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HUMAN DISTURBANCE OF SNOWY PLOVERS (*Charadrius nivosus*) IN NORTHWEST FLORIDA DURING THE BREEDING SEASON

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Abstract.—Snowy Plovers (*Charadrius nivosus*), a state-threatened shorebird in Florida, are subject to human-caused disturbance due to the proximity of their habitat to development and recreation. The degree to which human disturbance is a limiting factor for reproduction is unknown, and even basic data on disturbance rates and behavioral responses are lacking. Fencing often protects nesting areas from disturbance, but foraging and brood-rearing areas are typically unprotected. We measured rates of disturbance in plover habitat and response distances in Northwest Florida in 2010, using focal observations and track counts for unprotected foraging sites and brood-rearing sites as well as protected nest sites. Our results suggested that a 40-m buffer could prevent flushing of foraging adults by pedestrians, while a 50-m buffer could prevent alertness responses by incubating adults to pedestrians and vehicles. Foraging adults were more sensitive to humans than to potential competitors and predators, and chicks did not respond to potential disturbances except for in one observation where a pedestrian approached within 10 m. Current 50-m buffers appear adequate to prevent incubating birds from being flushed by humans in our study area. Consequences of disturbance to foraging adults require further evaluation. Chicks may be susceptible to mortality due to vehicles because they did not exhibit disturbance responses to vehicles as close as 10 m.

Beach-nesting birds often are negatively affected by human recreation and coastal development (Fleming et al. 1988, Burger 1990, Weston and Elgar 2007). Human impacts include habitat loss, disturbance, destruction of nests or chicks, and increased predation by domestic and human-commensal predators that can affect survival, dispersal, breeding behavior, and productivity (Ruhlen et al. 2003,

Cohen et al. 2009, Engeman et al. 2010). Snowy Plovers (*Charadrius nivosus*), which breed and winter along the U.S. Gulf Coast, are state-listed as threatened in Florida, with human development and recreation identified as primary threats (Himes et al. 2006). Estimates of breeding plover numbers in Florida in recent decades have remained relatively stable but low, at between 200 and 225 pairs in the state (Himes et al. 2006). Much of the historic nesting habitat for plovers on the southwest Florida coast has been lost to development, with the majority of the current population nesting in northwest Florida. Nest sites of Snowy Plovers in Florida often are protected with symbolic fencing (signed posts connected with roping in the highest human use areas) to prevent disturbance and direct mortality by humans, but foraging and brood-rearing areas in the region typically are not protected from human disturbance. The Florida population of Snowy Plovers is not protected by federal endangered species law, under which disturbance to nesting birds often is considered a violation regardless of demographic effects, and the state's endangered species act prohibits only direct intentional physical harm. However, several natural resource management agencies in Florida with jurisdiction over beach-nesting bird habitat have made the provision of low-disturbance areas for breeding part of their policy. The success of their specific management strategies in preventing the behavioral and demographic impacts of disturbance has yet to be fully evaluated.

In 88% of studies published from 1978-2010 on the effect of non-motorized recreation on birds, a negative impact to physiology, behavior, abundance, or reproductive success was documented (review by Steven et al. 2011). Shorebirds in particular have been found to be more sensitive to disturbance than other waterbirds, often vacating an area completely when other species flush a shorter distance or remain at the site (Burger 1981). For Snowy Plovers, survival of chicks in California was found to be greater on weekdays than weekends, implying a negative effect of human recreation (Ruhlen et al. 2003). Nonbreeding Snowy Plovers in California failed to acclimate to human disturbance over short observation periods, and had lower foraging rates in the presence of human activity than when undisturbed (Lafferty 2001). Human disturbance has long been documented as a factor affecting habitat use and foraging behavior in the closely-related Piping Plover (*C. melanotos*) (Burger 1990, Hoopes 1993, Goldin and Regosin 1998), and has been demonstrated to contribute to lower reproductive success (Flemming et al. 1988, Strauss 1990, Goldin 1993). Limiting disturbance by fencing nesting areas or closing parts of beaches to human use has been a major part of the successful recovery strategy for Piping Plovers (Hecht and Melvin 2009). Data is lacking on the effects of human disturbance on Snowy Plovers on the Florida Panhandle,

and better information on setback distances for disturbance sources may help managers to reduce disturbance if it appears to be affecting time spent foraging or attending nests or young, or if it is affecting reproductive success.

The objectives of our study were 1) to determine rates of disturbance to incubating, brood-rearing, and foraging plovers in the Florida Panhandle, and 2) to determine the distances at which plovers engaged in different behaviors react to anthropogenic and natural disturbance. Our study provided the first examination of the sensitivity to human activities of adult Florida Snowy Plovers engaged in behavior other than incubation and brood-rearing, and aimed at guidance for beach management to protect and recover this species.

METHODS

Study Area

We studied plover disturbance response at nesting beaches within Camp Helen State Park (30.26980° N, 85.99465° W), Deer Lake State Park (30.30173° N, 86.08143° W), Topsail Hill Preserve State Park (30.36571° N, 86.29820° W), Water Sound Conservation Area (30.29773° N, 86.06893° W), and John C. Phipps Preserve (29.91087° N, 84.43590° W). The sites represented a range of potential disturbance levels, based on local expert opinion and our previous experience monitoring beach nesting birds (Camp Helen and Water Sound = high disturbance, Topsail, Deer Lake, and Phipps = low by comparison). Camp Helen, Water Sound, Deer Lake, and Topsail are mainland beaches with extensive dune systems and coastal dune lakes with temporary inlets. Phipps Preserve is a small barrier peninsula with narrow beaches and patchy, small dunes. The high disturbance sites had pedestrian footpaths bisecting the nesting areas.

At Camp Helen, Deer Lake, Water Sound, and Topsail, Snowy Plovers nest in open, sparsely vegetated interdune and upper beach areas, and forage on Gulf and inlet shorelines and in ephemeral pools. At John C. Phipps Preserve, Snowy Plovers nest in small, isolated pockets of sparse vegetation surrounded by small dunes, and forage on bay and Gulf shorelines.

Disturbance Source Counts

We recorded the presence of potential disturbance sources within 100 m of at least one member of each Snowy Plover (hereafter “plover”) pair in the study area at least once per two week period from 10 May to 31 July, 2010. Observations were typically made from 40 m to 60 m away. Each day, we selected one or more focal birds, ideally until both individuals of all known pairs were sampled within the 2 week period, at which point we replaced all birds for the next round of sampling. If pair members were found together, we collected data first on one, then the other when possible. For birds that were not uniquely banded, we identified sex by darkness of the black in the plumage. Observations were only collected on those unbanded individuals that could be identified based on territory location, age of brood, or association with a banded bird. When a focal bird was located, one observer watched it to keep track of its location, while a second recorded all potential disturbance sources within a 100-m radius circle of the initial location of the focal bird for 10 min. We did not record behavioral responses during these 10-min observations. Disturbance source (with subcategories) included pedestrians (walking, jogging, swimming, ball-playing, kite-flying, resting, fishing), dogs (leashed, unleashed),

parked or moving off-road vehicles (ORV) and all-terrain vehicles (ATV), moored or moving vessels, and potential predators [coyotes (*Canis latrans*), raccoons (*Procyon lotor*), domestic cats (*Felis sylvestris*), raptors, crows (*Corvus* spp.), gulls (*Larus* spp.), and other] and competitors (terns and shorebirds including conspecifics). We recorded the time that each disturbance source entered and left the 100-m radius circle so that total disturbance minutes, as well as total unique sources, could be calculated.

Disturbance Responses

After completion of the 10-min disturbance source counts, we recorded responses of the focal bird to disturbance sources continuously for up to 30 min (Altmann 1974). In addition to the disturbance sources recorded during the 10-min counts, we recorded focal bird responses to potential competitors (shorebirds and terns including conspecifics). We discarded all observations where focal birds were not in view for at least 20 min. We recorded the age (adult or chick), sex if known, and initial behavior (foraging, resting, incubating, brooding) of the focal plover. For each potential disturbance source causing a response, we recorded the distance (m) at which the focal bird first exhibited a response and the response type: alertness (upright posture, cessation of prior activity), displacement (movement away from disturbance source), and distress or aggression (crouched charge, alarm calls, distraction displays). If no response was elicited by a potential disturbance source, we recorded the minimum distance between the bird and the disturbance source that occurred during the observation. If a bird exhibited more than one response to a potential disturbance source, the most extreme response (Distress/Aggression > Displacement > Alertness) was used in the analysis. Distances were measured using range finders where possible, otherwise they were visually estimated. All observers were trained in visual distance estimation in the field, using objects set at known distances apart.

Track Evidence

After each 30-min behavioral observation, we recorded track evidence of the presence of human and other disturbance sources as a second method of comparing sites. We walked three transects perpendicular to the water line, from the water's edge to the landward edge of plover habitat (e.g., dense vegetation, human structures), sampling tracks in the sand as we walked and categorizing each type as "fresh" or "old" based on apparent wear, where fresh tracks would likely have been laid down within a day of our observation. The first transect was centered on the initial location of the focal bird. The other two transects were 100 m to either side. We recorded tracks of potential disturbance sources each time our toe touched tracks, and for each potential disturbance source we calculated an index of potential disturbance as "total toe-hits on all three transects" / "total paces on all three transects", which is an indicator of the proportion of the substrate covered by tracks, and can be multiplied by 100 to indicate a percentage (Hays et al. 1991). Combining transects in this way avoided pseudoreplication while allowing us to account for variability within each sampling plot. Unidentifiable tracks were scored as "unknown". With the exception of Phipps which was of low elevation and overwashed frequently, our sites were similar in elevation, aspect, and exposure to tides and weather, so track persistence was likely to be similar among them. At all sites, we assumed that fresh tracks in the intertidal zones were distinguishable from older tracks that would be removed by the daily high tides.

Statistical Analysis

We used SAS (SAS institute, Cary, North Carolina) for all analyses. We used negative-binomial ANOVA controlling for the fixed effect of "pair" to compare the mean disturbance count-minutes among low and high disturbance sites (models did not converge

when pair was used as a random effect, possibly due to small sample size). We used mixed logistic regression with a random pair effect to compare track indices among low and high disturbance sites (event = toe intersects a track, trial = toe hits the ground). We used mixed multinomial logistic regression (McFadden 1974) to estimate response distance curves (the relationship between the probability of different responses and distance to potential disturbance sources) by age and initial behavior, where the random effect was "individual". We used mixed effects logistic regression to determine if response probabilities differed among sites.

RESULTS

Disturbance Counts

We collected data on 17 plovers from 13 pairs across five sites. Some plovers carried leg bands from previous studies and were individually identifiable, and some were identified based on territory. Pedestrian-minutes within 100 m of plover locations were higher at *a priori*-designated high disturbance sites (Camp Helen and Water Sound) than at two of the low disturbance sites (Deer Lake and Phipps, Table 1). Mean vehicle-minutes and predator-minutes were near zero or had high variance, and did not differ among sites.

Track Counts

Fresh (< 1 day old) pedestrian tracks covered < 6.2% of the sandy substrate on average at all sites, but covered a greater proportion of the beach at pre-designated high disturbance sites than at low disturbance sites (mixed logistic regression with random pair effect, $F_{4,12} = 5.11$, $P = 0.012$). Tractor, ATV, and ORV tracks were present at all sites and

Table 1. Disturbance source count-minutes (total minute disturbance sources were within 100 m of focal birds) in Snowy Plover (SNPL) habitat, Florida, 2010.

| Site | SNPL Pairs | Num. obs. | Disturbance Source Minutes | | | | | |
|------------|---------------|--------------|----------------------------|------|----------------------|------|----------|-------|
| | | | Pedestrian | | ATV/ORV ^b | | Predator | |
| | | | Mean ^a | SE | Mean | SE | Mean | SE |
| Camp Helen | 5 | 32 | 29.4 A | 8.2 | 0.00 | 1.54 | 0.00 | 1.10 |
| Watersound | 2 | 6 | 39.1 A | 29.6 | 0.00 | 0.39 | 5.40 | 7.70 |
| Topsail | 1 | 2 | 12.0 AB | 11.8 | 1.00 | 1.04 | 10.50 | 18.70 |
| Deer Lake | 3 | 11 | 3.8 B | 2.3 | 0.36 | 0.24 | 2.10 | 2.20 |
| Phipps | 2 | 2 | 0.0 B | 0.0 | 0.00 | 0.00 | 10.00 | 17.80 |

^aMeans with the same capital letter are not significantly different, negative binomial Analysis of Variance controlled for fixed effect of bird, $F_{4,43} = 4.59$, $P = 0.050$. There were no significant differences in ATV/ORV or Predator disturbance-minutes among sites ($P > 0.050$).

