**Avian Point Count Survey**

**Salt River Ecosystem Restoration Project**

**Phase 1 – Year 5**

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**INTRODUCTION**

The Salt River Ecosystem Restoration Project is a large habitat restoration effort that is rehabilitating seven miles of aggraded river channel and returning 330 acres of agricultural land back 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 construction of this restoration phase, avian point count surveys were performed in 2011 to determine species composition in and around the project area. Under project permit requirements, an avian point count survey is to be performed the third, fifth, and tenth year after completion of the Phase 1 – Riverside Ranch portion of the project. The third year surveys were completed in 2016. This fifth year avian point count survey documents species presence, avian richness, and relative abundance in the restored restoration area. These Year 5 results will be compared to pre-project baseline conditions that were documented in 2011 and 2016’s surveys.

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

**SURVEY AREA**

Seven monitoring sites (five survey sites and two reference sites) have been established prior to restoration efforts. Before construction, the survey area primarily consisted of riparian and agricultural fields. After construction, the two reference sites’ habitats have remained static and are primarily associated with riparian and grazed pasture. 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).

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

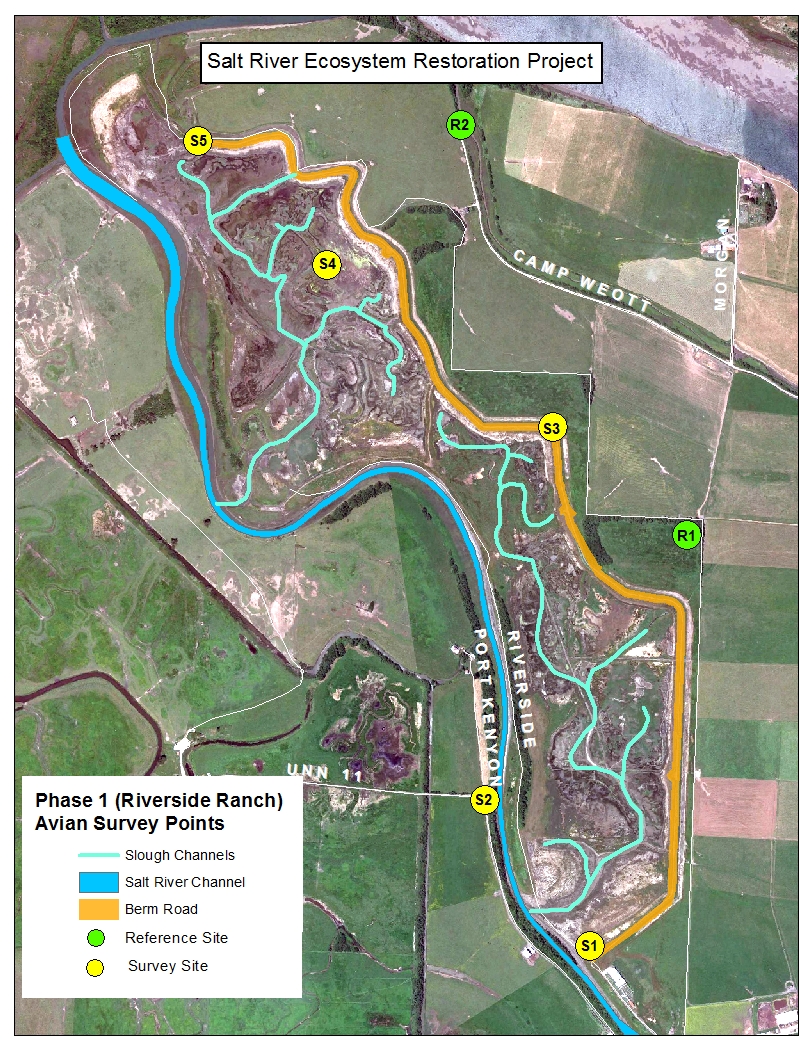
|  |  |  |
| --- | --- | --- |
| Monitoring Site | Pre-Project Habitat Type | Post Project Habitat Type (Year 5) |
| S1 – Survey Site 1 | Riparian | Riparian, Tidal Marsh, Tidally Influenced River Channel, and Pasture |
| S2 – Survey Site 2 | Riparian | Riparian, Tidally influence River Channel, and 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, followed a site-specific protocol developed in consultation with California Department of Fish & Wildlife and project biologists, which was modified from the protocol established by Ralph et al. (1993). An example of the modified protocol included survey duration where breeding bird surveys were conducted for 15 minutes, verses the traditional 3 minute point count, at each monitoring site within 4 hours of sunrise to capture the peak period of bird activity. Surveys were not conducted during rain or strong winds or after 10:30 am.

Point count surveys were conducted at five survey sites on Phase 1 - 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).

