FLORIDA SANDHILL CRANE NESTING ON THE LOXAHATCHEE NATIONAL WILDLIFE REFUGE

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THE Florida Sandhill Crane (*Grus canadensis pratensis*) is currently listed by the Bureau of Sport Fisheries and Wildlife (U. S. Dept. Interior, 1966: B-23) as a rare subspecies. Since Walkinshaw's (1949) classic work little additional information on the life history of the Florida Sandhill Crane has been published. This paper is the result of a 5-year study stemming from the bureau's long range propagation and reintroduction studies on the several subspecies of the Sandhill Crane and the Whooping Crane (*Grus americana*). The purposes of this study were: 1) to determine the nesting habitat requirements of the Florida Sandhill Crane, 2) to document nesting chronology, and 3) to initiate a study of population dynamics.

The author gratefully acknowledges the assistance of the bureau employees who participated in the collection of data over the 5-year period.

DESCRIPTION OF THE REFUGE

Loxahatchee National Wildlife Refuge, established in 1951, contains 145,525 acres of Everglades habitat in Palm Beach County, Florida. Of the total area, approximately 143,000 acres lie within the levees of Conservation Area No. 1 of the Central and Southern Florida Flood Control District and are managed for fish and wildlife under a lease and license agreement with the district.

This portion of the Everglades began as the bottom of a Pliocene sea during which a complex earth stratum of marl, shell beds, and limestone was formed (Cooke, 1939; Parker et al., 1955). The growth and decay of both plant and animal life for some 5,000 years formed one of the largest single bodies of organic soil in the world (Davis, 1946; Stephens, 1960). The elevation above mean sea level slopes from about 17 feet at the north end of the refuge to 11 feet at the extreme southern boundary (Figure 1). The difference in elevation allows a north to south movement of water supplied basically by 142.2 cm of annual rainfall and supplemented by Flood Control District pumping in times of extreme rainfall or drought.

Vegetation in the refuge is generally within one of the six physiographic divisions described by Jones (1948) as the ridge and slough sector. The vegetation has been further described by Davis (1943) and more recently by Loveless (1959) as being composed of wet prairie communities of

