BIRD MONITORING AT THE REGIONAL ATHLETIC COMPLEX AND JORDAN RIVER GOLF COURSE

2016 Project Report

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**Executive Summary**

The Jordan River is a waterway that flows over 50 miles through the Salt Lake valley. It provides recreation benefits to the 1.2 million residents of the area, and contains vital remnant habitat for resident and neotropical migratory birds. Especially in a highly disturbed system, restoration and management activities can have varying impacts on birds, and it is important to assess the current ecological conditions and monitor the impacts of these activities on species of interest in order for habitat modification to successfully promote healthy bird communities. In partnership with Salt Lake City Parks and Public Lands, Tracy Aviary is conducting citizen science bird monitoring projects at two sites along the Jordan River: 1) the Nature Preserve Area of the Regional Athletic Complex (RAC), and 2) the Jordan River Golf Course (JGC). Beginning in 2015, our goal for this study was to collect data on the avian community of these sites to inform the following management questions: 1) What bird species occur at the RAC and JGC, when do they use the areas, and how do they use the site?, 2) How do the bird communities in each site differ?, 3) Are any species of conservation concern using either site?, 4) What management actions (e.g. habitat modification, changes in public use) could improve habitat for bird species, 5) What actions or activities could degrade bird habitat and should be avoided?

We conducted breeding and non-breeding bird surveys at 6 sampling points at the RAC and 2 sampling points at the JGC during January through October of 2016. From April 29 to July 7, 2016, we had 885 bird observations and detected 66 species during the 6 breeding bird survey visits at the RAC, and 334 bird observations and detected 34 species at the JGC. During the monthly non-breeding surveys in January, February, March, April, August, September, and October of 2016, we detected 93 species (Table 2). Of these species, 41 were detected exclusively during the non-breeding surveys, making the total 2016 species count 111 different bird species for both the RAC and the JGC.

We also used data from breeding bird surveys at the RAC and JGC as part of a larger analysis of riparian bird communities along the Jordan River, and found that size, canopy cover, and native understory cover were the best supported indicators of a healthy riparian bird community.

These sites support a diverse bird community, and provides important habitat for migratory and resident bird species. Our monitoring efforts contribute to a holistic understanding of the ecological health of the RAC and JGC, and provide insight to guide effective restoration and management activities.

**Acknowledgements**

We’d like to thank the extremely dedicated team of volunteers from Tracy Aviary’s Citizen Science Program who braved the early mornings and long hours to collect this data. Thanks also to our project partner, Salt Lake City Parks and Public Lands.

**Introduction**



The Jordan River is a waterway that flows over 50 miles through the Salt Lake valley between Utah Lake and the Great Salt Lake. As a riparian corridor in a highly urbanized matrix, the Jordan River provides recreation benefits to the 1.2 million residents of the area, and also contains vital remnant wildlife habitat for the region (Figure 1). This habitat is especially important for both resident and neotropical migratory birds of northern Utah; riparian areas are used by up to ¾ of all Utah bird species and can have up to fourteen times the density of birds as upland habitat (Knopf et al. 1988).

**Figure 1.** Citizen Scientist Volunteers at a field training session at the Jordan River Golf Course.

Due to decades of channelization, development, urban and agricultural runoff, and the spread of exotic plants, the Jordan River has drastically changed from its historic condition. However, it remains an important resource for city residents and wildlife, and many sections are undergoing restoration and land management activities to promote the ecological health of the river and riparian area. Especially in a highly disturbed system, restoration and management activities can have varying impacts on birds, and it is important to assess the current ecological conditions and monitor the impacts of these activities on species of interest in order for habitat modification to successfully promote healthy bird communities (Block et al. 2001).

In partnership with Salt Lake City Parks and Public Lands, Tracy Aviary is conducting a citizen science bird monitoring project at two sites along the Jordan River: 1) the Nature Preserve Area of the Regional Athletic Complex (hencefourth: RAC), a 44 acre riparian buffer along the river, and 2) the Jordan River Golf Course (hencefourth: JGC), a nearby 15 acre disc golf course within the riparian zone of the river. Beginning in 2015, our goal for this study was to collect data on the avian community of these sites to inform the following management questions:

1) What bird species occur at the RAC and JGC, when do they use the areas, and how do they use the site?

2) How do the bird communities in each site differ?

3) Are any species of conservation concern using either site?

