

Shorebird and Seabird Monitoring and Management at Gulf Islands National Seashore, Florida District *2021 Annual Report*



ON THE COVER

Least tern chicks being brooded by adult at Gulf Islands National Seashore

Photography by NPS/Srubas

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Executive Summary

The Florida District of Gulf Islands National Seashore manages the protection of federally protected and state listed ground-nesting shorebirds and seabirds: snowy plover (*Charadrius nivosus*), Wilson's plover (*Charadrius wilsonia*), least tern (*Sternula antillarum*), black skimmer (*Rynchops niger*), and gull-billed tern (*Gelochelidon nilotica*). Snowy plover, least tern, and black skimmer are listed as threatened in the state of Florida. Wilson's plover is considered a "species of greatest conservation need" as determined by the Florida Fish and Wildlife Conservation Commission.

Snowy plover, Wilson's plover, least tern, and black skimmer nesting and brood-rearing behavior were monitored over 2,327 acres of suitable habitat. Three hundred seventy seven acres, or 12%, of suitable nesting habitat was symbolically protected from human disturbance.

Snowy plover:

- 52 breeding pairs were observed with 95 nest attempts
- 17 chicks fledged from 33 nests
- Park-wide average productivity = 0.33 chicks fledged/pair
- Depredation accounted for 14% of egg loss; unknown loss accounted for 32% of egg loss
- Predominant nest predators were ghost crab and coyote

Wilson's plover:

- 10 breeding pairs were observed with 12 nest attempts
- 7 chicks fledged from 4 nests
- Park-wide average productivity = 0.6 chicks fledged/pair
- Depredation accounted for 5% of egg loss; unknown loss accounted for 22% of egg loss
- Predominant nest predators were ghost crab and coyote

Least tern:

- Forty-nine colonies were established within the park; colonies ranged in size from 2 nests to over 100 nests
- 469 nests were observed at the peak of nesting
- 38 chicks were confirmed fledged
- Average productivity was poor; Tropical Storm Cristobal impacted many nests during peak nesting
- Depredation by ghost crab and coyote was the principle cause of egg loss
- Cause of chick loss is difficult to determine, but depredation by coyote was often suspected

Black skimmer:

- Two colonies were established at the Santa Rosa unit
- 23 breeding pairs were observed
- 0 chicks fledged
- Park-wide average productivity = 0.0 chicks fledged/pair
- Colony failure and egg loss was due to Tropical Storm Cristobal

Gull-billed tern:

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Migrating shorebirds:

- Mixed-species flocks including those with federally threatened red knot (*Calidris canutus*), federally threatened piping plover (*Charadrius melodus*), black-bellied plover (*Pluvialis squatarola*), willet (*Tringa semipalmata*), sanderling (*Calidris alba*), and other shorebird species were observed throughout the park mid-July through November

Acknowledgements

Special thanks are given to Science and Resource Stewardship (SRS) staff for their continued dedication to the protection of the nesting shorebird program. Without their daily efforts nesting shorebirds would struggle to persist. Recognition is given to the Science and Resource Stewardship staff that participated in shorebird monitoring activities, including Kris Dudus, Jennifer Manis, and Joe Burgess. Thanks are extended to Leah Vickery, Scientist in Park, for her time and effort put forth on monitoring. Thanks are also extended to Florida Fish and Wildlife Conservation Commission biologists Emily Hunter, Raya Pruner, and Marvin Friel for their assistance to field operations related to nesting shorebirds at GUIS and Clint Adams for assisting the park in predation management. SRS staff would also like to thank GUIS Facility Maintenance staff for their dedication to protected species while executing sand removal from roadways and parking lots during nesting season.

Introduction

Gulf Islands National Seashore (GUIs) Florida District is located in the northeastern portion of the Gulf of Mexico. This property provides miles of prime habitat for beach-nesting birds that breed on beaches used by millions of human visitors every year. While federally protected species utilize this property for loafing and foraging, many of the nesting species that rely on this habitat are listed as threatened by the Florida Fish and Wildlife Conservation Commission (FWC). This includes the least tern, snowy plover, and black skimmer. Using data from the Florida Shorebird Data base, FWC has calculated that 27% of snowy plover chicks that fledged in the Florida panhandle over the past 7 years have fledged from GUIs property. The Florida panhandle, in turn, constitutes 83% of the snowy plover's nesting effort, making GUIs an integral property for the persistence of this species. Likewise, about 3.8% of Least Tern pairs that nest in the state of Florida nest on GUIs property. GUIs also provides nesting habitat to "species of greatest conservation need" such as the Wilson's plover, and a multitude of other non-listed birds such as willets, nighthawks (*Chordeiles* spp.) and ground doves (*Zenaida* spp.) GUIs also provides habitat for wintering species such as the piping plover and snowy plover. GUIs manages the beaches with the goal of increasing shorebird species' productivity while providing for visitor access and recreation. Management practices include those designed to keep people out of nesting areas (e.g. temporary beach or parking lot closures and symbolic fencing with informational and enforcement signs) and those designed to reduce predation on birds (e.g. predator management and pet restrictions). These practices are adjusted day-to-day and are informed by ongoing monitoring.

GUIs shorebird staff regularly monitor the timing, survival, and reproductive success of shorebirds throughout each breeding season (spring-fall) as funding and staff workload allows. Just prior to the 2020 breeding season, GUIs was awarded \$853,821 in NRDA funds as part of a "Beach and Dune Habitat Protection Project" to offset damages caused by the 2010 Deepwater Horizon BP Oil Spill. The Beach and Dune Habitat Protection Project funding allows for additional shorebird protection measures and staffing dedicated exclusively to shorebird surveying and management for a total of three (possibly four) years that were not possible prior to 2020 and cannot be continued on annually appropriated park operational funding once the Project sunsets. This document summarizes biological data and associated management actions in 2020 for four species of breeding shorebirds. When comparing the 2020 data to prior years, it is important to consider that differences in available surveying time and resources may prompt misleading conclusions. It may

instead be beneficial to consider the 2020 breeding season data as a baseline with which to compare the next 2-3 years of data collected under similar conditions to see how multiple years of increased funding may benefit the species.

In order to achieve continuity in beach regulations throughout the state of Florida and make signage and management less confusing to the general public, GUIS participates with the Florida Shorebird Alliance and regularly communicates and coordinates with partners (e.g. FWC, Audubon, and U.S. Fish and Wildlife Service).

Protection and Monitoring Methods

Habitat assessments were conducted prior to the onset of the breeding season to identify suitable habitat for ground nesting shorebirds. Those assessments and historic nesting locations were used to demarcate pre-nesting areas closed to recreational activities. Habitat posting began in early February. Symbolic fencing- carsonite posts with signs (“Do Not Enter Critical Bird Nesting Habitat”) connected by string to prohibit entry- were installed around these sites before nesting activity was observed. These closures helped to minimize habitat disturbance in potential breeding areas and enabled birds to establish territories and nests in their preferred habitat. The closures were modified throughout the season to maintain a sufficient buffer around nests and provide adequate protection for staging areas used by migratory birds (FWC 2020).

