COMMUNITY SCIENCE BIRD MONITORING AT GALENA SOÓNKAHNI

Project Report 2015-2019

Project Overview

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. This habitat is especially important for both resident and neotropical migratory birds of northern Utah; riparian areas are used by up to three fourths of all Utah bird species and can have up to fourteen times the density of birds as upland habitat (Knopf et al. 1988).

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 county 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).

Since 2015, Tracy Aviary has been conducting a community science bird monitoring project at Galena/Soónkahni (henceforth: Galena), a 250 acre preserve adjacent to the Jordan River. Managed by a number of stakeholders, including Utah Division of Forestry, Fire and State Lands, Utah Open Lands, and Salt Lake County, Galena is one of the largest areas of protected open space along the Jordan River corridor. With this bird monitoring study, Tracy Aviary volunteers help to collect information about how birds use the habitats at Galena, and how community composition changes throughout the site and over time. This information can help guide bird-friendly restoration and management strategies.

BIRD MONITORING STUDY GOALS:

- Generate baseline information about the birds present in the area
- Provide management recommendations with regard to practices that favor avian communities present in the riparian and upland habitat along the Jordan River.

Survey Methods

Figure 1. *Two community scientists conduct a breeding season point count survey at Galena. The Observer (left) detects and identifies all bird species present and the recorder (right) writes down all bird observations, weather, and site variables.*

Breeding Season Point Count Surveys

During April - July of each year, community scientists conducted ~5 breeding season point count surveys at 26 survey points in Galena (Figure 1). Point count surveys were conducted by pairs of community scientists between dawn and 10am. The 'observer' identified all birds seen and heard during a 6-minute period, and noted the number of individuals, distance, and direction. The 'recorder' 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 and cloud cover.

Figure 2. *A group of community scientists conduct a non-breeding season group survey at Galena. The group walks a transect through the site, identifies all bird species, and counts all birds present in the area.*

Non-breeding Season Group Surveys:

We supplemented data from point count surveys with 8 non-breeding group surveys conducted each year in January, February, March, August, September, October, November, and December. During non-breeding surveys, groups of community scientists lead by a trained Tracy Aviary staff member walked a transect through the site and noted all birds seen and heard in the area.

Each year we also took measurements of vegetation and habitat features at each sampling point.

Birds that Occur in Galena

During 5 years of breeding season surveys, we detected an average of 80 species per breeding season and 604.4 individual bird observations per survey. During non-breeding season surveys we detected an average of 97.2 species and 1333.3 individual bird observations (Figure 3).

Since 2015, we have documented a total of 159 bird species that occur at Galena.

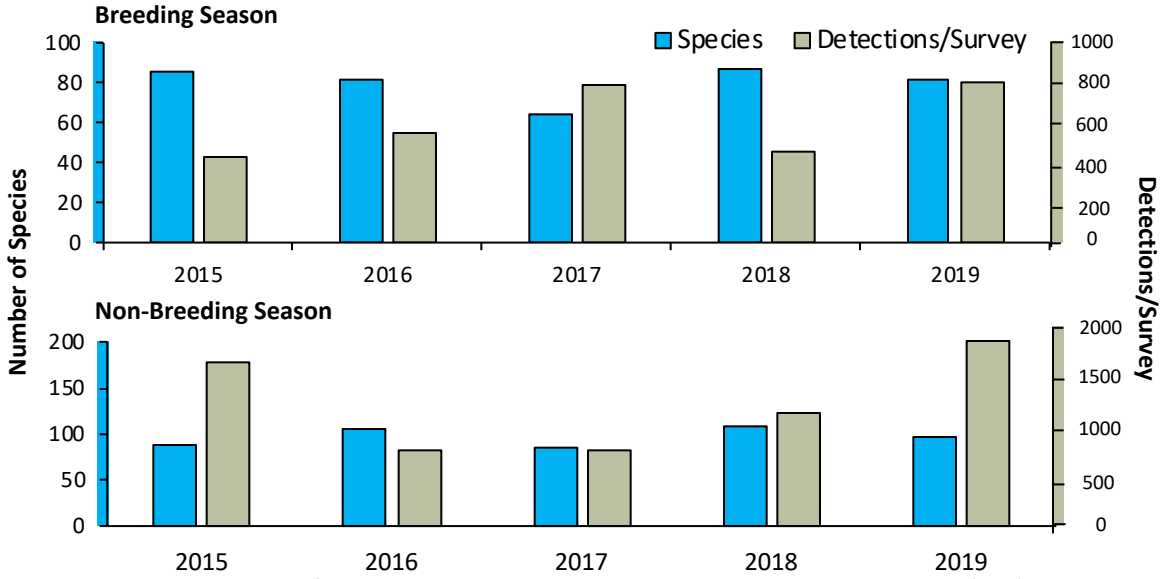


Figure 3. *Number of species and detections per survey during the breeding (top) and non-breeding (bottom) seasons of 2015-2019.*

Community Composition and Habitat Use Across Galena

Galena encompasses several different habitat types in different areas of the site (Figure 4), and we analyzed patterns in how different bird species use these areas. Based on similarities in the dominant trees, shrubs, groundcover, and water features present at each points, we classified them into six sections: north upland, north riparian, mid wetland, mid shrubland, mid grassland, and south riparian. We used point count data to calculate the relative abundance, or total number of observations per survey, of each species detected within 125m of each point. To explore patterns of species occurrence across the landscape, we separated species into family groups and habitat guilds, and noted how many observations of each we had in each section.

North Upland: Characterized by a distance of greater than 200m from the river, herbaceous and grass ground cover with interspersed Russian Olive trees and shrubs.

North Riparian: Characterized by a distance of less than 40m from the river, canopy cover greater than 30%, primarily Russian Olive, Cottonwood, and Tamarisk.

Mid Wetland: Characterized by canopy cover less than 30%, standing water for part of the year, and ground cover including sedges and other wetland vegetation.

Mid Grassland: Characterized by canopy cover less than 5%, no standing water, ground cover of grass and shrubs, including rabbitbrush, snakeweed, and greasewood.

Mid Shrubland: Characterized by canopy cover less than 10%, no standing water, shrub cover over 20%, primarily rabbitbrush and greasewood.

South Riparian: Characterized by distance less than 115m from river, canopy cover of Russian Olive, Tamarisk, and Willow.

