

**Whooping Crane Diurnal Behavior and Natural History during Migration in the Central  
Great Plains: Summary Report – Spring 2019 - Fall 2022**



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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., low-flying 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 69 whooping crane groups that were comprised of 248 birds including 209 adult and 39 juvenile whooping cranes. We collected 5,017 instantaneous scan samples of whooping crane groups which totaled 23,676 individual behaviors documented. We obtained hundreds of hours of video and thousands of photographs and identified whooping cranes foraging on several different animal taxa including 16 individual *Actinopterygii* spp. (ray-finned fish), 1 *Anura* sp. (frogs), 1 *Trionychidae* sp. (softshell turtles), and 8 individual *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. Whooping cranes were generally documented loafing and preening more often in palustrine and lacustrine wetland landcover classes and exhibited more alert and defensive behaviors while in cornfields than any other landcover class. While social interactions were relatively infrequently documented, these behavioral activities were most commonly observed within palustrine and lacustrine landcover classes. When comparing whooping crane adult groups to juvenile or family groups, adult whooping crane groups tended to spend more time preening, alert, and displaying social interactions than juvenile or family groups did. Conversely, juvenile groups spent more time foraging and drinking and less time exhibiting alert or social interspecific behaviors than adult or family groups did. We also observed 15 potential aircraft-whooping interactions involving 90 individuals. Reactions observed included 57 whooping cranes with no reaction during 9 instances, 30 whooping cranes where alert responses were observed during 10 instances, and 3 whooping cranes that flushed during 1 encounter. We observed 7 instances of bald eagles interacting with whooping cranes and several where they interacted with sandhill cranes. During these instances, the cranes displayed no reaction, exhibited a defensive or alert posture, or flushed. 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 also likely enables whooping cranes to perform important social interactions necessary for pair-bond formation and 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. This data can also help resource managers better understand quantity and level of threats faced by whooping cranes and sandhill cranes (*Grus canadensis*) during migration. This includes a better understanding of 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 caused by nearby roads, woodlands (predators), and powerlines.

In short, we gathered natural history information that has the potential to inform conservation efforts through behavioral observations. 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 federally managed U.S. Fish and Wildlife Service (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 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 response to low-flying (<1,500 m) aircraft or other potential disturbances.

## METHODS

Locations were provided via the United States Fish and Wildlife (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 to document their behaviors with the goal of linking this behavior to movements measured via new-age tracking technologies. 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 and funds allowed. 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, etc., and immediately reporting any information regarding observations of injured cranes to the proper authorities. The only times 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 remained 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 width whereas rivers were measured perpendicular to their banks. 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 the physical description of whooping cranes, including bands, other distinctive physical characteristics, and any 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.

## RESULTS

### *Whooping Crane Behavioral Activities*

During the spring 2019 - fall 2022, we documented 69 whooping crane groups that were comprised of 248 birds including 209 adult and 39 juvenile whooping cranes and collected 5,017 instantaneous scan samples which resulted in 23,676 behavioral observations. We observed a higher proportion of foraging and/or drinking in all agricultural landcover classes than any other behavioral activity recorded (**Table 1**). Whooping cranes were generally documented loafing and preening more often in palustrine and lacustrine wetland landcover classes and exhibited more alert and defensive behaviors while in cornfields than any other landcover class. While social interactions were



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

relatively infrequently documented, these behavioral activities were most commonly observed within palustrine and lacustrine landcover classes. When comparing whooping crane groups comprised of 1 or more adults to those comprised of at least 1 juvenile (juvenile) or at least 1 juvenile and 1 adult (family group), adult whooping crane groups tended to spend more time preening, alert, and displaying social interactions than juvenile or family groups did (**Table 2**). Conversely, juvenile groups spent more time foraging and drinking and less time exhibiting alert or social interspecific behaviors than adult or family groups did.

