

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/348018234>

# 2020 Species Detection, Collection, and Monitoring Report. Crane Trust, Wood River, Nebraska, USA, 19 p.

Technical Report · December 2020

DOI: 10.13140/RG.2.2.27047.37286

CITATIONS

0

READS

17

1 author:



Andrew James Caven

The Platte River Whooping Crane Maintenance Trust, Wood River, Nebraska 68883, USA

53 PUBLICATIONS 131 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Multimodal methods of ecological monitoring [View project](#)



Bison Health and Ecology [View project](#)



Trustees: Brad Korell, Craig Thompson and Shelley Sahling-Zart  
6611 W Whooping Crane Drive  
Wood River, NE 68883  
p. 308.384.4633  
f. 308.384.7209  
cranetrust.org

Species Detection,  
Collection, and  
Monitoring Report

December 16

2020

**Prepared by:**

*Andrew J. Caven, Director of Conservation Research, Crane Trust*

**In fulfillment of:**

*Nebraska Game and Parks Commission, Scientific and Education Permit,  
Master Permit No. 1212 (A. J. Caven)*

ATTN: Shaun Dunn, Zoologist, Nebraska Natural Heritage Program, Wildlife  
Division, NGPC, Lincoln, NE, USA.

**Project Funding:**

U.S. Fish and Wildlife Service, Ecological Services Field Office, Wood River,  
NE, USA.

U.S. Fish and Wildlife Service, Partners for Fish and Wildlife Program, Wood  
River, NE, USA.

Rainwater Basin Joint Venture, Grand Island, NE, USA.

A summary of species  
detected during long-term  
monitoring at the Crane  
Trust and permitted  
collection activities in the  
calendar year.

## Table of Contents

Introduction.....	1
Figure 1. Map of Mormon Island, Hall County, Nebraska .....	4
Small Mammal Monitoring .....	4
Table 1. Small Mammals Detected at the Crane Trust 2020.....	5
Avian Monitoring.....	5
Table 2. Avian Detections and Abundance at the Crane Trust 2020 .....	6
Slough Fish Monitoring.....	10
Table 3. Fish Detected at the Crane Trust 2020.....	11
Vegetation Monitoring .....	11
Table 4. Plant Specimens Collected for the Crane Trust Herbarium 2020.....	12
Butterfly Species of Concern Monitoring .....	13
Table 5. Butterfly Detections 2020.....	14
Herpetofauna Research .....	14
Table 6. Amphibian Calling Index.....	14
Table 7. Mean Anuran Species Abundance Indices in 2020.....	15
Sandhill Crane Aerial Surveys.....	16
Table 8. Sandhill Crane Count by Survey Week 2020 .....	16
Soil Macroinvertebrate Collections.....	17
Table 9. Counts of Soil Macroinvertebrates Collected in 2020.....	17
Conclusion .....	18
Appendix 1. Recent Publication Activity by Crane Trust Research Staff (2020) .....	18

## Introduction

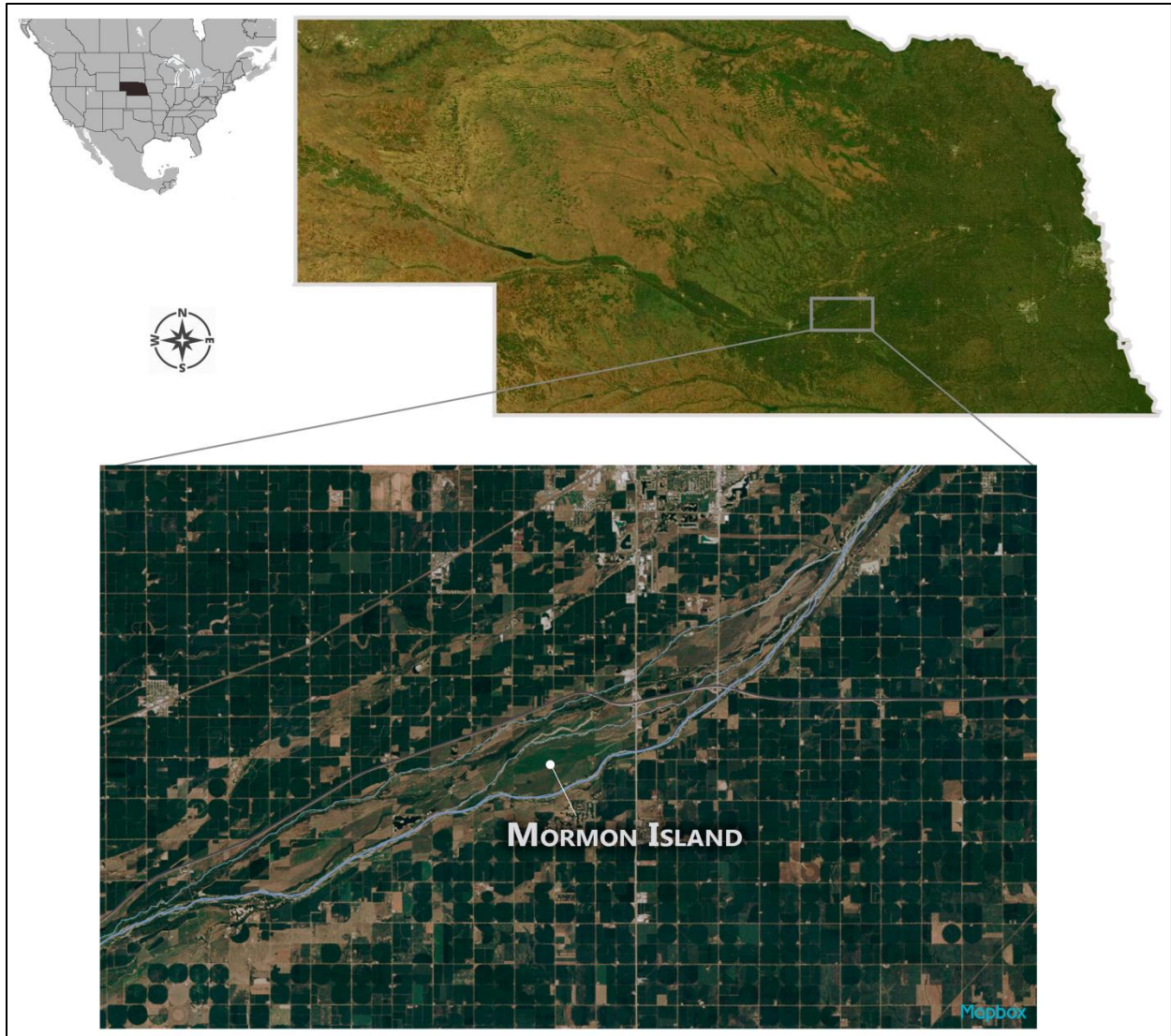
During the summer of 2015 we implemented a long-term biological monitoring plot layout system through set transects establishing survey lines in all parts of the Crane Trust properties with differing soils, vegetation, management practices, and land use histories (~2,430 ha currently; main complex = 40.798306°N, -98.416298°W, NAD 1983; 597 m elev., Hall County; Figure 1). These plots consist of two parallel transects: the vegetation line, totaling 100m and the bird, small mammal, and butterfly species of concern line, totaling 200m. Due to the complex mosaic of soil types and management histories on the property the total number of monitoring sites totaled 72 as of 2020; new sites are added as additional conservation properties are acquired or incorporated into Crane Trust management efforts. We have continued our efforts to survey the vegetation, avian community, small mammals, and butterfly species at these sites using standardized methodologies on a set rotation to monitor the

