# BIRD COMMUNITY AND VEGETATION OF LAS VEGAS WASH, 2005-2010

(SNWA Contract No. 01-3631-19100-046-0508)

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**Final Report, 20 July 2011**

## Acknowledgments

This study was funded by the Southern Nevada Water Authority through a grant from the Bureau of Reclamation. Thanks to our field surveyors, including Amy Leist, David Henderson, Dorothy Crowe, and Michael Maples. Many thanks are also due to Debbie Van Dooremolen of Southern Nevada Water Authority for project administration, coordination, and support, and to Gerald Braden and Aaron Miller, of the San Bernardino County Museum, for their support and assistance. We would also like to thank Debbie Van Dooremolen, Seth Shanahan, Keiba Crear, and the members of the Research and Environmental Monitoring Study Team for reviewing this document and the Las Vegas Wash Coordination Committee for their continued support for this project.

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## Abstract

The Great Basin Bird Observatory (GBBO) completed the fifth year of bird surveys and vegetation assessments along an 8.7 km stretch of the Las Vegas Wash (heareafter: Wash) in between February 2009 and January 2010. This effort is a continuation of major work done in the first four years of the project by the San Bernardino County Museum and the Southern Nevada Water Authority, the latter of which also heads a major stabilization and enhancement project designed to prevent erosion and reclaim wetland and riparian habitat in the Wash. In this report, we summarize bird species occurrence, trends in abundance, distribution patterns across the Wash, and trends in vegetation cover and structural diversity over the first five survey years (February 2005 – January 2010). In each of the five years, bird surveys were completed year-round every two weeks using 29 (later amended to 31) permanently established survey points. Once a year, in the fall, vegetation assessments were conducted at each survey point. A total of 176 bird species were recorded over the course of five years, constituting 44 – 59% of the total bird species richness of Nevada. Of these, 34 are conservation priority species according to current assessments in regional bird initiatives, as well as the Clark County Multiple Species Habitat Conservation Plan and the Lower Colorado River Multi-Species Conservation Program. Average species richness increased over the five survey years, as did total bird abundance. Species-specific trends were mixed with five bird species showing significant declines and 14 showing significant increases over the study period. Several of the declining birds are riparian shrub-associated, but the large number of other shrub-associated species with an increasing population trend suggests that habitat requirements of these guilds were at least mostly stable through project activities. We expect that with further recovery of native vegetation, even the species currently in decline will recover in the Wash in the long-term. Based on vegetation assessments, overall tree cover did not change significantly during the five-year study period, while the proportion of tamarisk decreased. Structural diversity was on an increasing trend (although not significant) at the ground- and shrub vegetation layer (0 – 2 m) over the course of the study, but overall vertical structure of the woody plants remained similar throughout the survey period. Our main recommendations include (1) maintaining a live database that is compatible with similar data collected in the region, and (2) considering stratification for the survey points that reflects their restoration history, type, or objectives, in order to better understand bird and vegetation responses to particular project actions.

# Introduction

The Las Vegas Wash (Wash), located in the southeastern portion of Las Vegas Valley, is the primary drainage of the Las Vegas Valley Hydrographic Basin. The lower Wash extends approximately 20 km, terminating in Las Vegas Bay, in Lake Mead. While the Wash was historically ephemeral, it has become a permanent riverine and wetland complex from treated wastewater runoff and wetland creation projects over the past 40 years. From the significant discharge, the Wash began to degrade through channel down-cutting, 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 an environmental group. The LVWCC generated 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 through to the present. Plan activities include installing weirs and other control structures to halt the down-cutting, and extensive vegetation improvements through tamarisk (*Tamarix ramosissima*) control, revegetation with native woodland species, and other plantings. 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 (the lead agency of the LVWCC), began point count bird surveys along an 8.7 km reach of the Wash (Braden et al. 2009). The purpose of these bird surveys was to (1) inventory bird population and bird habitat parameters to provide a baseline, (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 to 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 the fifth year of surveys, which was conducted by the Great Basin Bird Observatory in 2009, and analyzes it together with the previous four years of data from the museum.

# Methods

## *Study Area*

The study area encompasses 8.7 km of Las Vegas Wash between the Upper Diversion and Powerline Crossing Weirs (Figure 1). The upland habitat is dominated by Mojave scrub (dominated by creosote bush, *Larrea tridentata*). The riparian area is still dominated by the invasive, non-native tamarisk and common reed (*Phragmites australis*). Native vegetation present includes Goodding willow (*Salix gooddingii*), sandbar willow (*Salix 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.).

Active channel stabilization and revegetation activities occurred along the length of the study area throughout the study period, with nine weirs and 75 acres of revegetation in place by the end of the first year and 12 weirs and approximately 260 acres of revegetation in place by the end of the fifth. In 2009 through early 2010, 12 of the 31 bird survey points were undergoing construction activities or non-native vegetation removal efforts during early spring. Since project activities have been ongoing throughout the first five years of this study, our monitoring data are likely directly or indirectly affected by them.

## *Bird Data and Analyses*

### Data Collection Methods

Birds were surveyed using standard 5-minute point counts (Ralph and Scott 1981). The study began with 29 points in 2005 and with later additions and deletions now comprises 31 points, arranged along both sides of the Wash (Figure 1). The survey points were established at regular 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.

Each survey occurred approximately every two weeks over a two-day period. Surveys were conducted from sunrise to approximately five hours post-sunrise, to capture the period of greatest bird activity and vocalization. The order in which points were sampled rotated among surveys.

Twenty-six surveys were done each year, with the survey year typically running from mid-February through January (Year 5 surveys began on January 31) except in Year 4, for which 25 surveys were included in this report. A 26$^{th}$ survey was later discovered from Year 4, completing the set. This survey was added to the five-year data set, but it was not included in the analyses for this report.

While surveyors were rotated to minimize observer effects, a review of the data suggested that some observer effects remained, particularly with regard to distance measurements. Prior to 2009, rangefinders were not used to determine distances to birds, which adds to the difficulty in interpreting distance data in the full dataset. For future surveys, the use of rangefinders should be standard, if distance data are to be used in analyses.

### Data Analysis

### Species List

A comprehensive species list of all birds recorded in Las Vegas Wash was generated based on the first five years of surveys, including all survey points (the total of which varied among years between 29 and 31, with 28 being surveyed consistently over the study period), birds detected at all distances during the point count surveys, and incidental records. The list also includes “fly-over” sightings (e.g., Red-tailed Hawks flying high overhead) of birds that were detected between surveys and thus may not have been closely tied to the vegetation present at a survey

point. The 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 detections were included regardless of survey effort.

## Species Richness and Abundance

For the purpose of analyzing species richness and abundance patterns, we included survey data from all survey points for which data were available, and for all 26 survey events per year, except for 2008, where one survey was missing from the dataset at the time of this analysis. The number of survey points varied slightly over the first few years, which we considered an insignificant source of variation, particularly given that the added and deleted survey points were similar in habitat and species composition, and given the fact that abundance estimates for this report were standardized to the estimated density figure of number of birds per 40 ha.

For our quantitative analyses, only bird detections that occurred within a 100 m radius of each survey point were included. Fly-overs were excluded, even if they occurred directly above a survey point, because these birds were generally not assumed to be actively using the surveyed area. Similarly, species observed beyond 100 m and incidental detections outside of survey periods were excluded. Limiting the sample to detections within 100 m of the point allows for comparability among survey points of birds tied to the surveyed area. However, this approach eliminates a small handful of species that are primarily detected during flight, 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.

In previous reports on this project, abundances were calculated as total number of detections, or other metrics of total number of detections, which is useful for monitoring abundances within one study, but less useful for comparing data from this project to other regional and national abundance data. Therefore, we recalculated all abundance data to the standardized estimate of density of number of birds per 40 ha. This allows for comparisons of Wash abundances to regional data from the Nevada Bird Count program, as well as breeding bird densities reported in the majority of the published literature. For this report we plotted the number of bird species and the number of bird detections per 40 ha by survey event in order to illustrate temporal variation in species richness and abundance. We then performed linear regression analyses to determine whether trends were significant. Differences with p-values $< 0.05$ were considered significant.

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 resident and migrant species. In this report, we used the same definitions for consistency with previous analyses. This time period also encompasses spring and early fall migration of several mid and long-distance migrants so, inevitably, at least 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 to exclude nesting of most resident species. Average richness and estimated density per survey were calculated for these seasons.

## Species-Specific Abundances

For each species, estimated bird density and relative abundance were calculated for each year and separately for its breeding and non-breeding seasons. As an index of abundance, we used the number of bird detections per 40 ha. Relative abundance was calculated as the percentage of detections contributed by each species. Only the 28 points surveyed consistently for all five years were included in these analyses.

Breeding season bird abundances from the Wash surveys were compared to data collected as a part of GBBO's Nevada Bird Count (NBC), within the lower Colorado River watershed. This was done to provide a reference point for the estimated densities at the Wash from regional data collected in similar habitat types (Mojave lowland riparian). The NBC data were collected from 1099 point counts distributed over 25 transects in seven years (2002-2008), compared to the Wash data, which were from 1757 point counts over five years (2005-2010). Both datasets included only detections within 100 m of the survey point for the purpose of comparisons. However, NBC data were collected over a 10 min survey period per point, rather than a 5 min period used in 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 30 June, with surveys primarily occurring in May and early June. Nonetheless, we consider this standardized estimate of breeding density informative for regional comparisons of most breeding landbird species.

Only species that were detected during at least 40 survey events between February 2005 and January 2010 were included in the trend analyses, which resulted in 37 species for trend analyses. The 40 event threshold was established because we need at least moderately common species to determine meaningful trends. Regression analyses were used to examine trends in species-specific abundance over the five years of data collection. Survey data from all survey points for which data were available were included in these analyses.

## Species-Specific Frequencies

Species-specific frequency is a measure of the distribution of a species across the Wash. Absolute frequency represents the total number of survey points where a species was detected during a given time period, and relative frequency represents the percentage of survey points with detections.

# *Vegetation Measurements*

## Data Collection

Vegetation data were collected at each bird survey point along the Wash during each fall between 2005 and 2009, using a vegetation protocol developed by Braden et al. (2009). Three 100 m vegetation transects were laid out radially, at 120$^{o}$ angles from the point. Data were collected along each transect at the distances of 20 m (extending to 40 m) and at 50 m (extending to 70 m) from the survey point. Along each of the six 20 m segments, plant species occurrence,

height, and vertical structure were recorded at 2 m intervals, yielding 60 sampling stations per point. Using an 11 m survey rod, perennial plant height was measured to within 0.1 m; any vegetation exceeding the height of the survey rod was estimated to within 0.5 m. Perennial plant structure was measured as the number of vegetation contacts at 1 m vertical intervals along the survey rod.

### Data Analysis

Percent cover type composition was calculated for each survey point, using averages from the point's vegetation transects, and also across the Wash, using averages from the 28 points surveyed consistently over the study period. Cover types included in the analyses were categorized as trees, shrubs, grasses, forbs, and cattails. Because some vegetation transects ended in the channel, emergent vegetation may be underestimated overall due to its naturally-clustered distribution along the channel shores. Analysis of Variance, with the SIDAK correction for multiple comparisons, was used to investigate vegetation differences.

Percent cover of live trees by species was calculated for each survey point, and across the Wash. The following species were included in this analysis: catclaw (*Acacia greggii* ), Fremont cottonwood, honey mesquite, screwbean mesquite, Goodding willow, sandbar willow, and tamarisk.

Perennial (tree) height for each point was calculated as the average perennial height of the 60 sampling stations, and was analyzed for differences between years using the point as the sample unit. Vertical structural diversity was assessed by plotting the mean number of contacts vegetation made with the survey rod against the height categories 0-2 m, 2-4 m, 4-6 m, 6-8 m, and 8-10 m. These data were also analyzed for between-year differences.

Horizontal perennial heterogeneity was evaluated using the Hill (1973) proportional diversity measure $[1/\sum p_i^2]$, where $p_i$ is the proportion of vegetation-rod hits at each of the six vegetation-transect segments at a survey point. The diversity measure was calculated for each point over the five years, with values increasing as vegetation becomes more evenly distributed.

# Results

## *Bird Surveys*

### Species List

Between 12 February 2005 and 31 January 2010, 176 bird species were observed during point counts (Table 1). In the fifth year (2009), 15 species were detected for the first time in the Wash, including for example Cactus Wren, Eurasian Collared-Dove, Indigo Bunting, Least Sandpiper, and Rufous Hummingbird. Thirty species that had been recorded at least once during the first four years were not found in 2009, including for example Bell's Vireo, Long-billed Dowitcher, Summer Tanager, Swainson's Hawk, Western Grebe, and Willow Flycatcher.

Of the 176 species observed during the five-year period, 147 were recorded during the breeding season (15 March - 31 August), and 126 were recorded during the non-breeding season (1 October - 31 January). Thirty-four recorded species are conservation priorities according to the *Nevada Comprehensive Bird Conservation Plan* (GBBO 2010), the Clark County Multiple Species Habitat Conservation Plan (Clark County 2000), or the Lower Colorado River Multi-Species Conservation Program (Bureau of Reclamation 2006). Sixteen of the priority species were recorded during the non-breeding season, and 25 were recorded during the breeding season. Five of the priority species were confirmed to nest within the Wash in 2009, including Abert's Towhee, Blue Grosbeak, Gambel's Quail, Yellow Warbler, and Lucy's Warbler. Nesting was confirmed through the standard breeding bird atlas methods (e.g., Floyd et al. 2007) of observing active nests, dependent young, food/nest material/fecal sac carrying, or nest building.

## Species Diversity

## Species Richness

Seasonal patterns of species richness were similar among years, with richness being lowest in February, and peaking during April-May and August-September due to migration and juvenile dispersal (Figure 2). Regression analysis of species richness over time showed an increasing trend over the five-year period, with an $R^2$ value of 0.023 and a p-value of 0.046 (Figure 3).

When comparing the Wash data to breeding season data from GBBO's Nevada Bird Count, species richness was higher in the Wash with 147 species recorded, compared with 133 species recorded in the greater lower Colorado River watershed. Some of this difference may be explained by the comparatively larger survey effort and extended survey period in the Wash, but future studies may examine these species lists in more detail to determine specific differences.

## Total Bird Abundance

Total bird abundance varied seasonally and annually, but overall patterns were similar among years, with peaks observed during the late breeding season, primarily in June and July, and during the late fall migration period (October-November; Figure 4). Regression analysis of bird abundance showed an increase in estimated total bird density over the five-year period (Figure 5), with an $R^2$ value of 0.112 and a p-value of $< 0.001$.

## Species-Specific Abundances

## Overall Abundance Patterns

For the whole study period, the species with the greatest abundances included Abert's Towhee, Song Sparrow, Yellow-rumped Warbler, Red-winged Blackbird, Bewick's Wren, Marsh Wren, American Coot, White-crowned Sparrow, Black-tailed Gnatcatcher, and Verdin (Table 2a). Density estimates by species, averaged for years and seasons, are provided in Tables 2a and 2b. Relative abundances (% of total bird abundance by each species) are reported in Tables 3a and 3b.

**Trend Analyses.** Thirty-seven species had detections during at least 40 survey events (from a total of 129) between February 2005 and January 2010, and were included in a trend analyses for the five-year period (Table 4). Of the 37 species, 15 had negative trend slopes, with five (13%) showing significant declines ($p < 0.05$), including Song Sparrow, Lucy's Warbler, Abert's Towhee, Mourning Dove, and Killdeer (Figure 6).

Of the 37 species, 22 had positive trend slopes, with 14 (38%) showing significant increases ($p < 0.05$), including such species as Mallard, Say's Phoebe, Marsh Wren, Great-tailed Grackle, Great Blue Heron, Yellow-rumped Warbler, Verdin, White-crowned Sparrow, Gambel's Quail, and House Finch (Figures 7a-c). Table 3 shows summary regression statistics for all 37 species included in the trend analysis.

## Breeding Season Species Abundances

During the breeding season, the ten most abundant species included Abert's Towhee, Song Sparrow, Red-winged Blackbird, Common Yellowthroat, Brown-headed Cowbird, Bewick's Wren, Lucy's Warbler, Yellow-breasted Chat, Verdin, and Black-tailed Gnatcatcher (Table 2a). In comparison, the ten most abundant species recorded during seven years of Nevada Bird Count (NBC) surveys in the Lower Colorado River watershed included Gambel's Quail, Lucy's Warbler, Mourning Dove, Song Sparrow, Black-throated Sparrow, Brown-headed Cowbird, Yellow-breasted Chat, Verdin, House Finch, and Yellow Warbler. Half of these two species lists was the same among the two monitoring efforts, indicating an overall large degree of similarity between the Wash and similar habitat types in the region. In fact, some of the dissimilar species included upland-associated and generalist species in the NBC data set (e.g., Black-throated Sparrow) that were not among the most abundant in the Wash.

Of the riparian-associated species, Red-winged Blackbird, Common Yellowthroat, Bewick's Wren and Abert's Towhee stand out as particularly abundant in the Wash, indicating a significant marsh and riparian shrub component of the site. Yellow Warbler was among the ten most abundant species elsewhere (and the 16$^{th}$ most abundant species on the Wash), suggesting that a willow component may still be somewhat underrepresented compared to other riparian sites.

When comparing the Wash's breeding abundances of select conservation priority species to regional NBC data from similar habitats, the Wash supported much greater numbers of Abert's Towhee, and somewhat greater numbers of Lucy's Warblers. The Wash and the NBC data showed similar abundance estimates for Blue Grosbeak, and for Costa's Hummingbird and Willow Flycatcher, two other high priority conservation species. The Wash supported fewer Bell's Vireos, Gambel's Quail, and White-throated Swifts compared with regional abundances.

## Non-breeding Season Species Abundances

During the non-breeding season, the ten most abundant species of the Wash included Yellow-rumped Warbler, White-crowned Sparrow, Abert's Towhee, American Coot, Marsh Wren, Song Sparrow, American Pipit, Ruby-crowned Kinglet, Red-winged Blackbird, and Mallard (Table 2a). 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) and the most abundant migrants and wintering species of the Mojave Desert (e.g., Yellow-rumped Warbler, White-crowned Sparrow, and American Pipit).

## Species-Specific Frequencies

## Year-Round Frequencies

In this report, frequency refers to the number of survey points at which a species was detected, providing a measure for how widespread a species is within the Wash. A total of 16 species were recorded at all survey points when the five years of surveys were analyzed cumulatively, including Abert's Towhee, Bewick's Wren, Black Phoebe, Black-tailed Gnatcatcher, Blue Grosbeak, Common Yellowthroat, Gambel's Quail, Greater Roadrunner, House Finch, Orange-crowned Warbler, Red-winged Blackbird, Ruby-crowned Kinglet, Song Sparrow, Verdin, White-crowned Sparrow, and Yellow-rumped Warbler. Table 5 shows overall, breeding, and non-breeding frequencies for the fifth year of bird surveys. For all other years, please see results in Braden et al. (2009).

We conducted a series of trend analyses for the species that were most abundant and were detected on the majority of survey points in the Wash, and these analyses largely mirrored our results for trends in abundance (see above, Species-Specific Abundances: Trend Analyses). For the sake of brevity, we are therefore not reporting species-specific frequency trends.

## Breeding Season Frequencies

During the breeding season, 11 species were found on at least 30 survey points when the five years were analyzed together, including Abert's Towhee, Blue Grosbeak, Common Yellowthroat, Song Sparrow, Verdin, Bewick's Wren, Black-tailed Gnatcatcher, Red-winged Blackbird, Brown-headed Cowbird, Mourning Dove, and Yellow-breasted Chat (for results of fifth year of surveys, see Table 5, for all other years, see results in Braden et al. 2009). The majority of these species are riparian-associated for nesting, suggesting that riparian woodland and marsh cover are widely available through the project area.

## Non-Breeding Season Frequencies

During the non-breeding season, ten species were found on at least 30 of the 31 survey points over the five years, including Abert's Towhee, Song Sparrow, Bewick's Wren, Black-tailed Gnatcatcher, Yellow-rumped Warbler, Ruby-crowned Kinglet, White-crowned Sparrow, Verdin, Black Phoebe, and American Pipit (for results of fifth year of surveys, see Table 5, for all other years, see results in Braden et al. 2009). Generally, wintering and migration use of habitats by songbirds is less narrow than their breeding season habitat requirements, but all of these species are classic riparian or wetland migrants for the Mojave region.

## *Vegetation Measurements*

### Tree Cover

Tree cover provided the largest contribution (30-40% over five years) to vegetative cover of the Wash bird survey points (Figures 8-19). Tree cover showed no significant trend over the five-year period (Figure 8). Native tree cover also showed no significant trend (Figure 9), but tamarisk cover declined significantly, by 19%, between 2005 and 2009 (Figure 10; see also Anova results, below). Tamarisk originally formed the majority of the trees found across the Wash, averaging 36% cover in 2005, compared to 16% in 2009 (Figure 8 and 10). Despite the declining tamarisk cover, cover estimates for cottonwood, Goodding willow, sandbar willow, or mesquite trees were not statistically different over the five-year period (Figures 11-14, see also Anova results below).

### Perennial Plant Height

Mean perennial plant height decreased significantly by 1.3 m between 2005 and 2009 (Figure 15). Perennial plant height averaged 2.9 m in 2005, remaining at similar levels through 2008, and decreased to 1.6 m in 2009 (Figure 15).

### Cover Types

Five cover types were evaluated for changes in the Wash over the five-year study period, including trees, shrubs, forbs, grasses, and cattails (Figures 16-19). Only one cover type, grass cover, changed significantly over the time period, increasing by 10.8% between 2005 and 2009 (Figure 18). We also examine changes in percent native tree cover over the course of the five years (Figure 20), which shows an overall increase in proportion of native trees, although this relationship was not statistically significant.

### Vertical Perennial Plant Structure

There was no overall difference in vertical perennial plant structure over the five-year period based on the number of hits along the vertical rod (Figure 21). There was an increasing trend, although not significant, in perennial vegetation in the 0-2 m height interval (Figure 22), and a significant decrease in the 2-4 m height interval (Figure 23). There were no significant differences in the 4-6 m height interval (Figure 24), the 6-8 m height interval (Figure 25), and the 8-10 m height interval (Figure 26).

### Horizontal Perennial Plant Structure

Horizontal perennial plant structure was evaluated using a proportional plant diversity measure based on rod hits along the transect line, and it remained similar throughout the five-year survey period (Figure 27). There was no significant difference in among years.

Results of ANOVA

| Habitat variable | F-statistic | P-value | DF |
|---|---|---|---|
| Overall Tree Cover | 1.743 | 0.144 | 4, 135 |
| Native Riparian Trees | 0.434 | 0.784 | 4, 135 |
| ***Tamarisk*** | **2.582** | **0.040** | 4, 135 |
| Cottonwood Trees | 0.184 | 0.95 | 4, 135 |
| Goodding Willow Trees | 0.177 | 0.95 | 4, 135 |
| Sandbar Willows | 1.824 | 0..51 | 4, 135 |
| Mesquite Trees | 0.892 | 0.47 | 4, 135 |
| ***Perennial Height*** | ***5.764*** | ***<0.001*** | 4, 135 |
| Shrub Cover | 0.652 | 0.63 | 4, 135 |
| Forb Cover | 2.117 | 0.08 | 4, 135 |
| ***Grass Cover*** | ***13.130*** | ***<0.001*** | 4, 135 |
| Cattail Cover | 0.261 | 0.90 | 4, 135 |
| Native Tree proportion | 0.434 | 0.78 | 4, 135 |
| Perennial Structure | 0.956 | 0.43 | 4, 135 |
| 0-2 m | 2.314 | 0.061 | 4, 135 |
| ***2-4 m*** | ***2.613*** | ***0.038*** | 4, 135 |
| 4-6 m | 1.591 | 0.180 | 4, 135 |
| 6-8 m | 0.722 | 0.579 | 4, 135 |
| 8-10 m | 0.695 | 0.597 | 4, 135 |
| Horizontal heterogeneity | 1.298 | 0.274 | 4, 135 |

# Discussion

## *Bird Community*

Las Vegas Wash provides important habitat for a large suite of bird species throughout the year. Over the five-year period between 2005 and 2010, 176 species were observed in and around the Wash, including 34 conservation priority species, and breeding-season data resulted in a slightly greater number of species than detected in other Mojave lowland riparian sites across the region. Species richness was lowest in February, with peaks during spring (April-May) and fall (August-September) migration. Abundance peaked in June/July, perhaps a result of juvenile dispersal, and again in October/November, likely a result of migrant waves. A total of 300 species regularly occur, and over 400 species have ever been reported, in Nevada (GBBO 2010). Therefore, the Wash supports a large proportion (44 – 59%) of the overall diversity of bird species in the state.