**Figure 1. Survey Site Location Map**

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**YEAR 5 (2018) AVIAN SURVEY RESULTS**

In Year 5, monitoring was performed on June 23rd and July 26th of 2018. A combined total of 1,333 individual bird detections were made over the two surveys dates (a total of 14 avian point counts) and were represented by at least 54 different species. Two species, Song Sparrow (*Melospiza melodia*) and the Common Raven (*Corvus corax*) were detected at all points during at least one of the two survey days. The most prevalent species overall was the Song Sparrow, detected during all 14 point counts. The most abundant species was the Least Sandpiper (*Calidris minutilla*), with 339 combined detections, followed by Western Sandpiper (*Calidris mauri*) (211) and Semipalmated Plover (*Charadrius semipalmatus*) (101). Twelve species were represented by single birds detected only once (Table 1).

Of the 54 species detected, one (1) is listed as *Species of Special Concern* (SSC) by the California Department of Fish and Wildlife or as *Threatened* (T) or *Endangered* (E) under the California Endangered Species Act. This species is underscored in Table 1, below. Two (2) of the species detected, denoted below with an asterisk (\*), were only observed while flying over the project area and were not associating with the surveyed habitats. Other flyover birds were actively foraging (e.g., swallows) or hunting (raptors) while in flight over the project area.

**Table 1: All Species Detected with Relative Abundance (total count) for Year 5 (2018) – Phase 1 (Riverside Ranch).** Table continues on next page.

|  |  |  |
| --- | --- | --- |
| **Common Name** | **Species Name** | **Relative Abundance** |
|  |  |  |
| Allen's Hummingbird | *Selasphorus sasin* | 1 |
| American Goldfinch | *Carduelis tristis* | 28 |
| American Robin | *Turdus migratorius* | 5 |
| Anna's Hummingbird | *Calypte anna* | 2 |
| Band-tailed Pigeon | *Patagioenas fasciata* | 17 |
| Barn Swallow | *Hirundo rustica* | 22 |
| Belted Kingfisher | *Ceryle alcyon* | 1 |
| Black Phoebe | *Sayornis nigricans* | 8 |
| Black-bellied Plover | *Pluvialis squatarola* | 8 |
| Black-capped Chickadee | *Poecile atricapillus* | 17 |
| Black-headed Grosbeak | *Pheucticus melanocephalus* | 3 |
| Brewer's Blackbird | *Euphagus cyanocephalus* | 10 |
| Brown-headed Cowbird | *Molothrus ater* | 27 |
| Bullock's Oriole | *Icterus bullockii* | 1 |
| Canada Goose\* | *Branta canadensis* | 2 |
| Chestnut-backed Chickadee | *Poecile rufescens* | 1 |
| Common Raven | *Corvus corax* | 53 |
| Common Yellowthroat | *Geothlypis trichas* | 3 |
| Double-crested Cormorant\* | *Phalacrocorax auritus* | 12 |
| Downy Woodpecker | *Picoides pubescens* | 3 |
| Eurasian Collared-Dove | *Streptopelia decaocto* | 9 |
| European Starling | *Sturnus vulgaris* | 2 |
| Great Blue Heron | *Ardea herodias* | 2 |
| Great Egret | *Ardea alba* | 14 |
| Greater Yellowlegs | *Tringa melanoleuca* | 46 |
| House Finch | *Carpodacus mexicanus* | 12 |
| Killdeer | *Charadrius vociferus* | 3 |
| Least Sandpiper | *Calidris minutilla* | 339 |
| Long-billed Dowitcher | *Limnodromus scolopaceus* | 1 |
| Mallard | *Anas platyrhynchos* | 8 |
| Marsh Wren | *Cistothorus palustris* | 21 |
|  |  |  |
| Mourning Dove | *Zenaida macroura* | 1 |
| Northern Flicker | *Colaptes auratus* | 7 |
| Northern Harrier | *Circus cyaneus* | 3 |
| Orange-crowned Warbler | *Vermivora celata* | 3 |
| Osprey | *Pandion haliaetus* | 1 |
| Pacific-slope Flycatcher | *Empidonax difficilis* | 2 |
| Peregrine Falcon | *Falco peregrinus* | 1 |
| Red Knot | *Calidris canutus* | 1 |
| Red-tailed Hawk | *Buteo jamaicensis* | 1 |
| Bryant's Savannah Sparrow | *Passerculus sandwichensis alaudinus* | 25 |
| Semipalmated Plover | *Charadrius semipalmatus* | 101 |
| Short-billed/Long-billed Dowitcher | *Limnodromus sp.* | 11 |
| Song Sparrow | *Melospiza melodia* | 65 |
| Swainson's Thrush | *Catharus ustulatus* | 10 |
| Tree Swallow | *Tachycineta bicolor* | 6 |
| Turkey Vulture | *Cathartes aura* | 33 |
| Unidentified Hummingbird | *Trochilidae (gen, sp)* | 1 |
| Unidentified small shorebird | *#N/A* | 127 |
| Virginia Rail | *Rallus limicola* | 1 |
| Western Gull | *Larus occidentalis* | 3 |
| Western Sandpiper | *Calidris mauri* | 211 |
| White-crowned Sparrow | *Zonotrichia leucophrys* | 21 |
| White-tailed Kite | *Elanus leucurus* | 6 |
| Wilson's Warbler | *Wilsonia pusilla* | 3 |
| Wrentit | *Chamaea fasciata* | 8 |
|  | **TOTAL** | **1,333** |

