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WINTER ECOLOGY OF TRUMPETER SWANS IN SOUTHERN ILLINOIS

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FINAL REPORT

Federal Aid Project W-142-R-(3-5)

Submitted by:
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Title: Winter ecology of Trumpeter Swans in Southern Illinois

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NEED: The Interior Population (IP) of Trumpeter Swans (*Cygnus buccinator*) once numbered >100,000 but was extirpated by the early 1890s (Mitchell 1994). By 1935 only 69 individual Trumpeter Swans were known to exist in the lower 48 states (Mitchell 1994). Reintroduction of the IP began in 1960 and has successfully established a projected fall flight of 3,414 individuals (171% of the objective population, Ad hoc drafting committee 2002). Although breeding populations have now been well established in the upper midwestern states (i.e., Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin), only about 10% of the population has established traditional migratory behavior to wintering sites below 40° N latitude (Ad hoc drafting committee 2002). Most of the swans that have not established migratory behavior are artificially fed at some point during the winter period, likely delaying the establishment of migratory behavior (Gillette 1997). Thus, although the population is at 171% of the objective, the re-introduction has not been 100% successful at establishing a self sustaining population (Gillette 1997).

One argument often used to justify the continued supplemental feeding and supply of ice-free water is supplemental feeding is necessary to maintain winter survival adequate to sustain the desired population growth (Ad hoc drafting committee 2002). Post-fledging survival is the vital

rate that most influences population dynamics of large bodied waterfowl such as geese and swans (e.g., Schmutz et al. 1997). Post-fledging mortality of large bodied waterfowl is thought to primarily occur due to nutritional limitations or disease during the energetically stressful period of spring and fall migration. The perception is nonmigratory swans survive at a higher rate than migratory swans because nonmigratory swans are not exposed to the "hazards" of migration. Mortality of nonmigratory populations, however, may be high during the winter periods due to the harsh climate of more northern wintering areas and greater potential for nutritional limitations. I propose to compare annual survival rate between migratory and nonmigratory swans to determine if survival of nonmigratory swans is increased adequately to justify the continued practice of artificially maintaining open water and food.

An additional concern is adequate wintering habitat to support the desired Trumpeter Swan population below 40° N latitude no longer exists because the IP Trumpeter Swans has not demonstrated an aptitude for exploiting agricultural habitat as a winter food source. Thus, artificial maintenance of habitat is necessary. Two populations (approximately 140 individuals) have naturally established migratory behavior on more traditional wintering areas located at Burning Star # 5 (BS5), a reclaimed coal mine owned by Consolidation Coal Company in Jackson County, approximately 6 miles east of DeSoto, Illinois, and the U.S. Army Corps of Engineers (USACE) "Riverlands Tract" (Riverlands), a backwater area of the Mississippi River on the west side of the Mississippi River near Alton, Illinois. Neck collar observations indicate little movement between these 2 winter locations suggesting they are separate winter populations (Woolf 2003). To determine habitat needs of wintering swans and determine if IP Trumpeter Swans have adapted to take advantage of agricultural habitats similar to other swan populations and species of waterfowl, Faye Babineau conducted a study on the wintering population near DeSoto, Illinois. She concluded this population of swans, which appears to be increasing in abundance, uses primarily agricultural

habitat as a food source. Although, these results suggest the IP Trumpeter Swans can adapt to exploit agricultural habitat, agricultural foods may not supply all the nutritional requirements of free ranging geese (e.g., Buckley 1989, Amat et al. 1991); thus, although swans using agricultural habitat may be meeting their minimal nutritional needs, use of this habitat type may not be allowing for maximum growth of the population. If swans are able to meet their nutritional requirements through the exploitation of agricultural habitat, it appears adequate wintering habitat exists throughout the historic wintering range of the IP of Trumpeter Swans to maintain the desired population.

