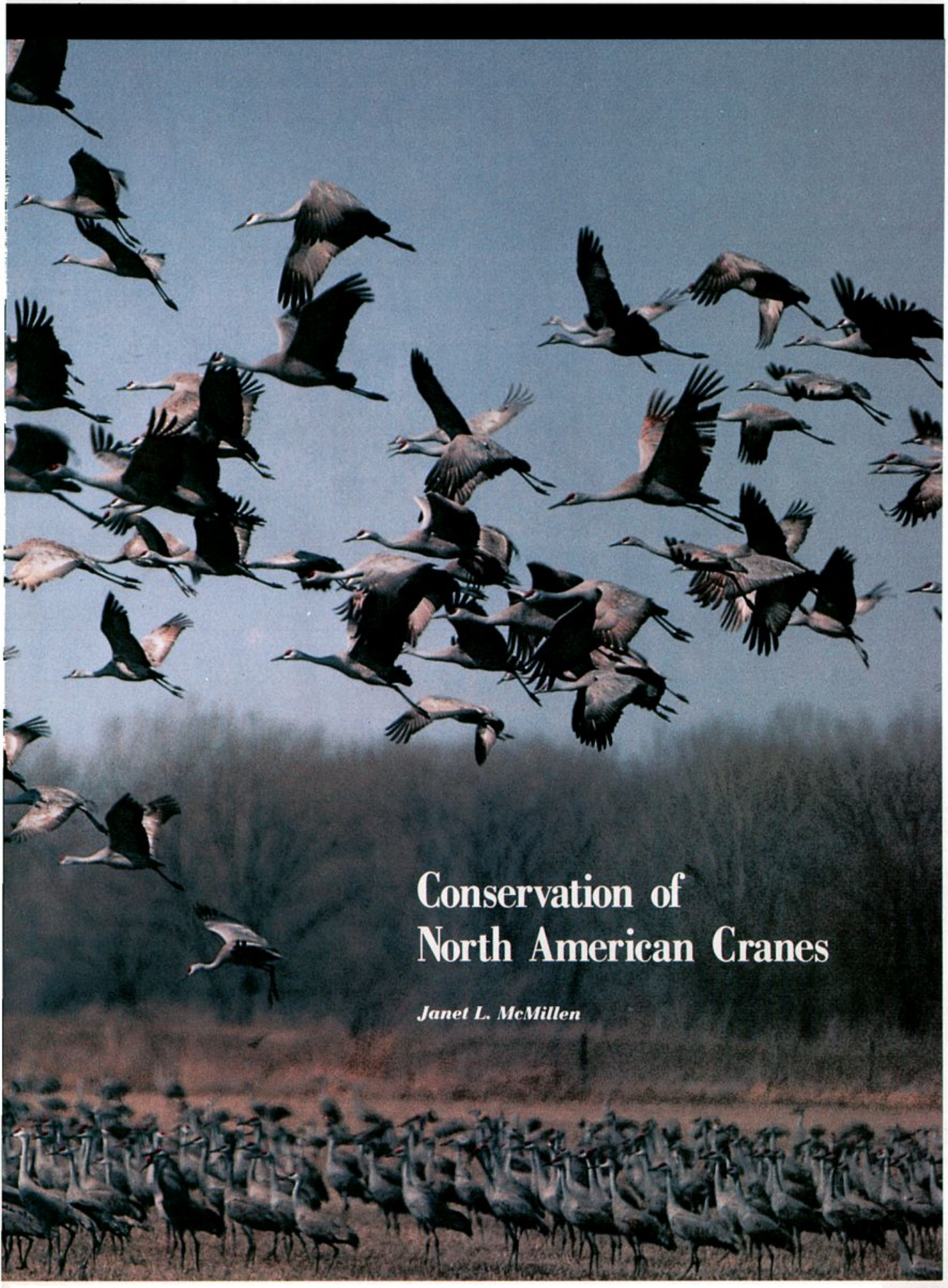

INTERNATIONAL COUNCIL FOR BIRD PRESERVATION



Conservation of North American Cranes

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TWO SPECIES OF CRANES, THE SANDhill Crane (*Grus canadensis*) and the Whooping Crane (*G. americana*), are native to North America. There are six Sandhill Crane subspecies. The Greater Sandhill Crane (*G. c. tabida*), the Lesser Sandhill Crane (*G. c. canadensis*), and the Canadian Sandhill Crane (*G. c. rowani*) are migratory, and they have fairly large populations (Table 1) and broad, disjunct breeding and wintering ranges (Fig. 1). The Florida Sandhill Crane (*G. c. pratensis*), Mississippi Sandhill Crane (*G. c. pulla*), and Cuban Sandhill Crane (*G. c. nesiotes*) are sedentary, and they have highly restricted ranges and relatively small populations (Fig. 1, Table 1).

