



BIRD POPULATION AND HABITAT TREATMENT EFFECTS AT THE LAS VEGAS WASH, 2005–2020



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Cover photo: Las Vegas Wash #22A, 7 December 2019. Photo by Ned Bohman.

Abstract

In 2020, Great Basin Bird Observatory completed the 12th year of bird surveys and vegetation assessments along an 8.7-km stretch of the Las Vegas Wash (hereafter: Wash). This effort accompanies the Las Vegas Wash Coordination Committee's (LVWCC's) stabilization and enhancement project designed to prevent erosion and increase native habitat in the Wash. By the fall of 2020, the LVWCC had constructed all 21 planned weirs, greatly reduced tamarisk, and revegetated over 200 ha with native plants.

In this report, we summarize bird species occurrence, trends in richness and abundance, and restoration treatment effects over the course of the project. In each of the first 11 years of data collection, bird surveys were completed year-round every two weeks using 29 (later amended to 31) permanently established survey points. In this 12th year of data collection, three surveys were eliminated during the early breeding season due to the coronavirus pandemic. Once a year, in the fall, vegetation assessments were conducted at each survey point.

A total of 237 bird species have been recorded, constituting approximately 48% of the total bird species richness recorded in Nevada. Of these, 57 are conservation priority species according to conservation rankings by regional bird initiatives.

Average species richness and total abundance increased significantly over the project period, particularly in the six most recent years of Wash surveys. Species-specific trends were mixed with five species showing significant declines and 11 showing significant increases over the study period. Several of the declining birds are riparian shrub-associated, including non-native shrubs, and many of the species with increasing trends are marsh- or water-dependent.

Four of the six currently- or recently-declining species were found in significantly greater numbers in intermediate and older vegetation, indicating that allowing vegetation to mature will likely result in their recoveries. Two other species showed more complex relationships with treatment status, indicating that their recovery may require direct intervention to increase shrub density and increase shrubs adjacent to water. Recently-revegetated (post-construction) sites showed increased total numbers and American Coots, likely reflecting the weir construction and subsequent increase in water and wetland habitats. Species richness did not differ by treatment status.

In this report, we note a marked shift in the bird community along the Wash in the past six years (2014–2020) of the project, as species richness and abundance significantly increased relative to the first six years of surveys (2005–2011). These increases are largely the result of increased wetland formation resulting from weir construction along the Wash. Riparian shrub-associated species are expected to recover more slowly than the marsh- and water-associated species. While major weir construction along the Wash is complete, a stabilization facilities assessment concluded that approximately 26 ha of marsh and riparian habitat would need to be cleared from the channel to ensure facilities function as designed. We recommend proactive measures to increase riparian shrub habitats, including addressing shrub density and proximity to water.

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Introduction

The Las Vegas Wash (hereafter: Wash) is the primary drainage of the Las Vegas Valley Hydrographic Basin and is located in the southeastern portion of Las Vegas Valley. The Wash extends approximately 20 km, flowing through the Clark County Wetlands Park (Figure 1) and terminating in Las Vegas Bay of Lake Mead. While the Wash was historically ephemeral, it has become a perennial riverine and wetland complex due to drainage of treated wastewater and urban runoff, as well as a shallow groundwater table. From the increasing Las Vegas Valley discharge, the Wash began to degrade through channel downcutting, which led in 1998 to the formation of the Las Vegas Wash Coordination Committee (LVWCC), a stakeholder group that includes local, state, and federal agencies; citizens; businesses; a university; and environmental groups. The LVWCC developed the Las Vegas Wash Comprehensive Adaptive Management Plan that recommended measures to halt the channel degradation, restore riparian and wetland habitats, and conduct wildlife monitoring (LVWCC 2000). In 2000, implementation of this plan began and continues to the present. Plan activities include installing weirs and bank protection to halt erosion, and extensive vegetation improvements through tamarisk (*Tamarix ramosissima*) control, revegetation with native woodland species, and other plantings. For more details on the history of these efforts, see Braden et al. (2009). The plan also led to the creation and implementation of the Las Vegas Wash Wildlife Management Plan, which contains 31 recommended actions designed to conserve native species, protect and enhance their habitats, and increase community awareness of these resources (Shanahan et al. 2008).

In 2005, the San Bernardino County Museum, in conjunction with the Southern Nevada Water Authority (SNWA; the lead agency of the LVWCC), began point count bird surveys along an 8.7-km reach of the Wash (Braden et al. 2007, 2009). The purpose of these bird surveys was to (1) inventory bird populations and bird habitat parameters to provide a baseline dataset, (2) set up a long-term monitoring program that is designed to document the benefits of project activities, and (3) assist in the adaptive management process by providing valuable insight on which activities are effective and in what time frame. The museum conducted four years of surveys which are summarized in Braden et al. (2009). Our report summarizes 12 years of surveys: the four years conducted by the museum, and the eight years conducted by the Great Basin Bird Observatory (GBBO; 2009–2011 and 2014–2020, respectively), for which we

analyzed all data to characterize bird community structure, population trends, and treatment effects related to construction and restoration. Habitat changes through the 14th year of the project were reported in GBBO (2020).

Methods

Study Area

The study area encompasses 8.7 km of the Wash from the Upper Diversion Weir to just downstream of the Powerline Crossing Weir (Figure 1). Twenty-nine points were established in 2005, and later additions and a deletion yielded 31 points by the end of 2006. The survey points are arranged along both sides of the Wash (Figure 1) at evenly-spaced intervals to monitor the bird community and vegetation where channel modification and revegetation has occurred or will occur, as well as in areas where project activities are unlikely to occur (Braden et al. 2007), providing a broad cross-section of the different habitat types found at the Wash. The site's upland vegetation falls into the Mojave scrub landcover type, which is dominated by creosote bush (*Larrea tridentata*). Common reed (*Phragmites australis*) is extensive in riparian and wetland areas, with native, non-native, and hybrid genotypes present. Early in the project, the riparian area was dominated by the invasive, non-native tamarisk, but due to vegetation treatments, this cover type has significantly declined. Native vegetation includes Goodding's willow (*Salix gooddingii*), sandbar willow (*S. exigua*), seep willow (*Baccharis salicifolia*), Fremont cottonwood (*Populus fremontii*), honey and screwbean mesquite (*Prosopis glandulosa* and *P. pubescens*), arrowweed (*Pluchea sericea*), cattail (*Typha domingensis*), and bulrush (*Schoenoplectus* spp.). Mesquites have now become the most abundant tree along the Wash (GBBO 2018).

Active channel stabilization and revegetation activities occurred along the length of the study area throughout the study period. By the end of the first year, nine weirs and 30 ha of revegetation had been installed. Mid-way through the study period (Year 6), 12 weirs and 113 ha of revegetation were in place. By the fall of 2020, all 21 planned weirs were constructed and over 200 ha were revegetated.

Bird Data and Analyses

Data Collection Methods

Birds were surveyed using standardized five-minute point counts (Ralph and Scott 1981). Initially, 26 survey points were established and three were added within a few months, reaching a total of 31 by the end of the second year. Subsequently, from Year 3 through Year 13, all 31 of these points were surveyed or attempted to be surveyed each year, with some survey points having to be skipped in some years due to active construction. Some survey points had to be replaced due to construction activities during the course of the project (Table 1). Replacement

points were established in locations as close as was safely possible to the original location, which resulted in replacement points up to 50 m from their original location. In 2018 (late Year 13), construction at one survey point (#17) made surveying unsafe, and this point was removed from the survey rotation. A new survey point (#34) was then added to the survey schedule in a newly planted riparian revegetation site next to the recently completed Tropicana Weir.

Each survey point was visited approximately every two weeks, with all survey points visited over a two-day period. The order in which points were sampled was rotated among survey visits. Surveys were conducted from sunrise to approximately five hours post-sunrise to capture the period of greatest bird activity and vocalization frequency. Nesting evidence was collected from 2009 onward using standard breeding bird atlas methods (e.g., Floyd et al. 2007), which consider breeding to be confirmed if active nests, dependent young, food/nest material/fecal sac carrying, or nest building is observed. For more details on the point count protocol, see Braden et al. (2007).

Through Year 14, 26 surveys were conducted per year; however, during Year 15 (2019–2020), only 23 surveys were completed because of state coronavirus measures during late March through early May (Table 1). The survey year typically ran from mid-February through January for the first phase of the study, while for the six most recent years of surveys, the survey year ran from September through August. The majority of this report covers the first full six years between 12 February 2005 and 31 January 2011, and the final six years between 5 September 2014 and 1 September 2020. The few seventh-year surveys conducted in 2011 (1 February through 24 April) were not included in most of our analyses, but they were included in the comprehensive species list.

Data Analysis

Species List

A comprehensive species list of all birds recorded at the Wash was generated based on all visits between 12 February 2005 and 1 September 2020, including all survey points (the total of which typically varied among years), all detection distances, and all birds detected incidentally outside of formal surveys. The list also includes “flyover” sightings (e.g., Red-tailed Hawks flying high overhead) of birds that were in the Wash area but may not have been closely tied to the vegetation present at the survey point. This species list was generated to characterize the bird community of the Wash as comprehensively as possible, and because no quantitative comparisons are necessary to do that, all survey results and incidental and flyover detections were included regardless of survey effort.

Species Richness and Abundance

Unlike our approach for the comprehensive species list, species richness and abundance patterns were analyzed using standardized comparisons that included only bird detections that occurred within a 100 m radius of each survey point. Flyovers were also excluded even if they occurred directly above a survey point, because these birds were generally not assumed to actively use the surveyed area. Limiting the sample to detections within 100 m of the point allowed us to

compare bird abundances among survey points and treatment areas, but it precluded analyses for species with a primarily aerial lifestyle, such as swallows, swifts, and nighthawks. For these species, a separate analysis that includes flyovers would be necessary, if determining their trends and habitat associations is desired.

We included survey data from all survey points for which data were available, which varied slightly over the first few years of the project. Although species richness (i.e., the number of species detected) can be sensitive to survey effort, we considered the variation to be minor, particularly given that the added and deleted survey points were representative of the rest of the study area in terms of habitat types and species composition present.

To be able to compare the Wash data to other regional abundance data (see below), we used the standardized estimate of density of the number of bird detections per 40 ha, converted from the fixed radius of 100 m around each point (3.14 ha). We then plotted the number of bird species and the number of bird detections per 40 ha by survey visit in order to illustrate temporal variation in species richness and abundance. Hatch-year birds were excluded from analyses of breeding season data. We analyzed richness and abundance by survey visit using two methods: simple linear regression by time and an Analysis of Variance (ANOVA) by stage of project, early (Years 1–6) and late (Years 10–15). For all statistical analysis results in this report, $P < 0.05$ was used as the significance level, unless otherwise noted.

Species richness and abundance were also examined for the breeding and non-breeding seasons. In previous analyses (Braden et al. 2009), the breeding season was defined as the period between 15 March through 31 August to encompass the breeding of the majority of both year-round resident and migrant species. In this report, we used the same definitions to retain consistency with previous analyses. This time period overlaps with spring and early fall migration of several mid- and long-distance migrants, so some non-breeding birds are included in the breeding season estimates. The non-breeding season was defined as 1 October through 31 January to include overwintering birds but exclude nesting of most resident species. Average species richness and estimated density per survey were calculated for these seasons. Transitional periods covering the dates not included in either the breeding or non-breeding seasons were also included in the results, where appropriate.

Species-Specific Abundances

For each species, estimated bird density (birds per 40 ha) was calculated for each year overall, and for its breeding and non-breeding seasons. Relative abundance (proportion of total bird abundance contributed by a species) was calculated for the same periods, but only for species representing at least 1% of the total abundance in one or more periods. We also report species frequency, which represents the percentage of Wash survey points at which the species was detected at any point during a year. This metric provides a measure of how widespread a species is within the study area. Partway through Year 13, one point was dropped and another point was added; this resulted in 32 points used for the frequency calculations for that year, rather than the usual 31 (past point changes have either been close to changes in survey-year, or have been relatively minor shifts in location to accommodate construction).

Breeding season abundances from the Wash surveys were also compared to data collected as a part of GBBO's Nevada Bird Count (NBC) in other Clark County lowland riparian areas. This was done to provide a reference point for the estimated densities at the Wash from regional data collected in similar habitat types. The NBC data were collected on 190 survey visits of 46 transects, generating surveys on approximately 1,900 point-visits (since each transect typically consists of 10 points) in roughly the same period (2005–2014) as the early and intermediate Wash surveys (7,853 point-visits). Both datasets included only detections from within 100 m of the survey point for the purpose of comparisons. However, NBC data were collected over a 10-minute survey period per point, rather than the five-minute period used at the Wash. Further, the breeding season periods differed in that the Wash data were for the period between 15 March through 31 August, with surveys evenly distributed throughout that time period, while the NBC data were collected from mid-April through June, with surveys primarily occurring in May and early June. Regardless of these differences in methods, we consider the regional comparisons of estimates of breeding densities reported here informative for most breeding landbird species. No similar datasets were available for the non-breeding season, preventing us from making regional comparisons for that period.

Finally, to determine whether population trends over time were significant, we performed negative-binomial regression analyses for count data, using year as a predictor and number of points per visit as an exposure variable. The 20 species for which we performed population analyses were all abundant along the Wash, with estimated densities of at least one detection per 40 ha; represented conservation priority or indicator species for the project (see earlier GBBO reports); and comprised a balanced mix of species representing different seasonal bird use of the Wash.

Restoration Treatment Effects

Wash stabilization treatments included clearing vegetation for construction and building weirs that locally widened the channel and impounded the stream to arrest channel downcutting. In these areas, water surface area increased and led to passive and active establishment of marsh vegetation cover. The revegetation treatments included removing monotypic stands of tamarisk and planting native wetland, riparian, riparian-transitional (i.e., mesquite and acacia) and upland vegetation covers. Following weir construction, several survey points were flooded. Cleared areas were hydroseeded immediately after construction and then later revegetated with container plants.

For our analyses of restoration treatment effects on bird populations, we divided the project period into three-year implementation periods. The first period (2005–2007) was not analyzed, because details of treatment status were lacking. Points from the other three periods, 2008–2010, 2014–2017, 2017–2020 were included in the analysis. For each of those time periods, the survey points for which we had information were then divided into five categories based on the status of project implementation affecting the area within 100 m of the survey point: no treatment (n = 18 point-surveys), recently cleared/completed (n = 46; clearing/construction); recently revegetated (n = 60; revegetation occurred < 5 years ago), moderately recently revegetated (n = 78;

revegetation occurred 5–9 years ago), and older revegetation ($n = 78$; revegetation occurred at least 10 years ago).

Because clearing, construction, and revegetation occurred throughout the project, treatment status was estimated according to what was dominant within that period. Because there were few untreated point-surveys, these were lumped with the older sites for analysis. However, the need to assess treatment status across a time period resulted in mismatches in status within those time periods. This was not deemed problematic for sites undergoing more gradual changes, such as the succession from intermediate-aged revegetation sites to older revegetation sites, but the change from being vegetated to being completely cleared for construction was substantial, and clearly led to misleading results. For this reason, the cleared/construction category was summarized but not included in the analysis.

We compared total abundance, species richness, and abundance of 11 species across the treatment categories: Abert's Towhee, American Coot, Bewick's Wren, Common Yellowthroat, Gambel's Quail, Lucy's Warbler, Ruby-crowned Kinglet, Song Sparrow, Verdin, Yellow-breasted Chat, and Yellow-rumped Warbler. These species were selected to encompass declining species along the Wash and a variety of life histories (e.g., residents, overwintering species, waterbirds, and migrants). While Ruby-crowned Kinglet was not shown to be significantly declining as of this 15th year, it was included because it had been declining as of the 2018–2019 analysis, and therefore merited closer investigation.

To compare species richness effects of treatments, we calculated total species richness per survey point for detections within 100 m. Total bird abundance and species abundances were summarized as the number of birds per 40 ha to maintain comparability with other abundance analyses reported here. The species selected for abundance comparisons included all species with an observed frequency of at least 50%. Presence of differences between treatment classes was determined by ANOVA. Where the ANOVA produced significant results, negative binomial count regression modelling was used to compare treatment categories, with surveys per point used as an exposure variable.

Results

Species List

Between 12 February 2005 and 1 September 2020, 237 bird species were observed during survey visits to the Wash (Table 2); this total does not include a likely Cackling Goose that was excluded due to the possibility of it being a Lesser Canada Goose. In the 15th year of the project (2019–2020), eight species were detected for the first time: American Crow, American Redstart, Bald Eagle, Barrow's Goldeneye, Cassin's Finch, Mississippi Kite, Rose-breasted Grosbeak, and Roseate Spoonbill (all scientific names in Table 2). Seventy-five species that had been detected at least once during previous years' surveys were not found in 2019–2020, including such species as Black-headed Grosbeak, Dusky Flycatcher, Eurasian Collared-Dove, Golden-crowned

Kinglet, Gray Flycatcher, Indigo Bunting (though an Indigo Bunting x Blue Grosbeak hybrid was recorded), Pine Siskin, Townsend’s Warbler, White-winged Dove, and Wilson’s Snipe. It is likely some of these species were not recorded because of the lack of surveys during much of spring migration (due to the coronavirus lockdown).

Of the 237 species observed during the 12 years of surveys, 200 were recorded during the breeding season (15 March – 31 August), and 175 were recorded during the non-breeding season (1 October – 31 January). While most species were recorded during at least one of the transitional seasons (190), only a small number of species (8) were detected exclusively during these periods, suggesting that most migrants actually passed through during the breeding or non-breeding seasons.

Fifty-seven species recorded at the Wash are conservation priorities according to the Nevada Comprehensive Bird Conservation Plan (GBBO 2010), the Clark County Multiple Species Habitat Conservation Plan (Clark County 2000), the Lower Colorado River Multi-Species Conservation Program (Bureau of Reclamation 2006), and/or the Partners in Flight Landbird Conservation Plan (Rosenberg et al. 2016; Table 2). Thirty-nine of the priority species were recorded during the non-breeding season, and 46 were recorded during the breeding season. Forty-four priority species were detected during the transitional periods, but only four of these were detected exclusively in the transitional seasons. Two conservation priorities were newly recorded on the Wash in 2019–2020: Bald Eagle and Cassin’s Finch.

Two new species were confirmed as breeders in 2019–2020, Great Blue Heron and Neotropic Cormorant, resulting in a total of 47 species confirmed to be nesting at the Wash based primarily on breeding evidence gathered in 2009–2020. Eleven conservation priority species were confirmed to nest at the Wash. The full list of birds confirmed as breeders is as follows (conservation priority species in bold):

Abert’s Towhee	Crissal Thrasher	Mourning Dove
American Avocet	Double-crested Cormorant	Neotropic Cormorant
American Kestrel	Gambel’s Quail	Northern Harrier
Bell’s Vireo	Great Blue Heron	Northern Mockingbird
Bewick’s Wren	Greater Roadrunner	Northern Rough-winged Swallow
Black Phoebe	Great-tailed Grackle	Red-shouldered Hawk
Black-chinned Hummingbird	Green Heron	Red-tailed Hawk
Black-crowned Night-Heron	Hooded Oriole	Red-winged Blackbird
Black-tailed Gnatcatcher	House Finch	Say’s Phoebe
Blue Grosbeak	Indigo Bunting	Song Sparrow
Brown-headed Cowbird	Killdeer	Verdin
Canada Goose	Least Bittern	Western Kingbird
Common Gallinule	Loggerhead Shrike	Yellow Warbler
Common Yellowthroat	Long-eared Owl	Yellow-breasted Chat
Cooper’s Hawk	Lucy’s Warbler	Yellow-headed Blackbird
Costa’s Hummingbird	Mallard	

It is important to note that when comparing data collected during 2019–2020 to that of other years, results for the breeding season may be misleading, given the lack of surveys during the early breeding season and spring migration due to the coronavirus lockdown.

Species Richness and Total Abundance

Species richness varied seasonally throughout the study period. Over the whole study period, it was lowest in June and peaked during September, likely due to migration and juvenile dispersal (Figure 2). However, richness patterns changed after the first six years of the project. In the early years, richness typically was lowest during the non-breeding season/winter transition, with a second dip during June, and it was highest during the late breeding season (August) and fall transition, with a second, lower, peak around May. Over the six most recent years of the study, the lowest species richness was in June/July, with the peak in August/September continued as in previous years, but then after a small dip, richness increased again and remained high over much of December through April (Figure 2, Table 3). Species richness showed a significantly increasing trend over the project period ($R^2 = 0.50$; $P < 0.001$). Richness was similar among the first six years, showing only a slight overall increase, but it was significantly higher in Years 10 through 15 compared to previous years, averaging 12 more species per survey (ANOVA, $R^2 = 0.54$; $P < 0.001$; Figure 3, Table 3).

Total bird abundance (bird detections per 40 ha) also varied seasonally, and the pattern changed over time (Figure 4). Across the life of the project, total abundance was lowest during the late breeding season and fall transition, particularly in August, and highest during the non-breeding season and winter transition. During the first six project years, overall abundance showed a peak in the breeding season (May–July), as well as a larger peak during the early non-breeding season (October–November; Figure 4). Total abundance was the lowest in either February/March or August/September, generally corresponding with the winter and fall transitional periods (Table 4). In contrast, over the most recent six survey years, the lowest abundances were recorded in the breeding season and fall transition (particularly June, July, August, and September), and the highest abundances were found in the non-breeding and winter transition seasons (December, January, and February; Figure 4, Table 4). Interestingly, the pattern of peak and least abundances has been much more stable over the most recent six years, relative to the first six years.

Total bird abundance increased almost every year (Figure 5; Table 4) following an overall significant increasing trend ($R^2 = 0.27$; $P < 0.001$). Average number of birds detected over the most recent six years was 106 birds per 40ha greater than those detected over the first six years of the project ($R^2 = 0.30$; $P < 0.001$). The largest increases in abundance between the early and late stages of the project were observed during the non-breeding season and the winter transition (Table 4).

Species-Specific Abundances

Overall Abundance Patterns

Over the entire study period, the 10 species with the greatest absolute abundances were American Coot, Yellow-rumped Warbler, Mallard, Red-winged Blackbird, Gadwall, Abert's Towhee, American Wigeon, Song Sparrow, Marsh Wren, and White-crowned Sparrow (Table 5). In the six most recent survey years, waterbird abundances increased dramatically relative to the first six years, particularly American Coot, American Wigeon, Gadwall, and Mallard (Tables

5 and 6a–b). For example, the average estimated density of American Coots over the past six years of surveys was 3.5 times their estimated density from the first six years of the project. Mallard, Gadwall, and American Wigeon showed similar patterns of increase in recent years. Though these waterbirds showed some decline in 2018–2019, detections rebounded in 2019–2020 for all but Gadwall. While waterbirds made substantial gains in the late project period, several species associated with riparian shrub/tree habitats declined from the early project period, including Abert’s Towhee, Bewick’s Wren, Lucy’s Warbler, Song Sparrow, and Yellow-breasted Chat.

The species with the highest absolute abundances also had the highest relative abundances (percentage of total bird abundance by each species; Tables 7 and 8a–b), and the shifts in waterbirds and riparian shrub birds were apparent here as well. American Coots increased from approximately 2% to 11% of the total bird abundance between the first and most recent year’s surveys. Abert’s Towhees, on the other hand, declined from approximately 12% to 5% of total bird abundance over the same period (Table 7).

While wetland and waterbird species were among the most abundant, they were not the most widespread along the Wash, as measured by the percent of total survey points with detections (frequency of occurrence). Yellow-rumped Warbler, Black Phoebe, Abert’s Towhee, Verdin, White-crowned Sparrow, Song Sparrow, Black-tailed Gnatcatcher, Common Yellowthroat, Bewick’s Wren, and Orange-crowned Warbler had the highest frequencies of occurrence along the Wash over the project period (Table 9).

Changes in frequency of occurrence during the project period included Bewick’s Wren, Brown-headed Cowbird, Ruby-crowned Kinglet, Crissal Thrasher, Mourning Dove, Lucy’s Warbler, Yellow-breasted Chat, Wilson’s Warbler, Dark-eyed Junco, Blue-gray Gnatcatcher, and White-winged Dove, which were less widespread in the late, compared to the early, project period. Conversely, Great-tailed Grackle, Gambel’s Quail, Great Blue Heron, Northern Mockingbird, American Wigeon, Anna’s Hummingbird, Common Gallinule, Sora, White-faced Ibis, and Eared Grebe were found to be more widespread along the Wash in the late, compared to the early, project period.

Results for some species, particularly spring migrants stopping over at the Wash, were likely affected by the lack of surveys during the early breeding season in 2020. For example, frequencies for species such as Western Wood-Pewee, Wilson’s Warbler, and Yellow Warbler, appear particularly low in Year 15.

Breeding Season Species Abundances in Relation to Regional Abundances

During the breeding season, the 10 most abundant species at the Wash over the course of the study included Red-winged Blackbird, Abert’s Towhee, Common Yellowthroat, Great-tailed Grackle, Song Sparrow, American Coot, Gambel’s Quail, Verdin, Black-tailed Gnatcatcher, and Brown-headed Cowbird (Table 10). In comparison, the 10 most abundant species recorded during 10 years of NBC surveys within Clark County included Gambel’s Quail, Abert’s Towhee, Lucy’s Warbler, Mourning Dove, Brown-headed Cowbird, Yellow Warbler, Verdin, House Finch, Red-winged Blackbird, and Song Sparrow (Table 10). Six of the 10 most abundant

species in the NBC were also among the 10 most abundant for the Wash, and of the 50 most abundant species at the Wash, 33 (66%) were also in the 50 most abundant species in the NBC surveys (Table 10), indicating broad similarities between the Wash and other, often longer-established, riparian areas of the region.