Permanent posting consisting of wooden posts and rope were installed to protect dune habitat during the nesting season as well as protect and support rehabilitation of habitat outside of the nesting season. This permanent posting is focused around high visitor use/visibility areas, such as around parking lots, facilities, and beach accesses. This permanent posting required excavation, and as such, was subject to section 106 compliance. Over two weeks, 24-28 February and 9-13 March, Regional Archaeologist Stephen Lacey oversaw the digging and sifting of 178 0.5 m diameter x 1 m deep survey pits by project staff, park staff, and volunteers to confirm the absence of significant archeological artifacts. In many places, this posting is only one sided around the parking lot edges. During the nesting season shorebird posting was erected to make a complete closed area. When shorebird posting was removed at the end of the nesting season, the areas around parking lots were inundated with foot traffic of visitors disregarding the posting. All the permanent posting was affected during the 2020 hurricane season and will have to be repaired or replaced in 2021.

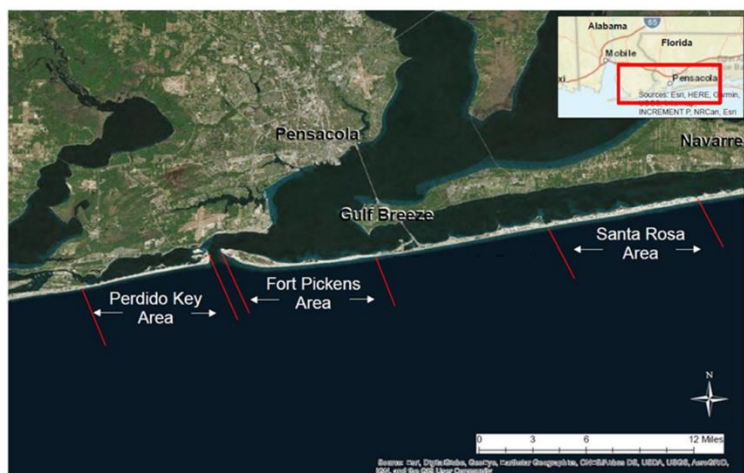
With the additional funding provided by the NRDA Beach and Dune Habitat Protection Project, GUIS was able to purchase more posting supplies in 2020 and therefore protect more nesting habitat than in past years. The extent of all posting was quantified on 31 March. As of 31 March, 52,376 ft (9.9 mi) of carsonite posting and 9,847 ft (1.9 mi) of wooden posting were erected, protecting a total 285 acres of habitat, which is approximately 12% of suitable habitat on Santa Rosa, Fort Pickens, and Perdido Key (Table 5). The totals from March however do not reflect the entire season. The use of posting is highly dynamic. It is taken down and replaced throughout the season as nesting and weather requires. Least terns are known to move colonies depending on predators and disturbances, which requires posting to be moved often for their protection. Balancing staff’s time constraints with other responsibilities prevented mapping and quantifying posting with every change, so only a representative snapshot (the March totals) were quantified during 2020. A project-funded intern will be tasked with quantifying and mapping the amount of posting monthly throughout the 2021 season. All seasonal carsonite posting is removed as soon as each individual area is no longer being used by nesting shorebirds or chicks, with the final posting removed in early September.

GUIs also recognizes two areas of critical habitat for federally threatened piping plovers; these areas are to be closed permanently. There are 5 acres at the tip of Fort Pickens and 5 acres on the north shore of Santa Rosa east of the Opal complex around 2 small mud flats/ponds. These areas are marked with the white carsonite posts.

According to the FWC document, *Guidelines for Posting Shorebird and Seabird Sites in Florida*, posting habitat works effectively to protect and encourage reproductive success. Data from 2010 and 2011 suggests that snowy plovers are 1.5 times more likely to hatch eggs when the nest is protected by posting. When habitat is pre-posted (posts are put in place prior to known nests), snowy plovers are 4 times more likely to use that habitat for nesting. Finally, when snowy plover chicks have access to posted and protected brood-rearing habitat they are a twice as likely to make it to flight-capable.

GUIs follows the monitoring and protection methods outlined in the FWC *Guidelines for Posting Shorebird and Seabird Sites in Florida* (2020) and FWC *Breeding Bird Protocol for Florida's Shorebirds and Seabirds* (2020), in addition to the GUIs Shorebird Manual, Coastal Species of Concern Predation Management Plan and Programmatic Environmental Assessment, and Scientific Collection and Research Permit #GUIs-2019-SCI-0022. In following the Breeding Bird Protocol, GUIs surveyed for nesting shorebirds and entered data into the statewide Florida Shorebird Database (FSD). There are 6 FSD survey windows over the course of 6 months (18-24 March, 15-21 April, 13-19 May, 10-16 June, 8-14 July, and 5-11 August). Each window allows managers to view an area from pre-nesting to post-nesting. Surveys were not completed in March and April due to the park closure for COVID-19. Surveys post COVID-19 closure resumed on 4 May, and all 3 properties received full attention for the remainder of the breeding season. GUIs conducted additional complete unit surveys with all staff members prior to and in between each FSD survey window, which allowed all GUIs units to be fully surveyed on a bi-weekly basis. Outside of full surveys staff checked nest and brood status at least once a week. Additional surveys and time spent in the field allowed for more accurate record keeping regarding hatch success, fledge success, and cause of loss. It also allowed staff to keep posted areas up-to-date concerning nests and vulnerable young. Even with all the surveys, completed nests had gone unfound and chicks arrived unexpectedly on 14 occasions (post COVID-19 shutdown).

Shorebirds and seabirds were monitored in three survey areas at GUIs within Escambia County. Survey areas were established by park boundaries. The three survey areas are Santa Rosa, Fort Pickens, and Perdido Key (Map 1). The Santa Rosa area consists of 12.2 km of shoreline on Santa Rosa Island located between Navarre Beach and a conservation area owned by the University of West Florida. Fort Pickens is comprised of 12.3 km of beach and is located west of Pensacola Public Beach on Santa Rosa Island. The Perdido Key area is 11.2 km of shoreline located between the public beach of Perdido Key and the Pensacola Pass. These three areas comprise the 35.7 km (22.2 mi) of shoreline within the Florida district where shorebirds and seabirds typically nest.



Map 1 Shorebird Nesting Areas at GUIs

Snowy plover and Wilson's plover nest in the sand, creating a small depression often filling it with attractive rocks and shells. Both species lay 3 eggs per clutch and incubate the eggs for approximately 28 days. Their chicks are precocial and will leave the nest within hours and start to feed themselves on small invertebrates. The males are considered the protectors of the brood while the female has the option to move on and nest again with a new mate, but they can often be found staying with their chicks. Chicks gain the ability to fly around 30 days.

