



# *Sustainable Rivers Program*

## Waterbird and aquatic invertebrate responses to managed reservoir drawdowns at Lake Red Rock

### Field season report - 2023

March 2024

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Prepared for U.S. Army Corps of Engineers

and other cooperating organizations

# **Waterbird and aquatic invertebrate responses to managed reservoir drawdowns at Lake Red Rock – Field season report – 2023**

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## Project Objectives

- 1) Document migrating waterbird responses to decreasing water levels at Lake Red Rock.
- 2) Document space use and movement patterns and estimate residency time of Pectoral Sandpipers (*Calidris melanotos*) at Lake Red Rock.
- 3) Measure aquatic insect response to decreasing water levels at Lake Red Rock.

## Field Methods

The study area of this project is the alluvial delta of Lake Red Rock. This delta is located at the west end of Lake Red Rock on the Des Moines River in Marion County, Iowa. This is the same study area used for waterbird and vegetation monitoring related to environmental pool management in 2021 and 2022 (Bosco and Dinsmore 2023). Altogether, 37 days were spent at the study site in 2023. This project will continue in 2024.

To address objective one, waterbird surveys were conducted roughly every five days. Surveys were completed during daytime, only in adequate weather, and using a standardized search method. A total of 17 waterbird surveys were completed, the first on 19 July 2023 and the last on 2 October 2023.

To address objective two, the Pectoral Sandpiper was selected as a focal species. Satellite tags were attached to 29 Pectoral Sandpipers. Mist nets were set up nine times and two tag types were used: PinPoint GPS ARGOS (Global Positioning System; Advanced Research and Global Observation Satellite) tags to gather information on fine scale movements at Red Rock and Sunbird Solar ARGOS tags to gather migration information after they departed Red Rock.

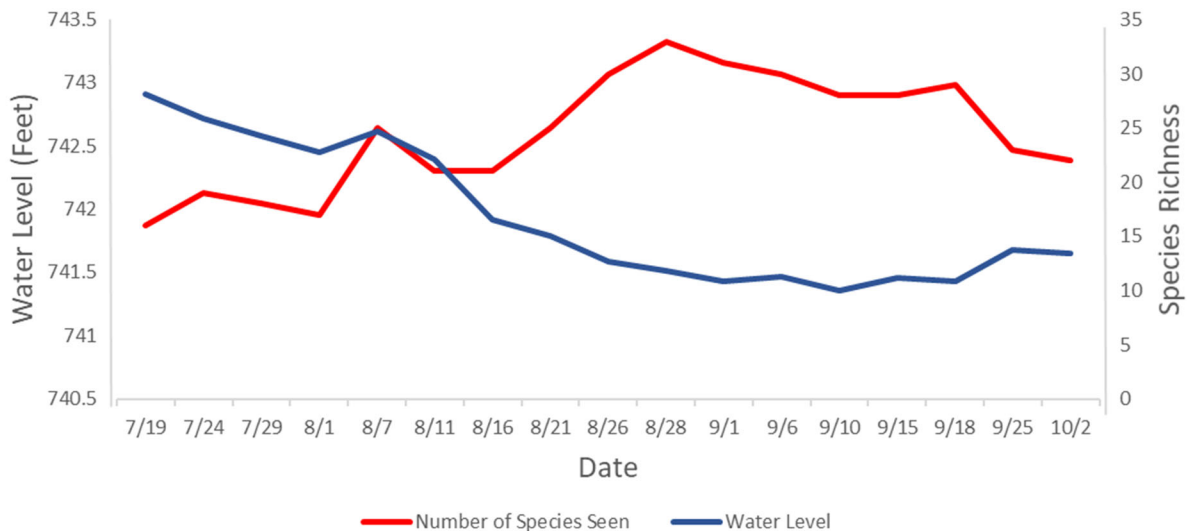
PinPoint GPS ARGOS tags (Lotek 2022) (n = 25) were attached using a temporary clip and glue method (tags fall off when the bird molts later in fall) and were programmed to take 14 points a day, one at midnight to get a roosting location and the other 13 fixes every 75 min starting at 0600 and ending at 2100. Deployment of these tags was staggered between 1 and 27 August 2023 to span the main migration period.

