

# Community Science Bird Monitoring at the RAC and Jordan River Golf Course 2022 Project Report



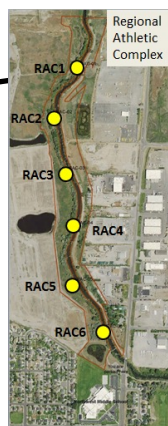
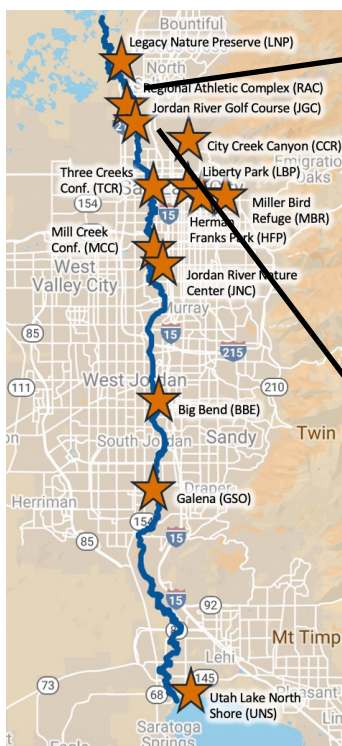
## PROJECT OVERVIEW

In partnership with Salt Lake City, Tracy Aviary is conducting community 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 better understand the birds that occur at the RAC and JGC, determine how the bird community differs between sites and over time, and identify the presence of species of conservation concern. Here, we summarize results from our 2022 field season.

## STUDY SITES

We generated six sampling points across the RAC and two points at the JGC site where we conducted bird and vegetation surveys. These surveys are part of a larger community science bird monitoring program that includes twelve other study sites in the Salt Lake region.

### Bird Monitoring Sites



**Regional Athletic Complex (RAC)**



**Jordan River Golf Course (JGC)**

## BIRD SURVEY METHODS



### Breeding Season Point Count Surveys

During April – July of 2022, 7 community scientists and Tracy Aviary staff conducted 6 breeding season point count surveys at RAC and JGC. Point count surveys were conducted by pairs of community scientists between dawn and 10am. The ‘observer’ identified all birds seen and heard during six minutes, and noted the number of individuals, distance, and direction. The ‘recorder’ wrote all of the observations on the datasheet, and also noted weather and site variables, such as wind speed and cloud cover.



### Non-breeding Season Group Surveys

Information from point count surveys was supplemented by monthly non-breeding group surveys conducted at each site between August – March 2022. During non-breeding surveys, groups of volunteers led by a trained Tracy Aviary staff person walked a transect through the site and noted all birds seen and heard in the area.



### Owl Playback Surveys

During April, when owls are most likely to be vocalizing, groups of volunteers led by a trained aviary staff person walked the sites in the evening listening for owls, stopping periodically to play owl calls and listen for responses.

# 2022 BIRD MONITORING RESULTS

## Regional Athletic Complex

### 5 Breeding Season Surveys

- 773 bird observations
- 52 species

### 7 Non-breeding Surveys

- 3,047 bird observations
- 74 species

### 1 Owl Survey

- 0 owl detections
- 0 species

89 total bird species were detected at the RAC in 2022

## Jordan River Golf Course

### 5 Breeding Season Surveys

- 143 bird observations
- 22 species

### 5 Non-breeding Surveys

- 537 bird observations
- 39 species

### 1 Owl Survey

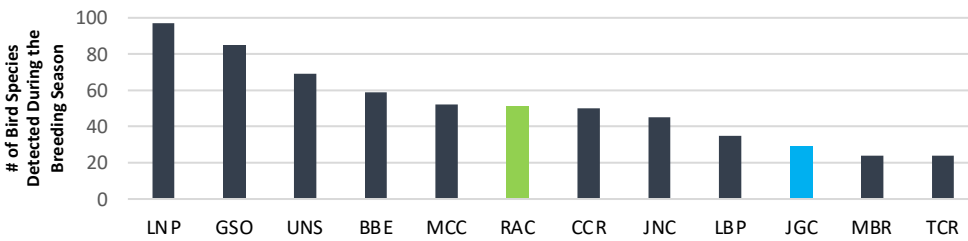
- 0 owl detections
- 0 species

45 total bird species were detected at JGC in 2022

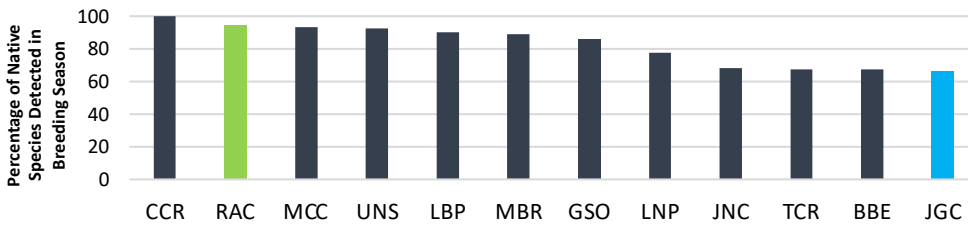
## Comparison to Other Sites Along the Jordan River

We can measure the health of an urban riparian site such as RAC and JGC by looking at several metrics, including species richness (the number of species detected), and the proportion of native, riparian-associated and urban-sensitive birds that use the site. When comparing RAC (light green) and JGC (light blue) and to other monitoring sites (dark blue), we found high breeding season species richness, average native and urban-sensitive bird species.