Both the Whooping Crane and the Mississippi Sandhill Crane are federally listed as endangered. Factors that led to their decline include habitat modification, human disturbance, hunting, and specimen collection. Natural factors such as weather and low reproductive rate, *i.e.*, delayed sexual maturity and small clutch size, compounded the problem (Valentine 1984; U.S. Fish and Wildlife Service 1986).

The Mississippi Sandhill Crane, consisting of approximately 50 individuals in a single sedentary population and 49 in captivity, is considered the world's rarest and most endangered crane (Archibald *et al.* 1981). Its range formerly extended at least from Louisiana into Alabama; however, the single remaining population is confined to southern Jackson County in southeastern Mississippi. The Mississippi Sandhill Crane National Wildlife Refuge was established in 1975 and has continued to expand through additional land purchases.

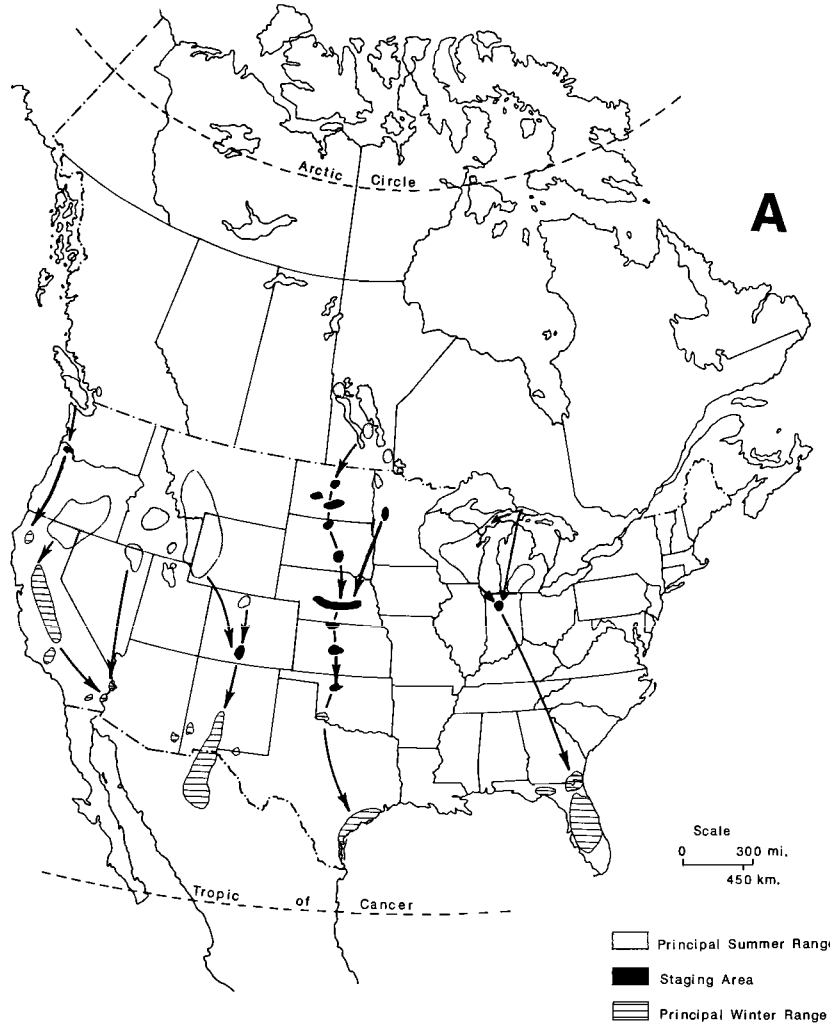

Figure 1. (A) Nesting range, migration routes and wintering areas for Greater Sandhill Cranes

The Whooping Crane was uncommon and declining by the late 1800s, and population estimates for the 1870s varied from 500 to no more than 1400 (U.S. Fish and Wildlife Service 1986) The breeding range extended south-

Table 1. Population estimates and status of the Sandhill Crane subspecies. Adapted from Drewien and Lewis (1987).

Subspecies	*Population estimate*	*Trend over past decade*	*Endangered status (King 1981)*
Greater			—
Central Valley	3,200	Stable	
Lower Colorado River	1,600	Unknown	
Rocky Mountain	16,500	Increasing	
Eastern	15,000	Increasing	
Coastal Texas	5,000	Unknown	
Lesser and Canadian of Platte River staging area	540,000	Increasing	—
Lesser in California	25,000	Stable	—
Florida	5,000–6,000	Stable	—
Mississippi	50	Stable to decreasing	Endangered
Cuban	Unknown (100–150)	Unknown	Rare

Photograph on preceeding page by Ron Klataske.

