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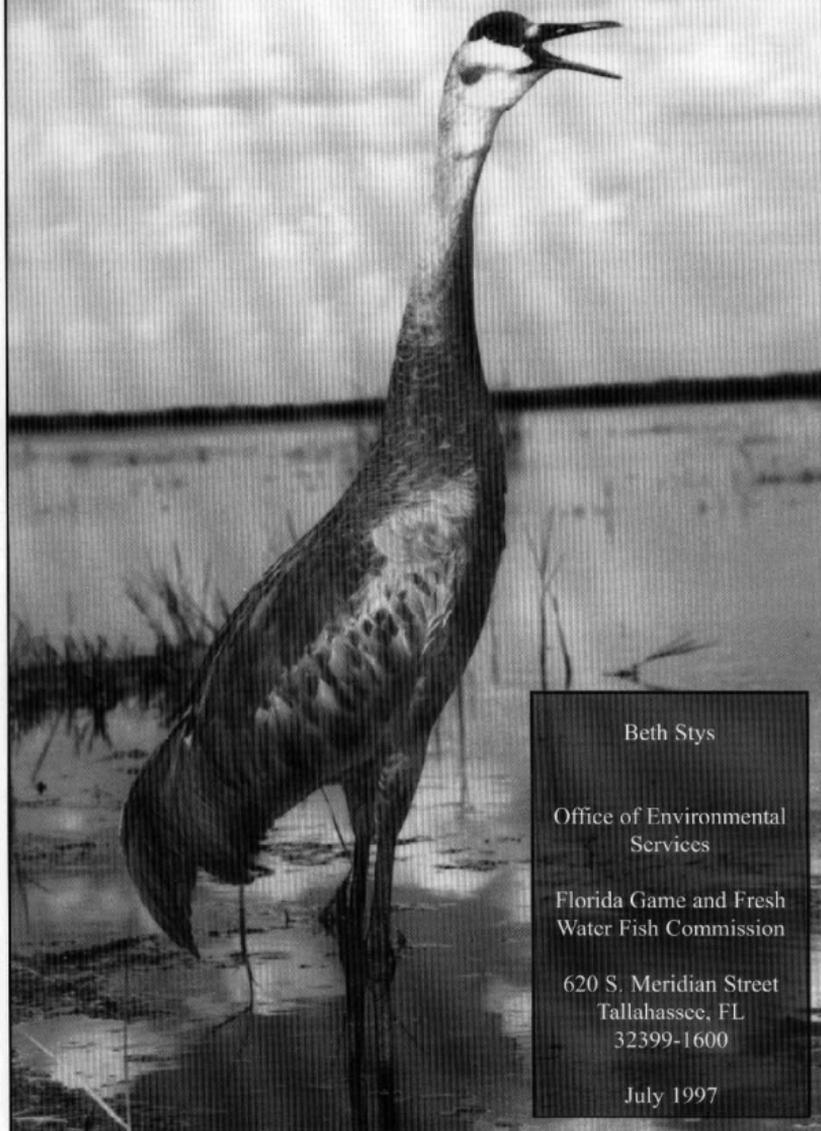
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ECOLOGY OF THE FLORIDA SANDHILL CRANE

NONGAME WILDLIFE TECHNICAL REPORT NO. 15



Beth Stys

Office of Environmental
Services

Florida Game and Fresh
Water Fish Commission

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July 1997

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INTRODUCTION

The Florida sandhill crane (*Grus canadensis pratensis*) is one of Florida's most recognizable birds. It stands almost 4 feet tall, and its call is a unique trumpeting rattle. It uses a mosaic of wetland and prairie habitats in peninsular Florida south of the Aucilla River, nesting in herbaceous wetlands and foraging in open prairies, improved pastures, and wetland habitats.

The long-term survival potential of the Florida sandhill crane is at risk due to the increasing rate of habitat loss or modification, small population size, and low reproductive potential (i.e., small clutch size, low recruitment rate, seasonal nesting). Habitat loss from filling or draining of wetlands, degradation or loss of prairie and range habitats, and fragmentation of remaining habitat into patches too small or too isolated to be suitable for sandhill crane use are the most serious problems facing Florida's population of sandhill cranes. Habitat fragmentation and human disturbances may force sandhill cranes to temporarily or permanently abandon the areas they inhabit, and may reduce the overall fitness of sandhill crane populations by forcing cranes to travel greater distances to find foraging and roosting sites. In recognition of these factors, the Florida Game and Fresh Water Fish Commission listed the Florida sandhill crane as a threatened species in 1974 (FGFWFC 1996).

Loss of habitat has resulted in an increasing number of cranes using suburban and urban areas. In addition to their natural habitats, sandhill cranes can be found in such places as golf courses, airports, suburban subdivisions, sod farms, beef and dairy cattle farms, and horse farms. Appropriate management on the remaining public and private lands where sandhill cranes exist will enhance their long-term chances of survival in Florida.