effectiveness of our management techniques in promoting native biodiversity. Additionally, we conducted surveys of native and exotic slough-dwelling fish and monitored groundwater levels. We also added anuran vocalization surveys in 2018. In 2019, we added new monitoring sites to the North Binfield property sold by the Platte River Recovery Implementation Program, which is currently under private ownership. Finally, we added three new monitoring sites on the 240-acre Morrow Tract, which the Crane Trust bought in 2020. We also added new monitoring sites on the Crane Trust's Alda Farms and Mormon Island properties associated with the restoration of cropland to native grassland in 2019 and 2020. We discontinued the IBS's (Institute for Bird Populations) MAPS program (Monitoring Avian Productivity and Survivorship) in 2020, which involved banding at four different sites throughout the breeding season (June-July) as we determined that point count data sufficed to answer most of our current management questions and the project was labor intensive while yielding data at a limited spatial scale (Federal Bird Banding Permit No. 23224, Station Permit: Platte River Whooping Crane Trust, Wood River, NE; currently inactive). Finally, we conducted aerial Sandhill Crane counts from mid-February to mid-April, continuing a study which began in 2002. In this report we summarize all species detections from research conducted in 2020. All species detections were from a 13.5 km reach of the Platte River beginning 3 km west of Alda Rd. and continuing east to HWY 281 in Hall County, Nebraska, aside from aerial Crane Surveys, plant surveys, and macroinvertebrate surveys, which spanned the Central Platte River Valley (CPRV; Chapman to Overton, Nebraska). Earlier reports included data from Buffalo County, at Dippel Island, which we have since sold to the Platte River Recover Implementation Program (effective 2018).

As of 15 December 2020, the Crane Trust field team performed 160 avian surveys, 39 small mammal surveys across 13 sites totaling 1950 trap nights (trap number x nights set), 41 vegetation surveys, 4 days of fish seining, 64 butterfly species of concern surveys, 10 aerial Sandhill Crane surveys, a total of 114 anuran call surveys, and took part in the Nebraska Bumble Bee Atlas project during 2020. Below is a summary of species detections from 2020 and general methods for surveys.

The 2020 Crane Trust research team consisted of *Director of Conservation Research* Andrew J. Caven, *Habitat Ecologist* Joshua D. Wiese, Jr. *Wildlife Biologist* Jenna Malzahn, *Biological Science Intern* Carson Schultz, University of Nebraska at Kearney *MS student* and *Biological Science Technician* Bethany Ostrom, Oklahoma State University *PhD student* Abraham Kanz, and Oklahoma State University *Biological Science Technician* Courtnay Pogainis. Volunteers and student interns included Aurora Fowler (Nova Southeastern University), Mathew Ford (Grand Island Senior High School), Phoebe Dunbar (University of Nebraska at Kearney), and Josh Meyer (University of Nebraska at Kearney). External researchers associated with our 2020 projects included Dr. Craig Davis (Oklahoma State University), Dr. Mary J. Harner (University of Nebraska at Kearney), Emma M. Brinley Buckley (University of Nebraska at Kearney), and Matthew R. Rabbe (U.S. Fish and Wildlife Service). We also want to thank The Nature Conservancy, Audubon Nebraska, and the Platte River Recovery Implementation Program for land access and logistical support during the 2020 field season.

Figure 1. Map of Mormon Island, Hall County Nebraska, the largest site owned and managed by the Crane Trust since 1978. Also depicting the Big Bend Region of the Platte River and Nebraska’s position within the United States.



Footnote: Aerial imagery clearly depicts the prairie habitat of Mormon Island within a largely agricultural landscape (Map credit – E. M. Brinley Buckley).

### Small Mammal Monitoring

We used Sherman Box Traps baited with a seed mixture of sterilized (autoclaved or baked) oats, sunflower seeds, and cracked corn. For general methods see Newsome (2015). Mealworms were also added in areas suspected or known to have high proportions of Soricomorpha. Traps were placed every 5m along a 200m set transect with an additional 10 traps placed within 10m of the transect for incidental detections. Small mammals were identified to species when possible; the age, sex, and

reproductive status of each individual were also recorded when possible. Measurements such as weight and length were not recorded unless necessary for identification. Our trapping began in early August and ended in late September. Total survey trap effort concluded at 1950 trap nights (trap number per site (50)\*sites trapped (13)\*trap nights per site (3)).

No individual was killed for collection; however, individuals that died in trap were taken as samples to be submitted to teaching or scientific collections (UNL, NE or FHSU, KS). This year trap mortality was 2.5%, which is in line with mortality levels observed in 2016 (3.3%), 2017 (3.5%), and 2018 (2.9%). However, this represents an increase over last year’s 1.1% trap mortality. Trap mortality totaled 5 individuals of 197 caught (Table 1). We captured 9 total species, although we did not detect the Least Shrew, Thirteen-lined Ground Squirrel, or Plains Pocket Mouse as in some past years. We noted >100% increases in Northern Short-tailed Shrew, Prairie Vole, White-footed Mouse, Western Harvest Mouse, and Plains Harvest Mouse abundance, as well as a moderate increase in Deer Mouse abundance (31%) compared to 2019. We noted significant declines in Meadow Voles (-47%) and Meadow Jumping Mouse (-75%) captures compared to 2019.

**Methods:**

Newsome, S. 2015. Small Mammal Mark-Recapture Population Dynamics at Core Research Sites at the Sevilleta National Wildlife Refuge, New Mexico (1989-present). Sevilleta LTER: Long Term Ecological Research, University of New Mexico, Albuquerque, NM, USA.