Sunbird Solar ARGOS tags (Lotek 2023) (n = 4) have a solar rechargeable battery and were attached using a more permanent leg loop harness. The fix frequency was variable and dependent on the charge of the tag. Deployment of these tags occurred between 4 and 13 September 2023. Birds fitted with either tag had morphometric body measurements taken.

To address objective three, 25 random transects running perpendicular to the shoreline were sampled for aquatic invertebrates weekly. Sampling started 20 July and ended 8 September 2023. At each transect, a benthic core sample was taken along the transect at three water depths: zero cm of water/wet mud, 3 cm of water, and 6 cm of water. Each sample was sieved. Invertebrates collected were identified to Family or Order and will be weighed, which will allow an estimation of total invertebrate biomass. Species richness (weekly) was computed by summing the number of families collected in each week (25 transects, 3 samples per transect).

Preliminary Results

Objective 1 – A total of 45 species were seen during 2023 waterbird surveys. There was a mean average of 24.5 (standard deviation = 5.3) waterbird species per survey (range was 16 to 33). Species richness (number of species observed) peaked during the last week in August (Figure 1) and correlated with low pool levels ( $r = -0.83$ ; in statistics, “r” denotes a simple correlation, which is a measure of how two variables are related; “r” values range from 1 to -1; an “r” value of 0 indicates that the two variables are wholly unrelated; the closer the “r” value is to 1 or -1, the stronger the statistical relationship between the two variables; a negative correlation indicates an inverse relationship, which, in this case, means that as the pool was lowered, species richness increased). Of the 45 species seen, 23 were shorebirds, 10 were waterfowl, and 12 fell into other waterbird groups. A total of >185,000 individual waterbirds were counted. American White Pelican was the most numerous with 109,590 recorded (59.2% of the total). The most numerous shorebird species was the Pectoral Sandpiper with 16,314 individuals counted (8.8% of the total). Limpkin, Hudsonian and Marbled godwits, and White-rumped Sandpiper were some of the uncommon species observed (Appendix A).



**Figure 1.** Waterbird species richness and water level at Lake Red Rock, 2023.

Objective 2 – A total of 29 Pectoral Sandpipers were fitted with a tracking tag. This group consisted of 12 adult males, 12 adult females, and five juvenile males (Appendix B). The farthest

a tagged Pectoral Sandpiper traveled was 5,465 km starting at Lake Red Rock and landing in Venezuela with no stops (Figure 2; 252439). The last tagged Pectoral Sandpiper left Lake Red Rock on 7 October. Multiple individuals were tracked to South America.

Objective 3 – Twelve orders and 22 families of invertebrates were identified. The most abundant family by count was Chironomidae (67.6%) followed by Corixidae (18.5%) (Appendix C). The average site richness was 0.68 (SD = 0.97) for 0 cm samples, 0.74 (SD = 0.98) for 3 cm samples, and 0.87 (SD = 1.02) for 6 cm samples. The site richness ranged from 0 to 4 in all water depths. The average site abundance was 2.1 (SD = 4.3) for 0 cm samples, 3.8 (SD = 8.5) for 3 cm samples, and 4.0 (SD = 9.5) for 6 cm samples. Site abundance ranged from 0 to 32 in 0 cm samples, 0 to 55 in 3 cm samples, and 0 to 76 in 6 cm samples.



**Figure 2.** Migratory tracks of tagged Pectoral Sandpipers at Lake Red Rock, 2023. Inset shows local movements. Symbology per tag ID (ending) is: yellow – 424, blue – 422, brown – 427, orange – 439, pink – 426, purple – 437, and aqua – 431.

### Literature Cited

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### Acknowledgments

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Appendix A. Waterbird survey results for Lake Red Rock, Iowa, 19 July 2023 to 2 October 2023.

