

Avian Point Count Survey

Salt River Ecosystem Restoration Project

Phase 1 – Year 10

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INTRODUCTION

The Salt River Ecosystem Restoration Project is a large habitat restoration effort that rehabilitates seven miles of aggraded river channel and returns 330 acres of agricultural land into a tidal marsh. The project is being constructed in multiple phases. In 2013, the “Phase 1 – Riverside Ranch” of the project excavated 2.5 miles of river channel and restored 330 acres of a tidal marsh. Prior to the construction of this restoration phase, in 2011 avian point count surveys were performed to determine species composition in and around the project area. Under project permit requirements, an avian point count survey is to be performed in the third, fifth, and tenth year after completion of Phase 1 – Riverside Ranch project. Each year's survey documented species presence, avian richness, and relative abundance in the restored restoration area. These Year 10 results will also be compared to the previous year's 2011, 2016, and 2018 survey results.

All surveys were performed by Sean E. McAllister & Associates.

SURVEY AREA

The survey area consisted of seven monitoring sites that were established prior to restoration efforts, five of the sites are survey sites (S1-S5) and two are reference sites (R1-R2). Before construction, the survey area primarily consisted of riparian and agricultural fields. After construction, the two reference sites' habitats have remained static, primarily associated with riparian and grazed pastures. While the five survey sites' habitats shifted from riparian and agricultural fields to tidal marsh or riparian associated with a significantly larger and tidally influenced river channel (Table 1 and Figure 1).

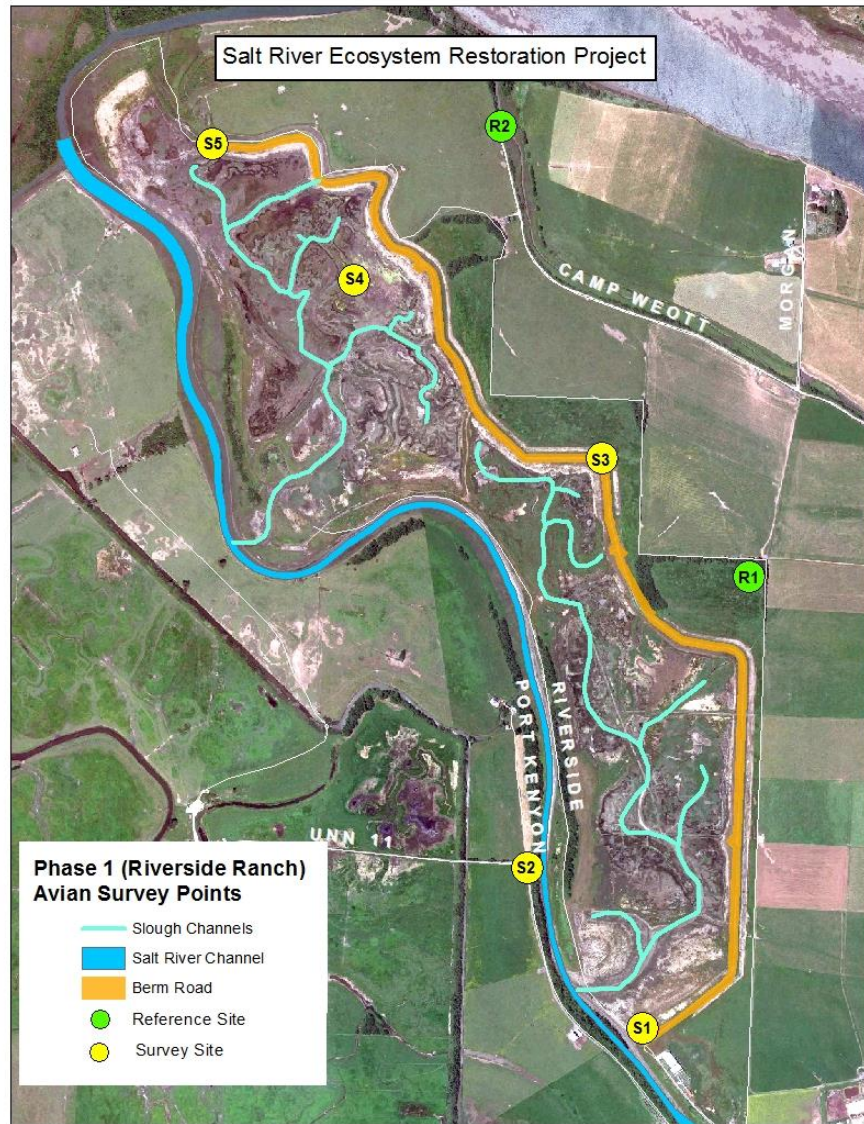
Table 1: Description of Phase 1 – Riverside Ranch Avian Point Count Monitoring Sites

Monitoring Site	Pre-Project Habitat Type	Post Project Habitat Type
S1 – Survey Site 1	Riparian	Riparian, Tidal Marsh, Tidally Influenced River Channel, and Pasture
S2 – Survey Site 2	Riparian	Riparian, Tidally influence River Channel, and Grazed Pasture
S3 – Survey Site 3	Agricultural Field	Tidal Marsh and Pasture
S4 – Survey Site 4	Agricultural Field	Tidal Marsh
S5 – Survey Site 5	Levee (Upland)	Tidal Marsh and Grazed Pasture
R1 – Reference Site 1	Riparian (Freshwater wetland)	Riparian (Freshwater wetland)
R2 – Reference Site 2	Riparian (Tidal Marsh)	Riparian (Tidal Marsh)

METHODS

Census monitoring using point count methods that followed a site-specific protocol developed in consultation with the California Department of Fish & Wildlife and project biologists. This protocol was modified from the protocol established by Ralph et al. (1993). An example of the modifications included survey duration. Breeding bird surveys were conducted for 15 minutes, versus the traditional three-minute point counts at each monitoring site. The surveys were done within four hours of sunrise to capture the peak period of bird activity. Surveys were not conducted during rain or strong winds or after 10:30 a.m. Point count surveys were conducted at the five survey sites on Riverside Ranch and at two reference site locations in the vicinity of the project area to control for inter-annual variability in species abundance.

