

## Reproductive Success of Sandhill Cranes in Northeastern Illinois

The greater sandhill crane (*Grus canadensis tabida*) commonly was found breeding in Illinois up until the mid-1800's (Johnsgard, 1983). Following years of unabated market hunting and alteration of much of its wetland nesting habitat, the sandhill crane was considered extirpated as a breeding species by the 1890s (Meine & Archibald, 1996). However, in 1979, cranes once again were documented as breeding in northeastern Illinois (Meine & Archibald, 1996). Comprehensive aerial surveys documented a single nest and one pair of adults breeding in Illinois in 1980. Comparable surveys in 2007 confirmed 56 nests and 130 adult birds (Semel, unpubl. data). Concurrent wetland bird surveys revealed that the Illinois population of cranes had increased at an annual rate of 33.3% from 1980 to 2005 (Ward, in review). The successful return of cranes as a common breeding species in northeastern Illinois was somewhat unexpected as land use was changing dramatically during this time from a rural agricultural landscape to high density urban. Little is known about how cranes have adapted in light of continued human encroachment and loss of agricultural row crops throughout the region. Indeed, nearly all other wetland-dependent birds in the region are experiencing dramatic population declines while this species seems to be expanding both in terms of density and distribution (Ward, in review). This dichotomy between cranes and other wetland birds prompted the question of how crane populations have been able to increase so dramatically, especially in light of current development trends. There are two possible alternatives for this increase, 1) immigration into Illinois from larger, more established populations in nearby Wisconsin to the north, or 2) high recruitment of young birds produced in the Illinois population.

Anecdotal observations of only a small number of pairs with colts by late summer suggested high rates of colt mortality in northeastern Illinois. Preliminary research during the summers of 2008 and 2009 suggested less than 50% of colts survived to the fledgling stage. Moreover, mortality of 8-50% can be predicted for this species between the fledgling stage and independence (Nesbitt, 1992; Toland, 1999). These data suggest that local reproduction was unlikely to result in the observed population increase. However, cranes are long-lived animals and research suggests a population can be maintained with pairs only producing one to two

young over the course of their lives. To reveal underlying causes of current demographic trends additional research into the reproductive success of sandhill cranes in this region, and how specific habitat selection that may influence colt survival, is warranted. Furthermore, the location of this study is ideal to investigate how the survival of colts differs in the continuum from rural to highly urbanized landscapes. Collection of supplementary data will also allow us to determine if local reproduction is sufficient to sustain or allow for increasing populations in the absence of immigration from other states. Answers to these questions also are paramount to address current proposals for opening a public hunting season on this species.

#### RESEARCH OBJECTIVES and METHODS:

Our primary objective was to estimate the survival of colts within the state's greatest concentration of emergent wetlands, located in northeastern Illinois. We estimated survival rates using a "sight-resight" methodology. Annual breeding surveys coordinated by the International Crane Foundation (ICF), field observations, and aerial surveys via helicopter provided us with focal areas for locating breeding pairs and nest sites. Coinciding with the beginning of the peak egg-laying period, focal sites were monitored from mid-April to late May to assess nesting density and hatching success rates (Tacha et al., 1992). Nest sites with brooding adults or reproductively mature pairs were revisited weekly to determine nesting status. Sites where colts were observed were monitored to facilitate the capture and tagging of young. Young colts were monitored from a discrete location so as not to influence foraging behavior and movements. Teams of two or more researchers approached the family unit and captured the colts. Captures have demonstrated a high probability that young colts sought cover and remained motionless, making captures relatively passive events involving direct and slow approach. Older and more mobile colts required short pursuits.

Once captured, the colts were placed into a cloth bag to protect them from excessive stimuli. A spring scale was used to determine mass. Measurements were taken of 1) the long toe to hock, and 2) the hind toe to hock. Combined with plumage condition, these values allowed us to predict colt age and to establish development trends. A trimmer and surgical scissors were used to reduce the length of colts' down between the scapulae. Radio transmitters weighing less than 5% of average colt hatching mass (ca. 100g) were sewn and glued (e.g. non-toxic, quick drying eye lash glue) to small fabric patches (Tacha et al., 1992). Non-toxic, quick drying eye-

lash glue was sandwiched between the transmitter fabric and prepared mid-scapular location – this procedure required 1-2 minutes of gentle restraint while the glue cured. The color of the package resembled natal plumage and the surface was porous, allowing subsequent plumage growth to permeate the fabric and reinforce attachment. Upon release, colts were observed until reunion of the family unit was visually confirmed. Transmitters usually fell off the birds within 45 days, and observations confirmed that the transmitter does not affect bird behavior.

Recaptures were conducted to determine growth rates and reinforce transmitter attachment.

Capture and tagging rarely exceeded ten minutes, and 100% of radio-tagged colts were observed rejoining their parents shortly after release.