Least terns and black skimmers nest in colonies in large flat, open, and shelly/gravelly areas devoid of vegetation. Both species nest in depressions in the sand, but without adornments. Least terns can lay up to 3 eggs and black skimmers up to 5 eggs; they incubate their eggs for approximately 23 days. Their chicks cannot feed themselves and require the adults to bring back fish for them. It is common to see older chicks near the high-water line waiting for adults to bring back food. They gain the ability to fly around 28 days.

American oystercatchers (*Haematopus palliatus*) were observed nesting in the Perdido Key area for the first time in 2014. No American oystercatchers have been found nesting in the park since the 2014 season. Gull-billed terns (*Gelochelidon nilotica*) have nested in established colonies with least terns and black skimmers on occasion since 2009 in the Fort Pickens and Santa Rosa areas. No gull-billed terns were recorded nesting at GUIs in 2020.

Monitoring began in February and continued through August. Field staff searched the beaches weekly for signs of shorebird nesting activity (e.g. nesting behavior, nest scrapes, and concentrated tracks). Surveys were conducted primarily on foot using walk-through grid techniques. Survey methods consisted of trained personnel walking to cover the areas of plover habitat, from the frontal beach back into the tertiary dune system to the north shore. Almost all solitary nests were located after clutch completion. The eggs in these nests were floated to determine an accurate hatch date. Egg floating is a permitted activity through FWC and the U.S. Fish and Wildlife Service, Migratory Bird Office; it was performed by a trained FWC biologist. Once colonies were established, each species was monitored and the numbers of incubating adults (considered nests), chicks, and a total adult count was performed as often as possible. Nests, broods, and colonies were generally monitored every seven to ten days. Symbolic fencing was adjusted in response to breeding or staging behaviors. To minimize disturbance, observations were made from a distance of 5 to 30 meters through binoculars and spotting scopes.

Results and Discussion

Snowy Plover

Snowy plovers are threatened in the state of Florida. They are year-round residents at GUIs. They were first documented in breeding pairs in mid-February. Snowy plovers nested at all three beach units, Fort Pickens, Santa Rosa, and Perdido Key, in 2020. The first nest was documented at Fort Pickens on 9 March. Nests with eggs were present from 8 March to 31 July. Hatching dates ranged from 9 April to 31 July. Most nests were located behind the primary dune in gravel areas with sparse vegetation.

Nesting results are summarized in Table 1 and Maps 2, 4 and 6. Forty-one breeding pairs laid 74 nests, of which 43 (58%) hatched at least one chick and 31 (42%) failed to hatch any chicks. Of those nests that were lost, 8 (26%) were lost before full incubation began. The proportion of

successful nests did not differ between areas, vegetation, or habitats. Of the 41 breeding pairs, 15 (37%) fledged at least one chick, 17 (41%) had complete brood losses, and 6 (15%) failed to hatch any eggs.

A total of 181 eggs were laid, of which 70 (39%) hatched. Of the 111 (61%) failed eggs 8 (7%) were abandoned prior to hatching. Unknown egg loss accounted for 58 (52%) eggs lost. Predation was the most common known cause for egg loss with 26 (23%) eggs lost, followed by abandonment (8 [7%]) and weather events (11 [10%]).

Of the 70 eggs that hatched, a total of 18 chicks fledged. The overall fledge rate (number of chicks fledged/total number of eggs hatched) was 26%. From the 41 breeding pairs, 18 chicks fledged, resulting in an overall productivity rate of 0.44 chicks fledged/breeding pair. Fledging dates in 2020 ranged from 1 May to 1 September. Active broods of unfledged chicks were present on GUIS beaches from 8 April to 1 September.

GUIS is home to banded snowy plovers. Banding activities occurred at GUIS from 2011 to 2016 as an agreement with the Park, FWC, and graduate student, Maureen Durkin. In 2020, 44 banded snowy plovers were documented on GUIS beaches. In 2020, 14, 9, and 7 banded snowy plovers nested at Fort Pickens, Perdido Key, and Santa Rosa, respectively.

Total snowy plover nests stayed the same from 2019 to 2020, with 74 nests documented (Figure 2). This is most likely due to the closure of the park for 6 weeks in March and April 2020. The total number of nests counted would likely be higher if staff were able to perform surveys during that time. Additionally, the total number of nests is not always a proper indicator of species productivity. When plovers lose a nest due to depredation, weather events, or other causes, they will often try again and renest, whereas if a male plover successfully fledges chicks, this will often conclude his breeding attempts for the season. Therefore, more nests could potentially be in response to losses from depredation or weather events from the same number of breeding individuals. Unfortunately, the number of nests documented is the only metric that has been consistently analyzed among all available reports prior to 2020.

Wilson's Plover

Wilson's plovers are considered a "species of greatest conservation need" in Florida. The first Wilson's plover was observed at Santa Rosa on 12 March. Wilson's plover nested only at the Santa Rosa area in 2020. The first nest was documented on 5 May. Nests with eggs were present from 30 March to 4 July. Hatching dates ranged from 5 May to 4 July. All nests were located behind the primary dune in gravel areas with sparse vegetation, 8 (50%) nests were located north of State Road 399.

Nesting results are summarized in Table 3 and Map 4. Twelve breeding pairs laid 16 nests, of which 15 (94%) hatched at least one chick and 1 (6%) failed to hatch any chicks. The one nest lost was due to predation from coyote. Of the 12 breeding pairs, 8 (66%) fledged at least one chick, 4 (33%) had complete brood loss, and 0 (0%) failed to hatch any eggs.

A total of 37 eggs were laid, of which 24 (65%) hatched. Of the 13 (35%) failed eggs only 1 was abandoned. Unknown egg loss accounted for 8 eggs lost. Predation was the only other cause for known loss with 2 eggs lost to coyote. Wilson's plovers nested far enough away from the shoreline that weather events did not affect their nest success this season.

Of the 24 eggs that hatched, a total of 12 chicks fledged. The overall fledge rate (number of chicks fledged/total number of eggs hatched) was 50%. From the 12 breeding pairs, 12 chicks fledged; resulting in an overall productivity rate of 1.00 chicks fledged/breeding pair. Fledgling dates in 2020 ranged from 12 June to 5 August. Active broods of unfledged chicks were present on GUIS beaches from 2 May to 5 August.

Total number of Wilson plover nests doubled from 2019 to 2020 from 8 to 16 nests (Figure 2). The number of breeding individuals also increased from 16 to 20, potentially indicating population recruitment from 2019 to 2020. Without being able to identify individuals it is not known where the birds were recruited from.