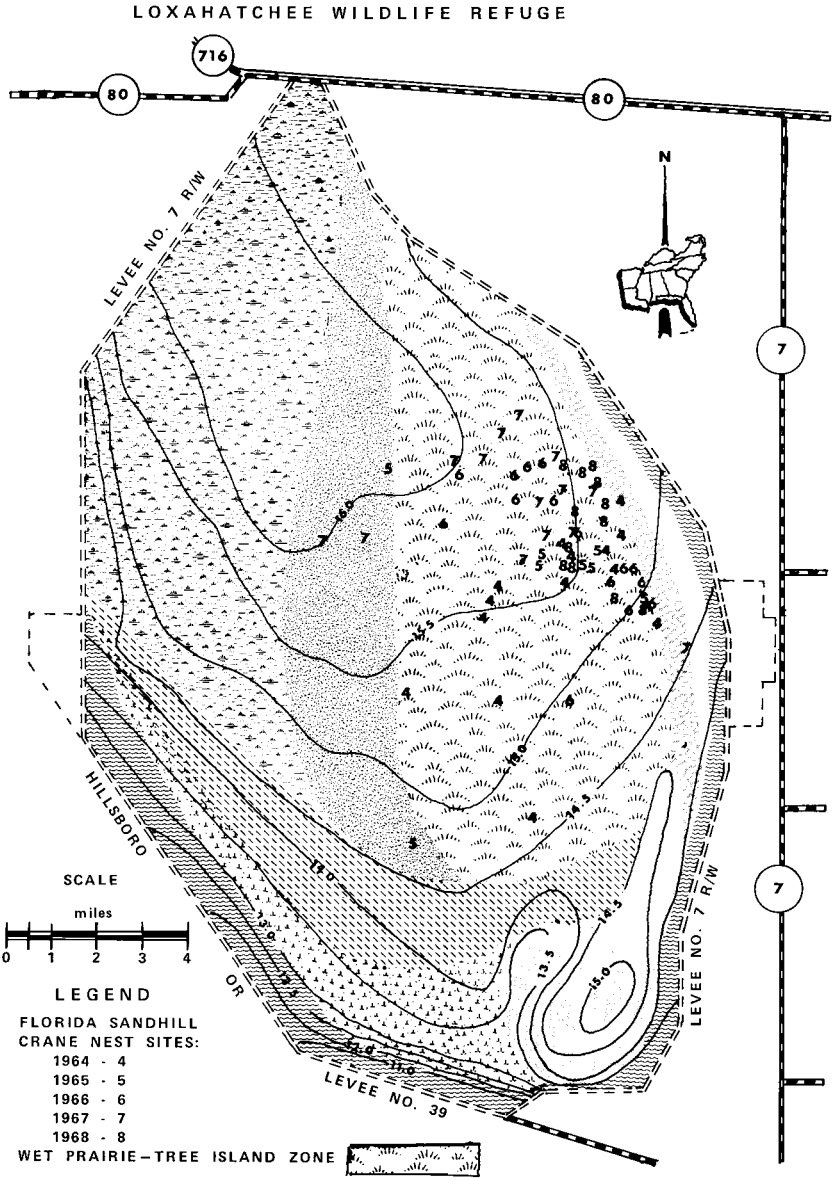

Figure 1. The location of Florida Sandhill Crane nests found during the study from 1964 through 1968.

relatively low stature plants interspersed with stands of sawgrass (*Cladium jamaicensis*) and slough aquatic communities which support white water lilies (*Nymphaea oderata*). This complex is further broken up by thousands of tree islands varying in size from a few trees to several hundred acres.

METHODS

Three forms of transportation were used to locate Florida Sandhill Crane nests on the refuge: 1) airboat, 2) single engine, fixed-wing aircraft, and 3) helicopter. Search patterns used were both systematic and random-meanderings. Airboat searches provided the best results, but availability of other transportation forms permitted comparison. Data recorded for each nest included location, habitat description, nest measurements, water depths at nest sites, nest materials, notes on the chronological progress, and photographs. An attempt was made to visit the nests at least once a week during incubation, but some nests were visited as many as 10 times and others only once.

RESULTS

A total of 61 Florida Sandhill Crane nests were located during the five nesting seasons from 1964 through 1968 (1964, 14; 1965, 8; 1966, 12; 1967, 15; 1968, 12). In addition to active nests, many old nests were found. Five young birds, 1 to 7 days old, were seen but their nests not located. Prior to 1964 the refuge records contained notes on only 25 nests and 2 young (1953, 3; 1954, 5; 1955, 2; 1957, 7; 1958, 8).

Nesting habitat.—Figure 1 shows the location of Florida Sandhill Crane nests found during the 5-year study. Nests were in several vegetative zones and at different land elevations. The refuge has been divided into nine broad vegetative zones according to the basic plant communities described by Davis (1943) and Loveless (1959). A detailed description for all the vegetative zones is beyond the scope of this paper, and because 88 per cent of the nesting birds showed a preference for the wet prairie-tree island zone, only this vegetative complex is discussed in detail. Other nests were located in vegetative zones that closely resemble the wet prairie-tree island zone.

The wet prairie and tree island plant communities are treated separately by Loveless (1959) but grouped here because the combination of the two communities as an identifiable zone is a prevalent vegetative feature over much of the refuge. This vegetative zone is a complex of many species, the composition seeming to vary with the amount and duration of inundation. The dominant plant of the wet prairie is a short beakrush (*Rhynchospora traceyi*). An inconspicuous species of spikerush (*Eleocharis elongata*) occurs amid the beakrush and is only slightly less plentiful on most flats. Other common species are less uniform in their distribution, being plentiful on some flats but absent on others. Generally such plants as large beakrush (*Rhynchospora corniculata*), yellow-eyed grass (*Xyris*

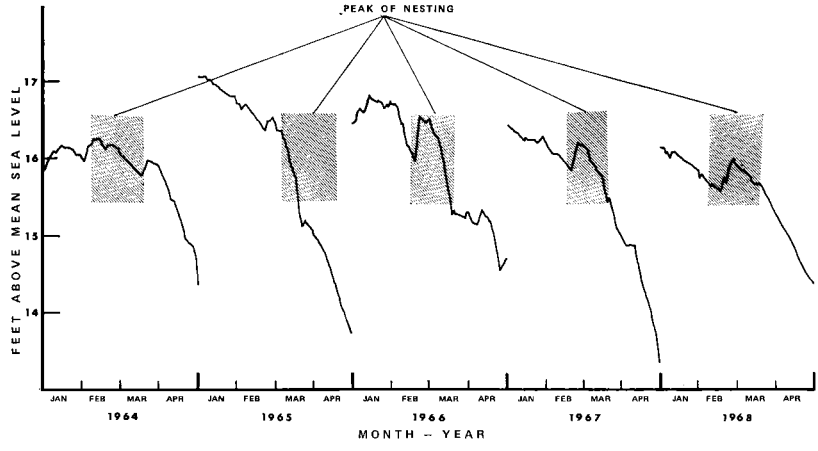

Figure 2. Water levels in Conservation Area No. 1 during the Florida Sandhill Crane nesting season (January to April) for the 5-year study period.

