



Trumpeter Swan by *Thomas R. Schultz*

# Wisconsin Trumpeter Swan Recovery Plan

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*The Wisconsin Trumpeter Swan Recovery Plan outlines the activities that are needed to restore the extirpated Trumpeter Swan as a self-sustaining, breeding, and migratory bird in the state, with a minimum nesting population of 20 pairs.*

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The Trumpeter Swan (*Cygnus buccinator*), first described in 1805–06 by Lewis and Clark (Coues 1903), was once a fairly common breeding bird throughout most of the northern United States and Canada (Figure 1). Lumsden (1984b) speculated that the species' former breeding range east of the Rocky Mountains included 2.6 million km<sup>2</sup> of suitable prairie and boreal habitat. Applying a density figure of one swan per 20 km<sup>2</sup> recorded in Alaska in 1968, he calculated that there may have been as many as 130,000 Trumpeter Swans east of the Rockies in the 1600s. Baird *et al.* (1884), Coues (1903), and Forbush (1912) suggest that the Trumpeter Swan was common or fairly common across the northern interior of North America, with Baird *et al.* stating that the species was common "in all the valley of the Mississippi."

Market gunning and the millinery trade almost led to the extinction of the Trumpeter Swan. Birds were hunted for their highly valued plumage and for food. Baird *et al.* (1884) compared the taste

of a Trumpeter Swan to that of a steer. Citing London fur trade records, Banko and MacKay (1964) reported 108,000 swan skins sold from 1823 to 1877, with an average of 3,000 sold per year between 1823 and 1853. About 5,000 were sold in 1828 (Banko 1960). Despite the onslaught, Trumpeter Swans survived, though in very low numbers. By 1932 only 69 Trumpeter Swans were known to exist in the entire continental United States south of Canada. A nonmigratory population existed in the remote mountain valleys of Montana, Idaho, and Wyoming (Hansen 1973). Another remnant population existed in Alberta, Canada (USFWS and CWS 1984).

Concern about possible extinction led to concerted conservation efforts that included protection from hunting, intensive management of remnant populations, and transplanting of wild stock (Hansen 1973). In 1935, the U.S. government established the Red Rock Lakes National Wildlife Refuge (NWR) in southwestern Montana solely for the protection of Trumpeter Swans (Han-

sen 1973). With protection there and in the adjacent Yellowstone National Park, the Trumpeter Swan population grew until it saturated available habitat within a 100-mile radius (Hansen 1973). This led to the initiation of a transplanting program in other states utilizing swans from Red Rock Lakes Refuge. Trumpeter Swans are slow to pioneer new areas, and transplanting offered a means to reintroduce the species more quickly to its former range (Hansen 1973).

The transplant technique that has proved successful has involved translocating cygnets prior to flight in September, clipping their wings to preclude flight during winter and until the next molt, and placing the birds in semi-captivity in spring-fed enclosures where food is provided as needed. Once the birds regain flight the following summer they have become familiar with their immediate marsh environment, can explore a wider area, and slowly develop a traditional attachment to the area (Hansen 1973).

Independent of management efforts was the discovery of a separate population in Alaska in 1954 (Bergman 1985) and along the North Pacific Coast (Hansen 1973). Surveys of Alaskan Trumpeter Swans in 1968, 1975, 1980, and 1985 produced population counts of 2,847, 4,170, 7,696, and 9,459, respectively (Conant *et al.* 1986).

After the 1968 Alaska count, Trumpeter Swans were removed from a list of species considered for federal endangered status. The species' current federal status is "rare." In 1984, the North American population was reportedly estimated at about 10,000, with about 8,000 Trumpeter Swans in Alaska alone (North American Management Plan For Trumpeter Swans 1984).

