

Tundra Swan Use of the Upper Mississippi River during Autumn Migration

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Abstract.—The Upper Mississippi River is an autumn stopover site for the Eastern Population of Tundra Swans (*Cygnus columbianus columbianus*). A total of 37 aerial surveys and ten video surveys were conducted along 180 km of this river in the autumn of 1998 and 1999 to estimate swan numbers, percentage of young and brood sizes. Numbers peaked during late November and swans were present on the river in substantial numbers (>5,000) for nearly two months. Calculations suggest that 52% of the Eastern Population cygnets and about 25% of all Eastern Population swans used the study area during autumn migration. Video surveys indicated that breeders arrived later than non-breeders in autumn migration and that average brood size was 1.9 in 1999. Based on 43 radio-marked swans tracked every two to three days, the average length of stay was 33.6 days. The turnover rate (swans using the study area/peak number recorded in the study area) was low, 1.29 in 1998 and 0.94 in 1999. These findings suggest that the Upper Mississippi River is an important autumn stopover site for the Eastern Population of Tundra Swans, and may be especially important for cygnets.

Key words.—Aerial surveys, *Cygnus columbianus columbianus*, brood size, length of stay, migratory stopover site, percent young, radiotelemetry, Tundra Swan, Upper Mississippi River, videography.

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The Eastern Population of Tundra Swans (*Cygnus columbianus columbianus*) increased at an average annual rate of 2.4% from 1955 to 1989 (Serie and Bartonek 1991a), but has experienced no significant growth since 1984 (Serie *et al.* 2002). The Eastern Population now exceeds the North American Waterfowl Management Plan goal of 80,000 birds (Serie and Bartonek 1991b). The Eastern Population nests from east of Point Hope, Alaska to Hudson Bay and winters primarily in North Carolina and Maryland (Limpert *et al.* 1991). In spring, Eastern Population swans stage primarily in the Susquehanna River Valley in Pennsylvania and Lake St. Clair in southern Ontario before moving through Wisconsin, Minnesota, North Dakota, and the southern Canadian prairies. Major autumn migration stopover sites include the Prairie Pothole area of North Dakota, the Upper Mississippi River in Minnesota, and the Long Point region of Lake Erie (Limpert and Earnst 1994; Petrie *et al.* 2002). Few studies have investigated the number of swans, percentage of young, brood sizes or length of stay at autumn stopovers.

About 90 Tundra Swans were first observed on the Upper Mississippi River in 1946 and use of the river in autumn appears to have increased through 1990, although survey data are incomplete. During this period, peak swan numbers reached 8,334 in 1972, 12,000 in 1984 and 8,780 in 1990. About 200,000 swan use-days (i.e., number of swans times days of use) were calculated for the autumns of 1972 and 1984 (E. Nelson, unpublished data). Swan use of the Upper Mississippi River has increased dramatically since 1990. Peak swan counts were as high as 20,000 in 1993 and swan use-days in autumn neared 620,000 in 1997 (Wetzel 1999).

The objectives of our study were to estimate (1) number of swans using the area, (2) brood size and percentage of young by week and for the autumn season, and (3) length of stay and turnover rates at this Upper Mississippi River autumn stopover site.

STUDY AREA

The Upper Mississippi River is one of three segments of the Mississippi River. It lies between the Headwaters segment and the Lower Mississippi River