MANAGEMENT GUIDELINES

for the

MID-CONTINENT POPULATION OF SANDHILL CRANES

Compiled by the:

Central Flyway Webless Migratory Game Bird Technical Committee

Prepared for the:

Central Flyway Waterfowl Council
Mississippi Flyway Waterfowl Council
Pacific Flyway Waterfowl Council
U.S. Fish and Wildlife Service

July 1981
Revised March 1990
Revised March 1993
Revised March 2006

MANAGEMENT GUIDELINES
of the
CENTRAL, MISSISSIPPI, AND PACIFIC FLYWAYS
for the
MID-CONTINENT POPULATION OF SANDHILL CRANES

These guidelines were prepared by the Central Flyway Webless Migratory Bird Technical Committee of the Central Flyway Waterfowl Council.

Approved by:

_____	_____
Chairman, Central Flyway Waterfowl Council	Date
_____	_____
Chairman, Mississippi Flyway Waterfowl Council	Date
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Chairman, Pacific Flyway Waterfowl Council	Date

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FOREWORD

Original guidelines for the cooperative management of the Mid-Continent Population (MCP) of sandhill cranes were adopted unanimously by the Central Flyway Waterfowl Council in official session at Billings, Montana, on July 30, 1981. The Council recommended that such guidelines be dynamic and these guidelines include provision for periodic review and revision, as necessary, to take advantage of new and improved information, to adapt to changing circumstances, and/or to accommodate new and changing intentions and desires.

In 1993, the Central Flyway Waterfowl Council recommended that the Pacific Flyway Waterfowl Council jointly adopt revised guidelines for the MCP of sandhill cranes. This revised cooperative management plan incorporates comprehensive biological information available for inter-flyway management of these cranes.

During Council's March, 1993 meeting in Washington, D.C., the Central Flyway Waterfowl Council approved revised guidelines for management of MCP sandhill cranes. These revisions reflected new information available on crane biology and management since 1981.

In 2005, through sandhill cranes that were tagged with radio and satellite telemetry equipment in the Central Platte River Valley in Nebraska, it was recognized that sandhill cranes breeding in northwestern Minnesota are indeed part of the MCP. Therefore, the Mississippi Flyway Waterfowl Council shall be further involved in the cooperative management of this population of sandhill cranes.

MCP sandhill cranes migrate into or through many jurisdictions in at least four nations. They are of great interest to many individuals and organizations. The Central, Mississippi, and Pacific Flyway Waterfowl Councils solicit the cooperation of all who are responsible for or interested in the management of the international resource these great birds comprise. Inquiries or comments may be addressed to:

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March 2006

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TABLE OF CONTENTS

MANAGEMENT GUIDELINES

for

MID-CONTINENT SANDHILL CRANES

INTRODUCTION

This plan sets forth guidelines for the cooperative management of the Mid-Continent Population of sandhill cranes (hereafter MCP). The range of the MCP is extensive (Figure 1). During the breeding season, these cranes are widely scattered throughout central, northern, and southeast Canada (Appendix A and B); Alaska; northeastern Siberia; and northwestern Minnesota. Fall migration routes include areas where large numbers of MCP cranes stage in Alberta, Saskatchewan, Manitoba, North Dakota, and in recent years, Kansas (Appendix B). Other fall staging areas are located in northwestern Minnesota, Montana, Wyoming, South Dakota, Colorado, and Oklahoma. During autumn and winter, MCP cranes are in Oklahoma, Texas, New Mexico, Arizona, and also northern and central Mexico, primarily in the Interior Highlands in the states of Chihuahua and Durango. At some time during late February to early April each year, the majority of individuals in the MCP are among the spectacular numbers of migratory birds which stage in the central Platte Valley of Nebraska.

Some authorities (Walkinshaw 1973, Johnson and Stewart 1973, Guthery and Lewis 1979) recognize and suggest management of three subspecies of the MCP: lesser (*Grus canadensis canadensis*), Canadian (*G. c. rowani*), and greater (*G. c. tabida*) based on differences in morphometrics and breeding ranges. However, genetic studies using mitochondrial DNA (Rhymer et al. 2001, Glenn et al. 2002, Peterson et al. 2003, Jones et al. 2005) suggest that only two subspecies occur in the MCP: lessers and greaters. Sandhill cranes formerly within the *rowani* subspecies are grouped with *tabida* (Rhymer et al. 2001, Glen et al. 2002), but Jones et al. (2005), based on patterns of morphologic and microsatellite DNA variation, suggest that *rowani* is intermediate between *canadensis* and *tabida*. Other authorities (Tacha et al. 1984, 1985, 1992) suggest the MCP be managed as two subpopulations: eastern (or Gulf Coast) and western. G.L. Krapu (U.S. Geological Survey, Northern Prairie Wildlife Research Center, unpublished data) suggests that there are four "breeding affiliations" within the MCP: Western Alaska/Siberia, Northern Canada/Nunavut, West-Central Canada/Alaska, and East-Central Canada/Minnesota.

The parties to this plan have carefully considered management strategies of the MCP in light of several criteria: the definition of a subpopulation, the need to differentially manage subpopulations, and the feasibility to manage at a subpopulation level. Consideration of designated subpopulations within the MCP has been ever-evolving due to incoming data from researchers. Therefore, the Councils are reluctant to use the term subpopulation when managing the MCP, but instead will refer to "breeding affiliations" which are defined as groups of birds that nest in discrete areas, and are composed of the same subspecies according to mitochondrial DNA (G.L. Krapu, U.S. Geological Survey, Northern Prairie Wildlife Research Center, unpublished data). One key difference between breeding affiliations and current subpopulations is that breeding affiliations from both

subpopulations are likely to simultaneously occur in the same areas throughout migration and winter.

The Councils believe that differential management of breeding affiliations could be warranted if there is sufficient evidence to delineate separate cohesive population units, and the following parameters sufficiently differ among breeding affiliations: 1) population trends, 2) recruitment rates 3) harvest rates, and 4) harvest pressure (i.e., spatio-temporal exposures to hunting). However, despite some evidence that the four breeding affiliations in the MCP may have different recruitment rates and harvest pressure (G.L. Krapu, U.S. Geological Survey, Northern Prairie Wildlife Research Center, unpublished data), the Councils have concluded that there is not sufficient evidence to delineate breeding affiliations. Thus, management by such units is not feasible at this time because population and harvest parameters of potential breeding affiliations cannot be monitored separately. In other words, the MCP breeding affiliations are not distinct enough spatially or temporally in portions of the annual cycle, other than on the breeding grounds, to monitor population trends, harvest, and/or recruitment. Thus, the MCP will continue to be managed as a single population until breeding affiliations are adequately defined, and population and harvest parameters can be monitored separately.

GOAL

The management goal is to provide optimum diverse aesthetic, educational, scientific, recreational, and consumptive public uses that are consistent with the welfare of the MCP, international treaties, and socio-economic constraints such as depredation of agricultural crops.

POPULATION GUIDELINES

Objective A: A population index for the MCP within a range of 349,000-472,000 birds. This index is based on the most recent 3-year running average index of the population which is indicated by the photo-corrected surveys during spring in the central Platte region of Nebraska.

Rationale: The number of individuals in the MCP that occurred during 1982-2005 was abundant enough to fulfill subsistence, recreational (hunting and non-hunting), and other interests. The upper and low thresholds were re-calculated to include data from 1993-2005, and are about 4.6% higher than previous thresholds (1982-1992). Problems associated with crop depredations continued during this time, but at manageable levels.

The exact number of individuals in the MCP is unknown. The population has been monitored using surveys in late March since 1957 in Nebraska, and since 1974 throughout the Central Flyway (Table 1). High-altitude vertical photography of the central Platte Valley of Nebraska in 1982 resulted in an estimate of <u>at least</u> 510,000 cranes in the population. Since 1982, surveys for cranes have not used high altitude vertical photography to estimate the size of the MCP, but have relied upon photo-corrected ocular transects to estimate population status. In March 1990, the 3-year running average of the photo-corrected ocular transect replaced the high altitude vertical photography as the primary measure for monitoring population status. This survey provides only a <u>minimum index</u> of the population and may be subject to substantial annual variations. However, use of 3-year averages of

those estimates helps mitigate some of those large annual variations that are partially resultant of annual sampling error due to fluctuating portions of the MCP that are outside of the aerial transect area on the survey date. Analysis of these averages suggests a stable population trend.

It is generally assumed that the annual aerial survey for cranes is reliable if the photo-corrected estimate represents at least 90% of total cranes (i.e., photo-corrected plus ground counts). However, during 3 of the past 11 surveys, the proportion of cranes on the Platte River on the survey date was below 90% (Table 1). Radio-telemetry data also indicated that 76-77% of the radioed sample was in the Platte River Valley on the survey date in 2003 and 2004 (G.L. Krapu, U.S. Geological Survey, Northern Prairie Wildlife Research Center, unpublished data). Ground checks have been used to account for MCP cranes staging outside of the Platte Region on the aerial survey date. However, these ground checks are of a spot check nature, and are not consistently performed.

The population objective was calculated by taking ±15% of the 1982-2005 average 411,000 cranes estimated from photo-corrected aerial ocular transect estimates in Nebraska. Plotting this 3-year running average of the population index shows an objective well within threshold limits (349,000-472,000) (Figure 2). An additional figure has been included to indicate what thresholds would have been if ground count data were included in the annual index (Figure 3); however, at present, these thresholds are not used as decision criteria. Survey and nesting data of MCP cranes are in Appendix A.

Strategy A-1: Monitor the status of the MCP:

a. Obtain an annual index of the MCP through coordinated surveys in late March in specific Central Flyway States. This will include an annual photo-corrected aerial transect survey with design and coverage comparable to that initiated in 1982, and ground surveys in locations outside of the Platte Region indicated by frequent sightings of cranes during past ground surveys in the same areas and preponderances of radio and satellite telemetry data points from 1998-2004 near the survey date of those years.

b. Continue efforts to identify and address potential biases in survey results in order to improve population estimates. Some potential sources of this bias include: 1) the timing of the survey in relation to the migration chronology of the cranes, 2) habitat changes that may affect the proportion of the MCP that stage in the central Platte River Valley, 3) the proportion of the central Platte River cranes not on the survey area while the survey is being conducted.

c. Periodically (every 5 years) obtain a more-complete population estimate for the MCP using high-altitude vertical photography of the central Platte Valley.

d. Obtain estimates of cranes in Texas and eastern New Mexico during the midwinter waterfowl surveys.

e. Continue to include cranes in routine waterfowl breeding ground surveys and in any special surveys of breeding areas in Alaska.

f. Consider information from all sources to determine the validity of low estimates from the spring survey in Nebraska.

Rationale: Reliable data on the status and trend of the MCP are essential for effective management of the population. The coordinated, annual spring surveys have been improved through statistically valid sampling procedures that include photo-correction of ocular estimates from the central Platte Valley in Nebraska where the majority of the population occurs during late March. The spring survey in the central Platte River Valley accounted for over 90% of the cranes included in the survey during 1982-92. Because an increasing proportion of cranes have not been counted on the aerial survey 3 times since 1993, additional ground survey efforts could be added to the aerial survey data to determine the annual index. These annual estimates are expected to provide reasonable indicators of trends in the MCP.

Responsibilities: U.S. Fish and Wildlife Service (a, b, c, e, and f), cooperating agencies in Central Flyway States (a, b, and c), Canadian Wildlife Service (e), and Alaska Department of Fish and Game (e). The flyway technical committees will develop guidelines and specific strategies.

Strategy A-2: Continue current management of refuges and wildlife management areas, disease control, and other management programs which may affect sandhill cranes as long as the population index (latest 3-year running average) falls within the 349,000 to 472,000 objective range.

Rationale: The available information indicates that the MCP has remained within the objective population range in recent years. Wildlife management agencies will guard against any action, or inaction, which would substantially decrease the population size of the MCP.

Responsibilities: All cooperating agencies. Flyway technical committees, Councils, and USFWS will monitor on-going programs and develop recommendations for changes in management programs not consistent with this objective.

Strategy A-3: Maintain sufficient breeding, staging, and wintering habitat to support the population at the objective level. Discourage actions and programs which destroy or degrade habitats used by the MCP. Emphasis will be on information and education programs demonstrating the value of key habitats to all wildlife and in identifying alternate sites where proposed developments will have the least negative effect.

Rationale: Breeding habitat is considered to be generally adequate to abundant; however, there are significant threats to some breeding areas and migration and wintering habitats. Of particular concern are the extremely low flows in the Platte River as seen during the early 2000s and decreases in available waste-corn in the Central Platte River Valley during the past 20 years due to increases in harvest efficiency, increasing numbers of geese in the region, and expanding soybean production

(Krapu et al. 2004, 2005). The loss or degradation of any of these seasonal habitats would be detrimental to the MCP resulting in reductions in recruitment and/or survival.

Responsibilities: U.S. Fish and Wildlife Service, the Canadian Wildlife Service, the Alaska Department of Fish and Game, and the cooperating agencies in the Territories and Provinces of Canada, and Central and Mississippi Flyway States.

Strategy A-4: Determine potential cause(s) of local or regional non-hunting mortality and make appropriate adjustments in management programs for the MCP to avoid or reduce non-hunting mortality.

Rationale: Overall non-hunting mortality is relatively low but occasional, highly visible local or regional non-hunting mortality occurs and should be addressed. Sources of non-hunting mortality may include but are not limited to: disease outbreaks, predation, power line and tower strikes, and killing by vandals.

Responsibilities: All cooperating agencies. Flyway technical committees, USFWS, and CWS will monitor the population and develop guidelines for necessary changes in management programs.

Strategy A-5: Modify hunting opportunities to maintain the MCP within the population index objectives (see Objective C).

Rationale: Manipulating the harvest currently is a primary management action for managing the size of the MCP. However, several factors will affect the rate of change in the population, including harvest rates and the magnitude of non-hunting mortality.

Responsibilities: All cooperating agencies.

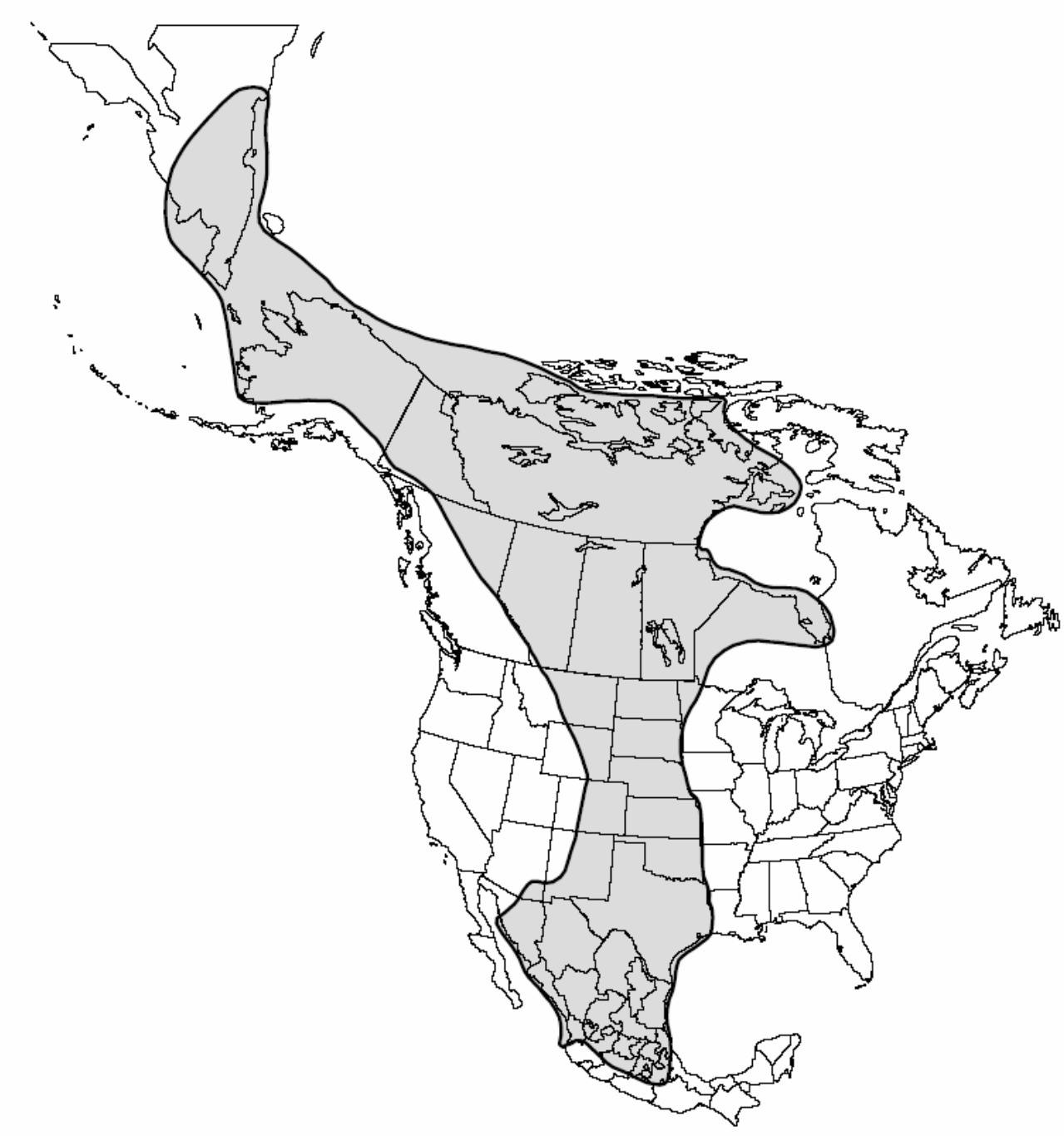

Figure 1. Approximate range of Mid-Continent sandhill cranes (based on figures from Sharp et al. 2000, Tacha et al. 1994, and data from radio-telemetered birds provided by G. Krapu, Northern Prairie Wildlife Research Center, Jamestown, ND).