The North American Management

Plan For Trumpeter Swans (USFWS and CWS 1984) recognizes for management purposes 3 Trumpeter Swan populations: (1) The Pacific Coast Population—swans that breed mainly within Alaska and winter mainly in coastal British Columbia. This population also includes restoration flocks (of Red Rock Lakes NWR origin) at Turnbull, Malheur, and Ruby Lake NWRs; (2) The Rocky Mountain Population—a nonmigratory tristate (Wyoming, Montana, Idaho) subpopulation and a migratory interior Canadian subpopulation that winters in the tristate area; and (3) The Interior Population—restoration flocks east of the Rocky Mountains consisting primarily of transplants (during 1938–66) from Red Rock Lakes NWR and from the Peace River (Grande Prairie) region of Alberta (Figure 2). Restored flocks of Wisconsin Trumpeter Swans would comprise part of the Interior Population.

#### TRUMPETER SWANS IN WISCONSIN

Trumpeter Swans occurred as breeding birds in both Wisconsin and Minnesota until the mid-to-late nineteenth century (Schorger 1968, Hansen 1973, Henderson 1981). Hoy (1852) reported the Trumpeter Swan as "frequently seen, and occasionally shot in our vicinity (Racine, Racine County)." Grundtvig (1895) commented that Trumpeter Swans were seen during migration and indicated that the species bred in northwestern Wisconsin. King (1883) reported it as a "rather rare migrant." McCollum (1884) reported the Trumpeter Swan as rare in central and eastern portions of the state apparently during 1879–84. Cantwell (1890) sighted the swans at various times on October 3, 1889, at Lake Mills in western Jefferson County. Cory (1909) described the Trumpeter Swan as oc-



Figure 1. Historical breeding range of the Trumpeter Swan.

curring “sparingly” in Wisconsin during migration. He added: “It is fast becoming a very rare bird, at least east of the Mississippi.”

Schorger (1968) found no information on specific Wisconsin nest locations, but based on a thorough research of the literature believed that the species bred on or near Lakes Waubesa and Kegonsa (“the Madison lakes”) different years during the period 1839–87. Parmalee (1960, 1963) reported excavated remains of Trumpeter Swans from Jef-

erson and Winnebago counties. Regarding the Jefferson County site, he documented the remains of 7 Trumpeter Swans located approximately 8 km northwest of Jefferson. From the Winnebago County site he noted the remains of 8 Trumpeter Swans found along the south shore of Lake Butte des Morts. Both Schorger’s and Parmalee’s findings support the reported former breeding of the species in Dane and Jefferson counties in the early 1840s (Kumlien and Hollister 1903).



Figure 2. Management populations delineated in the North American Management Plan for Trumpeter Swans.

Kumlien and Hollister (1903) described the status of the bird as “very rare” in the state during the early part of this century. Thure Kumlien obtained a juvenile between 1842–45 in Jefferson County, procured 6 birds from a large flock on a prairie east of Stoughton in 1857, and collected an adult male at Lake Koshkonong on April 20, 1880 (Kumlien and Hollister 1903, Coale 1915). Kumlien and Hollister (1903) also reported a flock of 3 Trumpeter Swans on

Lake Koshkonong on May 6, 1893, and a “large, fine male” killed by Ludwig Kumlien on the Rock River in March, 1892. They commented that the species “doubtless [occurred] more frequently along the Mississippi River than in other parts of the state.”

Other Wisconsin records include: an adult male shot in Waukesha County in February 1904 (Coale 1915); a single specimen sent to the Milwaukee Public Museum by the Wisconsin Natural His-



ported nesting pairs at Red Rock Lakes NWR.

### SWAN HABITAT IN WISCONSIN

There is an estimated total of 4.4 million acres (1.78 million ha)  $\pm$  10% of wetlands in Wisconsin (Steve Fix, pers. comm.). The southeastern, predominantly agricultural, shallow marsh region, the western-southwestern Mississippi pool area, and the northwest-northcentral high density lake region of Wisconsin support large, shallow marshes considered suitable Trumpeter Swan nesting habitat. During spring waterfowl surveys in 1986, the southeastern region averaged 3.5 and the northern region averaged 1.9 deep fresh marsh and open wetland areas per square mile (Fendry *et al.* 1986).