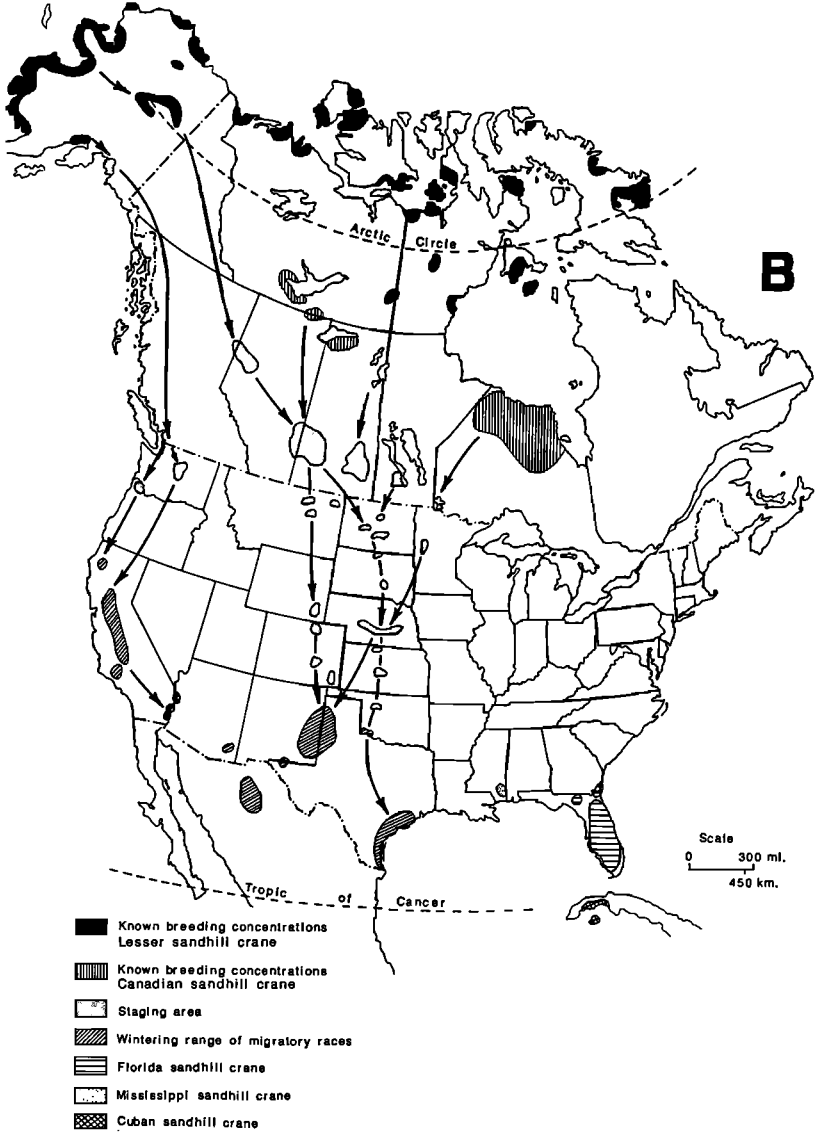

Figure 1. (B) Nesting range, migration routes and wintering areas for Canadian and Lesser Sandhill Cranes and occupied range of Cuban, Florida, and Mississippi subspecies. Adapted from Johnsgard (1983).

east from Alberta, Saskatchewan, and southern Manitoba into northeastern North Dakota, western Minnesota, and northern Iowa. Migration routes led to wintering areas in Louisiana, Texas, and the Rio Grande Delta region of Mexico, and to the Atlantic seaboard. A small, non-migratory population also occurred in southwestern Louisiana (Fig. 2) (Allen 1952). The species teetered on extinction in 1945 when only three individuals remained in the sedentary Louisiana population and 18 in a population that bred at Wood Buffalo National Park, Northwest Territories, Canada, and wintered at the Aransas National Wildlife Refuge along the Texas coast (Fig. 3). The last documented breeding in the non-migratory population occurred in 1939, and the sole survivor was taken into captivity in 1950 (U.S. Fish and Wildlife Service 1986).

Since 1945 the population of Whooping Cranes has increased to an estimated 160 in two non-captive populations (Fig. 4), with an additional 48 in captivity. This comeback is attributable to a multifaceted conservation program, which includes captive propagation, release, and habitat preservation as cornerstones. Similar efforts have prevented the further decline of the Mississippi Sandhill Crane. Because the Whooping Crane is indigenous to both the United States and Canada, recovery efforts have often been conducted jointly by the U.S. Fish and Wildlife Service and the Canadian Wildlife Service. The directors of both services formalized this long-standing cooperation in 1985 by signing a memorandum of understanding. Canada and the United States now make all Whooping Crane decisions jointly and have equal ownership of all eggs, birds, and specimens (U.S. Fish and Wildlife Service 1986).

Captive Propagation

Following recommendations by Lynch (1956) and Erickson (1961), the United States Fish and Wildlife Service began a captive propagation and release program in 1961 to avert extinction of wild crane populations. The objectives of this program were to: 1) develop propagation and husbandry techniques using non-endangered Sandhill Cranes as surrogates, 2) produce endangered cranes for release, and 3) foster basic research on cranes. The captive surrogate flock was developed initially on the Monte Vista National Wildlife Reserve, Colorado, but in 1966 it was transferred to permanent facilities at the Patuxent Wildlife Research Center in Laurel, Maryland.

