Whooping Crane Diurnal Behavior and Natural History during Migration in the Central Great Plains: Interim Report – Fall 2020

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ABSTRACT

Stopover sites provide important forage resources and protection from predators for the Aransas-Wood Buffalo population of whooping cranes (*Grus americana*) as they migrate 4,000 km across the Great Plains each spring and fall. Little is known about the forage resources acquired by whooping cranes during migration due to the expansive migration corridor, sensitivity to human disturbance, small population size, and protected status under the Endangered Species Act (i.e., behavioral observations are rarely made at distances where this information is discernable). Similarly, very little information exists regarding whooping crane responses to perceived threats such as predators (e.g., bald eagles - *Haliaeetus leucocephalus*) or human disturbances (e.g., aircraft). We used high-resolution long-range photography/videography, spotting scopes, and binoculars to document whooping crane activity as well as their responses to aircraft and potential predators via a scan sampling approach. We observed 10 unique whooping crane groups that were comprised of 27 individuals including 25 adult and 2 juvenile whooping cranes. We collected 776 instantaneous scan samples of whooping crane groups which, in total, documented 2,358 individual behaviors. We obtained nearly 100 hours of video and >1,000 photographs and identified whooping cranes foraging on several different animal taxa including 16 individual *Actinopterygii* spp. (ray-finned fish), 2 *Anura* spp. (frogs), 1 *Trionychidae* sp. (softshell turtles), and 8 *Arthropoda* spp. (Arthropods). Many more animals were likely consumed during our observations, but the above represents what could be distinguished to relevant taxa via photo or visual assessment through a scope. Foraging and/or drinking were the most common behavioral activities recorded while loafing and preening were observed most often in open-water wetland classes and alert and defensive behaviors were most often observed in cornfields. Social interactions were somewhat infrequently documented, however, when observed they most commonly occurred within open-water landcover classes. When comparing adult whooping crane groups to family groups, adult groups spent more time loafing, preening, and interacting with conspecifics, while family groups spent more time foraging, drinking, and exhibiting interspecific social behaviors. We also observed 3 potential aircraft-whooping crane interactions and 1 potential bald eagle-whooping crane interaction during fall 2020, but were unable to observe the whooping cranes' responses due to property access limitations in each case. We also observed 12 bald eagles interacting with approximately 1,000 sandhill cranes; however, the sandhill cranes did not notably react to the presence of the bald eagles. Our observations largely accord with the existing literature, indicating that wetland landcover classes provide a valuable habitat for whooping cranes to forage and rest. The security provided by wetland habitats likely enables whooping cranes to perform important social interactions necessary for pair-bond maintenance.

INTRODUCTION

Recent research has found that whooping cranes (*Grus americana*) consume a wider variety of food items during migration than previously documented, including a variety of wetland dependent vertebrates (Geluso et al. 2013, Caven et al. 2019a). Behavioral monitoring can help conservation organizations determine the intrinsic value of protecting various landscapes such as

those that provide important forage resources during migration and safe areas for social display. Behavioral monitoring can also inform us of how activity patterns vary within and across various landcover types (Jorgensen and Dinan 2016). This data can also help resource managers better understand the quantity and level of threats faced by whooping cranes during migration including the frequency of depredation attempts by bald eagles (*Haliaeetus leucocephalus*; Rabbe et al. 2019) as well as the level of exposure to disturbances and risks such as nearby roads, woodlands (predators), and powerlines (Baasch et al. 2019).

In short, we gathered natural history information that has the potential to inform conservation efforts through behavioral observation. Behavioral surveys were paired with and serve as a supplement to regular efforts to confirm public sightings of whooping cranes in the Platte River Valley and beyond for the U.S. Fish and Wildlife Service's (USFWS) public sightings database (Lewis 1992, Caven et al. 2020). Additional support for science-focused staff in the months of March and April (spring migration) as well as October and November (fall migration) helped us scale-up the collection of behavioral data as well as increase ground crew efforts to locate/relocate whooping cranes, thereby further improving the USFWS's public sightings database. The objectives of our study were to 1) collect behavioral data that allows us to calculate whooping crane time budgets and link them to the habitats they are utilizing; 2) document forage items consumed by whooping cranes during migration; 3) document whooping crane and sandhill crane responses to potential predators such as bald eagles; and 4) document whooping crane responses to aircraft flying at <1,500 m altitude or other potential disturbances.