Locations that offer potentially suitable Trumpeter Swan nesting habitat include, but are not limited to, the Kakagon River-Bad River Slough complex and Fish Creek Slough in Ashland County, the Gordon Flowage in Douglas County, Crex Meadows Wildlife Area in Burnett County, the Necedah Wildlife Refuge in Juneau County, Horicon Marsh in Dodge County, Grand River Marsh in Marquette and Green Lake counties, an integrated complex of marshes and lakes in southeastern counties, and the Mississippi River pool marshes in Buffalo, Trempealeau, and La Crosse counties.

### FOOD REQUIRED BY SWANS

Trumpeter Swan diets consist mostly of tubers and stems from a variety of aquatic plants; consumption per day is about 20 pounds, (Henderson 1981) including arrowhead (*Sagittaria latifolia*), pondweeds (*Potamogeton* spp.), and bulrush (*Scirpus* spp.). Seeds of yellow pond

lily (*Nuphar variegatum*) and sedges (*Carex* spp.) are also important (Banko 1960, Bellrose 1976). During summer, submergents comprise most of the Trumpeter Swan's diet (Larry Gillette, pers. comm.). Lumsden (1986) observed that Trumpeter Swans fed predominantly on pondweeds in 1983, and when less pondweeds were available in 1984–86 they moved to marsh edges to feed on duckweed (*Lemna* sp.), alga (*Spirogyra* sp.), arrowhead, and occasionally bur reed (*Sparganium americanum*). Beggartick (*Bidens cernua*) was also taken near the center of the marsh.

During the first few days of a cygnet's life, aquatic insects, crustaceans, and duckweed (*Lemna minor*) are eaten. After a few weeks the diet includes more aquatic vegetation, and at 2–3 weeks of age it is similar to that of the vegetative diet of the parents (Banko 1960, Hansen *et al.* 1971).

### LIMITING FACTORS FOR TRUMPETER SWANS

**Habitat.**—The size and suitability of potential Trumpeter Swan breeding habitat in Wisconsin needs to be determined through careful field investigations. One element affecting habitat suitability is the presence of lead (discussed below) in the food chain at breeding or wintering sites. Generally, breeding habitat does not appear to be limiting in the state, but only a systematic field survey of potential habitat will determine quantity and quality. Isolation, as indicated by Hansen *et al.* (1971), is an important criterion when identifying suitable habitat. The presence of abundant submergent plants, particularly pondweeds, is important also.

Related to habitat suitability is the absence of carp. At the Malheur NWR,

peaks in swan production in 1963, 1971, and 1979 occurred 2 years after drought conditions. Remaining water areas were treated with rotenone to eradicate carp. Production of sago pondweed (*Potamogeton pectinatus*) and other submergent aquatics increased dramatically as water availability increased (Cornely 1982).

At Cranberry Marsh in Ontario, where most cross-fostering of Trumpeter Swan eggs involving Mute Swans as foster parents has occurred, the absence of carp has resulted in a "luxuriant growth of submergent aquatic plants, not seen in adjacent marshes where carp are present" (Lumsden *et al.* 1986).

**Illegal Harvest.**—Trumpeter Swans are protected from hunting in the United States, but they present a large, low-flying target and thus are susceptible to illegal shooting. Tundra Swans are not hunted in the Mississippi Flyway; it is unlikely that waterfowl hunters would mistake Trumpeter Swans for other legal game species. Nevertheless, at Grand River Marsh in eastern Wisconsin, Tundra Swans have been mistaken for snow geese and shot (William Wheeler, pers. comm.). Illegally shot Trumpeter Swans in Minnesota were not mistaken for snow geese; they were intentionally shot (Larry Gillette, pers. comm.). Illegal shooting of Trumpeter Swans should not pose a significant problem in Wisconsin because of the public interest in swans and the expected heightened public awareness of a Trumpeter Swan reintroduction program. Occasional intentional shooting, however, may occur.