\* Star indicates individual species flying over monitoring sites with no association with the immediate surrounding habitat

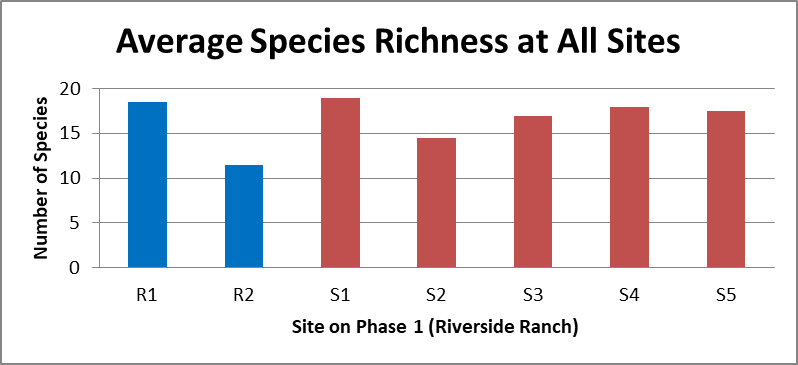
\_\_ Underlined species indicates a California Species of Special Concern

Fourteen point count surveys performed across seven monitoring sites in June and July of 2018 showed that species richness averaged 16.6 species per survey date across all seven sites (range 11 to 20). Species richness averaged 15 per survey date across the two reference sites. Survey sites averaged 15.4 species per survey date across the five survey sites (Figure 4). Additional analysis of average species richness in 2018 per survey point is shown in Figure 2.

From the 14 point count surveys, relative abundance averaged 95.2 birds per site across all seven monitoring sites. Reference sites averaged lower at 55.5 birds per site while survey sites averaged significantly higher at 111.1 birds per site. A further breakdown of average relative abundance per site for each monitoring date is shown in Figure 3. This figure shows that while most monitoring sites ranged with an average of 34.5 to 65.5 of individuals detected, site S4 soars above the others with an average 373 individuals. More birds were detected across all sites in July (1,072) than in June (261).

Tables 2 through 8 details species and number of birds detected at each monitoring site.

**Figure 2. Average Species Richness at All Sites for Year 5 (2018) – Phase 1 (Riverside Ranch)**

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**Figure 3. Average Relative Abundance at All Sites for Year 5 (2018) – Phase 1 (Riverside Ranch)**

**Figure 4. Comparing Average Abundance and Average Number of Species Between Reference and Survey Sites for Year 5 (2018) – Phase 1 (Riverside Ranch)**

**Table 2: Survey Site 1 Species and Individual Point Count Data for Year 5 (2018) - Phase 1 (Riverside Ranch)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S1** | **Species - Common Name** | **June** | **July** | **Total** | **< 50m** | **>50m** | **Fly over** |
| 1 | Allen's Hummingbird | 1 | 0 | **1** | 1 | 0 | 0 |
| 2 | Barn Swallow | 6 | 2 | **8** | 0 | 0 | 8 |
| 3 | Black Phoebe | 1 | 0 | **1** | 0 | 1 | 0 |
| 4 | Black-capped Chickadee | 2 | 2 | **4** | 4 | 0 | 0 |
| 5 | Black-headed Grosbeak | 1 | 0 | **1** | 1 | 0 | 0 |
| 6 | Bryant's Savannah Sparrow | 2 | 0 | **2** | 0 | 2 | 0 |
| 7 | Bullock's Oriole | 1 | 0 | **1** | 0 | 1 | 0 |
| 8 | Canada Goose | 2 | 0 | **2** | 0 | 0 | 2 |
| 9 | Common Raven | 2 | 1 | **3** | 0 | 3 | 0 |
| 10 | Common Yellowthroat | 0 | 1 | **1** | 1 | 0 | 0 |
| 11 | Double-crested Cormorant | 0 | 1 | **1** | 0 | 0 | 1 |
| 12 | Eurasian Collared-Dove | 2 | 1 | **3** | 2 | 1 | 0 |
| 13 | Great Egret | 2 | 2 | **4** | 0 | 4 | 0 |
| 14 | Greater Yellowlegs | 0 | 29 | **29** | 0 | 29 | 0 |
| 15 | House Finch | 0 | 2 | **2** | 2 | 0 | 0 |
| 16 | Mallard | 2 | 0 | **2** | 0 | 0 | 2 |
| 17 | Mourning Dove | 0 | 1 | **1** | 0 | 0 | 1 |
| 18 | Northern Flicker | 0 | 1 | **1** | 0 | 1 | 0 |
| 19 | Northern Harrier | 1 | 1 | **2** | 0 | 1 | 1 |
| 20 | Pacific-slope Flycatcher | 1 | 1 | **2** | 1 | 1 | 0 |
| 21 | Short-billed/Long-billed Dowitcher | 0 | 11 | **11** | 0 | 11 | 0 |
| 22 | Song Sparrow | 4 | 4 | **8** | 5 | 3 | 0 |
| 23 | Swainson's Thrush | 2 | 0 | **2** | 0 | 2 | 0 |
| 24 | Tree Swallow | 1 | 2 | **3** | 0 | 1 | 2 |
| 25 | Turkey Vulture | 1 | 0 | **1** | 0 | 0 | 1 |
| 26 | White-crowned Sparrow | 0 | 2 | **2** | 0 | 2 | 0 |
| 27 | White-tailed Kite | 0 | 1 | **1** | 0 | 1 | 0 |
| 28 | Wrentit | 2 | 1 | **3** | 1 | 2 | 0 |
|  |  |  |  |  |  |  |  |
|  | **Totals** | **36** | **66** | **102** | **18** | **66** | **18** |