Differences in bird abundance between the Wash and other riparian areas were found for some species associated with wetland, disturbed, and riparian and riparian/upland interface habitats. Red-winged Blackbird, Great-tailed Grackle, Common Yellowthroat, American Coot, Song Sparrow, Mallard, Marsh Wren, Black-tailed Gnatcatcher, and Abert's Towhee were all detected in greater numbers along the Wash than in regional riparian areas. Fewer species were found in notably greater numbers in regional riparian areas than along the Wash, and among them were House Finch and Phainopepla (Table 10). While habitat patches containing mesquite have increased over the course of the project due to restoration action, significant patches are still fairly rare, and mistletoe infestations are still lower than in longer-established mesquite stands (GBBO pers. obs.), and species such as Phainopepla are known to respond to these infestations.

Non-Breeding Season Species Abundances

During the non-breeding season, the 10 most abundant species at the Wash over the entire study period included American Coot, Yellow-rumped Warbler, Gadwall, Mallard, White-crowned Sparrow, American Wigeon, American Pipit, Marsh Wren, Abert's Towhee, and Red-winged Blackbird (Tables 5 and 6a–b). No similar datasets were available from elsewhere, preventing us from making regional comparisons. The most abundant birds of the non-breeding season were a mix of year-round residents (e.g., Abert's Towhee, Red-winged Blackbird), migrants and wintering species of the Mojave Desert (e.g., Yellow-rumped Warbler, White-crowned Sparrow, American Pipit), and wetland/aquatic species (e.g., American Coot, Gadwall, Mallard, Marsh Wren, American Wigeon).

The change in composition of this list in recent years relative to the earlier project period continues to be striking, as waterfowl have become increasingly abundant. Over the first three years of the project, the 10 most abundant species were Yellow-rumped Warbler, Abert's Towhee, Red-winged Blackbird, American Coot, White-crowned Sparrow, Song Sparrow, Ruby-crowned Kinglet, Marsh Wren, Bewick's Wren, and Black Phoebe. In the most recent three years of the project, the 10 most abundant species were American Coot, Yellow-rumped Warbler, Gadwall, American Wigeon, Mallard, White-crowned Sparrow, American Pipit, Gambel's Quail, Marsh Wren, and Verdin. Only four species are shared: Yellow-rumped Warbler, American Coot, White-crowned Sparrow, and Marsh Wren. Species no longer as prominent within the community are mostly riparian songbirds, such as Song Sparrow, Ruby-crowned Kinglet, and Bewick's Wren, whereas waterbirds and birds of open areas, such as Gadwall, American Wigeon, Mallard, and American Pipit, are now more dominant members of the Wash bird community.

Trends in Species Abundances

We examined trends in abundance for 20 focal species of the Wash over the 15-year survey period (Figures 6a–e, Table 11). Eleven species showed significant increases, including

American Coot, Yellow-rumped Warbler, Mallard, Gadwall, Red-winged Blackbird, Verdin, Gambel's Quail, Black-tailed Gnatcatcher, American Pipit, Orange-crowned Warbler, and Crissal Thrasher. These species are associated with wetland marsh (e.g., Red-winged Blackbird), open water (e.g., American Coot, Mallard, Gadwall), and drier or more open habitat types than cottonwood/willow woodlands (e.g., Black-tailed Gnatcatcher, Verdin, American Pipit, Gambel's Quail, Crissal Thrasher). Orange-crowned Warbler migration and overwintering habitat use is variable, with western individuals primarily associated with riparian corridors (e.g., cottonwood, willow, and tamarisk) and shrubby woodland habitats (Gilbert et al. 2010). Yellow-rumped Warbler increases have only recently become statistically significant. This species' migration and overwintering habitat use is also variable; while it generally avoids arid habitats, it is found in marshes, shrublands, and open forest (Hunt and Flaspohler 1998).

Five of the species showed significant declines in abundance along the Wash, including Abert's Towhee, Song Sparrow, Bewick's Wren, Lucy's Warbler, and Yellow-breasted Chat. These species tend to be found in dense riparian shrub habitats (e.g., Abert's Towhee, Song Sparrow, Bewick's Wren, Yellow-breasted Chat), and in woodlands mature enough to provide nest cavities or cavity-like substrates (Lucy's Warbler). These species likely responded to the initial reduction of such vegetation due to tamarisk removal; if sites recover from this disturbance and revegetated stands mature, these species may increase in abundance. However, the decline in Lucy's Warbler and Yellow-breasted Chat detections has been particularly steep and warrants greater focus.

Marsh Wren, Common Yellowthroat, and Black Phoebe detections remained stable over the course of the study. Marsh Wren and Common Yellowthroat are most often associated with wetlands, and Black Phoebe habitat use varies, but the species requires close proximity to water (Guzy and Ritchison 1999, Wolf 1997). While Ruby-crowned Kinglet did not show a significant decreasing trend as of 2019–2020, it had done so through 2018–2019, indicating that it should continue to be monitored.

Restoration Treatment Effects

Recently revegetated sites supported significantly higher numbers of individuals than did intermediate and older revegetated sites (Table 12). These sites were often directly adjacent to the Wash and near expansive open water containing significant wetland vegetation. Also, American Coots were found in significantly greater number on these sites. This agrees with the results of the 2017–2018 analysis, which found that the bird species found in significantly greater numbers near open water relative to the recently cleared/completed sites were almost entirely aquatic and wetland species: American Coot, Marsh Wren, Red-winged Blackbird, Gadwall, and Mallard. The disturbance-associated Great-tailed Grackle was the exception, although at the Wash, it has been found to favor emergent marsh vegetation for nesting (GBBO 2019a). The reduction in numbers in the other two treatment categories may reflect encroaching vegetation into the channel, reducing the number of waterbirds using wetland areas, decreasing detectability of birds due to increased vegetation, and some sites being repeatedly impacted by clearing and construction. Interestingly, species richness did not differ by treatment status.

Four of the six currently- or recently-declining species (Table 11) were detected in significantly greater numbers in intermediate and older-aged vegetation: Abert's Towhee, Bewick's Wren, Ruby-crowned Kinglet, and Lucy's Warbler. These results appear to indicate that recovery of these species' numbers may continue if vegetation along the Wash is allowed to mature.

In contrast, Yellow-breasted Chat numbers did not significantly differ among treatment categories, indicating that their habitat requirements may be more complex than those of some other species. Chats prefer dense riparian shrub habitats, and it is possible that simply allowing riparian habitats to mature is not sufficient to encourage their use of the site. However, the model performed poorly, with under 10% of the variation in the sample explained by treatment status, leaving these conclusions to be tenuous.

We also found a trend toward fewer detections of Song Sparrows in older revegetation sites compared to other treatment classes. It is unclear why this may be the case, but it may reflect a combination of Song Sparrows preferring close proximity to water and substantial woody riparian shrubs. It is possible that, as woody riparian vegetation is allowed to mature adjacent to water, Song Sparrow numbers may increase. However, the model also performed poorly, and while interesting, limited emphasis should be placed on it until additional data are available.

Of the stable or increasing species evaluated, other than American Coot, three species were recorded in significantly greater number in intermediate and older vegetation compared with other treatments, including Verdin, Gambel's Quail and Yellow-rumped Warbler. Given their similar basic natural history, it is unclear why these species are increasing while Abert's Towhee, Bewick's Wren, Ruby-crowned Kinglet, and Lucy's Warbler are decreasing. Verdin and Gambel's Quail may be more able to thrive in drier upland and riparian/upland edge conditions. The Yellow-rumped Warbler and Gambel's Quail models, however, performed poorly.

Common Yellowthroat numbers remain stable (Table 11), but they were detected in significantly fewer numbers in older vegetation compared with other treatment classes. This pattern of abundance by treatment status appears similar to that of Song Sparrow. The model performed poorly, however, with approximately 10% of the variation in the data explained by treatment status.

Discussion

As discussed in previous reports (GBBO 2011a, 2011b, 2018, 2019a, 2020), the bird community of the Wash is particularly diverse, featuring approximately 48% of all bird species recorded in Nevada and providing habitat for 57 conservation priority species, 11 of which were confirmed to be nesting on the site. It is important to note when reviewing the Year 15 results that they are not directly comparable to earlier years in some values, particularly those depending on surveys during the early breeding season, given the loss of three surveys during that period due to coronavirus pandemic restrictions. Because of this, some species' estimated abundances may be over- or underestimated, depending on when they are most abundant along the Wash.

The Wash's bird community shifts seasonally throughout the year, with bird species richness being at its lowest in June and peaking during September. Species richness patterns changed over the course of the project, with the peaks in richness not only increasing over time, but also shifting to the transition periods and non-breeding season. This illustrates the importance of year-round monitoring when monitoring the effectiveness of restoration projects, as many of the benefits to birds may lie in the reliable availability of high-quality migration stopover and wintering habitat rather than in adding breeding season support.

Seasonal patterns of bird abundance also changed dramatically over the course of the project. Total bird abundance increased throughout the project period, and while abundances remained highest during the winter months, they were mostly due to landbird contributions (e.g., large flocks of wintering American Pipits in October/November) in the early project phase, while in the late phase, they were mostly driven by wintering waterbirds.

In comparison to other riparian areas of the Mojave Desert region, the Wash is becoming increasingly similar to long-established perennial riparian areas regardless of the fact that historically, the Wash was ephemeral. The stabilization of the channel and permanent flows of the Wash have created an environment that is similar to natural perennial streams, while also creating significant open water and marsh habitat types due to multiple impoundments. With the vegetation shifting overall to native shrub and tree cover types (due to extensive active and passive revegetation), the main microhabitat types that appear to be still in recovery and may need to be actively promoted by additional management, include riparian-obligate shrubs, cavity-producing trees, and mistletoe-infected mesquite.

Treatments impacted the bird community differentially. Recently-revegetated (post-construction) sites supported significantly greater total numbers and American Coot numbers, likely reflecting that weir construction had created more open water and wetland habitats. Richness did not differ by treatment status.

Of the six currently- or recently-declining species, Abert's Towhee, Bewick's Wren, Ruby-crowned Kinglet, and Lucy's Warbler were found in significantly greater numbers in intermediate and older-aged vegetation compared with earlier-successional stages, indicating that passively allowing vegetation succession to occur will likely result in recovery of these species. Yellow-breasted Chat and Song Sparrow showed a more complex relationship, indicating that more direct interventions may be required to recover numbers of these species, including managing for increased densities and for increasing shrubs directly adjacent to water.

As vegetation covers at the Wash changed with construction, stabilization, and restoration activities, species richness and total abundance of the bird community also changed. Richness was significantly higher in the late phase of the project relative to the first six years, and abundance showed a significant increasing trend over the course of the project. Interestingly, however, in Year 14, the overall number of birds decreased to their lowest point in the most recent six years, primarily due to a large decline in the number of birds recorded during the non-breeding season. It is unclear why this may have occurred, but it is possible that changes in water levels elsewhere in the region could have resulted in shifts in local use by waterbirds. In Year 15,

numbers rebounded somewhat, mostly due to increases in bird numbers during the winter transition.

Recent increases in species richness and total abundance were particularly due to birds of aquatic and wetland habitat types, such as Red-winged Blackbirds, American Coots, Mallards, and Gadwalls. The replacement of dry tamarisk sites by upland shrubs and mesquites has also resulted in significant increases in several species, including Black-tailed Gnatcatcher, Verdin, Gambel's Quail, and Crissal Thrasher. However, several species requiring denser riparian shrub habitats and larger stems have declined over the course of the project, including Song Sparrow, Lucy's Warbler, and Yellow-breasted Chat. We attribute these declines to the initial responses of these species to vegetation removal. Active revegetation is ongoing, but it takes time to grow a dense riparian shrub layer and trees of sufficient stem diameter to support cavities. In some cases, changes in revegetation design may be warranted.

Recommendations

A stabilization facilities assessment concluded that approximately 26 ha of marsh and riparian habitat would need to be cleared from the channel to ensure facilities function as designed. The goal is to have the weirs and associated areas returned to benchmark conditions, then maintained (i.e., cleared of vegetation) every two years. This will inevitably reduce in-channel wetland and riparian vegetation, but it may also help to mechanically create some of the dynamism typically seen in marsh and riparian systems that are subject to periodic flooding. Still, we recommend SNWA continue to work to identify potential sites for habitat protection and creation outside of the weir impact zone, and to take advantage of opportunities to expand low elevation floodplain areas. Given the changes that are expected, we recommend continuing the biweekly point counts and detailed annual vegetation monitoring to keep assessing program impacts on the Wash bird community.

With declines in Lucy's Warbler and Yellow-breasted Chat detections, as well as declines in some other riparian shrub species, we recommend proactive steps be taken to establish dense riparian shrub and mesquite habitats outside of the channel, and to protect larger-stemmed woodlands for cavity nesting species. While a number of currently- or recently-declining species, such as Abert's Towhee, Bewick's Wren, Lucy's Warbler, and Ruby-crowned Kinglet appear to be responding positively in areas where vegetation is allowed to mature, more proactive steps may be required to increase numbers of Yellow-breasted Chats and Song Sparrows.

Because of the complex patterns and timelines of clearing, construction, and revegetation, and the difficulty in crosswalking those patterns and timelines to the bird data, treatment effects modeling – while useful – has limits. Currently, analysis of treatment effects is conducted every other year, alternating with summarizing changes in vegetation. It may be useful to adjust that schedule and add direct bird-habitat analyses into the rotation every third or fourth year.

Conclusion

Great Basin Bird Observatory completed the 12th year of bird surveys and vegetation assessments along the Wash in 2020 as part of research associated with the LVWCC's stabilization and enhancement project on the channel. In the first 11 years of the study, bird surveys were completed year-round every two weeks using 29 (later amended to 31) points. In the 12th year of data collection, three surveys were eliminated during the early breeding season due to the coronavirus pandemic.

A total of 237 bird species have been recorded, constituting nearly 50% of the total bird species richness recorded in Nevada. Of these, 57 are conservation priority species. Average species richness and total abundance increased significantly over the project period, particularly in the six most recent years. Species-specific trends were mixed with five species showing significant declines and 11 showing significant increases over the study period. Several of the declining birds are riparian shrub-associated, including non-native shrubs, and many of the species with increasing trends are marsh- or water-dependent.

Four of the six currently- or recently-declining species were found in significantly greater numbers in intermediate and older vegetation, indicating that allowing vegetation to mature will likely result in their recoveries. Two other species showed more complex relationships with treatment status, indicating that their recovery may require direct intervention to increase shrub density and increase shrubs adjacent to water. Recently-revegetated (post-construction) sites showed increased total numbers and American Coots, likely reflecting the weir construction and subsequent increase in water and wetland habitats. Species richness did not differ by treatment status.

The Wash bird community has changed dramatically in the past six years of the study, as species richness and abundance increased significantly, primarily due to increased open water and wetland formation resulting from weir construction. While major construction is complete, a stabilization facilities assessment concluded that approximately 26 ha of marsh and riparian habitat would need to be cleared from the channel to ensure proper facility function. We recommend SNWA identify sites for habitat protection and creation outside of the weir impact zone. We also recommend taking steps to establish dense riparian shrub and mesquite habitats outside of the channel, and to protect larger-stemmed trees for cavity nesting birds. Finally, analysis of treatment effects is currently conducted every other year, alternating with summarizing vegetation changes, but it may be useful to revise this schedule and perform direct bird-habitat analyses every third or fourth year.

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Figures

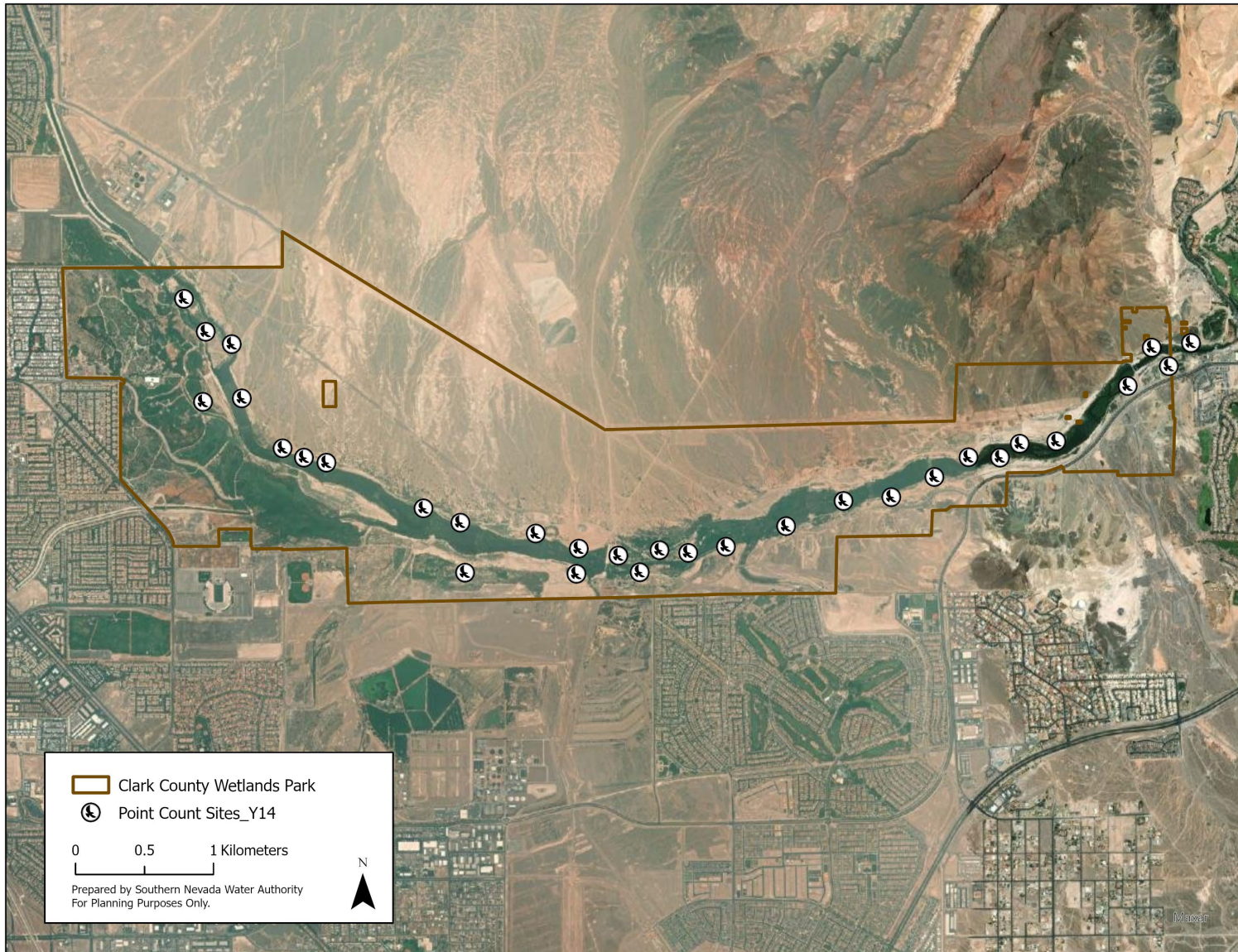


Figure 1. Distribution of points across Las Vegas Wash. Map courtesy of Southern Nevada Water Authority.

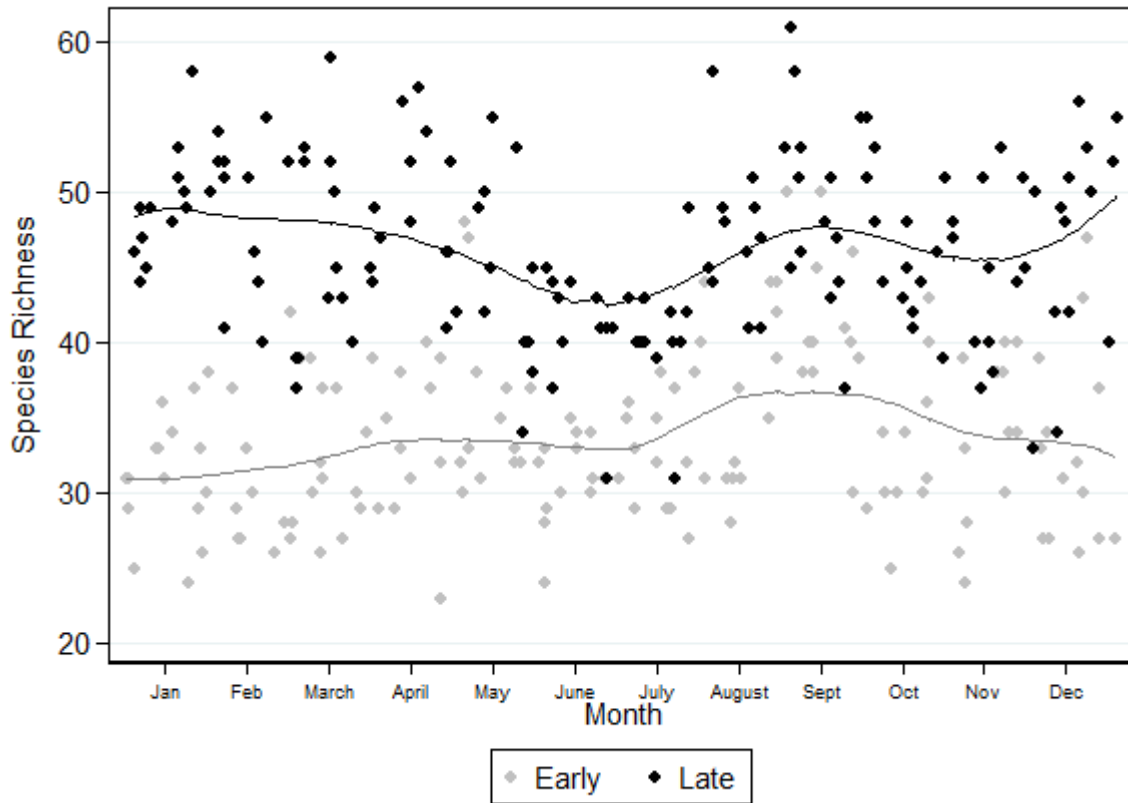


Figure 2. Seasonal bird richness per survey visit from 309 surveys of the Las Vegas Wash (2005–2020), by stage of project: Early (Years 1 to 6) and Late (Years 10 to 15). Curves represent LOWESS smoothed fits for variation in richness among survey visits.

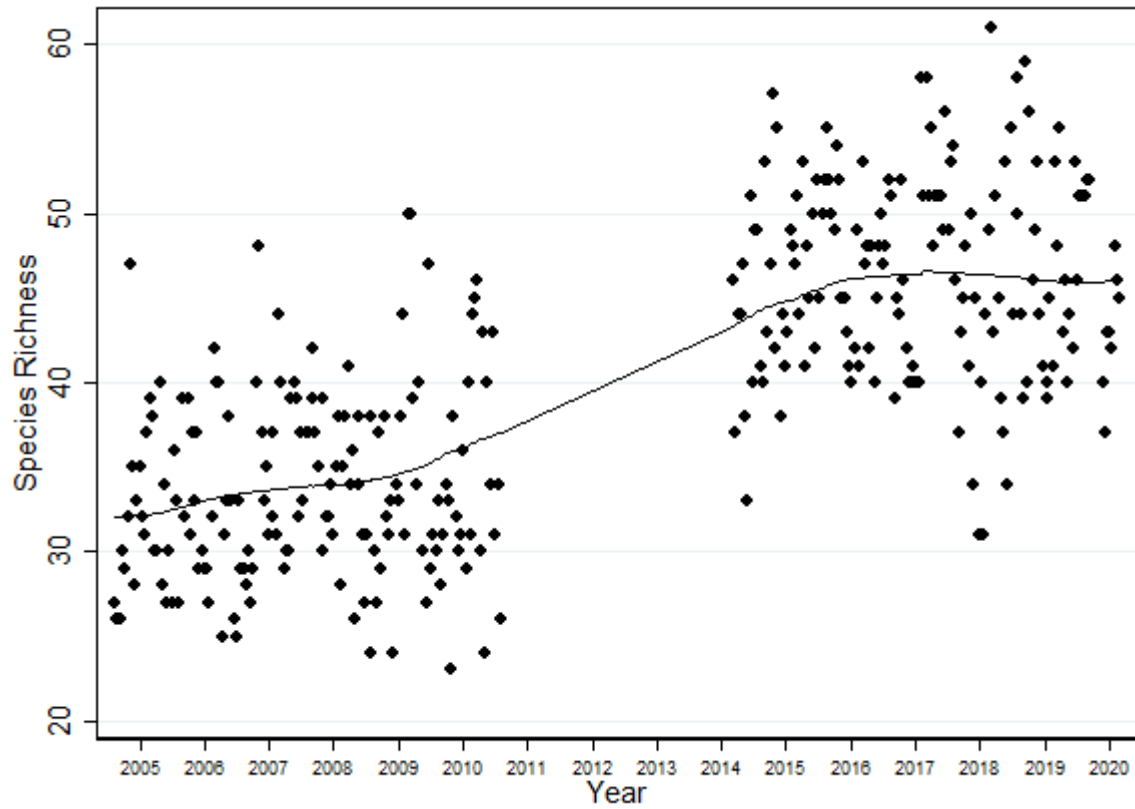


Figure 3. Trend in species richness from 309 surveys of the Las Vegas Wash (2005–2020). Curve represents a LOWESS smoothed fit for variation in richness among survey visits.

