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Status and Harvests of Sandhill Cranes

Mid-continent, Rocky Mountain, Lower Colorado River Valley and Eastern Populations

2012



Acknowledgments

This report provides population status, recruitment indices, harvest trends, and other management information for the Mid-Continent (MCP), Rocky Mountain (RMP), Lower Colorado River Valley (LCRVP), and Eastern (EP) populations of sandhill cranes. Information was compiled with the assistance of a large number of biologists from across North America. We acknowledge the contributions of: D.S. Benning, J.L. Drahota, R.C. Drewien, P.P. Thorpe, T.S. Liddick and D.L. Fronczak for conducting annual aerial population surveys; R.C. Drewien for conducting RMP productivity surveys; K.D. Richkus, K.A. Wilkins and M.H. Gendron for conducting the U.S. and Canadian Federal harvest surveys for the MCP; J.R. Bohne for compiling harvest information collected on sandhill cranes in the Pacific Flyway; M.J. Rabe for compiling information for the LCRVP; S. Kelly and D.L. Fronczak for compiling population information for the EP; G.L. Krapu and D.A. Brandt for providing preliminary results from satellite-transmitted MCP cranes; and D.E. Sharp who was the mainstay behind this report until his retirement in 2011. We especially want to recognize the support of the state and provincial biologists in the Central and Pacific Flyways for the coordination of sandhill crane hunting programs and especially the distribution of crane hunting permits and assistance in conducting of annual cooperative surveys.

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STATUS AND HARVESTS OF SANDHILL CRANES

MID-CONTINENT, ROCKY MOUNTAIN, LOWER COLORADO RIVER VALLEY and EASTERN POPULATIONS 2012

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Abstract: Compared to increases recorded in the 1970s, annual indices to abundance of the Mid-Continent Population (MCP) of sandhill cranes have been relatively stable since the early 1980s. The spring 2012 index for sandhill cranes in the Central Platte River Valley, Nebraska, uncorrected for visibility bias, was 259,576 birds, which was significantly lower than the previous 5 years likely due to later timing of the survey period and an early spring migration. The photo-corrected, 3-year average for 2009-11 was 579,863, which is above the established population-objective range of 349,000-472,000 cranes. All Central Flyway States, except Nebraska, allowed crane hunting in portions of their States during 2011-12. An estimated 7,836 hunters participated in these seasons, which was 11% lower than the number that participated in the previous season. Hunters harvested 14,442 MCP cranes in the U.S. portion of the Central Flyway during the 2011-12 seasons, which was 23% lower than the harvest for the previous year and 1% lower than the long-term average. The retrieved harvest of MCP cranes in hunt areas outside of the Central Flyway (Arizona, Pacific Flyway portion of New Mexico, Minnesota, Alaska, Canada, and Mexico combined) was 13,205 during 2011-12. The preliminary estimate for the North American MCP sport harvest, including crippling losses, was 31,354 birds, which was a 13% decrease from the previous year's estimate. The long-term (1982-2008) trends for the MCP indicate that harvest has been increasing at a higher rate than population growth. The fall 2011 pre-migration survey for the Rocky Mountain Population (RMP) resulted in a count of 17,494 cranes. The 3-year average was 19,626 sandhill cranes, which is within the established population objective of 17,000-21,000 for the RMP. Hunting seasons during 2011-12 in portions of Arizona, Idaho, Montana, New Mexico, Utah, and Wyoming resulted in a harvest of 1,262 RMP cranes, a 6% decrease from the previous year's harvest. The Lower Colorado River Valley Population (LCRVP) survey results indicate a slight increase from 2,415 birds in 2011 to 2,646 birds in 2012. The 3-

year average is 2,442 LCRVP cranes which is below the population objective of 2,500. The Eastern Population (EP) has rebounded from near extirpation in the late 1800s to over 30,000 cranes by 1996. As a result of this rebound and their range expansion, the Atlantic and Mississippi Flyway Councils developed a cooperative management plan for this population and criteria have been developed describing when hunting seasons can be opened. Kentucky held its first hunting season on this population in 2011-12 and harvested 50 cranes.

Introduction

The MCP of sandhill cranes, numerically the most abundant of all North American crane populations, is comprised of lesser (*Grus canadensis canadensis*) and greater (*G. c. tabida*) subspecies of sandhill cranes. A third intermediate-sized subspecies, the Canadian sandhill crane (*G. c. rowanii*), was identified in the MCP (Walkinshaw 1965); however, recent genetic investigations question the differentiation of this third subspecies (Rhymer et al. 2001, Peterson et al. 2003, Jones et al. 2005). The MCP was believed to have >500,000 individuals in the spring during the 1990s (Tacha et al. 1994). The breeding range extends from northwestern Minnesota and western Quebec, then northwest through Arctic Canada, Alaska, and into eastern Siberia. The MCP wintering range includes western Oklahoma, New Mexico, southeastern Arizona, Texas, and Mexico (Fig. 1). Extensive, spring aerial surveys on major concentration areas that are corrected for observer visibility bias provide annual indices of abundance used to measure population trends. These surveys are conducted in late March, at a time when birds that wintered in Mexico, Arizona, New Mexico, and Texas usually have migrated northward to spring staging areas, but before spring "break-up" conditions allow cranes to move into Canada (Benning and Johnson 1987). The MCP Cooperative Flyway Management Plan (Central, Mississippi and Pacific Flyway Councils 2006) established regulatory thresholds for changing harvest regulations that are based on an objective of maintaining sandhill crane abundances at 1982-2005 levels (i.e., spring index of 349,000–472,000 [$\bar{x} = 411,000 \pm 15\%$]). Sandhill crane hunters are required to obtain either a Sandhill Crane hunting permit or register under the Harvest Information Program (HIP) to hunt MCP cranes in the U.S. portion of the Central Flyway and Minnesota in the Mississippi Flyway. The permits or HIP registration records provide the sampling frame to conduct annual harvest surveys. In Canada, the harvest survey is based on the sales of Federal Migratory Bird Hunting Permits, which are required for all crane hunters.

The RMP is comprised exclusively of greater sandhill cranes that breed in isolated river valleys, marshes, and meadows of the U.S. portions of the Central and Pacific Flyways (Drewien and Bizeau 1974). The highest nesting concentrations are located in western Montana and Wyoming, eastern Idaho, northern Utah, and northwestern Colorado. The RMP migrates through the San Luis Valley (SLV) in Colorado and winters primarily in the Rio Grande Valley, New Mexico, with smaller numbers wintering in the southwestern part of New Mexico, in southeastern Arizona, and at several locations (~14) in the Northern Highlands of Mexico (Fig. 2). During 1984-96, the RMP was monitored at spring stopover areas in the SLV. However, cranes from the MCP also began to use this area, which confounded estimates of RMP abundance. In 1995, a fall pre-migration (September) survey replaced the spring count as the primary tool for monitoring population change. The RMP Cooperative Flyway Management Plan established a population objective (17,000-21,000 birds), and identifies surveys used to monitor recruitment and harvest levels that are designed to maintain a stable abundance (Pacific and Central Flyway Councils 2007). The plan contains a formula for calculating allowable annual harvests consistent with the goal of staying within the range of the population objective. All sandhill crane hunters in the range of the RMP must obtain a state permit to hunt cranes, which provides the sampling frame for independent harvest estimates and allows for assignment of harvest quotas by state. In many areas, harvest estimates are supplemented by periodic mandatory check-station reporting.

The LCRVP is numerically the least abundant of the six migratory populations of sandhill cranes recognized in the U.S. (Drewien et al. 1976, Drewien and Lewis 1987). The LCRVP is comprised exclusively of greater sandhill cranes that breed primarily in northeastern Nevada, with smaller numbers in adjacent parts of Idaho, Oregon, and Utah (Fig. 3), and winters in the

Colorado River Valley of Arizona and Imperial Valley of California. LCRVP cranes have the lowest reported recruitment rate (4.8%) of any sandhill crane population in North America (Drewien *et al.* 1995). In the fall, these cranes leave breeding areas during late September-early October and congregate at staging areas in eastern Nevada. Wintering areas historically extended south along the Colorado River to near its delta with the Gulf of California. However, the current wintering distribution is concentrated at Cibola National Wildlife Refuge and on adjacent areas belonging to the Colorado River Indian Tribes in southwestern Arizona, with a few birds at the Sonny Bono Salton Sea NWR in southern California and the Gila River in Arizona. Collectively, these areas are believed to winter in excess of 90% of the total cranes in the LCRVP. Spring migration is generally initiated as early as the first week of February. Since 1998, an aerial cruise survey has been conducted that covers the four main winter concentration areas.

The Eastern Population (EP), which consists of greater sandhill cranes, has rebounded from near extirpation in the late 1800's (Walkinshaw 1949, 1973; Leopold 1949). Management actions, such as regulating take and the protection and restoration of habitat, have allowed this population to increase to a level that exceeded 30,000 cranes by 1996 (Meine and Archibald 1996). The majority of EP cranes breed across the Great Lakes region (Wisconsin, Michigan, Ontario, and Minnesota); however, the range of this population is currently expanding in all directions (Fig. 4). By early fall, EP cranes leave their breeding grounds and congregate in large flocks on traditional staging areas throughout the breeding range. During migration, EP cranes use traditional stopover areas which include Jasper-Pulaski Fish and Wildlife Area in northwest Indiana and Hiwassee State Wildlife Refuge in southeast Tennessee. Historically, EP cranes primarily wintered in southern Georgia and throughout Florida (Walkinshaw 1973, Lewis 1977, Tacha *et al.* 1992, Meine and Archibald 1996). Recent annual Midwinter Survey data, conducted by state and federal agencies, show an abundance of cranes have wintered farther north into Kentucky and Tennessee (2003-2011 U.S. Fish and Wildlife Service Reports, unpublished data).

Mid-Continent Population of Sandhill Cranes

No sport hunting seasons for MCP cranes were allowed in the U.S. between 1918-60. In the Central Flyway, areas open to hunting were gradually expanded during 1961-74, but since that time have remained relatively stable. Operational hunting seasons are now held annually in portions of Colorado, Kansas, Montana, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming. Nebraska is the only Central Flyway state that does not have a sandhill crane sport hunting season. Areas open to crane hunting in the Central Flyway during 2011-2012 are shown in Fig. 5. Beginning in 2010, Minnesota, a Mississippi Flyway state, opened a limited hunt in the northwest portion of the state.

During 1961-74, hunters gradually improved their knowledge of sandhill cranes and improved their hunting success. During 1975-85, a tradition of sandhill crane hunting became established. Together with improvements in equipment (decoys, calls, clothing, blinds, etc.) and a shift from pass-shooting and hunting on roosts to decoy-hunting in fields, crane hunter success increased (Sharp and Vogel 1992). Dubovsky and Araya (2008) found that in the late 1990s and early 2000s hunters were more successful in harvesting 2 or 3 cranes per day than they were during the early 1980s. However, since the late 1990s, average seasonal bags have declined for the Flyway.

For most states, sandhill crane seasons began in relatively small areas, and expanded incrementally in subsequent years as experience with the seasons was gained. For example, sandhill crane seasons in North Dakota resumed in 1968 after being closed following the signing of the Migratory Bird Treaty Act in 1918. During 1968-79, the number of counties open for crane hunting increased from 2 to 8, and increased to 30 during 1980-92 and were grouped into two zones that were west of HW 281. Beginning in 1993, the zones were eliminated and Federal frameworks were fully utilized for the designated hunting area (Sharp and Cornely 1997). In 2001, North Dakota extended hunting to the entire state and created two zones with the area east of HW 281 open only for 37 days compared to 93 days for the western zone. Kansas was the most recent Central Flyway state to initiate a crane hunting season in 1993. Initially, crane hunting was open only in portions of 17 counties, but by 2003 the area was expanded to 62 counties, essentially the entire western portion of the state (Sharp et al. 2010). Also, during early years of these seasons, bag limits and shooting hours often were more restrictive than Federal frameworks allowed.

MCP harvest areas have remained relatively consistent from year to year; however, the levels of harvest vary with respect to many factors including changes in hunting pressure, land use, and environmental factors. Most shifts in annual harvests occur locally, but large-scale changes in harvest distributions also have occurred. Since the late 1990s, harvests have increased in Saskatchewan, while harvests have declined in North Dakota (Fig. 6). Causal factors for these changes have not been determined, but are likely different because birds staging in Saskatchewan are largely from the West-central Canada-Alaska breeding affiliation whereas those in North Dakota are from the East-central Canada-Minnesota breeding affiliation (Krapu et al. 2011). Increased hunting pressure in Saskatchewan, mainly by non-resident U.S. hunters (Araya et al. 2010), has likely contributed to increases in harvests whereas declines in harvests in North Dakota appear to be more complex and involve several interrelated factors, likely including changes in hunting pressure, conversion of cropland to grass cover, and environmental conditions.

The MCP included at least 510,000 sandhill cranes in March 1982, the last extensive survey involving high-altitude vertical photography of major spring migration staging concentrations. Beginning in 1982, an intensive photo-corrected ocular-transect survey of Nebraska's Central Platte River Valley (CPRV) and ocular assessments from other spring staging areas have been used to monitor the annual status and trends for this population (Table 1). Use of the CPRV count in the development of annual harvest recommendations relies on the premise that a high proportion (>90%) of the MCP are in the CPRV at the time of the annual survey. Recent research with radio-tracked birds suggests that the proportion of MCP cranes in the CPRV during the survey varies by year (G. Krapu, Northern Prairie Wildlife Research Center, personal communication). Annual variability in weather patterns can reduce the percentage below 90% in some years. However, conducting the survey a few days earlier or a few days later likely would not result in a 'better' count (i.e., a higher proportion of birds being in the CPRV), because birds migrate into and out of the area continuously (G. Krapu, Northern Prairie Wildlife Research Center, personal communication).

The March 2012 index for the CPRV, which has not yet been corrected for visibility bias, was 259,576 (Table 1, Fig. 7). The number of MCP sandhill cranes observed in 2012 was significantly lower than counts from the previous 5 years. The survey is traditionally flown on the 4th Tuesday in March. Because 2012 was a leap year, the 4th Tuesday fell nearly a week later in the month. This, coupled with the very mild winter and early spring, resulted in many of the cranes migrating out of the CPRV prior to the start of the survey. The manager at the Rowe Sanctuary indicated that 20-30% of the cranes had departed the area at least a week prior to

the start of the survey. That observation is further supported by a record number of cranes being counted in South Dakota (>14,000) and North Dakota (1,100). Nebraska counted 12,800 cranes outside of the traditional survey area, a 31% decrease from 2011. Counts conducted in states south of Nebraska were very low when compared to past years and provide further evidence of an early move north. These combined factors highlight that the survey missed the peak of the cranes this year and is not likely due to a decreasing population of MCP cranes (T. Liddick, U.S. Fish and Wildlife Service, personal communication).

The annual photo-corrected estimates and 95% confidence intervals for the CPRV portion of the survey indicate a relatively stable ($P = 0.08$) population trend for the MCP since 1982 (Fig. 8). The average index for photo-corrected counts during 2009-11 is 579,863 cranes, which is 3% lower than the previous 3-year average of 600,892 (Liddick 2011), but above the management objective level (349,000-472,000) for this population (Fig. 9).

Since 1975, special Sandhill Crane Hunting Permits or more recently HIP certification have been required for crane hunters participating in seasons in the Central Flyway. Additionally, a limited MCP sandhill crane hunt was offered in Minnesota starting in 2010, for which a state-issued permit was required for hunters to participate. A sample of these permittees are mailed questionnaires soon after the completion of each hunting season. The resulting responses enable estimation of hunting activities and success (Martin 2007). Estimated numbers of hunters registering as sandhill crane hunters in Texas had been increasing since 1997 when crane hunting was included in the combination licenses issued by the state, with a record high of 122,533 permits issued in 2008. In 2009, Texas revised their licensing system and crane hunters now must go to selected locations to obtain their permit, which resulted in a 91% decrease in the number of hunters identified as crane hunters from 2008. Thus, the number of crane hunters in Texas likely did not decrease as suggested by the data; rather, the number of hunters classified as crane hunters by the Texas registration process declined. During the 2011-12 seasons in the Central Flyway, 25,945 hunters were either HIP-certified or obtained crane hunting permits, which were not limited in number (Table 2), with 7,836 of these individuals hunting at least one time (Table 3). The number of active hunters in the Central Flyway was 11% lower than the previous year (Fig. 10). In 2011, the number of hunters in Texas (35%) and North Dakota (48%) combined comprised 83% of all sandhill crane hunters in the Central Flyway. Minnesota sold 1,954 permits and had 964 active hunters in their first season but interest declined in the 2nd year by 31% (1,342 permits) and 33% (643 active hunters), respectively.

Federal frameworks allowed daily bag/possession limits of 3/6, which most states selected (only portions of North Dakota, Texas and Minnesota had lower bag and possession limits). Specific dates selected by states in the Central Flyway for 2011-12 were similar to those of previous hunting seasons (Table 4).

An index to crippling-loss rates (number of cranes lost/[number of cranes lost + retrieved]) in the U.S. portion of the Central Flyway has declined ($R^2 = 0.90$, $P < 0.01$) from over 16% in 1975 to a preliminary estimate of about 6.9% during the most recent hunting season (Fig. 11). The number of days afield (3.8) increased slightly from the previous year (Fig. 12) and is 24% higher than the long-term average of 3.07. The preliminary estimate of seasonal bag per hunter was 1.84 birds (Fig. 13), which is 14% lower the long-term average of 2.15. The preliminary estimate of retrieved and unretrieved mortality associated with the sport harvest in the Central Flyway (15,508) was 25% lower than the previous year's estimate (Fig. 14). The increasing trend ($R^2 = 0.60$, $P < 0.01$) in the Central Flyway's harvest of MCP cranes during 1975-2011 likely was related to the gradual increase in hunter opportunity combined with improved

knowledge of crane behavior, hunting techniques, and hunter success (Sharp and Vogel 1992, Dubovsky and Araya 2008).

Cranes from the MCP are also harvested in Minnesota and in the RMP hunt areas in Arizona, New Mexico, Alaska (Table 5), Canada, and Mexico. The final estimate for the 2011-12 sport harvest in Canada (Manitoba and Saskatchewan) has not been completed, but will likely be near 9,074 based on the average harvest from 2000-10 (Table 6). The estimated harvest estimate for Alaska and the RMP hunt areas in Arizona and New Mexico combined was 852 birds for 2011-2012. For Alaska, sandhill crane harvest in harvest zones 1-6 is believed to be mostly MCP cranes and zones 7-12 are sandhill cranes from the Pacific Population of lesser sandhill cranes. There also is some intermingling of MCP cranes with RMP cranes in portions of New Mexico and Arizona; however, periodic bag checks allow estimates of harvests for each population. In the 2nd year of Minnesota's sandhill crane hunt the harvest declined by 8% from 830 to 765 cranes. No annual harvest surveys are conducted in Mexico, but annual MCP harvests probably are <10% of the retrieved harvest in the U.S. and Canada (R. Drewien and D. Nieman, personal communication). This assumed low level of harvest was supported by an independent assessment of harvest in Mexico (Kramer et al. 1995). The 2011-2012 preliminary estimate of retrieved and unretrieved kill of MCP cranes by sport hunters was 31,354, which is a 13% decrease from the previous year and a 8% decrease from the average for 2000-09 (Table 7, Fig. 15).

