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James B. Montgomery, Jr.

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# TEMPORAL PATTERNS OF SANDHILL CRANE USE OF THE PECOS RIVER VALLEY, CHAVES COUNTY, NEW MEXICO

JAMES B. MONTGOMERY, JR.,<sup>1,2</sup> Volunteer, Bitter Lake National Wildlife Refuge, 4200 East Pine Lodge Road, Roswell, NM 88201, USA

**Abstract:** The Pecos River Valley is an important stopover area for both migrating and wintering sandhill cranes (*Grus canadensis*) in southeastern New Mexico. The combination of shallow impoundments and a playa lake at Bitter Lake National Wildlife Refuge, off-refuge shallow ponds and riverine wetlands, and approximately 20,000 ha of nearby irrigated farmlands in Chaves County provided roosting and foraging areas used by the cranes. Once per week sandhill cranes were counted when departing their roosts during September through April 2005-2024. The fall migration during October and November peaked at  $24,431 \pm 204$  (SE). During this peak period, cranes divided foraging between corn stubble and green crops; the large numbers presumably consumed most of the available food resources. From December on, cranes primarily used fields with green crops and some alfalfa fields. After the peak, crane numbers fell by 1,200 birds per week to  $4,696 \pm 729$  in late January and further to  $3,182 \pm 682$  in late February. This winter decline indicated agricultural food resources in Chaves County are important for cranes in fall but are not sufficient to support large numbers of cranes through the entire winter.

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**Key Words:** sandhill crane, *Grus canadensis*, southeastern New Mexico, farming practices, insufficient food, winter.

The Pecos River Valley of southeastern New Mexico, USA, has been recognized as a migration route and wintering area for sandhill cranes (*Grus canadensis*) since the 1940s (Ligon 1961, Mitchusson 2003, Montgomery 1997, Walkinshaw 1949). The number of cranes using this region has varied over time, both within and between years. Walkinshaw (1949) reported 5,800 cranes at Bitter Lake National Wildlife Refuge (NWR) in Chaves County, New Mexico, in December 1942. He also reported 11,000 in March 1943, and 8,000 in November 1943. Boeker et al. (1961) counted 10,229 to 16,706 cranes at 4 roosts in Chaves County in December 1960. Crane peak numbers recorded in unpublished Bitter Lake NWR annual refuge narratives averaged  $41,075 \pm 6,414$  (SE) between 1969 and 1979 when corn and sorghum grain production was much higher than today (Montgomery 1997). Peak numbers at Bitter Lake NWR then fell from 32,200 in 1980 to 6,000 in 1988. Peak numbers in Chaves County (Bitter Lake NWR plus off-refuge roost sites) then increased from 5,640 in 1989 to 13,560 in 2004 (Montgomery 2008). The objectives of this study were to monitor sandhill crane numbers in Chaves County and relate these data to agricultural crops and practices and field use by the cranes over time.

Bitter Lake NWR and the city of Roswell in Chaves County (Fig. 1) lie within an “island” of farmland

surrounded by grass and brushland 160 km southwest of Muleshoe NWR in west Texas, which is another important crane migration and wintering area. The combination of shallow impoundments and a playa lake at Bitter Lake NWR, ponds on the Bureau of Land Management (BLM) Overflow Wetlands south of the Bitter Lake NWR, and ponds along the Pecos River with approximately 20,135 ha of irrigated farmland provide resources for both migrating and wintering cranes. Agricultural practices included disking the corn and sorghum stubble within weeks after the fall harvest and planting winter wheat, barley, or triticale (e.g., green crops). Very few stubble fields remained by December, in contrast to the early 1990s when green crops were not routinely planted and corn stubble remained through the winter (Montgomery 1997).



Figure 1. Location of Roswell, New Mexico, and Bitter Lake National Wildlife Refuge in Chaves County, southeastern New Mexico, USA.

<sup>1</sup> E-mail: braxtol@gmail.com

<sup>2</sup> Present address: 250 East Alameda, Apt. 712, Santa Fe, NM 87501

Although not included in my study area, a smaller nearby crane-use area is centered around Artesia in Eddy County, New Mexico, 65 km south of Roswell (Fig. 1). The William S. Huey Wildlife Management Area, which has crops for cranes and ponds for roosting, is located northeast of Artesia. The Eddy County area consisted of 8,550 ha of cultivated and 6,210 ha of fallow or idle farmland in 2023 (USDA CroplandCROS). Brautigam (2021) designated these 2 wintering landscapes in Chaves and Eddy Counties as “Areas of Importance” for migrating and wintering sandhill cranes.

