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NEST SITES OF FLORIDA SANDHILL CRANES IN SOUTHWESTERN FLORIDA

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Abstract.—We located twenty-eight nest sites of the Florida Sandhill Crane in southwestern Florida during the 1991 breeding season. Similar to other studies, all sites were classified as palustrine emergent wetlands. Average wetland area and average maximum depth were 5.96 ha and 0.61 m, respectively. Vegetation assessments at seven of the sites yielded 82 plant species. *Panicum hemitomon, Sagittaria lancifolia, Pontederia cordata* and *Eleocharis interstincta* were the most common species and also contributed the most cover. Twenty-four of the 28 nests were found in isolated temporary wetlands of less than 23 ha, which illustrates the importance of relatively small isolated wetlands. Because of this, the crane population in southwestern Florida may be vulnerable to pressure from future development. Conservation efforts should recognize the importance of protecting small isolated wetlands within a matrix of uplands.

The Florida Sandhill Crane (*Grus canadensis pratensis)* is one of three nonmigratory subspecies of the Sandhill Crane. It is estimated that there are 4000-6000 individuals (Williams 1978, Logan and Nesbitt 1987) of this subspecies occurring primarily in central Florida (Walkinshaw 1976, 1982); however, the range extends from Okefenokee Swamp in southern Georgia (Bennett 1989) to the Everglades (Kushlan 1982).

Crane nesting habitat has been described from Loxahatchee National Wildlife Refuge (Thompson 1970) in southeastern Florida, and from Myakka River State Park and C. M. Webb Wildlife Management Area (Bishop 1988, Bishop and Collopy 1987) in west central Florida. Both of these areas differ to some extent from southwestern Florida. Although the population in Florida is relatively stable (Nesbitt 1992) some segments or sub-populations may be declining (Layne 1983). Probable causes for this decline include direct loss of habitat as well as drainage of wetlands, which has reduced the suitability of nest sites (Layne 1983). Because the Florida subspecies requires an area with at least some standing water to initiate nesting (Layne 1981), the remaining wetlands in southwestern Florida are of particular concern. The objective of this study was to determine what was important nesting habitat to cranes in southwestern Florida. Presented here are vegetative and topographic descriptions as well as distribution information on ponds used for nest sites of Florida Sandhill Cranes found on and around the Immokalee Rise in southwestern Florida.

Study Area

The study area, located in southwestern Florida (26° 52.5'N to 26° 7.5'N and 81° 37.5'W, to 80° 52.5'W), is 6216 km^2 and is represented by five physiographic regions (Fernald and Patton 1984) (Fig. 1). The most predominant of the five regions is the Immokalee Rise, which includes most of Hendry county and parts of Lee, Glades and Collier counties. The central portion of the study area is made up of a mosaic of pine flatwoods and temporary wetlands, the southern third is primarily cypress forest, and the northern third is agricultural areas.

Historically, before 1940 this area was comprised of marsh and wet prairie (41%), pineland systems (29%), cypress stands (18%), and grassy scrub systems (9%) (University of Florida, Center for Wetlands). By 1989 much of this area had been converted to open range and cattle pasture (28%) and other agricultural uses (18%) (Mazzotti et al. 1992).

