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STATUS OF NON-MIGRATORY WHOOPING CRANES IN FLORIDA

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Abstract: We soft-released 289 whooping cranes (*Grus americana)* into central Florida during 1993-2006 in an effort to establish a non-migratory population. As of September 2008, the population numbered 30 birds (11 pairs), including 12 males and 18 females. Survival and productivity rates have been lower than expected. Males did not survive past 10 years of age, whereas females have lived to at least 15 years of age. Most older males died as a result of predation or from colliding with power lines. We marked power lines and developed a streamlined transmitter to help reduce the number of collisions with the lines. From 68 nests monitored between 1999 and 2008, 31 chicks hatched and 9 fledged. Since 2002, when the first wild chick fledged, 3 wild-fledged birds have died and 1 has gone missing and is presumed dead. Florida has undergone several major droughts since the first nest was initiated in 1999; rainfall and wetland water levels did not meet apparent thresholds necessary for productivity in 6 out of 10 study years. Loss of habitat was an additional concern.

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Key words: Florida, *Grus americana*, non-migratory, reintroduction, status, whooping crane.

One of the goals of the recovery plan for the whooping crane (*Grus americana*) is to establish 2 distinct populations in addition to the remnant population that breeds in Wood Buffalo National Park, Canada, and winters at Aransas National Wildlife Refuge, Texas (AWBP; CWS and USFWS 2005). We began releasing whooping cranes into central Florida in 1993 in order to establish a non-migratory population that would serve as 1 of the 2 additional populations needed for species recovery (Nesbitt et al. 1997).

This was the first-ever use of the soft-release technique in an effort to reintroduce whooping cranes to the wild. Soft-release involves holding birds in a pen for a several-week acclimation period before releasing them into the wild. In the early years, a number of challenges were met and overcome (Folk et al. 2008[a]). Lessons learned from the Florida project helped pave the way for future releases, including the reintroduction of migratory whooping cranes to the eastern U.S. The intent of this paper is provide an update on this project since the publication of our last update (Folk et al. 2008a), with a focus on future direction.

METHODS

We soft-released 289 whooping cranes into central Florida during 1993-2006 in an effort to establish a non-migratory population. The cranes were released into Osceola, Polk, and Lake counties into habitats where cattle were actively grazed (Folk et al. 2006*a*). These pastures were dominated by low-growing bahia grass (*Paspalum notatum*) and interspersed with shallow marshes that were dominated by maidencane (*Panicum hemitomon*) and pickerelweed (*Pontederia cordata*). We monitored each bird via VHF radio telemetry daily for 3-6 months after release and then 2-3 times weekly thereafter for the life of the bird. We used aerial telemetry when birds moved beyond their

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normal ranges.

Birds were monitored more intensively during the breeding season; nesting birds were visually checked every 1-2 days. Biweekly over-flights in a Cessna 172 helped us monitor the nesting progress; some nests were visible only from the air. We collected detailed nest behavior data with the aid of 12-volt, time-lapse, VHS video-surveillance equipment. A sample of visible nests was videotaped so that we could collect behavioral data and to assist us in determining reasons for nest abandonment. We visited nests that were abandoned or incubated past a normal incubation period to collect information regarding the nest site. Intact eggs and egg remains were collected for necropsy. We monitored families until the chicks fledged or were lost. We captured fully fledged chicks before they became independent from their parents so that we could attach transmitters and bands and conduct brief health checks. We did not capture younger (prefledged and recently fledged) chicks because we did not want to compromise their flight capability. At the time of capture we recorded body mass, a pectoral mass index (estimated percent of 100% full musculature), and bill length from posterior nares to tip. We collected blood and fecal samples and visually inspected the birds for any abnormalities.

We captured fledged young and previously released birds for routine transmitter replacement and health checks using techniques invented for, or enhanced specifically for, whooping cranes (Folk et al. 1999, Folk et al. 2006*b*, Parker et al. 2008). Techniques for safely capturing and handling the birds included minimizing the time the birds were restrained.