During the five years of bird surveys on the Wash, both species richness and total bird abundance increased significantly (Figures 3 and 5). While both of these measures are good basic descriptors of the bird community, we recommend future analyses that characterize the shifts within the community and in species abundances in greater detail. For instance, the species list can be divided into habitat-use groups, such as riparian-dependent, riparian-facultative, upland, and generalist species. With increasing effects of habitat enhancements, the proportion of riparian habitat specialist species is predicted to increase, while the number of generalist species should remain the same or decrease.

Also, conservation priority species may be addressed with additional data analyses, and perhaps with intensified data collection on occupancy patterns, habitat use, and breeding status. These species are of particular interest, as their conservation is directly addressed by habitat enhancement and other project activities that are already occurring on the Wash.

## *Species-Specific Abundances and Frequencies*

The Las Vegas Wash forms important breeding habitat for four conservation priority species, the Abert's Towhee, Lucy's Warbler, Blue Grosbeak, and Gambel's Quail, all of which are quite abundant in the Wash. Abert's Towhee was, by far, the most abundant and among the most widely-distributed bird species in the Wash, likely because of the abundance of quailbush and dense riparian understory (Tweit and Finch 1994). Similarly, Gambel's Quail are frequently found in mesquite thickets, cottonwood-willow habitats, and *Atriplex* thickets (quailbush and four-wing saltbush; Brown et al. 1998, Rosenberg et al. 1991). Lucy's Warblers are common to mesquite brushlands and cottonwood-willow habitats (Johnson et al. 1997). Similarly, Blue Grosbeaks are common to mesquite and cottonwood-willow habitats, usually with low shrub densities and low tree cover by medium-sized trees (Ingold 1993). All of these species are also tolerant of tamarisk (Tweit and Finch 1994, Rosenberg et al. 1991, Johnson et al. 1977, Ingold 1993, Van Riper et al. 2008). Interestingly, the one conservation priority species that stood out as being less abundant in the Wash than in similar sites across the region was Bell's Vireo. This is somewhat of a surprising result, as most other riparian-dependent species were found in expected abundances. Based on previous habitat-association studies (GBBO 2009, 2010), we found that this species is associated with moderately-sized riparian trees and shrubs very similar to what is present in the Wash. It may be useful to examine habitat requirements of this species further to better understand what, if any, habitat components are missing to make the site more suitable for it.

Trends in abundance were mixed within the community, although more species (14) were increasing significantly over the five-year period than decreasing (5). Some patterns of species trends were complex, with the shrub-cover associated Abert's Towhee in decline over the course of five years, while Gambel's Quail, which uses similar microhabitats, was increasing. Also, Mourning Dove populations were declining across the Wash over the five-year period. While the Mourning Dove is reported to use a variety of habitat types (Otis et al. 2008), Cunningham et al. (1997) reported selection of nest sites in tamarisk and honey mesquite, particularly those with diameters-at-breast-height of 14 – 20 cm. It is possible that changes in Mourning Dove populations in the Wash reflect both tamarisk reduction (Figure 10) and a trend toward increasing structural diversity in low vegetation height intervals (Figure 22). Patterns in trends of

frequency of these species (i.e., how widespread they were in the study area) were similar to trends in abundance.

Significantly declining in numbers were the Abert's Towhee, Lucy's Warbler, and Song Sparrow. All three species prefer dense shrubby habitats, and are tolerant of tamarisk (Tweit and Finch 1994, Johnson et al. 1997, Arcese et al. 2002). It is possible that the reduction of tamarisk throughout the Wash has resulted in temporary declines in the populations of these species. Birds that underwent significant increases included open shrubland or grassland species, such as the wintering White-crowned Sparrow and American Pipit. A significant increase in grass cover (Figure 18) may be favoring these species.

Overall, the changes in the bird community were balanced and actually the increasing trends outnumbered the decreasing ones, which is remarkable given that significant construction and plant management occurred throughout the five years of bird surveys. More than a third of the bird survey points underwent tamarisk control activities and/or weir construction in 2009 alone, which appeared to have little effect on the 2009 bird survey results. In a bird community of this size, it is expected that a handful of birds show significant trends, both increasing and decreasing, and there is no evidence of a radical restructuring of the bird community. In fact, both species richness and total bird abundance increased over the period of significant construction and plant management. Likely, the bird community will change gradually, as bird habitat created by project activities matures. Long-term monitoring over 20 – 50 years will better reveal the bird responses to project activities, for which the data of the first five years will serve as an excellent baseline data set.

## *Vegetation Composition and Structure*

Over the five-year period, tamarisk remained the dominant cover within the Wash bird survey points (Figures 9-14), but it experienced significant decreases in cover, most likely due to tamarisk control activities. Also, the proportion of native trees slightly increased (not significantly, though), which may be a result of revegetation efforts and greater survival of trees with decreased competition. Other observed changes in plant cover and vertical structure were expected based on project activities, and the bird numbers suggest that no major losses of important habitat types have occurred.

## *Other Considerations*

This five-year data collection period was an important phase for setting a baseline for future monitoring. We fully expect that the final benefits of the Wash stabilization and revegetation activities, which are still ongoing, will not be determined until the vegetation matures to the point where it becomes suitable for a large variety of conservation priority species. For this five-year dataset, however, it is important to consider these ongoing activities when analyzing and interpreting the data. For this reason, we recommend that this baseline dataset be used as an overall reference point for monitoring long-term effects on bird populations after 20-50 years have passed. Further, we recommend stratifying the 31 survey points according to a scheme that allows us to document the timeline of habitat and bird population recovery. For instance, the survey points may be grouped by year of weir construction or revegetation, type of revegetation,

or desired outcome. While this approach would reduce the overall available sample size, we believe that bird responses and benefits of habitat enhancement would better be pinpointed, if the history of project activities were taken into account. Further, this would allow us to estimate time required for recolonization of a site by high priority species. Finally, this approach would also more directly feed into the adaptive management process than an analysis of all survey points with mixed project histories. The Las Vegas Wash Wildlife Management Plan (Shanahan et al. 2008) calls for effectiveness monitoring and specifies this bird point count study as a valuable tool for determining whether the management objectives related to conserving native species and protecting and enhancing their habitats are being met. By stratifying the points, we would gain a better understanding of how project activities are impacting birds and their habitats on the Wash.

## Recommendations

Based on the dataset and analyses of the first five years of bird and bird-habitat surveys in the Wash, we have the following recommendations for continuation of the bird monitoring effort:

1. GBBO spent a large amount of time setting up a formal database for both the bird survey data and the vegetation data. We recommend that this database be maintained on an annual basis and all data are entered according to the standards set. If additional data are collected in the future, these can be accommodated by adding new fields. Finally, we recommend that the data be uploaded to the Avian Knowledge Network (AKN, www.avianknowledge.net), or better yet, to the Coordinated Bird Monitoring Database (CBMD) node of the AKN. This node also allows for storing supplementary data, such as vegetation measurements. The purpose of the AKN and its nodes is to store bird monitoring data for the long-term and make it available based on the specifications of the data provider. This can be an important function in monitoring projects designed to continue for 20-50 years and through periods of staff turnover. GBBO can provide a contact for CBMD.
2. We recommend aligning the breeding season field data collection and initial data processing with the procedures of the Nevada Bird Count (NBC). This has the advantage that NBC data can be queried on a regular basis to compare trends at the Wash with regional trends to distinguish local, project-related effects from regional patterns. Minor differences between the current Wash surveys and NBC data collection methods can be resolved fairly easily, and the surveyors of the project can be trained in our annual NBC training session which would hopefully prevent major observer-related biases.
3. We recommend stratifying the survey point locations according to weir construction or revegetation history, revegetation type, or desired outcome. This effort, while compromising the sample sizes somewhat, would likely provide improved interpretability of the bird and habitat data collected in light of project goals.
4. For the adaptive management process, the first five years of data collection indicate that initial construction impacts are relatively minor overall, but setbacks in some bird populations may be occurring and may continue until project activities are concluded. Adaptive management may benefit from a point-by-point analysis that examines particular activities, or else a stratification of survey points as outlined above, to better pinpoint those that are successful.

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**Table 1. Bird species detected at Las Vegas Wash, February 2005 through January 2010, overall, and during the breeding and non-breeding seasons.** Bolded species are conservation priorities (Clark County 2000, Bureau of Reclamation 2006, GBBO 2010). X denotes at least one detection in that season (for season definitions, see Methods), and M denotes migrant occurrence outside of the two seasons. Species listed in taxonomic order.

| Bird Species | Scientific Name | Breeding Season | Non-Breeding Season |
|---|---|---|---|
| Canada Goose | *Branta canadensis* | X | X |
| Snow Goose | *Chen caerulescens* | X | X |
| Ross's Goose | *Chen rossii* | | X |
| Wood Duck | *Aix sponsa* | | X |
| Gadwall | *Anas strepera* | X | X |
| American Wigeon | *Anas americana* | X | X |
| Mallard | *Anas platyrhynchos* | X | X |
| Blue-winged Teal | *Anas discors* | X | X |
| **Cinnamon Teal** | ***Anas cyanoptera*** | X | X |
| Northern Shoveler | *Anas clypeata* | X | X |
| **Northern Pintail** | ***Anas acuta*** | | X |
| Green-winged Teal | *Anas crecca* | X | X |
| **Redhead** | ***Aythya americana*** | | M |
| Bufflehead | *Bucephala albeola* | X | X |
| Common Goldeneye | *Bucephala clangula* | | X |
| Common Merganser | *Mergus merganser* | X | X |
| Ring-necked Duck | *Aythya collaris* | | X |
| **Gambel's Quail** | ***Callipepla gambelii*** | X | X |
| Pied-billed Grebe | *Podilymbus podiceps* | X | X |
| **Eared Grebe** | ***Podiceps nigricollis*** | X | |
| **Western Grebe** | ***Aechmophorus occidentalis*** | | X |
| **Clark's Grebe** | ***Aechmophorus clarkii*** | X | |
| **American White Pelican** | ***Pelecanus erythrorhynchos*** | X | |
| Double-crested Cormorant | *Phalacrocorax auritus* | X | X |
| American Bittern | *Botaurus lentiginosus* | X | |
| **Least Bittern** | ***Ixobrychus exilis*** | X | X |
| Great Blue Heron | *Ardea herodias* | X | X |
| Great Egret | *Ardea alba* | X | X |
| **Snowy Egret** | ***Egretta thula*** | X | X |
| Green Heron | *Butorides virescens* | X | X |
| Black-crowned Night-Heron | *Nycticorax nycticorax* | X | X |

| Bird Species | Scientific Name | Breeding Season | Non-Breeding Season |
|---|---|---|---|
| **White-faced Ibis** | ***Plegadis chihi*** | X | X |
| Turkey Vulture | *Cathartes aura* | X | |
| Osprey | *Pandion haliaetus* | X | X |
| Northern Harrier | *Circus cyaneus* | X | X |
| Sharp-shinned Hawk | *Accipiter striatus* | X | X |
| Cooper's Hawk | *Accipiter cooperii* | X | X |
| Red-shouldered Hawk | *Buteo lineatus* | | X |
| **Swainson's Hawk** | ***Buteo swainsoni*** | X | |
| Red-tailed Hawk | *Buteo jamaicensis* | X | X |
| American Kestrel | *Falco sparverius* | X | X |
| Merlin | *Falco columbarius* | | X |
| **Peregrine Falcon** | ***Falco peregrinus*** | X | X |
| **Prairie Falcon** | ***Falco mexicanus*** | | X |
| Virginia Rail | *Rallus limicola* | X | X |
| Sora | *Porzana carolina* | X | X |
| Common Moorhen | *Gallinula chloropus* | X | X |
| American Coot | *Fulica americana* | X | X |
| Semipalmated Plover | *Charadrius semipalmatus* | X | |
| Killdeer | *Charadrius vociferus* | X | X |
| **Black-necked Stilt** | ***Himantopus mexicanus*** | X | |
| **American Avocet** | ***Recurvirostra americana*** | X | |
| Spotted Sandpiper | *Actitis macularia* | X | X |
| Greater Yellowlegs | *Tringa melanoleuca* | X | X |
| Lesser Yellowlegs | *Tringa flavipes* | | X |
| Semipalmated Sandpiper | *Calidris pusilla* | X | |
| **Western Sandpiper** | ***Calidris mauri*** | X | |
| **Least Sandpiper** | ***Calidris minutilla*** | X | X |
| Pectoral Sandpiper | *Calidris melanotos* | | M |
| **Long-billed Dowitcher** | ***Limnodromus scolopaceus*** | X | |
| Wilson's Snipe | *Gallinago delicata* | X | |
| Ring-billed Gull | *Larus delawarensis* | X | X |
| California Gull | *Larus californicus* | | X |
| Caspian Tern | *Sterna caspia* | X | |
| Rock Pigeon | *Columba livia* | X | X |
| Eurasian Collared-Dove | *Streptopelia decaocto* | X | |
| White-winged Dove | *Zenaida asiatica* | X | X |

| **Bird Species** | **Scientific Name** | **Breeding Season** | **Non-Breeding Season** |
|---|---|---|---|
| Mourning Dove | *Zenaida macroura* | X | X |
| Greater Roadrunner | *Geococcyx californianus* | X | X |
| Barn Owl | *Tyto alba* | X | X |
| Great Horned Owl | *Bubo virginianus* | X | X |
| Long-eared Owl | *Asio otus* | X | |
| Lesser Nighthawk | *Chordeiles acutipennis* | X | |
| Vaux's Swift | *Chaetura vauxi* | X | X |
| **White-throated Swift** | ***Aeronautes saxatalis*** | X | X |
| Black-chinned Hummingbird | *Archilocus alexandri* | X | X |
| Anna's Hummingbird | *Calypte anna* | X | X |
| **Costa's Hummingbird** | ***Calypte costae*** | X | X |
| **Rufous Hummingbird** | ***Selasphorus rufus*** | | M |
| Belted Kingfisher | *Megaceryle alcyon* | X | X |
| Red-naped Sapsucker | *Sphyrapicus nuchalis* | X | X |
| Ladder-backed Woodpecker | *Picoides scalaris* | X | X |
| Hairy Woodpecker | *Picoides villosus* | | X |
| Northern Flicker | *Colaptes auratus* | X | X |
| **Olive-sided Flycatcher** | ***Contopus cooperi*** | X | |
| Western Wood-Pewee | *Contopus sordidulus* | X | |
| **Willow Flycatcher** | ***Empidonax traillii*** | X | |
| **Gray Flycatcher** | ***Empidonax wrightii*** | X | |
| Dusky Flycatcher | *Empidonax oberholseri* | X | |
| Western Flycatcher | *Empidonax difficilis/occidentalis* | X | |
| Black Phoebe | *Sayornis nigricans* | X | X |
| Say's Phoebe | *Sayornis saya* | X | X |
| Ash-throated Flycatcher | *Myiarchus cinerascens* | X | |
| Brown-crested Flycatcher | *Myiarchus tyrannulus* | X | |
| Western Kingbird | *Tyrannus verticalis* | X | |
| Loggerhead Shrike | *Lanius ludovicianus* | X | X |
| **Bell's Vireo** | ***Vireo bellii*** | X | |
| Solitary Vireo spp. | *Vireo* spp. | X | |
| Warbling Vireo | *Vireo gilvus* | X | |
| Common Raven | *Corvus corax* | X | X |
| Horned Lark | *Eremophila alpestris* | X | X |
| Tree Swallow | *Tachycineta bicolor* | X | X |
| Violet-green Swallow | *Tachycineta thalassina* | X | X |

| Bird Species | Scientific Name | Breeding Season | Non-Breeding Season |
|---|---|---|---|
| Northern Rough-winged Swallow | *Stelgidopteryx serripenis* | X | X |
| Bank Swallow | *Riparia riparia* | X | |
| Cliff Swallow | *Petrochelidon pyrrhonot* | X | X |
| Barn Swallow | *Hirundo rustica* | X | X |
| Verdin | *Auriparus flaviceps* | X | X |
| Bushtit | *Psaltriparus minimus* | X | X |
| Red-breasted Nuthatch | *Sitta canadensis* | | X |
| Cactus Wren | *Campylorhynchus brunneicapillus* | | X |
| Rock Wren | *Salpinctes obsoletus* | X | X |
| Canyon Wren | *Catherpes mexicanus* | X | X |
| Bewick's Wren | *Thryomanes bewickii* | X | X |
| House Wren | *Troglodytes aedon* | X | X |
| Winter Wren (Pacific) | *Troglodytes pacificus* | | X |
| Marsh Wren | *Cistothorus palustris* | X | X |
| Golden-crowned Kinglet | *Regulus satrapa* | | X |
| Ruby-crowned Kinglet | *Regulus calendula* | X | X |
| Blue-gray Gnatcatcher | *Polioptila caerulea* | X | X |
| Black-tailed Gnatcatcher | *Polioptila melanura* | X | X |
| Western Bluebird | *Sialia mexicana* | | X |
| Mountain Bluebird | *Sialia currucoides* | | X |
| Hermit Thrush | *Catharus guttatus* | X | X |
| American Robin | *Turdus migratorius* | | X |
| Northern Mockingbird | *Mimus polyglottos* | X | X |
| Crissal Thrasher | *Toxostoma crissale* | X | X |
| European Starling | *Sturnus vulgaris* | | X |
| American Pipit | *Anthus rubescens* | X | X |
| Cedar Waxwing | *Bombycilla cedrorum* | | X |
| **Phainopepla** | ***Phainopepla nitens*** | | X |
| Orange-crowned Warbler | *Oreothlypis celata* | X | X |
| Nashville Warbler | *Oreothlypis ruficapilla* | X | |
| **Virginia's Warbler** | ***Oreothlypis virginiae*** | | M |
| **Lucy's Warbler** | ***Oreothlypis luciae*** | X | |
| **Yellow Warbler** | ***Dendroica petechia*** | X | |
| Yellow-rumped Warbler | *Dendroica coronata* | X | X |
| Black-throated Gray Warbler | *Dendroica nigrescens* | | X |
| MacGillivray's Warbler | *Oporornis tolmiei* | X | |

| Bird Species | Scientific Name | Breeding Season | Non-Breeding Season |
|---|---|---|---|
| Common Yellowthroat | *Geothlypis trichas* | X | X |
| Wilson's Warbler | *Wilsonia pusilla* | X | X |
| Yellow-breasted Chat | *Icteria virens* | X | X |
| **Summer Tanager** | ***Piranga rubra*** | | M |
| Western Tanager | *Piranga ludoviciana* | X | |
| Green-tailed Towhee | *Pipilo chlorurus* | X | |
| Spotted Towhee | *Pipilo maculatus* | X | X |
| **Abert's Towhee** | ***Melozone aberti*** | X | X |
| Canyon Towhee | *Melozone fuscus* | X | |
| Rufous-crowned Sparrow | *Aimophila ruficeps* | X | |
| Chipping Sparrow | *Spizella passerina* | X | X |
| **Brewer's Sparrow** | ***Spizella breweri*** | X | X |
| Vesper Sparrow | *Pooecetes gramineus* | X | |
| Lark Sparrow | *Chondestes grammacus* | X | |
| Black-throated Sparrow | *Amphispiza bilineata* | X | |
| Savannah Sparrow | *Passerculus sandwichensis* | X | X |
| Song Sparrow | *Melospiza melodia* | X | X |
| Lincoln's Sparrow | *Melospiza lincolnii* | X | X |
| White-crowned Sparrow | *Zonotrichia leucophrys* | X | X |
| Dark-eyed Junco | *Junco hyemalis* | X | X |
| Black-headed Grosbeak | *Pheucticus melanocephalus* | X | |
| **Blue Grosbeak** | ***Passerina caerulea*** | X | |
| Lazuli Bunting | *Passerina amoena* | X | X |
| Indigo Bunting | *Passerina cyanea* | X | |
| Red-winged Blackbird | *Agelaius phoeniceus* | X | X |
| Western Meadowlark | *Sturnella neglecta* | X | X |
| Yellow-headed Blackbird | *Xanthocephalus xanthocephalus* | X | X |
| Brewer's Blackbird | *Euphagus cyanocephalus* | X | X |
| Great-tailed Grackle | *Quiscalus mexicanus* | X | X |
| Brown-headed Cowbird | *Molothrus ater* | X | X |
| Hooded Oriole | *Icterus cucullatus* | X | X |
| Bullock's Oriole | *Icterus bullockii* | X | |
| House Finch | *Carpodacus mexicanus* | X | X |
| Pine Siskin | *Carduelis pinus* | X | X |
| Lesser Goldfinch | *Carduelis psaltria* | X | X |
| American Goldfinch | *Carduelis tristis* | X | X |

| Bird Species | Scientific Name | Breeding Season | Non-Breeding Season |
|---|---|---|---|
| House Sparrow | *Passer domesticus* | | X |

**Table 2a. Estimated species-specific densities (# birds/40 ha), averages for survey events overall, among seasons from the full data set (2005-2010), and overall values by year.** Species listed in taxonomic order.