Figure 1. Survey Site Location Map



YEAR 10 (2023) AVIAN SURVEY RESULTS

In Year 10, monitoring was performed on May 27th, June 17th, and July 23rd of 2023. A combined total of 741 individual bird detections were made over the three survey dates, that's a total of 21 avian point counts represented by 44 different species. The American Goldfinch (*Spinus tristis*) and the Song Sparrow (*Melospiza melodia*) were detected at all points during each of the survey days. The Song Sparrow was the most abundant species with 89 combined detections, followed by American Goldfinch (*Carduelis tristis*) with 81 combined detections and the Marsh Wren (*Cistothorus palustris*) with 61 combined detections. Eight species were represented by single birds detected only once (Table 2). Of the 44 species detected, three are listed as *Species*

of *Special Concern* (SSC) by the California Department of Fish and Wildlife. These species are underscored in Table 2. Of these species of special concern, the Northern Harrier was seen at S1 in June, the Yellow Warbler at S2 in May, and the Yellow-breasted Chat at R1 also in June. During the 2018 survey, only one listed species, the Bryant's Savannah Sparrow was seen.

Table 2: All Species Detected with Relative Abundance (total count) for Year 10 (2023) – Phase 1 (Riverside Ranch). Stars (*) indicate individual species flying over monitoring sites with no association with the immediate surrounding habitat. Underlined (__) individuals represent listed species of special concern.

Scientific Name	Common Name	Number of Birds
<i>Selasphorus sasin</i>	Allen's Hummingbird	1
<i>Corvus brachyrhynchos</i>	American Crow	3
<i>Spinus tristis</i>	American Goldfinch	81
<i>Turdus migratorius</i>	American Robin	27
<i>Riparia riparia</i>	Bank Swallow	6
<i>Hirundo rustica</i>	Barn Swallow	31
<i>Sayornis nigricans</i>	Black Phoebe	2
<i>Poecile atricapillus</i>	Black-capped Chickadee	5
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak	3
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird	46
<i>Molothrus ater</i>	Brown-headed Cowbird	44
<i>Icterus bullockii</i>	Bullock's Oriole	11
<i>Callipepla californica</i>	California Quail	7
<i>Petrochelidon pyrrhonota</i> *	Cliff Swallow	4
<i>Corvus corax</i>	Common Raven	28

<i>Geothlypis trichas</i>	Common Yellowthroat	9
<i>Phalacrocorax auritus</i> *	Double-crested Cormorant	2
<i>Dryobates pubescens</i>	Downy Woodpecker	2
<i>Streptopelia decaocto</i>	Eurasian Collared-Dove	27
<i>Sturnus vulgaris</i>	European Starling	54
<i>Ardea alba</i>	Great Egret	8
<i>Haemorhous mexicanus</i>	House Finch	6
<i>Vireo huttoni</i>	Hutton's Vireo	1
<i>Charadrius vociferus</i>	Killdeer	1
<i>Anas platyrhynchos</i>	Mallard	11
<i>Cistothorus palustris</i>	Marsh Wren	61
<i>Zenaida macroura</i>	Mourning Dove	3
<i>Colaptes auratus</i>	Northern Flicker	6
<u><i>Circus hudsonius</i>*</u>	Northern Harrier	1
<i>Pandion haliaetus</i> *	Osprey	2
<i>Empidonax difficilis</i>	Pacific-slope Flycatcher	3
<i>Buteo jamaicensis</i> *	Red-tailed Hawk	1
<i>Passerculus sandwichensis</i>	Savannah Sparrow	19
<i>Melospiza melodia</i>	Song Sparrow	89
<i>Catharus ustulatus</i>	Swainson's Thrush	37
<i>Tachycineta bicolor</i>	Tree Swallow	35
<i>Cathartes aura</i>	Turkey Vulture	23

<i>Hirundinidae (gen, sp)*</i>	Unidentified Swallow	4
<i>Hirundinidae (gen, sp)*</i>	Unidentified Swallow	4
<i>Rallus limicola</i>	Virginia Rail	1
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	12
<i>Chamaea fasciata</i>	Wrentit	18
<u><i>Setophaga petechia</i></u>	Yellow Warbler	1
<u><i>Icteria virens</i></u>	Yellow-breasted Chat	1
Total Birds Detected		741

Twenty-one point count surveys were performed across seven monitoring sites in May, June, and July of 2023. The results from these surveys showed that species richness averaged 14.6 species per survey date across all seven sites (range of 11 to 17 species). S1 had the highest species richness out of all the locations (Figure 2). It was found that June had the highest species richness out of the three survey months (Figure 3). R1 and R2 had a lower average of 13 species across all three survey dates while S1-S5 averaged 15.27 species per survey date (Figure 6). This is consistent with the survey data from 2018 and 2016 (Figure 8).

Figure 2. Average Species Richness at All Sites for Year 10 (2023) – Phase 1 (Riverside Ranch)

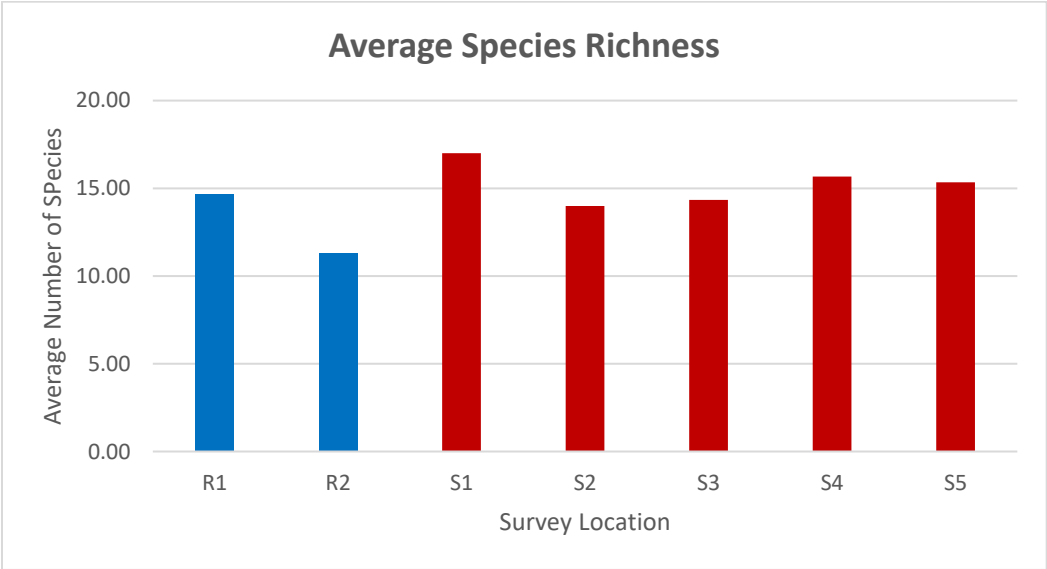
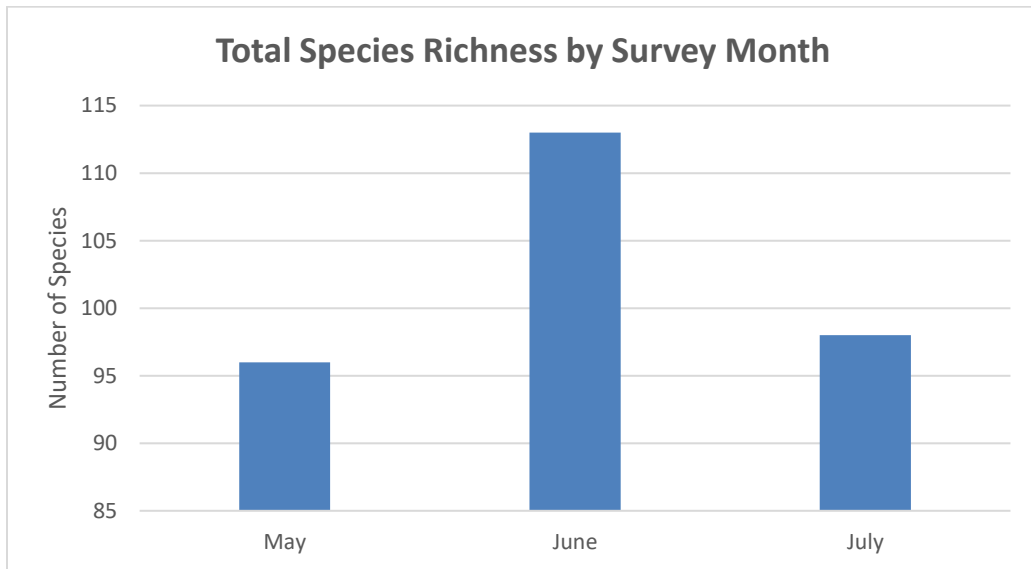