Table 1. Annual spring population indices for the Mid-Continent Population of sandhill cranes (Sharp et al. 2005).

	CENTRAL PLATTE RIVER VALLEY, NE				OTHER						ALL OTHER AREAS +			
	OCULAR CRUISE	OCULAR	PHOTO CORRECTED OCULAR TRANSECT		OTHER						OCULAR CRUISE	OCULAR	PHOTO CORRECTED OCULAR TRANSECT	
YR	TRANSECT	TRANSECT	ANNUAL	3-YR AVG	NE	KS	CO	OK	NM	TX	TRANSECT	TRANSECT	ANNUAL	3-YR AVG
1974	162,600	-	-	-	9,000	1,900	0	400	0	3,200	177,100	-	-	-
1975	223,600	-	-	-	2,300	900	500	100	100	tr	227,500	-	-	-
1976	147,500	-	-	-	2,800	300	0	100	1,000	800	152,500	-	-	-
1977	173,400	-	-	-	1,100	1,600	0	400	12,500	30,700	220,000	-	-	-
1978	149,800	188,582	-	-	2,200	700	0	0	2,300	4,900	159,900	198,682	-	-
1979	-	203,574	-	-	2,600	1,100	500	1,500	0	0	-	209,274	-	-
1980	223,400	254,417	-	-	5,000	4,100	0	100	500	1,400	234,500	265,517	-	-
1981	-	248,882	-	-	8,300	11,200	500	0	0	21,800	-	290,682	-	-
1982	-	347,996	417,263	(95%)[1]	7,100	2,000	2,800	0	100	7,800	-	367,796	437,063	-
1983	-	306,316	343,378	(97%)	4,100	200	0	200	tr	7,000	-	317,816	354,878	-
1984	-	222,710	261,802	(93%)	340,814	18,100	900	0	1,100	tr	800	-	243,610	282,702	358,214
1985	-	378,127	514,763	(97%)	373,314	11,500	3,000	-	-	-	1,200	-	393,827	530,463	389,348
1986	-	317,025	353,040	(99%)	376,535	1,000	200	-	-	-	2,100	-	320,325	356,340	389,835
1987	-	383,581	416,058	(100%)	427,954	0	tr	-	-	-	400	-	383,981	416,458	434,420
1988	-	386,853	463,457	(98%)	410,852	0	0	-	-	-	7,700	-	394,553	471,157	414,652
1989	-	391,353	391,995	(100%)	423,837	100	1,000	-	-	-	800	-	393,253	393,895	427,170
1990	-	385,950	412,154	(94%)	422,535	11,000	5,200	-	-	-	10,300	-	412,450	438,654	434,569
1991	-	297,831	340,645	(100%)	381,598	100	800	-	-	-	200	-	298,931	341,745	391,431
1992	-	257,709	406,457	(97%)	386,419	12,200	300	-	-	-	1,100	-	271,309	420,057	400,152
1993	-	253,799	378,883	(85%)	375,328	16,800	37,750	-	-	-	13,500	-	321,849	446,933	402,912
1994	-	395,543	477,215	(96%)	420,852	14,600	0	2,400	-	-	0	-	412,543	494,215	453,735
1995	-	273,376	326,181	(90%)	394,093	30,400	0	6,700	-	-	0	-	310,476	363,281	434,810
1996	-	318,514	519,984	(98%)	441,127	7,600	0	3,900	-	-	0	-	330,014	531,484	462,993
1997	-	350,932	534,630	(97%)	460,265	16,200	100	-	-	-	0	-	367,232	550,930	481,898
1998	-	337,203	530,848	(97%)	528,487	13,600	100	-	-	-	0	-	350,903	544,548	542,321
1999	-	219,800	284,900	(73%)	450,126	3,500	100,000	-	-	-	0	-	323,300	388,400	494,626
2000	-	484,600	490,100	(92%)	435,283	16,900	26,100	-	-	-	500	-	528,100	533,600	488,849
2001	-	387,300	413,500	(88%)	396,167	10,500	42,300	-	-	-	3,500	-	443,600	469,800	463,933
2002	-	309,000	315,000	(90%)	406,200	17,100	15,100	-	-	-	1,200	-	342,400	348,400	450,600
2003	-	300,900	348,000	(91%)	358,833	24,800	4,100	-	-	-	3,800	-	333,600	380,700	399,633
2004		356,850	426,500	(95%)	363,167	17,700	1,200	-	100	-	2,200	-	386,600	447,700	394,200
2005		412,300	491,900	(92%)	422,133	27,100	2,900	-	2,600	-	8,700	-	453,600	533,200	453,867

[1] Proportion of total MCP index comprised of the corrected occular transect.

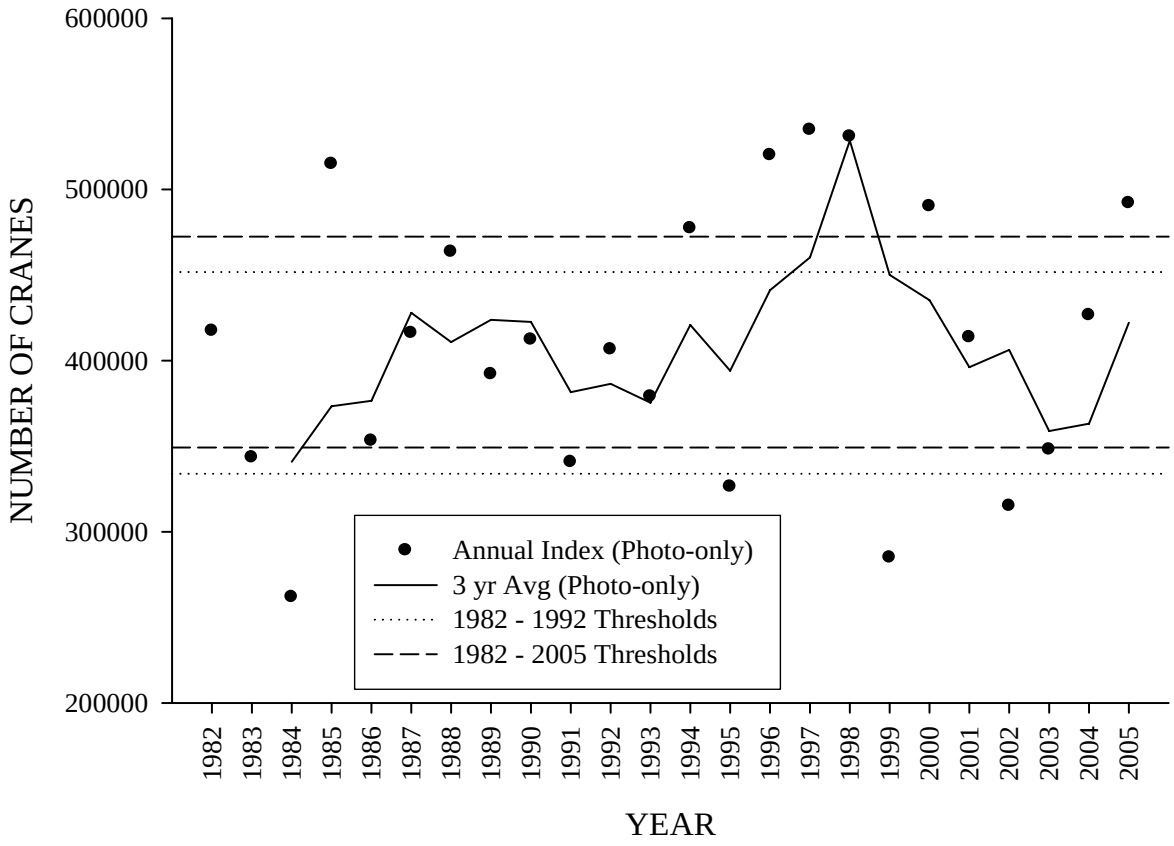

Figure 2. Annual and 3-year spring population indices and population objective thresholds for Mid-Continent sandhill cranes. Population indices are from the photo-corrected air surveys along the Platte River. Thresholds are equal to the mean for a given time period ± 15%.

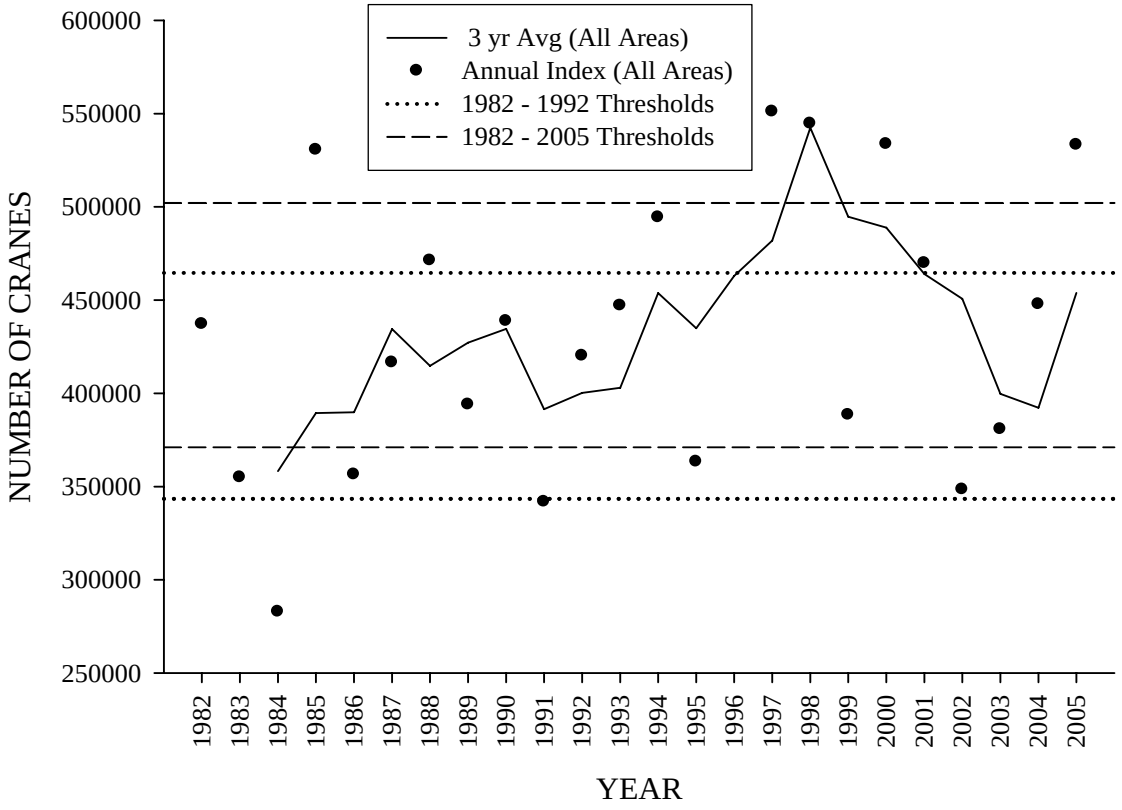

Figure 3. Annual and 3-year spring population indices and population objective thresholds for Mid-Continent sandhill cranes. Population indices are the sum of photo-corrected air surveys along the Platte River and ground counts conducted in other areas (excluding ND and SD). Thresholds are equal to the mean for a given time period ± 15%.

DISTRIBUTION GUIDELINES

Objective B: Maintain the geographic and temporal distribution of MCP cranes similar to the 1982-2005 period.

Rationale: The current geographic and temporal distributions of MCP cranes are considered acceptable. There are no recognized adverse effects of the current distribution of the birds. MCP cranes generally are tolerated on the privately owned lands they occupy during substantial portions of each year. Use programs may be adjusted to assure satisfactory recreational opportunities within the current distributions. Figures showing MCP crane distribution in Canada are in Appendix B.

Strategy B-1: Continue to maintain refuges, management areas, habitat protection, disease control and other wildlife management programs to benefit cranes. Proposed changes in management (for changes in hunting, see USE GUIDELINES) which may affect the distribution of MCP cranes will be assessed by the agency considering such changes and, if major impacts are probable, such proposals will be presented to the Flyway Councils for consideration.

Rationale: The current distributions of MCP cranes probably reflect the effects of agricultural land uses, roosting habitats, weather, and wildlife management programs. However, even minor changes in management programs could result in shifts that might affect programs in other areas and tolerance of MCP cranes on private lands. It is recognized that, other than managing habitats and hunting, management agencies have minimal control of crane distribution.

Responsibilities: All cooperating agencies. The Central, Mississippi, and Pacific Flyway Technical Committees will assess the potential impacts of proposed changes in management programs and develop recommendations for action.

Strategy B-2: Provide adequate habitats for MCP cranes during migration and wintering period:

a. Identify changes in areas regularly used by cranes.

b. Encourage the preservation of publicly-owned habitats controlled by governmental agencies other than wildlife agencies.

c. Encourage the preservation of key habitats on private lands. Seek funds to assure the preservation of imminently threatened key habitats by lease, easement, fee title purchase and/or cooperative agreements (e.g., water rights) with special emphasis on major roosting sites in wintering areas (specifically playas and saline lakes) and roost sites and wet meadows within the central Platte River Valley in Nebraska

(e.g., maintaining flows in the Platte River).

Rationale: Habitat is a key factor affecting both the geographic and temporal distribution of MCP cranes. Losses and/or degradation of important habitats and changes in agricultural land uses in staging and wintering areas undoubtedly will affect current distributions. Changes in distribution on wintering areas may result in overcrowding that will affect the welfare of MCP cranes.

Responsibilities: U.S. Fish and Wildlife Service, Canadian Wildlife Service, and cooperating agencies in Alaska, Central and Mississippi Flyway States and Provinces, and Mexico. Programs that include cooperation with private landowners (e.g., Alaska Natives, First Nations of Canada, and agricultural producers) will be essential.

Strategy B-3: Minimize activities such as boating, blasting, drilling, and low-level flying that unnecessarily disturb MCP cranes using key staging and wintering areas (e.g., Lake Williams, North Dakota, and Mound Lake, Texas). Emphasis will be on educational programs, direct appeals and regulations as appropriate.

Rationale: Major disturbances probably would alter the temporal and geographic distribution of MCP cranes. Additionally, there is concern that energetic balances will be negatively affected by excessive disturbances.

Responsibilities: All cooperating agencies.

Strategy B-4: Monitor MCP cranes in areas of known risk (e.g., where avian cholera is common, or areas where cranes are concentrated).

a. Implement regional disease contingency plans (e.g., Playa Lakes Region Migratory Bird Disease Contingency Plan) or consult the National Wildlife Health Center if losses to diseases are detected.

b. Initiate measures to discourage or disperse birds occurring in undesirable concentrations (e.g., that show effects of overcrowding) with emphasis on developing nearby alternative habitats.

Rationale: Any alteration of geographic or temporal distribution required for the welfare of MCP cranes will be considered consistent with this objective; however, any redistribution will be the minimum appropriate to the needs of Strategy B-4, and feasible to management agencies.

Responsibilities: All cooperating agencies.