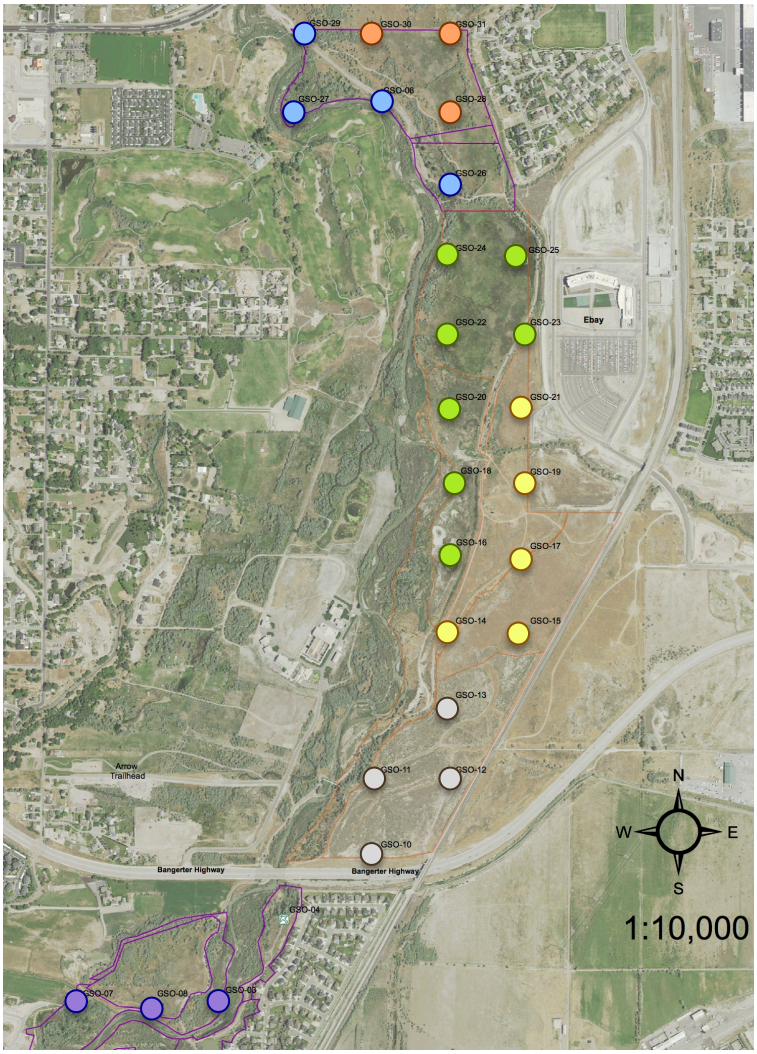


Figure 4. *Bird sampling points and habitat types at Galena.*

Species Richness and Detection Rates in each Habitat Section

In 2015 through 2019, species richness and detections per survey were on average higher in the riparian and wetland sections than the upland, shrubland, and grassland sections.

The highest average species richness and detection rate was in the South Riparian Section, with an average species richness of 24.1 per point and an average detection rate of 21.5 birds detected per survey. In comparison, the Mid-Grassland section had an average species richness of 13.36 per point and an average detection rate of 9.3 birds detected per survey.

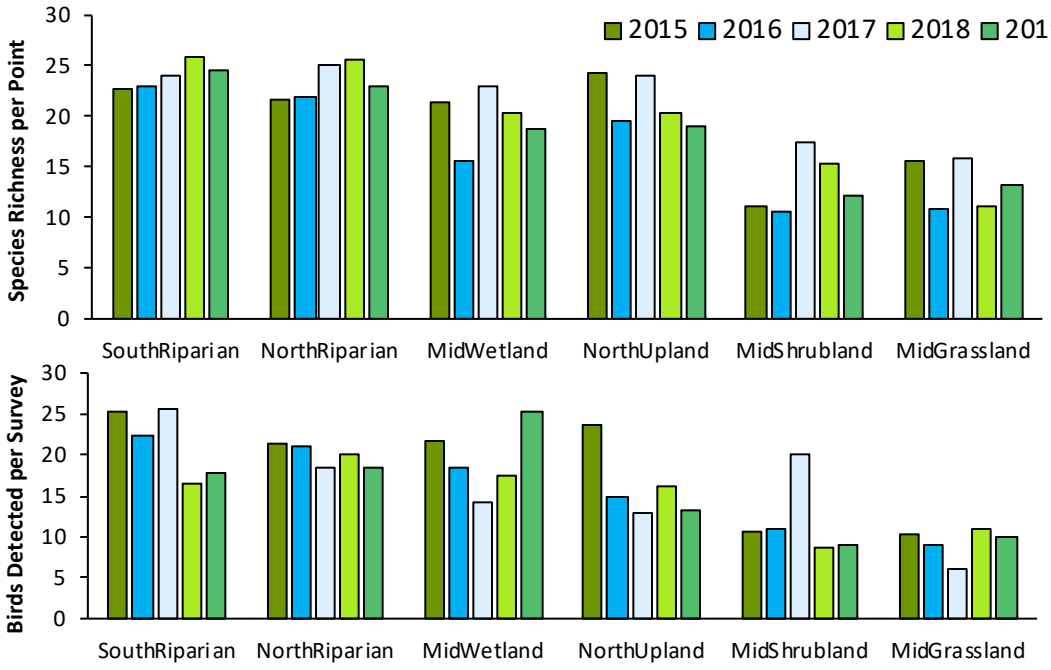


Figure 5. *Species richness (top) and bird detections per survey (bottom) for each habitat section during 2015-2019.*

Community Composition in each Habitat Section – Taxonomic Families

Although overall community composition was fairly consistent across habitat types, we had a few differences in proportions of bird detections of different species from different families (Figure 6). We found the highest proportion of warblers and sparrows in the riparian and wetland sections. We had high numbers of swallows throughout the site, but especially high proportions in the grassland and wetland section. Non-native species, such as old world sparrows and starlings, were found in higher numbers in the upland and grassland sections.