smalliana), redroot (*Gyrotheca tinctoria*), maidencane (*Panicum hemitomon*), water hyssop (*Bacopa caroliniana*), and St. John's-wort (*Hypericum virginicum*) increase in frequency toward the north and to the south gives way to white water lily (*Nymphaea odorata*), floating heart (*Nymphoides aquaticum*), bladderwort (*Utricularia* sp.), pickerelweed (*Pontederia lanceolata*), and bulltongue (*Sagittaria lancifolia*). Scattered throughout are tree islands that vary in size from several trees to several hundred acres. The major plant species on the tree island include redbay (*Persea borbonia*), dahoon holly (*Ilex cassine*), waxmyrtle (*Myrica cerifera*), cocoaplum (*Chrysobalanus interior*), bamboo vine (*Smilax laurifolia*), muscadine grape (*Vita* sp.), and several ferns (*Osmunda* sp., *Woodwardia* sp., and others). The species composition of these tree islands varies in dominance and frequency of occurrence from east to west and from north to south. For example, the islands along the extreme northeastern fringe are almost exclusively dahoon holly.

Nest sites.—Nest sites the Sandhill Cranes selected were generally in the open sloughs of the wet prairie areas. At the time of nesting these areas were shallowly flooded. Water depths at nest sites varied from about 2.5 to 99.1 cm with an average of 25.0 cm for 44 nests. All the nests were found at elevations above the 14.5 feet mean sea level contour. Figure 2 shows the water levels in the conservation area during the nesting season over the 5 years. Considerable variation occurred in water levels later in each year, but they remained fairly constant during the nesting seasons.

Figure 3. Wet prairie-tree island complex sites were used by Sandhill Cranes for nesting.

Bent (1926), Walkinshaw (1949) and Stieglitz (1965) all stress the significance of water for successful crane nesting. Water levels below 11.0 feet mean sea level on Loxahatchee Refuge in 1962 led Stieglitz to conclude that crane nesting was a failure that year. Evidence indicates that nesting may be delayed during periods of high water and completely abandoned in a prolonged drought. The importance of shallow water depths at the time of nesting is not well understood, but suggests an important role in the rearing of young similar to that experienced with waterfowl and other marsh birds. The story of wet prairie habitat losses in Florida through various causes is well documented in a broad spectrum of popular and scientific writings (Tabb, 1963).

The nesting habitat of the Florida Sandhill Crane on the refuge differs somewhat from those described by Walkinshaw (1949), Bent (1926), and Howell (1932). Walkinshaw describes the prairies of central Florida as predominantly covered with saw palmetto (*Serenoa repens*), and scattered groups of trees or "hammock" of cabbage palm (*Sabal palmetto*), live oak (*Quercus* sp.), and other trees with a thin sprinkling of grass. Interspersed were marshes varying in size from the mile after mile of extensively flooded Kissimmee River border to small ponds a few acres in extent with sedge, grasses, pickerelweed, or a border of guinea cypress

