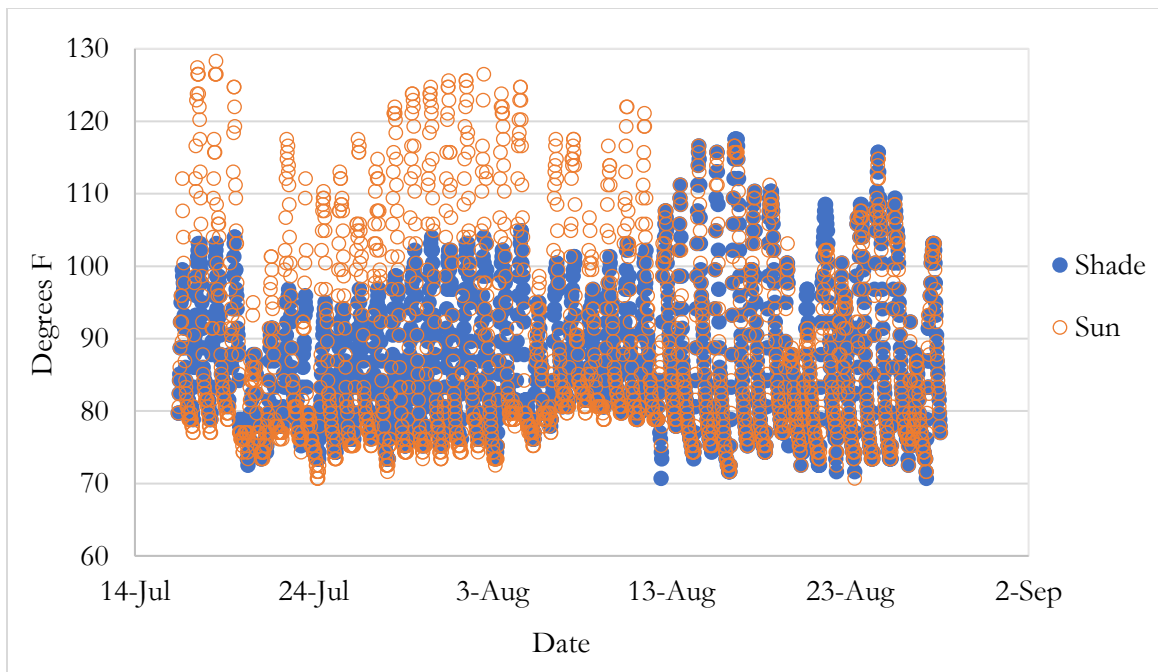
Site	Average sun	Average shade	Max. sun	Max. shade
Alabama Point*	92.1	88.0	117.5	118.4
Beach Club	95.1	89.0	122.9	104.9
No Fly Zone**	96.7	91.8	120.2	110.3
Piggly Wiggly	102.2	84.6	129.2	97.7

\*Alabama Point ThermoChron iButtons were removed from site 5 June in preparation for impact of tropical storm Cristobal and redeployed on 10 June.

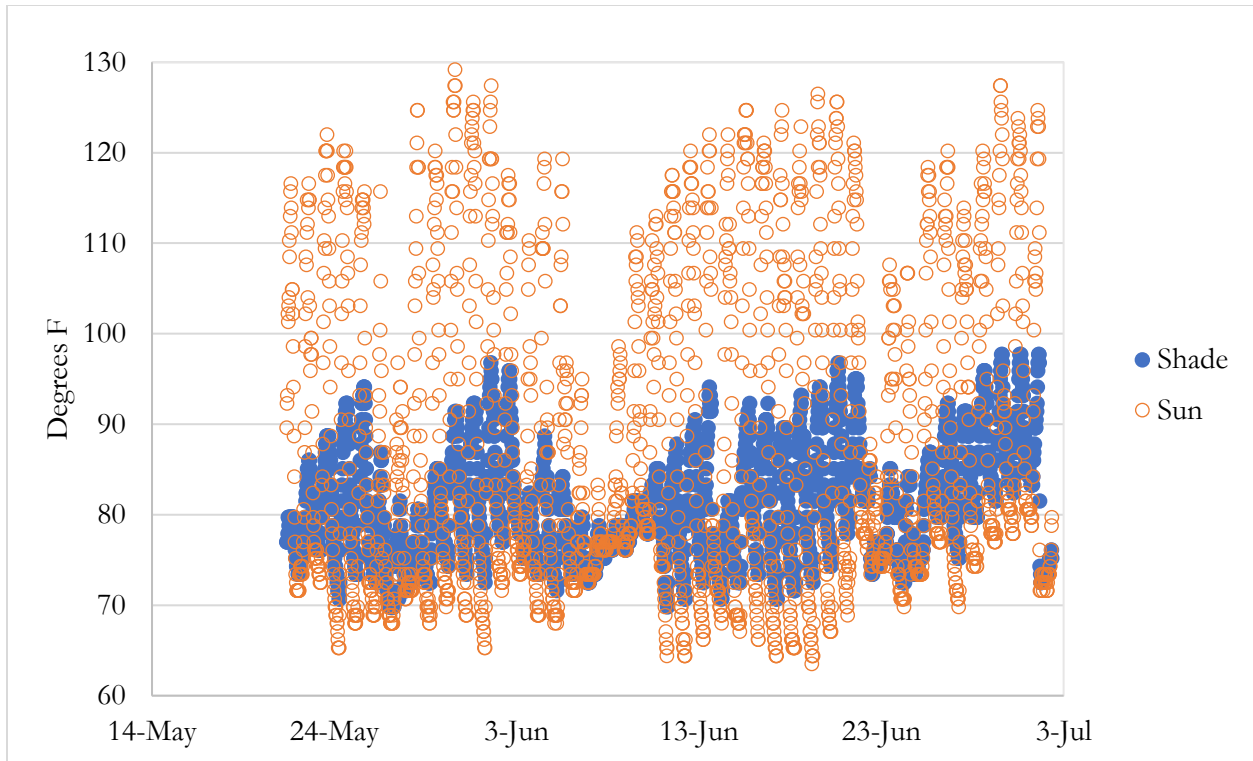
\*\*No Fly Zone data in table represents temperatures recorded from 3 June to 1 July. Two sun ThermoChron iButtons were not retrieved from the site resulting in a loss of data.



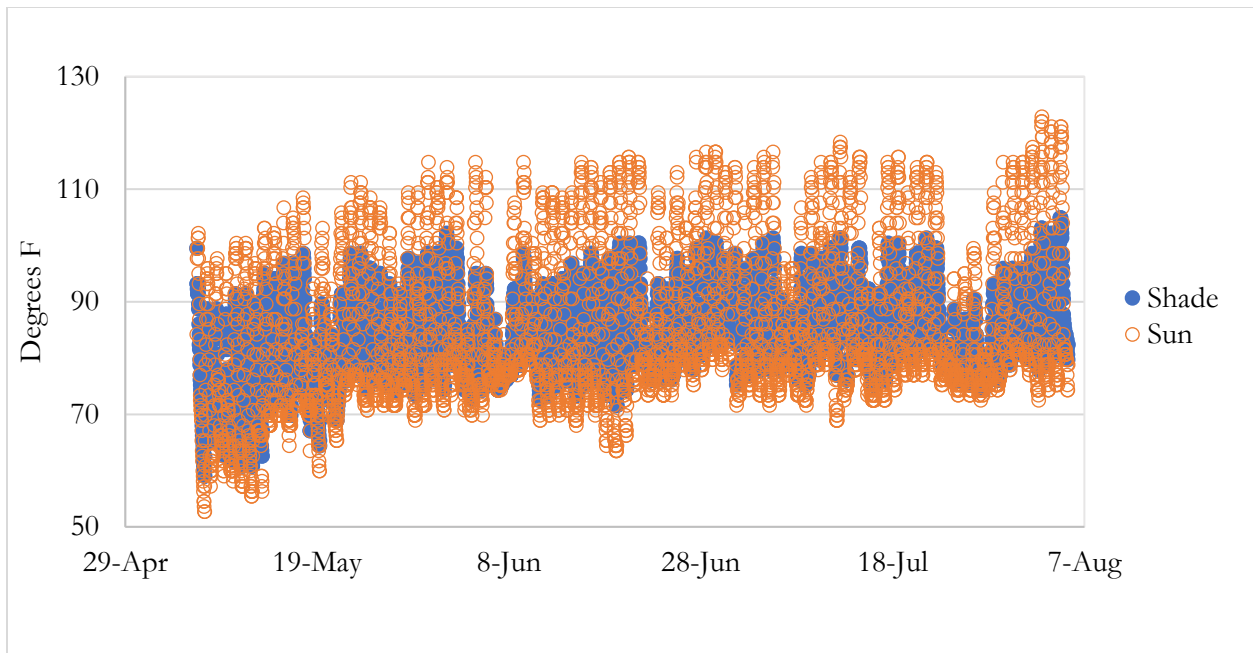
**Figure 7. Temperatures on the Piggly Wiggly rooftop (Fairhope, AL) in full sun and shade, 31 May–6 July 2019.**



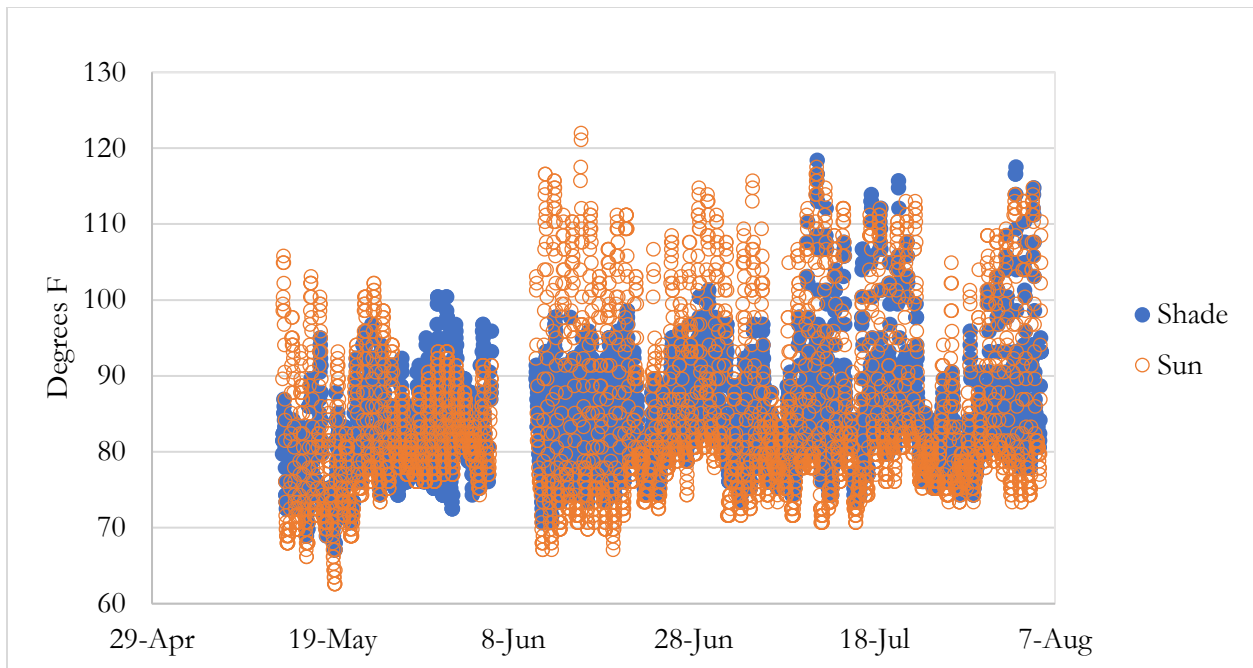
**Figure 8. Temperatures at the Beach Club least tern colony site in full sun and under a chick shelter, 16 July– 12 August 2019.**