Figure 3. Total Species Richness Compared by Survey Month for Year 10 (2023) – Phase 1 (Riverside Ranch)



From the 21 point count surveys, relative abundance averaged 35.29 birds per site across all seven monitoring sites (range of 27 to 47 individual birds). S1 also had the highest average relative abundance compared to other sites (Figure 4). It was found that June also had the highest relative abundance out of the three months surveyed (Figure 5). R1 and R2 averaged lower at 32.83 birds per site across all three survey dates while S1-S5 averaged 36.27 birds per survey date (Figure 6).

Tables 3 through 9 detail species and number of birds detected at each monitoring site. The “Sum of Total” category includes a total of all individual bird encounters. The next two columns are a sum of individual birds seen at less than fifty meters away and greater than fifty meters away. The final column is the total count of birds seen flying over the survey location, these encounters are not necessarily associated with aquatic or tidal marsh habitat.

Figure 4. Average Relative Abundance at All Sites for Year 10 (2023) – Phase 1 (Riverside Ranch)

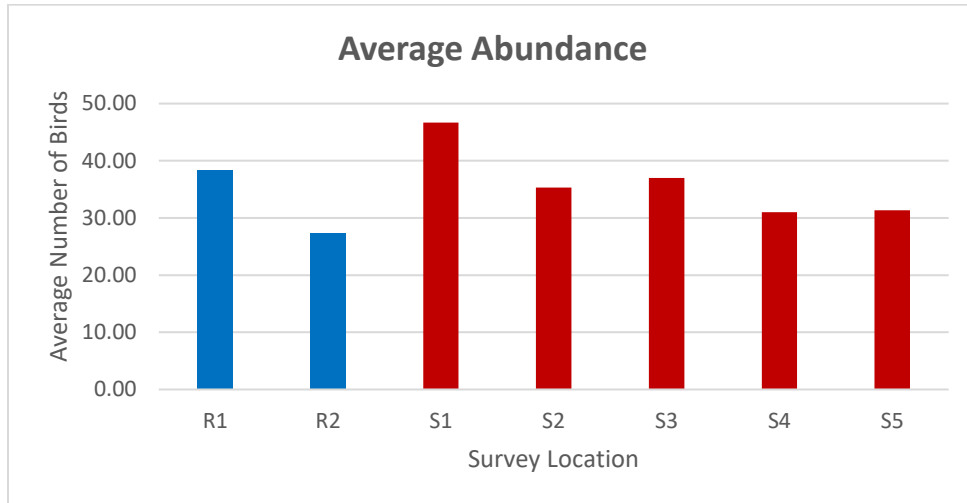


Figure 5. Average Relative Abundance at All Sites for Year 10 (2023) – Phase 1 (Riverside Ranch)

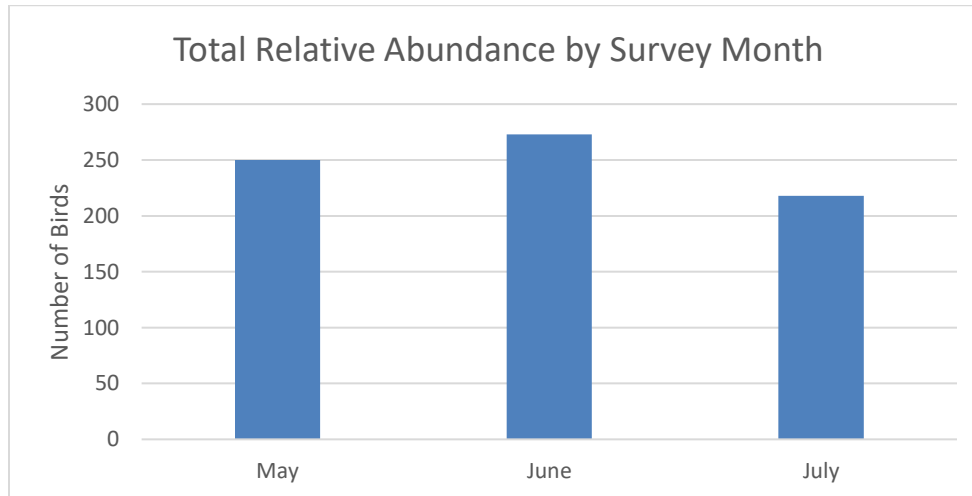


Figure 6. Comparing Average Abundance and Average Richness Between Reference and Survey Sites for Year 10 (2023) – Phase 1 (Riverside Ranch)