Least Tern

Least terns are threatened in the state of Florida. They typically arrive on GUIS beaches in April; the exact date is unknown this season due to the COVID-19 park wide shut down. Least tern colonies were documented starting on 4 May when field staff were allowed to return to the park. They nested at all three beach units: Fort Pickens, Santa Rosa, and Perdido Key in 2020.

Nesting results are summarized in Table 3 and Maps 3, 5 and 7. Colony sized fluctuated throughout the season. Nesting season peaked with 469 nests during the last week of May and first week of June. The majority of nests were located at the Santa Rosa area with 389 found 14-15 May.

Chicks began hatching in late May, the first hatch was documented on 28 May at Perdido Key. The first least terns fledged 11 June, and the last to fledge were on 12 August. The 469 nests located produced 38 fledged chicks, yielding a productivity of 0.08 from GUIS beaches in 2020. This number is low due to the time in between surveys. Chicks could have fledged and left in between surveys and staff would not know.

Black Skimmer

Black skimmers are threatened in the state of Florida. One colony was documented at Santa Rosa on 4 May. The first nests were identified on 14 May. At peak nesting 23 nests were identified on 1 June. Tropical Storm Cristobal wiped out the entire colony on 8 June. Three pairs attempted to re-nest in a new colony west of the original colony on 25 June but failed for unknown reasons.

Nesting results are summarized in Table 4 and Map 4. With no chicks produced from 26 nests black skimmers yielded a productivity of 0.0 from GUIS beaches in 2020.

COVID-19

Due to health and safety concerns regarding the spread of COVID-19, and resulting federal, state, and local guidelines, the Santa Rosa, Fort Pickens, and Perdido Key portions of GUIS were closed to the public on 20 March and all staff were put on telework status. On 4 May, staff returned to the field in a focused effort to determine the current nesting status of the focal shorebird species at Santa Rosa, Fort Pickens, and Perdido Key, and add to existing post and rope areas to protect sensitive areas from public impact once each property was re-opened to visitation. Santa Rosa was reopened, with limitations, on 6 May, Perdido Key was opened on 9 May, and Fort Pickens

reopened on 16 May. Santa Rosa was opened with two parking lots closed due to least tern and black skimmer colonies in the immediate vicinity.

Tropical Weather

GUIS was impacted by six named storms in 2020. The earliest and most devastating to the shorebird and seabird nesting season was Tropical Storm Cristobal. Hurricanes Marco, Laura, Delta, and Zeta all impacted GUIS beach areas, but occurred outside of the nesting season. Hurricane Sally also occurred after nesting was complete but impacted the habitat significantly for future nesting.

Tropical Storm Cristobal made landfall in southeast Louisiana on 8 June. This storm caused high tides and over washing on the barrier islands. The park was closed from 6 June to 9 June, no surveys were completed during that time. Upon returning to work the priority for staff was to assist with clearing sand from the road at Fort Pickens and Santa Rosa. This storm heavily impacted nesting shorebirds, especially the colony nesting birds, least terns and black skimmers. The entire black skimmer colony was lost to over wash during this storm and 3 pairs attempted to re-nest in a different area but were unsuccessful. It is hard to quantify how many least tern nests were lost during the storm; it is estimated that 200 nests were lost at Santa Rosa. In addition, 4 snowy plover nests/broods were lost during the storm.

Hurricane Sally made landfall as a Category 2 storm near Gulf Shores, AL on 16 September. The park closed each beach unit on 12 September as a safety precaution. Each unit received heavy over wash from the Gulf into the Bay. This storm was significant as it sat offshore for 16 hours and brought heavy rains and strong winds to the area. The first 4 miles of the Fort Pickens road were covered in 4 feet of sand and suffered some roadway wash out (Image 1). While there was not as much sand covering the road at Santa Rosa there was significant damage to previously repaired road surfaces. Perdido Key received over wash along the entire unit, boardwalks were destroyed, and minimal roadway washout occurred. There are 3 new breaks in the island at Perdido Key near the tip, which has the potential to cause an issue for shorebird nest monitoring in the future if they do not fill back in with sand. The dune habitat was significantly impacted as the primary dune was lost along much of the shoreline during this storm. There are now vast open spaces that were not present prior to Hurricane Sally. Shorebird nesting habitat has significantly changed. The impacts from this storm were so significant that GUIS requested help from a regional Incident Management Team. Over 60 individuals responded from the region to get the park operational. Each beach area is still impacted and there are still closures in place as of December 2020.

Depredation

Unfortunately, predators are a problem for beach nesting birds. With their nests on the ground for 28 days and chicks not gaining the ability to fly for another 30 days, they are an easy target. The most common predators at GUIS are ghost crabs (*Ocypode quadrata*) and coyotes (*Canis latrans*). Coyotes are non-native but naturalized to the area due to the absence of an apex predator, the red wolf (*Canis rufus*). Eight plover nests were lost to ghost crabs, three to coyotes, and 16 to unknown causes. Unknown losses were found 5-7 days after the event occurred and the sign of predator could not be determined. Once a chick is mobile after hatching it is difficult to determine the reason for loss unless it was witnessed firsthand. A total of 32 broods were lost after confirmed hatching. These numbers are much higher for the least terns, as they are more numerous and nest in a colony and are easy for a coyote to depredate eggs as it is passing through. Since individual nests were not followed for least terns, we do not know exactly how many were lost to predators.

With 469 LETE nests counted at the peak of nesting and only 38 flight capable chicks seen it would be safe to say a significant number of nests were predated.

Loggerhead shrike (*Lanius ludovicianus*) was the confirmed predator in killing an adult snowy plover at Fort Pickens.

Fish crow (*Corvis ossifragus*), gull-billed tern, and laughing gull (*Leucophaeus atricilla*) were observed hunting in nesting areas and colonies on several occasions but were not documented as the confirmed predator on any nests. Avian predators are extremely difficult to confirm as they leave little to no tracks at the nest site. Virginia opossum (*Didelphis virginiana*), non-native nine-banded armadillo (*Dasypus novemcinctus*) and raccoon (*Procyon lotor*) tracks were documented near nest sites on various occasions throughout the season but were not confirmed in depredating any nests.