**Table 1.** Behavioral activities of whooping cranes (*Grus americana*) observed within each landcover class during spring 2019 - fall 2022 migration seasons.

Landcover	Behavior						
	Forage	Fly/Walk	Loaf	Preen	Alert/Defensive	Social Conspecific	Social Interspecific
Corn Field	51.1%	18.9%	14.5%	1.6%	12.2%	1.4%	0.3%
Soybean Field	66.1%	17.1%	9.8%	1.7%	2.4%	2.8%	0.0%
Flooded Soybean Field	45.0%	36.9%	6.7%	2.0%	3.4%	0.7%	5.4%
Alfalfa Field	76.5%	15.7%	5.9%	0.0%	2.0%	0.0%	0.0%
Wheat/Barley Field	51.3%	21.1%	15.4%	5.2%	4.2%	2.3%	0.5%
Other Ag. Field	65.0%	20.8%	8.3%	0.8%	5.0%	0.0%	0.0%
Lowland Tallgrass Prairie	4.2%	0.0%	27.1%	66.7%	2.1%	0.0%	0.0%
Wet Meadow	47.9%	26.8%	11.7%	4.1%	6.7%	1.3%	1.5%
Flooded Wet Meadow	41.1%	10.1%	22.5%	14.1%	2.2%	9.7%	0.2%
Shallow Marsh	36.3%	12.9%	36.8%	7.3%	5.5%	1.3%	0.0%
Flooded Shallow Marsh	48.4%	11.3%	7.7%	21.5%	7.6%	3.5%	0.0%
Open-water Slough	16.0%	45.3%	26.7%	4.0%	4.0%	4.0%	0.0%
Open-water Palustrine	43.0%	11.4%	3.1%	36.6%	2.9%	2.9%	0.0%
Natural Lacustrine	34.4%	17.2%	29.4%	13.2%	3.2%	2.2%	0.4%
River	40.4%	16.5%	23.7%	10.3%	6.6%	1.9%	0.7%

**Table 2.** Behavioral activities of whooping cranes (*Grus americana*) observed based on group composition during spring 2019 - fall 2022 migration seasons.

Group Composition	Behavior						
	Forage	Fly/Walk	Loaf	Preen	Alert/Defensive	Social Conspecific	Social Interspecific
Adult	40.0%	13.9%	18.2%	15.8%	8.5%	2.4%	1.1%
Family	44.9%	17.9%	20.4%	7.5%	7.1%	1.9%	0.3%
Juvenile	53.4%	19.0%	20.7%	3.4%	3.4%	0.0%	0.0%

### Whooping Crane Forage Items

During the fall of 2019 - fall of 2022, we obtained numerous hours of video and thousands of photographs and were able to clearly identify whooping cranes foraging on animal prey of multiple taxa including 16 individual *Actinopterygii* sp. (ray-finned fish), 1 *Anura* sp. (frog), 1 *Trionychidae* sp. (softshell turtle), and 8 *Arthropoda* spp. (arthropod; **Table 3**).

**Table 3.** Forage items documented being consumed by whooping cranes (WC; *Grus americana*) during spring 2019 - fall 2022 migrations.

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

### 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 ( $\geq 5$  wires) or minor ( $\leq 4$  wires) power line. Whooping crane use locations were, on average, 491 m from any wooded area (range 25 m – 10,000 m). On average, use locations were 1,842 m from the nearest major road (range 60 m – 8,800 m). Use locations averaged 857 m from the nearest major or minor power line (range 50 m – 4,475 m) with no discernable difference in distance between use locations and these 2 types of power line.