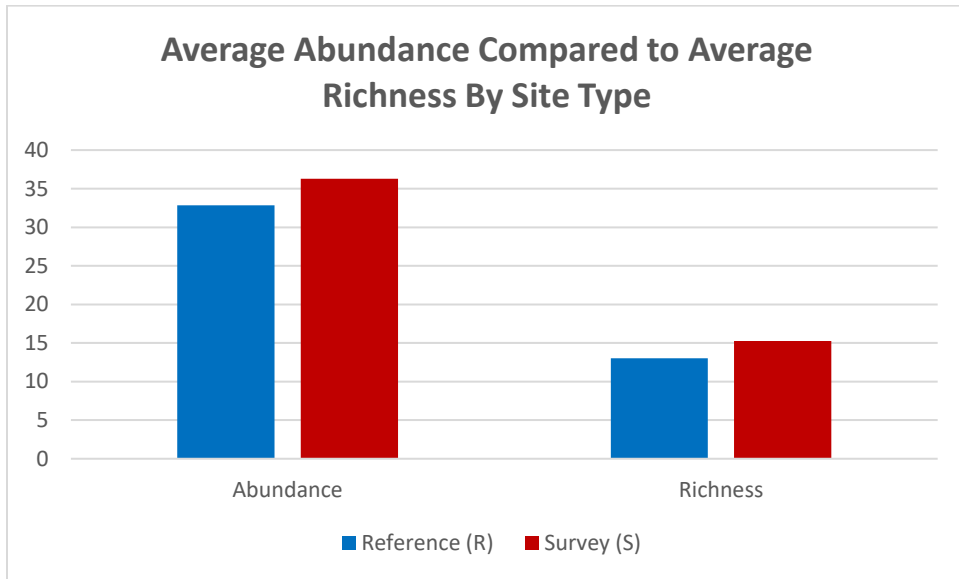


Table 3: Survey Site 1 Species and Individual Point Count Data for Year 10 (2023) - Phase 1 (Riverside Ranch)

Survey Site 1 - (S1)												
Species - Common Name	Sum of Total			Sum of # <=50m			Sum of #>50m			Sum of # Flyover		
	May	June	July	May	June	July	May	June	July	May	June	July
American Goldfinch	3	7	3	3	3	2	0	0	1	0	4	0
American Robin	1	1	1	1	1	1	0	0	0	0	0	0
Barn Swallow	2	2	2	2	1	1	0	0	0	0	1	1
Black-capped Chickadee	1	0	0	1	0	0	0	0	0	0	0	0
Brewer's Blackbird	20	0	0	3	0	0	17	0	0	0	0	0
Brown-headed Cowbird	6	4	4	4	4	4	2	0	0	0	0	0
Bullock's Oriole	1	0	0	1	0	0	0	0	0	0	0	0
Cliff Swallow	0	2	0	0	0	0	0	0	0	0	2	0
Common Raven	2	3	3	1	1	0	1	2	2	0	0	1
Eurasian Collared-Dove	2	1	1	0	0	1	2	1	0	0	0	0
European Starling	3	1	3	0	1	1	1	0	2	2	0	0
House Finch	2	0	0	0	0	0	0	0	0	2	0	0
Killdeer	1	0	0	0	0	0	1	0	0	0	0	0
Marsh Wren	2	6	3	2	3	2	0	3	1	0	0	0
Northern Flicker	0	1	1	0	1	1	0	0	0	0	0	0
Pacific-slope Flycatcher	1	1	1	1	1	1	0	0	0	0	0	0
Savannah Sparrow	0	1	2	0	1	0	0	0	2	0	0	0
Song Sparrow	7	4	4	4	3	1	3	1	3	0	0	0
Swainson's Thrush	1	2	2	0	0	0	1	2	2	0	0	0
Tree Swallow	9	0	0	9	0	0	0	0	0	0	0	0
Turkey Vulture	0	2	2	0	0	0	0	0	0	0	2	2
Virginia Rail	0	1	0	0	1	0	0	0	0	0	0	0
White-crowned Sparrow	1	0	0	0	0	0	1	0	0	0	0	0
Wrentit	0	2	1	0	1	0	0	1	1	0	0	0
Yellow-breasted Chat	0	1	0	0	1	0	0	0	0	0	0	0
Grand Total	65	42	33	32	23	15	29	10	14	4	9	4

Table 4: Survey Site 2 Species and Individual Point Count Data for Year 10 (2023) - Phase 1 (Riverside Ranch)

Survey Site 2 - (S2)												
Species - Common Name	Sum of Total			Sum of # <=50m			Sum of # >50m			Sum of # Flyover		
	May	June	July	May	June	July	May	June	July	May	June	July
American Goldfinch	3	6	4	2	2	2	0	1	0	1	3	2
American Robin	1	2	2	1	1	1	0	1	1	0	0	0
Brown-headed Cowbird	1	4	2	1	2	2	0	2	0	0	0	0
Bullock's Oriole	2	1	0	0	0	0	2	1	0	0	0	0
Common Yellowthroat	1	1	1	0	0	0	1	1	1	0	0	0
Eurasian Collared-Dove	2	3	3	0	1	1	2	2	2	0	0	0
European Starling	4	7	7	2	0	0	1	2	2	1	5	5
Great Egret	2	1	0	0	0	0	2	1	0	0	0	0
Mallard	6	0	0	0	0	0	0	0	0	6	0	0
Marsh Wren	1	2	2	1	1	1	0	1	1	0	0	0
Song Sparrow	4	3	5	3	1	3	1	2	2	0	0	0
Swainson's Thrush	2	2	1	1	0	0	1	2	1	0	0	0
Tree Swallow	3	3	0	3	3	0	0	0	0	0	0	0
Turkey Vulture	3	2	1	0	0	0	3	0	0	0	2	1
White-crowned Sparrow	0	2	1	0	0	1	0	2	0	0	0	0
Wrentit	0	1	1	0	0	0	0	1	1	0	0	0
Yellow Warbler	1	0	0	1	0	0	0	0	0	0	0	0
Grand Total	36	40	30	15	11	11	13	19	11	8	10	8

Table 5: Survey Site 3 Species and Individual Point Count Data for Year 10 (2023) - Phase 1 (Riverside Ranch)