**Table 1. Small Mammals Detected at the Crane Trust 2020**

Scientific Name	Common Name	Number	Mortality
<i>Blarina brevicauda</i>	Northern Short-tailed Shrew	13	1
<i>Cryptotis parva</i>	Least Shrew	0	0
<i>Ictidomys tridecemlineatus</i>	Thirteen-lined Ground Squirrel	0	0
<i>Microtus ochrogaster</i>	Prairie Vole	52	2
<i>Microtus pennsylvanicus</i>	Meadow Vole	64	0
<i>Perognathus flavescens</i>	Plains Pocket Mouse	0	0
<i>Peromyscus leucophagus</i>	White-footed Mouse	30	0
<i>Peromyscus maniculatus</i>	Deer Mouse	17	0
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	4	0
<i>Reithrodonotmys monatnus</i>	Plains Harvest Mouse	10	0
<i>Sorex spp.</i>	Masked/Prairie Shrew	2	2
<i>Zapus hudsonius</i>	Meadow Jumping Mouse	5	0
<b>Total</b>		<b>197</b>	<b>5</b>

**Avian Monitoring**

We conducted stationary focal point surveys for 15 minutes at long-term monitoring sites throughout the year, with two surveys conducted at each site during the breeding season. During these surveys, all species detected by sight and/or vocalization were recorded. The total number of individual birds detected of each species was estimated, taking efforts not to double-count individuals. Each bird detection was recorded as within 50m or outside 50m of the observer. We did not try to estimate the

real population based off the number of birds detected, but instead treated each count as an index for discerning the relative abundance of species. In some ways this data equates to *bird detection days*, as individual birds (i.e. - Whooping Cranes, breeding songbirds, etc.), which stayed for a significant length of time, were regularly counted multiple times across rotational surveys. Common names are consistent with AOU standards.

Point-count surveys were conducted at 58 monitoring sites across Crane Trust-managed properties in 2020, thus far totaling (as of 12/15/2020) 160 surveys and 244,336 birds counted of 163 species (including incidental sightings from 39 locations). Total counts of each species are presented in Table 2. We detected several priority species for the US FWS Mountain-Prairie Region (6). Bald Eagles were common and detected throughout the year, including 2 nesting locations on/near Crane Trust properties. A significant density of Sandhill Cranes roosted between HWY 281 and Alda Rd., along the Crane Trust’s main conservation property (aerial survey estimates are presented in a later section of the report). We also had 1 Least Tern nest that successfully fledged at least 1 chick on off-channel island habitat (i.e., restored sandpit wetland). We recorded 19 Upland Sandpiper, 335 Grasshopper Sparrow, and 755 Bobolink during breeding season surveys as well as 5,042 Northern Pintail, 101 Hudsonian Godwit, 34 Lesser Scaup, 8 Greater Scaup, 6 Buff-breasted Sandpiper, 2 Piping Plover, 1 Burrowing Owl, and 1 Henslow’s Sparrow during migration surveys.

**Methods:**

Gregory, R.D., D.W. Gibbons, and P.F. Donald. 2004. Bird census and survey techniques. Pages 17–56 in W.J. Sutherland, I. Newton, and R.E. Green, editors, Bird ecology and conservation: A handbook of techniques. Oxford University Press, Oxford, United Kingdom.

**Table 2. Avian Detections and Abundance at the Crane Trust 2020**

Common names, scientific names, alpha codes, and total counts for each species detected during Crane Trust long-term monitoring surveys. Data from point count surveys as well as incidental detections in the calendar year 2020 are included. Aerial survey data is presented separately in a later section of this report.

Common Name	Species Name	Alpha Code	Count
American Avocet	<i>Recurvirostra americana</i>	AMAV	4
American Coot	<i>Fulica americana</i>	AMCO	263
American Crow	<i>Corvus brachyrhynchos</i>	AMCR	70
American Goldfinch	<i>Spinus tristis</i>	AMGO	474
American Kestrel	<i>Falco sparverius</i>	AMKE	11
American Redstart	<i>Setophaga ruticilla</i>	AMRE	1
American Robin	<i>Turdus migratorius</i>	AMRO	447
American Wigeon	<i>Mareca americana</i>	AMWI	40
American Tree Sparrow	<i>Spizelloides arborea</i>	ATSP	95
American White Pelican	<i>Pelecanus erythrorhynchos</i>	AWPE	115
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BAEA	108
Bank Swallow	<i>Riparia riparia</i>	BANS	10

Baltimore Oriole	<i>Icterus galbula</i>	BAOR	89
Barn Swallow	<i>Hirundo rustica</i>	BARS	286
Baird's Sandpiper	<i>Calidris bairdii</i>	BASA	96
Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>	BBSA	6
Black-capped Chickadee	<i>Poecile atricapillus</i>	BCCH	15
Belted Kingfisher	<i>Megaceryle alcyon</i>	BEKI	6
Bell's Vireo	<i>Vireo bellii</i>	BEVI	11
Brown-headed Cowbird	<i>Molothrus ater</i>	BHCO	1772
Blue Jay	<i>Cyanocitta cristata</i>	BLJA	241
Black Tern	<i>Chlidonias niger</i>	BLTE	86
Bobolink	<i>Dolichonyx oryzivorus</i>	BOBO	755
Brown Thrasher	<i>Toxostoma rufum</i>	BRTH	100
Bufflehead	<i>Bucephala albeola</i>	BUFF	25
Burrowing Owl	<i>Athene cunicularia</i>	BUOW	1
Broad-winged Hawk	<i>Buteo platypterus</i>	BWHA	1
Blue-winged Teal	<i>Spatula discors</i>	BWTE	269
Cackling Goose	<i>Branta hutchinsii</i>	CACG	19401
Cattle Egret	<i>Bubulcus ibis</i>	CAEG	12
Canada Goose	<i>Branta canadensis</i>	CANG	26215
Canvasback	<i>Aythya valisineria</i>	CANV	6
Clay-colored Sparrow	<i>Spizella pallida</i>	CCSP	173
Chipping Sparrow	<i>Spizella passerina</i>	CHSP	16
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	CLSW	515
Common Goldeneye	<i>Bucephala clangula</i>	COGO	7
Common Grackle	<i>Quiscalus quiscula</i>	COGR	19
Common Merganser	<i>Mergus merganser</i>	COME	34
Common Yellowthroat	<i>Geothlypis trichas</i>	COYE	362
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	DCCO	232
Dark-eyed Junco	<i>Junco hyemalis</i>	DEJU	3
Dickcissel	<i>Spiza americana</i>	DICK	1382
Downy Woodpecker	<i>Picoides pubescens</i>	DOWO	45
Eastern Bluebird	<i>Sialia sialis</i>	EABL	55
Eared Grebe	<i>Podiceps nigricollis</i>	EAGR	2
Eastern Kingbird	<i>Tyrannus tyrannus</i>	EAKI	212
Eastern Meadowlark	<i>Sturnella magna</i>	EAME	108
Eastern Phoebe	<i>Sayornis phoebe</i>	EAPH	3
Eastern Wood-pewee	<i>Contopus virens</i>	EAWP	5
Eurasian Collared-Dove	<i>Streptopelia decaocto</i>	EUCD	3
European Starling	<i>Sturnus vulgaris</i>	EUST	152
Field Sparrow	<i>Spizella pusilla</i>	FISP	163
Fox Sparrow	<i>Passerella iliaca</i>	FOSP	1
Forster's Tern	<i>Sterna forsteri</i>	FOTE	8
Franklin's Gull	<i>Leucophaeus pipixcan</i>	FRGU	343