**Table 3: Survey Site 2 Species and Individual Point Count Data for Year 5 (2018) - Phase 1 (Riverside Ranch)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S2** | **Species - Common Name** | **June** | **July** | **Total** | **< 50m** | **>50m** | **Fly over** |
| 1 | American Goldfinch | 3 | 1 | **4** | 1 | 0 | 3 |
| 2 | Barn Swallow | 2 | 0 | **2** | 0 | 0 | 2 |
| 3 | Belted Kingfisher | 0 | 1 | **1** | 1 | 0 | 0 |
| 4 | Black Phoebe | 1 | 1 | **2** | 1 | 1 | 0 |
| 5 | Black-capped Chickadee | 2 | 3 | **5** | 1 | 4 | 0 |
| 6 | Brewer's Blackbird | 4 | 0 | **4** | 0 | 2 | 2 |
| 7 | Brown-headed Cowbird | 4 | 9 | **13** | 6 | 3 | 4 |
| 8 | Chestnut-backed Chickadee | 1 | 0 | **1** | 1 | 0 | 0 |
| 9 | Common Raven | 0 | 1 | **1** | 0 | 1 | 0 |
| 10 | Eurasian Collared-Dove | 2 | 0 | **2** | 1 | 1 | 0 |
| 11 | Greater Yellowlegs | 1 | 4 | **5** | 0 | 2 | 3 |
| 12 | Mallard | 0 | 1 | **1** | 0 | 1 | 0 |
| 13 | Red-tailed Hawk | 1 | 0 | **1** | 0 | 0 | 1 |
| 14 | Song Sparrow | 6 | 5 | **11** | 7 | 4 | 0 |
| 15 | Swainson's Thrush | 2 | 1 | **3** | 1 | 2 | 0 |
| 16 | Tree Swallow | 0 | 1 | **1** | 0 | 0 | 1 |
| 17 | Turkey Vulture | 2 | 1 | **3** | 0 | 0 | 3 |
| 18 | White-crowned Sparrow | 3 | 2 | **5** | 3 | 2 | 0 |
| 19 | Wrentit | 2 | 2 | **4** | 0 | 4 | 0 |
|  |  |  |  |  |  |  |  |
|  | **Total** | **36** | **33** | **69** | **23** | **27** | **19** |

**Table 4: Survey Site 3 Species and Individual Point Count Data for Year 5 (2018) - Phase 1 (Riverside Ranch)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S3** | **Species - Common Name** | **June** | **July** | **Total** | **< 50m** | **>50m** | **Fly over** |
| 1 | American Goldfinch | 2 | 0 | **2** | 0 | 0 | 2 |
| 2 | Band-tailed Pigeon | 7 | 3 | **10** | 0 | 10 | 0 |
| 3 | Barn Swallow | 2 | 1 | **3** | 0 | 0 | 3 |
| 4 | Black Phoebe | 0 | 1 | **1** | 0 | 1 | 0 |
| 5 | Black-bellied Plover | 0 | 3 | **3** | 0 | 3 | 0 |
| 6 | Brown-headed Cowbird | 3 | 0 | **3** | 1 | 0 | 2 |
| 8 | Bryant's Savannah Sparrow | 4 | 4 | **8** | 4 | 2 | 2 |
| 9 | Common Raven | 1 | 4 | **5** | 0 | 4 | 1 |
| 10 | Common Yellowthroat | 1 | 0 | **1** | 1 | 0 | 0 |
| 11 | European Starling | 0 | 2 | **2** | 0 | 1 | 1 |
| 12 | Great Egret | 0 | 1 | **1** | 0 | 1 | 0 |
| 13 | Greater Yellowlegs | 1 | 1 | **2** | 0 | 2 | 0 |
| 14 | House Finch | 0 | 1 | **1** | 0 | 0 | 1 |
| 15 | Killdeer | 1 | 0 | **1** | 0 | 1 | 0 |
| 16 | Mallard | 0 | 3 | **3** | 0 | 2 | 1 |
| 17 | Marsh Wren | 0 | 2 | **2** | 2 | 0 | 0 |
| 18 | Northern Flicker | 1 | 1 | **2** | 0 | 2 | 0 |
| 19 | Orange-crowned Warbler | 1 | 0 | **1** | 1 | 0 | 0 |
| 20 | Song Sparrow | 5 | 5 | **10** | 5 | 5 | 0 |
| 21 | Swainson's Thrush | 1 | 0 | **1** | 1 | 0 | 0 |
| 22 | Turkey Vulture | 1 | 0 | **1** | 0 | 0 | 1 |
| 23 | Unidentified small shorebird | 0 | 12 | **12** | 0 | 12 | 0 |
| 24 | White-crowned Sparrow | 2 | 2 | **4** | 1 | 3 | 0 |
| 25 | White-tailed Kite | 1 | 1 | **2** | 0 | 0 | 2 |
| 26 | Wrentit | 0 | 1 | **1** | 0 | 1 | 0 |
|  |  |  |  |  |  |  |  |
|  | **Total** | **34** | **48** | **82** | **16** | **50** | **16** |