| SPECIES | Overall | Breeding | Non-breeding | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 |
|---|---|---|---|---|---|---|---|---|
| Canada Goose | 0.05 | 0.05 | 0.08 | 0.00 | 0.00 | 0.25 | 0.00 | 0.00 |
| Wood Duck | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 |
| Gadwall | 1.48 | 0.44 | 2.11 | 0.74 | 1.12 | 1.56 | 1.46 | 2.45 |
| American Wigeon | 0.15 | 0.12 | 0.14 | 0.00 | 0.07 | 0.21 | 0.13 | 0.36 |
| Mallard | 4.39 | 2.40 | 6.14 | 1.02 | 2.29 | 4.75 | 4.28 | 9.39 |
| Cinnamon Teal | 0.06 | 0.12 | 0.02 | 0.09 | 0.00 | 0.00 | 0.00 | 0.21 |
| Northern Shoveler | 0.03 | 0.02 | 0.04 | 0.07 | 0.03 | 0.00 | 0.00 | 0.05 |
| Northern Pintail | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 |
| Green-winged Teal | 0.14 | 0.01 | 0.16 | 0.00 | 0.16 | 0.33 | 0.11 | 0.11 |
| Redhead | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 |
| Bufflehead | 0.12 | 0.01 | 0.12 | 0.00 | 0.00 | 0.19 | 0.36 | 0.04 |
| Common Goldeneye | 0.04 | 0.00 | 0.05 | 0.00 | 0.00 | 0.05 | 0.09 | 0.04 |
| Common Merganser | 0.06 | 0.02 | 0.05 | 0.04 | 0.02 | 0.09 | 0.04 | 0.11 |
| Gambel's Quail | 1.80 | 2.54 | 1.04 | 1.63 | 1.05 | 1.09 | 1.71 | 3.46 |
| Pied-billed Grebe | 0.20 | 0.16 | 0.25 | 0.07 | 0.12 | 0.53 | 0.11 | 0.14 |
| Eared Grebe | 0.06 | 0.13 | 0.00 | 0.02 | 0.00 | 0.25 | 0.00 | 0.05 |
| Western Grebe | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 |
| Double-crested Cormorant | 0.23 | 0.15 | 0.34 | 0.04 | 0.09 | 0.60 | 0.24 | 0.16 |
| American Bittern | 0.01 | 0.01 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.02 |
| Least Bittern | 0.01 | 0.02 | 0.01 | 0.02 | 0.02 | 0.00 | 0.02 | 0.00 |
| Great Blue Heron | 0.36 | 0.29 | 0.37 | 0.20 | 0.28 | 0.30 | 0.24 | 0.75 |
| Great Egret | 0.10 | 0.02 | 0.13 | 0.09 | 0.03 | 0.09 | 0.07 | 0.20 |
| Snowy Egret | 0.15 | 0.14 | 0.16 | 0.18 | 0.05 | 0.32 | 0.04 | 0.14 |
| Green Heron | 0.32 | 0.54 | 0.10 | 0.29 | 0.56 | 0.28 | 0.24 | 0.23 |
| Black-crowned Night-Heron | 0.06 | 0.05 | 0.08 | 0.05 | 0.10 | 0.07 | 0.04 | 0.04 |
| White-faced Ibis | 0.08 | 0.15 | 0.00 | 0.07 | 0.24 | 0.00 | 0.02 | 0.04 |
| Turkey Vulture | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 |
| Osprey | 0.03 | 0.03 | 0.01 | 0.02 | 0.03 | 0.04 | 0.02 | 0.05 |
| Northern Harrier | 0.11 | 0.03 | 0.23 | 0.04 | 0.12 | 0.25 | 0.09 | 0.07 |
| Sharp-shinned Hawk | 0.10 | 0.01 | 0.23 | 0.18 | 0.03 | 0.04 | 0.09 | 0.18 |
| Cooper's Hawk | 0.08 | 0.02 | 0.13 | 0.05 | 0.10 | 0.11 | 0.04 | 0.11 |
| Red-shouldered Hawk | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| Red-tailed Hawk | 0.05 | 0.01 | 0.12 | 0.07 | 0.03 | 0.05 | 0.05 | 0.04 |
| American Kestrel | 0.05 | 0.09 | 0.00 | 0.09 | 0.03 | 0.04 | 0.02 | 0.05 |
| Merlin | 0.01 | 0.00 | 0.02 | 0.00 | 0.02 | 0.00 | 0.00 | 0.02 |
| Peregrine Falcon | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 |
| Prairie Falcon | 0.01 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 |
| Virginia Rail | 0.06 | 0.02 | 0.11 | 0.07 | 0.05 | 0.07 | 0.07 | 0.05 |
| Sora | 0.04 | 0.02 | 0.07 | 0.04 | 0.05 | 0.04 | 0.04 | 0.02 |
| Common Moorhen | 0.15 | 0.19 | 0.13 | 0.13 | 0.17 | 0.16 | 0.05 | 0.21 |

| SPECIES | Overall | Breeding | Non-breeding | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 |
|---|---|---|---|---|---|---|---|---|
| American Coot | 6.39 | 2.60 | 8.92 | 2.32 | 8.95 | 10.42 | 4.52 | 5.33 |
| Semipalmated Plover | 0.00 | 0.01 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Killdeer | 0.96 | 1.17 | 0.61 | 1.80 | 0.89 | 0.33 | 0.86 | 0.92 |
| Black-necked Stilt | 0.04 | 0.08 | 0.00 | 0.07 | 0.00 | 0.00 | 0.00 | 0.11 |
| American Avocet | 0.05 | 0.11 | 0.00 | 0.22 | 0.00 | 0.00 | 0.00 | 0.05 |
| Spotted Sandpiper | 0.39 | 0.52 | 0.16 | 0.32 | 0.58 | 0.11 | 0.40 | 0.51 |
| Greater Yellowlegs | 0.20 | 0.05 | 0.35 | 0.29 | 0.26 | 0.11 | 0.15 | 0.20 |
| Lesser Yellowlegs | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| Semipalmated Sandpiper | 0.01 | 0.03 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.00 |
| Western Sandpiper | 0.13 | 0.22 | 0.00 | 0.38 | 0.02 | 0.00 | 0.00 | 0.27 |
| Least Sandpiper | 0.25 | 0.27 | 0.35 | 0.00 | 0.00 | 0.00 | 0.00 | 1.23 |
| Pectoral Sandpiper | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| Long-billed Dowitcher | 0.01 | 0.02 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.00 |
| Wilson's Snipe | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| Ring-billed Gull | 0.38 | 0.00 | 1.07 | 0.00 | 0.70 | 1.10 | 0.00 | 0.04 |
| Rock Dove | 0.01 | 0.00 | 0.03 | 0.00 | 0.00 | 0.04 | 0.02 | 0.00 |
| Eurasian Collared-Dove | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| White-winged Dove | 0.33 | 0.70 | 0.01 | 0.32 | 0.19 | 0.37 | 0.35 | 0.41 |
| Mourning Dove | 2.53 | 4.93 | 0.20 | 5.37 | 1.80 | 1.74 | 1.42 | 2.26 |
| Greater Roadrunner | 0.59 | 0.85 | 0.23 | 0.70 | 0.54 | 0.56 | 0.60 | 0.51 |
| Barn Owl | 0.03 | 0.05 | 0.01 | 0.07 | 0.03 | 0.02 | 0.00 | 0.02 |
| Great Horned Owl | 0.02 | 0.02 | 0.01 | 0.00 | 0.02 | 0.02 | 0.00 | 0.07 |
| Long-eared Owl | 0.01 | 0.02 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Lesser Nighthawk | 0.01 | 0.02 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.02 |
| Black-chinned Hummingbird | 0.29 | 0.59 | 0.01 | 0.16 | 0.31 | 0.33 | 0.29 | 0.32 |
| Anna's Hummingbird | 0.07 | 0.09 | 0.04 | 0.13 | 0.03 | 0.02 | 0.05 | 0.12 |
| Costa's Hummingbird | 0.12 | 0.21 | 0.01 | 0.07 | 0.16 | 0.19 | 0.09 | 0.09 |
| Belted Kingfisher | 0.22 | 0.04 | 0.34 | 0.23 | 0.17 | 0.21 | 0.20 | 0.27 |
| Red-naped Sapsucker | 0.02 | 0.01 | 0.05 | 0.04 | 0.05 | 0.02 | 0.00 | 0.00 |
| Ladder-backed Woodpecker | 0.01 | 0.02 | 0.02 | 0.02 | 0.00 | 0.00 | 0.02 | 0.04 |
| Hairy Woodpecker | 0.00 | 0.00 | 0.01 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 |
| Northern Flicker | 0.65 | 0.02 | 1.39 | 0.38 | 0.51 | 0.77 | 0.86 | 0.69 |
| Olive-sided Flycatcher | 0.01 | 0.02 | 0.00 | 0.02 | 0.00 | 0.02 | 0.00 | 0.00 |
| Western Wood-Pewee | 0.08 | 0.13 | 0.00 | 0.07 | 0.09 | 0.07 | 0.13 | 0.05 |
| Willow Flycatcher | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 |
| Gray Flycatcher | 0.03 | 0.05 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.02 |
| Western Flycatcher | 0.04 | 0.05 | 0.00 | 0.02 | 0.05 | 0.14 | 0.02 | 0.02 |
| Dusky Flycatcher | 0.04 | 0.08 | 0.00 | 0.02 | 0.03 | 0.09 | 0.02 | 0.02 |
| Western Flycatcher | 0.04 | 0.08 | 0.00 | 0.02 | 0.03 | 0.09 | 0.02 | 0.02 |
| Black Phoebe | 4.11 | 2.48 | 5.31 | 3.88 | 4.46 | 3.65 | 4.10 | 4.32 |
| Say's Phoebe | 0.88 | 0.78 | 0.99 | 0.54 | 0.66 | 0.33 | 1.00 | 1.85 |
| Ash-throated Flycatcher | 0.04 | 0.07 | 0.00 | 0.05 | 0.02 | 0.11 | 0.02 | 0.00 |
| Brown-crested Flycatcher | 0.01 | 0.02 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Western Kingbird | 0.47 | 0.84 | 0.00 | 0.23 | 0.35 | 0.68 | 0.51 | 0.55 |
| Loggerhead Shrike | 0.33 | 0.34 | 0.25 | 0.45 | 0.23 | 0.12 | 0.22 | 0.62 |
| Bell's Vireo | 0.05 | 0.11 | 0.00 | 0.16 | 0.00 | 0.09 | 0.00 | 0.00 |
| Solitary Vireo | 0.03 | 0.06 | 0.00 | 0.00 | 0.02 | 0.02 | 0.11 | 0.00 |
| Warbling Vireo | 0.06 | 0.09 | 0.00 | 0.07 | 0.07 | 0.04 | 0.05 | 0.09 |
| Common Raven | 0.02 | 0.00 | 0.04 | 0.00 | 0.00 | 0.07 | 0.00 | 0.02 |
| Horned Lark | 0.11 | 0.17 | 0.10 | 0.05 | 0.00 | 0.18 | 0.33 | 0.02 |
| Tree Swallow | 0.01 | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.05 | 0.00 |
| Violet-green Swallow | 0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.04 | 0.05 | 0.02 |

| SPECIES | Overall | Breeding | Non-breeding | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 |
|---|---|---|---|---|---|---|---|---|
| Northern Rough-winged Swallow | 0.43 | 0.83 | 0.00 | 0.20 | 0.21 | 0.18 | 1.09 | 0.50 |
| Cliff Swallow | 0.20 | 0.39 | 0.00 | 0.00 | 0.00 | 0.11 | 0.78 | 0.12 |
| Barn Swallow | 0.28 | 0.59 | 0.00 | 0.00 | 0.00 | 1.32 | 0.07 | 0.00 |
| Verdin | 4.66 | 5.18 | 3.90 | 3.57 | 4.42 | 4.10 | 5.21 | 5.79 |
| Bushtit | 0.42 | 0.02 | 1.00 | 0.57 | 0.38 | 0.26 | 0.02 | 0.83 |
| Red-breasted Nuthatch | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.02 | 0.02 | 0.00 |
| Rock Wren | 0.14 | 0.13 | 0.19 | 0.09 | 0.12 | 0.05 | 0.13 | 0.32 |
| Canyon Wren | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 |
| Bewick's Wren | 7.05 | 7.24 | 5.94 | 7.38 | 7.96 | 5.37 | 7.05 | 7.21 |
| House Wren | 0.01 | 0.01 | 0.02 | 0.04 | 0.02 | 0.00 | 0.00 | 0.02 |
| Pacific Wren | 0.01 | 0.00 | 0.02 | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 |
| Marsh Wren | 6.78 | 4.16 | 8.83 | 4.40 | 5.42 | 6.54 | 8.03 | 9.27 |
| Golden-crowned Kinglet | 0.04 | 0.00 | 0.11 | 0.02 | 0.00 | 0.11 | 0.04 | 0.04 |
| Ruby-crowned Kinglet | 3.39 | 0.48 | 6.99 | 4.65 | 4.16 | 3.35 | 2.22 | 2.40 |
| Blue-gray Gnatcatcher | 0.34 | 0.42 | 0.12 | 0.38 | 0.45 | 0.23 | 0.55 | 0.09 |
| Black-tailed Gnatcatcher | 4.75 | 4.95 | 4.30 | 4.53 | 5.11 | 3.49 | 4.64 | 5.77 |
| Western Bluebird | 0.01 | 0.00 | 0.03 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mountain Bluebird | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 |
| Hermit Thrush | 0.08 | 0.02 | 0.13 | 0.13 | 0.21 | 0.02 | 0.02 | 0.02 |
| American Robin | 0.06 | 0.00 | 0.15 | 0.02 | 0.02 | 0.11 | 0.13 | 0.04 |
| Northern Mockingbird | 0.15 | 0.18 | 0.15 | 0.04 | 0.23 | 0.18 | 0.07 | 0.25 |
| Crissal Thrasher | 1.40 | 1.26 | 1.48 | 1.80 | 1.29 | 0.81 | 1.22 | 1.83 |
| American Pipit | 4.25 | 0.98 | 7.40 | 1.42 | 2.85 | 2.21 | 6.63 | 8.06 |
| Cedar Waxwing | 0.01 | 0.00 | 0.01 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 |
| Phainopepla | 0.16 | 0.00 | 0.39 | 0.16 | 0.19 | 0.07 | 0.22 | 0.14 |
| Orange-crowned Warbler | 1.73 | 0.30 | 2.91 | 1.71 | 1.05 | 1.86 | 2.06 | 1.94 |
| Nashville Warbler | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.05 | 0.04 | 0.02 |
| Virginia's Warbler | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 |
| Lucy's Warbler | 3.20 | 6.89 | 0.00 | 5.08 | 3.29 | 2.65 | 3.08 | 1.79 |
| Yellow Warbler | 1.70 | 3.45 | 0.00 | 1.08 | 1.01 | 1.30 | 2.79 | 2.29 |
| Yellow-rumped Warbler | 9.43 | 0.92 | 21.64 | 6.48 | 3.15 | 11.47 | 10.98 | 14.74 |
| Black-throated Gray Warbler | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| MacGillivray's Warbler | 0.01 | 0.02 | 0.00 | 0.02 | 0.02 | 0.02 | 0.00 | 0.00 |
| Common Yellowthroat | 4.64 | 9.19 | 0.03 | 3.91 | 4.51 | 4.31 | 5.87 | 4.46 |
| Wilson's Warbler | 0.67 | 1.24 | 0.07 | 1.11 | 0.79 | 0.65 | 0.40 | 0.37 |
| Yellow-breasted Chat | 2.68 | 5.66 | 0.01 | 3.16 | 2.85 | 2.42 | 3.72 | 1.15 |
| Western Tanager | 0.04 | 0.06 | 0.00 | 0.05 | 0.02 | 0.04 | 0.02 | 0.05 |
| Green-tailed Towhee | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 |
| Spotted Towhee | 0.15 | 0.02 | 0.31 | 0.07 | 0.09 | 0.21 | 0.26 | 0.12 |
| Abert's Towhee | 12.87 | 13.02 | 11.53 | 15.48 | 14.15 | 10.80 | 11.18 | 12.22 |
| Canyon Towhee | 0.00 | 0.01 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 |
| Chipping Sparrow | 0.22 | 0.11 | 0.14 | 0.09 | 0.10 | 0.12 | 0.09 | 0.69 |
| Brewer's Sparrow | 0.90 | 0.46 | 0.26 | 0.29 | 0.45 | 0.74 | 0.91 | 2.10 |
| Vesper Sparrow | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 |
| Lark Sparrow | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.02 |
| Black-throated Sparrow | 0.00 | 0.01 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 |
| Savannah Sparrow | 0.12 | 0.09 | 0.05 | 0.11 | 0.00 | 0.11 | 0.24 | 0.16 |
| Song Sparrow | 10.83 | 12.79 | 8.64 | 12.19 | 12.75 | 10.70 | 9.67 | 8.35 |
| Lincoln's Sparrow | 0.45 | 0.12 | 0.90 | 0.84 | 0.21 | 0.54 | 0.35 | 0.28 |
| White-crowned Sparrow | 5.46 | 0.67 | 12.27 | 4.35 | 4.28 | 5.44 | 5.83 | 7.19 |
| Dark-eyed Junco | 0.74 | 0.02 | 1.83 | 0.14 | 0.23 | 1.75 | 0.80 | 0.75 |
| Black-headed Grosbeak | 0.05 | 0.08 | 0.00 | 0.13 | 0.07 | 0.04 | 0.00 | 0.04 |

| SPECIES | Overall | Breeding | Non-breeding | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 |
|---|---|---|---|---|---|---|---|---|
| Blue Grosbeak | 1.71 | 3.50 | 0.00 | 2.39 | 1.64 | 1.61 | 1.77 | 1.07 |
| Lazuli Bunting | 0.10 | 0.09 | 0.00 | 0.11 | 0.12 | 0.05 | 0.18 | 0.02 |
| Indigo Bunting | 0.03 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 |
| Red-winged Blackbird | 8.51 | 12.04 | 6.68 | 5.76 | 7.42 | 9.91 | 9.93 | 9.22 |
| Western Meadowlark | 0.03 | 0.01 | 0.07 | 0.00 | 0.03 | 0.00 | 0.02 | 0.11 |
| Yellow-headed Blackbird | 0.40 | 0.70 | 0.08 | 0.97 | 0.28 | 0.04 | 0.36 | 0.36 |
| Brewer's Blackbird | 0.11 | 0.01 | 0.32 | 0.00 | 0.00 | 0.00 | 0.51 | 0.07 |
| Great-tailed Grackle | 2.96 | 4.21 | 1.88 | 0.74 | 1.56 | 3.60 | 3.99 | 4.81 |
| Brown-headed Cowbird | 3.79 | 8.23 | 0.01 | 3.43 | 3.78 | 3.77 | 4.61 | 3.21 |
| Hooded Oriole | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 |
| Bullock's Oriole | 0.06 | 0.13 | 0.00 | 0.02 | 0.14 | 0.09 | 0.00 | 0.07 |
| House Finch | 1.76 | 1.57 | 1.50 | 0.95 | 1.28 | 1.51 | 1.04 | 3.96 |
| Pine Siskin | 0.08 | 0.00 | 0.22 | 0.11 | 0.00 | 0.28 | 0.00 | 0.00 |
| Lesser Goldfinch | 0.62 | 0.26 | 0.39 | 0.38 | 0.63 | 0.23 | 0.66 | 1.19 |
| American Goldfinch | 0.01 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 |
| House Sparrow | 0.00 | 0.00 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |

**Table 2b. Estimated species-specific densities (# birds/40 ha), averages by seasons for each of five survey years (2005-2010).** Species listed in taxonomic order.

| SPECIES | Year 1 Breed | Year 1 Non-breed | Year 2 Breed | Year 2 Non-breed | Year 3 Breed | Year 3 Non-breed | Year 4 Breed | Year 4 Non-breed | Year 5 Breed | Year 5 Non-breed |
|---|---|---|---|---|---|---|---|---|---|---|
| Canada Goose | 0.000 | 0.000 | 0.000 | 0.000 | 0.228 | 0.404 | 0.000 | 0.000 | 0.000 | 0.000 |
| Wood Duck | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.051 | 0.000 | 0.000 |
| Gadwall | 0.078 | 1.768 | 0.038 | 2.577 | 0.304 | 1.768 | 0.165 | 1.725 | 1.601 | 2.759 |
| American Wigeon | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.303 | 0.124 | 0.101 | 0.508 | 0.318 |
| Mallard | 0.469 | 1.314 | 0.455 | 5.558 | 2.166 | 6.871 | 2.687 | 4.920 | 6.288 | 12.308 |
| Cinnamon Teal | 0.195 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.391 | 0.106 |
| Northern Shoveler | 0.000 | 0.202 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.078 | 0.000 |
| Northern Pintail | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Green-winged Teal | 0.000 | 0.000 | 0.038 | 0.303 | 0.000 | 0.354 | 0.000 | 0.101 | 0.000 | 0.053 |
| Redhead | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Bufflehead | 0.000 | 0.000 | 0.000 | 0.000 | 0.038 | 0.505 | 0.000 | 0.000 | 0.000 | 0.106 |
| Common Goldeneye | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.152 | 0.000 | 0.000 | 0.000 | 0.106 |
| Common Merganser | 0.078 | 0.000 | 0.000 | 0.051 | 0.000 | 0.152 | 0.000 | 0.051 | 0.039 | 0.000 |
| Gambel's Quail | 3.125 | 0.505 | 1.629 | 0.808 | 1.634 | 0.657 | 1.860 | 1.674 | 4.452 | 1.592 |
| Pied-billed Grebe | 0.000 | 0.202 | 0.038 | 0.253 | 0.494 | 0.758 | 0.124 | 0.000 | 0.156 | 0.000 |
| Eared Grebe | 0.039 | 0.000 | 0.000 | 0.000 | 0.532 | 0.000 | 0.000 | 0.000 | 0.078 | 0.000 |
| Western Grebe | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.051 | 0.000 | 0.000 | 0.000 | 0.000 |
| Double-crested Cormorant | 0.039 | 0.000 | 0.076 | 0.152 | 0.266 | 1.263 | 0.165 | 0.152 | 0.195 | 0.106 |
| American Bittern | 0.000 | 0.000 | 0.038 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Least Bittern | 0.039 | 0.000 | 0.000 | 0.051 | 0.000 | 0.000 | 0.041 | 0.000 | 0.000 | 0.000 |
| Great Blue Heron | 0.195 | 0.202 | 0.114 | 0.404 | 0.304 | 0.303 | 0.165 | 0.203 | 0.664 | 0.743 |
| Great Egret | 0.039 | 0.152 | 0.000 | 0.051 | 0.000 | 0.253 | 0.041 | 0.051 | 0.000 | 0.159 |
| Snowy Egret | 0.273 | 0.000 | 0.000 | 0.152 | 0.266 | 0.556 | 0.041 | 0.000 | 0.117 | 0.106 |
| Green Heron | 0.469 | 0.101 | 0.872 | 0.253 | 0.456 | 0.101 | 0.496 | 0.000 | 0.391 | 0.053 |
| Black-crowned Night-Heron | 0.117 | 0.000 | 0.076 | 0.202 | 0.038 | 0.152 | 0.041 | 0.051 | 0.000 | 0.000 |
| White-faced Ibis | 0.156 | 0.000 | 0.531 | 0.000 | 0.000 | 0.000 | 0.041 | 0.000 | 0.000 | 0.000 |
| Turkey Vulture | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

| SPECIES | Year 1 Breed | Year 1 Non-breed | Year 2 Breed | Year 2 Non-breed | Year 3 Breed | Year 3 Non-breed | Year 4 Breed | Year 4 Non-breed | Year 5 Breed | Year 5 Non-breed |
|---|---|---|---|---|---|---|---|---|---|---|
| Osprey | 0.000 | 0.000 | 0.076 | 0.000 | 0.038 | 0.000 | 0.000 | 0.051 | 0.039 | 0.000 |
| Northern Harrier | 0.000 | 0.101 | 0.038 | 0.253 | 0.076 | 0.556 | 0.000 | 0.101 | 0.039 | 0.159 |
| Sharp-shinned Hawk | 0.000 | 0.455 | 0.000 | 0.051 | 0.000 | 0.101 | 0.000 | 0.254 | 0.039 | 0.318 |
| Cooper's Hawk | 0.039 | 0.000 | 0.000 | 0.152 | 0.038 | 0.202 | 0.000 | 0.051 | 0.039 | 0.265 |
| Red-shouldered Hawk | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.053 |
| Red-tailed Hawk | 0.000 | 0.202 | 0.038 | 0.000 | 0.000 | 0.152 | 0.000 | 0.152 | 0.000 | 0.106 |
| American Kestrel | 0.156 | 0.000 | 0.076 | 0.000 | 0.076 | 0.000 | 0.000 | 0.000 | 0.117 | 0.000 |
| Merlin | 0.000 | 0.000 | 0.000 | 0.051 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.053 |
| Peregrine Falcon | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.041 | 0.000 | 0.000 | 0.053 |
| Prairie Falcon | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.106 |
| Virginia Rail | 0.039 | 0.101 | 0.038 | 0.101 | 0.000 | 0.152 | 0.041 | 0.101 | 0.000 | 0.106 |
| Sora | 0.000 | 0.101 | 0.038 | 0.101 | 0.038 | 0.051 | 0.041 | 0.051 | 0.000 | 0.053 |
| Common Moorhen | 0.156 | 0.152 | 0.227 | 0.202 | 0.228 | 0.000 | 0.041 | 0.101 | 0.273 | 0.212 |
| American Coot | 1.211 | 4.547 | 1.402 | 17.229 | 5.815 | 9.398 | 1.530 | 5.529 | 2.929 | 7.852 |
| Semipalmated Plover | 0.039 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Killdeer | 2.382 | 1.112 | 1.023 | 0.404 | 0.342 | 0.202 | 0.537 | 1.116 | 1.562 | 0.212 |
| Black-necked Stilt | 0.156 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.234 | 0.000 |
| American Avocet | 0.469 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.078 | 0.000 |
| Spotted Sandpiper | 0.469 | 0.202 | 0.909 | 0.253 | 0.152 | 0.000 | 0.620 | 0.152 | 0.469 | 0.212 |
| Greater Yellowlegs | 0.000 | 0.707 | 0.076 | 0.253 | 0.000 | 0.303 | 0.000 | 0.203 | 0.156 | 0.265 |
| Lesser Yellowlegs | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.039 | 0.000 |
| Semipalmated Sandpiper | 0.000 | 0.000 | 0.152 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Western Sandpiper | 0.820 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.273 | 0.000 |
| Least Sandpiper | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.367 | 1.804 |
| Pectoral Sandpiper | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Long-billed Dowitcher | 0.000 | 0.000 | 0.076 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Wilson's Snipe | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.039 | 0.000 |
| Ring-billed Gull | 0.000 | 0.000 | 0.000 | 2.021 | 0.000 | 3.183 | 0.000 | 0.000 | 0.000 | 0.106 |
| Rock Dove | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.101 | 0.000 | 0.051 | 0.000 | 0.000 |
| Eurasian Collared-Dove | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.039 | 0.000 |
| White-winged Dove | 0.664 | 0.051 | 0.417 | 0.000 | 0.798 | 0.000 | 0.785 | 0.000 | 0.859 | 0.000 |
| Mourning Dove | 11.131 | 0.303 | 3.524 | 0.000 | 3.117 | 0.354 | 3.018 | 0.101 | 3.828 | 0.265 |
| Greater Roadrunner | 0.898 | 0.455 | 0.872 | 0.101 | 1.026 | 0.101 | 0.744 | 0.355 | 0.703 | 0.159 |
| Barn Owl | 0.117 | 0.000 | 0.076 | 0.000 | 0.000 | 0.051 | 0.000 | 0.000 | 0.039 | 0.000 |
| Great Horned Owl | 0.000 | 0.000 | 0.000 | 0.000 | 0.038 | 0.000 | 0.000 | 0.000 | 0.039 | 0.053 |
| Long-eared Owl | 0.078 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Lesser Nighthawk | 0.000 | 0.000 | 0.038 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.039 | 0.000 |
| Black-chinned Hummingbird | 0.352 | 0.000 | 0.682 | 0.000 | 0.722 | 0.000 | 0.620 | 0.051 | 0.586 | 0.000 |
| Anna's Hummingbird | 0.195 | 0.051 | 0.076 | 0.000 | 0.000 | 0.000 | 0.083 | 0.051 | 0.078 | 0.106 |
| Costa's Hummingbird | 0.156 | 0.000 | 0.227 | 0.000 | 0.380 | 0.000 | 0.124 | 0.051 | 0.156 | 0.000 |
| Belted Kingfisher | 0.039 | 0.556 | 0.076 | 0.253 | 0.038 | 0.455 | 0.000 | 0.254 | 0.039 | 0.159 |
| Red-naped Sapsucker | 0.039 | 0.051 | 0.000 | 0.152 | 0.000 | 0.051 | 0.000 | 0.000 | 0.000 | 0.000 |
| Ladder-backed Woodpecker | 0.039 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.041 | 0.000 | 0.000 | 0.106 |
| Hairy Woodpecker | 0.000 | 0.000 | 0.000 | 0.051 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Northern Flicker | 0.000 | 0.859 | 0.000 | 1.112 | 0.038 | 1.869 | 0.000 | 1.826 | 0.078 | 1.273 |
| Olive-sided Flycatcher | 0.039 | 0.000 | 0.000 | 0.000 | 0.038 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Western Wood-Pewee | 0.156 | 0.000 | 0.152 | 0.000 | 0.114 | 0.000 | 0.165 | 0.000 | 0.078 | 0.000 |
| Willow Flycatcher | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.083 | 0.000 | 0.000 | 0.000 |
| Gray Flycatcher | 0.039 | 0.000 | 0.000 | 0.000 | 0.190 | 0.000 | 0.000 | 0.000 | 0.039 | 0.000 |

