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# Record-sized Flock of Whooping Cranes (*Grus americana*) Observed Staging in the Central Platte River Valley during Autumn 2021

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**Abstract.**—Increases in population size and reductions in suitable migration stopover habitat associated with drought, water development, and agricultural practices, along with conspecific attraction, are hypothesized mechanisms for increasing flock sizes of migrating Whooping Cranes. During autumn 2021, we observed such a phenomenon during a period of drought in the central Great Plains when 46 Whooping Cranes gathered as a single flock in the central Platte River valley. We provide a detailed account of how this larger aggregation formed from 5 smaller groups, behavioral observations, and environmental conditions experienced during this event including river flow, ambient temperature, and wind and drought conditions. Here, we report considerations for environmental and hydrologic conditions preceding and during this event as well as use patterns and behaviors we observed while the largest single flock of Whooping Cranes ever documented in the United States portion of the migration corridor was in the central Platte River valley. *Received 16 Aug 2022, accepted 3 Jan 2023.*

**Key words.**— central Platte River valley, drought; endangered species, flock size, Great Plains, *Grus americana*, landscape ecology, migration, Nebraska, Whooping Crane

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Once on the precipice of extinction, the Aransas-Wood Buffalo population of Whooping Cranes (*Grus americana*) have rebounded to an estimated population of just over 540 individuals in 2022 (USFWS 2022). Historically, Whooping Cranes traveled in small family-based groups, occasionally more, but recent research has noted much larger groups at stopover sites between the Aransas National Wildlife Area in southern Texas and Wood Buffalo National Park in northern Canada (Caven *et al.* 2020, Silcock and Jorgensen 2021). In addition to population increases, Caven *et al.* (2020) observed larger groups of whooping cranes roosting in locations where high-quality wetland sites were relatively limited and also noted that larger groups were apparently more likely to form near the center of the migration corridor where stopovers are more common, potentially as a result of conspecific attraction.

Whooping Cranes that roost in the central Platte River often select areas with wide channels, open views, shallowly submerged sandbars, and sufficient flows that provide inundated channel areas surrounding the roost site which affords them the security not available in narrow or drier channel areas (Baasch *et al.* 2019). Research by the United

States Fish and Wildlife Service (USFWS) and others have estimated 70% of the mean annual flow in the central Platte River valley (CPRV) has been lost resulting in narrower, more incised channels than existed prior to development (Williams 1978; USFWS 1981; Faanes and Bowman 1988; Pfeiffer and Currier 2005). As such, the widest channels in the CPRV are now mechanically maintained by conservation organizations such as the Crane Trust, Rowe Sanctuary and The Nature Conservancy as well as the Platte River Recovery Implementation Program (Caven *et al.* 2019).

Wetland habitat availability during the Whooping Crane migration season decreases when drier conditions exist in the Great Plains (Valk 2005, Wright *et al.* 2014). During periods of drought, Whooping Cranes travel longer distances to access dietary resources and roosting locations that freshwater wetlands provide (Ritenour *et al.* 2016). In addition to longer travel distances, Lingle *et al.* (1991) and Caven *et al.* (2022a) reported that limited wetland availability may reduce the probability of Whooping Crane occurrence and stopover stay length, respectively. The availability of suitable river channels in Nebraska may be especially important dur-

ing periods of drought when palustrine wetland habitat availability is reduced regionally (Chavez-Ramirez and Wehtje 2012).

Until recently, Whooping Crane flock sizes of more than five individuals were considered notable (Austin and Richert 2001; Caven *et al.* 2020). However, as the population of has increased, so has the incidence and scale of large Whooping Crane group sightings (Caven *et al.* 2020). While a total of 76 Whooping Cranes were once observed in multiple groups at Quivira National Wildlife Refuge in the spring of 2010, they were distributed across several wetland areas and were never observed functioning as a single flock (Rachel Laubhan, Quivira National Wildlife Refuge, personal communication). While a “group” has generally been used to describe the number of individuals using a particular location or area, a “flock” infers that the birds are acting collectively as a single unit in flight, during social roosting, and/or foraging which can benefit each member of the flock in terms of safety from predators, foraging efficiency, or energy expenditure (Bajec and Heppner 2009). We describe the largest single Whooping Crane flock ever documented within the United States portion of the migration corridor. The objectives of this publication are to highlight the historic event that occurred during the fall 2021 migration season when 46 Whooping Cranes were observed functioning as a single flock in the CPRV, to document environmental and hydrologic conditions preceding and during this event, and to document the use patterns and behaviors we observed.