Survey Site 3 - (S3)												
Species - Common Name	Sum of Total			Sum of # <=50m			Sum of #>50m			Sum of # Flyover		
	May	June	July	May	June	July	May	June	July	May	June	July
American Goldfinch	1	5	5	0	3	3	0	0	0	1	2	2
Barn Swallow	0	1	1	0	0	0	0	0	0	0	1	1
Black-capped Chickadee	0	0	2	0	0	0	0	0	2	0	0	0
Brewer's Blackbird	1	8	8	0	8	8	0	0	0	1	0	0
Brown-headed Cowbird	2	1	1	0	1	1	1	0	0	1	0	0
California Quail	1	0	0	0	0	0	1	0	0	0	0	0
Common Raven	3	3	3	0	0	0	2	0	0	1	3	3
Common Yellowthroat	1	1	1	1	0	0	0	1	1	0	0	0
Eurasian Collared-Dove	1	2	0	0	0	0	1	2	0	0	0	0
European Starling	0	1	1	0	0	0	0	1	1	0	0	0
Mallard	3	0	0	0	0	0	1	0	0	2	0	0
Marsh Wren	0	5	5	0	3	3	0	2	2	0	0	0
Mourning Dove	0	1	0	0	1	0	0	0	0	0	0	0
Red-tailed Hawk	0	1	0	0	0	0	0	0	0	0	1	0
Savannah Sparrow	3	6	2	2	4	0	1	2	2	0	0	0
Song Sparrow	7	3	3	4	2	1	3	1	2	0	0	0
Swainson's Thrush	2	4	1	0	1	0	2	3	1	0	0	0
Tree Swallow	0	2	0	0	2	0	0	0	0	0	0	0
Turkey Vulture	1	0	0	0	0	0	1	0	0	0	0	0
White-crowned Sparrow	0	3	3	0	0	0	0	3	3	0	0	0
Wrentit	0	1	1	0	0	0	0	1	1	0	0	0
Grand Total	26	48	37	7	25	16	13	16	15	6	7	6

Table 6: Survey Site 4 Species and Individual Point Count Data for Year 10 (2023) - Phase 1 (Riverside Ranch)

Survey Site 4 - (S4)												
Species - Common Name	Sum of Total			Sum of # <=50m			Sum of # >50m			Sum of # Flyover		
	May	June	July	May	June	July	May	June	July	May	June	July
Allen's Hummingbird	0	1	0	0	1	0	0	0	0	0	0	0
American Goldfinch	1	4	3	0	0	1	0	1	0	1	3	2
American Robin	2	2	2	0	0	0	2	2	2	0	0	0
Bank Swallow	2	2	2	0	2	2	0	0	0	2	0	0
Barn Swallow	2	0	0	0	0	0	0	0	0	2	0	0
Black-headed Grosbeak	0	1	1	0	0	0	0	1	1	0	0	0
Brewer's Blackbird	0	1	1	0	0	0	0	0	0	0	1	1
Brown-headed Cowbird	1	1	1	1	1	1	0	0	0	0	0	0
Bullock's Oriole	0	2	2	0	0	0	0	2	2	0	0	0
California Quail	2	1	1	0	0	0	2	1	1	0	0	0
Cliff Swallow	0	1	1	0	0	0	0	0	0	0	1	1
Common Raven	1	1	1	0	0	0	0	1	1	1	0	0
Eurasian Collared-Dove	1	0	0	0	0	0	1	0	0	0	0	0
European Starling	0	8	8	0	0	0	0	0	0	0	8	8
Great Egret	0	1	1	0	0	0	0	0	0	0	1	1
Marsh Wren	5	0	0	3	0	0	2	0	0	0	0	0
Northern Flicker	0	1	1	0	0	0	0	1	1	0	0	0
Savannah Sparrow	1	0	0	1	0	0	0	0	0	0	0	0
Song Sparrow	3	5	5	3	2	2	0	3	3	0	0	0
Swainson's Thrush	2	1	1	0	0	0	2	1	1	0	0	0
Tree Swallow	0	1	1	0	0	0	0	0	0	0	1	1
Wrentit	0	2	2	0	0	0	0	2	2	0	0	0
Grand Total	23	36	34	8	6	6	9	15	14	6	15	14

Table 7: Survey Site 5 Species and Individual Point Count Data for Year 10 (2023) - Phase 1 (Riverside Ranch)

Survey Site 5 - (S5)												
Species - Common Name	Sum of Total			Sum of # <=50m			Sum of #>50m			Sum of # Flyover		
	May	June	July	May	June	July	May	June	July	May	June	July
American Crow	2	0	0	0	0	0	2	0	0	0	0	0
American Goldfinch	3	1	1	1	1	1	1	0	0	1	0	0
American Robin	1	3	3	0	0	0	1	3	3	0	0	0
Barn Swallow	2	0	0	2	0	0	0	0	0	0	0	0
Black-headed Grosbeak	1	0	0	0	0	0	1	0	0	0	0	0
Brown-headed Cowbird	0	2	2	0	2	2	0	0	0	0	0	0
Common Raven	3	0	0	0	0	0	0	0	0	3	0	0
Double-crested Cormorant	0	1	1	0	0	0	0	0	0	0	1	1
Downy Woodpecker	0	1	1	0	0	0	0	1	1	0	0	0
Eurasian Collared-Dove	1	0	0	0	0	0	1	0	0	0	0	0
Great Egret	1	1	1	1	0	0	0	0	0	0	1	1
House Finch	0	1	1	0	1	1	0	0	0	0	0	0
Mallard	2	0	0	0	0	0	2	0	0	0	0	0
Marsh Wren	5	7	7	3	3	3	2	4	4	0	0	0
Mourning Dove	0	1	1	0	0	0	0	0	0	0	1	1
Osprey	0	1	1	0	0	0	0	0	0	0	1	1
Song Sparrow	6	4	4	3	2	2	3	2	2	0	0	0
Swainson's Thrush	1	1	1	0	0	0	1	1	1	0	0	0
Tree Swallow	0	1	1	0	0	0	0	0	0	0	1	1
Turkey Vulture	1	2	2	0	0	0	0	0	0	1	2	2
Unidentified Swallow	0	0	4	0	0	0	0	0	0	0	0	4
Unidentified Swallow	0	4	0	0	0	0	0	0	0	0	4	0
Wrentit	1	1	1	0	0	0	1	1	1	0	0	0
Grand Total	30	32	32	10	9	9	15	12	12	5	11	11

Table 8: Reference Site 1 Species and Individual Point Count Data for Year 10 (2023) - Phase 1 (Riverside Ranch)