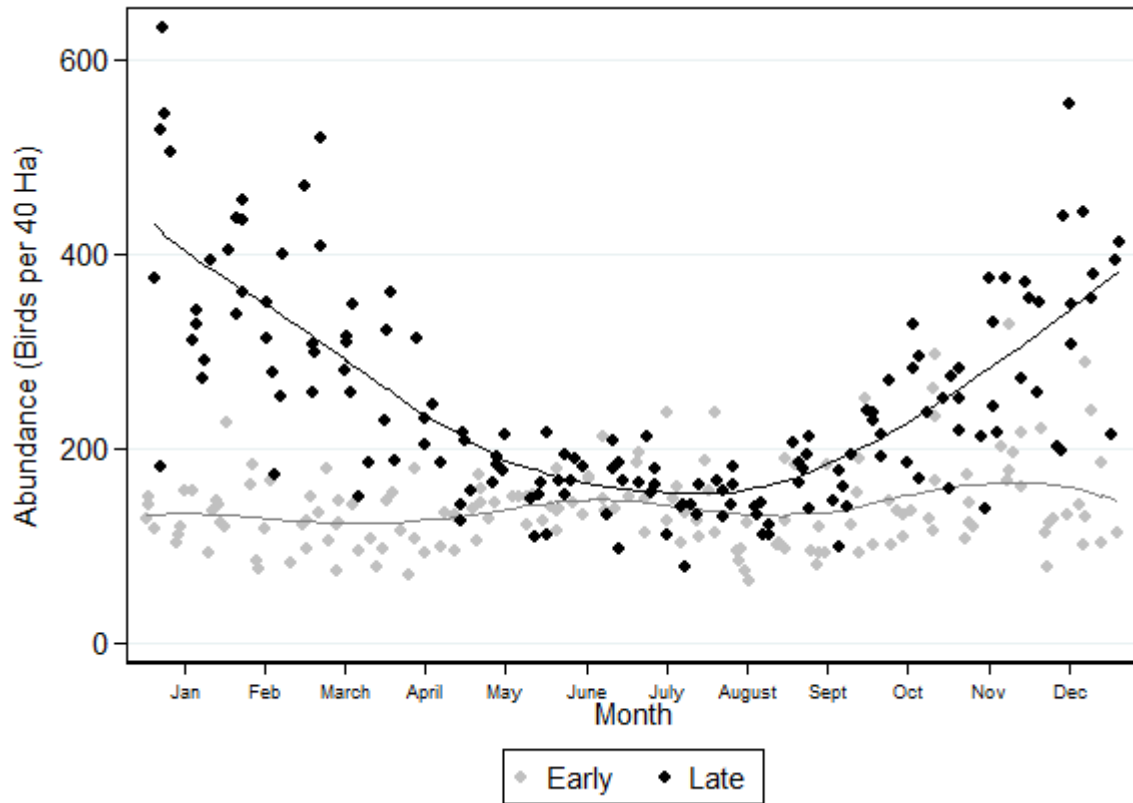


Figure 4. Seasonal total bird abundance per survey visit from 309 surveys of the Las Vegas Wash (2005–2020), by stage of project: Early (Years 1 to 6) and Late (Years 10 to 15). Curves represent LOWESS smoothed fits for variation in abundance among survey visits.

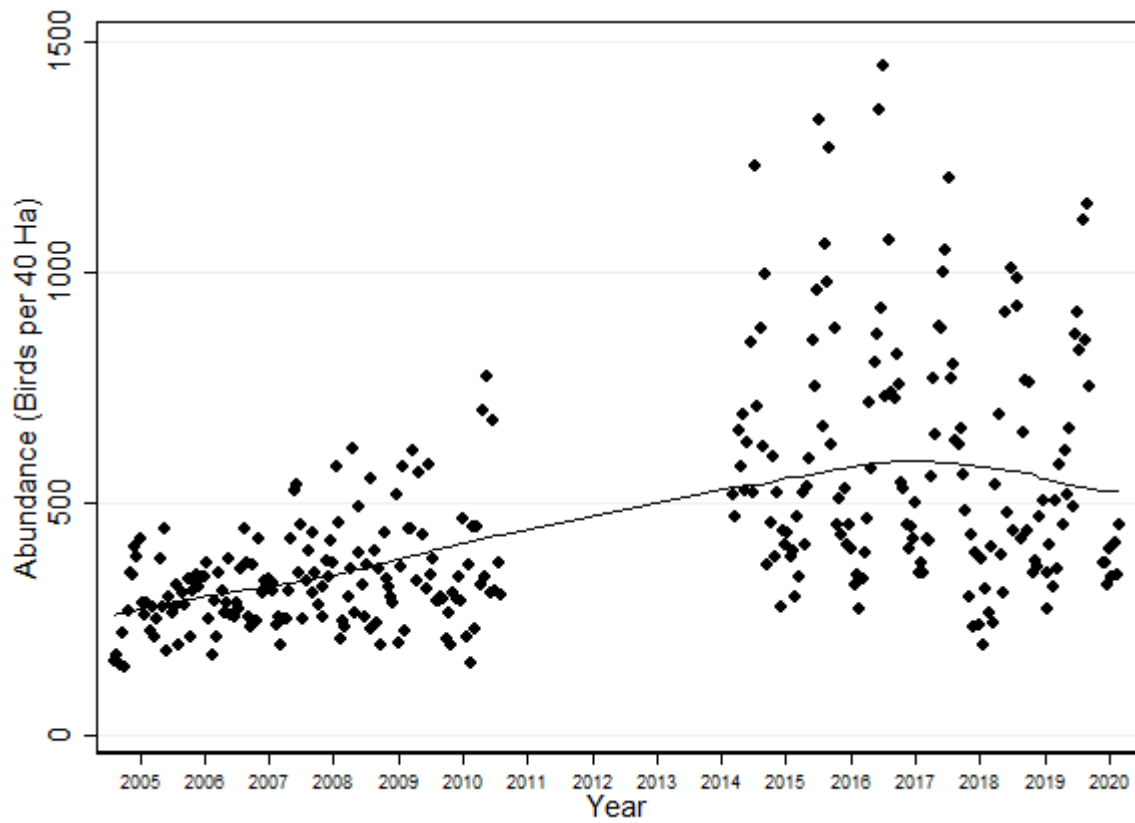


Figure 5. Trend in estimated total bird abundance from 309 surveys of the Las Vegas Wash (2005–2020). Curve represents a LOWESS smoothed fit for variation in abundance among survey visits.

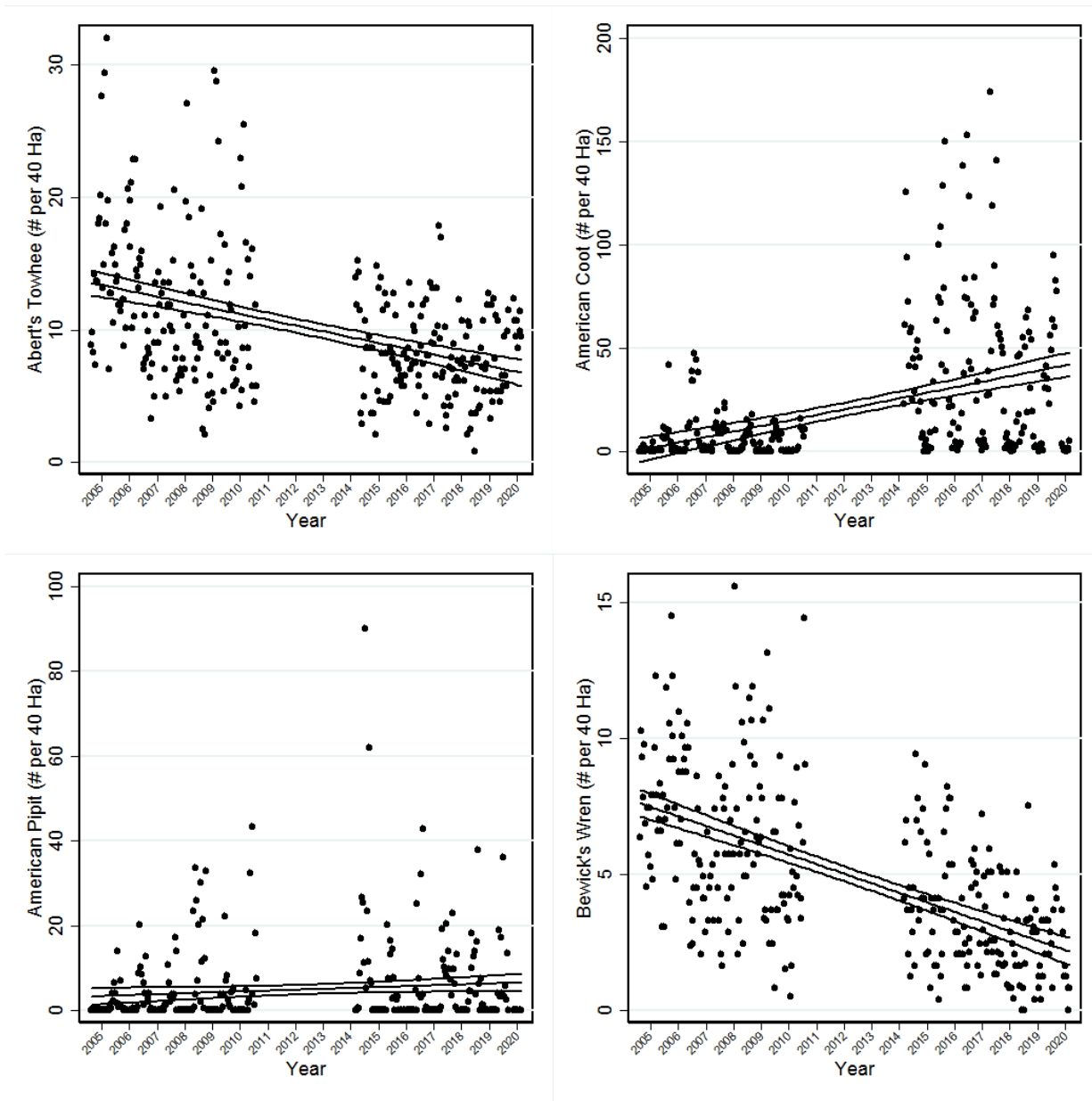


Figure 6a. Population trends of four common species along the Las Vegas Wash, by year (2005–2020). See Table 11 for statistical analysis results.

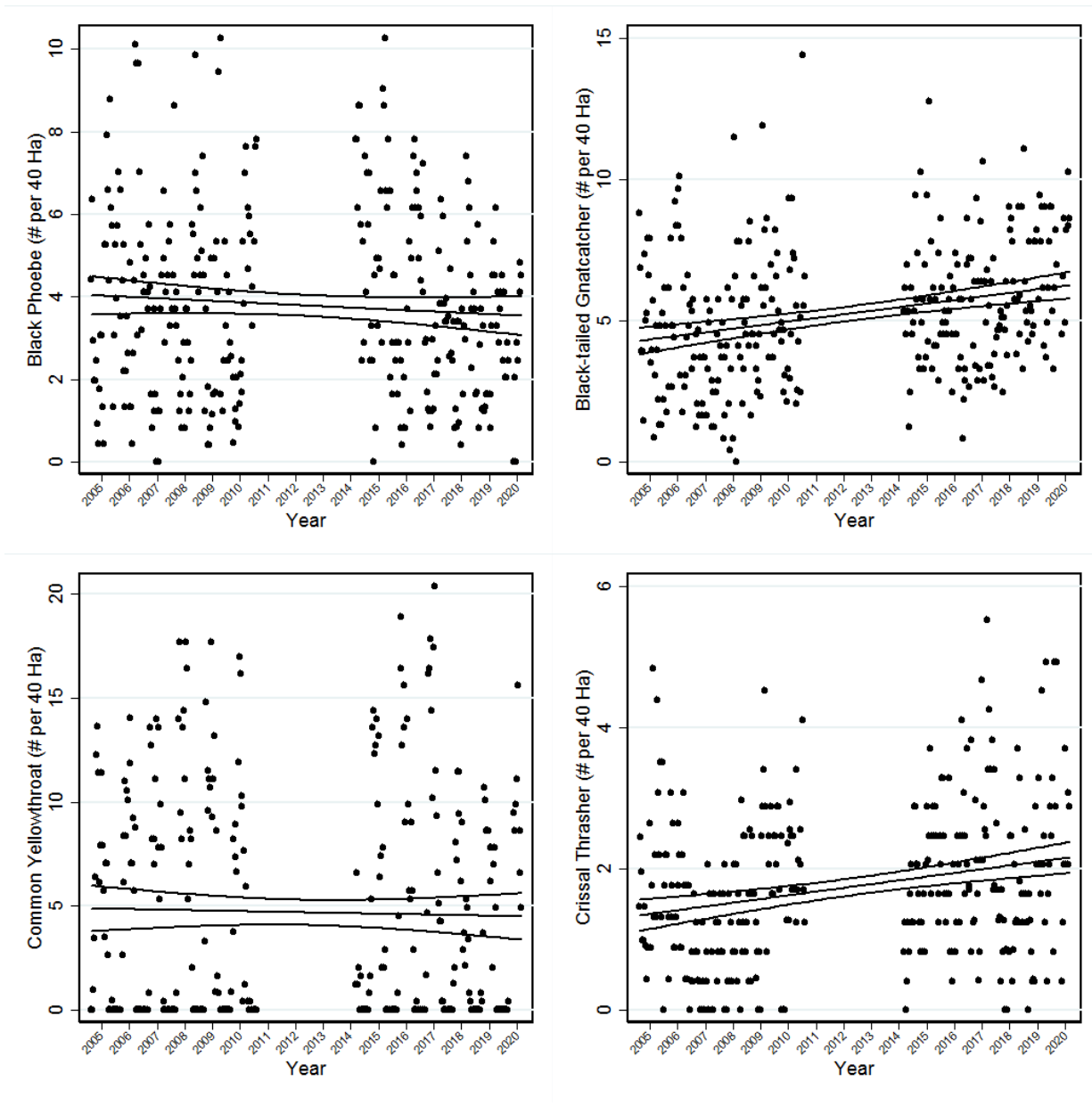


Figure 6b. Population trends of four common species along the Las Vegas Wash, by year (2005–2020). See Table 11 for statistical analysis results.

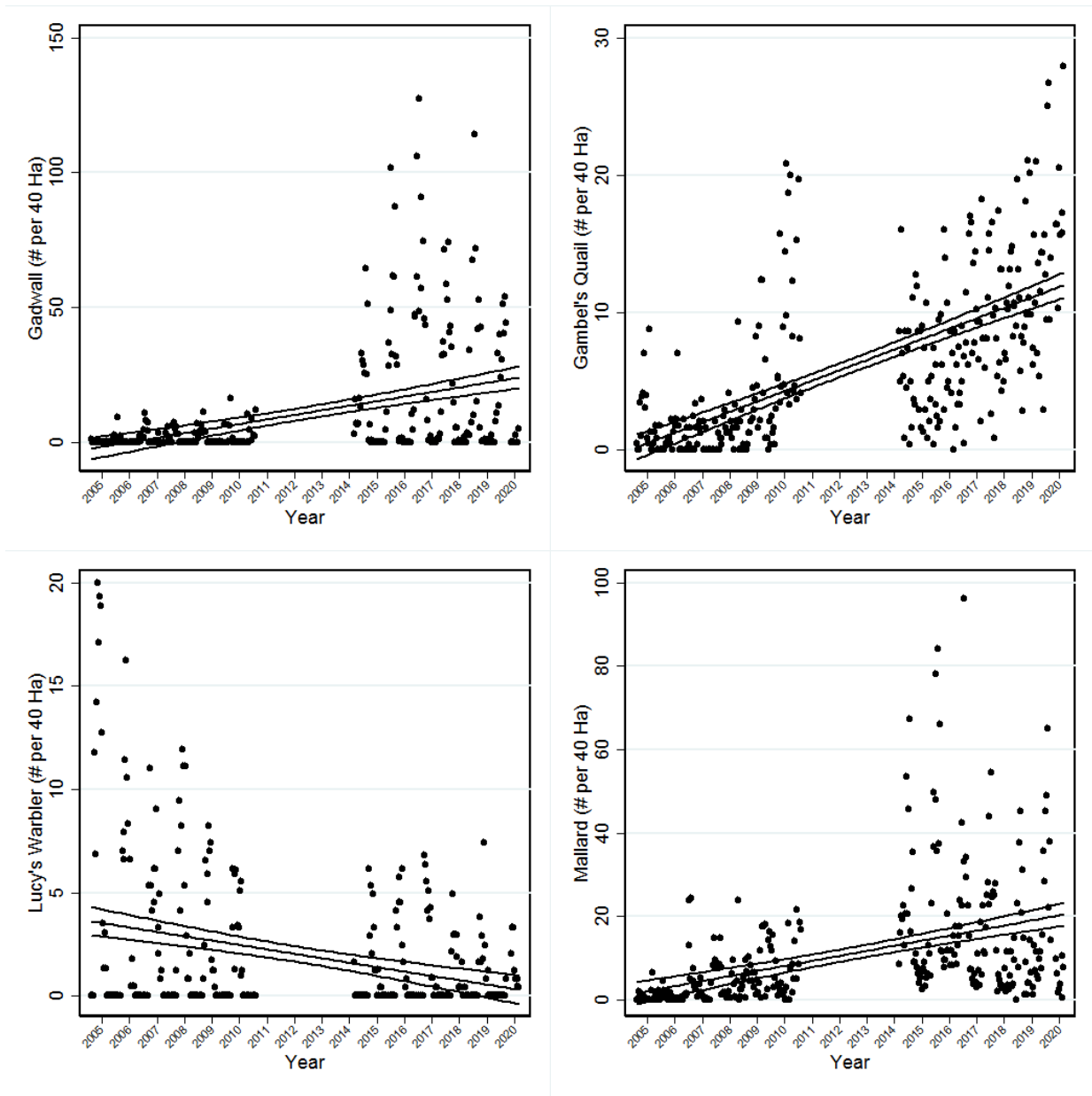


Figure 6c. Population trends of four common species along the Las Vegas Wash, by year (2005–2020). See Table 11 for statistical analysis results.

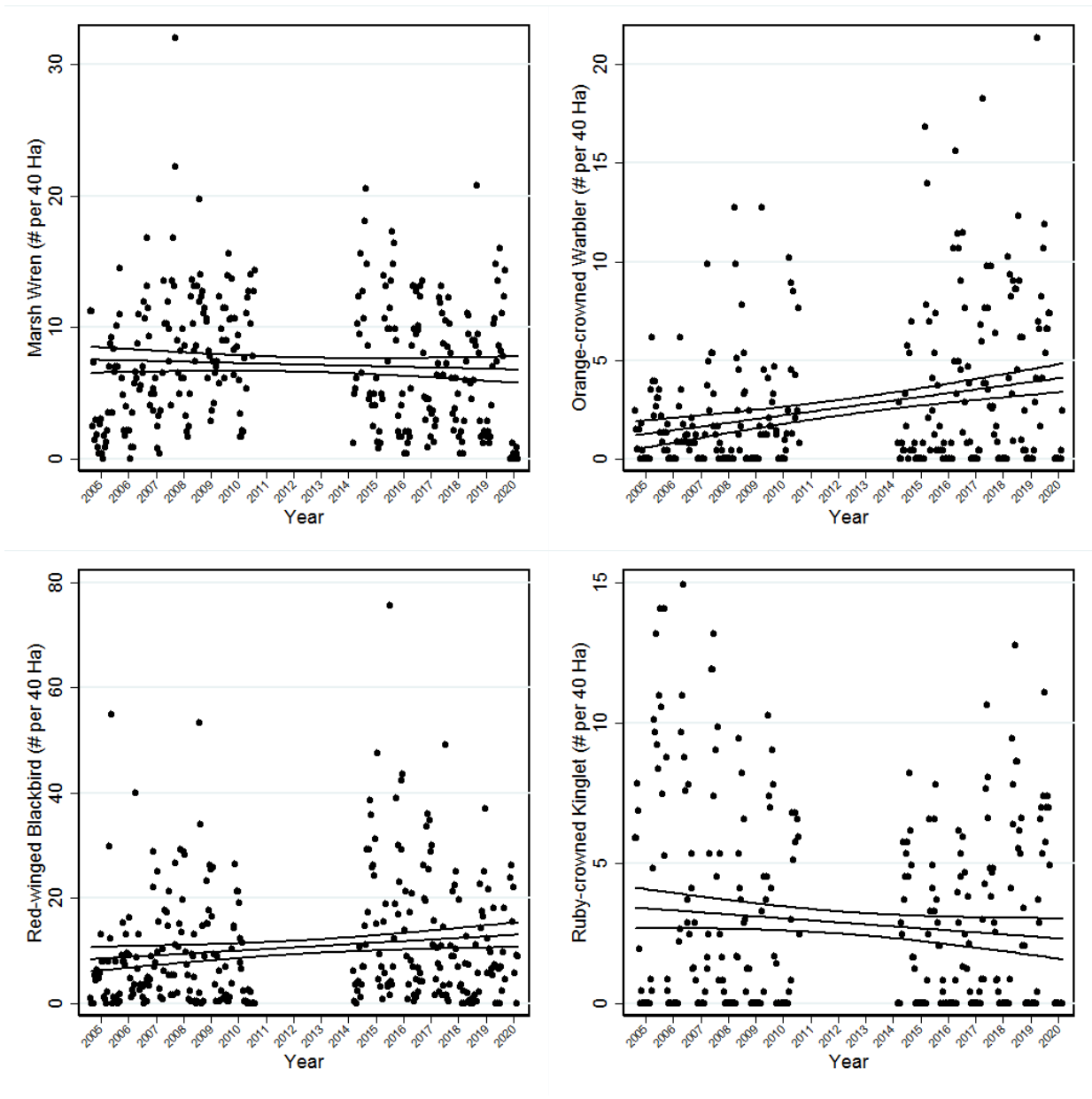


Figure 6d. Population trends of four common species along the Las Vegas Wash, by year (2005–2020). See Table 11 for statistical analysis results.

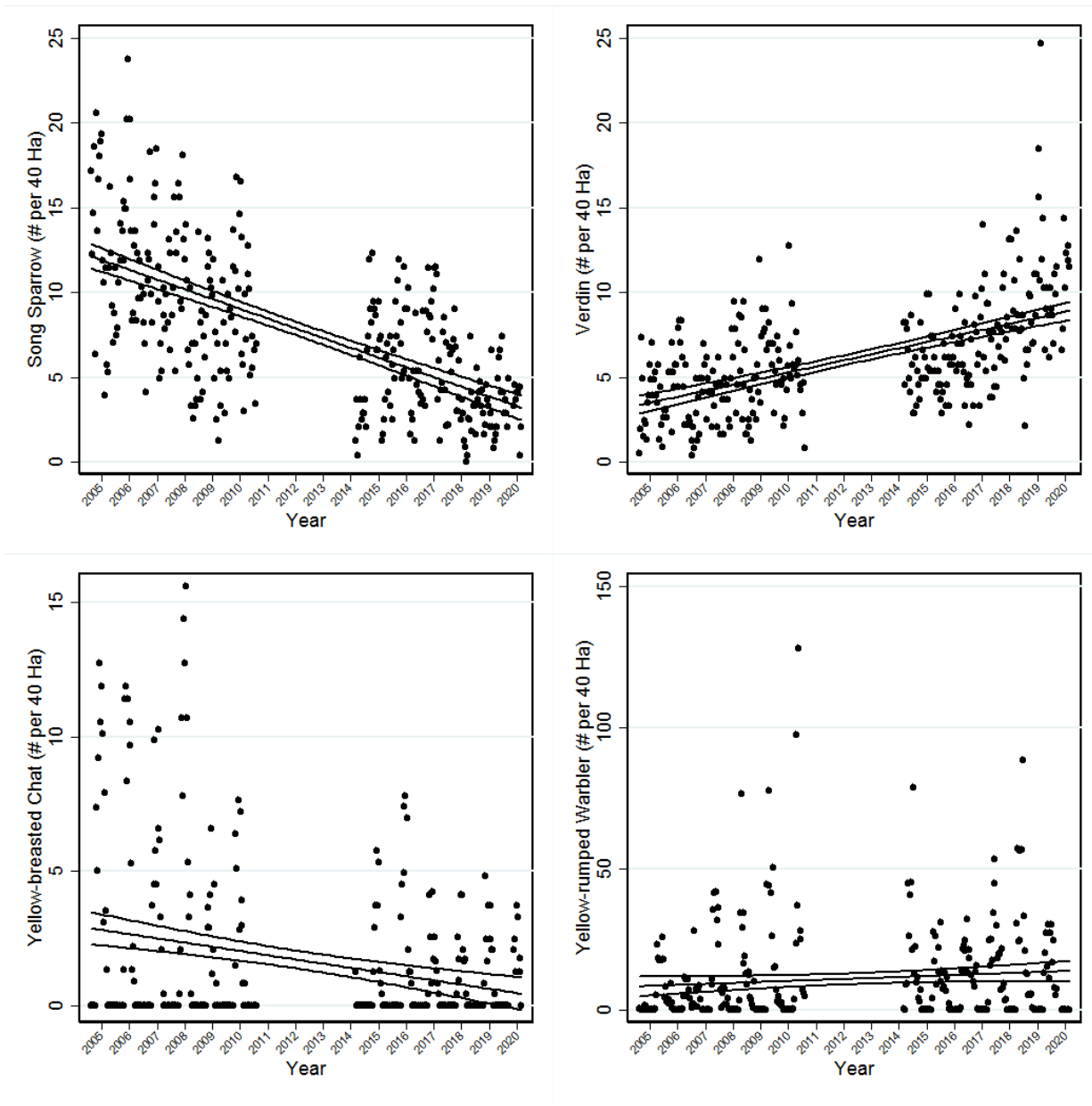


Figure 6e. Population trends of four common species along the Las Vegas Wash, by year (2005–2020). See Table 11 for statistical analysis results.

Tables

Table 1. Number of point count surveys conducted per year along the Las Vegas Wash.