Gadwall	<i>Mareca strepera</i>	GADW	27
Great Blue Heron	<i>Ardea herodias</i>	GBHE	30
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	GCFL	10
Great Horned Owl	<i>Bubo virginianus</i>	GHOW	10
Gray Catbird	<i>Dumetella carolinensis</i>	GRCA	15
Green Heron	<i>Butorides virescens</i>	GRHE	3
Greater Prairie-chicken	<i>Tympanuchus cupido</i>	GRPC	139
Greater Scaup	<i>Aythya marila</i>	GRSC	8
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	GRSP	335
Greater Yellowlegs	<i>Tringa melanoleuca</i>	GRYE	41
Greater White-fronted Goose	<i>Anser albifrons</i>	GWFG	7382
Green-winged Teal	<i>Spatula crecca</i>	GWTE	10
Harris's Sparrow	<i>Zonotrichia querula</i>	HASP	13
Henslow's Sparrow	<i>Ammodramus henslowii</i>	HESP	1
Horned Lark	<i>Eremophila alpestris</i>	HOLA	3
Hooded Merganser	<i>Lophodytes cucullatus</i>	HOME	8
House Sparrow	<i>Passer domesticus</i>	HOSP	3
House Wren	<i>Troglodytes aedon</i>	HOWR	333
Hudsonian Godwit	<i>Limosa haemastica</i>	HUGO	101
Indigo Bunting	<i>Passerina cyanea</i>	INBU	3
Killdeer	<i>Charadrius vociferus</i>	KILL	352
Lark Sparrow	<i>Chondestes grammacus</i>	LASP	1
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	LBDO	7
Le Conte's Sparrow	<i>Ammodramus leconteii</i>	LCSP	35
Least Flycatcher	<i>Empidonax minimus</i>	LEFL	6
Lesser Scaup	<i>Aythya affinis</i>	LESC	34
Least Sandpiper	<i>Calidris minutilla</i>	LESA	12
Interior Least Tern	<i>Sterna antillarum athalassos</i>	LETE	13
Lesser Yellowlegs	<i>Tringa flavipes</i>	LEYE	13
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	LISP	47
Mallard	<i>Anas platyrhynchos</i>	MALL	2503
Marsh Wren	<i>Cistothorus palustris</i>	MAWR	3
Mourning Dove	<i>Zenaida macroura</i>	MODO	280
Northern Bobwhite	<i>Colinus virginianus</i>	NOBO	203
Northern Cardinal	<i>Cardinalis cardinalis</i>	NOCA	124
Northern Flicker (undistinguished)	<i>Colaptes auratus</i>	NOFL	97
Northern Harrier	<i>Circus hudsonius</i>	NOHA	34
Northern Pintail	<i>Anas acuta</i>	NOPI	5042
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	NRWS	9
Northern Shrike	<i>Lanius excubito</i>	NSHR	2
Northern Shoveler	<i>Spatula clypeata</i>	NSHO	59
Orange-crowned Warbler	<i>Oreothlypis celata</i>	OCWA	2
Orchard Oriole	<i>Icterus spurius</i>	OROR	135

Osprey	<i>Pandion haliaetus</i>	OSPR	4
Palm Warble	<i>Setophaga palmarum</i>	PAWA	1
Pied-billed Grebe	<i>Podilymbus podiceps</i>	PBGR	13
Pectoral Sandpiper	<i>Calidris melanotos</i>	PESA	45
Piping Plover	<i>Charadrius melodus</i>	PIPL	2
Pine Siskin	<i>Spinus pinus</i>	PISI	20
Prairie Falcon	<i>Falco mexicanus</i>	PRFA	2
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	RBGR	18
Ring-billed Gull	<i>Larus delawarensis</i>	RBGU	14
Red-bellied woodpecker	<i>Melanerpes carolinus</i>	RBWO	35
Ruby-crowned Kinglet	<i>Regulus calendula</i>	RCKI	11
Redhead	<i>Aythya americana</i>	REDH	23
Red-eyed Vireo	<i>Vireo olivaceus</i>	REVI	3
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	RHWO	36
Rough-legged Hawk	<i>Buteo lagopus</i>	RLHA	12
Ring-necked Duck	<i>Aythya collaris</i>	RNDU	18
Ring-necked Pheasant	<i>Phasianus colchicus</i>	RNEP	221
Rock Pigeon	<i>Columba livia</i>	ROPI	22
Red-tailed Hawk	<i>Buteo jamaicensis</i>	RTHA	25
Ruddy Duck	<i>Oxyura jamaicensis</i>	RUDU	18
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	RWBL	12489
Sandhill Crane (does not include aerial surveys)	<i>Antigone canadensis</i>	SACR	121241
Sanderling	<i>Calidris alba</i>	SAND	17
Savannah Sparrow	<i>Passerculus sandwichensis</i>	SAVS	118
Lesser Canada Goose	<i>B. c. parvipes</i>	SCGO	1240
Short-eared Owl	<i>Asio flammeus</i>	SEOW	1
Semipalmated Sandpiper	<i>Calidris pusilla</i>	SESA	38
Sedge Wren	<i>Cistothorus platensis</i>	SEWR	52
Snow Goose	<i>Anser caerulescens</i>	SNGO	29796
Sora	<i>Porzana carolina</i>	SORA	1
Song Sparrow	<i>Melospiza melodia</i>	SOSP	243
Spotted Sandpiper	<i>Actitis macularius</i>	SPSA	41
Spotted Towhee	<i>Pipilo maculatus</i>	SPTO	61
Sharp-shinned hawk	<i>Accipiter striatus</i>	SSHA	1
Stilt Sandpiper	<i>Calidris himantopus</i>	STSA	20
Swainson's Hawk	<i>Buteo swainsoni</i>	SWHA	7
Swamp Sparrow	<i>Melospiza georgiana</i>	SWSP	25
Swainson's Thrush	<i>Catharus ustulatus</i>	SWTH	1
Tennessee Warbler	<i>Oreothlypis peregrina</i>	TEWA	11
Tree Swallow	<i>Tachycineta bicolor</i>	TRES	100
Turkey Vulture	<i>Cathartes aura</i>	TUVU	7
Upland Sandpiper	<i>Bartramia longicauda</i>	UPSA	19