^bATV = All-terrain vehicle, ORV = off-road vehicle (i.e., trucks)

were related to cleanup of the Deepwater Horizon oil spill; <5.4% of the beach was covered on average at all sites. Old (> 1 day old) ATV tracks covered a greater proportion of the beach at high disturbance sites than low disturbance sites (mixed logistic regression with random pair effect, $F_{4,12} = 6.63$, $P = 0.004$). Potential predator tracks were detected too rarely using our method to be of use for analyses.

Disturbance Responses

All foraging plovers in our study were outside symbolically-fenced protected areas. Behavioral responses of plovers to pedestrians depended on the distance to pedestrians (mixed multinomial logistic regression with generalized-logit link and random effect of individual, $F_{2,123} = 8.08$, $P < 0.001$, $n = 147$ observations of 14 birds). Pedestrians within 20 m of a foraging adult plover were >50% likely to displace the focal bird (Fig. 1). The probability of displacement decreased to near 0% for pedestrians > 40 m from the focal bird, based on our model prediction (Fig. 1).

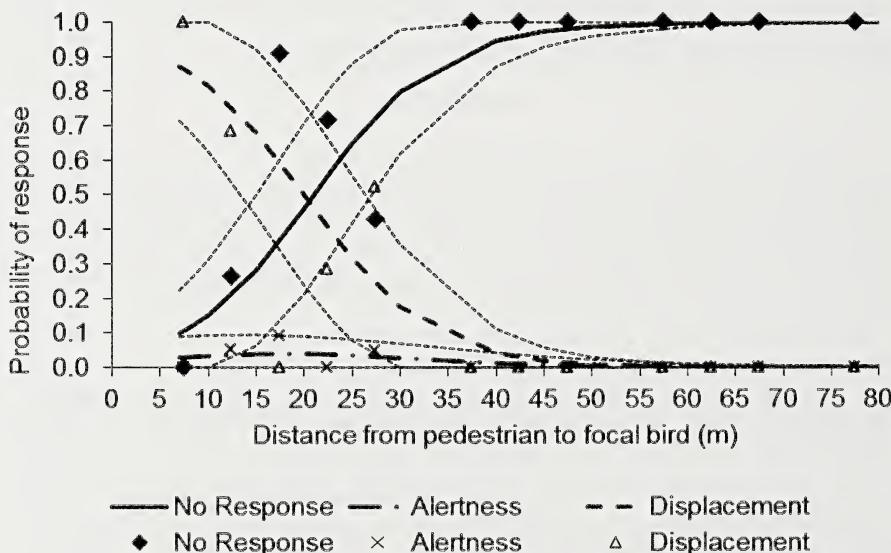


Figure 1. Probability of the most severe response of foraging Snowy Plovers to pedestrians being “none”, “alertness”, or “displacement” vs. distance to the pedestrian in the Florida Panhandle, 2010. The point symbols are the observed means (the mean proportion of responses of a particular type binned within 5-m categories of distance). The heavy lines are predicted probabilities of response from the best model: (mixed multinomial logistic regression with generalized-logit link and random effect of individual, $F_{2,123} = 8.08$, $P < 0.001$, $n = 147$ observations, $N = 14$ birds). The light dashed lines are 95% confidence intervals around the prediction lines.

Behavioral response to potential competitor species did not significantly depend on distance ($F_{1,72} = 2.00, P < 0.162, n = 72$ observations of 14 birds). However, potential competitors (terns and shorebirds including conspecifics) elicited disturbance responses only when within 10 m (Fig. 2).

We found no other significant relationships between distance to non-pedestrian disturbance sources and responses of foraging plovers at $\alpha = 0.05$, but we observed few potential interactions. Of eight potential encounters of foraging adults with ORVs, the most severe response was alertness one time (at 30 m), and displacement four times (at 0.5 to 25 m). Of 49 potential interactions with predators, foraging plovers were displaced four times (at 15 and 90 m) and exhibited distress once (at 5 m).

In 14 of 17 30-min observations of resting birds, the focal animal was outside of protective fencing. Response rates of resting birds in our study

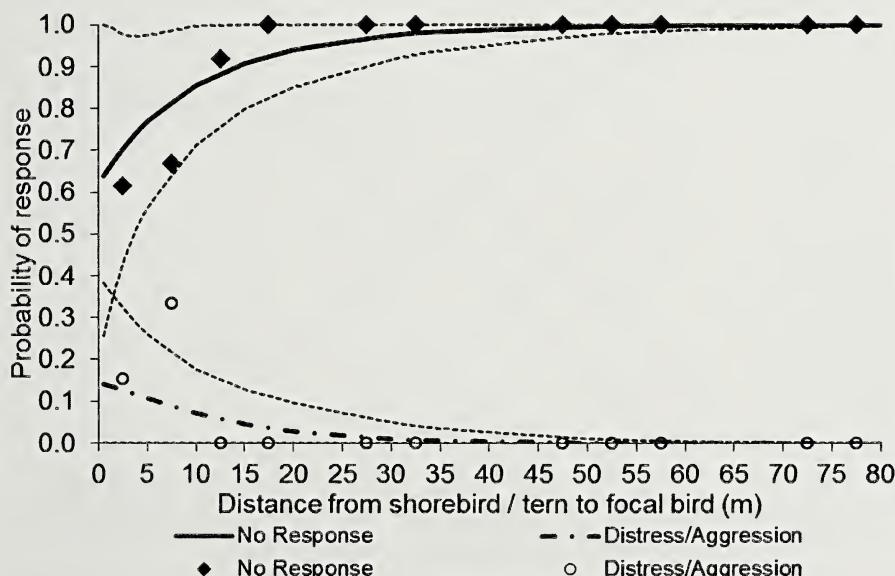


Figure 2. Probability of the most severe response of foraging Snowy Plovers to potential competitors (terns and shorebirds including other Snowy Plovers) being “none” or “distress/aggression” vs. distance to the potential competitor in the Florida Panhandle, 2010. The point symbols are the observed mean (the mean proportion of responses of a particular type binned within 5-m categories of distance). The heavy lines are predicted probabilities of response from the model (mixed multinomial logistic regression with generalized-logit link and random effect of individual, $F_{1,72} = 2.00, P < 0.162, n = 72$ observations, $N = 14$ birds). The light dashed lines are 95% confidence intervals around the prediction lines.

did not show any relationship with distance to disturbance sources. Of 42 encounters with pedestrians, 62% elicited no response, 23% elicited alertness, and 15% caused displacement (median distance between pedestrian and bird = 10 m). Of 5 encounters with ORVs, 2 elicited no response, 3 elicited alertness, and 1 caused displacement (median distance = 10 m). Of 54 encounters with potential predators, 1 elicited alertness and 1 caused displacement, and the rest did not elicit a response (median distance = 25 m). Of 97 encounters with conspecifics or other shorebirds or terns, none elicited any response (median distance = 20 m).

All incubating plovers in our study were inside symbolically-fenced areas, and pedestrians and vehicles were outside. Incubating plovers demonstrated alertness to the presence of pedestrians, depending on distance ($F_{1,85} = 5.55, P = 0.023, n = 87$ observations of 14 birds). We did not observe any responses to pedestrians more severe than alertness. Although our model predicts a smooth decline in alertness rate with distance, we did not actually observe any responses to pedestrians > 50 m from the focal animal (Fig. 3).

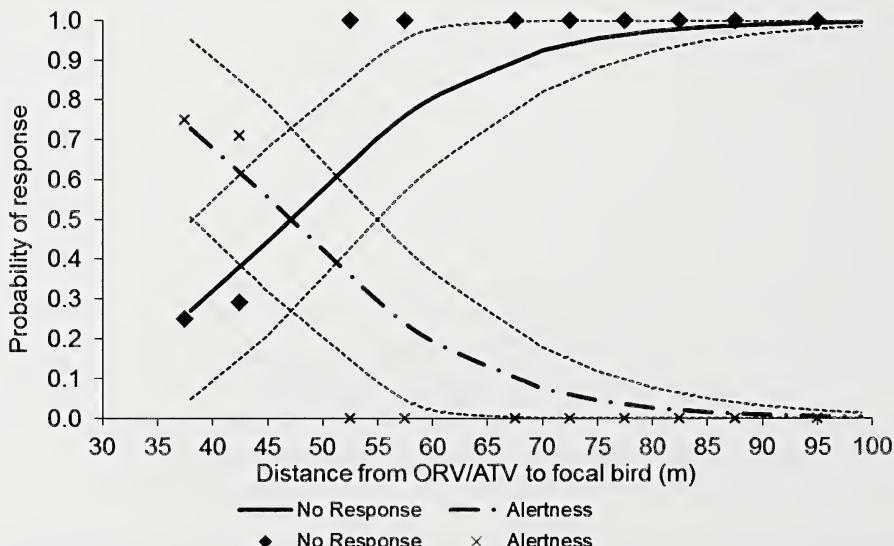


Figure 3. Probability of the most severe response of incubating Snowy Plovers to pedestrians being “none” or “alertness” vs. distance to the pedestrian in the Florida Panhandle, 2010. The point symbols are the observed means (the mean proportion of responses of a particular type within 5-m categories of distance). The heavy lines are predicted probabilities of response from the model: (mixed multinomial logistic regression with generalized-logit link and random effect of individual, $F_{1,85} = 5.55, P = 0.023, n = 87$ observations, $N = 14$ birds). The light dashed lines are 95% confidence intervals around the prediction lines.

Incubating plovers also were alert to the presence of vehicles, depending on distance ($F_{1,55} = 6.20, P = 0.016, n = 63$ observations of 14 birds). As with pedestrians, ORVs and ATVs did not elicit any response more severe than alertness. Predicted response rate declined smoothly with distance, although we did not observe any responses to vehicles > 60 m from the focal bird (Fig. 4).

We did not find a distance-dependent response of incubating plovers to predators. Of 40 potential interactions, 38 caused no response (distances ranged from 5 – 99 m). One crow caused displacement at 45-50 m (10% of the observations in that distance category), and one crow caused distress/aggression at 65-70 m (50% of the observations in that distance category). Of 33 potential interactions with competitors, 28 caused no response (distances ranged from <1 – 99 m) and five (all

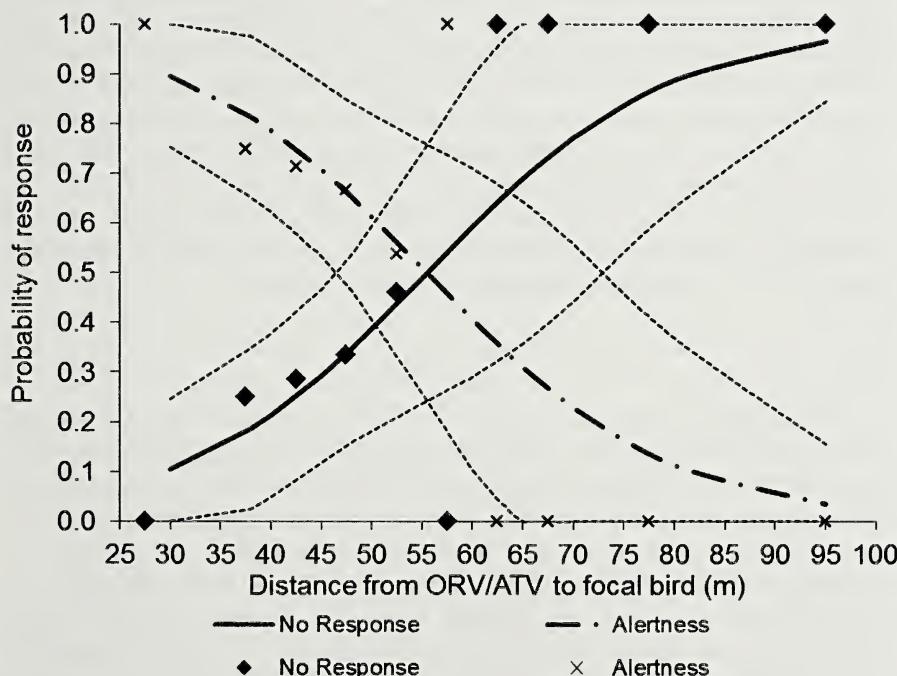


Figure 4. Probability of the most severe response of incubating Snowy Plovers to vehicles being “none” or “alertness” vs. distance to the vehicle in the Florida Panhandle, 2010. The point symbols are the observed means (the mean proportion of responses of a particular type within 5-m categories of distance). The heavy lines are predicted probabilities of response from the model (mixed multinomial logistic regression with generalized-logit link and random effect of individual, $F_{1,55} = 6.20, P = 0.016, n = 63$ observations, $N = 14$ birds). The light dashed lines are 95% confidence intervals around the prediction lines.

conspecifics) caused distress/aggression response within 5 m, 28% of the potential interactions in that distance category.