USE GUIDELINES

Objective C: Maximize subsistence and consumptive recreational use consistent with population and distribution objectives.

Rational: MCP sandhill cranes are highly prized by consumptive and non-consumptive users throughout the Central, Mississippi, and Pacific Flyways. Both recreational and subsistence use of the MCP are key motivations for managing the MCP at, or above Objective (A) levels. Managing the MCP at these levels will allow managers to maximize both recreational and subsistence use and enjoyment, while also limiting socio-economic conflicts such as agricultural crop depredation by MCP cranes.

Strategy C-1: Adjust hunting regulations within treaty frameworks to:

a. Permit hunting opportunities in all areas where MCP cranes regularly occur, except areas closed by statutes or regulations.

b. Attract hunters to areas where losses of agricultural crops have been verified and during the periods when depredations are likely to occur. Crop depredation was the reason for implementing hunting in the Central Flyway in 1961, and continues to be reported. Depredation control hunts may be allowed below the established lower harvest threshold based upon legitimate complaints of losses. In such cases, the Councils encourage collection of data documenting losses (such as frequency, time period, number of cranes involved, crop types, acres affected, estimated and confirmed financial loss).

c. Maximize harvest opportunities while the MCP is at Objective (A) levels. If the MCP rises above or falls below Objective (A) levels then consider changes in harvest opportunities by making adjustments in daily bag limits, season length, areas open to hunting, number of permits available, and/or options for zoning and splits. Initial regulatory changes in Canada may be differential daily bag limits for resident, non-resident, and Alien non-resident sandhill crane hunters.

Rationale: Based upon long-term regression of spring photo-corrected spring population index on the Platte River since 1982 (Figure 4), the MCP is stable while total estimated harvest is increasing (Sharp et al. 2005). Recent trends (2003-2005) indicate a rebounding spring population, and the 3-year average index (photo-corrected only) in 2005 was 422,213 (21% above the lower threshold of 349,000). Decreases in the spring population index could be a concern because of drought and habitat threats on the Platte River in Nebraska, and also in Canada and Texas. An additional figure (Figure 5) has been included to show the trend of the spring index relative to harvest when ground count data from outside the Platte River are included.

Conversely, increases in the population could result in over-crowding and/or increased depredation of crops. Hunting is an important component of management of the MCP and

may assist in alleviating depredations, overcrowding, and preventing the population from growing beyond objective levels. Regulations may be adjusted to permit hunting in all areas yet attract hunters to specific problem areas (e.g., earlier opening dates in the latter areas). Currently, specific harvest alternatives do not exist for MCP sandhill cranes. However, future plans will reflect alternatives that will incorporate results from ongoing investigations of MCP harvest rates, geographic variability in recruitment rates of MCP cranes, and other factors that may influence the ability of the MCP to sustain harvest.

Responsibilities: All cooperating agencies. Proposed changes in federal hunting regulation frameworks must be endorsed by the appropriate Council(s) prior to consideration by the U.S. Fish and Wildlife Service.

Strategy C-2: Assure reasonable protection for threatened and endangered species by:

a. Informing citizens of the need to protect such species.

b. Advising hunters of the possible occurrence of threatened and endangered species within areas open to hunting.

c. Implementing the Whooping Crane Contingency Plan when confirmed sightings of Aransas/Wood Buffalo whooping cranes occur in areas open to sandhill crane hunting.

d. Implement the Eastern Whooping Crane Memorandum of Understanding (MOU) if whooping cranes are identified to be part of this introduced population.

Rationale: Information and education programs for hunters and the general public, and law enforcement will minimize the risk to threatened and endangered species. It is recognized that whooping cranes, especially during their first autumn, could be mistaken as sandhill cranes; however, the on-going programs of monitoring migrations and, if necessary, temporary suspensions of hunting in the vicinity will assure adequate protection of whooping cranes in areas open to sandhill crane hunting. Whooping cranes within the MCP's range could be from either the Aransas/Wood Buffalo Population or the Eastern Population which was introduced starting in 2001. If it can be determined which population an individual or group belongs to, then the strategy for dealing with them should differ. If an individual or group belongs to the Aransas/Wood Buffalo Population, then the Whooping Crane Contingency Plan (which may involve informal spot closures of hunting areas) should be implemented. If an individual or group belongs to the Eastern Population, then the MOU (which may allow continued MCP crane hunting and involve relocation of the individual[s]) should be implemented.

Responsibilities: All cooperating agencies.

Strategy C-3: Monitor the harvest of MCP cranes by:

a. Continuing and improving annual harvest surveys. The USFWS Harvest Surveys Section is working with Migratory Bird Harvest Information Program (HIP) data to provide annual harvest estimates of MCP cranes for Alaska, Arizona, and New Mexico given that sandhill cranes from multiple populations could be harvested in these states.

b. The CWS will attempt to provide improved recreational harvest estimates.

c. Consistent with objective A, the optimum management scale, at this time, is still considered to be at the MCP as a whole, rather than at subpopulation, or breeding affiliation levels.

d. Researchers will attempt to collect demographic and harvest information at a finer scale than the population level (i.e., subpopulation or breeding affiliations). This may prove to be impractical or unfeasible.

e. It is recommended that harvest surveys achieve a target precision goal for the U.S. portion of the MCP that do not exceed 10% of point estimates (95% CI) for harvest, hunters and days of hunting. The USFWS Harvest Surveys Section will determine current precision, constraints and costs to achieve target precision.

f. Apply harvest modeling results from the Rocky Mountain Population (RMP) and the MCP by Region 6 into MCP management where appropriate. This may include decision criteria, "prescriptions" or breaks in regulations with predicted impacts on harvest and breeding population size.

g. Special permits in the U.S. portion of the Central Flyway will continue to be mandatory (as a sampling universe for postseason harvest surveys) until a suitable alternative is developed. However, the states and the USFWS will address declining response rates of voluntary hunter mail questionnaires, and attempt to estimate and adjust estimates for any resulting non-response bias.

h. The Councils do not recommend eliminating or phasing out of the traditional MCP harvest survey in lieu of the HIP survey at this time. Problems of over-issuance of HIP certifications are similar to those of over-issuance of federal sandhill crane hunting permits in states like Texas that use Point of Sale (POS) systems. Confidence intervals of HIP estimates of less frequently hunted species like cranes are currently too high (> ±50% of estimate, $a = 0.1$) to measure response of harvest to subtle reductions in bag or season length.

i. Develop methods to reasonably estimate the subsistence take of MCP in Canada and Russia, and total harvest in Mexico. The CWS has made considerable progress in Canada, but this data currently is unavailable.

Rationale: Annual harvest surveys are important in monitoring the distribution of harvest, hunter participation and success, and assuring maximum hunting opportunities in all parts of MCP range. Moreover, improving accuracy of harvest surveys is important in Canada where

MCP harvest is increasing due to harvest liberalizations and increased interest by guides and outfitters, but only ~45% of crane hunters respond to surveys (Dan Nieman, CWS, personal communication). Harvest by hunters is the preferred method of stabilizing the MCP but must be monitored to assure that it is adequate and can be adjusted should the population fall below Objective (A) levels. A summary of MCP harvest in the Central Flyway is noted in Appendix C.

Researchers will evaluate the ability to collect demographic and harvest information at scales smaller than the MCP. Satellite transmitter locations of the various breeding affiliations may be used to partition harvest within Central Flyway states. However, it is unlikely that distribution patterns will be consistent in the next few years.

Until differences in recruitment rates and exposures to harvest among breeding affiliations are demonstrated, the Councils do not recommend management at a smaller scale than the MCP as a whole with current management zones. Moreover, management of breeding affiliations separately is contingent on our ability to determine whether harvest data can be collected at scales smaller than the MCP, and whether or not these affiliations sufficiently differ to warrant separate management schemes.

Response rates of voluntary hunter mail questionnaires have decreased, raising concerns about non-response bias. Average response rate among states has dropped from about 70% in 1980 to about 60% today. The USFWS is taking steps to measure this bias and improve response rates including adding, changing questionnaire instructions and making periodic mailings throughout the hunting season. Those states implementing POS license distribution systems should provide more timely contact information. This would allow more frequent mailings, and could increase response rates, and possibly reduce effects of 'memory bias' (Atwood 1959).

States must continue to take the lead by providing complete and accurate contact lists of crane hunter names and addresses in their respective states. Sampling problems in some states are likely the result of permits being issued free of charge through POS licensing systems. Thus, many permits are issued to a large proportion of license applicants who may not have specifically requested it, resulting in non-response at higher rates than in the past, or among other states with more accurate contact lists. The result is higher cost for the survey as more questionnaires must be mailed to achieve adequate sample sizes of active hunters. During periods of budgetary constraint, additional mailings may exceed available funds, and in essence, undermine the purpose of stratifying the sampling universe by permit issuance. In addition, there is the hidden cost of unknown bias in harvest estimates.

States agencies could focus permit acquisition on active crane hunters by either charging a nominal application fee, issuing the permit only from its offices or by toll free telephone number or internet. We believe that these measures would greatly reduce over-sampling and thus greatly increase efficiency of the USFWS harvest survey.

Responsibilities: All cooperating agencies. The flyway technical committees, USFWS, and CWS will assist in developing appropriate strategies to adjust harvest rates should

problems develop. The Councils welcome population modeling efforts by qualified biometricians including the USGS-BRD Patuxent, Northern Prairie Wildlife Research Center, and USFWS Division of Migratory Bird Management scientists to illustrate effects of harvest on population size, and effects of harvest regulations on total harvest.

Strategy C-4: Increase public opportunities, where feasible, to observe or photograph MCP cranes by:

a. Designate observation points at appropriate sites along public roads from which concentrations of MCP cranes can be observed.

b. Construct towers and/or blinds with screened access routes to overlook concentrations on public lands.

c. Provide information via news releases to mass media and special articles in conservation publications on time and place for crane viewing.

d. Develop outreach explaining facts regarding hunting to non-consumptive users.

Rationale: Sandhill cranes are spectacular birds which attract considerable interest among non-consumptive users. Unfortunately, MCP cranes spend much of their time in relatively remote areas of flat terrain. Publicity regarding where and when to observe cranes and observation aids at such locations does attract considerable use as evidenced by events during the spring migration in Nebraska.

Responsibilities: All cooperating agencies.

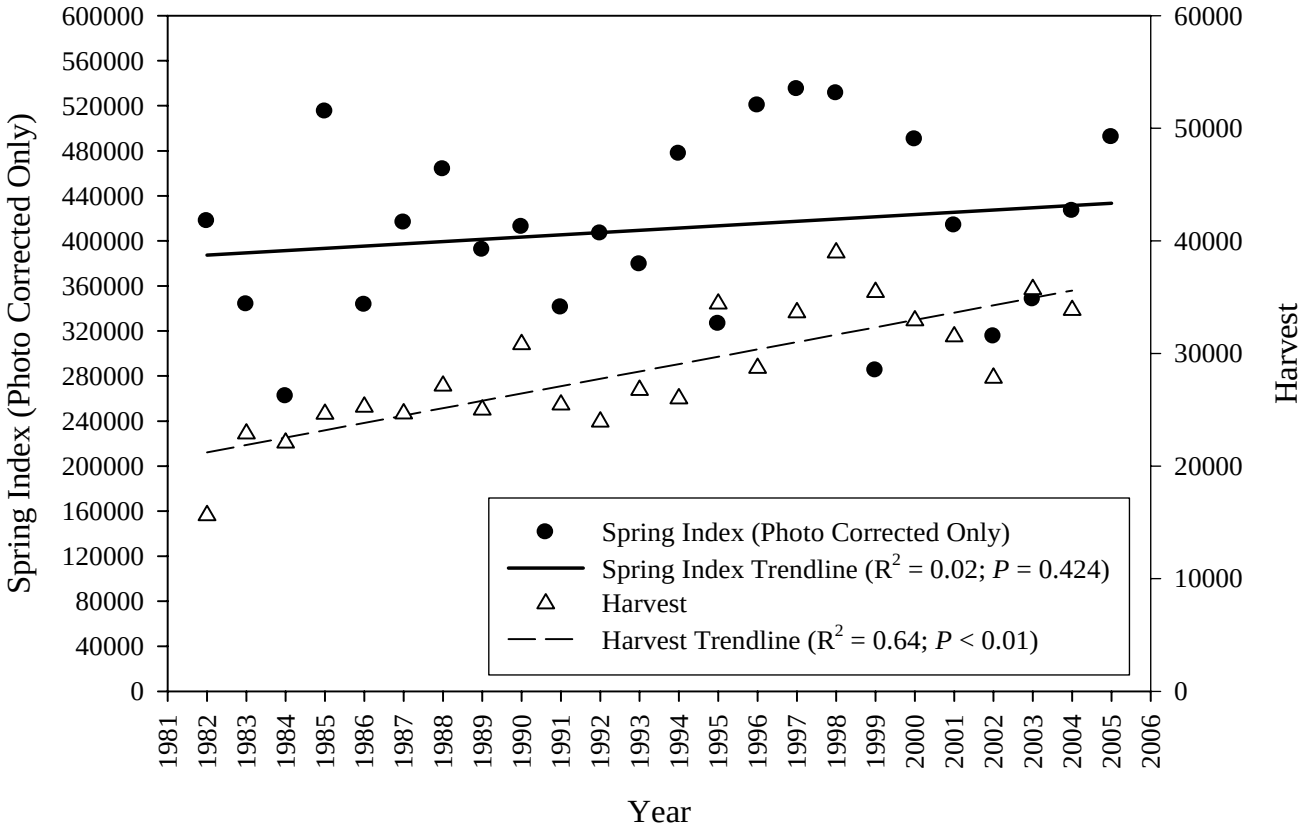

Figure 4. Trend analysis of indices of abundance and harvest of MCP sandhill cranes 1982-2005. Abundance includes only photo-corrected ocular aerial transect counts within the Central Platte River Valley of Nebraska. Harvest includes retrieved and unretrieved estimates from Central and Pacific Flyway states, Canada, and Mexico. The analysis was performed on log-transformed data (after Sharp et al. 2005); data points and trend lines presented are log back-transformed.

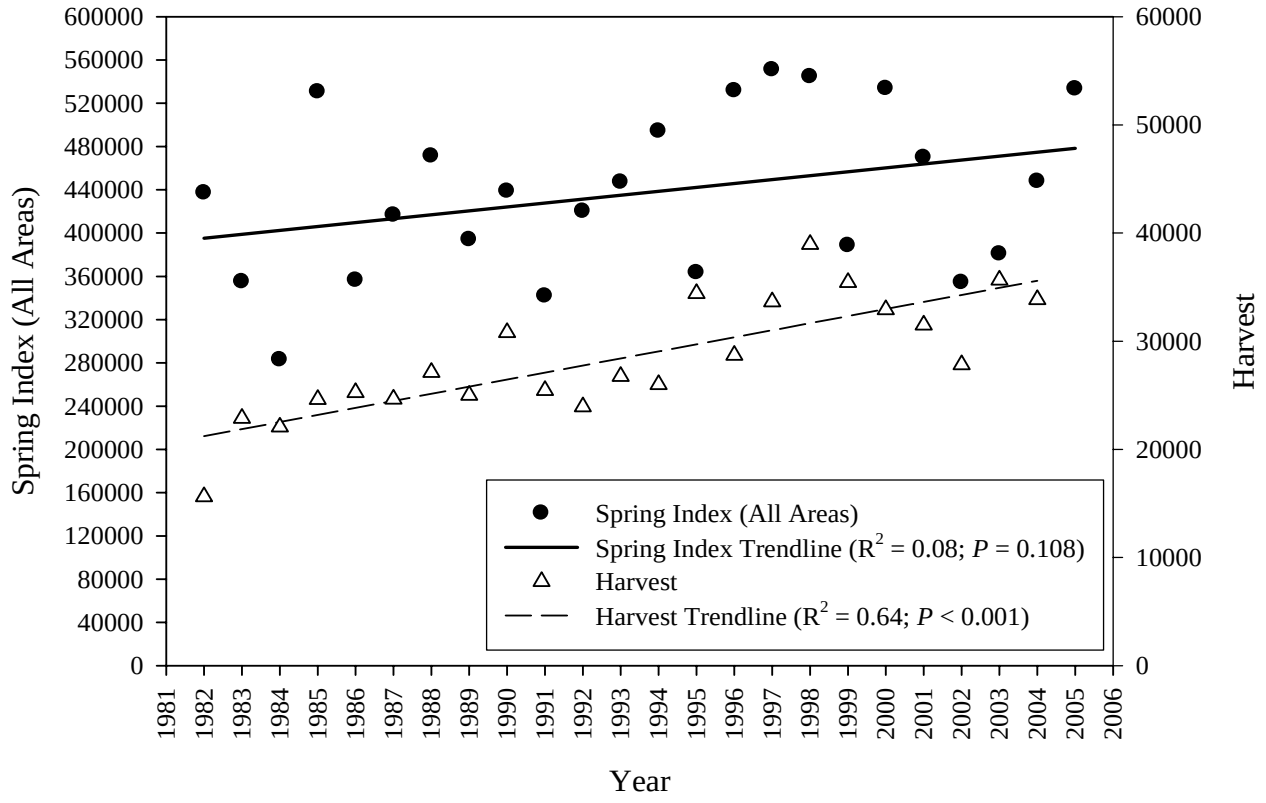

Figure 5. Trend analysis of indices of abundance and harvest of MCP sandhill cranes 1982-2005. Abundance includes photo-corrected ocular aerial transect counts within the Central Platte River Valley of Nebraska plus ground counts outside this area. Harvest includes retrieved and unretrieved estimates from Central and Pacific Flyway states, Canada, and Mexico. The analysis was performed on log-transformed data (after Sharp et al. 2005); data points and trend lines presented are log back-transformed.