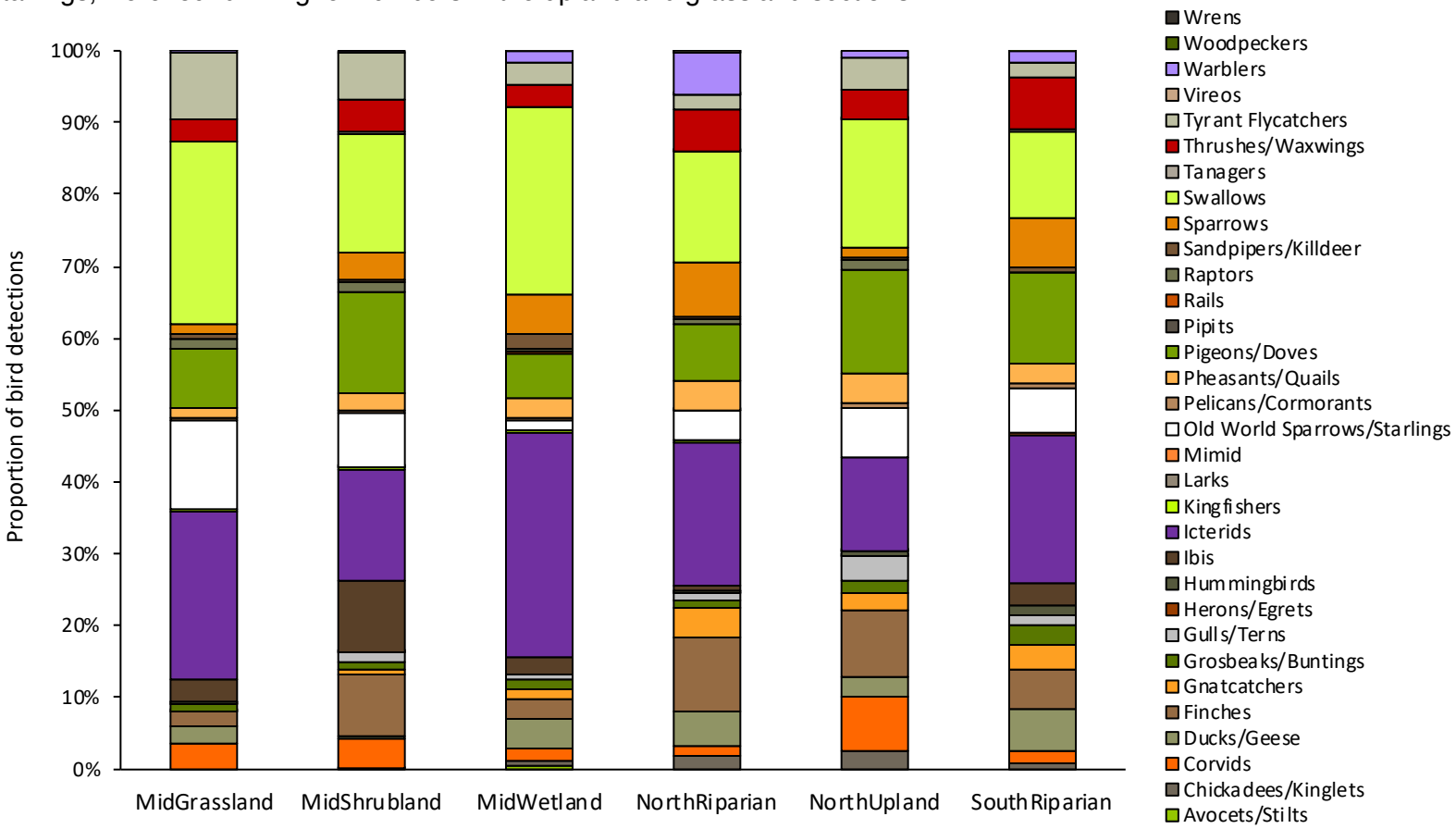


Figure 6. *Proportion of bird detections from different bird families in each habitat section.*

Community Composition in each Habitat Section – Habitat Guilds

We also found differences in the proportion of birds from different habitat guilds within each habitat type (Figure 7) We had higher proportions of forest-associated birds in the riparian, wetland, and the northern upland sections. The smallest proportion of urban-adapted species were in the northern riparian section, while the highest proportion of these species were found in habitat sections closest to the edges of the property: in the mid-shrubland and grassland areas.

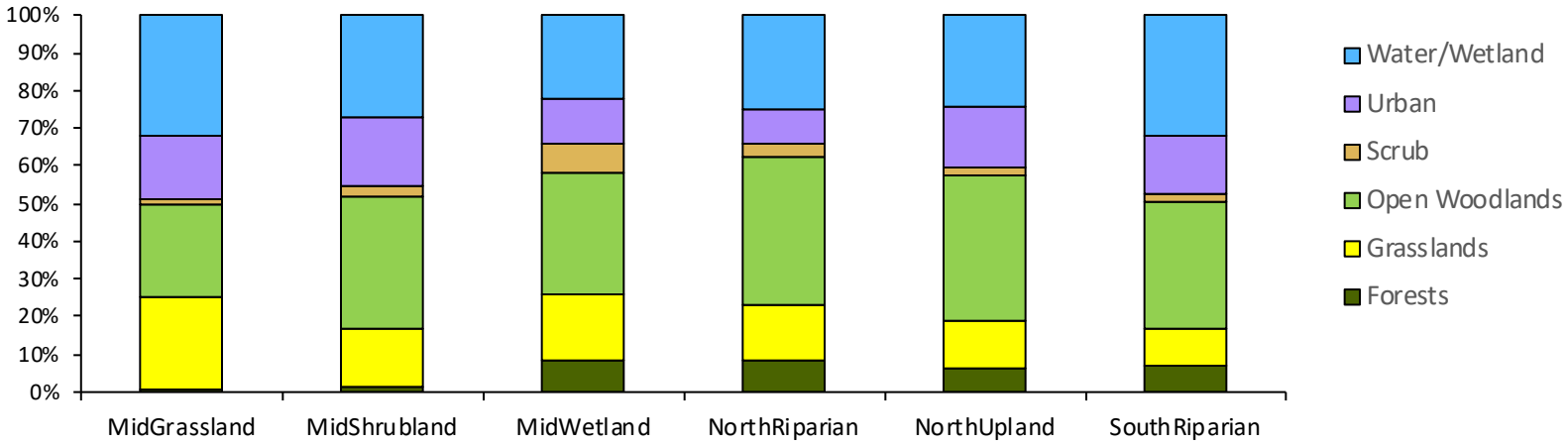


Figure 7. *Proportion of bird detections from different bird families in each habitat section.*

Comparison to other Jordan River Sites

We compared the bird community at Galena with a sample of 6 other sites that we monitor along the Jordan River (Figure 8). These sites contain 25 sampling points located within lowland riparian habitat surrounding the river. We compiled data from 2019 breeding season surveys at all sites between April and July 2019. We classified bird species in three different ways. First we determined whether they were native or non-native to the area. Second, we classified them as urban-adapted or urban-neutral/urban-avoider based on classification developed by Wood et al. (2014). Finally, we classified them according to their association with riparian vegetation; species were classified as riparian-associated when >60% of nests/abundance are in riparian vegetation (Bureau of Land Management 1998, Young et al. 2013). For each survey, we calculated the number of species of each group that were detected within 125m of the sampling point. We used an independent samples t-test to test for significant differences between the proportion of non-native species, urban-adapted species, and riparian-associated species detected in Galena and other Jordan River comparison sites.