We found no significant relationship between distance to disturbance source and response of brood-rearing adults, although we did observe responses at various distances. Of 147 potential pedestrian interactions, adults with broods showed no response 102 times, alertness three times, and displacement 42 times. Of eight interactions with ORVs/ATVs, attendant adults showed no response one time, alertness three times, and were displaced four times.

In one observation where a pedestrian approached within 10 m of foraging chicks, the brood was displaced. In the other 45 observations of the 3 broods in our study area, pedestrians approached within 23 m – 95 m of foraging broods, and never caused a response by the chicks. Of eight potential interactions with ORVs/ATVs at 10 m – 99 m, foraging chicks showed no response.

Foraging adult plovers were more likely to respond to disturbances within 100 m at low disturbance sites ($73 \pm 18\%$ SE, $n = 17$) than at high disturbance sites ($22 \pm 7\%$, $n = 273$, mixed logistic regression with random bird effect, $F_{1,15} = 5.13$, $P = 0.039$). The reverse was true of incubating birds, which were more likely to respond to disturbance (with alertness only) at high disturbance sites ($45 \pm 6\%$, $n = 181$) than at low disturbance sites ($6 \pm 4\%$, $n = 54$, $F_{1,96} = 14.00$, $P < 0.001$). We were only able to collect behavioral observations of broods at high disturbance sites, so we could not compare response rates of attendant adults or their chicks between the two categories.

DISCUSSION

Adult Snowy Plovers in our study responded more frequently and at further distances to pedestrians than to potential predators and competitors. Pedestrians were the largest and most conspicuous potential disturbance source on the landscape apart from vehicles, and possibly were thus perceived as the greatest predation risk (Beale and Monaghan 2004a). Foraging adults rarely flushed in response to disturbances greater than 40 m away. Adult Piping Plovers have been found to flush from humans at similar distances as Snowy Plovers in our study, and to also exhibit different responses to anthropogenic and natural disturbances (Flemming 1988, Hoopes 1993). Also similar to our study, nonbreeding Snowy Plovers in California did not flush from human disturbances that were more than 30 m away (Lafferty 2001). If 40-m buffers were implemented to provide disturbance-free foraging sites and left in place after the breeding season, they could benefit nonbreeding Snowy and Piping Plovers as well.

Human disturbance to beach-nesting birds may lead to demographic effects via direct mortality (such as crushing of eggs), disruption of foraging leading to poor nutrition, reduced vigilance against predators, or induced dispersal increasing the risk of injury or death (Weston and Elgar 2005). Burger (1990) demonstrated increased time spent in alert postures for Piping Plovers in the presence of human disturbance. Maslo (2011) found that Piping Plover adult and chick foraging rates decreased when people were within 50 m.

Lack of flushing in response to human disturbance in some instances has been linked to an individual bird's nutritional condition; some animals may not be able to devote the energy to fleeing from disturbances that are far away (Beale and Monaghan 2004b, Gill et al. 2007). Birds in poor condition, in areas with low food quality, or with a lack of alternative foraging sites may be willing to take a greater risk in remaining in the area despite the presence of a threat (Beale and Monaghan 2004b). Due to the highly fragmented nature of Snowy Plover habitat along the Eastern Panhandle, it is possible that birds simply do not have alternate foraging areas, and are reluctant to flush. However, it is more likely that because the birds in our study were on nesting territories, they were too heavily invested in their selected locations and in the care and defense of their nests and young to flush often or to great distances.

Prevention of disturbance to foraging plovers may be important to their energy balance in the breeding season, because each adult may spend 9–12 hours per day incubating, limiting available foraging time (Kosztolányi and Székely 2002). Foraging also tends to occur outside of nesting areas protected by symbolic fencing, as was the case for all observations of foraging birds in our study. The presence of anthropogenic disturbance can alter the normal foraging behavior of adult and juvenile Snowy Plovers (Lafferty 2001, Faillace 2010) and Piping Plovers (Flemming 1988, Burger 1990, Strauss 1990, Hoopes 1993, Maslo 2011). Modeling efforts have indicated that frequent disturbances that result in lost foraging time and an energy cost may be more damaging at the population level than permanent loss of habitat (West et al. 2002).

Although we did record nest and brood fates of the birds we followed, our sample size of pairs was not large enough to draw conclusions about effects of disturbance on population parameters such as reproductive success. However, negative population-level effects of disturbance have been demonstrated for Snowy Plovers, including lowered chick survival and decreased immigration of nesting adults into potential nesting sites (Ruhlen et al. 2003, Lafferty et al. 2006).

Like foraging plovers in our study, incubating birds responded at greater distances to humans than to naturally-occurring disturbances, but they never displayed responses to human disturbance more intense than “alertness.” Our results thus suggest that current buffer zones

at these state parks are adequate to prevent flushing of incubating adults. Keeping buffer distances for incubating plovers at or above the current level is important, as increased disturbance near the nest has been found to decrease diurnal nest attendance in closely related species (Weston and Elgar 2007).

Track counts and 10-min disturbance counts supported our *a priori* classification of sites into low and high disturbance categories. We found some evidence of increased tolerance of foraging adult plovers to high levels of disturbance, based on comparisons between high and low level sites. Incubating adults, however, were more likely to be alert to the presence of pedestrians at high disturbance sites, possibly because our high disturbance study sites have pedestrian footpaths that bisect nesting areas, bringing pedestrians closer to incubating birds more frequently. Some, but not all shorebird species have been shown to habituate to human disturbance (Lord et al. 2001, Glover et al. 2011). Habituation could be beneficial if plovers are able to conduct normal behaviors in the presence of human activity, but the risks to nests or chicks from the presence of humans may need to be managed (Baudains and Lloyd 2007). Furthermore, physiological responses to disturbance (increase in stress hormones, etc.) are not always readily apparent or easily measurable, so outward signs of habituation may not be indicative of all possible effects (Bejder et al. 2009).

Failure of plover chicks to try and evade ORVs or humans further than 10 m may potentially put them at risk (Goldin 1993, Baudains and Lloyd 2007). High levels of anthropogenic disturbance at some Piping Plover breeding sites have been linked to decreased reproductive success due to low fledge rates (Strauss 1990, Goldin 1993). To date there has not been a formal comparison of chick fates among beaches with different disturbance levels. If many of these cryptic young are killed inadvertently by pedestrians or vehicles, protection of brood-rearing areas would merit further attention.

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LAND COVER ALONG BREEDING BIRD SURVEY ROUTES IN FLORIDA

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Abstract.—The Breeding Bird Survey (BBS) is the most extensive systematic monitoring program for breeding birds in Florida. However, bias associated with different representations of available land cover, may exist in estimates of avian trends derived from roadside counts. Rates of change in land cover along roads also may be different from those within the wider landscape. Six land cover categories (grassland, wetland/open water, scrub/successional, woodland, urban, and other) represented within 400 m of BBS roadside routes ($N = 92$) in Florida were examined to determine whether they adequately represented land cover within their sample areas. BBS routes appeared to represent their sample areas, and land cover changes along routes from 1985 to 2003 were consistent with those within the sample areas. Mean and median differences were negative for grassland and scrub/successional cover and positive for wetland/open water, woodland, and urban. The mean change for the land cover category designated other was positive, but the median change was 0. Statewide BBS data are likely to provide unbiased trend estimates for birds relative to land cover categories and changes in land cover. Additional BBS routes are needed to sample relatively rare habitats and areas with few roads. Remote sensing was a reliable and cost-effective method of quantifying changing patterns of land cover, and BBS routes should be reassessed when more recent land cover data become available. Local and species-specific studies are needed to detect evidence of habitat fragmentation and to obtain information on the relationship between estimates of avian population trends and changes in land cover.

The North American Breeding Bird Survey (BBS) is a volunteer program initiated by the U.S. Fish and Wildlife Service (USFWS) in 1966 to monitor trends in avian distribution and abundance. The program is managed by the U.S. Geological Survey (USGS) in partnership with the Canadian Wildlife Service. Each BBS route is 39.4 km long, is located on a secondary road, and consists of 50 3-minute counts at 0.8-km intervals. Route locations (starting point and directions) are determined randomly within 1° blocks of latitude and longitude and stratified by state or province. Routes are surveyed by trained observers once annually, during the peak of the breeding season (in Florida, 1 May–15 June). All birds seen or heard at each count point during a 3-minute count period are totaled (Bystrak 1981, Robbins et al. 1986). The survey produces an index of relative abundance, not a complete count of populations. It is assumed that these indices reflect

population trends and that consistent survey methods and conditions produce results that are comparable over time.

The BBS is the most extensive systematic monitoring program for breeding birds in Florida. Cox (1987) analyzed Florida BBS data from 19 of 43 routes surveyed from 1969 through 1983 and found 4 species whose populations exhibited strong increasing trends, 15 species with strong decreasing trends, and 66 species that showed no strong trend. Local relative abundances based on BBS results appear to be influenced by habitat availability (Wamer 1978) and habitat changes in Florida (Cox 1987, Hanauer et al. 2010) and elsewhere (Igl and Johnson 1997, Donovan and Flather 2002). Roadside surveys of avian populations, however, may not adequately sample some habitats due to the nonrandom placement of roads and uneven changes in land cover along roads compared with changes across the landscape (Bart et al. 1995, Keller and Scallan 1999, Betts et al. 2007, Harris and Haskill 2007). Consequently, estimated trends in avian abundance obtained from roadside surveys may not be representative of trends within the wider landscape. Evaluating possible bias associated with route representation of its sample area had been identified as an important information need for the BBS (O'Connor et al. 2000, Thogmartin et al. 2006). The objective of this study was to determine whether BBS routes in Florida adequately represented habitats and habitat changes within their sample areas.

METHODS

Land Cover Characteristics

The study area was the entire state of Florida as sampled by the BBS (Fig. 1). Digitized location data for BBS routes in Florida were downloaded from the USGS website (<http://nationalatlas.gov/mld/bbsrtsl.html>). Active and inactive (i.e., discontinued) routes were isolated, and routes with survey data spanning 1985–2003 were identified. Digital land cover data for Florida were obtained from the classification of Landsat 5 Thematic Mapper satellite images (30-m resolution) acquired from 1985–1989 and again in 2003 (Stys et al. 2004). Land cover data derived from Landsat images in 2003 identified 43 classes of natural and human-derived habitats.

Each of the 43 habitat classes in the 2003 land cover dataset was reclassified to represent one of five avian habitat associations (land cover categories) following Peterjohn and Sauer (1993) and one category for other habitats not included in their listing (Table 1). Land cover categories included grassland, water/wetland, scrub/successional, woodland, urban, and other. After reclassification, the land cover data set was generalized using a majority filter that gave each 30- × 30-m cell the most common value of all eight neighboring cells. All spatial analysis was completed using ArcGIS 10.0 (ESRI, Redmond, California).

The land cover data set from 1985–1989 had the same extent and resolution as the 2003 data set but had been classified into only 22 habitat classes. To allow comparison of changes in land cover between the two data sets, we performed a crosswalk to match



Figure 1. Breeding Bird Survey route locations with buffer areas ($N = 92$) in Florida from 1985 to 2003, and route sample areas.