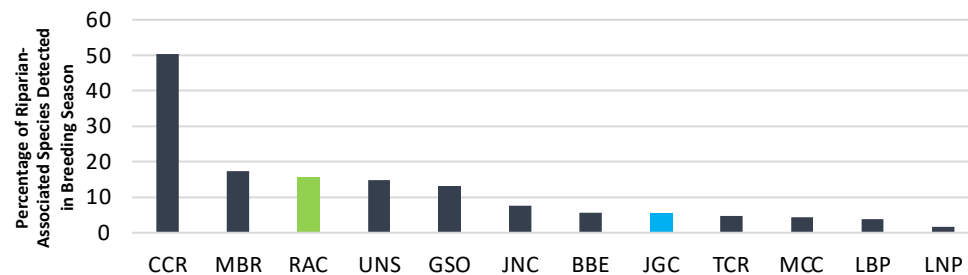
### Species Richness



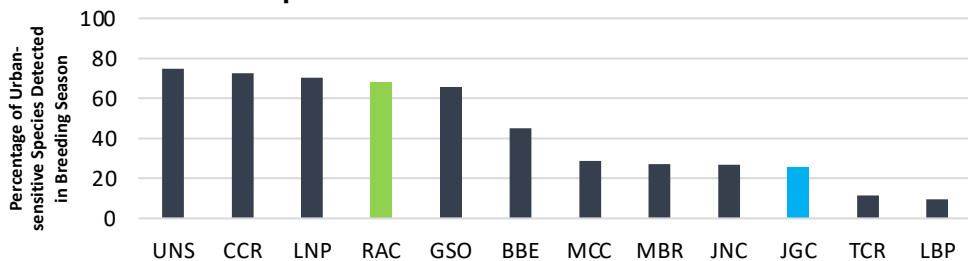
### Native Bird Species



### Riparian-associated Bird Species



### Urban-sensitive Bird Species

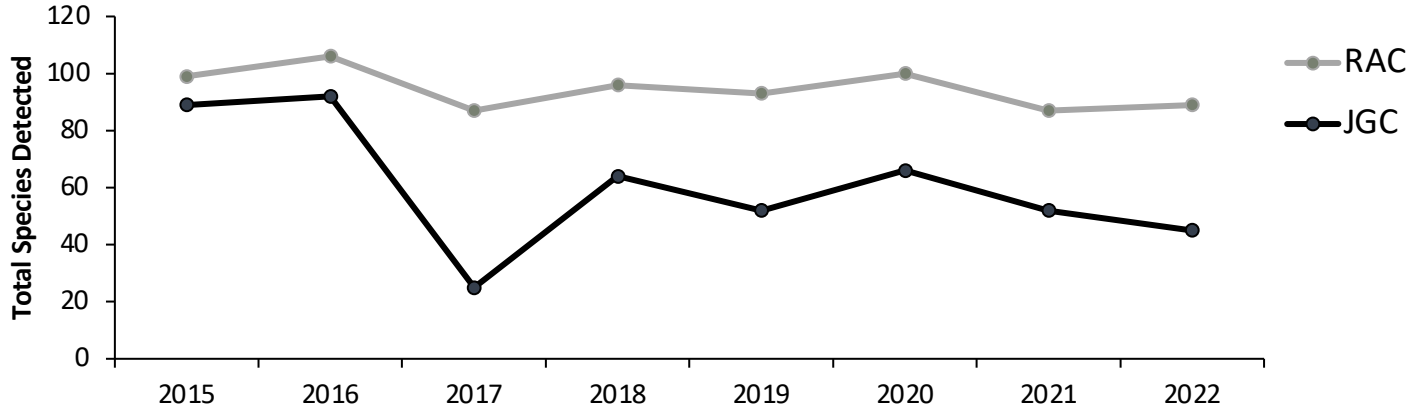


# 2022 BIRD MONITORING RESULTS

## Trends Over Time

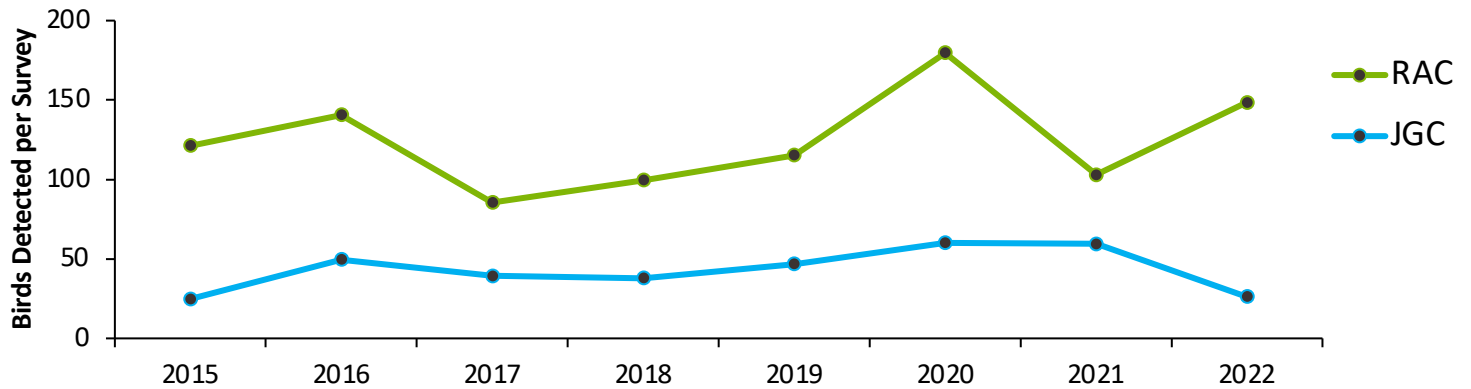
We measured trends in bird habitat use at the site over our bird monitoring period by examining changes in breeding season and non-breeding season species richness (number of bird species detected), and breeding season relative abundance (detections per survey) for several species of interest.

### Species Richness

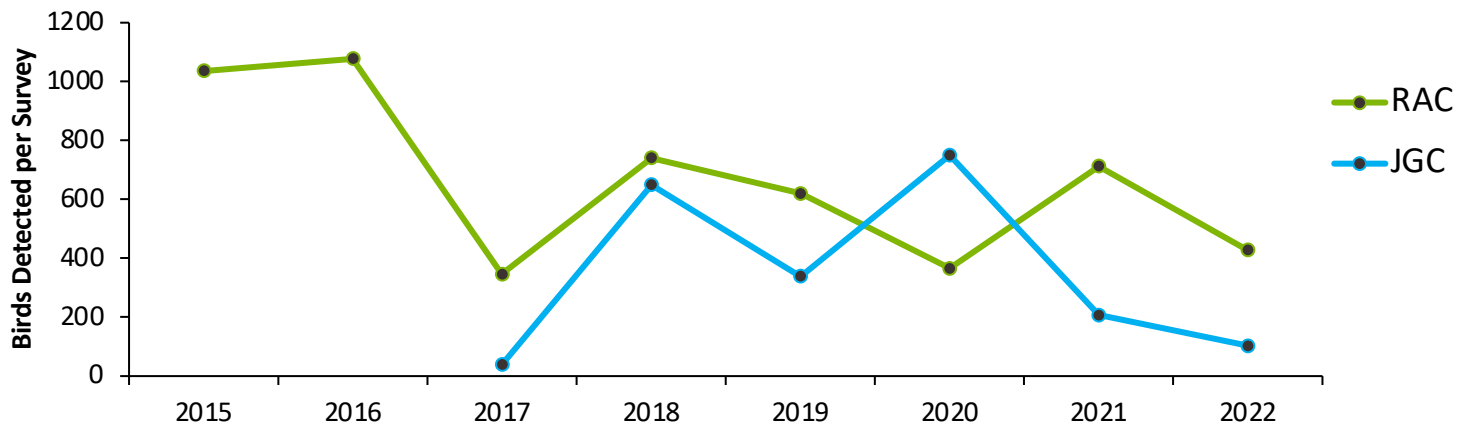


### Relative Abundance

Breeding Season (April – July)