**Table 5: Survey Site 4 Species and Individual Point Count Data for Year 3 (2016) - Phase 1 (Riverside Ranch)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S4** | **Species - Common Name** | **June** | **July** | **Total** | **< 50m** | **>50m** | **Fly over** |
| 1 | American Goldfinch | 1 | 0 | **1** | 0 | 0 | 1 |
| 2 | American Robin | 1 | 0 | **1** | 0 | 1 | 0 |
| 3 | Barn Swallow | 2 | 2 | **4** | 0 | 0 | 4 |
| 4 | Black-bellied Plover | 0 | 3 | **3** | 3 | 0 | 0 |
| 5 | Black-capped Chickadee | 1 | 2 | **3** | 2 | 1 | 0 |
| 6 | Brown-headed Cowbird | 1 | 1 | **2** | 0 | 1 | 1 |
| 7 | Bryant's Savannah Sparrow | 4 | 2 | **6** | 3 | 3 | 0 |
| 8 | Common Raven | 0 | 1 | **1** | 0 | 1 | 0 |
| 9 | Double-crested Cormorant | 3 | 2 | **5** | 0 | 1 | 4 |
| 10 | Downy Woodpecker | 0 | 1 | **1** | 1 | 0 | 0 |
| 11 | Eurasian Collared-Dove | 2 | 0 | **2** | 0 | 2 | 0 |
| 12 | Great Egret | 0 | 4 | **4** | 0 | 2 | 2 |
| 13 | Greater Yellowlegs | 0 | 2 | **2** | 0 | 2 | 0 |
| 14 | House Finch | 4 | 0 | **4** | 0 | 0 | 4 |
| 15 | Killdeer | 2 | 0 | **2** | 0 | 2 | 0 |
| 16 | Least Sandpiper | 0 | 300 | **300** | 300 | 0 | 0 |
| 17 | Long-billed Dowitcher | 0 | 1 | **1** | 0 | 1 | 0 |
| 18 | Marsh Wren | 2 | 2 | **4** | 2 | 2 | 0 |
| 19 | Red Knot | 0 | 1 | **1** | 0 | 1 | 0 |
| 20 | Semipalmated Plover | 0 | 70 | **70** | 30 | 40 | 0 |
| 21 | Song Sparrow | 3 | 4 | **7** | 2 | 5 | 0 |
| 22 | Swainson's Thrush | 1 | 0 | **1** | 0 | 1 | 0 |
| 23 | Turkey Vulture | 0 | 1 | **1** | 0 | 0 | 1 |
| 24 | Unidentified small shorebird | 15 | 100 | **115** | 0 | 115 | 0 |
| 25 | Western Gull | 2 | 0 | **2** | 0 | 2 | 0 |
| 26 | Western Sandpiper | 0 | 200 | **200** | 200 | 0 | 0 |
| 27 | White-crowned Sparrow | 2 | 1 | **3** | 1 | 2 | 0 |
|  |  |  |  |  |  |  |  |
|  | **Totals** | **46** | **700** | **746** | **544** | **185** | **17** |