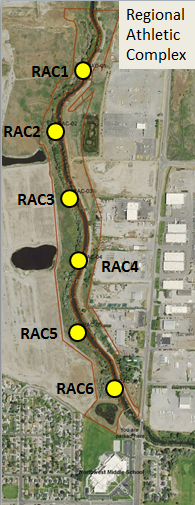
4) What management actions (e.g. habitat modification, changes in public use) could improve habitat for bird species.

5) What actions or activities could degrade bird habitat and should be avoided?

As the study continues over the long-term, the data that we collect can also identify any changes in diversity, species richness, community composition, and how birds use these sites over time.

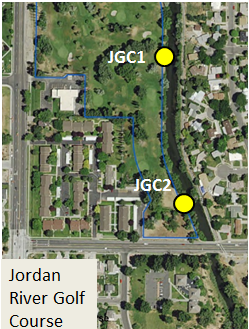
**Methods**

***Study Design***

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Located north of 1700 N along Redwood Road, the Nature Preserve Area of the Regional Athletic Complex provides a 44 acre natural buffer between the Jordan River and the sports fields of the complex (Figure 2). On average, the RAC is 68m in width, and is designed to protect the river from the developed area, support a natural meandering river corridor with natural and stable bank slopes, and enhance wildlife habitat.

Just south of the RAC at approximately 1000 N along Redwood Road, the Jordan River Golf Course is a 15 acre disc golf course adjacent to the river (Figure 3). Although the main portion of the area is landscaped, there is a narrow zone of riparian vegetation along the bank of the river.

******We conducted breeding and non-breeding bird surveys at the RAC and JGC during January through November of 2016. These surveys were a continuation of monitoring data collected in the same locations in 2015. We used the United States National Grid to randomly generate six sampling points throughout the RAC and two sampling points in the JGC (Figure 2, Figure 3). To ensure independence between sampling areas, points were separated by a distance of at least 250m.

**Figure 2.** Bird survey point location in the RAC.

***Citizen Scientist Participation and Training***

We recruited a total of 8 participants to complete breeding bird surveys at the RAC and JGC. These participants were trained as part of Tracy Aviary’s Citizen Science Program, which is made up of 32 participants that conducted breeding bird surveys in 8 project locations throughout Salt Lake County. Training for the Citizen Science Program began in late February and continued through the survey season. We provided 6 indoor trainings (2-3 hours), 35 field trainings (2-5 hours), and we required citizen scientists to attend at least one indoor training and 4-6 field trainings. Before citizen scientists conducted surveys, they were required to pass two tests: a bird identification by sound test, where they had to identify the calls and songs of 30 of the most common birds, and a field survey test, where they had to successfully complete a series of mock breeding bird surveys.

**Figure 3.** Bird survey point location in the JGC.

***Surveys***

We completed 6 breeding bird surveys during the 2016 breeding season between April 29th and July 7th. Following the point-transect method used by the Rocky Mountain Bird Observatory (Hanni et al. 2015), pairs of citizen scientists conducted unlimited radius point count surveys at these locations between sunrise and approximately 10am. The ‘observer’ of the team identified all birds seen and heard at the point during a six minute point count, and noted the exact distance using a laser rangefinder, direction, detection type (visual, singing, calling, other), and any other information they could determine about the bird (age, sex, etc.). The ‘recorder’ of the team wrote all of the observations on the datasheet, noted the minute during the survey (1-6) when the observation was made, and also noted weather and site variables, such as wind speed, cloud cover, ambient noise levels, and presence of water/snow.

In addition to the breeding bird surveys conducted in the spring and summer, we also completed monthly non-breeding surveys to better understand the birds that use the area year-round. These surveys were conducted once a month in January, February, March, April, August, September, October, and November (and they will continue throughout the winter). During the non-breeding surveys, at least one trained Tracy Aviary staff person lead groups of participants on a walk through the sampling area, and noted any birds seen and heard during that time. Participants were allowed to point out and identify birds, but they survey leader made the final decision for identification of the bird species and the number of individuals present. The survey leader also noted weather variables, the total amount of time, and the total distance traveled during the survey.

***Data Analysis***

We used point count data to calculate species richness and the relative abundance, or total number of observations, for each species. To evaluate the composition of the bird community, we used the scientific literature to classify species based on their habitat preferences and foraging needs. We compared total species richness and the proportion of species within different habitat and foraging guilds across sampling points during the breeding season of 2016 to 2015.

