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TRENDS IN SANDHILL CRANE NUMBERS IN EASTERN NEW MEXICO

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Abstract: Following a 1980s decline in the number of cranes in the Bitter Lake National Wildlife Refuge area of the Pecos River Valley in eastern New Mexico, peak fall migration numbers increased from 5,640 in 1989-90 to 15,790 in 2003-04 and 13,650 in 2004-05. Concurrently, hectares of corn grown for silage to feed dairy cows increased from 1,781 in 1989 to 8,013 in 2003 and 7,325 in 2004. The population goals of the NM Department of Game and Fish are being met but a downturn in the dairy industry could result in a decline in crane numbers.

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Key words: Bitter Lake NWR, corn, counts, dairy, food, New Mexico cranes.

Annual peak counts of sandhill cranes (*Grus canadensis*) recorded at Bitter Lake National Wildlife Refuge near Roswell in eastern New Mexico fell from 54,000 in 1979 to 6,000 in 1988 (Bitter Lake NWR Annual Narrative Reports 1979-1988, Montgomery 1997). Hectares of corn and sorghum grown in the region also declined from 2,550 to 1,740 and 2,833 to 405, respectively and Montgomery (1997) concluded that the decline in crane numbers resulted from a reduction in available food. This report documents a subsequent steady increase in crane numbers during the next 16 years with a concurrent increase in hectares of corn.

STUDY AREA

Bitter Lake National Wildlife Refuge (Long. -104.523, Lat. 33.392) and the city of Roswell (Long. -104.406, Lat. 33.489) are in the Pecos River Valley in Chaves County, New Mexico, where a northern extension of Chihuahuan desert merges with shortgrass prairie. Bitter Lake (a natural playa basin) and refuge impoundments, spring-fed shallow ponds on the Bureau of Land Management Overflow Wetlands, and temporary ponds on private land provided roosting sites for migrating and wintering cranes. Within the region, alfalfa, corn (98% for silage instead of grain), wheat and hay crops, sorghum, cotton, and chile peppers were grown on approximately 40,000 ha of irrigated farmland.

METHODS

From 1989-90 through 2004-05, U.S. Fish and Wildlife Service personnel and volunteers made weekly morning counts of cranes departing roosts within the refuge boundaries and the author made concurrent previous evening (arriving) and morning counts at roosts away from the refuge. When adverse weather or absence of observers prevented scheduled counts, estimates or counts were made on the following day. The “fall migration peak” was the highest total number counted during fall migration (late October

Table 1. Peak crane numbers in the Roswell area and agricultural statistics^a for Chaves County, New Mexico: 1989–2004.

Year	Crane peak numbers		ha of corn	ha of alfalfa	Dairy cows
	Fall	Spring			
1989–90	5,640	4,800	1,781	18,211	12,000
1990–91	6,610	6,920	2,428	20,630	19,000
1991–92	8,030	7,160	2,428	22,258	34,000
1992–93	6,760	3,210	2,529	21,449	39,500
1999–94	8,880	7,780	2,752	21,408	49,000
1994–95	6,890	3,950	3,845	18,009	66,000
1995–96	10,350	7,060	3,116	17,762	70,000
1996–97	8,410	8,190	2,307	18,211	70,000
1997–98	10,900	4,390	2,873	15,297	72,000
1998–99	8,070	3,600	3,642	17,402	75,000
1999–00	9,300	7,020	5,059	20,235	76,000
2000–01	9,320	5,340	6,516	20,235	83,000
2001–02	11,000	4,790	5,261	18,211	83,000
2002–03	9,660	4,120	7,042	19,245	86,000
2003–04	15,790	6,860	8,013	12,546	86,000
2004–05	13,650	8,540	7,325	12,546	87,000
<i>b</i> ^b	449	30	391	-376	4,801
<i>t</i> ^c	5.221***	0.302	7.886***	-2.938*	9.469***

^aStatistics were obtained from New Mexico Agricultural Statistics Service.

^bThe symbol *b* is the regression coefficient.

^cStudent’s *t* test of the significance of *b*.

* $t_{.05 [1,14]} = 2.145$. ** $t_{.01 [1,14]} = 2.997$, *** $t_{.001 [1,14]} = 4.140$

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through November) and the “spring migration peak” was the highest count from the last week of January through March. Regression coefficients from linear regression analyses of annual fall and spring peak crane numbers, hectares of corn and alfalfa, and numbers of dairy cows were tested for significance by Student’s *t* tests. Agriculture data were obtained from crop reports published annually by the New Mexico Agricultural Statistics Service in Las Cruces, NM. Associations between crane peak numbers and estimates of food production (hectares of corn, and alfalfa) and between numbers of dairy cows and food production were tested by computing correlation coefficients (Sokal and Rohlf 1969). To identify trends during the fall migration, averages of weekly counts from 7-13 October through 23-29 December were determined for three periods: 1989-1993, 1994-1999, and 2000-2004. Regression coefficients of the averages from weeks 4-10 November through December were calculated to determine if significant declines in crane numbers occurred after the fall peak.

