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## Sandhill Crane Activity in the Central Platte River Valley in Late May and Early June

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The Central Platte River Valley (CPRV) between Chapman and Overton, Nebraska, served as a regular breeding grounds for Sandhill Cranes (*Antigone canadensis*) until the early 1900s (Silcock and Jorgensen 2018). Sandhill Cranes nest in shallow wetlands with emergent herbaceous vegetation and avoid forested habitats (Baker et al. 1995). Due to habitat loss and fragmentation, the mid-continent population no longer breeds in much of its former range in the Great Plains (Sharpe et al. 2001). Historic nesting records from the central and northern Great Plains of the United States suggest that on average Greater Sandhill Cranes (*A. c. tabida*) laid eggs by the middle of May (Walkinshaw 1973). Caven and Brinley Buckley (2017) recently observed Sandhill Cranes copulating on 09 March 2017 in the CPRV, which is a behavior generally reserved for near or on the breeding grounds, suggesting potential regional breeding (Tacha et al. 1992). Additionally, within the last 20 years nesting records have again been reported in Nebraska and adjacent states (Silcock and Jorgensen 2018).

The CPRV also serves as a crucial staging area for approximately 80% of the mid-continent Sandhill Crane population (USFWS 1981). Sandhill Cranes arrive in late February or early March and stay for about 4 weeks to build fat reserves before continuing north between late-March and mid-April (USFWS 1981, Krapu et al. 2014). As Melvin and Temple (1981) note, stopover length for individual Sandhill Cranes is governed by a combination of factors, including weather patterns, the physiological condition and dietary needs of birds, and habitat conditions at the stopover site. In this report we discuss observations of Sandhill Cranes remaining in the CPRV until early June 2018 and discuss potential explanations for this extended stay into the breeding season.

### Methods

We first detected Sandhill Cranes while conducting land management work on 15 May 2018. Observational data were recorded on their behavior until 23 May 2018 (n = 5 obs.) when we began systematically collecting behavioral data utilizing instantaneous scan sampling (Altmann 1974; n = 5 obs.). Every three minutes we recorded what behaviors the cranes were exhibiting. If there were multiple cranes displaying different behaviors, all behaviors were recorded as present during that scan. Behavior was categorized into six classes: (1) foraging, which includes food searching

behavior, (2) social, which includes all dancing, pair bonding, intraspecific aggression, or copulatory behavior, (3) physical maintenance, which includes preening feathers, bathing, and related activities, (4) alert-defensive, which includes alarm calls, wing-spread displays, or bill-stab displays directed at potential interspecific threats (people, raccoons, coyotes, eagles, etc.), (5) flying, which includes all flight activity regardless of distance, and (6) parental care, which includes brooding behavior, feeding chicks, etc. Tacha (1988) and Ellis et al. (1998) were utilized to inform the creation of behavioral categories as well as to interpret behaviors. In addition to continuing to observe cranes in known locations, we solicited information on additional sightings through the Crane Trust Nature and Visitors Center (Wood River, NE; <https://cranetrust.org/visit/nature-visitor-center/>). We also conducted 11 driving searches on rural roads between highway 281 and Wood River, NE (~20 km distance) within 3 km of the Platte River from 18 May 2018 to 13 July 2018 to locate any additional Sandhill Crane activity.

**Table 1.** Site description for habitats utilized by Sandhill Cranes (*Antigone canadensis*) in the Central Platte River Valley from 15 May 2018 to 7 June 2018