		Survey Date																Total		
		7/19	7/24	7/29	8/1	8/7	8/11	8/16	8/21	8/26	8/28	9/1	9/6	9/10	9/15	9/18	9/25		10/2	
Species	Snow Goose								2			1	1	1	1				6	
	Canada Goose	23		2	102	6	18	297	95	221	260	143	208	235	67	69	185	221	2152	
	Wood Duck					14				1	5	2			1				23	
	Blue-winged Teal					26	15	103	101	191	52	22	1384	64	240	49	16	6	2269	
	Northern Shovler									35	19	32	56	73	46	21	14	24	320	
	Mallard		28	5	23	75	28	61	436	489	202	268	69	308	170	208	300	23	2693	
	Northern Pintail								5	20	3				11	6	9	38	107	199
	Green-winged Teal								11	94	9	5	448	132	42	135	293	1340	2509	
	Redhead					2														2
	American Coot													14	6	127	81	59	287	
	Common Gallinule														1					1
	Limpkin															1				1
	Black-necked stilt		1																	1
	American Avocet					2			1	1	1		4	6	5	6			2	28
	Black-bellied Plover											2	1		2	4	1	19	29	
	American Golden-Plover								1			4	53	49	123	69	27		326	
	Killdeer	20	37	145	77	52	93	54	177	157	130	50	47	77	2	10	1	7	1136	
	Semipalmated Plover					22	35		2	38	36	128	6		1	1			269	
	Hudsonian Godwit													1					1	
	Marbled Godwit					1											1		2	
	Ruddy Turnstone			1						2	1	8	3						15	
	Stilt Sandpiper		37	4		5	16	5	23	380	242	198	164	84	4	2	1		1165	
	Sanderling						1			2	5	19	13	32	7	5	28	16	128	
	Baird's Sandpiper				2				7	35	10	23	13						90	
	Least Sandpiper	6	57	93	62	95	252	26	96	204	204	164	28	18					1305	
	White-rumped Sandpiper											1							1	
	Buff-breasted Sandpiper								26	63	4	1	8	3					105	
	Pectoral Sandpiper	7	53	309	552	1107	1491	3125	3251	3193	1368	683	550	217	140	180	26	62	16314	
Semipalmated Sandpiper	5	3	6	11	34	21		3	64	17	28	3						195		

Short-billed Dowitcher		1			1		3	2	3	3	2		1					16
Spotted Sandpiper	1	5	13	1	6	8	2	10	13	3	3				2	2		69
Solitary Sandpiper	2	2		1														5
Lesser Yellowlegs	1	9	57	27	52	60	26	28	6	8	5	53	42	2	2	2	3	383
Greater Yellowlegs		1	2	2	10	4	3	1				1	1		6			31
Wilson's Phalarope									3	2	1	3	5	1	1			16
Red-necked Phalarope			1		1	2		10	20	35	29		6	3	1	1	1	110
Franklin's Gull	180	23	365	1083	643	1709	1009	1583	3949	2544	2262	2193	363	3010	2467	5993	697	30073
Ring-billed Gull	259	350	730	321	239	281	1348	808	714	506	656	445	471	751	1643	877	560	10959
Caspian Tern	1	2			4	4		1			1	2	22	33	10	8	1	2
Black Tern							1		1	2								4
Forster's tern	1																2	3
Double-crested Cormorant	28	49	28	83	53	44	70	76	76	54	72	61	92	147	111	86	86	1216
American White Pelican	7501	8055	10785	6180	6776	7336	17185	10131	9365	10085	4591	3790	1773	1156	2733	829	1319	109590
Great Blue Heron	11	10	10	3	11	17	27	31	20	27	20	12	27	30	25	17	13	311
Great Egret	23	27	16	8	52	32	38	99	18	27	11	49	88	85	41	33	23	670
Green Heron															1			1
Total	8069	8750	12572	8538	9289	11467	23390	17009	19379	15871	9483	9685	4300	6005	7895	8826	4592	

Appendix B – Satellite tagging and tracking results for Lake Red Rock, Iowa, 1 August to 13 September 2023. Data include weight in grams, lengths in millimeters, gender, maturity, tag type, tag ID, and lifespan for tagged Pectoral Sandpipers. Gender (Sex) is based on wing chord ( $\geq 133$  mm assumed male) so there is some uncertainty for individuals close to this cut-off.