Non-breeding Season (August – March)



# 2022 BIRD MONITORING RESULTS

## Bird Habitat Use Patterns Throughout the Jordan River

We use breeding season data to help understand how habitat features and landscape attributes impact where different bird species are found; information that could help with land management and restoration decisions that create, protect, or enhance healthy bird habitat for target species. A multi-season occupancy modeling analysis using bird survey data from 2013-2022 identified the most important factors influencing habitat use by three target riparian-associated and three urban-associated species across our bird monitoring sites. Our analysis examined which habitat attributes (Table 1) influenced the probability that these species would use an area within our sampling sites, or locally colonize or go extinct from an area.

### Occupancy Analysis: Species Results

**Canopy Cover** was found to be an important factor for habitat use by Song Sparrows. They were more likely to occupy and less likely to go locally extinct from areas with higher canopy cover. Bullock's Orioles were more likely to occupy areas with more herbaceous vegetation, and were more likely to locally colonize areas with greater shrub cover. **These results highlight the importance of maintaining and enhancing vertical structure, including canopy trees, shrubs, and herbaceous plants on the ground.**

**Distance to River** was found to be an important factor for habitat use by all of the target species examined. All species had decreased habitat use as distance from river increased, and Yellow Warblers were also less likely to locally colonize areas further from the river. **This finding highlights the importance of enhancing habitat directly surrounding the river.**

Urban-associated species such as House Finches and House Sparrows were less likely to use habitat with a greater **Buffer Distance** to the developed area, and House Sparrows were more likely to go locally extinct from areas further from development. This finding highlights the importance of providing a large area of protected space that can buffer sites from development, and decrease use by non-target urban-adapted species.

**Table 1.** Habitat and landscape attributes included in occupancy analysis.

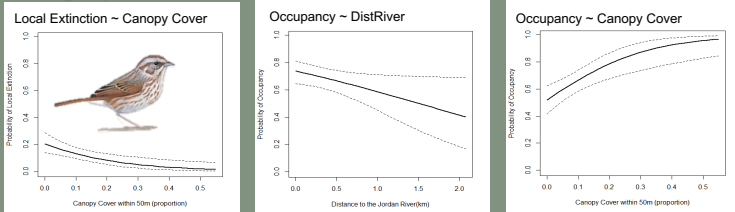
Variable	Measurement (unit)
Canopy Cover	Tree canopy cover within 50m (%)
Canopy Lost*	Decrease in canopy cover from first to last year of monitoring
Shrub Cover	Shrub cover within 50m (%)
Shrub Lost*	Decrease in shrub cover from first to last year of monitoring
Herb Cover	Herbaceous cover within 50m (%)
Water Cover	Cover of water within 50m (%)
Native Canopy	Cover of native canopy trees within 50m
DistRiver	Distance to the river or stream (km)
Riparian125	Riparian or wetland habitat within 125m (%)
Buffer	Buffer distance to nearest developed area (km)

\*Variable only included as covariate for local extinction or colonization parameters

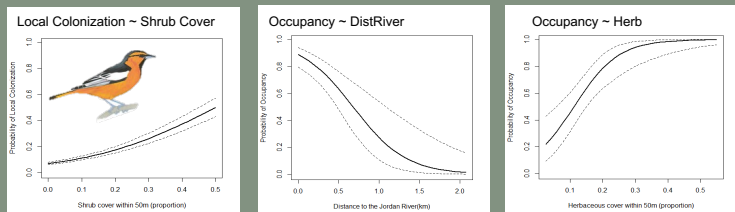
### Riparian-Associated Birds

#### Habitat Relationship Graphs

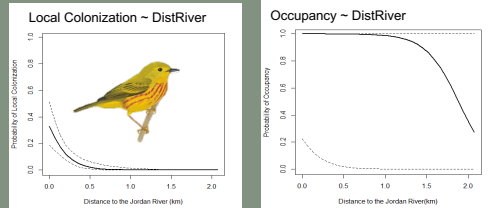
#### Song Sparrow



#### Bullock's Oriole



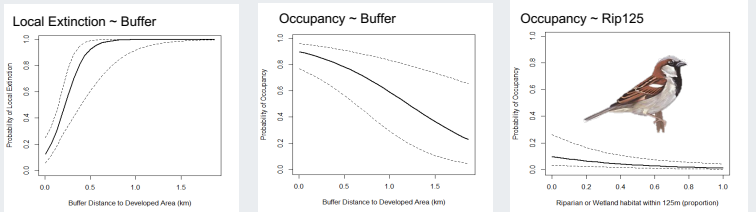
#### Yellow Warbler



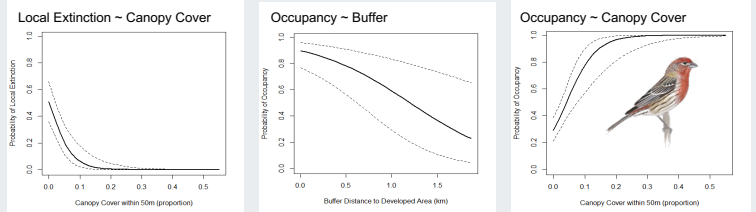
### Urban-Associated Birds

#### Habitat Relationship Graphs

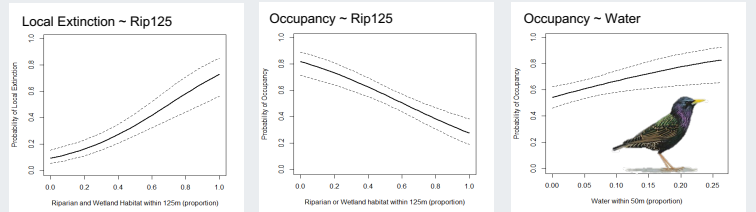
#### House Sparrow



#### House Finch



#### European Starling



# RECOMMENDATIONS TO ENHANCE AND PRESERVE BIRD HABITAT

**Plant and maintain trees, shrubs, and other native vegetation over a large footprint of the site.** This vegetation will enhance the contiguous habitat along the Jordan River corridor and provide a buffer from the surrounding roads and residential development.