1985–1989 habitat classes to the 2003 habitat classes. Most of the 2003 habitat classes were either identical to 1985–1989 classes or were a sub-habitat of the more general 1985–1989 habitats; some 1985–1989 classes, however, had to be converted (Table 1). This conversion was accomplished by assuming that 2003 habitats were also present in 1985–1989 and assigning the detailed 2003 habitat classes to the general classes of the 1985–1989 data. For example, in the 1985–1989 land cover, habitat class *barren* includes lands that actually were barren but also those that were urban. To identify areas that were urban in 1985–1989, we overlaid the 2003 land cover layer indicating urban areas on the 1985–1989 barren areas and reclassified any barren area that intersected the urban area into an *urban* class. This allowed us to estimate change in urban land cover even though the area had not been identified as such in 1985–1989.

Each active BBS route line ($N = 92$) was buffered by 400 m, the usual maximum distance of birds detected at stops (Robbins et al. 1986), to create a polygon that represented the area surveyed along each route. The total area of each land cover category within the

Table 1. Land cover category (avian habitat association from Peterjohn and Sauer, 1993) and reclassification of 43 habitat classes in Florida from 2003, and 22 habitat classes from 1985–1989 vegetation and land cover datasets. Habitats from 1985–1989 set in normal typeface are directly comparable with those from 2003; classes set in italics are a substitute for the 2003 habitats; classes set in bold italics required conversion before comparisons could be made.

| Land cover category | 2003 habitat class | 1985–1989 habitat class |
|---------------------|---|---|
| Grassland | dry prairie grassland improved pasture unimproved pasture | dry prairie grassland (agriculture) <i>grassland (agriculture)</i> <i>grassland (agriculture)</i> |
| Wetland/open water | salt marsh freshwater marsh and wet prairie cypress swamp shrub swamp mangrove swamp open water sawgrass marsh cattail marsh scrub mangrove tidal flat sand/beach | coastal salt marsh freshwater marsh and wet prairie cypress swamp shrub swamp mangrove swamp open water <i>freshwater marsh and wet prairie</i> <i>freshwater marsh and wet prairie</i> <i>mangrove swamp</i> <i>coastal salt marsh</i> <i>barren</i> |
| Scrub/successional | | coastal strand sand pine scrub xeric oak scrub shrub and brushland |
| Woodland | pinelands sandhill | mixed hardwood–pine forests |

Table 1. (Continued) Land cover category (avian habitat association from Peterjohn and Sauer, 1993) and reclassification of 43 habitat classes in Florida from 2003, and 22 habitat classes from 1985–1989 vegetation and land cover datasets. Habitats from 1985–1989 set in normal typeface are directly comparable with those from 2003; classes set in italics are a substitute for the 2003 habitats; classes set in bold italics required conversion before comparisons could be made.

| Land cover category | 2003 habitat class | 1985–1989 habitat class |
|---------------------|-------------------------------|--------------------------------------|
| Urban | | |
| | hardwood hammocks and forest | hardwood hammocks and forests |
| | tropical hardwood hammock | tropical hardwood hammock |
| | hardwood swamp | hardwood swamp |
| | bay swamp | bay swamp |
| | bottomland hardwood forest | bottomland hardwoods |
| | cabbage palm–live oak hammock | <i>hardwood hammocks and forests</i> |
| | cypress/pine/cabbage palm | <i>cypress swamp</i> |
| | mixed wetland forest | <i>hardwood swamp</i> |
| | hydric hammock | <i>hardwood hammocks and forests</i> |
| | | |
| | high impact urban | <i>barren</i> |
| | low impact urban | <i>barren</i> |
| Other | | |
| | exotic plants | exotic plant communities |
| | Australian pine | <i>exotic plant communities</i> |
| | melaleuca | <i>exotic plant communities</i> |
| | Brazilian pepper | <i>exotic plant communities</i> |
| | bare soil/clearcut | <i>barren</i> |
| | sugar cane | <i>grassland (agriculture)</i> |
| | citrus | <i>grassland (agriculture)</i> |
| | row/field crops | <i>grassland (agriculture)</i> |
| | other agriculture | <i>grassland (agriculture)</i> |
| | extractive | <i>barren</i> |

buffered area was calculated for 1985–1989 and 2003. To evaluate how well a BBS route represented the surrounding landscape, we used Euclidean allocation to create “route neighborhood” polygons (Niemuth et al. 2007). Route neighborhoods or sample areas represent the area of the state closest to each buffered route (Fig. 1). The total land area of each land cover category within the route sample areas was calculated for 1985–1989 and 2003. Changes in land cover categories were quantified as differences in percentage cover in pixels for both route buffers and sample areas.

Statistical Methods

Statistical tests and graphical summaries were prepared with the R statistical package, version 2.14.2 (R Development Core Team 2012) and with SAS/STAT® version 9.3 for Windows® copyright © 2010 SAS Institute Inc. Differences between 1985 and 2003 in percentage land cover categories for route buffer and sample areas were determined for the 92 BBS routes. Median changes in percentage cover were tested for significance from 0 by the sign test. Chi-square tests were applied to assess significance of difference from a 50:50 split among the routes of positive and negative changes (>0 and <0) within a land cover category. For purposes of display, the differences in percentage land cover were sorted from smallest to largest within each category and then represented as bars in the appropriate direction (positive or negative). Omnibus and pair wise differences in route changes between land cover categories were tested by nonparametric analysis of variance (Kruskal-Wallis rank sum chi-square test). Spearman correlations were determined between route-specific pairs of land cover category changes in the BBS buffer areas and between pairs of land cover category percentages in route buffer areas vs. in route neighborhood sample areas. Because percentages are necessarily constrained (not completely independent), P values and significance statements based on them are intended more as approximate interpretational guides than as exact probability references.

RESULTS

Differences in percentage land cover by category type in 92 route buffer areas from 1985 to 2003 are summarized in Table 2, and sorted bar plots of changes are shown in Figure 2. Mean and median differences were negative for grassland and scrub/successional cover and positive for wetland/open water, woodland, and urban. The mean change for the land cover category designated *other* was positive, but the median change was 0. Normal-based confidence intervals did not span 0 for any land cover categories except for woodland and other, but none of the land cover category change distributions fit normal models well. Interquartile ranges spanned 0 in all cases except for scrub/successional and urban classes. Medians differed significantly from 0 for grassland, scrub/successional, and urban categories.

There was a highly significant omnibus test of heterogeneity among the land cover categories in their degree of change (chi-square = 137, df = 5, $P < 10^{-15}$). Of 15 pair wise comparisons of change in land cover categories, all were highly significant (chi-square ≥ 15.69 , df = 1, $P \leq 10^{-4}$) except grassland vs. woodland (significant at chi-square = 5.29, df = 1, $P = 0.02$), woodland vs. wetland/open water (chi-square = 0.82,

Table 2. Summary statistics for differences (2003–1985) in percentage land cover categories in 92 BBS route buffer areas in Florida.

| Route buffer land cover | N | Min | LowerQ | Median | UpperQ | Max | Mean | StdErr | LCLmean | UCLmean |
|-------------------------|----|--------|--------|--------|--------|-------|-------|--------|---------|---------|
| Grassland | 92 | -20.66 | -4.77 | -0.86# | 0.08 | 18.87 | -1.69 | 0.67 | -3.01 | -0.37* |
| Wetland/open water | 92 | -13.02 | -1.47 | 1.27 | 3.75 | 25.72 | 1.89 | 0.66 | 0.58 | 3.20* |
| Scrub/successional | 92 | -36.44 | -11.70 | -5.74# | -1.55 | 13.49 | -7.48 | 0.88 | -9.24 | -5.72* |
| Woodland | 92 | -25.63 | -3.61 | 0.05 | 4.48 | 26.95 | 0.97 | 0.90 | -0.83 | 2.77* |
| Urban | 92 | -28.03 | 1.80 | 4.92# | 8.54 | 31.59 | 5.92 | 0.86 | 4.22 | 7.63* |
| Other | 92 | -20.67 | -3.54 | 0.00 | 4.92 | 30.51 | 0.51 | 0.92 | -1.31 | 2.33* |

Abbreviations: N = sample size, Min = minimum observed value, LowerQ = lower quartile (25th percentile), Median = 50th percentile), UpperQ = upper quartile (75th percentile), Max = maximum observed value, Mean = mean, StdErr = standard error of the mean, LCLmean = lower 95% asymptotic confidence bound for the mean; UCLmean = upper 95% asymptotic confidence bound for the mean.

#Median significantly different from 0% by sign test.

*Distribution significantly different from normal; confidence limits approximate at best.

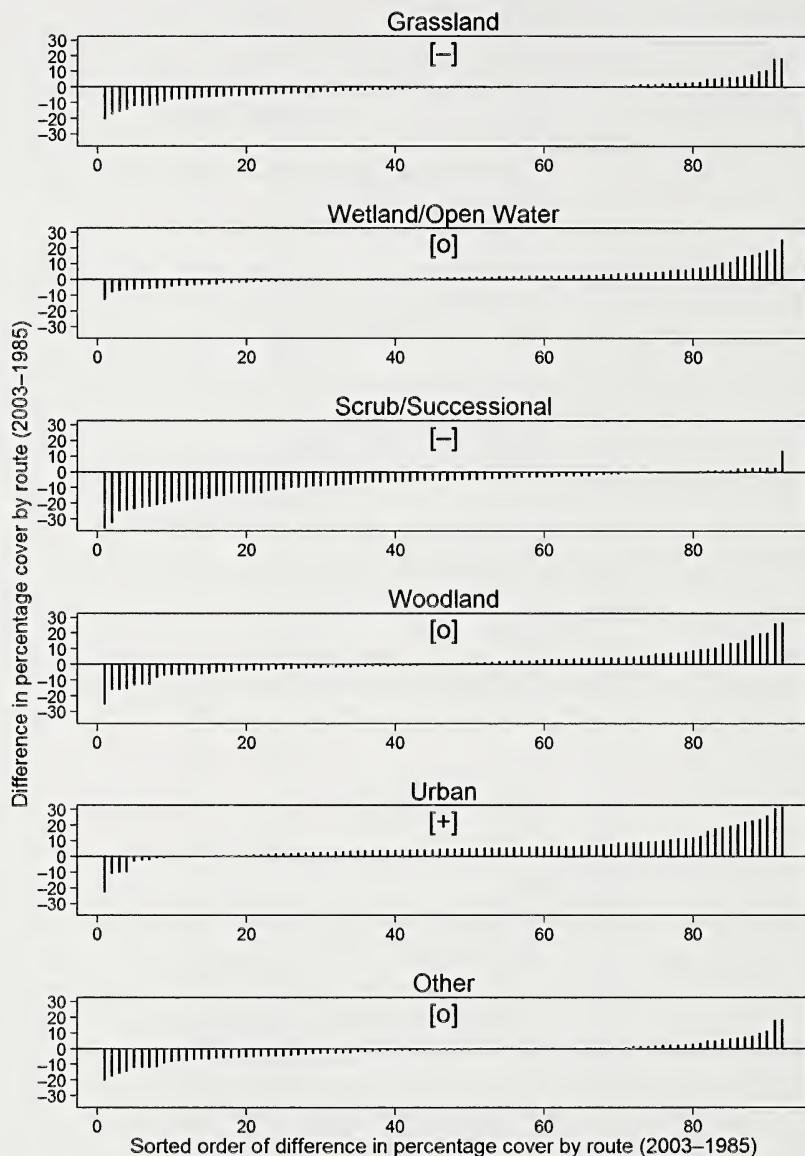


Figure 2. Estimates of differences between 1985 and 2003 in percentage land cover for 400-m buffer areas around 92 individual Breeding Bird Survey routes in Florida, sorted from greatest decrease to greatest increase. Each bar in each plot shows the change estimated for a land cover category on one BBS route. “-” in square brackets indicates that the number of negative changes significantly exceeds the number of positive changes in comparison to a 50:50 split; “+” in brackets indicates that the number of positive changes significantly exceeds the number of negative changes in comparison to a 50:50 split; “o” in brackets indicates that the number of positive changes did not significantly exceed the number of negative changes.