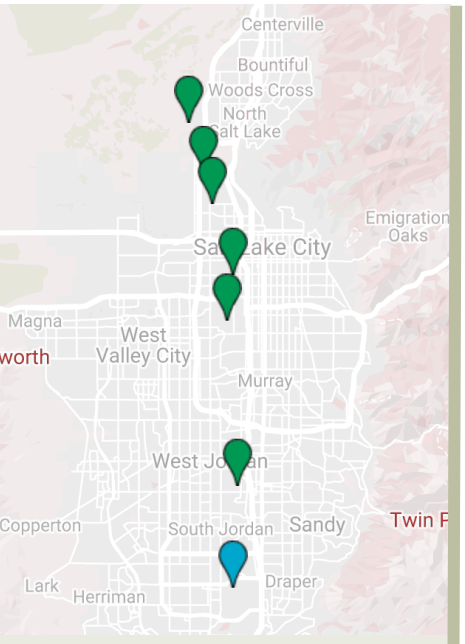


Figure 8. Map of the location of Galena (blue) and other study areas used as Jordan River Comparison sites (green).

Compared to the other Jordan River Sites, Galena appears to have a fairly healthy bird community. Galena had a slightly lower proportion of detections per survey of non-native and urban-adapted species than other Jordan River Comparison sites, and a slightly higher proportion of riparian-associated species. However, these trend were not statistically significant (independent samples t-tests, p>0.05).

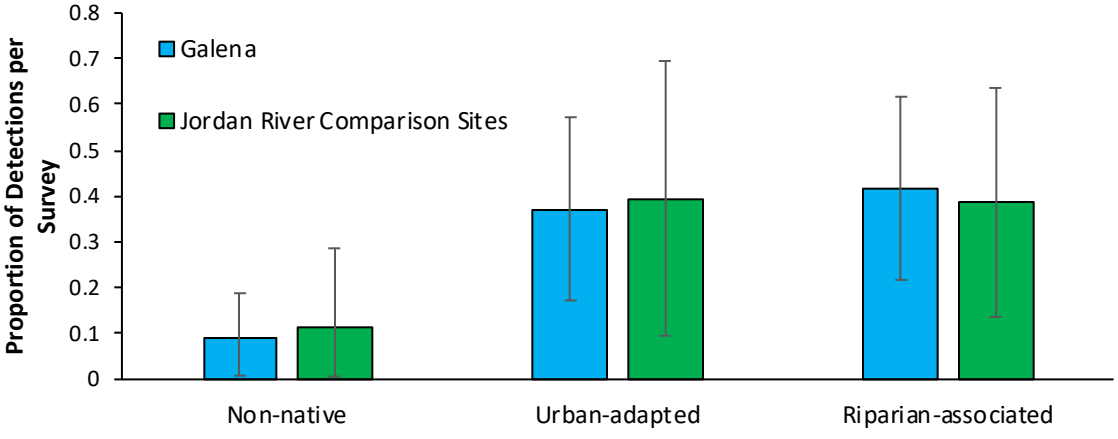


Figure 9. Average proportion and standard deviation of detections of non-native, urban-adapted, and riparian-associated birds at Big Bend (blue) and Jordan River Comparison sites (green).

Trends over time:

There will naturally be some variability in bird occurrence numbers across years, and many of the small differences we saw year-to-year in our bird survey numbers likely reflect changes in weather, food availability, or other larger scale factors. However, we noticed a few consistently positive or negative trends in relative abundance (number of detections per survey) for several bird species during the breeding (Figure 10) and non-breeding seasons (Figure 11) that could reflect changing site conditions at Galena, and may merit further investigation.

Breeding Season (April – July) Trends Over Time:

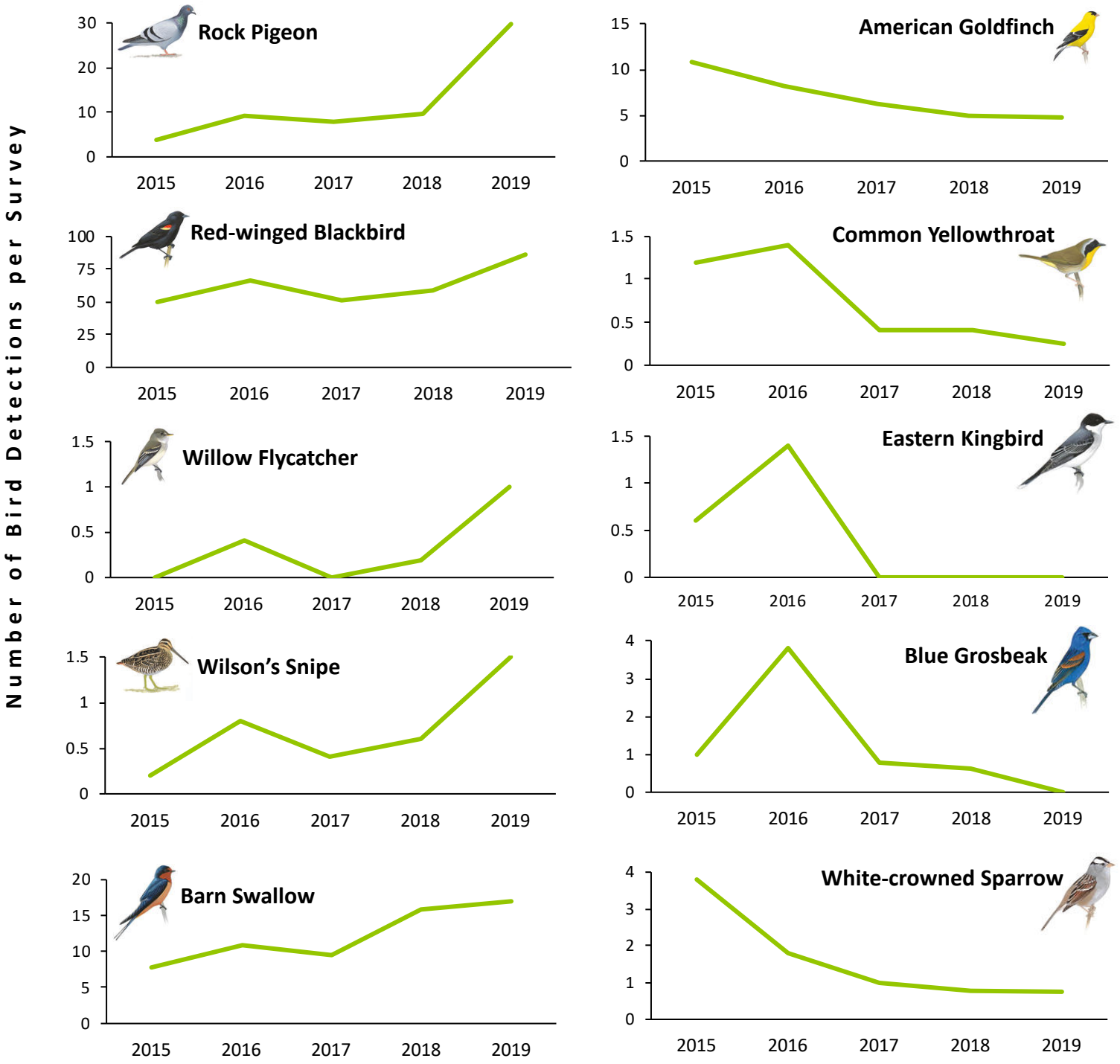


Figure 10. *Positive (left) and negative (right) trends in the relative abundance (i.e., number of bird detections per survey) of select bird species during the breeding season (April – July) at Galena.*

