

Platte River
Recovery Implementation Program
IMPLEMENTATION OF THE WHOOPING CRANE
MONITORING PROTOCOL
2021 Spring



Photo: Colleen Childers

**Prepared for: PRRIP Technical Advisory and Governance
Committees**

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Table of Contents

Summary.....	3
Introduction.....	3
Methods	4
Study area.....	4
Systematic flight transects.....	4
Observations and data collection.....	6
Results.....	7
Confirmed whooping crane sightings.....	7
Proportion of population	8
Streamflow and unobstructed channel width at whooping crane use locations.....	9
USFWS/PRRIP data comparison.....	13
Ground search effort and opportunistic observations.....	15
Incidental take.....	16
Observation efficiency trials.....	17
Flight results.....	18
Supplements	19
References Cited.....	20
Maps.....	22
Aerial Photos.....	30

Summary

The Executive Director’s Office (EDO) of the Platte River Recovery Implementation Program (“Program” or “PRRIP”) conducted whooping crane monitoring during the spring 2021 migration in accordance with *Platte River Recovery Implementation Program – Whooping Crane Monitoring Protocol – Migrational Habitat Use in the Central Platte River Valley rev. June 2017* ([PRRIP 2017b](#)). Spring migration monitoring took place from March 6th through April 29th, 2021. During the 55-day monitoring period, surveys were conducted using systematic flight transects along the Platte River from Chapman to Lexington, NE. Eighty-two percent of the scheduled flight transects were completed. Systematic and opportunistic sightings resulted in the observation of 6 individual whooping cranes, 1.19% of the estimated Aransas – Wood Buffalo (AWB) migratory whooping crane population. Unobstructed channel width at whooping crane use sites averaged 966 feet and nearest forest averaged 635 feet. Streamflow in the Platte River ranged from 245-6,440 cfs (cubic feet per second) ([USGS 2021b](#), [USGS 2021d](#)). Information from this monitoring effort will be used to help evaluate the biological response of whooping cranes to the land and water management activities of the Program.

Introduction

The Program is responsible for implementing certain aspects of the endangered whooping crane (*Grus americana*) recovery plan. More specifically, the Program’s Adaptive Management Plan (AMP) ([PRRIP 2020b](#)) management objective is to *contribute to the survival of whooping cranes during migration*. Performance indicators include:

- Increase area of suitable roosting and foraging habitat,
- Increase crane use days, and
- Increase proportion of whooping crane population use.

During development of the AMP in the early 2000’s, there was substantial disagreement about the appropriate management strategy to achieve the management objective. Program participants developed a number of priority hypotheses that reflected whooping crane-related uncertainties. In 2010, those hypotheses were sequenced to develop a smaller set of Tier 1 hypotheses to receive focused attention during the First Increment of the Program (2007-2019) ([PRRIP 2020c](#)) including:

- **WC-1:** Whooping crane use will increase as a function of Program land and water management activities.
- **WC-3:** Whooping crane use is related to habitat suitability. Riverine habitat suitability for whooping cranes is a function of channel characteristics such as water depth, channel width, and unobstructed-view widths.

As a means of better linking science learning to Program decision-making, priority hypotheses were further refined into a set of “Big Questions” that provided a template for linking specific hypotheses and performance measures to management objectives and overall Program goals.

The two “Big Questions” that relate directly to whooping cranes include ([PRRIP 2020a](#)):

- **Big Question #5** – Do whooping cranes select suitable riverine roosting habitat in proportions equal to its availability?
- **Big Question #10** – How do Program management actions in the central Platte River contribute to least tern, piping plover, and whooping crane recovery?

Implementation of the whooping crane monitoring protocol is intended to provide the systematically-collected whooping crane use and habitat (i.e., landscape level attributes at roost sites and diurnal use sites) data necessary to test the Tier 1 whooping crane hypotheses, evaluate learning related to the whooping crane Big Questions, and ultimately assess progress toward meeting the whooping crane management objective ([PRRIP 2017a](#), [PRRIP 2020a](#)).

The Program’s whooping crane monitoring protocol includes two major components ([PRRIP 2017b](#)):

- 1) Detect and confirm whooping crane stopovers in the study area through systematic targeted aerial surveys of river channel and palustrine wetland habitat within the 90-mile Associated Habitat Reach (AHR). Stopover data is used to comparatively evaluate changes in the frequency and distribution of stopovers within the study area over time.
- 2) Collect landscape-level habitat data at use locations. Habitat data is used for resource selection analyses and other analyses intended to inform Program habitat creation and maintenance activities.

Methods

The PRRIP EDO conducted spring 2021 migration monitoring in accordance with the *Platte River Recovery Implementation Program – Whooping Crane Monitoring Protocol – Migrational Habitat Use in the Central Platte River Valley rev. June 2017* ([PRRIP 2017b](#)). General methods are described below.

Study area

The area of study (Figs. 1-2) is the Program’s AHR, extending from the Highway 283 Platte River bridge near Lexington, Nebraska (40° 44’ 08.15” N; 99° 44’ 37.31” W) to the Platte River bridge near Chapman, Nebraska (40° 59’ 07.06” N; 98° 08’ 40.40” W) focusing on Platte River channels and adjacent wetlands and ponds within 3.5 miles of the river channel(s). The monitoring area encompasses a total of approximately 90 linear miles of river.

Systematic flight transects

Two Cessna 172 aircraft, each crewed by a pilot and two observers, were used to make aerial observations along predetermined systematic flight transects. The pilot utilized a GPS unit to follow the pre-loaded route and track miles flown. Systematic aerial transects were flown daily, conditions permitting, at an air speed of approximately 100 MPH and an altitude of approximately 750 feet, unless conditions demanded higher altitudes. Two flights were initiated each morning, one from Grand Island (east route, shown in red on Figs. 1 and 2) and one from Kearney (west route, shown in green on Fig.1 and 2). Planes were required to be at transect starting points ½ hour before sunrise. Flights were typically completed in less than two hours. In the event of adverse

weather, crews were able to wait up to two hours after sunrise for conditions to improve before cancelling the flight. Pilots were also able to cancel flights the night before or morning of a flight based on their best judgment of the forecasted weather and current conditions.

Two types of transects were flown to ensure coverage of both on-channel riverine and off-channel wetland habitat. On-channel river transects (OSE and OSW, river shown in blue on Figs. 1-2) were flown east to west and the plane was oriented south of the southern-most river channel to reduce the effect of sun glare. Starting points along riverine transects were alternated daily between two flight routes to allow different sections of the study area to be observed as early as possible in the flight times. Off-channel transects (in red and green on Figs. 1-2) were designed to sample existing off-channel habitat within the 3.5-mile limit, as well as to serve as functional routes for planes to return to starting airports.

Route 1 (Fig. 1): Transects begin at Minden bridge and Chapman bridge and follow the southern channel of the Platte River (OSW and OSE shown in blue) ending at Lexington bridge and Minden bridge, respectively. The primary wetland return transects (PWRTW, PW RTE) are then flown back east, along with one secondary transect (CSRT) in the east route, to get back to the airports.

Route 2 (Fig. 2): Transects begin at the midpoint of the OSW and OSE river channel transects (Odessa bridge and Wood River bridge, respectively). The west half of the river transects are flown first and end at Lexington and Minden bridges. The primary wetland return transects (PWRTW, PW RTE) are then flown back east ending at Minden bridge and Chapman bridge. Once the primary return transects are completed, the east half the river channel transects are then completed and end at Odessa bridge and Wood River bridge. To return to the airports, secondary return transects (ESRT, WSRT) are then flown east from Elm Creek (Hwy 183) and Wood River bridges.