This document is intended to provide accurate information on the biology and habitat requirements of Florida sandhill cranes. From this information public land managers and private landowners should be better equipped to manage their lands for sandhill cranes or to predict how their land use practices may affect sandhill cranes. This information should prove useful to anyone who desires to maintain or enhance sandhill crane populations or their habitat.

LIFE HISTORY

Description

The Florida sandhill crane is a heavy-bodied bird with a characteristic bustle-like arrangement of tail feathers (Figure 1). It is a long-necked, long-legged bird, standing approximately 3.9 ft (1.2 m) tall. Adult sandhill cranes are uniformly grayish-brown with a white cheek patch and a red unfeathered crown. The sexes are identical in appearance, with the adult male slightly larger than the female. At a distance, sandhill cranes can be mistaken for great blue herons (*Ardea herodias*), but upon closer examination the crane's reddish crown will distinguish it from the great blue heron. Sandhill cranes fly with both their neck and legs extended (Figure 2). The call of the sandhill crane is a remarkable trumpeting rattle sound that can often be heard up to two-miles away.



Figure 1. Adult Florida sandhill crane. Photo by Brian Toland.

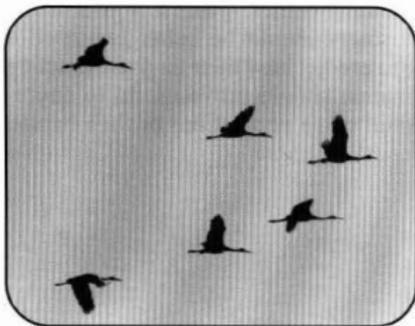


Figure 2. Sandhill cranes in flight.

Range and Habitat

The Florida sandhill crane ranges throughout the Florida peninsula from the Okefenokee Swamp, Georgia, to the Everglades (Figure 3). However, it is scarce in Monroe and Dade Counties and is rare west of Alachua County (Williams 1978). The Florida sandhill crane is one of six subspecies of sandhill crane (*Grus canadensis*). Only one other sub-

species of sandhill crane occurs regularly in Florida. The greater sandhill crane (*G. c. tabida*) is a wintering migrant in Florida, arriving in north Florida during October and November and beginning spring migration in late February (Williams and Phillips 1972). While the two subspecies cannot be distinguished from one another in the field, sandhill cranes observed in Florida between May and September can be assumed to be the Florida subspecies. Population estimates of the Florida sandhill crane range from 4,000 to 6,000 individuals (Tacha et al. 1992).

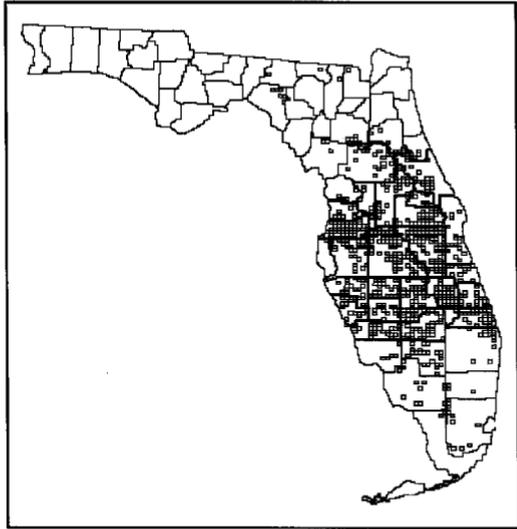


Figure 3. Range of the Florida sandhill crane. Data from the Florida Atlas of Breeding Birds.

Florida sandhill cranes are typically found in wide-open prairies (Walkinshaw 1973). Water depth and seasonal food availability are the primary factors controlling seasonal shifts in habitat use (Bennett 1992). Large areas of open water and areas of dense or woody vegetation are not usually considered suitable sandhill crane nesting or foraging habitat. The majority of sandhill cranes in Florida spends much of the year feeding in a variety of upland habitat types including improved pasture, open pine forests, and agricultural croplands (Walkinshaw 1949, 1973; Layne 1981, 1983). In south and central Florida, cranes nest in shallow freshwater marshes and forage on cattle ranches, horse farms, and sod farms. In extreme south Florida, most nests are built in freshwater marshes near the transition zone between inland marshes and coastal mangrove swamps (Kushlan 1982).

At night, sandhill cranes roost in shallow herbaceous wetlands. Roost sites are characterized by standing water 4-12 inches (10-30 cm) deep surrounded by deeper water or large expanses of marsh (Tacha et al. 1992). Roost site selection is dependent upon seasonal water levels. Roost wetlands can be limiting in the dry season. During hot weather, sandhill cranes will use forest-

ed edges of forest-pasture transition (Nesbitt and Williams 1990) or emergent herbaceous wetlands for midday loafing (Bishop 1988).

Florida sandhill cranes are increasingly becoming residents of suburban areas, and even select areas in urban settings (e.g., golf courses, airports) (Figure 4). It appears that sandhill cranes can become acclimated to living in close proximity to people. Types of developed lands that can provide suitable habitat for sandhill cranes include horse farms, cattle farms, sod farms, nature trail areas, golf course roughs, and other types of development that retain grasslands and small herbaceous wetlands.