To assess the relative rates of change between population size (abundance) and harvest, we periodically assess trends in these parameters. In the most recent analysis we used linear regression on the natural log-transformed values for these variables for the years 1982-2008. Because >10% of the MCP occurs outside the CPRV in the spring of some years, we combined the photo-corrected counts in the CPRV with the ocular cruise estimates from areas outside the CPRV for analyses of population abundance. For harvest, we used only the estimates of 'retrieved' harvest for the Central Flyway, RMP hunt areas in Arizona and New Mexico, Alaska, and Canada, because crippling-loss rates for the latter three areas are unknown and there are no empirical estimates of harvest from Mexico. Regression of the log-transformed values indicate a non-significant slope for the abundance values ($P = 0.26$; $R^2 = 0.05$; slope = + 0.5% per year change), suggesting no trend in the abundance of cranes over the time frame. However, the regression of the harvest values suggested an increase in the rate of harvest over that same time period ($P < 0.01$; $R^2 = 0.76$; slope = + 2.6% per year) (Fig. 16). These results suggest that the increase in the rate of harvest is increasing faster than the rate of growth in crane abundance, and the divergent trends cannot continue indefinitely. Methods have been developed (e.g., Araya and Dubovsky 2008, Dubovsky and Araya 2008) that will assist managers in structuring changes in harvest regulations should such need arise in the future. Results suggest that a bag-limit reduction of 1 bird per day may reduce state-specific harvests by 4%-23%, whereas fairly large restrictions in season framework dates may be needed to realize a perceptible decrease in harvest.

Subsistence harvest levels of MCP sandhill cranes historically were poorly documented. However, the 1997 U.S./Canada Migratory Bird Treaty Amendment identified improvements that should be made to sandhill crane harvest-monitoring programs in both the U.S. and Canada. Intensive studies conducted on the Yukon-Kuskokwim (Y-K) Delta, Alaska, in 2006 reported an MCP harvest of 4,501 adults and fledged young and 345 eggs (Naves 2010). These estimates are relatively similar to long-term averages (1985-2005) of 3,148 adults and fledged young and 528 eggs taken by subsistence hunters on the Y-K Delta (Wentworth 2007). Efforts are being made to gather additional information on subsistence harvests for the remainder of Alaska, Siberia, and Canada.

Rocky Mountain Population of Greater Sandhill Cranes

The RMP was not hunted in the U.S. from 1918-80. Arizona initiated the first modern-day season in 1981. Since that time hunting programs have been guided by a cooperative management plan, including a harvest strategy that has been periodically updated and endorsed by the Central and Pacific Flyways (Kruse et al. 2008). The harvest strategy for the RMP calculate an allowable harvest based on crane survey counts and recruitment relative to the population objective. Thus, allowable harvest changes annually based on the current status of the birds.

Counts conducted in the SLV during the spring migration suggested that the number of RMP cranes was relatively stable during 1984-96 (Table 9). However, survey biologists found that these estimates contained increasing numbers of the MCP (lesser subspecies). An adjustment, using ground-derived proportions, was made to correct for the lesser subspecies but was not a viable approach for the long-term (Benning et al. 1996). In 1996, the survey was discontinued (Fig. 18). In 1997, an attempt was made to survey these cranes during the fall (October) in the SLV, but MCP cranes also were present at that time. Biologists concluded that neither a spring nor a fall count in the SLV would result in a reliable index to the abundance of the RMP. As an alternative, a cooperative 5-state September pre-migration staging-area survey, experimentally tested in 1987 and 1992, has been ongoing operationally since 1995. Because no other crane population comingles with them during that time, the September pre-migration survey for the RMP appears to be a good alternative to either a spring or fall survey in the SLV and was designated as the official count for the RMP in 1997 (Table 10). Although operational in 1995 and 1996, the survey was variable in timing and survey effort. What appears to be a decrease in the population estimates (Fig. 18) in 1995 and 1996 is likely more an artifact of inconsistent survey effort (R. Drewien, personal communication).

The Cooperative Flyway Management Plan (Pacific Flyway Council and Central Flyway Council 2007) recommends using the most recent three-year running average of the September survey to determine status of the RMP. The 2011 September pre-migration survey was completed successfully and resulted in 17,494 cranes counted (Thorpe and Benning 2011). For the 2011-2012 RMP hunting seasons, the 3-year average was 19,626 (Fig. 19), which was a 6% decrease from the average in 2010, but within the established population objective (17,000-21,000).

During 1986-95, important breeding areas in the Intermountain West experienced extremely dry conditions and indices of recruitment (% juveniles) were low (generally between 4-6%) (Fig. 20). A return to more favorable breeding conditions during 1996-99 resulted in higher recruitment rates (8-12%), but drier conditions resulted in lower production during 2000-02. Since 2003 recruitment rates have again increased to above-average levels due to improved wetland habitats and favorable spring and summer breeding conditions. In 2011, habitat conditions were fair but cold spring temperatures and late storms delayed nesting or prevented nesting in some cases. The recruitment rate fell to 6.5%, which is 19.1% below the long-term (1972-2011) average of 8.1 (Drewien 2011). Biologists believe that the production outlook for the 2012 breeding season will be at or above average.

Special limited hunting seasons during 2011-2012 resulted in a harvest of 1,262 RMP sandhill cranes (Table 8), which was 6% lower than the previous year's harvest (Fig. 17). In 2009 Arizona increased their bag limit from 2 birds to 3 birds, which resulted in a corresponding increase in harvest but was still well below their harvest allocation. Based on population and

recruitment indices for the 2009-11 period, management guidelines allow for a maximum allowable take of 1,270 birds during the 2012-13 hunting season.

Lower Colorado River Valley Population of Greater Sandhill Cranes

The LCRVP is the smallest of the migratory populations of sandhill cranes in North America. The range of this population is believed to overlap ranges with the Rocky Mountain and Central Valley populations. Historically, winter counts of the LCRVP have not been well coordinated or conducted using a consistent methodology. However, in recent years efforts have been made to standardize areas surveyed and the timing of the survey to obtain more accurate counts and increased ability to determine trends in population abundance. Beginning in 1998, a coordinated winter aerial cruise survey with a fixed-wing aircraft has been conducted at the 4 major wintering areas: Cibola NWR, the Colorado River Indian Tribes wetland areas, Sonny Bono Salton Sea NWR, and the Gila River. Collectively these counts are believed to contain in excess of 90% of the total number of cranes in this population. The counts are not corrected for cranes present but not seen by aerial crews, and therefore have unknown bias and precision. Survey results suggested an increase from 1,900 birds in 1998 to 2,646 birds in 2012 (Table 11, Fig. 21). Using linear regression on log-transformed counts indicated an average growth rate of approximately 3% per year between 1998-2007 (U.S.D.I. 2007). The recruitment rate in 2012 was estimated to be 8.1% (Mike Rabe, Arizona Game and Fish Department, personal communication).

The LCRVP was not hunted after the signing of the Migratory Bird Treaty Act in 1918. In 2007, the Service completed an Environmental Assessment “Proposed hunting regulations for the Lower Colorado River Valley Population of Greater Sandhill Cranes in the Pacific Flyway” (U.S.D.I. 2007). In 2008, the Service determined that a small allowable harvest (about 30) could be allowed on this population in years when the 3-year average of winter counts exceeded 2,500. The hunting season is guided by a cooperative management plan (Pacific Flyway Council 1995) which includes methodology for determining allowable harvests and allocation of the harvest. Once a hunting season is initiated, this season will be experimental for 3 years. After the 3 years, the season will be reviewed and revised if necessary.

A limited youth hunting season for this population was conducted during 2010 in AZ, the only state that has hunted these cranes, but no LCRVP cranes were harvested. The current winter count 3-year average is 2,442 LCRVP cranes, which is below the population objective that would support promulgation of a hunting season in the 2012-13 season (as was also the case in the 2011-12 season).

Eastern Population of Greater Sandhill Cranes

In 1979, the Service initiated a coordinated fall survey of historic EP migratory staging areas in the Mississippi and Atlantic Flyways. This survey is conducted annually in late October by volunteers and agency personnel (Sean Kelly, USFWS, personal communication). Overall, the survey has documented a long-term increasing trend in EP cranes, with an average growth rate in the population of 3.9% per year (1979-2009) (Amundson and Johnson 2010). The most recent count from 2011 was 72,233 cranes and the 3-year average is 60,592 (Table 12, Fig. 22). The 2011 index was 45% above last year’s index of 49,666. The large increase can be attributed to the addition of counts from staging areas in eastern Minnesota into the survey for the first time as well as adding counts from several new staging areas in Wisconsin. It is

recognized that this index is not a statistically designed population estimate; however, the index does represent a minimum population estimate for EP cranes.

In 2010, the Atlantic and Mississippi Flyway Councils (Ad Hoc Eastern Population Sandhill Crane Committee 2010) endorsed a management plan for EP cranes due to their increasing abundance. One of the plan's provisions includes guidelines for potential harvest of this population when the 3-year average of the fall survey is above 30,000 cranes. Last year, Kentucky held the first season in modern times from December 15, 2011 to January 15, 2012. The hunt plan for Kentucky called for the harvest of up to 400 cranes by hunters registered through a state permit system. Statistics from the Kentucky Department of Fish and Wildlife indicated that 267 permitted hunters harvested 50 cranes during the inaugural season (Rocky Pritchert, KY Dept. of Fish and Wildlife, personal communication).

Priority Research Efforts and Needs for Management of Sandhill Cranes

1. On April 7-9, 2009, a workshop was conducted to discuss the status of North American sandhill cranes and to update research and management priorities. A published document providing outcomes of the workshop is available at: http://www.fws.gov/migratorybirds/NewReportsPublications/Research/WMGBMR/Priority_Information_Needs_for_Sandhill_Cranes_10-09-09_FINAL.pdf. The following five priority information needs were identified (Case and Sanders, 2009).

Priority 1. Improving Sandhill Crane Harvest-Management Decision Structures- Current methods to manage harvest for RMP and MCP sandhill cranes use threshold approaches based on population objectives. Recent advances in modeling techniques and computer programs allow managers to better integrate empirical estimates of demographic parameters into models of population dynamics. Such techniques will be explored for the RMP and the MCP, which have the greatest amount of monitoring information of the 6 migratory crane populations. A graduate student was hired by Colorado State University and the Colorado Cooperative Fish and Wildlife Research Unit and is conducting this work.

Priority 2. Improving the Eastern Population Sandhill Crane Survey- An assessment of the USFWS long-term coordinated fall index survey was completed in 2010 (Amundson and Johnson 2010). The conclusion clarified that the current survey is adequate to track the population trends, but is unable to estimate abundance or the geographic distribution of the population. Recommendations to improve the survey were also included. In addition, a satellite telemetry project to assess distribution and timing of movements for EP cranes throughout the migration cycle was initiated in 2010. This project will be completed in 2013.

Priority 3. Information Needs for Sandhill Crane Populations in the West- These populations are monitored relatively poorly, with no standardized surveys to estimate abundance or other demographic parameters. Potential survey methodologies will be explored to provide better information to managers. Understanding use of wintering and breeding areas by these populations will assist in developing monitoring strategies and provide a better biological rationale for harvest and habitat management decisions. In March, 2011, a pilot survey using an Unmanned Aerial System (UAS) was conducted by a team of researchers and managers from the Service and the U.S. Geological Survey. A Raven RQ-11A was flown over roosting cranes at the Monte Vista National Wildlife Refuge in the San Luis Valley of Colorado, and thermal

videography taken of the cranes. Estimates were derived from the imagery and compared to counts of roosting cranes taken by biologists on the ground. Initial results proved promising, and additional work has been completed in Fall 2011 and Spring 2012. Summaries of this work and popular articles are available at <http://rmgsc.cr.usgs.gov/uas/sandhillcraneproject.shtml>.

Priority 4. Assessing Effects of Habitat Changes on the Rocky Mountain Population of Sandhill Cranes- The wintering habitat for RMP sandhill cranes has been identified as the limiting factor for this population. A coordinator would be hired and responsible for developing and promoting outreach and grant projects to encourage and enable private land owners to protect and improve crane habitat as well as inform and educate the public of the importance of preserving agricultural land for sandhill crane management.

Priority 5. Improving Population Abundance Estimates for the Mid-Continent Population of Sandhill Cranes- The current survey framework for the annual cooperative spring survey has been in place since 1982 and has provided a reliable index of abundance for MCP sandhill cranes. However, managers are becoming increasingly concerned that habitat changes may be affecting historic spatial and temporal patterns of cranes in the survey area. Evaluation of other survey techniques is needed to compare abundance, variability, and reliability to the existing survey.

2. A monograph on the geographic distribution of Mid-Continent Population sandhill cranes recently was published by Gary Krapu, Dave Brandt, Ken Jones, and Doug Johnson (Wildlife Monographs 175). The results provide information from many years of satellite telemetry work which followed the cranes throughout their annual cycle, and will have important implications for management of the MCP in the future.
3. The agricultural landscape on which sandhill cranes depend for a portion of their annual cycle has undergone dramatic changes in recent years. A recently published paper indicates that the percentage of cropland in the CPRV that is being planted to soybeans, which are not valuable nutritionally for cranes, is increasing whereas the percentage planted to corn is decreasing (Pearse et al. 2010). In years when availability of corn is reduced, some cranes may not be able to increase lipid reserves as much as they did historically, due not only to increased crane numbers but also increased waterfowl abundance, particularly snow geese. If corn acreage and availability decline further, major changes could occur in the abundance or condition of cranes using the area.
4. The standardized timing (4th Tuesday in March) of the cooperative Spring MCP survey in the Central Platte River Valley is being assessed by the Northern Prairie Wildlife Research Center. They will use data from radio-marked cranes to estimate proportions of birds present during spring surveys conducted between 2000 and 2007. They also conducted roadside surveys in eastern South Dakota during the cooperative spring survey to determine presence, distribution, and number of cranes that have already left Nebraska. Preliminary survey results reveal that a sizeable but relatively similar number of cranes (10,000-15,000) move north of the Platte River by late March. Overall, preliminary information indicates that the current survey timing is appropriate (A. Pearse, Northern Prairie Wildlife Research Center, personal communication).

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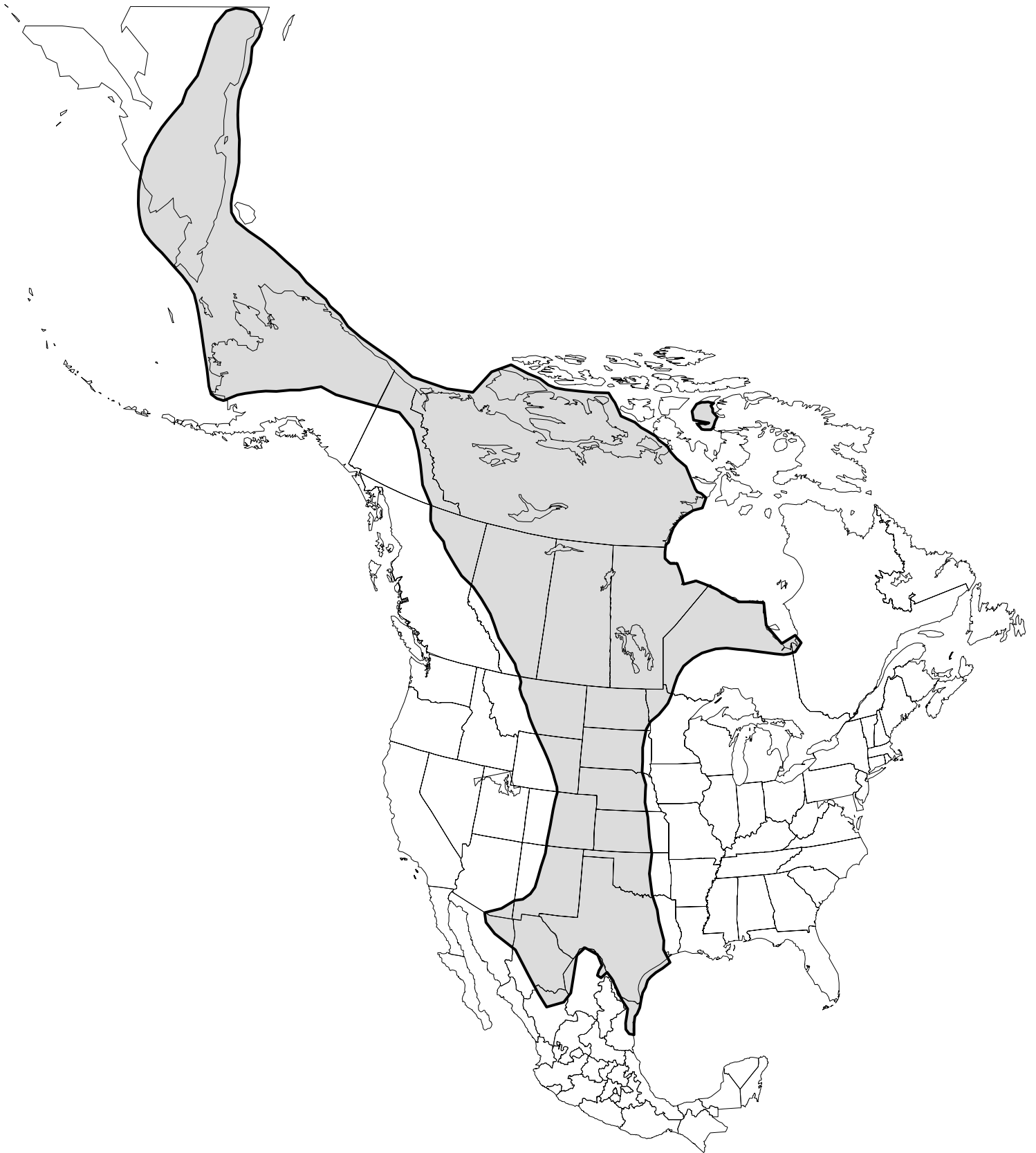


Figure 1. Primary wintering and breeding range and the approximate migration corridor of Mid-continent sandhill cranes (based on figures in Tacha et al. 1994 and Krapu et al. 2011).

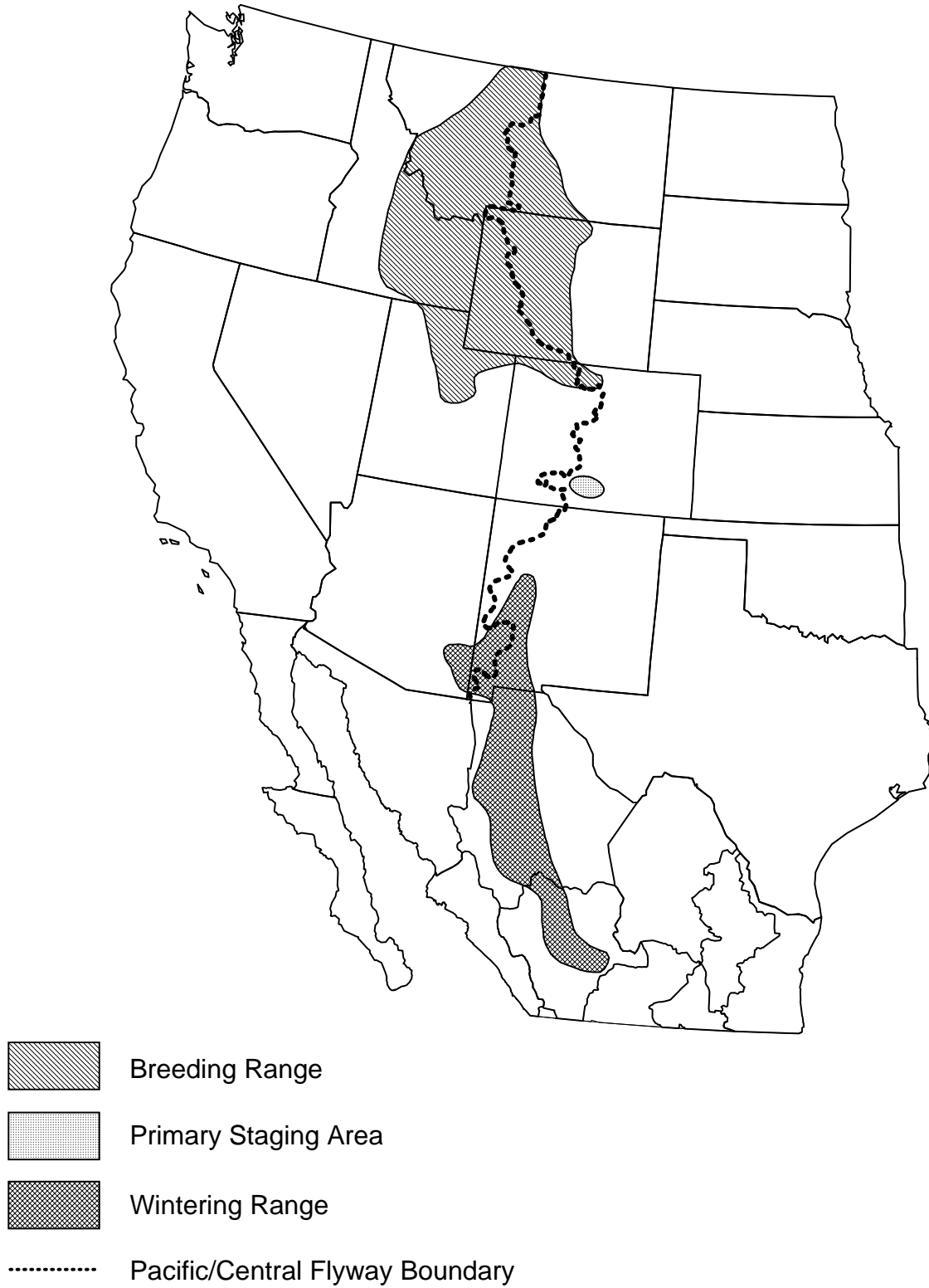


Figure 2. Approximate range of the Rocky Mountain Population of Greater Sandhill Cranes (Tacha et al. 1994, Drewien et al. 1996).