Tag Type	ID	Deployment Date	Weight (g)	Culmen (mm)	Head-Bill (mm)	Tarsus (mm)	Wing Chord (mm)	Sex	Age	Number of Fixes
PinPoint	252421	8/10/2023	90	28.60	50.78	27.01	132	F	A	158
PinPoint	252422	8/10/2023	82	28.12	51.52	27.16	128	F	A	152
PinPoint	252423	8/15/2023	96	29.69	55.25	29.78	141	M	A	158
PinPoint	252424	8/17/2023	84	28.78	53.41	27.55	125	F	A	168
PinPoint	252425	8/27/2023	82	27.62	51.73	27.37	125	F	A	16
PinPoint	252426	8/1/2023	105	28.74	55.41	29.08	136	M	A	154
PinPoint	252427	8/17/2023	80	27.50	52.42	27.42	125	F	A	145
PinPoint	252428	8/17/2023	84	26.62	51.12	29.00	128	F	A	152
PinPoint	252429	8/15/2023	88	29.20	53.43	26.95	133	M	A	151
PinPoint	252430	8/15/2023	88	28.15	51.52	27.38	130	F	A	140
PinPoint	252431	8/25/2023	102	28.12	51.59	27.51	131	F	A	148
PinPoint	252432	8/25/2023	82	28.47	52.79	25.61	131	F	A	166
PinPoint	252433	8/25/2023	86	27.44	51.48	26.30	134	M	J	160
PinPoint	252434	8/25/2023	95	26.52	48.59	27.59	130	F	A	160
PinPoint	252435	8/5/2023	93	28.61	55.62	28.62	141	M	A	166
PinPoint	252436	8/5/2023	101	29.34	56.40	29.36	141	M	A	118
PinPoint	252437	8/5/2023	84	27.14	50.16	27.65	124	F	A	145
PinPoint	252438	8/5/2023	107	29.10	55.73	28.81	139	M	A	164
PinPoint	252439	8/5/2023	110	27.44	54.64	29.31	141	M	A	150
PinPoint	252440	8/5/2023	83	26.84	49.10	27.81	128	F	A	143
PinPoint	252441	8/1/2023	120	30.12	55.00	31.25	142	M	A	101
PinPoint	252442	8/1/2023	103	29.14	56.12	30.42	139	M	A	164
PinPoint	252443	8/1/2023	119	30.25	57.12	29.60	146	M	A	105
PinPoint	252444	8/1/2023	115	29.41	55.87	28.18	145	M	A	109
PinPoint	252446	8/1/2023	108	29.87	56.33	30.30	142	M	A	150
Sunbird	253348	9/13/2023	92	30.07	56.09	29.01	138	M	J	488
Sunbird	253349	9/13/2023	94	29.34	55.76	29.52	138	M	J	517
Sunbird	253350	9/13/2023	81	30.38	57.07	30.75	143	M	J	731
Sunbird	253351	9/4/2023	98	28.41	51.09	29.99	133	M	J	374



Appendix C. Summary of aquatic invertebrate sampling (counts of individuals by Family) at Lake Red Rock, Iowa, 20 July to 8 September 2023. Quantity of individuals in each family are broken up by sampling event and depth they were collected.

	Date			7/20-7/21			7/27-7/28			8/3			8/9-8/10			8/17-8/18			8/26-8/27			9/2-9/3			9/8			Total					
	Depth (cm)	0	3	6	0	3	6	0	3	6	0	3	6	0	3	6	0	3	6	0	3	6	0	3	6								
Families	Carabidae																								1			1					
	Ceratopogonidae							2	1		5		1		6		16	2		25	6	6	13	1		2		86					
	Chironomidae	5	8	11	1	2	2	8	41	21	6	26	21	3	1	1	105	99	70	41	92	123	73	246	279			1285					
	Coenagrionidae																											1					
	Corixidae	5	1	8						3					24	27		5	5	2	30	15		3	40	26	2	23	35	2	35	60	351
	Dolichopodidae																									1			1				
	Dytiscidae																										3	1	4	2	10		
	Ephemeraeidae																										2			10	20		
	Erpobdellidae																										2			2			
	Gomphidae			2																										1	6		
	Haliplidae																														1		
	Heteroceridae																														1	28	
	Hydrophilidae																														1	3	
	Ixodidae																														1	1	
	Lymnaeidae	5																													1	13	
	Notonectidae																														1	1	
	Physidae	4																													1	25	
	Sphaeriidae																														1	1	
	Staphylinidae																														2	2	
	Tabanidae																														1	7	
Tetigoniidae																														1	1		
Tipulidae																														1	1		
<b>Total</b>	19	11	20	2	4	8	16	70	51	14	33	28	7	40	18	130	148	99	97	121	174	95	288	354					1847				