#### METHODS

United States Fish and Wildlife Service maintains a public-sightings database for which publicly documented detections of Whooping Cranes are stored (USFWS 2021). The Platte River Recovery Implementation Program conducts daily flights between Lexington and Chapman, Nebraska, every spring and fall Whooping Crane migration season to document Whooping Cranes within the central Platte River valley (PRRIP 2017). These data also get reported to the USFWS and are stored in their public-sightings database. In addition, the USFWS, Canadian Wildlife Service (CWS),

and United States Geological Survey (USGS) have been placing GPS transmitters on Whooping Cranes that record locations every 30 minutes since August of 2017. This data has been shared with Crane Trust and was used to confirm arrival, departure, and locational data reported here. We used locational data collected via public sighting reports, aerial flights implemented by the Platte River Recovery Implementation Program, and telemetry data provided by the USFWS, CWS, and USGS to track Whooping Cranes while in the CPRV. We also used telemetry data to determine the location of stopover sites for 4 of the Whooping Crane individuals prior to arriving in the CPRV and following their departure.

In addition to documenting flock sizes and locations, we also conducted instantaneous scan sampling of flock behavior in all landcover types the Whooping Cranes were recorded using (See Altmann 1974, Caven *et al.* 2022b). This included tallying the behaviors exhibited by individuals in the flock via visual scanning at 1-minute intervals for 30 to 40 minutes unless the Whooping Cranes took flight and/or moved to a different landcover class (Altmann 1974, Caven *et al.* 2022b). Only 1 set of observations were recorded for each use location each day (Caven *et al.* 2022b). Observations were recorded from public roads or crane viewing blinds along the Platte River. Binoculars and long-range photography and videography were used to view the Whooping Cranes and all guidelines put forth by the U.S. Fish and Wildlife Service were followed to avoid disturbing the birds.

To examine the local and regional environmental contexts surrounding this flocking event we gathered weather, seasonal climate, and hydrological data from secondary sources. We obtained weather data including average daily temperature and wind speeds as well as prevailing wind direction between 0900 and 1400 hours (i.e., time interval when Whooping Cranes are most likely to migrate) during the period when the 46 Whooping Cranes were within the CPRV from Weather Underground’s website (<https://www.wunderground.com/history/daily/us/ne/grand-island/KGRI/date>). Similarly, Platte River flow data recorded at Grand Island (USGS Gaging Station - 06770500) during the same period were obtained from the United States Geological Survey’s website ([https://waterdata.usgs.gov/nwis/uv?site\\_no=06770500](https://waterdata.usgs.gov/nwis/uv?site_no=06770500)). We obtained United States Drought monitoring data from the North American Drought Monitor website (<https://www.ncdc.noaa.gov/monitoring-content/temp-and-precip/drought/nadm/maps/narr/nadm-narr-202111.pdf>).

#### RESULTS

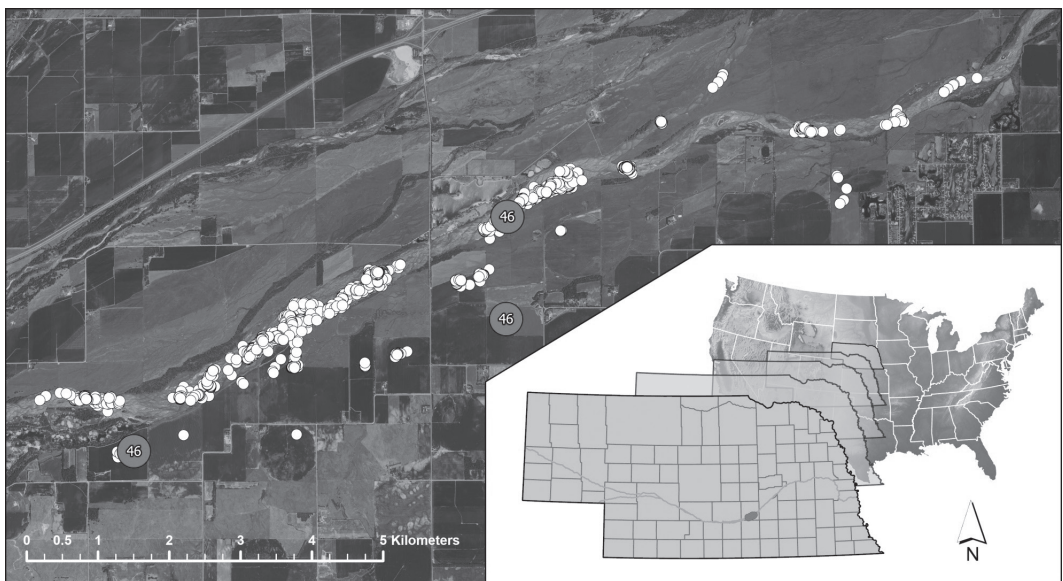
Forty-six Whooping Cranes including 4 telemetry-marked individuals with active transmitters arrived within the CPRV on 2 November, 2021 and were first observed on 3 November, 2021 when they were comprised