In contrast to the swan wintering at BS5, observations of the Riverlands winter population indicates those swans use primarily naturally occurring aquatic vegetation as a food source similar to foods thought to have been historically consumed by swans (Ed Zwicker, Illinois Department of Natural Resources [IDNR] pers. comm.). To determine if agricultural habitat is supplying adequate nutrients to minimize nutritionally related mortality, I propose to compare survival between swans exploiting natural foods (Riverlands winter population) and swans exploiting agricultural foods (BS5 population).

OBJECTIVES:

1. Determine if agricultural foods provide adequate nutrition to maintain desired abundance and population growth.
2. Determine if artificially supplying wintering habitat above 40° N latitude, which likely delays the establishment of migratory behavior, is necessary to maintain winter survival at an adequate level to maintain the desired population abundance and growth.

3. Provide IDNR personnel with a final report determining if nutrient acquisition from agricultural habitat allows for adequate survival of swans to support the desired abundance and growth of the population.

EXECUTIVE SUMMARY

Segment 5 of Illinois Department of Natural Resources Federal Aid Project W-142-R (Winter ecology of Trumpeter Swans in Southern Illinois) was the third year of a 3-year project. The single study involves: Job 1.1 (Verify the perceived difference in wintering habitat use and diet between swans wintering on BS5 and swans wintering at Riverlands); Job 1.2 (Determine if seasonal and annual survival differs between swans wintering at BS5 and swans wintering at Riverlands); Job 1.3 (Determine if annual survival differs between migratory and non-migratory swans breeding and wintering in Wisconsin and Illinois); and Job 1.4 (Provide IDNR personnel with a final report determining which type of winter habitat (submergent aquatic vegetation or a variety of agricultural crops) is most sufficient at supporting wintering Trumpeter Swans). This report documents the completion of the project.

Job 1.1 Document differences in diet

Nearly 500 swans currently winter in or near southern Illinois and have apparently adapted to local conditions. Migratory IP trumpeter swans make heavy use of agricultural resources and have been doing so for several years (Babineau 2004, this study). Swans in the 3 study groups spent between 9.1% and 31.5% of daylight hours foraging in crop fields during the winter. In contrast, between 5.2% and 12.5% of daylight hours were spent foraging in aquatic habitats. Although we could not determine the exact proportion of the swan diet that is made up of agricultural foods when compared to natural foods, flock surveys and behavioral observations provide further evidence of the importance of field-feeding in winter. If further attempts at

establishing migratory groups are to be made, availability of crop foods should be taken into account when selecting locations.

Soybeans are widely regarded as a poor-quality food for wildlife. For the most part, swans seemed to avoid soybeans and instead used corn and winter wheat. The importance of winter wheat increased in the late winter, possibly because its high protein content helps swans better prepare for the nutrient demands of egg-laying and incubation. Where winter wheat was not available, it appeared that submerged and emergent aquatic vegetation was substituted. The percentage of cygnets in the population, a measure of population health, was slightly higher each winter at BS5 (30.5%) than at Riverlands (26.6%) and much higher than at Universal (9.8%). Availability of winter wheat was greatest at BS5, intermediate at Riverlands, and lowest at Universal. Use of winter wheat in the late winter may have contributed to the reproductive success of some swans. It is also possible that breeding swans select wintering sites where winter wheat is more readily available, causing the proportion of cygnets in the population to be higher at those sites. When managing wintering areas for swans, emphasis should be placed on the availability of corn and winter wheat in suitable, nearby fields.

Job 1.2 Estimate and compare survival between the two wintering populations

The objectives of this job are to (i) estimate seasonal survival rate of young and adult swans wintering in the 2 study sites and (ii) determine if seasonal and annual survival differs among swans at different wintering sites.