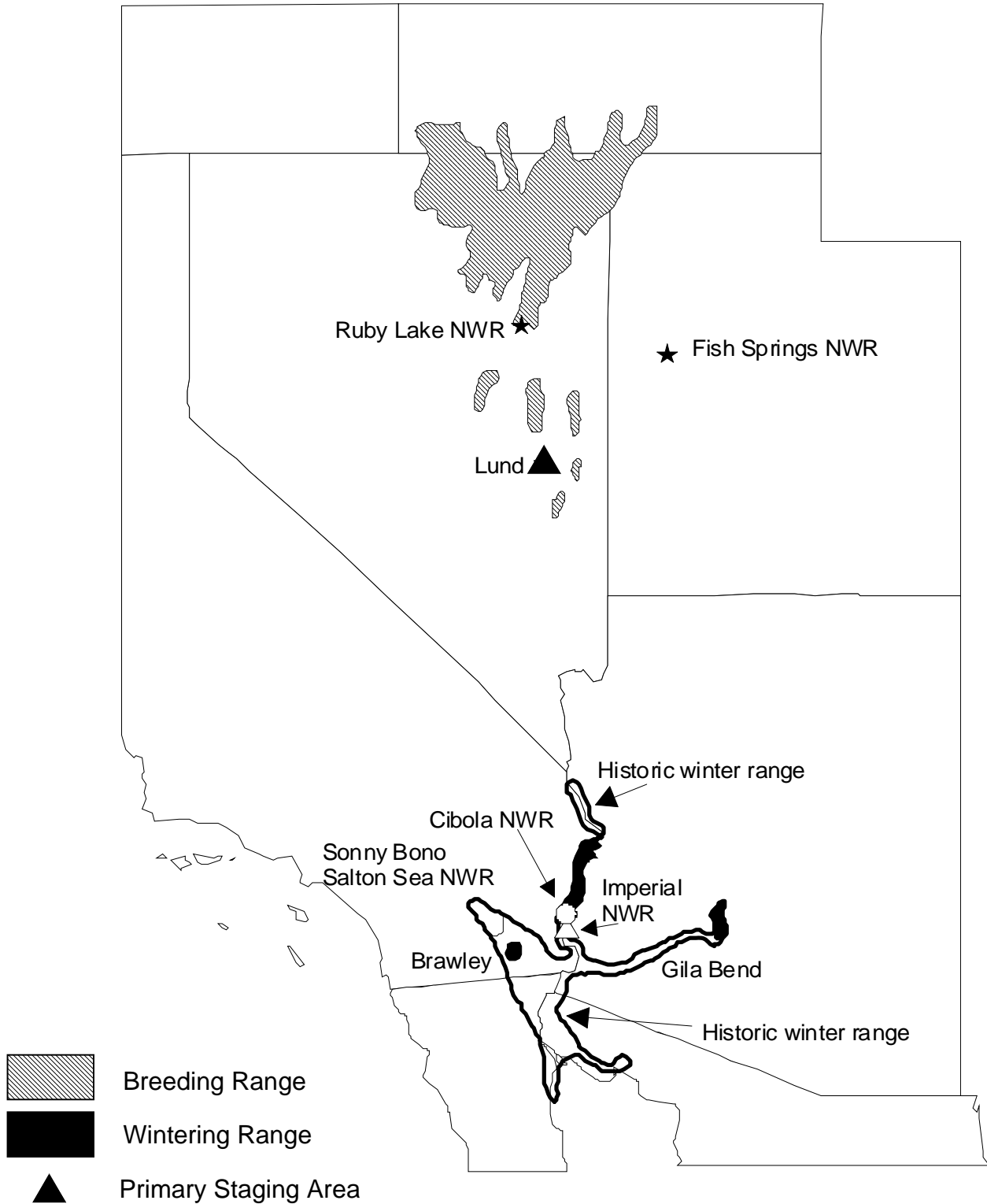


Figure 3. Approximate range of the Lower Colorado River Population of Greater Sandhill Cranes (Pacific Flyway Council 1995).

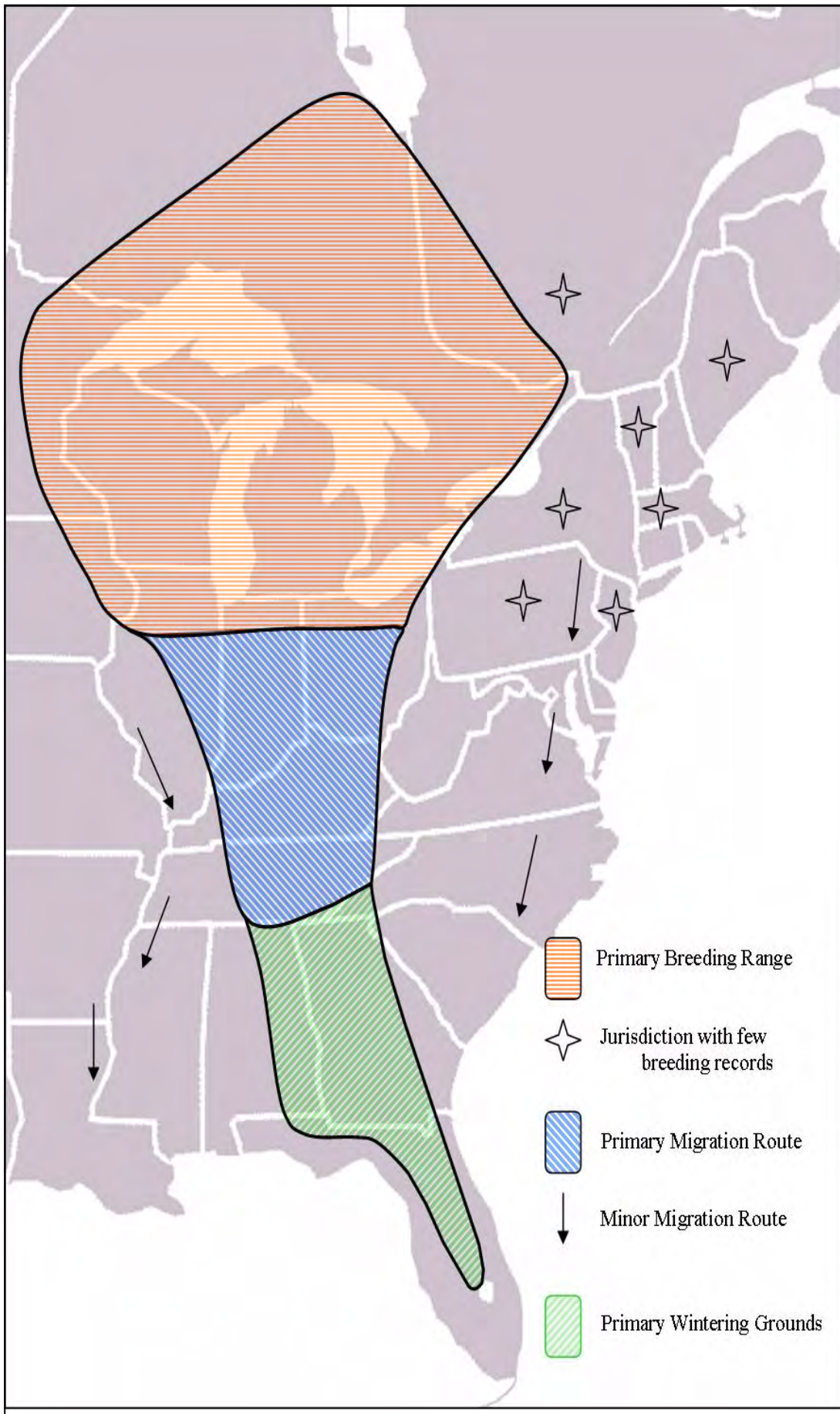


Figure 4. Approximate range of the Eastern Population of Greater Sandhill Cranes (Atlantic and Mississippi Flyway Councils 2010).

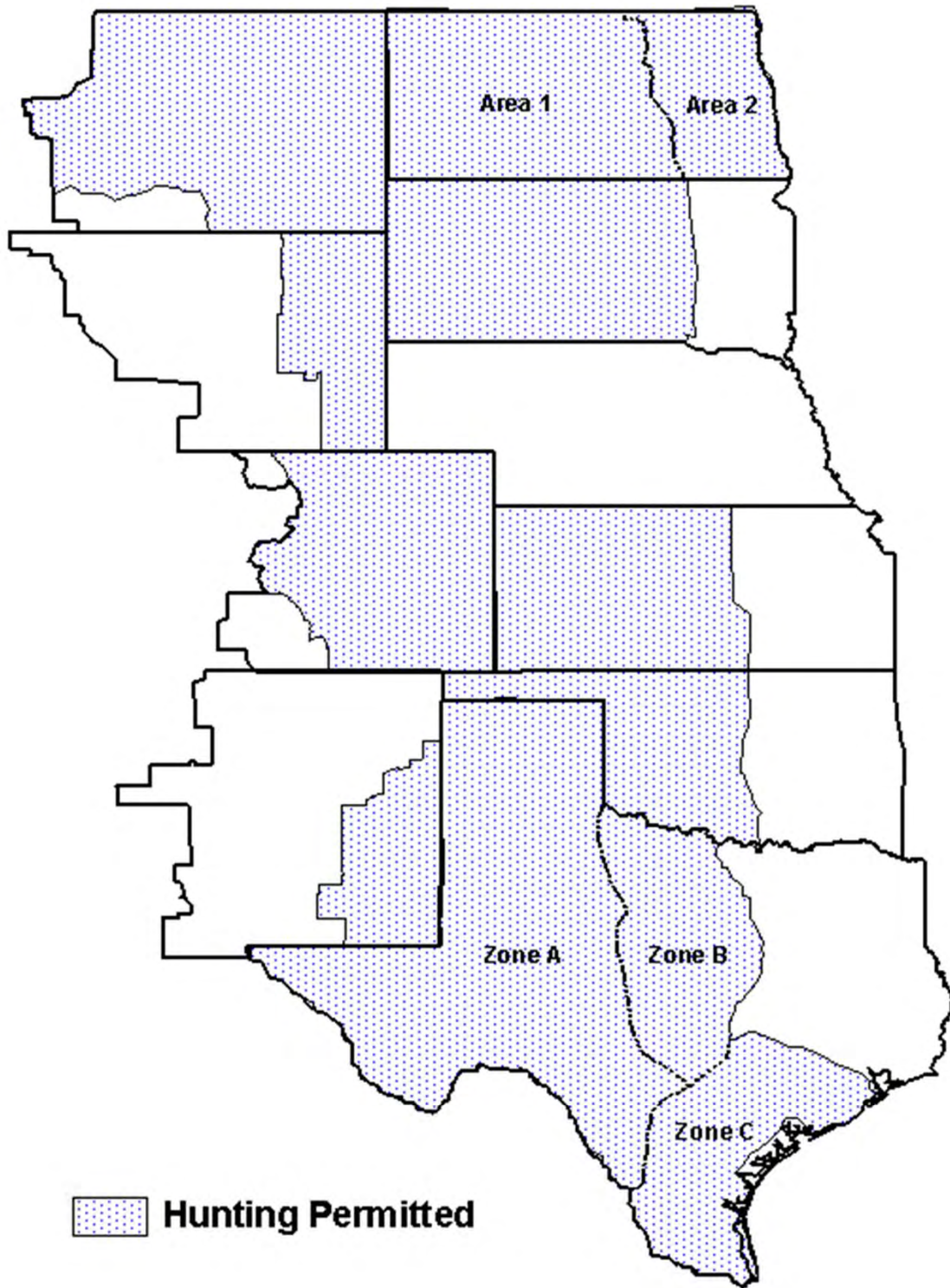


Figure 5. Areas open to the hunting of Mid-continent sandhill cranes by Federal frameworks in the Central Flyway states, 2011-12.

Figure 6. Annual harvests of Mid-Continent sandhill cranes in Saskatchewan and North Dakota, 1980-2010.

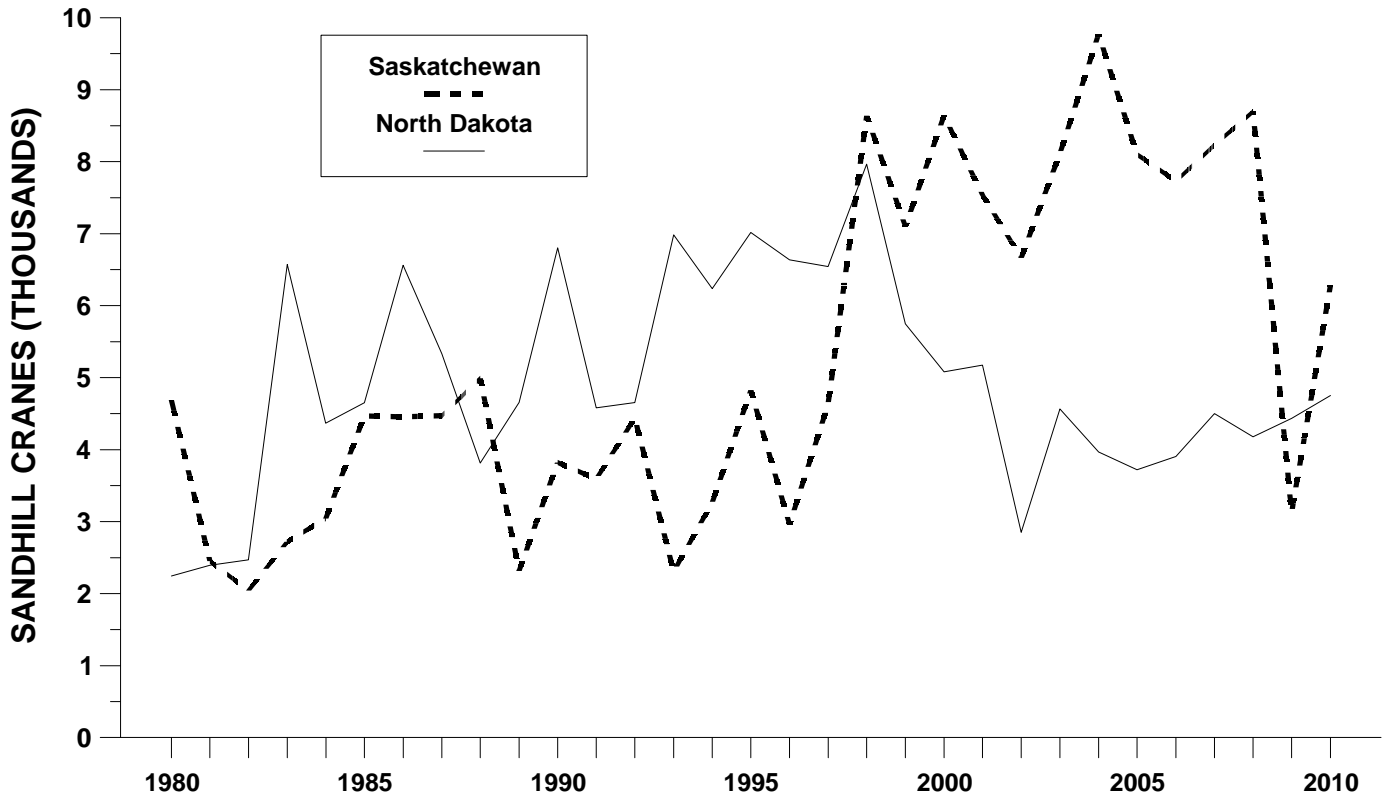


Figure 7. Spring population indices for Mid-Continent sandhill cranes on the Central Platte River Valley, Nebraska.

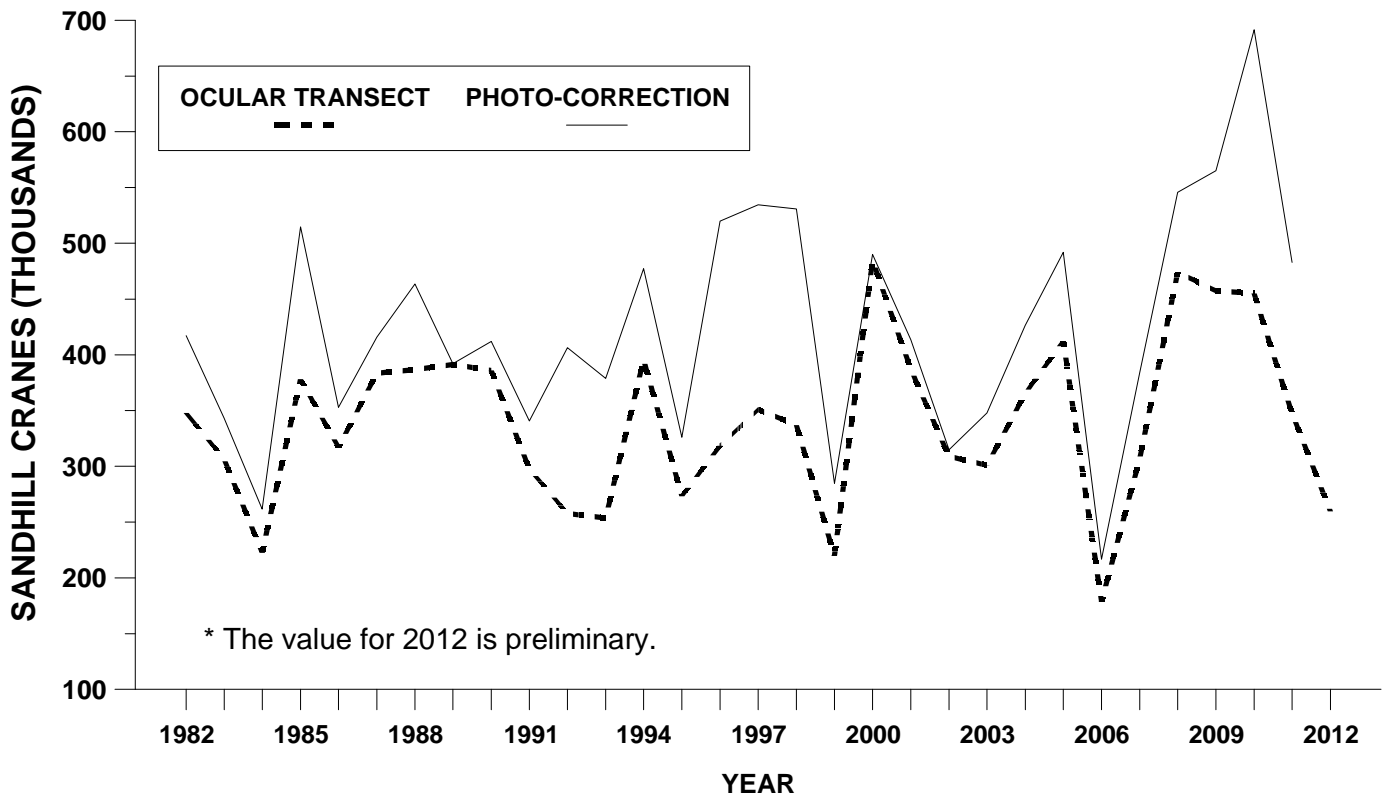


Figure 8. Photo-corrected spring population estimates (solid line) and the 95% confidence intervals (dashed lines) for Mid-Centroid sandhill cranes on the Central Platte River Valley, Nebraska.