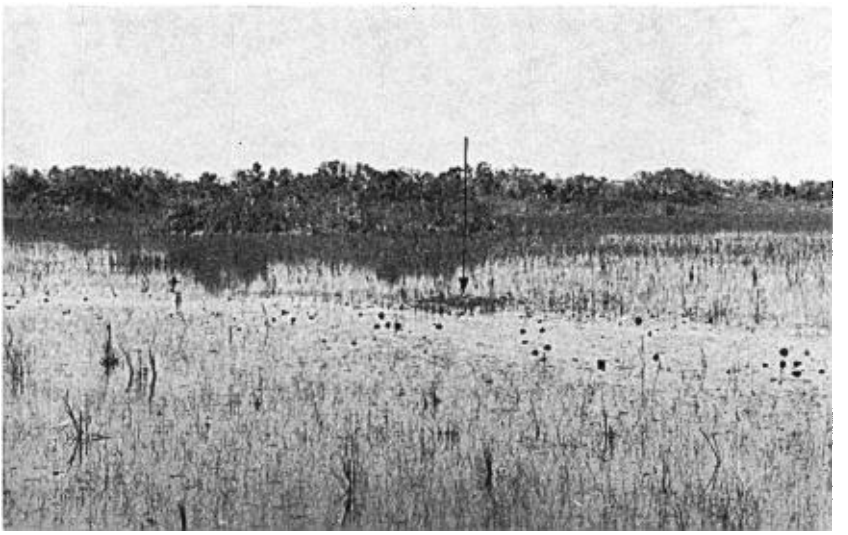

Figure 4. A typical nest site of the Florida Sandhill Crane on the Loxahatchee National Wildlife Refuge showing the distance to the nearest tree island and the thinly vegetated surroundings of the wet prairie-tree island zone.

(*Hypericum* sp.). The preferred nesting sites on Loxahatchee as described in the preceding section and shown in Figure 3 are not in well defined ponds or marshes, but are scattered throughout the wet prairie-tree island zone. The literature contains few references to nesting within the historical boundaries of the Everglades, and the apparent absence of any significant nesting populations south of the refuge suggests the refuge is at the fringe of the nesting range in Florida.

Figure 4 shows a typical nest site. The birds seem to prefer the open stretches between tree islands. The average distance from these tree islands for 44 nests was 36.5 ± 20.1 m with the closest being 6.3 m and the farthest 137.1 m.

Vegetation at 65 per cent of the nest sites was sparse to absent. The remaining nests were in fairly dense stands of maidencane or pickerelweed as shown in Figures 4 through 6. The height of vegetation at the immediate nest site or vicinity was dependent upon water levels, but generally was never more than 30.5 to 45.7 cm. The relative frequency with which various plant species occurred as a dominant vegetative feature at 45 nest sites were: maidencane 91 per cent, beakrush 82 per cent, white water lily 62 per cent, swamp lily (*Crinum americanum*) 51 per cent, yellow-eyed grass 31 per cent, bulltongue 8 per cent, pipewort (*Eriocaulon compressum*) 24 per cent, pickerelweed 33 per cent, bladderwort 4 per cent,

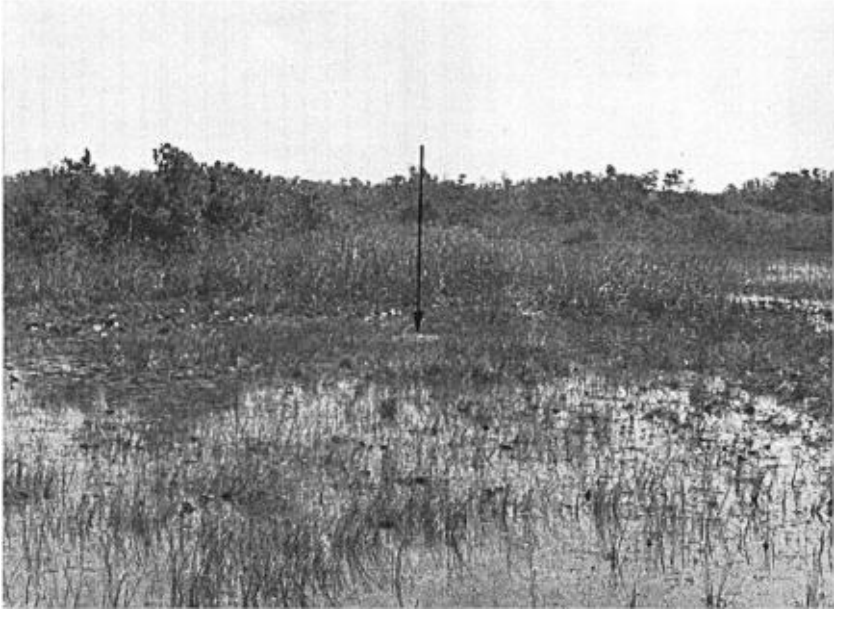

Figure 5. A crane nest located close to a tree island and in dense stand of maidencane with sawgrass and pickerelweed nearby.

Gulf Coast spikerush (*Eleocharis cellulosa*) 8 per cent, sawgrass 35 per cent, willow (*Salix* sp.) 4 per cent, St. John's-wort 2 per cent.

Nest sites were often within 100 m of active alligator (*Alligator mississippiensis*) dens. Several nests were within a few meters of active alligator trails or runs.