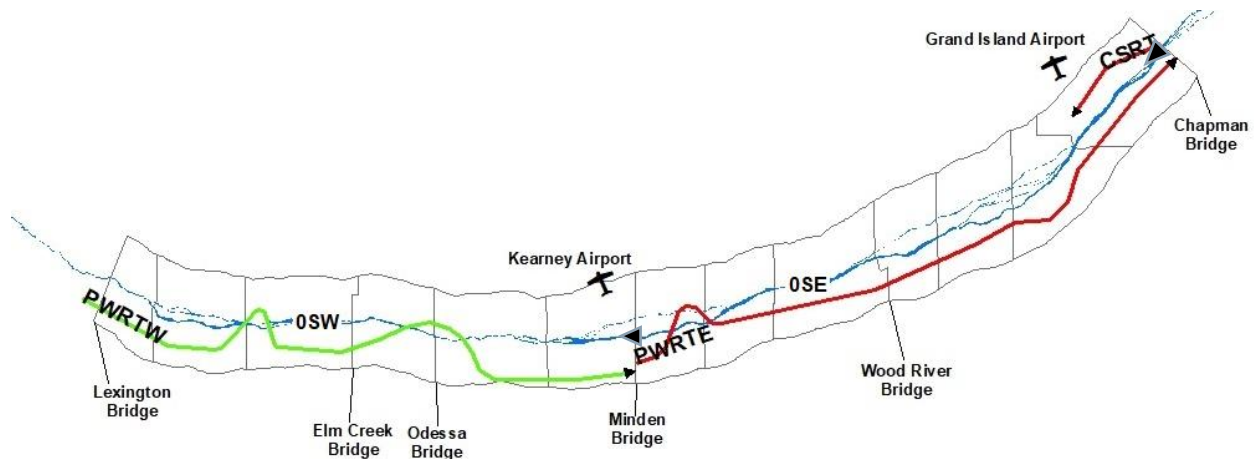


Figure 1. Route one east and west flight transects. Black and grey triangles indicate starting points. River channel shown in blue (OSW, OSE). West primary wetland return transect (PWRTW) is shown as a green line. East primary wetland return transect (PW RTE) and secondary return transect (CSRT) are shown as red lines.

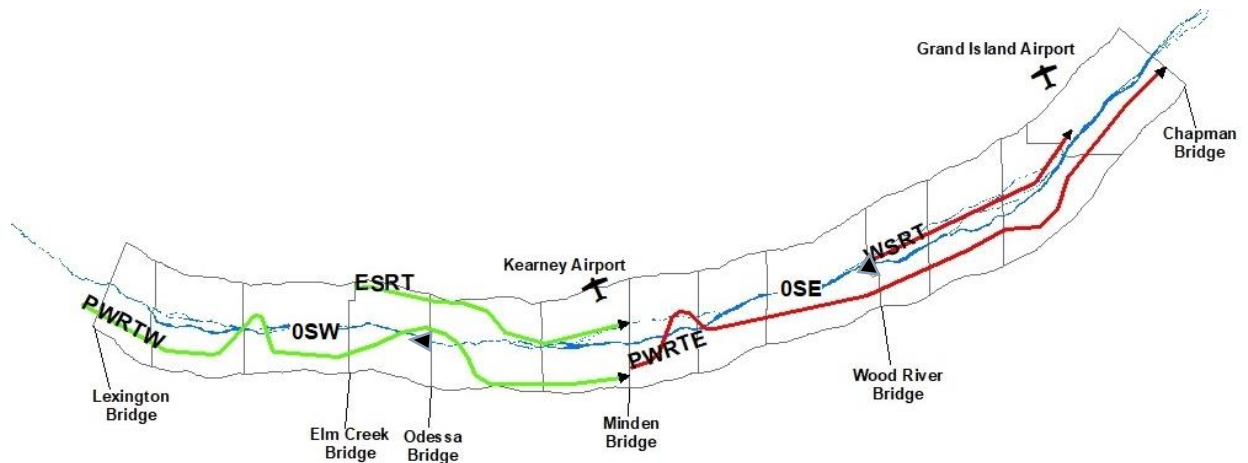


Figure 2. Route two east and west flight transects. Black and grey triangles indicate starting points. River channel shown in blue (OSW, OSE). West primary wetland return transect (PWRTW) and secondary return transect (ESRT) are shown as green lines. East primary wetland return transect (PWRTE) and secondary return transect (WSPT) are shown as red lines.

Observations and data collection

At the beginning of each transect and at turn around points, the aerial crews relayed their position via mobile phone to the nearby ground crews so they could stay in relative proximity. The aerial observers utilized binoculars for sighting and a Canon Rebel T6s 760D camera for photo documentation. If an aerial crew spotted potential whooping cranes, they would take photos of the objects and the surrounding area to later confirm the identity and location. If additional observations for confirmation were needed, aerial crew would contact the nearest ground observer via mobile phone, who would then position themselves to make a positive identification of the object without disturbance. The U.S. Fish and Wildlife Service (USFWS) were notified of daily survey results following the completion of both flights.

In addition to systematic flights, the aerial and ground crews also confirmed and reported opportunistic sightings. Immediately after receiving a report, either a plane would be deployed from the nearest airport and/or ground personnel would survey the area until the cranes were located and confirmed, or sufficient search time was allocated to confirm the cranes had left and/or were not present in the immediate area.




Aerial and ground crews used photographs and data sheets to document their observations of whooping crane groups, documenting numbers and age category of individuals, location, habitat type, time, and date of observation. Aerial flight logs and ground search data sheets were used to document time and mileage devoted to searching for and identifying whooping cranes. Universal Transverse Mercator (UTM) coordinates within UTM Zone 14N were determined for each crane group utilizing satellite imagery with a Geographic Information System (GIS) in conjunction with observation photos and location descriptions from datasheets. All data were later transcribed from the completed data sheets directly to the PRRIP species database. Data were then subjected to Quality Assurance/Quality Control (QA/QC) checks by the EDO to ensure accuracy.


























Results

Confirmed whooping crane sightings

A total of 6 individual whooping cranes were confirmed during the 55-day monitoring effort (Table 1). Two of those individuals were seen together on various days forming a 2:0 crane group (2 adults/0 juveniles). A crane group was defined as one or more whooping cranes observed at one location. Each crane group was given a unique crane group ID (e.g., 2021SP01 = year-season-number) at sighting and would be re-labeled as a new group and given a new crane group ID the next day if they were observed again. There were 25 crane groups registered on 17 days over the spring 2021 monitoring period. Use sites were given a numerical value at the time of sighting if the crane group was observed in riverine, lacustrine, or palustrine environment. Crane groups sighted outside of these environments were not assigned a use site number, but rather recorded the location's appropriate land cover classification or denominated as "AIR" if the group was sighted while in flight (Table 1).

Table 1 includes unique crane group icons, observation dates, the number of cranes in each group, crane group ID's, use site designations, and the type of observation during each sighting instance. To facilitate cross-referencing, crane group icons are included in Tables 1, 2, 3, 4 and 5 as well as on the collective crane group location map in Fig. 8 and the individual crane group location maps in Figs. 9-15.

Table 1. Data for each crane group observed during the 2021 spring survey including: unique group identifier icons; date of observation; number of cranes in each group; group ID; use site number attributed to unique riverine, lacustrine, or palustrine use sites and off-channel habitat type; GPS locations within UTM Zone 14N; type of observation; and figure references. Crane group  was formed from the joining of  &  individuals.

Spring 2021	Unique Group Icon	Obs. Dates	# of Cranes Adult:Juv	Group ID #	Use Site #	Zone 14N UTMx	Zone 14N UTMy	Observation Type	See Figures
		3/6/21	1:0	2021SP01	Corn	545693	4512140	Ground	8, 9, 16
		3/7/21	1:0	2021SP02	Corn	545443	4512082	Ground	8, 9, 16
		3/7/21	1:0	2021SP03	Corn	541197	4511447	Ground	8, 12, 19
		3/8/21	1:0	2021SP04	1	544508	4514419	Systematic	8, 10, 17
		3/8/21	1:0	2021SP05	2	540470	4512192	Systematic	8, 12, 19
		3/8/21	1:0	2021SP06	Corn	545528	4512026	Ground	8, 9, 16
		3/9/21	1:0	2021SP07	Corn	541699	4509000	Systematic	8, 12, 19
		3/10/21	1:0	2021SP08	3	540613	4512155	Systematic	8, 12, 19
		3/10/21	1:0	2021SP09	4	544798	4514492	Systematic	8, 9, 16
		3/11/21	2:0	2021SP10	5	543686	4513767	Systematic	8, 11, 18
		3/11/21	1:0	2021SP11	6	540565	4512398	Systematic	8, 12, 19
		3/12/21	1:0	2021SP12	7	540823	4512283	Systematic	8, 12, 19
		3/12/21	1:0	2021SP13	8	439268	4508027	Systematic	8, 13, 20
		3/14/21	1:0	2021SP14	Corn	542079	4512166	Ground	8, 12, 19
		3/16/21	1:0	2021SP15	Corn	542411	4510256	Ground	8, 12, 19
		3/17/21	1:0	2021SP16	Corn	542098	4504858	Ground	8, 12, 19
		3/18/21	1:0	2021SP17	9	541436	4512877	Systematic	8, 12, 19
		3/18/21	2:0	2021SP18	Corn	548855	4507800	Ground	8, 11, 18
		3/19/21	1:0	2021SP19	10	540840	4512428	Systematic	8, 12, 19
		3/19/21	2:0	2021SP20	Corn	548365	4507329	Ground	8, 11, 18
		3/20/21	2:0	2021SP21	11	548913	4515152	Systematic	8, 11, 18
		3/22/21	2:0	2021SP24	AIR	549299	4515282	Systematic	8, 11, 18
		3/27/21	1:0	2021SP22	AIR	513047	4502834	Ground	8, 14, 21
	3/28/21	1:0	2021SP23	12	512405	4502774	Systematic	8, 14, 21	
	3/31/21	1:0	2021SP25	13	504653	4500941	Systematic	8, 15	

Proportion of population

According to the most recent survey conducted by the U.S. Fish and Wildlife Service during the winter of 2019-2020, the Aransas – Wood Buffalo (AWB) migratory whooping crane population was estimated as 506 birds (95% CI: 342.6 - 678.0; [USFWS 2020](#)). The 6 individuals observed during the spring 2021 monitoring effort constitute approximately 1.19% of that migratory population estimate.