RESEARCH NEEDS

Researchers continue to add valuable knowledge to the management of Mid-continent Population sandhill cranes (MCP cranes). However, additional information is needed to refine population monitoring techniques and enhance management of MCP cranes. Cooperative funding agreements, such as the Platte River Fund, are imperative for meeting these future research needs. Information has been identified that will meet these needs and support ongoing management programs. The following are prioritized research items needing immediate action.

1. Continue to improve our understanding of influences of bag limits, season lengths, and season dates on harvest and population size of the MCP, as reflected by the spring survey index.

2. Continue to evaluate feasibility of managing harvest at a scale smaller than the MCP by determining whether spatial and temporal differences exist for distributions of breeding affiliations of MCP cranes in fall, and whether they are substantial enough to warrant differential management of the affiliations.

3. Determine recruitment rates of potential breeding affiliations of MCP cranes.

4. Continue to research other means (e.g., stable isotopes and MtDNA) of monitoring MCP crane harvest amongst breeding affiliations.

5. Estimate subsistence harvest of MCP cranes in Siberia, and sport harvest in Siberia and Mexico.

6. Continue to evaluate other methods for estimating size of the MCP.

Other research topics of interest are noted below in an unprioritized listing. These may also enhance management of Mid-Continent Sandhill Cranes but are of lesser importance.

1. Evaluate different techniques to determine age ratios among harvested MCP cranes such as collection of wings, wing-tips, contour feathers, or skin from the forehead.

2. Continue to assess corn availability in the Platte Region while developing more efficient methods of data collection.

Responsibilities: All cooperating agencies and research groups.

MAINTENANCE OF GUIDELINES

These guidelines will be maintained by the appropriate technical committees of the Central, Mississippi, and Pacific flyways. The parties to this plan will provide revisions to the 2006 plan in 3-6 years. Delaying future revisions will allow results from ongoing research projects to be finalized and incorporated into management decisions. Such changes will be recommended to the Councils for adoption.

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APPENDIX A

Table A-1. Estimated densities of Sandhill Cranes seen in summer in Canada.

Location	(Cranes/sq. km.)	Breeding Occupancy	Reference
1. Banks Island, NWT	x = 0.094 s = 0.214	n.e.	Manning et al., 1956
	n.e.	0.172	Walkinshaw, 1965
2. Adelaide Peninsula. NWT	0.079*	n.e.	Macpherson & Manning, 1959
3. Perry River, NWT	n.e.	0.177-.318	Hanson et al., 1956
4. Kendall Island, NWT	0.10	n.e.	Barry & Spencer, 1976
5. Spence Bay-Manitoba boundary, NWT (proposed pipeline)	x = 0.140** s = 0.255	n.e.	Allen & Hogg, 1979
6. McConnell River, NWT	n.e.	2.0	Harvey et al., 1968
7. "Athabina", AB	n.e.	0.047 (1976) 0.033 (1977)	Carlisle, 1979 Carlisle, 1979
8. Northwest, Sask.	n.e.	0.012	Stephen, pers. comm.
9. Interlake, MB	n.e.	0.034	Stephen, pers. comm.
10. Hudson Bay Lowland, ON	n.e.	n.e.	Lumsden, 1971
11. Southern Algoma, ON	0.039	0.009	Tebbel, Ankney, 1979

n.e. = not estimated
*estimated on basis of technique used by Manning et al., 1956
**standard aerial survey technique used, occupancy reported as birds/km to include cranes seen off transect

Table A-2. Sandhill crane breeding population index for Alaska, 1957-2004.

Year	Kenai Susitna	Nelchina	Tanana-Kusko.	Yukon Flats	Innoko	Koyukuk	Bristol Bay	Yukon Delta	Seward Pennisula	Kotzebue Sound	Total
1957	0	0	0	700	100	N.A.	5,900	11,300	1,900	2,500	22,400
1958	0	0	600	1,200	2,000	200	1,700	13,600	800	300	20,400
1959	0	0	300	900	300	200	800	15,000	3,100	700	21,300
1960	0	0	500	100	400	0	3,100	7,200	3,500	900	15,700
1961	0	0	0	500	300	0	2,500	19,000	2,100	1,200	25,600
1962	100	0	500	100	600	400	0	17,300	1,400	200	20,600
1963	0	0	0	0	0	200	700	17,000	1,200	1,000	20,100
1964	0	0	200	0	300	100	1,300	20,600	300	800	22,500
1965	0	0	100	1,100	100	0	1,500	14,600	1,400	1,200	18,700
1966	100	0	100	700	600	100	300	13,200	1,000	2,300	18,600
1967	0	0	900	400	600	300	3,000	20,300	200	800	23,000
1968	200	0	1100	900	800	200	1,900	19,300	2,400	2,000	28,300
1969	200	0	800	300	600	300	2,900	30,800	2,100	800	40,200
1970	200	0	1,100	1,500	600	900	4,700	29,400	1,000	900	46,300
1971	100	0	1,100	800	800	700	1,900	31,500	1,300	1,800	40,100
1972	0	0	800	900	1,000	400	2,800	18,200	800	1,200	25,800
1973	0	0	600	500	1,400	500	1,400	19,200	1,400	1,600	25,900
1974	200	0	900	700	1,100	400	2,000	16,100	1,600	2,500	26,500
1975	200	0	0	400	0	200	2,000	20,800	1,400	2,200	27,300
1976	0	0	400	0	300	0	4,600	17,000	1,000	400	23,300
1977	0	0	1,100	2,600	1,200	900	2,800	32,500	3,000	1,000	47,700
1978	0	0	900	700	300	400	2,700	29,000	1,800	1,600	36,300
1979	0	0	700	500	500	600	5,200	38,300	7,000	5,800	59,600
1980	0	0	300	900	1,200	800	2,500	26,900	1,400	3,800	38,100
1981	0	0	400	3,100	800	700	1,600	24,000	7,600	2,500	40,900
1982	0	0	800	1,200	1,700	2,200	4,200	32,700	17,300	4,000	64,100
1983	100	0	1,100	800	700	800	3,400	26,000	8,400	6,400	47,600
1984	0	0	400	2,000	300	800	2,300	28,600	5,100	2,800	42,300
1985	0	0	500	1,200	1,500	1,000	7,700	29,400	5,600	3,300	50,200
1986	100	0	200	2,300	200	300	2,700	22,800	12,500	3,200	44,300
1987	100	0	600	1,500	200	300	6,800	27,800	2,100	4,100	43,500
1988	100	0	100	1,200	1,200	1,000	3,900	25,400	1,900	3,800	38,600
1989	300	0	600	4,300	500	1,400	2,900	23,600	3,300	5,600	42,500
1990	0	0	600	1,100	700	1,400	2,800	32,600	3,300	5,600	48,100
1991	100	0	800	1,600	700	700	4,500	25,900	6,200	4,700	45,200
1992	200	0	200	900	1,500	900	3,300	25,200	12,500	4,700	49,400
1993	0	0	500	900	1,200	1,000	4,600	28,300	6,100	4,100	46,700
1994	200	0	400	2,000	200	700	3,300	29,000	13,800	4,200	53,800
1995	300	0	300	1,200	500	1,200	5,800	29,200	7,800	3,500	49,800
1996	100	0	200	1,900	200	1,100	5,300	30,800	5,400	4,200	49,200
1997	0	0	800	2,200	200	1,100	4,600	31,700	3,700	4,500	48,800
1998	100	0	400	3,200	1,100	600	2,400	29,800	8,000	3,000	48,600
1999	0	0	200	400	1,500	900	2,900	22,200	4,000	4,800	36,900
2000	700	0	1,300	1,800	500	1,400	5,100	18,200	5,200	7,200	41,400
2001	100	0	1,300	500	700	1,400	6,100	34,600	6,300	5,800	56,800
2002	300	0	700	1,400	400	600	5,900	19,500	7,600	2,300	38,700
2003	0	0	1,300	1,500	200	800	3,800	23,200	5,100	3,600	39,500
2004	400	0	1,000	1,500	400	2,300	2,400	22,500	9,200	2,600	42,300
Avg	94	0	577	1,169	671	689	3,260	23,773	4,398	2,875	37,573

Table A-3. Spring aerial surveys of sandhill cranes on Kent Peninsula, Northwest Territories, 1988-92[a].

Year	Survey area (km^2)	Crane density/km^2
1988-92[b]	80	1.19
1991[c]	724	0.52
	80	0.74
	434	0.18
1992	724	0.86
	80	0.50
	434	0.12

[a]Data from R. Bromley and B. Croft, NWT Department of Renewable Resources.
[b]Average crane density over 5-year period from one intensive study area.
[c]Data from three additional study areas for 1991 and 1992.

Table A-4. Sandhill crane nesting data on Kent Peninsula, Northwest Territories, 1987-92[a].

			Nest success		Egg success		
Year	Nests	Clutch	*n*	%	*n*	%	Hatch date (n)
1987	10	1.4	10	61	10	72	
1988	6	1.8	5[b]	80	5[b]	78	
1989	8	1.8	8	100	8	100	8 July (8)
1990	9	1.9	8	80	8	54	3 July (6)
1991	9	1.3	3	28	3	39	
1992	9	1.7	9	54	9	19	6 July (7)

[a]Data from R. Bromley and B. Croft, NWT Department of Renewable Resources, based on ground searches of 11-17 km^2.
[b]Nest and egg success is "apparent" success, all others are "Mayfield" estimates.

Table A-5. Estimated number of Mid-winter estimates of Mid-continent sandhill cranes wintering in New Mexico, 1960-2005.[a]

	Transect			
Year	Pecos, NE1, NE2 [b]	MRGV[c,d]	SW NM[d]	Total
1960	60	-	-	60
1961	280	-	-	280
1962	893	-	-	893
1963	2,444	-	-	2,444
1964	1,131	-	-	1,131
1965	3	-	-	3
1966	1,324	-	-	1,324
1967	3,534	-	-	3,534
1968	83	-	-	83
1969	37	-	-	37
1970	14	-	-	14
1971	2,092	-	-	2,092
1972	260	-	-	260
1973	184	-	-	184
1974	185	-	-	185
1975	900	-	-	900
1976	316	-	-	316
1977	177	-	-	177
1978	5,430	-	-	5,430
1979	848	-	-	848
1980	1,430	-	-	1,430
1981	735	-	-	735
1982	1,006	-	-	1,006
1983	80	-	-	80
1984	0	-	-	0
1985	0	-	-	0
1986	50	-	-	50
1987	218	-	-	218
1988	1,100	-	-	1,100
1989	480	-	-	480
1990	90	-	-	90
1991	29	-	-	29
1992	1,489	-	-	1,489
1993	2,535	-	-	2,535
1994	18	-	-	18
1995	0	-	-	0
1996	63	5,192	58	5,313
1997	1,684	1,305	175	3,164
1998	131	2,047	1,821	3,999
1999	136	1,795	61	1,992
2000	607	6,178	1,043	7,828
2001	287	2,661	625	3,573
2002	25	600	0	625
2003	40	1,138	129	1,307
2004	1,403	818	65	2,286
2005	1,030	1,134	755	2,919
Avg	758	2,287	473	-

[a] Survey conducted as part of the Mid-winter aerial waterfowl survey in New Mexico.

[b] Combined estimate from Pecos, NE1 and NE2 transects where predominantly Mid-continent cranes occur.

[c] Middle Rio Grande Valley Transect.

[d] These transects include both Rocky Mountain sandhill cranes and Mid-continent sandhill cranes. Thus, estimates are based on the total transect sandhill crane estimate, multiplied by the average proportion of Mid-continent sandhill cranes in the total crane harvest in NM from 1996-2000.

APPENDIX B

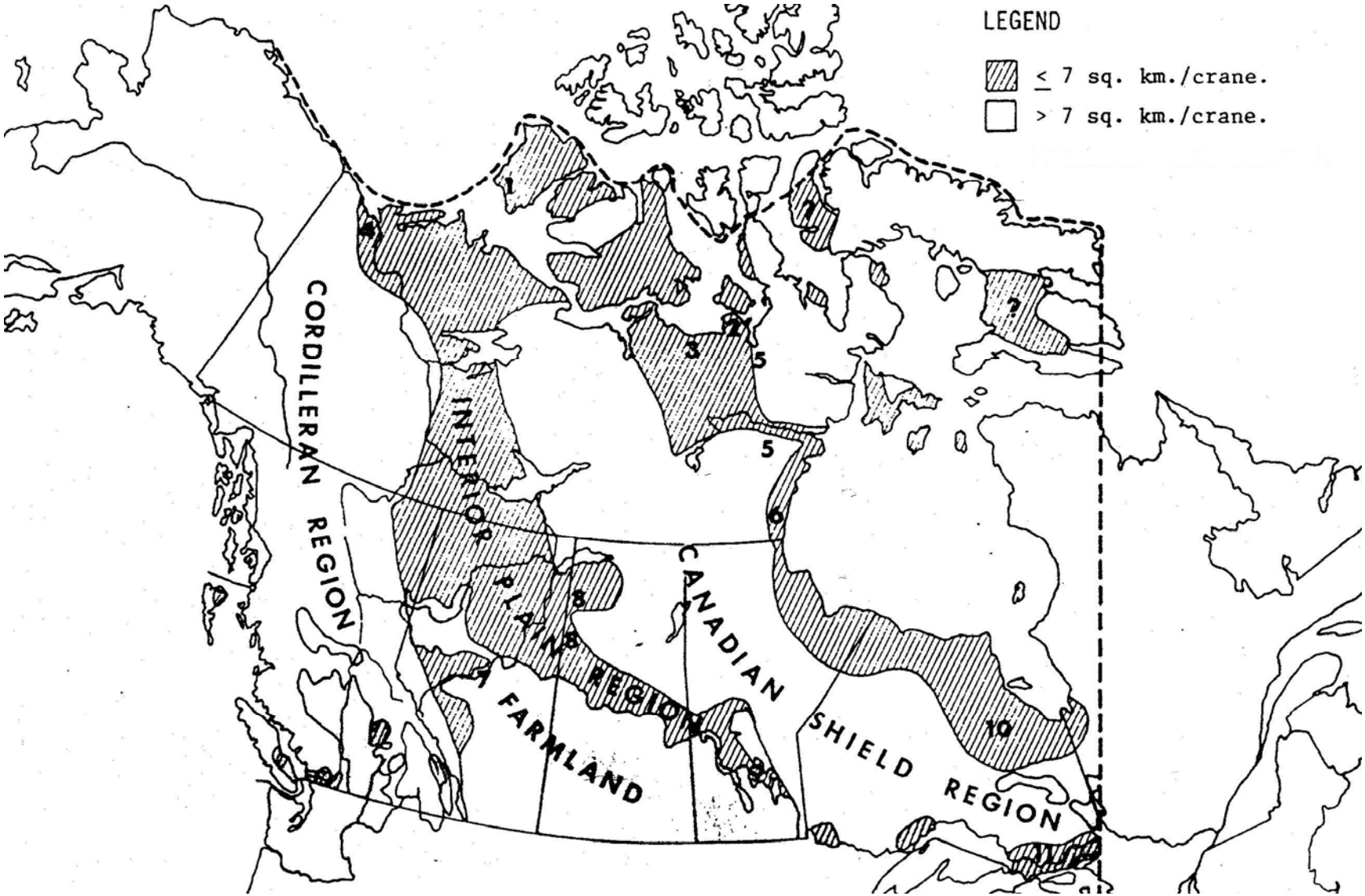

Figure B-1. Estimated limits and densities of sandhill cranes breeding in Canada. Numbers represent locations cited in table A-1.