**Results**

***Breeding Bird Surveys***

From April 29 to July 7, 2016, we had 885 bird observations and detected 66 species during the 6 breeding bird survey visits at the RAC, and 334 bird observations and detected 34 species at the JGC (Table 1).

We observed several new species in 2016. In 2015, we had 5 visits with 833 detections of 59 species at the RAC, and 220 detections of 24 species at the JGC (Table 1).

**Table 1:** Complete list of species and the total number of observations for each species during breeding season surveys at the RAC and JGC in 2015 and 2016. Years where there were no observations of the species are highlighted in gray. *Note: there were a different number of survey visits during each year, so the total observations are not directly comparable and they do not represent the abundance of these species in the area.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Species** | **Number of Observations\*** | | | |
|  | **RAC** | | **JGC** | |
|  | **2015** | **2016** | **2015** | **2016** |
| Northern Rough-winged Swallow | 61 | 20 | 0 | 3 |
| American Robin | 49 | 74 | 21 | 35 |
| Song Sparrow | 47 | 53 | 1 | 5 |
| European Starling | 38 | 29 | 10 | 35 |
| Mourning Dove | 35 | 42 | 12 | 7 |
| Bullock’s Oriole | 27 | 53 | 2 | 4 |
| Canada Goose | 24 | 13 | 0 | 0 |
| House Finch | 22 | 25 | 4 | 10 |
| Mallard | 22 | 30 | 8 | 25 |
| White-faced Ibis | 20 | 8 | 1 | 0 |
| Killdeer | 18 | 13 | 0 | 1 |
| Yellow Warbler | 17 | 21 | 4 | 7 |
| Franklin’s Gull | 16 | 129 | 2 | 31 |
| Black-billed Magpie | 15 | 19 | 9 | 2 |
| Cedar Waxwing | 15 | 4 | 0 | 5 |
| Lesser Goldfinch | 12 | 3 | 7 | 11 |
| Red-winged Blackbird | 12 | 11 | 0 | 0 |
| Western Kingbird | 12 | 28 | 0 | 0 |
| Brown-headed Cowbird | 10 | 16 | 0 | 1 |
| Cliff Swallow | 10 | 48 | 2 | 2 |
| American White Pelican | 9 | 2 | 0 | 0 |
| Downy Woodpecker | 9 | 4 | 0 | 5 |
| Eurasian Collared-Dove | 8 | 11 | 4 | 14 |
| Yellow-headed Blackbird | 8 | 19 | 0 | 0 |
| Barn Swallow | 7 | 7 | 12 | 23 |
| White-crowned Sparrow | 7 | 0 | 0 | 1 |
| American Avocet | 5 | 1 | 0 | 0 |
| American Goldfinch | 5 | 9 | 3 | 6 |
| Black-capped Chickadee | 5 | 17 | 4 | 6 |
| Forster’s Tern | 5 | 6 | 0 | 0 |
| Ring-necked Pheasant | 5 | 1 | 0 | 0 |
| Western Tanager | 5 | 9 | 0 | 1 |
| American Coot | 4 | 2 | 1 | 0 |
| California Gull | 4 | 14 | 2 | 4 |
| Great-tailed Grackle | 4 | 12 | 0 | 0 |
| Blue-gray Gnatcatcher | 3 | 0 | 0 | 0 |
| Spotted Sandpiper | 3 | 1 | 0 | 0 |
| Black-necked Stilt | 2 | 2 | 0 | 0 |
| California Quail | 2 | 0 | 2 | 0 |
| Gray Catbird | 2 | 2 | 0 | 0 |
| House Sparrow | 2 | 3 | 10 | 27 |
| Lazuli Bunting | 2 | 0 | 0 | 0 |
| Spotted Towhee | 2 | 1 | 0 | 0 |
| Black-crowned Night Heron | 1 | 2 | 0 | 0 |
| Belted Kingfisher | 1 | 0 | 0 | 0 |
| Cinnamon Teal | 1 | 0 | 0 | 0 |
| Common Yellowthroat | 1 | 0 | 0 | 0 |
| Double-crested Cormorant | 1 | 3 | 0 | 4 |
| Evening Grosbeak | 1 | 0 | 0 | 2 |
| Gadwall | 1 | 5 | 0 | 0 |
| House Wren | 1 | 0 | 0 | 0 |
| Lincoln’s Sparrow | 1 | 0 | 0 | 0 |
| MacGillivray’s Warbler | 1 | 1 | 0 | 0 |
| Pied-billed Grebe | 1 | 2 | 0 | 0 |
| Pine Siskin | 1 | 0 | 0 | 0 |
| Say’s Phoebe | 1 | 0 | 0 | 0 |
| Warbling Vireo | 1 | 0 | 1 | 2 |
| Western Meadowlark | 1 | 2 | 0 | 0 |
| Yellow-rumped Warbler | 1 | 17 | 0 | 5 |
| Black-chinned Hummingbird | 0 | 4 | 1 | 1 |
| Western Wood-pewee | 0 | 2 | 1 | 0 |
| Tree Swallow | 0 | 15 | 0 | 0 |
| Chipping Sparrow | 0 | 5 | 0 | 0 |
| Barn Owl | 0 | 4 | 0 | 0 |
| Brewer’s Blackbird | 0 | 3 | 0 | 0 |
| Bank Swallow | 0 | 2 | 0 | 0 |
| Rock Pigeon | 0 | 2 | 0 | 7 |
| Vesper Sparrow | 0 | 2 | 0 | 0 |
| American Crow | 0 | 1 | 0 | 1 |
| Black-headed Grosbeak | 0 | 1 | 0 | 1 |
| Black Phoebe | 0 | 1 | 0 | 0 |
| Caspian Tern | 0 | 1 | 0 | 0 |
| Common Raven | 0 | 1 | 0 | 0 |
| Sandhill Crane | 0 | 1 | 0 | 0 |
| Snowy Egret | 0 | 1 | 0 | 0 |
| Sharp-shinned Hawk | 0 | 1 | 0 | 0 |
| Swainson’s Hawk | 0 | 1 | 0 | 0 |
| Turkey Vulture | 0 | 1 | 0 | 0 |
| Pine Siskin | 0 | 0 | 0 | 3 |