### Whooping Crane and Sandhill Crane Response to Bald Eagles

We observed 7 instances of bald eagles interacting with whooping cranes and several where they interacted with sandhill cranes. During the first instance, 3 juvenile bald eagles flew near 4 foraging whooping cranes and landed on a nearby sandbar. At least one whooping crane became alert and watched the bald eagles as they got closer. Eventually, the 4 whooping cranes approached the sandbar where one bald eagle was foraging and the adult whooping crane approached the bald eagle and jump-raked it which resulted in the bald eagles flying away. During the second instance, 1 juvenile bald eagle dive bombed a group of 4 whooping cranes, seemingly focused on the juvenile whooping crane, and one adult whooping crane jump-raked the bald eagle in defense and the bald eagle flew away. During the next encounter, a bald eagle lit near where  $>30,000$  sandhill cranes were roosting and  $\sim 150$  sandhill cranes flushed and others moved away. The rest of the sandhill cranes and 1 whooping crane remained within 800 m of the bald eagle until it eventually took off. During the fourth instance, 18 whooping cranes were in the Platte River channel within 30 m of a bald eagle on a sandbar. The bald eagle took flight and flew low (20 m) over the whooping cranes and 4 became alert and 2 flushed. The 2 whooping cranes that flushed returned to the channel after a few minutes. During the fifth instance, two

adult and 1 juvenile bald eagles were on a downed tree in the Platte River close to four adult whooping cranes. One adult and one juvenile bald eagle swooped down towards the 4 whooping cranes that did not react and then the bald eagles flew away. During the next instance, an adult bald eagle that was perched high on a wood pile swooped down next to 3 adult and 1 juvenile whooping crane that became defensive and then the bald eagle flew back to the tree and was perched. During the seventh and final encounter, the 1 whooping crane loafed, preened, and stretched its wings and jumped while staying alert as three eagles sat on a nearby sandbar. The whooping crane took off with a flush of sandhill cranes as the bald eagle swooped low over the roost. We also observed 3 adult bald eagles interacting with 4 whooping cranes during 1 instance on the Platte River near Overton, Nebraska; however, due to access limitations we were unable to document the response of the whooping cranes to the eagles.

We observed 1 bald eagle fly low over a roost of ~500 sandhill cranes which all took flight except 1. The bald eagle approached the sandhill crane and attempted to grab it with its talons, but the sandhill crane used a bill-stab defense to drive the bald eagle away. During another instance, 10 bald eagles flew individually or in groups of 2-3 over a sandhill crane at about 10 feet, occasionally swooping lower. The sandhill crane became alert and the bald eagles eventually returned to forage on an unknown avian species. On another occasion, we observed a juvenile bald eagle sitting on a sandbar ~30 yards from a sandhill crane roost. The sandhill cranes all walked towards the bald eagle and nearly surrounded it when the bald eagle took off and left the area. We also observed an interaction between 12 bald eagles and ~1,000 sandhill cranes at Quivira National Wildlife Refuge in Kansas. During these observations, we documented 7 adult and juvenile bald eagles flying over the 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 assume was a snow goose (**Figure 1**). We did not observe any defensive or flush response from the sandhill cranes to these low-flight 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.





**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.

### *Whooping Crane Response to Aircraft*

We observed 15 potential aircraft-whooping interactions involving 90 individuals during the spring 2019 - fall 2022. Reactions observed included 57 whooping cranes with no reaction during 9 instances, 30 whooping cranes where alert responses were observed during 10 instances, and 3 whooping cranes that flushed during 1 encounter. We observed 3 additional instances where an aircraft flew low over the area where whooping cranes were located the night before, but were unable to observe the whooping cranes' response due to property access limitations in each case. On one instance, we observed a Chinook helicopter flying low (~1,000 – 1,500m) over the lower Platte River near Fremont, Nebraska near 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. Similarly, we were not able to obtain permission to access the North Loup River or central Platte River channels to observe whooping crane responses to low-flying (~750 – 1,000 m) Cessna 172 aircraft during the other 2 instances. We also positioned ourselves near whooping crane groups on 2 occasions to document their response to low-flying aircraft; however, during one attempt the scheduled flight was cancelled; during the second instance the whooping cranes departed the river prior to the plane arriving.

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