Year	Points/Survey	Number of Surveys	Max. Number of Points/Year	Total Number of Survey Visits
Year 1	26	6	29	26
	28	1		
	29	19		
Year 2	29	22	32	26
	31	3		
	32	1		
Year 3	30	2	31	26
	31	24		
Year 4	30	1	31	26
	31	25		
Year 5	22	1	31	26
	28	1		
	30	2		
	31	22		
Year 6	25	1	31	26
	26	2		
	27	2		
	29	1		
	30	11		
	31	9		
Year 10	30	1	37*	26
	31	25		
Year 11	31	26	33*	26
Year 12	29	2	31	26
	30	10		
	31	14		
Year 13	27	1	35*	26
	29	3		
	30	16		
	31	6		
Year 14	27	1	31	26
	28	1		
	29	1		
	30	3		
	31	20		
Year 15	29	1	31	23
	31	22		

* Numbers are larger than 31 because they include original and replacement points.

Table 2. All bird species detected at Las Vegas Wash, February 2005 to August 2020, during breeding, non-breeding, and transitional seasons. Conservation status includes priority species from multiple sources: A (Clark County 2000); B (Bureau of Reclamation 2006); C (GBBO 2010); D (Rosenberg et al. 2016, Intermountain Partners in Flight); E (Rosenberg et al. 2016, Continental Partners in Flight). X denotes at least one detection in that season (for season definitions, see Methods). Asterisks indicate species that were recorded incidentally, as flyovers, or > 100 m from a survey point. Species listed in taxonomic order.

Common Name	Scientific Name	Conservation Status	Breeding Season	Fall Transition	Non-Breeding Season	Winter Transition	Overall
Snow Goose	<i>Anser caerulescens</i>		*		X	X	X
Ross's Goose	<i>Anser rossii</i>				X	*	X
Graylag Goose	<i>Anser anser</i>		*	*	*		*
Greater White-fronted Goose	<i>Anser albifrons</i>			*	X	X	X
Cackling Goose/Lesser Canada Goose †	<i>Branta hutchinsii/canadensis</i>					*	*
Canada Goose	<i>Branta canadensis</i>		X	X	X	X	X
Tundra Swan	<i>Cygnus columbianus</i>	C			*		*
Wood Duck	<i>Aix sponsa</i>				X	*	X
Blue-winged Teal	<i>Spatula discors</i>		*	*	X		X
Cinnamon Teal	<i>Spatula cyanoptera</i>	C	X	X	X	X	X
Northern Shoveler	<i>Spatula clypeata</i>		X	X	X	X	X
Gadwall	<i>Mareca strepera</i>		X	X	X	X	X
American Wigeon	<i>Mareca americana</i>		X	X	X	X	X
Mallard	<i>Anas platyrhynchos</i>		X	X	X	X	X
Northern Pintail	<i>Anas acuta</i>	C	X	X	X	X	X
Green-winged Teal	<i>Anas crecca</i>		X	X	X	X	X
Canvasback	<i>Aythya valisineria</i>	C			*		*
Redhead	<i>Aythya americana</i>	C	X		X	X	X
Ring-necked Duck	<i>Aythya collaris</i>		*		X	X	X
Lesser Scaup	<i>Aythya affinis</i>	C	X	*	X	X	X
Bufflehead	<i>Bucephala albeola</i>		X		X	X	X
Common Goldeneye	<i>Bucephala clangula</i>		X		X	X	X
Barrow's Goldeneye	<i>Bucephala islandica</i>					X	X
Hooded Merganser	<i>Lophodytes cucullatus</i>		X	X	X	X	X
Common Merganser	<i>Mergus merganser</i>		X	X	X	X	X
Ruddy Duck	<i>Oxyura jamaicensis</i>		*		X	X	X
Gambel's Quail	<i>Callipepla gambelii</i>	C	X	X	X	X	X
Pied-billed Grebe	<i>Podilymbus podiceps</i>		X	X	X	X	X
Horned Grebe	<i>Podiceps auritus</i>		X		X	*	X
Eared Grebe	<i>Podiceps nigricollis</i>	C	X	X	X	X	X
Western Grebe	<i>Aechmophorus occidentalis</i>	C	X		X	*	X
Clark's Grebe	<i>Aechmophorus clarkii</i>	C	*		*	*	*
Rock Pigeon	<i>Columba livia</i>		*	*	X	*	X

Common Name	Scientific Name	Conservation Status	Breeding Season	Fall Transition	Non-Breeding Season	Winter Transition	Overall
Eurasian Collared-Dove	<i>Streptopelia decaocto</i>		X	X	X	*	X
White-winged Dove	<i>Zenaida asiatica</i>		X	X	X		X
Mourning Dove	<i>Zenaida macroura</i>		X	X	X	X	X
Greater Roadrunner	<i>Geococcyx californianus</i>		X	X	X	X	X
Groove-billed Ani	<i>Crotophaga sulcirostris</i>				X		X
Lesser Nighthawk	<i>Chordeiles acutipennis</i>		X	X			X
Common Nighthawk	<i>Chordeiles minor</i>	D		*			*
Vaux's Swift	<i>Chaetura vauxi</i>		*	*	*		*
White-throated Swift	<i>Aeronautes saxatalis</i>	C	X	*	*	*	X
Black-chinned Hummingbird	<i>Archilochus alexandri</i>		X	X	X	*	X
Anna's Hummingbird	<i>Calypte anna</i>		X	X	X	X	X
Costa's Hummingbird	<i>Calypte costae</i>	C	X	X	X	X	X
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>			X			X
Rufous Hummingbird	<i>Selasphorus rufus</i>	C; E	X	*			X
Virginia Rail	<i>Rallus limicola</i>		X	X	X	X	X
Sora	<i>Porzana carolina</i>		X	X	X	X	X
Common Gallinule	<i>Gallinula galeata</i>		X	X	X	X	X
American Coot	<i>Fulica americana</i>		X	X	X	X	X
Sandhill Crane	<i>Antigone canadensis</i>	C	X		*	*	X
Black-necked Stilt	<i>Himantopus mexicanus</i>	C	X	X		*	X
American Avocet	<i>Recurvirostra americana</i>	C	X	X	X	X	X
Semipalmated Plover	<i>Charadrius semipalmatus</i>		X				X
Killdeer	<i>Charadrius vociferus</i>		X	X	X	X	X
Whimbrel	<i>Numenius phaeopus</i>		*				*
Long-billed Curlew	<i>Numenius americanus</i>	C	*	*			*
Marbled Godwit	<i>Limosa fedoa</i>	C	*	*			*
Stilt Sandpiper	<i>Calidris himantopus</i>			*			*
Dunlin	<i>Calidris alpina</i>		X				X
Least Sandpiper	<i>Calidris minutilla</i>	C	X	X	X	X	X
Pectoral Sandpiper	<i>Calidris melanotos</i>			X			X
Semipalmated Sandpiper	<i>Calidris pusilla</i>		X				X
Western Sandpiper	<i>Calidris mauri</i>	C	X	X	X	X	X
Short-billed Dowitcher	<i>Limnodromus griseus</i>		*				*
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	C	X	X	X	X	X
Wilson's Snipe	<i>Gallinago delicata</i>		X	*	X	X	X
Spotted Sandpiper	<i>Actitis macularius</i>		X	X	X	X	X
Solitary Sandpiper	<i>Tringa solitaria</i>		X	X			X
Lesser Yellowlegs	<i>Tringa flavipes</i>		X	X	X	X	X
Willet	<i>Tringa semipalmata</i>	C	X				X

Common Name	Scientific Name	Conservation Status	Breeding Season	Fall Transition	Non-Breeding Season	Winter Transition	Overall
Greater Yellowlegs	<i>Tringa melanoleuca</i>		X	X	X	X	X
Wilson's Phalarope	<i>Phalaropus tricolor</i>	C	*	*			*
Bonaparte's Gull	<i>Chroicocephalus philadelphia</i>		X				X
Franklin's Gull	<i>Leucophaeus pipixcan</i>	C	*				*
Ring-billed Gull	<i>Larus delawarensis</i>		X	*	X	X	X
California Gull	<i>Larus californicus</i>		X		*	*	X
Lesser Black-backed Gull	<i>Larus fuscus</i>		*				*
Caspian Tern	<i>Hydroprogne caspia</i>		X	*	*		X
Forster's Tern	<i>Sterna forsteri</i>		*				*
Neotropic Cormorant	<i>Phalacrocorax brasilianus</i>		X	*	X	X	X
Double-crested Cormorant	<i>Phalacrocorax auritus</i>		X	X	X	X	X
American White Pelican	<i>Pelecanus erythrorhynchos</i>	C	X	X	X	X	X
American Bittern	<i>Botaurus lentiginosus</i>		X	X		*	X
Least Bittern	<i>Ixobrychus exilis</i>	B; C	X	X	X	X	X
Great Blue Heron	<i>Ardea herodias</i>		X	X	X	X	X
Great Egret	<i>Ardea alba</i>		X	X	X	X	X
Snowy Egret	<i>Egretta thula</i>	C	X	X	X	X	X
Cattle Egret	<i>Bubulcus ibis</i>		*	X			X
Green Heron	<i>Butorides virescens</i>		X	X	X	X	X
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>		X	X	X	X	X
White Ibis	<i>Eudocimus albus</i>		*				*
White-faced Ibis	<i>Plegadis chihi</i>	C	X	X	X	X	X
Roseate Spoonbill	<i>Platalea ajaja</i>		*				*
Turkey Vulture	<i>Cathartes aura</i>		X	*	*	X	X
Osprey	<i>Pandion haliaetus</i>		X	X	X	X	X
White-tailed Kite	<i>Elanus leucurus</i>		*				*
Mississippi Kite	<i>Elanus mississippiensis</i>		*				*
Bald Eagle	<i>Haliaeetus leucocephalus</i>	C			*		*
Northern Harrier	<i>Circus hudsonius</i>		X	X	X	X	X
Sharp-shinned Hawk	<i>Accipiter striatus</i>		X	X	X	X	X
Cooper's Hawk	<i>Accipiter cooperii</i>		X	X	X	X	X
Northern Goshawk	<i>Accipiter gentilis</i>	C			*		*
Red-shouldered Hawk	<i>Buteo lineatus</i>		X	X	X	X	X
Swainson's Hawk	<i>Buteo swainsoni</i>	C	X				X
Red-tailed Hawk	<i>Buteo jamaicensis</i>		X	*	X	X	X
Golden Eagle	<i>Aquila chrysaetos</i>	C			*		*
Barn Owl	<i>Tyto alba</i>		X	X	X		X
Great Horned Owl	<i>Bubo virginianus</i>		X	X	X	X	X
Long-eared Owl	<i>Asio otus</i>	E	X	X			X

Common Name	Scientific Name	Conservation Status	Breeding Season	Fall Transition	Non-Breeding Season	Winter Transition	Overall
Belted Kingfisher	<i>Megaceryle alcyon</i>		X	X	X	X	X
Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>		X	X	X	X	X
Ladder-backed Woodpecker	<i>Picoides scalaris</i>		X	X	X	X	X
Hairy Woodpecker	<i>Picoides villosus</i>				X		X
Northern Flicker	<i>Colaptes auratus</i>		X	X	X	X	X
American Kestrel	<i>Falco sparverius</i>		X	X	X	X	X
Merlin	<i>Falco columbarius</i>		*		X	X	X
Peregrine Falcon	<i>Falco peregrinus</i>	C	X	*	X	*	X
Prairie Falcon	<i>Falco mexicanus</i>	C	*	*	X		X
Olive-sided Flycatcher	<i>Contopus cooperi</i>	C; D; E	X				X
Western Wood-Pewee	<i>Contopus sordidulus</i>		X	X			X
Willow Flycatcher	<i>Empidonax traillii</i>	A; B; C	X	*			X
Hammond's Flycatcher	<i>Empidonax hammondii</i>		X				X
Gray Flycatcher	<i>Empidonax wrightii</i>	C	X	X	X		X
Dusky Flycatcher	<i>Empidonax oberholseri</i>		X	X			X
Western Flycatcher (unidentified)	<i>Empidonax difficilis/occidentalis</i>		X	X			X
Black Phoebe	<i>Sayornis nigricans</i>		X	X	X	X	X
Eastern Phoebe	<i>Sayornis phoebe</i>				*		*
Say's Phoebe	<i>Sayornis saya</i>		X	X	X	X	X
Vermilion Flycatcher	<i>Pyrocephalus rubinus</i>	A; B	X		X		X
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>		X	X		X	X
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>		X				X
Cassin's Kingbird	<i>Tyrannus vociferans</i>		*				*
Western Kingbird	<i>Tyrannus verticalis</i>		X	X			X
Eastern Kingbird	<i>Tyrannus tyrannus</i>		X				X
Scissor-tailed Flycatcher	<i>Tyrannus forficatus</i>			X			X
Loggerhead Shrike	<i>Lanius ludovicianus</i>	D	X	X	X	X	X
Bell's Vireo	<i>Vireo bellii</i>	A; B; C	X	X			X
Cassin's Vireo	<i>Vireo cassinii</i>		X	X			X
Plumbeous Vireo	<i>Vireo plumbeus</i>		X	*			X
Warbling Vireo	<i>Vireo gilvus</i>		X	X	X		X
American Crow	<i>Corvus brachyrhynchos</i>				*		*
Common Raven	<i>Corvus corax</i>		X	X	X	X	X
Horned Lark	<i>Eremophila alpestris</i>	D	X	X	X	*	X
Tree Swallow	<i>Tachycineta bicolor</i>		X	*	X	*	X
Violet-green Swallow	<i>Tachycineta thalassina</i>		X	X	*	*	X
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>		X	X	X	X	X
Bank Swallow	<i>Riparia riparia</i>		X	*			X
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>		X	X	X	*	X

Common Name	Scientific Name	Conservation Status	Breeding Season	Fall Transition	Non-Breeding Season	Winter Transition	Overall
Barn Swallow	<i>Hirundo rustica</i>		X	X	X	*	X
Verdin	<i>Auriparus flaviceps</i>		X	X	X	X	X
Bushtit	<i>Psaltriparus minimus</i>		X	X	X	X	X
Red-breasted Nuthatch	<i>Sitta canadensis</i>			X	X	X	X
Brown Creeper	<i>Certhia americana</i>				X		X
Rock Wren	<i>Salpinctes obsoletus</i>		X	X	X	X	X
Canyon Wren	<i>Catherpes mexicanus</i>		X	*	X	X	X
House Wren	<i>Troglodytes aedon</i>		X	X	X	X	X
Pacific Wren	<i>Troglodytes pacificus</i>				X	X	X
Marsh Wren	<i>Cistothorus palustris</i>		X	X	X	X	X
Bewick's Wren	<i>Thryomanes bewickii</i>		X	X	X	X	X
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>				*	X	X
Blue-gray Gnatcatcher	<i>Poliophtila caerulea</i>		X	X	X	X	X
Black-tailed Gnatcatcher	<i>Poliophtila melanura</i>		X	X	X	X	X
Golden-crowned Kinglet	<i>Regulus satrapa</i>				X	X	X
Ruby-crowned Kinglet	<i>Regulus calendula</i>		X	X	X	X	X
Western Bluebird	<i>Sialia mexicana</i>				X		X
Mountain Bluebird	<i>Sialia currucoides</i>				X		X
Swainson's Thrush	<i>Catharus ustulatus</i>			X			X
Hermit Thrush	<i>Catharus guttatus</i>		X	X	X	X	X
American Robin	<i>Turdus migratorius</i>		X	X	X	X	X
Gray Catbird	<i>Dumetella carolinensis</i>				X		X
Brown Thrasher	<i>Toxostoma rufum</i>				X		X
Crissal Thrasher	<i>Toxostoma crissale</i>		X	X	X	X	X
Northern Mockingbird	<i>Mimus polyglottos</i>		X	X	X	X	X
European Starling	<i>Sturnus vulgaris</i>		X	X	X	*	X
Cedar Waxwing	<i>Bombycilla cedrorum</i>		*	X	X		X
Phainopepla	<i>Phainopepla nitens</i>	A	X	*	X	X	X
House Sparrow	<i>Passer domesticus</i>		X	*	X	X	X
American Pipit	<i>Anthus rubescens</i>		X	X	X	X	X
House Finch	<i>Haemorhous mexicanus</i>		X	X	X	X	X
Cassin's Finch	<i>Haemorhous cassinii</i>	D; E			*		*
Red Crossbill	<i>Loxia curvirostra</i>				X		X
Pine Siskin	<i>Spinus pinus</i>	D	X	*	X		X
Lesser Goldfinch	<i>Spinus psaltria</i>		X	X	X	X	X
American Goldfinch	<i>Spinus tristis</i>		X		X		X
Green-tailed Towhee	<i>Pipilo chlorurus</i>	C	X	X			X
Spotted Towhee	<i>Pipilo maculatus</i>		X	X	X	X	X
Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>		X				X

Common Name	Scientific Name	Conservation Status	Breeding Season	Fall Transition	Non-Breeding Season	Winter Transition	Overall
Canyon Towhee	<i>Pipilo fuscus</i>		X				X
Abert's Towhee	<i>Melospiza aberti</i>	C	X	X	X	X	X
Chipping Sparrow	<i>Spizella passerina</i>		X	X	X		X
Brewer's Sparrow	<i>Spizella breweri</i>	C	X	X	X		X
Vesper Sparrow	<i>Pooecetes gramineus</i>		X	X			X
Lark Sparrow	<i>Chondestes grammacus</i>		X	X			X
Black-throated Sparrow	<i>Amphispiza bilineata</i>		X		*	*	X
Sagebrush Sparrow	<i>Artemisospiza nevadensis</i>	C	*		X		X
Bell's Sparrow	<i>Artemisospiza belli</i>	C		X	*		X
Savannah Sparrow	<i>Passerculus sandwichensis</i>		X	X	X	X	X
Fox Sparrow	<i>Passerella iliaca</i>				X		X
Song Sparrow	<i>Melospiza melodia</i>		X	X	X	X	X
Lincoln's Sparrow	<i>Melospiza lincolni</i>		X	X	X	X	X
Swamp Sparrow	<i>Melospiza georgiana</i>				X	*	X
White-throated Sparrow	<i>Zonotrichia albicollis</i>				X	*	X
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>		X	X	X	X	X
Dark-eyed Junco	<i>Junco hyemalis</i>		X	X	X	X	X
Yellow-breasted Chat	<i>Icteria virens</i>		X	X	X		X
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>		X	X	X	*	X
Western Meadowlark	<i>Sturnella neglecta</i>		X	X	X	X	X
Hooded Oriole	<i>Icterus cucullatus</i>		X	X	*		X
Bullock's Oriole	<i>Icterus bullockii</i>		X	X	X	X	X
Red-winged Blackbird	<i>Agelaius phoeniceus</i>		X	X	X	X	X
Brown-headed Cowbird	<i>Molothrus ater</i>		X	X	X	X	X
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	D	X		X	*	X
Great-tailed Grackle	<i>Quiscalus mexicanus</i>		X	X	X	X	X
Ovenbird	<i>Seiurus aurocapilla</i>				X		X
Black-and-white Warbler	<i>Mniotilta varia</i>		X	*	X	X	X
Orange-crowned Warbler	<i>Oreothlypis celata</i>		X	X	X	X	X
Lucy's Warbler	<i>Oreothlypis luciae</i>	C	X	X		X	X
Nashville Warbler	<i>Oreothlypis ruficapilla</i>		X	X	X		X
Virginia's Warbler	<i>Oreothlypis virginiae</i>	C; D; E		X			X
MacGillivray's Warbler	<i>Geothlypis tolmiei</i>		X	X	X		X
Common Yellowthroat	<i>Geothlypis trichas</i>		X	X	X	X	X
Hooded Warbler	<i>Setophaga citrina</i>		*				*
American Redstart	<i>Setophaga ruticilla</i>		X				X
Yellow Warbler	<i>Setophaga petechia</i>	B	X	X	X		X
Blackpoll Warbler	<i>Setophaga striata</i>				X		X
Yellow-rumped Warbler	<i>Setophaga coronata</i>		X	X	X	X	X

Common Name	Scientific Name	Conservation Status	Breeding Season	Fall Transition	Non-Breeding Season	Winter Transition	Overall
Black-throated Gray Warbler	<i>Setophaga nigrescens</i>		X	X	X		X
Townsend's Warbler	<i>Setophaga townsendi</i>		X	X			X
Wilson's Warbler	<i>Cardellina pusilla</i>		X	X	X	X	X
Summer Tanager	<i>Piranga rubra</i>	A; B	X	X			X
Western Tanager	<i>Piranga ludoviciana</i>		X	X			X
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>		X				X
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>		X	X			X
Blue Grosbeak	<i>Passerina caerulea</i>	A	X	X	X		X
Lazuli Bunting	<i>Passerina amoena</i>		X	X	*		X
Indigo Bunting	<i>Passerina cyanea</i>		X	X			X
Lazuli x Indigo Bunting ‡	<i>Passerina amoena x cyanea</i>		X				X
Species Richness		57	200	168	175	136	239
Conservation Priority Richness		57	46	38	39	27	57

‡ Not included in count of species.

Table 3. Average bird species richness along the Las Vegas Wash, by season and year, with numbers of weirs and revegetated hectares.

Year	Breeding	Fall Transition	Non-Breeding	Winter Transition	COMBINED (avg # species/survey)	# Weirs	# Ha Reveg*
Year 1	34.0	34.0	31.7	26.3	32.3	9	30
Year 2	32.9	40.0	30.3	32.7	32.5	10	55
Year 3	35.3	34.5	35.2	29.0	34.5	10	71
Year 4	33.8	39.5	31.2	39.3	34.0	11	79
Year 5	34.8	44.5	34.0	31.3	34.8	12	105
Year 6	33.1	45.5	33.9	30.7	34.2	12	113
Year 10	46.2	41.5	43.9	44.7	44.8	19	172
Year 11	45.9	47.5	48.1	50.0	47.3	19	198
Year 12	44.9	50.0	46.2	47.3	46.0	19	204
Year 13	41.8	54.7	51.0	45.7	46.5	21	201
Year 14	46.1	51.7	45.6	44.3	46.4	21	208
Year 15 **	44.1	51.5	45.6	51.5	46.6	21	231
COMBINED	39.3	45.2	39.4	40.0	39.9	15.3	138.9

* For Years 1–6, this number was derived from acreages reported in Las Vegas Wash Coordination Committee year-end reports as the study year ran February–January. From Year 10 onward, this number was derived from acreages reported in annual Las Vegas Wash vegetation monitoring reports, which reflect areas planted up to but not including the fall of that year, thus more closely approximating the new September–August study year.

** In Year 15, three surveys during the early breeding season were missing due to coronavirus restrictions.

Table 4. Average total bird abundance along the Las Vegas Wash, by season and year, with numbers of weirs and revegetated hectares.

Year	Breeding	Fall Transition	Non-Breeding	Winter Transition	COMBINED (avg # birds per 40 ha/survey)	# Weirs	# Ha Reveg*
Year 1	134.9	106.7	131.1	78.5	124.9	9	30
Year 2	132.3	123.8	126.2	114.7	127.5	10	55
Year 3	127.0	91.4	157.2	146.9	137.0	10	71
Year 4	143.8	109.3	151.9	156.3	145.4	11	79
Year 5	148.1	217.5	173.4	137.9	161.0	12	105
Year 6	131.3	141.7	192.1	121.4	152.0	12	113
Year 10	171.0	203.7	292.1	341.9	235.1	19	172
Year 11	193.2	167.4	302.7	452.9	259.1	19	198
Year 12	209.0	150.1	367.2	351.0	275.6	19	204
Year 13	156.7	198.3	386.4	291.7	247.8	21	201
Year 14	186.3	164.4	269.0	296.3	221.9	21	208
Year 15 **	162.3	193.9	275.2	397.2	245.2	21	231
COMBINED	157.9	157.7	233.2	244.8	193.9	15.3	138.9

* For Years 1–6, this number was derived from acreages reported in Las Vegas Wash Coordination Committee year-end reports as the study year ran February–January. From Year 10 onward, this number was derived from acreages reported in annual Las Vegas Wash vegetation monitoring reports, which reflect areas planted up to but not including the fall of that year, thus more closely approximating the new September–August study year.

** In Year 15, three surveys during the early breeding season were missing due to coronavirus restrictions.

Table 5. Estimated species-specific densities (birds per 40 ha) for survey visits overall, among seasons from the full dataset (2005–2020), and overall values by survey year. Species are in descending order of overall abundance. Conservation status includes priority species from multiple sources: A (Clark County 2000); B (Bureau of Reclamation 2006); C (GBBO 2010); D (Rosenberg et al. 2016, Intermountain Partners in Flight); E (Rosenberg et al. 2016, Continental Partners in Flight). An “X” indicates the species was recorded, but not within 100 m of a point; no entry means that the species was not detected.