The nest.—Walkinshaw (1949) states that the Florida Sandhill Crane nest is a bulky mass constructed of the most readily available material. Many of the same plant species Walkinshaw lists were used for nest construction on the refuge. It is not surprising then that, just as maidencane was one of the main plants at the nest sites, it was used in 94 per cent of 37 nests. This was followed by beakrush 54 per cent, pickerelweed 34 per cent, spikerush 32 per cent, yellow-eyed grass 13 per cent, swamp lily 10 per cent, sawgrass 10 per cent, white water lily, bulltongue and pipewort each 2 per cent. The entire plant was used in most cases but when rootstock was used alone, maidencane and yellow-eyed grass were preferred. The presence of buttonbush (*Cephalanthus occidentalis*), plume grass (*Erianthus strictus*), willow bushes, or dead snags at the edge of the nest was noted at 35 per cent of 34 nests. Nests in dense or fairly dense stands of maidencane or pickerelweed without such "markers" were an

Figure 6. A Florida Sandhill Crane nest in a dense stand of maidencane. The nest is large and bulky with a well-defined depression for eggs.

exception. Nests that lacked such a distinguishing feature were often open and exposed with little or no vegetation either at the nest site or in the immediate vicinity.

Diameters of 30 nests ranged from 58.4 to 152.0 cm with the average at 93.9 ± 20.5 cm. The average height of these nests above water was 16.7 ± 7.3 cm but ranged from 10.1 to 45.7 cm. The nest cup depression averaged 4.5 ± 2.9 cm in depth with a range from 0 to 15.2 cm, and from 15.2 to 71.1 cm in diameter with an average of 33.0 ± 15.4 cm.

Old nests were often noted in the vicinity of active nests. We suspect that birds may use the same nest for more than one nesting season, although only one such case was recorded. Bent (1926) reports that the Florida Sandhill Crane will make several nests before finally laying in one, and each year during the study we found newly made but unused nests. Active nests were generally ¼ mile (0.41 km.) or more apart, but a number were closer together; once we found three active nests within ¼ mile of each

other. Two nests were about 137 m apart and separated by relatively little vegetation.

Egg laying and incubation.—The earliest nest with eggs found during the study was on 6 February and the latest was found on 30 March. Earlier refuge records list 28 December as the earliest nesting attempt and 27 April for the latest. Several nests have been reported for January with young hatched as early as the second week of January (1958). The majority of the nests were recorded from early February through mid-March. Bent (1926) gives dates of 89 eggs in Florida as ranging from 28 January to August and 45 records from 23 February to 21 March. Walkinshaw (1949) reports the average date of Florida egg sets located in various museums as 13 March.

The exact laying period could not be determined, but observations on four nests indicated that the clutch was completed within a 7-day period. Bent (1926), Howell (1932), and Walkinshaw (1949) all state that the clutch may vary from one to three eggs. In the present study 64 nests contained 118 eggs for an average of 1.84 eggs per nest, which agrees closely with Walkinshaw's (1949) 1.823 eggs per set based upon 34 sets from Holt, Howell, and his own investigations. The occurrence of single-egg clutches may easily be misinterpreted especially if the nest is visited only once. At least five observations were made of single-egg nests that when revisited contained another egg. Notes were also made of two-egg clutches that subsequently lost an egg. One nest when located had a single egg, one day later contained two eggs, and four days later only one egg.

Hatching.—The "Report of the Florida Sandhill Crane questionnaire" (R. P. Allen, MS) compiled by the National Audubon Societies in 1938 notes a 70 per cent hatching success for Florida Sandhill Crane eggs which Walkinshaw (1949) reported agreed with his data on the Greater Sandhill Crane (*G. c. tabida*). During the course of this study it was possible to follow the fate of 25 nests that contained 44 eggs. A total of 31 eggs or 70 per cent hatched successfully, 4 eggs or 9 per cent were infertile, 4 eggs or 9 per cent of the embryos died during incubation, and 5 eggs or 11 per cent were lost to predators or other unknown causes. Actually only three nests were considered unsuccessful and 88 per cent of the nesting attempts were successful in hatching at least one young.

Walkinshaw (1949) notes that "Of 39 Michigan Sandhill Crane nests, 8 were deserted during incubation, undoubtedly because of my visits." Valentine (pers. comm.) also reported two and possibly four nests abandoned during his study of the remnant Florida Sandhill Crane population in Jackson County, Mississippi. During my study no nests were known to have been deserted despite numerous visits by airboat, several

by helicopter, and the collection of a single egg from some nests for propagation studies.