\**Note: there were a different number of survey visits during each year, so the total observations are not directly comparable and they do not represent the abundance of these species in the area.*

***Top Species Observed***

At the RAC in 2016, we had the most observations of Franklin’s Gulls (129 observations), American Robins (74), Bullock’s Orioles (53), Song Sparrow (53), and Cliff Swallows (48). At the JGC, we had the most observations of American Robins (35 observations), European Starlings, 35), Franklin’s Gulls (31), House Sparrows (27) and Mallards (25) (Table 1, Figure 3). At both sites, Franklin’s Gulls were much more common this year than in 2015; there were 6.7 times more observations of Franklin’s Gulls per visit at the RAC and 12.9 times more observations at the JGC (Figure 4).

JGC

RAC

**Figure 4**. The top 5 species with the most observations in the RAC and JGC during 2015 and 2016 and the total number of observations per visit.

***Widespread Species***

A total of 11 species were widespread at the RAC, and were detected at all 6 sampling points: American Robin, Bullock’s Oriole, Cliff Swallow, European Starling, Franklin’s Gull, Killdeer, Mallard, Mourning Dove, Song Sparrow, Western Kingbird, and Yellow Warbler. At the JGC, 20 species were widespread and detected at both sampling points: American Goldfinch, American Robin, Barn Swallow, Black-capped Chickadee, Bullock’s Oriole, California Gull, Cliff Swallow, Eurasian Collared-Dove, European Starling, Franklin’s Gull, House Finch, House Sparrow, Lesser Goldfinch, Mallard, Mourning Dove, Northern Rough-winged Swallow, Song Sparrow, Warbling Vireo, Yellow Warbler, Yellow-rumped Warbler.

***Species Richness and Community Composition across Survey Points***

In the 2016 breeding season, the species richness per point ranged from 27 to 39 (mean: 31, standard deviation: 4.8), with the highest species richness found at RAC 4 and the lowest at RAC 3 and JGC 2 (Figure 5). Although not statistically significant, the RAC had higher average species richness per point (mean: 32.2, standard deviation: 5.1) than the JGC (mean: 27.5, standard deviation: 0.7).

**Figure 5**. The total species richness for each sampling point at the JGC (purple) and the RAC (blue) during the 2016 breeding season.