| SPECIES | Year 1 Breed | Year 1 Non-breed | Year 2 Breed | Year 2 Non-breed | Year 3 Breed | Year 3 Non-breed | Year 4 Breed | Year 4 Non-breed | Year 5 Breed | Year 5 Non-breed |
|---|---|---|---|---|---|---|---|---|---|---|
| Western Flycatcher | 0.039 | 0.000 | 0.038 | 0.000 | 0.304 | 0.000 | 0.041 | 0.000 | 0.000 | 0.000 |
| Dusky Flycatcher | 0.039 | 0.000 | 0.038 | 0.000 | 0.190 | 0.000 | 0.041 | 0.000 | 0.000 | 0.000 |
| Western Flycatcher | 0.039 | 0.000 | 0.038 | 0.000 | 0.190 | 0.000 | 0.041 | 0.000 | 0.000 | 0.000 |
| Black Phoebe | 2.382 | 4.951 | 2.690 | 5.760 | 2.318 | 4.699 | 2.315 | 6.138 | 2.695 | 4.987 |
| Say's Phoebe | 0.430 | 0.505 | 0.758 | 0.505 | 0.456 | 0.202 | 1.116 | 1.167 | 1.172 | 2.653 |
| Ash-throated Flycatcher | 0.117 | 0.000 | 0.000 | 0.000 | 0.190 | 0.000 | 0.041 | 0.000 | 0.000 | 0.000 |
| Brown-crested Flycatcher | 0.078 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Western Kingbird | 0.469 | 0.000 | 0.720 | 0.000 | 1.330 | 0.000 | 0.909 | 0.000 | 0.781 | 0.000 |
| Loggerhead Shrike | 0.586 | 0.253 | 0.303 | 0.152 | 0.076 | 0.101 | 0.331 | 0.051 | 0.430 | 0.690 |
| Bell's Vireo | 0.352 | 0.000 | 0.000 | 0.000 | 0.190 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Solitary Vireo | 0.000 | 0.000 | 0.038 | 0.000 | 0.038 | 0.000 | 0.248 | 0.000 | 0.000 | 0.000 |
| Warbling Vireo | 0.156 | 0.000 | 0.114 | 0.000 | 0.038 | 0.000 | 0.041 | 0.000 | 0.117 | 0.000 |
| Common Raven | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.202 | 0.000 | 0.000 | 0.000 | 0.000 |
| Horned Lark | 0.117 | 0.000 | 0.000 | 0.000 | 0.304 | 0.101 | 0.413 | 0.406 | 0.039 | 0.000 |
| Tree Swallow | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.051 | 0.124 | 0.000 | 0.000 | 0.000 |
| Violet-green Swallow | 0.000 | 0.000 | 0.000 | 0.000 | 0.076 | 0.000 | 0.124 | 0.000 | 0.000 | 0.000 |
| Northern Rough-winged Swallow | 0.234 | 0.000 | 0.417 | 0.000 | 0.304 | 0.000 | 2.191 | 0.000 | 1.094 | 0.000 |
| Cliff Swallow | 0.000 | 0.000 | 0.000 | 0.000 | 0.228 | 0.000 | 1.778 | 0.000 | 0.039 | 0.000 |
| Barn Swallow | 0.000 | 0.000 | 0.000 | 0.000 | 2.851 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Verdin | 3.945 | 2.981 | 5.911 | 2.324 | 4.599 | 3.739 | 5.250 | 4.870 | 6.210 | 5.677 |
| Bushtit | 0.078 | 1.415 | 0.000 | 1.011 | 0.000 | 0.152 | 0.000 | 0.000 | 0.000 | 2.493 |
| Red-breasted Nuthatch | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.051 | 0.000 | 0.000 |
| Rock Wren | 0.039 | 0.202 | 0.114 | 0.152 | 0.038 | 0.051 | 0.207 | 0.051 | 0.273 | 0.531 |
| Canyon Wren | 0.039 | 0.000 | 0.000 | 0.051 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Bewick's Wren | 7.030 | 6.821 | 8.867 | 6.114 | 5.245 | 4.901 | 7.565 | 6.797 | 7.499 | 5.040 |
| House Wren | 0.000 | 0.051 | 0.038 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.053 |
| Pacific Wren | 0.000 | 0.101 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Marsh Wren | 1.992 | 7.074 | 2.994 | 7.377 | 3.687 | 8.892 | 5.126 | 10.095 | 7.108 | 10.823 |
| Golden-crowned Kinglet | 0.000 | 0.051 | 0.000 | 0.000 | 0.000 | 0.303 | 0.000 | 0.101 | 0.000 | 0.106 |
| Ruby-crowned Kinglet | 0.703 | 10.055 | 0.796 | 7.730 | 0.532 | 7.579 | 0.289 | 4.058 | 0.078 | 5.464 |
| Blue-gray Gnatcatcher | 0.586 | 0.303 | 0.341 | 0.000 | 0.380 | 0.000 | 0.827 | 0.051 | 0.000 | 0.265 |
| Black-tailed Gnatcatcher | 5.077 | 3.436 | 6.328 | 4.345 | 3.459 | 3.335 | 4.630 | 4.718 | 5.234 | 5.730 |
| Western Bluebird | 0.000 | 0.152 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Mountain Bluebird | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.051 | 0.000 | 0.000 |
| Hermit Thrush | 0.039 | 0.303 | 0.038 | 0.253 | 0.000 | 0.051 | 0.000 | 0.051 | 0.000 | 0.000 |
| American Robin | 0.000 | 0.051 | 0.000 | 0.051 | 0.000 | 0.303 | 0.000 | 0.254 | 0.000 | 0.106 |
| Northern Mockingbird | 0.078 | 0.000 | 0.265 | 0.253 | 0.228 | 0.051 | 0.041 | 0.101 | 0.273 | 0.371 |
| Crissal Thrasher | 1.562 | 2.274 | 1.478 | 0.859 | 0.570 | 0.859 | 1.033 | 1.522 | 1.640 | 1.910 |
| American Pipit | 0.000 | 3.941 | 0.114 | 7.023 | 0.418 | 3.688 | 0.000 | 14.153 | 4.335 | 8.276 |
| Cedar Waxwing | 0.000 | 0.051 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Phainopepla | 0.000 | 0.455 | 0.000 | 0.455 | 0.000 | 0.101 | 0.000 | 0.507 | 0.000 | 0.424 |
| Orange-crowned Warbler | 0.352 | 2.880 | 0.379 | 1.819 | 0.418 | 3.133 | 0.083 | 3.957 | 0.234 | 2.759 |
| Nashville Warbler | 0.000 | 0.000 | 0.000 | 0.000 | 0.114 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Virginia's Warbler | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Lucy's Warbler | 11.053 | 0.000 | 7.086 | 0.000 | 5.625 | 0.000 | 6.780 | 0.000 | 3.906 | 0.000 |
| Yellow Warbler | 2.343 | 0.000 | 2.122 | 0.000 | 2.699 | 0.000 | 5.953 | 0.000 | 4.335 | 0.000 |
| Yellow-rumped Warbler | 0.273 | 17.179 | 1.137 | 6.013 | 1.824 | 24.606 | 0.661 | 26.936 | 0.664 | 34.059 |
| Black-throated Gray Warbler | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.053 |
| MacGillivray's Warbler | 0.039 | 0.000 | 0.000 | 0.000 | 0.038 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

| SPECIES | Year 1 Breed | Year 1 Non-breed | Year 2 Breed | Year 2 Non-breed | Year 3 Breed | Year 3 Non-breed | Year 4 Breed | Year 4 Non-breed | Year 5 Breed | Year 5 Non-breed |
|---|---|---|---|---|---|---|---|---|---|---|
| Common Yellowthroat | 7.655 | 0.051 | 8.640 | 0.000 | 8.780 | 0.000 | 11.782 | 0.101 | 9.256 | 0.000 |
| Wilson's Warbler | 1.992 | 0.354 | 1.629 | 0.000 | 1.330 | 0.000 | 0.537 | 0.000 | 0.664 | 0.000 |
| Yellow-breasted Chat | 6.757 | 0.000 | 6.101 | 0.000 | 5.017 | 0.051 | 8.020 | 0.000 | 2.539 | 0.000 |
| Western Tanager | 0.117 | 0.000 | 0.038 | 0.000 | 0.076 | 0.000 | 0.000 | 0.000 | 0.078 | 0.000 |
| Green-tailed Towhee | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.041 | 0.000 | 0.000 | 0.000 |
| Spotted Towhee | 0.039 | 0.152 | 0.000 | 0.202 | 0.038 | 0.505 | 0.000 | 0.558 | 0.000 | 0.106 |
| Abert's Towhee | 17.302 | 12.934 | 15.612 | 12.581 | 10.414 | 10.913 | 11.534 | 9.435 | 10.155 | 11.777 |
| Canyon Towhee | 0.000 | 0.000 | 0.038 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Chipping Sparrow | 0.078 | 0.000 | 0.000 | 0.000 | 0.228 | 0.000 | 0.000 | 0.152 | 0.234 | 0.584 |
| Brewer's Sparrow | 0.000 | 0.303 | 0.606 | 0.000 | 1.254 | 0.000 | 0.248 | 0.507 | 0.156 | 0.477 |
| Vesper Sparrow | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.078 | 0.000 |
| Lark Sparrow | 0.000 | 0.000 | 0.000 | 0.000 | 0.038 | 0.000 | 0.000 | 0.000 | 0.039 | 0.000 |
| Black-throated Sparrow | 0.000 | 0.000 | 0.038 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Savannah Sparrow | 0.234 | 0.000 | 0.000 | 0.000 | 0.228 | 0.000 | 0.000 | 0.152 | 0.000 | 0.106 |
| Song Sparrow | 14.021 | 10.307 | 15.271 | 9.751 | 12.314 | 9.600 | 12.443 | 6.138 | 9.803 | 7.321 |
| Lincoln's Sparrow | 0.117 | 1.869 | 0.076 | 0.152 | 0.342 | 0.960 | 0.041 | 0.710 | 0.000 | 0.796 |
| White-crowned Sparrow | 0.586 | 10.509 | 1.440 | 6.417 | 0.228 | 13.490 | 0.207 | 14.457 | 0.859 | 16.711 |
| Dark-eyed Junco | 0.117 | 0.101 | 0.000 | 0.556 | 0.000 | 4.951 | 0.000 | 1.420 | 0.000 | 2.122 |
| Black-headed Grosbeak | 0.234 | 0.000 | 0.114 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.039 | 0.000 |
| Blue Grosbeak | 4.609 | 0.000 | 3.486 | 0.000 | 3.421 | 0.000 | 3.886 | 0.000 | 2.109 | 0.000 |
| Lazuli Bunting | 0.117 | 0.000 | 0.189 | 0.000 | 0.114 | 0.000 | 0.041 | 0.000 | 0.000 | 0.000 |
| Indigo Bunting | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.273 | 0.000 |
| Red-winged Blackbird | 5.429 | 8.842 | 9.019 | 8.539 | 12.466 | 10.661 | 16.536 | 2.942 | 17.068 | 2.175 |
| Western Meadowlark | 0.000 | 0.000 | 0.038 | 0.000 | 0.000 | 0.000 | 0.000 | 0.051 | 0.000 | 0.318 |
| Yellow-headed Blackbird | 2.070 | 0.051 | 0.189 | 0.000 | 0.076 | 0.000 | 0.496 | 0.355 | 0.703 | 0.000 |
| Brewer's Blackbird | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.420 | 0.039 | 0.159 |
| Great-tailed Grackle | 0.625 | 1.162 | 2.046 | 1.314 | 4.713 | 2.779 | 5.705 | 3.145 | 8.085 | 0.955 |
| Brown-headed Cowbird | 7.460 | 0.000 | 8.147 | 0.000 | 8.172 | 0.000 | 10.417 | 0.051 | 7.069 | 0.000 |
| Hooded Oriole | 0.000 | 0.000 | 0.000 | 0.000 | 0.114 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Bullock's Oriole | 0.039 | 0.000 | 0.303 | 0.000 | 0.190 | 0.000 | 0.000 | 0.000 | 0.117 | 0.000 |
| House Finch | 1.289 | 0.354 | 1.061 | 1.819 | 0.950 | 2.930 | 0.909 | 1.319 | 3.632 | 1.061 |
| Pine Siskin | 0.000 | 0.303 | 0.000 | 0.000 | 0.000 | 0.808 | 0.000 | 0.000 | 0.000 | 0.000 |
| Lesser Goldfinch | 0.078 | 0.202 | 0.455 | 0.051 | 0.266 | 0.101 | 0.124 | 0.913 | 0.352 | 0.690 |
| American Goldfinch | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.039 | 0.106 |
| House Sparrow | 0.000 | 0.051 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**Table 3a. Relative abundance (percent of total abundance) by species among seasons from the full data set (2005-2010), and overall values by year.** Species listed in taxonomic order.

| SPECIES | Overall | Breeding | Non-breeding | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 |
|---|---|---|---|---|---|---|---|---|
| Canada Goose | 0.04 | 0.03 | 0.06 | 0 | 0 | 0.18 | 0 | 0 |
| Wood Duck | 0 | 0 | 0.01 | 0 | 0 | 0 | 0.01 | 0 |
| Gadwall | 1.04 | 0.32 | 1.45 | 0.59 | 0.88 | 1.12 | 1 | 1.48 |
| American Wigeon | 0.11 | 0.09 | 0.1 | 0 | 0.05 | 0.15 | 0.09 | 0.21 |
| Mallard | 3.1 | 1.73 | 4.2 | 0.82 | 1.8 | 3.42 | 2.94 | 5.67 |
| Cinnamon Teal | 0.04 | 0.08 | 0.01 | 0.07 | 0 | 0 | 0 | 0.13 |
| Northern Shoveler | 0.02 | 0.01 | 0.03 | 0.06 | 0.03 | 0 | 0 | 0.03 |
| Northern Pintail | 0 | 0 | 0 | 0 | 0.01 | 0 | 0 | 0 |
| Green-winged Teal | 0.1 | 0.01 | 0.11 | 0 | 0.12 | 0.24 | 0.07 | 0.06 |

| SPECIES | Overall | Breeding | Non-breeding | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 |
|---|---|---|---|---|---|---|---|---|
| Redhead | 0.01 | 0 | 0 | 0 | 0 | 0 | 0.02 | 0 |
| Bufflehead | 0.08 | 0.01 | 0.08 | 0 | 0 | 0.14 | 0.25 | 0.02 |
| Common Goldeneye | 0.03 | 0 | 0.03 | 0 | 0 | 0.04 | 0.06 | 0.02 |
| Common Merganser | 0.04 | 0.02 | 0.03 | 0.03 | 0.01 | 0.06 | 0.02 | 0.06 |
| Gambel's Quail | 1.27 | 1.83 | 0.71 | 1.31 | 0.82 | 0.78 | 1.17 | 2.09 |
| Pied-billed Grebe | 0.14 | 0.12 | 0.17 | 0.06 | 0.1 | 0.38 | 0.07 | 0.09 |
| Eared Grebe | 0.05 | 0.1 | 0 | 0.01 | 0 | 0.18 | 0 | 0.03 |
| Western Grebe | 0 | 0 | 0.01 | 0 | 0 | 0.01 | 0 | 0 |
| Double-crested Cormorant | 0.16 | 0.11 | 0.23 | 0.03 | 0.07 | 0.43 | 0.16 | 0.1 |
| American Bittern | 0.01 | 0.01 | 0 | 0 | 0.01 | 0 | 0 | 0.01 |
| Least Bittern | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0 | 0.01 | 0 |
| Great Blue Heron | 0.25 | 0.21 | 0.25 | 0.16 | 0.22 | 0.21 | 0.16 | 0.45 |
| Great Egret | 0.07 | 0.01 | 0.09 | 0.07 | 0.03 | 0.06 | 0.05 | 0.12 |
| Snowy Egret | 0.1 | 0.1 | 0.11 | 0.14 | 0.04 | 0.23 | 0.02 | 0.09 |
| Green Heron | 0.23 | 0.39 | 0.07 | 0.23 | 0.44 | 0.2 | 0.16 | 0.14 |
| Black-crowned Night-Heron | 0.04 | 0.04 | 0.06 | 0.04 | 0.08 | 0.05 | 0.02 | 0.02 |
| White-faced Ibis | 0.05 | 0.11 | 0 | 0.06 | 0.19 | 0 | 0.01 | 0.02 |
| Turkey Vulture | 0 | 0 | 0 | 0 | 0 | 0 | 0.01 | 0 |
| Osprey | 0.02 | 0.02 | 0.01 | 0.01 | 0.03 | 0.03 | 0.01 | 0.03 |
| Northern Harrier | 0.08 | 0.02 | 0.16 | 0.03 | 0.1 | 0.18 | 0.06 | 0.04 |
| Sharp-shinned Hawk | 0.07 | 0.01 | 0.16 | 0.14 | 0.03 | 0.03 | 0.06 | 0.11 |
| Cooper's Hawk | 0.06 | 0.02 | 0.09 | 0.04 | 0.08 | 0.08 | 0.02 | 0.06 |
| Red-shouldered Hawk | 0 | 0 | 0.01 | 0 | 0 | 0 | 0 | 0.01 |
| Red-tailed Hawk | 0.04 | 0.01 | 0.08 | 0.06 | 0.03 | 0.04 | 0.04 | 0.02 |
| American Kestrel | 0.03 | 0.06 | 0 | 0.07 | 0.03 | 0.03 | 0.01 | 0.03 |
| Merlin | 0.01 | 0 | 0.01 | 0 | 0.01 | 0 | 0 | 0.01 |
| Peregrine Falcon | 0.01 | 0.01 | 0.01 | 0 | 0 | 0 | 0.01 | 0.01 |
| Prairie Falcon | 0.01 | 0 | 0.01 | 0 | 0 | 0 | 0 | 0.02 |
| Virginia Rail | 0.05 | 0.02 | 0.08 | 0.06 | 0.04 | 0.05 | 0.05 | 0.03 |
| Sora | 0.03 | 0.02 | 0.05 | 0.03 | 0.04 | 0.03 | 0.02 | 0.01 |
| Common Moorhen | 0.1 | 0.14 | 0.09 | 0.1 | 0.14 | 0.11 | 0.04 | 0.13 |
| American Coot | 4.52 | 1.87 | 6.11 | 1.86 | 7.03 | 7.51 | 3.1 | 3.22 |
| Semipalmated Plover | 0 | 0.01 | 0 | 0.01 | 0 | 0 | 0 | 0 |
| Killdeer | 0.68 | 0.84 | 0.42 | 1.44 | 0.7 | 0.24 | 0.59 | 0.56 |
| Black-necked Stilt | 0.03 | 0.06 | 0 | 0.06 | 0 | 0 | 0 | 0.06 |
| American Avocet | 0.04 | 0.08 | 0 | 0.17 | 0 | 0 | 0 | 0.03 |
| Spotted Sandpiper | 0.27 | 0.38 | 0.11 | 0.26 | 0.45 | 0.08 | 0.27 | 0.31 |
| Greater Yellowlegs | 0.14 | 0.03 | 0.24 | 0.23 | 0.21 | 0.08 | 0.1 | 0.12 |
| Lesser Yellowlegs | 0 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0.01 |
| Semipalmated Sandpiper | 0.01 | 0.02 | 0 | 0 | 0.05 | 0 | 0 | 0 |
| Western Sandpiper | 0.09 | 0.16 | 0 | 0.3 | 0.01 | 0 | 0 | 0.16 |
| Least Sandpiper | 0.17 | 0.2 | 0.24 | 0 | 0 | 0 | 0 | 0.74 |
| Pectoral Sandpiper | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01 |
| Long-billed Dowitcher | 0.01 | 0.01 | 0 | 0 | 0.05 | 0 | 0 | 0 |
| Wilson's Snipe | 0 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0.01 |
| Ring-billed Gull | 0.27 | 0 | 0.73 | 0 | 0.55 | 0.8 | 0 | 0.02 |
| Rock Dove | 0.01 | 0 | 0.02 | 0 | 0 | 0.03 | 0.01 | 0 |
| Eurasian Collared-Dove | 0 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0.01 |
| White-winged Dove | 0.23 | 0.51 | 0.01 | 0.26 | 0.15 | 0.27 | 0.24 | 0.25 |
| Mourning Dove | 1.79 | 3.55 | 0.14 | 4.31 | 1.41 | 1.25 | 0.97 | 1.36 |
| Greater Roadrunner | 0.42 | 0.61 | 0.16 | 0.56 | 0.43 | 0.4 | 0.41 | 0.31 |
| Barn Owl | 0.02 | 0.03 | 0.01 | 0.06 | 0.03 | 0.01 | 0 | 0.01 |