Non-breeding Season (August – March) Trends Over Time:

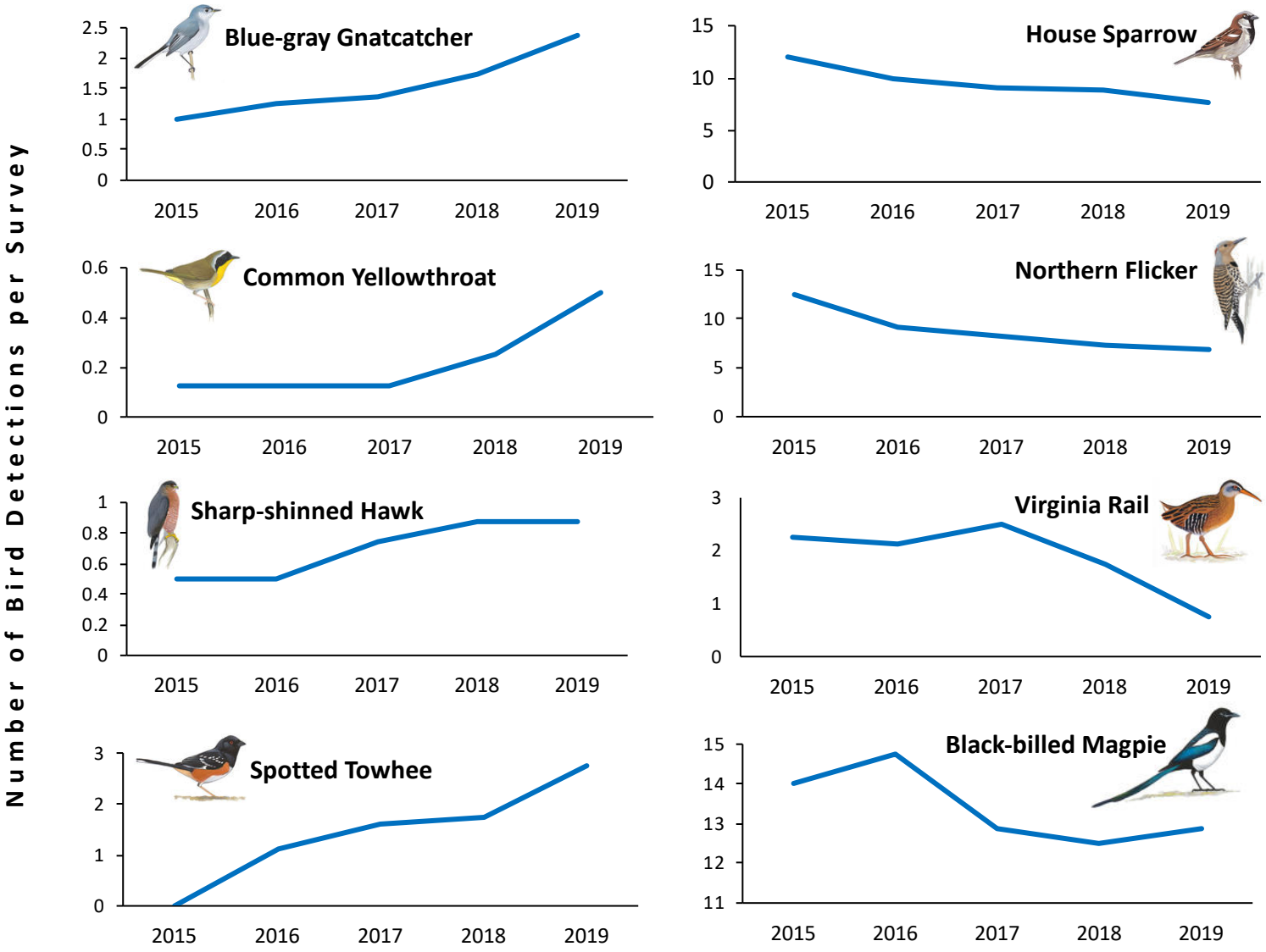


Figure 11. *Positive (left) and negative (right) trends in the relative abundance (i.e., number of bird detections per survey) of select bird species during the non-breeding season (August – March) at Galena.*

Species of Conservation Interest

Since we began monitoring, we have documented several bird species of local conservation interest at Galena, including:

Blue Grosbeak

The Blue Grosbeak breeds in lowland riparian habitat, and has been largely extirpated from the Jordan River as the riparian habitat has been degraded over time. To our knowledge, Galena was the only site along the Jordan River where Blue Grosbeaks regularly nested. Unfortunately, we did not detect Blue Grosbeak during the breeding season in 2019.

Willow Flycatcher

The Willow Flycatcher is associated with healthy lowland riparian habitat. Although they are declining in Utah due to a loss of riparian habitat and pressure from brown-headed cowbirds, we have seen an overall increase in Willow Flycatchers at Galena over the past five years.

Common Yellowthroat

The Common Yellowthroat breeds in wetlands and lowland riparian habitat in Utah. They occur sporadically along the Jordan River corridor, but are detected regularly at Galena. For reasons that we have not yet determined, their numbers have been increasing during the non-breeding season, but decreasing during the breeding season.

American White Pelican

The American White Pelican is listed as a Species of Greatest Conservation Need on the Utah Wildlife Action Plan (2015-2025). We regularly observe pelicans on stretches of the river at Galena.

Long-eared Owl

The Long-eared Owl nests in lowland and mountain riparian habitats in Utah. We have detected long-eared owls roosting in several intact stands of Russian Olive at the northern section of the site.