Predator Management

To reduce predation of the Park's ground nesting birds, experienced predator biologists from FWC assist GUIS with predator management. Trapping took place only at Fort Pickens in 2020, with 3 trapping events targeting coyotes occurring February 11-18, May 19-29, and June 16-25. In February, 15 foothold traps were set for 7 nights, 9 foothold traps were set for 10 nights in May, and 9 foothold traps were set for 9 nights in June, for a total trapping effort of 276 trap nights. While coyotes are rarely seen in the park, evidence of their activity is abundant, from finding tracks within tern colonies moving from nest to nest or locating scat with feathers in it. With the assistance from FWC, 2 coyotes were removed from the landscape during the February trapping event, and an additional coyote was removed during the June trapping event. Lethal removal was conducted in accordance with the Coastal Species of Concern Predation Management Plan and Programmatic Environmental Assessment, and Scientific Research and Collection Permit #GUIS-2019-SCI-0022. Because the first 2 coyotes were removed prior to shorebird nesting, and the last coyote was removed after most shorebird and seabird chicks were hatched, it is not possible to determine the effect of their removal on 2020 shorebird productivity at Fort Pickens. Recorded observations of coyote tracks in Fort Pickens did however decrease after June 17. Other nest predators such as raccoons were also targeted during each trapping event, but none were successfully trapped.

Human Disturbances

Human intrusions were prevalent this season in all three beach areas. It is popular for individuals to walk along the roadside with their beach gear and cut through the dunes to get to a desirable spot on the beach. However, it is not feasible to put posting up along the entirety of the roadways throughout the park. Individuals boating in pose a risk to the birds nesting on the northern sides of the beach areas; they often go unnoticed by staff but risk trampling nests or chicks. On one occasion at the tip of Perdido Key a snowy plover pair was seen making scrapes in a back-dune area where people were walking throughout. No nest was ever located in this spot, potentially due to human disturbance.

Colonies are highly susceptible to human disturbance. Human presence within the colony's flushing distance will cause the entire colony to take flight. This can interrupt breeding and egg incubation, leaves eggs exposed to environmental factors (e.g.: sun, wind, and rain), and predators. While sign enclosures work well in keeping most humans away from the colonies, the road presents access

problems through the colonies. Walkers and bicyclists passing within approximately 300ft (especially ones with dogs) will cause the colony to flush and defend the colony area. Enclosed vehicles (e.g.: cars, trucks, and UTVs) are not regarded by the birds as predators and are typically ignored. While the colony is flushed and adult birds defend their nesting territory, mortality results from vehicle strikes while the bird's protective flight pattern crosses the road. On 10 occasions, off-road vehicle tracks were documented in suitable habitat for ground nesting birds. However, no nest loss was documented from such events.

Over the course of the 2020 Breeding season, human footprints were documented near shorebird nesting a total of 152 times. Approximately two thirds of the documented disturbance (98 of the 152 recordings) occurred in shorebird nesting areas that had not been posted. This is even more significant considering that posting efforts focus on the areas of GUIS with the highest visitor density.

Roadways and Roadkill

Each beach area contains a roadway bisecting shorebird nesting habitat. The Santa Rosa area is the most problematic with State Road 399 connecting Pensacola Beach and Navarre Beach with 24-hour access. The speed limit is 35 mph but is reduced for a portion to 25 mph during nesting season. The Fort Pickens road also contributes to road killed shorebirds, but the speed limit is 25 mph and is only accessible after sunset by those staying in the campground. The Perdido Key area also has a roadway, it encompasses a smaller amount of nesting habitat and historically has not proven to be a significant problem for nesting shorebirds. Various methods have been implemented to attempt to mitigate road kills during the nesting season, including seasonal speed limit reductions, flashing radar speed limit signs, reader boards, speed humps, increased law enforcement, and public outreach.

Roadkill surveys were completed opportunistically as staff encountered road killed shorebirds or their chicks on the roadways. A total of 31 individuals of imperiled species were found dead on roadways in the park. Thirty-seven other vertebrates were found dead on the roadways in the park, for a total of 68 individuals. Only 3 individuals were located at Fort Pickens and 0 at Perdido Key. The remaining 65 were at Santa Rosa. All the 31 individuals of imperiled species found dead were at Santa Rosa. There were 25 least terns, 4 snowy plovers, and 2 Wilson's plovers. Santa Rosa poses the greatest risk to nesting birds; there is suitable habitat on both sides of the road for the entire 7 miles of the unit and species tend to nest on the north side of the road and bring their young to the Gulf shoreline in the early morning hours and retreat to the safety of dense vegetation in the hot hours of the day. Map 8 illustrates the species killed at Santa Rosa.

Additional law enforcement patrols are contracted out locally to support strict enforcement of the reduced speed limit for the portion Hwy 399 passing through the Santa Rosa Unit of GUIS. The contract runs 7 days a week alternating shifts between 6-10am and 3-7pm starting 3 April until 17 August, but patrols were delayed this year to 6 May due to park closure. Officers spent a total of 516 hours patrolling, making 1,902 vehicle stops that resulted in 452 citations and 1,627 warnings. The contract for the 2021 breeding season has been edited to require the contractor to provide more detailed information regarding the patrols, stops, and warnings that is expected to help GUIS better evaluate the effectiveness of the patrols.

Outreach

Press releases were made to the public throughout the shorebird nesting season. After the first snowy plover nest was found on 9 March a press release went out notifying the public of the beginning of shorebird nesting season. It mentions the reduction of the speed limit at Santa Rosa and the importance of staying out of closed areas. On 5 May a press release went out outlining the increased law enforcement patrols at Santa Rosa and the importance of following speed limits within the park; a second press release went out later that day mentioning parking lots 33A and 36A would remain closed due to seabird colonies in the area. No press releases were made to conclude the nesting season as the park was dealing with a very active hurricane season.

Each year, GUIS distributes decorative car magnets at the entrance fee stations promoting shorebird awareness and the seasonally reduced 25mph speed limits. When the weather was good entrance station staff would hand out approximately 250 magnets in a single day, totaling approximately 10,000 magnets distributed over the course of 2020.

Outreach by field staff is conducted informally and opportunistically with the public. Staff is often approached by inquisitive visitors. We do our best to inform visitors of the current status of the nesting shorebirds in a positive light. This reminds visitors that GUIS is not just for visitor recreation but is also responsible for resource protection of the habitat and the birds themselves. Dogs are not allowed on the beach of GUIS. This rule dates back to concerns over pet waste contaminating the water the children and families recreate in. It is also accepted among the shorebird community that canine presence, including domestic dogs, on nesting beaches can result in abandonment of nests and young. Field staff has opportunistically kept track of dogs on the beach over the course of the 2020 nesting season. Twenty dogs were noted on the park's beaches between 18 March and 21 August. There are numerous other occasions where dog tracks are seen on the beach, especially on the north shore of the units where visitors can boat in, and at Perdido Key where visitors can camp on the shoreline without permit or registration. To help decrease disturbance by domestic dogs, 1,000 B.A.R.K. Ranger tags were purchased by the end of 2020. B.A.R.K. stands for: Bag your pet's waste, Always leash your pet, Respect wildlife, and Know where you can go. These tags and accompanying information will encourage park visitors to follow all park regulations regarding dogs. The tags will be handed out to park visitors in 2021 any time project staff must ask a dog-owner to remove their dog from the beach, hopefully making it a much more positive and impactful interaction. Safety precautions related to COVID-19 prevented any large-scale public outreach events focused on informing local and visiting dog-owner for 2020, but such events may be possible in 2021 depending on progress with the COVID-19 situation.