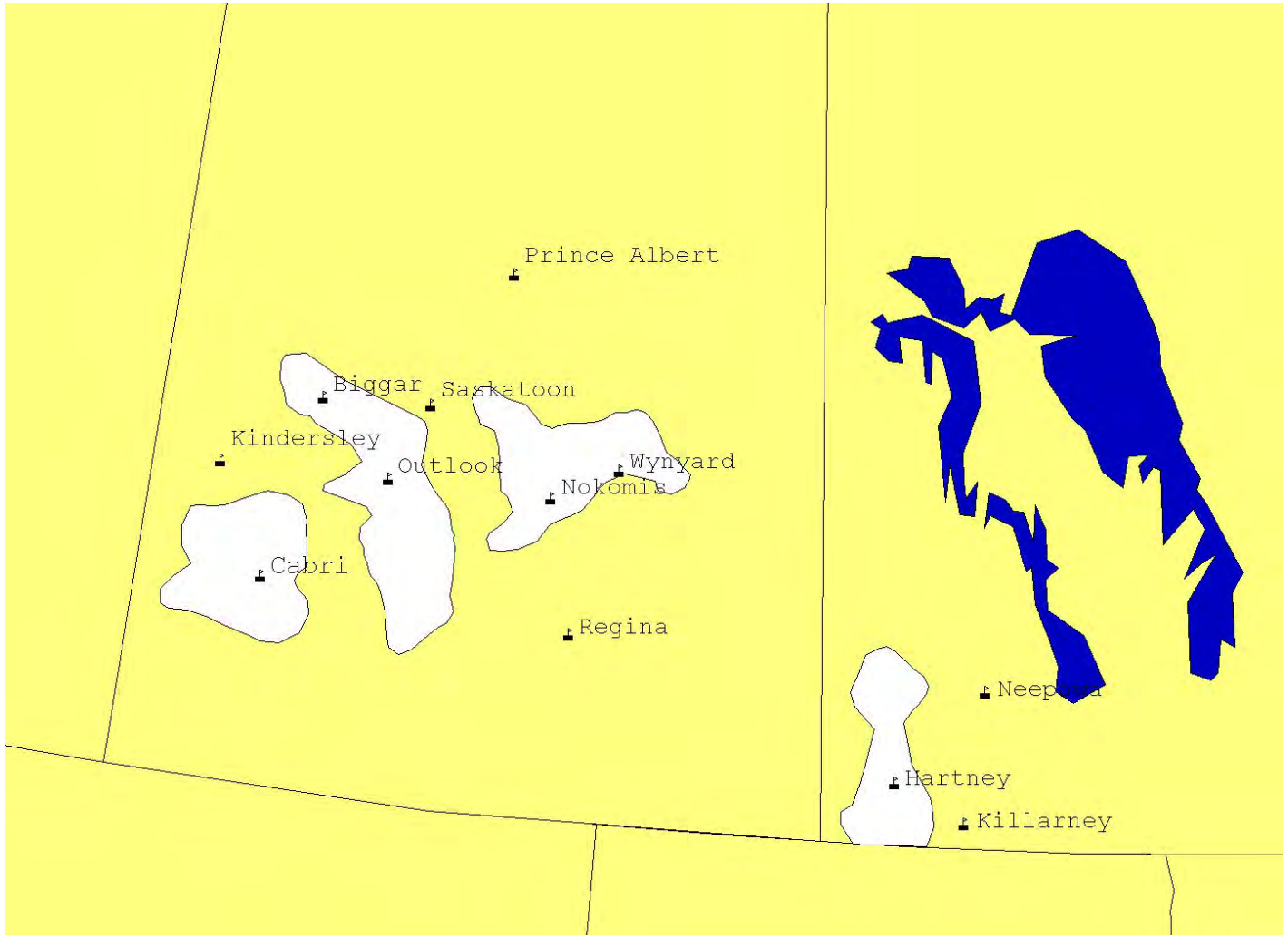

Figure B-2. Sandhill crane migration stopover areas (white) in the Prairie Provinces from radio-telemetered cranes (G.L. Krapu, U.S. Geological Survey, Northern Prairie Wildlife Research Center, unpublished data).

APPENDIX C

HISTORY OF MID-CONTINENT POPULATION OF SANDHILL CRANE HUNTING, REGULATIONS, AND HARVEST

Legal Status. Cranes (family Gruidae) are protected internationally under the migratory bird conventions between the United States and Canada (as amended in 1997) between the US and Mexico (as amended in 1997), and Russia (1976). Hunting of migratory birds in the United States is regulated by the Migratory Bird Treaty Act (MBTA, 40 Stat. 755; 16 U.S.C. 703) that gives effect to the international treaties. Migratory birds defined as "game birds" in the terms of these conventions and MBTA are listed in section 20.11 of Part 1, Title 50, Code of Federal Regulations and include the Family Gruidae.

The treaty with Canada in 1916 listed "Gruidae or cranes, including little brown, sandhill, and whooping cranes." Subsequently, the little brown crane and sandhill crane were shown to be subspecies of a single species (Oberholser, 1921). Intermediates between the lesser and greater subspecies were then described morphologically. The "little brown crane" is now called the lesser sandhill crane; the "sandhill crane" is now called the greater sandhill crane. The “intermediate” formerly recognized as a separate subspecies (Walkinshaw 1965) is now considered only a hybrid based upon mtDNA analyses (Rhymer et al. 2001, Glenn et al. 2002, Peterson et al. 2003). We generally do not distinguish harvest of Mid-continent Population of sandhill cranes (MCP) by subspecies because the morphological differences are not readily identifiable and are becoming less distinguishable with time. Current discrimination is only attempted in those instances where ranges overlap with other populations dominated by one subspecies.

Hunting Regulations. A general closed season was established on all cranes in the United States, May 20, 1916. It remained in effect until January 1, 1961, when a 30-day season was authorized on lesser sandhill cranes in eastern New Mexico (NM) and western Texas (TX). TX did not participate at that time because cranes were not defined as game birds in statute. In the fall of 1961, a 30-day season was authorized for Alaska (AK; Sept. 1-30) and in NM and West TX (Nov. 4-Dec. 3). Minor changes were made in subsequent seasons in these states. The area open to hunting in NM and TX was enlarged, and the hunting period in AK was increased to 45 days during the 1964-65 waterfowl season. In 1977, migratory bird seasons in AK were standardized, and crane seasons were allowed for the full 107-day framework for waterfowl, recognizing that only 45 days of hunting actually are available before freeze-up.

In 1967, hunting was permitted in the Central Flyway (CF) portion of Colorado (CO), exclusive of the San Luis Valley and, in the following year, in western Oklahoma (OK), the eastern portion of the TX panhandle, and prescribed areas of North Dakota (ND) and South Dakota (SD). In 1972, hunting was permitted in prescribed areas of Montana (MT) and Wyoming (WY).

From 1968-1979 in ND, the number of counties open to hunting was expanded from 2 to 8 (Sharp and Cornely 1997, Sharp et al. 2005). From 1980-92, the number of counties with open seasons increased to 30 and were grouped into two zones. In 1993, crane hunting opened statewide west of U.S. Hwy. 281 and used full federal frameworks.

In 1993, western Kansas (KS) was opened to hunting. In 2001, ND and TX accepted a reduction in season length and daily bag limit to slightly expand the area open to hunting. Except for these changes in the last 10 years, the area open to hunting has remained relatively unchanged. Nebraska is the only CF state that currently does not have a recreational hunting season.

MCP cranes have been legally hunted in Mexico at least since 1940, and in portions of Canada since 1959. In 2004, only Manitoba (MB), Saskatchewan (SK) and Northwest Territories (NWT) have been open to hunting. Hunting season dates and bag and possession limits, 1961- 2004, in Central Flyway states, AK, MB, SK, and MX are listed in Tables C-l, C-2, C-3, C-4.

In 1997, the United States Senate ratified amendments to the migratory bird treaties with Canada and Mexico to legally recognize and regulate traditional spring and summer hunting in AK and Canada. The Alaska Migratory Bird Comanagement Council (AMBCC) was established to broadly involve subsistence hunters in migratory bird management, as well as establish the first spring and summer hunting regulations. In 2003, the first legal spring and summer season commenced under federal regulations. The AMBCC annually reviews proposed regulatory changes, consults with the Flyway Councils, and makes recommendations to the USFWS.

Harvest. NM obtained estimates of its crane harvest via hunter questionnaire beginning with the first season in January 1961. ND and OK also estimated harvest from hunter questionnaires through the mid-1970s. Harvest was minimal in ND until hunting in September was authorized in 1977. TX, an important crane harvest state, relied upon periodic harvest estimates made by field personnel; these estimates ranged from 890 (1966) to 3,076 (1971).

Surveys in SK and MB indicated hunters took ca. 2,959 cranes/year 1972-76. However, these estimates did not include unretrieved or subsistence harvest. Harvest has been quite variable in Canada while tending to increase in SK (CWS Waterfowl Committee 2004). No cranes were reported harvested in the Yukon in 2003.

The annual harvest in Mexico was estimated to be 500-1,000 cranes through the mid-1970s (Baer in Lewis 1977:28). Because there are no comprehensive harvest surveys in Mexico and interest in crane hunting is believed to be increasing in Mexico, commensurate with that in the United States, it has been assumed that harvest has been proportional (10%) to the combined United States and Canadian sandhill crane harvests (R. Drewien, personal communication). This assumed low harvest level has been supported by an independent assessment of harvest in Mexico (Kramer et al. 1995).

Since 1975, federal sandhill crane hunting permits have been required for all hunters participating in seasons in the U.S. portion of the CF (Table C-6, Sharp et al. 2005). The permits were supplied to the states by the USFWS and initially were issued free of charge to hunters upon request. The USFWS mails a questionnaire to a sample of these permit holders at the close of the hunting season. Responses are expanded to estimate hunting activity and success in each geographic area or state (Martin 2005). The questionnaire includes inquiries about number of days hunted, retrieved and un-retrieved harvest, and counties hunted. Follow-up questionnaires have been mailed to non-respondents to improve response rates.

This mail survey indicates that the number of active hunters has remained relatively stable in the CF (Table C-7). TX (56%) and ND (27%) hunters comprise the majority of active hunters in the Central Flyway. Hunter participation and harvest in MT, WY, CO, SD, NM and KS has been relatively small. Current results indicate that only about half of permit holders actually harvest a crane during the hunting season (Martin 2005). Approximately 40% take 1 - 3 and the remaining 10% take more than 3 per hunting season. Hunter reported unretrieved harvest in the United States portion of the CF has decreased ($R^2 = 0.93$, $P < 0.01$) since 1975 (Sharp et al. 2005) and the number of days afield per hunter has remained relatively stable (~3 days/hunter).

However, the estimated total MCP harvest has increased (Table C-9). Total estimated North American harvest including estimated unretrieved loss has increased an average of about 2.6%/year (Table C-9, Figure 3) - a higher rate than the breeding population index. Largest increases in harvest were seen in the Central Flyway during the 1990s, but have since decreased. Recent (since 1998) large increases in harvest have been seen in SK (Tables C-8, 9). Estimated seasonal bag per hunter in the Central Flyway has ranged from about 1.5 in the 1970s to about 2.5 in the 1990s; however, in recent years, seasonal bag per hunter has again decreased to < 2.

Harvest surveys indicated that a 14% reduction in harvest would be realized with a bag limit change from 3 to 2, and a 43% reduction in harvest with a bag limit change from 2 to 1 (Miller 1987). However, a more current analysis including effects of incremental reduction in season lengths and changes in opening dates should be completed.

Subsistence harvest of MCP historically was poorly documented in the United States and Canada (Sharp et al. 2005). In the 1980s, the state of Alaska initiated a broad program of subsistence harvest surveys of 151 rural communities (Wolfe et al. 1990). About the same time, an intensive village harvest survey program was designed and implemented to measure subsistence harvest of geese, other waterfowl, cranes, and other birds on the Yukon-Kuskokwim Delta (YKD). On the YKD, where the highest densities of MCP cranes in AK occur, subsistence harvest averaged 3,240 cranes and 500 eggs from 1985-1995 (Wentworth and Seim 1996). During the period 1996-2002, average harvest for the region was 3,111 cranes and 500 eggs (Wentworth, unpublished data). Harvest surveys from other parts of AK that host MCP cranes are not complete, but Wolfe et al. (1990) characterized crane harvest from these other regions at about 3,000 birds, the most notable area being the Seward Peninsula where cranes are traditionally hunted during migration to and from Siberia. Since 2003, a statewide subsistence harvest survey program has been implemented through the AMBCC; this effort is expected to produce more regular and reliable harvest information for all subsistence hunting areas across AK in the future.

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Table C-1. Season dates (month/day) for sandhill crane hunting in Central Flyway states, 1960-present (Sharp et al. 2005).