**Table 6: Survey Site 5 Species and Individual Point Count Data for Year 5 (2018) - Phase 1 (Riverside Ranch)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S5** | **Species - Common Name** | **June** | **July** | **Total** | **< 50m** | **>50m** | **Fly over** |
| 1 | American Goldfinch | 2 | 1 | **3** | 0 | 1 | 2 |
| 2 | American Robin | 1 | 1 | **2** | 0 | 2 | 0 |
| 3 | Barn Swallow | 0 | 1 | **1** | 0 | 0 | 1 |
| 4 | Black Phoebe | 1 | 0 | **1** | 0 | 1 | 0 |
| 5 | Black-capped Chickadee | 0 | 1 | **1** | 0 | 1 | 0 |
| 6 | Brewer's Blackbird | 6 | 0 | **6** | 0 | 0 | 6 |
| 7 | Bryant's Savannah Sparrow | 3 | 1 | **4** | 3 | 1 | 0 |
| 8 | Common Raven | 1 | 1 | **2** | 0 | 2 | 0 |
| 9 | Double-crested Cormorant | 2 | 2 | **4** | 0 | 2 | 2 |
| 10 | Downy Woodpecker | 0 | 1 | **1** | 0 | 1 | 0 |
| 11 | Great Blue Heron | 1 | 1 | **2** | 1 | 1 | 0 |
| 12 | Great Egret | 2 | 3 | **5** | 1 | 3 | 1 |
| 13 | Greater Yellowlegs | 0 | 1 | **1** | 0 | 1 | 0 |
| 14 | House Finch | 1 | 0 | **1** | 0 | 0 | 1 |
| 15 | Least Sandpiper | 0 | 37 | **37** | 7 | 30 | 0 |
| 16 | Mallard | 2 | 0 | **2** | 0 | 0 | 2 |
| 17 | Marsh Wren | 3 | 2 | **5** | 4 | 1 | 0 |
| 18 | Northern Flicker | 0 | 2 | **2** | 0 | 2 | 0 |
| 19 | Northern Harrier | 0 | 1 | **1** | 1 | 0 | 0 |
| 20 | Peregrine Falcon | 1 | 0 | **1** | 0 | 0 | 1 |
| 21 | Song Sparrow | 6 | 5 | **11** | 6 | 5 | 0 |
| 22 | Turkey Vulture | 3 | 2 | **5** | 0 | 0 | 5 |
| 23 | Western Sandpiper | 0 | 10 | **10** | 0 | 10 | 0 |
| 24 | White-crowned Sparrow | 1 | 0 | **1** | 0 | 1 | 0 |
| 25 | White-tailed Kite | 0 | 3 | **3** | 3 | 0 | 0 |
|  |  |  |  |  |  |  |  |
|  | **Total** | **36** | **76** | **112** | **26** | **65** | **21** |

**Table 7: Reference Site 1 Species and Individual Point Count Data for Year 5 (2018) - Phase 1 (Riverside Ranch)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **R1** | **Species - Common Name** | **June** | **July** | **Total** | **< 50m** | **>50m** | **Fly over** |
| 1 | American Goldfinch | 3 | 2 | **5** | 3 | 0 | 2 |
| 2 | American Robin | 0 | 2 | **2** | 1 | 1 | 0 |
| 3 | Anna's Hummingbird | 1 | 1 | **2** | 2 | 0 | 0 |
| 4 | Band-tailed Pigeon | 6 | 0 | **6** | 0 | 6 | 0 |
| 5 | Black Phoebe | 2 | 1 | **3** | 2 | 1 | 0 |
| 6 | Black-bellied Plover | 0 | 1 | **1** | 0 | 1 | 0 |
| 7 | Black-capped Chickadee | 2 | 2 | **4** | 1 | 3 | 0 |
| 8 | Black-headed Grosbeak | 2 | 0 | **2** | 2 | 0 | 0 |
| 9 | Brown-headed Cowbird | 3 | 2 | **5** | 4 | 0 | 1 |
| 10 | Bryant's Savannah Sparrow | 0 | 5 | **5** | 4 | 1 | 0 |
| 11 | Common Raven | 3 | 37 | **40** | 0 | 5 | 35 |
| 12 | Common Yellowthroat | 1 | 0 | **1** | 0 | 1 | 0 |
| 13 | Double-crested Cormorant | 0 | 2 | **2** | 0 | 0 | 2 |
| 14 | Downy Woodpecker | 1 | 0 | **1** | 1 | 0 | 0 |
| 15 | Eurasian Collared-Dove | 2 | 0 | **2** | 1 | 1 | 0 |
| 16 | Marsh Wren | 0 | 3 | **3** | 2 | 1 | 0 |
| 17 | Northern Flicker | 0 | 2 | **2** | 1 | 1 | 0 |
| 18 | Orange-crowned Warbler | 1 | 1 | **2** | 2 | 0 | 0 |
| 19 | Osprey | 0 | 1 | **1** | 0 | 0 | 1 |
| 20 | Song Sparrow | 6 | 5 | **11** | 6 | 5 | 0 |
| 21 | Swainson's Thrush | 1 | 2 | **3** | 2 | 1 | 0 |
| 22 | Tree Swallow | 1 | 1 | **2** | 0 | 0 | 2 |
| 23 | Turkey Vulture | 4 | 18 | **22** | 0 | 0 | 22 |
| 24 | Unidentified Hummingbird | 0 | 1 | **1** | 1 | 0 | 0 |
| 25 | Wilson's Warbler | 1 | 2 | **3** | 1 | 2 | 0 |
|  |  |  |  |  |  |  |  |
|  | **Total** | **40** | **91** | **131** | **36** | **30** | **65** |