$df = 1$, $P = 0.36$), other vs. grassland (chi-square = 3.71, $df = 1$, $P = 0.05$), other vs. wetland/open water (chi-square = 1.50, $df = 1$, $P = 0.22$), and other vs. woodland (chi-square = 0.12, $df = 1$, $P = 0.73$). Route changes for grassland, scrub/succesional and urban covers were significantly different from 50:50 positive:negative splits (chi-square ≥ 20.32 , $df = 1$, $P = \text{at } P \leq 10^{-5}$), whereas those for three cover categories were not significantly different from 50:50: wetland/open water (chi-square = 3.521, $df = 1$, $P = 0.06$), woodland (chi-square = 0, $df = 1$, $P = 1.0$), and other (chi-square = 0, $df = 1$, $P = 1.0$) (Fig. 2).

Although absolute values of correlations between changes for pairs of land cover categories were generally not large, each change in a land cover category for a route buffer was significantly negatively correlated with at least one other category change (Table 3). Correlations were high between changes in land cover categories of the route buffer areas and the route sample areas, and correlations were similarly positive for differences based on the two areas (Table 4).

DISCUSSION

Accurate spatial and temporal information on the status of avian species is needed so that their ability to persist may be evaluated and appropriate conservation strategies determined (Ruth et al. 2003). Roads provide convenient transects that are easily sampled for estimating avian abundance and trends. However, bias may exist in abundance and trend estimates from roadside counts associated with

Table 3. Spearman correlations (r , above in each row) and $P(r=0)$ between differences (2003–1985) in percentage land cover categories for buffer areas of 92 Florida BBS routes.

| | Wetland/ open water | Scrub/ successional | Woodland | Urban | Other |
|--------------------|------------------------|------------------------|-----------------|----------------|------------------|
| Grassland | -0.28 0.01 | -0.21 0.04 | -0.31 0.003 | 0.17 0.11 | -0.032 0.77 |
| Wetland/open water | | -0.07 0.52 | -0.37 0.0003 | 0.03 0.75 | -0.11 0.32 |
| Scrub/succesional | | | -0.11 0.28 | -0.20 0.06 | -0.42 <0.0001 |
| Woodland | | | | -0.33 0.001 | 0.12 0.27 |
| Urban | | | | | -0.39 0.0001 |

Table 4. Mean percentage cover by land cover category for buffer and sample areas of 92 Florida BBS routes in 1985 and in 2003. Spearman correlations were all significantly different from 0 at $P < 0.0001$.

| Land cover type | 1985 | | Spearman correlations | | Spearman correlations | |
|--------------------|--------|-------------|-----------------------|-------|-----------------------|-------|
| | Buffer | Sample area | 1985 | 2003 | 2003 | 2003 |
| Grassland | 14.39 | 13.16 | 0.876 | 12.70 | 11.10 | 0.906 |
| Wetland/open water | 16.02 | 23.05 | 0.778 | 17.91 | 25.20 | 0.816 |
| Scrub/successional | 13.17 | 11.19 | 0.889 | 5.69 | 4.67 | 0.888 |
| Woodland | 36.79 | 35.82 | 0.818 | 37.77 | 36.92 | 0.870 |
| Urban | 6.77 | 6.35 | 0.683 | 12.69 | 10.94 | 0.533 |
| Other | 12.23 | 10.05 | 0.754 | 12.74 | 10.82 | 0.798 |

*Correlations between buffer and sample areas with respect to route-specific change (difference) in percentage cover from 1985 to 2003.

different representations of available habitat types and different rates of habitat change within the wider landscape (O'Connor et al. 2000).

Buffer areas around BBS routes in Florida appear to closely reflect composite land cover categories within sampling areas surrounding routes. Estimates of avian population trends should therefore be considered unbiased with respect to changes in habitat availability. The large number of routes ($N = 92$) in Florida may adequately sample major land cover categories. Large-scale (statewide or physiographic region) analysis of BBS data are not usually subject to large errors caused by environmental misrepresentation (Lawler and O'Connor 2004). Sauer et al. (2003) concluded that the summary of BBS data within North American Bird Conservation Regions (a geographic framework for management plans) appeared reasonable. Analyzing 52 BBS routes in the Northern Plains, Niemuth et al. (2007) found no significant differences between the routes and the route sample areas or “neighborhoods” for upland land cover classes but did detect differences in the representation of deep-water habitat that could bias trend inferences for wetland birds associated with this land cover. In contrast, Harris and Haskell (2007) found a significantly biased representation of land cover along unsurveyed roads and 50 BBS routes in Tennessee compared with land cover proportions of the entire state. Land cover biases changed over time, and simulations of bird trends indicated potential misrepresentation of trends for synanthropic birds and those occupying early-successional habitats sampled by BBS routes (Harris and Haskell 2007).

Studies at a smaller spatial scale evince greater potential bias in avian trend estimates from roadside surveys due to greater discrepancies in land cover between the route and the wider landscape. Examining roadside survey routes at 27 locations in Ohio, Bart et al. (1995) compared land cover at distances of 0–140 m with that at distances of 140–280 m, and with land cover in the surrounding 21 km² of the sampling area. They found little bias (<1%) in land cover among areas examined but detected less woodland cover along roads than in the surrounding sample area, which could affect avian trend estimates. A comparison of land cover within BBS route buffers of 200 m and 200–1600 m in Ohio ($N = 25$) and Maryland ($N = 28$) found similar differences in land cover at all distances from roads but significantly more urban cover closer to roads in Maryland (Keller and Scallan 1999). Betts et al. (2007) compared variation in the cover of woodland within 150 m of 22 BBS routes to the surrounding 1° block in New Brunswick, Canada, and related changes in woodland cover to a bias in trend estimates of the Blackburnian Warbler (*Setophaga fusca*).

Land cover changes within BBS route buffer areas in Florida from 1985 to 2003 were consistent with those in the route sample areas.

We expected more land cover change along BBS routes than within their sample areas because roadsides are generally more accessible for development. Perhaps land cover along BBS routes was similar to sample areas because of the ubiquity of roads within the landscape.

Relatively rare habitats and areas in Florida with fewer roads (e.g., dry prairie, salt marsh, mangrove forest) are underrepresented by BBS route placement, and land cover changes for these areas were not included in our study. The limited accuracy of Thematic Mapper satellite images may have introduced errors in land cover classification, but these would have been the same for route buffer areas as well as the route sample areas. Our adjustment of land cover categories available from different time periods (1985–1989 and 2003) may also have introduced error (see Kautz et al. 2007). Kautz et al. (2007) examined changes in land cover types in Florida from 1985–89 to 2003 and found an overall decrease in natural and agricultural lands, and a concomitant increase in developed areas. They provide detailed information on the locations and causes of major land cover changes in Florida during our study period.

The projected 90% increase in the conversion of rural land to developed area in Florida by 2030 (White et al. 2009) will almost certainly affect avian population trends. Because land use patterns can change rapidly, BBS route representation of the landscape should be assessed every 5–10 years (O'Connor et al. 2000). Remote sensing was a reliable and cost-effective method of quantifying changes in land cover patterns, and BBS routes should be reassessed whenever more recent land cover data become available. Future assessments should include ground-truthing of land-cover categories and should examine habitat fragmentation along BBS routes and within sampling areas, especially for the scrub/successional and grassland land cover categories. Our results pertaining to the representation of roadside habitats to the wider landscape may apply to the Nightjar Survey Network (see <http://www.nightjars.org/>), which uses portions of BBS routes to monitor abundance and trends in nightjars; they also may apply to other roadside surveys in Florida such as the North American Amphibian Monitoring Program (Weir and Mossman 2005) and the USFWS Mourning Dove (*Zenaida macroura*) call-count survey (Seamans et al. 2012).

Additional nonrandom BBS routes are needed to better sample dry prairie, salt marsh, and mangrove swamps. This type of route is established to monitor a specific area. Methods can be more flexible than for standard surveys, allowing disjunct count points (>0.8 km apart) and surveys may be conducted on foot or from watercraft. Although results from such routes are not included in the annual USGS analysis of BBS data, these data are available to the public

at the BBS website (<http://www.mbr-pwrc.usgs.gov/bbs/bbs.html>) and can contribute important trend information for local and statewide use. Current (2011) trend estimates for individual species at the statewide level also are available.

Because avian population trends can vary widely across geographic regions (Peterjohn and Sauer 1993), the spatial scale of future studies should be considered. Our land cover data identified large-scale habitat features, but birds also respond to local conditions (Cody 1981, Jones 2001, Johnson 2007) that are difficult to discern with remote sensing. Species-specific studies that include detailed habitat variables and demographic information are needed to determine the relationships between land cover changes and avian population trends.

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FIRST WINTER RECORD OF SWAINSON'S WARBLER (*Limnothlypis swainsonii*) FOR FLORIDA AND THE UNITED STATES

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Swainson's Warbler (*Limnothlypis swainsonii*, hereafter SWWA) is one of the most secretive bird species in the Nearctic and one of the least known. After its original description by Audubon in 1834 it took more than 50 years until the species was again mentioned in the scientific literature (Brewster 1885), and it took a further 85 years until more of its life history became known (Meanley 1971). Since then, several studies shed light on the life history traits and habitat preferences of the SWWA (summarized in Anich et al. 2010). However, knowledge of SWWA's ecology and conservation status in its migratory and wintering habitats is still scarce (but see Graves 1996).

Its breeding range is rather patchily distributed across the southeastern United States, ranging from rhododendron thickets in the Appalachian Mountains to the bottomland hardwood forests which form its main breeding habitat. This habitat has undergone strong fragmentation due to habitat loss (Gosselink and Lee 1989). Consequently, of the five characteristic bird species for this type of habitat (Askins 2002), three have already gone extinct or are possibly extinct, namely Carolina Parakeet (*Conuropsis carolinensis*), Ivory-billed Woodpecker (*Campephilus principalis*) and Bachman's Warbler (*Vermivora bachmanii*). In addition, a further specialist of this habitat is the Prothonotary Warbler (*Protonotaria citrea*) which is not yet threatened, despite its population is decreasing (Butcher & Niven 2007). Because of its habitat specialization and with an estimated global population size of just 84,000 individuals (Rich et al. 2004), the SWWA is of high conservation concern. The wintering range of the SWWA is located in the Greater Antilles and the Yucatán peninsula, as well as adjacent areas in Belize and Honduras (Ridgely et al. 2007). In this note, I provide the first documented winter record of a Swainson's Warbler in Florida, and the United States.

On 15 January 2013 a small passerine was discovered in the understory of a hardwood hammock along the Golden Orb Hiking Trail of Long Key State Park, Long Key, Monroe County, Florida. The bird was hidden but unperturbed by the observer while foraging in the litter layer ('leaf-lifting'). It was slightly smaller than an Ovenbird (*Seiurus aurocapilla*) but bulky bodied and without any strong plumage pattern, except a rather obvious pale supercilium that contrasted with a darker eye stripe. The bill was long and like a spike. The rufous crown slightly contrasted with the brownish body. The underparts of the bird were much paler than the upperparts, with flanks a pale grayish brown and the throat and breast a pale washed-out grayish yellow. The flanks and breast were unstreaked. The feathers were brighter towards the vent and the undertail coverts. The silent bird was observed for a few minutes until it disappeared in the thickets of the hammock.

As initial conditions prevented me from taking photographs, an extensive search for the bird was conducted the next day (16 January). After almost four hours of searching in the location, the bird was rediscovered ca. 50 m away in similar dense vegetation. A tape playback was not used and the bird remained silent. Again, it was followed for several minutes until a Gray Catbird (*Dumetella carolinensis*) snatched some prey from

the bird, which, apparently in consequence, left the site. However, documentary photos were taken showing the bird's distinctive characters while foraging (Fig. 1). Due to the dense vegetation (Fig. 2), the unfavorable light conditions, and the continual movement of the bird, I could not take a photograph showing the entire bird.

Despite its unobtrusive plumage, the SWWA is a rather distinctive Nearctic species. Its rather plain plumage patterns are reminiscent of the plumages of some Old World warblers of the genera *Acrocephalus* or *Phylloscopus* but are unique in North American passerines. However, Old World warblers typically do not forage in the litter layer and have several other distinctive features such as different body size, tail length, and bill shape. Other ground-living parulids like Ovenbird or waterthrushes (genus *Seiurus* and *Parkesia*) have a much more striking plumage pattern with heavily streaked breasts and flanks. Wrens (family *Troglodytidae*) differ by having barred wings or tail feathers and undertail coverts. SWWA shows no obvious barring. All these considerations support identification of the bird I saw on 15 January as SWWA.