Reference Site 1 - (R1)												
Species - Common Name	Sum of Total			Sum of # <=50m			Sum of #>50m			Sum of # Flyover		
	May	June	July	May	June	July	May	June	July	May	June	July
American Crow	1	0	0	0	0	0	1	0	0	0	0	0
American Goldfinch	4	6	2	2	1	0	0	0	1	2	5	1
American Robin	0	2	2	0	1	1	0	1	0	0	0	1
Barn Swallow	0	2	4	0	0	3	0	0	0	0	2	1
Black-capped Chickadee	2	0	0	2	0	0	0	0	0	0	0	0
Brewer's Blackbird	1	3	3	0	0	0	0	3	3	1	0	0
Brown-headed Cowbird	6	2	2	3	2	2	3	0	0	0	0	0
Bullock's Oriole	0	2	0	0	2	0	0	0	0	0	0	0
Common Raven	0	2	2	0	1	1	0	1	1	0	0	0
Common Yellowthroat	2	0	0	0	0	0	2	0	0	0	0	0
Eurasian Collared-Dove	2	4	4	0	2	2	2	2	2	0	0	0
European Starling	5	4	1	3	0	0	2	4	0	0	0	1
House Finch	0	1	1	0	1	0	0	0	0	0	0	1
Hutton's Vireo	0	1	0	0	1	0	0	0	0	0	0	0
Northern Harrier	0	1	0	0	0	0	0	0	0	0	1	0
Savannah Sparrow	2	0	0	0	0	0	2	0	0	0	0	0
Song Sparrow	5	6	3	2	3	2	3	3	1	0	0	0
Swainson's Thrush	4	2	2	2	0	0	2	2	2	0	0	0
Tree Swallow	4	5	1	0	2	1	0	0	0	4	3	0
Turkey Vulture	1	3	1	0	0	0	0	0	0	1	3	1
Wrentit	0	1	1	0	0	0	0	1	1	0	0	0
Grand Total	39	47	29	14	16	12	17	17	11	8	14	6

Table 9: Reference Site 2 Species and Individual Point Count Data for Year 10 (2023) - Phase 1 (Riverside Ranch)

Reference Site 2 - (R2)												
Species - Common Name	Sum of Total			Sum of # </=50m			Sum of #>50m			Sum of # Flyover		
	May	June	July	May	June	July	May	June	July	May	June	July
American Goldfinch	5	6	8	2	3	5	0	2	3	3	1	0
American Robin	2	0	0	2	0	0	0	0	0	0	0	0
Barn Swallow	5	5	3	0	0	0	0	0	0	5	5	3
Black Phoebe	0	1	1	0	1	1	0	0	0	0	0	0
Brown-headed Cowbird	0	1	1	0	1	1	0	0	0	0	0	0
Bullock's Oriole	1	0	0	0	0	0	1	0	0	0	0	0
California Quail	1	1	0	1	0	0	0	1	0	0	0	0
Common Raven	1	0	0	0	0	0	1	0	0	0	0	0
Common Yellowthroat	1	0	0	0	0	0	1	0	0	0	0	0
European Starling	1	0	0	0	0	0	1	0	0	0	0	0
Marsh Wren	5	6	0	3	4	0	2	2	0	0	0	0
Northern Flicker	0	1	1	0	1	1	0	0	0	0	0	0
Savannah Sparrow	2	0	0	1	0	0	1	0	0	0	0	0
Song Sparrow	5	1	2	2	1	1	3	0	1	0	0	0
Swainson's Thrush	0	2	3	0	1	1	0	1	2	0	0	0
Tree Swallow	0	2	2	0	0	0	0	0	0	0	2	2
Turkey Vulture	0	1	1	0	0	0	0	0	0	0	1	1
White-crowned Sparrow	2	0	0	1	0	0	1	0	0	0	0	0
Wrentit	0	1	1	0	0	0	0	1	1	0	0	0
Grand Total	31	28	23	12	12	10	11	7	7	8	9	6

COMPARISON OF PRE-PROJECT (2011) AND POST-PROJECT (2016, 2018 and 2023) RESULTS

In 2023, avian point counts were performed at the same survey and reference sites as in 2011, 2016, and 2018. Avian biologist, Sean McAllister, performed the avian point count surveys for all survey years. The 2011 survey was completed two years before the construction of Phase 1 - Riverside Ranch of the Salt River Ecosystem Restoration Project (S. Kline et al 2011). The pre-project surveys aim to track richness and relative abundance from baseline (pre-project) conditions through post-project conditions.

The following compares the total species richness observations by pre-construction (2011) and post-construction (2016, 2018, and 2023) survey years. The total species richness for 2011 was 38, in 2016 it increased to 52, in 2018 it increased again to 56, and in 2023 it decreased to 44.

The year 2018 had the highest species richness (Figure 7). When comparing the average annual richness from each site to each survey year (Figure 8) S1 starts with the lowest species richness in 2011 but jumps to the site with the highest species richness consistently in the following survey years 2016, 2018, and 2023. Sites S1, S4, R1, and R2 had the highest species richness in 2016 whereas sites S2, S3, and S5 all had the highest species richness in 2018. This year, R2 continued to have the lowest average species richness value of 11, while all other sites had very similar values ranging from 14-17.

Figure 7. Total Number of Species Compared Between Survey Years

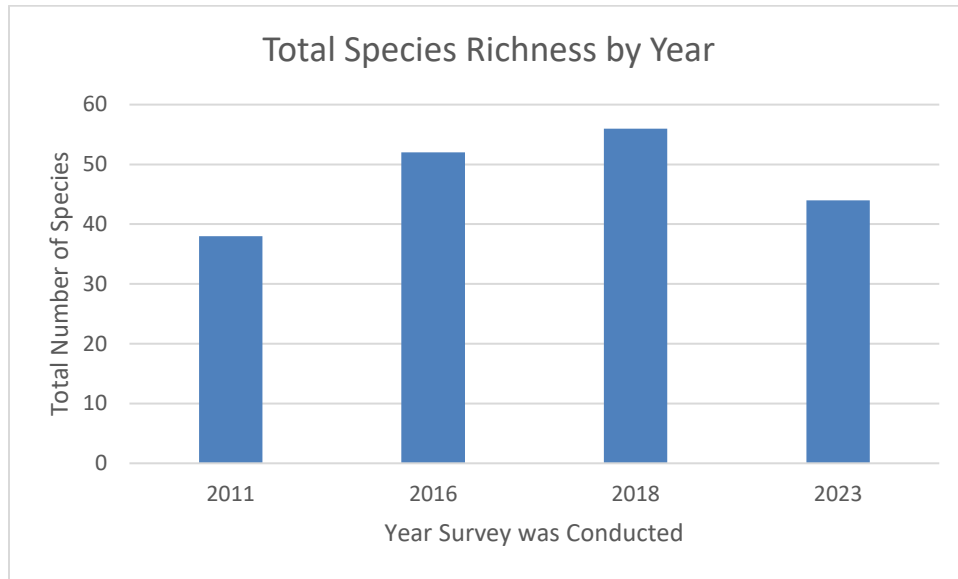
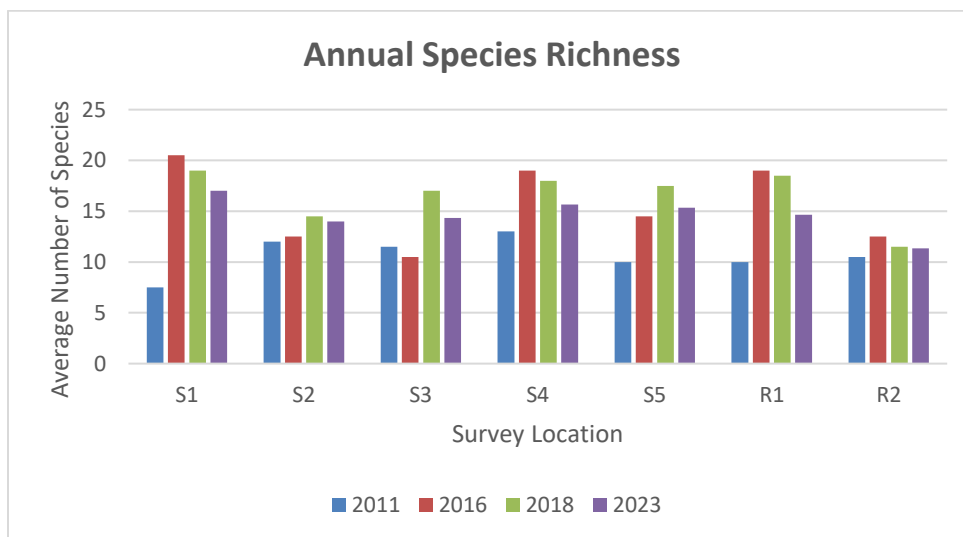