| SPECIES | Overall | Breeding | Non-breeding | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 |
|---|---|---|---|---|---|---|---|---|
| Great Horned Owl | 0.02 | 0.01 | 0.01 | 0 | 0.01 | 0.01 | 0 | 0.04 |
| Long-eared Owl | 0.01 | 0.01 | 0 | 0.03 | 0 | 0 | 0 | 0 |
| Lesser Nighthawk | 0.01 | 0.01 | 0 | 0 | 0.01 | 0 | 0 | 0.01 |
| Black-chinned Hummingbird | 0.2 | 0.43 | 0.01 | 0.13 | 0.25 | 0.24 | 0.2 | 0.19 |
| Anna's Hummingbird | 0.05 | 0.06 | 0.03 | 0.1 | 0.03 | 0.01 | 0.04 | 0.08 |
| Costa's Hummingbird | 0.09 | 0.15 | 0.01 | 0.06 | 0.12 | 0.14 | 0.06 | 0.05 |
| Belted Kingfisher | 0.15 | 0.03 | 0.23 | 0.19 | 0.14 | 0.15 | 0.14 | 0.16 |
| Red-naped Sapsucker | 0.02 | 0.01 | 0.03 | 0.03 | 0.04 | 0.01 | 0 | 0 |
| Ladder-backed Woodpecker | 0.01 | 0.01 | 0.01 | 0.01 | 0 | 0 | 0.01 | 0.02 |
| Hairy Woodpecker | 0 | 0 | 0.01 | 0 | 0.01 | 0 | 0 | 0 |
| Northern Flicker | 0.46 | 0.02 | 0.95 | 0.3 | 0.4 | 0.56 | 0.59 | 0.42 |
| Olive-sided Flycatcher | 0.01 | 0.01 | 0 | 0.01 | 0 | 0.01 | 0 | 0 |
| Western Wood-Pewee | 0.06 | 0.1 | 0 | 0.06 | 0.07 | 0.05 | 0.09 | 0.03 |
| Willow Flycatcher | 0.01 | 0.01 | 0 | 0 | 0 | 0 | 0.02 | 0 |
| Gray Flycatcher | 0.02 | 0.04 | 0 | 0.01 | 0 | 0.06 | 0 | 0.01 |
| Western Flycatcher | 0.03 | 0.06 | 0 | 0.01 | 0.03 | 0.06 | 0.01 | 0.01 |
| Dusky Flycatcher | 0.03 | 0.06 | 0 | 0.01 | 0.03 | 0.06 | 0.01 | 0.01 |
| Western Flycatcher | 0.03 | 0.04 | 0 | 0.01 | 0.04 | 0.1 | 0.01 | 0.01 |
| Black Phoebe | 2.91 | 1.79 | 3.64 | 3.11 | 3.5 | 2.63 | 2.81 | 2.6 |
| Say's Phoebe | 0.62 | 0.56 | 0.68 | 0.43 | 0.52 | 0.24 | 0.69 | 1.11 |
| Ash-throated Flycatcher | 0.03 | 0.05 | 0 | 0.04 | 0.01 | 0.08 | 0.01 | 0 |
| Brown-crested Flycatcher | 0.01 | 0.01 | 0 | 0.03 | 0 | 0 | 0 | 0 |
| Western Kingbird | 0.33 | 0.61 | 0 | 0.19 | 0.27 | 0.49 | 0.35 | 0.33 |
| Loggerhead Shrike | 0.23 | 0.25 | 0.17 | 0.36 | 0.18 | 0.09 | 0.15 | 0.38 |
| Bell's Vireo | 0.04 | 0.08 | 0 | 0.13 | 0 | 0.06 | 0 | 0 |
| Solitary Vireo | 0.02 | 0.05 | 0 | 0 | 0.01 | 0.01 | 0.07 | 0 |
| Warbling Vireo | 0.05 | 0.07 | 0 | 0.06 | 0.05 | 0.03 | 0.04 | 0.05 |
| Common Raven | 0.01 | 0 | 0.03 | 0 | 0 | 0.05 | 0 | 0.01 |
| Horned Lark | 0.08 | 0.12 | 0.07 | 0.04 | 0 | 0.13 | 0.22 | 0.01 |
| Tree Swallow | 0.01 | 0.02 | 0.01 | 0 | 0 | 0.01 | 0.04 | 0 |
| Violet-green Swallow | 0.02 | 0.03 | 0 | 0 | 0 | 0.03 | 0.04 | 0.01 |
| Northern Rough-winged Swallow | 0.31 | 0.6 | 0 | 0.16 | 0.16 | 0.13 | 0.75 | 0.3 |
| Cliff Swallow | 0.14 | 0.28 | 0 | 0 | 0 | 0.08 | 0.54 | 0.08 |
| Barn Swallow | 0.2 | 0.42 | 0 | 0 | 0 | 0.95 | 0.05 | 0 |
| Verdin | 3.29 | 3.74 | 2.67 | 2.87 | 3.47 | 2.96 | 3.57 | 3.49 |
| Bushtit | 0.3 | 0.01 | 0.69 | 0.46 | 0.3 | 0.19 | 0.01 | 0.5 |
| Red-breasted Nuthatch | 0.01 | 0 | 0.01 | 0 | 0 | 0.01 | 0.01 | 0 |
| Rock Wren | 0.1 | 0.1 | 0.13 | 0.07 | 0.1 | 0.04 | 0.09 | 0.19 |
| Canyon Wren | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0 | 0 | 0 |
| Bewick's Wren | 4.98 | 5.22 | 4.07 | 5.92 | 6.25 | 3.87 | 4.84 | 4.35 |
| House Wren | 0.01 | 0.01 | 0.01 | 0.03 | 0.01 | 0 | 0 | 0.01 |
| Pacific Wren | 0.01 | 0 | 0.01 | 0.03 | 0.01 | 0 | 0 | 0 |
| Marsh Wren | 4.79 | 3 | 6.05 | 3.53 | 4.26 | 4.71 | 5.51 | 5.59 |
| Golden-crowned Kinglet | 0.03 | 0 | 0.08 | 0.01 | 0 | 0.08 | 0.02 | 0.02 |
| Ruby-crowned Kinglet | 2.4 | 0.35 | 4.79 | 3.73 | 3.27 | 2.41 | 1.52 | 1.45 |
| Blue-gray Gnatcatcher | 0.24 | 0.3 | 0.08 | 0.3 | 0.36 | 0.16 | 0.37 | 0.05 |
| Black-tailed Gnatcatcher | 3.35 | 3.57 | 2.94 | 3.63 | 4.01 | 2.51 | 3.19 | 3.48 |
| Western Bluebird | 0.01 | 0 | 0.02 | 0.04 | 0 | 0 | 0 | 0 |
| Mountain Bluebird | 0 | 0 | 0.01 | 0 | 0 | 0 | 0.01 | 0 |
| Hermit Thrush | 0.06 | 0.01 | 0.09 | 0.1 | 0.16 | 0.01 | 0.01 | 0.01 |
| American Robin | 0.04 | 0 | 0.1 | 0.01 | 0.01 | 0.08 | 0.09 | 0.02 |
| Northern Mockingbird | 0.11 | 0.13 | 0.1 | 0.03 | 0.18 | 0.13 | 0.05 | 0.15 |

| SPECIES | Overall | Breeding | Non-breeding | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 |
|---|---|---|---|---|---|---|---|---|
| Crissal Thrasher | 0.99 | 0.91 | 1.01 | 1.44 | 1.02 | 0.58 | 0.84 | 1.1 |
| American Pipit | 3.01 | 0.7 | 5.07 | 1.14 | 2.24 | 1.59 | 4.55 | 4.87 |
| Cedar Waxwing | 0.01 | 0 | 0.01 | 0.04 | 0.01 | 0 | 0 | 0 |
| Phainopepla | 0.11 | 0 | 0.27 | 0.13 | 0.15 | 0.05 | 0.15 | 0.09 |
| Orange-crowned Warbler | 1.22 | 0.21 | 1.99 | 1.37 | 0.82 | 1.34 | 1.41 | 1.17 |
| Nashville Warbler | 0.02 | 0.02 | 0 | 0 | 0 | 0.04 | 0.02 | 0.01 |
| Virginia's Warbler | 0 | 0 | 0 | 0 | 0 | 0.01 | 0 | 0 |
| Lucy's Warbler | 2.26 | 4.96 | 0 | 4.08 | 2.58 | 1.91 | 2.11 | 1.08 |
| Yellow Warbler | 1.2 | 2.49 | 0 | 0.86 | 0.8 | 0.94 | 1.91 | 1.38 |
| Yellow-rumped Warbler | 6.66 | 0.66 | 14.81 | 5.2 | 2.47 | 8.26 | 7.54 | 8.9 |
| Black-throated Gray Warbler | 0 | 0 | 0.01 | 0 | 0 | 0 | 0 | 0.01 |
| MacGillivray's Warbler | 0.01 | 0.01 | 0 | 0.01 | 0.01 | 0.01 | 0 | 0 |
| Common Yellowthroat | 3.28 | 6.62 | 0.02 | 3.14 | 3.54 | 3.11 | 4.02 | 2.69 |
| Wilson's Warbler | 0.47 | 0.89 | 0.05 | 0.89 | 0.62 | 0.47 | 0.27 | 0.23 |
| Yellow-breasted Chat | 1.89 | 4.08 | 0.01 | 2.54 | 2.24 | 1.74 | 2.55 | 0.7 |
| Western Tanager | 0.03 | 0.05 | 0 | 0.04 | 0.01 | 0.03 | 0.01 | 0.03 |
| Green-tailed Towhee | 0 | 0.01 | 0 | 0 | 0 | 0 | 0.01 | 0 |
| Spotted Towhee | 0.11 | 0.01 | 0.21 | 0.06 | 0.07 | 0.15 | 0.17 | 0.08 |
| Abert's Towhee | 9.1 | 9.39 | 7.89 | 12.43 | 11.11 | 7.78 | 7.67 | 7.37 |
| Canyon Towhee | 0 | 0.01 | 0 | 0 | 0.01 | 0 | 0 | 0 |
| Chipping Sparrow | 0.16 | 0.08 | 0.1 | 0.07 | 0.08 | 0.09 | 0.06 | 0.42 |
| Brewer's Sparrow | 0.64 | 0.33 | 0.17 | 0.23 | 0.36 | 0.53 | 0.62 | 1.26 |
| Vesper Sparrow | 0.01 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0.02 |
| Lark Sparrow | 0.01 | 0.01 | 0 | 0 | 0 | 0.01 | 0 | 0.01 |
| Black-throated Sparrow | 0 | 0.01 | 0 | 0 | 0.01 | 0 | 0 | 0 |
| Savannah Sparrow | 0.09 | 0.07 | 0.03 | 0.09 | 0 | 0.08 | 0.16 | 0.1 |
| Song Sparrow | 7.65 | 9.22 | 5.91 | 9.79 | 10.01 | 7.71 | 6.64 | 5.04 |
| Lincoln's Sparrow | 0.32 | 0.08 | 0.62 | 0.68 | 0.16 | 0.39 | 0.24 | 0.17 |
| White-crowned Sparrow | 3.86 | 0.48 | 8.4 | 3.49 | 3.36 | 3.92 | 4 | 4.34 |
| Dark-eyed Junco | 0.52 | 0.02 | 1.25 | 0.12 | 0.18 | 1.26 | 0.55 | 0.45 |
| Black-headed Grosbeak | 0.04 | 0.06 | 0 | 0.1 | 0.05 | 0.03 | 0 | 0.02 |
| Blue Grosbeak | 1.21 | 2.52 | 0 | 1.92 | 1.29 | 1.16 | 1.21 | 0.64 |
| Lazuli Bunting | 0.07 | 0.07 | 0 | 0.09 | 0.1 | 0.04 | 0.12 | 0.01 |
| Indigo Bunting | 0.02 | 0.04 | 0 | 0 | 0 | 0 | 0 | 0.08 |
| Red-winged Blackbird | 6.02 | 8.68 | 4.57 | 4.63 | 5.82 | 7.14 | 6.81 | 5.56 |
| Western Meadowlark | 0.02 | 0.01 | 0.05 | 0 | 0.03 | 0 | 0.01 | 0.06 |
| Yellow-headed Blackbird | 0.28 | 0.51 | 0.06 | 0.78 | 0.22 | 0.03 | 0.25 | 0.21 |
| Brewer's Blackbird | 0.08 | 0.01 | 0.22 | 0 | 0 | 0 | 0.35 | 0.04 |
| Great-tailed Grackle | 2.09 | 3.03 | 1.29 | 0.59 | 1.22 | 2.59 | 2.74 | 2.9 |
| Brown-headed Cowbird | 2.68 | 5.93 | 0.01 | 2.75 | 2.96 | 2.72 | 3.16 | 1.94 |
| Hooded Oriole | 0.01 | 0.02 | 0 | 0 | 0 | 0.04 | 0 | 0 |
| Bullock's Oriole | 0.05 | 0.1 | 0 | 0.01 | 0.11 | 0.06 | 0 | 0.04 |
| House Finch | 1.25 | 1.13 | 1.03 | 0.76 | 1 | 1.09 | 0.71 | 2.39 |
| Pine Siskin | 0.06 | 0 | 0.15 | 0.09 | 0 | 0.2 | 0 | 0 |
| Lesser Goldfinch | 0.44 | 0.19 | 0.27 | 0.3 | 0.49 | 0.16 | 0.45 | 0.72 |
| American Goldfinch | 0.01 | 0.01 | 0.01 | 0 | 0 | 0 | 0 | 0.03 |
| House Sparrow | 0 | 0 | 0.01 | 0.01 | 0 | 0 | 0 | 0 |

**Table 3b. Breeding and non-breeding relative abundances (% of total abundance) by species for each of five survey years (2005-2010).** Species listed in taxonomic order.

| SPECIES | Year 1 Breed | Year 1 Non-breed | Year 2 Breed | Year 2 Non-breed | Year 3 Breed | Year 3 Non-breed | Year 4 Breed | Year 4 Non-breed | Year 5 Breed | Year 5 Non-breed |
|---|---|---|---|---|---|---|---|---|---|---|
| Canada Goose | 0 | 0 | 0 | 0 | 0.18 | 0.26 | 0 | 0 | 0 | 0 |
| Wood Duck | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 | 0 |
| Gadwall | 0.06 | 1.39 | 0.03 | 2.03 | 0.23 | 1.13 | 0.11 | 1.15 | 1.06 | 1.62 |
| American Wigeon | 0 | 0 | 0 | 0 | 0 | 0.19 | 0.09 | 0.07 | 0.34 | 0.19 |
| Mallard | 0.34 | 1.03 | 0.34 | 4.37 | 1.67 | 4.38 | 1.84 | 3.29 | 4.17 | 7.22 |
| Cinnamon Teal | 0.14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.26 | 0.06 |
| Northern Shoveler | 0 | 0.16 | 0 | 0 | 0 | 0 | 0 | 0 | 0.05 | 0 |
| Northern Pintail | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green-winged Teal | 0 | 0 | 0.03 | 0.24 | 0 | 0.23 | 0 | 0.07 | 0 | 0.03 |
| Redhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bufflehead | 0 | 0 | 0 | 0 | 0.03 | 0.32 | 0 | 0 | 0 | 0.06 |
| Common Goldeneye | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0.06 |
| Common Merganser | 0.06 | 0 | 0 | 0.04 | 0 | 0.1 | 0 | 0.03 | 0.03 | 0 |
| Gambel's Quail | 2.29 | 0.4 | 1.24 | 0.64 | 1.26 | 0.42 | 1.28 | 1.12 | 2.95 | 0.93 |
| Pied-billed Grebe | 0 | 0.16 | 0.03 | 0.2 | 0.38 | 0.48 | 0.09 | 0 | 0.1 | 0 |
| Eared Grebe | 0.03 | 0 | 0 | 0 | 0.41 | 0 | 0 | 0 | 0.05 | 0 |
| Western Grebe | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 | 0 | 0 | 0 |
| Double-crested Cormorant | 0.03 | 0 | 0.06 | 0.12 | 0.21 | 0.81 | 0.11 | 0.1 | 0.13 | 0.06 |
| American Bittern | 0 | 0 | 0.03 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Least Bittern | 0.03 | 0 | 0 | 0.04 | 0 | 0 | 0.03 | 0 | 0 | 0 |
| Great Blue Heron | 0.14 | 0.16 | 0.09 | 0.32 | 0.23 | 0.19 | 0.11 | 0.14 | 0.44 | 0.44 |
| Great Egret | 0.03 | 0.12 | 0 | 0.04 | 0 | 0.16 | 0.03 | 0.03 | 0 | 0.09 |
| Snowy Egret | 0.2 | 0 | 0 | 0.12 | 0.21 | 0.35 | 0.03 | 0 | 0.08 | 0.06 |
| Green Heron | 0.34 | 0.08 | 0.66 | 0.2 | 0.35 | 0.06 | 0.34 | 0 | 0.26 | 0.03 |
| Black-crowned Night-Heron | 0.09 | 0 | 0.06 | 0.16 | 0.03 | 0.1 | 0.03 | 0.03 | 0 | 0 |
| White-faced Ibis | 0.11 | 0 | 0.4 | 0 | 0 | 0 | 0.03 | 0 | 0 | 0 |
| Turkey Vulture | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Osprey | 0 | 0 | 0.06 | 0 | 0.03 | 0 | 0 | 0.03 | 0.03 | 0 |
| Northern Harrier | 0 | 0.08 | 0.03 | 0.2 | 0.06 | 0.35 | 0 | 0.07 | 0.03 | 0.09 |
| Sharp-shinned Hawk | 0 | 0.36 | 0 | 0.04 | 0 | 0.06 | 0 | 0.17 | 0.03 | 0.19 |
| Cooper's Hawk | 0.03 | 0 | 0 | 0.12 | 0.03 | 0.13 | 0 | 0.03 | 0.03 | 0.16 |
| Red-shouldered Hawk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 |
| Red-tailed Hawk | 0 | 0.16 | 0.03 | 0 | 0 | 0.1 | 0 | 0.1 | 0 | 0.06 |
| American Kestrel | 0.11 | 0 | 0.06 | 0 | 0.06 | 0 | 0 | 0 | 0.08 | 0 |
| Merlin | 0 | 0 | 0 | 0.04 | 0 | 0 | 0 | 0 | 0 | 0.03 |
| Peregrine Falcon | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 | 0 | 0.03 |
| Prairie Falcon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.06 |
| Virginia Rail | 0.03 | 0.08 | 0.03 | 0.08 | 0 | 0.1 | 0.03 | 0.07 | 0 | 0.06 |
| Sora | 0 | 0.08 | 0.03 | 0.08 | 0.03 | 0.03 | 0.03 | 0.03 | 0 | 0.03 |
| Common Moorhen | 0.11 | 0.12 | 0.17 | 0.16 | 0.18 | 0 | 0.03 | 0.07 | 0.18 | 0.12 |
| American Coot | 0.89 | 3.57 | 1.06 | 13.55 | 4.48 | 6 | 1.05 | 3.7 | 1.94 | 4.6 |
| Semipalmated Plover | 0.03 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Killdeer | 1.75 | 0.87 | 0.78 | 0.32 | 0.26 | 0.13 | 0.37 | 0.75 | 1.04 | 0.12 |
| Black-necked Stilt | 0.11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.16 | 0 |
| American Avocet | 0.34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.05 | 0 |
| Spotted Sandpiper | 0.34 | 0.16 | 0.69 | 0.2 | 0.12 | 0 | 0.43 | 0.1 | 0.31 | 0.12 |
| Greater Yellowlegs | 0 | 0.55 | 0.06 | 0.2 | 0 | 0.19 | 0 | 0.14 | 0.1 | 0.16 |
| Lesser Yellowlegs | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 |
| Semipalmated Sandpiper | 0 | 0 | 0.11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| SPECIES | Year 1 Breed | Year 1 Non-breed | Year 2 Breed | Year 2 Non-breed | Year 3 Breed | Year 3 Non-breed | Year 4 Breed | Year 4 Non-breed | Year 5 Breed | Year 5 Non-breed |
|---|---|---|---|---|---|---|---|---|---|---|
| Western Sandpiper | 0.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.18 | 0 |
| Least Sandpiper | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.91 | 1.06 |
| Pectoral Sandpiper | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Long-billed Dowitcher | 0 | 0 | 0.06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wilson's Snipe | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 |
| Ring-billed Gull | 0 | 0 | 0 | 1.59 | 0 | 2.03 | 0 | 0 | 0 | 0.06 |
| Rock Dove | 0 | 0 | 0 | 0 | 0 | 0.06 | 0 | 0.03 | 0 | 0 |
| Eurasian Collared-Dove | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 |
| White-winged Dove | 0.49 | 0.04 | 0.32 | 0 | 0.62 | 0 | 0.54 | 0 | 0.57 | 0 |
| Mourning Dove | 8.16 | 0.24 | 2.67 | 0 | 2.4 | 0.23 | 2.07 | 0.07 | 2.54 | 0.16 |
| Greater Roadrunner | 0.66 | 0.36 | 0.66 | 0.08 | 0.79 | 0.06 | 0.51 | 0.24 | 0.47 | 0.09 |
| Barn Owl | 0.09 | 0 | 0.06 | 0 | 0 | 0.03 | 0 | 0 | 0.03 | 0 |
| Great Horned Owl | 0 | 0 | 0 | 0 | 0.03 | 0 | 0 | 0 | 0.03 | 0.03 |
| Long-eared Owl | 0.06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lesser Nighthawk | 0 | 0 | 0.03 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 |
| Black-chinned Hummingbir | 0.26 | 0 | 0.52 | 0 | 0.56 | 0 | 0.43 | 0.03 | 0.39 | 0 |
| Anna's Hummingbird | 0.14 | 0.04 | 0.06 | 0 | 0 | 0 | 0.06 | 0.03 | 0.05 | 0.06 |
| Costa's Hummingbird | 0.11 | 0 | 0.17 | 0 | 0.29 | 0 | 0.09 | 0.03 | 0.1 | 0 |
| Belted Kingfisher | 0.03 | 0.44 | 0.06 | 0.2 | 0.03 | 0.29 | 0 | 0.17 | 0.03 | 0.09 |
| Red-naped Sapsucker | 0.03 | 0.04 | 0 | 0.12 | 0 | 0.03 | 0 | 0 | 0 | 0 |
| Ladder-backed Woodpecker | 0.03 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 | 0 | 0.06 |
| Hairy Woodpecker | 0 | 0 | 0 | 0.04 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern Flicker | 0 | 0.67 | 0 | 0.87 | 0.03 | 1.19 | 0 | 1.22 | 0.05 | 0.75 |
| Olive-sided Flycatcher | 0.03 | 0 | 0 | 0 | 0.03 | 0 | 0 | 0 | 0 | 0 |
| Western Wood-Pewee | 0.11 | 0 | 0.11 | 0 | 0.09 | 0 | 0.11 | 0 | 0.05 | 0 |
| Willow Flycatcher | 0 | 0 | 0 | 0 | 0 | 0 | 0.06 | 0 | 0 | 0 |
| Gray Flycatcher | 0.03 | 0 | 0 | 0 | 0.15 | 0 | 0 | 0 | 0.03 | 0 |
| Western Flycatcher | 0.03 | 0 | 0.03 | 0 | 0.15 | 0 | 0.03 | 0 | 0 | 0 |
| Dusky Flycatcher | 0.03 | 0 | 0.03 | 0 | 0.15 | 0 | 0.03 | 0 | 0 | 0 |
| Western Flycatcher | 0.03 | 0 | 0.03 | 0 | 0.23 | 0 | 0.03 | 0 | 0 | 0 |
| Black Phoebe | 1.75 | 3.88 | 2.04 | 4.53 | 1.79 | 3 | 1.59 | 4.1 | 1.79 | 2.92 |
| Say's Phoebe | 0.31 | 0.4 | 0.57 | 0.4 | 0.35 | 0.13 | 0.77 | 0.78 | 0.78 | 1.56 |
| Ash-throated Flycatcher | 0.09 | 0 | 0 | 0 | 0.15 | 0 | 0.03 | 0 | 0 | 0 |
| Brown-crested Flycatcher | 0.06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Western Kingbird | 0.34 | 0 | 0.55 | 0 | 1.03 | 0 | 0.62 | 0 | 0.52 | 0 |
| Loggerhead Shrike | 0.43 | 0.2 | 0.23 | 0.12 | 0.06 | 0.06 | 0.23 | 0.03 | 0.28 | 0.4 |
| Bell's Vireo | 0.26 | 0 | 0 | 0 | 0.15 | 0 | 0 | 0 | 0 | 0 |
| Solitary Vireo | 0 | 0 | 0.03 | 0 | 0.03 | 0 | 0.17 | 0 | 0 | 0 |
| Warbling Vireo | 0.11 | 0 | 0.09 | 0 | 0.03 | 0 | 0.03 | 0 | 0.08 | 0 |
| Common Raven | 0 | 0 | 0 | 0 | 0 | 0.13 | 0 | 0 | 0 | 0 |
| Horned Lark | 0.09 | 0 | 0 | 0 | 0.23 | 0.06 | 0.28 | 0.27 | 0.03 | 0 |
| Tree Swallow | 0 | 0 | 0 | 0 | 0 | 0.03 | 0.09 | 0 | 0 | 0 |
| Violet-green Swallow | 0 | 0 | 0 | 0 | 0.06 | 0 | 0.09 | 0 | 0 | 0 |
| Northern Rough-winged Swallow | 0.17 | 0 | 0.32 | 0 | 0.23 | 0 | 1.5 | 0 | 0.73 | 0 |
| Cliff Swallow | 0 | 0 | 0 | 0 | 0.18 | 0 | 1.22 | 0 | 0.03 | 0 |
| Barn Swallow | 0 | 0 | 0 | 0 | 2.2 | 0 | 0 | 0 | 0 | 0 |
| Verdin | 2.89 | 2.34 | 4.48 | 1.83 | 3.54 | 2.39 | 3.6 | 3.26 | 4.12 | 3.33 |
| Bushtit | 0.06 | 1.11 | 0 | 0.79 | 0 | 0.1 | 0 | 0 | 0 | 1.46 |
| Red-breasted Nuthatch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 | 0 |