Figure 4. Pair of Florida sandhill cranes nesting in a small wetland on a small airport. Photo by Brian Toland.

Diet

Sandhill cranes are opportunistic feeders. Their diet includes such items as aquatic invertebrates and plants, insects, worms, seeds, grass shoots, grains, bulbs, berries, lichens, small mammals, and birds. Sandhill cranes scratch with their feet or probe with their bill to unearth underground food items. In central Florida, sandhill cranes have been observed eating fruit and tubers from nut grass (*Cyperus* spp.), blueberry (*Vaccinium myrsinites*), and huckleberry (*Gaylussacia dumosa*) (Walkinshaw 1976), as well as acorns from live oaks (*Quercus virginiana*) (Bishop 1988). Additionally, sandhill cranes will feed on agricultural crops, especially corn and peanuts (Nesbitt 1996).

Social Organization

Sandhill crane populations can be divided into three primary social units: (1) unpaired subadults and adults, (2) mated pairs, and (3) families. They also are often classified into groups based on their age: juvenile, less than one year of age; subadult, one to three years of age; and adult, greater than three years of age (Nesbitt and Williams 1990). Families, which consist of a mated

pair and juveniles, will often forage in close proximity to other cranes or share the same roost (Bishop 1988). Juveniles remain with their parents until ten months of age (Nesbitt 1992). When families break up in the spring, first-year juveniles join or assemble into non-breeder flocks, usually of two to five cranes, which remain together for up to one year (Nesbitt and Wenner 1987). It is in these non-breeder flocks that initial pair bonds are often formed (Nesbitt and Wenner 1987).

Subadult pairings are often ephemeral, with most birds pairing several times before establishing a persistent bond. The successful production of young is usually related to the establishment and duration of a pair bond (Nesbitt and Wenner 1987, Nesbitt 1989). Established pairs are perennially monogamous, having a pair bond that is persistent even during the non-breeding season (Walkinshaw 1973, Nesbitt and Wenner 1987). Re-pairing usually occurs after the death or disappearance of a mate (Nesbitt and Wenner 1987). An unpaired adult crane without a territory often will join the juvenile/non-breeder flock, soon thereafter pairing with a new mate.

Nesting

Nest initiation is influenced by the amount of water in nesting ponds, and the amount and timing of rainfall during the prenesting and nesting seasons (Walkinshaw 1976, Bishop 1988). Rainfall amounts in January-March can explain almost all (97%) variation in the number of pairs with young. High winter rainfall increases productivity by creating suitable water depths for nesting and by improving feeding conditions. On the other hand, high rainfall amounts in early spring may reduce productivity due to flooding of nest sites (Layne 1983). Sporadic use of specific nesting areas should be expected due to the highly variable nature of suitable water conditions for sandhill crane nesting. Non-use of a wetland site during one or more nesting seasons should not be interpreted as abandonment of an area.

Nest initiation for Florida sandhill cranes can begin as early as December, but usually begins in January (Walkinshaw 1973) and can extend through August (Bent 1926). In south central Florida, average laying dates are 22 to 24 February (Walkinshaw 1982), while 3 March is the average laying date in north central Florida (Tacha et al. 1992). After the loss of eggs or chicks, sandhill cranes will re-nest. Florida sandhill cranes have been documented re-nesting up to three times per year, with 19.5 days the average interval between loss of clutch and laying of new eggs (Nesbitt 1988).

Average clutch size for Florida sandhill cranes ranges between 1.72 and 2.0 eggs (Walkinshaw 1949, 1973, 1976, 1979, 1982; Thompson 1970;

Layne 1983; Nesbitt 1988; Dwyer and Tanner 1992). Clutch size is not affected by laying date or clutch sequence (Nesbitt 1988). Incubation begins the day the first egg is laid and is almost continuous until hatching (Walkinshaw 1976). Incubation lasts 29-31 days, with eggs usually hatching one day apart (Walkinshaw 1976). Both the male and female incubate the eggs (Walkinshaw 1985, Nesbitt 1988). Length of the nesting season varies by location, with the Kissimmee Prairie nesting season lasting approximately two months longer than the nesting season in northern Florida and Okefenokee Swamp (Bishop 1988).

Young Birds

Sandhill cranes are precocial; the young can run and swim when one day old. Within the first week the young accompany the adults up to 0.25 miles (0.4 km) from the nest site into drier pasture habitat to forage (Walkinshaw 1976, Layne 1981), and by 1.5 months old the young are traveling up to 0.30 miles (0.5 km) from the nest site to forage (Layne 1981) (Figure 5). Adults feed the young until the young reach approximately three to four months of age (Layne 1981). Adult cranes often construct accessory nests that are used as rest sites by the young during the day and for brooding the young at night (Layne 1981). Most accessory nests are located within 160 ft (50 m) of the original nest, varying with proximity of adjacent suitable habitat.



Figure 5. Family of Florida sandhill cranes traveling to upland foraging habitat. Photo by Brian Toland.