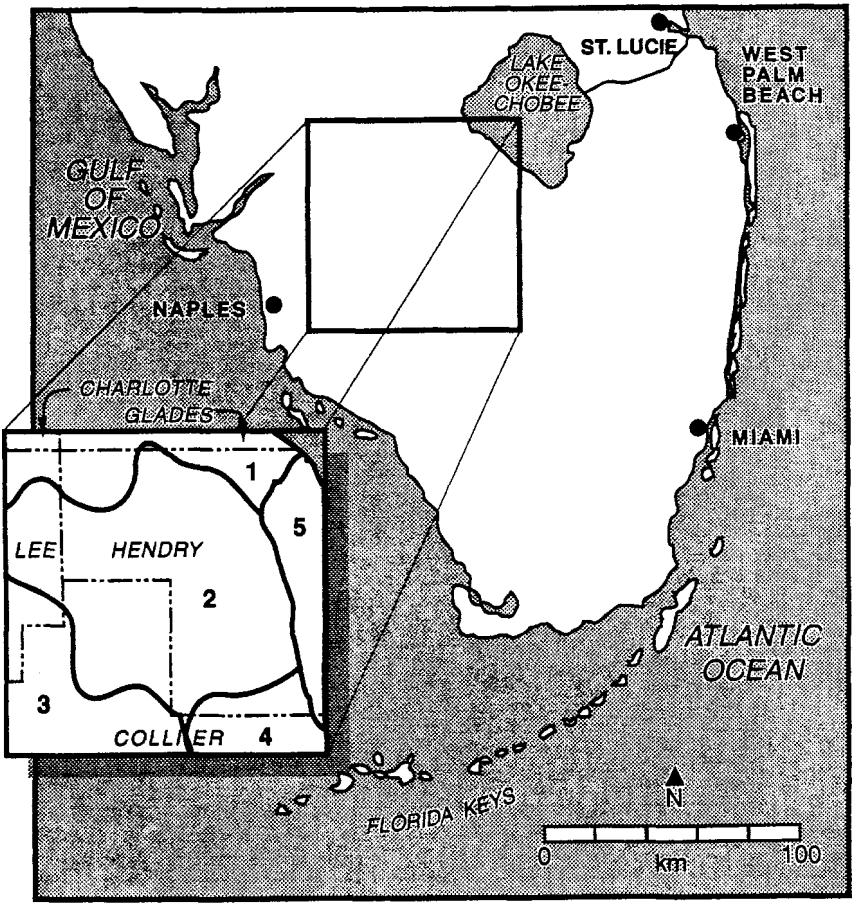

Figure 1. Study area and physiographic regions of southwestern Florida: 1=Caloosahatchee Valley, 2=Immokalee Rise, 3=Southwestern Slope, 4=Big Cypress Spur, 5=Everglades.

METHODS

Two types of surveys were used between January 1991 and June 1991 to locate crane nests: 1) aerial surveys and 2) road surveys. Peak nesting at Myakka River State Park for the years 1984, 1985, 1986 were 9 March, 11 March and 12 March, respectively (Bishop 1988); therefore, survey efforts were centered around these dates. A crane nest site was defined by the presence of a developed platform or the presence of an adult on the nest. Not all nests were verified as being active.

Most nest sites were classified using National Wetlands Inventory (NWI) maps (Cowardin et al. 1979). Areas were calculated by digitizing wetland outlines from these maps. Eleven of these nest sites were visited on the ground. Nest diameter and plant species composition of nest material were recorded when possible. The remaining sites were not available to us for field inspection; however, aerial surveys suggest they were similar to those wetlands that were visited in both size and NWI classification.

Wetland topography was determined for the 11 nest sites using a CLS Super Mite laser leveler. Determination of gradient was accomplished by running two transects perpendicular to each other through the center of each wetland starting from the outer edge of the wetland as defined by vegetation type. This was performed on 10 of the 11 sites for a total of 21 transects (at one site only one transect was run). Changes in elevation were recorded every 9.1, 18.3 or 27.4 meters along the transect depending on the size of the wetland.

Plant species cover abundance ratings were determined for seven of the eleven sites (selection of these sites was based on access) using a cover-abundance scale (Mueller-Dombois and Ellenberg 1974) on 29 May, 30 May and 27 June 1991. Vegetation assessments were made from 1-m^2 plots at intervals of 9.1, 18.3 or 27.4 meters along one transect through the central portion of the site. Species richness and percent cover-abundance for each species were determined for each plot using five different vegetation height classes (submerged, vines, < 1 m, 1 to 2 m, and > 2 m) and 7 different cover classes: solitary with small cover; few with small cover; numerous but < 5% cover; any number and 5-25% cover; any number and 25-50% cover; any number and 50-75% cover; and any number and > 75% cover. Qualitative vegetation assessment for species richness and relative abundance was conducted at all 11 sites using a meandering survey method.

RESULTS

Twenty-six nest platforms were located during aerial surveys. Twenty nests were located in March (14th, 21th, 26th and 27th) and six in early May (1st - 3rd). One nest was discovered on 8 Feb 1991 during driving surveys. This was the first active nest found. One additional nest was reported by a land owner. Of the 28 nest sites 24 were in temporary wetlands, three were in prairie and one was found in the confines of an agricultural stormwater detention area. Twenty-eight percent of the nest sites were located in the northern third of the study area ($N = 8$), 64% in the middle third ($N = 18$) and only 7% in the southern third ($N = 2$). All nests were in standing water. Fifteen of the nests were considered to be active by either visually confirming the presence of eggs or egg shell fragments or by the persistent presence of an adult at the platform.

Twenty-seven of the 28 nest sites were classified using NWI maps and codes. The 28th site was not classified by NWI and was not available for ground assessment. All 27 sites were classified as palustrine emergent wetlands with narrow-leaved persistent vegetation. Eleven of those sites (41%) were narrow-leaved persistent seasonal or seasonal well-drained, 6 sites (22%) were narrow-leaved persistent seasonal, 7 sites (26%) were a combination of narrow and broad-leaved persistent semipermanent or seasonally well drained. The remaining 3 sites (11%) were narrow-leaved persistent semipermanent, seasonally well drained or temporary. All but three of the nests were in isolated wetlands with well defined boundaries. The three nests not in temporary wetlands were located in sloughs.