**Keep dogs on leash and discourage use of site by cats.** These domestic animals can cause direct mortalities or disturbance to birds.

**Maintain standing dead trees** to provide habitat for cavity-nesting species. Avoid complete removal if possible; cutting them to a height of 10ft can mitigate safety concerns while still providing cavities.

**Promote vertical structure and canopy cover** throughout the site by protecting existing trees/shrubs and/or replacing trees that are removed. This will enhance habitat for riparian-associated birds such as warblers, flycatchers, and orioles.

**No tree removal or thinning activities should take place during the breeding and nesting season (April – July).** If trees are to be removed, mature trees should be thinned out slowly while they are replaced so vertical structure and fruiting resources are maintained throughout the restoration process.

**Improve water quality** in the river to support healthy aquatic invertebrate communities.

**Add and enhance wetland and ephemeral water elements.** Ephemeral water components and additional wetland vegetation will create high quality habitat for species such as Red-winged and Yellow-headed Blackbirds, Virginia Rails and Sora, Marsh Wrens, and Common Yellowthroats.

**Acknowledgements:** Thanks to project partners and the extremely dedicated team of volunteers from Tracy Aviary's Community Science Program who braved early mornings and long hours to collect these data.

# BIRD MONITORING AT THE RAC

## Complete List of Birds Detected during Breeding Season (BSS) and Non-breeding Season (NBS) Surveys

Species	Number of Observations (detections/survey)															
	2015		2016		2017		2018		2019		2020		2021		2022	
	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS
American Avocet	1	1.3	0.2	1.3	0	0	0	0.8	0	0	0.3	1.5	0.1	0	0	0.43
American Coot	0.8	8.5	0.3	15.1	0	9.1	0.2	7.4	0.4	13	0.2	3.5	0	2.8	0.6	4.71
American Crow	0	1.2	0.2	1.6	0	1.8	0	8.4	0	4.6	0.2	3.3	0.1	2	0	14
American Goldfinch	1	8.3	1.5	5.6	0.7	3.5	1.2	1.5	1.2	3	1.3	2.8	1.3	1.8	0.4	3.86
American Kestrel	0	0.5	0	1.1	0	0.6	0	0.5	0	0.6	0	0.4	0.1	0.2	0	0.43
American Pipit	0	1	0	0.4	0	0.1	0	1	0	0.2	0	0.3	0	0.4	0	0
American Robin	9.8	15.8	12.3	32.8	10.3	10.6	13.4	7.9	10.8	16.4	13.8	12.1	9.4	25.4	14.2	14.43
American Tree Sparrow	0	0.2	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0
American White Pelican	1.8	0	0.3	0	0	0	0	9.1	0	0	1.7	0	0	0	0	0
American Wigeon	0	0.5	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Bald Eagle	0	0	0	0.1	0	0	0	0.1	0	0.2	0	0.1	0	0	0	0
Bank Swallow	0	0	0.3	0.4	0	3.6	0.2	0.3	0	0	0.3	0	0.9	0	0.6	4
Barn Owl	0	0	0.7	0	0	0	0	0	0	0	0.3	0.1	0	0	0	0
Barn Swallow	1.4	1.7	1.2	4.4	1.2	0	0.6	2.1	2.6	5.2	1.3	1.9	0.4	0.8	0	0
Belted Kingfisher	0.2	0.7	0	0.4	0	0.3	0	1.1	0	0.4	0.2	0.6	0.3	0.6	0.2	0.71
Black Phoebe	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-billed Magpie	3	8.2	3.2	11.1	3.3	9.5	1.8	6.3	1.2	8.6	1	7.9	1	2.4	0.8	2
Black-capped Chickadee	1	8.5	2.8	8.9	0	4.4	1.6	3.5	1.4	9.2	1.5	3	0.6	2.8	1.4	3.29
Black-chinned Hummingbird	0	0.5	0.7	1.4	1.8	0.3	0.6	0.1	0	0.4	0.7	0.8	0.5	0	0	2
Black-crowned Night-Heron	0.2	0.2	0.3	0.5	0.3	0.1	0.2	0.8	0.2	0.4	0.3	0	0.6	0.2	0.6	0
Black-headed Grosbeak	0	0	0.2	0.1	0.2	0.1	0	0	0.2	0.2	0	0.3	1	0	0	0
Black-necked Stilt	0.4	0	0.3	0	0	0	0	0.6	0	0	0	0	0	0	0	0
Blue-gray Gnatcatcher	0.6	0.3	0	0.6	0.3	0.5	0.2	0.1	0	1.2	0.3	0.4	0	0.2	0.2	1
Blue-winged Teal	0	0.2	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Bohemian Waxwing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.57
Brewer's Blackbird	0	0.3	0.5	1	0	0	0	0.4	0	0.4	0	0	0	0	0	0
Brewer's Sparrow	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0
Broad-tailed Hummingbird	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	1.4	0
Brown Creeper	0	0.8	0	0.9	0	0	0	0.3	0	0	0	0	0	0	0	0
Brown-headed Cowbird	2	0	2.7	0.1	3.8	0	5.4	0	5	0	3.5	0	5.5	0	2.6	0
Bullock's Oriole	5.4	0.2	8.8	0.1	8.3	0	12.6	0	9.8	0	10.8	0	8.8	0	7	0.14
Cackling Goose	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
California Gull	0.8	29	2.3	1.8	0.5	2.6	0.8	9.4	0.8	16.8	1.3	2.6	3.8	4	9.6	0.14
California Quail	0.4	1.5	0	4.4	0.2	4	0.8	0.9	0.2	12.4	0.8	8.3	1	3	1.2	1.71
Canada Goose	4.8	86	2.2	78.8	0	28.5	0.2	29.8	2	23	3.5	19.6	0.1	8.4	0	21
Canvasback	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0
Caspian Tern	0	0.3	0.2	0	0	0	0	0	0	0	0.5	0	0.3	0	1	0
Cattle Egret	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0
Cassin's Finch	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0
Cedar Waxwing	3	12.8	0.7	6.1	0.8	0.8	0.6	1.6	2.2	5.6	3.3	2.8	0.1	5.4	5	2.14
Chipping Sparrow	0	0.8	0.8	0.5	0	0	0	0.1	0.2	0.2	0	0	0.1	0.2	0.2	0
Cinnamon Teal	0.2	0	0	0	0	0	0	0	0	1.2	0	0	0	0	0	0
Cliff Swallow	2	0	8	0	3	0.3	10.4	0	6.6	0.8	40.2	0	8.1	0	2.4	0
Common Goldeneye	0	0	0	0.1	0	0.3	0	0.5	0	1	0	0	0	0	0	0.14