RESULTS AND DISCUSSION

Recent Status

As of 3 September 2008, the population totaled 30 birds (11 pairs), and consisted of 12 males and 18 females. The birds were distributed across Polk, Osceola, Lake, Sumter, Marion, and Citrus counties of central Florida.

Survival and Nesting Success

Survival and productivity rates have been lower than expected based on data from wild crane populations (CWS and USFWS 2007). Males did not survive past 10 years of age, whereas females lived to at least 15 years of age. Most older males died as a result of predation or from colliding with power lines (Spalding et al. 2010).

From 68 nests monitored from 1999 to 2008, 31 chicks hatched and 9 fledged (Fig. 1), for a fledging rate of 0.13 young/nest. All fledged birds survived to independence from their parents. The sex ratio of wild-fledged birds was 2 males to 7 females. Since 2002,

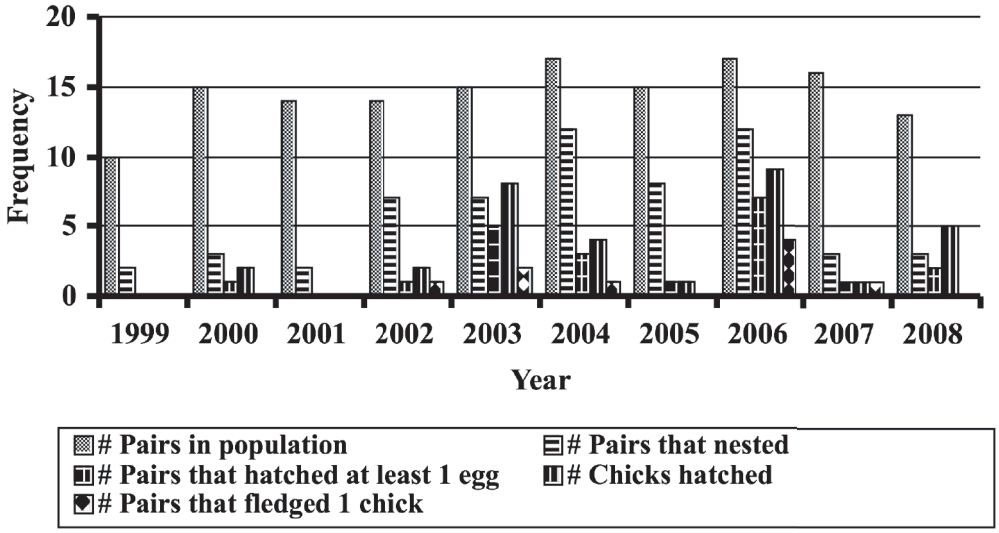

Figure 1. History of reproductive activity for the non-migratory flock of whooping cranes in central Florida.

when the first wild chick fledged, 3 wild-fledged birds have died and 1 has gone missing and is presumed dead. Most pairs nested each breeding season except when marshes were dry because of drought. Florida has undergone several major droughts since the first nest was initiated in 1999; rainfall and wetland water levels did not meet apparent thresholds necessary for productivity in 6 out of 10 study years. We calculated a breeding index to describe the level of breeding activity during each season (Spalding et al. 2009). Rainfall and marsh water levels before the breeding season were correlated with this breeding index, but rainfall during the breeding season was not.

Drought conditions prevailed during the 2007 and 2008 breeding seasons. Of 9 nests, 3 nests hatched 2 chicks, and 2 nests hatched 1 chick. One of the 8 chicks survived to fledging. It was the ninth chick to fledge in the wild during the project since the first crane fledged in 2002. Seven of the 9 nests were built in lakes by 2 crane pairs. Lakes are not typically chosen by cranes for nesting; prior to 2007, whooping cranes made only 1 (failed) nest attempt on a lake.

