



# Landscape-level Habitat Use by Trumpeter Swans in the Sandhills of Nebraska and South Dakota

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## Overview:

Since the beginning efforts in the 1960s to re-establish Trumpeter Swan (*Cygnus buccinator*) populations to the northern Great Plains, the High Plains Flock has successfully increased its numbers and expanded its range from the reintroduction at Lacreek National Wildlife Refuge, South Dakota, into the Sandhills of Nebraska and nearby locales. Broadly, the Interior Flock Trumpeter Swans have previously been identified as a focal species within the U.S. Fish and Wildlife Service's Focal Species strategy, which is committed to landscape-scale bird conservation. Yet, the Cooperative Management Plan for the High Plains Flock established objectives to direct management efforts based on a desired population goal, which was to increase numbers and distribution of trumpeter swans, maintaining a dispersed population consisting of at least 500 birds counted during the production survey and 50 successful breeding pairs. Currently the High Plains Flock Consists of 524 birds and 65 successful nesting pairs with an average population growth rate of 4.9% per year (from 1990-2010). However, the objectives of the Cooperative Management Plan were not based on empirical information regarding wetland use and landscape suitability for Trumpeter Swans. Rather, the plan directed management efforts based on a desired population abundance. Without further knowledge of the landscapes and habitats utilized by the High Plains Flock, managers cannot objectively determine the amount of habitat needed to maintain the population.

In order to identify relationships between wetland-use and the landscape surrounding wetlands, we established a set of objectives for an analysis, which were to (1) synthesize information on numbers and distribution of the High Plains Flock from existing survey databases; (2) compare wetland and landscape characteristics at swan locations to characteristics of wetlands and landscapes absent of swans, making inference over broad-scale habitat decisions; and (3) use the results to inform managers where alternative locations within the range of High Plains Flock which are suitable for nesting swans, or could be made suitable with management.

## Methods and Analysis:

Data from aerial cruise surveys was collected in August from 1979 to 2007. Surveys monitored the location, number, and age class of Trumpeter Swans in northeastern Wyoming and the western portions of Nebraska and South Dakota. Over the 17 year survey period, 933 swan locations were recorded throughout northeastern Wyoming, north-central Nebraska and south-central South Dakota. Given there was limited observations and lack of consistent land cover, the dataset was reduced to the Sandhills of Nebraska and South Dakota, totaling to 728 individual sightings for analysis.

Random points were assigned to each available wetland where swans were not observed within the two-mile-wide survey window along the flight path. The resulting dataset contained 9,411 total points on wetlands, of which 726 represented swan occurrence and 8,685 represented available wetlands where swans were not observed.

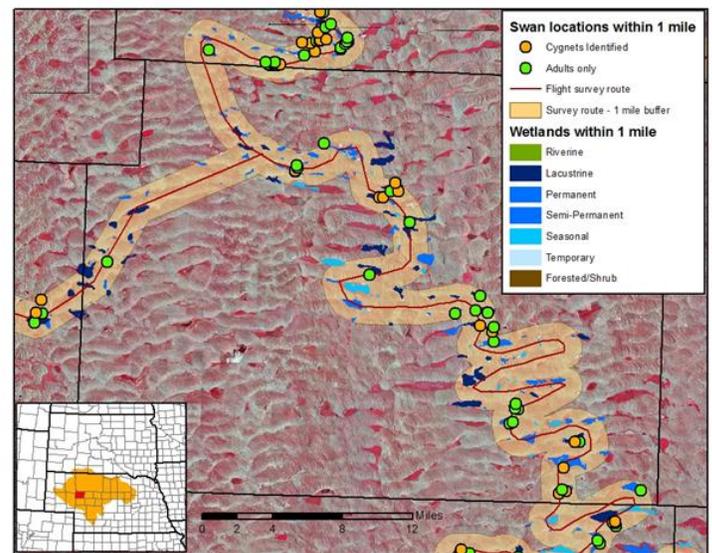


Fig. 1. Example of trumpeter swan observation points in relation to wetland basins developed using NWI data (blue and green) within one-mile buffer (orange lines) on either side of trumpeter swan survey route (red line) in Grant County, Nebraska.

Digital landcover data provided by the Great Plains GIS Partnership was used to identify landscape characteristics surrounding each wetland, which was summarized at multiple spatial scales, quantifying the percentage of each land cover class or wetland basin water regime within the respective radii. Land cover classes included grassland, woodland, cropland, developed, wetland, and roads.

Given the non-probabilistic manner in which the data was collected, descriptive analysis was used to show patterns in the data. Changes in the landscape over time were negligible (4.2% since 1973). Additionally, swans generally used the same wetlands each year. Given the temporal auto-correlation in the dataset and limited change in land cover, we analyzed relationships between swans and the surrounding landscape using data from 2002, which was the midpoint of the survey period and had the greatest number of swan observations. We compared characteristics of used wetlands and their surrounding landscapes versus what was available for adult and sub-adult swans. We also

compared local and landscape habitat characteristics for wetlands used by adult/sub-adult swans with cygnets versus wetlands which house only non-breeding adult/sub-adult birds.

**Results:**

The number of points at which trumpeter swans were observed increased from 1979 to 1991 but showed little increase from 1991 to 2007; the number of adults/sub-adults and cygnets varied among years, with adult/sub-adult numbers generally increasing from 1979-2007. The majority (79%) of wetland basins available to swans had temporary or seasonal water regimes. However, swans did not use wetlands in proportion to their availability, instead showing strong selection for lake and semipermanent wetlands and avoidance of temporary and seasonal wetlands (Fig. 2).