# BIRD MONITORING AT THE RAC

## Complete List of Birds Detected during Breeding Season (BSS) and Non-breeding Season (NBS) Surveys

Species	Number of Observations (detections/survey)															
	2015		2016		2017		2018		2019		2020		2021		2022	
	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS
Common Merganser	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Nighthawk	0	0	0	0.1	0	0	0	0.1	0	0.2	0	0	0	0	0	0
Common Raven	0	0.2	0.2	0	0.8	0.4	0	0	0	0.8	0	1.1	1.8	0.6	0.4	0.71
Common Yellowthroat	0.2	0	0	0.1	0.3	0	0.6	0.1	0.8	0.6	1.2	0.3	0.8	0	0.8	0.14
Cooper's Hawk	0	0.5	0	0.6	0.2	0.1	0	0.4	0.2	0.4	0.2	0.1	0.1	0.6	0	0.57
Cordilleran Flycatcher	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Dark-eyed Junco	0	32.2	0	14.4	0	6.3	0	4.9	0	10.2	0	8.1	0	5	0	3
Double-crested Cormorant	0.2	0.3	0.5	0	0	0	0.2	0.1	0.6	0.4	1.2	0.1	0.8	0.2	0.6	0
Downy Woodpecker	1.8	2.7	0.7	2.8	0.5	1.3	1	1.4	1.4	1.4	1.5	1.9	1.4	2	1	2
Dusky Flycatcher	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Eastern Kingbird	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.29
Eurasian Collared-Dove	1.6	22.2	1.8	38.4	0.7	13.8	0.4	6	1	13	1.2	17.8	1.9	12.4	1.8	6.14
European Starling	7.6	596.7	4.8	602.4	4.2	107.8	3.8	500.1	4.8	198	17.2	157.6	2.3	500	3.2	200
Evening Grosbeak	0.2	0.2	0	0	0	0.1	0	0	0	0	2	0.1	0	0	0	0
Ferruginous Hawk	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.14
Forster's Tern	1	0.2	1	0	0.3	0.1	0.6	0.6	0.6	0	3.3	0	2	0	5.8	0
Franklin's Gull	3.2	21.3	21.5	3.6	1	3.5	0.6	5.8	1.8	8.8	5.2	1.9	2.4	2.4	0.2	1.14
Gadwall	0.2	0.7	0.8	1.4	0	0.9	0	0.4	0	1.8	0.5	0.1	0.1	0	0.4	0
Golden Eagle	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Gray Catbird	0.4	0.2	0.3	0	0.5	0.3	0.2	0.1	0.2	0.8	1.2	0.4	0.4	0	0	0.29
Gray Flycatcher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.14
Great Blue Heron	0	0.2	0	0.1	0.2	0.5	0.4	0.3	0.2	0.4	0.8	0.1	0.3	0.6	0.2	0
Great Egret	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
Great-horned Owl	0	0	0	0.3	0	0	0	0.3	0	0	0	0	0	0	0.4	0.14
Great-tailed Grackle	0.8	0.2	2	0	1.7	0.3	0.8	0.6	0.4	0	0.5	0	0	0	0.8	0
Greater Yellowlegs	0	1.2	0	0.6	0	0.3	0	0.1	0	1.8	0	0	0	1.2	0	0
Green-winged Teal	0	0.2	0	0	0	0.3	0	0.5	0	2	0	0.1	0	0	0	0.29
Hammond's Flycatcher	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0
Harris's Sparrow	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0
Hermit Thrush	0	0	0	0.6	0	0.1	0	0.8	0	1.6	0.2	0.1	0	0.2	0	0.14
Herring Gull	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hooded Merganser	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0
House Finch	4.4	25	4.2	24.9	2.2	12.5	2.2	11.8	5.8	25.2	7.5	9.8	5	14.2	5.2	14.14
House Sparrow	0.4	21.3	0.5	25.1	0.3	5	0.8	3.5	0.8	6.8	0.3	3.3	0.8	3.2	0.2	2.71
House Wren	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killdeer	3.6	2.2	2.2	1.3	1.5	0.4	0.6	0.8	0.4	1.6	2.2	1.6	1.1	1.8	0.2	0.71
Lark Sparrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.14
Lazuli Bunting	0.4	0.5	0	0.4	0	0.8	0	0.3	0.4	0.4	0	0.3	0	0.6	0	1
Least Flycatcher	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0
Lesser Goldfinch	2.4	3.2	0.5	5.9	0.7	3	1.8	1.8	1.2	19.6	1.2	1.5	0.6	5.6	2.2	4.86
Lesser Scaup	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Lesser Yellowlegs	0	0	0	0	0	0	0	0	0	0.2	0	0.1	0	0	0	0
Lincoln's Sparrow	0.2	0.3	0	0.1	0	0	0	0	0	0.8	0	0.1	0	0.4	0	0
Loggerhead Shrike	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0

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## Complete List of Birds Detected during Breeding Season (BSS) and Non-breeding Season (NBS) Surveys