Observed whooping crane use of the central Platte River during spring systematic surveys of the AHR for PRRIP has varied from year to year (Fig. 3). Since the initiation of PRRIP monitoring efforts in 2007, the estimated proportion of the AWB population observed on the central Platte River through implementation of the PRRIP monitoring protocol has ranged from 1.13% - 23.76%. Linear regression analysis of the data from 2007 – 2021 demonstrated no significant increasing or decreasing long-term trend (slope coefficient = 0.002, p-value = 0.586) at an alpha level of 0.05.

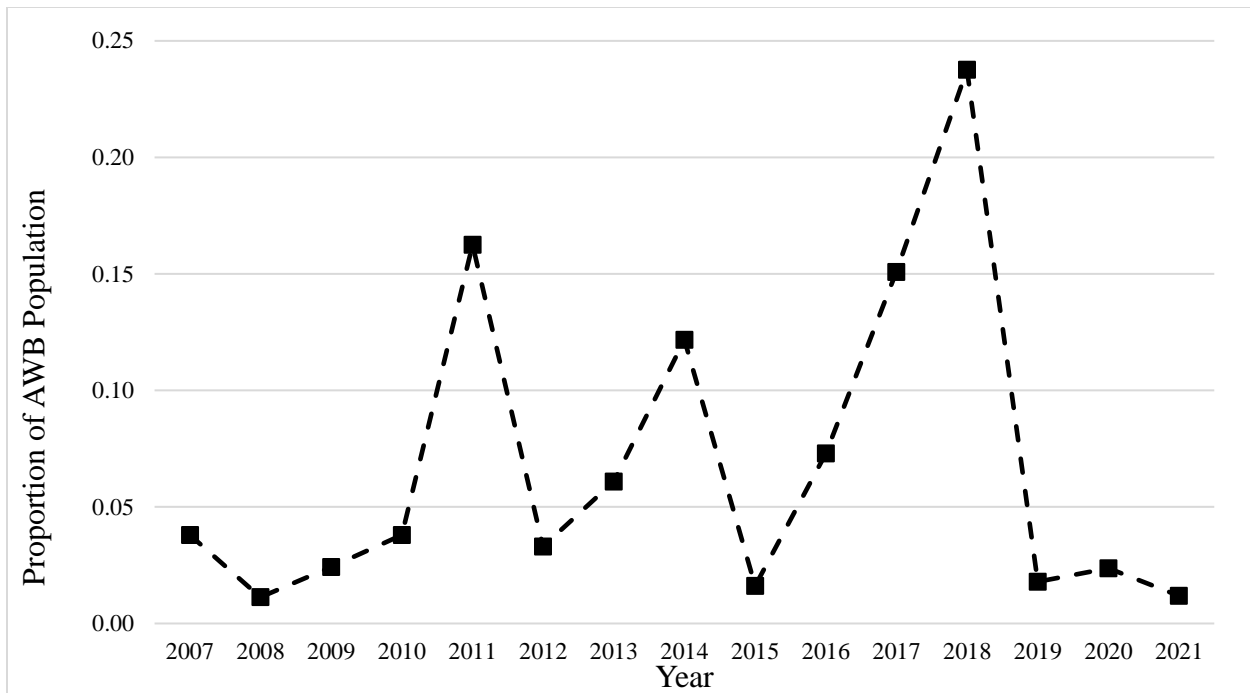















Figure 3. Annual proportion of the estimated Aransas-Wood Buffalo (AWB) whooping crane population observed (black squares) during aerial systematic and opportunistic spring migration surveys from 2007-2021.

Streamflow and unobstructed channel width at whooping crane use locations

During the spring 2021 whooping crane migration monitoring period, Platte River flow in the AHR ranged from a low of 245 cubic feet per second (cfs) at Overton on 04/29/21 ([USGS 2021b](#)) to a high of 6,440 cfs at Grand Island on 03/15/2021 ([USGS 2021d](#)). Instantaneous discharge at the nearest gaging station at the time crane groups were observed, ranged from 520 cfs – 3,250 cfs (Table 2).

Table 2. In-channel crane group use sites and associated streamflow discharge (cfs) based on nearest gauging station and time of observation.

Unique Group Icon	Crane Group ID	# of Cranes Adults:Juv	Use Site #	Date	Gauging station	Discharge (cfs)
	2021SP04	1:0	1	03/08/21	Grand Island ¹	1,010
	2021SP05	1:0	2	03/08/21	Grand Island ¹	1,010
	2021SP08	1:0	3	03/10/21	Grand Island ¹	1,030
	2021SP09	1:0	4	03/10/21	Grand Island ¹	1,030
	2021SP10	2:0	5	03/11/21	Grand Island ¹	1,100
	2021SP11	1:0	6	03/11/21	Grand Island ¹	1,100
	2021SP12	1:0	7	03/12/21	Grand Island ¹	1,180
	2021SP13	1:0	8	03/12/21	Overton ²	520
	2021SP17	1:0	9	03/18/21	Grand Island ¹	3,250
	2021SP19	1:0	10	03/19/21	Grand Island ¹	3,110
	2021SP21	2:0	11	03/20/21	Grand Island ¹	2,540
	2021SP23	1:0	12	03/28/21	Kearney ³	801
	2021SP25	1:0	13	03/31/21	Kearney ³	1,870

¹USGS 2020d

²USGS 2020b

³USGS 2020c

Figs. 4-6 display discharge during the spring 2021 monitoring period at USGS river gages located at Overton, Kearney, and Grand Island ([USGS 2020a](#)).

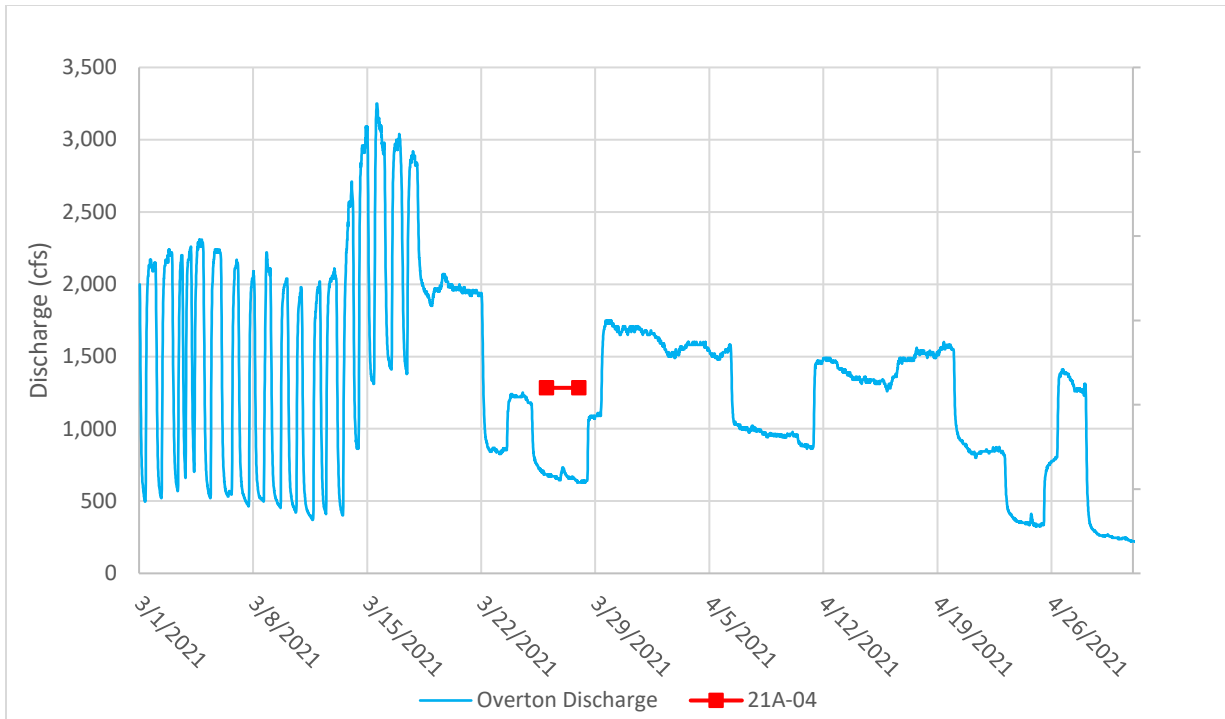


Figure 4. Discharge (blue line) at the Overton gage from 3/1 – 4/30 ([USGS 2020b](#)). USFWS crane group 21A-04 days of use shown in red.