| SPECIES | Year 1 Breed | Year 1 Non-breed | Year 2 Breed | Year 2 Non-breed | Year 3 Breed | Year 3 Non-breed | Year 4 Breed | Year 4 Non-breed | Year 5 Breed | Year 5 Non-breed |
|---|---|---|---|---|---|---|---|---|---|---|
| Rock Wren | 0.03 | 0.16 | 0.09 | 0.12 | 0.03 | 0.03 | 0.14 | 0.03 | 0.18 | 0.31 |
| Canyon Wren | 0.03 | 0 | 0 | 0.04 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bewick's Wren | 5.15 | 5.35 | 6.72 | 4.81 | 4.04 | 3.13 | 5.19 | 4.54 | 4.97 | 2.96 |
| House Wren | 0 | 0.04 | 0.03 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 |
| Pacific Wren | 0 | 0.08 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marsh Wren | 1.46 | 5.55 | 2.27 | 5.8 | 2.84 | 5.67 | 3.52 | 6.75 | 4.71 | 6.35 |
| Golden-crowned Kinglet | 0 | 0.04 | 0 | 0 | 0 | 0.19 | 0 | 0.07 | 0 | 0.06 |
| Ruby-crowned Kinglet | 0.52 | 7.89 | 0.6 | 6.08 | 0.41 | 4.84 | 0.2 | 2.71 | 0.05 | 3.2 |
| Blue-gray Gnatcatcher | 0.43 | 0.24 | 0.26 | 0 | 0.29 | 0 | 0.57 | 0.03 | 0 | 0.16 |
| Black-tailed Gnatcatcher | 3.72 | 2.7 | 4.8 | 3.42 | 2.67 | 2.13 | 3.18 | 3.15 | 3.47 | 3.36 |
| Western Bluebird | 0 | 0.12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mountain Bluebird | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 | 0 |
| Hermit Thrush | 0.03 | 0.24 | 0.03 | 0.2 | 0 | 0.03 | 0 | 0.03 | 0 | 0 |
| American Robin | 0 | 0.04 | 0 | 0.04 | 0 | 0.19 | 0 | 0.17 | 0 | 0.06 |
| Northern Mockingbird | 0.06 | 0 | 0.2 | 0.2 | 0.18 | 0.03 | 0.03 | 0.07 | 0.18 | 0.22 |
| Crissal Thrasher | 1.15 | 1.78 | 1.12 | 0.68 | 0.44 | 0.55 | 0.71 | 1.02 | 1.09 | 1.12 |
| American Pipit | 0 | 3.09 | 0.09 | 5.52 | 0.32 | 2.35 | 0 | 9.46 | 2.87 | 4.85 |
| Cedar Waxwing | 0 | 0.04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Phainopepla | 0 | 0.36 | 0 | 0.36 | 0 | 0.06 | 0 | 0.34 | 0 | 0.25 |
| Orange-crowned Warbler | 0.26 | 2.26 | 0.29 | 1.43 | 0.32 | 2 | 0.06 | 2.64 | 0.16 | 1.62 |
| Nashville Warbler | 0 | 0 | 0 | 0 | 0.09 | 0 | 0 | 0 | 0 | 0 |
| Virginia's Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lucy's Warbler | 8.1 | 0 | 5.37 | 0 | 4.34 | 0 | 4.65 | 0 | 2.59 | 0 |
| Yellow Warbler | 1.72 | 0 | 1.61 | 0 | 2.08 | 0 | 4.09 | 0 | 2.87 | 0 |
| Yellow-rumped Warbler | 0.2 | 13.48 | 0.86 | 4.73 | 1.41 | 15.7 | 0.45 | 18.01 | 0.44 | 19.98 |
| Black-throated Gray Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 |
| MacGillivray's Warbler | 0.03 | 0 | 0 | 0 | 0.03 | 0 | 0 | 0 | 0 | 0 |
| Common Yellowthroat | 5.61 | 0.04 | 6.55 | 0 | 6.77 | 0 | 8.09 | 0.07 | 6.14 | 0 |
| Wilson's Warbler | 1.46 | 0.28 | 1.24 | 0 | 1.03 | 0 | 0.37 | 0 | 0.44 | 0 |
| Yellow-breasted Chat | 4.95 | 0 | 4.63 | 0 | 3.87 | 0.03 | 5.51 | 0 | 1.68 | 0 |
| Western Tanager | 0.09 | 0 | 0.03 | 0 | 0.06 | 0 | 0 | 0 | 0.05 | 0 |
| Green-tailed Towhee | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 | 0 | 0 |
| Spotted Towhee | 0.03 | 0.12 | 0 | 0.16 | 0.03 | 0.32 | 0 | 0.37 | 0 | 0.06 |
| Abert's Towhee | 12.68 | 10.15 | 11.84 | 9.89 | 8.03 | 6.96 | 7.92 | 6.31 | 6.73 | 6.91 |
| Canyon Towhee | 0 | 0 | 0.03 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chipping Sparrow | 0.06 | 0 | 0 | 0 | 0.18 | 0 | 0 | 0.1 | 0.16 | 0.34 |
| Brewer's Sparrow | 0 | 0.24 | 0.46 | 0 | 0.97 | 0 | 0.17 | 0.34 | 0.1 | 0.28 |
| Vesper Sparrow | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.05 | 0 |
| Lark Sparrow | 0 | 0 | 0 | 0 | 0.03 | 0 | 0 | 0 | 0.03 | 0 |
| Black-throated Sparrow | 0 | 0 | 0.03 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Savannah Sparrow | 0.17 | 0 | 0 | 0 | 0.18 | 0 | 0 | 0.1 | 0 | 0.06 |
| Song Sparrow | 10.28 | 8.09 | 11.58 | 7.67 | 9.49 | 6.13 | 8.54 | 4.1 | 6.5 | 4.29 |
| Lincoln's Sparrow | 0.09 | 1.47 | 0.06 | 0.12 | 0.26 | 0.61 | 0.03 | 0.47 | 0 | 0.47 |
| White-crowned Sparrow | 0.43 | 8.24 | 1.09 | 5.05 | 0.18 | 8.61 | 0.14 | 9.66 | 0.57 | 9.8 |
| Dark-eyed Junco | 0.09 | 0.08 | 0 | 0.44 | 0 | 3.16 | 0 | 0.95 | 0 | 1.24 |
| Black-headed Grosbeak | 0.17 | 0 | 0.09 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0 |
| Blue Grosbeak | 3.38 | 0 | 2.64 | 0 | 2.64 | 0 | 2.67 | 0 | 1.4 | 0 |
| Lazuli Bunting | 0.09 | 0 | 0.14 | 0 | 0.09 | 0 | 0.03 | 0 | 0 | 0 |
| Indigo Bunting | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.18 | 0 |
| Red-winged Blackbird | 3.98 | 6.94 | 6.84 | 6.71 | 9.61 | 6.8 | 11.35 | 1.97 | 11.32 | 1.28 |

| SPECIES | Year 1 Breed | Year 1 Non-breed | Year 2 Breed | Year 2 Non-breed | Year 3 Breed | Year 3 Non-breed | Year 4 Breed | Year 4 Non-breed | Year 5 Breed | Year 5 Non-breed |
|---|---|---|---|---|---|---|---|---|---|---|
| Western Meadowlark | 0 | 0 | 0.03 | 0 | 0 | 0 | 0 | 0.03 | 0 | 0.19 |
| Yellow-headed Blackbird | 1.52 | 0.04 | 0.14 | 0 | 0.06 | 0 | 0.34 | 0.24 | 0.47 | 0 |
| Brewer's Blackbird | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.95 | 0.03 | 0.09 |
| Great-tailed Grackle | 0.46 | 0.91 | 1.55 | 1.03 | 3.63 | 1.77 | 3.92 | 2.1 | 5.36 | 0.56 |
| Brown-headed Cowbird | 5.47 | 0 | 6.18 | 0 | 6.3 | 0 | 7.15 | 0.03 | 4.69 | 0 |
| Hooded Oriole | 0 | 0 | 0 | 0 | 0.09 | 0 | 0 | 0 | 0 | 0 |
| Bullock's Oriole | 0.03 | 0 | 0.23 | 0 | 0.15 | 0 | 0 | 0 | 0.08 | 0 |
| House Finch | 0.94 | 0.28 | 0.8 | 1.43 | 0.73 | 1.87 | 0.62 | 0.88 | 2.41 | 0.62 |
| Pine Siskin | 0 | 0.24 | 0 | 0 | 0 | 0.52 | 0 | 0 | 0 | 0 |
| Lesser Goldfinch | 0.06 | 0.16 | 0.34 | 0.04 | 0.21 | 0.06 | 0.09 | 0.61 | 0.23 | 0.4 |
| American Goldfinch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0.06 |
| House Sparrow | 0 | 0.04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 4. Summary regression statistics for all 37 species that were detected at the Las Vegas Wash during at least 40 (of a total of 129) survey events between February 2005 and January 2010.**
Species listed in taxonomic order.

| SPECIES | No. of Events with Detection | Total No. of Birds Detected | Overall Density Estimate (birds/40 ha) | $R^2$-Value | Regression Coefficient | P-Value |
|---|---|---|---|---|---|---|
| Gadwall | 49 | 412 | 1.48 | 0.029 | 0.341 | 0.029 |
| Mallard | 100 | 1223 | 4.39 | 0.211 | 1.793 | 0 |
| Gambel's Quail | 90 | 502 | 1.80 | 0.047 | 0.388 | 0.008 |
| Great Blue Heron | 59 | 99 | 0.36 | 0.104 | 0.108 | 0 |
| Green Heron | 53 | 90 | 0.32 | 0.01 | -0.048 | 0.127 |
| American Coot | 105 | 1783 | 6.39 | 0 | 0.201 | 0.738 |
| Killdeer | 85 | 269 | 0.96 | 0.035 | -0.174 | 0.02 |
| Spotted Sandpiper | 60 | 108 | 0.39 | 0 | 0.02 | 0.594 |
| Mourning Dove | 85 | 706 | 2.53 | 0.041 | -0.738 | 0.012 |
| Greater Roadrunner | 81 | 164 | 0.59 | 0.003 | -0.049 | 0.234 |
| Belted Kingfisher | 41 | 61 | 0.22 | 0 | 0.016 | 0.476 |
| Northern Flicker | 57 | 180 | 0.65 | 0.021 | 0.122 | 0.053 |
| Black Phoebe | 127 | 1147 | 4.11 | 0 | 0.021 | 0.892 |
| Say's Phoebe | 89 | 246 | 0.88 | 0.189 | 0.289 | 0 |
| Loggerhead Shrike | 52 | 92 | 0.33 | 0.013 | 0.052 | 0.102 |
| Verdin | 129 | 1298 | 4.66 | 0.086 | 0.482 | 0 |
| Bewick's Wren | 129 | 1965 | 7.05 | 0.014 | -0.306 | 0.1 |
| Marsh Wren | 127 | 1891 | 6.78 | 0.132 | 1.327 | 0 |
| Ruby-crowned Kinglet | 80 | 945 | 3.39 | 0.011 | -0.394 | 0.125 |
| Black-tailed Gnatcatcher | 128 | 1323 | 4.75 | 0 | 0.126 | 0.422 |
| Crissal Thrasher | 117 | 390 | 1.40 | 0 | -0.012 | 0.842 |
| American Pipit | 61 | 1186 | 4.25 | 0.062 | 1.511 | 0.003 |

| SPECIES | No. of Events with Detection | Total No. of Birds Detected | Overall Density Estimate (birds/40 ha) | $R^2$-Value | Regression Coefficient | P-Value |
|---|---|---|---|---|---|---|
| Orange-crowned Warbler | 82 | 483 | 1.73 | 0.012 | 0.241 | 0.116 |
| Lucy's Warbler | 62 | 892 | 3.20 | 0.073 | -0.946 | 0.001 |
| Yellow Warbler | 55 | 474 | 1.70 | 0.024 | 0.334 | 0.042 |
| Yellow-rumped Warbler | 82 | 2628 | 9.43 | 0.086 | 3.115 | 0 |
| Common Yellowthroat | 73 | 1295 | 4.64 | 0 | -0.029 | 0.932 |
| Yellow-breasted Chat | 54 | 746 | 2.68 | 0.02 | -0.468 | 0.059 |
| Abert's Towhee | 129 | 3589 | 12.87 | 0.043 | -0.934 | 0.011 |
| Song Sparrow | 129 | 3019 | 10.83 | 0.193 | -1.43 | 0 |
| Lincoln's Sparrow | 52 | 125 | 0.45 | 0.008 | -0.068 | 0.152 |
| White-crowned Sparrow | 77 | 1522 | 5.46 | 0.073 | 1.667 | 0.001 |
| Blue Grosbeak | 48 | 476 | 1.71 | 0.015 | -0.282 | 0.09 |
| Red-winged Blackbird | 120 | 2374 | 8.51 | 0.028 | 1.596 | 0.033 |
| Great-tailed Grackle | 98 | 825 | 2.96 | 0.113 | 0.933 | 0 |
| Brown-headed Cowbird | 55 | 1056 | 3.79 | 0 | -0.266 | 0.449 |
| House Finch | 84 | 492 | 1.76 | 0.04 | 0.665 | 0.013 |

**Table 5. Overall, breeding, and non-breeding bird species frequencies during the fifth year of surveys in the Las Vegas Wash (February 2009 – January 2010), including absolute (number of survey points) and relative (% of all survey points) frequency.** Data collected at two week intervals at the 28 point-count stations consistently surveyed along the Las Vegas Wash. Birds that flew over or were > 100 m from the census stations are excluded. Species listed in taxonomic order. Compare with previous four years of data in Braden et al. (2009; Appendix II).

| Species | Overall | | Breeding | | Non-Breeding | |
|---|---|---|---|---|---|---|
| | Number of Survey Points | % Survey Points | Number of Survey Points | % Survey Points | Number of Survey Points | % Survey Points |
| Canada Goose | 0 | 0 | 0 | 0 | 0 | 0 |
| Wood Duck | 0 | 0 | 0 | 0 | 0 | 0 |
| Gadwall | 15 | 53.5 | 9 | 32.1 | 10 | 35.7 |
| American Wigeon | 3 | 10.7 | 3 | 10.7 | 1 | 3.5 |
| Mallard | 23 | 82.1 | 17 | 60.7 | 17 | 60.7 |
| Cinnamon Teal | 3 | 10.7 | 2 | 7.1 | 1 | 3.5 |
| Northern Shoveler | 2 | 7.1 | 1 | 3.5 | 0 | 0 |
| Northern Pintail | 0 | 0 | 0 | 0 | 0 | 0 |
| Green-winged Teal | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| Redhead | 0 | 0 | 0 | 0 | 0 | 0 |
| Bufflehead | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| Common Goldeneye | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| Common Merganser | 2 | 7.1 | 1 | 3.5 | 0 | 0 |

| Species | Overall | | Breeding | | Non-Breeding | |
|---|---|---|---|---|---|---|
| | Number of Survey Points | % Survey Points | Number of Survey Points | % Survey Points | Number of Survey Points | % Survey Points |
| Gambel's Quail | 16 | 57.1 | 12 | 42.8 | 5 | 17.8 |
| Pied-billed Grebe | 4 | 14.2 | 3 | 10.7 | 0 | 0 |
| Eared Grebe | 2 | 7.1 | 1 | 3.5 | 0 | 0 |
| Western Grebe | 0 | 0 | 0 | 0 | 0 | 0 |
| Double-crested Cormorant | 6 | 21.4 | 4 | 14.2 | 2 | 7.1 |
| American Bittern | 1 | 3.5 | 0 | 0 | 0 | 0 |
| Least Bittern | 0 | 0 | 0 | 0 | 0 | 0 |
| Great Blue Heron | 13 | 46.4 | 6 | 21.4 | 6 | 21.4 |
| Great Egret | 4 | 14.2 | 0 | 0 | 2 | 7.1 |
| Snowy Egret | 5 | 17.8 | 2 | 7.1 | 2 | 7.1 |
| Green Heron | 7 | 25 | 7 | 25 | 1 | 3.5 |
| Black-crowned Night-Heron | 1 | 3.5 | 0 | 0 | 0 | 0 |
| White-faced Ibis | 2 | 7.1 | 0 | 0 | 0 | 0 |
| Turkey Vulture | 0 | 0 | 0 | 0 | 0 | 0 |
| Osprey | 3 | 10.7 | 1 | 3.5 | 0 | 0 |
| Northern Harrier | 3 | 10.7 | 1 | 3.5 | 2 | 7.1 |
| Sharp-shinned Hawk | 7 | 25 | 1 | 3.5 | 5 | 17.8 |
| Cooper's Hawk | 3 | 10.7 | 1 | 3.5 | 2 | 7.1 |
| Red-shouldered Hawk | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| Red-tailed Hawk | 2 | 7.1 | 0 | 0 | 2 | 7.1 |
| American Kestrel | 2 | 7.1 | 2 | 7.1 | 0 | 0 |
| Merlin | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| Peregrine Falcon | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| Prairie Falcon | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| Virginia Rail | 2 | 7.1 | 0 | 0 | 2 | 7.1 |
| Sora | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| Common Moorhen | 5 | 17.8 | 4 | 14.2 | 2 | 7.1 |
| American Coot | 22 | 78.5 | 13 | 46.4 | 19 | 67.8 |
| Semipalmated Plover | 0 | 0 | 0 | 0 | 0 | 0 |
| Killdeer | 9 | 32.1 | 5 | 17.8 | 2 | 7.1 |
| Black-necked Stilt | 2 | 7.1 | 2 | 7.1 | 0 | 0 |
| American Avocet | 2 | 7.1 | 1 | 3.5 | 0 | 0 |
| Spotted Sandpiper | 9 | 32.1 | 3 | 10.7 | 3 | 10.7 |
| Greater Yellowlegs | 4 | 14.2 | 3 | 10.7 | 2 | 7.1 |
| Lesser Yellowlegs | 1 | 3.5 | 1 | 3.5 | 0 | 0 |
| Semipalmated Sandpiper | 0 | 0 | 0 | 0 | 0 | 0 |
| Western Sandpiper | 2 | 7.1 | 1 | 3.5 | 0 | 0 |
| Least Sandpiper | 1 | 3.5 | 1 | 3.5 | 1 | 3.5 |
| Pectoral Sandpiper | 1 | 3.5 | 0 | 0 | 0 | 0 |
| Long-billed Dowitcher | 0 | 0 | 0 | 0 | 0 | 0 |
| Wilson's Snipe | 1 | 3.5 | 1 | 3.5 | 0 | 0 |
| Ring-billed Gull | 1 | 3.5 | 0 | 0 | 1 | 3.5 |

| Species | Overall | | Breeding | | Non-Breeding | |
|---|---|---|---|---|---|---|
| | Number of Survey Points | % Survey Points | Number of Survey Points | % Survey Points | Number of Survey Points | % Survey Points |
| Rock Dove | 0 | 0 | 0 | 0 | 0 | 0 |
| Eurasian Collared-Dove | 1 | 3.5 | 1 | 3.5 | 0 | 0 |
| White-winged Dove | 5 | 17.8 | 5 | 17.8 | 0 | 0 |
| Mourning Dove | 24 | 85.7 | 22 | 78.5 | 4 | 14.2 |
| Greater Roadrunner | 17 | 60.7 | 13 | 46.4 | 3 | 10.7 |
| Barn Owl | 1 | 3.5 | 1 | 3.5 | 0 | 0 |
| Great Horned Owl | 3 | 10.7 | 1 | 3.5 | 1 | 3.5 |
| Long-eared Owl | 0 | 0 | 0 | 0 | 0 | 0 |
| Lesser Nighthawk | 1 | 3.5 | 1 | 3.5 | 0 | 0 |
| Black-chinned Hummingbird | 8 | 28.5 | 7 | 25 | 0 | 0 |
| Anna's Hummingbird | 5 | 17.8 | 2 | 7.1 | 2 | 7.1 |
| Costa's Hummingbird | 2 | 7.1 | 2 | 7.1 | 0 | 0 |
| Belted Kingfisher | 10 | 35.7 | 1 | 3.5 | 3 | 10.7 |
| Red-naped Sapsucker | 0 | 0 | 0 | 0 | 0 | 0 |
| Ladder-backed Woodpecker | 2 | 7.1 | 0 | 0 | 2 | 7.1 |
| Hairy Woodpecker | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern Flicker | 16 | 57.1 | 1 | 3.5 | 15 | 53.5 |
| Olive-sided Flycatcher | 0 | 0 | 0 | 0 | 0 | 0 |
| Western Wood-Pewee | 3 | 10.7 | 2 | 7.1 | 0 | 0 |
| Willow Flycatcher | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Flycatcher | 1 | 3.5 | 1 | 3.5 | 0 | 0 |
| Dusky Flycatcher | 1 | 3.5 | 0 | 0 | 0 | 0 |
| Western Flycatcher | 1 | 3.5 | 0 | 0 | 0 | 0 |
| Black Phoebe | 27 | 96.4 | 23 | 82.1 | 24 | 85.7 |
| Say's Phoebe | 27 | 96.4 | 14 | 50 | 23 | 82.1 |
| Ash-throated Flycatcher | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown-crested Flycatcher | 0 | 0 | 0 | 0 | 0 | 0 |
| Western Kingbird | 13 | 46.4 | 9 | 32.1 | 0 | 0 |
| Loggerhead Shrike | 15 | 53.5 | 7 | 25 | 9 | 32.1 |
| Bell's Vireo | 0 | 0 | 0 | 0 | 0 | 0 |
| Solitary Vireo | 0 | 0 | 0 | 0 | 0 | 0 |
| Warbling Vireo | 4 | 14.2 | 2 | 7.1 | 0 | 0 |
| Common Raven | 1 | 3.5 | 0 | 0 | 0 | 0 |
| Horned Lark | 1 | 3.5 | 1 | 3.5 | 0 | 0 |
| Tree Swallow | 0 | 0 | 0 | 0 | 0 | 0 |
| Violet-green Swallow | 1 | 3.5 | 0 | 0 | 0 | 0 |
| Northern Rough-winged Swallow | 7 | 25 | 7 | 25 | 0 | 0 |
| Cliff Swallow | 3 | 10.7 | 1 | 3.5 | 0 | 0 |
| Barn Swallow | 0 | 0 | 0 | 0 | 0 | 0 |
| Verdin | 28 | 100 | 26 | 92.8 | 25 | 89.2 |
| Bushtit | 3 | 10.7 | 0 | 0 | 3 | 10.7 |