Observations of radio-tagged individuals were conducted approximately twice per week on a rotational schedule to document 1) the presence and condition of colts, 2) the family unit's activities at different hours of the day, and 3) to record the types of habitat birds utilized. Radio telemetry was used to locate and confirm the location and status of colts (e.g. alive or dead). Visual confirmations were made when it did not interfere with behavior or movements. Before fledging, at approximately 67 days of age, final recaptures were conducted and colts were banded with permanent leg bands, including unique color combinations of plastic bands and a USFWS metal band (Tacha et al., 1992). Blood samples were concurrently collected in coordination with the ICF. The bands serve to identify birds returning in subsequent breeding seasons and facilitate the recognition of individuals for quantifying dispersal distances from natal areas and survival to independence. Deceased colts were retrieved when possible and necropsies will be performed to determine cause of mortality. The program MARK was used to estimate survival and multivariate statistics and an information theoretic approach was used to investigate the spatial and temporal variables related to colt survival. Spatial data was analyzed in ArcGIS v9.3 using high-resolution aerial photographs.

## CURRENT STATUS:

From 2008 to 2009 a total of 47 colts have been radio-tagged at over 20 locations (Table1). Mortality of 22 colts was confirmed. 20 colts in total were confirmed to survive the breeding seasons; 2 of 8 in 2008 and 18 of 39 in 2009. The fates of 5 colts are unknown.

Survival analysis via MARK estimated survival over the course of the study to be 47.61%. Mean annual survival thus far is 38.97%. The model most supported by Akaike's information criterion (AIC) suggested survival varied both through time and between sites with different land uses (Figures 1 and 2, respectively). Sites with different land uses may also influence growth rates, but additional data are required.

## DISCUSSION:

The cause(s) of colt mortality is difficult to definitively determine. However, it appears that avian predators were likely responsible for 2 kills, coyotes or foxes for 5 kills, raccoons for 1 kill, and snapping turtles for 2 kills. Intact condition of remains of 3 colts found within 48 hours of severe storms suggests mortality may have been due to exposure. Eight transmitters were recovered in locations and conditions suggestive of predation, with mortality confirmed via absence from respective family units, but lack of evidentiary remains made conclusions of cause of mortality impossible. One deceased colt was found largely intact among agricultural row crops (i.e. soybeans). It is important to note that the aforementioned conclusions as to cause of mortality are derived from anecdotal observations and known predators' feeding habits – more definitive conclusions may follow subsequent necropsies of preserved remains.

Survival and growth rates differing across landscapes with different land uses are suggestive of adaptability to disturbed urban habits with accessibility to nutritional supplement via agricultural row crops. On the other hand, "urban" cranes occupy habitats that make detection and capture more probable than for cranes occupying larger wetland and grassland habitats. The potential for sampling bias in this regard warrants additional data collection with focus on larger wetland and grassland habitats.

There appears to be a contradiction between our finding that survival over the course of the study is 47.61% - with subsequent 8-50% mortality predicted prior to independence – and the current 33.3% rate of population increase (Nesbitt, 1992; Toland, 1999). There are two possible explanations for the seemingly contradictory data. First, it may be that the increase in the Illinois

population is a direct result of immigration from Wisconsin. The population in Wisconsin has been increasing at a rate of 6.8% per year over the last 41 years (BBS, 2007). Therefore, although few colts are surviving, large numbers of juveniles might be recruited into the population from Wisconsin. Another possible explanation is that because Sandhill cranes are long lived (> 20 years), and have an annual adult survival rate >88% (Tacha et al., 1992), they do not need to produce many young to compensate for adult mortality. However, the lifetime reproductive output for breeding adults is only 1.86 to 2.70 young (Tacha et al., 1992; Toland, 1999). Therefore, the rapid increase in the population suggests immigration is the reason for the increase, and not successful reproduction in Illinois. However, more data are needed to adequately define and model population trends.

Our findings thus far contrast to other crane studies that revealed low survival rates in highly disturbed habitats when compared to intact habitats (32% and 86% mean annual survival, respectively: Toland, 1999). Our results also contrast to the survival rates observed in Florida and the Rocky Mountain populations (64.9% and 97%, respectively: Nesbitt, 1992; Drewin et al., 1999). Moreover, these contrasting trends are in light of a 33.3% annual population increase in northeastern Illinois. It is therefore essential to make subsequent observations of banded birds to reveal overall mortality rates prior to independence, as well as collect supplemental data for birds in larger wetland and grassland habitats. Furthermore, a more comprehensive understanding of human impacts on this crane population is likely to have direct implications in future conservation efforts and the sustainable utilization of natural resources.