Species	Number of Observations (detections/survey)															
	2015		2016		2017		2018		2019		2020		2021		2022	
	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS
MacGillivray's Warbler	0.2	0.2	0.2	0.3	0	0.1	0	0.1	0	0.6	0	0.3	0	0.6	0	0.57
Mallard	4.4	30.2	5	77.5	3.8	42	1.8	30.5	5	66.4	3.3	28.4	1.8	22.6	13.6	25.25
Marsh Wren	0	0.2	0	0	0	0	0	0.1	0	0.2	0	0.1	0	0	0	0.29
Merlin	0	0.3	0	0.3	0	0	0	0.1	0	0.2	0	0.1	0	0.2	0	0.14
Mountain Chickadee	0	0.3	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0
Mourning Dove	7	7.5	7	5.8	3.5	3.4	2.4	1.8	3.2	2.2	3.2	2.1	2.6	0.8	1.6	1.57
Nashville Warbler	0	0	0	0.1	0	0	0	0	0	0.2	0	0.1	0	0	0	0
Northern Flicker	0	6.7	0	8.1	0	2.9	0	2.4	0	4.2	0.2	1.6	0	7.2	0	5.29
Northern Parula	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Northern Harrier	0	0	0	0.3	0	0.4	0	0	0	0.6	0	0	0	0	0	0.43
Northern Mockingbird	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0
N. Rough-winged Swallow	12.2	0	3.3	0.8	0.8	0.3	2.2	0.5	4.8	0.6	1.8	0	1.6	0	11.2	0
Northern Shoveler	0	1.2	0	0.1	0	0.3	0	0	0	2.4	0	1.9	0	0.6	0	0.29
Northern Shrike	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Northern Waterthrush	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Olive-sided Flycatcher	0	0.3	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Orange-crowned Warbler	0	0.5	0	0.5	0	0	0	1.4	0	1.2	0	0.3	0	2.4	0.2	0.71
Osprey	0	0	0	0	0	0	0	0	0	0	0.2	0.1	0	0	0	0
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0
Pied-billed Grebe	0.2	1.5	0.3	1.3	0	1.4	0	1.4	0	0.8	0.2	0.5	0	0.6	0	0.71
Pine Siskin	0.2	0.3	0	0	0	0	0	0	0	0.6	0	0.1	0.3	0	0	0
Prairie Falcon	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Red Crossbill	0	0	0	0	0	0	0	0	0	0	2.2	0	0	0	0	0
Redhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.29
Red-breasted Nuthatch	0	0	0	0	0	0.1	0	0	0	0.2	0	0	0	0	0	0
Red-naped Sapsucker	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red-tailed Hawk	0	1.2	0	1.5	0	1.4	0	1.9	0.2	0.8	0	0.9	0	1	0	1.14
Red-winged Blackbird	2.4	3.7	1.8	10.9	2.5	13.8	0.6	14.1	5.2	12.2	2	2.5	3.3	4.4	7	6.43
Ring-billed Gull	0	8.8	0	13.3	0	1.9	0	6	0	8	0	1.5	0.8	7.4	0.2	6
Ring-necked Duck	0	0	0	0	0	2.6	0	4.3	0	3.4	0	0.1	0.1	0.4	0	1
Ring-necked Pheasant	1	0.3	0.2	0.3	0.8	1	0.6	0.1	0	0.2	0.5	0	0.3	0	0	0
Rock Pigeon	0	16.8	0.3	19	0.3	4.5	0.2	2.5	1.2	9.8	0.3	5.4	1.1	8.6	1.2	19.43
Rough-legged Hawk	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0
Ruby-crowned Kinglet	0	4.2	0	2.6	0	0.5	0	1.4	0.2	2.2	0.2	0.9	0	2	0	0.57
Rufous Hummingbird	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.14
Sandhill Crane	0	0	0.2	0	0	0	0	0	0	0	0.2	0	0	0	0	0
Savannah Sparrow	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0
Say's Phoebe	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sharp-shinned Hawk	0	0.3	0.2	0.5	0	0.4	0	0	0	0	0	0.1	0	0.2	0.2	0
Snow Goose	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Snowy Egret	0	0.2	0.2	0	0	0.1	0	0.8	0	0	0	0.3	0	0.6	0.6	0
Solitary Sandpiper	0	0	0	0.4	0	0.3	0	0.1	0	0	0	0	0	0.4	0	0.43
Song Sparrow	9.4	6.5	8.8	8.1	8.3	8.4	10.4	8.4	10	16	13	9.1	12.6	4	11.2	9.43
Sora	0	0	0	0.1	0	0	0	0	0	0.2	0	0	0	0	0	0



# BIRD MONITORING AT THE RAC

## Complete List of Birds Detected during Breeding Season (BSS) and Non-breeding Season (NBS) Surveys

Species	Number of Observations (detections/survey)															
	2015		2016		2017		2018		2019		2020		2021		2022	
	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS
Spotted Sandpiper	0.6	0	0.2	0.1	0	0	0	0.3	0	0	0	0.1	0.1	0	0	0
Spotted Towhee	0.4	1.3	0.2	0.9	0	0.1	0	1.4	0	1.6	0	2	0	3	0	0.86
Steller's Jay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.14
Swainson's Hawk	0	0.2	0.2	0	0	0	0	0	0	0	0.2	0.1	0	0	0	0
Townsend's Solitaire	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0.2	0	0
Tree Swallow	0	0	2.5	0.3	0	0	0	0.8	0	0	0.3	0	0	0	0	0
Tundra Swan	0	0	0	0	0	0	0	0	0	0	0	3.8	0	0	0	0
Turkey Vulture	0	0	0.2	0	0	0.1	0	0.1	0.4	0	0	0	0	0	0	0
Vesper Sparrow	0	0.2	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0
Violet-green Swallow	0	0	0	0	0	0	0.2	0	0.4	0	0	0	0	0	0	0
Virginia's Warbler	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Warbling Vireo	0.2	0.2	0	0.1	0.2	0	0.2	0.1	0.2	0	0	0.3	0	0	0	0
Western Kingbird	2.4	0.3	4.7	0.1	2.3	0.8	3	1	2.8	1.2	2.8	0.9	1.8	0	1	1.43
Western Meadowlark	0.2	0	0.3	0	0.2	0.1	1.6	0	1	2.6	0.5	0	0.5	1.4	0	0.14
Western Tanager	1	0.5	1.5	2.1	1.2	0.4	0.8	0.3	1.6	1.2	0.3	0.6	0.8	0.6	0.4	0.71
White-breasted Nuthatch	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Western Wood-pewee	0	0	0.3	0.4	0	0	0.6	0.1	0	0	0.5	0	0	0	0	0
White-crowned Sparrow	1.4	7.7	0	5.6	0.5	5.1	0	8.4	0	11.6	0.2	14.1	0.1	19.8	0.2	10.57
White-throated Sparrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0
White-faced Ibis	4	0	1.3	1.8	0.2	9	0.2	6.5	2.6	27.8	5	0.8	0.8	0	21.6	2.71
Willow Flycatcher	0	0	0	0.3	0	0	0	0	0.4	0	0	0	0.3	0	0	0.14
Wilson's Snipe	0	3.7	0	1.5	0	0.6	0	1.1	0	0.2	0	0	0	0.2	0	0.29
Wilson's Warbler	0	0.5	0	0.6	0.8	0	0	0.1	0.4	0	0.2	0.5	0.3	0.4	1.6	0.14
Wood Duck	0	0.3	0	0.1	0	0	0	0	0	0.4	0	0	0	0	0	0
Woodhouse's Scrub-Jay	0	0.7	0	1	0	0	0	0	0	0	0	0	0	0	0	1.71
Yellow Warbler	3.4	0.5	3.5	1.9	4.3	1.9	5	2.5	4.8	2	5.2	1	4.3	0.4	3.2	3.14
Yellow-breasted Chat	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Yellow-headed Blackbird	1.6	0	3.2	0	4.8	0.1	4.6	0.8	4.4	0.2	1.7	0.4	2	0	0.4	0.86
Yellow-rumped Warbler	0.2	6.5	2.8	5.4	1.2	1.5	0.4	2.5	1	15.4	0.5	5	1	10.2	0	5.72