Maps and Tables



Map 2 Fort Pickens Solitary Nest Locations 2020



Map 3 Fort Pickens Least Tern Colonies 2020

Solitary Shorebird Nests at Santa Rosa 2020

Gulf Islands National Seashore
National Park Service
U.S. Department of the Interior



Map 4 Santa Rosa Solitary Nest Locations 2020

Colonies at Santa Rosa 2020

Gulf Islands National Seashore
National Park Service
U.S. Department of the Interior



Map 5 Santa Rosa Least Tern and Black Skimmer Colonies 2020

Solitary Shorebird Nests at Perdido Key 2020

Gulf Islands National Seashore
National Park Service
U.S. Department of the Interior



Map 6 Perdido Key Solitary Nest Locations 2020

Colonies at Perdido Key 2020

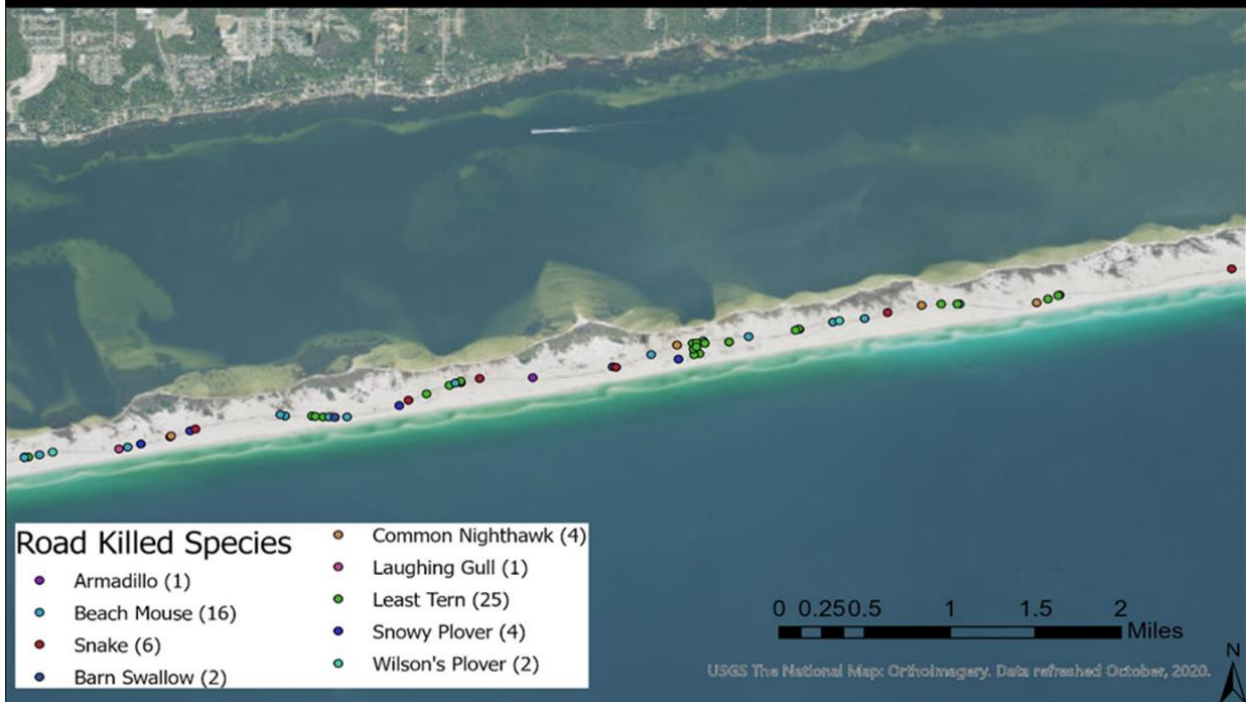
Gulf Islands National Seashore
National Park Service
U.S. Department of the Interior



Map 7 Perdido Key Least Tern Colonies 2020

Road Killed Species at Santa Rosa 2020

Gulf Islands National Seashore
National Park Service
U.S. Department of the Interior



Map 8 Road Killed Species at Santa Rosa

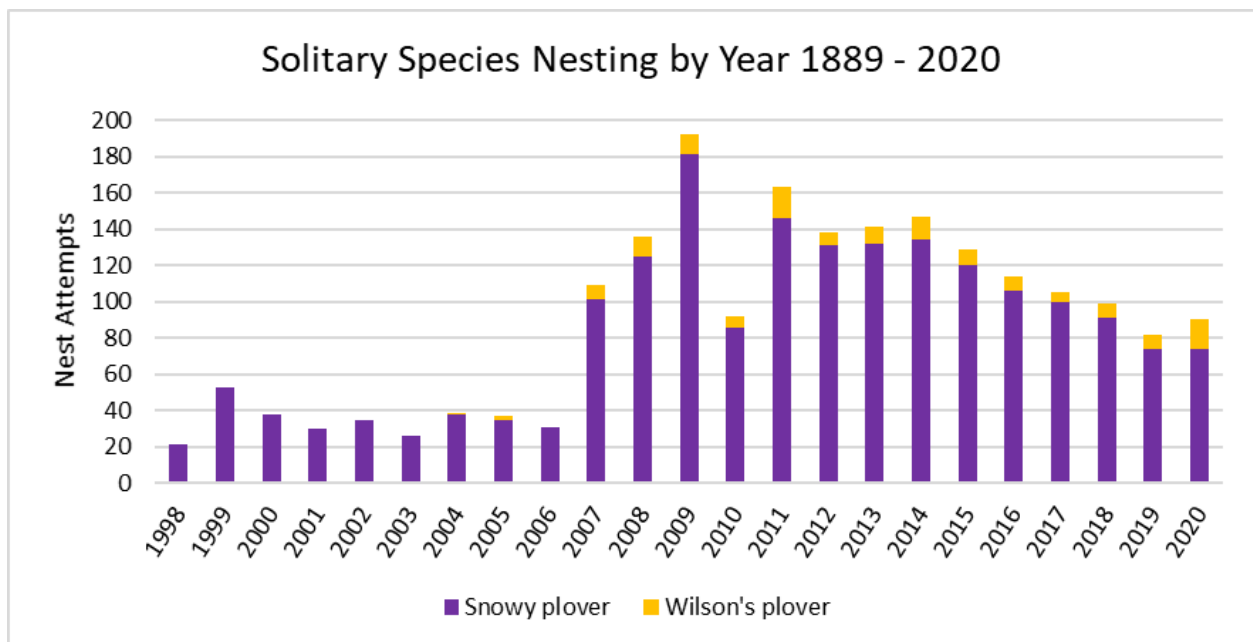


Figure 1 Solitary species nesting by year at GUIs from 1998 to 2020. 1998 to 2006 did not include surveys at Santa Rosa. After 2006 both species numbers increased due to surveys at Santa Rosa, indicating the importance of the area.