Species	Overall	Breeding	Non-Breeding	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
American Coot	21.4	7.6	35.2	2.2	8.7	10.1	5.4	4.8	3.7	34.8	43.1	45.1	45.6	22.9	30.5
Yellow-rumped Warbler	11.1	1.4	26.4	6.2	3.2	11.5	10.7	13.7	14.4	13.3	8.6	10.1	13.8	16.9	10.3
Mallard	11.0	4.7	16.8	1	2.1	4.6	4	8.4	6.3	18	24.5	18.4	15.7	11.4	17.7
Red-winged Blackbird	10.7	15.4	7.6	7	7.4	9.7	9.9	12.3	6.9	15.6	17.3	14.3	10	9.2	9.3
Gadwall	10.7	2.9	16.8	0.7	1.1	1.6	1.5	2	2.5	12.9	20.8	30.9	20.9	18.4	15.6
Abert's Towhee (C)	10.2	10.6	9.1	15.6	14.3	10.2	10.8	11.5	10.9	8.6	8.1	8.9	7.7	6.8	8.7
American Wigeon	7.9	2.7	12.8	X	0.1	0.2	0.2	0.3	0.7	11.2	21.5	22.2	15.5	9.7	13.7
Song Sparrow	7.7	9.1	6.4	12.2	12.8	10.5	9.4	7.7	9.2	5.9	6.4	6.7	4.7	3.2	3.6
Marsh Wren	7.2	4.2	9.8	4.5	5.5	7.5	9.9	9.2	9	7.6	7.3	6.8	6.6	5.7	6.6
White-crowned Sparrow	6.8	0.9	15.9	4.2	4.3	5.5	5.8	8.3	8.7	6.7	5.7	7.6	9.9	8.6	6.7
Verdin	6.2	6.9	5.1	3.5	4.5	3.9	4.9	5.6	5.4	5.9	5.5	6.7	8	9.7	10.1
Gambel's Quail (C)	6.1	7.1	5.3	1.7	1.1	1	1.7	3.3	8.6	6.3	5.7	8.1	9.4	11.5	14.9
Great-tailed Grackle	6.1	9.2	3.3	0.7	1.5	3.7	4.1	4.3	3.3	7.8	10.7	10.8	8.3	9.1	8.7
Black-tailed Gnatcatcher	5.3	5.6	5.0	4.6	5.4	3.3	4.3	5.5	5.3	5.8	5.3	5.3	5.3	6.4	6.9
American Pipit	4.9	0.8	10.0	1.3	2.7	2.1	5.8	6	4.9	11.4	3.5	4.7	6.4	5.4	4.7
Bewick's Wren	4.9	4.9	4.2	7.4	8	4.9	6.8	6.7	5.4	4.6	4	3.3	2.7	2.4	2.5
Common Yellowthroat	4.7	9.2	0.2	4.1	4.6	4.6	6	4.8	4.5	4.9	5.4	6.3	3.4	3.5	4.1
Black Phoebe	3.8	2.4	4.9	3.9	4.4	3.4	3.8	3.7	3.8	4.9	3.9	4	3.1	3.2	3.3
Ruby-crowned Kinglet	2.9	0.4	5.9	4.7	4.2	3.4	2.2	2.3	2.4	2.3	2	1.8	2.6	3.4	3.3
Orange-crowned Warbler	2.7	0.5	4.4	1.7	1.1	1.8	2	1.7	2.7	1.2	3	4.2	3.6	4	5.0
Brown-headed Cowbird	2.4	5.3	0.0	3.3	3.8	3.6	4.4	3.1	3	2.1	1.6	1.6	0.9	1.3	0.7
Mourning Dove	2.1	3.7	0.4	5.1	1.8	1.7	1.4	2.2	2.1	1.2	0.7	1.3	2.8	2	2.2
Lucy's Warbler (C)	2.0	4.2		5	3.2	2.5	2.9	1.8	1.6	1.2	1.3	1.5	0.9	0.9	0.6
Crissal Thrasher	1.8	1.5	2.0	1.9	1.4	0.8	1.2	1.8	1.9	1.6	2	2.3	1.9	1.7	2.6
House Finch	1.7	1.2	2.5	0.9	1.3	1.4	1.3	4	2.8	0.9	2.4	1.4	1.5	1.5	0.9
Yellow-breasted Chat	1.7	3.5	0.0	3.2	2.9	2.2	3.4	1.1	1.5	1	1.5	0.8	0.8	0.9	0.7
Yellow Warbler (B)	1.6	3.2	0.0	1	1	1.3	2.7	2.4	2.2	1.1	1.7	1.8	1.7	1.3	0.8

Species	Overall	Breeding	Non-Breeding	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Blue Grosbeak (A)	1.4	2.8	0.0	2.3	1.7	1.6	1.7	1	1	0.9	1.2	1.6	0.9	1	1.5
Killdeer	1.2	1.4	1.0	1.7	0.9	0.3	0.8	0.9	0.3	2.1	1.3	0.7	1.5	2.1	2.3
Greater Roadrunner	1.1	1.5	0.6	0.7	0.6	0.6	0.6	0.5	0.6	1	1.4	2	1.3	1.7	2.4
Yellow-headed Blackbird	1.0	1.3	0.0	0.9	0.3	0.0	0.3	0.3	0.1	5.4	1.7	0.7	0.4	1.2	1.0
Say's Phoebe	1.0	0.7	1.3	0.5	0.6	0.3	1	1.7	1.1	0.8	1.1	1.1	1.3	0.9	1.3
Great Blue Heron	0.9	0.7	1.0	0.2	0.3	0.3	0.2	0.7	0.4	1.4	1.7	1.8	1.5	1	1.4
Ring-billed Gull	0.8	0.3	0.8	X	0.6	1.2	X	0.0	X	0.1	0.9	0.0	1.2	1.2	4.8
Northern Flicker	0.7	0.1	1.6	0.4	0.5	0.9	0.9	0.6	0.7	1	0.9	0.8	0.8	0.9	0.6
Anna's Hummingbird	0.7	0.8	0.5	0.1	0.0	0.0	0.0	0.1	0.0	0.6	1	1.5	1.8	1.5	2.1
Brewer's Sparrow (C)	0.7	0.5	0.1	0.3	0.5	1	1	2	0.9	0.2	0.4	0.2	0.2	0.5	0.6
White-faced Ibis (C)	0.6	1.0	0.2	0.1	0.2	X	0.0	0.0	0.0	0.4	0.2	0.5	1.4	3.1	1.8
Lesser Goldfinch	0.6	0.4	0.6	0.4	0.7	0.3	0.6	1.1	2.8	0.3	0.4	0.2	0.2	0.2	0.4
Canada Goose	0.6	0.5	0.4		X	0.2		0.0	0.1	0.5	0.5	1.8	0.8	0.7	2.5
Double-crested Cormorant	0.6	0.3	0.9	0.0	0.1	0.6	0.2	0.1	0.0	0.7	0.6	2.2	1.4	0.5	0.6
Western Kingbird	0.6	1.2		0.2	0.3	0.6	0.4	0.5	0.4	1.1	0.6	1.2	0.3	0.1	1.2
Northern Mockingbird	0.6	0.7	0.5	0.0	0.2	0.2	0.1	0.2	0.2	0.5	1.1	1.2	0.6	0.8	1.7
Eared Grebe (C)	0.5	1.1	0.0	0.0		0.2		0.1	X	0.0	2	3.3	0.3	0.2	0.0
Northern Pintail (C)	0.5	0.0	1.2	X	0.0		X	X	0.1	1.6	1.5	1.5	0.6	0.5	0.3
Wilson's Warbler	0.5	0.9	0.0	1.1	0.8	0.6	0.5	0.5	0.2	1	0.1	0.2	0.7	0.2	0.0
Lincoln's Sparrow	0.5	0.1	0.8	0.8	0.2	0.5	0.3	0.3	0.3	0.3	0.4	0.6	0.8	0.4	0.6
Dark-eyed Junco	0.5	0.0	1.1	0.1	0.2	1.6	0.9	0.9	0.4	0.3	0.4	0.1	0.3	0.0	0.1
Northern Rough-winged Swallow	0.4	0.8	0.0	0.2	0.2	0.2	1	0.4	0.1	0.1	0.4	0.3	0.2	1.5	0.7
Spotted Sandpiper	0.4	0.5	0.3	0.3	0.6	0.1	0.3	0.6	0.2	0.8	0.6	0.5	0.3	0.5	0.4
Black-chinned Hummingbird	0.4	0.8	0.0	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.4	0.8
Green-winged Teal	0.4	0.1	0.5		0.1	0.3	0.1	0.1	0.1	0.5	0.7	0.2	0.7	0.6	1.1
Loggerhead Shrike (D)	0.4	0.3	0.4	0.4	0.2	0.1	0.2	0.6	0.2	0.5	0.6	0.5	0.4	0.3	0.2
Least Sandpiper (C)	0.4	0.3	0.6					1.1	0.4	1.5	0.1	0.0	0.7	0.4	0.1
Lesser Scaup (C)	0.3	0.0	0.4							0.2	0.0	0.5	0.7	0.8	1.9
Common Gallinule	0.3	0.4	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.5	0.4	0.6	0.6	0.5	0.5
Bufflehead	0.3	0.0	0.6			0.2	0.3	0.0	0.1	0.7	1.1	0.4	0.6	0.3	0.4
Savannah Sparrow	0.3	0.2	0.4	0.1		0.3	0.5	0.3	0.3	0.2	0.5	0.6	0.4	0.4	0.4

Species	Overall	Breeding	Non-Breeding	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Northern Shoveler	0.3	0.1	0.6	0.1	0.0			0.0	X	0.4	1.5	1.4	0.0	0.4	0.1
American Avocet (C)	0.3	0.3	0.0	0.2				0.0	X	0.3	0.0	0.0	0.3	0.9	1.9
Greater Yellowlegs	0.3	0.2	0.4	0.3	0.3	0.1	0.2	0.2	0.3	0.5	0.6	0.1	0.3	0.2	0.7
Green Heron	0.3	0.5	0.1	0.3	0.5	0.3	0.3	0.2	0.2	0.4	0.1	0.3	0.2	0.2	0.5
Pied-billed Grebe	0.3	0.2	0.4	0.1	0.1	0.5	0.2	0.1	0.1	0.1	0.5	0.8	0.5	0.3	0.3
Western Meadowlark	0.3	0.0	0.5	X	0.0		0.0	0.1	0.1	0.2	0.3	1.1	0.3	0.5	0.4
Cooper's Hawk	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.4	0.4	0.5	0.5	0.3
Bushtit	0.2	0.0	0.5	0.6	0.4	0.2	0.0	1.2	0.5						0.0
Snowy Egret (C)	0.2	0.2	0.2	0.2	0.0	0.3	0.0	0.1	0.1	0.3	0.3	0.4	0.2	0.5	0.4
Belted Kingfisher	0.2	0.1	0.4	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.4	0.3	0.2	0.3	0.3
Cinnamon Teal (C)	0.2	0.4	0.0	0.1	X	X	0.0	0.2		0.3	0.5	0.1	0.4	0.7	0.3
Common Merganser	0.2	0.1	0.2	0.0	0.0	0.1	0.0	0.1	0.0	0.2	0.4	0.6	0.2	0.2	0.5
Blue-gray Gnatcatcher	0.2	0.2	0.2	0.4	0.5	0.2	0.6	0.1	0.1	0.2		0.0	0.1	0.1	0.0
Black-crowned Night-Heron	0.2	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.1	0.2	0.1	0.4	0.4	0.3	0.4
Costa's Hummingbird (C)	0.2	0.3	0.0	0.1	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.6
Ring-necked Duck	0.2	X	0.3				X	X		0.1	0.4	0.1	0.5	0.7	0.3
Sora	0.2	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.4	0.3	0.3	0.6
White-winged Dove	0.2	0.3	0.0	0.3	0.2	0.3	0.3	0.4	0.2	0.2	0.0	X	X	X	
Black-necked Stilt (C)	0.2	0.3		0.1	X			0.1	X	0.1	0.0	0.0	0.2	0.9	0.5
Bullock's Oriole	0.2	0.3	0.0	0.0	0.1	0.1		0.1	0.2	0.2	0.4	0.4	0.2	0.2	0.1
Great Egret	0.1	0.1	0.2	0.1	0.0	0.1	0.1	0.2	0.1	0.1	0.2	0.3	0.1	0.2	0.3
Osprey	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.2	0.2	0.2	0.3
Chipping Sparrow	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.7	0.1	X	0.0	0.1	0.1	0.0	0.1
Cliff Swallow	0.1	0.3	0.0	X	X	0.1	0.7	0.1	X	X	X	X	X	0.5	0.1
Lazuli Bunting	0.1	0.2	X	0.1	0.1	0.0	0.2	0.0	X	0.0	0.0	0.0	0.4	0.2	0.3
Spotted Towhee	0.1	0.0	0.3	0.1	0.1	0.2	0.3	0.1	0.1	0.1	0.0		0.1	0.3	0.1
Western Wood-Pewee	0.1	0.2		0.1	0.1	0.1	0.2	0.0	0.2	0.3	0.1	0.1	0.2	0.2	0.0
Rock Wren	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.3	0.3	0.0	0.1	0.0	0.0	0.0	0.1
Barn Swallow	0.1	0.2	0.0	X	X	1.2	0.1	X	X	X	X	X	0.0	0.0	0.0
Northern Harrier	0.1	0.0	0.2	0.0	0.1	0.3	0.1	0.0	X	0.0	0.1	0.1	0.1	0.1	0.3
Red-tailed Hawk	0.1	0.0	0.3	0.1	0.0	0.1	0.1	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.2

Species	Overall	Breeding	Non-Breeding	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
American Kestrel	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.2	0.1	0.2
Phainopepla (A)	0.1	0.0	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.0	0.1	X	0.1	0.0	0.1
Warbling Vireo	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.2	0.0	0.1	0.2	0.1	0.1	0.1	0.0
Virginia Rail	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1
American White Pelican (C)	0.1	0.0	0.1				0.0	X	0.0	0.3	0.3	0.0	X	X	0.4
Hooded Merganser	0.1	0.0	0.2							0.0	0.3	0.2	0.3	0.1	0.1
Brewer's Blackbird (D)	0.1	0.0	0.2		X		0.4	0.1	0.4				0.0		0.0
Indigo Bunting	0.1	0.2						0.1	0.1	0.1	0.2	0.3	0.1	0.1	
House Wren	0.1	0.0	0.2	0.0	0.0			0.0		0.0	0.1	0.2	0.3	0.2	0.1
Sharp-shinned Hawk	0.1	0.0	0.2	0.2	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Western Sandpiper (C)	0.1	0.1	0.0	0.4	0.0			0.2	0.1	0.1			X	0.0	0.1
Horned Lark (D)	0.1	0.1	0.0	0.1		0.3	0.3	0.0	0.0	0.1		X	X		X
Great Horned Owl	0.1	0.1	0.1		0.0	0.0		0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.3
Long-billed Dowitcher (C)	0.1	0.1	0.0		0.1					0.1	0.1	0.2	0.1	0.2	0.1
Pine Siskin (D)	0.1	0.0	0.2	0.1		0.3			0.2		0.2				
Western Tanager	0.1	0.1		0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.2	0.1	0.1
Common Goldeneye	0.1	0.0	0.1			0.0	0.1	0.0	X	0.0	0.1	0.1	0.1	0.1	0.1
American Robin	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
Red-shouldered Hawk	0.1	0.0	0.1					X	0.0	0.0	0.1	0.2	0.2	0.1	0.1
Bell's Vireo (A; B; C)	0.1	0.1		0.2		0.1			0.1	0.1	0.2	0.0	0.0	0.1	0.0
Ladder-backed Woodpecker	0.1	0.0	0.1	0.0			0.0	0.0	0.2	0.1	0.1	0.1	0.0	0.0	X
Black-headed Grosbeak	0.0	0.1		0.1	0.1	0.0		0.0	0.1	0.0	0.0	0.0	0.1	0.1	
Ash-throated Flycatcher	0.0	0.1		0.1	0.0	0.1	0.0	X	0.1	0.1	0.0	0.1		0.0	0.0
Hermit Thrush	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Least Bittern (B; C)	0.0	0.1	0.0	0.0	0.0	0.1	0.1	X	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Tree Swallow	0.0	0.1	0.0			0.0	0.0	X	X	X	X	X	X	X	0.4
Lark Sparrow	0.0	0.1				0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0
Greater White-fronted Goose	0.0		0.1						X			0.0		0.3	0.0
California Gull	0.0	0.0	X					X	X	X		X	X	0.0	0.4
Common Raven	0.0	0.0	0.0	X	X	0.1	X	0.0	X	0.1	X	0.1	0.0	0.0	X
Nashville Warbler	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		X

Species	Overall	Breeding	Non-Breeding	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Western Flycatcher (unidentified)	0.0	0.0		0.0	0.1	0.1	0.0		X	0.1		0.0	0.0	0.0	0.0
Ruddy Duck	0.0	X	0.0						X	0.2	0.0			0.1	0.0
Hooded Oriole	0.0	0.0	X			0.0						0.0	0.1	0.1	0.1
Neotropic Cormorant	0.0	0.0	0.0							0.0	0.2	X	0.0	0.0	0.0
Black-throated Gray Warbler	0.0	0.0	0.0					0.0				0.0	0.1	0.1	0.1
MacGillivray's Warbler	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.1		0.0	0.0
Bank Swallow	0.0	0.0						X			X			0.2	0.0
Eurasian Collared-Dove	0.0	0.0	0.0					0.0	X	0.0	0.0	0.1	0.0	0.0	
Redhead (C)	0.0	0.0	0.0				0.0		X	0.0	X	X	X	0.0	0.2
Red-naped Sapsucker	0.0	0.0	0.0	0.0	0.1	0.0				0.0	0.0		0.0		0.1
Dusky Flycatcher	0.0	0.0		0.0	0.0	0.1		0.0		0.0					
Golden-crowned Kinglet	0.0		0.1	0.0		0.1	0.0	0.0	0.0					0.0	
Gray Flycatcher (C)	0.0	0.0	0.0	0.0		0.1		0.0	0.0		0.0	0.0			
Wilson's Snipe	0.0	0.0	0.0					0.0	X	0.0	0.0		0.0	0.1	
Pacific Wren	0.0		0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	X	0.0
Townsend's Warbler	0.0	0.0							0.1	0.1			0.0	0.0	
American Goldfinch	0.0	0.0	0.0					0.0		0.0			0.0	X	0.1
Lesser Nighthawk	0.0	0.0		X	0.0	X	X	0.0	X	0.0	0.0	0.1	X	X	0.0
Horned Grebe	0.0	0.0	0.0							0.0	0.1	0.0			
Summer Tanager (A; B)	0.0	0.0		X						0.0				0.0	0.1
Black-throated Sparrow	0.0	0.0	X		0.0				0.1						0.0
Barn Owl	0.0	0.0	0.0	0.1	0.0	0.0		0.0		X		X	0.0	X	
Cedar Waxwing	0.0	X	0.0	0.1	0.0			X					0.1	X	X
Violet-green Swallow	0.0	0.0	X		X	0.0	0.0	0.0	X	X	X		X	X	0.0
Olive-sided Flycatcher (C; D; E)	0.0	0.0		0.0		0.0			0.0	0.0	0.0	0.0		0.0	
Red-breasted Nuthatch	0.0		0.0			0.0	0.0			0.0	0.0		0.0		X
Lesser Yellowlegs	0.0	0.0	0.0					0.0		0.0	X		0.0	0.0	X
Solitary Vireo (unidentified)	0.0	0.0		X	0.0	0.0	0.1							X	
Western Grebe (C)	0.0	0.0	0.0	X		0.0				0.0	0.0	X		X	X
Snow Goose	0.0	X	0.0	X				X	X		0.0		X	0.1	X

Species	Overall	Breeding	Non-Breeding	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Caspian Tern	0.0	0.0	X				X			X	X		0.0	0.0	0.1
Brown-crested Flycatcher	0.0	0.0		0.0				X					0.0	0.0	0.0
Vesper Sparrow	0.0	0.0						0.0	0.0	0.0			X	X	X
Plumbeous Vireo	0.0	0.0					0.0			0.0	0.0		0.0		X
Dunlin	0.0	0.0								0.1					
Semipalmated Sandpiper	0.0	0.0			0.1										
Canyon Wren	0.0	0.0	0.0	0.0	0.0	X	X			X			0.0		
Vermilion Flycatcher (A; B)	0.0	0.0	0.0										0.0	0.0	0.0
Peregrine Falcon (C)	0.0	0.0	0.0	X	X	X	0.0	0.0	X	X	X	X	0.0	X	0.0
Merlin	0.0	X	0.0		0.0			0.0	X		0.0		X	0.0	
Green-tailed Towhee (C)	0.0	0.0					0.0	0.0				0.0	0.0		
Black-and-white Warbler	0.0	0.0	0.0									0.0	X	0.0	
European Starling	0.0	0.0	0.0				X	X	0.0		0.0			0.0	X
Sagebrush Sparrow (C)	0.0	X	0.0								0.0	0.0			
American Redstart	0.0	0.0													0.1
Willow Flycatcher (A; B; C)	0.0	0.0					0.0		0.0						X
Western Bluebird	0.0		0.0	0.1	X			X							
House Sparrow	0.0	0.0	0.0	0.0		X				0.0					0.0
Eastern Kingbird	0.0	0.0							0.0		0.0	0.0			
Wood Duck	0.0		0.0				0.0			X		X	0.0	X	X
Cassin's Vireo	0.0	0.0											0.0	0.0	
Rock Pigeon	0.0	X	0.0	X	X	0.0	0.0	X	X			X	X	X	X
Swamp Sparrow	0.0		0.0										0.0	X	
American Bittern	0.0	0.0			0.0			0.0				X			
Brown Creeper	0.0		0.0							0.0			0.0		
Prairie Falcon (C)	0.0	X	0.0	X	X			0.0	X	X	X	X	X	0.0	X
Rufous Hummingbird (C; E)	0.0	0.0						X	0.0						
Solitary Sandpiper	0.0	0.0											0.0		
Cactus Wren	0.0		X					X			0.0				
Turkey Vulture	0.0	0.0	X	X	X	X	0.0	X	X	X	X	0.0	X	X	X
White-throated Swift (C)	0.0	0.0	X	X	X	X	X	X	X	X	X	X	X	0.0	X

Species	Overall	Breeding	Non-Breeding	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Willet (C)	0.0	0.0								X	0.0			0.0	X
Barrow's Goldeneye	0.0														0.0
Lazuli X Indigo Bunting	0.0	0.0													0.0
Rose-breasted Grosbeak	0.0	0.0													0.0
Semipalmated Plover	0.0	0.0		0.0											
Canyon Towhee	0.0	0.0			0.0										
Fox Sparrow	0.0		0.0										0.0		
Hairy Woodpecker	0.0		0.0		0.0										
Bonaparte's Gull	0.0	0.0								X	X		0.0		
Long-eared Owl (E)	0.0	X		X										0.0	
Sandhill Crane (C)	0.0	0.0	X						X		X		0.0		
Swainson's Hawk (C)	0.0	0.0				X			X		X	X	0.0		
Bell's Sparrow (C)	0.0		X											0.0	X
Blackpoll Warbler	0.0		0.0								0.0				
Blue-winged Teal	0.0	X	0.0	X						X	0.0		X	X	
Broad-tailed Hummingbird	0.0								0.0						
Brown Thrasher	0.0		0.0											0.0	
Cattle Egret	0.0	X								X	0.0			X	
Gray Catbird	0.0		0.0											0.0	
Groove-billed Ani	0.0		0.0											0.0	
Hammond's Flycatcher	0.0	0.0								0.0				X	
Mountain Bluebird	0.0		0.0				0.0								
Ovenbird	0.0		0.0						0.0						
Pectoral Sandpiper	0.0							0.0							
Red Crossbill	0.0		0.0								0.0				
Ross's Goose	0.0		0.0					X				0.0		X	
Rufous-crowned Sparrow	0.0	0.0				0.0									
Scissor-tailed Flycatcher	0.0								0.0						
Swainson's Thrush	0.0													0.0	
Virginia's Warbler (C; D; E)	0.0					0.0									
White-throated Sparrow	0.0		0.0											0.0	

Species	Overall	Breeding	Non-Breeding	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
American Crow	X		X												X
Bald Eagle (C)	X		X												X
Cackling Goose/Lesser Canada Goose	X													X	
Canvasback (C)	X		X								X				
Cassin's Finch (D; E)	X		X												X
Cassin's Kingbird	X	X												X	
Clark's Grebe (C)	X	X	X				X			X	X			X	
Common Nighthawk (D)	X												X	X	
Eastern Phoebe	X		X											X	
Forster's Tern	X	X									X				
Franklin's Gull (C)	X	X									X			X	
Golden Eagle (C)	X		X											X	
Graylag Goose	X	X	X					X	X	X					
Hooded Warbler	X	X								X					
Lesser Black-backed Gull	X	X								X					
Long-billed Curlew (C)	X	X									X	X		X	
Marbled Godwit (C)	X	X									X				X
Mississippi Kite	X	X													X
Northern Goshawk (C)	X		X						X						
Roseate Spoonbill	X	X													X
Sage Sparrow (C)	X		X												
Short-billed Dowitcher	X	X											X		X
Snow Goose (x Domestic Goose?)	X		X										X		
Stilt Sandpiper	X											X			
Tundra Swan (C)	X		X									X			
Vaux's Swift	X	X	X			X		X					X		
Western/Clark's Grebe	X	X									X				
Western/Least Sandpiper	X										X				
Whimbrel	X	X								X					
White Ibis	X	X										X			

Species	Overall	Breeding	Non-Breeding	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
White-tailed Kite	X	X								X					
Wilson's Phalarope (C)	X	X									X		X	X	X

Table 6a. Breeding abundance (birds per 40 ha) by species for each of 12 survey years (2005–2020). Species listed are in descending order of overall abundance. Conservation status includes priority species from multiple sources: A (Clark County 2000); B (Bureau of Reclamation 2006); C (GBBO 2010); D (Rosenberg et al. 2016, Intermountain Partners in Flight); E (Rosenberg et al. 2016, Continental Partners in Flight). An “X” indicates the species was recorded, but not within 100 m of a point; no entry means that the species was not detected.