RESULTS

During the 16 seasons covered in this study the fall migration peak numbers increased significantly from 5,640 in 1989 to 13,650 in 2004 (Table 1). At the same time the spring peak migration numbers did not show a significant trend (Table 1). During the same period, dairy cows increased

from 12,000 to 87,000 ($t = 9.469$, $P < 0.001$) and, although sorghum is an important crane food resource (Boeker et al. 1961, Montgomery 1997, Walker and Schemnitz 1985), sorghum was a minor crop ($\bar{x} = 680$ ha) in the study area and showed no annual trend or correlations with cranes or dairy cow numbers. Therefore, sorghum was not included in this report.

Hectares of corn planted (98% grown for silage) quadrupled during the study from 1,781 to 7,325 ($t = 7.886$, $P < 0.001$, Table 1). Fall crane peak numbers and numbers of dairy cows were positively correlated with ha of corn ($r = 0.758$, $P < 0.01$ and $r = 0.762$, $P < 0.01$) and were negatively correlated with ha of alfalfa ($r = -0.816$, $P < .01$ and $r = -0.641$, $P < 0.01$, Table 1). Spring crane peak numbers were not significantly correlated with either ha of corn or alfalfa ($r = 0.076$ and $r = -0.102$). Fall migration crane numbers typically peaked during the first week of November. Average crane numbers in the period 1989-1993 remained relatively constant through December, but crane numbers fell by an average of 360 per week from November through December 1994-1999 and by an average of 765 per week during 2000-2004 (Table 2). Despite higher peak numbers, the average number of cranes (5,640) remaining in the Roswell area at the end of December during the years 2000-2004 was less than the average (6,106) that remained during the 1989-1993 period (Table 2).

Table 2. Average weekly crane numbers (both refuge and off-refuge counts) during three periods: 1989–1993, 1994–1999, and 2000–2004. Regression coefficients are for the count weeks 4–10 November through 23–29 December.

Count week	1989 – 1993	1994 – 1999	2000 – 2004
	Mean and (SE)	Mean and (SE)	Mean and (SE)
7 Oct. – 13 Oct.	1,280 (263)	993 (736)	1,370 (663)
14 Oct. – 20 Oct.	3,193 (901)	2,225 (818)	6,312 (1,052)
21 Oct. – 27 Oct.	3,394 (807)	6,443 (959)	8,626 (835)
28 Oct. – 3 Nov.	6,522 (445)	7,147 (687)	10,442 (1,442)
4 Nov. – 10 Nov.	6,118 (525)	7,745 (884)	10,998 (1,209)
11 Nov. – 17 Nov.	6,480 (285)	7,397 (732)	9,424 (669)
18 Nov. – 24 Nov.	5,754 (1,034)	7,278 (959)	7,864 (927)
25 Nov – 1 Dec.	5,550 (652)	6,953 (705)	7,606 (1,325)
2 Dec. – 8 Dec.	6,028 (933)	6,727 (960)	7,458 (1,139)
9 Dec. – 15 Dec.	5,860 (863)	6,203 (555)	8,304 (1,386)
16 Dec. – 22 Dec.	6,400 (1,135)	6,603 (942)	6,898 (1,580)
23 Dec. – 29 Dec.	6,106 (1,123)	5,218 (548)	5,640 (1,571)
<i>b</i> ^a	4	-299	582
<i>t</i> ^b	0.077 n.s.	-5.980***	-4.583**

^aThe symbol *b* is the regression coefficient for count weeks 4-10 November through 23-29 December.

^bStudent’s *t* test of the significance of *b*. * $t_{.05 [1,6]} = 2.447$, ** $t_{.01 [1,6]} = 3.707$, *** $t_{.01 [1,6]} = 5.959$

DISCUSSION

Mitchusson (2003) suggested that the 1980's decline in crane numbers in eastern New Mexico resulted from a shift to areas with more favorable habitat. The 1980's decline at Bitter Lake NWR was correlated with available food (Montgomery 1997), which is one component of habitat quality. Supporting this conclusion was the significant correlation of the steady increase in crane numbers from 1989 through 2004 with the concurrent increase in hectares of corn grown for silage to support the expanding dairy industry in Chaves County. Alfalfa fields were important for foraging and loafing, but the negative correlation with crane peak numbers during the fall indicated this resource was not a limiting factor. Food availability may have become a factor during the latter years when migrating crane numbers increased. The November through December decline, which became more pronounced in 2000-2004, suggests that the amount of food in the Roswell area was not sufficient to maintain the additional numbers for more than several weeks.

MANAGEMENT IMPLICATIONS

Crane peak numbers were significantly correlated with the hectares of corn grown to support the local dairy industry as the hectares of corn correlated positively with the number of dairy cows. When the dairy industry expanded, the number of cranes in the Roswell area increased. Therefore, a downturn in the dairy industry leading to reduced corn silage production would likely result in a decline in crane numbers if farmers did not switch to another crane food-producing crop. The New Mexico Department of Game and Fish long range crane management plan (Mitchusson 2003) called for migration and wintering peak populations in the Pecos Valley of 10,000 in 2003, 11,000 in 2004, and 15,000 by 2007. These goals are currently being met, but if corn production falls to late 1980s levels and is not replaced with a similar

crop, additional supplemental food planted by state and federal wildlife management agencies would be necessary to maintain the target population numbers. Another possibility could be cooperative agreements with farmers to grow food specifically for cranes.

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