of 5 individual flocks (3 adults and 1 juvenile, 8 adults and 1 juvenile, 13 adults and 2 juveniles, 13 adults and 2 juveniles, and 2 adults and 1 juvenile) dispersed across a 13-km area on the Platte River (Fig. 1). Prior to their arrival, the four flocks of Whooping Cranes containing one telemetry-marked bird each last stopped over in northcentral Nebraska between 125 km and 150 km from the Platte River. While in the CPRV, the five individual flocks merged and split multiple times and, among many aggregations observed, one flock comprised of 29 adults and 3 juveniles was observed on 5 November, 2021, one flock comprised of 33 adults and 4 juveniles was observed on 6 November, 2021 and then a single flock comprised of all 39 adults and 7 juveniles was observed and photographed while coming together into a single flock in a cornfield on 6 November, 2021 (40.74604, -98.54207). On 7 November, 2021 all 46 Whooping Cranes were observed and photographed as a single flock in a cornfield approximately 1 km south of the Platte River (40.76247, -98.48010) and again later in the Platte River (40.77538, -98.47981) within a recently disked chan-

nel on Crane Trust property (Fig. 2). These birds then began to re-assemble into smaller flocks and departed the CPRV between 8 and 11 November 2021. Upon departing the CPRV, the telemetry marked Whooping Cranes travelled between 125–440 km to their next stopover locations in northern Kansas or northern Oklahoma.

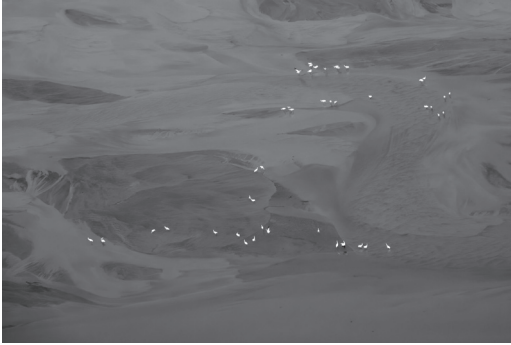
When the 46 Whooping Cranes arrived in the CPRV, the Platte River discharge near Grand Island, Nebraska was around 60 cms (2,110 cfs; Fig. 3), which was sufficient flow to create a shallow braided river interspersed with small, low-elevation sandbars even in the widest parts of the central Platte River. However, discharge levels dropped sharply throughout the remainder of the migration season and ended up being between 10 cms and 20 cms (350–700 cfs) for over one week due to a hydropower station maintenance operation that was scheduled prior to the Whooping Cranes arriving.

Average daily temperatures were near 5.0 °C and prevailing winds were 10–15 km/h from the south-southwest during the first 6 days the Whooping Cranes were in the CPRV (Fig. 4). During the stopover, wind speeds



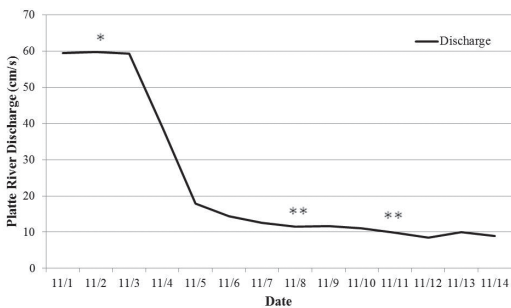
**Figure 1.** Distribution of Whooping Crane use locations documented via public sighting reports, aerial flights implemented by the Platte River Recovery Implementation Program, and telemetry data provided by the United States Fish and Wildlife Service (USFWS), Canadian Wildlife Service (CWS), and United States Geological Survey (USGS) from 2 November - 11 November 2021. Red symbols indicate locations where all 46 Whooping Cranes were observed functioning as a single flock within the central Platte River valley on 6 and 7 November 2021.