Figure 8. Comparison of species richness between Pre (2011) and Post Construction Periods (2016, 2018, & 2023) by survey location.



The following compares the total individual abundance observations by pre-construction (2011) and post-construction (2016, 2018, and 2023) survey years. In Table 10 the most abundant species for each year is listed. In 2011 the most abundant species were the Song Sparrow (58), American Goldfinch (43), and Barn Swallow (36). In 2016 the most abundant species were the European Starling (259), Song Sparrow (69), and Barn Swallow (68). In 2018, the most abundant species were the Least Sandpiper (339), Western Sandpiper (211), and Semipalmated Plover (101). This year the most abundant species, similar to 2011, are the Song Sparrow (89) and the American Goldfinch (81). Unique to 2023 is the Marsh Wren (61).

The total abundance for 2011 was 373 individual birds, in 2016 it increased to 832 individual birds, and then in 2018, it spiked to 1,333 primarily due to large groups of Least Sandpipers, unidentified small shorebirds, and Western Sandpipers. Then in 2023, it decreased to 741 individual birds. The year 2018 had the highest abundance (Figure 9). When comparing the annual abundance from each site to each survey year (Figure 9) S1 started with the lowest abundance in 2011 and then shot up to the second-highest recorded abundance value of 366 birds in 2016. Both S3 and S5 as well as R2 have experienced subtle increases in abundance each survey year. There was a slight drop from 131 to 93 in this year's abundance at R1. The abundance at all sites surveyed remains higher than the pre-project abundance in 2011.

Table 10. List of Most Abundant Species Across All Survey Years

2011	2016	2018	2023
Song Sparrow (58)	European Starling (259)	Least Sandpiper (339)	Song Sparrow (89)
American Goldfinch (43)	Song Sparrow (69)	Western Sandpiper (211)	American Goldfinch (81)
Barn Swallow (36)	Barn Swallow (68)	Semipalmated Plover (101)	Marsh Wren (61).

Figure 9. Comparison of Species Abundance between Pre (2011) and Post Construction Periods (2016, 2018, & 2023) by survey location.

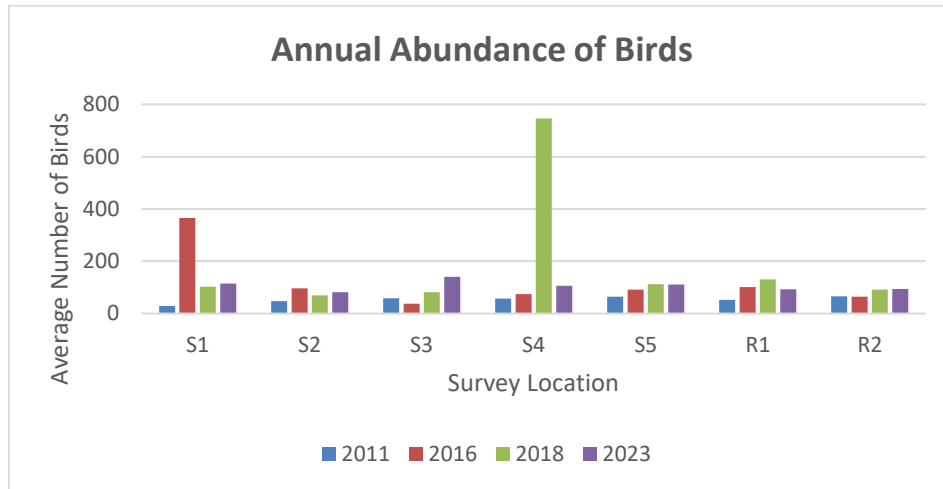
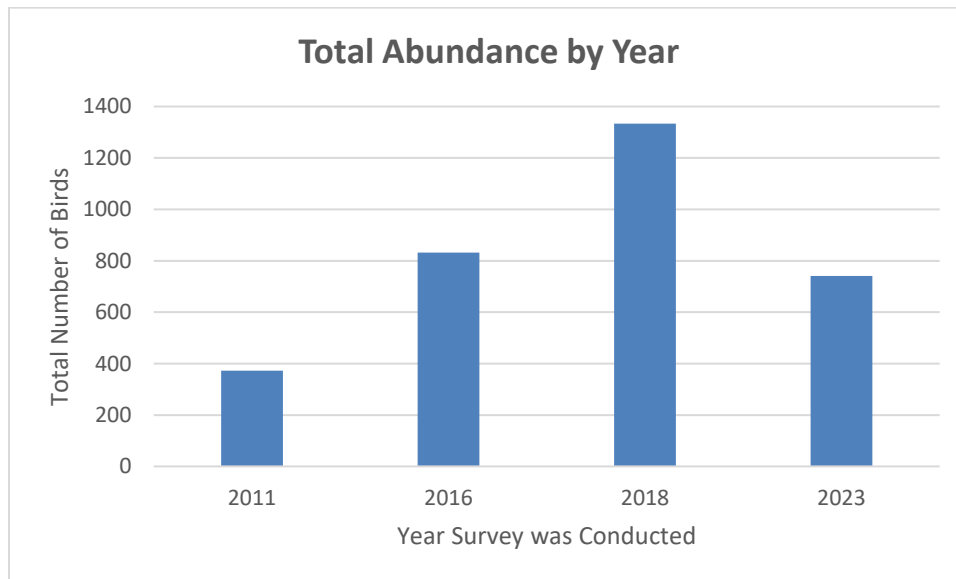


Figure 10. Total Abundance Compared Between Survey Years



Taking into consideration all monitoring sites, total species richness and abundance significantly increased from 2011 to 2023. Using 2011 data results as a baseline, total species abundance (i.e. number of individuals) increased by 199% in 2023. The total species richness at all survey sites increased by 116% in 2023 compared to 2011.