Vesper Sparrow	<i>Pooecetes gramineus</i>	VESP	49
Virginia Rail	<i>Rallus limicola</i>	VIRA	1
Warbling Vireo	<i>Vireo gilvus</i>	WAVI	53
White-breasted Nuthatch	<i>Sitta carolinensis</i>	WBNU	7
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	WCSP	34
Western Kingbird	<i>Tyrannus verticalis</i>	WEKI	6
Western Meadowlark	<i>Sturnella neglecta</i>	WEME	919
White-faced Ibis	<i>Plegadis chihi</i>	WFIB	80
Whooping Crane (total detections = crane use days; does not include aerial surveys)	<i>Grus americana</i>	WHCR	12
Willow Flycatcher	<i>Empidonax traillii</i>	WIFL	55
Wilson's Phalarope	<i>Phalaropus tricolor</i>	WIPH	30
Wilson's Snipe	<i>Gallinago delicata</i>	WISN	6
Wild Turkey	<i>Meleagris gallopavo</i>	WITU	62
Winter Wren	<i>Troglodytes hiemalis</i>	WIWR	2
Wood Duck	<i>Aix sponsa</i>	WODU	24
Wood Thrush	<i>Hylocichla mustelina</i>	WOTH	1
White-rumped Sandpiper	<i>Calidris fuscicollis</i>	WRSA	49
White-throated Sparrow	<i>Zonotrichia albicollis</i>	WTSP	9
Yellow Warbler	<i>Setophaga petechia</i>	YEWA	277
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	YBCU	2
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	YHBL	4202
Yellow-rumped Warbler	<i>Setophaga coronata</i>	YRWA	20
Yellow-shafted Flicker	<i>C. a. auratus</i>	YSFL	2
<b>Total</b>			<b>244336</b>

### Slough Fish Monitoring

Each survey consisted of six to eight runs totaling ~150m of the slough. Using a seine net sized to the general width of the slough channel, we ran the net at the slough bottom capturing as many fish as possible. We then dumped those fish into a 5-gallon bucket for identification and counting purposes. No individuals were collected. Two sloughs were sampled on two occasions each. We detected -48.8% fewer fish with approximately the same sampling effort as in 2019. Additionally, we collected 5 fewer total species. We failed to detect Gizzard Shad (*Dorosoma cepedianum*), Fathead Minnow (*Pimephales promelas*), Red Shiner (*Cyprinella lutrensis*), Northern Plains Killifish (*Fundulus kansae*), Smallmouth Bass (*Micropterus dolomieu*), and Common Carp (*Cyprinus carpio*), which were caught in 2019. However, we did record a Black Crappie (*Pomoxis nigromaculatus*), which was not documented last year. Western Mosquito Fish accounted for 75.6% of the sample, which is the highest percentage we have documented since 2017. One bright spot within the survey data was that Plains Topminnows

accounted for 10.7% of the sample, which is a proportional increase over 6.2% in 2019. In real numbers, Western Mosquito Fish, Plains Topminnow, Bigmouth Shiner, and Creek Chub counts were similar to last year. Brook Stickleback made up only 7.0% of all fish captured compared to 34.4% in 2019 and declined drastically in total captures from 1,182 to 124 (-89.5%). The Brassy Minnow also declined significantly, both as a proportion of the sample (14.8% to 4.1%) and in total captures (509 to 72; -85.9%) from 2019 to 2020. Only Green Sunfish demonstrated a notable increase as a proportion of the sample collected (0.2% to 1.5%) or in raw capture numbers (7 to 27). Platte River flows were certainly lower in August 2020 (mean discharge = 595 cfs) than in 2019 (mean = 3,273 cfs), which correlates with lower water depths in the backwater sloughs we monitor as well as generally higher water temperatures (USGS Gage Station 06770500, Grand Island, NE; [waterdata.usgs.gov/](http://waterdata.usgs.gov/)). It may be that certain taxa such as Brook Stickleback, which are generally associated with cooler water, moved downstream of our regular monitoring sites to deeper habitats during this period of relatively low flow and warm water.

**Methods:**

Onorato, D.P., R.A. Angus, and K.R. Marion. 1998. Comparison of a small-mesh seine and a backpack electroshocker for evaluating fish populations in a North-Central Alabama stream. *North American Journal of Fisheries Management* 18:361-373.

**Table 3. Fish Detected at the Crane Trust**

<b>Species</b>	<b>Scientific Name</b>	<b>Count</b>	<b>%</b>
Western Mosquito Fish	<i>Gambusia affinis</i>	1339	75.6%
Plains Topminnow	<i>Fundulus sciadicus</i>	189	10.7%
Brook Stickleback	<i>Culaea inconstans</i>	124	7.0%
Brassy Minnow	<i>Hybognathus hankinsoni</i>	72	4.1%
Green Sunfish	<i>Lepomis cyanellus</i>	27	1.5%
Bluegill	<i>Lepomis macrochirus</i>	8	0.5%
Bigmouth Shiner	<i>Notropis dorsalis</i>	4	0.2%
Black Crappie	<i>Pomoxis nigromaculatus</i>	3	0.2%
Johnny Darter	<i>Etheostoma nigrum</i>	2	0.1%
Creek Chub	<i>Semotilus atromaculatus</i>	1	0.1%
Largemouth Bass	<i>Micropterus salmoides</i>	1	0.1%
<b>Total</b>		<b>1770</b>	<b>100.0%</b>

**Vegetation Monitoring**

We targeted plants in excellent condition, in fruit or flower (ideally both), to fill in gaps and verify species for collection to the Crane Trust herbarium. We recorded the area where the plant was found to the nearest transect, the date it was collected, and its relative abundance in the area. We collected plant specimens from across Crane Trust properties (Table 4). Collections and identifications were made primarily by J. Wiese and A. Caven. Gerry Steinauer of the Nebraska Game and Parks Commission, Lincoln, Nebraska, verified county records.

Additionally, vegetation surveys using both point-line intercept (every two meters) and quadrat (0.5m x 1.0m every 10m) methods along a 100m permanently marked transect were conducted. Surveys began in July and ended in early October with the first frost. Notable finds in 2020 included native Allegheny Monkeyflower (*Mimulus ringens*), which had not been detected on Mormon Island in many years, as well as the continued presence of Fowl Mannagrass (*Glyceria striata*), another native that was recently confirmed as a Hall County record. Though yet to be officially confirmed, we detected Tower Rockcress (*Turritis glabra*), a native mustard, on a newly acquired property on the south bank of the main channel of the Platte River. If confirmed, it will also represent a Hall County record. Finally, we detected two exotic species not yet documented in Hall County, Nebraska, including Common Buckthorn (*Rhamnus cathartica*) and Scarlet Pimpernel (*Anagallis arvensis*). The identification of Common Buckthorn has not been officially confirmed. In total, we made collections of just 25 species in 2020, as we already have quality specimens of most local species in our herbarium. We expect collection efforts to remain moderate over the next several years.

**Methods:**

Symstad, A.J., C.L. Wienk, and A.D. Thorstenson. 2008. Precision, Repeatability, and Efficiency of Two Canopy-Cover Estimate Methods in Northern Great Plains Vegetation. *Rangeland Ecology and Management* 61:419-429.

**Additional Relevant Sources:**

Kaul, R.B., D. Sutherland, and S. Rolfsmeier. 2011. The flora of Nebraska. School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE, USA.