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
American Coot	1.2	1.4	5.5	3.3	1.3	1.1	10.5	17.5	20.4	12.3	15.0	2.1
Yellow-rumped Warbler	0.3	1.1	1.7	0.7	0.9	0.4	1.2	1.7	3.1	3.8	1.5	
Mallard	0.5	0.4	2.0	2.4	4.8	3.1	6.8	11.5	7.6	5.1	6.6	6.0
Red-winged Blackbird	5.3	8.7	11.7	15.1	15.6	14.1	25.4	24.0	23.6	11.8	15.9	13.5
Gadwall	0.1	0.0	0.3	0.5	0.7	0.2	0.7	5.4	9.8	7.0	8.7	1.1
Abert's Towhee (C)	17.4	15.8	9.9	11.1	11.0	10.8	7.8	7.5	9.6	7.7	8.0	10.5
American Wigeon		X	0.1	0.3	X	X	2.5	12.0	7.0	5.2	5.7	X
Song Sparrow	14.2	15.2	12.1	12.0	9.1	10.9	7.9	7.9	9.1	4.2	3.3	3.0
Marsh Wren	2.0	2.9	4.7	8.2	7.6	6.9	4.1	3.4	3.5	3.6	3.1	0.5
White-crowned Sparrow	0.6	1.4	0.3	0.2	0.6	0.7	0.8	1.2	1.2	2.3	1.2	
Verdin	3.9	5.9	4.3	5.0	6.0	5.6	6.2	5.8	8.0	9.6	11.8	11.0
Gambel's Quail (C)	3.2	1.8	1.5	1.7	4.6	9.6	6.2	7.4	10.8	8.9	12.2	17.9
Great-tailed Grackle	0.6	2.0	5.2	5.9	7.2	4.4	13.4	17.0	16.9	11.0	14.5	11.8
Black-tailed Gnatcatcher	5.0	6.8	3.2	4.2	5.2	4.8	6.2	5.2	5.9	6.1	6.7	7.7
American Pipit	X	0.1	0.4	X	3.8	0.4	1.1	0.3	0.1	2.5	0.8	
Bewick's Wren	7.1	9.0	4.8	7.0	6.6	3.8	4.6	5.0	3.9	2.5	2.4	1.7
Common Yellowthroat	8.1	8.9	9.3	11.3	10.1	9.0	9.4	10.5	12.2	6.2	6.3	9.1
Black Phoebe	2.3	2.7	2.1	2.3	2.3	2.0	3.4	2.1	2.0	2.2	2.2	2.9
Ruby-crowned Kinglet	0.8	0.8	0.5	0.4	0.2	0.1	0.4	0.3	0.6	0.4	0.6	
Orange-crowned Warbler	0.4	0.4	0.4	0.1	0.3	0.4	0.2	0.3	0.8	0.7	0.8	0.6
Brown-headed Cowbird	7.2	8.2	7.8	9.5	6.7	6.4	4.4	3.6	3.4	1.8	2.6	1.7
Mourning Dove	10.5	3.5	3.1	2.8	4.3	4.5	2.3	1.2	2.8	3.1	2.6	3.5
Lucy's Warbler (C)	10.8	7.0	5.2	6.2	3.9	3.5	2.4	2.8	3.2	2.0	2.0	1.4
Crissal Thrasher	1.5	1.7	0.5	1.0	1.7	1.4	1.8	1.5	2.2	1.0	1.6	2.4
House Finch	1.3	1.1	0.9	1.1	4.3	1.6	0.7	0.6	0.7	0.8	0.4	0.9
Yellow-breasted Chat	6.8	6.1	4.6	6.9	2.4	3.2	2.1	3.3	1.7	1.6	2.0	1.7
Yellow Warbler (B)	2.3	2.0	2.8	5.6	4.8	4.6	2.1	3.3	3.2	3.3	2.3	1.6

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Blue Grosbeak (A)	4.4	3.5	3.3	3.5	2.3	1.9	2.0	2.3	3.2	1.7	2.0	3.7
Killdeer	2.3	1.0	0.4	0.4	1.6	0.5	2.2	1.4	0.8	2.0	2.7	2.0
Greater Roadrunner	0.9	1.0	1.0	0.7	0.7	0.9	1.7	1.6	2.4	1.5	1.8	3.5
Yellow-headed Blackbird	1.9	0.2	0.1	0.4	0.7	0.2	4.9	1.4	1.1	0.5	2.3	2.1
Say's Phoebe	0.4	0.7	0.5	1.1	1.2	0.7	0.9	0.4	0.4	0.9	0.4	1.2
Great Blue Heron	0.2	0.1	0.3	0.1	0.8	0.3	1.5	1.5	1.0	0.6	0.9	1.2
Ring-billed Gull	X	X		X	X	X	0.0	X	X	1.5	1.7	X
Northern Flicker	X		0.1	0.1		0.0	0.0	0.1	0.1	X	0.2	
Anna's Hummingbird	0.2	0.1		0.1	0.1	0.0	0.7	1.2	1.9	1.9	1.8	2.0
Brewer's Sparrow (C)		0.7	1.7	0.3	0.6	1.2	0.2	0.0	0.1	0.4	X	1.0
White-faced Ibis (C)	0.1	0.5	X	0.0	0.0	0.1	0.7	0.2	0.6	2.9	3.9	2.4
Lesser Goldfinch	0.1	0.4	0.2	0.1	0.5	1.8	0.3	0.1	0.2	0.1	0.5	0.2
Canada Goose			0.2		X	0.1	1.0	0.3	0.2	1.0	0.3	2.8
Double-crested Cormorant	0.0	0.1	0.2	0.1	0.2	0.0	0.5	0.5	0.8	0.2	0.2	0.0
Western Kingbird	0.4	0.7	1.2	0.8	0.9	0.5	2.3	1.0	2.5	0.4	0.1	2.9
Northern Mockingbird	0.1	0.3	0.2	0.0	0.2	0.2	0.8	1.2	1.1	0.7	0.9	2.4
Eared Grebe (C)	0.0		0.5		0.1		X	4.4	7.1	0.7	0.3	0.0
Northern Pintail (C)							X		X		0.1	
Wilson's Warbler	2.1	1.7	1.3	0.5	1.0	0.4	2.2	0.1	0.4	1.4	0.4	0.0
Lincoln's Sparrow	0.1	0.1	0.3	0.1	0.1	0.0	0.1	0.2	0.4	0.4	0.0	
Dark-eyed Junco	0.1			0.3			0.1				0.1	
Northern Rough-winged Swallow	0.2	0.4	0.3	2.0	0.7	X	0.2	0.8	0.7	0.4	2.9	1.5
Spotted Sandpiper	0.4	0.9	0.1	0.5	0.7	0.2	1.0	0.8	0.5	0.0	0.6	0.4
Black-chinned Hummingbird	0.3	0.7	0.7	0.5	0.7	0.6	0.6	1.0	1.0	0.9	0.7	2.0
Green-winged Teal		0.0	X	0.1	X	0.1	0.2	0.2	0.0	0.2	0.3	0.2
Loggerhead Shrike (D)	0.6	0.3	0.1	0.3	0.5	0.1	0.4	0.1	0.5	0.0	0.0	0.3
Least Sandpiper (C)					1.2	0.7	0.5	0.3	X	0.1	0.5	X
Lesser Scaup (C)							X	0.1	0.1	0.0	0.1	
Common Gallinule	0.1	0.2	0.2	0.1	0.3	0.3	0.7	0.5	0.6	0.4	0.8	0.7
Bufflehead			0.0				0.1	0.0	0.2			
Savannah Sparrow	0.2		0.4	0.2	0.0	0.1	0.2	0.1	0.1	0.2	0.2	0.0

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Northern Shoveler					0.1		0.1	0.1	0.1	X	0.2	
American Avocet (C)	0.4				0.1	X	0.3	X	X	0.6	2.0	0.7
Greater Yellowlegs	X	0.1		0.0	0.1	0.3	0.3	0.3	0.0	0.3	0.1	0.7
Green Heron	0.5	0.8	0.4	0.5	0.4	0.4	0.9	0.3	0.4	0.4	0.3	1.0
Pied-billed Grebe		0.0	0.4	0.3	0.2	0.1	0.1	0.5	0.5	0.3	0.5	0.1
Western Meadowlark		0.0					0.1	X	0.1	X	0.1	
Cooper's Hawk	0.0		0.0	0.1	0.0	X	0.3	0.4	0.3	0.5	0.6	0.3
Bushtit	0.1					0.1						
Snowy Egret (C)	0.3	X	0.2	0.0	0.1	X	0.4	0.4	0.3	X	0.3	0.5
Belted Kingfisher	0.0	0.1	0.0	X	0.0	0.1	0.1	0.2	0.1	X	0.1	X
Cinnamon Teal (C)	0.2	X	X	0.1	0.1		0.1	1.0	0.2	0.6	1.4	0.7
Common Merganser	0.1	X		0.0	X	X	0.2	0.2	0.5	X	0.1	
Blue-gray Gnatcatcher	0.6	0.3	0.3	0.9					0.1	0.0	X	
Black-crowned Night-Heron	0.1	0.1	0.0	0.0	X	0.0	0.2	0.1	0.3	0.1	0.3	0.1
Costa's Hummingbird (C)	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.3	0.5	1.2
Ring-necked Duck							X	X		X	X	
Sora		0.0	0.0	0.0		0.1	0.0	0.1	0.2	0.2	0.1	0.1
White-winged Dove	0.6	0.4	0.7	0.7	0.8	0.5	0.3	0.1	X	X	X	
Black-necked Stilt (C)	0.1	X			0.2	X	0.2	0.0	0.1	0.4	1.7	1.1
Bullock's Oriole	0.0	0.3	0.2		0.1	0.2	0.4	0.7	0.8	0.4	0.4	0.2
Great Egret	0.0	X	X	0.0	0.2	0.1	0.1	0.0	0.2	0.0	0.2	0.1
Osprey	X	0.1	0.0	X	0.1	0.0	0.2	0.3	0.2	X	0.2	0.1
Chipping Sparrow	0.1		0.2		1.0	0.2				0.1		0.3
Cliff Swallow	X	X	0.2	1.5	0.0	X	X	X	X	X	1.1	0.4
Lazuli Bunting	0.1	0.2	0.1	0.0	0.0	X	0.1	0.1	0.0	0.8	0.1	0.6
Spotted Towhee	0.1		0.0	0.1		0.0				0.0	X	
Western Wood-Pewee	0.1	0.1	0.1	0.2	0.0	0.4	0.5	0.1	0.1	0.3	0.2	
Rock Wren	0.0	0.1	0.0	0.2	0.2	0.2	0.0	X				X
Barn Swallow		X	2.6	X	X	X	X	X	X	0.1	0.0	X
Northern Harrier		0.0	0.1	X	0.0	X	X	X	X	X	0.0	X
Red-tailed Hawk	X	0.0		0.0	X	X	0.1	X	X	X	0.0	

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
American Kestrel	0.1	0.1	0.1		0.1	0.1	0.3	0.3	0.1	0.3	X	0.4
Phainopepla (A)						0.0	X		X	0.0	X	
Warbling Vireo	0.2	0.1	0.1	0.1	0.3	0.1	0.2	0.0	0.1	0.1	0.1	0.0
Virginia Rail	0.0	0.0	0.0	0.0		0.2	0.1	0.1	0.2	0.1	0.0	0.0
American White Pelican (C)				0.1		0.0	0.3	0.1				X
Hooded Merganser							X	0.0	0.1	X		
Brewer's Blackbird (D)					0.2					0.0		X
Indigo Bunting					0.2	0.1	0.2	0.5	0.6	0.2	0.2	
House Wren		0.0					0.0		0.0		0.1	0.1
Sharp-shinned Hawk	X	X	X		0.0	X	X	X	X	X		
Western Sandpiper (C)	0.8				0.5	0.2	X			X		X
Horned Lark (D)	0.1		0.6	0.3	0.0		0.1		X			X
Great Horned Owl			0.0		0.1	0.1	0.0		0.1	0.1	0.0	0.4
Long-billed Dowitcher (C)		0.1					0.2	0.1	0.3	X	0.0	X
Pine Siskin (D)	X							0.2				
Western Tanager	0.1	0.0	0.1		0.1	0.1	0.0	0.1	0.0	0.4	0.1	0.1
Common Goldeneye							X	0.1	0.1	0.0	X	
American Robin								0.0			0.1	
Red-shouldered Hawk							X	0.0	0.0	0.1	0.0	0.0
Bell's Vireo (A; B; C)	0.4		0.2			0.1	0.1	0.3	0.0	0.0	0.2	0.1
Ladder-backed Woodpecker	0.0			0.0		0.1	0.1	X	0.1			
Black-headed Grosbeak	0.2	0.1			0.1	0.1	0.0	0.1	0.1	0.2	0.2	
Ash-throated Flycatcher	0.1	X	0.2	0.0		0.2	0.1	0.1	0.1		0.1	0.1
Hermit Thrush	0.0	0.0										
Least Bittern (B; C)	0.0		0.1	0.1	X	0.1	0.2	0.1	0.1	0.0	0.1	0.0
Tree Swallow				0.1	X	X	X	X	X	X	X	0.9
Lark Sparrow			0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.2		0.0
California Gull						X	X				0.0	0.1
Common Raven	X	X		X	X	X	0.1	X	0.2	X	X	X
Nashville Warbler			0.1			0.0	0.1	X	0.0	X		
Western Flycatcher (unidentified)		0.0	0.2	0.0		X	0.2		0.1	0.1	0.0	

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Ruddy Duck							X				X	
Hooded Oriole			0.1						0.1	0.2	0.1	0.1
Neotropic Cormorant							0.0	0.3	X	0.1	X	0.1
Black-throated Gray Warbler									X	0.2	0.1	0.0
MacGillivray's Warbler	0.0		0.0			0.0	0.0		0.0		0.1	0.0
Bank Swallow					X			X			0.4	0.1
Eurasian Collared-Dove					0.0	X	0.1	0.0	0.1	X	0.1	
Redhead (C)							X		X	X	0.0	
Red-naped Sapsucker	0.0											
Dusky Flycatcher	0.0	0.0	0.3				0.0					
Gray Flycatcher (C)	0.0		0.2		0.1			0.0	0.0			
Wilson's Snipe					0.0	X	0.0	0.0			0.0	
Townsend's Warbler						0.2	0.1				0.0	
American Goldfinch					0.0		X					
Lesser Nighthawk	X	0.0	X	X	0.0	X	0.1	X	0.0	X	X	0.1
Horned Grebe							0.0	0.1	0.1			
Summer Tanager (A; B)											0.0	0.3
Black-throated Sparrow		0.0				0.2						0.1
Barn Owl	0.1	0.1			0.0		X					
Cedar Waxwing										X	X	
Violet-green Swallow		X	0.1	0.1	X	X	X	X		X	X	0.1
Olive-sided Flycatcher (C; D; E)	0.0		0.0			0.0	0.0	0.0	0.1		0.0	
Lesser Yellowlegs							0.1			0.1	0.0	X
Solitary Vireo (unidentified)	X	0.0	0.0	0.2							X	
Western Grebe (C)							0.1	X	X		X	
Snow Goose	X					X						
Caspian Tern				X			X	X		0.1	0.0	0.1
Brown-crested Flycatcher	0.1				X					0.0	0.1	0.0
Vesper Sparrow					0.1	0.0						
Plumbeous Vireo				0.0			0.0	0.0		0.1		
Dunlin							0.2					

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Semipalmated Sandpiper		0.1										
Canyon Wren	0.0			X						0.0		
Vermilion Flycatcher (A; B)												0.0
Peregrine Falcon (C)			X	0.0	X	X	X	X	X	0.0		
Merlin											X	
Green-tailed Towhee (C)				0.0					0.0			
Black-and-white Warbler											0.0	
European Starling								0.0			X	
Sagebrush Sparrow (C)									X			
American Redstart												0.1
Willow Flycatcher (A; B; C)				0.1		0.0						
House Sparrow							0.0					
Eastern Kingbird						0.0		0.0	0.0			
Cassin's Vireo										0.0	0.0	
Rock Pigeon	X	X	X	X	X				X	X	X	X
American Bittern		0.0										
Prairie Falcon (C)						X			X			
Rufous Hummingbird (C; E)						0.1						
Solitary Sandpiper										0.0		
Turkey Vulture		X	X	X	X	X	X	X	0.0	X	X	X
White-throated Swift (C)	X	X	X	X	X	X	X	X	X	X	0.1	X
Willet (C)							X	0.0			0.0	X
Lazuli X Indigo Bunting												0.0
Rose-breasted Grosbeak												0.0
Semipalmated Plover	0.0											
Canyon Towhee		0.0										
Bonaparte's Gull							X	X		0.0		
Long-eared Owl (E)	X											
Sandhill Crane (C)										0.0		
Swainson's Hawk (C)			X			X		X	X	0.0		
Blue-winged Teal	X						X	X		X	X	

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Cattle Egret							X					
Hammond's Flycatcher							0.0				X	
Rufous-crowned Sparrow			0.0									
Cassin's Kingbird											X	
Clark's Grebe (C)				X				X				
Forster's Tern								X				
Franklin's Gull (C)								X			X	
Graylag Goose						X						
Hooded Warbler							X					
Lesser Black-backed Gull							X					
Long-billed Curlew (C)									X		X	
Marbled Godwit (C)												X
Mississippi Kite												X
Roseate Spoonbill												X
Short-billed Dowitcher										X		X
Vaux's Swift			X							X		
Western/Clark's Grebe								X				
Whimbrel							X					
White Ibis									X			
White-tailed Kite							X					
Wilson's Phalarope (C)								X		X		X

Table 6b. Non-breeding abundances (birds per 40 ha) by species for each of 12 survey years (2005–2020). Species listed are in descending order of overall abundance. Conservation status includes priority species from multiple sources: A (Clark County 2000); B (Bureau of Reclamation 2006); C (GBBO 2010); D (Rosenberg et al. 2016, Intermountain Partners in Flight); E (Rosenberg et al. 2016, Continental Partners in Flight). An “X” indicates the species was recorded, but not within 100 m of a point; no entry means that the species was not detected.

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
American Coot	4.5	16.8	9.6	6.0	7.7	6.7	61.1	58.6	82.9	97.1	30.2	41.2
Yellow-rumped Warbler	16.8	6.1	25.3	27.1	32.3	39.6	32.0	19.0	21.0	29.9	45.1	22.3
Mallard	1.3	5.2	6.6	4.8	11.3	11.1	31.4	33.5	30.3	28.4	12.5	25.3
Red-winged Blackbird	12.9	8.8	11.1	4.4	8.2	0.6	4.4	14.4	5.9	11.3	3.0	5.8
Gadwall	1.7	2.5	2.1	1.7	2.7	4.6	18.6	29.3	51.5	37.3	30.2	19.9
Abert's Towhee (C)	13.1	12.6	10.5	9.3	11.1	9.9	8.8	8.9	8.0	5.7	5.2	6.6
American Wigeon	X	X	0.3	0.1	0.3	0.6	17.5	23.9	44.1	37.4	11.2	18.6
Song Sparrow	10.2	9.7	9.5	5.9	6.8	7.7	2.9	5.2	4.7	5.4	3.7	4.8
Marsh Wren	7.1	7.6	9.7	11.0	10.5	11.2	9.9	10.5	10.2	10.2	8.0	11.2
White-crowned Sparrow	10.4	6.5	13.5	15.0	19.2	21.2	15.7	13.7	17.2	21.7	21.6	14.8
Verdin	3.0	2.3	3.8	4.7	5.5	4.6	5.8	4.9	5.1	5.6	7.5	8.6
Gambel's Quail (C)	0.6	0.7	0.6	1.8	1.6	8.9	6.5	4.0	5.1	10.3	12.1	10.8
Great-tailed Grackle	1.2	1.2	2.6	2.8	1.2	2.9	2.8	3.2	3.7	5.8	4.0	7.5
Black-tailed Gnatcatcher	3.6	4.6	3.1	4.4	5.7	5.4	4.6	5.5	4.5	4.4	6.9	6.9
American Pipit	3.8	6.7	3.6	13.0	8.7	12.3	20.5	9.1	8.4	12.9	10.5	10.9
Bewick's Wren	6.8	6.1	4.7	7.0	5.0	6.9	3.5	2.5	2.2	2.5	1.3	2.5
Common Yellowthroat	0.0		0.0	0.2		0.1	0.5	0.3	0.4	0.1	0.2	
Black Phoebe	4.9	5.6	4.3	5.9	4.2	5.6	5.7	5.4	6.3	3.8	3.5	3.6
Ruby-crowned Kinglet	10.1	7.7	7.4	4.1	5.4	4.8	3.9	4.4	3.4	5.8	7.9	6.2
Orange-crowned Warbler	2.9	2.0	3.1	4.0	2.6	4.5	1.4	4.9	8.0	6.1	6.9	6.9
Brown-headed Cowbird		X		0.0			0.0					
Mourning Dove	0.3	X	0.3	0.1	0.2	X	0.4	0.3	0.0	0.1	1.6	2.1
Crissal Thrasher	2.4	0.9	1.0	1.5	2.0	2.2	1.3	2.4	2.6	2.7	2.1	2.4
House Finch	0.3	1.9	2.6	1.9	1.2	4.1	1.6	5.5	2.9	2.6	3.9	0.8
Yellow-breasted Chat			0.0									
Yellow Warbler (B)							0.1		0.0			
Blue Grosbeak (A)						0.0						0.1

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Killdeer	1.1	0.4	0.2	1.0	0.2	0.1	2.0	1.2	0.6	1.3	1.1	3.3
Greater Roadrunner	0.4	0.1	0.2	0.4	0.2	0.1	0.4	0.9	1.4	1.1	1.1	1.3
Yellow-headed Blackbird	0.0			0.3	X			0.0	X	X	X	
Say's Phoebe	0.6	0.5	0.2	1.2	2.3	1.1	1.0	1.9	1.9	2.1	1.6	1.6
Great Blue Heron	0.2	0.4	0.3	0.2	0.6	0.4	1.4	1.7	2.6	2.2	1.0	1.6
Ring-billed Gull	X	1.8	3.1	X	0.1	X	0.2	1.0	0.0	0.8	0.2	2.3
Northern Flicker	0.9	1.1	2.1	1.9	1.0	1.7	2.0	2.0	1.7	2.1	2.1	1.1
Anna's Hummingbird	0.0			0.0	0.1		0.3	0.6	1.0	1.7	0.8	1.8
Brewer's Sparrow (C)	0.3			0.5	0.4		0.0	0.3	X			
White-faced Ibis (C)	X	X		X				X	0.5	0.1	0.4	1.0
Lesser Goldfinch	0.2	0.1	0.2	0.8	0.6	3.6	0.3	0.3	0.4	0.1	0.1	0.2
Canada Goose			0.4		0.1	X	0.0	0.2	1.0	0.7	1.3	1.0
Double-crested Cormorant	X	0.1	1.3	0.1	0.1	X	0.3	0.9	3.5	2.7	0.6	0.8
Northern Mockingbird		0.2	0.0	0.1	0.3	0.2	0.4	0.8	1.4	0.3	0.7	1.3
Eared Grebe (C)						X	0.1	X	0.1		0.1	
Northern Pintail (C)	X			X	X	0.2	4.3	3.1	3.4	1.7	1.0	0.7
Wilson's Warbler	0.3							0.0				
Lincoln's Sparrow	1.9	0.2	0.9	0.7	0.5	0.7	0.8	0.5	1.0	1.1	0.7	1.1
Dark-eyed Junco	0.1	0.5	4.7	1.4	2.5	0.6	0.4	1.0	0.3	1.0		0.4
Northern Rough-winged Swallow	X			X	X	X	X	X	X		X	0.1
Spotted Sandpiper	0.2	0.2		0.1	0.2	0.2	0.5	0.5	0.5	0.6	0.3	0.4
Black-chinned Hummingbird				0.0			0.1	0.0	0.0			
Green-winged Teal		0.3	0.3	0.1	0.2	0.1	0.3	1.2	0.4	0.8	1.2	0.9
Loggerhead Shrike (D)	0.2	0.1	0.1	0.1	0.6	0.3	0.6	0.8	0.6	0.7	0.5	0.3
Least Sandpiper (C)					1.6	0.0	3.5	X	0.1	1.9	X	
Lesser Scaup (C)							0.5	X	0.1	1.1	0.7	2.1
Common Gallinule	0.1	0.2		0.1	0.1	0.1	0.2	0.4	0.2	0.8	0.2	0.1
Bufflehead			0.5	X	0.1	0.2	1.5	2.1	0.7	1.6	0.6	0.4
Savannah Sparrow			0.2	0.6	0.5	0.4	0.1	0.5	0.6	0.8	0.3	0.4
Northern Shoveler	0.2					X	0.6	1.6	4.0	0.1	0.8	X
American Avocet (C)							0.0	X	X		X	

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Greater Yellowlegs	0.7	0.2	0.3	0.3	0.2	0.1	0.5	1.0	0.3	0.4	0.1	1.0
Green Heron	0.1	0.2	0.1		0.0	0.1		X	0.1	X	0.1	0.1
Pied-billed Grebe	0.2	0.2	0.7	X	0.1	0.3	0.1	0.5	1.3	0.7	0.1	0.2
Western Meadowlark				0.0	0.3	0.1	0.2	0.8	1.8	0.7	0.8	1.0
Cooper's Hawk	X	0.1	0.2	0.0	0.1	0.3	0.3	0.4	0.4	0.5	0.6	0.3
Bushtit	1.6	1.0	0.1		3.3							0.1
Snowy Egret (C)	X	0.1	0.5	X	0.0	0.0	0.0	0.1	0.5	0.5	0.5	0.4
Belted Kingfisher	0.5	0.2	0.4	0.3	0.1	0.1	0.5	0.7	0.9	0.3	0.4	0.6
Cinnamon Teal (C)					0.1		0.3	X	X			
Common Merganser	X	0.0	0.1	0.0	X	0.0	0.2	0.5	0.6	0.2	0.3	0.5
Blue-gray Gnatcatcher	0.3			0.0	0.2	0.4	0.3			0.2	0.4	
Black-crowned Night-Heron	X	0.2	0.1	0.0	X	0.3	0.3	0.1	0.4	0.8	0.2	0.1
Costa's Hummingbird (C)			X	0.0		0.0	0.2	0.1	0.0			0.1
Ring-necked Duck				X	X		0.1	0.6	0.3	1.4	1.2	X
Sora	0.1	0.1	0.0	0.1	0.0	0.1	0.2	0.2	0.6	0.5	0.6	0.9
White-winged Dove	0.0											
Bullock's Oriole						0.0						
Great Egret	0.1	0.0	0.2	0.0	0.1	0.1	X	0.2	0.5	0.3	0.2	X
Osprey	X			0.0	X	X	0.5	0.1	0.1	0.3	0.1	0.5
Chipping Sparrow				0.1	0.5		X					
Cliff Swallow			X	X	0.0				X			
Lazuli Bunting		X										
Spotted Towhee	0.1	0.2	0.5	0.6	0.1	0.1	0.2	0.1		0.2	0.9	0.2
Rock Wren	0.2	0.2	0.1	0.1	0.5	0.6	0.1	0.2	0.1	0.1	0.1	0.2
Barn Swallow			X	X	X	X		X	X	0.1	X	X
Northern Harrier	0.1	0.2	0.6	0.1	0.1	X	0.1	0.0	0.2	0.2	0.3	0.7
Red-tailed Hawk	0.2	X	0.2	0.1	0.1	0.4	0.4	0.2	0.3	0.5	0.3	0.3
American Kestrel	X	X		X	X	0.2	X	0.2	0.1	0.2	0.1	0.1
Phainopepla (A)	0.5	0.5	0.1	0.5	0.3	0.0	0.1	0.2	X	0.3	0.1	0.3
Warbling Vireo							X		0.1			
Virginia Rail	0.1	0.1	0.1	0.1	0.1	0.3	X	0.1	0.1	0.2	0.1	0.2