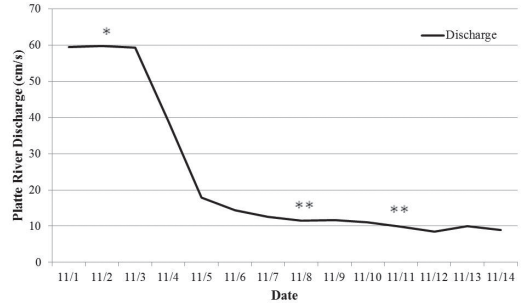


**Figure 2.** Documentation of 46 Whooping Cranes (39 adults and 7 juveniles) observed functioning as a single flock in the central Platte River (40.77538, -98.47981) in Nebraska, USA on 7 November 2021.

generally varied from 9-30 km/h but were  $\geq 35$  km/h the day the final Whooping Cranes left the CPRV. After being in the CPRV for 6 days (since 2 November), winds changed prevailing direction on 8 November 2021 and were generally out of the north-northeast and 32 Whooping Cranes (25 adults and 7 juveniles) departed the CPRV which coincided with the timeframe Platte River flows near Grand Island, Nebraska dropped to around 10 cms (350 cfs; Fig. 3). On 11 November 2021, the remaining 14 adults including 2 telemetry-marked birds left the CPRV prior to average daily temperatures dropping to near 0 °C and prior to prevailing winds switching back to a southwestwardly direction (Fig. 4). According to the North American Drought Monitor website, areas in Northcentral United States experienced extensive development or inten-



**Figure 3.** Average daily discharge at the United States Geological Survey gauging station (06770500) located near Grand Island, Nebraska USA noting the day the 5 Whooping Crane flocks containing 46 birds arrived (\*) within the central Platte River valley as well as the days they departed (\*\*) the area.



**Figure 4.** Average daily temperature and wind speed as well as prevailing wind direction between 0900 and 1400 (i.e., time interval when Whooping Cranes are most likely to migrate) while the 46 Whooping Cranes were located within the central Platte River Valley, Nebraska, USA noting the day the 5 individual flocks arrived (\*) and the days they departed (\*\*) the area.

sification of drought. A vast majority of areas in North Dakota and South Dakota were experiencing moderate drought or worse prior to and during the early November arrival of the 46 Whooping Cranes.

Based on telemetry data, the 46 Whooping Cranes spent a vast majority of their time (86%) during daylight hours in the Platte River as compared to other landcover classes. We recorded 9,763 total behavioral observations on the 46 Whooping Cranes while they were in three different landcover classes within the CPRV. While being observed in the Platte River, the 46 Whooping Cranes largely spent their time foraging and walking in search of food items or loafing. The Whooping Cranes also generally spent less time displaying alert or defensive behaviors while in the Platte River as compared to non-riverine landcover classes. Foraging and walking in search of food items were also the most observed behaviors while the Whooping Cranes were in palustrine wet meadows and agricultural cornfields. Conspecific social behaviors were observed about 30% more often while the Whooping Cranes were in palustrine wet meadow and cornfield landcover classes than when they were in the Platte River.

DISCUSSION

The increase in the population of Whooping Cranes, loss of wetland habitats within

the migration corridor, and conspecific attraction, have all been suggested as drivers of increases in flock size during migration (Caven *et al.* 2020). We documented the single largest flock of Whooping Cranes ever observed within the United States portion of the migration corridor in a context that supports the multiple assertions made in the published literature (e.g., Caven *et al.* 2020). While a larger number of whooping Cranes were observed at Quivira National Wildlife area (Caven *et al.* 2020; USFWS Public Sightings Database unpublished data), these groups were not reported to be functioning as a single flock (i.e., they were distributed across multiple wetlands and moving independently). To our knowledge the only location in which a larger flock has been detected is at a fall staging area in Saskatchewan, Canada (Johns, 1992; FOTWW 2018).

To maintain wide open braided rivers preferred by crane species (Gruidae spp.) conservation organizations use mechanical soil disturbances created by a tractor and disk to simulate the impacts of scouring that occurred naturally within the riverine ecosystem previous to the over-appropriation of Platte River to support industrial agriculture and human communities (Currier *et al.* 1985, Pfeiffer and Currier 2005). Research indicates this practice results in increased roosting and potentially foraging habitat quality for cranes (Pfeiffer and Currier 2005, Farnsworth *et al.* 2018). The large flock documented herein formed on a relatively short segment of the Platte River that had been disked within the previous two months, indicating that the river channel may have been in good condition, at least in relation to the available habitats nearby. This also indicates that riverine restoration may influence crane behaviour across relatively short as well as long timescales (Caven *et al.* 2019).