Freezing temperatures, long distance foraging flights, and lack of high quality agricultural foods may all contribute to diminished body condition, and thus mortality. There was no indication, however, that survival rates varied among the 3 migratory populations (BS5 = 82.3% ± 2.2%, Riverlands = 86.3% ± 3.8%, and Universal = 83.9% ± 3.6%). Swans are able to survive equally

well at the 3 sites regardless of varying levels of disturbance, weather conditions, and crop availability. This is further evidence that swans have successfully adapted to the conditions in and around southern Illinois and suggests that the number of suitable wintering areas in the south may be higher than previously thought. The 3 sites do have some things in common which managers should look for when evaluating potential wintering areas; open water for all or most of the winter, protection from hunting-related disturbance, and limited lead shot concentrations.

Each season poses a new set of challenges for birds, especially those that migrate. They may experience harsh weather conditions and limited natural foods in winter, the risks and costs of reproduction in summer, and a dangerous and energetically demanding migration in spring and fall. We found limited evidence that survival of swans varied by season. The most parsimonious model indicates survival is relatively high (99.2%) and constant among each of the 4 seasons. A very competitive model, however, indicates apparent survival is highest (99.8%) during the summer, from mid-May to mid-August, and during the winter, from early December to late February, and slightly lower (98.9%) during the spring, between late February and mid-May, and again in the fall, between mid-August and early December. A decrease in survival in spring and fall can likely be attributed to migration-related causes.

The distance between the central Wisconsin breeding areas and the BS5 wintering ground is approximately 700 km. This distance is quite short when compared to other migratory species of swans. Tundra swans travel up to 6000 km to reach their wintering grounds, while Bewick's swans fly approximately 4500 km each fall and spring. These results suggest that, while migration can possibly be linked to a reduction in survival rates, it may be advantageous for swans to trade-off the risks of migration for the benefits of wintering at BS5.

Job 1.3. Compare survival between migratory and nonmigratory swans

The objective of this job is to determine if annual survival differs between migratory and non-migratory swans breeding and wintering in Wisconsin and Illinois. There was strong evidence to suggest, however, that survival was higher for migratory swans (83.5% ± 1.9%) than non-migratory swans (74.9% ± 2.4%), despite the suspected dangers of migration. Survival was very high during the winter and summer periods for migratory swans. Little mortality occurs on BS5, indicating that it is a safe wintering location. The majority of mortalities may occur during migration, but not at a rate that limits migratory populations. It is unknown when the majority of mortalities occur for non-migratory swans. Future research that addressed this question would help managers make informed decisions regarding non-migratory groups. The estimated apparent survival rates presented here are likely lower than the actual annual survival rates of these swan populations. I was unable to fully estimate collar loss and emigration rates. Using the seasonal survival estimates, apparent annual survival at BS5 between 2005 and 2007 is 97.0%. This rate is much higher than that calculated using yearly resighting data from 2000 to 2007 (82.3%) and is likely more accurate. There is no evidence to suspect, however, that the amount of potential bias varies among the wintering sites. In other words, all sites are equally underestimated so the difference in survival observed between migratory and non-migratory swans is likely valid.

Both non-migratory and migratory swans survive at a rate that supports population growth. The average annual growth rate of swans in Wisconsin was 16.6% from 2000-05 (Caithamer 2001, Moser 2006). The population at BS5 has grown from 77 swans in 2002-03 to 129 swans in 2006-07, an average annual growth rate of 13.8%. These rates are comparable to those in states where swans are mostly non-migratory, which range from 12.7% in Michigan to 16.9% in Minnesota (Caithamer 2001, Moser 2006). Many non-migratory swans, however, have become dependent on humans during the winter; gathering in very large groups also makes the population more vulnerable to severe weather events and disease outbreaks. The primary goal of the IP Flyway

Management Plan is “to restore a self-sustaining, migratory metapopulation of trumpeter swans”. Winter feeding in northern areas contradicts that goal. Migratory swans survive as well as, if not better than, non-migratory swans. Concerns about high mortality during migration and a lack of suitable wintering grounds appear to be unsupported.

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