**Table 8: Reference Site 1 Species and Individual Point Count Data for Year 5 (2018) - Phase 1 (Riverside Ranch)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **R2** | **Species - Common Name** | **June** | **July** | **Total** | **< 50m** | **>50m** | **Fly over** |
| 1 | American Goldfinch | 3 | 10 | **13** | 8 | 0 | 5 |
| 2 | Band-tailed Pigeon | 0 | 1 | **1** | 0 | 0 | 1 |
| 3 | Barn Swallow | 1 | 3 | **4** | 0 | 0 | 4 |
| 4 | Black-bellied Plover | 0 | 1 | **1** | 0 | 1 | 0 |
| 5 | Brown-headed Cowbird | 3 | 1 | **4** | 3 | 1 | 0 |
| 6 | Common Raven | 1 | 0 | **1** | 0 | 1 | 0 |
| 7 | Greater Yellowlegs | 4 | 3 | **7** | 0 | 3 | 4 |
| 8 | House Finch | 4 | 0 | **4** | 2 | 2 | 0 |
| 9 | Least Sandpiper | 0 | 2 | **2** | 0 | 0 | 2 |
| 10 | Marsh Wren | 6 | 1 | **7** | 4 | 3 | 0 |
| 11 | Semipalmated Plover | 0 | 31 | **31** | 0 | 0 | 31 |
| 12 | Song Sparrow | 5 | 2 | **7** | 4 | 3 | 0 |
| 13 | Virginia Rail | 1 | 0 | **1** | 0 | 1 | 0 |
| 14 | Western Gull | 1 | 0 | **1** | 0 | 1 | 0 |
| 15 | Western Sandpiper | 0 | 1 | **1** | 0 | 0 | 1 |
| 16 | White-crowned Sparrow | 4 | 2 | **6** | 3 | 3 | 0 |
|  |  |  |  |  |  |  |  |
|  | **Total** | **33** | **58** | **91** | **24** | **19** | **48** |

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

In 2018, avian point counts were performed at the same survey and reference sites as in 2011 and 2016. Avian biologist, Sean McAllister, performed the avian point count surveys for all survey years. The 2011 survey was completed two years prior to construction of Phase 1 - Riverside Ranch of the Salt River Ecosystem Restoration Project (S. Kline et al 2011). The purpose of the pre-project surveys is to track richness and relative abundance from baseline (pre-project) conditions through post project conditions. The following narrative compares 2011 (pre-construction), 2016 (Year 3), and 2018 (Year 5) results.

Total species richness for 2011 was 38, 2016 was 52, and 2018 was 54. The most abundant species in 2011 were the Song Sparrow (58), American Goldfinch (43), and Barn Swallow (*Hirundo rustica)* (36). In 2016 the most abundant species were the European Starling (259), Song Sparrow (69), and Barn Swallow (68). While in 2018, the most abundant species were the Least Sandpiper (339*)*, and Western Sandpiper (211), and Semipalmated Plover (101).

The following compares June observations by pre-construction (2011) and post construction (2016 and 2018) survey years. In 2011, a total of 30 species were detected during June surveys across all monitoring sites and was comprised of 195 birds. June of 2016 had 36 species and 256 birds. June of 2018 had 45 species and 261 birds. June 2011 most abundant species were the American Goldfinch, Song Sparrow and Marsh Wren. While in June 2016 Song Sparrows were the most abundant species followed by Brewers Black Bird, American Goldfinch, and Shore bird species. The most abundant species in June of 2018 were the Song Sparrow, unidentified small shorebird, and the American Goldfinch. In June 2011, reference site R2 had the highest species richness (14) and abundance (47); S3 had the second highest abundance (35) and species richness (13); S1 had the least species richness (7), though a willow fly catcher, a species listed endangered by California, was detected at this site. June 2016 survey sites S1 and S4 both had the highest species richness (20); S1 had the highest abundance (49) and S4 had the second highest (44); S3 had the lowest species richness (12) and the lowest abundance (23) (Table 9). In June 2018, S1 had the highest species richness (19); R1 had the highest species abundance (40); R2 had the lowest species richness (11) as well as the lowest species abundance (33).

Comparing July observations for pre-construction and post construction survey years, 31 avian species were detected and 178 individuals counted in July 2011, July 2016 had 43 avian species and 576 individuals counted, and July 2018 had 45 avian species with 1,072 individuals. In July 2011, the most abundant species were Song Sparrow, Barn Swallow and American Goldfinch. In July 2016, the most abundant species were European Starlings, Barn Swallow, and American Goldfinch. The most abundant species in July 2018 were all shore birds consisting of the Least Sandpiper, Western Sandpiper, and an unidentified small shorebird. The survey site location with the highest species abundance and richness in July 2011 was S4 with 33 individuals of 13 different species; S1 had the lowest abundance (15) and R2 had the least species richness (7). July 2016’s S1 site had the highest abundance (317 (252 of which were European Starlings)) and species richness (21); S3 had the least number of species (9) and the lowest number of individuals (15). In July 2018, S4 had the highest abundance with 700 individuals; S4 and R1 both had the highest species richness (20); while S2 had the lowest species richness (14) and abundance (33). Tables 9 and 10 compares species and richness across years for each monitoring site.