Captive flocks of Mississippi Sandhill Cranes and Whooping Cranes were established at Patuxent in 1966 and 1967, respectively. Both colonies were built largely through incubation at Patuxent of single eggs removed from wild clutches. This procedure works well because most cranes lay two-egg clutches but relatively few pairs fledge more than one chick. An early study with surrogates, later corroborated with Whooping Cranes, showed that egg removal did not diminish fledging success (Erickson 1975, 1976). To date 92 Whooping Crane eggs and 58 Mississippi Sandhill Crane eggs have been collected from wild clutches. DNA studies are currently underway to identify relatedness among endangered cranes at Patuxent, and most eggs acquired recently were selected to increase the genetic diversities of the captive flocks.

Captive Mississippi Sandhill and Whooping cranes produced fertile eggs at Patuxent for the first time in 1973 and 1975, respectively. Cranes are indeterminate layers and can be manipulated to produce more than their typical two-egg clutch. Until recently maximum egg production was a primary propagation objective, and egg or clutch removal along with improved artificial insemination techniques and use of artificial light regimes have been used to enhance productivity. Before 1978, eggs were hatched in artificial incubators and

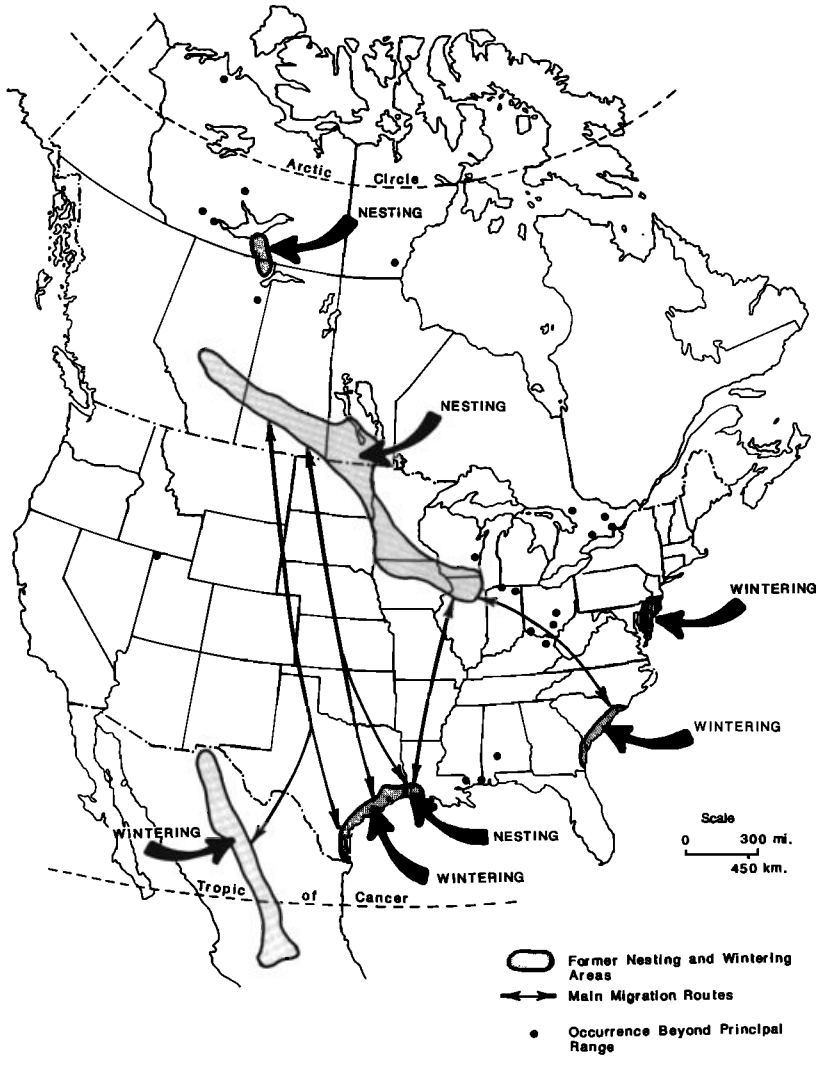

Figure 2. The original range of the whooping crane in recent times. Adapted from U.S. Fish and Wildlife Service (1986).

chicks were hand-raised. However, since 1978 most eggs of the endangered forms have been hatched and chicks reared by selected pairs of Greater or Florida Sandhill Crane foster parents. This procedure increased hatching success and resulted in chicks that were more robust than hand-reared young and properly socialized to conspecifics rather than human caretakers (Derrickson and Carpenter 1981). Since 1986 some young have been raised in a special chick-rearing facility by an "imprinting-socialization" technique. This involves the use of taxidermically prepared brooder models and feeding heads (Fig. 5) and live socialization models consisting of a fully grown conspecific penned adjacent to, and in constant visual and auditory contact with, the chicks (D. Ellis *pers. comm.*).