The young are capable of extended flight at 80-108 days of age (Walkinshaw 1976, Layne 1981, Nesbitt 1992). Juvenile cranes become independent at eight to ten months of age (248-321 days of age, mean 295) (Nesbitt 1992). At 10-14 months of age, the juveniles have an adult-like appearance (Lewis 1979). First nesting attempts have been recorded for two-year old males and three-year old females; however, the earliest age of first production (i.e., fledgling of young) occurs at three years of age for both sexes (Nesbitt 1992). The mean age of first production is 5.2 years of age for both sexes (Nesbitt 1992).

Behavior

Sandhill cranes are very social and often territorial birds, and thus have many postures and movements that communicate aggression, submissiveness, and courtship (Tacha 1988). Behavioral displays can provide clues to the social status and reproductive stage of sandhill cranes. Additionally, several behaviors are exhibited when a crane is aware of possible disturbance factors. When alarmed, sandhill cranes will stand rigidly erect with the body nearly vertical and the head elevated. This position appears to deliver the message that danger is near. Tacha (1988) described two alert behaviors; seven agonistic behaviors, four of which were aggressive displays; and eight courtship displays, three of which were limited to pairs, and the remainder of which were exhibited by all social classes. Many of the behaviors are also described by Vos (1977), and Nesbitt and Archibald (1981), with perhaps slightly different names.

Response to Disturbance

Although cranes will tolerate some human activity, even becoming relatively tame in some instances, they prefer large, open spaces with minimal disturbance (Bishop 1992). In particular, disturbances in and around wetlands with a nest can have a great impact because breeding pairs usually remain in the vicinity of the nest wetland during both the nesting and pre-fledgling period (Bishop 1992). Nesting by sandhill cranes can be deterred or interrupted due to disturbance. If sandhill cranes feel that the source of disturbance is a potential threat, they may leave the area. Nesting cranes flush when people approach within 10 to 250 ft (3 to 75 m) of the nest, and, once flushed, the birds remain off the nest for 15 minutes to three hours (Dwyer and Tanner 1992). Each pair of sandhill cranes and each nesting occurrence is unique, and individual cranes may react to disturbance differently. Such disturbances may not be severe enough to cause nest abandonment, but they may interrupt and thus extend incubation activity (Toland 1991, 1993). Incubation periods extended for even two days can lower hatchability or nestling survival rates. Success rates and recruitment levels of Florida sandhill cranes nesting in some developed areas may be below the level needed to compensate for natural and unnatural mortality (Toland 1991, 1993). However, if a source of disturbance is in place when sandhill cranes move into the area, the cranes may accept the disturbance as part of their nesting environment and remain throughout the nesting season.

POPULATION DYNAMICS

Reproduction

Hatching success rates range from 39 to 88 percent (Thompson 1970, Walkinshaw 1982, Nesbitt 1988, Bennett and Bennett 1992, Dwyer and Tanner 1992). Average brood size ranges from 1.14 to 1.59 chicks (Layne 1983, Bishop 1988). The probabilities of survival from hatching to fledgling, hatching to independence, and fledgling to independence are 0.65, 0.57, and 0.87, respectively (Nesbitt 1992). The percentage of juveniles in the population ranges between 6.0 and 11.1 percent (Bishop 1988, Bennett and Bennett 1990, McMillen et al. 1992, Nesbitt 1992). Lifetime reproduction is estimated at 1.86 young for any adult (Nesbitt 1992) and 2.70 young for an established breeder (i.e., an adult that has reproduced successfully at least once) (Tacha et al. 1992).

Mortality

Causes of nest failure include predation, flooding, abandonment, and egg infertility and addling (Dwyer and Tanner 1992). Flooding is the major cause of egg loss in north central Florida (McMillen et al. 1992). Egg and nest predators include raccoons (*Procyon lotor*) and fish crows (*Corvus ossifragus*) (Dwyer and Tanner 1992). Occasionally, eggs or chicks are lost to feral hogs (*Sus scrofa*), river otters (*Lutra canadensis*), red-tailed hawks (*Buteo jamaicensis*), great-horned owls (*Bubo virginianus*), and American alligators (*Alligator mississippiensis*) (Dwyer and Tanner 1992). Although predation by coyotes (*Canis latrans*) is minimal, they may become an important predator as their population expands in Florida (Nesbitt and Badger 1995).

Sandhill cranes are normally long-lived, up to 20+ years (Tacha et al. 1992). Adults have few natural enemies, occasionally falling prey to bobcats (*Felis rufus*) or bald eagles (*Haliaeetus leucocephalus*) (Nesbitt 1996). Avian botulism (*Clostridium botulinum*), avian cholera (*Pasteurella* spp.), and avian tuberculosis (*Mycobacterium avium*) have been reported in sandhill cranes in Arizona, Nebraska, and Colorado (Windingstad 1988). Moldy corn and waste peanuts have been the suspected sources of mycotoxins in several sandhill crane die-offs in Texas (Windingstad 1988). Lead poisoning has been responsible for several sandhill crane deaths in Colorado and Nebraska (Windingstad 1988).