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
American White Pelican (C)						X	0.5	0.2	X	X	X	0.2
Hooded Merganser							X	0.4	0.2	0.5	0.4	0.3
Brewer's Blackbird (D)		X		1.3	0.1	1.2						0.1
House Wren	0.0				0.0		0.1	0.2	0.5	0.6	0.5	0.1
Sharp-shinned Hawk	0.4	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.1
Western Sandpiper (C)						X	0.2					0.2
Horned Lark (D)			0.1	0.4		0.0						X
Great Horned Owl					0.0	0.0	X	0.2	0.0	0.1	0.2	0.3
Long-billed Dowitcher (C)							X	X	0.1	0.2		
Pine Siskin (D)	0.3		0.7			0.7		0.4				
Common Goldeneye			0.1		0.1	X	0.0	0.0	X	0.2	0.2	X
American Robin	0.1	0.0	0.3	0.2	0.1		0.1	0.1	0.2	0.1	0.2	0.4
Red-shouldered Hawk					X		0.0	0.2	0.2	0.2	0.1	0.2
Ladder-backed Woodpecker					0.1	0.3	0.1	0.3		0.1		X
Hermit Thrush	0.3	0.2	0.0	0.0				0.1		0.1	0.1	0.1
Least Bittern (B; C)		0.0	0.1						X	0.1		
Tree Swallow			0.1			X			X			
Greater White-fronted Goose						X			0.1		1.1	
California Gull					X	X	X		X	X		
Common Raven	X	X	0.3	X	X	X	0.0	X	X	0.1	0.1	X
Nashville Warbler						0.0		0.0	0.0			
Ruddy Duck						X	0.3	0.1			X	X
Hooded Oriole			X									
Neotropical Cormorant											0.1	
Black-throated Gray Warbler					0.0							
MacGillivray's Warbler									0.0			
Eurasian Collared-Dove								0.1	0.1	X	X	
Redhead (C)						X		X			X	0.1
Red-naped Sapsucker	0.0	0.1	0.0				0.0	0.0				0.1
Golden-crowned Kinglet	0.0		0.3	0.1	0.1	0.0					0.1	
Gray Flycatcher (C)								0.0				

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Wilson's Snipe								0.0		0.1	X	
Pacific Wren	0.1					0.1	0.0		X	0.1	X	0.1
American Goldfinch					0.1		0.1			0.1	X	0.3
Horned Grebe							0.0	0.1	X			
Black-throated Sparrow						X						
Barn Owl			0.0		X				X	0.1		
Cedar Waxwing	0.0				X					0.3		
Violet-green Swallow				X	X			X				
Red-breasted Nuthatch				0.0				0.0		0.1		
Lesser Yellowlegs					X						0.1	X
Western Grebe (C)	X		0.0				X	0.1				
Snow Goose					X	X		X		X	0.3	X
Caspian Tern								X				
Canyon Wren		0.0										
Vermilion Flycatcher (A; B)										0.1	0.1	
Peregrine Falcon (C)	X				0.0	X	X	X	X	X	X	0.1
Merlin		0.0			0.0	X		X		X	0.1	
Black-and-white Warbler											0.1	
European Starling					X	X		X			0.1	X
Sagebrush Sparrow (C)								0.1	0.1			
Western Bluebird	0.1	X			X							
House Sparrow	0.0											
Wood Duck				0.0			X		X	0.1	X	X
Rock Pigeon			0.1	0.0								
Swamp Sparrow										0.1		
Brown Creeper							0.0			0.1		
Prairie Falcon (C)					0.0	X	X	X		X	0.1	X
Cactus Wren					X							
Turkey Vulture								X	X		X	
White-throated Swift (C)		X							X			
Fox Sparrow										0.1		

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Hairy Woodpecker		0.0										
Sandhill Crane (C)						X						
Bell's Sparrow (C)												X
Blackpoll Warbler								0.0				
Blue-winged Teal	X							0.0				
Brown Thrasher											0.1	
Gray Catbird											0.1	
Groove-billed Ani											0.1	
Mountain Bluebird				0.0								
Ovenbird						0.0						
Red Crossbill								0.0				
Ross's Goose					X				0.0			
White-throated Sparrow											0.1	
American Crow												X
Bald Eagle (C)												X
Canvasback (C)								X				
Cassin's Finch (D; E)												X
Clark's Grebe (C)							X	X				
Eastern Phoebe											X	
Golden Eagle (C)											X	
Graylag Goose					X	X						
Northern Goshawk (C)						X						
Sage Sparrow, Unidentified (C)											X	
Snow Goose (x Domestic Goose?)										X		
Tundra Swan (C)									X			
Vaux's Swift					X							

Table 7. Relative species abundance (percent of total bird abundance) for all 12 years (overall), among seasons, and by survey year (2005–2020). Only species that represent at least 1% of the total bird abundance in one or more periods are listed (in descending order of overall relative abundance). Conservation status includes priority species from multiple sources: A (Clark County 2000); B (Bureau of Reclamation 2006); C (GBBO 2010); D (Rosenberg et al. 2016, Intermountain Partners in Flight); E (Rosenberg et al. 2016, Continental Partners in Flight). “X” indicates the species was only detected outside of the survey period or beyond 100 m of a point. No entry means that the species was not detected.

Species (Conservation Status)	Overall	Breeding	Non-Breeding	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
American Coot	11.0	4.8	15.0	1.8	6.9	7.3	3.7	3.0	2.4	14.8	16.6	16.4	18.4	10.3	12.4
Yellow-rumped Warbler	5.7	0.9	11.2	5.0	2.5	8.4	7.3	8.5	9.5	5.7	3.3	3.7	5.6	7.6	4.2
Mallard	5.7	3.0	7.1	0.8	1.7	3.3	2.8	5.2	4.1	7.6	9.5	6.7	6.3	5.1	7.2
Red-winged Blackbird	5.5	9.8	3.2	5.6	5.8	7.1	6.8	7.6	4.6	6.6	6.7	5.2	4.0	4.1	3.8
Gadwall	5.5	1.8	7.2	0.6	0.8	1.2	1.0	1.3	1.7	5.5	8.0	11.2	8.4	8.3	6.4
Abert's Towhee (C)	5.2	6.7	3.9	12.5	11.2	7.5	7.4	7.1	7.2	3.7	3.1	3.2	3.1	3.1	3.6
American Wigeon	4.1	1.7	5.5	X	0.1	0.2	0.1	0.2	0.4	4.7	8.3	8.1	6.3	4.4	5.6
Song Sparrow	4.0	5.7	2.7	9.7	10.0	7.7	6.4	4.8	6.0	2.5	2.5	2.4	1.9	1.5	1.5
Marsh Wren	3.7	2.7	4.1	3.6	4.3	5.5	6.8	5.7	5.9	3.2	2.8	2.5	2.7	2.6	2.7
White-crowned Sparrow	3.5	0.6	6.7	3.4	3.4	4.0	4.0	5.2	5.7	2.9	2.2	2.8	4.0	3.9	2.7
Verdin	3.2	4.4	2.2	2.8	3.5	2.9	3.4	3.5	3.6	2.5	2.1	2.4	3.2	4.4	4.1
Gambel's Quail (C)	3.1	4.5	2.2	1.4	0.9	0.7	1.1	2.1	5.7	2.7	2.2	2.9	3.8	5.2	6.1
Great-tailed Grackle	3.1	5.8	1.4	0.6	1.2	2.7	2.8	2.7	2.2	3.3	4.1	3.9	3.3	4.1	3.6
Black-tailed Gnatcatcher	2.7	3.5	2.1	3.7	4.3	2.4	2.9	3.4	3.5	2.4	2.0	1.9	2.2	2.9	2.8
American Pipit	2.5	0.5	4.3	1.1	2.1	1.5	4.0	3.7	3.2	4.8	1.4	1.7	2.6	2.4	1.9
Bewick's Wren	2.5	3.1	1.8	5.9	6.3	3.6	4.7	4.1	3.6	2.0	1.6	1.2	1.1	1.1	1.0
Common Yellowthroat	2.4	5.8	0.1	3.3	3.6	3.4	4.1	3.0	3.0	2.1	2.1	2.3	1.4	1.6	1.7
Black Phoebe	1.9	1.5	2.1	3.1	3.4	2.5	2.6	2.3	2.5	2.1	1.5	1.5	1.3	1.4	1.3
Ruby-crowned Kinglet	1.5	0.3	2.5	3.7	3.3	2.4	1.5	1.4	1.6	1.0	0.8	0.6	1.0	1.6	1.4
Orange-crowned Warbler	1.4	0.3	1.9	1.4	0.9	1.3	1.4	1.1	1.8	0.5	1.1	1.5	1.5	1.8	2.0
Brown-headed Cowbird	1.3	3.3	0.0	2.7	3.0	2.6	3.0	1.9	2.0	0.9	0.6	0.6	0.4	0.6	0.3
Mourning Dove	1.1	2.3	0.2	4.1	1.4	1.2	0.9	1.4	1.4	0.5	0.3	0.5	1.1	0.9	0.9
Lucy's Warbler (C)	1.0	2.7		4.0	2.5	1.8	2.0	1.1	1.1	0.5	0.5	0.5	0.4	0.4	0.2
Crissal Thrasher	0.9	1.0	0.8	1.5	1.1	0.6	0.8	1.1	1.2	0.7	0.8	0.8	0.8	0.8	1.0
House Finch	0.9	0.8	1.0	0.7	1.1	1.0	0.9	2.5	1.9	0.4	0.9	0.5	0.6	0.7	0.4
Yellow-breasted Chat	0.9	2.2	0.0	2.5	2.2	1.6	2.3	0.7	1.0	0.4	0.6	0.3	0.3	0.4	0.3
Yellow Warbler (B)	0.8	2.0	0.0	0.8	0.8	1.0	1.9	1.5	1.5	0.5	0.6	0.7	0.7	0.6	0.3

Species (Conservation Status)	Overall	Breeding	Non-Breeding	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Blue Grosbeak (A)	0.7	1.8	0.0	1.9	1.3	1.1	1.2	0.6	0.6	0.4	0.5	0.6	0.4	0.5	0.6
Killdeer	0.6	0.9	0.4	1.4	0.7	0.3	0.5	0.6	0.2	0.9	0.5	0.3	0.6	0.9	0.9
Yellow-headed Blackbird	0.5	0.8	0.0	0.7	0.2	0.0	0.2	0.2	0.1	2.3	0.7	0.3	0.2	0.5	0.4
Say's Phoebe	0.5	0.5	0.6	0.4	0.5	0.3	0.7	1.0	0.7	0.3	0.4	0.4	0.5	0.4	0.5
Ring-billed Gull	0.4	0.2	0.3	X	0.5	0.9	X	0.0	X	0.1	0.3	0.0	0.5	0.5	2.0
Brewer's Sparrow (C)	0.3	0.3	0.1	0.2	0.4	0.7	0.7	1.2	0.6	0.1	0.2	0.1	0.1	0.2	0.3
White-faced Ibis (C)	0.3	0.6	0.1	0.1	0.2	X	0.0	0.0	0.0	0.2	0.1	0.2	0.6	1.4	0.7
Lesser Goldfinch	0.3	0.2	0.2	0.3	0.5	0.2	0.4	0.7	1.8	0.1	0.2	0.1	0.1	0.1	0.2
Canada Goose	0.3	0.3	0.2		X	0.2		0.0	0.1	0.2	0.2	0.7	0.3	0.3	1.0
Eared Grebe (C)	0.3	0.7	0.0	0.0		0.2		0.0	X	0.0	0.8	1.2	0.1	0.1	0.0
Dark-eyed Junco	0.2	0.0	0.5	0.1	0.2	1.2	0.6	0.5	0.3	0.1	0.2	0.0	0.1	0.0	0.1

Table 8a. Breeding relative species abundances (percent of total bird abundance) for each of 12 survey years (2005–2020). Only species that represent at least 1% of the total bird abundance in one or more periods are listed (in descending order of overall relative abundance). Conservation status includes priority species from multiple sources: A (Clark County 2000); B (Bureau of Reclamation 2006); C (GBBO 2010); D (Rosenberg et al. 2016, Intermountain Partners in Flight); E (Rosenberg et al. 2016, Continental Partners in Flight). “X” indicates the species was only detected outside of the survey period or beyond 100 m of a point. No entry means that the species was not detected.

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
American Coot	0.9	1.0	4.4	2.3	0.9	0.8	6.1	9.1	9.8	7.8	8.1	1.3
Yellow-rumped Warbler	0.2	0.8	1.4	0.5	0.6	0.3	0.7	0.9	1.5	2.4	0.8	
Mallard	0.3	0.3	1.6	1.7	3.2	2.4	4.0	6.0	3.7	3.3	3.6	3.7
Red-winged Blackbird	3.9	6.6	9.2	10.5	10.6	10.8	14.9	12.4	11.3	7.5	8.6	8.3
Gadwall	0.1	0.0	0.2	0.3	0.4	0.1	0.4	2.8	4.7	4.5	4.7	0.7
Abert's Towhee (C)	12.9	12.0	7.8	7.7	7.4	8.3	4.6	3.9	4.6	4.9	4.3	6.5
American Wigeon		X	0.1	0.2	X	X	1.5	6.2	3.3	3.3	3.1	X
Song Sparrow	10.5	11.5	9.6	8.4	6.2	8.3	4.6	4.1	4.4	2.6	1.8	1.9
Marsh Wren	1.5	2.2	3.7	5.7	5.1	5.2	2.4	1.8	1.7	2.3	1.7	0.3
White-crowned Sparrow	0.4	1.1	0.2	0.1	0.4	0.5	0.5	0.6	0.6	1.5	0.6	
Verdin	2.9	4.5	3.3	3.5	4.1	4.3	3.6	3.0	3.8	6.1	6.4	6.8
Gambel's Quail (C)	2.3	1.3	1.2	1.2	3.1	7.3	3.6	3.8	5.2	5.7	6.6	11.0
Great-tailed Grackle	0.4	1.5	4.1	4.1	4.9	3.4	7.9	8.8	8.1	7.0	7.8	7.3
Black-tailed Gnatcatcher	3.7	5.1	2.5	2.9	3.5	3.7	3.6	2.7	2.8	3.9	3.6	4.7
American Pipit	X	0.1	0.3	X	2.5	0.3	0.7	0.1	0.0	1.6	0.4	
Bewick's Wren	5.3	6.8	3.8	4.9	4.5	2.9	2.7	2.6	1.9	1.6	1.3	1.1
Common Yellowthroat	6.0	6.7	7.4	7.9	6.8	6.9	5.5	5.5	5.8	4.0	3.4	5.6
Black Phoebe	1.7	2.0	1.7	1.6	1.6	1.6	2.0	1.1	0.9	1.4	1.2	1.8
Brown-headed Cowbird	5.3	6.2	6.2	6.6	4.5	4.9	2.6	1.8	1.6	1.2	1.4	1.0
Mourning Dove	7.8	2.6	2.5	1.9	2.9	3.4	1.4	0.6	1.4	2.0	1.4	2.2
Lucy's Warbler (C)	8.0	5.3	4.1	4.3	2.6	2.7	1.4	1.5	1.5	1.3	1.1	0.8
Crissal Thrasher	1.1	1.3	0.4	0.7	1.1	1.1	1.0	0.8	1.0	0.7	0.9	1.5
House Finch	0.9	0.8	0.7	0.7	2.9	1.3	0.4	0.3	0.3	0.5	0.2	0.5
Yellow-breasted Chat	5.0	4.6	3.6	4.8	1.6	2.4	1.2	1.7	0.8	1.0	1.1	1.1
Yellow Warbler (B)	1.7	1.5	2.2	3.9	3.2	3.5	1.2	1.7	1.5	2.1	1.3	1.0
Blue Grosbeak (A)	3.3	2.6	2.6	2.4	1.5	1.5	1.1	1.2	1.5	1.1	1.1	2.3
Killdeer	1.7	0.7	0.3	0.3	1.1	0.4	1.3	0.7	0.4	1.3	1.4	1.2

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Greater Roadrunner	0.6	0.7	0.8	0.5	0.5	0.7	1.0	0.8	1.2	1.0	1.0	2.1
Yellow-headed Blackbird	1.4	0.1	0.1	0.3	0.5	0.2	2.9	0.7	0.5	0.3	1.2	1.3
Anna's Hummingbird	0.2	0.1		0.0	0.1	0.0	0.4	0.6	0.9	1.2	1.0	1.2
Brewer's Sparrow (C)		0.5	1.3	0.2	0.4	0.9	0.1	0.0	0.0	0.2	X	0.6
White-faced Ibis (C)	0.1	0.4	X	0.0	0.0	0.1	0.4	0.1	0.3	1.9	2.1	1.5
Lesser Goldfinch	0.1	0.3	0.2	0.1	0.3	1.4	0.2	0.1	0.1	0.1	0.2	0.1
Canada Goose			0.2		X	0.1	0.6	0.2	0.1	0.6	0.2	1.7
Western Kingbird	0.3	0.5	0.9	0.5	0.6	0.4	1.3	0.5	1.2	0.3	0.1	1.8
Northern Mockingbird	0.1	0.2	0.2	0.0	0.2	0.1	0.4	0.6	0.5	0.4	0.5	1.5
Eared Grebe (C)	0.0		0.4		0.1		X	2.3	3.4	0.4	0.2	0.0
Wilson's Warbler	1.5	1.3	1.0	0.4	0.7	0.3	1.3	0.1	0.2	0.9	0.2	0.0
Northern Rough-winged Swallow	0.2	0.3	0.2	1.4	0.5	X	0.1	0.4	0.3	0.2	1.6	0.9
Black-chinned Hummingbird	0.2	0.5	0.6	0.4	0.5	0.5	0.4	0.5	0.5	0.6	0.4	1.2
American Avocet (C)	0.3				0.0	X	0.2	X	X	0.4	1.1	0.4
Cliff Swallow	X	X	0.2	1.0	0.0	X	X	X	X	X	0.6	0.2

Table 8b. Non-breeding relative species abundances (percent of total bird abundance) for each of 12 survey years (2005–2020). Only species that represent at least 1% of the total bird abundance in one or more periods are listed (in descending order of overall relative abundance). Conservation status includes priority species from multiple sources: A (Clark County 2000); B (Bureau of Reclamation 2006); C (GBBO 2010); D (Rosenberg et al. 2016, Intermountain Partners in Flight); E (Rosenberg et al. 2016, Continental Partners in Flight). “X” indicates the species was only detected outside of the survey period or beyond 100 m of a point. No entry means that the species was not detected.

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
American Coot	3.4	13.3	6.1	4.0	4.4	3.5	20.9	19.4	22.6	25.1	11.3	15.0
Yellow-rumped Warbler	12.8	4.8	16.1	17.9	18.6	20.6	11.0	6.3	5.7	7.7	16.8	8.1
Mallard	1.0	4.1	4.2	3.2	6.5	5.8	10.7	11.1	8.3	7.4	4.7	9.2
Red-winged Blackbird	9.8	7.0	7.1	2.9	4.7	0.3	1.5	4.7	1.6	2.9	1.1	2.1
Gadwall	1.3	2.0	1.3	1.1	1.6	2.4	6.4	9.7	14.0	9.7	11.2	7.2
Abert's Towhee (C)	9.9	10.0	6.7	6.1	6.4	5.2	3.0	2.9	2.2	1.5	1.9	2.4
American Wigeon	X	X	0.2	0.1	0.2	0.3	6.0	7.9	12.0	9.7	4.2	6.8
Song Sparrow	7.8	7.7	6.0	3.9	3.9	4.0	1.0	1.7	1.3	1.4	1.4	1.7
Marsh Wren	5.4	6.1	6.2	7.2	6.1	5.8	3.4	3.5	2.8	2.6	3.0	4.1
White-crowned Sparrow	7.9	5.1	8.6	9.9	11.1	11.1	5.4	4.5	4.7	5.6	8.0	5.4
Verdin	2.3	1.8	2.4	3.1	3.2	2.4	2.0	1.6	1.4	1.5	2.8	3.1
Gambel's Quail (C)	0.5	0.6	0.4	1.2	0.9	4.6	2.2	1.3	1.4	2.7	4.5	3.9
Great-tailed Grackle	0.9	1.0	1.7	1.9	0.7	1.5	1.0	1.1	1.0	1.5	1.5	2.7
Black-tailed Gnatcatcher	2.7	3.6	2.0	2.9	3.3	2.8	1.6	1.8	1.2	1.1	2.6	2.5
American Pipit	2.9	5.3	2.3	8.5	5.0	6.4	7.0	3.0	2.3	3.3	3.9	4.0
Bewick's Wren	5.2	4.9	3.0	4.6	2.9	3.6	1.2	0.8	0.6	0.6	0.5	0.9
Black Phoebe	3.7	4.5	2.8	3.9	2.4	2.9	2.0	1.8	1.7	1.0	1.3	1.3
Ruby-crowned Kinglet	7.7	6.1	4.7	2.7	3.1	2.5	1.3	1.5	0.9	1.5	2.9	2.3
Orange-crowned Warbler	2.2	1.6	2.0	2.7	1.5	2.3	0.5	1.6	2.2	1.6	2.6	2.5
Crissal Thrasher	1.9	0.7	0.6	1.0	1.2	1.2	0.4	0.8	0.7	0.7	0.8	0.9
House Finch	0.3	1.5	1.7	1.2	0.7	2.1	0.6	1.8	0.8	0.7	1.5	0.3
Killdeer	0.8	0.3	0.1	0.7	0.1	0.0	0.7	0.4	0.2	0.3	0.4	1.2
Say's Phoebe	0.4	0.4	0.1	0.8	1.3	0.6	0.3	0.6	0.5	0.6	0.6	0.6
Ring-billed Gull	X	1.4	1.9	X	0.1	X	0.1	0.3	0.0	0.2	0.1	0.8
Northern Flicker	0.7	0.9	1.3	1.2	0.6	0.9	0.7	0.6	0.5	0.5	0.8	0.4
Lesser Goldfinch	0.1	0.1	0.1	0.5	0.4	1.9	0.1	0.1	0.1	0.0	0.0	0.1

Species (Conservation Status)	Year1	Year2	Year3	Year4	Year5	Year6	Year10	Year11	Year12	Year13	Year14	Year15
Northern Pintail (C)	X			X	X	0.1	1.5	1.0	0.9	0.4	0.4	0.2
Lincoln's Sparrow	1.4	0.2	0.6	0.5	0.3	0.4	0.3	0.2	0.3	0.3	0.2	0.4
Dark-eyed Junco	0.1	0.4	3.0	0.9	1.4	0.3	0.1	0.3	0.1	0.2		0.1
Least Sandpiper (C)					0.9	0.0	1.2	X	0.0	0.5	X	
Northern Shoveler	0.1					X	0.2	0.5	1.1	0.0	0.3	X
Bushtit	1.2	0.8	0.1		1.9							0.0

Table 9. Relative frequencies (percent of survey points with detections on any of 26 surveys) of bird species in each of the 12 years of surveys in the Las Vegas Wash (February 2005 – August 2020). Number of survey points increased from 29 to 31 after the second year (see Methods; Table 1). Only 23 surveys conducted in Year 15, due to COVID-19. Birds recorded incidentally, as flyovers, or > 100 m from the survey point are excluded. Species listed in descending order of average frequency. Conservation status includes priority species from multiple sources: A (Clark County 2000); B (Bureau of Reclamation 2006); C (GBBO 2010); D (Rosenberg et al. 2016, Intermountain Partners in Flight); E (Rosenberg et al. 2016, Continental Partners in Flight).