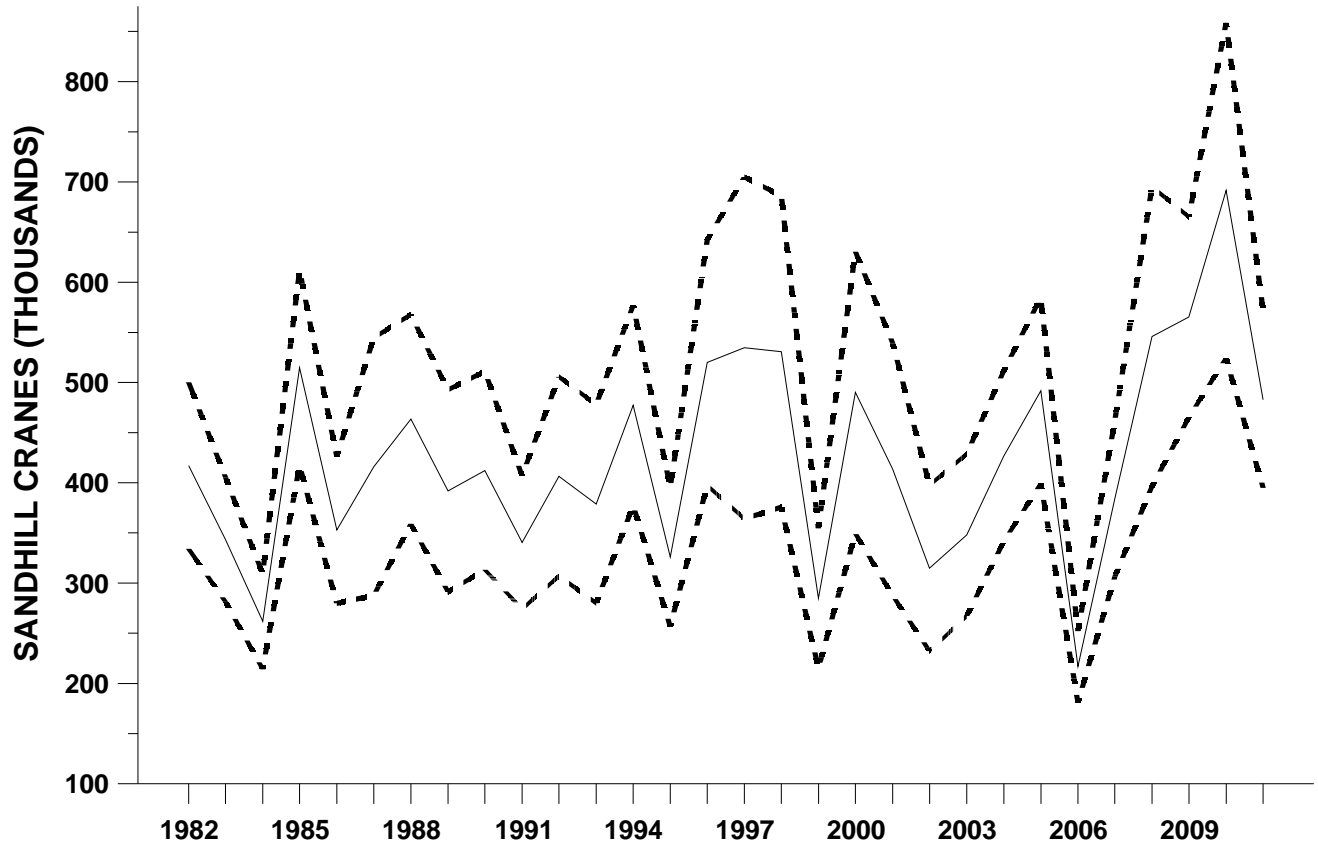


Figure 9. Annual and three-year average photo-corrected ocular transect spring population indices and population objective thresholds for Mid-Centroid sandhill cranes.

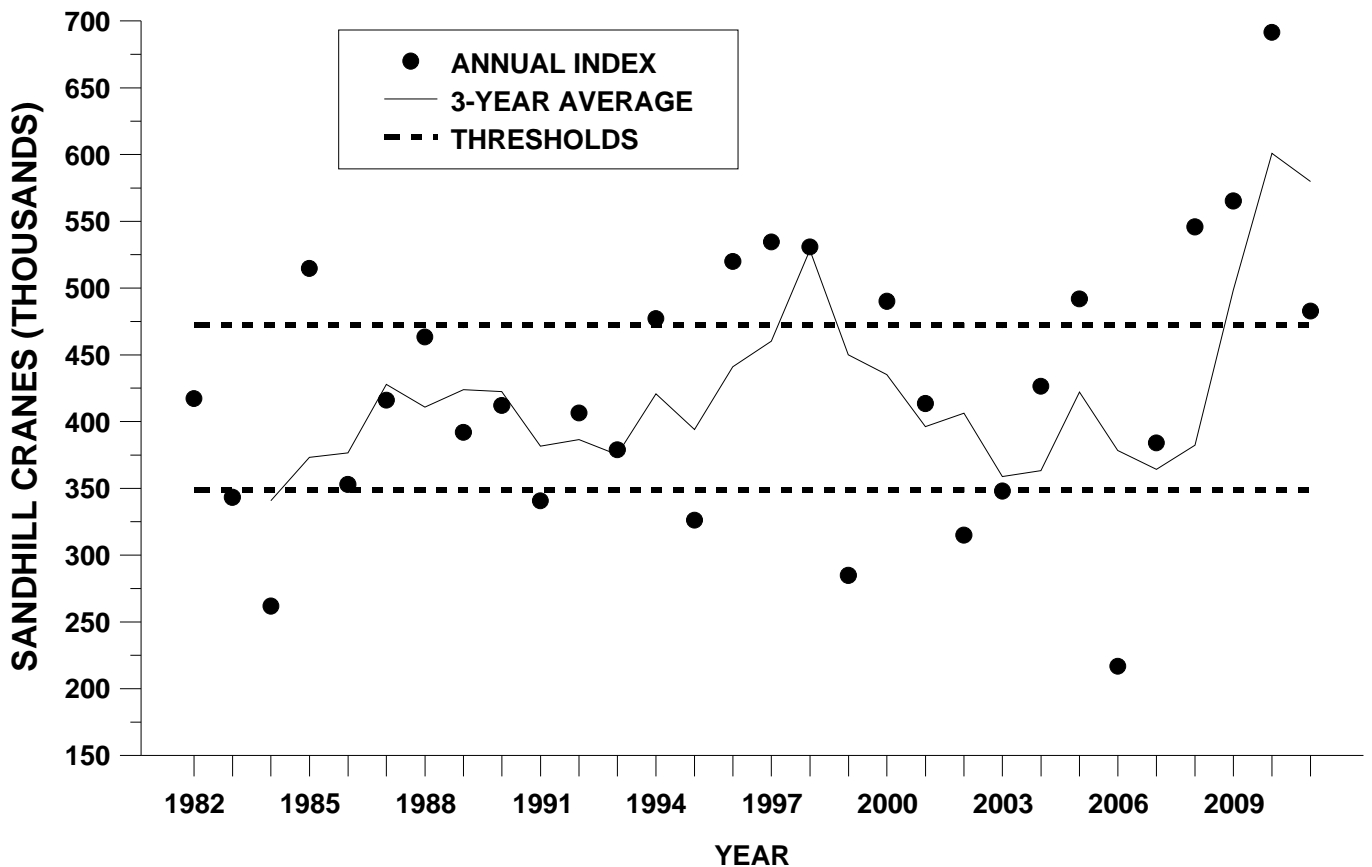


Figure 10. Active Mid-Continent sandhill crane hunters in the U.S. portion of the Central Flyway.

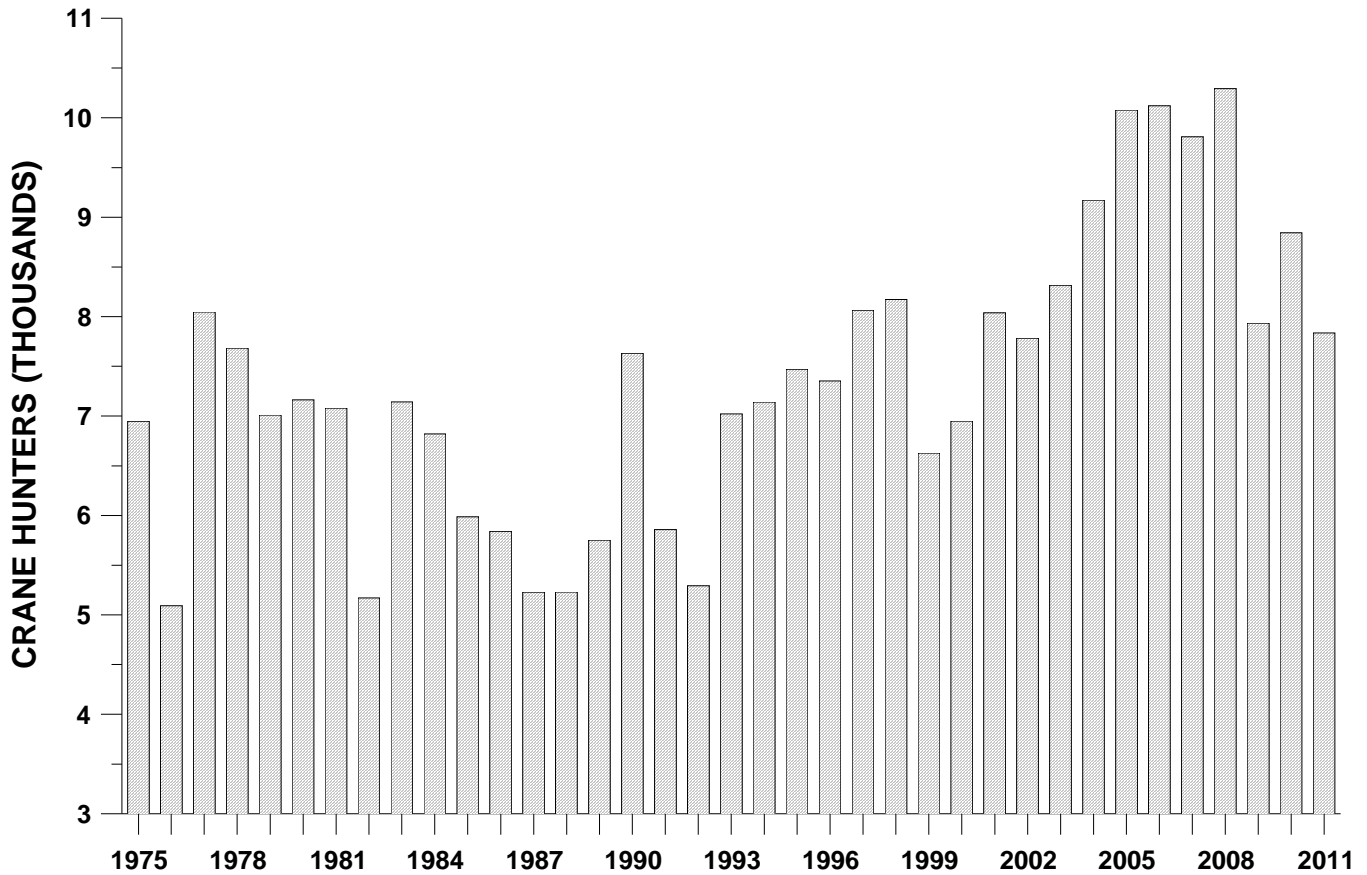


Figure 11. Crippling-loss rate (number lost/[number retrieved + lost]) of Mid-Continent sandhill cranes in the U.S. portion of the Central Flyway.

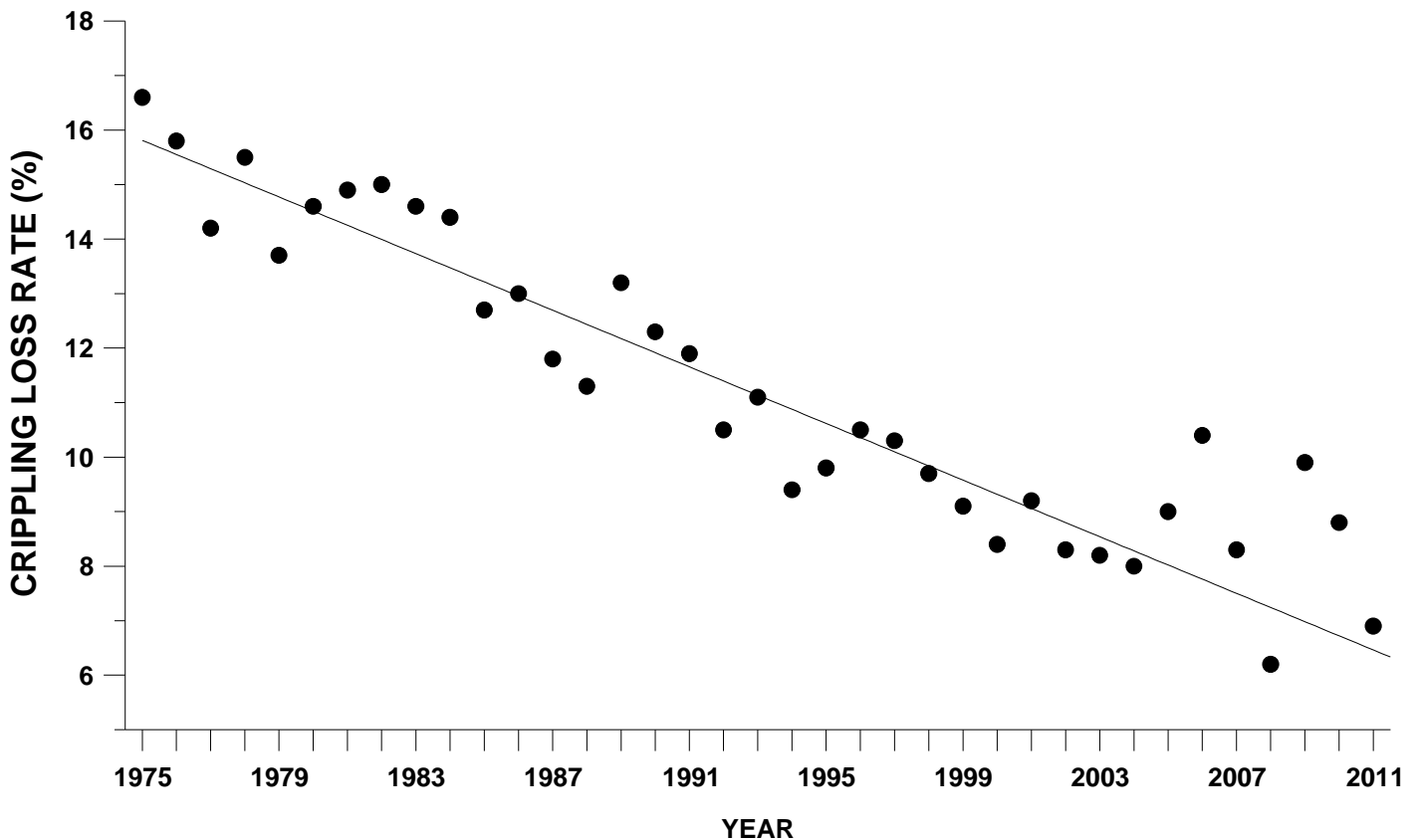


Figure 12. Average number of hunting days afield reported by active Mid-Continent sandhill crane hunters in the U.S. portion of the Central Flyway.

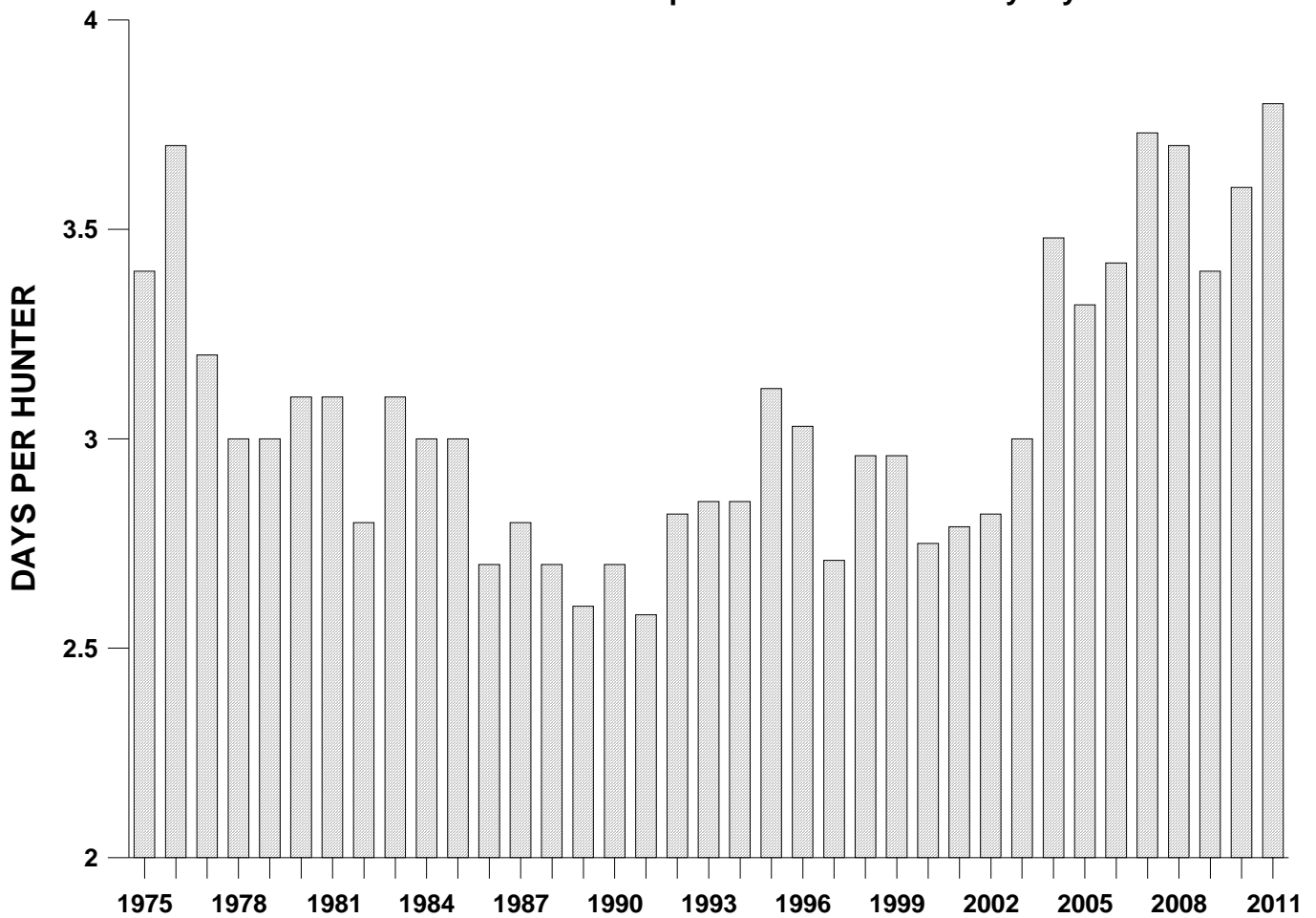


Figure 13. Seasonal bag per Mid-Continent sandhill crane hunter in the U.S. portion of the Central Flyway.