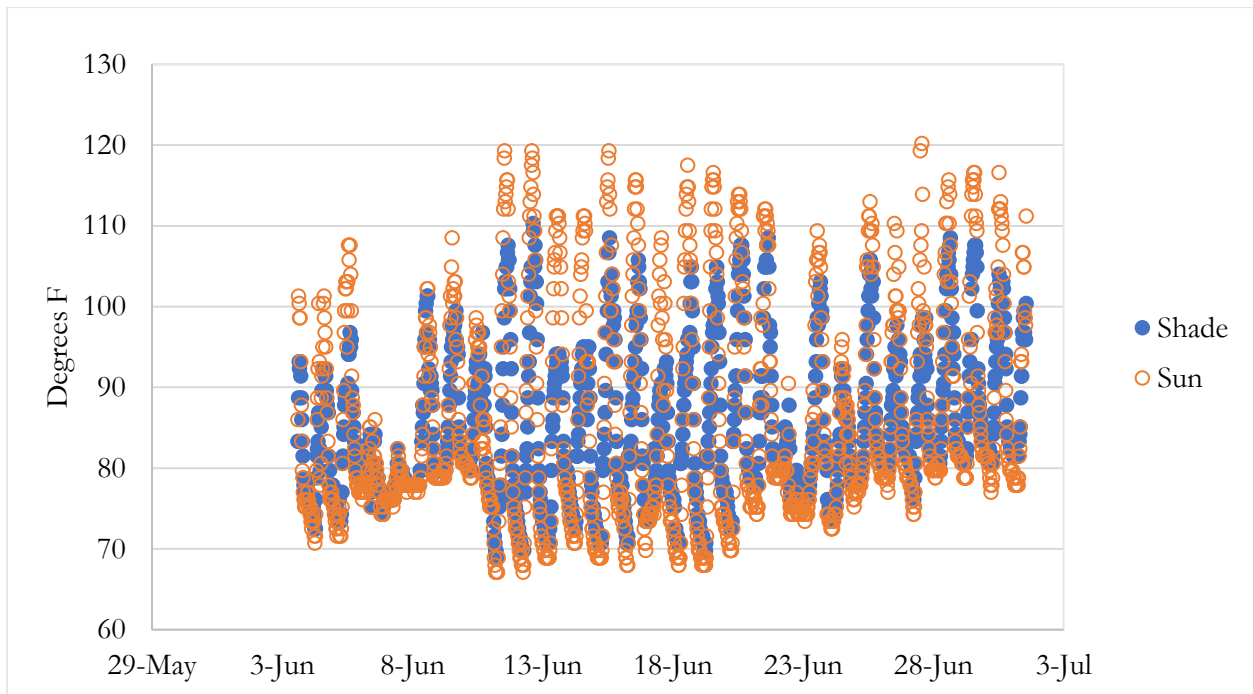
**Figure 9. Temperatures on the Piggly Wiggly rooftop (Fairhope, AL) in full sun and shade, 21 May–2 July 2020.**



**Figure 10. Temperatures at Beach Club least tern colony in full sun and shade, 6 May–5 August 2020.**



**Figure 11. Temperatures at Alabama Point in full sun and shade, 13 May–5 June 2020. Sensors removed from site in preparation for impact of tropical storm Cristobal 5 June. Redeployed on 10 June to continue until final date 5 August.**



**Figure 12. Temperatures at No Fly Zone least tern colony in full sun and shade, 3 June–July 2020.**



Figure 13. Chick shelter at least tern colony on Piggly Wiggly rooftop in Fairhope, AL.



Figure 14. Chick shelters being used by black skimmers at Alabama Point, Orange Beach, AL.

## *Nest Success Data*

### **Surveys and data collection**

We began breeding season monitoring efforts in 2018, and primarily focused on conducting coastwide surveys to determine where the majority of nesting activity was occurring. In 2019 and 2020, we focused survey efforts at sites that had most of the nesting activity in 2018, while continuing to survey other areas for any nesting activity.

In 2019, we surveyed nine sites in Baldwin County (Figure 15) and ten sites in Mobile County (Figure 16) and in 2020 we surveyed eight sites in Baldwin County and seven sites in Mobile County (Table 3). The frequency of surveys varied by site based on nesting activity and weather; however, on average solitary surveys were conducted every 2-3 days and colony surveys were conducted every 2-5 days across years (Table 4). Mainland surveys were delayed in 2020 as the beaches were closed due to the COVID-19 pandemic. Island surveys were not conducted during the 2020 breeding season due to safety concerns regarding COVID-19.



Figure 15. Beach-nesting bird survey areas in Baldwin County during the 2018–2020 breeding seasons. The Orange Beach area includes four rooftop colonies, Alabama Point, Shallow Lot, No Fly Zone, and Bird Island.



Figure 16. Beach-nesting bird survey areas in Mobile County during the 2018–2020 breeding seasons.

**Table 3. Sites and species monitored along the Alabama coast during 2018–2020.**

<b>Baldwin County</b>	<b>Years Surveyed</b>	<b>Species</b>
Alabama Point, Orange Beach	2018, 2019, 2020	least tern
No Fly Zone, Orange Beach	2018, 2019, 2020	least tern
Shallow Lot, Orange Beach	2018, 2019, 2020	least tern
Bird Island, Orange Beach	2018, 2019, 2020	least tern
Orange Beach Rooftops	2019, 2020	least tern
Bon Secour NWR	2019	snowy plover
Gulf State Park	2018, 2019, 2020	snowy plover
Beach Club, Fort Morgan	2018, 2019, 2020	least tern
Piggly Wiggly, Fairhope	2019, 2020	least tern
<b>Mobile County</b>		
Public Beach East, Dauphin Island	2018, 2019, 2020	snowy plover
Public Beach West, Dauphin Island	2018, 2019, 2020	snowy plover
Dauphin Island West End	2018, 2019, 2020	snowy plover
Katrina Cut, Dauphin Island	2018, 2019, 2020	snowy plover
Far West End, Dauphin Island	2018, 2019, 2020	snowy plover, American oystercatcher
Little Dauphin Island	2020	least tern, black skimmer
Pelican Island	2018, 2019, 2020	least tern, snowy plover, American oystercatcher
Tern Island	2018, 2019	least tern, black skimmer, American oystercatcher
Cat Island	2019	least tern, American oystercatcher
Coffee Island	2019	least tern, American oystercatcher, reddish egret
Marsh Island	2019	black skimmer



**Table 4. Breeding season survey information by year. Island surveys were conducted by boat and data were recorded for both solitary and colonial-nesting species on all islands.**

**Nearshore Islands include Cat, Coffee, Marsh, Tern.**

	Survey start date	Surveys/week	Total surveys
<b>2018</b>			
Mainland: solitary	22 February	2-3	162
Mainland: colony	03 April	4-5	225
Nearshore Islands	10 July	0.7	6
Perdido Islands	03 April	1-2	18
<b>2019</b>			
Mainland: solitary	28 January	3	337
Mainland: colony	02 May	3-4	287
Nearshore Islands	20 May	1	41
Perdido Islands	02 May	2	18
<b>2020</b>			
Mainland: solitary	01 May*	2-3	127
Mainland: colony	08 April*	2-3	376
Nearshore Islands**	n/a	0	0
Perdido Islands	30 April	1	43

\*Early-season survey efforts were restricted due to beach closures.

\*\*We did not survey nearshore islands due to COVID-19 restrictions.

Solitary species included snowy plover, Wilson’s plover, and American oystercatcher. We conducted solitary-nesting bird surveys to document the presence of solitary-nesting species and search for nests if individuals were exhibiting nesting behavior. During each solitary-nesting bird survey, we recorded site, date, survey start and end times, species seen, GPS location of the individual(s), time observed, behavior (foraging, loafing, territorial, scrape/pre-nesting, nesting), observed predators or active disturbances within 50’ of individual or nest, number of chicks or fledglings. When a nest was found during a survey, we recorded the GPS location, number of eggs, estimated initiation and hatch dates, and any signs of disturbance around the nest. Potential predators and disturbances included: coyotes, foxes, laughing gulls, crows, ghost crabs, people, and dogs.

Colonial-nesting species included least tern, black skimmer, and reddish egret. We also recorded breeding season metrics for royal tern (*Thalasseus maximus*), Caspian tern (*Hydroprogne caspia*), gull-billed tern (*Gelochelidon nilotica*), and sandwich tern (*Thalasseus sandvicensis*) in 2019. For colony surveys, we recorded estimates for number of breeding pairs, number of nests, number of chicks, number of fledglings, and evidence of disturbance within 50’. Number of breeding pairs refers to the total or estimated number of pairs that laid eggs (some colonies had a higher number of individuals present during surveys; however, we only included the number of pairs that were incubating or where we were able to confirm the presence of eggs using binoculars or a spotting scope).

If nest failures occurred early during the breeding season, snowy plovers attempted to reneest. Snowy plovers are solitary-nesting species that defend breeding territories; therefore, we could determine if a pair had reneested after a nest failure in the majority of instances because the second (or third) nest was in the same territory. Because least terns nest in colonies and were not banded, we could not confirm reneesting for specific pairs; however, we assumed that pairs within a colony reneested following nest loss.

For all species monitored, successful nests were those that hatched at least one egg. We assumed nests successfully hatched when adults were no longer incubating nests at the end of the average incubation

period (~28 days for snowy plovers and ~22 days for least terns) and were seen brooding and/or feeding chicks. We often confirmed nest success through direct observation for snowy plover nests. For least terns, we were able to assume nest failure based on evidence of depredation or overwash. We considered young to have successfully fledged if they survived to average fledging age (~30 days for snowy plovers and 20 days for least terns) or were seen exhibiting sustained flight. Productivity was calculated as the number of fledglings per pair for each site and/or across all sites.

### **Wilson's Plover**

Wilson's plovers are rare in Alabama during spring, summer, and fall. Breeding habitat includes coastal beaches, salt flats, lagoons, and dredge spoil islands with little to dense vegetation (Zdravkovic et al. 2020). Nests are shallow scrapes in the sand or shell, usually near a clump of vegetation. The population in Alabama has declined over the past several decades; Imhof (1976) noted that 47 individuals were seen on Dauphin Island in August 1954 and a 2007 breeding season census documented 13 pairs of Wilson's plovers in the state (Zdravkovic 2008). Wilson's plovers are listed as "highest conservation concern" in Alabama's State Wildlife Plan (ADCNR 2015).