Across all sampling points, the community was predominately composed of insectivorous birds (55%) (Figure 6), and those that used forest or open forested habitat (43%) (Figure 6). The composition of communities differed slightly between sampling points and study sites. For example, the two points in the JGC had the largest proportion of species that primarily ate plants or seeds during the breeding season, and the smallest proportion of species that were omnivorous, carnivorous, or piscivorous (Figure 6).

The two points at the JGC also had a relatively low proportion of species that utilized marsh, shore, or open water as their primary habitat when compared to most of the sampling points within the RAC (Figure 7).

**Figure 6**. The percentage of species detected at each sampling point within feeding guilds based on what they primarily feed on during the breeding season.

**Figure 7**. The percentage of species detected at each sampling point within habitat guilds based on the primary habitat they use during the breeding season.

***Non-breeding Surveys***

During the monthly non-breeding surveys in January, February, March, April, August, September, and October of 2016, we detected 93 species (Table 2). Of these species, 41 were detected exclusively during the non-breeding surveys, making the total 2016 species count 111 different bird species for both the RAC and the JGC.

**Table 2:** Species detected during non-breeding surveys in 2016, and the month or months in which they were detected.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Species** | **January** | **February** | **March** | **April** | **August** | | | **September** | **October** |
| American Avocet |  |  |  | X |  | | | X |  |
| American Coot | X | X | X | X | X | | | X |  |
| American Crow | X |  |  | X |  | | | X | X |
| American Goldfinch | X | X | X | X | X | | | X | X |
| American Kestrel | X |  |  |  |  | | | X | X |
| American Pipit |  |  |  |  |  | | |  | X |
| American Robin | X | X | X | X | X | | | X | X |
| Bald Eagle |  |  |  |  |  | | | X |  |
| Bank Swallow |  |  |  |  | X | | |  |  |
| Barn Owl |  |  |  | X |  | | |  |  |
| Barn Swallow |  |  |  |  | X | | | X |  |
| Black-billed Magpie | X | X | X | X | X | | | X | X |
| Black-capped Chickadee | X | X | X | X | X | | | X | X |
| Black-chinned Hummingbird |  |  |  |  | X | | | X |  |
| Black-crowned Night-heron |  |  |  |  | X | | | X |  |
| Black-headed Grosbeak |  |  |  |  |  | | | X |  |
| Blue-gray Gnatcatcher |  |  |  |  | X | | | X |  |
| Blue-winged Teal |  |  |  | X |  | | | X |  |
| Brewer’s Blackbird |  |  |  |  |  | | | X |  |
| Brown Creeper | X | X | X |  |  | | |  |  |
| Brown-headed Cowbird |  |  |  |  | X | | |  |  |
| Bullock’s Oriole |  |  |  |  | X | | |  |  |
| California Gull |  | X | X | X |  | | | X |  |
| California Quail |  |  |  | X | X | | | X | X |
| Canada Goose | X | X | X | X |  | | | X |  |
| Cedar Waxwing |  |  |  |  | X | | | X | X |
| Chipping Sparrow |  |  |  |  |  | | | X |  |
| Cinnamon Teal |  |  |  | X |  | | |  |  |
| Common Goldeneye | X |  |  |  |  | | |  |  |
| Common Nighthawk |  |  |  |  | |  | X | |  |
| Common Yellowthroat |  |  |  |  | | X |  | |  |
| Cooper’s Hawk |  |  | X |  | |  | X | | X |
| Cordilleran Flycatcher |  |  |  |  | | X |  | |  |
| Dark-eyed Junco | X | X | X | X | |  |  | | X |
| Double-crested Cormorant |  |  |  | X | |  |  | |  |