In 1988 there was a shift in propagation philosophy for Whooping Cranes from maximization to optimization of production. The primary stimulus for this change was the need to produce birds for release programs that had the greatest likelihood of survival and reproductive success in the wild. For the first time Whooping Cranes at Patuxent were allowed to hatch and rear chicks. Three pairs successfully fledged non-endangered fostered young, and two pairs successfully fledged Whooping Crane chicks.

Because of delayed sexual maturity, high chick mortality, and removal of eggs and individuals for reintroduction programs neither of the endangered flocks at Patuxent has ever been large. The current numbers of productive Whooping Crane and Mississippi Sandhill Crane females are six and eleven, respectively, and the highest annual production of fledged young was only eight Whooping Cranes in 1983 and 17 Mississippi Sandhill Cranes in 1984.

Disease-related mortality has severely affected recent Whooping Crane productivity at Patuxent. Late in 1984, seven Whooping Cranes died from eastern equine encephalitis. The losses were particularly serious because five of the birds that died were females. As a result, only four of the 14 surviving birds of breeding age in January 1985 were females (Carpenter *et al.* 1987). Additional setbacks have occurred as recently as September 1987 and May 1988 when five Whooping Cranes and one Mississippi Sandhill Crane died from what are believed to be food-related toxin outbreaks (S. Hereford *pers. comm.*).

A second captive Whooping Crane flock is being planned for Canada. The objectives are to: 1) increase the number of birds and eggs for reintroduction into the wild, 2) minimize the chance of an epidemic destroying the entire captive breeding program, and 3) provides Canadians with an opportunity to view Whooping Cranes and participate more actively in the captive propagation program (Pratt 1988). The projected date for the first Whooping Cranes to be on site is 1991.

Reintroduction attempts

Two attempts have been made to reintroduce endangered North American cranes into the wild. One attempt involves Mississippi Sandhill Cranes and a technique known as gentle release. With this technique Mississippi Sandhill Crane eggs are hatched at Patuxent by captive foster parents which then rear the chicks. When the birds are three to four months old they are transferred to community flight pens to develop cohort bonds. They remain at Patuxent until winter, when they are shipped to the Mississippi Sandhill Crane National Wildlife Refuge. At the release site the young are confined to pens for about one month, where they further strengthen cohort bonds, develop site fidelity, and learn to forage for corn and natural foods. Grain scattered in their pens attracts wild cranes that interact with the captives and aid their eventual integration into the wild flock. After this period of acclimation the juveniles are allowed to leave the holding pens. Supplemental feeding is continued until the young become independent (McMillen *et al.* 1987; Zwank and Derrickson 1981).

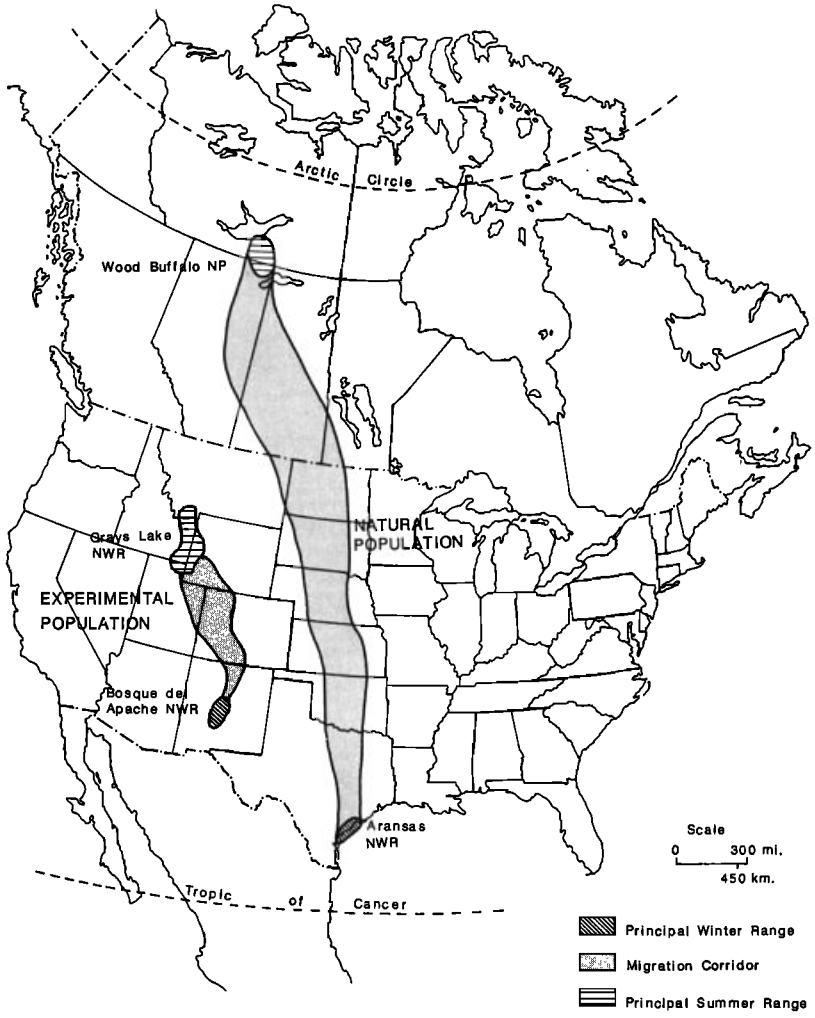

Figure 3. Current distribution of Whooping Cranes.