From late September through April, 2005-06 to 2023-24, U.S. Fish and Wildlife Service personnel and refuge volunteers conducted weekly morning counts of sandhill cranes departing roosts at Bitter Lake NWR and volunteers did evening (arrival) and morning (departure) counts at off-refuge roosts. Counts or estimates were made on the following day when adverse weather conditions prevented scheduled counts. The fall peak number was the highest combined weekly count occurring between October and December. Estimates of total crane use in Chaves County, expressed as crane-use-days (CUDs), were made by multiplying the sum of the weekly counts times 7 days.

Crop data for Chaves County were obtained from New Mexico annual agricultural statistics reports (2005-2007) and from satellite imagery (USDA CroplandCROS, 2008-2023). Three-year averages (2021-2023) of relevant crops in Chaves County were  $10,616 \pm 355$  ha of alfalfa,  $7,243 \pm 594$  ha of corn grown for silage (not for grain),  $392 \pm 230$  ha of sorghum varieties baled or grown for silage, and  $284 \pm 113$  ha of cotton. Correlation coefficients ( $r$ ) were calculated for the annual fall peak counts and CUDs with hectares of alfalfa, corn, sorghum and hectares of corn plus sorghum. Because sorghum data were not available for 2005-2007, only data from 2008-2023 ( $n = 16$ ) were used for the calculations.

Observations of agricultural field use by cranes were obtained by scanning fields while driving through farmlands from October through March 2021-22 to 2023-24. Two to 4 nonrandom searches per week were

made between 2 hours after sunrise and 2 hours before sunset. The county road network did not accommodate a random search pattern and some fields could not be observed from a public road. However, an effort was made to scan a variety of field types during each search. When cranes were located in a field, their number was counted or estimated and the field was classified as: Corn Stubble (both before and after disking), Green Crop (winter wheat, triticale, or barley, both sprouting or established), Alfalfa, Former Sorghum, Former Cotton (lightly tilled with dead plants removed), Strip of Uncut Corn Stalks, Fallow or Grassland, Tilled (without sprouting plants), Dairy (both within or next to the cow pens), and Pecan Trees (cranes standing under the trees adjacent to another field type). Three-year averages of observations (1 observation = 1 crane) for each month were calculated and converted into percentages within each field type for comparisons.

An increase in peak numbers of sandhill cranes from 5,640 in 1989 to 13,630 in 2004 was associated with an increase from 1,781 ha to 7,356 ha of corn grown for silage (Montgomery 2008). The 2005 peak count of 22,000 sandhill cranes (Table 1) was 61% higher than in the previous year (13,630). Peak counts then averaged  $24,431 \pm 1,201$  through 2023 (Table 1), while corn averaged  $7,011 \pm 175$  ha from 2005-2023 and did not increase during this period. Likewise, hectares of alfalfa and sorghum remained relatively constant. Food was a factor; CUDs showed a positive correlation ( $n = 16$ ,  $r = 0.603$ ,  $P < 0.05$ ) with combined hectares of corn and sorghum (Table 2). Average weekly crane numbers increased during the fall migration to an average  $20,267 \pm 1,037$  by the end of October (Fig. 2) and then fell by 1,200 birds per week to an average  $4,696 \pm 720$  by late January, a 76.8% decline. Average numbers continued to decline to  $3,876 \pm 791$  and  $3,182 \pm 682$ , respectively, during the last 2 weeks of February. This contrasts with a 46.6% decline during 1989-90 to 2004-05 from an average  $8,250 \pm 707$  at the beginning of November to  $4,403 \pm 331$  at the end of January. Average numbers continued to fall to  $4,726 \pm 448$  and  $4,047 \pm 475$  during the last 2 weeks of February.

**Table 1. Annual peak numbers of sandhill cranes, hectares of selected crops, and crane-use-days in Chaves County, New Mexico, USA, 2005-06 to 2023-24.**

Year	Crane peak count	Crane-use-days	Alfalfa (ha)	Corn (ha)	Sorghum (ha)	Corn + Sorghum (ha)
2005-06	22,000	1,834,140	12,546	7,608		data not available
2006-07	20,250	1,261,610	12,141	6,880		
2007-08	24,620	1,663,620	14,569	7,123		
2008-09	23,050	1,425,130	10,292	7,871	654	8,525
2009-10	24,510	1,991,850	9,127	7,991	1,320	9,311
2010-11	28,100	1,907,290	12,023	7,165	645	7,810
2011-12	30,020	1,490,020	9,629	6,825	1,139	7,964
2012-13	32,000	1,721,440	9,239	6,006	2,292	8,208
2013-14	20,340	1,386,310	9,662	5,836	1,631	7,467
2014-15	24,720	1,586,340	8,970	6,173	783	6,956
2015-16	25,430	1,045,170	9,901	6,447	436	6,883
2016-17	18,040	1,539,300	9,602	8,257	240	8,497
2017-18	29,930	1,445,360	10,321	7,282	29	7,311
2018-19	26,390	1,209,530	11,234	5,990	566	6,556
2019-20	23,820	1,266,510	10,748	7,002	868	7,870
2020-21	26,380	1,361,640	10,039	7,020	863	7,883
2021-22	17,880	1,794,660	10,114	7,758	1,063	8,821
2022-23	34,020	1,256,010	10,431	7,912	437	8,349
2023-24	12,740	680,470	11,303	6,058	1,175	7,233
Mean	24,434	1,466,653	10,626	7,011	884	7,853
SE	1,204	73,438	323	175	140	189