Table 1 Snowy Plover Data 2020

Nest #	Unit	lat	lon	Band combo		Date Clutch Found	Initial Egg #	High Egg #	Hatch Date (used)	Eggs					# Fledged	# chicks lost	# of Nest Checks
				male	female					# Hatched	# Probable Hatch	# Loss Unknown	# Not Hatched	# Predated			
FP01	FP	30.330913	-87.301556	YO/-:GY/-	bO/-:bL/-	3/9/2020	1	3	4/8/2020	2		1			2		4
FP02	FP	30.320935	-87.218650	GO/-:YG/-	YL/-:LO/-	3/9/2020	2	3				3					3
FP03	FP	30.324891	-87.187147	Lb/-:GO/-	ub	3/9/2020	1	3				3					3
FP04	FP	30.318911	-87.245210		ub	3/16/2020	3	3				2	1				2
FP05	FP	30.326446	-87.191345			3/16/2020	1	1				1					2
FP06	FP	30.322830	-87.204030	ub	ub	5/7/2020	1	3					1	2			5
FP07	FP	30.321926	-87.206552	ub		5/7/2020		1	4/10/2020	1					1		4
FP08	FP	30.325117	-87.200169	ub		5/7/2020		1								1	4
FP09	FP	30.318823	-87.251441	GO/-:LG/-	Yb/-:GG/-	5/13/2020	3	3	5/29/2020	1			2			1	6
FP10	FP	30.319417	-87.248763			5/13/2020	1	1	4/28/2020				1				1
FP11	FP	30.319548	-87.248104	ub	ub	5/13/2020	3	3	5/3/2020	1		2				1	4
FP12	FP	30.30765	-87.301209	YO/-:GY/-	bO/-:bL/-	5/18/2020	3	3	5/29/2020	2		1				2	6
FP13	FP	30.319550	-87.242722	ub		5/19/2020		1	5/16/2020	1						1	2
FP14	FP	30.318565	-87.250723	bL/-:OO/-	GG/-:LY/-	5/19/2020	1	1	5/20/2020	1						1	4
FP15	FP	30.322141	-87.222040	ub	bG/-:GY/-	5/25/2020	3	3	5/21/2020					3			4
FP16	FP	30.318772	-87.246444	ub	ub	5/25/2020	3	3	5/16/2020	2		1				2	6
FP17	FP	30.319702	-87.248755	ub	ub	5/27/2020	2	3	5/19/2020	2		1				2	13
FP18	FP	30.324220	-87.187206	Lb/-:GO/-	ub	5/27/2020		3	6/10/2020	3						3	3
FP19	FP	30.323254	-87.209725	ub	ub	5/29/2020	2	3	6/16/2020				3				3
FP20	FP	30.321054	-87.218068	Lb/-:Ob/-	bO/-:bO/-	5/29/2020		1	5/28/2020	1					1		8
FP21	FP	30.318428	-87.248106	ub		5/29/2020		2	5/23/2020	2						2	3
FP22	FP	30.321717	-87.218704	GO/-:YG/-	YL/-:LO/-	6/3/2020		2	6/26/2020	2						2	3
FP23	FP	30.316673	-87.265798	ub	ub	6/3/2020	2	2	5/28/2020				2				2
FP24	FP	30.33047	-87.30097	YO/-:GY/-	bO/-:bL/-	6/3/2020	2	3	5/28/2020	1		2				1	10
FP25	FP	30.318712	-87.250558	ub	ub	6/17/2020	3	3	5/31/2020			3					5
FP26	FP	30.325428	-87.188989	-YO/-:Y/-	bb/-:bY/-	6/22/2020	3	3	6/28/2020		3						5
FP27	FP	30.322138	-87.222032		bG/-:GY/-	6/23/2020	3	3	6/30/2020					3			2
FP28	FP	30.326307	-87.192791	Lb/-:GO/-	ub	6/30/2020	3	3	7/10/2020	2		1					6
FP29	FP	30.324961	-87.190284	ub	ub	7/6/2020		1	6/28/2020	1						1	2
FP30	FP	30.323123	-87.209530		ub	7/13/2020	3	3				3					2
PK01	PK	30.304548	-87.39371			3/18/2020	1	1	4/17/2020			1					2
PK02	PK	30.307228	-87.383812		-/-:GO/-	3/18/2020	2	2	4/15/2020			2					2
PK03	PK	30.308805	-87.374704	UB	UB	3/18/2020	2	2	4/15/2020			2					2
PK04	PK	30.300535	-87.410905		OY/-:YY/-	5/6/2020	3	3	5/15/2020	2			1			2	5
PK05	PK	30.303376	-87.397316		-/-:GO/-	5/6/2020	3	3	5/29/2020			3					2
PK06	PK	30.307209	-87.383506	UB	UB	5/6/2020	2	3	6/3/2020					3			6
PK07	PK	30.315767	-87.341989	UB	UB	5/11/2020		3	5/6/2020	3					1	2	5
PK08	PK	30.314930	-87.344703	UB	UB	5/11/2020	1	3	5/15/2020					3			3
PK09	PK	30.307550	-87.382005	UB	UB	5/13/2020	3	3	5/25/2020	2		1			1		5
PK10	PK	30.302327	-87.401087	bO/-:OG/-	bY/-:bY/-	5/20/2020	3	3	5/26/2020	2		1			1	1	10
PK11	PK	30.303195	-87.397233	GG/-:Lb/-		5/20/2020		1	5/15/2020	1						1	5
PK12	PK	30.301351	-87.406685	GO/-:OG/-	OO/-:bO/-	5/28/2020		1	5/24/2020	1						1	3
PK13	PK	30.313950	-87.349635	UB	UB	6/5/2020	3	3	6/14/2020	2		1			1	1	9
PK14	PK	30.309093	-87.374439	UB	OY/-:YY/-	6/18/2020	3	3	7/2/2020	3						3	6
PK15	PK	30.307042	-87.383633	UB	UB	6/18/2020	3	3	7/13/2020	2		1				2	8
PK16	PK	30.303279	-87.39749	UB	UB	6/24/2020	3	3	7/14/2020		3					3	7
PK17	PK	30.300406	-87.410498	GO/-:OG/-	UB	6/27/2020	3	3	7/14/2020	1		2			1		9
PK18	PK	30.322401	-87.314131	UB	bO/-:OG/-	7/7/2020	3	3	8/1/2020	1		2			1		11
PK19	PK	30.314417	-87.343002	UB	S/A/-:G	7/14/2020		2	7/13/2020	2					1		5
SR01	SR	30.356616	-87.007327	ub	ub	3/12/2020	1	3	4/9/2020	1		2			1		4
SR02	SR	30.364336	-86.966054	YG/-:Ob/-	bO/(YL):-/-	3/17/2020	2	3	4/14/2020			3					3
SR03	SR	30.367171	-86.950329			3/19/2020	3	3	4/14/2020			3					2
SR04	SR	30.36093	-86.98098	ub	ub	3/20/2020	2	2	4/17/2020			2					2
SR05	SR	30.356871	-87.014209		ub	3/20/2020	1	1	4/21/2020	1					1		6
SR06	SR	30.356086	-87.014112			3/20/2020	3	3	4/14/2020			3			3		2
SR07	SR	30.370779	-86.929018	ub	OL/-:LO/-	5/4/2020	3	3	5/29/2020				3				5
SR08	SR	30.363892	-86.977713	ub	ub	5/5/2020	3	3	5/21/2020					3			2
SR09	SR	30.360014	-86.991695	ub		5/5/2020		1	4/26/2020	1					1		4
SR10	SR	30.369383	-86.932961	ub	OL/-:LO/-	5/4/2020		2	4/28/2020	2						2	5
SR11	SR	30.355695	-87.013054	ub	ub	5/5/2020		1	4/29/2020	1					1	1	3
SR12	SR	30.364719	-86.961389		-/G(O/R):-/-	5/14/2020	2	2						2			4
SR13	SR	30.365163	-86.964976	YG/-:Ob/-	bO/(YL):-/-	5/14/2020	3	3	6/8/2020					3			2
SR14	SR	30.364446	-86.965644	ub	ub	5/14/2020	3	3					3				2
SR15	SR	30.359787	-86.98877	ub	ub	5/15/2020	1	3	6/14/2020	2				1		2	8
SR16	SR	30.356889	-87.014382	ub	ub	5/15/2020	3	3	5/31/2020			3					2
SR17	SR	30.358136	-87.008211	ub	ub	5/26/2020	3	3	6/20/2020	2		1				2	6
SR18	SR	30.371273	-86.928671			6/1/2020	3	3						3			2
SR19	SR	30.363831	-86.977537	ub	ub	6/2/2020	3	3	6/24/2020	1			2		1		10
SR20	SR	30.363122	-86.977044	ub	ub	6/12/2020	3	3	7/6/2020	3						3	11
SR21	SR	30.356785	-87.014253	ub	O/G:b/Y	6/12/2020	2	2	6/24/2020	2					1	1	10
SR22	SR	30.364411	-86.965776	-/OG:-/-	bO/(YL):-/-	6/19/2020	3	3	6/25/2020	1	2					3	8
SR23	SR	30.366818	-86.951702	ub	ub	6/25/2020		1	6/21/2020	1					1		8
SR24	SR	30.367442	-86.943621	S/b:GY/-	ub	7/6/2020		2	7/1/2020	2						2	3
SR25	SR	30.370011	-86.930506	ub	OL/-:LO/-	7/22/2020	3	3	7/31/2020	2		1				2	8
							137	181		70	8	58	19	26	18	54	354