METHODS

Locations were provided via the USFWS-managed public sightings database, to which the Crane Trust often contributes locally. Additionally, biologists were sent to the locations of some whooping cranes that were being tracked with cellular technology. Once a report was received, qualified biologists were sent to confirm public reports of whooping cranes. In addition to filling out the traditional USFWS sightings report, biologists also conducted scan sampling, as described below, to get a more comprehensive view of their behavior. Research was conducted predominantly in south-central Nebraska (Rainwater Basins, the Loup River system, Platte River system, etc.) with occasional work outside of this area (throughout Nebraska and northern Kansas) as time allowed. The Crane Trust used internal funds to complete any work outside of south-central Nebraska. All work was conducted following the guidelines drafted by the USFWS and the Nebraska Game and Parks Commission (NGPC) for "avoiding whooping crane disturbance and harassment" including making observations from >610 m (~0.4 mi, 2,000 ft.), avoiding intrusions into habitats to measure habitat parameters until after the cranes have clearly departed the area, and immediately reporting any information regarding observations of injured cranes to the proper authorities. The only occasions research staff were closer than 610 m to a whooping crane was when an individual or group approached an observing biologist concealed in a blind or vehicle. In these cases, the biologist remain in the blind or vehicle until 30 minutes after dusk or the cranes

had departed the area or moved far enough away to allow the biologist to depart without disturbing the whooping cranes.

We used an "instantaneous scan sampling" approach which included counting the number of whooping cranes displaying a particular behavior at one-minute intervals for a period of no less than 30 minutes (Altmann 1974) unless the cranes left the use location or moved out of sight. Time, date, and weather conditions (wind, cloud cover, temp, etc.) were recorded along with basic locational (description, latitude, longitude), habitat, and land management information at each site. We measured the distance whooping crane locations were to water (0 = within standing water) as well as major rivers (only in river valleys) using a range finder in the field for shorter measurements, and the most recent aerial imagery available from the same season and climatic conditions for longer measurements (e.g., wet spring, etc.). We also measured the unobstructed wetted width of wetland habitats used by whooping cranes. Unobstructed wetted width (UOWW) included the total width of the palustrine/lacustrine wetland or river channel unobstructed by vegetation >1.5 m in height (Pearse et al. 2017, Caven et al. 2019b). Wetlands were measured across their narrowest central width whereas rivers were measured perpendicular to their banks. Water depths at use locations were estimated based on the degree to which a whooping crane tarsus was submerged in water (mean tarsus length = 28 cm; Johnsgard 1983, Caven et al. 2019a). We also recorded each use location's distance to the nearest powerline and the powerline type (major $\geq$5 lines, minor <5) as well as distance to the nearest paved road. Finally, we recorded the bridge segment for whooping crane locations within the Central Platte River Valley (CPRV; 1-11; Caven 2019b). We also recorded a physical description of the whooping cranes, including bands, other distinctive physical characteristics, and any observed injuries.

We also documented eagle-crane interactions considering the recent increase in observations of bald eagles attempting to depredate crane species regionally (Rabbe et al. 2019). The crane-eagle interactions data represents a stand-alone dataset that also applies to sandhill cranes and thus has some overlap in questions (e.g., distance to woodland) with whooping crane behavioral scan sampling. We also recorded the presence of any aircraft, its altitude estimated visually (max = 1,500 m), the type of aircraft, and whooping crane reactions.

We relied on high resolution long-range photography and videography to document whooping crane foraging behavior using a Tamron SP 150-600 mm lens paired with a Nikon DSLR Camera as well as a Nikon Coolpix P1000 Super-telephoto digital camera (3,000 mm zoom equivalent). To ensure we did not disturb whooping cranes, flash photography was never used and photographs were only taken under natural light conditions. Our goal was to collect a minimum of 30 minutes of scan sampling data, given the whooping cranes continued presence. However, if at any time during those 30 minutes the biologists observed a whooping crane consuming visually discernable food items through the spotting scope, scan sampling was paused to focus on shooting photographs of the diet items considering the sparse amount of information available concerning whooping crane diet regionally and during migration (Caven 2019a). Following photography of visually discernable diet items, biologists resumed behavioral scan sampling until at least 30 minutes of

total effort was reached. Following the completion of 30 minutes of scan sampling, the observing biologist assessed whether to continue based on several criteria including the number of other birds to observe locally, the novelty of behaviors being recorded, and the degree to which the observer was safely and comfortably concealed from its subjects to ensure no disturbances to migrating whooping cranes.