Sandhill cranes are vulnerable to man-made hazards such as power lines and fences. In most power line mortality cases, death is caused by collision with the power line, resulting in broken necks, wings, and legs, and mul-

multiple fractures (Windingstad 1988). Fences in areas of suitable foraging habitat pose a great danger if cranes cannot walk under or pass through the fence. Cranes may sometimes misjudge the distance to a fence or the height of a fence and may collide with it when attempting to land, often resulting in broken bones and death (Nesbitt 1996). Free-ranging dogs and cats can cause reduced reproductive success by preying on eggs and young, as well as by lowering crane use of an area. Sandhill cranes may avoid areas where free-ranging dogs or cats are present (Nesbitt 1996).

Cranes with pre-fledged young run a higher risk of being struck by a vehicle. Adults with pre-fledged young will walk across roadways rather than fly, increasing their chances of being struck by a vehicle (Figure 6). Several cranes in south Florida have been killed or injured due to collisions with vehicles or airplanes when foraging in areas adjacent to highways and runways (K. Dryden, personal communication).



Figure 6. Family of Florida sandhill cranes walking across a road. Photo by Brian Toland.

Home Range Size

Home range size varies seasonally and regionally. In north central Florida, sandhill cranes had home range sizes of 625 acres (253 ha), 445 acres (180 ha), and 306 acres (124 ha) during the prenesting, nesting, and postnesting seasons, respectively (Nesbitt and Williams 1990). Paired adults on the Kissimmee Prairie had a mean annual home range size of 452 acres (183 ha) (Bishop 1988). Although home range size varies seasonally, there is much overlap in habitat use during the different seasons. Florida sandhill cranes do not have distinct winter, spring, or summer home ranges, but rather exhibit a slight shifting in home range size based on their current needs and location of suitable habitat. Subadult home range size averages 4 to 10 times larger than adults (Bishop 1988, Bennett 1989a, Nesbitt and Williams 1990).

Sandhill cranes in Florida defend nest sites and adjoining wetland habitats during the breeding season (Walkinshaw 1973); however, they may abandon their territories in late summer and become social (Walkinshaw 1973, Layne 1981, Nesbitt 1996). In central Florida, some pairs tend to remain social year-round, often with several pairs nesting in a single wetland as small as 13.5 acres (5.46 ha) (Bishop 1988). Social behavior may be important to cranes that follow a daily pattern of commuting between wetlands and uplands for feeding, and to populations that occupy small or ephemeral wetlands that cannot support cranes throughout the year (Nesbitt and Williams 1990).

HABITAT REQUIREMENTS

Nesting

Nest habitat selection is strongly influenced by water regimes and habitat availability, both of which are highly variable over time. Due to this variability, sandhill crane nesting habitat and nest site location often change from year to year. Nesting habitat used by Florida sandhill cranes also varies regionally. In north central, central, and south west Florida, sandhill cranes typically nest in mixed persistent and nonpersistent freshwater herbaceous wetlands with maidencane (*Panicum hemitomon*), pickerelweed (*Pontedaria cordata*), smartweeds (*Polygonum* spp.), and rushes (*Scirpus* spp) as the dominant wetland vegetation (Walkinshaw 1976, Nesbitt and Williams 1990, Depkin et al. 1994) (Figure 7). In south Florida, cranes typically nest in



Figure 7. Florida sandhill crane nesting in herbaceous wetland vegetation. Photo by Brian Toland.

open slough areas of wet prairies and in freshwater marshes (Thompson 1970, Kushlan 1982). At 65% of the south Florida nest sites there was little to no vegetation. The remaining nests were located in areas dominated by maiden-

cane and pickerelweed (Thompson 1970) (Figure 8).

Mean water depth at nest sites ranges from 5.3 to 12.8 inches (13.5 cm to 32.6 cm); although water depth at the nest site is highly variable, depending on weather conditions during the nesting period (Thompson 1970, Walkinshaw 1976, Dwyer 1990, Bennett 1992). Nesting of sandhill cranes on dry prairies has been noted by Holt (1930), Walkinshaw (1976), and Layne (1982) and has been observed on a golf course (B. Toland, personal communication).

Nests are usually 15.7 to 57.1 inches (40 to 145 cm) in diameter (Bennett 1992) and are usually 4 to 6.3 inches (10-16 cm) above the water surface (Tacha et al. 1992). Distance between simultaneously active nests of two different pairs ranges from 236 ft (72 m) to several miles, and the average distance between same-season renestings is 600 ft (183 m) (Dwyer 1990). There are often multiple simultaneous nestings within wetlands, with up to six pairs recorded in a 212-acre (86 ha) wetland (Dwyer 1990). Although the cryptic coloration of sandhill cranes makes them difficult to observe, their nests are usually large and conspicuous and can be located during aerial surveys (Bishop and Collopy 1987, Bishop 1988, Bishop et al. 1991).