**Lead Poisoning.**—Lead poisoning (mostly from lead fishing sinkers) is a major cause of Mute Swan mortality in England (Eltringham 1963). Trumpeter Swans occupy the same ecological niche

as Mute Swans and available evidence suggests that Trumpeter Swans are at least as susceptible to lead poisoning as Mute Swans (Carrol Henderson, pers. comm.). Elevated levels of lead in the blood were found in one-fifth of 25 Mute Swans banded in northern Wisconsin in January 1986. At least 2 adult Mute Swans, and possibly as many as 5, died of lead poisoning (from fishing sinkers) in the Mercer area during the 1985–86 winter (Amundson and Marcquenski 1986). At a potential release site in Chequamegon Bay, however, lead levels were below detection levels (0.1 ppm) in Mute Swans sampled on August 1, 1986 (Amundson 1986).

Lead deposition from fishing sinkers and spent lead shot could pose a significant risk to the successful reintroduction of Trumpeter Swans locally if birds nest or overwinter in areas where lead levels in sediments are high. Bottom sampling in potential nesting habitat will be conducted to determine lead levels in sediments. Periodic monitoring of lead levels in Mute Swans from areas intended as reintroduction locations for Trumpeter Swans will indicate the extent of lead ingestion and will help determine whether these locations are suitable as release sites.

**Power Lines.**—Power lines present a potentially major source of mortality for Minnesota Trumpeter Swans. The Hennepin County Park Reserve District is in the vicinity of the heavily populated Minneapolis-St. Paul area (Larry Gillette, pers. comm.). Monitoring the movements and survival of reintroduced Trumpeter Swans will reveal the extent to which power lines limit the birds. Wisconsin restoration efforts will occur in wetland areas of low power-line density,



which should help minimize the potential threat of this limiting factor.

**Snapping Turtles.**—Snapping turtles have been a major source of Trumpeter Swan cygnet mortality during foster rearing in Ontario and Michigan and have limited the success of restoration efforts (Lumsden 1984a, Joe Johnson, pers. comm.). Four foster parent Mute Swan pairs lost 4 and may have lost 12 Trumpeter Swan cygnets to snapping turtle predation during 1983–86 (Lumsden *et al.* 1986). Consequently, the Ontario Ministry of Natural Resources instituted turtle control measures. Michigan's entire 1986 hatch (7 Trumpeter Swan cygnets) was eradicated by snapping turtles during the first year of cross-fostering under Mute Swans (Joe Johnson, pers. comm.).

Only one suspected snapping turtle-related Mute Swan cygnet mortality was observed in 1985 at Fish Creek Slough, a northern Wisconsin marsh on Lake Superior. Here, 15 Mute Swan cygnets successfully hatched, with 14 surviving to flight stage in 1985. Snapping turtles are suspected to have taken cygnets and caused poor nesting success for some Mute Swan pairs in the Eagle-Palmyra area of southeastern Wisconsin during 1986 (Tom Bintz, pers. comm.).

**Mute Swans.**—Mute Swans are native to Eurasia and were brought to North America by European immigrants as estate or park birds in the 1800s (Hindman 1982). They escaped from captivity and first bred as wild birds in 1910 on the Hudson River near the Atlantic Coast (Hindman 1982). Mute Swans have spread to 11 states on the Atlantic Coast, where there are now 4,900 birds, plus 1,500 in Michigan, 100 plus in Ontario,

(Lumsden 1984a), and about 150 in Wisconsin.