Adult behavior.—Walksinshaw's (1965) study of crane attentiveness at the nest indicated that at least one of the pair was at the nest at all times. Notes for 139 visits to crane nests by airboat during this study record at least one adult present on 128 occasions. One adult was observed incubating on 64 per cent of the visits; one adult was nearby 21 per cent of the time; one adult was incubating and one nearby 7 per cent of the time, and two adults were nearby on 7 per cent of the visits. On two occasions one bird was seen incubating and two birds nearby, which may indicate some tolerance of subadults during the incubation period.

When flushed from the nest site the bird generally flew a short circular route, returned and landed within less than 100 m of the nest and covered the remaining distance on foot. Early in incubation and often before completion of the clutch the adult birds were especially reluctant to go far or stay away from the nest very long. The approach to the nest while the airboat was present was accompanied by soft distress or alarm calls; birds showed their nervousness by repeatedly pulling up and dropping plants or tossing them in the air. Several partial wounded-bird displays were seen, but only once did a bird give me the full treatment of broken wing, fluttering, crouching, and head bowing to entice me away.

Populations.—An expressed objective of this study was to initiate a study of the crane population dynamics on the refuge. The value of using crane nests as an indication of population size on the refuge has too many variables to be considered anything other than an index at best.

Summary

A 5-year study of Florida Sandhill Crane nesting on the Loxahatchee National Wildlife Refuge provides a description of the bird's nesting habitat requirements. A majority of the 61 nests were located in open areas of a wet prairie-tree island vegetative zone. Water conditions on the refuge were fairly uniform during the nesting period each year of the study and most nests were built in an average of 25.0 cm of water. The mean distance of nests to the nearest tree island was 36.5 m. Open marsh or sloughs with low-growing vegetation in shallow water are prerequisite to a successful nesting season. The mean nest dimensions were: diameter, 93.9 cm; nest top above the water, 16.7 cm; cup depression, 4.5 cm; and cup diameter, 33.0 cm. Nesting materials were mainly maidencane, beakrush, pickerelweed and spikerush. The earliest nesting on the refuge was 28 December and the latest 27 April. The average clutch was 1.84 eggs with about 70 per cent hatching success in 23 out of 25 nests.

LITERATURE CITED

BENT, A. C. 1926. Life histories of North American marsh birds. U. S. Natl. Mus., Bull. 135.

COOKE, C. W. 1939. Scenery of Florida. Florida Geol. Surv., Bull. 17.

DAVIS, J. H. 1943. The natural features of southern Florida. Florida Geol. Surv., Bull. 25.

DAVIS, J. H. 1946. The peat deposits of Florida. Florida Geol. Surv., Bull. 30.

HOWELL, A. H. 1932. Florida bird life. Florida Dept. Game and Fresh Water Fish, with Biol. Surv., U. S. Dept. Agr.

JONES, L. A. 1948. Soils, geology and water control in the Everglades region. Univ. Florida Agr. Exp. Sta. in cooperation with U. S. Soil Conserv. Serv., Bull. 442.

LOVELESS, C. M. 1959. A study of the vegetation of the Florida Everglades. Ecology, 40: 1–9.

PARKER, G. G., G. E. FERGUSON, S. K. LOVE, and others. 1955. Water resources of southeastern Florida with special reference to geology and ground water of the Miami area. U. S. Geol. Surv., Water-Supply Paper 1255.

STEPHENS, J. C. 1960. Subsidence of organic soils in the Florida Everglades. Proc. Soil Sci. Soc. Amer., 20: 77–80.

STIEGLITZ, W. O. 1965. The Florida Sandhill Crane (*Grus canadensis pratensis*); with special reference to the Loxahatchee National Wildlife Refuge population. Unpublished rept. (typewritten), Bur. Sport Fisheries and Wildl.

TABB, D. C. 1963. A summary of existing information on the fresh-water brackish-water and marine ecology of the Florida Everglades region in relation to fresh-water needs of Everglades National Park. Marine Lab., Inst. Marine Sci., Univ. Miami, ML no. 63609.

U. S. DEPT. INTERIOR. 1966. Rare and endangered fish and wildlife of the United States. Compiled by Comm. on Rare and Endangered Species. Bur. of Sport Fisheries and Wildl., Unnumbered.

WALKINSHAW, L. H. 1949. The Sandhill Cranes. Cranbrook Inst. Sci., Bull. 29.

WALKINSHAW, L. H. 1965. Attentiveness of cranes at their nests. Auk, 82: 465–476.

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