**Table 2** continued.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Species** | **January** | **February** | **March** | **April** | **August** | **September** | **October** |
| Downy Woodpecker | X | X | X | X | X | X | X |
| Eurasian Collared-Dove | X | X | X | X | X | X | X |
| European Starling | X | X | X |  | X | X | X |
| Franklin’s Gull |  |  |  | X | X | X |  |
| Gadwall | X |  |  |  |  |  |  |
| Great Horned Owl |  |  | X |  |  |  |  |
| Greater Yellowlegs |  |  |  |  | X | X | X |
| Great-tailed Grackle |  |  |  | X |  |  |  |
| Hammond’s Flycatcher |  |  |  |  |  | X |  |
| Hermit Thrush |  |  |  |  |  | X | X |
| House Finch | X | X | X | X | X | X | X |
| House Sparrow | X | X | X | X | X | X | X |
| Killdeer |  |  |  | X | X | X |  |
| Lazuli Bunting |  |  |  |  | X | X |  |
| Lesser Goldfinch | X | X | X | X | X | X | X |
| Lincoln’s Sparrow | X |  |  |  |  |  |  |
| MacGillivray’s Warbler |  |  |  |  | X | X |  |
| Mallard | X | X | X | X | X | X | X |
| Merlin |  |  |  |  |  |  | X |
| Mourning Dove | X |  | X | X | X | X | X |
| Nashville Warbler |  |  |  |  |  | X |  |
| Northern Flicker | X | X | X | X | X | X | X |
| Northern Harrier |  | X |  |  |  |  |  |
| Northern Rough-winged Swallow |  |  |  | X | X |  |  |
| Northern Shoveler |  |  |  |  |  | X |  |
| Orange-crowned Warbler |  |  |  |  |  | X | X |
| Pied-billed Grebe | X | X |  | X | X |  | X |
| Red-tailed Hawk | X |  | X |  |  |  | X |
| Red-winged Blackbird | X | X | X | X |  |  | X |
| Ring-billed Gull | X | X |  |  | X | X | X |
| Ring-necked Pheasant | X |  | X | X |  |  |  |
| Rock Pigeon | X | X | X |  | X | X | X |
| Ruby-crowned Kinglet | X | X | X |  |  | X | X |
| Say’s Phoebe |  |  |  | X |  |  |  |
| Sharp-shinned Hawk |  |  | X |  |  |  | X |
| Solitary Sandpiper |  |  |  |  | X |  |  |
| Song Sparrow | X | X | X | X | X | X | X |
| Sora |  |  |  |  | X |  |  |
| Spotted Sandpiper |  |  |  |  | X |  |  |
| Spotted Towhee | X |  |  |  |  |  | X |
| Swainson’s Hawk |  |  |  |  | X |  |  |
| Townsend’s Solitaire |  |  |  |  |  | X |  |
| Warbling Vireo |  |  |  |  |  | X |  |
| Western Kingbird |  |  |  |  | X |  |  |

**Table 2** continued.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Species** | **January** | **February** | **March** | **April** | **August** | **September** | **October** |
| Western Meadowlark |  |  |  | X |  |  |  |
| Western Tanager |  |  |  |  |  | X |  |
| Western Wood-pewee |  |  |  |  |  | X |  |
| White-crowned Sparrow | X | X | X | X |  | X |  |
| White-faced Ibis |  |  |  |  | X | X |  |
| Willow Flycatcher |  |  |  |  |  | X |  |
| Wilson’s Snipe |  |  |  |  |  | X |  |
| Wilson’s Warbler |  |  |  |  |  | X | X |
| Wood Duck |  | X |  |  |  |  |  |
| Woodhouse’s Scrub-Jay | X |  |  |  | X | X | X |
| Yellow Warbler |  |  |  |  | X | X |  |
| Yellow-headed Blackbird |  |  |  | X |  |  |  |
| Yellow-rumped Warbler | X | X | X | X |  | X | X |

**Jordan River Riparian Index Analysis**

We used data from breeding bird surveys at the RAC and the JGC as part of a larger analysis of riparian bird communities along the Jordan River. Many species of bird have specific habitat relationships, especially in riparian areas, and their presence and abundance in an area can provide important information about the health of that ecosystem (Bureau of Land Management 1998). For example, as riparian areas became degraded or their vegetation is modified, certain bird species might stop using the area, or the community could be replaced by another suite of species (Bureau of Land Management 1998, Rottenborn 1999).

In order to assess the health of riparian areas along the Jordan River, and to better understand how to manage and restore riparian areas in a way that will protect and benefit birds, we collected and analyzed breeding bird survey data from 4 sampling sites along the Jordan River (Table 3). We used data collected by our team of citizen scientist volunteers to investigate the factors that influence how riparian areas support healthy riparian bird communities.