Site Description	Habitat Notes & Mgmt.	Coordinates		Dates	No. Seen
		Latitude	Longitude		
North Bank Cornfield <sup>d</sup>	Gravity irrigated, planted	40.7984	98.4802	18 May	2
North Bank Prairie <sup>d</sup>	Lowland tallgrass prairie, cattle grazing, spring burn	40.8008	98.4731	15-18 May	2
Mormon Island Meadow-Slough <sup>d</sup>	Wet meadow and slough, rested	40.8030	98.4300	31 May	2
Shoemaker Island Prairie <sup>d</sup>	Lowland tallgrass prairie, cattle bison grazing	40.7916	98.4585	1 June	2
South Bank Meadow-Savanna <sup>b</sup>	Wet meadow, cottonwoods, savannah, lowland tallgrass prairie & slough, cattle grazing	40.7748	98.4555	15 May	2
South Bank Meadow-Slough <sup>b</sup>	Wet meadow with slough, rested	40.7696	98.4625	29 May	1-2
South Bank Cornfield <sup>b</sup>	Irrigated with center pivot, planted	40.7665	98.4584	23-29 May	1-2
South Bank Prairie Ag. Wetland <sup>f</sup>	Depressional wetland, half planted, half lowland prairie, cattle grazing	40.7494	98.5001	16-23 May	1-3
Sandpit Lake <sup>f</sup>	Cottonwood parkland, mowed yard adjacent to sandpit lake	40.8844	98.3615	6-7 June	1

Notes: <sup>“A”</sup> = use attributed to pair A, <sup>“B”</sup> = use attributed to pair B, <sup>“3”</sup> = use associated with group of 3, and <sup>“f”</sup> = use associated with individual, and Dates = first and last dates cranes were detected at a particular location.

We summarized weather data from the nearest National Oceanic and Atmospheric Administration (NOAA) weather station located at Hastings Municipal Airport in Hastings, Nebraska (40.60056 °N, -98.42583 °W; ~ 20 km S of study area), for the month of April 2018, to determine if unfavorable migration conditions may have influenced the Sandhill Cranes to remain in the CPRV through their typical

nesting season. We considered minimum daily temperatures above freezing (32°F), mostly sunny skies (or clearer), an absence of precipitation, and average wind direction (southerly component, S, SE, SW, etc.) and speed ( $x > 5$  mph) as indicators of appropriate migratory conditions (Melvin and Temple 1981, Littlefield 2010). Temperature and precipitation represent daily values, while sky and wind conditions were determined using values from between 10:00 and 14:00 hrs. based on data from Melvin and Temple (1981) and Littlefield (2010) on the departure times of migrating Sandhill Cranes.

## Results

We detected two pairs of adult Sandhill Cranes in two different locations on 15 May 2018 (Table 1). We then detected three injured adult Sandhill Cranes in a third location on 16 May 2018 (Table 1). Two of the three Sandhill Cranes each had a missing leg and the third crane's leg was broken above the tibiotarsal joint; however, all were still capable of foraging and flight. Later, on 6 June 2018, a Sandhill Crane was reported to the Crane Trust Nature and Visitor Center north of our survey area near Grand Island, Nebraska (Sandpit Lake, Table 1). In all, Sandhill Cranes were located in nine distinct locations throughout the CPRV from 15 May 2018 to 07 June 2018 (Table 1). Considering their temporal and spatial occurrence, we estimate that there were seven to eight unique individual cranes present in the late May to early June period (Table 1). However, without making assumptions about their movements, there could have been a significantly higher number of Sandhill Cranes present (Table 1). They were detected in a diversity of habitats including lowland tallgrass prairie and wet meadow (Table 1; for habitat definitions see Currier 1982, Harner and Whited 2011). Sandhill Cranes were generally detected within 2 km of the Platte River ( $\bar{x} \pm SD = 1.19 \pm 1.28$  km).

Through 33 total instantaneous scan samples collected from 5 site visits we recorded four different categories of crane behavior, including foraging (82%), physical maintenance (3%), alert-defense (6%), and flying (3%). This is a relatively small sample, but the data suggests the cranes were behaving more like migrants than local breeders. On 15 May 2018 we noted potential nesting behavior from two Sandhill Crane pairs at two separate locations (South Bank Meadow-Savanna and North Bank Prairie, Table 1; Gerber et al. 2014). In both cases pairs were separated by over 100 m with one crane foraging and the other remaining stationary for the duration of the observation (~ 20 min.). We did not detect this behavior again during our study and we were unable to search either location as potential nest tending behavior ended before we were able to search at one site and we were not granted private property access to the other.