A pair of Mute Swans began to nest successfully in northwestern Wisconsin in Prentice Park (city of Ashland) adjacent to Chequamegon Bay during 1973 when park employees built a nesting platform for them. Since then, this single pair has been responsible for a free-flying, summer population of about 35 on Chequamegon Bay and roughly another 15 on inland lakes and marshes in Ashland, Bayfield, and Douglas counties. Another free-flying, summer population of about 100 Mute Swans exists in southeastern Wisconsin.

Mute Swans typically nest in high densities, with breeding territories of 4 to 10 acres (1.5–4 ha) (Bellrose 1976). These birds may detrimentally affect surrounding aquatic vegetation. They consume large quantities of aquatic vegetation, predominantly submerged aquatics (Hindman 1982), averaging about 3.8 kg (8.4 lbs, wet weight) a day (Willey 1968). Also, while feeding and nest building large amounts of aquatic vegetation are uprooted but not utilized (Gillham 1956, Willey 1968).

Regarding interspecific interactions, Mute Swans generally may out-compete Trumpeter Swans for nesting sites and feeding territories (James Cooper, pers. comm., Sublett 1981). In the Gordon Flowage in 1985, however, a pair of Trumpeter Swans displaced at least 1 Mute Swan pair (Fred Strand, pers. comm.). Larry Gillette (pers. comm.) believes that in most cases wild nesting Trumpeter Swans will dominate nesting Mute Swans when individuals of both species are the same age.

Most of the states that have feral Mute Swan populations have Mute Swan control programs (5 states) or are contemplating control. A desirable effect of

reintroduction efforts with Trumpeter Swans would be to replace exotic Mute Swans. Trumpeter Swans are ecologically compatible with native waterfowl and do not damage aquatic vegetation because they occur in low breeding densities, with breeding territories seldom smaller than 23 ha (Banko 1960). Trumpeter Swans also are less aggressive towards other waterfowl species and are more tolerant of waterfowl species nesting within their breeding territories (Henderson 1981).

### RECOVERY PLAN OBJECTIVES AND STRATEGIES

The Wisconsin Trumpeter Swan Recovery Plan establishes objectives and reintroduction strategies for restoring a self-sustaining, migratory, and breeding population of Trumpeter Swans in the state by the year 2000. The program goal is to establish a minimum nesting population of at least 20 pairs in the state.

The plan lists eight primary objectives:

- (1) identify and maintain suitable Trumpeter Swan breeding habitat;
- (2) cross-foster Trumpeter Swan eggs using selected pairs of nesting Mute Swans;
- (3) document hatching, development, behavior, health, and survivorship of fostered Trumpeter Swan cygnets;
- (4) raise Trumpeter Swans in captivity and release as subadults (23 months of age) at selected sites;
- (5) purchase and place single adult Trumpeter Swans of the appropriate sex in marshes that are used by single adult Trumpeter Swans of known sex that have dispersed from the Hennepin County (MN) Trumpeter Swan restoration flock. Determine if nesting occurs and document nesting success;
- (6) establish a Wisconsin Department

of Natural Resources' (WDNR) Swan Committee to address control of Wisconsin's feral Mute Swan population and to evaluate Trumpeter Swan reintroduction strategies and recovery objectives;

- (7) develop public support for a Trumpeter Swan reintroduction program and provide the public opportunities to observe this species; and

- (8) determine nesting locations and nesting success of Trumpeter Swan pairs constituting a restored Wisconsin flock.

Two major techniques will be utilized in the reintroduction effort: (1) cross-fostering Trumpeter Swan eggs using selected pairs of Mute Swans as foster parents; and (2) captive-rearing of Trumpeter Swan cygnets hatched from artificially incubated eggs. Cygnets will be reared in captivity following the techniques described by Gillette and Dyhr (1977). They will be placed in separate groups in large outdoor enclosed pens, with siblings confined within individual groups since it has been determined that captive Canada Geese outbreed by mating with individuals with whom they were not reared (Henderson 1985). At the age of about 4 months, wing-clipped cygnets will be transferred to overwintering sites and maintained until they are subadults (23 months of age). The birds will be recaptured and wing-clipped once again during the summer preceding the following spring release at 23 months of age. Unrelated birds will be paired and released at selected sites.