***Methods***

**Table 3:** Survey sites along the Jordan River, Salt Lake County, UT used in the riparian bird index analysis.

|  |  |  |
| --- | --- | --- |
| **Site** | **Total Area** | **No. Sampling Points** |
| Regional Athletic Complex | 44 acres | 6 |
| Jordan River Golf Course | 15 acres | 2 |
| Big Bend | 80 acres | 8 |
| Galena Soo’nkhanni Preserve | 252 acres | 27 |

We conducted breeding bird point count surveys at 43 sampling points within four different survey sites along the Jordan River (Table 3). We measured canopy percent cover and species cover, understory percent cover and species cover, and ground cover at each sampling point using the Bird Conservancy of the Rockies Integrated Monitoring in Bird Conservation Region protocol (Hanni et al. 2015).

The presence of a suite of riparian obligate and dependent birds can indicate high quality vegetation, water, and insect communities within a riparian area (Young et al. 2013). We created a riparian bird index to signify a functioning riparian bird community based on work by Young et al. (2013), who found that overall riparian habitat condition could be effectively assessed using species richness of riparian-obligate and riparian-dependent birds. We created the riparian index using the following criteria: 1) the species had been detected in Salt Lake County and 2) the species was classified as either riparian-obligate (>90% of nests/abundance are in riparian vegetation) or riparian-dependent (60%-90% of nests/abundance are in riparian vegetation) (Bureau of Land Management 1998). Our final list consisted of 28 bird species (Table 4). For each sampling point, we calculated the number of those 28 species that were detected in the area (within 125m).

We generated a list of 6 habitat characteristics that we hypothesized would influence the riparian bird community: total size of the preserve, grass cover, forb cover, overstory (trees >3m) canopy cover, understory (trees and shrubs 0.25m-3m) canopy cover, and percentage of the understory that is non-native.

We built multiple linear regression models to examine the relationship between the habitat characteristics and the riparian bird index. We included one and two covariates in the models, and we used Akaike’s Information Criterion (AIC) for model selection.

**Table 4:** Index of riparian-obligate and riparian-dependent bird species in Salt Lake County used for the Jordan River riparian index analysis.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **#** | **Species** | **Classification** | **#** | **Species** | **Classification** |
| 1 | American Dipper | Obligate | 15 | Lazuli Bunting | Dependent |
| 2 | American Goldfinch | Dependent | 16 | Lesser Goldfinch | Dependent |
| 3 | Bank Swallow | Dependent | 17 | MacGillivray’s Warbler | Dependent |
| 4 | Belted Kingfisher | Obligate | 18 | Northern Goshawk | Dependent |
| 5 | Black-capped Chickadee | Dependent | 19 | Orange-crowned Warbler | Obligate |
| 6 | Black-headed Grosbeak | Dependent | 20 | Red-naped Sapsucker | Dependent |
| 7 | Blue Grosbeak | Dependent | 21 | Song Sparrow | Obligate |
| 8 | Bullock’s Oriole | Dependent | 22 | Swainson’s Thrush | Dependent |
| 9 | Common Yellowthroat | Obligate | 23 | Warbling Vireo | Dependent |
| 10 | Cooper’s Hawk | Dependent | 24 | Western Wood-pewee | Dependent |
| 11 | Cordilleran Flycatcher | Dependent | 25 | Willow Flycatcher | Obligate |
| 12 | Eastern Kingbird | Dependent | 26 | Wilson’s Warbler | Obligate |
| 13 | Fox Sparrow | Dependent | 27 | Yellow Warbler | Obligate |
| 14 | Gray Catbird | Dependent | 28 | Yellow-breasted Chat | Obligate |

***Results***

The RAC and JGC’s breeding bird community contained 39% of the riparian-obligate and -dependent species commonly found in Salt Lake County. Sampling points JGC2 and RAC6 had the highest riparian bird index (8 riparian species), and point RAC3 had the lowest riparian bird index (4 riparian species), with an average of 6 riparian bird species per point across all sampling points (Figure 8).

**Figure 8**. The riparian index, or the number of riparian dependent and riparian obligate species detected at each sampling point during the 2016 breeding season.

Based on the two best supported models, size, canopy cover, and native understory cover were the best indicators of a healthy riparian bird community (Table 5). As the total size of the preserve increased, there were a higher number of riparian birds in the community (β= 0.012, Standard Error = 0.04). The riparian bird index was also positively related to overstory canopy cover (β= 0.044, Standard Error = 0.02). Finally, as the percentage of non-native understory increased, the number of riparian birds in the community also increased (β= 0.071, Standard Error = 0.03).