Virginia Rail

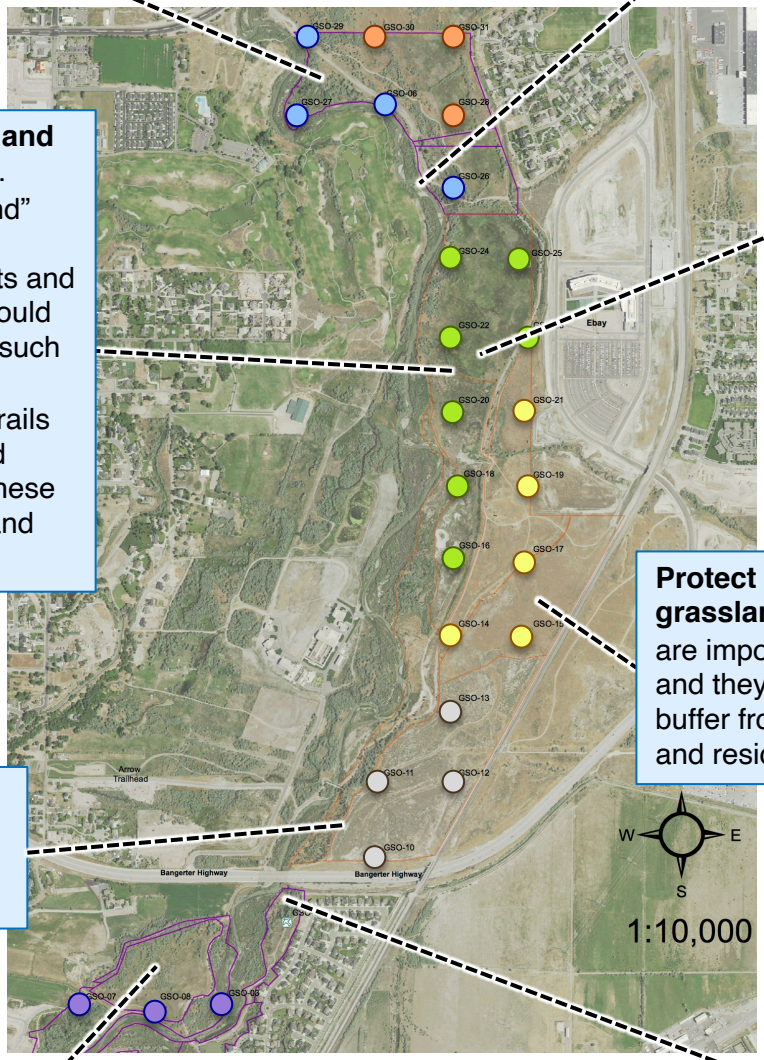
The Virginia Rail uses wetland habitat in Utah, and is found regularly in 2-3 territories at Galena. Unfortunately we've seen a decline in rail numbers, likely due to development and habitat disturbance near one of the wetland areas.

Management and Restoration Recommendations

Based on our monitoring data, we recommend the following bird-friendly restoration and management actions:

Promote vertical structure and canopy cover throughout the riparian zones within the site by protecting existing trees 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).



Add and enhance wetland and ephemeral water elements. Especially in the "mid-wetland" area of the site, enhancing ephemeral water components and adding wetland vegetation could enhance habitat for species such as Red-winged and Yellow-headed Blackbirds, Virginia rails and Sora, Marsh Wrens, and Common Yellowthroats. In these areas, maintain native forb and sedge species.

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.

Protect upland shrub and grassland habitat: These habitats are important for many bird species, and they provide the riparian area a buffer from the surrounding roads and residential development.

In addition to canopy trees, include shrubs and other understory species when re-vegetating an area.

Maintain standing dead trees to provide habitat for cavity-nesting species, such as chickadees, nuthatches, screech-owls, and woodpeckers. Avoid complete removal if possible; cutting them to a height of 10ft can mitigate safety concerns while still providing cavity habitat.

Plant in "clumps" and "strips": concentrate plantings in clumps that mimic natural establishment of vegetation, and connect patches of existing habitat with strips of continuous vegetation that are at least 3-10m wide. This helps birds disperse through the site to unoccupied but suitable habitat patches.

COMPLETE LIST OF BIRDS DETECTED DURING BREEDING SEASON SURVEYS (BSS) AND NON-BREEDING SEASON SURVEYS (NBS) AT GALENA IN 2015 - 2019

Species	Number of Observations (detections/survey)									
	2015		2016		2017		2018		2019	
	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS
Red-winged Blackbird	50	25.88	66.2	21	52	47.75	58.6	34.3	86.25	17.3
Song Sparrow	28	10.38	29.4	10	23.4	8.75	26	7.88	21	10.1
Bullock's Oriole	26.4	0.5	38.4	0.5	26.8	0.375	34.2	0	33.5	0.13
Mourning Dove	25	9.5	28.6	5.3	20.4	7.75	27.4	10.6	31.75	10.1
American Robin	24	92.75	28.2	98	12.2	68.38	25.2	82	22.5	168
Black-billed Magpie	22.4	14	23.6	15	20.8	12.88	19.2	12.5	22.25	12.9
Western Meadowlark	15.6	0.25	15	0.3	3.8	0.375	5.8	1.25	8.5	1
Western Kingbird	14.6	2.125	17.8	2.1	20	0.625	14.8	0.88	21.5	1.13
Mallard	14	99.5	13.8	66	9	75.13	11.6	51.1	22	60.4
American Goldfinch	10.8	8.125	8.2	6.6	6.2	9.375	5	9.38	4.75	9.75
Brown-headed Cowbird	10.6	0	18.6	0.3	9.8	0	10.4	0	15.5	0
House Finch	9.8	30.5	5.8	12	5.2	11.88	7.2	21	12.75	15.5
California Quail	9.6	9.625	18.2	11	5.4	3	10.4	2.38	10.75	6.63
Canada Goose	9.2	169.4	5.2	110	4.2	128.1	8	148	35.5	197
Cliff Swallow	9.2	0.25	9.8	1.3	15.6	0	8.2	0	85.25	0
Blue-gray Gnatcatcher	9	1	11.8	1.3	9	1.375	9.8	1.75	9.75	2.38
Barn Swallow	7.8	7.75	11	11	9.4	22	16	13.4	17	15.9
Yellow Warbler	7.8	0	10.2	2.3	7	1.25	10.2	1.63	8.75	1.75
Northern Rough-winged Swallow	7.6	5.5	12.4	4.3	11.8	1.5	11.4	1.25	17.25	5.75
European Starling	7.2	1051	8	221	6.2	133.3	10.4	569	16	1205
Black-headed Grosbeak	7	0.125	10	0.4	6.6	0.375	7.2	0.13	3.5	0.13
Ring-necked Pheasant	6.6	0.75	19.8	0.8	10.6	1.75	27	1.5	23.75	1.75
Yellow-headed Blackbird	5	0.25	5.6	2.5	2.4	11.38	0.8	0.13	3	0.5
Lesser Goldfinch	4.4	3.875	4.6	5.1	4	1.75	6.8	2	14	7.38
Black-capped Chickadee	4.2	5.75	8.8	5	4.4	4.125	3.4	4.88	6.5	8
Killdeer	4	0.5	7.4	0.8	1.8	0.875	5	0.63	6.75	0.63
Lazuli Bunting	4	0.5	3.6	0.8	0	0.75	0.2	1.25	0.75	1.5
Rock Pigeon	3.8	19.63	9	35	8	126	9.6	60.3	29.75	62.3
White-crowned Sparrow	3.8	40.5	1.8	19	1	12.5	0.8	24.4	0.75	35.3
Bank Swallow	3.6	2.875	5	0.8	1.6	0.875	3.4	3.75	5	12
Cedar Waxwing	3.4	25.88	0	8.8	0	1.375	0.6	8.38	3.75	9.63
American Kestrel	3	1.75	6.2	1.4	6.8	2	4.6	2.75	3.25	3.38
Black-chinned Hummingbird	2.6	0.75	2	3	1.4	1.25	2	1.75	1.75	2
American White Pelican	2.2	1.875	4	0.4	1.4	0	3.2	0	3	2.5
Spotted Sandpiper	2.2	3.375	3.8	0	0.2	0.25	1.6	0	4	0.13
Double-crested Cormorant	2	0.125	4	0.1	0.6	0	0.2	0.13	2.5	3.38
Red-tailed Hawk	1.8	2.75	3.6	4.1	2.6	5.5	3.8	3.88	3.5	4.88
Belted Kingfisher	1.6	0.625	2.2	0.3	1.2	1.5	3.4	0.38	0.75	1.13
White-faced Ibis	1.6	10.75	2	5.5	6.2	3.875	3.2	41.8	10.25	9.38
American Avocet	1.4	0	0.2	0	0	0	0.2	0.13	2.5	0.13
Tree Swallow	1.4	0.125	0	0	0	0	1	0.25	4	0.38
California Gull	1.2	0.625	3.2	3.8	2.4	1.5	1.4	0.38	5.5	0.63
Common Yellowthroat	1.2	0.125	1.4	0.1	0.4	0.125	0.4	0.25	0.25	0.5
Blue Grosbeak	1	0.25	3.8	0	0.8	0	0.6	0	0	0