**Table 9. Comparison Species Abundance between Pre (2011) and Post Construction Periods (2016 & 2018) by Month**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **SPECIES ABUNDANCE** | | |
| Monitoring Site | 2011 | 2016 | 2018 |
|  | **June** | | |
| S1 | 14 | 49 | 36 |
| S2 | 21 | 42 | 36 |
| S3 | 35 | 23 | 34 |
| S4 | 24 | 44 | 46 |
| S5 | 33 | 30 | 36 |
| R1 | 21 | 40 | 40 |
| R2 | 47 | 28 | 33 |
| **TOTAL** | **195** | **256** | **261** |
|  | **July** | | |
| S1 | 15 | 317 | 66 |
| S2 | 26 | 55 | 33 |
| S3 | 23 | 15 | 48 |
| S4 | 33 | 31 | 700 |
| S5 | 31 | 61 | 76 |
| R1 | 31 | 61 | 91 |
| R2 | 19 | 36 | 58 |
| **TOTAL** | **178** | **576** | **1072** |

**Table 10. Comparison Species Richness between Pre (2011) and Post Construction Periods (2016 & 2018) by Month**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **SPECIES RICHNESS** | | |
| Monitoring Site | 2011 | 2016 | 2018 |
|  | **June** | | |
| S1 | 7 | 20 | 19 |
| S2 | 12 | 14 | 15 |
| S3 | 13 | 12 | 16 |
| S4 | 13 | 20 | 16 |
| S5 | 12 | 14 | 16 |
| R1 | 9 | 18 | 17 |
| R2 | 14 | 15 | 11 |
| **TOTAL** | **30** | **39** | **110** |
|  | **July** | | |
| S1 | 8 | 21 | 19 |
| S2 | 12 | 11 | 14 |
| S3 | 10 | 9 | 18 |
| S4 | 13 | 18 | 20 |
| S5 | 8 | 15 | 19 |
| R1 | 11 | 20 | 20 |
| R2 | 7 | 10 | 12 |
| **TOTAL** | **31** | **43** | **122** |

Taking into consideration all monitoring sites, total species richness and abundance significantly increased from 2011 to 2018. Using 2011 data results as a baseline, total species abundance (i.e. number of individuals) increased by 123% in 2016 and 257% in 2018. Comparing the June survey data, species abundance increased by 31% in 2016 and 34% in 2018. July’s increase is more significant post-construction where abundance increased by 224% in 2016 and 502% in 2018. Total species richness at all survey sites increased by 34% in 2016 and 280% in 2018. June’s species richness increased 30% in 2016 and 267% in 2018. July’s species richness increased by 38% in 2016 and 294% in 2018.

A list of species unique to each survey year is tabulated for 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 prior to (riparian and agricultural fields) and after (tidal marsh) restoration efforts. The post-project surveys have has shown that the numbers of species unique to survey sites have increased since 2011. A majority of the survey site’s unique species to are not necessarily associated with aquatic or tidal marsh habitat. 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*).

**Table 11. Comparing Detected Species Unique to Specific Survey Years at Survey Sites**

|  |  |  |
| --- | --- | --- |
| **Species Observed Only In Specified Survey Years at Survey Sites** | | |
| **2011** | **2016** | **2018** |
| American Crow | Anna's Hummingbird | Allen's Hummingbird |
| 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. Prior to this specific restoration phase, avian point count surveys were performed across seven monitoring sites in and around the project area. Three years after the completion of construction for Phase 1 another avian point count survey was performed in 2016. In 2018, the required Year 5 point count survey was performed. This survey continues to document species presence, avian richness, and relative abundance in the restored restoration area.

It must be noted that of the seven monitoring sites, S1, S3, S4, and S5 have undergone the most dramatic habitat changes. Prior to construction, these sites were located in grazed pasture with some associated riparian. Tidal marsh habitat is now associated with these sites. S1, S3, and S5 are transition sites, as they 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 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 pasture land, 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 site) after the project had some time to equilibrate after construction. Figure 4 shows that the average abundance (number of individuals) was larger for survey sites in 2018, while average number of species were nearly the same for survey and reference sites; though species composition varied between survey and reference sites (Tables 2 to 8). Comparing between the survey years, abundance and species richness primarily increased in 2016 and 2018 for both survey and reference sites (Tables 9 and 10). This could be caused by a number of variables such as weather effects, previous year’s food abundance, or that the Phase 1 – Riverside Ranch portion of the Salt River Ecosystem Restoration Project provided larger beneficial habitat effects beyond the project footprint. Though abundance and species richness values increased for all sites since 2011, it is notable to point out that species composition evolved between the two years. Table 11 demonstrates that though the 2011 survey detected some aquatic species at survey sites, the habitat conversion from agricultural land to tidal marsh conditions promoted a significant increase of observed aquatic or tidal marsh associated species post-construction.

The results of the 2018 avian point count survey continues to demonstrate that species abundance and richness has predictably responded to the habitat conversion and that the diversity if species in the habitat created by the SRERP beneficially impacted the avian population in the immediate area. Therefore, the 2018 results indicate that the project is meeting its success criteria of showing a trajectory towards, and achieving, increased species richness and abundance in Year 5.

**REFERENCES:**

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