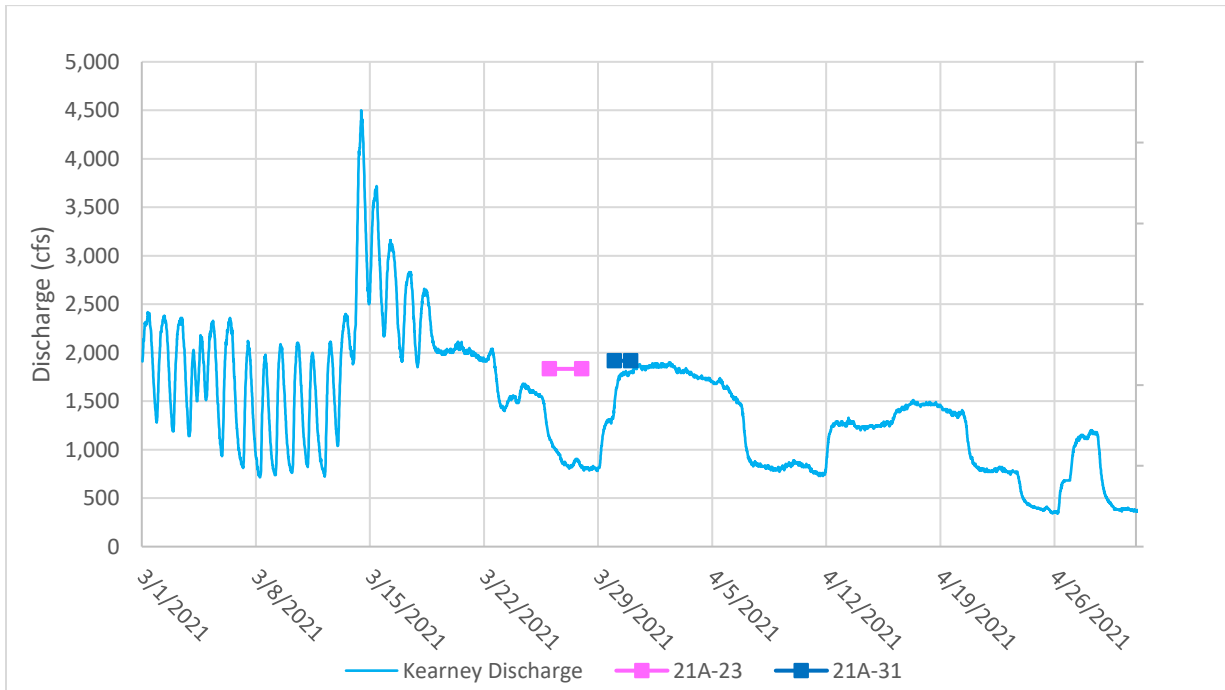


Figure 5. Discharge (blue line) at the Kearney gage from 3/1 – 4/30 ([USGS 2020c](#)). USFWS crane groups 21A-23 and 21A-31 days of use shown in pink and blue.

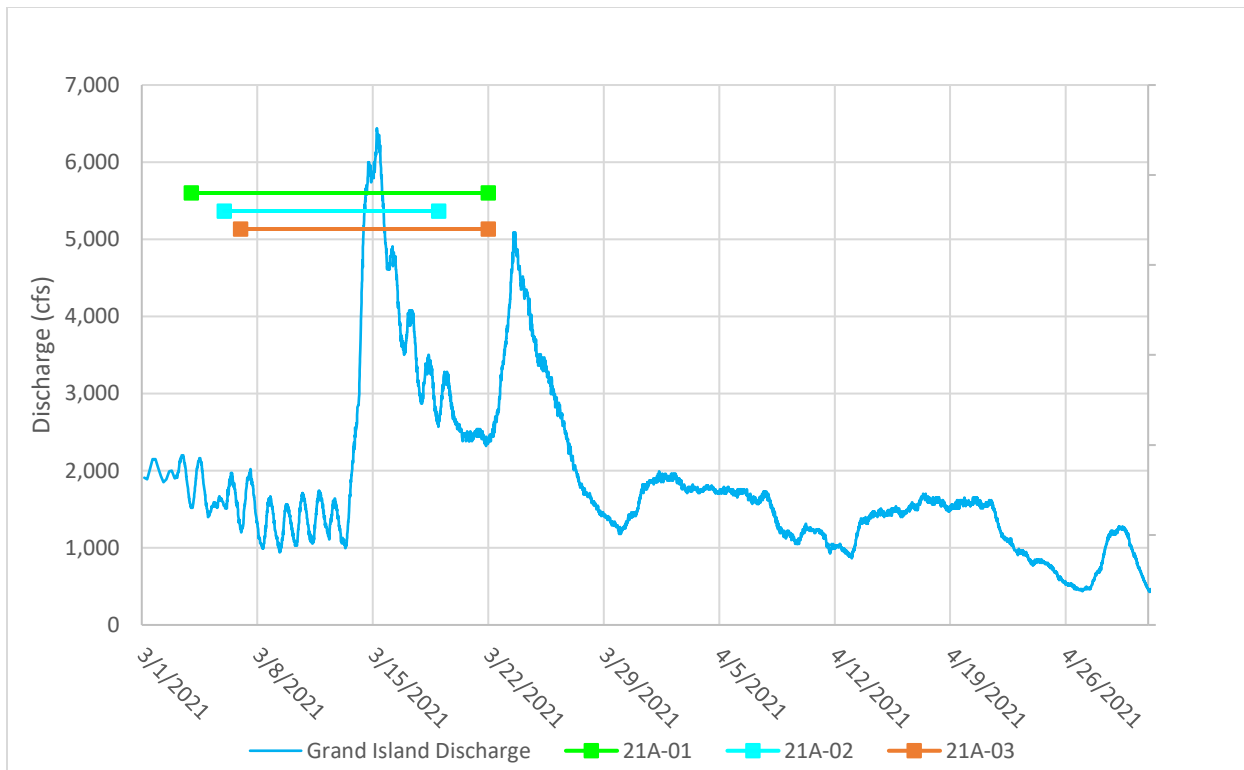















Figure 6. Discharge (blue line) at the Grand Island gage from 3/1 – 4/30 ([USGS 2020d](#)). USFWS crane groups 21A-01, 21A-02 and 21A-03 days of use shown in green, light blue, and orange.

Unobstructed channel width (width of channel unobstructed by dense vegetation) and nearest forest (distance to nearest riparian forest) have both been found to be important predictors of whooping crane use of the Platte River (Baasch *et al.* 2019). Table 3 includes unobstructed channel width and nearest forest at each in-channel whooping crane use location measured from October 2020 imagery. Unobstructed channel widths at riverine use sites ranged from 154 – 1,419 feet (average = 966 feet). Nearest forest ranged from 77 – 1,379 feet (average = 635 feet).

Table 3. Unobstructed channel width and nearest forest at each in-channel crane use location.

Unique Group Icon	Crane Group ID #	Use Site #	Zone 14N UTM _x	Zone 14N UTM _y	Unobstructed Channel Width (ft)	Nearest Forest (ft)
	2021SP04	1	544508	4514419	1,156	1,105
	2021SP05	2	540470	4512192	1,166	599
	2021SP08	3	540613	4512155	1,115	210
	2021SP09	4	544798	4514492	1,080	1,379
	2021SP10	5	543686	4513767	824	731
	2021SP11	6	540565	4512398	1,170	848
	2021SP12	7	540823	4512283	1,219	370
	2021SP13	8	439268	4508027	154	77
	2021SP17	9	541436	4512877	1,419	554
	2021SP19	10	540840	4512428	1,225	803
	2021SP21	11	548913	4515152	778	271
	2021SP23	12	512405	4502774	939	208
	2021SP25	13	504653	4500941	309	1,105

USFWS/PRRIP data comparison







Table 4 compares the USFWS whooping crane sighting data (provided by Matt Rabbe – USFWS whooping crane lead) to the PRRIP survey effort on all reported observations within the AHR. Included are the icons associated with each unique crane group, the date(s) the group was observed, the number of individuals in the group and each agency’s identification numbers assigned to the respective groups. The difference in ID #'s is due to the USFWS data operating on an “initial sighting” basis of identification, whereas PRRIP assigns a new crane group ID number each day a group is observed.