COMPLETE LIST OF BIRDS DETECTED DURING BREEDING SEASON SURVEYS (BSS) AND NON-BREEDING SEASON SURVEYS (NBS) AT GALENA IN 2015 - 2019

Species	Number of Observations (detections/survey)									
	2015		2016		2017		2018		2019	
	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS
Common Raven	0.8	0.375	0.4	1.1	0.4	0.75	1	2	0.75	1.25
Marsh Wren	0.8	1.625	0.2	1.3	0	0.5	0	1.5	0	1.88
Ruby-crowned Kinglet	0.8	0.375	0.2	0.1	0	0.125	0.2	0.5	0	0.5
Caspian Tern	0.6	0.25	0.4	0.8	1	0.125	1.2	0.5	1	0
Cinnamon Teal	0.6	0	1.6	0.9	0.2	0	1.4	0	0.75	0
Eastern Kingbird	0.6	0	1.4	0	0	0.125	0	0.88	0	0
Eurasian Collared-Dove	0.6	2.125	3.6	2.8	1.6	9.75	3.4	6.5	3.5	6.88
Franklin's Gull	0.6	0.875	3.6	1.5	1.6	0.125	0.4	0	1.75	7.88
House Sparrow	0.6	12	1.4	10	0.6	9	1.6	8.88	2	7.63
Northern Flicker	0.6	12.5	0	9.1	0	8.125	0.2	7.38	0	6.88
Swainson's Hawk	0.6	0.5	0	0.6	3.4	0.75	2	0.25	2	0.5
Violet-green Swallow	0.6	0	0	0	0	0	0	0.13	0.25	0.25
Yellow-rumped Warbler	0.6	14.38	2	16	0.2	7.125	0.2	7.75	2.25	11.4
American Coot	0.4	7.75	0	5	0.2	6	0.2	4	0.5	1.88
Chipping Sparrow	0.4	0	0	0.8	0	0.125	0	0.75	0	0.13
Forster's Tern	0.4	0	0	0	0.2	0	0	0	0	0
Fox Sparrow	0.4	0	0	0	0	0	0	0	0	0
Gray Catbird	0.4	0	0	0	0	0	0.2	0.13	0	0
Great Blue Heron	0.4	0.75	0.2	0.4	0	1.625	0.2	1.25	0.5	0.38
Spotted Towhee	0.4	0	1.4	1.1	0	1.625	0.4	1.75	0.5	2.75
Western Tanager	0.4	0.25	0.6	1	0.8	0.125	0.4	1	1.25	0.25
American Pipit	0.2	4.125	0	0.5	0	3.625	0.2	3.13	0	1.13
Black-necked Stilt	0.2	0	0	0	0	0	0	0	0	0
Brewer's Blackbird	0.2	0	1.6	0	0	0	2.4	0	0.5	0
Common Merganser	0.2	0	0	2.3	0	0.375	0	0.13	0	0.13
Cooper's Hawk	0.2	1.375	0.2	0.5	0	0.75	0	0.75	0	0.63
Dusky Flycatcher	0.2	0	0	0	0	0	0	0.13	0.5	0
Evening Grosbeak	0.2	4.875	0.2	0	0	4.25	0.2	1.25	0	1.13
Green-winged Teal	0.2	1.5	0.4	5.1	0	0.25	0	0.88	1	0.5
Lark Sparrow	0.2	0	0	0.1	0	0	0.2	0.38	0	0.63
Lincoln's Sparrow	0.2	0.25	0	0.3	0	0	0	0.38	0	0.5
Loggerhead Shrike	0.2	0	0	0	0	0	0	0.38	0	0
Long-billed Curlew	0.2	0	0	0	0	0	0	0	0.25	0
Pine Siskin	0.2	0.125	0.6	0	0	0	0	0	0	0.38
Savannah Sparrow	0.2	0	0.2	0	0	0	0	0.13	0	0
Say's Phoebe	0.2	0	0.6	0	0.2	0.25	0.4	0.38	0.75	0.13
Sharp-shinned Hawk	0.2	0.5	0	0.5	0.2	0.75	0.8	0.88	0	0.88
Sora	0.2	0	0	0.1	0	0	0.4	0.13	0	0.13
Turkey Vulture	0.2	0.125	0.8	1	0	0	0.6	0.38	2	0.13
Wilson's Snipe	0.2	0.125	0.8	0	0.4	0.25	0.6	0.13	1.5	0.25
Wilson's Warbler	0.2	0	0.6	0.1	0	0	0	0.88	0.5	0
Yellow-breasted Chat	0.2	0	5.6	0	0.2	0	0.8	0	1	0
American Crow	0	15.38	0	0.8	0	0	0.4	2	0	0
American Tree Sparrow	0	0.625	0	1	0	0.5	0	0.25	0	0.13