#### CONCLUSIONS and EXPECTED RESULTS OF FURTHER INVESTIGATION:

It appears that the rapid increase in sandhill cranes in northeastern Illinois is not due to local reproduction, but rather immigration from nearby populations in Wisconsin. Survival of colts in our study population is lower than observed in other regions with established populations. Although survival is apparently low, revealing if it is enough to sustain the population in the absence of immigration and/or under hunting pressures requires follow-up of the 2008-2009 field season, which effectively laid the foundations for subsequent long-term research. Investigation is needed to verify the survival rate estimated in this study as well as to elucidate the roles of landscape composition in growth and survival, and to observe juvenile dispersal patterns, mortality post-fledgling, and recruitment. Such research is expected to

provide wildlife and habitat management programs with the information necessary to protect the Sandhill cranes and wetland and grassland habitats in northeastern Illinois and other developing regions.

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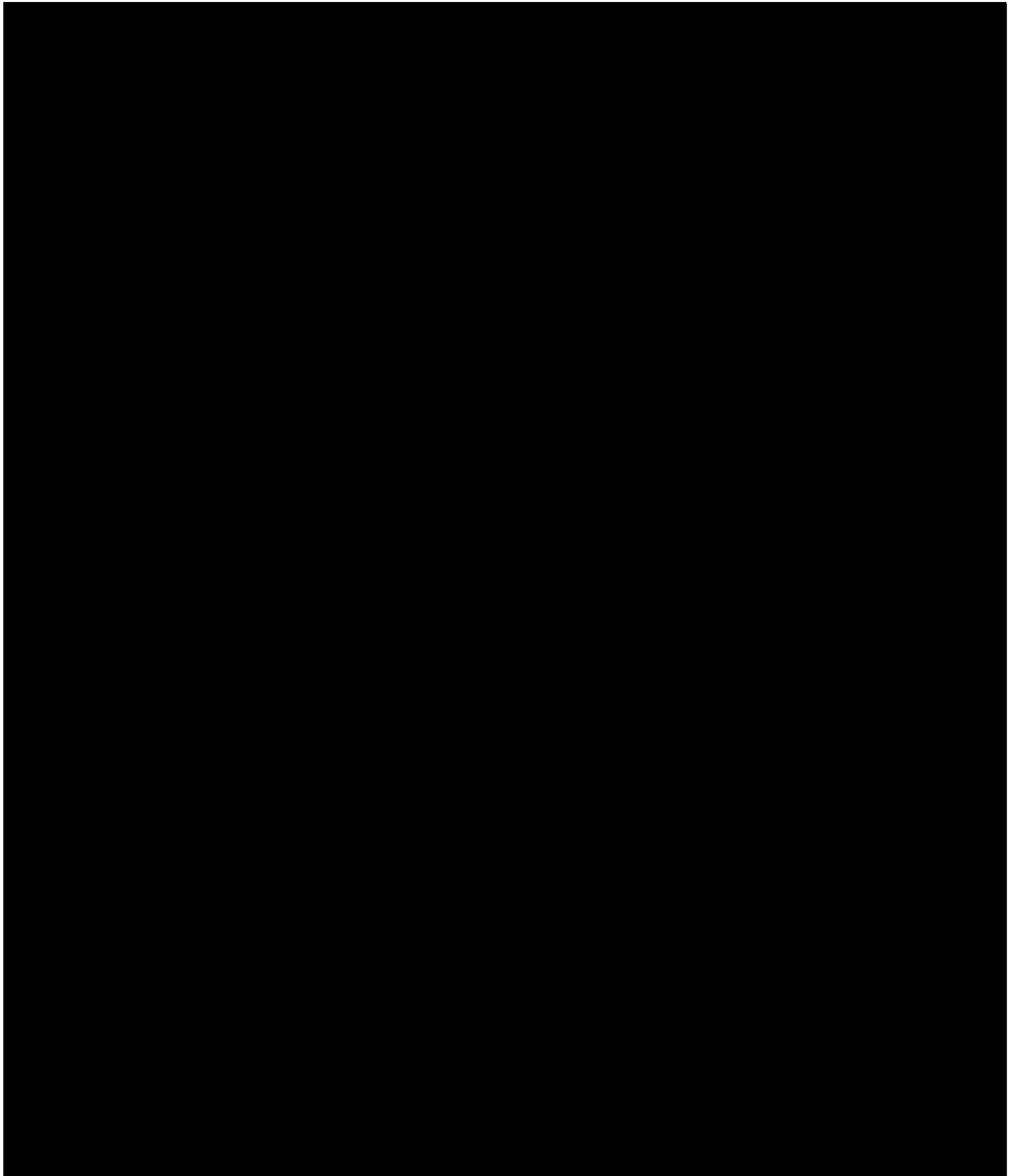