Pair 1291/898 chose a small (5-ha) urban lake in Lake County for nesting when marshes dried in their territory. Their primary feeding area was away from the lake and necessitated flying over paved roads, including a busy 4-lane highway. Normally the parents would fly to the feeding area, but because they had a chick (that would be flightless for ~80 days) we had concerns they would try to walk there and encounter the busy highway. We erected 206 m of fence between the nest marsh and the highway in an effort to prevent possible automobile collisions. We hoped that even if the parents hopped over the fence, the chick would remain on the safe side and prevent all from walking to the highway. We believed there were enough resources in and near the nest marsh for raising a chick to fledging age; therefore, keeping them from walking to the distant foraging area should not have limited their ability to raise the chick. As soon as physically possible, just a few days after the chick fledged, the family flew to the feeding area across the busy highway.

Another pair (772/369) nested in the littoral zone of Lake Kissimmee when the marshes dried up where they normally nested. This lake (14,143 ha) is the third largest lake in Florida and sustains heavy public use. The pair nested between 2 airboat trails and we observed heavy airboat traffic near the nest. The eggs, and more importantly, the incubating adults, were deemed at risk from an airboat, especially at night when visibility is poor and the birds would be less able to avoid the airboats. We decided to remove the eggs to reduce the threat of an airboat striking the incubating adults. The fertile eggs were artificially incubated at Disney's Animal Kingdom, Bay Lake, Florida. There were no other Florida whooping crane nests that could potentially accept the eggs, so the eggs were transferred to the eastern migratory reintroduction project. The eggs hatched normally and were captive reared, but 1 chick died in captivity while the other survived and successfully migrated behind ultra-light aircraft.

The pair re-nested in early May after we removed their first clutch, despite the late date in the breeding season. We discovered them incubating on 8 May, less than 100 m from where the previous nest was located. This time we tried a different approach in trying to reduce the probability that an airboat would strike the incubating adults and their eggs. On 11 May we posted protective signs around the nest to reduce human disturbance. On 19 May an airboat festival was centered at a boat ramp 1.6 km from the nest. Before the event, a wildlife officer visited the local airboat club and stressed the importance of avoiding the nest area. On the day of the festival we distributed 130 brochures describing the reason for the closure. Two wildlife officers in an airboat and 2 biologists in another airboat patrolled the edge of the closed zone during the festival. Most people respected the signs and avoided the zone. However, several groups of airboats crossed the closed zone, ran over the nest, and destroyed the clutch. It could not be determined which boat was responsible for the act and thus no charges were filed.

In 2008 the pair once again nested on Lake Kissimmee due to drought. Their first nest was isolated from human disturbance; the pair hatched 2 chicks but lost both within 4 weeks. They re-nested on the open lake and were more susceptible to human disturbance. Shallow water prevented conventional boats from disturbing the pair, but airboats could travel the area. The male had molted his flight feathers at the time of nest initiation. This was the first time we had documented a bird molting during incubation. Normally molting follows the nesting season (Folk et al. 2008*b*). We decided to adapt a "wait and see" policy with regard to taking any protective actions. The

location of the nest did not permit the use of video surveillance to document nest attendance. From visits to monitor the nest, we determined that the pair appeared to tend their nest quite faithfully despite interruptions by occasional airboat traffic. Time spent off the nest seemed greater than what we have observed at uninterrupted nests, but 1 of the pair always returned to the nest after the airboat left the vicinity. Upon checking the nest on day 17 of incubation, the nest was unattended but the female was nearby. The male had been missing for 24 hours. The unattended eggs were very hot to the touch, determined to be nonviable, and collected for necropsy.