COMPLETE LIST OF BIRDS DETECTED DURING BREEDING SEASON SURVEYS (BSS) AND NON-BREEDING SEASON SURVEYS (NBS) AT GALENA IN 2015 - 2019

Species	Number of Observations (detections/survey)									
	2015		2016		2017		2018		2019	
	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS
American Wigeon	0	1	0.2	0	0	16.13	0	0.38	0	0.5
Bald Eagle	0	0	0	0	0	0	0	0	0	0.25
Barn Owl	0	0	0	0.1	0	0.125	0.2	0	0	0.25
Barrow's Goldeneye	0	0	0	0.1	0	0	0	0	0	0
Black-crowned Night Heron	0	0	0.4	0	0.4	0	0	0	0	0
Blue-winged Teal	0	0	0	0	0	0	0	0	0.25	0
Brewer's Sparrow	0	0	0.6	1	0	0.375	0.2	2.38	0	0.38
Broad-tailed Hummingbird	0	0.125	0.2	0	0	0	0.2	0.13	0.75	0
Bufflehead	0	0	0	0.5	0	0.25	0	0	0	0
Cackling Goose	0	0.125	0	0	0	0	0	0.5	0	0.13
Calliope Hummingbird	0	0	0	0.1	0	0	0	0	0	0
Cassin's Vireo	0	0	0	0.1	0	0	0	0	0	0
Common Goldeneye	0	0.25	0	1.3	0	1.625	0	0.75	0	0.63
Common Grackle	0	0	0	0	0	0	0.2	0	0	0
Dark-eyed Junco	0	4.5	0.2	4.8	0	4	0.2	5.38	0	10.8
Downy Woodpecker	0	0.625	0.4	0.5	0.2	0.5	0	0.63	0.25	0.88
Eared Grebe	0	0	0	0	0	0	0	0	0.25	0
Eastern Bluebird	0	0	0	0	0	0.25	0	0	0	0
Ferruginous Hawk	0	0	0	0	0	0	0	0.13	0	0
Gadwall	0	5	0	1.6	0	2.75	0.2	1.25	0	0.13
Golden Eagle	0	0	0	0	0	0	0.2	0	0.5	0
Grasshopper Sparrow	0	0	0.2	0	0	0	0	0.13	0	0
Great Egret	0	0	0.4	0	0	0	0	0	0	0
Great Horned Owl	0	0	0.2	0.1	0.2	0.125	0	0	0	0
Great-tailed Grackle	0	0	0	0.1	0.2	0	0	0.88	0.75	0
Green-tailed Towhee	0	0	0.2	0.1	0	0	0	0	0	0
Hammond's Flycatcher	0	0	0	0.1	0	0	0	0.13	0	0
Hermit Thrush	0	0	0	0.3	0	0.125	0	0.13	0	0.25
Herring Gull	0	0	0	0.3	0	0	0	0	0	0
Hooded Merganser	0	0.625	0	0.3	0	0	0	0	0	0
Horned Lark	0	0.5	0	0	0	0	0	0.25	0.25	0.25
House Wren	0	0	0	0.1	0	0	0	0	0	0
Lesser Scaup	0	0.125	0	0	0	0	0	0	0	0
Long-eared Owl	0	0	0	0	0	0	0	0.13	0	0
MacGillivray's Warbler	0	0	0	0.4	0	0	0.4	0.13	0.5	0
Merlin	0	0.125	0	0.1	0.2	0	0	0.13	0	0
Mexican Duck	0	0	0	0	0	0.125	0	0	0	0
Mountain Bluebird	0	0	0	0	0	0	0	0.13	0	0
Nashville Warbler	0	0	0	0.4	0	0	0	0.38	0	0.13
Northern Goshawk	0	0	0	0	0	0.125	0	0	0	0
Northern Harrier	0	0.5	0	0.8	0	0.875	0	0.13	0	1.75
Northern Pintail	0	0.375	0	1.4	0	0	0	0	0	0.13
Northern Shoveler	0	1.375	0	0.3	0	0	0	0	0	0
Northern Shrike	0	0	0	0.1	0	0	0	0	0	0

COMPLETE LIST OF BIRDS DETECTED DURING BREEDING SEASON SURVEYS (BSS) AND NON-BREEDING SEASON SURVEYS (NBS) AT GALENA IN 2015 - 2019

Species	Number of Observations (detections/survey)									
	2015		2016		2017		2018		2019	
	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS	BSS	NBS
Olive-sided Flycatcher	0	0	0	0.1	0	0	0	0	0	0
Orange-crowned Warbler	0	0.25	0	0.6	0	0.125	0	0.75	0	1.25
Osprey	0	0.125	0	0	0	0	0	0	0.75	0.13
Peregrine Falcon	0	0	0	0	0	0	0.2	0	0.25	0
Pied-billed Grebe	0	1.25	0	0.6	0	0.25	0	0.38	0	0.25
Prairie Falcon	0	0	0	0	0	0	0	0.13	0	0.38
Ring-billed Gull	0	4	0	12	0.2	3	0	0.88	0.25	2.38
Ring-necked Duck	0	0	0	0	0	0.125	0	0	0	0.25
Ross's Goose	0	0	0	0.1	0	0	0	0.13	0	0
Ruddy Duck	0	0	0	0	0	0	0.2	0	0	0
Rufous Hummingbird	0	0	0	0	0	0	0	0.25	0	0
Sandhill Crane	0	0	0	0.1	0.2	0	0	0.38	0	0
Snowy Egret	0	0.125	0	0	0	0	0.2	0	0	0
Swamp Sparrow	0	0	0	0	0	0	0	0	0	0.13
Tennesse Warbler	0	0	0	0	0	0	0	0.13	0	0
Townsend's Solitaire	0	0	0	0	0	0	0	0	0.25	0.38
Tundra Swan	0	0	0	2.6	0	0	0	0	0	0
Vesper Sparrow	0	0.5	0.2	0	0	0.25	0	0.38	0.25	0
Virginia Rail	0	2.25	1	2.1	0.2	2.5	0.4	1.75	0.75	0.75
Warbling Vireo	0	0.125	0.2	0.1	0	0	0.4	0	0.25	0.13
Western Screech-owl	0	0.25	0	0	0	0.25	0	0	0	0
Western Wood-pewee	0	0	1.4	0.1	0	0	0.2	0.13	0	0
White-throated Sparrow	0	0	0	0	0	0	0	0.13	0	0
Willow Flycatcher	0	0	0.4	0.1	0	0.125	0.2	0	1	0
Wilson's Phalarope	0	0	0	0	0	0	0	0	0	0.25
Wood Duck	0	1.125	0	0.1	0	0.5	0	0	0	0.25
Woodhouse's Scrub-Jay	0	0	0	0	0	0.125	0	0.13	0	0.13

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