Nagel, H.G., and O.A. Kolstad. 1987. Comparison of plant species composition of Mormon Island Crane Meadows and Lillian Annette Rowe Sanctuary in central Nebraska. *Transactions of the Nebraska Academy of Sciences* 15:37-48.

**Table 4. Plant Specimens Collected for the Crane Trust Herbarium 2020**

Family	Species	Common Name	Record	Status
Asteraceae	<i>Erigeron philadelphicus</i>	Philadelphia Fleabane	-	N
Asteraceae	<i>Helianthus tuberosus</i>	Jerusalem Artichoke	-	N
Asteraceae	<i>Liatris glabrata</i> (Syn. <i>L. squarrosa</i> var. <i>glabrata</i> )	Scaly Blazing Star	-	N
Brassicaceae	<i>Turritis glabra</i> (Syn. <i>Arabis glabra</i> )	Tower Rockcress	Hall Co.*	N
Cyperaceae	<i>Carex blanda</i>	Eastern Woodland Sedge	Hall Co. <sup>c</sup>	N
Cyperaceae	<i>Carex emoryi</i>	Emory's Sedge	-	N
Cyperaceae	<i>Carex granularis</i> var. <i>haleana</i>	Limestone Meadow Sedge	Hall Co. <sup>c</sup>	N
Cyperaceae	<i>Carex parryana</i> var. <i>unica</i> (Syn. <i>C. hallii</i> )	Deer Sedge	-	N
Cyperaceae	<i>Carex sartwellii</i>	Sartwell's Sedge	-	N
Cyperaceae	<i>Carex tetanica</i>	Rigid Sedge	-	N

Cyperaceae	<i>Carex vulpinoidea</i>	Fox Sedge	-	N
Fabaceae	<i>Lotus corniculatus</i>	Bird's-Foot Trefoil	Hall Co. <sup>c</sup>	I
Fabaceae	<i>Trifolium fragiferum</i>	Strawberry Clover	-	I
Iridaceae	<i>Sisyrinchium montanum</i>	Strict Blue-eyed Grass	-	N
Onagraceae	<i>Ludwigia palustris</i>	Marsh Seedbox	-	N
Poaceae	<i>Alopecurus aequalis</i>	Shortawn Foxtail	-	N
Poaceae	<i>Eriochloa villosa</i>	Hairy Cupgrass	Hall Co.*	I
Poaceae	<i>Glyceria striata</i>	Fowl Mannagrass	Hall Co. <sup>c</sup>	N
Poaceae	<i>Poa compressa</i>	Canada Bluegrass	-	I
Poaceae	<i>Poa</i> sp.	A Bluegrass	-	U
Poaceae	<i>Sphenopholis obtusata</i>	Prairie Wedgescale		N
Primulaceae	<i>Anagallis arvensis</i>	Scarlet Pimpernel	Hall Co. <sup>c</sup>	I
Primulaceae	<i>Lysimachia ciliata</i>	Fringed Loosestrife	-	N
Rhamnaceae	<i>Rhamnus cathartica</i>	Common Buckthorn	Hall Co.*	I
Scrophulariaceae	<i>Mimulus ringens</i>	Allegheny Monkeyflower	-	N

**Notes:** “<sup>c</sup>” refers to a county record per Kaul et al. (2011) that has been confirmed by an outside expert during the last 6 years of surveys from 2015-2020. Confirmations were made by the late Dr. R. Kaul before 2019 and by G. Steinauer since. Those marked with an asterisk have yet to be confirmed by a third party.

### Butterfly Species of Concern Monitoring (w/ Pollinator Notes)

We counted butterflies using linear walking transects. Surveys were conducted by two research personnel; the observer spotted butterfly species of concern, while the recorder utilized a GPS and a compass to navigate the monitoring transect, record data, and aid in the detection of butterflies. We counted “butterflies observed ahead and to the sides to the limit at which a species can be identified with binoculars” (Swengel 1996). Detections were recorded as within 10m of the transect or outside of this area. Only Regal Fritillaries within 10m of the transect line were sexed. Males have a lower line of orange spots on the hind wing, while females have two lines of white spots. Monarchs were not sexed since male and female morphological differences are slight, and accuracy may be compromised. Monarchs and Regals were incidentally recorded on the walk to and from biological monitoring plots using GPS as well. All sightings within 200m of the start of a monitoring transect and their corresponding GPS locations were included as incidental detections associated with specific monitoring plots. In total, we surveyed 21 monitoring sites 3 times each in 2020. Surveys lasted 15 minutes and were only conducted during favorable weather conditions (sunny, wind under 10mph) between the late morning (10:00am) and the midafternoon (4:00pm). All plots were visited three times during the Regals’ active period, from June 15th to September 15th, and at least once during peak Regal activity, from June 15th to August 1st, based on the timing of Regal activity demonstrated from previous work conducted in the region. We also recorded incidental detections of Monarchs and Regal Fritillaries made off long-term monitoring plots while out conducting other survey work. In past years we have only reported abundance estimates from systematic monitoring surveys. Generally, this works well for Regal Fritillaries considering their strong associations with particular habitats and their resident life history. However, as migrants, Monarch concentrations can shift widely from year to year, and sometimes their highest

densities are detected outside of our monitoring plot system. Furthermore, there is significant temporal variability in peak Monarch abundance, and the highest densities can migrate through the CPRV outside of our standardized survey periods. Therefore, starting with this 2020 document we will also describe incidental butterfly species of concern detections in our annual *Species Detection, Collection, and Monitoring Report*. Systematic Regal Fritillary counts reached their highest point since we began monitoring in 2015 and were up 78.8% from last survey season and well above median values ( $\bar{x}$  = 120). Systematic Monarch counts were up 21.8% over last year and also above median values ( $\bar{x}$  = 110). However, off-plot incidental Monarch detections were up over 1,000% compared to 2019, with five groups  $\geq 50$  detected the week after systematic monitoring surveys ended. The Crane Trust also participated in the Nebraska Bumble Bee Atlas Project coordinated by the Xerces Society in 2020 and documented 46 Brown-belted Bumblebees (*Bombus griseocollis*), 12 American Bumblebees (*B. pensylvanicus*), 3 Southern Plains Bumblebees (*B. fraternus*), and 1 Common Eastern Bumblebee (*B. impatiens*) (for methods see - [www.nebraskabumblebeeatlas.org](http://www.nebraskabumblebeeatlas.org)).

**Methods:**

Caven, A.J., K.C. King, J.D. Wiese, and E.M. Brinley Buckley. 2017. A descriptive analysis of Regal Fritillary (*Speyeria idalia*) habitat utilizing biological monitoring data along the big bend of the Platte River, NE. *Journal of Insect Conservation* 21:183–205.

Swengel, A.B. 1996. Effects of fire and hay management on abundance of prairie butterflies. *Biological Conservation* 76(1):73-85.