There was presumably at least one nesting pair on Dauphin Island in 2015; two fledglings were observed on Pelican Island (A. Haffenden, pers. comm.). In 2016, a nest was found at Katrina Cut on Dauphin Island and an overwashed, one-egg nest was found on Pelican Island (A. Haffenden, pers. comm.). We observed individuals and 1-2 pairs of Wilson's plovers on Dauphin Island during beach-nesting bird surveys, but we did not find any nests during 2018-2020.

### **Snowy Plover**

Snowy plovers are present year-round on the Alabama coast. They are small shorebirds that nest on unvegetated to slightly vegetated sand beaches. Snowy plovers nest solitarily and defend breeding territories. The species faces a suite of threats throughout the annual cycle (Page et al. 2009). Broadly, this includes habitat loss from human development and increased levels of human disturbance. Human disturbance can indirectly lead to nest loss when adults flush from eggs or young, leaving them exposed to heat and predators. Direct mortality of nests and chicks is caused by people, vehicles, pets, storms, and a host of predators including coyotes, foxes, American crows (*C. brachyrhynchos*), common ravens (*C. corax*), and striped skunks (*Mephitis mephitis*; Page et al. 2009). Snowy plovers are listed as "highest conservation concern" in Alabama's State Wildlife Plan (ADCNR 2015).

We monitored snowy plover breeding pairs at Gulf State Park and Dauphin Island (as well as Bon Secour NWR in 2019). The number of breeding pairs at Gulf State Park decreased from three pairs in 2018 and 2019 to one pair in 2020. The number of pairs on Dauphin Island fluctuated across years, with the most in 2019 (Table 5). We found two deceased adult snowy plovers on Dauphin Island in December 2019 and sent them to USGS for necropsy. The cause of death wasn't determined but lack of pathogens and good body condition were consistent with mortality due to neurotoxins.

The earliest estimated nest initiation dates were 03 March 2018, 01 April 2019, and 23 April 2020 (early nests may have been missed in 2020 due to pandemic-related beach closures). Snowy plover productivity was low overall, particularly on Dauphin Island where we only documented two fledglings during 2018-2020 (Table 5). Cumulative productivity for Gulf State Park and Dauphin Island was 0.11 fledglings/pair in 2019 and 0.25 in 2020. Using data from all three sites in 2019, we conducted preliminary nest survival analyses using RMark (Laake 2019) in R (R Core Team 2019) to construct models for Program MARK (White and Burnham 1999, Dinsmore et al. 2002). We tested four models and used the Akaike information criterion corrected for small samples sizes (AICc) to determine the best model (Table 6). We also calculated pseudo- $R^2$  values (Nagelkerke 1991) to determine how well each model explained

variation in nest survival. Constant daily survival rate (DSR) during the incubation period was 0.95 and the probability of a nest surviving a 30-day incubation period was 0.21. The top model in our analysis included the site covariate and accounted for 99% of the model weight (Table 7). Gulf State Park had the highest survival rate at 0.98 DSR and 0.68 for the incubation period. Bon Secour followed with 0.96 and 0.34, and Dauphin Island had the lowest survival estimates at 0.84 and <0.01. While these results highlight the poor breeding success snowy plovers have on Dauphin Island, caution should be taken in interpreting them; this analysis was based on a small sample size and just one season of data. Further, site accounted for only 37% of the variation in nest survival; therefore, other factors that we did not model were influencing snowy plover nest survival in Alabama.

Known causes of nest failure included overwash, abandonment, and depredation by coyotes, ghost crabs, and red foxes (Table 8). In 2019, predation accounted for 65% of the known causes of failure across all sites. We deployed game cameras at two snowy plover nests on the far west end of Dauphin Island and two at Gulf State Park in 2019 to document causes of failure. On Dauphin Island we obtained photographs of red foxes depredating eggs on two separate occasions (Figure 17), and at Gulf State Park we documented depredation of a nest by a coyote (Figure 18).

**Table 5. Snowy plover breeding season metrics during 2018–2020.**

	<b>Pairs</b>	<b>Successful nests</b>	<b>Failed nests</b>	<b>Chicks</b>	<b>Fledglings</b>	<b>Productivity</b>
<b>2018</b>						
Gulf State Park	2-3	1	2	3	0	0.00
Laguna Key	1	1	0	2	0	0.00
Dauphin Island	3	1	2	2	0	0.00
<b>2019</b>						
Bon Secour*	12	8	12	19	5	0.42
Gulf State Park	3	3	1	7	1	0.33
Dauphin Island	6	1	15	3	0	0.00
<b>2020</b>						
Gulf State Park	1	1	0	2	1	1.00
Dauphin Island	3	3	1	4	0	0.00

\*Alabama Audubon monitored Bon Secour National Wildlife Refuge for American Bird Conservancy in 2019.

**Table 6. Models used in snowy plover nest survival analysis.**

<b>Model</b>	<b>Justification</b>
Constant	Survival is constant.
Time	Survival decreases later in the season.
Nest Age	Survival increases with nest age.
Site	Survival varies by site.

**Table 7. Results of snowy plover nest survival analysis for 2019 breeding season.**

<b>Model</b>	<b><math>K</math></b>	<b><math>AIC_c</math></b>	<b><math>\Delta AIC_c</math></b>	<b><math>w_i</math></b>	<b>Dev</b>	<b>Pseudo-<math>R^2</math></b>
Site	3	130.78	0.00	0.99	124.73	0.37
Nest Age	2	139.92	9.13	0.01	135.89	0.13
Constant	1	142.64	11.85	0.00	140.63	0.00
Time	2	144.65	13.87	0.00	140.63	0.00

**Table 8. Causes of snowy plover nest failure during 2018-2020 breeding seasons showing total number of nests lost.**

<b>Cause of failure</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
Predation: ghost crab	0	5	0
Predation: coyote	2	2	0
Predation: fox	0	2	0
Predation: unknown	0	2	0
Wind	0	3	0
Storm/overwash	0	2	1
Abandoned	1	2	0
Unknown	1	10	0



Figure 17. Foxes depredating a snowy plover nest at the far west end of Dauphin Island, Alabama, in 2019.



Figure 18. Coyote depredating a snowy plover nest at Gulf State Park, Alabama, in 2019.

## Least Tern

Least terns are the smallest tern in North America. They are present in Alabama during the breeding season, and winter along the coasts of Mexico, Central America, and South America. Least terns nest in colonies of tens to hundreds of pairs on mainland beaches, offshore islands, and gravel rooftops. Nests are shallow scrapes in the sand. Terns face similar threats as snowy plovers; nests and chicks can be lost due to flooding by high tides and storm events, and eggs can die if exposed to extreme temperatures (as when adults are disturbed and flushed from the nest). Predators of eggs and chicks include American crow, fish crow, common raven, boat-tailed grackle (*Quiscalus major*), gulls, great horned owl (*Bubo virginianus*), red fox, coyote, raccoon, striped skunk, ghost crab, cats, and dogs, among others (Thompson et al. 1997).

In 2018, we primarily focused on finding least tern colonies across the Alabama coast; therefore, data on the number of chicks and fledglings is incomplete for some colonies (Table 9). In 2019 and 2020, we focused our monitoring efforts on priority sites and monitored the colonies more frequently to obtain more accurate counts of pairs, nests, chicks, and fledglings. We found nests in early-May each year. We conducted the first nearshore island surveys on 20 May 2019, and found three nests on Cat Island and 13 on Coffee Island that day, indicating nest initiations likely start in late-April or early-May on the nearshore islands. In 2020, the colony at Alabama Point was significantly smaller than in 2019, having gone from 124 nests to eight nests (Tables 10 and 11). This may be due to low fledging success in 2018 and 2019. We also discovered a new colony location in 2020; the least terns began nesting in newly created habitat at the Lightning Point restoration area near Bayou La Batre. We were unable to monitor the least terns there due to it being an active construction site, so we do not know how successful they were. We estimated productivity for 2019 and 2020 across all monitored sites. In 2019, we used the minimum number of estimated breeding pairs to calculate the estimate of productivity of 0.02 fledglings/pair. Productivity was 0.21 fledglings/pair in 2020, although several colonies (e.g. nearshore islands, Lightning Point) were not monitored.

We documented nest and/or colony failure, which included depredation by coyotes, foxes, ghost crabs, and gulls, overwash by storm-driven high tides, and human disturbance. Coyotes and foxes depredated nests at mainland colonies including at Alabama Point, Beach Club, and Pelican Island. Overwash was common on nearshore islands; least terns nested in the open beach/shell habitat on Cat Island and Coffee Island which was generally along the perimeters of the islands and more susceptible to overwash from high tides. Tern Island is also particularly susceptible to overwash as it has very little elevation; it was completely submerged on at least two occasions during 2018-2019. Furthermore, Tern Island was subjected to human disturbance as people regularly docked their boats near the island and walked around it. In 2018, we discovered that people had collected least tern eggs and put them in a pile so they could set up volleyball nets on the island (Figures 19 and 20). This event made international news with articles in the Washington Post (<https://www.washingtonpost.com/news/early-lead/wp/2018/08/08/its-pretty-nasty-beach-volleyball-players-in-alabama-accidentally-kill-hundreds-of-birds/>) and BBC (<https://www.bbc.com/news/world-us-canada-45119323>), among others. Because we were out conducting surveys and monitoring beach-nesting birds, we documented this disturbance, went to Tern Island to save some of the eggs and nests, and posted signs along the perimeter of the island.

We deployed game cameras at least tern colonies to obtain data on disturbances and causes of failure. In 2019, we deployed cameras at the Beach Club, Alabama Point, and Bird Island colonies and at the Beach Club and Piggly Wiggly colonies in 2020. We documented a coyote at Alabama Point in 2019 (Figure 21) and at the Beach Club colony in 2020 (Figure 22). The game camera on the Piggly Wiggly rooftop recorded images of laughing gulls and fish crows; however, this was after the colony failed. Unfortunately, we did not obtain photos of the assumed depredation event that caused nest failure.

**Table 9. Breeding season metrics for least tern colonies in 2018.**

Site	Pairs	Nests	Failed nests	Chicks	Fledglings
Beach Club	25	25	unk	unk	4
Alabama Point	60-120	unk	unk	unk	4
Bird Island	10	10	unk	9+	0
Orange Beach	50-60	50-60	unk	unk	0
No Fly Zone	6	7	unk	unk	unk
Gulf State Park	7-10	7-10	unk	unk	0
Laguna Key	13	13	unk	unk	0
Shallow Lot	10-15	10-15	7	unk	4
Gulf State Park	7-10	7-10	unk	unk	0
Phoenix on the Bay II	12-15	unk	unk	unk	unk
Perdido Grande	15	unk	unk	unk	unk
Piggly Wiggly	18-20	unk	unk	unk	unk
Dauphin Island Causeway	12	12	unk	unk	0
Pelican Island	1-4	1-4	unk	unk	0
Coffee Island	13	13	unk	unk	2
Cat Island	150-250	150-250	unk	unk	6
Tern Island	500+	520-580	unk	unk	82
Total	909-1,098+	825-1,009+			102

**Table 10. Breeding season metrics for least tern colonies in 2019.**

Site	Pairs	Nests	Failed nests	Chicks	Fledglings
Bon Secour	1	1	1	1	0
Beach Club	26	39	17	7	5
Alabama Point	124	124	~118	7	6
No Fly Zone	11	11	3+	8	3
Shallow Lot	4	4	3	1	0
Piggly Wiggly	58	68	68	13	0
Pelican Island	57	58	58	0	0
Coffee Island	12	12	12	0	0
Cat Island	5	8	8	0	0
Tern Island	613	613	563	47	1
Total	911*	938	851	84	15

\*Maximum number of pairs. There were likely pairs that renested after nest failure. The estimated minimum number of pairs at all sites monitored was 660, based on timing of failure and initiation of new colonies. The overall productivity estimate for LETE was based on a total of 660 pairs.