# BIRD MONITORING AT THE JGC

## Complete List of Birds Detected during Breeding Season (BSS) and Non-breeding Season (NBS) Surveys

Species	Number of Observations (detections/survey)															
	2015		2016		2017		2018		2019		2020		2021		2022	
	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS
American Avocet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
American Coot	0.2	0	0	0	0	2.4	0	2.2	0.2	4.8	0.6	5.2	0.2	0.8		
American Crow	0	0.2	0	0	0.2	9	0	3.8	1	4.6	0.3	6	0	5.4		
American Goldfinch	0.6	1	0.3	0.3	0.8	6.7	0	1.6	0	2.4	0.1	2.5	0	1.6		
American Kestrel	0	0	0	0	0	0.3	0	0.2	0.2	0	0	0.3	0	0		
American Pipit	0	0	0	0	0	0.1	0	0	8.3	0.2	0	0	0	0		
American Robin	4.2	5.8	7.5	7.5	7	15.6	7.6	9	0.2	23.8	9.5	5.7	2.2	3.8		
American Tree Sparrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
American Wigeon	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Bank Swallow	0	0	0	0	0	0	0	0	0	0	0	0	0	3.2		
Barn Owl	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0		
Barn Swallow	2.4	3.8	3	3	3.2	6.6	5.4	0	5.7	2.8	3.5	0.3	0.2	0		
Belted Kingfisher	0	0	0.3	0.3	0	0.4	0	0.6	0	0.4	0.1	0.2	0	0.6		
Black-billed Magpie	1.8	0.3	1.7	1.7	0	6.9	0	2	0	3.8	0	1.3	0	0		
Black-capped Chickadee	0.8	1	0.3	0.3	1	3.7	1.8	2	1	2.8	0.5	1.8	0.4	1.4		
Black-chinned Hummingbird	0.2	0.2	0	0	0	0.6	0.4	0	0.8	0.8	0.3	0	0	0.6		
Black-crowned Night-Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Black-headed Grosbeak	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0		
Blue-gray Gnatcatcher	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Blue-winged Teal	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Brewer's Blackbird	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0		
Brewer's Sparrow	0	0	0	0	0	0	0	0	0.3	0	0.1	0	0	0		
Brown Creeper	0	0	0	0	0	0.1	0	0.2	0	0.6	0	0.5	0	0		
Brown-headed Cowbird	0	0.2	1.3	1.3	0.6	0	1.4	0	0.2	0	1.1	0	0	0		
Bullock's Oriole	0.4	0.7	0.5	0.5	0.4	0	0.4	0	0	0	0	0	0	0		
Cackling Goose	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0		
California Gull	0.4	0.7	1.8	1.8	0.2	1.4	0	3.2	0	1.2	2	0.3	2.2	0.6		
California Quail	0.4	0	0	0	0	0	0	0	0	1	0	1	0	0		
Canada Goose	0	0	0	0	0	23.4	0	59	0.2	49.6	5.6	37.3	0	0.2		
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Cassin's Finch	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0		
Cedar Waxwing	0	0.8	0.2	0.2	0.6	2.3	0.6	1	0	2	0.1	4.3	0	0.2		
Chipping Sparrow	0	0	0	0	0	0	0	0.6	0	0	0	0	0	0		
Cinnamon Teal	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Cliff Swallow	0.4	0.3	1.3	1.3	1.2	0	0.6	0	3	0	1.1	0	1.2	0		
Common Goldeneye	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0		
Common Merganser	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Common Nighthawk	0	0	0	0	0.2	0.1	0	0	0	0	0.1	0	0	0		
Common Raven	0	0	0	0	0	0.3	0	0	0	0	0	0.3	0	0		
Common Yellowthroat	0	0	0	0	0	0	0.2	0	0	0.2	0	0	0	0		
Cooper's Hawk	0	0	0	0	0.2	0	0	0.6	0	0.8	0	0.2	0	0		
Cordilleran Flycatcher	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Dark-eyed Junco	0	0	0	0	0	18.3	0	16.6	0	12.4	0	6.7	0	1.2		