| Species | Overall | | Breeding | | Non-Breeding | |
|---|---|---|---|---|---|---|
| | Number of Survey Points | % Survey Points | Number of Survey Points | % Survey Points | Number of Survey Points | % Survey Points |
| Red-breasted Nuthatch | 0 | 0 | 0 | 0 | 0 | 0 |
| Rock Wren | 6 | 21.4 | 4 | 14.2 | 5 | 17.8 |
| Canyon Wren | 0 | 0 | 0 | 0 | 0 | 0 |
| Bewick's Wren | 27 | 96.4 | 27 | 96.4 | 24 | 85.7 |
| House Wren | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| Pacific Wren | 0 | 0 | 0 | 0 | 0 | 0 |
| Marsh Wren | 23 | 82.1 | 20 | 71.4 | 22 | 78.5 |
| Golden-crowned Kinglet | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| Ruby-crowned Kinglet | 25 | 89.2 | 2 | 7.1 | 23 | 82.1 |
| Blue-gray Gnatcatcher | 3 | 10.7 | 0 | 0 | 3 | 10.7 |
| Black-tailed Gnatcatcher | 28 | 100 | 22 | 78.5 | 23 | 82.1 |
| Western Bluebird | 0 | 0 | 0 | 0 | 0 | 0 |
| Mountain Bluebird | 0 | 0 | 0 | 0 | 0 | 0 |
| Hermit Thrush | 1 | 3.5 | 0 | 0 | 0 | 0 |
| American Robin | 2 | 7.1 | 0 | 0 | 2 | 7.1 |
| Northern Mockingbird | 8 | 28.5 | 5 | 17.8 | 5 | 17.8 |
| Crissal Thrasher | 25 | 89.2 | 20 | 71.4 | 18 | 64.2 |
| American Pipit | 16 | 57.1 | 3 | 10.7 | 12 | 42.8 |
| Cedar Waxwing | 0 | 0 | 0 | 0 | 0 | 0 |
| Phainopepla | 5 | 17.8 | 0 | 0 | 5 | 17.8 |
| Orange-crowned Warbler | 20 | 71.4 | 4 | 14.2 | 13 | 46.4 |
| Nashville Warbler | 1 | 3.5 | 0 | 0 | 0 | 0 |
| Virginia's Warbler | 0 | 0 | 0 | 0 | 0 | 0 |
| Lucy's Warbler | 21 | 75 | 21 | 75 | 0 | 0 |
| Yellow Warbler | 21 | 75 | 19 | 67.8 | 0 | 0 |
| Yellow-rumped Warbler | 28 | 100 | 7 | 25 | 28 | 100 |
| Black-throated Gray Warbler | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| MacGillivray's Warbler | 0 | 0 | 0 | 0 | 0 | 0 |
| Common Yellowthroat | 26 | 92.8 | 26 | 92.8 | 0 | 0 |
| Wilson's Warbler | 9 | 32.1 | 8 | 28.5 | 0 | 0 |
| Yellow-breasted Chat | 17 | 60.7 | 17 | 60.7 | 0 | 0 |
| Western Tanager | 3 | 10.7 | 2 | 7.1 | 0 | 0 |
| Green-tailed Towhee | 0 | 0 | 0 | 0 | 0 | 0 |
| Spotted Towhee | 4 | 14.2 | 0 | 0 | 2 | 7.1 |
| Abert's Towhee | 27 | 96.4 | 27 | 96.4 | 24 | 85.7 |
| Canyon Towhee | 0 | 0 | 0 | 0 | 0 | 0 |
| Chipping Sparrow | 5 | 17.8 | 2 | 7.1 | 4 | 14.2 |
| Brewer's Sparrow | 17 | 60.7 | 3 | 10.7 | 4 | 14.2 |
| Vesper Sparrow | 1 | 3.5 | 1 | 3.5 | 0 | 0 |
| Lark Sparrow | 1 | 3.5 | 1 | 3.5 | 0 | 0 |
| Black-throated Sparrow | 0 | 0 | 0 | 0 | 0 | 0 |
| Savannah Sparrow | 5 | 17.8 | 0 | 0 | 2 | 7.1 |

| Species | Overall | | Breeding | | Non-Breeding | |
|---|---|---|---|---|---|---|
| | Number of Survey Points | % Survey Points | Number of Survey Points | % Survey Points | Number of Survey Points | % Survey Points |
| Song Sparrow | 28 | 100 | 27 | 96.4 | 23 | 82.1 |
| Lincoln's Sparrow | 7 | 25 | 0 | 0 | 6 | 21.4 |
| White-crowned Sparrow | 27 | 96.4 | 9 | 32.1 | 26 | 92.8 |
| Dark-eyed Junco | 10 | 35.7 | 0 | 0 | 10 | 35.7 |
| Black-headed Grosbeak | 2 | 7.1 | 1 | 3.5 | 0 | 0 |
| Blue Grosbeak | 21 | 75 | 20 | 71.4 | 0 | 0 |
| Lazuli Bunting | 1 | 3.5 | 0 | 0 | 0 | 0 |
| Indigo Bunting | 5 | 17.8 | 5 | 17.8 | 0 | 0 |
| Red-winged Blackbird | 27 | 96.4 | 26 | 92.8 | 14 | 50 |
| Western Meadowlark | 3 | 10.7 | 0 | 0 | 3 | 10.7 |
| Yellow-headed Blackbird | 2 | 7.1 | 2 | 7.1 | 0 | 0 |
| Brewer's Blackbird | 2 | 7.1 | 1 | 3.5 | 1 | 3.5 |
| Great-tailed Grackle | 23 | 82.1 | 21 | 75 | 7 | 25 |
| Brown-headed Cowbird | 27 | 96.4 | 27 | 96.4 | 0 | 0 |
| Hooded Oriole | 0 | 0 | 0 | 0 | 0 | 0 |
| Bullock's Oriole | 4 | 14.2 | 3 | 10.7 | 0 | 0 |
| House Finch | 18 | 64.2 | 15 | 53.5 | 8 | 28.5 |
| Pine Siskin | 0 | 0 | 0 | 0 | 0 | 0 |
| Lesser Goldfinch | 13 | 46.4 | 3 | 10.7 | 5 | 17.8 |
| American Goldfinch | 2 | 7.1 | 1 | 3.5 | 1 | 3.5 |
| House Sparrow | 0 | 0 | 0 | 0 | 0 | 0 |

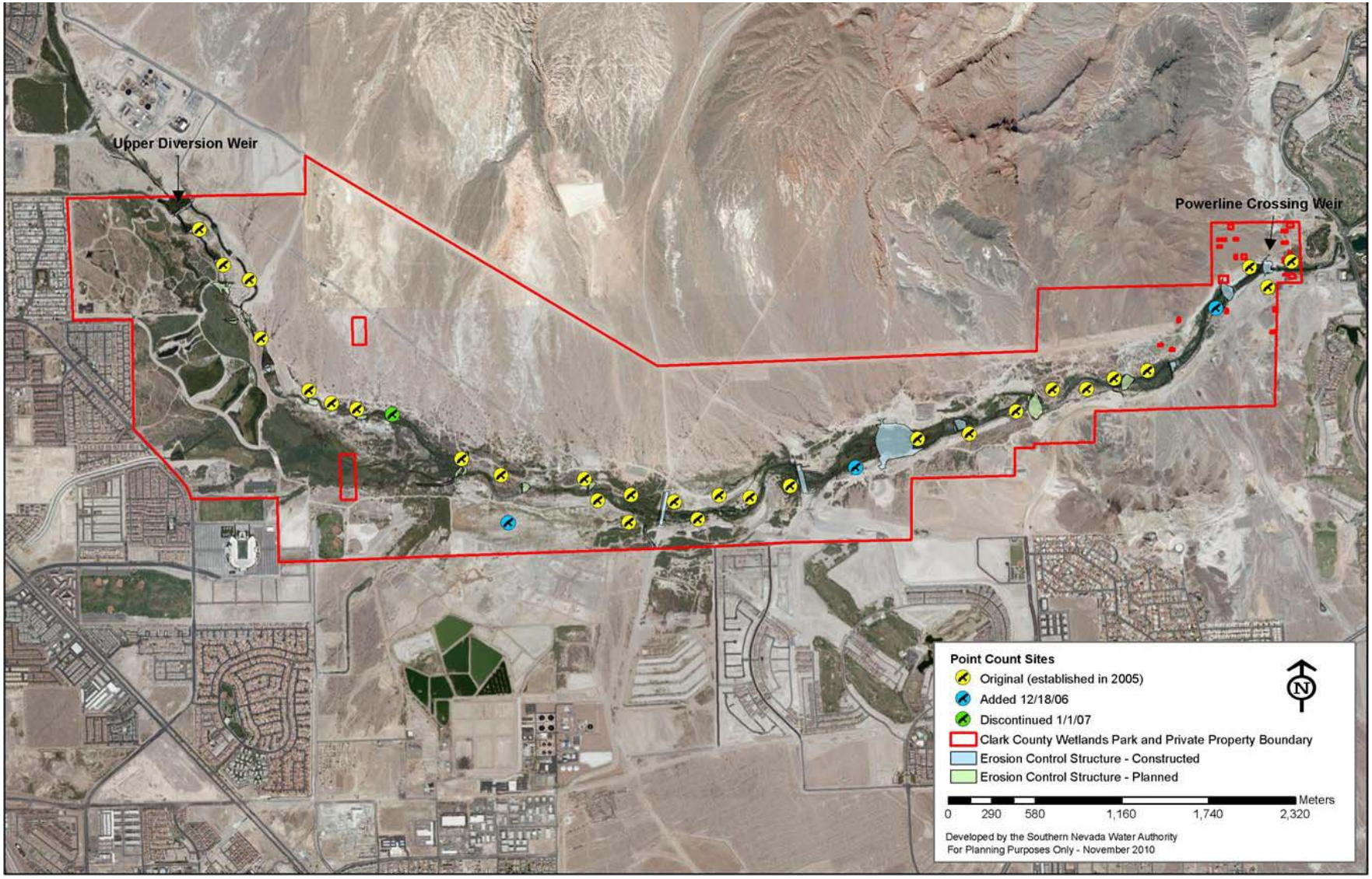


**Figure 1. Distribution of point counts across Las Vegas Wash.** Map courtesy of Southern Nevada Water Authority.

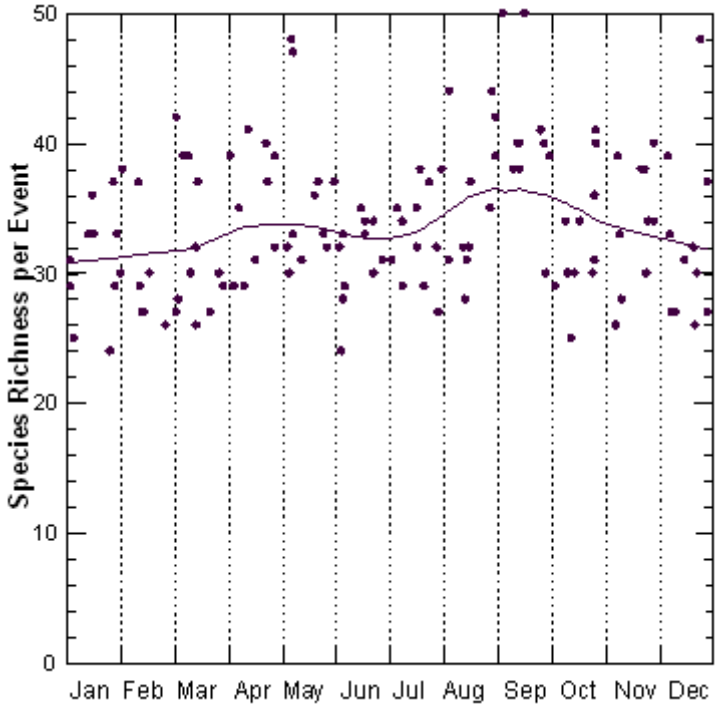


**Figure 2. Seasonal species richness per survey event from 129 surveys of the Las Vegas Wash (February 2005 – January 2010).** Curve represents best fit for variation in richness among survey events.

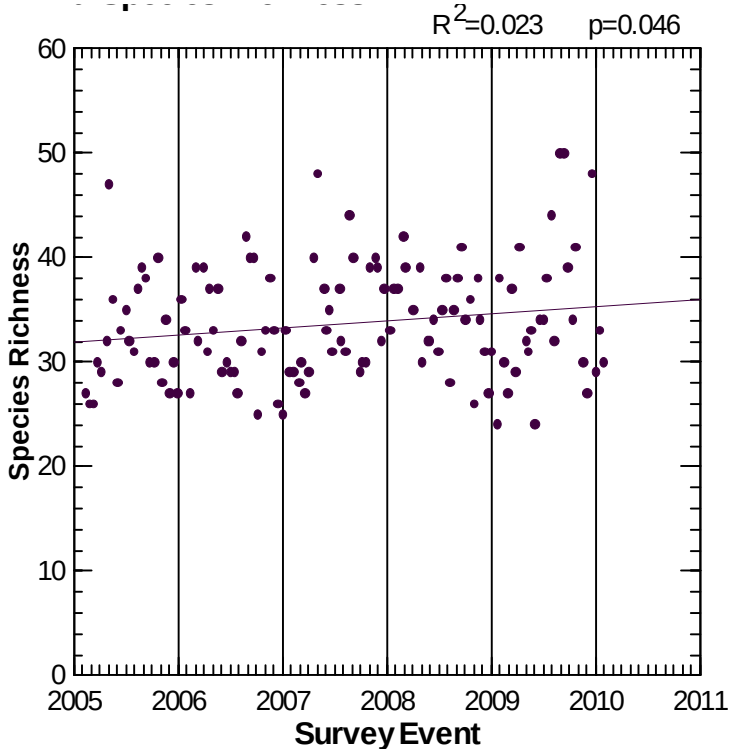


**Figure 3. Trend in species richness from 129 surveys of the Las Vegas Wash (February 2005 – January 2010).**

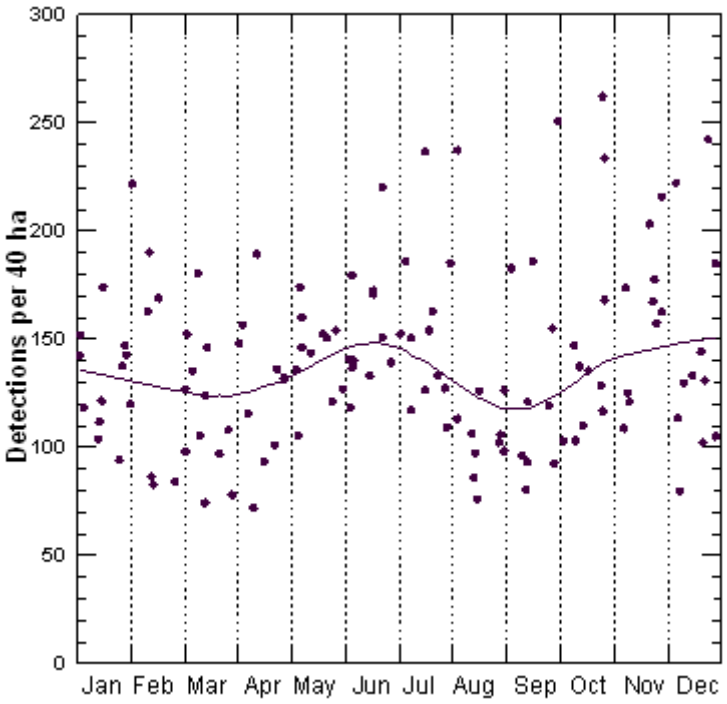


**Figure 4. Seasonal total bird abundance per survey event from 129 surveys of the Las Vegas Wash (February 2005 – January 2010).** Curve represents best fit for variation in abundance among survey events.

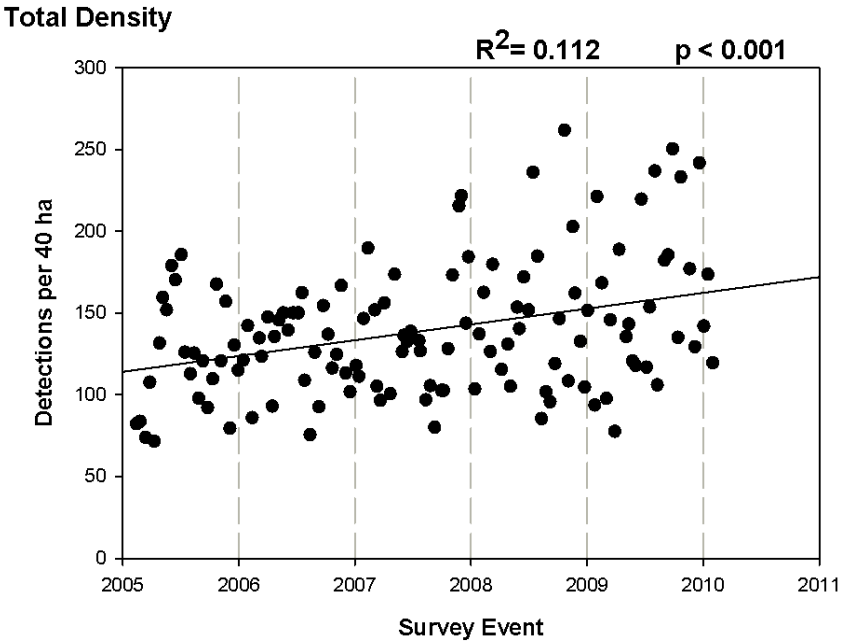


**Figure 5. Trend in estimated total bird abundance from 129 surveys of the Las Vegas Wash (February 2005 – January 2010).**

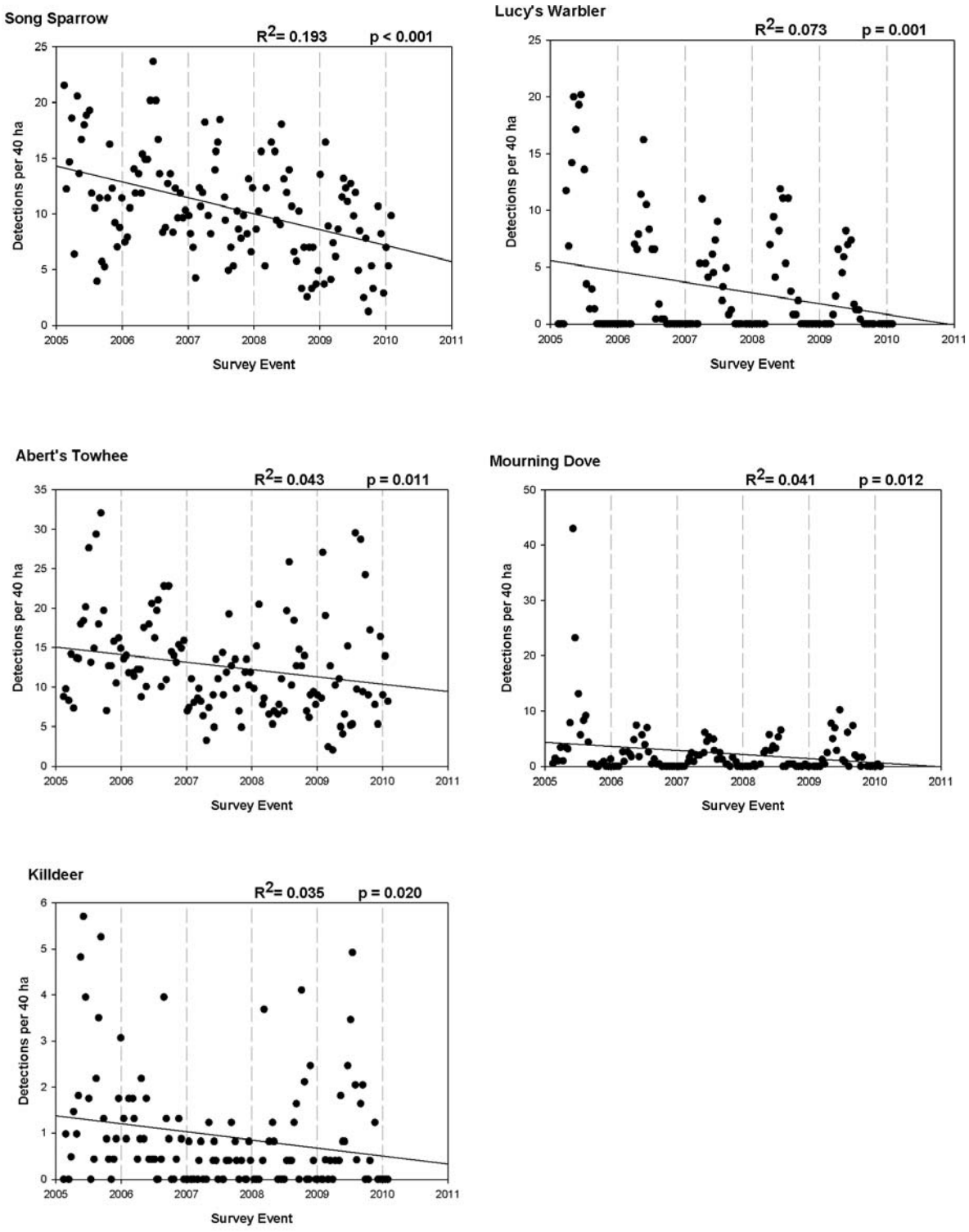


**Figure 6. Regression analyses on density estimates (bird detections per 40 ha) by survey event for the five species showing declines in the Las Vegas Wash from 12 February 2005 through 30 January 2010.** Correlations are significant at $p < 0.05$ and (approximately) $R^2 = 0.030$.

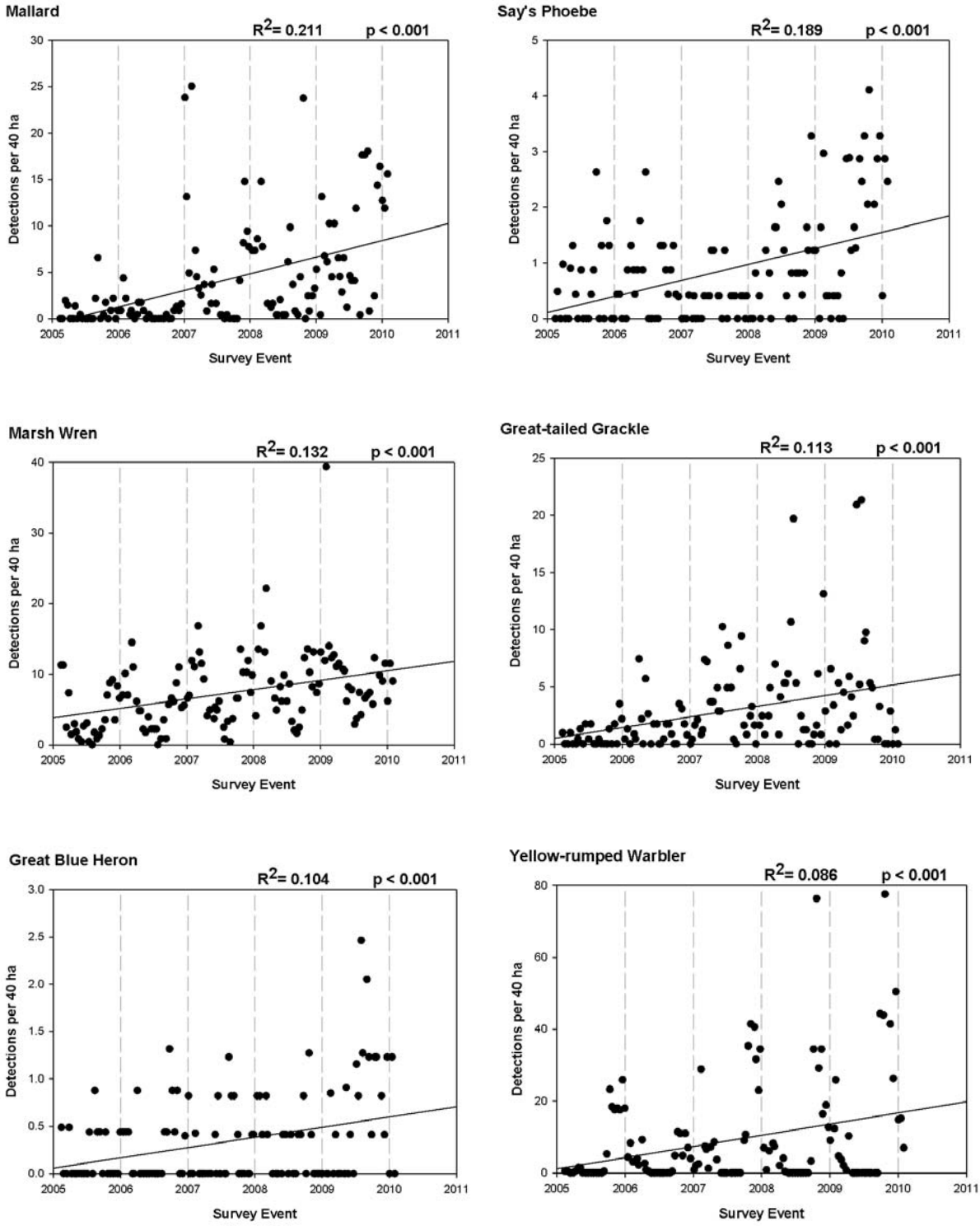


**Figure 7a. Regression analyses on density estimates (bird detections per 40 ha) by survey event for six species showing increases in the Las Vegas Wash from 12 February 2005 through 30 January 2010.** Correlations are significant at $p < 0.05$ and (approximately) $R^2 = 0.030$.