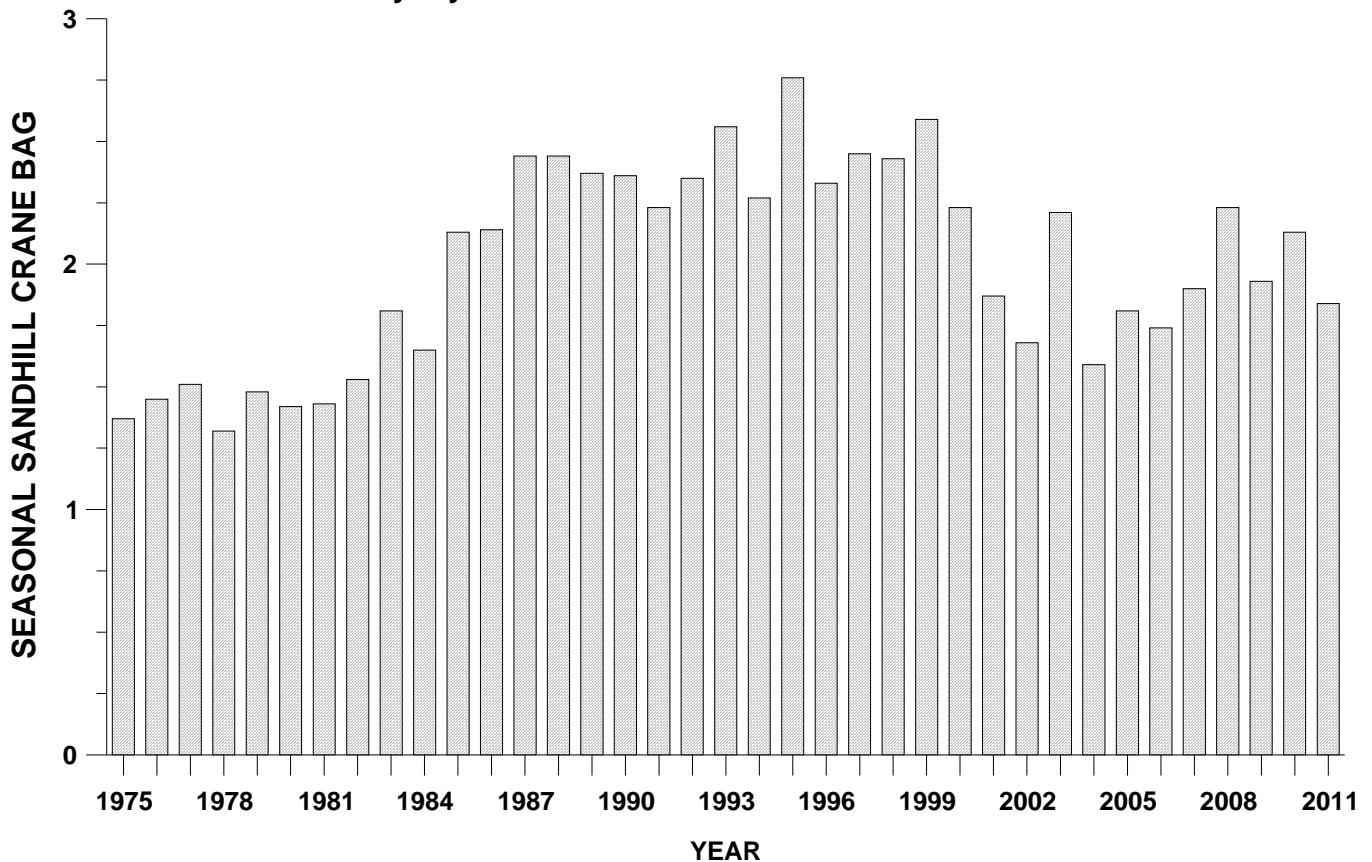


Figure 14. Estimated hunting mortality (retrieved and unretrieved) of Mid-Continent sandhill cranes in the U.S. portion of the Central Flyway.

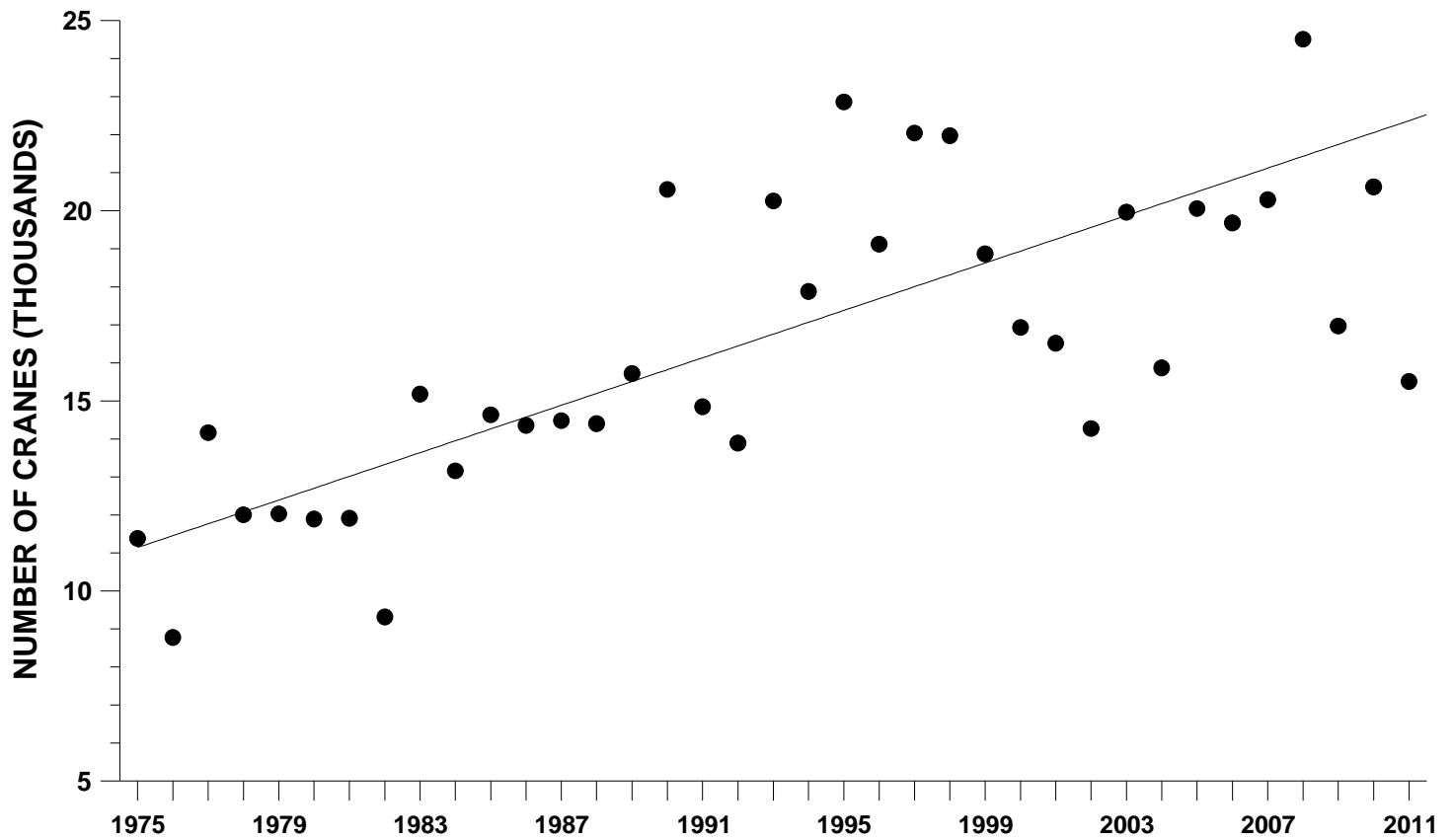
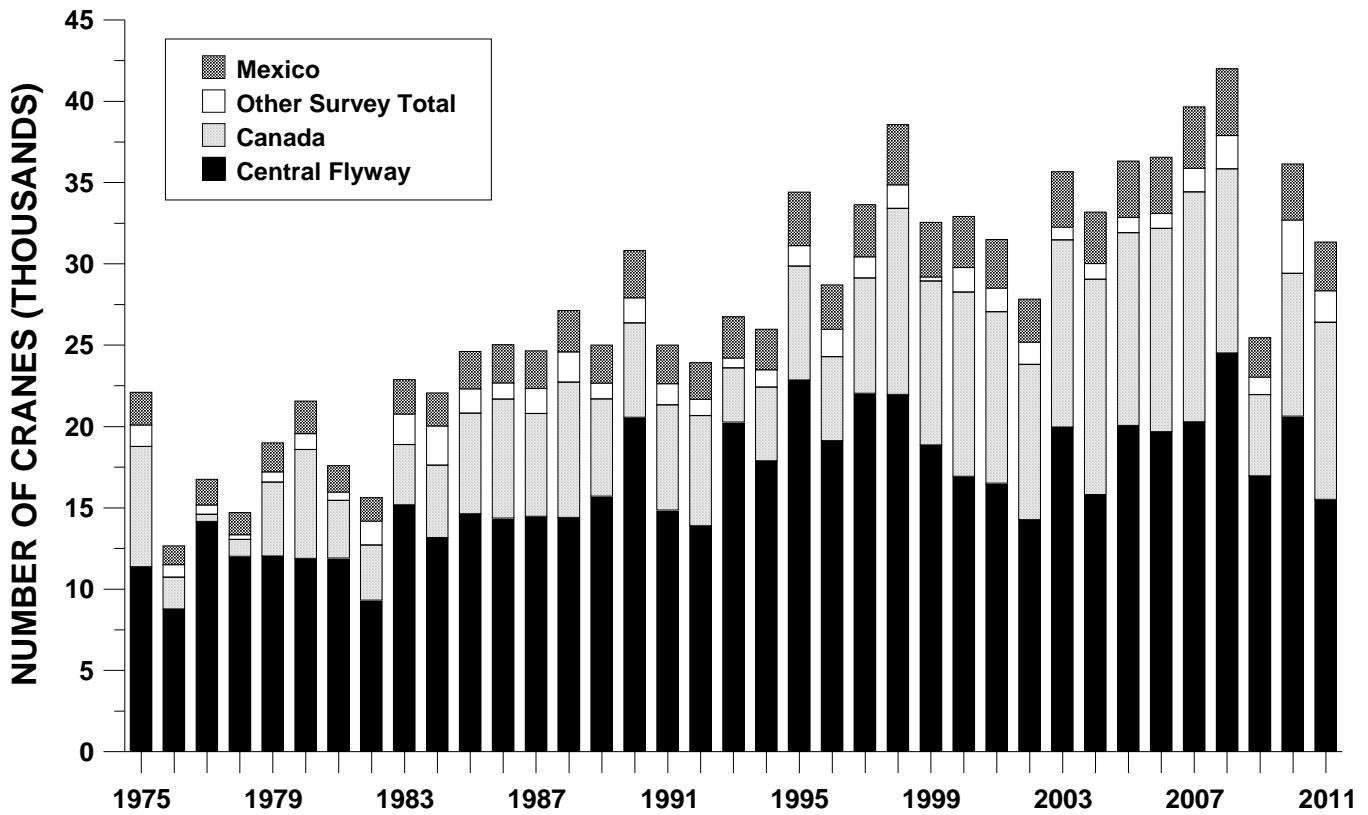


Figure 15. Estimated hunting mortality (retrieved and unretrieved) of Mid-Continent sandhill cranes in North America. ^{1,2}



1. In 1999, there was no estimate available for AK.
 2. In 2010, MN began hunting MCP in the northwestern portion of the state.

Figure 16. Trend analyses of indices to abundance and harvest of Mid-Century sandhill cranes.

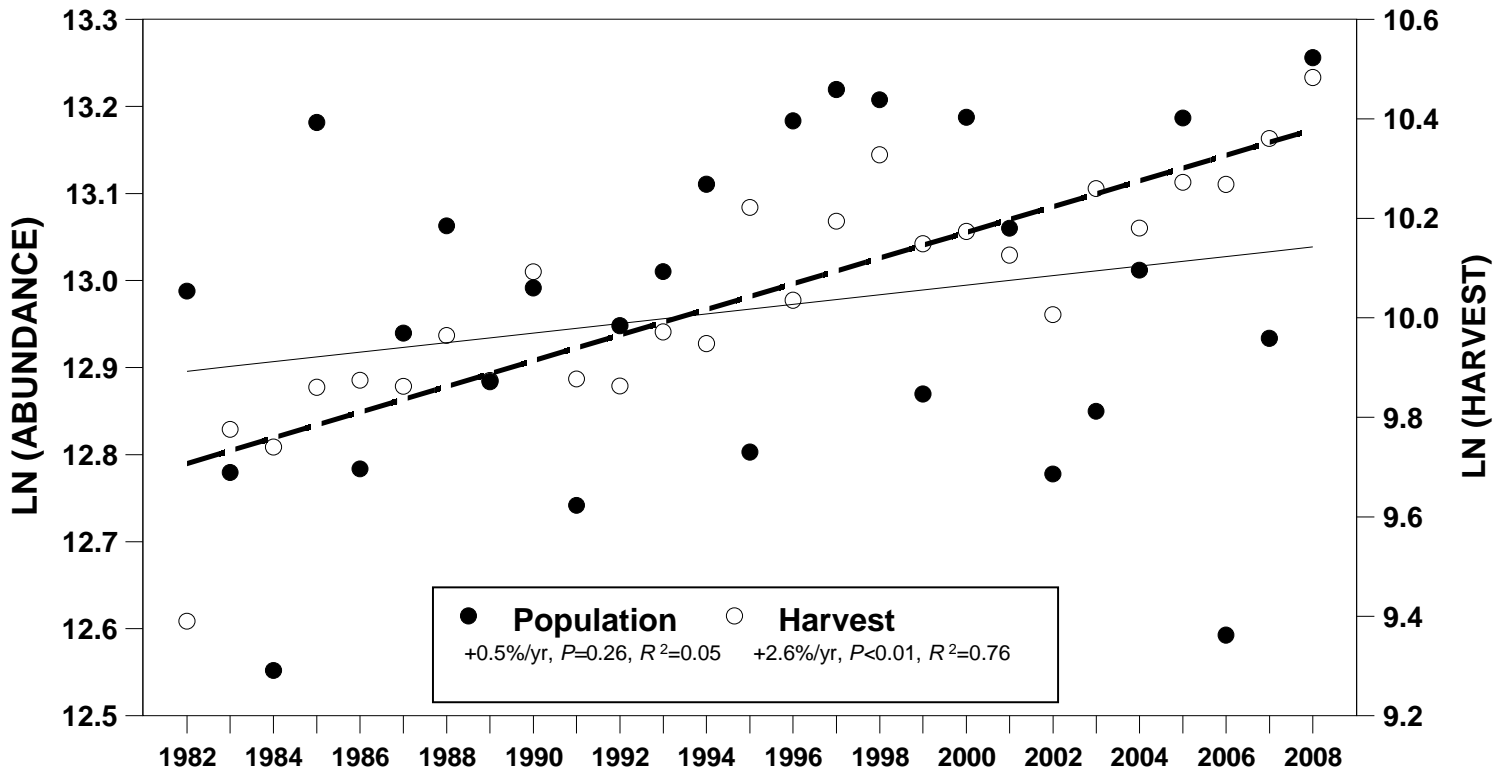


Figure 17. Estimated harvest of Rocky Mountain Population sandhill cranes.

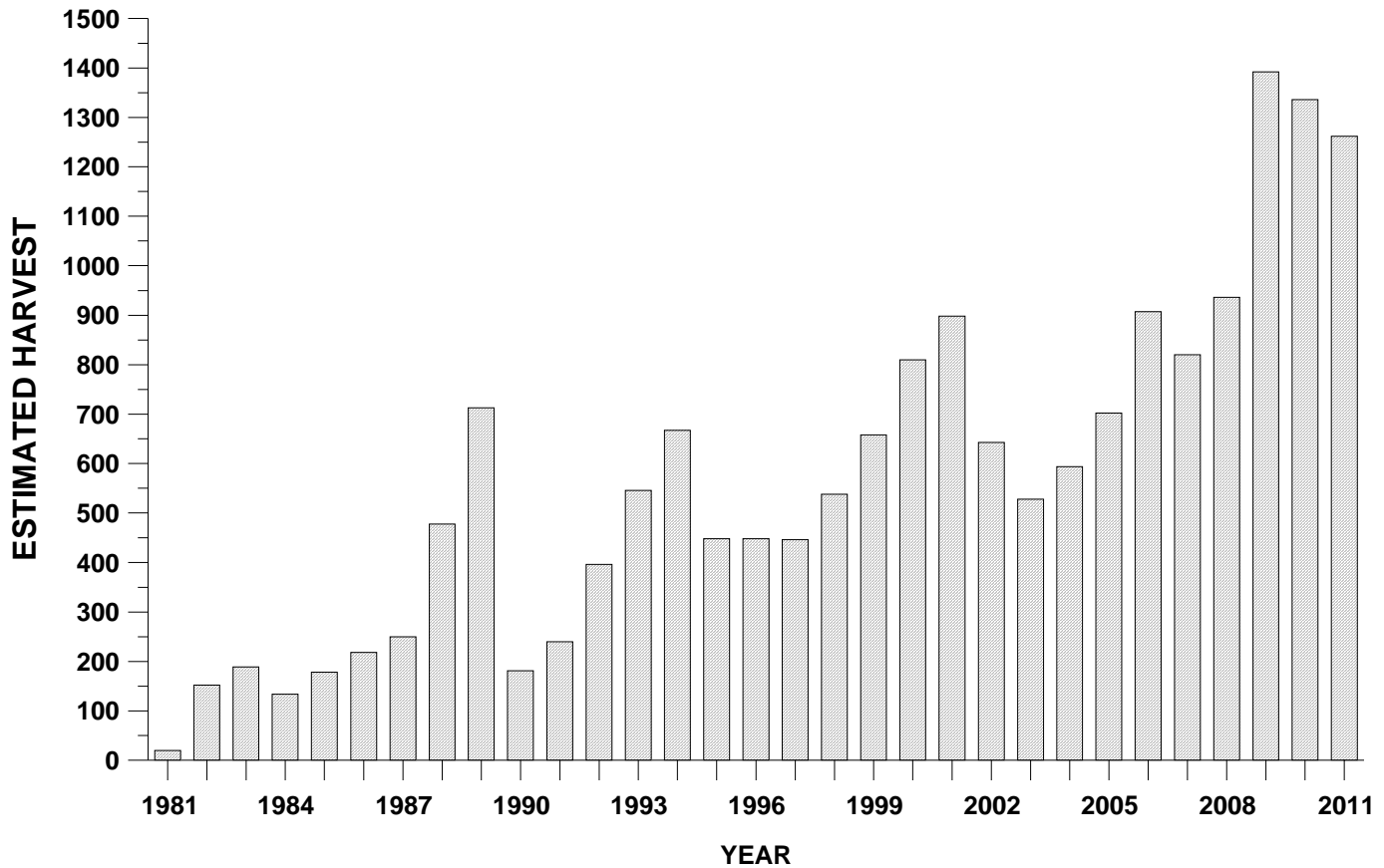


Figure 18. Abundance indices for the Rocky Mountain Population of sandhill cranes
 (Incomplete survey efforts in years prior to 1997 might have resulted in lower estimates;
 the official count begins in 1997. In 2006, survey was not conducted due to mechanical issues with the aircraft.)