Foraging

Throughout central Florida, resident sandhill cranes spend much of their time foraging in uplands consisting of improved pasture interspersed with cabbage palm (*Sabal palmetto*), pines or oaks; live oak hammocks (*Quercus virginianus*); open pine forests; herbaceous wetlands; and agricultural croplands (Walkinshaw 1949; Layne 1981, 1983; Bishop 1988). Improved pasture is the most frequently used daytime habitat, followed by herbaceous emergent wetlands. Croplands and plowed pastures are used seasonally (Bishop 1988). On the Kissimmee Prairie, much of the best sandhill crane foraging habitat is located on large, privately owned cattle ranches (Layne 1981). Suitable upland habitat for sandhill crane foraging needs to have a majority, or can be managed to have a majority, of the vegetative cover in the area equal to or less than 20 inches (0.5 m) in height. During the pre-fledgling period, herbaceous emergent wetlands are one of the most commonly used foraging habitats (McMillen et



Figure 8. Florida sandhill crane nest in southern Florida. Note the sparse vegetation surrounding the nest. Photo by Brian Toland.

al. 1992). However, sandhill crane use of wetland habitats for foraging is limited by water depth, with cranes rarely foraging in water that is greater than hock-deep (S.A. Nesbitt, personal communication). In north central and central Florida, some of the important habitats used by sandhill crane families during the pre-fledgling period are improved pasture supporting *Cynodon dactylon* or *Paspalum notatum*; herbaceous emergent wetlands dominated by sedges (*Carex* spp), pickerelweed, maiden-cane, and beggar-ticks (*Bidens* spp.); and marsh/pasture transition zones vegetated by maiden-cane, rushes (*Juncus* spp.), and spikerush (*Eleocharis* spp.) (McMillen et al. 1992).

SURVEYING FOR SANDHILL CRANES

Before implementing any type of management actions for sandhill cranes, several questions should be answered. First, are cranes using the area in question? If so, what types of areas and specific locations are they using, and what part of their life history needs (i.e., reproduction, foraging, roosting) are being met on site? A general knowledge of the area's habitat types will make answering these questions quicker and easier. The time of year cranes are observed, the number of cranes observed, and the habitat types the cranes are observed in can be used to help determine the extent of crane use of the surveyed area. A pair of cranes observed in close proximity to wetland habitat during the breeding season is most likely using the area for nesting and foraging. Additionally, a lone crane observed during the nesting season should be assumed to be nesting and its mate is on the nest (M. Folk, personal communication). A group of cranes observed during any time of the year is most likely using the area for foraging. Cranes observed entering a wetland area in the evening and leaving the area in the morning are most likely roosting within the wetland.

Surveys can be conducted to determine if cranes are using the area and where they are, and possibly which of their needs are being met. Surveys should be conducted in areas of suitable sandhill crane habitat. The following habitat types (Florida Dept. of Transportation 1985) are considered suitable for sandhill cranes with the italicized types representing those which are most frequently used for nesting: cropland, fallow cropland, pastureland, sod farms, horse farms, herbaceous rangeland, mixed rangeland, shrub and brushland, hydric pine flatwoods (cypress-pine-cabbage palm), shorelines, *inland ponds and sloughs*, *freshwater marshes*, *wet prairies*, *emergent aquatic vegetation*, and *intermittent ponds*. Suitable upland habitat is dominated by vegetation equal to or less than 20 inches (0.5 m) in height. Dense, brushy vegetation is not considered suitable. Suitable wetland areas are relatively shallow, with normal water depths ranging from 0 to 32 inches (0 to 80 cm). Large areas of

open water and areas dominated by dense vegetation are usually not suitable for sandhill crane nesting.

If the amount of suitable sandhill crane habitat is small, ground surveys are probably the best survey method. Due to the often elusive nature of sandhill cranes, surveyors may want to initially approach the site quietly and scan the area from as far away as possible. Surveys on small areas can be conducted by selecting an observation point from which the area can be viewed completely. An observation point will reduce the chance of disturbing the birds, if they are present on the area. If the area is large (i.e., cannot be viewed from one observation point) surveys can be conducted by vehicle, boat, foot, or horseback. For best possible coverage, transect surveys should provide as close to 100% coverage of all suitable sandhill crane habitat as possible. The distance between transects should be spaced according to the limits on visibility imposed by vegetation and terrain. Ground surveys and nest searches conducted during the active nesting season should be done during the cool part of the day (dawn - 1000 hr, and 1600 hr - dark) to avoid flushing the cranes from the nest and leaving the eggs exposed during the hot part of the day (S.A. Nesbitt, personal communication).