**Table 2. Correlations (r) between crops and peak counts and crane use-days in Chaves County, New Mexico, USA, 2008-09 to 2023-24.**

	Alfalfa (ha)	Corn (ha)	Sorghum (ha)	Corn + Sorghum (ha)
Peak counts (2008-09 to 2023-24)	-0.093	0.022	-0.044	-0.019
Crane use-days (2008-09 to 2023-24)	-0.328	0.411	0.217	0.598 <sup>a</sup>

<sup>a</sup>  $P < 0.05$ ,  $r_{[1,14]} = 0.497$

Field use by the cranes (Table 3) during fall migration (specifically October and November) was concentrated in corn stubble and in green crops that were planted over the stubble. By December most of the stubble was replaced with established green crops and the cranes were also using other fields. Generally, flocks used a particular field for one to several weeks and then concentrated in another field. For example, during December of both 2021 and 2022 approximately 5,000 cranes foraged in fields where sorghum varieties had been cut and baled. Cotton was harvested in late December and January 2023.

Flocks were subsequently observed foraging in former cotton fields that were lightly tilled (with some planted in a green crop). For a week during February of all 3 years, the 1,000 or so cranes still roosting at Bitter Lake NWR discovered a strip of uncut corn stalks left after the field was harvested. During late winter, up to 100 cranes fed daily on spilled corn silage at a local dairy. However, fields with green crops or dry alfalfa still received the most use from January to March.

There is no clear explanation for the large increase in the fall peak numbers beginning in 2005 (Table 1). Except for fluctuations between years, hectares of corn and sorghum did not show corresponding increases and correlations with peak numbers and these crops showed no significance (Table 2). In contrast, the increases in

peak numbers from 1989 to 2004 were significantly correlated ( $n = 16$ ,  $r = 0.758$ ,  $P < 0.01$ ), with increases in hectares of corn (Montgomery 2008). The sizes of the fall peaks during 2005-2023 may be related to the numbers of cranes present at Muleshoe NWR in West Texas or other wintering areas. For instance, the fall peak of 12,710 in 2003 was the lowest in 19 years. Concurrently, the number of cranes at Muleshoe NWR was much lower than usual (J. Smith, Muleshoe NWR manager, personal communication). Conversely, the number of cranes at Muleshoe NWR during the previous year was approximately 60,000 (N. Pope, Muleshoe NWR technician, personal communication) and the peak count in Chaves County was 32,020.

The large weekly decline in crane numbers during November (Fig. 2) was, in part, due to birds migrating on to Mexico or other regions. Two of the 3 cranes that K. Brautigam (personal communication) tracked from Texas into New Mexico moved through Chaves County en route to Mexico during October and November. Hunting disturbances may have caused some cranes to leave. The waterfowl and sandhill crane hunting seasons open around the end of October and run through most of January. Boeker et al. (1961) noted a large number of cranes departed eastern New Mexico after the start of the experimental crane hunting season. Water conditions were not a factor as the important roosting areas in Chaves County had sufficient water throughout this study.

**Table 3. Field use (%) by sandhill cranes in Chaves County, New Mexico from 2021-02 to 2023-24.**

Field type	Percent of field use by month					
	Oct	Nov	Dec	Jan	Feb	Mar
Corn stubble	47.8	32.3	2.0	0.3	0	3.3
Green crop	43.3	58.4	28.3	46.2	71.9	62.5
Alfalfa	6.8	9.2	16.4	31.3	7.3	18.5
Former sorghum	0	0	44.9	0.7	0.3	2.1
Former cotton	0	0	0.5	13.8	0.1	0
Strip of corn stalks	0	0	0	0.8	10.1	0
Fallow or grassland	0	0.1	1.9	2.1	0	11.7
Tilled	2.1	0	5.8	0	1.1	0
Dairy	0	0	0.1	3.5	1.9	2.4
Pecan trees	0	0	0.1	1.3	0.1	0
3-yr avg. no. cranes observed <sup>a</sup>	26,458	62,936	17,804	10,907	21,003	8,363