**Table 5:** Top multiple linear regression models (ΔAIC>2) relating habitat covariates to riparian bird index at sites along the Jordan River, Salt Lake County, UT.

|  |  |  |  |
| --- | --- | --- | --- |
| **Model** | **Adjusted R2** | **ΔAIC** | **AIC** |
| ~ Size + OverstoryCC | 0.2059 | 0 | 192.7125 |
| ~ Size + NonNativeUnderstory | 0.2052 | 0.0383 | 192.7508 |
| ~ Size + PercentGrass | 0.1874 | 0.9906 | 193.7031 |
| ~ Size + PercentForb | 0.1769 | 1.5411 | 194.2536 |
| ~ Size + MidstoryCC | 0.1733 | 1.7294 | 194.4419 |
| ~ NonNativeUnderstory + MidstoryCC | 0.173 | 1.7437 | 194.4562 |

**Discussion**

The RAC and JGC support a diverse bird community, and provide important habitat for migratory and resident bird species. The species richness of the area is comparable, and even higher, than yearly counts of species in other riparian areas in Northern Utah. For example, in a study by Parrish et al. (2007) of Utah’s riparian birds surveyed during May to August in 1992-2005, the sites near Ogden, Provo, Logan, and Salt Lake City had an average of 29 to 56 species detected per year. We detected 66 species at the RAC and 34 at the JGC during the 2016 breeding season.

We also detected several species of conservation concern during both the breeding and non-breeding surveys, indicating the importance of this area as wildlife habitat. We detected 3 of the 24 Partners in Flight Utah Avian Conservation Strategy priority species: the American Avocet, American White Pelican, and Black-necked Stilt (Parrish et al. 2002). We also detected 4 of the 20 North American Waterfowl Management Plan (NAWMP) priority species, 7 of the 11 North American Waterbird Conservation Plan priority species, 8 of the 37 Great Basin Ecoregional Conservation Blueprint priority species, and 4 of the 23 State of Utah Sensitive Species List (1998) (Utah Steering Committee 2005).

Compared to other riparian areas that we monitor along the Jordan River, the RAC and JGC contain a smaller riparian bird community both across the site and within individual points. At 39%, the RAC and JGC’s breeding bird community contained a relatively low percentage of the riparian-obligate and -dependent species commonly found in Salt Lake County. These two sites also had the lowest average riparian bird index for the sites that we examined along the Jordan River (6 riparian species/point); Galena Soo’nkhanni had the highest with 8.1 riparian species/point, Parley’s had the second highest with 8 riparian species/point, and Big Bend had the second lowest with 6.4 riparian species/point. The lower proportion of riparian birds at sampling points could indicate a range of issues including lower quality riparian habitat, disturbances from recreation activities, and development in the surrounding landscape.

The results of the Jordan River Riparian Index Analysis identified a few key factors that are currently influencing the community of riparian birds along the Jordan River. We found that larger protected areas, and those with sufficient vertical structure and canopy cover, support healthier riparian bird communities. As restoration and management activities happen along the Jordan River, it will be important to preserve large contiguous areas of riparian habitat, and to protect existing established trees and/or replace trees that are removed. We also found that the number of riparian birds in the community increased as the proportion of the understory that was non-native increased. This finding may be surprising given that some studies find negative impacts of non-native plants on bird communities (e.g., Rodewald et al. 2010). However, we found that trees and shrubs across all of our study areas were predominantly non-native. A vast majority (90%) of canopy trees were non-native, with Russian Olives (non-native) making up 78.7% of canopy trees. A majority (55%) of the understory was non-native, with Russian Olives making up 36.6%, and Rabbit Brush (native), making up 20.3% of understory trees and shrubs. The bird communities in these areas exist in a very modified system; non-native trees and shrubs such as Russian Olives are providing most of the vegetative structure and fruits for nesting and foraging. If Russian Olives or other non-native trees are removed, mature trees should be thinned out slowly while they are replaced with native trees and shrubs so vertical structure and fruiting resources are maintained throughout the restoration process

**Conclusion**

Riparian areas are often evaluated using measurements of the stream and the surrounding vegetation (Burton et al. 2008), but understanding the bird community provides a more complete picture of the ecosystem as a whole (Bureau of Land Management 1998; Young et al. 2013). Especially given the low proportion of riparian birds using these sites, continued bird monitoring at the RAC and JGC will be important to evaluate the site’s ecological health and determine management activities that should be taken and actions that should be avoided.

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