For large areas containing suitable sandhill crane habitat, surveys are often completed by conducting aerial transects. Although the cryptic coloration of sandhill cranes makes them difficult to observe during aerial surveys, their nests are usually large and conspicuous from the air (Bishop and Collopy 1987, Bishop 1988, Bishop et al. 1991). Aerial surveys are normally conducted during the breeding season (January-June). Nesting activity is best determined based on several surveys spaced several weeks apart throughout the breeding season. However, if only a single or a limited number of surveys is feasible, then it is recommended that surveys be performed later in the breeding season. Either a fixed-wing aircraft or helicopter may be used to conduct aerial surveys of a site. Fixed-wing airplanes have been successfully used for sandhill crane surveys when flown at an altitude of 165-500 ft (50-150 m) with a flight speed of approximately 90 mph (145 km/hr) (Dwyer 1990, Bishop et al. 1991). Helicopter surveys should be flown at an altitude of 115-300 ft (35-90 m) (Bennett 1989b, Dwyer 1990). It is best to conduct aerial surveys on calm, clear days, when visibility will be best. Although aerial surveys may be the most effective method, they are often too costly to be used in many management situations.

In addition to surveys, a thorough search for documented historical sandhill crane nesting activity on an area and adjacent property can be conducted to determine possible past use of the area by sandhill cranes. Both the Florida Game and Fresh Water Fish Commission and the Florida Natural Areas

Inventory maintain databases of recorded locations of wildlife species. In addition, local chapters of the Audubon Society may be able to provide information about a specific area. If sandhill cranes used an area for nesting during past years, that area may contain potential nesting habitat, often depending on current water levels and recent rainfall patterns. It is also possible that appropriate management on such an area could return overgrown or degraded areas to suitable nesting habitat.

MANAGEMENT CONSIDERATIONS

Wetland Habitats

A management plan for sandhill cranes should include some provisions for maintenance of suitable wetland habitat. The pickerelweed/maiden-cane wetlands that are important crane habitat may become unsuitable for sandhill crane use without appropriate management. If possible, the wetland habitat should be maintained as a herbaceous natural system. It may be important to maintain the quality and quantity of incoming or outgoing water to avoid succession to a cattail/willow (*Typha* spp./*Salix* spp.) community or a community of other woody plants. If an area managed for sandhill cranes becomes degraded in this manner, cattail control or water level manipulation could be used to restore the area to suitable sandhill crane habitat.

Precautions should be taken to ensure that hydrology is not altered due to the placement of impermeable surfaces (e.g., roads) adjacent to the managed wetland. Ponds (e.g., livestock pond) that are created in areas used by sandhill cranes can be constructed in such a way as to provide additional nesting, foraging, and roosting habitat for cranes. A shallow end or shelf that is created and vegetated with native wetland species will provide a potential nesting site for cranes. To be suitable for sandhill crane use, wetland areas are typically composed of relatively shallow areas, with normal water depths ranging from 0 to 31.5 inches (0 to 80 cm). For this to be successful, livestock will need to be kept off of that portion of the pond. Livestock use tends to reduce the amount of vegetation within and at the edge of wetlands and ponds.

Upland Habitats

Management for maintaining or creating suitable sandhill crane foraging habitat should include activities that would keep the area in herbaceous vegetation. Sandhill cranes prefer foraging in vegetation, particularly grasses, less than 20 inches (0.5 m) in height. Several possible management options include burning, mowing, or grazing. Frequency of burning would depend on

the type and density of vegetation on a site. Time of year should be considered when planning a controlled burn. It is best to conduct burning or mowing outside of the nesting season and after young are capable of sustained flight. Grazing can be an appropriate management tool as long as an area is not overgrazed. Generally, grazing at rates or densities recommended for livestock production and pasture health appears to provide satisfactory crane habitat. Agricultural extension agents may be consulted for information regarding appropriate livestock stocking rates based on the area and vegetation types present. The Natural Resources Conservation Service may be contacted for information on restoration of native grassland.

Sandhill crane management is compatible with many agricultural uses of land. However, there are a few adjustments that may make an area more suitable and less hazardous for cranes. If fencing is used in an area that is to be also managed for cranes, a three-strand fence with the bottom strand 18 inches (46 cm) from the ground is easier for cranes to crouch down and walk under and is thus less dangerous than a four- or five-strand fence (Nesbitt 1996). Additionally, a framed walk-through (24 inches high x 18 inches wide) placed periodically (every 0.3 miles) in a woven wire fence would allow cranes to walk through the fence but still restrain livestock (Nesbitt 1996).

Response to Disturbance — Nesting Season

Management plans for sandhill cranes subject to disturbance during the breeding season should include provisions for nest site protection buffers. Buffers should be designed to keep disturbance activities at a sufficient distance to prevent crane nesting from being interrupted. A buffer zone extending approximately 400 ft (125 m) from the nest would include reported flushing distances (250 ft, 75 m) and also allow for an awareness zone (150 ft, ~ 50 m). Cranes may be aware of a disturbance factor without necessarily responding in an obvious manner, such as flushing, as long as the disturbance factor remains within the awareness zone. Disturbances within the awareness zone can interrupt the nesting pair and may even cause abandonment of the area. The size and configuration of a nest site buffer will depend on site conditions and the individual pair of cranes. Observations of crane responses can be used to modify the boundaries to protect the nesting pair while reducing the impact on desired human activities.