Captive-reared Mississippi Sandhill Cranes have been released to the wild annually since 1981. Overall, their social integration and survivorship have been good. Of the 53 birds released since 1981, 23 (43%) still survive, and Patuxent-reared birds comprise approximately one-half of the wild flock. The first breeding attempt occurred in 1985 when a captive-reared male nested with a wild female. Unfortunately the nest was destroyed. In 1987, five Patuxent-reared cranes were involved in nesting efforts. Additionally one with an inviable egg fledged a chick from a substitute egg produced by Mississippi Sandhills at Patuxent. To date of the 15 Patuxent eggs substituted 14 have hatched. Nesting was drastically reduced in 1988 because of drought (R. Ingram *pers. comm.*). Despite the successful survival, integration, and breeding of the released birds, the wild population remains in serious jeopardy because of the continued lack of recruitment of juveniles into the population (Valentine 1984, R. Ingram *pers. comm.*).

The other reintroduction attempt began in 1975 and involved cross-fostering Whooping Crane eggs into Greater Sandhill Crane nests at Grays Lake National Wildlife Refuge, Idaho, to create a population of Whooping Cranes disjunct from the Wood Buffalo-Aransas population. These cranes migrate through the San Luis Valley, Colorado, and winter in central New Mexico, primarily Bosque del Apache National Wildlife Refuge (Fig. 3) (Drewien and Bizeau 1978). To date 289 eggs from Wood Buffalo and Patuxent have been placed singly in nests of Sandhill Crane pairs, after their own eggs have been removed.

Some aspects of the cross-fostering experiment have been successful. For example, Sandhill Crane pairs accept and hatch the Whooping Crane eggs and rear the young; Whooping Crane young accept the foster parents, learn their migration route, and generally adapt to their activity patterns (Fig. 6); and foster-parented Whooping Cranes have not attempted to pair with Sandhill Cranes. However, there have been disappointments. Despite great expenditure of time, energy, money, and eggs, the foster flock is still extremely small and has few individuals in each year class. The flock has declined from 33 birds in 1985 to approximately 15 in-

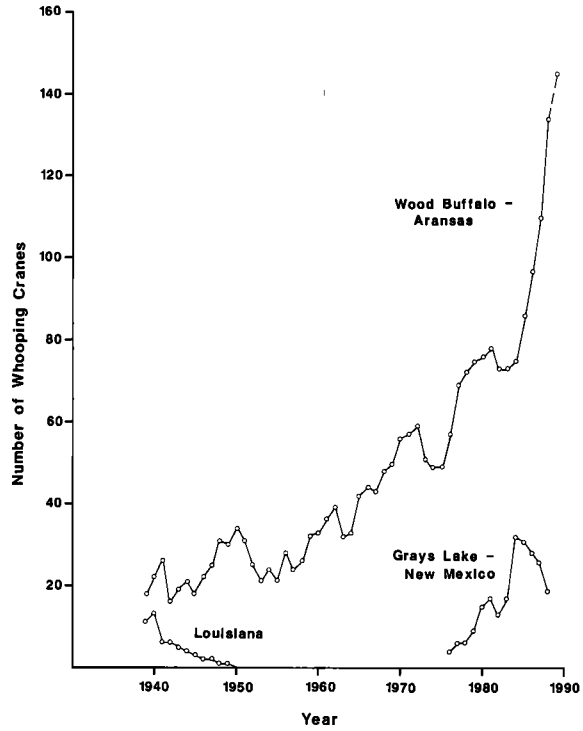

Figure 4. Peak Whooping Crane winter populations at Aransas and vicinity, coastal Louisiana, and New Mexico, 1939–1989. The 1989 Aransas National Wildlife Refuge value is estimated.

dividuals in 1988 (Fig. 4). Inclement weather at hatching and drought and Coyote (*Canis latrans*) predation in the pre-fledging period have resulted in excessively high chick mortality (Drewien and Bizeau 1978; Drewien *et al.* 1985). Collisions with powerlines along the migration route have caused numerous deaths of flighted birds (Brown *et al.* 1987), and avian tuberculosis has recently surfaced as a serious threat to the population.

A second major disappointment has been the breeding failure of the cross-fostered Whooping Cranes in the Idaho flock. Differential mortality rates have led to unequal sex ratios among adults, and the few females of breeding age scatter across a four-state area each spring and summer, resulting in limited opportunity for association with adult males. Biologists have attempted to promote breeding by transferring both captive-reared and wild, cross-fostered female Whooping Cranes to territorial males at Grays Lake National Wildlife Refuge. Out of necessity translocations of the wild birds were made in the summer, well past the peak of reproductive activity. Although the females showed initial interest in the male Whooping Cranes, the translocated birds neither returned to Grays Lake nor paired and nested elsewhere. No translocation attempts were made in summer 1988, but both types will be attempted during the 1989 nesting period (J. Lewis *pers. comm.*). The Grays Lake project will be evaluated late in 1989, and decisions will then be made about continuing, modifying, or abandoning the experiment (U.S. Fish and Wildlife Service 1986).