A list of species unique to each survey year is tabulated for all survey sites (not reference sites) in Table 11. This table shows a species composition unique to each survey year and associated with the type of habitat existing before (riparian and agricultural fields) and after (tidal marsh) restoration efforts. The post-project surveys have shown we continue to see new species

unique to our survey sites since 2011. A majority of the survey site’s unique species are not necessarily associated with aquatic or tidal marsh habitats. In 2018, unique species for the two reference sites only included four species: Anna’s Hummingbird (*Calypte anna*), Osprey (*Pandion haliaetus*), Virginia Rail (*Rallus limicola*), and the Wilson’s Warbler (*Wilsonia pusilla*). Then in 2023 we only found one unique species. Though it appears that there has been a decrease in unique species detected since 2011, many of the unique species from previous years were observed in much higher numbers, for example, the Brewer’s Blackbird, which had 46 spotted individuals in 2023, only had 10 in 2018. It is also likely that we are settling into a more stable ecosystem that has reached a healthy equilibrium point.

Table 11. Comparing Detected Species Unique to Specific Survey Years for all Surveyed Sites

Species Observed Only In Specified Survey Years at Survey Sites			
2011	2016	2018	2023
American Crow	Anna's Hummingbird	Allen's Hummingbird	Hutton's Vireo
Band-tailed Pigeon	Bald Eagle	Belted Kingfisher	
California Quail	Black-bellied Plover	Brewer's Blackbird	
Mallard	Black-crowned Night-Heron	Bullock's Oriole	
Osprey	Bullock's Oriole	Canada Goose	
Virginia Rail	Caspian Tern	Chestnut-backed Chickadee	
Willow Flycatcher	Double-crested Cormorant	European Starling	
	Downy Woodpecker	Great Blue Heron	
	Great Blue Heron	Great Egret	
	Greater Yellowlegs	Killdeer	
	Lesser Goldfinch	Long-billed Dowitcher	
	Northern Harrier	Mallard	
	Orange-crowned Warbler	Mourning Dove	
	Pacific Wren	Northern Harrier	
	Pacific-slope Flycatcher	Pacific-slope Flycatcher	
	Purple Martin	Peregrine Falcon	
	Semipalmated Plover	Red Knot	
	Violet-green Swallow	Red-tailed Hawk	
	Western Gull	White-tailed Kite	
	Yellow Warbler	Wrentit	
	Yellow-breasted Chat		

CONCLUSION

In 2013, Phase 1 of the Salt River Ecosystem Restoration Project converted over 300 acres of agricultural fields back to tidal marsh and additionally expanded and deepened 2.5 miles of adjacent river channel. Before this specific restoration phase, avian point count surveys were performed across seven monitoring sites in and around the project area. In 2016, three years after the completion of construction for Phase 1, another avian point count survey was performed. In 2018, the required Year 5-point count survey was performed, and then in 2023, the required 10-year point count survey was completed. This survey has documented species presence, avian richness, and relative abundance in the restored restoration area.

It must be noted that the seven monitoring sites, S1, S3, S4, and S5, have undergone the most dramatic habitat changes which show the larger increases in relative abundance and species richness demonstrated in Figure 8 and Figure 9. Prior to construction, these sites were located in grazed pastures with some associated riparian. Tidal marsh habitat is now associated with these sites. S1, S3, and S5 are transition sites that sit between agricultural fields and tidal marsh. S4 is completely located within the tidal marsh. S1 is not only co-located between agricultural fields and a tidal marsh but it is also located next to a significantly larger restored river channel with mature riparian. Survey site S2 remains next to mature riparian and grazed pastureland, however, the river channel has also expanded in this area.

Project goals projected that with a more diverse habitat across the project area, abundance, and species richness would increase at survey sites (non-reference sites) after the project had some time to equilibrate after construction. Figure 6 shows that the average abundance (number of individuals) and average richness are similar in value for survey and reference sites, but overall survey sites contain higher values of relative abundance and richness when compared to reference sites in 2023. Comparing the survey years, abundance increased at four of the sites while species richness decreased at both survey and reference sites from 2018 to 2023 (Figures 8 & 9). Though abundance only increased at four sites and species richness values decreased at all seven sites since 2018, it is notable to point out that species composition continues to evolve, and the species richness and relative abundance are higher than the pre-construction survey results. These outcomes could be caused by several variables such as weather effects, the previous year's food abundance, or the Phase 1 – Riverside Ranch portion of the Salt River Ecosystem Restoration Project provided larger beneficial habitat effects beyond the project footprint. Table 11 demonstrates that though there has been a dip in species richness and relative abundance at multiple sites three new listed species have been found in 2023, showing how the habitat conversion from agricultural land to tidal marsh conditions promotes a healthier ecosystem for species of concern.

The results of the 2023 avian point count survey when compared to the pre-construction survey results in 2011, continue to demonstrate that species abundance and richness have predictably responded to the habitat conversion and that the diversity of species in the habitat created by the SRERP beneficially impacted the avian population in the immediate area. Therefore, the 2023 results indicate that the project is meeting its success criteria of showing a trajectory towards and achieving, increased species richness and abundance in Year 10 compared to the pre-construction conditions.

REFERENCES:

Kline, S.; Mierzwa, K; Svehla, J. 2011. *Avian Protocol and Initial 2011 Survey Report to Support Pre and Post-Construction Monitoring*. Prepared for the Humboldt County Resource Conservation District, Eureka, CA.

Ralph, C. J.; Geupel, G. R.; Pyle, P.; Martin, T. E.; DeSante, D. F. 1993. *Handbook of Field Methods for Monitoring Landbirds*. Gen. Tech. Rep. PSW-GTR-144-www. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 41 p.