Species (Conservation Status)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Average Frequency
Yellow-rumped Warbler	100	97	100	97	100	90	97	100	97	94	100	100	98
Black Phoebe	100	100	100	94	94	90	100	97	94	94	97	90	96
Abert's Towhee (C)	100	100	97	97	97	94	90	97	97	94	90	94	96
Verdin	93	97	90	97	100	87	90	94	94	100	100	100	95
White-crowned Sparrow	93	100	97	97	97	84	94	97	100	88	94	97	95
Song Sparrow	100	97	97	97	100	87	87	90	90	88	84	81	92
Black-tailed Gnatcatcher	93	97	94	90	100	81	84	84	90	81	94	100	91
Common Yellowthroat	93	90	94	90	90	81	90	90	94	84	87	94	90
Bewick's Wren	97	100	90	97	97	90	84	77	77	75	68	74	86
Orange-crowned Warbler	93	83	77	87	74	81	68	90	94	91	90	94	85
Red-winged Blackbird	72	86	97	94	94	84	81	90	81	84	77	71	84
Brown-headed Cowbird	97	97	94	94	94	84	77	84	84	63	77	55	83
Marsh Wren	93	83	81	87	81	81	77	87	74	81	74	87	82
Ruby-crowned Kinglet	100	97	94	87	90	74	68	71	74	69	84	77	82
American Coot	59	69	74	74	77	74	84	77	87	75	81	77	76
Great-tailed Grackle	34	41	55	71	84	68	90	100	84	97	94	90	76
Gambel's Quail (C)	76	52	48	71	58	84	84	84	84	78	87	94	75
Greater Roadrunner	66	66	68	71	65	58	77	68	90	78	87	100	75
Crissal Thrasher	90	83	77	77	90	77	61	61	68	72	65	68	74
Blue Grosbeak (A)	97	86	81	84	74	68	68	61	65	63	65	71	74
Mallard	31	45	81	68	81	71	81	77	84	81	81	68	71
Say's Phoebe	52	48	35	68	97	77	68	71	81	72	74	77	68
Yellow Warbler (B)	59	48	55	61	74	68	55	74	84	75	84	55	66
Mourning Dove	90	76	87	71	84	84	48	52	42	41	55	52	65
Lucy's Warbler (C)	93	90	77	84	74	68	55	42	48	44	58	45	65
House Finch	59	76	68	68	68	68	42	68	61	66	61	42	62

Species (Conservation Status)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Average Frequency
Yellow-breasted Chat	90	76	77	84	61	65	45	58	45	44	45	39	61
Northern Flicker	59	66	65	77	55	52	58	58	45	50	68	48	58
American Pipit	59	62	77	61	52	65	52	45	68	41	52	48	57
Great Blue Heron	24	41	32	29	42	42	61	65	77	72	68	61	51
Gadwall	31	34	42	48	55	52	45	48	58	59	45	42	47
Lincoln's Sparrow	66	28	61	39	29	29	35	39	58	69	45	52	46
Western Kingbird	24	17	55	32	45	39	87	42	68	31	23	77	45
Killdeer	55	55	29	48	32	19	55	48	45	53	48	32	43
Wilson's Warbler	76	66	65	48	35	29	58	23	26	56	29	6	43
Loggerhead Shrike (D)	52	31	13	35	58	35	48	65	48	47	32	32	41
Brewer's Sparrow (C)	21	28	42	58	65	55	19	39	16	22	45	39	37
Northern Mockingbird	7	31	23	13	29	19	32	52	68	41	48	77	37
Spotted Sandpiper	31	34	10	32	32	29	45	55	52	31	48	32	36
American Wigeon	0	3	19	13	13	13	42	68	55	66	58	55	34
Black-chinned Hummingbird	17	38	35	32	32	32	32	39	29	31	35	45	33
Green Heron	21	55	32	29	19	29	52	29	35	25	23	45	33
Belted Kingfisher	38	28	26	29	32	23	35	39	48	28	26	26	32
Anna's Hummingbird	24	3	3	10	16	6	35	39	48	53	58	65	30
Lesser Goldfinch	24	34	32	39	45	48	39	19	13	16	16	23	29
Common Gallinule	10	10	16	13	19	23	29	26	52	44	35	42	27
Dark-eyed Junco	21	24	61	45	39	29	23	29	13	16	3	10	26
Double-crested Cormorant	3	14	35	23	19	3	29	26	42	28	29	48	25
Northern Rough-winged Swallow	21	21	13	45	19	16	13	23	13	13	58	35	24
Blue-gray Gnatcatcher	52	62	29	58	10	19	23	0	3	13	16	3	24
Greater Yellowlegs	31	10	13	16	13	19	32	52	19	28	16	35	24
Cooper's Hawk	10	14	16	10	10	26	26	32	29	28	35	35	23
Pied-billed Grebe	7	17	26	19	16	13	16	32	35	34	29	26	23
Savannah Sparrow	14	0	19	16	19	32	19	29	32	38	23	19	22
Costa's Hummingbird (C)	14	17	26	16	6	23	19	16	6	16	26	45	19
Bullock's Oriole	3	21	16	0	13	23	19	35	39	31	16	13	19
Western Wood-Pewee	10	17	13	26	6	29	42	13	10	25	26	3	18

Species (Conservation Status)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Average Frequency
Yellow-headed Blackbird	10	7	10	16	10	6	35	32	26	16	32	16	18
Black-crowned Night-Heron	10	10	13	3	3	10	23	19	35	25	26	35	18
Sora	3	7	6	10	3	10	13	19	29	31	29	39	17
Snowy Egret (C)	7	3	23	6	13	13	16	29	32	13	26	16	16
Great Egret	14	7	13	6	13	16	13	26	26	16	29	13	16
Northern Harrier	7	14	35	19	6	0	10	13	13	13	26	35	16
White-winged Dove	45	21	39	29	16	23	13	3	0	0	0	0	16
Western Meadowlark	0	7	0	3	10	13	19	19	39	19	23	32	15
Red-tailed Hawk	14	7	13	10	6	16	23	19	16	16	19	23	15
Spotted Towhee	17	14	16	39	13	10	16	10	0	6	23	16	15
White-faced Ibis (C)	7	7	0	3	6	6	16	16	23	25	32	39	15
American Kestrel	14	7	6	3	6	13	23	26	13	31	10	23	15
Lazuli Bunting	17	24	6	29	3	0	6	6	3	34	23	23	15
Osprey	3	3	6	3	10	6	29	19	19	16	32	16	14
Warbling Vireo	17	14	10	10	19	6	10	19	16	13	19	3	13
Rock Wren	14	14	10	16	23	29	6	13	6	3	10	10	13
Sharp-shinned Hawk	24	7	10	19	23	13	13	10	10	9	6	6	13
Green-winged Teal	0	17	13	6	6	6	19	19	10	19	19	16	13
Virginia Rail	14	7	6	6	6	23	10	16	16	19	13	13	12
Canada Goose	0	0	10	0	3	10	23	16	23	22	23	19	12
Common Merganser	7	3	10	6	6	3	16	19	35	13	19	10	12
Eared Grebe (C)	3	0	3	0	6	0	6	42	45	19	16	3	12
Phainopepla (A)	21	31	6	23	16	6	3	10	0	9	3	10	12
Indigo Bunting	0	0	0	0	16	10	16	26	39	9	10	0	11
Northern Pintail (C)	0	3	0	0	0	3	23	16	19	28	23	10	10
Western Tanager	10	3	6	3	10	10	3	13	6	28	19	10	10
Bufflehead	0	0	6	3	3	3	19	13	23	19	16	16	10
Chipping Sparrow	17	7	16	10	23	10	0	3	3	9	3	6	9
House Wren	7	3	0	0	3	0	3	13	16	28	26	6	9
American Robin	7	3	16	13	6	3	6	10	10	3	10	13	8
Ash-throated Flycatcher	14	3	16	3	0	13	13	10	10	0	10	6	8

Species (Conservation Status)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Average Frequency
Bell's Vireo (A; B; C)	21	0	10	0	0	6	13	16	6	6	10	6	8
Black-headed Grosbeak	14	14	6	0	6	13	3	6	10	9	13	0	8
Cinnamon Teal (C)	3	0	0	3	10	0	19	13	3	16	19	6	8
Bushtit	31	21	6	3	16	10	0	0	0	0	0	3	8
Red-shouldered Hawk	0	0	0	0	0	3	6	16	16	13	16	19	7
Ladder-backed Woodpecker	3	0	0	3	6	23	10	23	10	3	6	0	7
Ring-billed Gull	0	3	16	0	3	0	6	13	3	13	16	10	7
Great Horned Owl	0	3	3	0	10	19	3	6	3	16	6	13	7
American Avocet (C)	7	0	0	0	6	0	13	3	3	19	13	16	7
Lesser Scaup (C)	0	0	0	0	0	0	3	3	10	16	19	23	6
Common Goldeneye	0	0	6	6	3	0	6	6	10	16	10	10	6
Hermit Thrush	14	28	3	3	3	0	3	6	0	6	3	3	6
Ring-necked Duck	0	0	0	0	0	0	6	19	6	16	13	10	6
Black-necked Stilt (C)	3	0	0	0	3	0	10	3	6	6	19	16	6
Northern Shoveler	3	3	0	0	6	0	6	13	6	3	19	3	5
Least Bittern (B; C)	3	3	6	6	0	6	6	6	6	9	6	3	5
Western Flycatcher (unidentified)	3	7	13	3	0	0	16	0	6	6	3	3	5
Cliff Swallow	0	0	6	10	10	0	0	0	0	0	19	13	5
Least Sandpiper (C)	0	0	0	0	3	10	19	3	3	6	10	3	5
Nashville Warbler	0	0	3	6	3	6	10	10	10	9	0	0	5
Lark Sparrow	0	0	6	3	3	6	10	3	3	9	3	6	4
MacGillivray's Warbler	3	3	3	0	0	10	3	0	16	0	10	3	4
American White Pelican (C)	0	0	0	3	0	3	10	10	3	0	0	13	4
Hooded Merganser	0	0	0	0	0	0	3	13	10	6	6	3	3
Hooded Oriole	0	0	6	0	0	0	0	0	6	9	10	10	3
Dusky Flycatcher	3	7	23	0	3	0	3	0	0	0	0	0	3
Common Raven	0	0	10	0	3	0	6	0	13	3	3	0	3
Pine Siskin (D)	7	0	6	0	0	13	0	10	0	0	0	0	3
Red-naped Sapsucker	7	10	3	0	0	0	3	3	0	3	0	6	3
Pacific Wren	7	3	0	0	0	3	3	3	6	6	0	3	3
Long-billed Dowitcher (C)	0	3	0	0	0	0	6	6	3	6	6	3	3

Species (Conservation Status)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Average Frequency
Townsend's Warbler	0	0	0	0	0	13	13	0	0	3	3	0	3
Black-throated Gray Warbler	0	0	0	0	3	0	0	0	3	6	10	10	3
Eurasian Collared-Dove	0	0	0	0	3	0	10	6	6	3	3	0	3
Horned Lark (D)	3	0	10	6	3	3	6	0	0	0	0	0	3
Western Sandpiper (C)	10	3	0	0	6	3	3	0	0	0	3	3	3
Gray Flycatcher (C)	3	0	6	0	6	3	0	6	3	0	0	0	2
Barn Owl	10	7	3	0	3	0	0	0	0	3	0	0	2
Golden-crowned Kinglet	3	0	10	3	3	3	0	0	0	0	3	0	2
Wilson's Snipe	0	0	0	0	3	0	3	10	0	3	6	0	2
Neotropic Cormorant	0	0	0	0	0	0	6	10	0	3	3	3	2
Tree Swallow	0	0	6	3	0	0	0	0	0	0	0	16	2
Olive-sided Flycatcher (C; D; E)	3	0	3	0	0	3	3	3	6	0	3	0	2
Red-breasted Nuthatch	0	0	3	3	0	0	3	6	0	9	0	0	2
Horned Grebe	0	0	0	0	0	0	6	10	6	0	0	0	2
Solitary Vireo (unidentified)	0	3	3	16	0	0	0	0	0	0	0	0	2
Brewer's Blackbird (D)	0	0	0	3	10	3	0	0	0	3	0	3	2
American Goldfinch	0	0	0	0	6	0	3	0	0	3	0	10	2
Redhead (C)	0	0	0	3	0	0	3	0	0	0	3	13	2
Lesser Yellowlegs	0	0	0	0	3	0	6	0	0	6	6	0	2
Lesser Nighthawk	0	3	0	0	3	0	3	3	3	0	0	6	2
Bank Swallow	0	0	0	0	0	0	0	0	0	0	16	3	2
Brown-crested Flycatcher	7	0	0	0	0	0	0	0	0	3	6	3	2
Barn Swallow	0	0	3	3	0	0	0	0	0	6	3	3	2
Ruddy Duck	0	0	0	0	0	0	6	6	0	0	3	3	2
Violet-green Swallow	0	0	3	6	3	0	0	0	0	0	0	6	2
Cedar Waxwing	10	3	0	0	0	0	0	0	0	3	0	0	1
Summer Tanager (A; B)	0	0	0	0	0	0	3	0	0	0	3	10	1
Plumbeous Vireo	0	0	0	3	0	0	3	3	0	6	0	0	1
Black-throated Sparrow	0	3	0	0	0	6	0	0	0	0	0	6	1
Green-tailed Towhee (C)	0	0	0	3	3	0	0	0	3	3	0	0	1
Merlin	0	3	0	0	3	0	0	3	0	0	3	0	1

Species (Conservation Status)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Average Frequency
Vesper Sparrow	0	0	0	0	3	6	3	0	0	0	0	0	1
Western Grebe (C)	0	0	3	0	0	0	6	3	0	0	0	0	1
Peregrine Falcon (C)	0	0	0	3	3	0	0	0	0	3	0	3	1
Caspian Tern	0	0	0	0	0	0	0	0	0	3	3	6	1
Black-and-white Warbler	0	0	0	0	0	0	0	0	3	0	6	0	1
Canyon Wren	3	3	0	0	0	0	0	0	0	3	0	0	1
Cassin's Vireo	0	0	0	0	0	0	0	0	0	3	6	0	1
Eastern Kingbird	0	0	0	0	0	3	0	3	3	0	0	0	1
European Starling	0	0	0	0	0	3	0	3	0	0	3	0	1
Sagebrush Sparrow (C)	0	0	0	0	0	0	0	3	6	0	0	0	1
Snow Goose	0	0	0	0	0	0	0	3	0	0	6	0	1
Greater White-fronted Goose	0	0	0	0	0	0	0	0	3	0	3	3	1
House Sparrow	3	0	0	0	0	0	3	0	0	0	0	3	1
Vermilion Flycatcher (A; B)	0	0	0	0	0	0	0	0	0	3	3	3	1
California Gull	0	0	0	0	0	0	0	0	0	0	3	6	1
American Bittern	0	3	0	0	3	0	0	0	0	0	0	0	1
Brown Creeper	0	0	0	0	0	0	3	0	0	3	0	0	1
Cactus Wren	0	0	0	0	0	0	0	6	0	0	0	0	1
Prairie Falcon (C)	0	0	0	0	3	0	0	0	0	0	3	0	1
Rock Pigeon	0	0	3	3	0	0	0	0	0	0	0	0	1
Rufous Hummingbird (C; E)	0	0	0	0	0	6	0	0	0	0	0	0	1
Solitary Sandpiper	0	0	0	0	0	0	0	0	0	6	0	0	1
Swamp Sparrow	0	0	0	0	0	0	0	0	0	6	0	0	1
Turkey Vulture	0	0	0	3	0	0	0	0	3	0	0	0	1
Willet (C)	0	0	0	0	0	0	0	3	0	0	3	0	1
Willow Flycatcher (A; B; C)	0	0	0	3	0	3	0	0	0	0	0	0	1
Wood Duck	0	0	0	3	0	0	0	0	0	3	0	0	1
Bell's Sparrow (C)	0	0	0	0	0	0	0	0	0	0	3	0	0
Blackpoll Warbler	0	0	0	0	0	0	0	3	0	0	0	0	0
Blue-winged Teal	0	0	0	0	0	0	0	3	0	0	0	0	0
Bonaparte's Gull	0	0	0	0	0	0	0	0	0	3	0	0	0

Species (Conservation Status)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Average Frequency
Broad-tailed Hummingbird	0	0	0	0	0	3	0	0	0	0	0	0	0
Brown Thrasher	0	0	0	0	0	0	0	0	0	0	3	0	0
Canyon Towhee	0	3	0	0	0	0	0	0	0	0	0	0	0
Cattle Egret	0	0	0	0	0	0	0	3	0	0	0	0	0
Dunlin	0	0	0	0	0	0	3	0	0	0	0	0	0
Fox Sparrow	0	0	0	0	0	0	0	0	0	3	0	0	0
Gray Catbird	0	0	0	0	0	0	0	0	0	0	3	0	0
Groove-billed Ani	0	0	0	0	0	0	0	0	0	0	3	0	0
Hairy Woodpecker	0	3	0	0	0	0	0	0	0	0	0	0	0
Hammond's Flycatcher	0	0	0	0	0	0	3	0	0	0	0	0	0
Long-eared Owl (E)	0	0	0	0	0	0	0	0	0	0	3	0	0
Mountain Bluebird	0	0	0	3	0	0	0	0	0	0	0	0	0
Ovenbird	0	0	0	0	0	3	0	0	0	0	0	0	0
Pectoral Sandpiper	0	0	0	0	3	0	0	0	0	0	0	0	0
Red Crossbill	0	0	0	0	0	0	0	3	0	0	0	0	0
Ross's Goose	0	0	0	0	0	0	0	0	3	0	0	0	0
Rufous-crowned Sparrow	0	0	3	0	0	0	0	0	0	0	0	0	0
Sandhill Crane (C)	0	0	0	0	0	0	0	0	0	3	0	0	0
Scissor-tailed Flycatcher	0	0	0	0	0	3	0	0	0	0	0	0	0
Semipalmated Plover	3	0	0	0	0	0	0	0	0	0	0	0	0
Semipalmated Sandpiper	0	3	0	0	0	0	0	0	0	0	0	0	0
Swainson's Hawk (C)	0	0	0	0	0	0	0	0	0	3	0	0	0
Swainson's Thrush	0	0	0	0	0	0	0	0	0	0	3	0	0
Virginia's Warbler (C; D; E)	0	0	3	0	0	0	0	0	0	0	0	0	0
Western Bluebird	3	0	0	0	0	0	0	0	0	0	0	0	0
White-throated Sparrow	0	0	0	0	0	0	0	0	0	0	3	0	0
White-throated Swift (C)	0	0	0	0	0	0	0	0	0	0	3	0	0
American Redstart	0	0	0	0	0	0	0	0	0	0	0	3	0
Barrow's Goldeneye	0	0	0	0	0	0	0	0	0	0	0	3	0
Lazuli X Indigo Bunting	0	0	0	0	0	0	0	0	0	0	0	3	0
Rose-breasted Grosbeak	0	0	0	0	0	0	0	0	0	0	0	3	0

Table 10. Estimated densities (birds per 40 ha) and abundance ranks for Nevada Bird Count (NBC) Mojave lowland riparian transects within Clark County (2005–2014) compared to Las Vegas Wash breeding season data (2005–2020). Species are listed in descending order of abundance from the NBC data, and include the 50 most abundant species from each of the datasets. Conservation status includes priority species from multiple sources: A (Clark County 2000); B (Bureau of Reclamation 2006); C (GBBO 2010); D (Rosenberg et al. 2016, Intermountain Partners in Flight); E (Rosenberg et al. 2016, Continental Partners in Flight).

Species (Conservation Status)	NBC		Wash	
	Abundance	Rank	Abundance	Rank
Gambel's Quail (C)	7.68	1	7.14	7
Abert's Towhee (C)	7.49	2	10.60	2
Lucy's Warbler (C)	6.14	3	4.19	14
Mourning Dove	4.96	4	3.69	15
Brown-headed Cowbird	4.58	5	5.29	10
Yellow Warbler (B)	4.20	6	3.16	17
Verdin	3.97	7	6.93	8
House Finch	3.93	8	1.19	27
Red-winged Blackbird	3.88	9	15.41	1
Song Sparrow	3.62	10	9.07	5
Bewick's Wren	3.59	11	4.87	11
Yellow-breasted Chat	3.19	12	3.53	16
Phainopepla (A)	2.82	13	0.01	
Northern Rough-winged Swallow	2.42	14	0.83	33
Black-tailed Gnatcatcher	2.24	15	5.58	9
Cliff Swallow	2.17	16	0.26	
Black-throated Sparrow	2.14	17	0.03	
Common Yellowthroat	2.05	18	9.20	3
Ash-throated Flycatcher	2.00	19	0.08	
Crissal Thrasher	1.37	20	1.53	22
Blue Grosbeak (A)	1.32	21	2.80	19
Blue-gray Gnatcatcher	1.10	22	0.18	
Bell's Vireo (ABC)	1.01	23	0.12	
Lesser Goldfinch	0.98	24	0.38	47
Spotted Towhee	0.97	25	0.02	
Great-tailed Grackle	0.96	26	9.16	4
Mallard	0.83	27	4.74	12
Say's Phoebe	0.78	28	0.73	37
Northern Mockingbird	0.75	29	0.66	39
Bullock's Oriole	0.74	30	0.31	
Brewer's Sparrow (C)	0.70	31	0.51	42
American Coot	0.64	32	7.62	6

Species (Conservation Status)	NBC		Wash	
	Abundance	Rank	Abundance	Rank
White-winged Dove	0.62	33	0.34	49
Wilson's Warbler	0.60	34	0.95	31
Rock Wren	0.56	35	0.07	
Black-chinned Hummingbird	0.54	36	0.82	35
Killdeer	0.53	37	1.45	24
White-crowned Sparrow	0.53	38	0.87	32
Western Scrub-Jay (Unidentified)	0.53	39		
White-faced Ibis (C)	0.52	40	0.96	30
Western Kingbird	0.52	41	1.15	28
Yellow-rumped Warbler	0.51	42	1.38	25
Lazuli Bunting	0.50	43	0.17	
House Sparrow	0.49	44	0.00	
Eurasian Collared-Dove	0.45	45	0.03	
Western Meadowlark	0.44	46	0.03	
Cactus Wren	0.43	47		
Black Phoebe	0.43	48	2.37	21
Canyon Wren	0.39	49	0.01	
Common Raven	0.39	50	0.02	
American Avocet	0.02		0.34	50
American Pipit			0.79	36
American Wigeon			2.73	20
Anna's Hummingbird	0.24		0.83	34
Canada Goose	0.17		0.50	43
Cinnamon Teal (C)	0.04		0.37	48
Common Gallinule			0.41	46
Eared Grebe (C)	0.03		1.09	29
Gadwall			2.86	18
Great Blue Heron	0.05		0.71	38
Greater Roadrunner	0.31		1.46	23
Green Heron	0.05		0.53	40
Marsh Wren	0.39		4.20	13
Orange-crowned Warbler	0.10		0.47	44
Ruby-crowned Kinglet	0.06		0.43	45
Spotted Sandpiper	0.18		0.52	41
Yellow-headed Blackbird	0.16		1.32	26

Table 11. Summary trends from negative binomial regression statistics for 20 species with more than 1 detection per 40 ha overall, that were detected within 100 m of survey points at the Las Vegas Wash between February 2005 and August 2020. Species listed in descending order of detections. Dark gray shading indicates significantly negative trends (five species), and light gray shading indicates significantly positive trends (11 species).

Species	No. of Visits with Detections	Total No. of Birds Detected	Overall Density Estimate (Birds/40 ha)	Incident Rate Ratio	P
American Coot	276	15814	21.4	1.20	< 0.001
Yellow-rumped Warbler	198	8205	11.1	1.04	0.027
Mallard	275	8119	11.0	1.18	< 0.001
Gadwall	170	7929	10.7	1.32	< 0.001
Red-winged Blackbird	286	7919	10.7	1.03	0.021
Abert's Towhee	309	7473	10.2	0.96	< 0.001
Song Sparrow	308	5619	7.7	0.92	< 0.001
Marsh Wren	303	5290	7.2	0.99	0.564
Verdin	309	4512	6.2	1.06	< 0.001
Gambel's Quail	269	4459	6.1	1.17	< 0.001
Black-tailed Gnatcatcher	308	3876	5.3	1.03	< 0.001
American Pipit	147	3655	4.9	1.06	0.009
Bewick's Wren	306	3602	4.9	0.92	< 0.001
Common Yellowthroat	187	3438	4.7	0.99	0.588
Black Phoebe	304	2793	3.8	0.99	0.202
Ruby-crowned Kinglet	184	2105	2.9	0.98	0.096
Orange-crowned Warbler	208	1962	2.7	1.08	< 0.000
Lucy's Warbler	137	1419	2.0	0.89	< 0.001
Crissal Thrasher	289	1286	1.8	1.03	< 0.001
Yellow-breasted Chat	122	1217	1.7	0.90	< 0.001

Table 12. Comparison of species richness, total abundance and estimated densities (birds per 40 ha) of 11 species in three vegetation treatments (see Methods). Species listed in descending order of statistical significance. Green shading indicates significantly higher values relative to recently revegetated sites; orange shading indicates significantly lower values. Note that the recently-cleared category necessarily includes surveys of sites prior to clearing and construction. For this reason, the recently-cleared category is excluded from the analysis. Bold text indicates analyses with R-squared > 15%.

Treatment	Older Reveg/Untreated (n=96)	Intermediate Reveg (n=78)	Recent Reveg (n=60)	Recently Cleared/Completed (n=46)	R ²	P
Abundance	156.9	207.5	315.7	219.6	0.202	<0.0001
Richness	38.7	40.8	39.1	37.2	0.013	0.2255
American Coot	6.0	21.0	61.5	29.4	0.230	<0.0001
Abert's Towhee	11.8	10.4	4.0	8.1	0.193	<0.0001
Verdin	11.6	6.0	2.9	3.7	0.311	<0.0001
Bewick's Wren	5.8	4.2	1.2	5.2	0.124	<0.0001
Ruby-crowned Kinglet	3.9	2.9	0.6	1.3	0.111	<0.0001
Common Yellowthroat	3.4	6.2	5.1	4.6	0.095	<0.0001
Yellow-rumped Warbler	13.9	14.0	7.8	12.8	0.079	0.0001
Gambel's Quail	13.8	7.3	2.5	2.0	0.077	0.0005
Song Sparrow	4.7	7.3	6.9	6.8	0.037	0.0218
Lucy's Warbler	2.0	1.5	0.2	1.5	0.068	0.0098
Yellow-breasted Chat	1.2	1.7	0.9	1.5	0.052	0.0429