Table 2 Santa Rosa Wilson's Plover Data 2020

Nest #	Unit	lat	lon	Band combo		Date Clutch Found	Initial Egg #	High Egg #	Hatch Date (used)	Eggs					# Fledged	# chicks lost	# of Nest Checks
				male	female					# Hatched	# Probable Hatch	# Loss Unknown	# Not Hatched	# Predated			
SR01	SR	30.361080	-86.983830	ub	ub	5/5/2020		3	5/2/2020	3					1	2	3
SR02	SR	30.355690	-87.013024	ub	ub	5/5/2020	3	3	5/26/2020	1		1	1			1	5
SR03	SR	30.352875	-87.029593	ub	ub	5/5/2020		2	5/5/2020	2					2		6
SR04	SR	30.361914	-86.977555	ub	ub	5/12/2020	3	3	5/15/2020	2		1			2		3
SR05	SR	30.366209	-86.953165	ub	ub	5/14/2020	2	2	6/10/2020					2			2
SR06	SR	30.366125	-86.960254	ub	ub	5/14/2020	3	3	5/25/2020	2		1			2		7
SR07	SR	30.366128	-86.954830	ub	ub	5/14/2020		1	5/12/2020	1					1		3
SR08	SR	30.355157	-87.020525	ub	ub	5/22/2020		2	5/14/2020	2					1	1	5
SR09	SR	30.369038	-86.939059	ub	ub	6/1/2020		1	5/29/2020	1					1		3
SR10	SR	30.367578	-86.947513	ub	ub	6/1/2020	3	3	6/28/2020	2		1			2		3
SR11	SR	30.366600	-86.952678	ub	ub	6/1/2020	2	3	6/28/2020	1	2					1	7
SR12	SR	30.361827	-86.976488	ub	ub	6/2/2020	3	3	6/8/2020	3						3	6
SR13	SR	30.356943	-87.006023	ub	ub	6/2/2020		1	5/26/2020	1						1	4
SR14	SR	30.355259	-87.029558	ub	ub	6/4/2020		1	5/31/2020	1						1	2
SR15	SR	30.354867	-87.027054	ub	ub	6/4/2020	3	3	6/19/2020	1		2				1	4
SR17	SR	30.35505	-87.01852	ub	ub	6/12/2020	2	3	7/4/2020	1		2				1	6
								37		24	2	8	1	2	12	12	69

Table 3 Least Tern Data 2020

	Adults Max	Adults Mean	Nests Max	Nests Mean	Chicks Max	Chicks Mean	Fledge Max	Fledge Mean
Fort Pickens	159	41	25	6	0	0	0	0
Santa Rosa	910	365	389	109	50	28	15	7
Perdido Key	159	69	55	19	9	3	3	2
All Units	1228	158	469	45	59	10	18	3

Table 4 Black Skimmer Data 2020

	Adults Max	Adults Mean	Nests Max	Nests Mean	Chicks Max	Chicks Mean	Fledge Max	Fledge Mean
Fort Pickens	0	0	0	0	0	0	0	0
Santa Rosa	36	365	23	9	0	0	0	0
Perdido Key	0	0	0	0	0	0	0	0
All Units	36	122	23	3	0	0	0	0

Table 5 Quantities of habitat protected by symbolic and post-and-rope fencing within each GUIS Unit

	Total Area of Uplands (ac)	Suitable Habitat (ac)	Posted Area (ac)	Posted Area of Suitable Habitat	Percentage of total posted area
Perdido Key	805	483	26	5%	3%
Fort Pickens	1,385	719	184	25%	13%
Santa Rosa	1,276	1,125	75	6%	6%
Total	3,466	2,327	285	12%	8%