Sandhill cranes feeding in snow-covered cornfield. Photograph/Ron Klataske.

The United States and Canadian Whooping Crane Recovery Plans set a minimum goal of 40 breeding pairs in the Wood Buffalo population and at least 25 breeding pairs in two additional, disjunct populations before the Whooping Crane can be downlisted from endangered to threatened. The rise in the major wild population has been significant in the 1980s (Fig. 4), and in autumn 1988 this group contained about 145 individuals, including 30–32 breeding pairs and 20–22 juveniles (J Lewis *pers. comm.*). If this trend continues the 40-pair minimum for the original wild population will likely be attained in the early 1990s.

Figure 5. Mississippi Sandhill Crane chick being fed from the bill of a taxidermically prepared crane head in an effort to encourage imprinting on cranes rather than humans. Photo courtesy of Gary Montoya.

The Grays Lake experimental population represents the first attempt to establish a disjunct population. From 1984 to 1988, three Sandhill Crane populations in eastern North America were examined to determine their suitability for supporting a new Whooping Crane population. These Sandhill populations are in the Upper Peninsula of Michigan and adjacent areas of Ontario, the Okefenokee Swamp in southern Georgia, and three sites in central Florida.

Despite many arguments favoring Michigan/Ontario, this area is not being considered for the next release site. The

Top: Crane habitat along the Platte River. Below: Sandhill Cranes take flight. Photographs/ Ron Klataske.

cross-fostering results from Grays Lake remain inconclusive and no well established gentle-release techniques are available for migratory cranes. However, preliminary work on migratory gentle-release began at the International Crane Foundation in the early 1980s, and it laid the groundwork for a more intensive study currently underway at Seney National Wildlife Refuge, Michigan. Pending the results of this study, the suitability of this population may be reconsidered.

Selection of the Kissimmee Prairie in central Florida or the Okefenokee National Wildlife Refuge as the eastern reintroduction site is anticipated this year. Asynchrony between the nesting chronologies of the non-migratory Florida Sandhill Cranes and the Whooping Crane populations in Canada and Patuxent preclude cross-feathering as a reintroduction technique in either of these candidate populations. Gentle-release, however, may be suitable as evidenced by its success in Mississippi and by studies with migratory surrogates that suggest Whooping Cranes will likely remain sedentary when introduced into a non-migratory situation (Nesbitt 1988). As reintroductions are

made in the southeast, comparisons will be made of survival, behavior, and breeding of Whooping Crane young raised by 1) captive, foster Sandhill Crane parents, 2) captive, foster Whooping Crane parents, and 3) "imprinting-socialization" (D. Ellis *pers. comm.*).

Figure 6. Juvenile Whooping Crane with its foster parents on the Bosque del Apache National Wildlife Refuge, New Mexico, wintering grounds. Photo courtesy of David Ellis.

Habitat preservation

One of the major causes of extinction throughout the world has been the destruction of natural habitats. Some critically important endangered crane habitats in North America, such as the lands in Wood Buffalo National Park, Aransas National Wildlife Refuge, and the Mississippi Sandhill Crane National Wildlife Refuge, have been protected, and efforts to expand them are ongoing. However, much vital crane habitat remains threatened, and the Platte River stands as the quintessential example.

The Platte River (Fig. 7) is one of North America's most important migratory bird habitats. More than 500,000 Lesser and Canadian Sandhill Cranes use it as a major migration stopover, remaining over a month in the spring to increase body weight by as much as 10%. Small flocks, pairs, or individual Whooping Cranes occasionally use the Platte River as a stopover site, but usually they remain for only one to seven days. The river is also used on migration by more than seven million ducks and geese, and it provides nesting habitat for the endangered Interior Least Tern (*Sterna antillarum*) and threatened Piping Plover (*Charadrius melodus*) (Shoemaker 1988).

Originally most of the Platte River met crane roosting requirements (bare and submerged sandbars with adjacent water less than 18 inches deep, situated where the river was at least 500 feet wide) because shearing ice flows and high spring runoffs created a wide, braided river and prevented encroachment of woody vegetation. Today 70% of the instream flow is diverted for irrigation and hydropower, and spring flood flows into central Nebraska are only one-fifth of their original levels Consequently the river has deepened and narrowed in most places; cottonwood and willow stands are common on sandbars, and only about 50 miles of the river between Kearney and Grand Island, Nebraska on the Big Bend (Fig 7) are somewhat suitable for crane roosting (Farrar 1985; VanderWalker 1988). As a result of deteriorating habitat, more than 20,000 Sandhill Cranes will roost along a single mile, increasing risk of epidemics. Whooping Crane use appears to have shifted to the nearby Rainwater Basins where avian cholera outbreaks have recently killed more than 300,000 ducks and geese (Shoemaker 1988). According to Farrar (1985:16) "the situation is a biological bomb; the diversion of the Platte's waters and the destruction of basin marshes are the burning fuse."