**Table 11. Breeding season metrics for least tern colonies in 2020  
(nearshore islands were not monitored).**

Site	Pairs	Nests	Failed nests	Chicks	Fledglings
Beach Club	40	44	25	30	11
Gulf State Park	4	4	3	1	1
Alabama Point	8	8	8	0	0
No Fly Zone	25	25	10	15	15
Shallow Lot	11	11	7	5	1
Perdido Grande East	1	1	1	0	0
Perdido Grande West	5	5	5	0	0
Phoenix on the Bay I	4	4	2	2	0
Phoenix on the Bay II	2	2	1	2	0
Piggly Wiggly	25	25	25	0	0
Laguna Key	1	1	1	0	0
Pelican Island	0	0	0	0	0
Little Dauphin Island	10	10	10	0	0
Total	136	140	98	55	28



**Figure 19. Volleyball equipment left on Tern Island in 2018. Photo by Andrew Haffenden.**





Figure 20. Least tern eggs that were displaced by volleyball players on Tern Island, AL, in 2018.  
Photo by Andrew Haffenden.



Figure 21. Game camera photo of a coyote at Alabama Point in Orange Beach in 2019.



Figure 22. Game camera photo of a coyote at the Beach Club least tern colony on 30 July 2020.

## **Black Skimmer**

Black skimmers are present year-round in Alabama. Like least terns, skimmers nest in colonies that range in size from tens to hundreds of pairs. In Alabama they tend to utilize nearshore islands for nesting, as islands are generally free from disturbance and mammalian predators. The species is highly sensitive to disturbance, which can lead to complete abandonment of a colony. Flooding, storms, and predation are also known causes of colony failure (Gochfeld and Burger 1994). Black skimmers historically nested along Alabama's barrier beaches; however, recently they are only infrequently seen nesting on mainland beaches and in small numbers when they do. This may be a direct result of increased predator pressures, human disturbance, and habitat loss in the last decade. Black skimmers are listed as "moderate conservation concern" in Alabama's State Wildlife Plan (ADCNR 2015).

In 2019, we estimated 100 nests on Marsh Island on the first survey day (20 May), indicating that skimmers started nesting in late-April to early-May. We estimated a total of 245 nests and 61 fledglings on Marsh Island, with a productivity estimate of 0.25 fledglings/pair (Table 12).

We did not monitor nearshore islands in 2020 due to pandemic-related safety protocols; however, we documented four pairs with assumed nests on Little Dauphin Island and one pair at Alabama Point in Orange Beach. Skimmers were not successful on Little Dauphin Island. We put signs, rope, and barriers around the nest at Alabama Point to protect the nest and chicks, as this site experienced high levels of human disturbance, and the pair successfully fledged two chicks.

## **American Oystercatcher**

American oystercatchers are found in Alabama year-round. They nest solitarily and defend territories during the breeding season. Oystercatchers nest on sand and shell beaches of barrier islands and offshore islands. They make a shallow scrape for a nest that is usually near vegetation. Oystercatchers are sensitive to human disturbance and habitat loss, and storm events and high tides can lead to nest and chick loss. Predators of eggs and chicks include gulls, raccoons, foxes, coyotes, and cats, among others. The American oystercatcher is listed as "highest conservation concern" in Alabama's State Wildlife Plan (ADCNR 2015).

The breeding population of American oystercatchers in Alabama is small and mostly limited to the nearshore islands. In 2019, one pair attempted to nest at the far west end of Dauphin Island but the nest failed, and we believe the pair attempted to reneest on Tern Island. Oystercatchers nested successfully on Cat Island and Coffee Island each year, with productivity ranging from 1.00 to 3.00 fledglings/pair across years and sites (Table 12).

## **Reddish Egret**

Reddish egrets are a colonial-nesting waterbird and habitat specialist, requiring shallow, unvegetated water for foraging. Reddish egrets have been recorded in small numbers in coastal Alabama since 1955 (Imhof 1958). A 2006 status report estimated 5-10 breeding pairs in Alabama (Green 2006), and the population has declined since. The reddish egret is listed as "high conservation concern" in Alabama's State Wildlife Plan (ADCNR 2015).

In 2018 and 2019, we documented one pair nesting on Coffee Island that successfully fledged two young (Table 12).

## Other Colonial-Nesting Species

Marsh Island supported other colonial-nesting species including Caspian terns, gull-billed terns, royal terns, and sandwich terns. We recorded estimates of the number of pairs, nests, chicks, and fledglings for these species in 2019 (Table 12). Royal terns were the most productive, with an estimated 1.23 fledglings/pair.

**Table 12. Breeding season metrics for reddish egrets (REEG), American oystercatchers (AMOY), black skimmers (BLSK), Caspian terns (CATE), gull-billed terns (GBTE), royal terns (ROYT), and sandwich terns (SATE) on nearshore islands during 2018–2020.**

Site	Species	Pairs	Nests	Chicks	Fledglings	Productivity
<b>2018</b>						
Coffee Island	REEG	1	1	2	unk	
Coffee Island	AMOY	1	1	3	3	3.00
Cat Island	AMOY	1	1	3	3	3.00
Tern Island	BLSK	13-15	15	unk	15	1.00-1.15
Marsh Island	BLSK	150-250	150-250	unk	unk	
<b>2019</b>						
Coffee Island	REEG	1	1	2	2	2.00
Coffee Island	AMOY	2	2	4	3	1.50
Cat Island	AMOY	1	1	1	1	1.00
Tern Island	AMOY	1	1	0	0	0.00
Tern Island	BLSK	31	31	51	1	0.03
Marsh Island	BLSK	150	245	unk	61	0.25
Marsh Island	CATE	60	unk	78	23	0.38
Marsh Island	GBTE	45	25	19	19	0.42
Marsh Island	ROYT	887	unk	1,307	1,090	1.23
Marsh Island	SATE	276	unk	414	125	0.45
<b>2020</b>						
Little Dauphin Island	BLSK	4	4	0	0	0.00

## Trainings to Support Nesting Colony Stewardship

When the Alabama Coastal Bird Stewardship Program began in 2017, we focused the first two training sessions in December on ACBS monitoring protocols and recruiting volunteers for those surveys. The training, adapted for Alabama from National Audubon Society’s ACBS training manual, also included a short section on stewardship. We asked participants to indicate their interest in volunteering for ACBS or stewardship activities. Fifty-one participants attended the December sessions. Several people signed up to participate in ACBS, but no one signed up for stewarding activities. We held more training sessions in March, with little to no interest in stewardship. The standard training sessions were lengthy and largely in a classroom setting, therefore we decided to split the sessions and developed a new manual to accommodate this. We transitioned stewardship training from a classroom to field-based setting and we offered the first stewardship training on 22 May 2018. This first session was a pre-fencing event at Dauphin Island Public Beach. Four participants assisted two staff members and learned how to place symbolic fencing at nesting areas.

In summer 2018, we hosted several nest stewardship trainings that resulted in nine volunteers learning how to establish “Steward Stations” near nesting colonies. Lastly, we hosted two beach-nesting bird walks in June 2018. These walks provided volunteers and the public with an opportunity to join staff

during their routine breeding-bird surveys and monitoring efforts. During these walks, participants saw how a survey was conducted and viewed nesting birds, eggs, and chicks. We advertised all training/walk dates through social media and a volunteer listserv. A total of three people participated between the two dates.

Participant interest appeared to be much higher when training and/or events were outside and not formal classroom settings. Beginning in June 2018, Alabama Audubon staff and volunteers held Bird Identification (ID) 101 Walks. These guided walks were led by an expert birder and focused on simplistic shorebird identification skills in the field. Between June 2018 and December 2019, we held 17 Bird ID 101 Walks with a total of 142 participants. These walks served as stewardship training, ACBS training, and garnered interest in the program.

### *Outreach and Communication to Support Nesting Colony Stewardship*

Staff and volunteers conducted outreach during the breeding season by setting up tables and spotting scopes near least tern colonies. This allowed stewards to protect the colonies from human disturbance while simultaneously educating the public about nesting birds. In 2018 and 2019, we hired two part-time seasonal stewards (one in Mobile County and one in Baldwin County). The seasonal stewards were responsible for (1) assisting with the installation of symbolic fencing around nesting colonies, (2) interacting with the public to promote conservation of and discourage disturbance to colonies, (3) educating interested beach visitors about beach-nesting birds, (4) collecting data on the human use of Alabama's beaches and its impacts on colonial nesters, and (5) training and scheduling volunteers.

The City of Orange Beach's Coastal Stewardship Coordinator (under subcontract with Alabama Audubon) started in May 2018. The role of the coordinator as an employee of the City of Orange Beach was to assist with monitoring and management of beaches and other important habitats for priority birds and associated wildlife within the city. The coordinator also trained other City of Orange Beach staff and volunteers in our monitoring and stewardship protocols. The largest portion of the coordinator's role was education and outreach to both residents and visitors. During the 2018–2020 breeding seasons, the coordinator averaged one to two public interactions per day, five days per week. During the non-breeding season, the coordinator was on the beach less frequently but averaged one to two interactions per week.

In 2018, volunteers contributed 40.5 hours to stewardship activities. Our first large-scale stewardship event was on 04 July 2018. We set up stewardship stations at Alabama Point and Dauphin Island Public Pier, as these sites were close to large nesting colonies and had high numbers of beachgoers. Stewardship stations consisted of a tent or umbrella, spotting scope, binoculars, informational/educational materials, water, and giveaways. Alabama Audubon staff spent eight hours at each site and interacted with approximately 30 people, all with positive interactions.

In 2019, the Coastal Stewardship Coordinator and City of Orange Beach personnel contributed 164.5 hours to stewardship. The two part-time seasonal stewards contributed 10-15 hours per week on stewardship activities. The July 4<sup>th</sup> stewardship event was extended to two sites (Alabama Point and Bon Secour NWR) in Baldwin County and an extra day (July 5<sup>th</sup>) at Alabama Point and Dauphin Island Public Pier. We also added the collection of quantitative data in 2019, and documented each interaction with the public (positive, negative, or neither). Overall, the stewardship days consisted of 16 volunteer hours with 17 positive interactions and no negative interactions.

The summer of 2020 brought about several challenges that were not accommodating for in-person stewardship events (i.e. COVID-19 and multiple severe weather disturbances). However, the City of

Orange Beach Coastal Stewardship Coordinator was on the beaches and, along with other City of Orange Beach staff, contributed 101 hours to stewardship.