Whooping cranes were observed by PRRIP on 17 of the 55 days of the survey effort (on 30.9% of the days; Table 1). There were three instances (21A-07, 21A-09, 21A-18) where USFWS reported a crane group that was not observed by PRRIP. Crane group 21A-07 arrived and departed prior to PRRIP’s monitoring dates. Crane group 21A-09 left the river prior to the survey plane reaching them. Crane group 21A-18 was reported by the public and only seen north of the Platte River foraging in a cornfield that PRRIP flight transects do not cover.

Crane use days were calculated by multiplying the number of individual cranes in each group by the number of days the group was present, plus one day per crane, as each crane observed during early morning PRRIP aerial surveys was assumed to have been present the evening prior to the

morning of the first observation. This resulted in a total of 64 crane use days during the spring survey (Table 4). Linear regression analysis of the data from 2007 – 2021 demonstrated no significant increasing or decreasing long-term trend (slope coefficient = 9.643, p-value = 0.182) at an alpha level of 0.05 (Fig. 7).

Table 4. Comparison of USFWS and PRRIP whooping crane (WC) sightings including: PRRIP group icon, dates present according to PRRIP and USFWS, number and age category of individuals, USFWS and PRRIP group ID comparisons, and crane use days.

Unique Group Icon	Dates Present	# of WC Ad:Juv	USFWS ID #	PRRIP ID #	Use Days = (Days Present x Cranes) + 1 day per crane			
					Days Present PRRIP	Days Present PRRIP/USFWS	Cranes	Use Days
N/A	3/4	1:0	21A-07	N/A	0	1	1	2
	3/5-3/10 3/11-3/22	1:0	21A-01	2021SP01, 02, 06, 09 2021SP10, 18, 20, 21, 24	17	18	1	19
	3/7-3/19	1:0	21A-02	2021SP03, 05, 07, 08, 11, 12, 14, 15, 16, 17, 18, 19	13	13	1	14
	3/8 3/11-3/22	1:0	21A-03	2021SP04 2021SP10,18, 20, 21, 24	15	15	1	16
	3/12	1:0	21A-04	2021SP13	1	1	1	2
N/A	3/16	1:0	21A-09	N/A	0	1	1	2
N/A	3/27	2:0	21A-18	N/A	0	1	2	4
	3/27-3/28	1:0	21A-23	2021SP22, 23	2	2	1	3
	3/31	1:0	21A-31	2021SP25	1	1	1	2
							Crane Use Days	64

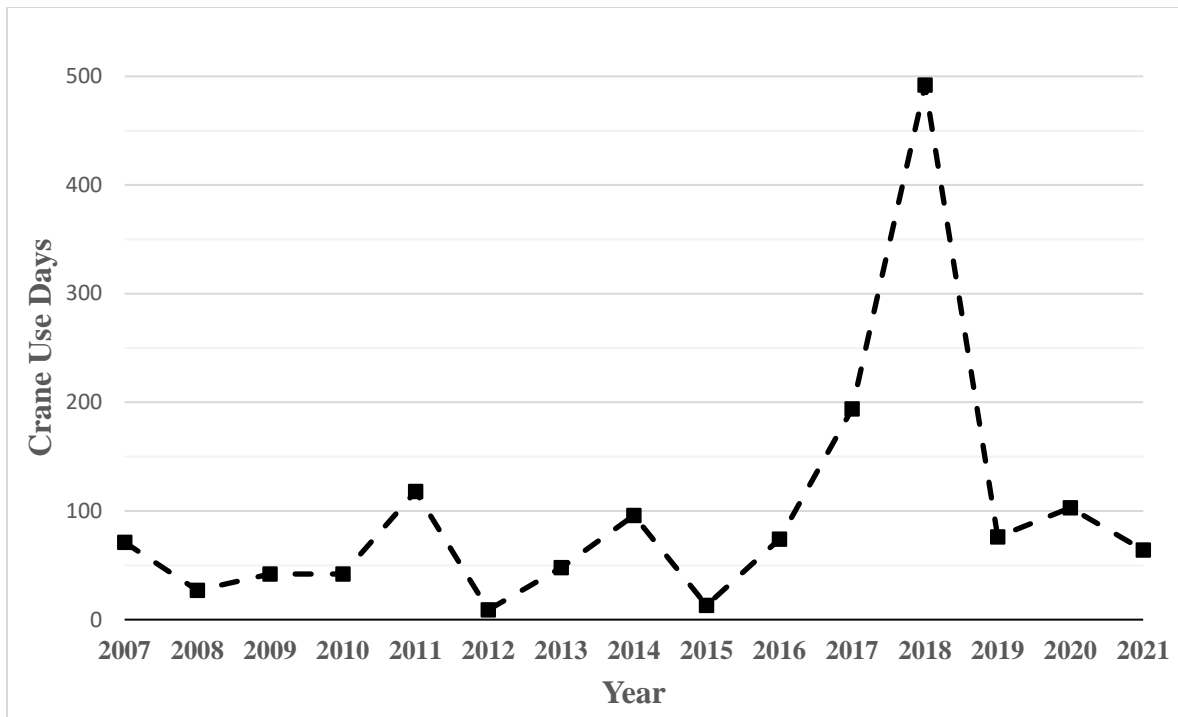














Figure 7. Number of crane use days (black squares) during the annual spring migration surveys from 2007-2021.

Ground search effort and opportunistic observations

There were 10 instances when ground crews independently observed a whooping crane group as well as 6 other instances when they acted on a confirmation request to verify a white object spotted by aerial crews within the survey area during the 55-day monitoring effort (Table 5). In Table 5, the “miles driven” column indicates the total miles driven in the effort to locate a potential crane group, starting from the location of the last reported sighting or known location based on previous days’ observations, then continuing until the crane group or white object was located and identified or a reasonable amount of effort has been put forth. Of the 25 sightings (Table 1), 10 were made by ground crews without the aid of aerial support.

Table 5. Ground search effort for whooping cranes (WC) in response to aerial sighting by plane (plane), found based upon previous known locations (known), or opportunistic sighting with no prior knowledge of whooping crane presence in the area (opportunistic). Sighting resulted from effort by aerial and ground crew working together (both) or ground crew sighting alone (ground). Efforts that resulted in no WC found, are recorded as None.

Unique Group Icon	Date	Source	WC Confirmed Ad:Juv	Miles Driven	Aerial/Ground Effort
	3/6	Known	1:0	1	Ground
	3/7	Known	1:0	2	Ground
	3/7	Known	1:0	1	Ground
	3/8	Known	1:0	2	Ground
	3/12	Plane	1:0	41	Both
	3/14	Known	1:0	1	Ground
	3/16	Known	1:0	98	Ground
	3/17	Known	1:0	27	Ground
N/A	3/17	Known	None	18	Ground
N/A	3/17	Plane	None	15	Both
	3/18	Known	2:0	40	Ground
	3/19	Known	2:0	30	Ground
N/A	3/23	Known	None	109	Ground
N/A	3/25	Plane	None	61	Both
	3/27	Opportunistic	1:0	20	Ground
N/A	3/30	Plane	None	5	Both
	3/31	Plane	None	3	Both
N/A	4/2	Plane	None	20	Both

Incidental take

The USFWS requests information and documentation of any human activity that occurred in the proximity of whooping cranes that could constitute “take” as defined by the Endangered Species Act (i.e., “...to harass, harm, pursue, hunt, shoot, wound, kill, capture, or collect, or attempt to engage in any such conduct”). Because harassment interrupts essential feeding or sheltering behaviors, the definition includes disturbance of whooping cranes sufficient to result in cranes taking flight. During the monitoring period, PRRIP documented no instances of take as defined above. Specifically:

- *Lethal or crippling take*

There were no observations of crippling or lethal take of whooping cranes this season resulting from the monitoring conducted by PRRIP.

- *Harassment*

PRRIP staff did not observe or engage in any activity that could be construed as harassment as defined by USFWS.

- *Public disturbance*

PRRIP staff did not observe any incident of public disturbance of whooping cranes.