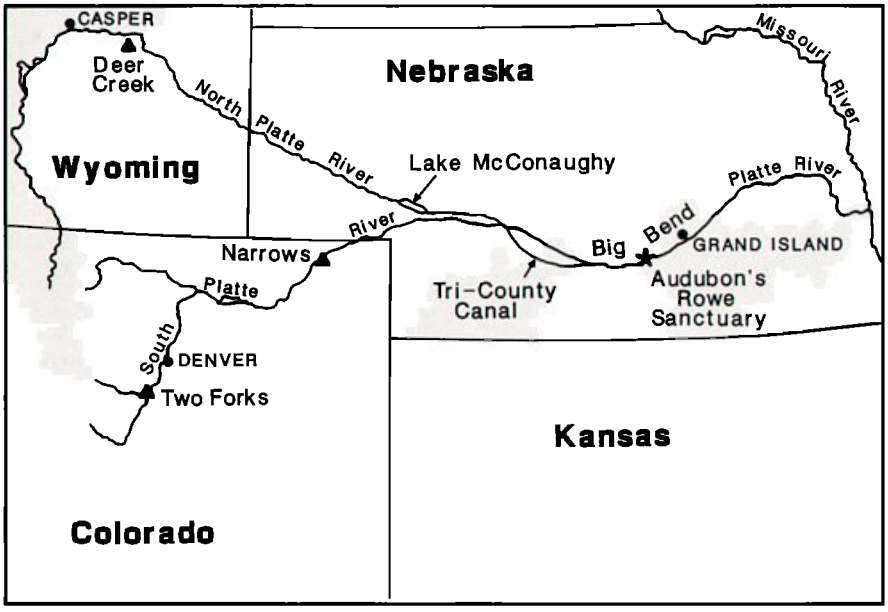

Figure 7. Location of the Platte River, the Big Bend, and some proposed diversion projects.

Management of instream flow is controlled by the states. Instead of protecting existing water flows Colorado, Wyoming, and Nebraska have proposed additional diversions of water (VanderWalker 1988). The courts will play a pivotal role in deciding the future of the Platte River because most of these proposals, *e.g.*, the Deer Creek project in Wyoming, and the Catherland project in Nebraska, are in various stages of litigation. Shoemaker (1988) feels that the United States Supreme Court case of Nebraska *vs* Wyoming could be the most significant decision in decades

because it could potentially restrict Wyoming's water diversion to maintain some instream flows for wildlife in Nebraska. Another potentially precedent-setting situation is the relicensing of the Nebraska public power and irrigation district, which control Lake McConaughy/Kingsley complex which includes the Tri-County Supply Canal (Fig. 7). This is of particular concern because the lake is both the largest reservoir in the basin and significantly influences flows into the Big Bend area. The canal diverts approximately 80% of the Platte's flow. Relicensing of Kingsley is now subject to the National Environmental Policy Act, Section 7 of the Endangered Species Act, and the 1986 Electric Consumers Protection Act. The last-named requires the Federal Energy Regulatory Commission to give equal consideration to the protection and enhancement of fish and wildlife habitats when licenses are reissued. Consequently, the new licenses might stipulate that the flow of water be regulated throughout the year to manage for wildlife (Shoemaker 1988).

Unfortunately, intense local opposition prevented establishment of a national wildlife refuge on the Platte in 1974. However, some preservation has been achieved through: 1) Category 1 Resources designation for Sandhill Cranes along various sections of the river, 2) Whooping Crane critical habitat designation for 54 miles of the Big Bend, 3) the National Audubon Society's acquisition of the 2000-acre Lillian Annette Rowe Sanctuary, and 4) the 7000 acres protected by the Platte River Whooping Crane Habitat Maintenance Trust. The Trust has plans to acquire an additional 18,000 acres with assistance of The Nature Conservancy. Management on these lands, which includes mechanical removal of woody vegetation and discing, has resulted in use of the river by Whooping Cranes, and Sandhill Cranes. However, these commitments to habitat protection are of minimal value without adequate instream flows.

Extinction of species has become commonplace in our rapidly changing environment. Maintaining species populations and preventing further extinction are tasks fraught with overwhelming obstacles.

I congratulate the individuals and organizations whose foresight and conservation actions have brightened the outlook for North American cranes. Much, however, remains to be done. In part, legal battles must be fought and won to provide adequate instream flows and crane habitat on the Platte River; the factors limiting the growth of the Mississippi Sandhill Crane population must be identified and resolved; and efforts must be continued to produce viable populations of Whooping Cranes that are disjunct from the Wood Buffalo-Aransas flock. I exhort the conservation community at large to provide the support necessary for the challenges ahead.

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