<sup>a</sup> One observation is 1 crane in 1 field

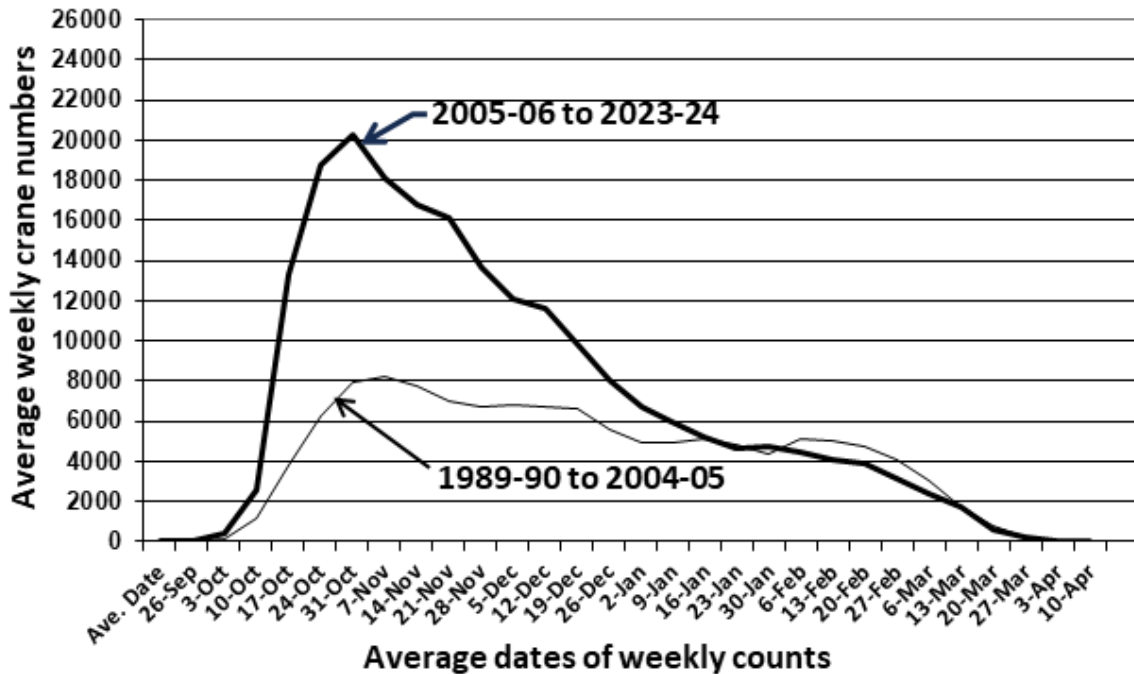


Figure 2. Crane numbers in Chaves County, New Mexico, USA. Weekly averages from 2005-06 through 2023-24 (bold line) and 1989-90 to 2004-05 (light line). Dates are the average date of each count week.

The significant positive correlation between CUDs and hectares of corn plus sorghum point to food as a factor in retention of cranes into winter months. The 76.8% decline in weekly crane numbers began in November when most stubble fields were being replaced with green crops and the large numbers of cranes were presumably depleting much of the available food. This suggested food resources in green crops and alfalfa fields were not sufficient to maintain large numbers of cranes through the winter. However, these resources did support a declining population through March. The continued decline from November through January was most likely due to cranes leaving in search of regions with more food, such as the W. S. Huey Wildlife Management Area in Eddy County, New Mexico (J. B. Montgomery, personal observation), or perhaps back to Texas. Cranes returning to Texas is suggested by the third crane that K. Brautigam tracked back to Texas in December, and the observed large increases in crane numbers in West Texas between January and mid-February by Iverson et al. (1985).

Except for 2021-22 when 16,770 and 14,200 cranes were counted during the last 2 weeks of February,

the low late-winter numbers (Fig. 2) showed Chaves County and Bitter Lake NWR were not an important spring migration stopover site. Migrating cranes were routinely seen or heard flying over the refuge during February and March, but only small numbers (<100) were observed standing by the impoundments at Bitter Lake NWR during mid-afternoon. In contrast, hundreds of fall-migrating cranes could be observed standing on the refuge and BLM Overflow Wetlands by mid-day in October and November (J. B. Montgomery, personal observation).

In summary, Chaves County and Bitter Lake NWR provide an important fall migration stopover habitat, but the agricultural-based resources are not sufficient to sustain a large crane population through the winter. This area is not important as a spring migration stopover site. If the resource base changes in the future, as it has in the past, this pattern can be expected to change.

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