### ***Priority Species***

We started collecting additional information on 11 focal species in 2018 to obtain a greater understanding of how these birds utilize coastal areas. Avian species deemed as “priority” include those that were significantly impacted by the Deepwater Horizon oil spill disaster in April 2010, and others that are of federal or state conservation concern. Six species breed and overwinter on the Alabama coast, one species is found in the state during the breeding season, and four species migrate through or winter along the Alabama coast (Table 13). Together, these species represent different nesting strategies, foraging strategies, and microhabitat use across the year.

Additional data collected on these priority species included: GPS coordinates, behavior, and band combinations if applicable. We adapted our data collection protocols over the last three years to maximize efficiency and improve the overall quality of the data set. In 2019, we discontinued documenting priority birds on active breeding territories, as these observations were collected in breeding surveys. Below, we present data based on the most recent protocols. In 2019, we discontinued recording brown pelican, least tern, sanderling, and short-billed dowitcher sightings in priority bird data due to their frequent encounters. This decision was carried out in the 2020 breeding season as well.

#### **2018**

In the 2018 breeding season (March-August), we documented at least one priority bird sighting at 14 sites in Mobile County and 13 sites in Baldwin County. We documented all 11 focal species at Dauphin Island West End, 10 at Pelican Island, and four at Laguna Key and Orange Beach. Mobile County sites that had the highest recorded number of priority bird sightings included Pelican Island (n= 2,934) and Dauphin Island West End (n=475). In Baldwin County, Laguna Key (n=292) and Alabama Point (n=280) had the highest number of priority bird sightings. Sites with the lowest number of priority bird sightings included Katrina Cut (n=5) on Dauphin Island and Robinson Island (n=17) in Orange Beach.

We documented a total of 5,749 priority bird sightings during the 2018 breeding season. Sanderling had the most records (n= 1,972), followed by brown pelican (n=1,838), and least tern (n=643). 51% of least tern sightings occurred at Dauphin Island West End. Piping plover (n=192) and snowy plover (n=147) had a comparable number of sightings during the season. 96% of piping plover sightings and 88% of snowy plover sightings were on Pelican Island.

#### **2019**

We documented priority birds at nine different locations across both Mobile and Baldwin Counties during the 2019 breeding season, six of the focal species on the Far West End of Dauphin Island and five on Pelican Island. Both of these locations had the highest number of priority bird sightings for Mobile County with (n=73) and (n=220), respectively. Bon Secour NWR Fort Morgan Unit and Perdue Unit had the greatest number of sightings in Baldwin County. We observed five different species at Fort Morgan and three at Perdue. Both had a comparable number of sightings, with 49 at Fort Morgan and 45 at Perdue. Sites with the lowest number of reported sightings (n=1) included Public Beach West on Dauphin Island, Gulf State Park in Gulf Shores, and Walker Island in the Perdido Pass.

We recorded 406 priority bird sightings among the two counties in 2019. The species with the highest number of reported sightings were snowy plover (n=222) followed by piping plover (n=61) and reddish egret (n=61). Pelican Island had 56% of snowy plover, 74% of piping plover, and 50% of reddish egret sightings.

## 2020

In 2020, we documented focal species at 13 different sites among both counties: seven species on Pelican Island and six at the Far West End of Dauphin Island. Lightning Point, a recently completed restoration project located in Bayou La Batre, had the greatest number of priority bird sightings (n=360), all of which were black skimmers. Pelican Island and Far West End followed with 213 and 131 records, respectively. Gulf State Park had the greatest number of priority bird sightings in Baldwin County, with six sightings of four species. Sites with the lowest number of sightings included Little Dauphin Island (n=2) and Bon Secour NWR Fort Morgan Unit (n=1).

Despite a decrease in the 2020 breeding season survey efforts due to pandemic-related restrictions, we documented 768 priority bird sightings. The black skimmer had the greatest number of sightings (n=531), followed by snowy plover (n=80), and reddish egret (n=74). 80% of snowy plover and 47% of reddish egret sightings were on Pelican Island. Wilson's plover had the fewest sightings (n=2), one at Pelican Island and the other at Dauphin Island West End.

We can use these additional data to understand how these 11 species utilize different habitat along the Alabama coast during the breeding season. Mapping the locations of individuals/groups allows for further examination on how particular sites and habitats are important for meeting species-specific requirements. Data collected during the breeding season over the last three years highlights the importance of barrier island sites such as Dauphin Island and the Fort Morgan peninsula (Figures 23-32). Pelican Island had the most locations over the three-year period (Figures 25 and 26). This section of the island is approximately 1.5 km (1 mile) long and is surrounded on both sides by nutrient-rich water from the Gulf of Mexico. We recorded more sightings on the western end of Dauphin Island (Dauphin Island West End, Katrina Cut, and Far West End) during the latter half of the breeding season (June-August) compared to the beginning of the breeding season (March- May; Figures 23 and 24). We observed some of the focal species on the nearshore islands (Coffee and Marsh Islands) and near the Bayou La Batre fishing docks (Figure 27). Survey efforts at these sites were minimal over the three-year period due to the late addition of the nearshore islands, the restoration project at Bayou La Batre, and COVID-19-related restrictions. We documented a high concentration of snowy plovers along the Fort Morgan peninsula at Bon Secour NWR sites during the latter half of the breeding season (Figure 29). We also documented priority birds at Bayfront Park in July 2018 (Figure 32).

**Table 13. Alabama Audubon's priority bird species and their annual statuses.**

<b>Species</b>	<b>Annual status</b>
American oystercatcher	Resident
Black skimmer	Resident
Brown pelican	Resident
Least tern	Breeding, Migration
Piping plover	Wintering
Reddish egret	Resident
Red knot	Migration, Wintering
Sanderling	Migration, Wintering
Short-billed dowitcher	Migration, Wintering
Snowy plover	Resident
Wilson's plover	Breeding, Migration



Figure 23. Priority bird locations during the first half (March–May) of the 2018–2020 breeding seasons at Far West End, Dauphin Island West End, and Katrina Cut.

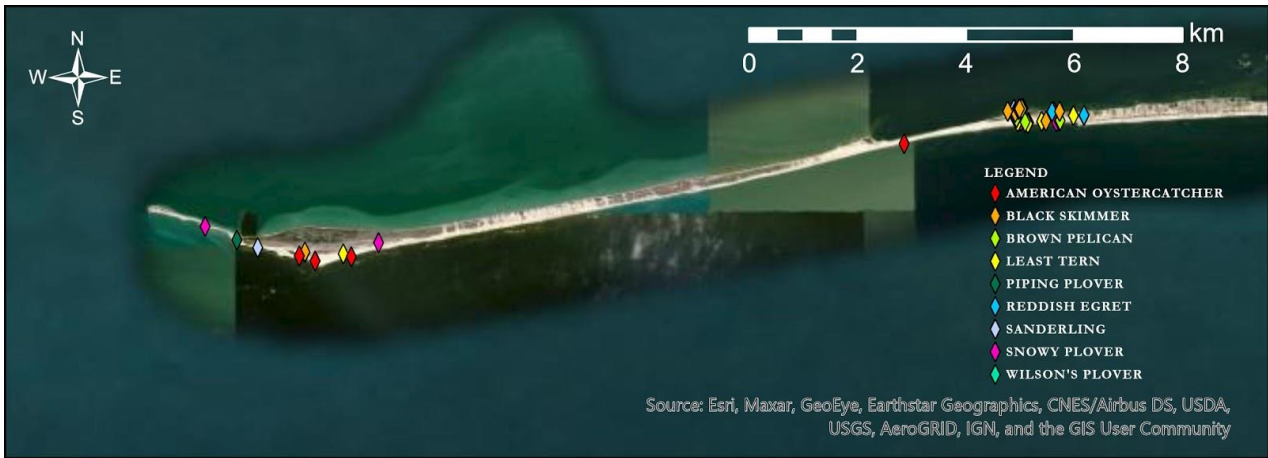


Figure 24. Priority bird locations during the second half (June–August) of the 2018–2020 breeding seasons at Far West End, Dauphin Island West End, and Katrina Cut.

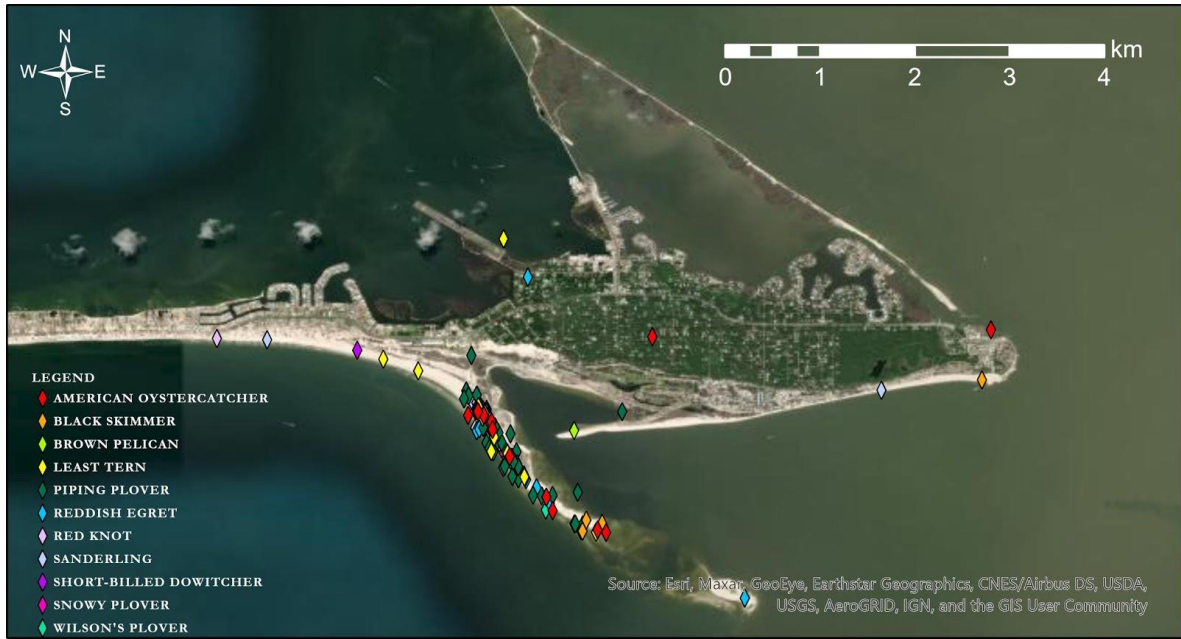


Figure 25. Priority bird locations during the first half (March–May) of the 2018–2020 breeding seasons on Pelican Island, Pelican Bay, Pelican Hook, Little Dauphin Island, Public Beach East, Public Beach West, and Tern Island.



Figure 26. Priority bird locations during the second half (June–August) of the 2018–2020 breeding seasons on Pelican Island, Pelican Bay, Pelican Hook, Little Dauphin Island, Public Beach East, Public Beach West, and Tern Island.