Because the southernmost part of Florida including the Florida Keys is often seen as transitional between the Nearctic and the Caribbean zones in general and birds in particular, it was has been presumed that the SWWA might be a possible candidate for wintering in the continental U.S. (David Simpson and Robin Diaz, pers. comm.). The first evidence of a wintering bird in Florida (Lake Jessup area) dates back to 'winter of 1869' and a further record originates from Key Largo from 6 December 1971 (Stevenson and Anderson 1994). Both records are considered vague because the first lacks a definite date and the second is during the migration period for many southbound species (Andrew W. Kratter, pers. comm.). Two further records obtained during Christmas Bird Counts (CBC) from 22 December 1964 (Lower Keys CBC) and 15 December 1973 (New Port Richey CBC) are 'not accepted' by Stevenson and Anderson (1994). However, a bird banded at

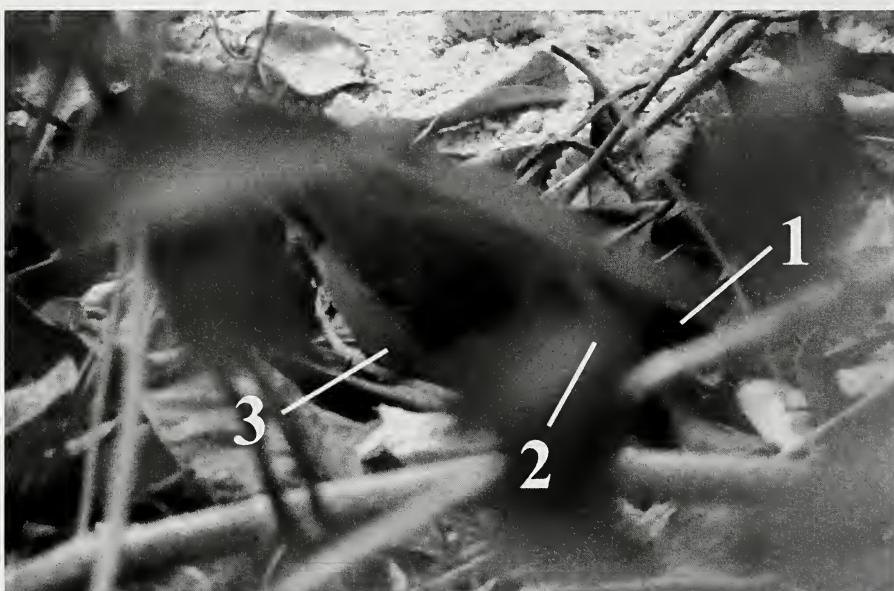


Figure 1. Picture of the foraging Swainson's Warbler in the litter layer of the hardwood hammock located at the Golden Orb trail of the Long Key State Park, Layton, FL. Distinctive features are highlighted: 1) rufous crown, 2) light supercilium, 3) unstriped flanks.



Figure 2. The dense vegetation of the hardwood hammock where the Swainson's Warbler was found. A) Respective habitat along the Golden Orb trail.

the Cape Florida Banding Station in 2006 most likely wintered in this area, although a final confirmation was not achieved (Robin Diaz, pers. comm.). This bird was banded on 29 September 2006 and thereafter recaptured six times until 3 November 2006, and then again on 12 March 2007. According to Robin Diaz (per. comm.), each time the bird was recaptured, its fat score was at the lower end but its muscle score at the higher end of the scale, indicating a healthy individual which was not in a migration mode (i.e. with high fat score), but its whereabouts between November and March remain unproven. However according to Stevenson and Anderson (1994), its last capture in fall was within the migratory period of the SWWA, whereas its first recapture in spring was just three days before the earliest recorded arriving day of SWWA in Florida (15 March). From this, a record in mid January would be the best evidence for a wintering bird in Florida.

For the past two decades, Pranty et al. (2008, and references therein) listed and documented verifiable first wintering records for Florida of seven bird species which normally winter in the Caribbean or in the Neotropics. Most of these observations might be rare events, however, they show that Florida is a rather exceptional place in the temperate Nearctic. Although we cannot document that the birds persist through the entire winter, their survival until January or February indicates that some may have endured the winter months in Florida. The winter season 2012/13 was exceptionally warm and dry, though (e.g., NOAA 2013). Thus, the outstanding warm conditions might have prompted some species to stay farther north than in normally cold winters (cf. La Sorte and Thompson 2007).

ACKNOWLEDGMENTS

I thank David Simpson and Robin Diaz for providing information on Swainson's Warbler wintering status in Florida. Furthermore, I am grateful to Rangel Diaz and Cath-

erine A. Close for fruitful discussions about rare bird sightings at the Florida Keys and Long Key State Park in particular and to Andre von Bloedau da Silveira for showing me that there is always a cheaper way to go to the Keys. Comments from Michelle Dickson, Andrew W. Kratter, Darius Stiels, Kathrin Schidelko and Tom Webber greatly improved this work. Finally, thank the founders of eBird. Without this platform this record would have never been recognized by the local experts highlighting me its value.

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WING-FLASHING IN A PARTIALLY LEUCISTIC BAHAMA MOCKINGBIRD (*Mimus gundlachii*) ON ALLEN CAY, EXUMA ISLANDS, BAHAMAS

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The Bahama Mockingbird (*Mimus gundlachii*) is native to the Bahamas, Cuba, and Jamaica (Aldridge 1984). It is a common resident in the Bahamas, and is found throughout the Exuma Islands, including sparsely vegetated small islets (Burden 1992). The Allen Cays lie in the northern Exuma Islands, approximately 55 km southeast of Nassau, New Providence, in the Commonwealth of the Bahamas (Iverson et al. 2004). The island group consists of three main islands, as well as a number of small rocky islets, and the vegetation height ranges 1-3 m.

Periodically between 6 and 11 May 2012, we observed a partially leucistic Bahama Mockingbird (Fig. 1a) across the southern half of Allen Cay (7 ha), but most frequently it remained near the island's landing beach (UTM 18R 313960.67 m E, 2738320.76 m N). The bird was most commonly observed vocalizing from prominent perches throughout most of the day.

Although leucism is perhaps one of the most common color aberrations in birds (van Grouw 2006), it is rarely observed in natural populations because it is often selected against (Ellegren et al. 2000, Slagsvold et al. 1988). This individual, possessing both partially and completely white feathers throughout its body, represents the first reported instance of leucism in Bahama Mockingbirds.

On 6 May 2012 at 1203 EST, we observed the mockingbird fly within 1 m of us onto an area of open limestone, where it leaned forward, spread its wings above its back, and began wing-flashing (Fig. 1b) at a Bahamian racer (*Cubophis vudii*). The mockingbird then chased the snake for approximately 3 m until the snake retreated into a crevice in the limestone (Fig. 1c). Wing-flashing has been described in several mimid species while foraging and in the presence of potential predators (e.g., Sutton 1946, Tomkins 1950, Haverschmidt 1953, Hicks 1955, Whitaker 1957, Selander and Hunter 1960, Burt et al. 1994). This behavior, most frequently observed in Northern Mockingbirds (*M. polyglottos*), is rarely observed in Bahama Mockingbirds (Aldridge 1984). The occurrence of both these unrelated and rare phenomena in one individual makes our observation even more unusual.

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Figure 1. a) Partially leucistic Bahama Mockingbird (*Mimus gundlachii*) on Allen Cay, Exuma Islands, Bahamas. b) Wing-flashing behavior of mockingbird as a Bahamian racer (*Cubophis vudii*) approaches. 3) Bahama Mockingbird wing-flashing at a Bahamian racer.

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FIELD OBSERVATIONS

Summer report: June-July 2013.—This report consists of significant bird observations compiled by the Field Observations Committee (FOC). Electronic submissions to the FOC should be in the following format: species, number of individuals, age and sex of the bird(s), color morph if applicable, location (including county), date, observer(s), and significance. Seasons are winter (December-February), spring (March-May), summer (June-July), and fall (August-November). Submit observations to regional compilers within two weeks after the close of each season, or to the state compiler within one month. Addresses of the compilers follow this report.

Sight-only observations are considered “reports” while only those observations supported by verifiable evidence (photographs, video or audio recordings, or specimens) are called “records.” Species for which documentation is required by the FOC and by the FOS Records Committee (FOSRC; fosbirds.org/official-florida-state-bird-list) are marked here with an asterisk (*). A county designation (in italics) accompanies the first-time listing of each site in this report. Abbreviations in this report are: AFB = Air Force Base, AFR = Air Force Range, EOS = end of season, NERR = National Estuarine Research Reserve, nm = nautical miles, NP = National Park, NSRA = North Shore Restoration Area, NWR = National Wildlife Refuge, SF = State Forest, SP = State Park, STA = Stormwater Treatment Area, STF = sewage treatment facility, WMA = Wildlife Management Area, and N, S, E, W etc., for compass directions. Bold-faced entries denote birds newly reported or verified in Florida, or record numbers.

SUMMARY OF THE SUMMER SEASON

While it was a rather uneventful season with no major storms, several noteworthy sightings were made including Florida's first Variegated Flycatcher discovered and photographed by Diane Reed at Guana Tolomato Matanzas Reserve NERR on 5 June and accepted by the FOSRC. Unfortunately, despite the efforts made by many other birders it was not relocated. The state's first breeding record of a Tropical Kingbird fledged four young at Lido Key. A Long-tailed Duck, Common Eider, and all three species of scoters were found summering at various sites throughout the state. Few other rarities were reported: Neotropic Cormorant at Peaceful Waters Sanctuary and a Fork-tailed Flycatcher at Lake Apopka NSRA.

I thank my predecessor as state editor & compiler, Bill Pranty. For 21 years Bill has painstakingly prepared these seasonal reports starting with the 1992 Summer Season. Bill was kind enough to help answer my many questions as the new state editor and look over an earlier draft of this report; however any mistakes made are mine alone.

SPECIES ACCOUNTS

BLACK-BELLIED WHISTLING-DUCK: 3 at Taminco Sanctuary (*Santa Rosa*) 3-29 Jun (L. Kelly, B. Furlow); 1 at Brooker Creek Preserve (*Pinellas*) 8 Jun (R. & L. Smith); 4 at Lehigh Acres (*Lee*) 15 Jun (J. Padilla); 1 at St. Johns River at SR-415 (*Volusia*) 20 Jun (M. Brothers); 3 at Milton (*Santa Rosa*) 7 Jul (K. Holley); 1 pair & 6 chicks at Tallahassee (*Leon*) 13 Jul (J. Cavanagh); 26 at Lem Turner spray fields (*Duval*) 13 Jul (D. Foster); 42 at Jefferson Collection Station 29 Jul (M. Smith, K. Seward).

FULVOUS WHISTLING-DUCK: 6 at Lake Apopka NSRA (*Orange*) 23 Jun (H. Robinson); 3 at Wauchula (*Hardee*) 27 Jun (C. Fredricks et al.).