By nesting in atypical, alternate sites such as lakes, the whooping cranes showed efforts at adapting to adverse habitat conditions during drought. Unfortunately, the cranes nesting on lakes were negatively affected by humans. Even if pairs managed to hatch chicks during drought, low water levels often compromised chick survival. In addition, we have documented that when drought causes water levels to be extremely low, cattle are able to approach and disturb nesting cranes. In an extreme case, the female of a nesting pair apparently was killed by livestock. During non-drought seasons, when water levels are higher, cattle more frequently graze at the shallow edges of marshes, thus serving a valuable ecological function of keeping vegetation in check. The ecotone at the marsh-upland interface is one of the most valuable habitats to cranes (Nesbitt and Williams 1990) and is prone to becoming overgrown by plants such as wax myrtle (*Myrica cerifera*) and fetterbush (*Lyonia lucida*) if not intensively managed (grazed or trampled).

Power Lines

Collision with power lines is the greatest known source of mortality for fledged whooping cranes in the AWBP (Stehn and Wassenich 2008). Whooping cranes reintroduced in 3 projects (Rocky Mountains, Eastern Migratory Population, and Florida resident flock) have also died after striking power lines (Hartup et al. 2010). Of the 23 times we documented Florida whooping cranes striking power lines, 18 resulted in death of the bird. Five cranes collided with lines and survived, based on the recovery of transmitters with broken leg bands under power lines and subsequent observations of the birds that had carried those transmitters.

From 2003 to 2006, 9 deaths took place under 8 km of high-voltage transmission lines that bisected good

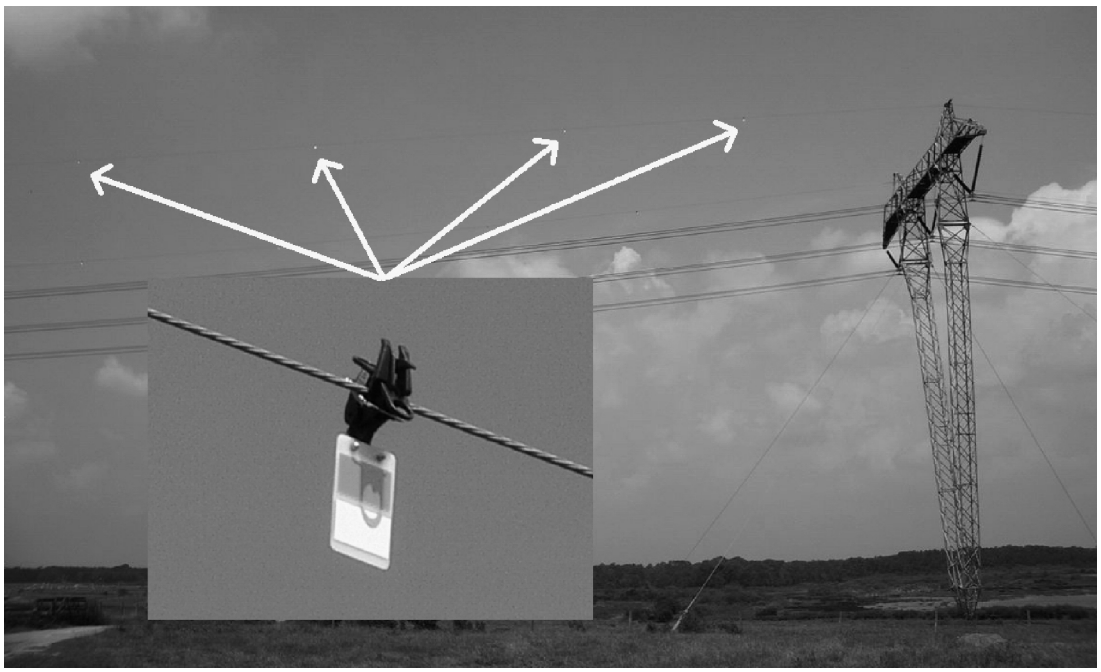

Figure 2. Firefly Bird Flapper® bird diverter used to mark 8 km of power lines where whooping cranes were striking, central Florida.