**Table 5. Butterfly Detections 2020**

Common Name	Regal Fritillary	Monarch
<b>Systematic On-Plot</b>	261	134
<b>Incidental On-Plot</b>	19	26
<b>Incidental Off-Plot</b>	44	1,478
<b>Total</b>	324	1,638

**Herpetofauna Research**

In 2018 we began an anuran monitoring program estimating general abundance and species presence or absence based on vocalization activity following the methods of USGS (2012). Abundance is broken up into 3 differentiable categories (Weir and Mossman 2005; USGS 2012):

**Table 6. Amphibian Calling Index (Weir and Mossman 2005; USGS 2012)**

- 
- 1 “Individuals can be counted; there is space between calls”
  - 2 “Calls of individuals can be distinguished but there is some overlapping of calls”
  - 3 “Full chorus, calls are constant, continuous and overlapping”

Surveys were conducted as early as 30 minutes after official sunset in humid and low wind (<15 mph) conditions, with early spring temperatures above 42° F (March-15 to May-15) and late spring-summer

temperatures above 50° F (May-15 forward) (Weir and Mossman 2005; USGS 2012). Surveys lasted 5 minutes per site and were conducted at least 2-4 times per survey season at each site, with 1-2 surveys conducted in the early spring period and 1-2 surveys conducted in the late spring-summer period at each site (USGS 2012). A recording device was brought to each site to record novel calls and to provide evidence for species not previously detected on Crane Trust properties. Novel calls were investigated physically following timed survey periods at a set location. Playback was also used to look for rare species following the official survey, but not during. In 2020 we began categorizing whether vocalization activity was present locally (within 20 m of the observer) or simply present at the landscape-level.

We detected five species in 2020 including the Cope’s Grey Treefrog. Several new public reports and range extensions (pers. comm. K. Geluso, McLean et al. 2015) suggest that Cope’s Grey Treefrogs have significantly expanded their range west along the Platte River in recent years. In 2020, Boreal Chorus Frogs had both the highest mean calling index and were the only species detected at 100% of sites. Woodhouse’s Toads were the second most widespread anuran and were detected at 83.3% of sites and demonstrated a mean calling index of 1.46 where detected. Aside from the Boreal Chorus Frog and Bullfrog, all species declined in terms of the number of sites they were detected at, while calling indices remained relatively stable. Only Cope’s Grey Treefrogs and Bullfrogs displayed notably higher calling indices than in 2019, suggesting that they might have been more abundant *where* they were detected than in the past. Our results indicate a contraction in the spatial distribution of several species comparing 2019 to 2020. Plains Leopard Frogs were documented vocalizing locally (within 20m) 56% of the time where detected. All other species were detected vocalizing locally <32% of the time.

Table 7. Mean anuran species abundance indices, percent of plots detected, and percent of surveys detected locally (≤20 m) during 2020 monitoring surveys.

Common Name	Scientific Name	Call Index	% Plots	% Local
Boreal Chorus Frog	<i>Pseudacris maculata</i>	2.83	100.0%	25.0%
Woodhouse’s Toad	<i>Anaxyrus woodhousii</i>	1.46	83.3%	0.0%
Plains Leopard Frog	<i>Lithobates blairi</i>	1.44	50.0%	55.6%
Cope’s Gray Treefrog	<i>Hyla chrysoscelis</i>	1.4	50.0%	0.0%
Bullfrog	<i>Lithobates catesbeianus</i>	1.37	66.7%	31.6%
Plains Spadefoot Toad	<i>Spea bombifrons</i>	0	0.0%	0.0%

**Methods:**

US Geological Survey. 2012. North American Amphibian Monitoring Program (NAAMP): NAAMP Protocol. Patuxent Wildlife Research Center, Laurel, Maryland, USA.

Weir, L.A., and M.J. Mossman. 2005. North American Amphibian Monitoring Program (NAAMP). Pages 307-313 in M.J. Lannoo, editor, Amphibian declines: the conservation status of United States species. University of California Press, Berkeley, California, USA.

**Additional Relevant Source:**

McLean, R.P., G.D. Wright, and K. Geluso. 2015. Cope’s Gray Treefrog (*Hyla chrysoscelis*) along the Platte River, Hall County, Nebraska. *Collinsorum* 4(1):2-4.



## Sandhill Crane Aerial Surveys

We counted a total of over 2 million Sandhill Cranes in the Central Platte River Valley (Chapman to Overton, NE) across 10 weeks of surveys in 2020 (total of bias-corrected mid-point estimates). Relative error estimates per survey ranged from -33.6 to +3.9% comparing ocular to photo counts (mean= -15.3%). Our counts accurately capture cranes on the river as well as those in post roost aggregations within 1 km of the river. However, cranes departing the river early and leaving this narrow band were potentially not counted or were counted at a reduced rate. Therefore, our numbers represent a systematic underestimation. The peak count of 541,000 was observed on 12 March 2020. However, this number was not bias corrected as high winds negatively influenced our ability to take clear photos for bias estimation on that day. The subplot photos we were able to use suggested that our estimates may have been around -30% low, indicating that there could have been as many as 700,000 Sandhill Cranes present on 12 March per our protocol. Peak abundance was sustained in 2020, with estimates across three consecutive weeks from mid-late March exceeding 475,000 Sandhill Cranes. We also attempted to count other large-bodied waterbird species as time allowed including dark geese, Trumpeter Swans, Bald Eagles, American White Pelicans, and Whooping Cranes. We counted 108,100 dark geese and 40 Trumpeter Swans across the first two survey weeks in mid-February and 64 Bald Eagles over the first three survey weeks. Finally, we documented 116 American White Pelicans during the last three weeks of surveys in early to mid-April. We also detected a total 6 Whooping Cranes during March (some individual WHCRs may have been counted across multiple surveys).

### **Methods:**

Caven, A.J., E.M. Brinley Buckley, K.C. King, J.D. Wiese, D.M. Baasch, G.D. Wright, M.J.

Harner, A.T. Pearse, M. Rabbe, D.M. Varner, B. Krohn, N. Arcilla, K.D. Schroeder, K.F. Dinan. 2019.

Temporospatial shifts in Sandhill Crane staging in the Central Platte River Valley in response to climatic variation and habitat change. *Monographs of the Western North American Naturalist* 11(1):33-76.

**Table 8. Sandhill Crane Count by Survey Week 2020**

<b>Date</b>	<b>Point Est. <math>\pm</math> C.I.</b>
2/11/2020	6,150 $\pm$ 240
2/18/2020	13,120 $\pm$ 1,950
2/24/2020	34,500 $\pm$ 1,200
3/3/2020	196,400 $\pm$ 47,570
3/12/2020	541,000-703,000*
3/21/2020	524,266 $\pm$ 110,222
3/29/2020	475,600 $\pm$ 65,100
4/7/2020	224,800 $\pm$ 49,200
4/13/2020	64,460 $\pm$ 5,340
4/20/2020	210*

Notes: "\*" bias correction not applied due to insufficient photo-subplot data.