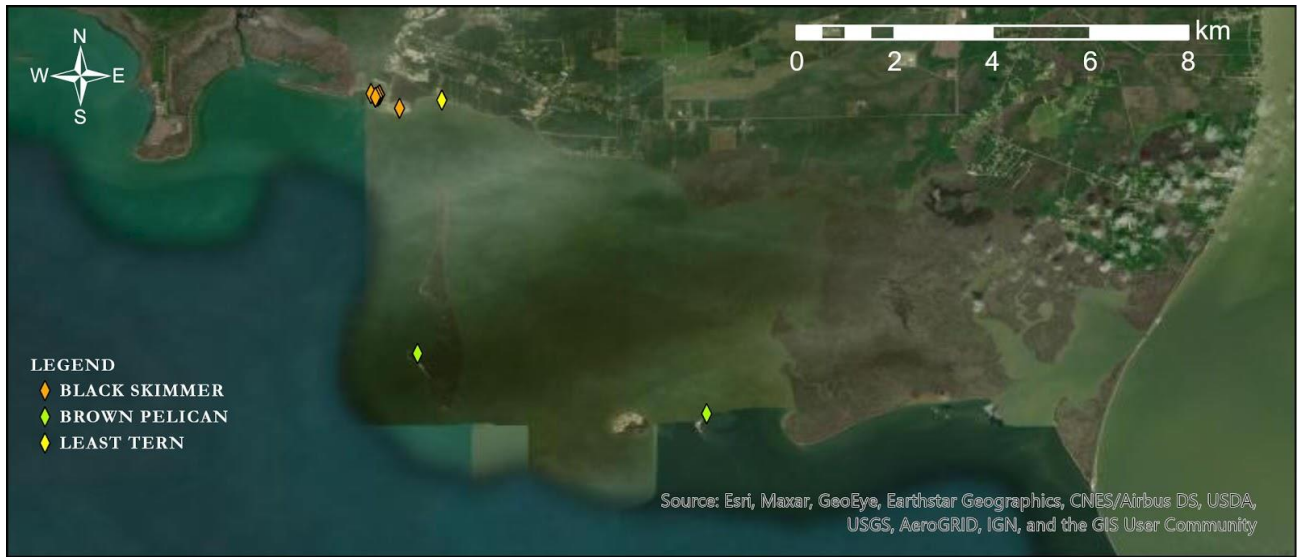


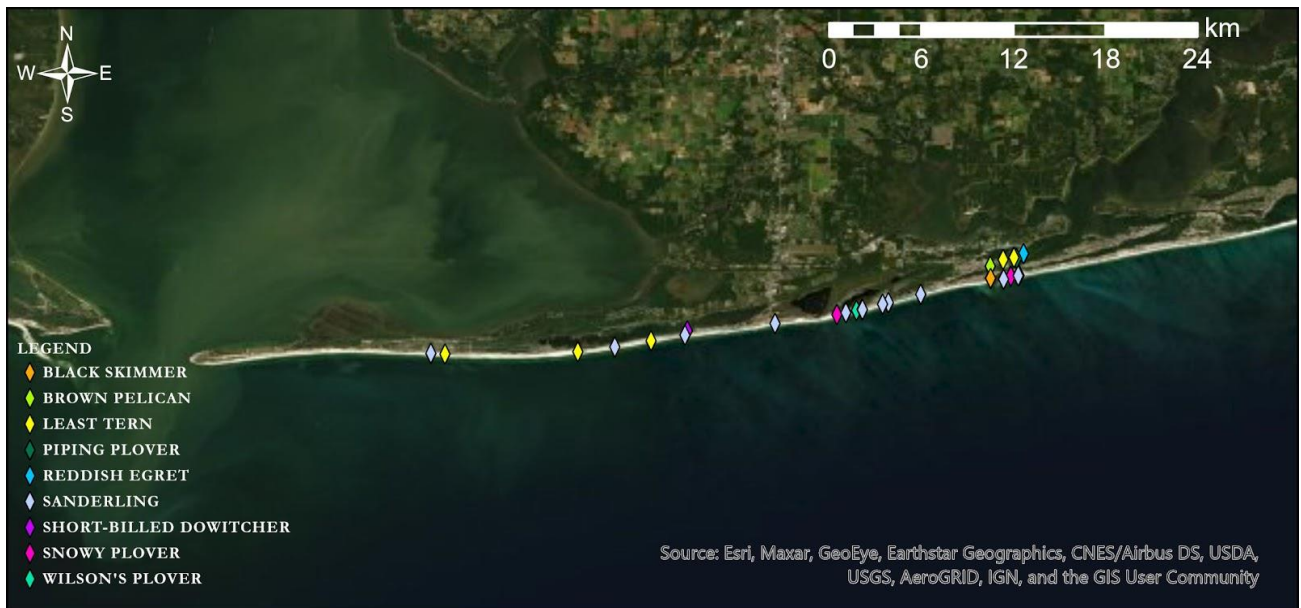
Figure 27. Priority bird locations during the 2018–2020 breeding seasons (March–August) at Bayou La Batre, Coden, Lightning Point, Coffee Island, and Marsh Island.



Figure 28. Priority bird locations during the first half (March–May) of the 2018–2020 breeding seasons at Bon Secour Fort Morgan Unit, Bon Secour Perdue Unit, Beach Club, and Kiva Dunes.



**Figure 29. Priority bird locations during the second half (June–August) of the 2018–2020 breeding seasons at Bon Secour Fort Morgan Unit, Bon Secour Perdue Unit, and Beach Club.**



**Figure 30. Priority bird locations during the first half (March–May) of the 2018–2020 breeding seasons at Gulf Highlands, Gilchrist, Alabama Point, Gulf State Park, Orange Beach, and the Perdido Islands.**



Figure 31. Priority bird locations during the second half (June–August) of the 2018–2020 breeding at Alabama Point, Gulf State Park, Laguna Key, Orange Beach, and the Perdido Islands.

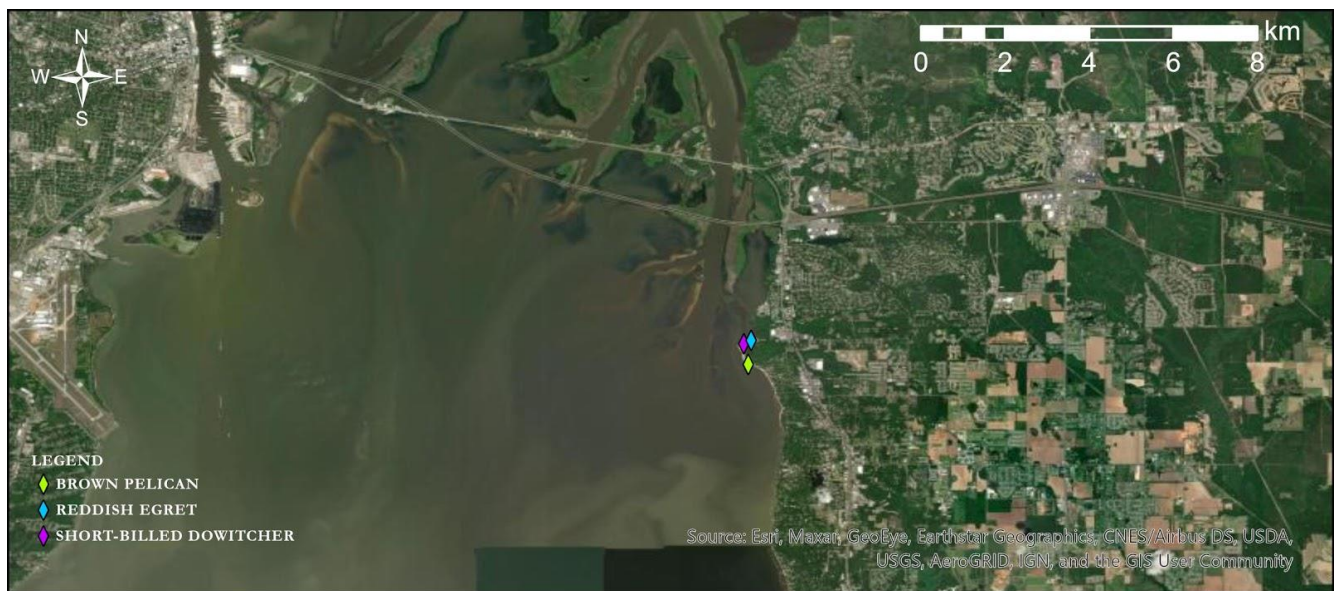


Figure 32. Priority bird locations in July 2018 at Bayfront Park.

## Band Resights

Alabama Audubon's presence on the coast year-round allowed staff to collect valuable resight data on banded birds. These data give researchers insight on a species' migration patterns, territories, population numbers, lifespans, and behavior. Throughout 2017, Alabama Audubon staff and volunteers recorded 121 banded bird observations: snowy plover (n=75), piping plover (n=40), red knot (n=3), Caspian tern (n=2), and sanderling (n=1, Table 14). 62.2% of all resights occurred on Pelican Island, including all but one piping plover observation. The red knot, Caspian tern, and sanderling resights were also on Pelican Island.

During 2018, we had 356 resights, including snowy plover (n=254), piping plover (n=95), and dunlin (n=7, Table 15). 58.3% of all resights occurred on Pelican Island, including 89 of the piping plover observations. Bon Secour NWR Perdue Unit had the second highest number of resights (n=73), followed by Bon Secour NWR Fort Morgan Unit (n=26).

In 2019, staff and volunteers reported a total of 1,113 banded bird observations, with the majority being snowy plover (n=1,075), followed by piping plover (n=28), and American oystercatcher (n=10, Table 16). 58.6% of resights occurred on Bon Secour NWR Purdue Unit (n=652), followed by Bon Secour NWR Fort Morgan Unit (n=209).

The total number of resights dropped to 121 in 2020 and included snowy plover (n=85), piping plover (n=33), least tern (n=2), and American oystercatcher (n=1, Table 17). Pelican Island had the most records (n=35), followed by Bon Secour NWR Purdue Unit and Far West End of Dauphin Island (n=28). We received band histories on 19 piping plovers that have been recorded overwintering in coastal Alabama. Many of the birds were banded at their northern breeding grounds in South Dakota (n=5), North Dakota (n=6), and Michigan (n=6). Two of the piping plovers were banded on Dauphin Island as adults in 2010, making them >10 years old.