Observation efficiency trials

A total of 20 whooping crane decoy sets (1-3 decoys per set) were placed by the EDO in 20 unique locations along the aerial transects. Ten decoy sets were placed at randomly selected locations within the channel and ten decoy sets were placed at randomly selected locations along off channel conservation lands within 500 feet of the channel. Flight crews spotted 6 of the 10 decoy sets placed in a wetted channel (60.0%) and 1 of the 10 decoy sets placed at off-channel locations (10.0%) (Table 6).

Table 6. Observation efficiency trials using whooping crane decoys.

Date Placed	Date Tested	UTMx	UTMy	# of Decoys	Habitat Type	Detected
3/11	3/12	496849	4500514	3	Channel	YES
3/11	3/12	453621	4503564	2	Channel	YES
3/18	3/19	472555	4503627	2	Channel	YES
3/19	3/20	471126	4503653	3	Wet-Meadow	YES
3/22	3/24	496136	4501458	2	Wet-Meadow	NO
3/29	3/30	490387	4500770	1	Wet-Meadow	NO
3/29	3/30	446550	4505549	1	Wet-Meadow	NO
3/30	4/31	541914	4512761	2	Wet-Meadow	NO
3/31	4/1	517363	4505570	3	Wet-Meadow	NO
3/31	4/1	542157	4512897	3	Wet-Meadow	NO
4/5	4/6	444522	4504369	1	Channel	NO
4/5	4/6	505360	4501010	2	Wet-Meadow	NO
4/6	4/8	449232	4503661	3	Wet-Meadow	NO
4/7	4/8	511456	4502785	1	Wet-Meadow	NO
4/8	4/9	447063	4504740	1	Channel	NO
4/12	4/13	566226	4531772	3	Channel	YES
4/13	4/14	567541	4532696	3	Channel	YES
4/20	4/21	519743	4506411	2	Channel	YES
4/21	4/22	571770	4537113	1	Channel	NO
4/27	4/29	547086	4516205	1	Channel	NO

Flight results

Of the 110 scheduled flights, there were 92 instances when crews were able to depart the airport, of which 91 were completed, resulting in an overall completion of 82.7% (Table 7). One flight was initiated, but not completed and eighteen flights were cancelled due to weather.

Table 7. Flight completion rates.

	East	West	Totals
Completed	47	44	91
Cancelled/Incomplete	8	11	19
Scheduled Season Total	55	55	110
% Completed	85.5%	80.0%	82.7%

Of the 302 scheduled systematic transects, 246 (81.5%) were completed (Table 8). Of the 25 sightings of whooping crane groups, 15 of these were observed from the air while conducting systematic flight transects, and 10 were observed by ground crews while independently searching.

1

2 **Table 8.** Whooping crane (WC) sightings made during flight transects and ground surveys with associated transect completions, hours, and mileage.

	Flight Transects	WC Group Sightings ¹	Completed	Uncompleted	Cancelled	TOTAL SCHEDULED	Hours	Miles
On Channel	OSE, OSW ²	14	91	1	18	110	22:16:00	11,023.00
Off Channel	PWRTE, PWRTW ³	1	91	1	18	110	17:39:00	
	WSRT/CSRT, ESRT ⁴	0	64	0	18	82	11:24:00	
Ground/Oppportunistic ⁵		10					25:15:00	530.00
TOTALS		25	246	2	54	302	76:56:00	11,553.00

3

¹See Table 1 for crane group sighting details.

²Primary Transect (Riverine), (East – OSE, West – OSW) (Figs. 1-2)

³Primary Return transect, (East – PWRTE, West – PWRTW) (Figs. 1-2)

⁴Secondary Return transect, (East – WSRT and CSRT, West – ESRT) (Figs. 1-2)

⁵Ground/Oppportunistic were efforts made outside of systematic flight transects to confirm or deny unconfirmed crane groups or to independently search for previous day groups by motorized vehicle when flights were cancelled.

4

5

6 **Supplements**

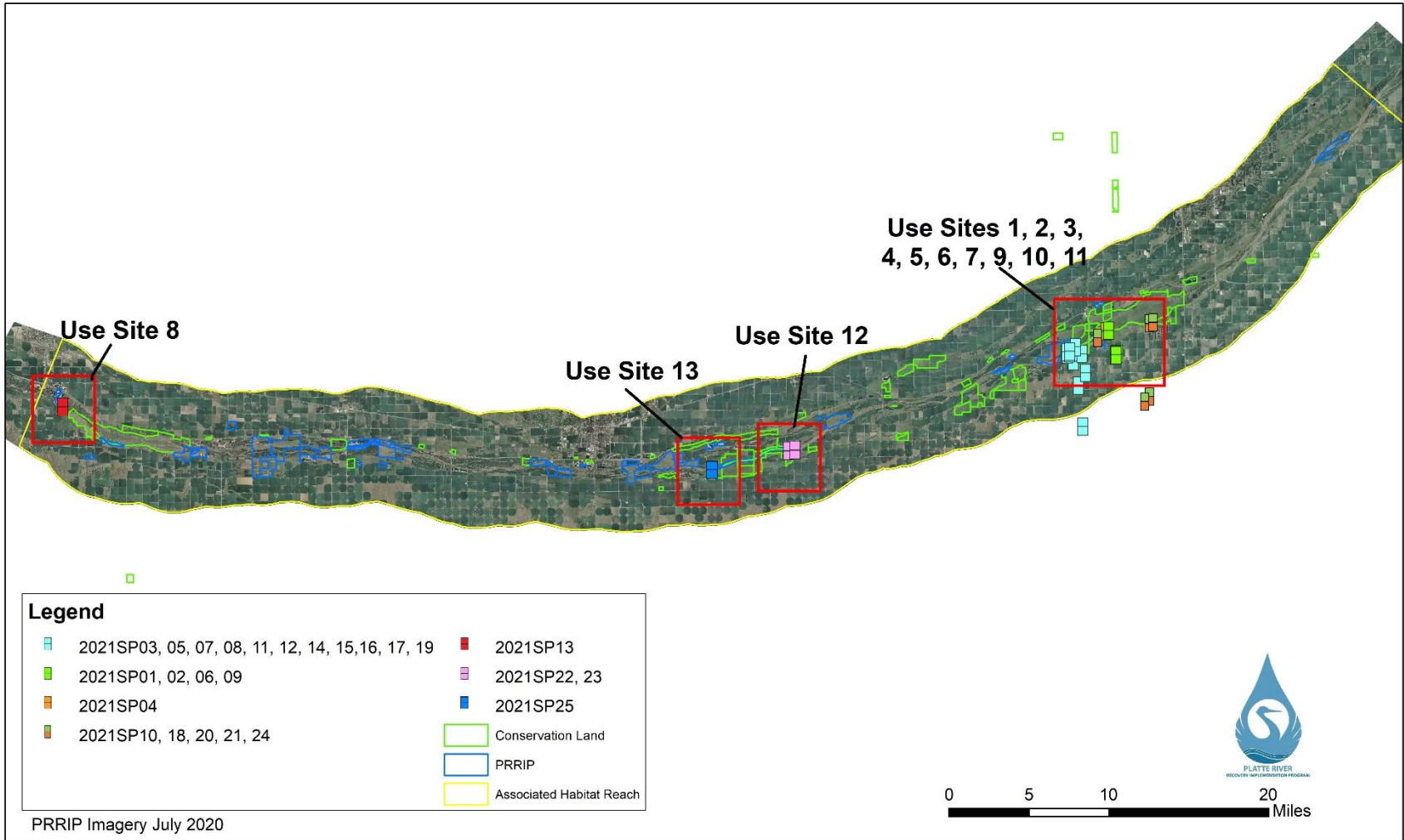
7 QA/QC of database was performed by PRRIP EDO staff.