YR	CO	KS	MT[1]	MT[2]	NM	ND[1]	ND[2]	OK	SD	TX[1]	TX[2]	TX[3]	WY
1960	-	-	-	-	01/01-01/30	-	-	-	-	-	-	-	-
1961	-	-	-	-	11/04-12/03	-	-	-	-	11/04-12/03	-	-	-
1962	-	-	-	-	11/03-12/02	-	-	-	-	11/03-12/02	-	-	-
1963	-	-	-	-	11/02-12/01	-	-	-	-	11/02-12/01	-	-	-
1964	-	-	-	-	10/31-11/29	-	-	-	-	10/31-11/29	-	-	-
1965	-	-	-	-	10/30-11/28	-	-	-	-	10/30-11/28	-	-	-
1966	-	-	-	-	10/29-11/27	-	-	-	-	10/29-11/27	-	-	-
1967	10/01-10/30	-	-	-	11/04-01/02	-	-	-	-	11/04-01/02	-	-	-
1968	10/01-10/30	-	-	-	11/02-12/28	11/09-12/08	-	12/14-01/02	11/09-12/08	11/02-12/28	12/14-01/02	-	-
1969	10/04-11/02	-	-	-	11/01-12/28	11/08-12/07	-	12/13-01/11	11/08-12/07	11/01-12/28	12/13-01/11	-	-
1970	10/03-11/01	-	-	-	10/31-01/10	11/14-12/13	-	12/05-01/10	11/14-12/13	10/31-01/10	12/05-01/10	-	-
1971	10/02-11/07	-	-	-	10/30-01/30	11/13-12/02	-	12/04-01/30	11/13-12/02	10/30-01/30	12/04-01/30	-	-
1972	10/01-11/05	-	10/01-11/06	-	11/03-01/31	11/11-12/10	-	12/02-01/28	11/11-12/10	10/28-01/28	12/02-01/28	-	10/07-11/05
1973	10/01-11/05	-	09/29-11/04	-	10/27-01/27	11/10-12/09	-	12/01-01/27	11/10-12/09	10/27-01/27	12/01-01/27	-	10/13-11/11
1974	10/01-11/05	-	09/28-11/03	-	10/26-01/26	11/09-12/08	-	11/30-01/26	11/09-12/08	10/26-01/26	11/30-01/26	-	10/12-11/10
1975	10/04-11/08	-	10/04-11/09	-	10/25-01/25	11/08-12/07	-	11/29-01/25	11/08-12/07	10/25-01/25	11/29-01/25	-	10/11-11/09
1976	10/02-11/06	-	10/02-11/07	-	10/30-01/30	11/06-12/05	-	11/27-01/23	11/06-12/05	10/30-01/30	12/04-01/30	-	10/09-11/07
1977	10/01-11/06	-	10/01-11/06	-	10/29-01/29	09/07-09/11	-	11/26-01/22	09/07-09/11	11/01-01/31	12/05-01/31	-	10/08-11/06
1978	09/30-11/05	-	09/30-11/05	-	10/28-01/28	09/07-09/11	-	11/25-01/21	09/07-09/11	10/31-01/31	12/05-01/31	-	10/07-11/05
1979	10/13-11/18	-	09/29-11/04	-	10/27-01/27	09/07-09/11	-	11/24-01/20	09/07-09/11	10/30-01/30	12/04-01/30	-	10/13-11/18
1980	10/11-11/16	-	10/04-11/09	-	10/30-01/31	09/06-09/14	09/06-09/10	11/22-01/18	09/20-09/28	10/31-01/31	12/05-01/31	-	10/11-11/16
1981	10/10-11/15	-	10/03-11/08	-	10/31-01/31	09/05-09/20	09/05-09/13	11/22-01/18	09/20-09/28	10/31-01/31	12/05-01/31	-	10/03-11/08
1982	10/02-11/28	-	10/02-11/28	-	10/31-01/31	09/04-09/19	09/04-09/12	10/23-01/23	10/02-11/11	10/30-01/30	12/04-01/30	-	09/25-11/21
1983	10/01-11/27	-	11/01-11/27	11/01-11/27	10/29-01/28	09/10-11/06	09/10-09/30	10/22-01/22	10/01-11/06	11/12-02/12	12/03-02/12	01/14-02/12	09/24-11/20
1984	09/29-11/25	-	09/29-11/25	11/01-11/25	10/27-01/27	09/08-11/04	09/08-09/28	10/13-01/13	09/29-11/04	11/10-02/10	12/01-02/10	01/12-02/10	09/22-11/18
1985	09/28-11/24	-	09/28-11/24	11/01-11/24	10/26-01/26	09/07-11/03	09/07-09/27	10/12-01/12	09/28-11/03	11/09-02/09	11/30-02/09	01/11-02/09	09/21-11/17
1986	10/04-11/30	-	10/04-11/30	11/01-11/30	10/25-01/25	09/06-11/02	09/06-10/03	10/11-01/11 10/10-11/20	09/28-11/02	11/08-02/08	11/29-02/08	01/03-02/08	09/20-11/16
1987	10/03-11/29	-	10/03-11/29	10/03-11/29	10/24-01/24	09/05-11/01	09/05-10/02	11/28-01/17	09/26-11/01	11/14-02/14	11/28-02/07	01/02-02/07	09/19-11/15
1988	10/01-11/27	-	10/01-11/27	10/01-11/27	10/22-01/22	09/10-11/06	09/10-09/30	10/22-01/22	09/24-10/30	11/12-02/12	11/26-02/05	01/07-02/12	09/17-11/13
1989	09/30-11/26	-	09/30-11/26	09/30-11/26	10/21-01/21	09/09-11/05	09/09-09/29	10/21-01/21	09/30-11/05	11/11-02/11	12/02-02/11	01/06-02/11	09/16-11/12
1990	09/29-11/25	-	09/29-11/25	09/29-11/25	10/20-01/20	09/08-11/04	09/08-10/14	10/20-01/20	09/29-11/04	11/10-02/10	12/01-02/10	01/05-02/10	09/15-11/11
1991	09/28-11/24	-	09/28-11/24	09/28-11/24	10/19-01/19	09/07-11/03	09/07-10/13	10/19-01/19	09/28-11/03	11/09-02/09	12/07-02/09	01/04-02/09	09/15-11/11
1992	10/03-11/29	-	09/26-11/22	09/26-11/22	10/17-01/17	09/05-11/01	09/05-10/11	10/17-01/17	09/26-11/01	11/14-02/14	12/05-02/14	01/02-02/07	09/15-11/11
1993	10/02-11/28	11/06-01/02	09/25-11/21	09/25-11/21	10/16-01/16	09/11-11/07	09/11-11/07	10/16-01/16	09/25-10/31	11/13-02/13	12/04-02/13	01/08-02/13	09/15-11/11
1994	10/01-11/27	11/05-01/05	09/24-11/20	09/24-11/20	10/15-01/15	09/10-11/06	09/10-11/06	10/15-01/15	09/24-10/30	11/12-02/12	12/03-02/12	01/07-02/12	09/15-11/11
1995	09/30-11/26	11/05-01/05	09/23-11/19	09/23-11/19	10/31-01/31	09/09-11/05	09/09-11/05	10/22-01/28	09/23-11/19	11/11-02/11	12/02-02/11	01/06-02/11	09/14-11/10
1996	10/05-12/01	11/02-12/29	09/28-11/24	09/28-11/24	10/31-01/31	09/07-11/03	09/07-11/03	10/26-01/26	09/28-11/24	11/09-02/09	11/30-02/09	01/04-02/09	09/14-11/10
1997	10/04-11/30	11/01-12/28	10/04-11/30	10/04-11/30	10/31-01/31	09/06-11/02	09/06-11/02	10/25-01/25	09/27-11/23	11/08-02/08	11/29-02/08	01/03-02/08	09/13-11/09
1998	10/03-11/29	11/07-01/03	10/03-11/29	09/12-09/20	10/31-01/31	09/05-11/01	09/05-11/01	10/24-01/24	09/26-11/22	11/07-02/07	11/28-02/07	01/02-02/07	09/12-11/08
1999	10/02-11/28	11/06-01/02	10/02-11/28	09/11-09/19	10/30-01/30	09/11-11/07	09/11-11/07	10/30-01/30	09/25-11/21	11/13-02/13	12/04-02/13	01/08-02/13	09/11-11/07
2000	10/07-12/03	11/04-12/31	09/30-11/26	09/09-09/17	10/31-01/31	09/16-11/12	09/16-11/12	11/04-02/04	09/23-11/19	11/11-02/11	12/02-02/11	12/30-02/04	09/09-11/05
2001	10/07-12/03	11/03-12/30	09/29-11/25	09/08-09/16	10/31-01/31	09/15-11/11	09/15-10/21	11/03-02/03	09/22-11/18	11/10-02/10	12/01-02/10	12/29-01/20	09/15-11/11
2002	10/05-12/01	11/02-12/29	09/28-11/24	09/07-09/15	10/31-01/31	09/21-11/17	09/21-10/27	11/09-02/09	09/21-11/17	11/09-02/09	11/30-02/09	12/21-01/19	09/14-11/10
2003	10/04-11/30	11/01-12/28	09/27-11/23	09/06-09/14	10/31-01/31	09/20-11/16	09/20-10/26	10/25-01/25	09/27-11/23	11/01-02/01	11/22-02/01	12/20-01/18	09/13-11/09
2004	10/02-11/28	11/06-1/02	09/25-11/21	09/11-09/19	10/31-01/31	09/18-11/14	09/18-10/24	10/30-01/30	09/25-11/21	11/06-02/01	11/27-02/01	12/18-01/16	09/18-11/14

MT[1] Central Flyway portion of MT, except that area south of I-90 and west of the Bighorn River and Sheridan Co.

MT[2] Sheridan County, MT.

ND[1] Area 1, ND.

ND[2] Area 2, ND.

TX[1] Area A, TX.

TX[2] Area B, TX.

TX[3] Area C, TX.

Table C-2. Regular season dates (mo/day) for sandhill crane hunting seasons in Alaska, Manitoba, and Saskatchewan, 1961-62 to 2004-05.

	State/Province				
Season	Alaska	Manitoba	Saskatchewan		
1961-62	09/01-09/30	-	-		-
1962-63	09/01-09/30	-	-		-
1963-64	09/01-09/30	-	-		-
1964-65	09/01-10/15	09/01-09/19	09/01-09/19		-
1965-66	09/01-10/15	09/01-09/18	09/01-09/18		-
1966-67	09/01-10/15	09/01-09/17	09/01-09/17		-
1967-68	09/01-10/15	09/01-09/16	09/01-09/16		-
1968-69	09/01-10/15	09/02-09/16	09/02-09/16		-
1969-70	09/01-10/15	09/01-09/13	09/01-09/13		-
1970-71	09/01-10/15	09/01-09/14	09/01-09/12		-
1971-72	09/01-10/15	09/01-09/14	09/01-09/11		-
1972-73	09/01-10/15	09/01-09/14	09/01-09/09		-
1973-74	09/01-10/15	09/02-09/14	09/02-09/07		-
1974-75	09/01-10/15	09/01-09/15	09/01-09/08		-
1975-76	09/01-10/15	09/01-09/13	09/01-09/06		-
1976-77	09/01-10/15	09/01-09/11	09/01-09/07		-
1977-78	09/01-12/16	09/01-09/10	09/01-09/07		-
1978-79	09/01-12/16	09/01-09/30	09/01-09/09		-
1979-80	09/01-12/16	09/01-09/30	09/01-09/08	&	09/17-09/22
1980-81	09/01-12/16	09/01-09/30	09/01-09/06	&	09/15-09/20
1981-82	09/01-12/16	09/01-09/30	09/01-09/05	&	09/14-09/19
1982-83	09/01-12/16	09/01-10/02	09/01-09/04	&	09/13-09/18
1983-84	09/01-12/16	09/01-10/01	09/01-09/06	&	09/14-09/20
1984-85	09/01-12/16	09/01-09/29	09/01-09/11	&	09/12-09/18
1985-86	09/01-12/16	09/01-09/28	09/02-09/17	&	09/11-09/24
1986-87	09/01-12/16	09/01-09/27	09/01-09/16	&	09/10-09/23
1987-88	09/01-12/16	09/01-09/26	09/01-09/15	&	09/09-09/22
1988-89	09/01-12/16	09/01-09/30	09/01-09/13	&	09/12-09/20
1989-90	09/01-12/16	09/01-09/30	09/01-09/12	&	09/11-09/19
1990-91	09/01-12/16	09/01-09/29	09/01-09/18	&	09/10-09/25
1991-92	09/01-12/16	09/02-09/28	09/02-09/17	&	09/09-09/24
1992-93	09/01-12/16	09/01-10/03	09/01-09/15	&	09/14-09/22
1993-94	09/01-12/16	09/01-10/02	09/01-09/14	&	09/01-09/29
1994-95	09/01-12/16	-	09/01-09/15	&	09/01-09/30
1995-96	09/01-12/16	09/01-09/30	09/01-09/30	&	09/01-09/30*
1996-97	09/01-12/16	09/01-09/28	09/02-09/30	&	09/02-09/30*
1997-98	09/01-12/16	09/01-09/27	09/01-09/30		-
1998-99	09/01-12/16	09/01-10/03	09/01-12/12		-
1999-00	09/01-12/16	-	09/01-12/11		-
2000-01	09/01-12/16	-	09/01-12/16		-
2001-02	09/01-12/16	09/01-11/30	09/01-12/16		-
2002-03	09/01-12/16	09/01-11/30	09/01-12/16		-
2003-04	09/01-12/16	09/01-11/30	09/01-12/16		-
2004-05	09/01-12/16	09/01-11/30	09/01-12/16		-

* 1995 SASK ZN 21-23,29,30,41,44 (09/01-09/15)

* 1996 SASK ZN 21-23,29,30,41,44 (09/02-09/14)

Table C-3. Regular season dates (month/day) for the hunting of sandhill cranes in Mexico, 1975-76 to 2004-05 [1].

	State															
Year	Chihuahua	Coahuila	Durango	Guerrero	Guanajuato	Jalisco	Mexico	Nayarit	Nuevo Leon	Puebla	S.L. Potosi	Sinaloa	Sonora	Tamaulipas	Vera Cruz	Zacatecas
1978-79	11/01-02/28	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26	11/01-02/26
1979-80	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28	11/01-02/28
1980-81	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01	10/31-03/01
1981-82	11/06-03/07	10/31-02/28	10/31-02/28	10/31-02/28	10/31-02/28	10/17-02/14	10/17-02/14	10/31-02/28	10/31-02/28	10/31-02/28	10/31-02/28	10/30-02/28	10/30-02/28	10/30-02/28	10/31-02/28	10/31-02/28
1982-83	11/05-03/06	10/29-02/27	10/29-02/27		10/29-02/27	10/15-02/13	11/19-03/06	10/15-02/13	10/29-02/27	10/15-02/13	10/22-02/27	10/22-02/13	10/22-02/13	10/22-02/13		10/29-02/27
1983-84	11/15-03/06	10/29-02/27	11/19-03/04		10/29-02/26			10/29-02/27	10/29-02/27		10/22-02/26	10/15-02/12	10/29-02/26	10/29-02/26		10/29-02/26
1984-85	10/27-02/24	10/27-02/24	10/27-02/24		10/27-02/24			10/27-02/24	10/27-02/24		10/27-02/24		10/27-02/24	10/27-02/24		10/27-02/24
1985-86	10/27-02/24	10/27-02/24	10/27-02/24		10/27-02/24			10/27-02/24	10/27-02/24		10/27-02/24		10/27-02/24	10/27-02/24		10/27-02/24
1986-87	10/24-02/22	10/24-02/22	11/14-02/22		10/31-02/22			10/24-02/22	10/24-02/22		10/24-02/22		11/07-03/01	10/31-02/22		10/24-02/22
1987-88	11/06-02/28	10/16-02/14	11/13-02/21		10/30-02/21			10/23-03/06	10/23-02/21		10/23-02/21		11/06-03/16	10/30-02/21		10/23-03/06
1988-89	11/04-02/26	10/12-02/12	11/11-02/19					10/21-02/21	10/21-02/21		10/21-02/21		11/06-03/05	10/28-02/26		10/21-02/21
1989-90	11/03-02/25	10/12-02/11	11/17-02/25					10/20-02/18	10/20-02/18		10/20-02/18		11/03-03/04	10/27-02/25		10/20-02/18
1990-91	11/02-02/24	10/12-02/10	11/16-02/24					10/19-02/17	10/19-02/17		10/19-02/17		11/02-03/03	10/26-02/24		10/19-02/17
1991-92	11/01-02/23	10/18-02/16	11/15-02/23					10/16-02/16	10/18-02/16		10/18-02/16		11/01-03/01	10/25-02/23		10/18-02/16
1992-93	11/06-02/28	10/16-02/14	11/13-02/21					10/16-02/14	10/16-02/14		10/16-02/14		11/06-03/07	10/23-02/21		10/16-02/14
1993-94	11/05-02/27	10/15-02/13	11/12-02/20						10/15-02/13		11/01-02/28		11/05-03/06	10/22-02/20		10/15-02/13
1994-95	11/04-02/28	10/14-02/12	11/11-02/19						10/14-02/12		11/04-02/26		11/04-03/15	10/21-02/19		10/14-02/12
1995-96	11/03-02/25	10/13-02/11	11/10-02/18						10/13-02/11		11/03-02/25		11/03-03/03	10/20-02/18		10/13-02/11
1996-97																
1997-98	11/07-03/01	10/17-02/15	11/14-02/22						10/17-02/15		11/07-03/01		11/07-03/08	10/24-02/22		10/17-02/15
1998-99	11/06-02/28	10/16-02/14	11/13-03/14						10/16-02/14							
1999-00	11/05-02/27															
2000-01	11/01-02/28															
2001-02	11/02-02/24															
2002-03	11/01-02/23															
2003-04	10/31-02/22															
2004-05	10/29-02/20															

[1] Countrywide regular season dates for 1975-76, 1976-77, and 1977-78 were 11/01-02/28.

Table C-4. Summary of Central Flyway frameworks and season selections by state, 1960-2004 (Sharp et al. 2005).