- GREATER WHITE-FRONTED GOOSE:** 2 at Bystre Lake (*Hernando*) through 2 Jun (S. Mann et al.).
- CANADA GOOSE:** 51 at The Villages (*Lake*) 6 Jul is an increase within the local flock (J. Dinsmore).
- EURASIAN WIGEON:** 1 male at Cape Coral (*Lee*) through 15 Jun (J. Padilla).
- BLUE-WINGED TEAL:** 3 at Merritt Island NWR (*Brevard*) 14 Jun (D. Freeland); 2 at Ritch Grissom Memorial Wetlands, Viera (*Brevard*) 30 Jun (P. Mansfield); as many as 2 at Paynes Prairie Preserve SP (*Alachua*) through 17 Jul (J. Mays et al.).
- REDHEAD:** 2 summered at Tierra Verde (*Pinellas*; R. Smith et al.); 1 at Cockroach Bay Preserve (*Hillsborough*) 2 Jun (R. Sullivan).
- RING-NECKED DUCK:** 1 at south Jacksonville (*Duval*) 26 Jun (T. Rohlatsu).
- GREATER SCAUP:** 1 at Seminole (*Pinellas*) 1 Jun (R. Smith).
- LESSER SCAUP:** as many as 2 at Newnans Lake (*Alachua*) 2-25 Jun (M. Manetz, R. Rowan, J. Hintermister); 8 at Cedar Key (*Levy*) 18 Jun (J. Hintermister); 9 at Palm Shores (*Brevard*) 25 Jun (D. Freeland); 1 female at William E. Dunn STF (*Pinellas*) 23-31 Jul (J. Wells).
- COMMON EIDER:** 1 summered at Clearwater Pass (*Pinellas*; T. Young, et al.).
- SURF SCOTER:** 1 male at Ponce de Leon Inlet (*Volusia*) 12 Jun (M. Brothers); 1 summered at Alligator Point (*Franklin*; J. Murphy).
- WHITE-WINGED SCOTER:** 1 male at Hillsborough Bay (*Hillsborough*) 1-15 Jun (C. Cassels et al.); 1 at Huguenot Memorial Park (*Duval*) 1-22 Jun (K. Dailey); 1 female summered at Al Palonis Park (*Hillsborough*; B. Marcischak et al.).
- BLACK SCOTER:** 1 female Halifax River, Port Orange (*Volusia*) 10 Jun (M. Brothers); 21 summered at Huguenot Memorial Park (K. Dailey).
- LONG-TAILED DUCK:** 1 at Hillsborough Bay 1 Jun (C. Cassels et al.); 1 at Cape San Blas (*Gulf*) 14 Jun (J. Murphy).
- HOODED MEGANSER:** 1 male at Deltona (*Volusia*) 17 Jun (E. Shaperow *fide* M. Brothers).
- RED-BREASTED MEGANSER:** 1 at Helen Floyd Cooper Park (*Duval*) 9 Jun (T. Rohlatsu).
- RUDDY DUCK:** 2 at Newnans Lake 25 Jun (R. Rowan, J. Hintermister).
- COMMON LOON:** 1 at Green Key (*Pasco*) 28 Jun (K. Tracey).
- HORNED GREBE:** 1 at Green Key 24 Jun (K. Tracey); 1 at Newnans Lake 25 Jun (J. Hintermister, R. Rowan).
- AMERICAN FLAMINGO:** 1 near Florida's Turnpike and Glades Road (*Palm Beach*) 29 Jul (L. & D. Connor).
- BLACK-CAPPED PETREL:** 2 birds 61 nm off Ponce de Leon Inlet 21 Jul (M. Brothers et al.).
- CORY'S SHEARWATER:** 6 off Fort Clinch (*Nassau*) 2 Jun (M. Brothers); 1 bird 8 nm off New Port Richey (*Pasco*) 14 Jun (K. Tracey); 25 as many as 78 nm off Ponce de Leon Inlet 21 Jul (M. Brothers et al.).
- GREAT SHEARWATER:** 1 at Ponce de Leon Inlet 24 Jun (M. Brothers); 1 bird 78 nm off Ponce de Leon Inlet 21 Jul (M. Brothers et al.).
- AUDUBON'S SHEARWATER:** 6 birds as many as 78 nm off Ponce de Leon Inlet 21 Jul (M. Brothers et al.).
- WILSON'S STORM-PETREL:** 38 birds as many as 78 nm off Ponce de Leon Inlet 21 Jul (M. Brothers et al.).
- BAND-RUMPED STORM-PETREL:** 4 birds as many as 83 nm off Ponce de Leon Inlet 21 Jul (M. Brothers et al.).
- MAGNIFICENT FRIGATEBIRD:** 1 at Cocoa Beach (*Brevard*) 30 Jun (P. Mansfield); 1 at Merritt Island NWR 4 Jul (D. Freeland).
- MASKED BOOBY:** 1 subadult off Miami (*Miami-Dade*) 14 Jul (R. Torres).
- BROWN BOOBY:** 1 subadult at Fort De Soto Park (*Pinellas*) 15 Jul-EOS (T. Hart et al.).
- ***NEOTROPIC CORMORANT:** 1 at Peaceful Waters Sanctuary (*Palm Beach*) 8 Jun-3 Jul (M. Gomes).

- DOUBLE-CRESTED CORMORANT:** 2 at Gulf Breeze (*Santa Rosa*) 7 Jun (B. Duncan) where very rare in Jun.
- AMERICAN WHITE PELICAN:** 7 at Lake Apopka NSRA, Clay Island (*Lake*) 1 Jun (P. Hueber et al.); 113 at Lake Apopka NSRA 7 Jun (H. Robinson); 4 at Lake Dora, Tavares (*Lake*) 28 Jun (J. Dinsmore); 5 at Tallahassee 3 Jul (H. Hooper); 26 at Taminco Sanctuary 7 Jul (L. Kelly, B. Furlow); 32 at International Paper Wetlands (*Escambia*) 13 Jul & 52 there 27 Jul (J. & B. Callaway); 2 at The Villages (*Marion*) 19 Jul (J. Dinsmore).
- BROWN PELICAN:** as many as 4 summered at Spring Lake, Altamonte Springs (*Seminole*; P. Hueber).
- AMERICAN BITTERN:** 1 at Lake Apopka NSRA 14 Jun (H. Robinson).
- WHITE-FACED IBIS:** 1 at Sanderson (*Baker*) 2 Jun (B. Richter); 1 at Brookridge STF (*Hernando*) 30 Jun-22 Jul (J. & S. Mann, M. Gardler et al.).
- ROSEATE SPOONBILL:** 69 at Cedar Key 19 Jun (R. Rowan); 26 at Withlacoochee Trail (*Citrus/Levy*) 6 Jul (C. & K. Bandyk); 2 at Panacea (*Wakulla*) 13 Jul (D. Bryan).
- OSPREY:** 144 at Lake Apopka NSRA 14 Jun (H. Robinson).
- SWALLOW-TAILED KITE:** 640 at Lake Apopka NSRA 23 Jun (H. Robinson); 38 at Wacissa (*Jefferson*) 22 Jul (B. Bergstrom, M. Smith); as many as 30 summered along Powerline Road (*Hernando/Pasco*; P. Trunk et al.).
- WHITE-TAILED KITE:** 1 at Kissimmee Prairie Preserve SP (*Okeechobee*) 26 Jul (C. Bespolka).
- SNAIL KITE:** 1 at Blue Lake, Lake Wales (*Polk*) 2 Jun (Y. Tanner); 1 at Lake Apopka NSRA 5 Jun (H. Robinson); 1 at Orlando Wetlands Park (*Orange*) 15 Jun (K. Hamblett et al.); 1 at Edward Medard Park (*Hillsborough*) 6-8 Jul (J. Paisley).
- MISSISSIPPI KITE:** 2 along Powerline Road 1 Jun-8 Jul (M. Gardler et al.); 2 at Ridge Manor West (*Hernando*) 8-12 Jun (L. Lane); 1 at Lake Apopka NSRA 12 Jun (H. Robinson); 1 at Mount Dora (*Lake*) 27 Jun-5 Jul (E. Horn); 20 at M&M Dairy (*Duval*) 6 Jul (K. Dailey).
- NORTHERN HARRIER:** 1 off SR-724 (*Okeechobee*) 26 Jul (C. Bespolka).
- SHORT-TAILED HAWK:** 1 dark morph at Dallas White Park (*Sarasota*) 14 Jun (B. Pranty et al.); 1 light morph at Central Park, Ormond Beach (*Volusia*) 20 Jun (M. Brothers); 1 at Newnans Lake 29-30 Jun (A. Zions, M. Zeglen); 1 light morph at Sanibel Island (*Lee*) 6 Jul (K. Werner); 1 at Hague (*Alachua*) 28 Jul-EOS (R. Rowan, A. Zions et al.).
- BLACK RAIL:** 1 vocalized at Three Lakes WMA (*Osceola*) 18 Jul (A. Larned, C. Mezebish).
- KING RAIL:** 2 at Lake Apopka NSRA 28 Jun (H. Robinson).
- PURPLE SWAMPHEN:** 2 at Harney Pond Canal Recreational Area (*Glades*) 1-2 Jun (E. Haney et al.).
- PURPLE GALLINULE:** 2 at Possum Branch Preserve (*Pinellas*) 2 Jun (T. Mast).
- SANDHILL CRANE:** 4 (2 adults, 2 colts) at New World Avenue (*Duval*) 23 Jun-4 Jul (T. Rohlatsu) furnished the first breeding report in *Duval*.
- BLACK-BELLIED PLOVER:** 6 at Merritt Island NWR 1 Jun (D. Freeland).
- SNOWY PLOVER:** 2 at Fort De Soto Park 16 Jun (S. Tavaglione).
- SEMIPALMATED PLOVER:** 2 at Merritt Island NWR 14 Jun (D. Freeland).
- AMERICAN OYSTERCATCHER:** 1 at Opal Beach, Gulf Islands National Seashore (*Escambia*) 6 Jun (B. & L. Duncan); 2 adults, one incubating eggs, at Port Orange 7 Jun (M. Brothers).
- BLACK-NECKED STILT:** 32 at Brookridge STF 10 Jul (D. Gagne).
- AMERICAN AVOCET:** 1 at Fort De Soto Park 1 Jun (S. Janes); 1 at Three Rooker Island (*Pinellas*) 19 Jun (M. Vetricek et al.); 100+ summered at Seahorse Key (*Levy*; fide D. Henderson).
- SPOTTED SANDPIPER:** 1 at San Felasco Hammock SP (*Alachua*) 20 Jul (J. Mays); as many as 5 at Hague Dairy 27 Jul-EOS (M. Manetz, R. Rowan et al.).

- SOLITARY SANDPIPER:** 5 at Brookridge STF 19 Jul (M. Gardler); 2 in northern *Jefferson* 22 Jul (B. Bergstrom, M. Smith); 3 at Orlando Wetlands Park 22 Jul (J. Leavens); as many as 9 at Hague 27 Jul-EOS (M. Manetz, J. Hintermister et al.).
- GREATER YELLOWLEGS:** 3 at Merritt Island NWR 1 Jun (D. Freeland); 1 at Three Rooker Island 16-19 Jun (R. Smith et al.); 1 at Newnans Lake 14 Jun (S. Ewing, D. Ewing); as many as 19 at Brookridge STP 11 Jun-EOS (A. & B. Hansen et al.); 1 at Watermelon Pond (*Alachua*) 12 Jul (S. Ewing et al.).
- LESSER YELLOWLEGS:** 6 at Merritt Island NWR 1 Jun (D. Freeland); 12 at Brookridge STF 23 Jul (A. & B. Hansen et al.); 2 at Hague Dairy 30 Jul (M. Manetz).
- WHIMBREL:** 2 at Three Rooker Island 16-19 Jun (R. Smith et al.).
- RUDDY TURNSTONE:** 2 at Titusville (*Brevard*) 1 Jun (D. Freeland).
- SEMIPALMATED SANDPIPER:** 4 at Merritt Island NWR 1 Jun (D. Freeland); 1 at Ponce de Leon Inlet 26 Jul (M. Brothers); 1 at Hague 27 Jul (J. Hintermister, R. Rowan).
- LEAST SANDPIPER:** 6 at Merritt Island NWR 1 Jun (D. Freeland); 1 at Watermelon Pond 12 Jul (S. Ewing, M. Manetz et al.); 49 at Brookridge STF 23 Jul (D. Gagne); as many as 9 at Hague 27 Jul-EOS (M. Manetz, A. Zions et al.).
- WHITE-RUMPED SANDPIPER:** 1 at Merritt Island NWR 1 Jun (D. Freeland); 6 at Homestead (*Miami-Dade*) 6 Jun (R. Torres); many in *Pinellas* during the first two weeks in Jun highlighted by 4 at Honeymoon Island SP 13 Jun (P. Plage); as many as 3 at Port Orange 4-17 Jun (M. Brothers).
- PECTORAL SANDPIPER:** 1 at Brookridge STF 8 Jul (M. Gardler); up to 4 at Hague Dairy 27 Jul-EOS (M. Manetz, J. Hintermister et al.); 4 at Old Dixie Highway (*Pasco*) 31 Jul (B. Pranty, D. Gagne).
- STILT SANDPIPER:** as many as 3 at Brookridge STF 29 Jun-22 Jul (A. & B. Hansen et al.).
- BUFF-BREASTED SANDPIPER:** 1 at Alligator Point (*Franklin*) 26 Jul (J. Murphy).
- RED-NECKED PHALAROPE:** 9 off Fort Clinch 2 Jun (M. Brothers).
- RING-BILLED GULL:** 1 at Newnans Lake 5-7 Jun (A. Kendall et al.).
- LESSER BLACK-BACKED GULL:** 1 adult at Huguenot Memorial Park 15 Jun (K. Dailey); 1 at Treasure Island Beach (*Pinellas*) 18 Jun-EOS (W. Meehan).
- GREAT BLACK-BACKED GULL:** 1 at Port Orange 8 Jun (J. Stefancic); 1 at Treasure Island Beach 19 Jul-EOS (B. Forrys).
- BROWN NODDY:** 1 adult off Miami 29 Jun (R. Torres).
- SOOTY TERN:** 1 juvenile at Longboat Key (*Sarasota*) 6 Jun (S. Wilson et al.); 1 at Three Rooker Island 1-16 Jun (S. Crawford et al.); 1 found dead at Shell Key Preserve (*Pinellas*) 9 Jun (T. Ploger); 22 birds 61-78 nm off Ponce de Leon Inlet 21 Jul (M. Brothers et al.); 2 adults at old St. George Island Causeway (*Franklin*) throughout reporting period (J. Murphy).
- BRIDLED TERN:** 7 birds as many as 83 nm off Ponce de Leon Inlet 21 Jul (M. Brothers et al.).
- LEAST TERN:** 1 at Newnans Lake 8 Jun (R. Rowan, A. Kratter); 4 at The Villages (*Sumter*) 21 Jun (J. Dinsmore).
- GULL-BILLED TERN:** 2 at Harney Pond Canal Recreational Area 2 Jun (B. Wagner); 2 at Ponce de Leon Inlet 12 Jun (M. Brothers); 2 at Weedon Island Preserve (*Pinellas*) 29 Jun (R. Smith et al.); 1 at Gandy Beach (*Pinellas*) 29 Jun (J. Fitzgerald).
- CASPIAN TERN:** 1 at Newnans Lake 8 Jun (J. Mays).
- BLACK TERN:** 25 at Three Rooker Island 2 Jun & 350 there 13 Jul (L. Kenney); 1 at Watermelon Pond 12 Jul (R. Rowan, S. Ewing et al.).
- COMMON TERN:** 60 at Fort De Soto Park 6 Jun (E. Plage); 100 at Three Rooker Island 19 Jun (M. Vetricek et al.).
- FORSTER'S TERN:** 2 at Magnolia Park, Apopka (*Orange*) 14 Jun (P. Hueber); 1 at Newnans Lake 27 Jun (J. Mays); 19 at Tavares 28 Jun (J. Dinsmore); 20 at Bystre Lake 16 Jul (D. Gagne).
- ROYAL TERN:** 16 at Silver Lake (*Lake*) 12 Jun (J. Dinsmore).