**Table 14. Number of resights and banded individuals recorded in Alabama in 2017.**

Species	Resights	Individuals
Caspian Tern	2	2
Piping Plover	40	11
Red Knot	3	1
Sanderling	1	1
Snowy Plover	75	28

**Table 15. Number of resights and banded individuals recorded in Alabama in 2018.**

Species	Resights	Individuals
Dunlin	7	2
Piping Plover	95	16
Snowy Plover	254	47

**Table 16. Number of resights and banded individuals recorded in Alabama in 2019.**

<b>Species</b>	<b>Resights</b>	<b>Individuals</b>
American Oystercatcher	10	4
Piping Plover	28	14
Snowy Plover	1,075	69

**Table 17. Number of resights and banded individuals recorded in Alabama in 2020.**

<b>Species</b>	<b>Resights</b>	<b>Individuals</b>
American Oystercatcher	1	1
Least Tern	2	2
Piping Plover	33	11
Snowy Plover	85	24

## **Audubon Coastal Bird Surveys**

### *Training to Support ACBS*

As stated above, we held the first ACBS trainings in December 2018, and we adapted the training for Alabama from National Audubon Society’s ACBS training manual. We advertised all training events through Alabama Audubon’s social media sites as well through an email listserv. Further, the Alabama Coastal Foundation (ACF) advertised the events through their listserv and social media channels. ACF also hosted the registration process for all trainings. In 2018, we held eight training sessions (December, March, July and August), with a total 102 participants. As mentioned in the stewardship section, participant interest appeared to be much higher when training and/or events were outside and not formal classroom settings. Beginning in June 2018, our staff and volunteers held Bird ID 101 Walks in addition to formal, classroom ACBS training. Since participant numbers were decreasing in the typical ACBS trainings and increasing with the Bird ID Walks, during August 2019–December 2019 we completely transitioned to these walks for ACBS training. Between June 2018 and December 2019, we held 17 Bird ID 101 Walks, with a total of 142 participants. We recruited eight ACBS lead volunteers, who picked their desired survey route and each season scheduled the rounds, recorded data, and trained other volunteers. Several lead volunteers had more than one ACBS route.

### *Volunteer Effort*

In 2017, at the very beginning of the ACBS program, there were two volunteers who participated in surveys. By the end of 2018, 54 volunteers had participated in ACBS, for a total of 301.5 hours. In 2019, surveys were conducted along 13 routes with 35 volunteers contributing 359.5 hours. In 2020, 20 volunteers spent 536.5 hours conducting surveys across coastal Alabama.

### *Important Roosting and Loafing Areas*

Barrier island sites with the greatest number of records of the 11 priority species included Pelican Island (Figure 33), Dauphin Island West End (Figure 34), and Bon Secour NWR Fort Morgan Unit (Figure 35). All 11 species were present at Pelican Island throughout the year, and 10 of the 11 species were found at Dauphin Island West End, which shares the same ecological niche. Although few data were collected on nearshore islands during the past three years, Little Dauphin Island had the greatest number of priority bird observations in the winter 2020 ACBS. These sites should be a priority for conservation and stewardship throughout the year.

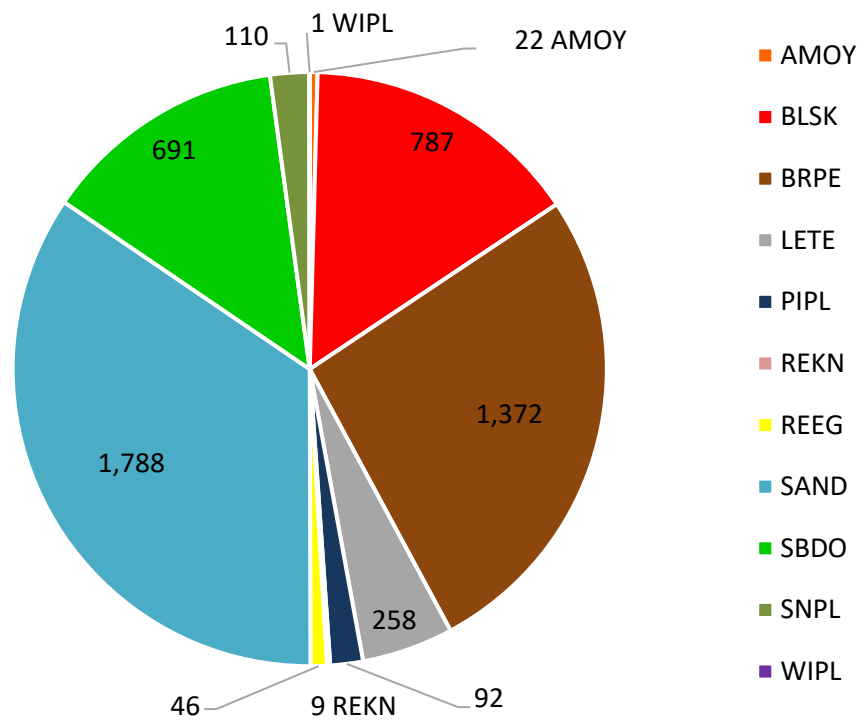


Figure 33. Priority bird sightings recorded at Pelican Island during ACBS 2017-2020.

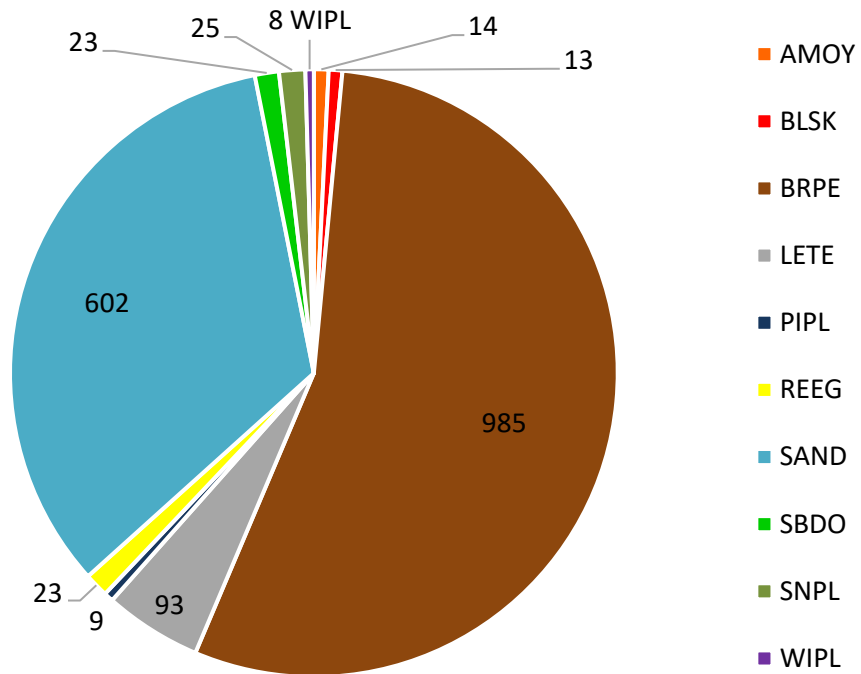


Figure 34. Priority bird sightings recorded at Dauphin Island West End during ACBS 2017-2020.

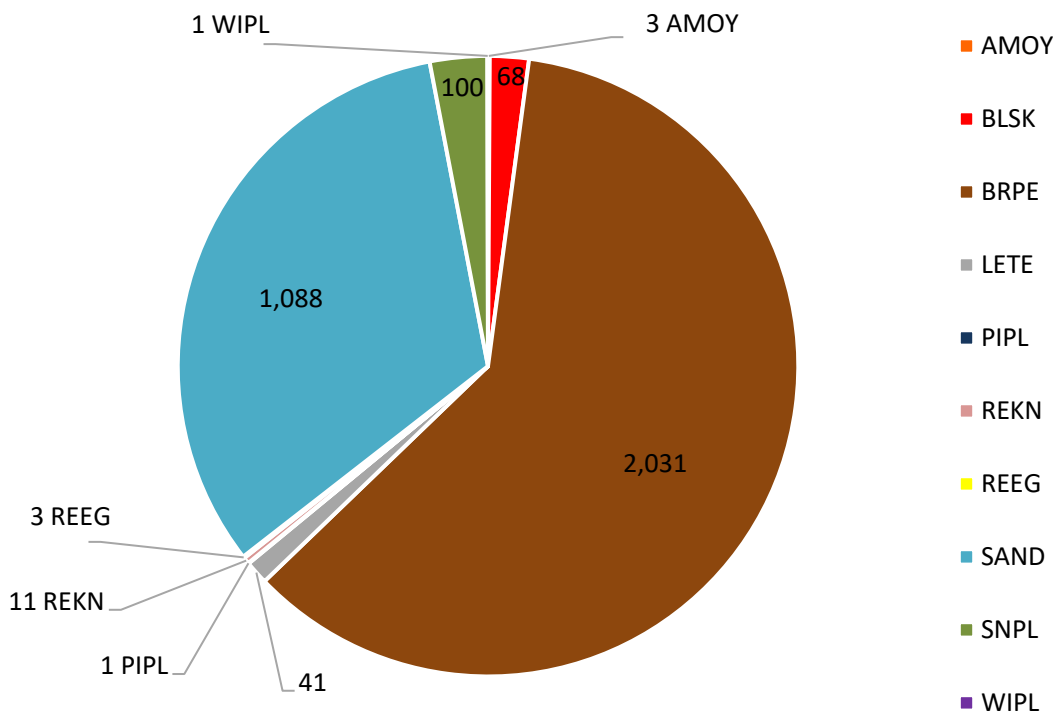


Figure 35. Priority bird sightings recorded at Bon Secour NWR - Fort Morgan Unit during ACBS 2017-2020.

## **Habitat stewardship**

In 2019, we deployed four game cameras at snowy plover nests and three at least tern colonies, and in 2020 we deployed game cameras at two least tern colonies with the goals of documenting disturbances to nesting birds and identifying predators. At all sites, we recorded data on the presence of coyotes and coyote tracks. When evidence of coyote presence was seen in the City of Orange Beach, we shared details with the appropriate people in order to help direct predator management efforts.

Throughout the duration of this project we have been developing relationships with building owners/managers that have least tern colonies on gravel rooftops. We had the most success with the Piggly Wiggly in Fairhope, who let us access the rooftop for monitoring and to set up a game camera.

## **Outreach and Education**

Alabama Audubon staff, partners, and volunteers worked for three years to educate and inform residents and visitors to coastal Alabama about priority species and their habitats. Outreach and education occurred in multiple ways, such as large outreach events, formal and informal presentations, training events, meetings with local municipal officials and partners, meetings with partners, and interactions with beachgoers. Between ACBS training, stewardship training, and outreach events during 2017–2020, we reached ~6,900 people. Due to COVID-19-related restrictions in the spring of 2020, we transitioned to mostly virtual programming. Coastal Biologists offered two online courses, “Audubon at Home: Snowy Plovers” and “Audubon at Home: Birds of a Feather Nest Together” with a total of 77 participants. We also held four Facebook Live events from important nesting or ACBS sites. Cumulatively, those events reached 7,831 people.

Alabama Audubon created a one-page informational flyer (Figure 36) and tri-fold brochure (Figure 37). These were handed out at outreach events, distributed to partners, and utilized as part of the stewardship package. The City of Orange Beach Coastal Stewardship Coordinator distributed 90 flyers at 10 different restaurants/facilities and 50 flyers at two different city facilities within the City of Orange Beach proper. Also, working with the stewardship coordinator, we created informational door hangers (Figure 38) and magnets for distribution to rental/residential properties directly on the beach within the city limits. The stewardship coordinator distributed 200 door hangers and 50 magnets to two different property management companies. She also created a “Dear Property Owner” letter to educate residents living on the beach about the birds they might encounter on or near their property during nesting season, which was distributed to 90 homeowners.