Cranes and People

If providing for the needs of sandhill cranes within a semi-developed area is a goal of a landowner or land manager, some time should be spent reviewing management practices that would be beneficial to sandhill cranes.

Land use practices that directly or indirectly cause sickness, reduced reproductive ability, reduced prey availability, or death (e.g., pesticide use) should be avoided in areas managed or set aside for sandhill cranes.

When cranes are in close proximity to people, there are some precautions that should be taken. Potential crane-human conflicts may be avoided if people remember to treat sandhill cranes as wild animals and maintain a safe distance. Many rural and suburban residents regularly offer food to local sandhill cranes. Cranes may appear to become tame, even eating out of peoples' hands; however, 'tame' sandhill cranes can quickly and easily become a nuisance. During the breeding and nesting season they can become territorial and quite aggressive, considering people and pets as potential adversaries. Reflective surfaces and windows that cranes can easily approach can result in the crane reacting aggressively (S. A. Nesbitt, personal communication). Caution should be used when cranes are in close proximity to reflective surfaces, especially during the breeding season. Planting a visual buffer in front of the reflective surface or fencing the area off may eliminate or reduce this problem.

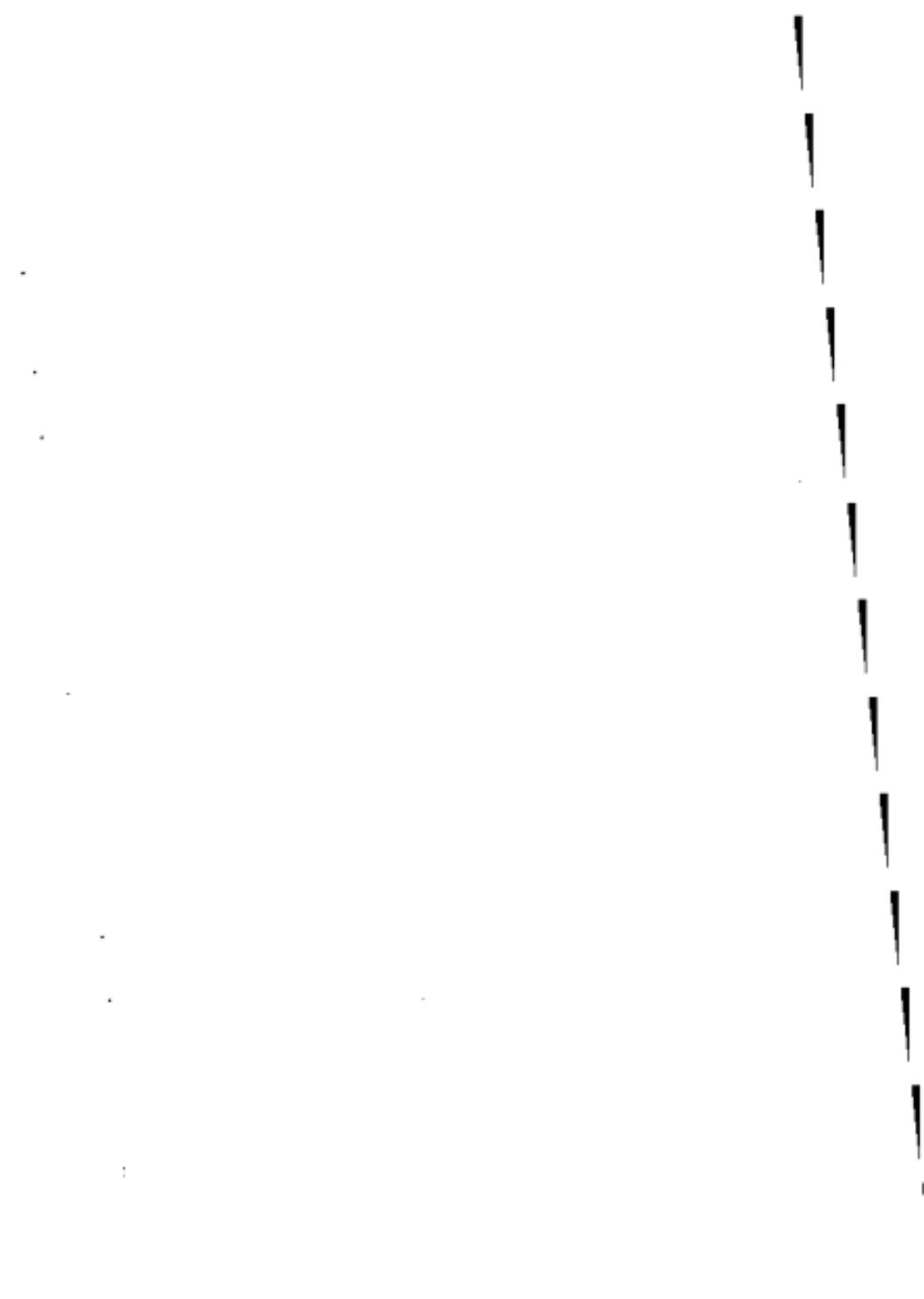
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