Length, width and area of the temporary wetlands were determined from NWI maps. Average length was 328 m ± 193 SD (N = 23, range 84-936 m). Average width was 194 m ± 73 SD (N = 23, range 84-321 m). Average area was 5.96 ha ± 5.56 SD (N = 22, range 0.25-22.78 ha). Sixteen nest site wetlands were in or on the edge of pasture while another nine nests were located in temporary wetlands surrounded by pine flatwoods adjacent to range or pasture. The remaining three nests, located in sloughs, also were adjacent to range or pasture.

Four nest platforms were assessed for size and plant species composition. Average nest diameter was 99.2 cm ± 11.87 SD (N = 4, range 88-116 cm). Nest platforms were constructed from the nearest available material, in these cases *Panicum hemitomon* and *Pontederia cordata*. Size and plant species composition of the nests were consistent with other studies (Thompson 1970).

Average maximum change in relief within wetlands containing nest sites was 0.61 m ± 0.16 SD and ranged from 0.36 to 1.00 m (N = 21). On the average, 26% of the change in relief occurred within the first 15% of the transect. This zone generally corresponded to an area of higher plant species diversity. The central deep-water part of these wetlands often was dominated by a few plant species (*Panicum hemitomon, Pontederia cordata* and *Eleocharis* sp.) which were common in many of the nest sites.

Ninety-six 1-m^2 plots at seven sites were assessed for species richness and cover-abundance. These surveys yielded 82 plant species. The total number of species per site ranged from 16 to 33. Although 82 plant species were identified, only 2% (N = 2) of the species occurred at all seven sites compared with 58% (N = 48) of the species occurring only at a single site. The most common species were *Panicum hemitomon* (76 of 96 plots) *Pontederia cordata* (60 of 96 plots) and *Sagittaria lancifolia* (53 of 96 plots). Within the five height classes there were 616 plant occurrences. Of these, 84% (N = 518) were less than 1 m in height, only 13% (N = 80) exceeded 1 m and no plants were greater

than 2 m in height. The most common species exceeding 1 m in height were *Panicum hemitomon, Sagittaria lancifolia, Pontederia cordata* and *Eleocharis interstincta*. The remaining 3% of the occurrences were either submerged vegetation (2%) or vines (1%).

Fifteen plant species accounted for 62% (N = 386) of the occurrences in the seven cover classes and 68% of the total relative cover (Table 1). The species contributing the most relative percent cover at the most sites were *Panicum hemitomon* (25%), *Eleocharis* spp. (13%), *Sagittaria lancifolia* (7%) and *Pontederia cordata* (6%). Most of the species that occurred at the sites contributed less than 25% cover at a given plot.

One hundred and forty-six plant species were encountered at 11 sites in meandering transects. Many of these species also were found in the cover-abundance survey. The total number of species per site ranged from 23 to 58. The number of plant species shared among sites was similar to that observed in the cover-abundance survey. Only 1% (N = 2) of the species occurred at all 11 sites whereas 38% (N = 56) were found at only one site.

Twenty-seven of 28 nest sites were located on private land. Ownership status on one site was undetermined.

DISCUSSION

Florida Sandhill Cranes rarely initiate nesting unless there is at least some standing water. The species has been known to delay breeding during years when water levels were unfavorable (Walkinshaw 1976). The 1991 breeding season was preceded by a two-year drought (NOAA 1990). Although heavy rainfalls in the beginning of 1991 may have helped recharge some of the small temporary wetlands, it may not have been enough to recharge some of the more extensive sloughs. Therefore parts of these sloughs may not have been available as nesting habitat in 1991 but may be available in wetter years. That 24 of 28 crane nests were found in isolated temporary wetlands and only three of the remaining four sites were found in sloughs illustrates the importance of temporary ponds as crane nesting habitat during the 1991 nesting season and probably during years of similar hydrological conditions. It may be that sloughs are more important as nest sites in years when hydrological conditions are different and the sloughs are recharged.

The concentration of most of the favorable nesting habitat (temporary wetlands within a mosaic of uplands) within the central portion of the study area probably accounts for the unequal distribution of nesting throughout the study area. The majority of the public land (and hence protected areas) is located in the southern portion of the study

Table 1. Most common species within the seven cover classes at seven Florida Sandhill Crane nest sites. Only those species occurring five or more times in a single cover class are included.