- BLACK SKIMMER: 26 at Lake Apopka NSRA 9 Jun (H. Robinson); 19 at Silver Lake 12 Jun (J. Dinsmore).
- PARASITIC JAEGER: 1 off St. Petersburg Beach (*Pinellas*) 15 Jun (E. Plage).
- WHITE-WINGED DOVE: 13 at Lake Apopka NSRA 26 Jun (H. Robinson).
- MOURNING DOVE: 640 at Lake Apopka NSRA 30 Jun (H. Robinson).
- COMMON GROUND-DOVE: 47 at Lake Apopka NSRA 23 Jun (H. Robinson).
- MANGROVE CUCKOO: 3 at Bunche Beach (*Lee*) 17 Jun (C. Black).
- SMOOTH-BILLED ANI: 1 at Long Key SP (*Monroe*) 4 Jun (J. House); 1 at Fort Zachary Taylor Historic SP (*Monroe*) 21 Jun-8 Jul (M. Hedden).
- BARN OWL: 3 at Lake Apopka NSRA 19 Jun (H. Robinson).
- BURROWING OWL: 29 at Kissimmee Prairie Preserve SP 11 Jul (P. Miller).
- RUBY-THROATED HUMMINGBIRD: 1 female at Corkscrew Swamp Sanctuary (*Collier*) 2 Jun (B. Ahern et al.).
- BELTED KINGFISHER: singles at Gainesville 16 Jun (F. & I. Goodwin) and 19 Jul (A. & G. Kent); 1 at Newnans Lake 25 Jun-4 Jul (R. Rowan, J. Hintermister et al.).
- HAIRY WOODPECKER: 2 at International Paper Wetlands 20 Jul (J. & B. Callaway).
- CRESTED CARACARA: 1 at St. Johns River at SR-46 (*Volusia*) 20 Jun (M. Brothers).
- AMERICAN KESTREL: 1 male at DeBary (*Volusia*) 18 Jun (E. Shaperow *fide* M. Brothers); 1 female & male at Lake Apopka NSRA 8 & 14 Jul respectively (P. Hueber).
- MERLIN: 1 at Lake Apopka NSRA 5 Jun (H. Robinson).
- MONK PARAKEET: 6 pairs at Patrick AFB (*Brevard*) 1-30 Jun (D. Freeland).
- NANDAY PARAKEET: 3 visited a cavity at Fort Myers (*Lee*) 7 Jun (J. Padilla); 3 at South Lake Bonnet, Lakeland (*Polk*) 29 Jun (N. Langwald et al.).
- *VARIEGATED FLYCATCHER: 1 at Guana Tolomato Matanzas NERR (*St. Johns*) 5 Jun (D. Reed et al.; photos to FOSRC) provided the first Florida record.
- *TROPICAL KINGBIRD: 1 female at Lido Key (*Sarasota*) incubated four eggs that hatched by 11 Jun, and fledged four young by 29 Jun (S. Wilson, V. Ponzo et al.) providing the first Florida breeding record & 1 additional adult there 23 Jun-EOS (S. Wilson et al.); 1 at Rookery Bay NERR (*Collier*) 4 Jun (M. Higgins).
- GRAY KINGBIRD: 2 at Marsh Landing (*Duval*) 2 Jun (J. Wheat); 1 at Lake Apopka NSRA 9 Jun (H. Robinson).
- SCISSOR-TAILED FLYCATCHER: 1 at *Okaloosa* STF 27 Jul (M. Swan).
- FORK-TAILED FLYCATCHER: 1 at Lake Apopka NSRA 17-22 Jul (H. Robinson et al.).
- FLORIDA SCRUB-JAY: 1 at Jim Keene Boulevard, Winter Haven (*Polk*) 1 Jul (C. Fredricks et al.).
- TREE SWALLOW: 1 at Newnans Lake 2 Jun (L. Davis); 1 at Lake Apopka NSRA 21 Jun (H. Robinson).
- CLIFF SWALLOW: 1 at Lake Apopka NSRA 23 Jun (H. Robinson).
- CAROLINA CHICKADEE: 1 at A. D. "Doug" Barnes Park (*Miami-Dade*) 4 Jul-EOS (T. Mitchell et al.).
- TUFTED TITMOUSE: 1 at Riverbend Park (*Palm Beach*) 2 Jun (S. McKemy).
- AMERICAN ROBIN: 3 including 1 fledgling at Hyde Grove (*Duval*) 5 Jun (C. Wainwright); 1 fledgling in e. *Orange* brought to a local rehabber 10 Jun (L. Williams *fide* A. Vinokur); 1 at Ortega Farms (*Duval*) 12 Jun (B. Richter); 1 near Bradley Junction (*Polk*) 14 Jun (C. Fredricks et al.); 1 at Gainesville 29 Jul (G. Parks).
- GRAY CATBIRD: 1 at Paynes Prairie Preserve SP 7 Jun (J. Mays).
- BAHAMA MOCKINGBIRD: 1 at Fort Zachary Taylor SP 2 Jun (D. Patton, M. Hedden).
- CEDAR WAXWING: 1 at Lochloosa Conservation Area (*Alachua*) 4 Jun (J. Bryan).
- WORM-EATING WARBLER: 1 at Micanopy (*Alachua*) 31 Jul (M. Manetz).
- LOUISIANA WATERTHRUSH: 1 at Orange Park (*Clay*) 6 Jul (L. McCullagh); 1 at Paynes Prairie Preserve SP 16 Jul (J. Mays); 1 at Chassahowitzka WMA (*Hernando*) 20 Jul (A. & B. Hansen).

BLACK-AND-WHITE WARBLER: 1 male sang at Cedar Key 11 Jun (D. Henderson); 1 at Newnans Lake 12 Jul (J. Hintermister); 3 at Six Mile Cypress Slough Preserve (*Lee*) 21 Jul (V. McGrath); 1 at Orlando Wetlands Park 22 Jul (J. Leavens).

PROTHONOTARY WARBLER: 1 at John Chesnut Park (*Pinellas*) 2 Jun (R. Smith).

SWAINSON'S WARBLER: 1 male in song at Bloody Bluff Road (*Franklin*) 21 Jun (J. Murphy).

AMERICAN REDSTART: 1 at Gainesville 1-2 Jun (R. Robinson); 1 at Lake Worth (*Palm Beach*) 8 Jun (C. Weber); 2 at Central Winds Park (*Seminole*) 23 Jul (J. Leavens); 1 at Boardman (*Marion*) 26 Jul (J. Hintermister); 1 female at Altamonte Springs 26 Jul (P. Hueber); 1 at Newnans Lake 28 Jul (M. Manetz).

YELLOW WARBLER: 1 at Paynes Prairie Preserve SP 27 Jul (R. Rowan).

YELLOW-THROATED WARBLER: 3 at Six Mile Cypress Slough Preserve 22 Jul (E. Combs).

PRAIRIE WARBLER: 8 singing at Tarpon Key (*Pinellas*) 4 Jun (E. Plage); 1 at Paynes Prairie Preserve SP 9 Jul (J. Mays); 12 at Lake Apopka NSRA (*Lake*) 19 Jul (R. Stalnaker).

YELLOW-BREASTED CHAT: 7 at Lake Apopka NSRA 5 Jun (H. Robinson); 1 at Three Lakes WMA (*Osceola*) 14 Jul (T. Towles).

BACHMAN'S SPARROW: 3 at Guana Tolomato Matanzas NERR 4 Jun (T. Blunden); 1 at Julington-Durbin Preserve (*Duval*) 12 Jul (C. Fredricks).

FLORIDA GRASSHOPPER SPARROW: 95 singing males detected in point-count surveys this season; 3 males and 1 female at Avon Park AFR (*Highlands*) including first breeding documented there since 2009 (G. Schrott); 25 at Kissimmee Prairie Preserve SP (*Okeechobee*; P. Miller); 67 at Three Lakes WMA (*Osceola*; T. Hannon).

BLUE GROSBEAK: 16 at Lake Apopka NSRA 16 Jun (H. Robinson).

INDIGO BUNTING: 1 near Bradley Junction 14 Jun (C. Fredricks et al.); 1 at Brooker Creek Preserve through 15 Jun (T. Mast); 30 at Lake Apopka NSRA 30 Jun (H. Robinson).

PAINTED BUNTING: as many as 2 at Lake Apopka NSRA 2-23 Jun (H. Robinson); 4 (3 males singing and 1 female) along County Line Ditch Road (*Volusia*) 8 Jun (M. Brothers); 1 male at Boyd Hill Nature Preserve (*Pinellas*) 14 Jun (S. Tavaglione).

BOBOLINK: 1 at John Chesnut Park 1 Jun (E. Tess); 1 at Lake Apopka NSRA 7 Jun (H. Robinson).

SHINY COWBIRD: 2 at Lake Apopka NSRA 5 Jun (H. Robinson); 1 at the Celery Fields (*Sarasota*) 19 Jun (C. Herzog).

ORCHARD ORIOLE: 18 at Lake Apopka NSRA 5 Jun (H. Robinson); 2 at The Villages (*Summer*) 16 Jun (J. Dinsmore), where the species has bred in past years.

HOUSE FINCH: 5 at Lake Apopka NSRA 23 Jun (H. Robinson).

AMERICAN GOLDFINCH: 1 at Salt Springs (*Marion*) 19-22 Jun (A. Luzader); 1 at Tallahassee 23 Jun (B. Johnson).

NUTMEG MANNIKIN: continued to be widely reported in the Pensacola (*Escambia*) area and reports are now coming from neighboring Baldwin County, Alabama (*fide* B. & L. Duncan).

PIN-TAILED WHYDAH: singles at Pensacola 5 Jun (J. Brinson) and 24 Jul (A. Carr, S. Rose).

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