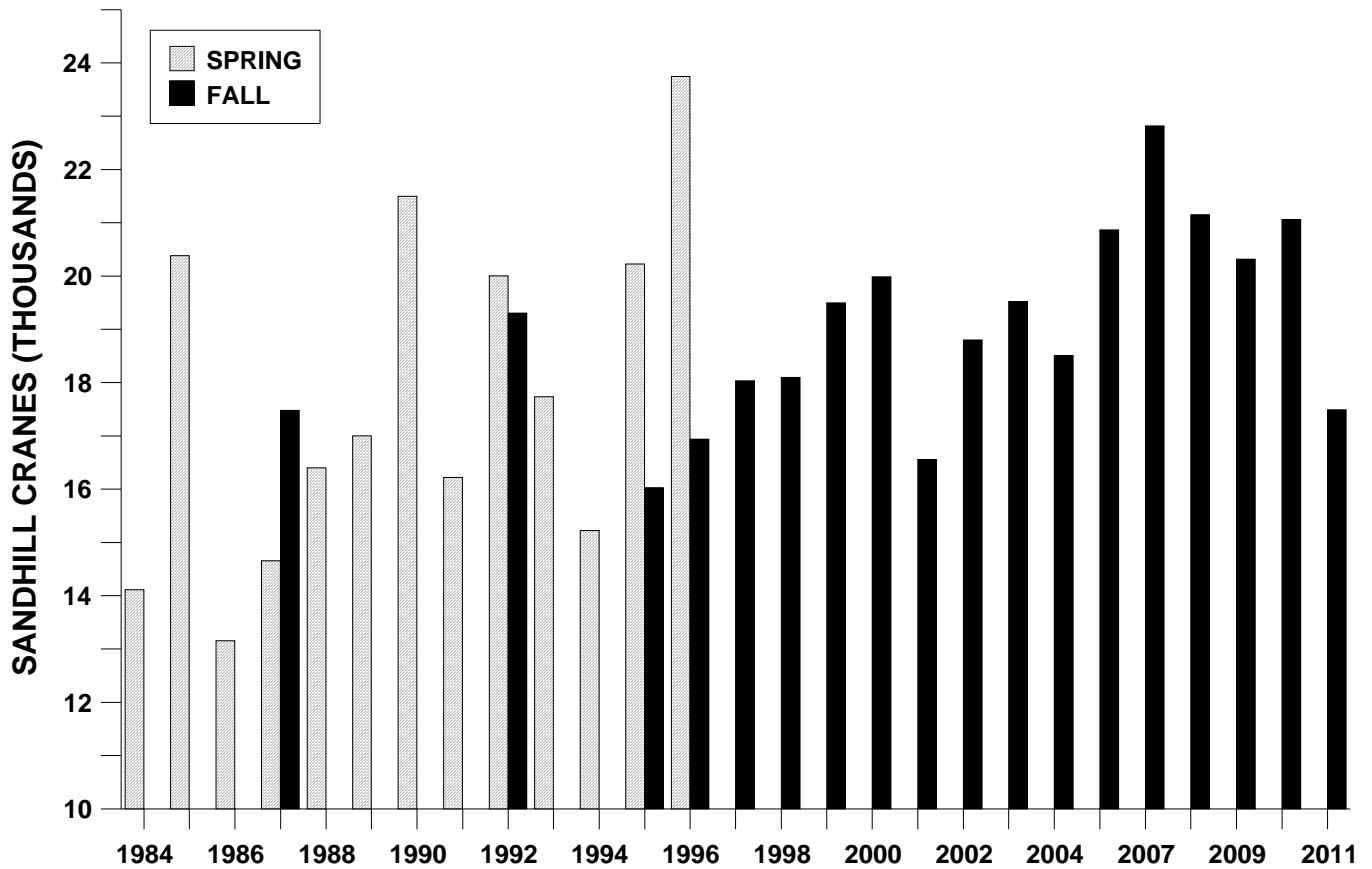


Figure 19. Annual and three-year average of fall pre-migration abundance indices for the Rocky Mountain Population of sandhill cranes.

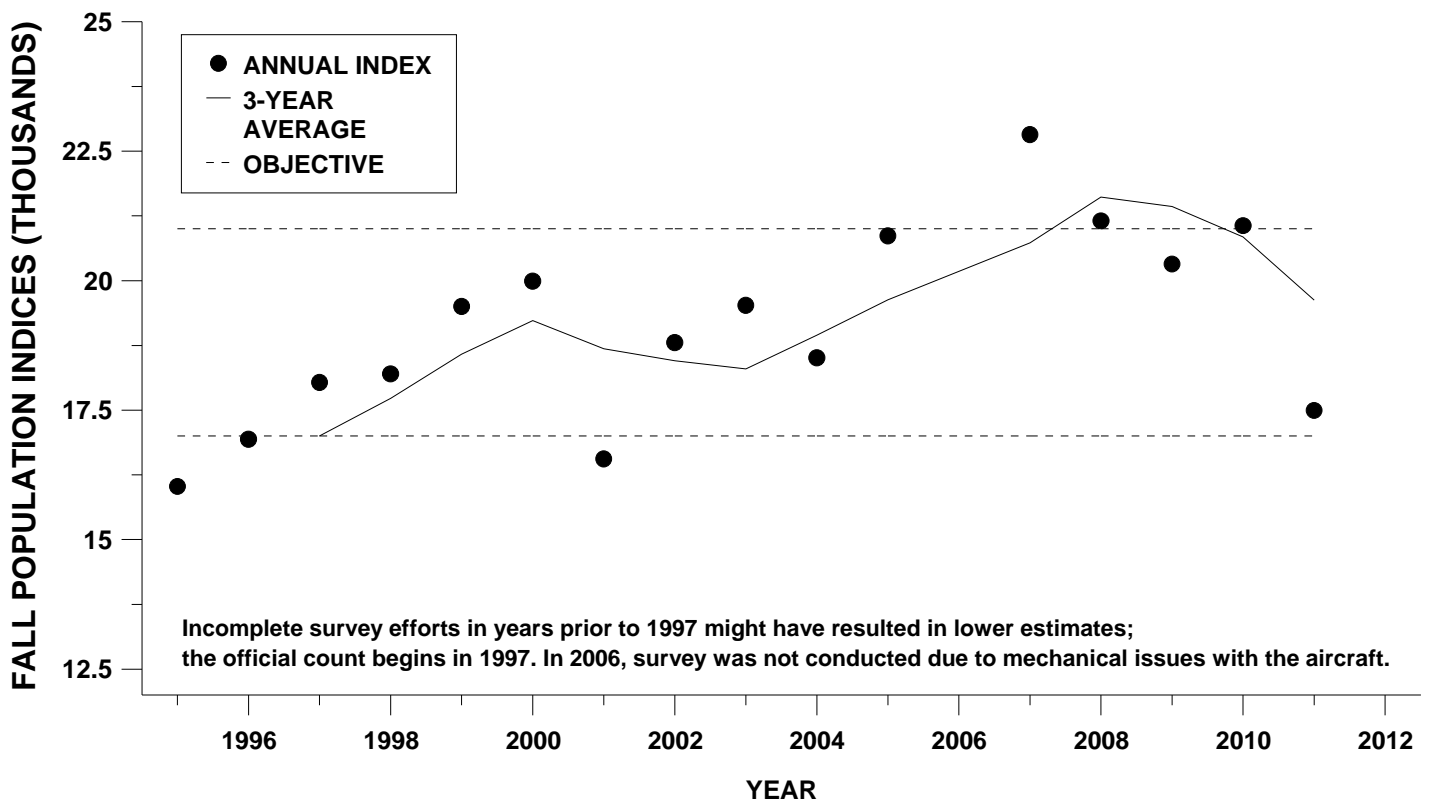


Figure 20. Annual indices for recruitment (% juveniles) of the Rocky Mountain Population of sandhill cranes.

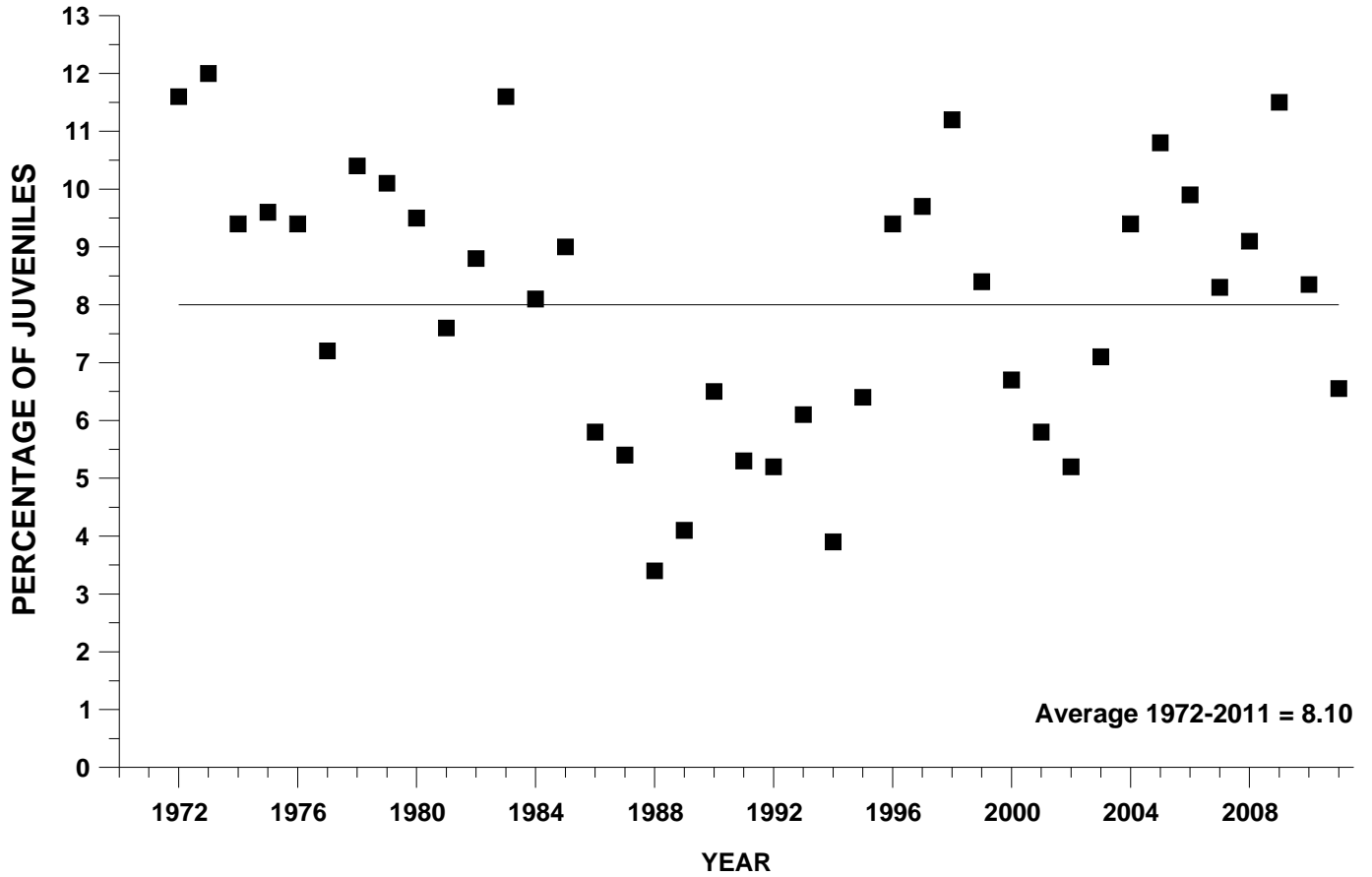
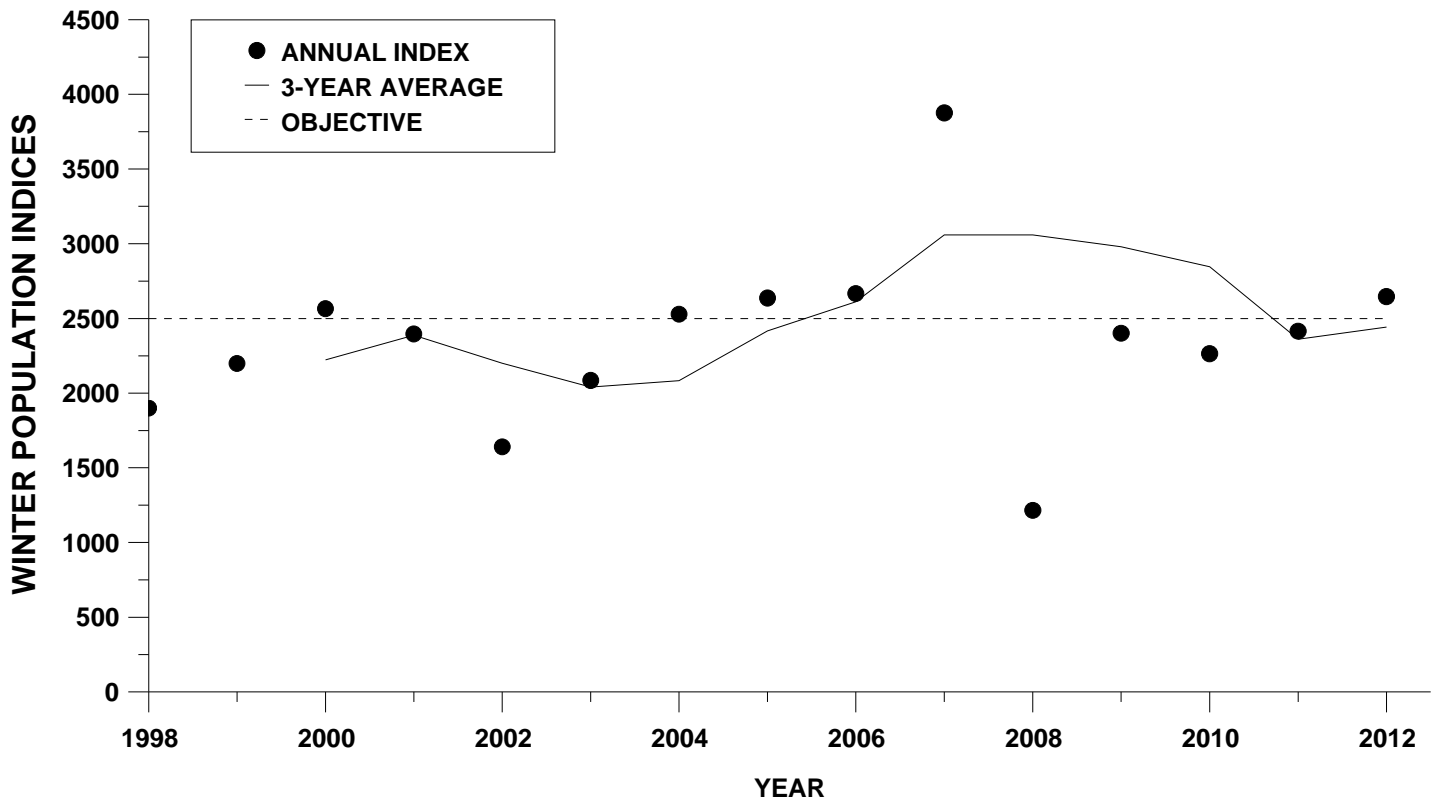
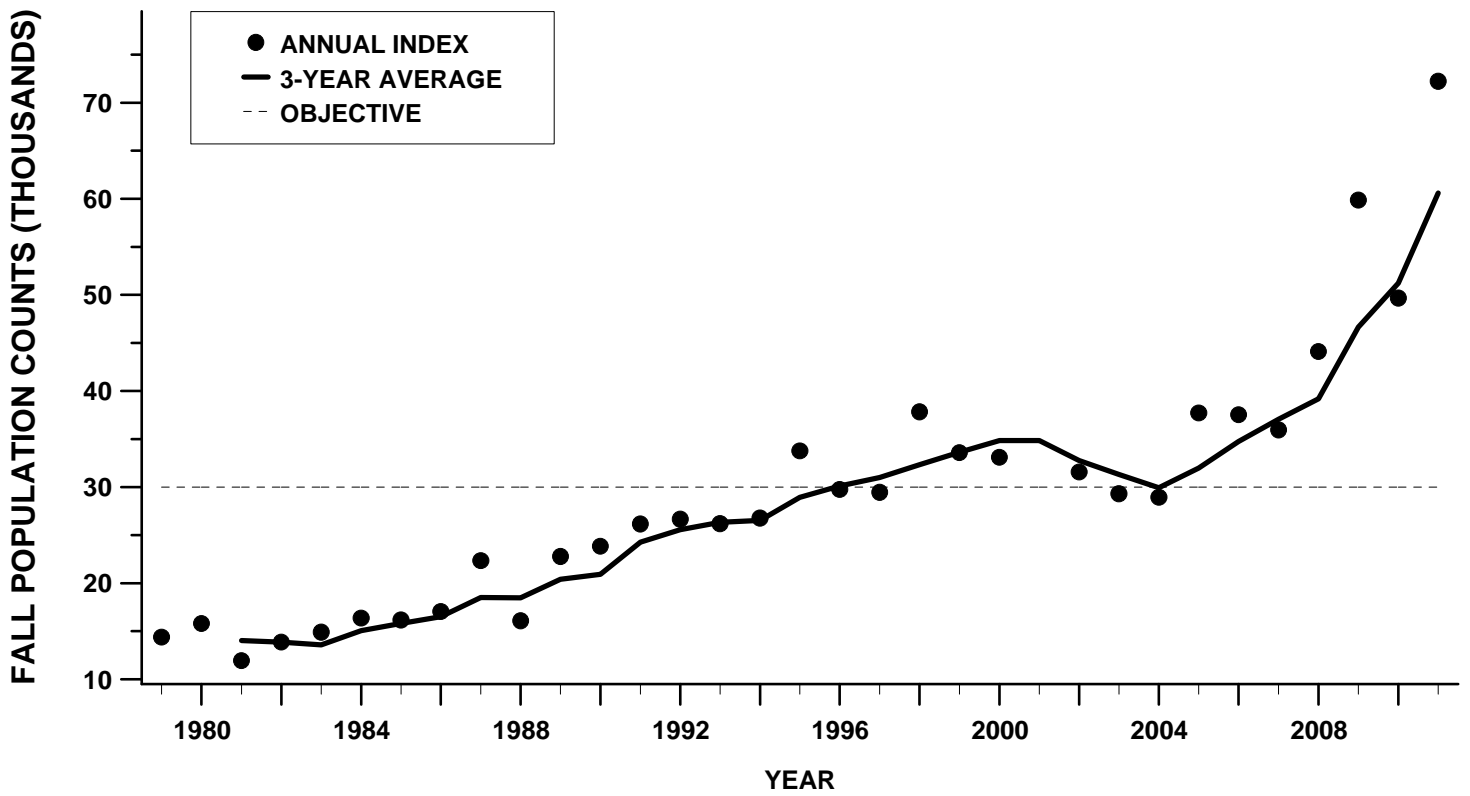


Figure 21. Annual and three-year average of winter counts of the Lower Colorado River Valley Population of sandhill cranes in Arizona and California.



In 2008, the survey was not complete. The 3-YR average for that year was calculated using 2005-07. In 2009 and 2010, the estimate for 2008 was not included in the 3-YR average

Figure 22. Annual and three-year average of fall counts of the Eastern Population of sandhill cranes.



Survey was not conducted in 2001. The 3-YR average for 2001 was calculated using 1998-2000.

In 2002 and 2003, the 3 yr averages did not include 2001.

New survey areas are still being added which is partially responsible for the increasing count.