There were a limited number of days in April which had favorable conditions for migration. A total of 9 days (30%) met three of the four weather parameters, while only 3 days (10%) fit all weather parameters for acceptable migration conditions based on our weather model. While sky visibility and precipitation met the parameters frequently (53.3% and 70%, respectively), daily average temperatures in the first half of April (1-15 April 2018, 36.8°F) were -11.5°F below the recorded historic average

and temperatures in the second half of the month (15-30 April 2018, 49.9°F) were - 3.4°F below the recorded average (NOAA 2018). Additionally, just 8 days (26.7%) had wind directions and speeds appropriate for migration.

## Discussion

Sandhill Cranes rarely initiate migration under unfavorable weather conditions (Melvin and Temple 1981). As Krapu et al. (2014) demonstrates, Sandhill Cranes delayed departure by two to three weeks when cold fronts and overcast skies arrived in early April, resulting in an estimated 150,000 Sandhill Cranes remaining until mid-April 2007. Caven (2018a, b, c) described a similarly delayed departure during the 2018 spring migration. Though a large number of Sandhill Cranes had arrived in the CPRV by 07 March 2018 (279,000±46,500; Caven 2018a), and peak numbers were detected by 22 March 2018 (598,000±111,000; Caven 2018b), large numbers remained into the second week of April (10 April, 238,000±26,600; Caven 2018c), likely a result of a strong cold front which brought well below average temperatures and winds predominantly out of the north. In April 2018 only 3 days fit all of the weather parameters defined by our model as appropriate for migration. Using the 10+ mph wind threshold associated with *en masse* migration described by Littlefield (2010), only 2 days (6.67%) in April were ideal for migration. Unfavorable weather conditions increase the labor of flight and decrease the speed of travel (Melvin and Temple 1981). Cranes weakened by sickness and injury may not be able to exert extra energy, further limiting their capacity to migrate. Research also indicates that individual cranes with poor body conditions require longer stopovers to recover and restore lipid reserves (Melvin and Temple 1981, Krapu et al. 2014). Though behavior potentially associated with nesting activity was observed in two seemingly healthy pairs of Sandhill Cranes at the beginning of this study, all further observation suggested that the Sandhill Cranes spent the majority of their remaining time in the CPRV foraging, which is indicative of efforts to improve body condition. Despite search efforts continuing until 13 July 2018 no Sandhill Cranes were detected in the study area after 07 June 2018, suggesting that the Sandhill Cranes potentially moved north to their typical breeding grounds, or a to more northerly staging area after improving their condition.

Foraging was observed in diverse habitats including cornfields, which supply an abundant and highly metabolizable food, and wet meadows and lowland tallgrass prairies, which supply dietary necessities such as protein and nutrients (USFWS 1981, Krapu et al. 2014; Table 1). Corn fields likely had a depleted supply of waste corn during our observations, following both the mass waterfowl and crane migrations through the CPRV (Pearse et al. 2010). However, the wet meadows and lowland tallgrass prairie habitats used by cranes in our study likely contained high value forage resources such as macroinvertebrates (Davis and Vohs 1993, Sparling and Krapu 1994). These native habitats also play an important role as a stage for Sandhill Crane social behavior, including pair bonding activity (Tacha 1988). Additionally, herbaceous wetland habitats in the CPRV, particular wet meadows interspersed with slough and marsh features, have several characteristics of typical Sandhill Crane nesting habitat (Baker et al. 1995). We suggest the primary reason that 7-8 cranes

remained in the CPRV until early June was that unfavorable weather conditions for migration predominated throughout the month in combination with poor body condition of individual birds or a member of a mated pair (Tacha 1988, Gerber et al. 2014). However, two mated pairs displayed altered behavior consistent with nest tending at two sites apparently suitable for nesting based on non-systematic observations from the beginning of our study (Gerber et al. 2014; Table 1). Continued large scale wet meadow and lowland grassland restoration efforts completed over the last forty years in the CPRV may promote site use outside of the typical migration time window and potentially encouraging nesting behavior, particularly when migration conditions do not allow for a timely departure for some cranes in April (Davis and Vohs 1993, Sparling and Krapu 1994).

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