					FRAMEWORK OFFERED			SEASONS SELECTED		
YEAR	Participating States	Begining Shooting Time	Ending Shooting Time	Daily Bag/ Poss.	Opening Date	Closing Date	Season Length (days)	Opening Date	Closing Date	Season Length (days)
1960	Portions of TX and NM	1/2 hr. before sunrise	sunset	2/2	Jan 01	Jan 30	30	Jan 01	Jan 30	30
1961	Portions of TX and NM	sunrise	sunset	2/2	Nov 04	Dec 03	30	Nov 04	Dec 03	30
1962	Portions of TX and NM	sunrise	sunset	2/2	Nov 03	Dec 02	30	Nov 03	Dec 02	30
1963	Portions of TX and NM	sunrise	sunset	2/2	Nov 02	Dec 01	30	Nov 02	Dec 01	30
1964	Portions of TX and NM	sunrise	sunset	2/2	Oct 31	Nov 29	30	Oct 31	Nov 29	30
1965	Portions of TX and NM	sunrise	sunset	2/4	Oct 30	Nov 28	30	Oct 30	Nov 28	30
1966	Portions of TX and NM	1/2 hr. before sunrise	sunset	2/4	Oct 29	Nov 27	30	Oct 29	Nov 27	30
1967	Portions of TX and NM	1/2 hr. before sunrise	sunset	2/4	Nov 04	Jan 02	60	Nov 04	Jan 02	60
" "	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	2/5	Oct 01	Oct 30	30	Oct 01	Oct 30	30
1968	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	2/4	Oct 01	Oct 30	30	Oct 01	Oct 30	30
""	Portions of ND	1/2 hr. before sunrise	sunset	2/4	Nov 09	Dec 08	30	Nov 09	Dec 08	30
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	2/4	Nov 02	Dec 28	57	Nov 02	Dec 28	57
""	Portions of TX	1/2 hr. before sunrise	sunset	2/4	Dec 14	Jan 12	30	Dec 14	Jan 12	30
1969	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Oct 04	Nov 02	30	Oct 04	Nov 02	30
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Nov 01	Dec 28	58	Nov 01	Dec 28	58
""	Portions of ND and SD	1/2 hr. before sunrise	sunset	3/6	Nov 08	Dec 07	30	Nov 08	Dec 07	30
""	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Dec 13	Jan 11	30	Dec 13	Jan 11	30
1970	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Oct 03	Nov 01	30	Oct 04	Nov 01	29
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 31	Jan 10	72	Oct 31	Jan 10	72
""	Portions of ND and SD	1/2 hr. before sunrise	sunset	3/6	Nov 14	Dec 13	30	Nov 14	Dec 13	30
""	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Dec 05	Jan 10	37	Dec 05	Jan 10	37
1971	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Oct 02	Nov 07	37	Oct 02	Nov 07	37
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 30	Jan 30	93	Oct 30	Jan 30	93
""	Portions of ND and SD	1/2 hr. before sunrise	sunset	3/6	Nov 13	Dec 12	30	Nov 13	Dec 12	30
""	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Dec 04	Jan 30	58	Dec 04	Jan 30	58
1972	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Oct 01	Nov 05	36	Oct 01	Nov 05	36
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 28	Jan 31	93	Oct 28	Jan 28	93
""	Portions of ND and SD	1/2 hr. before sunrise	sunset	3/6	Nov 11	Dec 10	30	Nov 11	Dec 10	30
""	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Dec 02	Jan 31	58	Dec 02	Jan 28	58
""	Phillips County, MT	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		37	Oct 01	Nov 06	37
""	Portions of WY	1/2 hr. before sunrise	sunset	3/6	Oct 07	Nov 05	30	Oct 07	Nov 05	30
1973	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Oct 01	Nov 05	36	Oct 01	Nov 05	36
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 27	Jan 31	93	Oct 27	Jan 27	93
""	Portions of ND and SD	1/2 hr. before sunrise	sunset	3/6	Nov 10	Dec 09	30	Nov 10	Dec 09	30
""	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Dec 01	Jan 31	58	Dec 01	Jan 27	58
""	Phillips County, MT	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		37	Sep 29	Nov 04	37
""	Portions of WY	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		30	Oct 13	Nov 11	30
1974	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Oct 01	Nov 05	36	Oct 01	Nov 05	36
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 26	Jan 31	93	Oct 26	Jan 26	93
""	Portions of ND and SD	1/2 hr. before sunrise	sunset	3/6	Nov 09	Dec 08	30	Nov 09	Dec 08	30
""	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Nov 30		58	Nov 30	Jan 26	58
""	Phillips County, MT	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		37	Sep 28	Nov 03	37
""	Portions of WY	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		30	Oct 12	Nov 10	30
1975	CF portions of CO excl. San Luis Valley&NP	1/2 hr. before sunrise	sunset	3/6	Oct 04	Nov 08	36	Oct 04	Nov 08	36
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 25	Jan 31	93	Oct 25	Jan 25	93
""	Portions of ND and SD	1/2 hr. before sunrise	sunset	3/6	Nov 08	Dec 07	30	Nov 08	Dec 07	30
""	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Nov 29		58	Nov 29	Jan 25	58
""	Phillips County, MT	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		37	Oct 04	Nov 09	37
""	Portions of WY	1/2 hr. before sunrise	sunset	3/6	Oct 11		30	Oct 11	Nov 09	30
1976	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Oct 02	Nov 08	36	Oct 02	Nov 06	36
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 23	Jan 31	93	Oct 30	Jan 30	93
""	Portions of ND and SD	1/2 hr. before sunrise	sunset	3/6	Nov 06	Dec 05	30	Nov 06	Dec 05	30
""	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Nov 27		58	OK Nov 27, TX Dec 4	OK Jan 23, TX Jan 30	58

Table C-4 continued.

""	Phillips County, MT	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		37	Oct 02	Nov 06	36
""	Portions of WY	1/2 hr. before sunrise	sunset	3/6	Oct 09		30	Oct 09	Nov 07	30
1977	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Oct 01	Nov 06	37	Oct 01	Nov 06	37
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 22	Jan 31	93	NM Oct 29, TX Nov 1	NM Jan 29, TX Jan 31	93, 92
""	Portions of ND and SD	1/2 hr. before sunrise	sunset	3/6	Sep 07	Sep 11	5	Sep 07	Sep 11	5
""	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Nov 26		58	OK Nov 26, TX Dec 5	OK Jan 22, TX Jan 31	58
""	Phillips County, MT	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		37	Oct 01	Nov 06	37
""	Portions of WY	1/2 hr. before sunrise	sunset	3/6	Oct 08		30	Oct 08	Nov 06	30
1978	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Sep 30	Nov 05	37	Sep 30	Nov 05	37
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 21	Jan 31	93	NM Oct 28, TX Oct 31	NM Jan 28, TX Jan 31	93
""	Portions of ND and SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Sep 11	5	Sep 07	Sep 11	5
""	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Nov 25		58	OK Nov 25, TX Dec 5	OK Jan 21, TX Jan 31	58
""	CF Portions of MT	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		37	Sep 30	Nov 05	37
""	Portions of WY	1/2 hr. before sunrise	sunset	3/6	Oct 07		30	Oct 07	Nov 05	30
1979	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Sep 29	Nov 18	37	Oct 13	Nov 18	37
""	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 20	Jan 31	93	NM Oct 27, TX Oct 30	NM Jan 27, TX Jan 30	93
""	Portions of ND and SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Sep 11	5	Sep 07	Sep 11	5
""	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Nov 24		58	OK Nov 24, TX Dec 4	OK Jan 20, TX Jan 30	58
""	CF Portions of MT	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		37	Sep 29	Nov 04	37
""	Portions of WY	1/2 hr. before sunrise	sunset	3/6	Sep 29	Nov 18	37	Oct 13	Nov 18	37
1980	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Oct 04	Nov 23	37	Oct 11	Nov 16	37
" "	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 20	Jan 31	93	Oct 31	Jan 31	93
" "	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Nov 22		58	OK Nov 22, TX Dec 5	OK Jan 18, TX Jan 31	58
" "	CF Portions of MT	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		37	Oct 04	Nov 09	37
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 06	Sep 10, Sep 14	5, 9	Sep 06	Sept 10, Sept 14	5, 9
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Sep 28	9	Sep 01	Sep 28	????
" "	Portions of WY	1/2 hr. before sunrise	sunset	3/6	Oct 04	Nov 23	37	Oct 11	Nov 09	30
1981	CF portions of CO excl. San Luis Valley	1/2 hr. before sunrise	sunset	3/6	Oct 03	Nov 22	37	Oct 10	Nov 15	37
" "	Portions of TX and NM	1/2 hr. before sunrise	sunset	3/6	Oct 20	Jan 31	93	Oct 31	Jan 31	93
" "	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Nov 22		58	OK Nov 22, TX Dec 5	OK Jan 18, TX Jan 31	58
" "	CF Portions of MT	1/2 hr. before sunrise	sunset	3/6	Open w/ goose season		37	Oct 03	Nov 08	37
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Sep 20	9, 16	Sep 05	Sept 13, Sept 20	5, 9
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Sep 28	9	Sep 20	Sep 28	9
" "	Portions of WY	1/2 hr. before sunrise	sunset	3/6	Oct 03	Nov 22	37	Oct 03	Nov 08	37
1982	CF portions of CO excl. San Luis Valley&NP	1/2 hr. before sunrise	sunset	3/6	Sep 01	Jan 31	58	Oct 02	Nov 28	58
" "	KS	1/2 hr. before sunrise	sunset	3/6	Sep 01	Jan 31	58	??	??	-
" "	Portions of TX and OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Jan 31	93	OK Oct 23, TX Dec 4	OK Jan 23, TX Jan 30	93, 58
" "	CF Portions of MT	1/2 hr. before sunrise	sunset	3/6	Sep 01	Jan 31	58	Oct 02	Nov 28	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Sep 20	9, 16	Sep 04	Sept 12, Sept 19	9, 16
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Jan 31	58	Oct 02	Nov 07	37
" "	Portions of WY [1]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Jan 31	58	Sep 25	Nov 21	58
" "	Portions of NM [1] & TX	1/2 hr. before sunrise	sunset	3/6	Sep 01	Jan 31	93	Oct 31	Jan 31	93
1983	CF portions of CO excl. San Luis Valley&NP	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 01	Nov 27	58
" "	KS	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	-	-	-
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 12	Feb 12	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/7	Sep 01	Feb 28	93	Oct 22	Jan 22	93
" "	CF Portions of MT [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 01	Nov 27	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 10	Nov 06	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 01	Nov 06	37
" "	Portions of WY [1]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 24	Nov 20	58
" "	Portions of NM [1]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 29	Jan 28	92
1984	CF portions of CO excl. San Luis Valley&NP	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 29	Nov 25	58
" "	KS	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	-	-	-
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 10	Feb 10	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 13	Jan 13	93
" "	CF Portions of MT [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 29	Nov 25	58

Table C-4 continued.

" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Z1& Z2 Sept 8	Z1 Nov 4, Z2 Sept 28	58, 21
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 29	Nov 04	37
" "	Portions of WY [1]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 22	Nov 18	58
" "	Portions of NM [1]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 27	Jan 27	93
1985	CF portions of CO excl. San Luis Valley&NP	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 28	Nov 24	58
" "	KS	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	-	-	-
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 09	Feb 09	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 12	Jan 12	93
" "	CF Portions of MT [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 28	Nov 24	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Z1& Z2 Sept 7	Z1 Nov 3, Z2 Sept 27	58, 21
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 28	Nov 03	37
" "	Portions of WY [1]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 21	Nov 17	58
" "	Portions of NM	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 26	Jan 26	93
1986	CF portions of CO excl. San Luis Valley&NP	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 04	Nov 30	58
" "	KS	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	-	-	-
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 08	Feb 08	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 11	Jan 11	93
" "	CF Portions of MT [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 04	Nov 30	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Z1& Z2 Sept 6	Z1 Nov 2, Z2 Oct 3	58, 28
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 28	Nov 02	36
" "	Portions of WY [1]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 20	Nov 16	58
" "	Portions of NM	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 25	Jan 25	93
1987	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 03	Nov 29	58
" "	KS	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	-	-	-
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 14	Feb 07	86
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 10, Nov 28	Nov 20, Jan 17	42, 51
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 03	Nov 29	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Z1& Z2 Sept 5	Z1 Nov 1, Z2 Oct 2	58, 28
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 26	Nov 01	37
" "	Portions of WY [1 3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 19	Nov 15	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 24	Jan 24	93
1988	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 01	Nov 27	58
" "	KS	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	-	-	-
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 12	Feb 12	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 22	Jan 22	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 01	Nov 27	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 10	Nov 06	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 24	Oct 30	37
" "	Portions of WY [1 3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 17	Nov 13	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 22	Jan 22	93
1989	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 30	Nov 27	59
" "	KS	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	-	-	-
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 11	Feb 11	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 21	Jan 21	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 30	Nov 26	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 09	Nov 05	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 30	Nov 05	37
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 16	Nov 12	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 21	Jan 21	93
1990	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 29	Nov 25	58
" "	KS	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	-	-	-
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 10	Feb 10	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 20	Jan 20	93

Table C-4 continued.

" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 29	Nov 25	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 08	Nov 04	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 29	Nov 04	37
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/7	Sep 01	Feb 28	58	Sep 15	Nov 11	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 20	Jan 20	93
1991	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 28	Nov 24	58
" "	KS	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	-	-	-
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 09	Feb 09	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 19	Jan 19	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 28	Nov 24	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 07	Nov 03	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 28	Nov 03	37
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 15	Nov 11	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 19	Jan 19	93
1992	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 03	Nov 29	58
" "	KS	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	-	-	-
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 14	Feb 14	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 17	Jan 17	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 26	Nov 22	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 05	Nov 01	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 26	Nov 01	37
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 15	Nov 01	48
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 17	Jan 17	93
1993	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 02	Nov 28	58
" "	KS	1/2 hr. before sunrise	sunset	2/4	Sep 01	Feb 28	58	Nov 06	Jan 02	58
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 13	Feb 13	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Deferred	Deferred	-
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 25	Nov 21	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 11	Nov 07	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 25	Oct 31	37
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 15	Nov 11	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 16	Jan 16	93
1994	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 01	Nov 27	58
" "	KS	sunrise	2pm	2/4	Sep 01	Feb 28	58	Nov 05	Jan 01	58
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 12	Feb 12	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 15	Jan 15	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 24	Nov 20	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 10	Nov 06	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 24	Oct 30	37
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 14	Nov 10	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 15	Jan 15	93
1995	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 30	Nov 26	58
" "	KS	sunrise	2pm	2/4	Sep 01	Feb 28	58	Nov 05	Jan 01	58
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 11	Feb 11	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 22	Jan 23	94
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 23	Nov 19	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 09	Nov 05	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 23	Nov 19	58
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 14	Nov 10	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 31	Jan 31	93
1996	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 05	Dec 01	58
" "	KS	sunrise	2pm	3/6	Sep 01	Feb 28	58	Nov 02	Dec 29	58

Table C-4 continued.

" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 09	Feb 09	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 26	Jan 26	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 28	Nov 24	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 07	Nov 03	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 28	Nov 24	58
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 14	Nov 10	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 31	Jan 31	93
1997	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 04	Nov 30	58
" "	KS	sunrise	2pm	2/4	Sep 01	Feb 28	58	Nov 01	Dec 28	58
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 08	Feb 08	93
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 25	Jan 25	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 04	Nov 30	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 06	Nov 02	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 27	Nov 23	58
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/7	Sep 01	Feb 28	58	Sep 13	Nov 09	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 31	Jan 31	93
1998	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 03	Nov 29	58
" "	KS	sunrise	2pm	2/4	Sep 01	Feb 28	58	Nov 07	Jan 03	58
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 07	Feb 07	93/37
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 24	Jan 24	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 03	Nov 29	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 05	Nov 01	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 26	Nov 22	58
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 12	Nov 08	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 31	Jan 31	93
1999	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 02	Nov 28	58
" "	KS	sunrise	2pm	2/4	Sep 01	Feb 28	58	Nov 06	Jan 02	58
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 13	Feb 13	93/16
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 30	Jan 30	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 02	Nov 28	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 11	Nov 07	58
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 25	Nov 21	58
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 11	Nov 07	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 30	Jan 30	93
2000	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 07	Dec 03	58
" "	KS	sunrise	2pm	2/4	Sep 01	Feb 28	58	Nov 04	Dec 31	58
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 11	Feb 11	93/23
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 04	Feb 04	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 30	Nov 26	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 18	Nov 12	56
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 23	Nov 19	58
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 09	Nov 05	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 31	Jan 31	93
2001	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 07	Dec 03	58
" "	KS	sunrise	2pm	2/4	Sep 01	Feb 28	58	Nov 03	Dec 30	58
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6, 2/4	Sep 01	Feb 28	37, 93	Nov 10	Feb 10	93/23
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 03	Feb 03	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 29	Nov 25	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6, 2/4	Sep 01	Feb 28	37, 58	Sep 15	Nov 11, Oct 21	58, 37
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 22	Nov 18	58
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 15	Nov 11	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 31	Jan 31	93
2002	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 05	Dec 01	58

Table C-4 continued.