We created a discrete list of habitat types (e.g., lowland tallgrass prairie, shallow marsh, cornfield, etc.) that are detailed in the research protocol which also includes a full-page figure providing visual and narrative descriptions of prairie and wetland habitats. We included a section in the datasheet to record pertinent notes on habitat characteristics. We also created a list of categories that apply to management in herbaceous and agricultural systems (e.g., grazed, burned, hayed, harvested, etc.), and provided a space on the datasheet for detailed notes regarding management as well.

In addition to documenting behavioral activities and diet items consumed, camera equipment was used to capture long-range videography, specifically to collect 10 minute videos following tracked birds to facilitate the evaluation of their on-the-ground behavior in comparison to accelerometer data from tracking devices. The start and end times of all videos were recorded to the nearest second to allow for direct comparison between photographic and accelerometer data. It was imperative to maintain focus only on banded and tracked whooping cranes while shooting this video.

Radio-tracked whooping crane observed and video recorded in a shallow, flooded wetland in south-central Nebraska, October 20, 2020.

RESULTS

Whooping Crane Behavioral Activities

During the pilot study in fall 2019 and spring 2020, we documented 3 whooping crane groups that were comprised of 7 adult and 1 juvenile and collected 274 instantaneous scan samples which resulted in 979 individual behavioral activities. During the fall migration season of 2020, we observed the behavior of 7 unique whooping crane groups that were comprised of 20 individuals including 19 adults and 1 juvenile. In addition, we observed a group of 6 adult whooping cranes flying within 50 m of a group of 4 adult whooping cranes we were observing on the North Loup River. The 4 whooping cranes we were observing joined the 6 in flight and were never detected again. For the 7 unique groups we gathered scan sampling data on, we collected 502 instantaneous samples which totaled 1,389 individual whooping crane behavioral activities.

We observed a higher proportion of foraging and/or drinking in all landcover classes than any other behavioral activity recorded (**Table 1**). Whooping cranes were documented loafing and preening more often in open-water wetland classes and exhibited slightly more alert and defensive

behaviors while in cornfields than all other landcover classes. Concurrently, alert and defensive behavior occurred less often in open-water palustrine habitats than all other landcover classes. While social interactions were relatively infrequently documented, these behavioral activities were also most commonly observed within open-water landcover classes.

Table 1. Behavioral activities of whooping cranes (*Grus americana*) observed within each landcover class during fall 2019, spring 2020, and fall 2020 migrations.

Behavioral Activity	Landcover Class			
	River	Open-water Palustrine	Wet Meadow	Cornfield
Forage/Drink	39.5%	43.0%	55.6%	54.6%
Loafing	22.0%	3.1%	8.5%	10.1%
Preening	15.9%	36.6%	0.0%	1.4%
Social Interspecific	1.8%	0.0%	0.0%	0.0%
Social Conspecific	1.2%	2.9%	0.0%	0.3%
Alert/Defensive	11.7%	2.9%	13.7%	17.5%
Fly/Walk	7.8%	11.4%	22.2%	16.2%

When comparing whooping crane groups comprised of 1 or more adults to those comprised of at least 1 juvenile and 1 adult (family group), adult whooping crane groups tended to spend more time loafing, preening, and displaying social interactions with conspecifics than family groups did (**Table 2**). Conversely, family groups spent more time foraging, drinking, and exhibiting social interspecific behaviors than adult groups did.

Table 2. Behavioral activities of whooping cranes (*Grus americana*) observed based on group composition during fall 2019, spring 2020, and fall 2020 migrations.

Group Composition	Forage/ Drink	Social Conspecific	Social Interspecific	Alert/ Defensive	Fly/ Walk	Loaf	Preen
Adults	37.6%	1.5%	0.4%	11.0%	12.1%	18.4%	19.1%
Family Groups	54.7%	0.9%	1.9%	12.1%	9.4%	10.2%	10.7%

Whooping Crane Forage Items

During the fall of 2020 we obtained >75 hours of video and >1,000 photographs and were able to identify whooping cranes foraging on animal prey of multiple taxa including 1 individual *Actinopterygii* sp. (ray-finned fish), 1 *Anura* sp. (frog), 1 *Trionychidae* sp. (softshell turtle), and 3 *Arthropoda* sp. (arthropod) (**Table 3**). We were also able to clearly identify 15 individual *Actinopterygii* spp. (ray-finned fish), 1 *Anura* sp. (frog), and 5 individual *Arthropoda* spp. (arthropods) being consumed by whooping cranes from photos, videos, and visual observations collected during the pilot study in the fall of 2019 (**Table 3**).

Table 3. Forage items documented being consumed by whooping cranes (WC; *Grus americana*) during fall 2019 and fall 2020 migrations.