8 Original datasheets – Retained at PRRIP EDO office.

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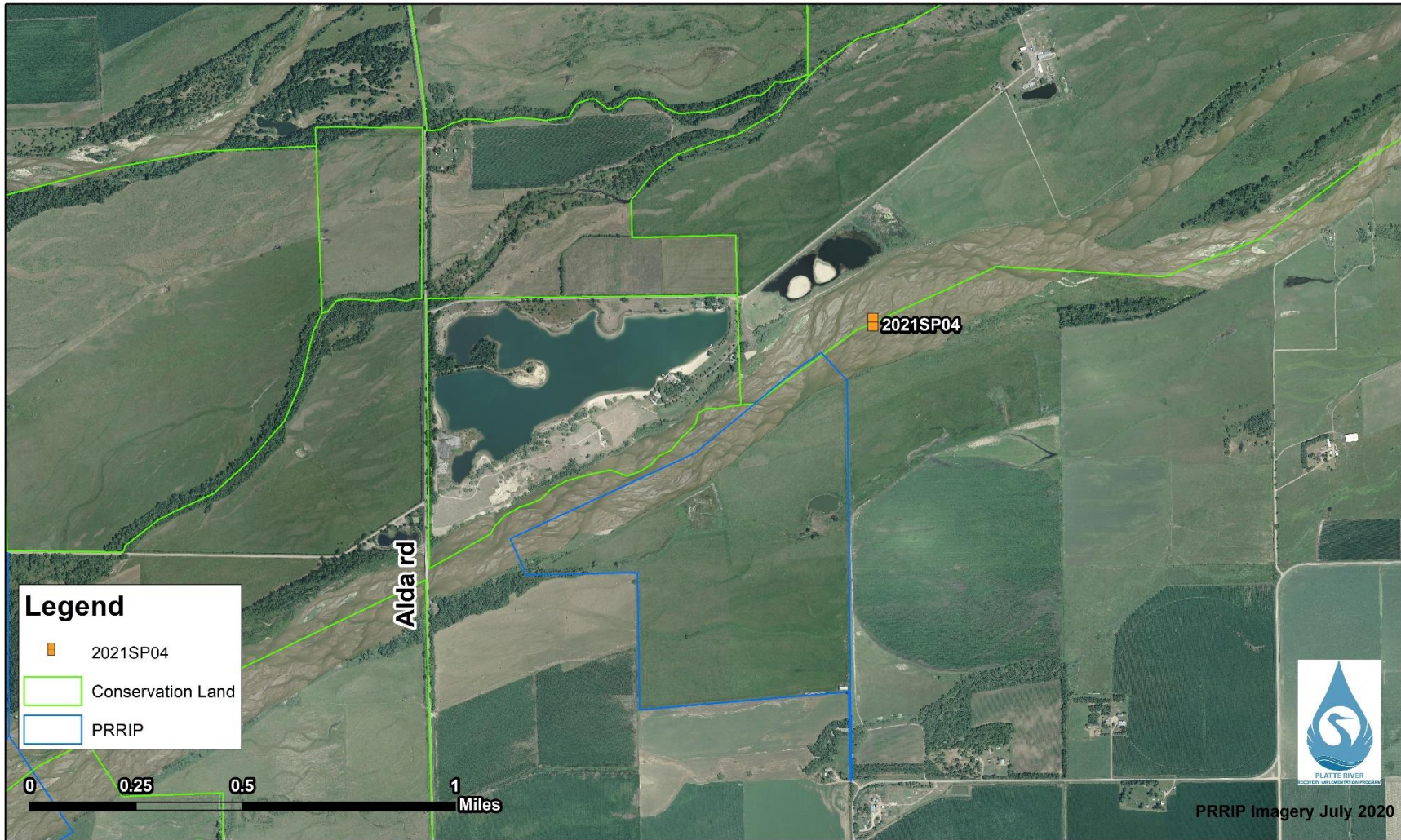
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61 **Figure 8.** Distribution of whooping crane group observations within the AHR (outlined in yellow) during the 2021 spring survey in relation to PRRIP lands
 62 (outlined in blue) and all other conservation lands (outlined in green).

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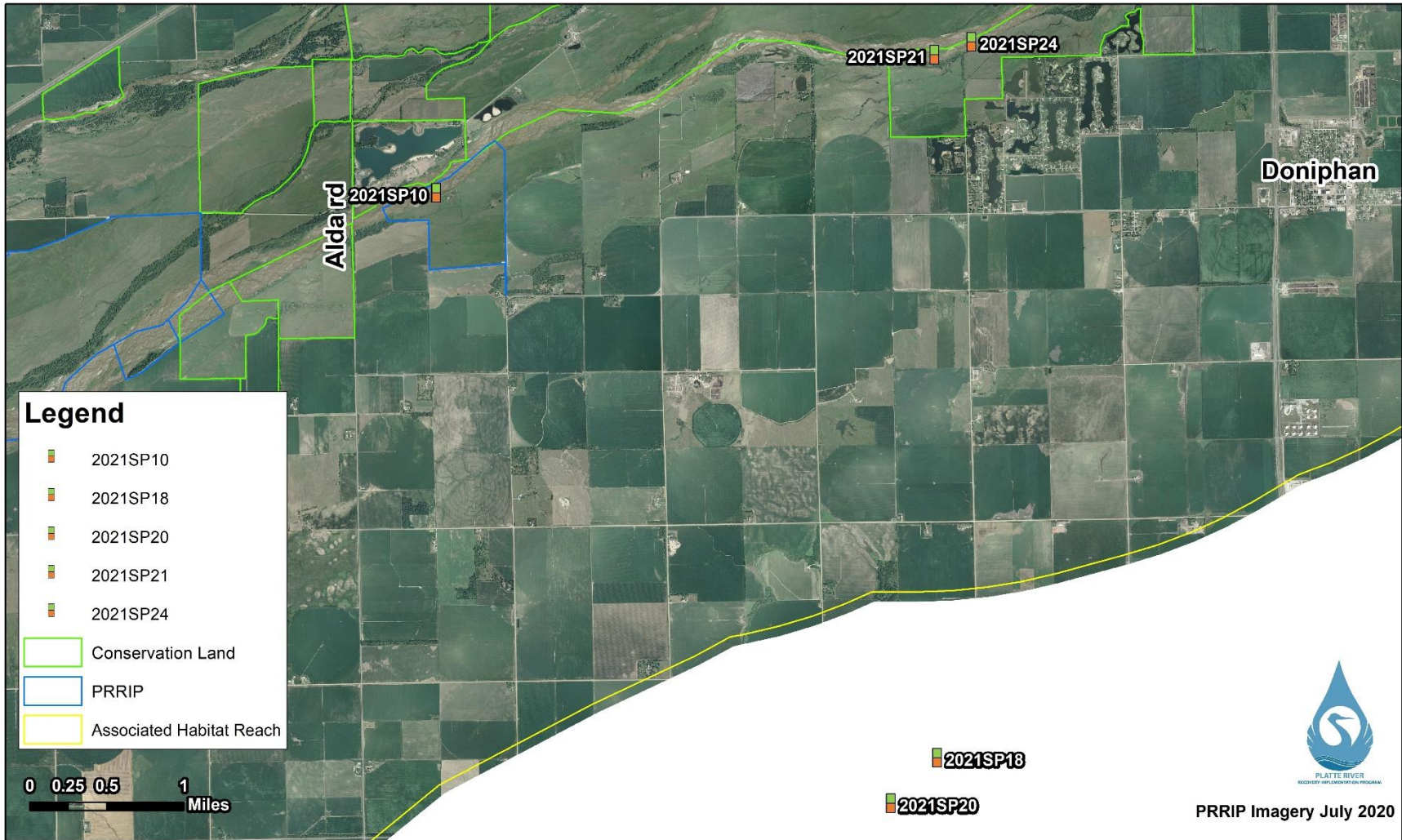
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65 **Figure 9.** Whooping crane groups 2021SP01, 02, 06, & 09 observed from 3/6/21 – 3/10/21 (including use site 4) south of Alda, NE.



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67 **Figure 10.** Whooping crane group 2021SP04 observed on 3/8/21 at use site 1 south of Alda, NE.