" "	KS	sunrise	2pm	2/4	Sep 01	Feb 28	58	Nov 02	Dec 29	58
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6, 2/4	Sep 01	Feb 28	37, 93	Nov 09	Feb 09	93/30
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Nov 09	Feb 09	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 28	Nov 24	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6, 2/4	Sep 01	Feb 28	37, 58	Sep 21	Nov 17, Oct 27	58, 37
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 21	Nov 17	58
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 14	Nov 10	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 31	Jan 31	93
2003	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 04	Nov 30	58
" "	KS	sunrise	2pm	2/4	Sep 01	Feb 28	58	Nov 01	Dec 28	58
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6, 2/4	Sep 01	Feb 28	37, 93	Nov 01	Feb 01	93/30
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 25	Jan 25	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 27	Nov 23	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6, 2/4	Sep 01	Feb 28	37, 58	Sep 20	Nov 6, Oct 26	58, 37
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 27	Nov 23	58
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 13	Nov 09	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 31	Jan 31	93
2004	CF portions of CO excl. San Luis Valley&NP [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Oct 02	Nov 28	58
" "	KS	sunrise	2pm	2/4	Sep 01	Feb 28	58	Nov 06	Jan 02	58
" "	Portions of TX [2]	1/2 hr. before sunrise	sunset	3/6, 2/4	Sep 01	Feb 28	37, 93	Nov 06	Feb 01	93/30
" "	Portions of OK	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 30	Jan 30	93
" "	CF Portions of MT [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 25	Nov 21	58
" "	Portions of ND	1/2 hr. before sunrise	sunset	3/6, 2/4	Sep 01	Feb 28	37, 58	Sep 18	Nov 14, Oct 24	58, 37
" "	Portions of SD	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 25	Nov 21	58
" "	Portions of WY [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	58	Sep 18	Nov 14	58
" "	Portions of NM [3]	1/2 hr. before sunrise	sunset	3/6	Sep 01	Feb 28	93	Oct 31	Jan 31	93

[1] Additional experimental seasons offered

[2] Season covers dates selected >1 zone/area

[3] RMP hunt: 9/1-1/31, 30 days, 3/9

Table C-5. Federal Mid-Continent sandhill crane permits issued in the U.S. portion of the Central Flyway. Data from Sharp et al. (2005).

YR	CO	KS	MT	NM	ND	OK	SD	TX	WY	TOTAL
1975	401	-	158	1,225	4,172	171	198	5,482	56	11,863
1976	341	-	117	1,195	4,137	265	200	5,060	37	11,352
1977	374	-	82	1,452	6,294	519	134	4,897	48	13,800
1978	343	-	209	956	5,798	620	98	5,198	52	13,274
1979	528	-	159	1,288	4,949	470	63	5,098	43	12,598
1980	437	-	118	1,082	5,754	510	240	5,239	33	13,413
1981	397	-	53	1,022	5,796	466	197	5,297	30	13,258
1982	528	-	147	962	4,714	750	579	4,650	40	12,370
1983	575	-	175	706	8,033	909	528	7,317	63	18,306
1984	538	-	113	721	7,436	1,187	544	6,838	43	17,420
1985	555	-	143	710	6,802	1,102	656	7,417	59	17,444
1986	617	-	99	595	8,926	1,073	705	7,258	25	19,298
1987	610	-	128	502	8,778	1,213	517	6,289	30	18,067
1988	512	-	162	480	6,214	1,472	437	7,053	38	16,368
1989	434	-	172	430	6,128	1,717	524	8,066	25	17,496
1990	389	-	143	533	7,268	1,725	646	11,994	22	22,720
1991	501	-	238	602	3,353	1,618	668	11,142	25	18,147
1992	498	-	303	582	3,760	1,397	721	9,848	18	17,127
1993	411	575	336	541	4,572	1,277	708	10,407	37	18,864
1994	427	567	320	547	4,790	1,561	636	10,515	49	19,412
1995	571	711	351	564	5,242	1,323	650	10,755	42	20,209
1996	612	837	369	499	5,570	1,391	677	11,334	41	21,330
1997	572	997	325	454	4,934	1,393	757	37,365 [2]	46	46,843
1998	4,937 [2]	1,088	270	449	6,082	1,385	951	32,523 [2]	49	47,734
1999	4,847 [2]	1,235	279	516	6,050	1,438	810	33,380 [2]	52	48,607
2000	5,169 [2]	1,084	283	493	7,451	1,333	721	44,719 [2]	58	61,311
2001	5,869 [2]	1,374	253	509	8,078	1,315	680	49,410 [2]	72	67,560
2002	5,644 [2]	1,279	303	496	8,245 [2]	1,186	619	37,558 [2]	54	55,384
2003	5,854 [2]	1,206	273	471	6,030 [2]	1,000	563	43,199 [2]	50	58,646
2004[1]	5,784 [2]	1,180	308	548	5,788 [2]	780	307	52,161 [2]	61	66,917
AVERAGES:										
1975-79	397	-	145	1,223	5,070	409	139	5,147	47	12,577
1980-89	520	-	131	721	6,858	1,040	493	6,542	39	16,344
1990-99	1,377	859	293	529	5,162	1,451	722	17,926	38	28,099
2000-04	5,664	1,225	284	503	7,118	1,123	578	45,409	59	61,964
1975-04	1,643	1,011	213	704	6,038	1,086	524	16,582	43	27,238

[1]Preliminary

[2]Harvest Information Program (HIP) or a point of sale electronic record used to identify hunters in lieu of sandhill crane hunting permit.

Table C-6. Estimated active[1] Mid-Continent sandhill crane hunters in the Central Flyway. Data from Sharp et al. (2005).

YR	CO	KS	MT	NM	ND	OK	SD	TX	WY	TOTAL
1975	226	-	69	806	2,896	80	117	2,733	22	6,949
1976	203	-	68	752	1,328	148	80	2,497	16	5,092
1977	189	-	40	921	4,126	339	77	2,329	27	8,048
1978	190	-	86	836	3,776	334	50	2,390	21	7,683
1979	275	-	61	745	3,225	307	29	2,356	13	7,011
1980	216	-	50	625	3,387	275	160	2,439	12	7,164
1981	216	-	23	598	3,315	269	103	2,543	14	7,081
1982	138	-	56	386	2,429	342	260	1,553	8	5,172
1983	211	-	64	253	3,551	384	225	2,435	20	7,143
1984	206	-	51	301	3,189	467	208	2,380	19	6,821
1985	187	-	37	216	2,383	372	168	2,613	12	5,988
1986	106	-	17	178	3,095	299	149	1,991	5	5,840
1987	113	-	29	133	2,529	358	120	1,942	5	5,229
1988	117	-	48	171	1,779	531	78	2,497	11	5,232
1989	74	-	52	152	2,018	492	153	2,805	6	5,752
1990	101	-	33	180	2,614	395	172	4,130	6	7,631
1991	153	-	69	220	1,674	370	139	3,231	3	5,859
1992	96	-	95	182	1,776	330	153	2,655	7	5,294
1993	87	294	97	218	2,223	357	140	3,602	5	7,023
1994	93	293	79	211	2,497	456	151	3,350	11	7,141
1995	154	393	118	211	2,408	331	143	3,707	6	7,471
1996	91	382	82	166	2,744	355	169	3,356	9	7,354
1997	67	452	68	124	2,386	264	178	4,515	10	8,064
1998	96	480	43	155	2,785	345	237	4,022	10	8,173
1999	133	533	60	204	2,444	375	173	2,699	8	6,629
2000	192	430	64	160	2,481	223	209	3,180	11	6,950
2001	202	555	72	173	2,934	391	145	3,554	13	8,039
2002	175	517	85	166	2,407	237	144	4,037	15	7,783
2003	236	495	60	244	2,271	64	114	4,821	10	8,315
2004[2]	339	538	97	260	2,509	288	79	5,193	17	9,320
AVERAGES:										
1975-79	217	-	65	812	3,070	242	71	2,461	20	6,957
1980-89	158	-	43	301	2,768	379	162	2,320	11	6,142
1990-99	107	404	74	187	2,355	358	166	3,527	8	7,064
2000-04	229	507	76	201	2,520	241	138	4,157	13	8,081
1975-04	163	447	62	332	2,639	326	144	3,052	12	6,908

[1] Those permittees reporting hunting cranes 1 or more times

[2] Preliminary

Table C-7. Estimated retrieved harvests of Mid-Continent sandhill cranes in the U.S. (Sharp et al. 2005).

YR	CO	KS	MT	NM	ND	OK	SD	TX	WY	CENTRAL FLYWAY	AZ	NM	AK[2 3]	PACIFIC FLYWAY	US TOTAL
1975	91	-	16	911	2,122	142	86	6,123	6	9,497	-	-	1,094	1,094	10,591
1976	106	-	29	858	52	200	12	6,122	14	7,393	-	-	637	637	8,030
1977	39	-	18	1,456	4,078	410	47	6,094	9	12,151	-	-	471	471	12,622
1978	106	-	36	1,089	2,777	389	19	5,720	10	10,146	-	-	239	239	10,385
1979	129	-	14	1,170	2,733	397	19	5,917	0	10,379	-	-	517	517	10,896
1980	68	-	16	1,019	2,245	363	130	6,305	6	10,152	-	-	809	809	10,961
1981	92	-	11	907	2,395	397	78	6,245	9	10,134	20	-	383	403	10,537
1982	49	-	21	335	2,469	535	212	4,295	0	7,916	62	-	1,160	1,222	9,138
1983	70	-	28	354	6,471	373	177	5,471	15	12,959	17	-	1,540	1,557	14,516
1984	85	-	15	414	4,367	433	139	5,811	7	11,271	23	-	1,986	2,009	13,280
1985	82	-	7	334	4,650	416	101	7,184	2	12,776	48	-	1,197	1,245	14,021
1986	33	-	1	250	6,563	392	99	5,149	0	12,487	108	184	539	831	13,318
1987	86	-	15	159	5,334	957	99	6,117	3	12,770	127	318	836	1,281	14,051
1988	68	-	18	372	3,815	1,061	100	7,330	8	12,772	172	127	1,241	1,540	14,312
1989	25	-	33	319	4,656	1,003	194	7,400	9	13,639	126	138	545	809	14,448
1990	87	-	44	377	6,804	698	165	9,865	1	18,041	114	259	918	1,291	19,332
1991	224	-	31	593	4,580	604	128	6,916	3	13,079	172	235	677	1,084	14,163
1992	84	-	103	505	4,654	478	141	6,455	13	12,433	139	54	640	833	13,266
1993	112	602	95	506	6,985	826	110	8,769	0	18,005	113	178	201	492	18,497
1994	143	767	56	357	6,235	1,167	239	7,233	4	16,201	86	153	648	887	17,088
1995	208	990	156	673	7,017	1,091	170	10,322	1	20,628	124	111	812	1,047	21,675
1996	91	933	58	332	6,639	1,066	166	7,816	10	17,111	114	78	1,205	1,397	18,508
1997	168	1,167	45	248	6,545	600	189	10,800	4	19,766	171	45	870	1,086	20,852
1998	64	1,362	17	258	7,967	645	454	9,054	10	19,831	114	55	1,042	1,211	21,042
1999	56	1,455	29	321	5,748	879	184	8,469	8	17,149	92	101	NA*	193	17,342
2000	363	590	15	311	5,081	552	374	8,208	10	15,504	166	100	985	1,251	16,755
2001	257	1,033	43	297	5,173	713	478	6,999	7	15,000	154	106	941	1,201	16,201
2002	294	1,067	23	342	2,852	490	160	7,837	22	13,087	197	92	850	1,139	14,226
2003	230	942	49	617	4,564	200	166	11,560	7	18,335	155	162	330	647	18,982
2004 [1]	115	846	69	387	4,054	653	71	8,925	4	15,124	192	167	438	797	15,921
AVERAGES:															
1975-79	94	-	23	1,097	2,352	308	37	5,995	8	9,913	-	-	592	592	10,505
1980-89	66	-	17	446	4,297	593	133	6,131	6	11,688	78	192	1,024	1,171	12,858
1990-99	124	1,039	63	417	6,317	805	195	8,570	5	17,224	124	127	779	952	18,177
2000-04	252	896	40	391	4,345	522	250	8,706	10	15,410	173	125	709	1,007	16,417
1975-04	121	980	37	536	4,654	604	157	7,350	7	13,858	117	140	819	974	14,832

[1] Preliminary

[2] A proportion of the Alaskan harvest is composed of lesser sandhill cranes from the Pacific Flyway Population

[3] Harvest data are from state harvest surveys for only the MCP portion of the state, except in 1977-81, 1986, 1991, and 1998-99 (shaded cells) where federal MQS state totals are prorated by the long-term percent MC cranes; data from 2000 forward are MC portion from HIP.

* No estimate is available.

Table C-8. Estimated retrieved harvests of Mid-Continent sandhill cranes in Canada (Sharp et al. 2005).

YEAR	MB	SK	TOTAL
1971	228	2,715	2,943
1972	113	2,030	2,143
1973	683	3,592	4,275
1974	58	6,641	6,699
1975	164	6,000	6,164
1976	210	1,425	1,635
1977	367	N/A	367
1978	876	N/A	876
1979	977	2,821	3,798
1980	892	4,690	5,582
1981	508	2,451	2,959
1982	796	2,041	2,837
1983	378	2,720	3,098
1984	674	3,043	3,717
1985	691	4,468	5,159
1986	1,651	4,455	6,106
1987	795	4,472	5,267
1988	1,955	4,991	6,946
1989	2,666	2,318	4,984
1990	1,018	3,821	4,839
1991	1,800	3,594	5,394
1992	1,205	4,440	5,645
1993	482	2,309	2,791
1994	529	3,259	3,788
1995	1,005	4,824	5,829
1996	1,352	2,961	4,313
1997	1,279	4,622	5,901
1998	889	8,636	9,525
1999	1,300	7,100	8,400
2000	805	8,645	9,450
2001	1,247	7,538	8,785
2002	1,283	6,665	7,948
2003	1,474	8,112	9,586
2004	1,267	9,769	11,036
AVERAGES:			
1971-79	408	3,603	3,211
1980-89	1,101	3,565	4,666
1990-99	1,086	4,557	5,643
2000-04	1,215	8,146	9,361
1971-04	930	4,599	5,258

Table C-9. Annual sport hunting mortality estimates for the Mid-Continent Population of sandhill cranes in North America (Sharp et al. 2005).

	SPORT HUNTING MORTALITY					
	Retrieved				Unretrieved	Total
Year	Central Flyway	Pacific Flyway	Canada	Mexico[2]	No. Am.[3]	
1975	9,497	1,094	6,164	1,676	3,672	22,102
1976	7,393	637	1,635	967	2,032	12,663
1977	12,151	471	367	1,299	2,440	16,728
1978	10,146	239	876	1,126	2,308	14,695
1979	10,379	517	3,798	1,469	2,807	18,970
1980	10,152	809	5,582	1,654	3,349	21,546
1981	10,134	403	2,959	1,350	2,722	17,568
1982	7,916	1,222	2,837	1,198	2,451	15,624
1983	12,959	1,557	3,098	1,761	3,503	22,879
1984	11,271	2,009	3,717	1,700	3,375	22,072
1985	12,776	1,245	5,159	1,918	3,524	24,622
1986	12,487	831	6,106	1,942	3,646	25,012
1987	12,770	1,281	5,267	1,932	3,406	24,656
1988	12,772	1,540	6,946	2,126	3,750	27,134
1989	13,639	809	4,984	1,943	3,628	25,003
1990	18,041	1,291	4,839	2,417	4,228	30,817
1991	13,079	1,084	5,394	1,956	3,455	24,967
1992	12,433	833	5,645	1,891	3,133	23,935
1993	18,005	492	2,791	2,129	3,334	26,751
1994	16,201	887	3,788	2,088	3,029	25,992
1995	20,628	1,047	5,829	2,750	4,161	34,416
1996	17,111	1,397	4,313	2,282	3,609	28,713
1997	19,766	1,086	5,901	2,675	4,211	33,640
1998	19,831	1,211	9,525	3,057	4,901	38,524
1999	17,149	193	8,400	2,574	3,950	32,267
2000	15,504	1,251	9,450	2,621	4,093	32,919
2001	15,000	1,201	8,785	2,499	4,014	31,499
2002	13,087	1,139	7,948	2,217	3,448	27,839
2003	18,335	647	9,586	2,857	4,246	35,671
2004[1]	15,124	797	11,036	2,696	4,195	33,847
AVERAGES:						
1975-79	9,913	592	2,568	1,307	2,652	17,032
1980-89	11,688	1,171	4,666	1,752	3,336	22,612
1990-99	17,224	952	5,643	2,382	3,801	30,002
2000-04	15,410	1,007	9,361	2,578	3,999	32,355
1975-04	13,858	974	5,424	2,026	3,487	25,769

[1] Preliminary

[2] Unknown harvests (Mexico) were assumed to be 10% of harvests in the U.S. and Canada.

[3] Unretrieved kill as reported by hunters is used for the Central Flyway; for the remainder of harvest areas, it is assumed to be 20% of retrieved harvests.