Date	Adult WC	Juvenile WC	Landcover Class	Taxa Consumed	Count
10/31-11/7/2019	3	1	Platte River	*Actinopterygii*	15
10/31/2019	3	1	Platte River	*Anura*	1
10/31-11/7/2019	3	1	Platte River	*Arthropoda*	5
10/22/2020	6	0	Shallow Wetland	*Trionychidae*	1
10/23/2020	6	0	Shallow Wetland	*Actinopterygii*	1
10/23/2020	6	0	Shallow Wetland	*Arthropoda*	3
10/24/2020	6	0	Shallow Wetland	*Anura*	1

Whooping Crane Use Locations in Relation to, Woodlands, Power Lines, and Roads

We estimated the distance each use location was from the nearest wooded area, major road (blacktop or highway), and nearest major (≥5 wires) or minor (≤4 wires) power line. Whooping crane use locations were, on average, 221 m from any wooded area (range 50 m – 450 m). On average, use locations were 1,818 m from the nearest major road (range 275 m – 4,000 m). Use locations averaged 975 m from the nearest major or minor power line with no discernable difference in distance between use locations and these 2 types of power line (range 250 m – 3,500 m).

Whooping Crane Use Location Characteristics

Including all data from the 2019 pilot program as well as 2020 observations, we documented whooping crane behavior in several terrestrial and aquatic habitats including corn field, lowland tallgrass prairie, open-water palustrine wetland, wet meadow palustrine wetland, and river channel. Use locations ranged from an estimated 0 m to 1,000 m from surface water ($\bar{x}$ = 137 m, *sd* = 304 m). Unobstructed wetted widths ranged from 80 m to 384 m at wetland use sites ($\bar{x}$ = 244 m, *sd* = 101 m) and estimated depths ranged from 6 cm to 10 cm ($\bar{x}$ = 7.9 cm, *sd* = 1.5 cm). Finally, whooping cranes were observed in 4 of the 11 reaches of the CPRV delineated by major bridge crossings, including segment 3 (HWY 281 to Alda), segment 6 (Shelton to Gibbon), segment 7 (Gibbon to HWY 10), and 11 (Elm Creek to Overton; see Caven et al. 2019b).

Whooping Crane and Sandhill Crane Response to Bald Eagles

We observed bald eagles interacting with whooping cranes during 1 instance on the Platte River near Overton, Nebraska; however, due to access limitations we were unable to observe the response of the whooping cranes to the eagles. We also observed the response of sandhill cranes to 12 bald eagles at Quivira National Wildlife Refuge in Kansas on 20 November, 2020. During these observations we documented 7 adult and juvenile bald eagles flying over a single flock of approximately 1,000 sandhill cranes at an elevation of 10 m above the water surface and occasionally swooping down to within 5 m of the sandhill cranes (**Figures 1 and 2**). Following

these low-altitude flights, the bald eagles stood in the water with several other bald eagles that were very near the sandhill crane flock and foraged on an unidentified avian species that we speculate was a snow goose (**Figure 1**). We did not observe any defensive or flush responses from the sandhill cranes to these low-altitude bald eagle flights.

Figure 1. Five adult and two juvenile bald eagles (*Haliaeetus leucocephalus*) foraging on an unidentified avian species within 20 m of approximately 1,000 sandhill cranes (*Grus canadensis*) at Quivira National Wildlife Refuge in Kansas on 20 November, 2020.

Figure 2. One adult and six juvenile bald eagles (*Haliaeetus leucocephalus*) observed foraging within 100 m of approximately 1,000 sandhill cranes (*Grus canadensis*) at Quivira National Wildlife Refuge in Kansas on 20 November, 2020.

Whooping Crane Response to Aircraft

We observed 3 potential aircraft-whooping crane interactions during the fall of 2020, but were unable to observe the whooping cranes' responses due to property access limitations in each case. On one instance, we observed a Chinook helicopter flying at 1,000–1,500 m altitude over the Lower Platte River near Fremont, Nebraska, and over the location where a group of whooping cranes had roosted the night before. However, we were unable to obtain permission to access the channel to observe their response prior to the aircraft departing the area. We were not able to obtain permission to access the North Loup River or Central Platte River channels to observe whooping crane responses to Cessna 172 aircrafts flying at 750–1,000 m altitude during another other 2 instances. We were able to position ourselves near whooping crane groups on 2 occasions to document their responses to aircrafts flying at below 1,500 m altitude, however, during one attempt

the scheduled flight was cancelled and during the second instance the whooping cranes departed the river prior to the plane arriving.

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