## Soil Macroinvertebrate Collections

We collected soil macroinvertebrates in partnership with A. Kanz and Dr. C. Davis of Oklahoma State University as part of a 3-year study funded by the EPA to examine macroinvertebrates in conjunction with vegetation communities and soil characteristics as indicators of wet meadow function in the CPRV. Macroinvertebrates were collected from 20 X 20 X 25 cm blocks of excavated soil, which were sampled 6 times at each site across a 100 m transect. We sampled 17 total sites during the summer of 2020. We detected a total of 237 worms (Annelida) of 6 total taxa, with *Diplocardia* spp. (native earthworms) being the most abundant (n = 99) and the exotic-invasive European earthworm *Aporrectodea trapezoides* being the second most abundant. We detected a total of 590 arthropods (Arthropoda) of 21 taxa, with *Tipulidae* spp. (crane flies) aptly being the most abundant taxa closely followed by *Scarabaeidae* spp. (scarab beetles). Sample identifications were made primarily by A. Kanz.

### **Methods:**

Davis, C.A., J.E. Austin, and D.A. Buhl. 2006. Factors influencing soil invertebrate communities in riparian grasslands of the Central Platte River floodplain. *Wetlands* 26(2):438-454.

**Table 9. Counts of Soil Macroinvertebrates Collected in 2020**

<b>Taxa</b>	<b>Count</b>
<i>Agromyzidae</i> spp.	7
<i>Anobiidae</i> spp.	1
<i>Aporrectodea trapezoides</i>	68
<i>Bimastos</i> spp.	2
<i>Byrrhidae</i> spp.	1
<i>Cantharidae</i> spp.	1
<i>Carabidae</i> spp.	16
<i>Chrysomelidea</i> spp.	2
<i>Diplocardia</i> spp.	99
<i>Dolichopodidae</i> spp.	2
<i>Eisenia</i> spp.	11
<i>Elateridae</i> spp.	52
<i>Formicidae</i> spp.	134
<i>Fulgoromorpha</i> spp.	4
<i>Gasteruptiidae</i> spp.	1
<i>Heteroceridae</i> spp.	7
<i>Isopoda</i> spp.	10
<i>Miridae</i> spp.	1
<i>Opiliones</i> spp.	8
<i>Scarabaeidae</i> spp.	164
<i>Stratiomyidae</i> spp.	5
<i>Tabanidae</i> spp.	6
<i>Tettigoniidae</i> spp.	2

<i>Thysanoptera</i> spp.	1
<i>Tipulidae</i> spp.	165
Unidentified Annelida (damaged/juvenile)	57
<b>Total Collected</b>	<b>827</b>

## Conclusion

Continued implementation of our long-term biological monitoring program will help us more critically assess the impacts of our management actions upon Whooping Cranes, Sandhill Cranes, other migratory/breeding bird species, and the ecosystem on which they depend in the Big Bend reach of the Platte River, Nebraska. In 2020 we conducted 160 avian point count surveys across 58 monitoring sites and detected 244,336 individual birds of 163 species. We conducted 1950 trap nights to detect 197 individuals and 9 species of small mammal. We conducted 41 vegetation surveys and collected and pressed 25 vascular plant specimens for our herbarium. We conducted 64 butterfly species of concern surveys and detected 134 Monarchs and 261 Regal Fritillaries via systematic surveys and 1,638 Monarchs and 324 Regal Fritillaries including incidental detections throughout Crane Trust-managed properties. We conducted 114 anuran vocalization surveys and documented 5 species of anurans and their relative abundances at 12 sites. Finally, we conducted 27 fish seine pulls (~12 hours, 600 m of slough) and detected 1,770 individuals of 11 species of fish. We conducted 10 aerial Sandhill Crane surveys and counted over 2 million cranes (individuals counted multiple times), with an estimated peak of abundance between 541,000 and 703,000 on 12 March 2020. Finally, we conducted soil macroinvertebrate surveys at 17 sites and collected 827 individuals. These data are all integrated into our long-term research and monitoring plan and will be used to develop models to improve management actions. This report represents preliminary findings and thus should be interpreted as such; our intention with this data is to produce peer-reviewed research that addresses issues of conservation concern in the Central Platte River Valley. As we publish results from our studies they will be posted on our website and available to the public (<https://cranetrust.org/what-we-do/conservation/research/>). We have also included a list of recent publication activity in Appendix 1 of this report. We thank the Rainwater Basin Joint Venture, the US Fish and Wildlife Service, and the Nebraska Game and Parks Commission for their continued support of our research program.

### Appendix 1. Publication Activity by Crane Trust Staff During the Calendar Year (2020)

1. Brinley Buckley, E.M., B.L. Gottesman, A.J. Caven, M.J. Harner, B.C. Pijanowski. 2021. Assessing ecological and environmental influences on boreal chorus frog (*Pseudacris maculata*) spring calling phenology using multimodal passive monitoring technologies. *Ecological Indicators* 121:107171.
2. Brinley Buckley, E.M., B.L. Gottesman, A.J. Caven, M.J. Harner, and B.C. Pijanowski. 2020. Boreal Chorus Frog (*Pseudacris maculata*) Spring Calling Activity, Habitat Metrics, and Associated Environmental Data. *Data in Brief* 33:106581.
3. Caven, A.J., M. Rabbe, J. Malzahn, and A.E. Lacy. 2020. Trends in the occurrence of large Whooping crane groups during migration in the Great Plains, USA. *Heliyon* 6:e03549

4. Caven, A.J., D.M. Varner, J. and J. Drahota. 2020. Sandhill Crane abundance in Nebraska during spring migration: making sense of multiple data points. *Transactions of the Nebraska Academy of Sciences and Affiliated Societies* 40:6-18.
5. Glass, A.J., A.J. Caven, D. Kim, M.O. Sutton and N. Arcilla. 2020. Climate change and land management implications for a declining Neotropical migratory songbird breeding in the North American Great Plains. *Avian Conservation and Ecology* 15 (1):4.
6. Malzahn, J., A.J. Caven, and J.D. Wiese. 2020. Characteristics of a River Otter (*Lontra canadensis*) Maternal Den in the Central Platte River Valley, NE. *Transactions of the Nebraska Academy of Sciences* 40:30-38.
7. Ostrom, B.L., A.J. Caven, J.M. Malzahn, and A. Vogel. 2020. Snowy Plover Activity in the Central Platte River Valley in May 2019. *Transactions of the Nebraska Academy of Sciences* 40:24-29.
8. Skipper, B.R., D. Kim, and C. Morris. 2020. Seasonal abundance and nutritional concentration of grassland arthropods. *Western North American Naturalist* 80(1):3.