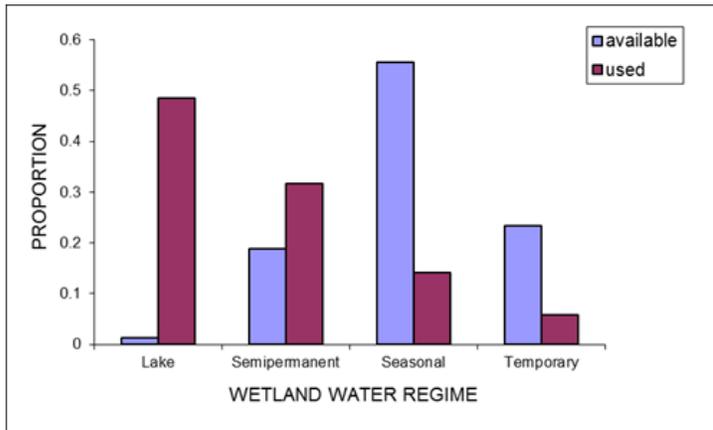


Fig. 2. Water regimes of wetlands used by swans in 2002 differed from water regimes that were available for use, with swans using more lake and semipermanent wetlands and few seasonal and temporary wetlands than were available.

Landscapes around wetlands at which swans were observed and available wetlands where swans were not observed were both dominated by grasslands and wetlands, particularly lakes and semipermanent wetlands. Landscapes surrounding used wetlands generally had lower densities of wetlands relative to what was available. Cropland, developed land, and woodland were uncommon, with swans showing a tendency to use wetlands in areas with lower amounts of cropland and woodland relative to what was available.

Lakes at which adults/sub-adults and cygnets were observed in 2002 were nominally larger than lakes at which adults/sub-adults but no cygnets were observed, but the difference was not statistically significant ( [SE] = 88.8 [12.8] and 72.4 [14.7] ha, respectively,  $p = 0.38$ ). Semipermanent wetlands showed a similar pattern ( [SE] = 42.3 [12.9] and 28.2 [6.0] ha, respectively,  $p = 0.35$ ).

Landscapes around wetlands at which cygnet and adult/sub-adult swans were observed had slightly greater amounts of grassland and developed land, lower amounts of woodland and lakes, and slightly more wetlands than landscapes around wetlands at which adults/sub-adults only were observed (Fig. 3).

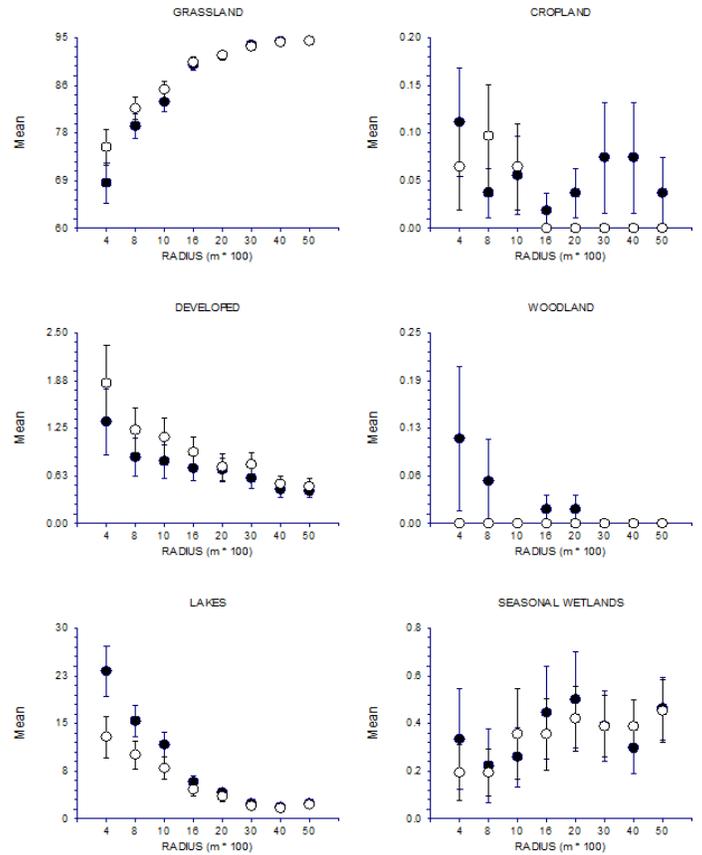


Fig. 3. Means and standard errors of amount of land or water (as percentage of landscape) and number of wetlands at multiple radii around 54 wetlands at which adults but no cygnets were observed (solid circles) and 31 wetlands at which adults and cygnets were observed (white circles) in 2002.

**Discussion:**

Results of this analysis suggest several possible management recommendations for trumpeter swans in the HPF. Use of large semipermanent and lacustrine wetlands by trumpeter swans suggests the value of these sites to swan populations. The presence of cygnets, and by extension, successful nesting, appears to be higher in areas with few trees and much grass, suggesting the maintenance or restoration of grass in areas with breeding swans and perhaps tree removal as potential management options for swans in the High Plains flock. Finally, relatively high wetland densities in landscapes surrounding wetlands where cygnets were observed suggest the importance of wetland complexes around large semipermanent and lake wetlands.