Table 1. Annual spring abundance indices for the Mid-Continent Population of sandhill cranes.

| YR | CENTRAL PLATTE RIVER VALLEY, NE | | | | OTHER | | | | | | ALL AREAS | | | | |
|-------------------|---------------------------------|-----------------|---------------------------------|----------|----------|---------|--------|-----------------|-----------------|-----------------|------------------------|-----------------|---------------------------------|----------|--|
| | OCULAR CRUISE TRANSECT | OCULAR TRANSECT | PHOTO CORRECTED OCULAR TRANSECT | | OTHER NE | KS | TX | CO ¹ | OK ¹ | NM ¹ | OCULAR CRUISE TRANSECT | OCULAR TRANSECT | PHOTO CORRECTED OCULAR TRANSECT | | |
| | | | ANNUAL | 3-YR AVG | | | | | | | | | ANNUAL | 3-YR AVG | |
| 1974 | 162,600 | | | | 9,000 | 1,900 | 3,200 | 0 | 400 | 0 | 177,100 | | | | |
| 1975 | 223,600 | | | | 2,300 | 900 | tr | 500 | 100 | 100 | 227,500 | | | | |
| 1976 | 147,500 | | | | 2,800 | 300 | 800 | 0 | 100 | 1,000 | 152,500 | | | | |
| 1977 | 173,400 | | | | 1,100 | 1,600 | 30,700 | 0 | 400 | 12,500 | 220,000 | | | | |
| 1978 | 149,800 | 188,582 | | | 2,200 | 700 | 4,900 | 0 | 0 | 2,300 | 159,900 | 198,682 | | | |
| 1979 | | 203,574 | | | 2,600 | 1,100 | 0 | 500 | 1,500 | 0 | | 209,274 | | | |
| 1980 | 223,400 | 254,417 | | | 5,000 | 4,100 | 1,400 | 0 | 100 | 500 | 234,500 | 265,517 | | | |
| 1981 | | 248,882 | | | 8,300 | 11,200 | 21,800 | 500 | 0 | 0 | | 290,682 | | | |
| 1982 | | 347,996 | 417,263 | | 7,100 | 2,000 | 7,800 | 2,800 | 0 | 100 | | 367,796 | 437,063 | | |
| 1983 | | 306,316 | 343,378 | | 4,100 | 200 | 7,000 | 0 | 200 | tr | | 317,816 | 354,878 | | |
| 1984 | | 222,710 | 261,802 | 340,814 | 18,100 | 900 | 800 | 0 | 1,100 | tr | | 243,610 | 282,702 | 358,214 | |
| 1985 | | 378,127 | 514,763 | 373,314 | 11,500 | 3,000 | 1,200 | | | | | 393,827 | 530,463 | 389,348 | |
| 1986 | | 317,025 | 353,040 | 376,535 | 1,000 | 200 | 2,100 | | | | | 320,325 | 356,340 | 389,835 | |
| 1987 | | 383,581 | 416,058 | 427,954 | 0 | tr | 400 | | | | | 383,981 | 416,458 | 434,420 | |
| 1988 | | 386,853 | 463,457 | 410,852 | 0 | 0 | 7,700 | | | | | 394,553 | 471,157 | 414,652 | |
| 1989 | | 391,353 | 391,995 | 423,837 | 100 | 1,000 | 800 | | | | | 393,253 | 393,895 | 427,170 | |
| 1990 | | 385,950 | 412,154 | 422,535 | 11,000 | 5,200 | 10,300 | | | | | 412,450 | 438,654 | 434,569 | |
| 1991 | | 297,831 | 340,645 | 381,598 | 100 | 800 | 200 | | | | | 298,931 | 341,745 | 391,431 | |
| 1992 | | 257,709 | 406,457 | 386,419 | 12,200 | 300 | 1,100 | | | | | 271,309 | 420,057 | 400,152 | |
| 1993 | | 253,799 | 378,883 | 375,328 | 16,800 | 37,750 | 13,500 | | | | | 321,849 | 446,933 | 402,912 | |
| 1994 | | 395,543 | 477,215 | 420,852 | 14,600 | 0 | 0 | 2,400 | | | | 410,143 | 491,815 | 452,935 | |
| 1995 | | 273,376 | 326,181 | 394,093 | 30,400 | 0 | 0 | 6,700 | | | | 303,776 | 356,581 | 431,776 | |
| 1996 | | 318,514 | 519,984 | 441,127 | 7,600 | 0 | 0 | 3,900 | | | | 326,114 | 527,584 | 458,660 | |
| 1997 | | 350,932 | 534,630 | 460,265 | 16,200 | 100 | 0 | | | | | 367,232 | 550,930 | 478,365 | |
| 1998 | | 337,203 | 530,848 | 528,487 | 13,600 | 100 | 0 | | | | | 350,903 | 544,548 | 541,021 | |
| 1999 | | 219,794 | 284,858 | 450,112 | 3,500 | 100,000 | 0 | | | | | 323,294 | 388,358 | 494,612 | |
| 2000 | | 484,585 | 490,118 | 435,275 | 16,900 | 26,100 | 500 | | | | | 528,085 | 533,618 | 488,841 | |
| 2001 | | 387,336 | 413,498 | 396,158 | 10,500 | 42,300 | 3,500 | | | | | 443,636 | 469,798 | 463,925 | |
| 2002 | | 309,029 | 315,044 | 406,220 | 17,100 | 15,100 | 1,200 | | 5,800 | | | 342,429 | 348,444 | 450,620 | |
| 2003 | | 300,918 | 348,023 | 358,855 | 24,800 | 4,100 | 3,800 | | | | | 333,618 | 380,723 | 399,655 | |
| 2004 | | 365,370 | 426,534 | 363,200 | 17,700 | 1,200 | 2,200 | | 100 | | | 386,470 | 447,634 | 392,267 | |
| 2005 | | 412,285 | 491,915 | 422,157 | 27,100 | 2,900 | 8,700 | | 2,600 | | | 450,985 | 530,615 | 452,991 | |
| 2006 | | 178,564 | 216,810 | 378,420 | 70,000 | 2,100 | 5,500 | | | | | 256,164 | 294,410 | 424,220 | |
| 2007 | | 307,094 | 384,118 | 364,281 | 20,400 | 3,600 | 5,900 | | | | | 336,994 | 414,018 | 413,014 | |
| 2008 | | 474,051 | 545,884 | 382,271 | 24,500 | 1,100 | 0 | | | | | 499,651 | 571,484 | 426,637 | |
| 2009 | | 457,436 | 565,257 | 498,420 | 29,900 | tr | 10,800 | | | | | 498,136 | 605,957 | 530,486 | |
| 2010 | | 455,104 | 691,534 | 600,892 | 17,600 | 1,300 | 28,000 | | | | | 502,004 | 738,434 | 638,625 | |
| 2011 | | 347,501 | 482,797 | 579,863 | 18,800 | 3,500 | 14,300 | | 4,700 | | | 384,101 | 519,397 | 621,263 | |
| 2012 ² | | 259,576 | | | 12,800 | 6 | 1,100 | | | | | 273,482 | | | |

¹ CO, OK, and NM were eliminated from the Official Survey Area in 1985 by the CF CMU.

² Preliminary

Table 2. Federal Mid-Continent sandhill crane permits issued in the Central Flyway.

| 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 | 46,845 |
| 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 ³ | 1,186 | 619 | 37,558 ² | 54 | 55,384 |
| 2003 ¹ | 5,854 ² | 1,206 | 273 | 471 | 6,030 ³ | 1,000 | 563 | 43,199 ² | 50 | 58,646 |
| 2004 ¹ | 5,784 ² | 1,180 ³ | 308 | 548 | 5,788 ³ | 780 ³ | 307 | 52,161 ² | 61 | 66,917 |
| 2005 ¹ | 5,766 ² | 805 ³ | 281 | 494 | 7,441 ³ | 698 ³ | 490 | 51,511 ² | 68 | 67,554 |
| 2006 ¹ | 4,792 ² | 826 ³ | 265 | 512 ⁴ | 7,410 ³ | 615 ³ | 445 ⁵ | 70,968 ² | 78 | 85,911 |
| 2007 ¹ | 4,931 ² | 598 ³ | 238 | 480 ⁴ | 7,442 ³ | 731 ³ | 390 ⁵ | 101,382 ² | 58 | 116,250 |
| 2008 ¹ | 5,772 ² | 655 ³ | 272 | 677 ⁴ | 6,501 ³ | 736 ³ | 398 ⁵ | 122,553 ² | 73 | 137,637 |
| 2009 ¹ | 4,038 ² | 540 ³ | 139 | 862 ⁴ | 7,774 ³ | 1,029 ³ | 693 ⁵ | 11,332 ⁵ | 62 | 26,469 |
| 2010 ¹ | 4,280 ² | 508 ³ | 283 | 701 ⁴ | 8,375 ³ | 1,055 ³ | 410 ⁵ | 12,560 ⁵ | 86 | 28,258 |
| 2011 ¹ | 783 ² | 801 ³ | 311 | 575 ⁴ | 8,024 ³ | 1,104 ³ | 356 ⁵ | 13,905 ⁵ | 86 | 25,945 |
| 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 | 28,100 |
| 2000-09 | 5,362 | 955 | 262 | 554 | 7,216 | 942 | 531 | 58,479 | 63 | 74,364 |
| 1975-2010 | 2,190 | 893 | 219 | 690 | 6,280 | 1,040 | 516 | 24,105 | 48 | 35,534 |

¹ Preliminary

² Harvest Information Program (HIP) or a point-of-sale electronic record (without cost) used to identify crane hunters in lieu of a special sandhill crane hunting permit

³ States began charging a fee for crane hunting permits which reduces the number of permits issued to hunters that only occasionally come into contact with sandhill cranes.

⁴ NM uses a combination of electronic and paper permits.

⁵ SD uses a special question in their HIP questionnaire to identify sandhill crane hunters; TX hunters can only obtain crane permits in selected locations.

Table 3. Estimated active Mid-Continent sandhill crane hunters¹ in the Central Flyway.

| 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 ² | 236 | 495 | 60 | 244 | 2,271 | 64 | 114 | 4,821 | 10 | 8,315 |
| 2004 ² | 315 | 539 | 93 | 252 | 2,491 | 265 | 79 | 5,121 | 16 | 9,171 |
| 2005 ² | 280 | 274 | 90 | 233 | 3,370 | 259 | 165 | 5,383 | 24 | 10,078 |
| 2006 ² | 144 | 445 | 71 | 245 | 3,272 | 243 | 144 | 5,531 | 25 | 10,120 |
| 2007 ² | 158 | 255 | 82 | 241 | 3,145 | 166 | 57 | 5,685 | 19 | 9,808 |
| 2008 ² | 191 | 283 | 84 | 239 | 2,815 | 255 | 64 | 6,338 | 24 | 10,293 |
| 2009 ² | 159 | 213 | 50 | 286 | 3,546 | 371 | 63 | 3,179 | 67 | 7,934 |
| 2010 ² | 302 | 182 | 93 | 192 | 3,474 | 332 | 52 | 4,187 | 29 | 8,843 |
| 2011 ² | 138 | 449 | 95 | 206 | 3,733 | 418 | 44 | 2,712 | 41 | 7,836 |
| 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 |
| 2000-09 | 205 | 401 | 75 | 224 | 2,873 | 247 | 118 | 4,683 | 22 | 8,849 |
| 1975-2010 | 169 | 390 | 65 | 316 | 2,744 | 316 | 135 | 3,383 | 15 | 7,338 |

¹ Those permittees reporting hunting cranes 1 or more times

² Preliminary

Table 4. Season dates (month/day) for the hunting of sandhill cranes in the Central Flyway states.

| 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 | 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 | 10/10-01/17 | 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 | 11/05-01/01 | 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 | 11/05-01/01 | 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 | 11/06-01/02 | 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 |
| 2005 | 10/01-11/27 | 11/09-01/05 | 09/24-11/20 | 09/10-09/18 | 10/31-01/31 | 09/17-11/13 | 09/17-10/23 | 10/29-01/29 | 09/24-11/20 | 11/05-02/05 | 11/26-02/05 | 12/24-01/29 | 09/17-11/13 |
| 2006 | 09/30-11/26 | 11/08-01/04 | 09/23-11/19 | 09/09-09/17 | 10/31-01/31 | 09/16-11/12 | 09/16-10/22 | 10/28-01/28 | 09/23-11/19 | 11/04-02/04 | 11/24-02/04 | 12/23-01/28 | 09/16-11/12 |
| 2007 | 10/02-12/02 | 11/07-01/03 | 09/22-11/18 | 09/08-09/16 | 10/31-01/31 | 09/15-11/11 | 09/15-10/21 | 10/27-01/27 | 09/22-11/18 | 11/04-02/04 | 11/24-02/04 | 12/23-01/28 | 09/15-11/11 |
| 2008 | 10/04-11/30 | 11/05-01/01 | 09/27-11/23 | 09/06-09/21 | 10/31-01/31 | 09/20-11/16 | 09/20-10/26 | 10/25-01/25 | 09/27-11/23 | 11/08-02/08 | 11/28-02/08 | 12/20-01/25 | 09/13-11/09 |
| 2009 | 10/03-11/29 | 11/11-01/07 | 09/26-11/22 | 09/05-09/20 | 10/31-01/31 | 09/19-11/15 | 09/19-10/25 | 10/24-01/24 | 09/26-11/22 | 11/07-02/07 | 11/27-02/07 | 12/19-01/24 | 09/19-11/15 |
| 2010 | 10/02-11/28 | 11/10-01/06 | 09/25-11/21 | 09/11-09/26 | 10/31-01/31 | 09/18-11/14 | 09/18-10/24 | 10/23-01/23 | 09/25-11/21 | 11/06-02/06 | 11/26-02/06 | 12/18-01/23 | 09/18-11/14 |
| 2011 | 10/01-11/27 | 11/09-01/05 | 09/24-11/20 | 09/10-09/25 | 10/31-01/31 | 09/17-11/13 | 09/17-10/23 | 10/22-01/22 | 09/24-11/20 | 11/05-02/05 | 11/25-02/05 | 12/24-01/29 | 09/17-11/13 |

MT¹ Central Flyway portion of MT, except that area south of I-90 and west of the Bighorn River and Sheridan Co.
 MT² Sheridan County, MT.

ND¹ Area 1, ND.
 ND² Area 2, ND.

TX¹ Area A, TX
 TX² Area B, TX
 TX³ Area C, TX

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Table 5. Estimated retrieved harvests of Mid-Continent sandhill cranes in the U.S.

| YR | CO | KS | MT | NM | ND | OK | SD | TX | WY | CENTRAL FLYWAY | OTHER SURVEY AREAS | | | | | U.S. TOTAL |
|--|------|-------|------|-------|-------|-------|------|--------|------|-------------------|--------------------|-----------------|-------------------|-----------------|-------|---------------|
| | | | | | | | | | | | AZ ⁴ | NM ⁴ | AK ^{2,3} | MN ⁵ | 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 | 1,275 | 29 | 321 | 5,748 | 879 | 184 | 8,469 | 8 | 16,969 | 92 | 101 | NA* | | 193 | 17,162 |
| 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 | 936 | | 1,196 | 16,196 |
| 2002 | 294 | 1,067 | 23 | 342 | 2,852 | 490 | 160 | 7,837 | 22 | 13,087 | 197 | 92 | 844 | | 1,133 | 14,220 |
| 2003 ¹ | 230 | 942 | 49 | 617 | 4,564 | 200 | 166 | 11,560 | 7 | 18,335 | 155 | 162 | 331 | | 648 | 18,983 |
| 2004 ¹ | 92 | 856 | 54 | 350 | 3,967 | 441 | 67 | 8,715 | 4 | 14,546 | 192 | 167 | 435 | | 794 | 15,340 |
| 2005 ¹ | 265 | 471 | 65 | 578 | 3,721 | 511 | 190 | 12,446 | 16 | 18,263 | 227 | 175 | 388 | | 790 | 19,053 |
| 2006 ¹ | 96 | 1,341 | 12 | 682 | 3,906 | 538 | 202 | 10,834 | 20 | 17,631 | 201 | 245 | 314 | | 760 | 18,391 |
| 2007 ¹ | 149 | 516 | 51 | 427 | 4,501 | 272 | 163 | 12,511 | 20 | 18,610 | 268 | 331 | 596 | | 1,195 | 19,805 |
| 2008 ¹ | 32 | 453 | 73 | 483 | 4,179 | 493 | 83 | 17,169 | 24 | 22,989 | 138 | 329 | 1,249 | | 1,716 | 24,705 |
| 2009 ¹ | 58 | 447 | 34 | 584 | 4,436 | 737 | 96 | 8,882 | 8 | 15,282 | 305 | 332 | 245 | | 882 | 16,164 |
| 2010 ¹ | 115 | 293 | 95 | 432 | 4,752 | 940 | 91 | 12,069 | 25 | 18,812 | 253 | 421 | 1,204 | 830 | 2,708 | 21,520 |
| 2011 ¹ | 68 | 908 | 51 | 297 | 3,733 | 808 | 64 | 8,493 | 20 | 14,442 | 151 | 366 | 335 | 765 | 1,617 | 16,059 |
| 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 | 1,014 | 63 | 417 | 6,317 | 805 | 195 | 8,570 | 5 | 17,206 | 124 | 127 | 779 | | 952 | 18,159 |
| 2000-09 | 184 | 772 | 42 | 467 | 4,238 | 495 | 198 | 10,516 | 14 | 16,925 | 200 | 204 | 632 | | 1,037 | 17,961 |
| 1975-2010 | 120 | 839 | 40 | 534 | 4,584 | 595 | 154 | 8,173 | 9 | 14,627 | 140 | 180 | 792 | | 1,035 | 15,662 |
| CURRENT YEAR PERCENT CHANGE FROM: | | | | | | | | | | | | | | | | |
| 2010 | -41% | 210% | -46% | -31% | -21% | -14% | -30% | -30% | -20% | -23% | -40% | -13% | -72% | -8% | -40% | -25% |
| 1975-79 | -28% | | 126% | -73% | 59% | 163% | 75% | 42% | 156% | 46% | | | -43% | | 173% | 53% |
| 1980-89 | 3% | | 209% | -33% | -13% | 36% | -52% | 39% | 239% | 24% | 93% | 91% | -67% | | 38% | 25% |
| 1990-99 | -45% | -10% | -20% | -29% | -41% | 0% | -67% | -1% | 270% | -16% | 22% | 188% | -57% | | 70% | -12% |
| 2000-09 | -63% | 18% | 22% | -36% | -12% | 63% | -68% | -19% | 45% | -15% | -25% | 79% | -47% | | 56% | -11% |
| 1975-2010 | -43% | 8% | 29% | -44% | -19% | 36% | -58% | 4% | 129% | -1% | 8% | 104% | -58% | | 56% | 3% |

¹ Preliminary

² A proportion of the Alaskan harvest is composed of lesser sandhill cranes from the Pacific Coast 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 where federal MQS state totals are prorated by the long-term percent MC cranes; data from 2000 forward are MC portion from HIP.

⁴ The MC harvest for AZ and NM represents MC sandhill cranes that were harvested in RMP areas and are not represented in the CF MC Sandhill Crane Federal Harvest Survey

⁵ Minnesota initiated a hunt in the NW portion of state.

* No estimate is available.