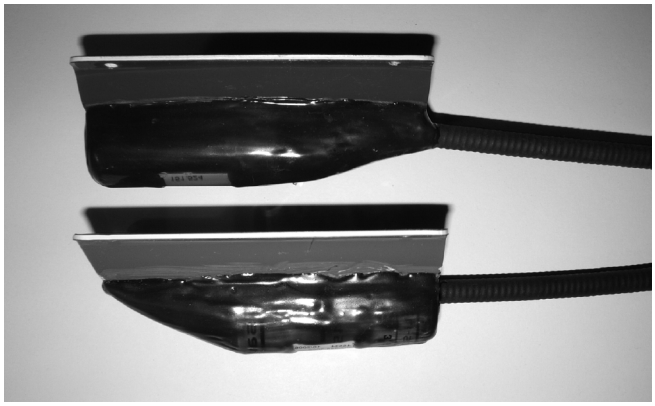

Figure 3. Side view of leg-mounted transmitters on half-bands in the position that they would be carried by a crane flying to the left. Redesign (bottom transmitter) shows streamlining to reduce effects of collisions with power lines.

crane habitat in central Florida. Project biologists also incidentally documented strikes by sandhill cranes (*Grus canadensis pratensis* and *G. c. tabida*), an American kestrel (*Falco sparverius*), and a bald eagle (*Haliaeetus leucocephalus*) with these lines. At our request, the utility company marked portions of the power line in January 2004, March 2005, and June 2005, and completed marking all 8 km in July 2006. At our request Firefly Bird Flappers® (PR Technologies, Portland, OR) were used (Fig. 2).

Another means of management for power line strikes was to modify our radio transmitters to be more streamlined at the leading edge, thereby allowing a bird to slide over a power line without its transmitter striking the line hard enough to shatter the band (Fig. 3). Cranes, as they fly over obstructions, will sometimes brush the object with their bodies. The old transmitters were square at the leading edge and likely collided with the line as the bird brushed over it (resulting in shattering of the transmitter band and possible bird injury or death). The newly designed transmitter will, upon impact, glide over the line. Since marking of the problem power lines and deploying the newly designed transmitter in that area over a 2-year span, we have not documented any mortalities and have observed only 1 non-injury contact with the line.

Future Concerns

Unfortunately, habitat for both whooping and sandhill cranes is disappearing from Florida at an alarming rate. Loss of habitat through development or alternative use is a serious threat to the state's crane populations. Too few acres of conservation lands are being actively managed in ways that benefit cranes. When given a choice, cranes select the most open habitats available; principally, these are on private ranch lands. Unless the state acquires more acreage from these private owners and gives priority to managing suitable grassland habitats–with an emphasis on grazing, seasonal burning, and wetland restoration–the long-term outlook for cranes in Florida will remain pessimistic.

From 1974 to 2003, suitable habitat in Florida declined 42% (Nesbitt and Hatchitt 2008). Cranes will inhabit developed land and are highly visible in urban areas. We suspected these developed habitats are not conducive to a self-sustaining crane population because of the increased mortality associated with a higher density of roads, power lines, fences, and human debris, all of which have been identified as sources of mortality for urban cranes (Folk et al. 2001). Comprehensive studies of Florida sandhill cranes have been conducted, but only in rural settings. A dedicated study is needed to determine the effects of human development and habitat conversion on cranes so that we can better anticipate and manage for the long term existence of the birds.

Preliminary results of population models for Florida whooping cranes, under various soft-release strategies, indicate that odds of achieving a self-sustaining population are extremely low unless the wild-fledged proportion of the population survives and reproduces at a much higher rate than birds released in 1993-2006. Major project partners used a structured-decision-making process as a tool for helping decide whether future releases should be made into the Florida flock. The resulting report was presented to the International Whooping Crane Recovery Team in September 2008. The Team used the report and other considerations to recommend that there be no further releases into Florida, but that studies of the remaining flock continue in order to maximize knowledge.

Because of the universal problem of cranes striking power lines, we recommend that managers consider adopting the streamlined transmitter design that we employed for whooping cranes in central Florida. This, along with marking of power lines in crane habitat, may reduce power line related injury and mortality.

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