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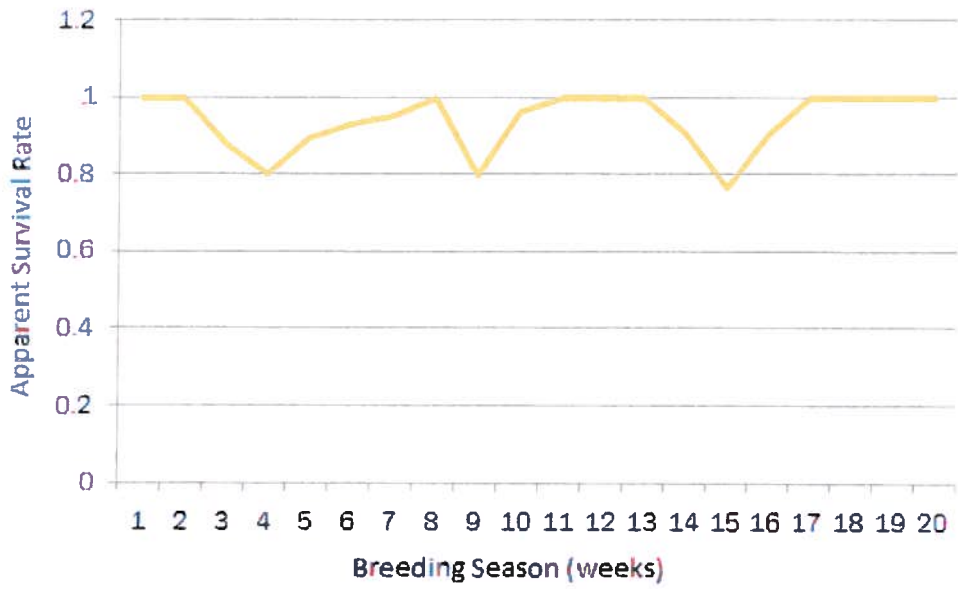
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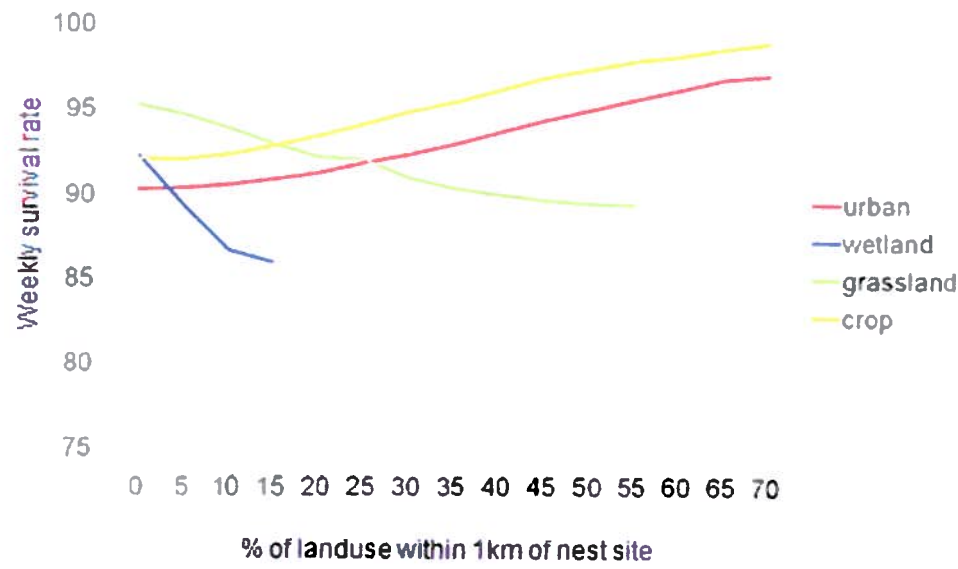
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**Figure 1: Sandhill crane colt survival through time.**



**Figure 2: Sandhill crane colt survival across different landscapes/land-uses.**



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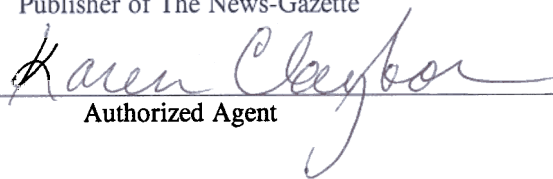
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#### FY10 Illinois Wildlife Preservation Fund Awards

- Phillips, C. Survey and status of the eastern massasauga (*Sistrurus c. cateratus*) and Kirtland's snake (*Chionopsis kirtlandii*) at Allerton Park, Platt County, Illinois - \$2,000. 10-019W
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- Tiemann, J.; K. Cummings Status of the freshwater snail Family Pleuroceridae in Illinois - \$5,816. RC10L17W
- Ward, M. Reproductive success of Sandhill Cranes (*Grus canadensis tabida*) in northeastern Illinois - \$5,204. RC10L18W
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