# BIRD MONITORING AT THE JGC

## Complete List of Birds Detected during Breeding Season (BSS) and Non-breeding Season (NBS) Surveys

Species	Number of Observations (detections/survey)															
	2015		2016		2017		2018		2019		2020		2021		2022	
	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS
Double-crested Cormorant	0	0.7	0	0	0.2	0.3	0.2	0	0.2	0	0.1	0	0	0		
Downy Woodpecker	0	0.8	0	0	0.4	1.4	0.6	0.4	0.3	1.2	0.8	0.7	0.6	1.2		
Eurasian Collared-Dove	0.8	2.3	1.5	1.5	0.8	14.6	1.8	3.6	1.3	6.6	1.6	5.8	0.8	2.4		
European Starling	2	5.8	4.8	4.8	4	403.1	2.8	154	5.5	432	5.9	36.2	2.4	23		
Evening Grosbeak	0	0.3	0	0	0	0.4	0	0.6	0	2	0	0	0	0		
Forster's Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Franklin's Gull	0.4	5.2	0	0	0.2	0.4	0	0	0	0	0	0	0.2	0		
Gadwall	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0		
Gray Catbird	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0		
Great Blue Heron	0	0	0.2	0.2	0	0.3	0	0.2	0	0	0	0.2	0	0		
Great Horned Owl	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Great-tailed Grackle	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0		
Greater Yellowlegs	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Green-winged Teal	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Hammond's Flycatcher	0	0	0	0	0	0.4	0	0	0	0.2	0	0	0	0		
Hermit Thrush	0	0	0	0	0	0.4	0	0.2	0	0.4	0	0.3	0	0		
Herring Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
House Finch	0.8	1.7	1.5	1.5	2	14.9	2.2	4.2	6.5	7	2.4	5.7	1.8	5		
House Sparrow	2	4.5	3.5	3.5	2.2	13.7	3.8	10.2	3.2	12.2	5.1	14.7	3.8	5.8		
Killdeer	0	0.2	0	0	0.2	0.1	0	0	0	0	0	0	0	0		
Lark Sparrow	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0		
Lazuli Bunting	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2		
Lesser Goldfinch	1.4	1.8	0.8	0.8	1.2	3.9	2.6	1	3.2	1.6	1.4	2.3	0.4	4		
Lincoln's Sparrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
MacGillivray's Warbler	0	0	0	0	0	0.1	0	0	0	0.4	0	0	0	0.2		
Mallard	1.6	4.2	3.8	3.8	2.2	30.9	2.8	24.2	3.3	41.4	4.9	19.8	2.2	12.4		
Marsh Wren	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Merlin	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0		
Mountain Chickadee	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Mourning Dove	2.4	1.2	1.7	1.7	1.4	0.9	0.8	0.4	0.2	1	3.4	0.2	0.6	0.6		
Nashville Warbler	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Northern Flicker	0	0	0	0	0	6	0	6.6	0	8	0	5.5	0	5.4		
Northern Harrier	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0		
Northern Mockingbird	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0		
Northern Pintail	0	0	0	0	0	1	0	0	0	0	0	0	0	0		
N. Rough-winged Swallow	0	0.5	0	0	0.4	0	0	0	0.2	0	0.4	0	0.8	0		
Northern Shoveler	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Olive-sided Flycatcher	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0		
Orange-crowned Warbler	0	0	0	0	0	0.3	0	0	0	1.2	0	0.8	0	0.4		
Pacific Wren	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0		
Pied-billed Grebe	0	0	0	0	0	1.1	0	0.4	0	0.4	0	0.8	0.2	0.8		
Pine Siskin	0	0.5	0	0	0	0	0	0	0	0.6	0.1	0	0	0		
Pinyon Jay	0	0	0	0	0	0	0	0	0	2.2	0	0	0	0		
Red-breasted Merganser	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2		

# BIRD MONITORING AT THE JGC

## Complete List of Birds Detected during Breeding Season (BSS) and Non-breeding Season (NBS) Surveys

Species	Number of Observations (detections/survey)															
	2015		2016		2017		2018		2019		2020		2021		2022	
	BSS	BSS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS
Red-breasted Nuthatch	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0	0	
Red-naped Sapsucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	
Red-tailed Hawk	0	0	0	0	0	0.7	0	1.6	0	0.8	0	0.5	0	0	0.2	
Red-winged Blackbird	0	0	0	0	0.2	0.7	0.2	12	0	38	0	0	0	0	2.4	
Redhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ring-billed Gull	0	0	0	0	0	1.6	0	2	0	3.8	0	5.3	0	1.2	0	
Ring-necked Pheasant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rock Pigeon	0	1.2	1.3	1.3	1	35.7	6.4	8.8	9.5	16	5.3	27.7	1.4	11.6	0	
Ruby-crowned Kinglet	0	0	0	0	0	4.7	0.2	0.4	1.3	3	0	1.7	0	1	0	
Sandhill Crane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Say's Phoebe	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	
Sharp-shinned Hawk	0	0	0	0	0	0.3	0	0.4	0	0.2	0	0	0	0	0	
Snow Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Snowy Egret	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
Solitary Sandpiper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Song Sparrow	0.2	0.8	0.3	0.3	1.2	1.6	1.4	0	0.2	4.2	1	1.2	1.2	1.2	0.8	
Sora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Spotted Sandpiper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Spotted Towhee	0	0	0	0	0	2.7	0	2	0	1.6	0	1	0	0	0.2	
Swainson's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Townsend's Solitaire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tree Swallow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Vesper Sparrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Warbling Vireo	0.2	0.3	0.3	0.3	1.2	0.1	0.4	0	0.5	0	0.3	0	0	0	0	
Western Kingbird	0	0	0	0	0.2	0	0	0	0	0.4	0	0	0	0	0	
Western Meadowlark	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	
Western Tanager	0	0.2	0.2	0.2	0.4	0.9	0.4	0	0.2	0.8	0	0	0	0	0.2	
Western Wood-pewee	0.2	0	0	0	0.4	0	0.4	0	0	0	0.1	0	0	0	0	
White-crowned Sparrow	0	0.2	0	0	0	0	0	0	0	4.8	0.1	0.8	0	0	0.6	
White-faced Ibis	0.2	0	0	0	0	0	0	0	0.2	30	0	0	2.4	0	0	
Willow Flycatcher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Wilson's Snipe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Wilson's Warbler	0	0	0	0	0	0.4	0	0	0	0.2	0	0.2	0	0	0	
Wood Duck	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	
Woodhouse's Scrub-jay	0	0	0	0	0	0.7	0	0.2	0	0	0	0	0	0	0.4	
Yellow Warbler	0.8	1.2	1	1	2	0.7	0.8	0	1.5	4	1.1	0	0	0	0.8	
Yellow-headed Blackbird	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	
Yellow-rumped Warbler	0	0.8	0.2	0.2	0	5.9	0.4	2.6	1.3	7	0.4	0.8	0.8	0.8	2	