Table 6. Estimated retrieved harvests of Mid-Continent sandhill cranes in Canada.

| 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 | 162 | 5,744 | 5,906 |
| 1976 | 209 | 1,427 | 1,636 |
| 1977 | 367 | N/A | 367 |
| 1978 | 877 | N/A | 877 |
| 1979 | 978 | 2,821 | 3,799 |
| 1980 | 891 | 4,698 | 5,589 |
| 1981 | 510 | 2,456 | 2,966 |
| 1982 | 797 | 2,037 | 2,834 |
| 1983 | 377 | 2,711 | 3,088 |
| 1984 | 661 | 3,042 | 3,703 |
| 1985 | 691 | 4,448 | 5,139 |
| 1986 | 1,662 | 4,452 | 6,114 |
| 1987 | 664 | 4,480 | 5,144 |
| 1988 | 1,958 | 4,990 | 6,948 |
| 1989 | 2,652 | 2,323 | 4,975 |
| 1990 | 1,023 | 3,812 | 4,835 |
| 1991 | 1,771 | 3,547 | 5,318 |
| 1992 | 1,221 | 4,718 | 5,939 |
| 1993 | 482 | 2,433 | 2,915 |
| 1994 | 544 | 3,286 | 3,830 |
| 1995 | 1,004 | 4,823 | 5,827 |
| 1996 | 1,351 | 2,961 | 4,312 |
| 1997 | 1,279 | 4,621 | 5,900 |
| 1998 | 889 | 8,637 | 9,526 |
| 1999 | 1,300 | 7,100 | 8,400 |
| 2000 | 805 | 8,645 | 9,450 |
| 2001 | 1,247 | 7,539 | 8,786 |
| 2002 | 1,282 | 6,665 | 7,947 |
| 2003 | 1,474 | 8,111 | 9,585 |
| 2004 | 1,267 | 9,770 | 11,037 |
| 2005 | 1,776 | 8,100 | 9,876 |
| 2006 | 2,688 | 7,729 | 10,417 |
| 2007 | 3,554 | 8,232 | 11,786 |
| 2008 | 742 | 8,697 | 9,439 |
| 2009 | 1,037 | 3,128 | 4,165 |
| 2010 | 1,051 | 6,280 | 7,331 |
| 2011 ¹ | | | 9,074 |
| AVERAGES: | | | |
| 1971-79 | 408 | 3,567 | 3,183 |
| 1980-89 | 1,086 | 3,564 | 4,650 |
| 1990-99 | 1,086 | 4,594 | 5,680 |
| 2000-09 | 1,587 | 7,662 | 9,249 |
| 1971-2010 | 1,058 | 4,985 | 5,794 |
| 2010 HARVEST: PERCENT CHANGE FROM: | | | |
| 2009 | 1% | 101% | 76% |
| 1971-79 | 157% | 76% | 130% |
| 1980-89 | -3% | 76% | 58% |
| 1990-99 | -3% | 37% | 29% |
| 2000-09 | -34% | -18% | -21% |
| 1971-2010 | -1% | 26% | 27% |

¹ Harvest data was not available in time for the report so the average from the 2000-2010 harvests was used for 2011.

Table 7. Annual sport hunting mortality estimates for the Mid-Continent Population of sandhill cranes in North America.

| YR | SPORT HUNTING MORTALITY | | | | | |
|--|-------------------------|--------------------|--------|---------------------|-------------------------------------|--------|
| | Retrieved | | | | Unretrieved No. Am. ³ | Total |
| | Central Flyway | Other Survey Total | Canada | Mexico ² | | |
| 1975 | 9,497 | 1,094 | 5,906 | 1,650 | 3,615 | 21,762 |
| 1976 | 7,393 | 637 | 1,636 | 967 | 2,032 | 12,665 |
| 1977 | 12,151 | 471 | 367 | 1,299 | 2,440 | 16,728 |
| 1978 | 10,146 | 239 | 877 | 1,126 | 2,308 | 14,697 |
| 1979 | 10,379 | 517 | 3,799 | 1,470 | 2,807 | 18,972 |
| 1980 | 10,152 | 809 | 5,589 | 1,655 | 3,351 | 21,556 |
| 1981 | 10,134 | 403 | 2,966 | 1,350 | 2,724 | 17,577 |
| 1982 | 7,916 | 1,222 | 2,834 | 1,197 | 2,451 | 15,620 |
| 1983 | 12,959 | 1,557 | 3,088 | 1,760 | 3,501 | 22,865 |
| 1984 | 11,271 | 2,009 | 3,703 | 1,698 | 3,372 | 22,053 |
| 1985 | 12,776 | 1,245 | 5,139 | 1,916 | 3,520 | 24,596 |
| 1986 | 12,487 | 831 | 6,114 | 1,943 | 3,648 | 25,023 |
| 1987 | 12,770 | 1,281 | 5,144 | 1,920 | 3,379 | 24,493 |
| 1988 | 12,772 | 1,540 | 6,948 | 2,126 | 3,751 | 27,137 |
| 1989 | 13,639 | 809 | 4,975 | 1,942 | 3,626 | 24,992 |
| 1990 | 18,041 | 1,291 | 4,835 | 2,417 | 4,228 | 30,811 |
| 1991 | 13,079 | 1,084 | 5,318 | 1,948 | 3,438 | 24,867 |
| 1992 | 12,433 | 833 | 5,939 | 1,921 | 3,198 | 24,323 |
| 1993 | 18,005 | 492 | 2,915 | 2,141 | 3,362 | 26,915 |
| 1994 | 16,201 | 887 | 3,830 | 2,092 | 3,038 | 26,048 |
| 1995 | 20,628 | 1,047 | 5,827 | 2,750 | 4,161 | 34,413 |
| 1996 | 17,111 | 1,397 | 4,312 | 2,282 | 3,609 | 28,711 |
| 1997 | 19,766 | 1,086 | 5,900 | 2,675 | 4,211 | 33,638 |
| 1998 | 19,831 | 1,211 | 9,526 | 3,057 | 4,901 | 38,526 |
| 1999 | 16,969 | 193 ⁴ | 8,400 | 2,556 | 3,947 | 32,065 |
| 2000 | 15,504 | 1,251 | 9,450 | 2,621 | 4,093 | 32,919 |
| 2001 | 15,000 | 1,196 | 8,786 | 2,498 | 4,013 | 31,493 |
| 2002 | 13,087 | 1,133 | 7,947 | 2,217 | 3,446 | 27,830 |
| 2003 ¹ | 18,335 | 648 | 9,585 | 2,857 | 4,246 | 35,671 |
| 2004 ¹ | 14,546 | 794 | 11,037 | 2,638 | 4,165 | 33,179 |
| 2005 ¹ | 18,263 | 790 | 9,876 | 2,893 | 4,512 | 36,334 |
| 2006 ¹ | 17,631 | 760 | 10,417 | 2,881 | 4,864 | 36,552 |
| 2007 ¹ | 18,610 | 1,195 | 11,786 | 3,159 | 4,904 | 39,654 |
| 2008 ¹ | 22,989 | 1,716 | 9,439 | 3,414 | 4,432 | 41,990 |
| 2009 ¹ | 15,282 | 882 | 4,165 | 2,033 | 3,100 | 25,462 |
| 2010 ¹ | 18,812 | 2,708 | 7,331 | 2,885 | 4,400 | 36,136 |
| 2011 ¹ | 14,442 | 1,617 | 9,074 | 2,513 | 3,707 | 31,354 |
| AVERAGES: | | | | | | |
| 1975-79 | 9,913 | 592 | 2,517 | 1,302 | 2,641 | 16,965 |
| 1980-89 | 11,688 | 1,171 | 4,650 | 1,751 | 3,332 | 22,591 |
| 1990-99 | 17,206 | 1,036 | 5,680 | 2,384 | 3,809 | 30,032 |
| 2000-09 | 16,925 | 1,037 | 9,249 | 2,721 | 4,177 | 34,108 |
| 1975-2010 | 14,627 | 1,059 | 5,992 | 2,165 | 3,633 | 27,452 |
| CURRENT YEAR PERCENT CHANGE FROM: | | | | | | |
| 2010 | -23% | -40% | 24% | -13% | -16% | -13% |
| 1975-79 | 46% | 173% | 261% | 93% | 40% | 85% |
| 1980-89 | 24% | 38% | 95% | 44% | 11% | 39% |
| 1990-99 | -16% | 56% | 60% | 5% | -3% | 4% |
| 2000-09 | -15% | 56% | -2% | -8% | -11% | -8% |
| 1975-2010 | -1% | 53% | 51% | 16% | 2% | 14% |

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.

⁴ There is no estimate available for AK in that year.

Table 8. Estimated retrieved harvests of the Rocky Mountain Population of sandhill cranes.

| YR | UT | NM | AZ | WY | MT | ID | TOTAL |
|--|------|------|------|-----|------|------|------------------|
| 1981 | | | 20 | | | | 20 |
| 1982 | | | 9 | 143 | | | 152 |
| 1983 | | | 35 | 154 | | | 189 |
| 1984 | | | 33 | 101 | | | 134 |
| 1985 | | | 40 | 138 | | | 178 |
| 1986 | | | 23 | 195 | | | 218 |
| 1987 | | | 60 | 190 | | | 250 |
| 1988 | | 310 | 40 | 128 | | | 478 |
| 1989 | 54 | 483 | 51 | 125 | | | 713 |
| 1990 | 35 | 79 | 9 | 58 | | | 181 |
| 1991 | 48 | 47 | 44 | 101 | | | 240 |
| 1992 | | 147 | 39 | 168 | 42 | | 396 |
| 1993 | 28 | 297 | 61 | 115 | 45 | | 546 |
| 1994 | 34 | 416 | 27 | 150 | 40 | | 667 |
| 1995 | 27 | 270 | 33 | 77 | 41 | | 448 |
| 1996 | 32 | 236 | 27 | 84 | 49 | 20 | 448 |
| 1997 | 30 | 114 | 22 | 82 | 62 | 136 | 446 |
| 1998 | 34 | 180 | 37 | 93 | 59 | 135 | 538 |
| 1999 | 54 | 198 | 21 | 124 | 71 | 190 | 658 ¹ |
| 2000 | 69 | 257 | 37 | 163 | 91 | 193 | 810 ² |
| 2001 | 77 | 288 | 26 | 142 | 87 | 278 | 898 |
| 2002 | 60 | 164 | 42 | 132 | 51 | 194 | 643 |
| 2003 | 57 | 169 | 34 | 72 | 50 | 146 | 528 |
| 2004 | 53 | 189 | 35 | 124 | 51 | 142 | 594 |
| 2005 | 62 | 236 | 50 | 116 | 49 | 189 | 702 |
| 2006 | 87 | 327 | 10 | 194 | 54 | 235 | 907 |
| 2007 | 103 | 276 | 43 | 138 | 73 | 187 | 820 |
| 2008 | 101 | 379 | 24 | 162 | 85 | 185 | 936 |
| 2009 | 149 | 603 | 67 | 195 | 124 | 254 | 1,392 |
| 2010 | 190 | 547 | 56 | 182 | 108 | 253 | 1,336 |
| 2011 ³ | 154 | 522 | 37 | 166 | 90 | 293 | 1,262 |
| AVERAGES: | | | | | | | |
| 1981-89 | 54 | 397 | 35 | 147 | | | 259 |
| 1990-99 | 36 | 198 | 32 | 105 | 51 | 120 | 457 |
| 2000-09 | 82 | 289 | 37 | 144 | 72 | 200 | 823 |
| 1981-2010 | 66 | 270 | 35 | 133 | 65 | 182 | 549 |
| CURRENT YEAR PERCENT CHANGE FROM: | | | | | | | |
| 2010 | -19% | -5% | -34% | -9% | -17% | 16% | -6% |
| 1981-89 | | 32% | 7% | 13% | | | 387% |
| 1990-99 | 330% | 163% | 16% | 58% | 76% | 144% | 176% |
| 2000-09 | 88% | 81% | 1% | 15% | 26% | 46% | 53% |
| 1981-2010 | 134% | 93% | 5% | 25% | 39% | 61% | 130% |

¹ RMP Sandhill cranes (40) were also taken as part of research project in the San Luis Valley, CO

² RMP Sandhill cranes (20) were also taken as part of research project in the San Luis Valley, CO

³ Harvest includes crippling loss.

Table 9. Spring population indices for Rocky Mountain sandhill cranes, 1984-96.

| YR | SAN LUIS VALLEY, COLORADO | | | | | SURVEY COND. |
|------|---------------------------|---------------------------------|--------------------------------|-------------|--------|--------------|
| | RAW COUNT | ADJ. FOR EST. BIAS ¹ | ADJ. TO REM. LES. ² | OTHER AREAS | INDEX | |
| 1984 | 10,962 | 14,488 | 13,562 | 550 | 14,112 | POOR |
| 1985 | 18,393 | 21,773 | 20,382 | 0 | 20,382 | GOOD |
| 1986 | 14,031 | 14,031 | 13,135 | 20 | 13,155 | POOR |
| 1987 | 13,561 | 15,661 | 14,660 | 0 | 14,660 | POOR |
| 1988 | 17,510 | 17,510 | 16,381 | 22 | 16,403 | POOR |
| 1989 | 17,302 | 18,389 | 17,004 | 0 | 17,004 | GOOD |
| 1990 | 20,851 | 24,593 | 21,221 | 275 | 21,496 | GOOD |
| 1991 | 19,990 | 18,405 | 16,045 | 175 | 16,220 | GOOD |
| 1992 | 23,516 | 23,516 | 19,999 | 9 | 20,008 | GROUND |
| 1993 | 17,576 | 17,576 | 16,478 | 1,260 | 17,738 | POOR |
| 1994 | 17,229 | 16,036 | 15,063 | 203 | 15,266 | FAIR |
| 1995 | 25,276 | 23,390 | 20,229 | 0 | 20,229 | GOOD |
| 1996 | 23,019 | 26,379 | 22,737 | 1,010 | 23,747 | GOOD |

¹ Raw estimate adjusted by photography for estimation bias

² Population estimate adjusted to remove the number of lesser sandhill cranes (non-RMP cranes).

Table 10. Fall pre-migration population indices for Rocky Mountain sandhill cranes.

| YR | UT | CO | ID | WY | MT | TOTAL | 3-YR AVG |
|---------------------|-------|-------|--------|-------|-------|--------|----------|
| 1987 | 1,578 | 1,443 | 10,686 | 2,327 | 1,447 | 17,481 | |
| 1992 | 2,810 | 3,181 | 5,801 | 2,248 | 5,264 | 19,304 | |
| 1995 | 1,528 | 2,284 | 6,864 | 1,671 | 3,681 | 16,028 | |
| 1996 | 1,849 | 1,255 | 8,334 | 2,526 | 2,974 | 16,938 | |
| 1997 ^{1,2} | 2,450 | 1,604 | 8,132 | 2,255 | 3,595 | 18,036 | 17,001 |
| 1998 | 2,185 | 1,273 | 8,067 | 3,162 | 3,415 | 18,102 | 17,692 |
| 1999 | 2,292 | 1,102 | 8,761 | 4,205 | 3,141 | 19,501 | 18,546 |
| 2000 | 2,416 | 749 | 9,337 | 3,890 | 3,598 | 19,990 | 19,198 |
| 2001 | 1,522 | 666 | 7,160 | 2,626 | 4,585 | 16,559 | 18,683 |
| 2002 | 1,869 | 1,355 | 7,698 | 3,038 | 4,843 | 18,803 | 18,451 |
| 2003 | 2,546 | 745 | 7,822 | 3,446 | 4,964 | 19,523 | 18,295 |
| 2004 | 2,239 | 1,410 | 7,152 | 3,072 | 4,637 | 18,510 | 18,945 |
| 2005 | 2,646 | 1,052 | 7,668 | 3,911 | 5,588 | 20,865 | 19,633 |
| 2006 ³ | | | | | | NS | 19,633 |
| 2007 ⁴ | 2,401 | 1,743 | 8,262 | 3,907 | 6,509 | 22,822 | 20,732 |
| 2008 ⁵ | 3,708 | 1,080 | 6,123 | 3,826 | 6,419 | 21,156 | 21,614 |
| 2009 | 2,283 | 1,162 | 6,934 | 3,613 | 6,329 | 20,321 | 21,433 |
| 2010 | 3,242 | 985 | 5,776 | 3,726 | 7,335 | 21,064 | 20,847 |
| 2011 | 1,498 | 1,347 | 5,029 | 2,978 | 6,642 | 17,494 | 19,626 |

¹ Incomplete survey efforts in years prior might have resulted in lower estimates; the official count begins in 1997.

06/13/12

² In October 1997, a special survey was also conducted in the SLV, Colorado and other areas, which resulted in a total of 27,090 Rocky Mountain and Mid-Continent cranes being counted.

³ In 2006, the survey was not conducted due to mechanical issues with the survey plane. The 3-yr Avg for 2006 is calculated using 2003-05.

⁴ The 3-yr average for 2007 was calculated using 2004, 2005, and 2007 because there was no survey in 2006.

⁵ The 3-yr average for 2008 was calculated using 2005, 2007, and 2008 because there was no survey in 2006.

Table 11. Winter counts of Lower Colorado River Valley Population of sandhill cranes in Arizona and California.

| YR | Cibola NWR | Colorado River Indian Tribe | Salton Sea NWR | Gila River | TOTAL | 3-YR AVG |
|-------------------|-------------------|------------------------------------|-----------------------|-------------------|--------------|-----------------|
| 1998 | 775 | 596 | 351 | 178 | 1,900 | |
| 1999 | 1,200 | 511 | 325 | 163 | 2,199 | |
| 2000 | 820 | 1,259 | 235 | 252 | 2,566 | 2,222 |
| 2001 | 961 | 952 | 350 | 134 | 2,397 | 2,387 |
| 2002 | 1,003 | 168 | 417 | 52 | 1,640 | 2,201 |
| 2003 | 1,200 | 455 | 430 | 0 | 2,085 | 2,041 |
| 2004 | 1,341 | 354 | 521 | 312 | 2,528 | 2,084 |
| 2005 | 1,513 | 457 | 476 | 191 | 2,637 | 2,417 |
| 2006 | 1,141 | 673 | 493 | 360 | 2,667 | 2,611 |
| 2007 | 2,322 | 809 | 295 | 450 | 3,876 | 3,060 |
| 2008 ¹ | 115 | NS | 687 | 413 | 1,215 | 3,060 |
| 2009 ² | 289 | 1216 | 603 | 293 | 2,401 | 2,981 |
| 2010 ³ | 266 | 729 | 904 | 365 | 2,264 | 2,847 |
| 2011 | 553 | 636 | 899 | 327 | 2,415 | 2,360 |
| 2012 | 1,097 | 474 | 924 | 151 | 2,646 | 2,442 |

NS = No survey was conducted.

06/13/12

¹ In 2008, the survey was not complete. The 3-YR average for that year was calculated using 2005-07.

² In 2009, the 3-YR average was calculated with 2006, 2007 and 2009 due to an incomplete survey in 2008.

³ In 2010, the 3-YR average was calculated with 2007, 2009, and 2010 due to an incomplete survey in 2008.

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Table 12. Fall index survey for Eastern Population of sandhill cranes.

| YR | TOTAL | 3-YR AVG |
|-------------------|--------------|-----------------|
| 1979 | 14,385 | |
| 1980 | 15,808 | |
| 1981 | 11,943 | 14,045 |
| 1982 | 13,879 | 13,877 |
| 1983 | 14,898 | 13,573 |
| 1984 | 16,363 | 15,047 |
| 1985 | 16,170 | 15,810 |
| 1986 | 17,043 | 16,525 |
| 1987 | 22,342 | 18,518 |
| 1988 | 16,086 | 18,490 |
| 1989 | 22,785 | 20,404 |
| 1990 | 23,852 | 20,908 |
| 1991 | 26,156 | 24,264 |
| 1992 | 26,656 | 25,555 |
| 1993 | 26,187 | 26,333 |
| 1994 | 26,783 | 26,542 |
| 1995 | 33,774 | 28,915 |
| 1996 | 29,753 | 30,103 |
| 1997 | 29,448 | 30,992 |
| 1998 | 37,827 | 32,343 |
| 1999 | 33,583 | 33,619 |
| 2000 | 33,105 | 34,838 |
| 2001 ¹ | NS | 34,838 |
| 2002 ² | 31,575 | 32,754 |
| 2003 ³ | 29,300 | 31,327 |
| 2004 | 28,947 | 29,941 |
| 2005 | 37,708 | 31,985 |
| 2006 | 37,529 | 34,728 |
| 2007 | 35,945 | 37,061 |
| 2008 | 44,110 | 39,195 |
| 2009 | 59,876 | 46,644 |
| 2010 | 49,666 | 51,217 |
| 2011 | 72,233 | 60,592 |

NS = No survey conducted

06/13/12

¹ In 2001, the survey was not conducted. The 3-YR average for that year was calculated using 1998-2000.

² In 2002, the 3-YR average was calculated with 1999, 2000 and 2002 since the survey was not conducted in 2001.

³ In 2003, the 3-YR average was calculated with 2000, 2002 and 2003 since the survey was not conducted in 2001.

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