Species	Number of occurrences in cover classes							Percent of total cover	Total number of sites
	>75%	50-74%	25-49%	5-24%	3%	1%	0.5%		
Bacopa caroliniana	0	1	3	6	7	4	1	3.9	4
Bacopa monnieri	0	1	1	6	0	1	0	2.3	4
Centella asiatica	0	0	2	4	8	5	0	2.1	5
Cuphea carthagenensis	0	0	0	2	1	6	0	0.4	4
Eleocharis cellulosa	0	0	5	5	5	3	0	3.6	2
Eleocharis interstincta	0	0	9	7	5	2	0	6.0	1
Eleocharis viviparous	2	0	0	1	1	0	0	3.4	1
Hydrocotyle umbellate	0	0	0	2	6	12	1	0.9	5
Panicum hemitomon	1	7	23	21	16	7	0	25.0	7
Paspalum notatum	0	2	1	3	5	6	0	3.5	3
Polygonum sp.	0	1	0	6	4	8	3	2.2	5
Pontederia cordata	0	0	6	12	18	23	1	6.2	7
Rhynchospora inundata	0	0	0	9	6	10	1	1.6	3
Sagittaria lancifolia	0	0	7	20	17	10	1	7.2	5
Setaria geniculata	0	0	0	0	0	6	0	0.1	3

area and consists of relatively large tracts of cypress and pine forest. Few crane nests were found in this area. The scarceness of temporary wetlands within this region makes it less suitable for crane nesting.

General NWI classification and physical topography of these nest site wetlands indicate that there is more similarity than dissimilarity when comparing wetlands with nest sites. Most of the sites were shallow depressions with a gradual change in surface topography. A change in plant species composition was observed with an increase in water depth. Sites also were similar in terms of the major plant species present. Three or four species (*Panicum hemitomon, Sagittaria lancifolia, Pontederia cordata* and *Eleocharis interstincta*) were important contributors to total cover at each site as well as being present at all or most sites. It may be that these species act to attract cranes to a particular wetland. Despite the similarity of the major plant species seen among the wetlands, these sites were not monotypic. A single site could display high plant diversity with the majority of the plant species occurring only a few times at a site. Not only are the individual sites diverse but many of the species encountered occurred at only one site making each site unique. This pattern also was observed for vertebrates within temporary wetlands sampled in the proximity of crane nest sites (Mazzotti et al. 1992). The high degree of diversity is probably a function of the temporal, dynamic nature of southern Florida wetlands. Because of the temporal, dynamic nature of these wetlands, a site used by cranes for nesting in one year may not be suitable the next year. Therefore, it will be important to protect a range of wetlands that are potentially suitable as crane nest sites. Because of the diversity in flora and fauna among wetlands, protecting a range of wetlands also will help to ensure the continued existence within the region of a variety of other wetland-dependent plant and animal species such as pine woods tree frogs, sirens, rails, and wading birds (Mazzotti et al. 1992; Moler and Franz 1987; Kushlan 1978).

Florida Sandhill Cranes require both upland and wetland habitats for successful nesting (Nesbitt and Williams 1990). The long-term productivity of cranes is dependent not only on the presence of wetlands with suitable hydroperiods (Layne 1983) but also proximity to suitable foraging habitat, including uplands (range, pasture and pasture-forest transition) and wetlands (Nesbitt and Williams 1990).

The findings of this study were consistent with those found at Myakka River State Park by Bishop (1988). In that study most nest sites were located in palustrine emergent wetlands where dominant plants *Panicum hemitomon, Pontederia cordata* and *Sagittaria* spp. occurred. *Carex* spp., another important species in her study was not an important species in this study. In both studies most nest sites were located

next to or in open range or pasture which emphasizes the importance of the relationship of wetlands and uplands to cranes.

The important difference between Myakka River State Park and this area in southwestern Florida is that of land ownership. Myakka River State Park is state-owned and most of the area within its boundaries are managed to resemble the "original natural Florida." Whereas the area in southwestern Florida is mostly privately owned and more vulnerable to pressure from future development. The continued conversion of pine flatwoods and temporary wetlands to agricultural uses will ultimately reduce the availability of habitat important for crane survival. We have described here the characteristics of crane nest sites from one year. It will be necessary to further address the question of crane nest site selection under different hydrological regimes, their population and breeding status, and habitat use in order to make meaningful decisions concerning the conservation of cranes in southwestern Florida.

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ERRATA

In the FOS Records Committee Report (1994, Fla. Field Nat. 22(1):17-23), record No. 92-259, Fork-tailed Flycatcher, the last sentence should read, "This white collar, which separates the black cap from the gray back, is a field mark used to distinguish those birds largely resident in Mexico and Central America from those that lack this collar and are migratory South American birds which more commonly find their way to the U.S. (previously accepted, 83-039, 84-068, 86-191, 90-210)." In Appendix 1, the scientific name for the Black-chinned Hummingbird should read "*Archilochus alexandri.*"