Criteria for selecting release sites include: (1) shallow marshes with extensive areas of emergent vegetation and a muskrat population to provide nest sites; (2) abundant aquatic macrophytes as a food source for cygnets and adults; (3) plentiful invertebrates as a food source for cygnets less than 3 weeks of age; (4)

absence of lead shot or lead sinkers; (5) few snapping turtles (small population); (6) control of public access; and (7) a frost-free period of over 140 days.

According to a model for Trumpeter Swan survivorship developed by Turner (1981), 43% of first-year Trumpeter Swans survive to age 1 year. Trumpeter Swans may begin to develop pair bonds at 20 months of age and some birds may nest for the first time at age 3 years (Monnie 1966). Most birds do not nest until they are 4–6 years old (Banko 1960). By releasing birds at age 23 months, the Wisconsin DNR will enhance the probability of survival and future breeding. Released birds, however, will not be encouraged to overwinter, and winter feeding by the public will be actively discouraged.

A third technique that will be employed in the restoration effort involves overwintering and rearing of cygnets produced by captive Trumpeter Swan pairs held at the Milwaukee County Zoo and at other sites to be determined. Trumpeter Swan cygnets would be removed from their parents at age 4 months and transferred to an overwintering site for eventual release at age 23 months.

Cross-fostering of 20 Trumpeter Swan eggs is planned from 1987 through 1996 and will occur initially in southeastern Wisconsin marshes. Live-trapping and translocation of snapping turtles will occur from designated cross-fostering sites to minimize risks of predation on cygnets. All Trumpeter Swan cygnets produced will be radio-tagged to determine survival and movements. The effectiveness of cross-fostering as a reintroduction technique will be carefully evaluated annually.

In 1987 and 1988, the Minnesota DNR will earmark 10 Alaskan Trum-

peter Swan eggs for Wisconsin among 50 they will collect each year from nests in the Minto Flats area near Fairbanks. Based on hatching success of the 50 eggs at the Carlos Avery Game Farm in Forest Lake, Minnesota, Wisconsin will receive a prorated number of cygnets. The Alaskan cygnets allocated to Wisconsin's program will be raised by the Minnesota DNR to age 15 months, at which time the cygnets will be transferred to a Wisconsin overwintering site. The following spring these birds will be paired with unrelated swans and released at selected marsh sites.

Beginning in 1989, the Wisconsin DNR will attempt to secure a minimum of 50 Trumpeter Swan eggs annually through 1996. It is hoped that at least 30 eggs will be obtained from Alaska (or alternate sources of wild stock). The remaining 20 eggs will come from private propagators or wild lower-48-state stock.

Since most Trumpeter Swans do not breed until 4–6 years of age, and it could take at least 4 years for the population to begin to replace itself, a minimum 10-year commitment to reintroduction efforts will be necessary if a viable population is to be established in the state.

One of the objectives of this plan is to control Wisconsin's feral Mute Swan population and to replace gradually selected pairs of nesting Mute Swans with nesting Trumpeter Swans. For the purposes of this plan a separate WDNR Swan Committee is created to address the issue of Mute Swan control.

A major information and education program, coordinated with key phases of the recovery effort, will be developed; this is essential and critical to program success.

A major assessment of reintroduction techniques and recovery objectives is called for after the 1991 and 1996 field

seasons. Implementation of the recovery program will require the cooperation and integrated efforts of the WDNR Bureaus of Research, Wildlife Management, Endangered Resources, and Information and Education. Other cooperating government agencies, organizations, and institutions in Wisconsin include the Great Lakes Indian Fish and Wildlife Commission, the Milwaukee County Zoo, the United States Fish and Wildlife Service, and the University of Wisconsin.

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