While Caven *et al.* (2020) noted that large gatherings of Whooping Cranes may present risks to the population (i.e., disease, severe weather, etc.), these gatherings may also provide insights as to the quality of stopover habitats and provide increased foraging success and vigilance to predators (Jullien and Clobert 2000, Sridhar *et al.* 2009). For in-

stance, Jullien and Clobert (2000) reported the survival rates of the obligate flock members were significantly higher than when feeding alone or in pairs, which until recently, have typically been the most commonly reported associations for Whooping Cranes. Individual Whooping Cranes are often observed to be loosely associated with large flocks of Sandhill Cranes (*Antigone canadensis*) on the central Platte River during the spring migration season (Baasch *et al.* 2019). These mixed-species associations provide further support for the “safety in numbers” hypothesis (Sridhar *et al.* 2009). Another potential benefit of flocking, especially for small populations, is that individuals have a higher probability of finding and securing a mate (Foster 1985). Despite the benefits of flocking for bird populations it will be important to monitor for evidence of disease in waterbirds locally during large Whooping Crane gatherings, especially when they occur along with densities of other waterbirds such as Sandhill Cranes, geese, and ducks, as Highly Pathogenic Avian Influenza (H5N1/H5N8) or other outbreaks could have significant impacts on Whooping Cranes if 10% or more of the population is gathered together in close proximity (Okuya *et al.* 2022).

The 46 Whooping Cranes observed in our study generally made short flights to nearby cornfields and wet meadows and were rarely located outside of 1 km from the Platte River. In addition, the Whooping Cranes generally spent < 1 hour in non-riverine habitats before returning to the river. Our findings that Whooping Cranes spent 86% of daylight hours in the Platte River during this stopover are similar to those of Jorgensen and Dinan (2016), which indicated Whooping Cranes spent the vast majority of diurnal hours in palustrine wetlands (76%–85%) as opposed to nearby agricultural fields in east-central Nebraska during a couple 2015 stopovers. Important aspects of stopover habitat use, including security, quality, and forage availability, often influence behavioral patterns during migration ((Jorgensen and Dinan 2016; Baasch *et al.* 2019; Caven *et al.* 2021, 2022a). Presumably, secure habitats associated with an abundant food supply will result

in an increase in foraging behavior and a decrease in defensive behaviors such as predator avoidance. We found the 46 Whooping Cranes spent a vast majority of their time (75.5 %) in the Platte River engaged in foraging, loafing, and preening behaviors. Jorgensen and Dinan (2016) similarly found that Whooping Cranes spent a combined 77-82% of their time foraging, resting, and in self-maintenance at palustrine wetland in Nebraska. . Our results suggest that whooping cranes occasionally use quality riverine sites similarly to how they use quality semi-permanent palustrine wetlands, as both foraging and roosting sites (Austin and Richert 2001, Jorgensen and Dinan 2016).

During the fall 2021 Whooping Crane migration season, the northern Great Plains was experiencing dryer than normal conditions which likely reduced wetland availability within portions of the migration corridor and may have contributed to this historic event on the central Platte River. Drought has been reported to influence the migration patterns of Sandhill Cranes, Whooping Cranes, and other avian species (Krapu *et al.* 2014; Wright *et al.* 2014; Pearse *et al.* 2018; Caven *et al.* 2019).

### Management Considerations

Given the importance of rivers to many waterbird species during migration, especially during drought conditions when other wetland habitats are more limited in size and distribution, maintaining adequate habitat characteristics conducive to their use is an important consideration when trying to preserve an endangered species such as Whooping Cranes. As such, the Crane Trust and other conservation organizations implement river restoration projects within the central Platte River valley on an annual or near-annual basis. For example, during the fall of 2021 the Crane Trust disked more than 10 km of river channel where the 46 Whooping Crane were observed using just a few months later. It is possible that the Platte River could attract increasingly large Whooping Crane groups given its apparent value as a foraging location if quality habitat conditions

persist (e.g., wide channel areas maintained through channel disking and flow management), especially when palustrine wetland habitat availability within the migration corridor is limited by dry conditions. In these contexts, it will be important to monitor for disease outbreaks in local waterbird populations given the high concentration Whooping Cranes in a single location.

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