ACF conducted outreach events throughout the duration of the program and provided information about our efforts at 137 events and meetings. They also promoted the program and volunteer opportunities through social media, with 101 unique tweets generating 684 "Likes" and 334 "Retweets" on Twitter, 68 unique posts generating 674 "Likes" and 244 "Shares" with a reach of 50,602 on Facebook, and 31 unique posts generating 912 "Likes" on Instagram.





## BIRMINGHAM AUDUBON COASTAL PROGRAMS



Birmingham Audubon launched our Coastal Programs office in downtown Mobile, Alabama, in August 2017. Together with trained volunteers, our coastal-programs staff implements the Alabama Coastal Bird Stewardship Program (ALCBSP), a citizen-science-supported effort focusing on priority-bird monitoring along coastlines and islands in Baldwin and Mobile counties. In addition to species monitoring, staff and volunteers also provide beach stewardship for colonial and solitary species, including Least Terns and Snowy Plovers.



Least Tern

Alabama's coastal beaches, marshes, and islands provide critical habitat for many species of shorebirds and waterbirds. Coastal populations of these birds continue to decline, driven largely by degradation and human disturbance of critical habitat. This project helps these species by training volunteers to steward and monitor targeted birds and their habitats at key nesting sites along the coast.

We are recruiting and training volunteers to help us with this critical conservation work, primarily through the collection of bird-population data at Alabama sites established by National Audubon's Coastal Bird Survey (ACBS). During the nesting season, we also need volunteers willing to maintain the health and safety of nesting colonies through public outreach and the construction of fences and signs at colony locations. Educating beachgoers through print material and scope-based viewing opportunities is also critical to help the public become more aware of coastal wildlife and habitats.

Interested in volunteering? Want to learn more? Contact Coastal Programs Coordinator Nicole Love ([nicolelove@birminghamaudubon.org](mailto:nicolelove@birminghamaudubon.org); 251-410-8600) or Coastal Senior Biologist Katie Barnes ([katiebarnes@birminghamaudubon.org](mailto:katiebarnes@birminghamaudubon.org); 251-410-8603).

*This program is funded by the National Fish and Wildlife Foundation's Gulf Environmental Benefit Fund with additional support from Alabama State Lands Division of the Department of Conservation and Natural Resources.*

**Birmingham Audubon Coastal Programs 118 North Royal Street, Suite 505 Mobile, Alabama 36602 • 251.410.8600**



Figure 36. One-page flyer about the Alabama Coastal Bird Stewardship Program.

## About the Audubon Coastal Bird Survey

The Audubon Coastal Bird Survey (ACBS) provides scientists with the data they need to help conserve Gulf Coast waterbird populations. Started in 2010 as a response to the Deepwater Horizon BP oil spill, the program continues to help conservation planners assess threats and identify target species experiencing continuing population decline. While the program started in Mississippi, it has since been adopted in Texas, Louisiana, and, most recently, here in Alabama. It provides Gulf-wide baseline data from which to compare future population trends across all coastal bird species, and can serve as an indicator of coastal ecosystem health.

Throughout its existence, ACBS has engaged thousands of volunteers in surveying and monitoring coastal birds. Data collected during migratory and overwintering periods has been useful for understanding how waterbirds use coastal habitats locally and across the northern Gulf of Mexico, and has been consistent with monitoring priorities developed by national conservation plans.



### Partners

Many thanks to the multiple partners who help make this program a success: National Fish and Wildlife Foundation, City of Orange Beach - Coastal Resources Division, National Audubon Society, Alabama Coastal Foundation, US Fish and Wildlife Service Alabama Ecological Services Field Office, Dauphin Island Park and Beach Board, Gulf State Park, Mobile Bay Audubon Society, Town of Dauphin Island

## Ready to volunteer?

We're currently recruiting and training individuals interested in collecting vital bird-population data at Audubon Coastal Bird Survey (ACBS) sites located along the Alabama coastline. During the nesting season, we'll also need volunteers willing to help monitor and protect nesting colonies through public outreach and the installation of fencing and signage.

All volunteers will receive in-depth training provided by Alabama Audubon staff.



For more information:

visit <https://alaudubon.org/coastalvolunteers/>  
or  
email [coast@alaudubon.org](mailto:coast@alaudubon.org)



This program is funded by the National Fish and Wildlife Foundation's Gulf Environmental Benefit Fund with additional support from Alabama State Lands Division of the Department of Conservation and Natural Resources

## Alabama Coastal Bird Stewardship Program



Monitoring Alabama's Coastal Birds

Collecting Population Data

Protecting Nest Sites

Educating Beachgoers



ALABAMA AUDUBON

## What is the Alabama Coastal Bird Stewardship Program?

The Alabama Coastal Bird Stewardship Program provides critical monitoring of and protection for Alabama's sensitive beach-nesting birds. Implemented by Alabama Audubon's coastal biologists, the program relies on volunteer support from communities located throughout Mobile and Baldwin Counties.

Our ACBS and breeding season monitoring efforts focus on eleven priority species: Wilson's plover, snowy plover, piping plover, American oystercatcher, red knot, sanderling, short-billed dowitcher, least tern, black skimmer, reddish egret, and brown pelican. The program complements the work of similar National Audubon Society initiatives across the Gulf of Mexico including those in Florida, Louisiana, Texas, and Mississippi.



## Coastal Habitats

Alabama's coastal habitats (its beaches, marshes, and islands) provide critical nesting, foraging, and overwintering grounds for many species of shorebirds and seabirds. Coastal habitat is a highly dynamic ecosystem that often suffers rapid decline due to erosion, sea-level rise, annual weather and tidal regimes, climate change, and human development and disturbance. Coastal birds—especially those that use beachfronts as nesting grounds—are threatened by these pressures, and are exceptionally sensitive to human recreational disturbances.



Photo: Harnet Wright

## Stewardship

The program's stewardship component connects the public with beach-nesting birds through volunteer opportunities, nest stewardship, and awareness-building activities. Volunteer coastal bird stewards act as the eyes, ears, and voices for nesting birds—maintaining the health and safety of nesting areas through symbolic fencing, signage, and direct outreach. Our stewards guide beachgoers and other threats away from these sensitive areas, ultimately leading to an increased probability of nest success. Additionally, stewards engage the public by providing scope-based viewing opportunities into nesting areas—opportunities that allow for detailed observation of the birds at a safe distance.

## Focal Nesting Species

### Least Tern



Habitat: early successional open-beach barrier islands  
Nesting style: colonial

### Black Skimmer



Habitat: early successional open-beach barrier islands  
Nesting style: colonial

### Snowy Plover



Habitat: slightly vegetated dunes and beachfronts  
Nesting style: solitary and hidden

### Wilson's Plover



Habitat: beachfronts with vegetative cover and adjacent marsh  
Nesting style: solitary and hidden

Figure 37. Trifold brochure about the Alabama Coastal Bird Stewardship Program.



Figure 38. Door hanger that was distributed to rental/residential properties.

# **Adaptive Management Plan**

## **Data synthesis and analysis**

We entered breeding season data in a digital format on a daily basis. We also compiled and analyzed data annually at the end of each breeding season. This allowed for an examination of our data collection practices and for adjustments to be made in subsequent seasons.

We submitted monthly reports to ADCNR staff. We also completed annual site-specific reports for various partners including Gulf State Park, Bon Secour National Wildlife Refuge, Piggly Wiggly, and Beach Club Resort and Spa. We began writing annual reports on all coastal activities in 2019. In 2020, we compiled and analyzed all ACBS data to date (2017-2020) and wrote a comprehensive report (Cobb and Morpeth 2020).

## **Adapt strategic plan/modify**

We adapted and adjusted our monitoring and data collection protocols throughout the duration of the program. In 2018, the beach-nesting bird survey and monitoring strategy reflected the need to do a comprehensive census of the coast and determine where the majority of the birds were nesting. We made an initial attempt to monitor individual least tern nests within a colony during 2018. In 2019, we shifted our focus to monitor priority nesting sites more frequently. This allowed for more accurate data collection in the 2019 and 2020 breeding seasons. In 2019, we also started monitoring nearshore islands. Our beach-nesting bird stewardship activities consisted of posting symbolic fencing at nesting colonies. Many sites were fenced before the onset of breeding activity; however, we also fenced sites as needed throughout each season. We adapted our fencing strategy for Tern Island in 2019.

Over the past three years we added ACBS routes in areas that appeared to be important non-breeding season habitat for many species, including Bayfront Park, Little Dauphin Island, the far west end of Dauphin Island, and the nearshore islands. In 2020, we worked with The Nature Conservancy to determine if the Lightning Point restoration area would be a good and feasible addition to ACBS routes.

We had eleven priority species, listed above, that we collected additional data on throughout the year. We modified the protocol for recording data on these species over the past three years in order to maximize the efficiency of our surveys. For example, we did not record locations of priority species if they were on an active breeding territory. The information for those individuals was recorded in our solitary and colonial breeding bird survey data sheets. Further, we discontinued recording data on several of the species during the breeding season in order to focus our time on collecting quality nest and brood success data.

We adjusted volunteer training events early in the program in order to increase participation, moving from a classroom setting to outdoor training.

## Literature Cited

- Alabama Department of Conservation and Natural Resources. 2015. Alabama wildlife action plan 2015-2025.
- Cobb, S. D. and O. A. Morpeth. 2020. Analysis of Audubon Coastal Bird Survey Data in Alabama: 2017-2020.
- Dinsmore, S. J., G. C. White and F. L. Knopf. 2002. Advanced techniques for modeling avian nest survival. *Ecology* 83: 3476-3488.
- Gochfeld, M. and J. Burger. 1994. Black Skimmer (*Rynchops niger*), version 2.0. In *The Birds of North America* (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA.
- Imhof, T. A. 1958. Recent additions to the avifauna of Alabama. *Auk* 75: 354-357.
- Imhof, T. A. 1976. Alabama birds, 2nd ed. University, AL: Univ. Alabama Press.
- Laake, J. 2019. Package 'RMark'. R Code for Mark Analysis. <https://cran.r-project.org/web/packages/RMark/RMark.pdf>
- Nagelkerke, N. J. D. 1991. A note on a general definition of the coefficient of determination. *Biometrika* 78: 691-692.
- Page, G. W., L. E. Stenzel, J. S. Warriner, J. C. Warriner and P. W. Paton. 2009. Snowy Plover (*Charadrius nivosus*), version 2.0 In *The Birds of North America* (A. F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA.
- R Core Team. 2019. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>
- Thompson, B. C., J. A. Jackson, J. Burger, L. A. Hill, E. M. Kirsch, and J. L. Atwood. 2020. Least Tern (*Sternula antillarum*), version 1.0. In *Birds of the World* (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA.
- White, G. C. and K. P. Burnham. 1999. Program MARK: survival estimation from populations of marked animals. *Bird Study* 46: 120-138.
- Zdravkovic, M. 2008. Beach-nesting bird breeding Census and Report for Coastal Alabama- 2007 Report, Audubon Coastal Bird Conservation Program, Science Dept. National Audubon Society, New York, NY.
- Zdravkovic, M. G., C. A. Corbat, and P. W. Bergstrom. 2020. Wilson's Plover (*Charadrius wilsonia*), version 1.0. In *Birds of the World* (P. G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.wilplo.01>