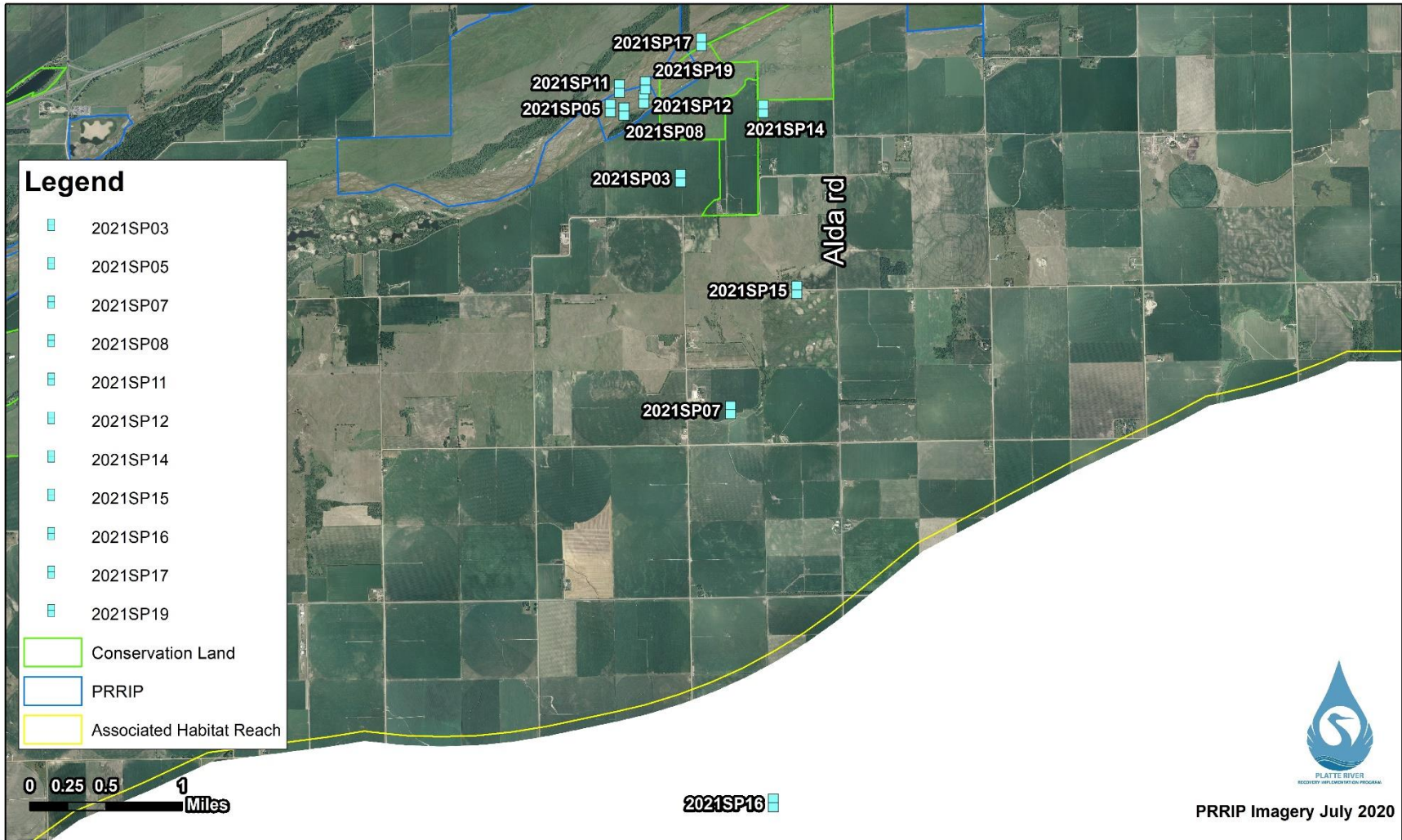
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70 **Figure 11.** Whooping crane group 2021SP10, 18, 20, 21, & 24 observed from 3/11/21 – 3/22/21 (including use sites 5 and 11) south of Alda, NE and west of
 71 Doniphan, NE. 2021SP18 and 2021SP20 were observed outside the AHR.

72



73

74 **Figure 12.** Whooping crane group 2021SP03, 05, 07, 08, 11, 12, 14, 15, 16, 17, and 19 observed from 3/7/21 – 3/19/21 (including use sites 3, 6, 7, 9, and 10)
 75 south of Alda, NE. Crane group 2021SP16 was observed outside the AHR.

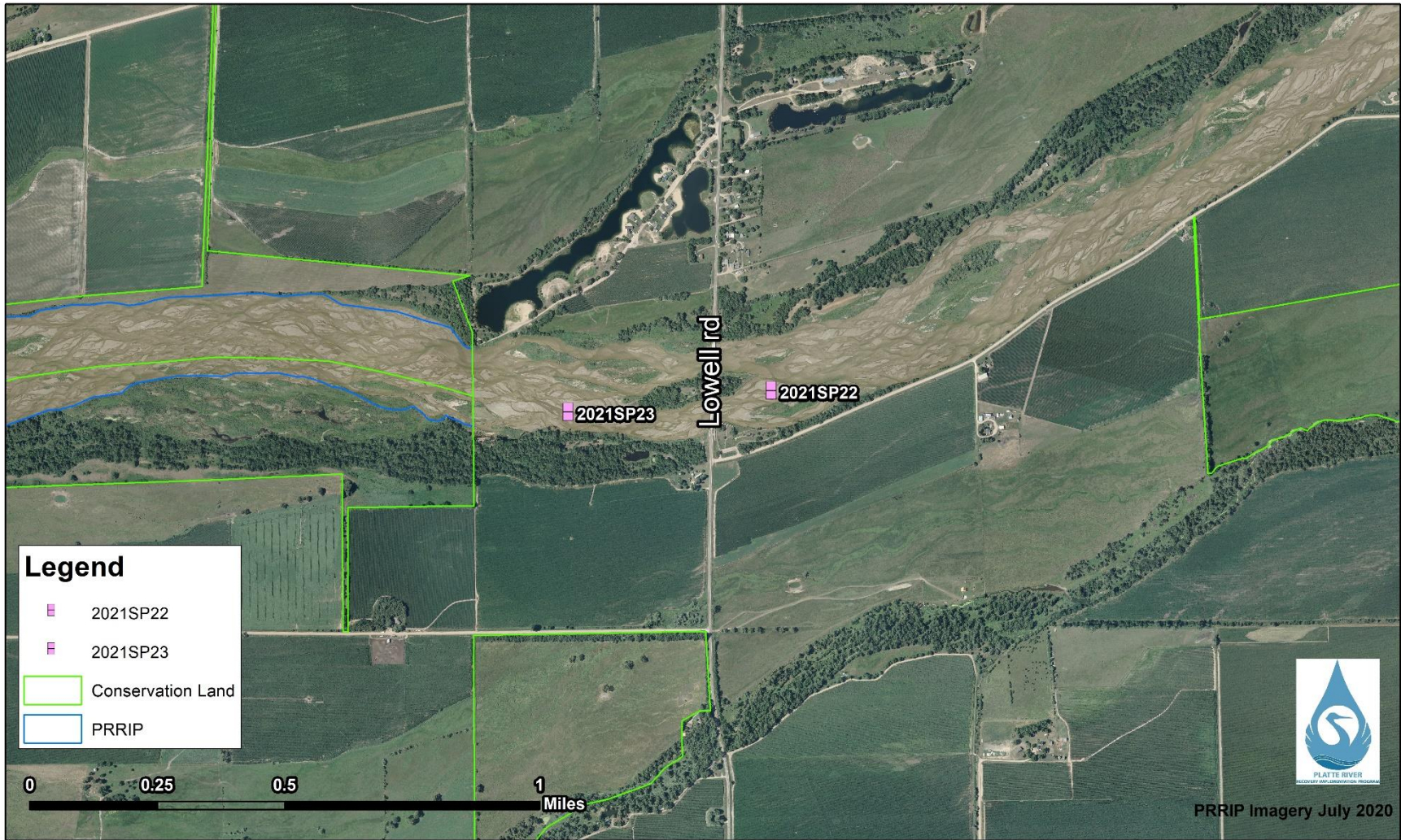
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79 **Figure 13.** Whooping crane group 2021SP13 observed on 3/12/21 at use site 8 south of Lexington, NE.



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81
82
83

Figure 14. Whooping crane group 2021SP22 and 23 observed on 3/27/21- 3/28/21 (including use site 12) south of Gibbon, NE.



84

85 **Figure 15.** Whooping crane group 2021SP25 observed on 3/31/21 at use site 13 north of Minden, NE.

86



87 **Figure 16.** Photo taken during a systematic observation of crane group 2021SP09 on 3/10/21 at use site 4 in the main
88 channel of the Platte River (see Fig. 9 above for location).

89



90 **Figure 17.** Photo taken during a systematic observation of crane group 2021SP04 on 3/8/21 at use site 1 in the Platte
91 River (see Fig. 10 above for location).



92 **Figure 18.** Photo taken during a systematic observation of the 2:0 crane group 2021SP21 on 3/20/21 at use site 11 in
93 the Platte River (see Fig. 11 above for location).

94



95 **Figure 19.** Photo taken during a systematic observation of crane group 2021SP05 on 3/8/21 at use site 2 in the Platte
96 River (see Fig. 12 above for location).



97 **Figure 20.** Photo taken during a systematic observation of crane group 2021SP13 on 3/12/21 at use site 8 in the
98 Platte River (see Fig. 13 above for location).

99



100 **Figure 21.** Photo taken during a systematic observation of crane group 2021SP23 on 3/28/21 on use site 12 in the
101 Platte River (see Fig. 14 above for location).