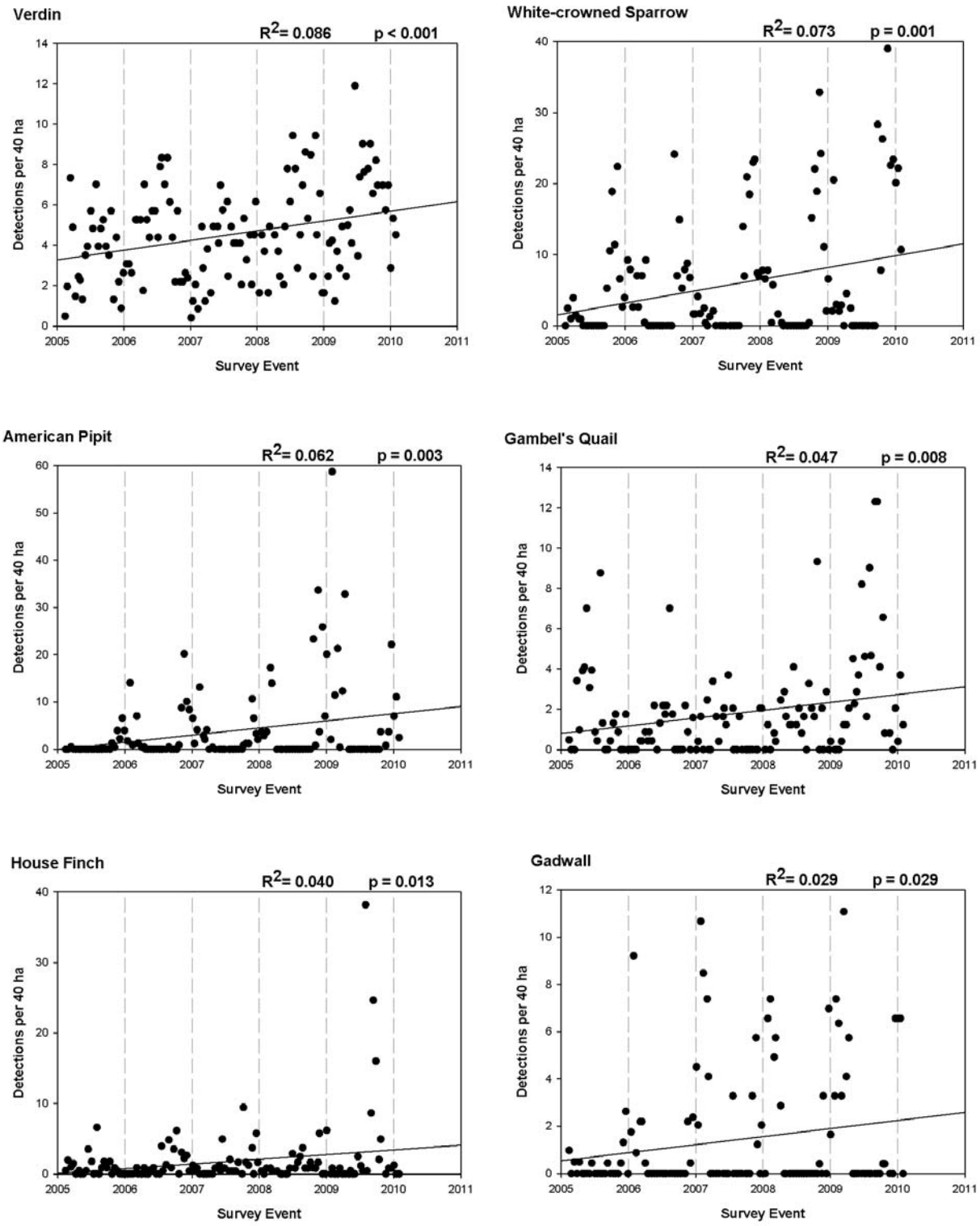


**Figure 7b. Regression analyses on density estimates (bird detections per 40 ha) by survey event for six species showing increases in the Las Vegas Wash from 12 February 2005 through 30 January 2010.** Correlations are significant at $p < 0.05$ and (approximately) $R^2 = 0.030$.

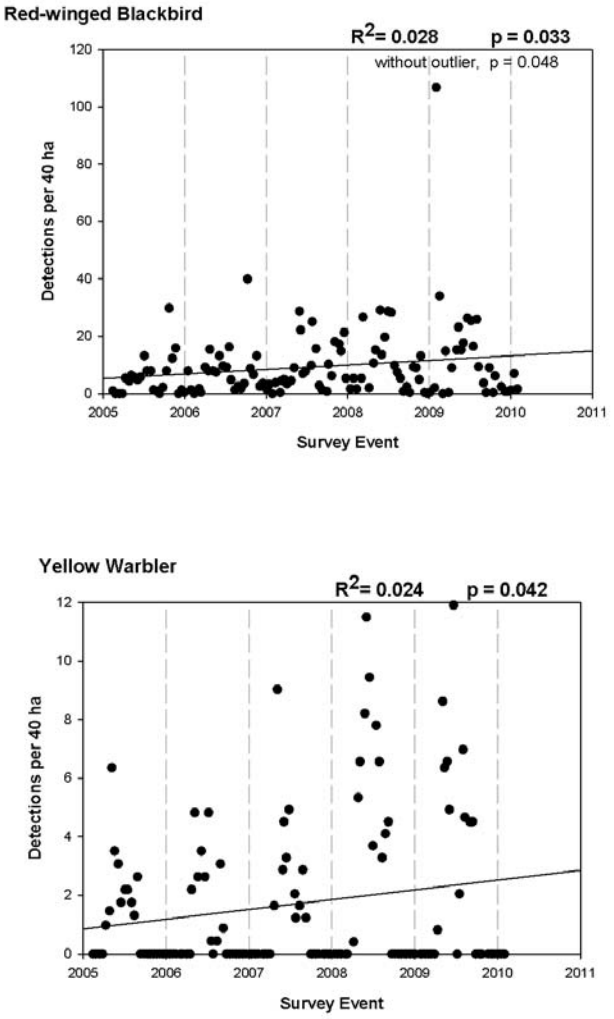


**Figure 7c. Regression analyses on density estimates (bird detections per 40 ha) by survey event for two species showing increases in the Las Vegas Wash from 12 February 2005 through 30 January 2010.** Correlations are significant at $p < 0.05$ and (approximately) $R^2 = 0.030$.

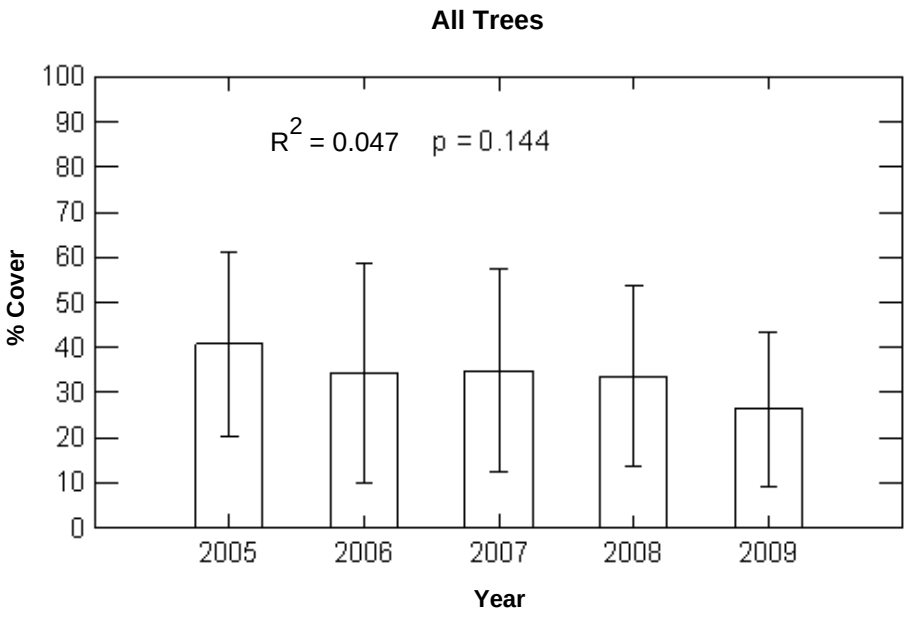


**Figure 8. Tree cover (% cover of all trees) in the Las Vegas Wash by year, 2005-2009.** Error bars represent standard deviation.

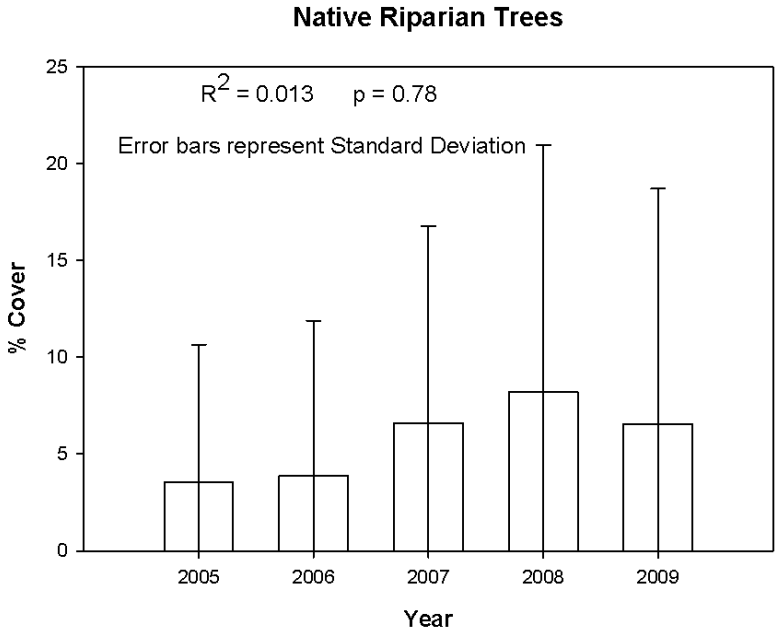


**Figure 9. Native riparian tree cover (%) in the Las Vegas Wash by year, 2005-2009.**

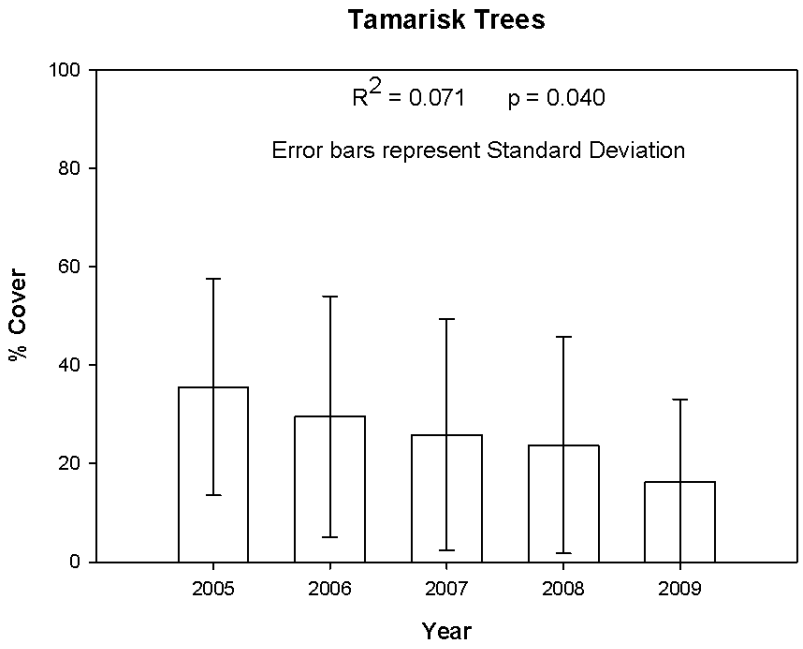


**Figure 10. Tamarisk tree cover (%) in the Las Vegas Wash by year, 2005-2009.**

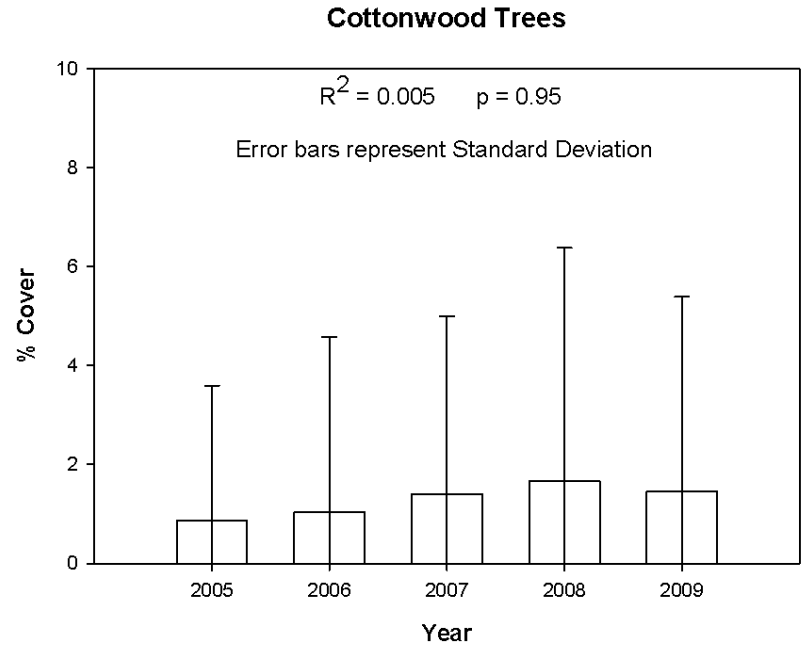


**Figure 11. Cottonwood tree cover (%) in the Las Vegas Wash by year, 2005-2009.**

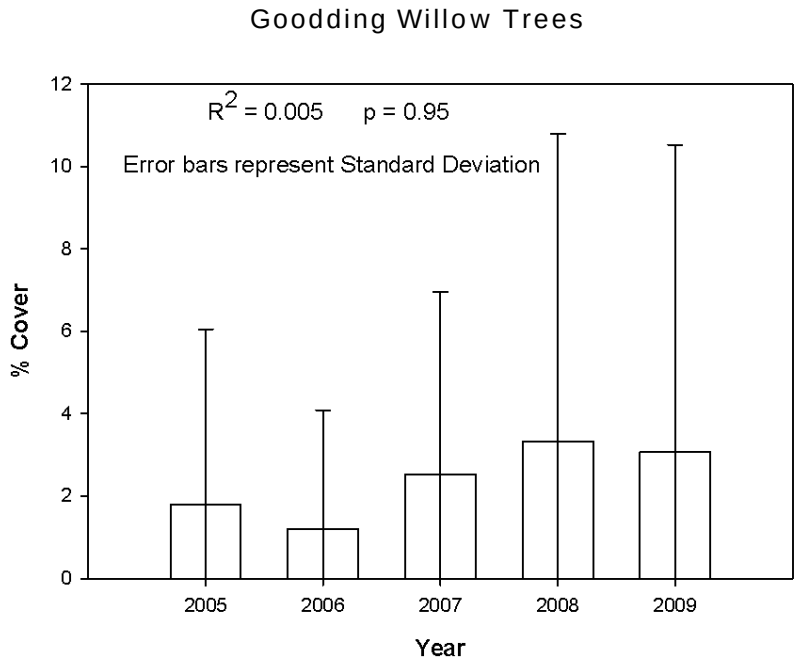


**Figure 12. Goodding willow tree cover (%) in the Las Vegas Wash by year, 2005-2009.**

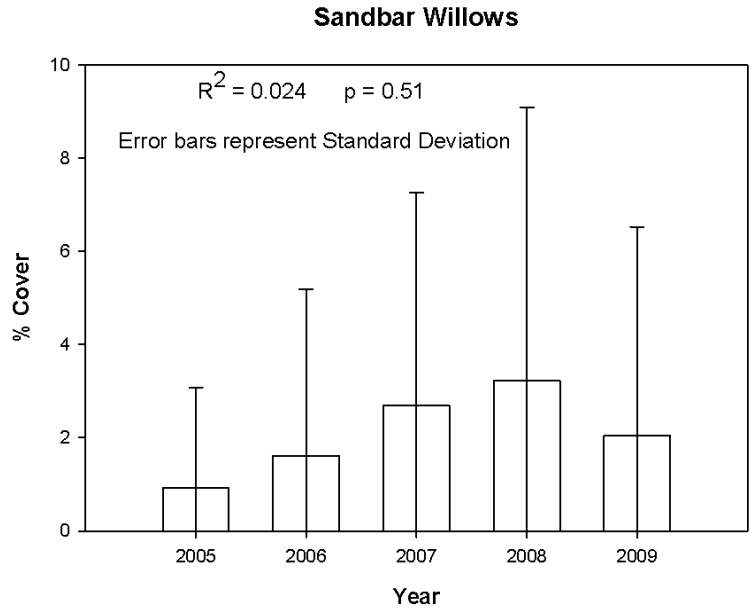


**Figure 13. Sandbar willow cover (%) in the Las Vegas Wash by year, 2005-2009.**

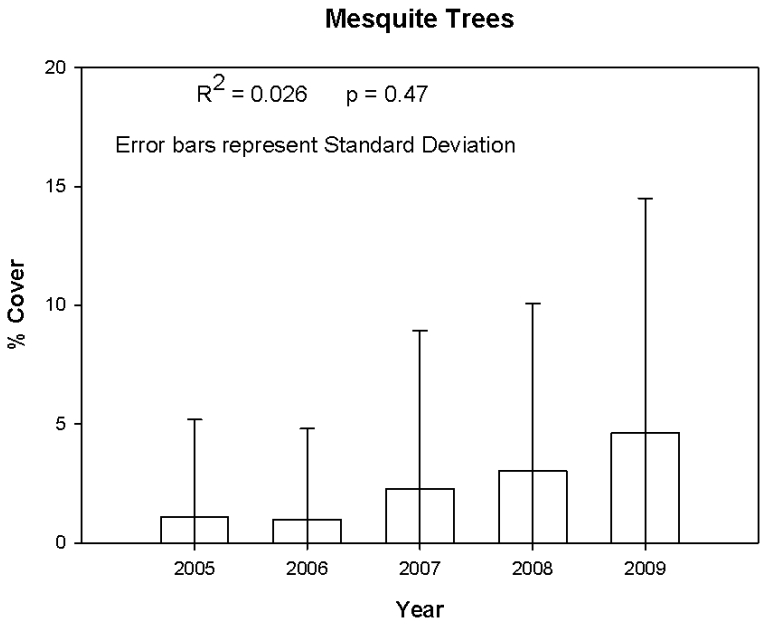


**Figure 14. Mesquite tree cover (%) in the Las Vegas Wash by year, 2005-2009.**

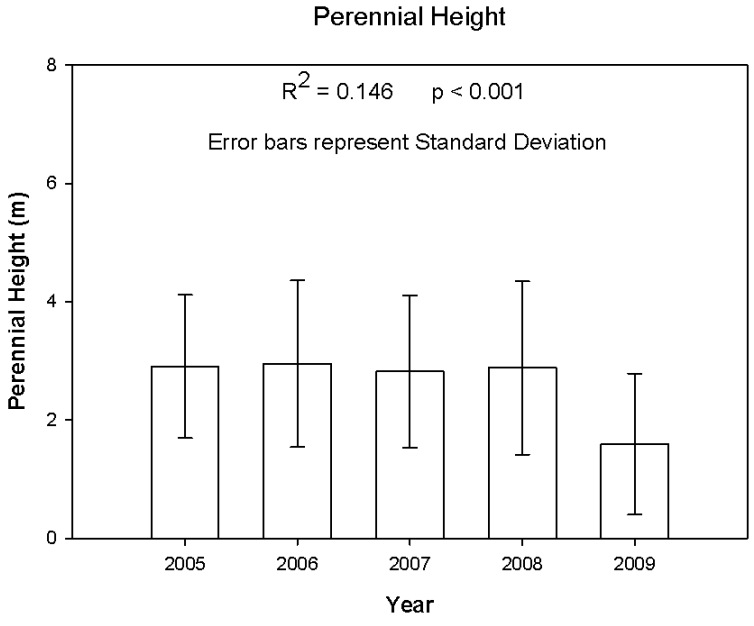


**Figure 15. Mean perennial plant height (m) in the Las Vegas Wash by year, 2005-2009.**

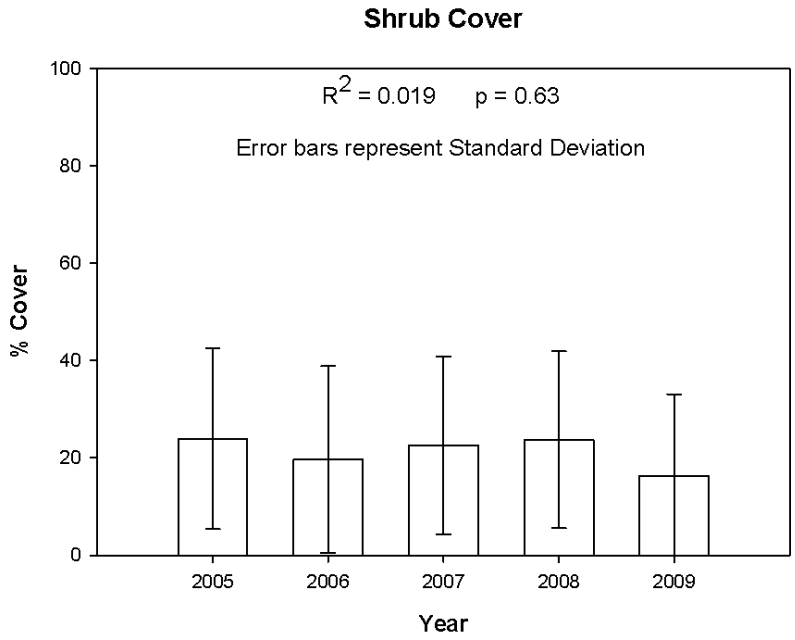


**Figure 16. Mean shrub cover (%) in the Las Vegas Wash by year, 2005-2009.**

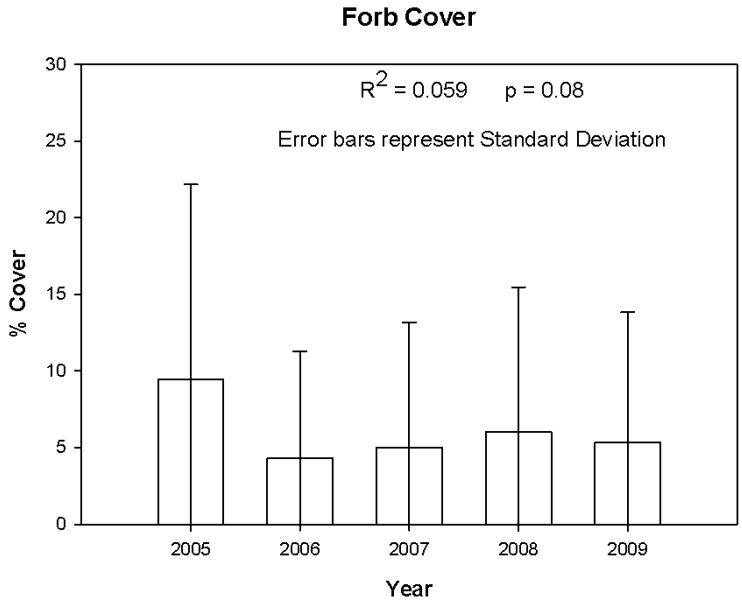


**Figure 17. Mean forb cover (%) in the Las Vegas Wash by year, 2005-2009.**

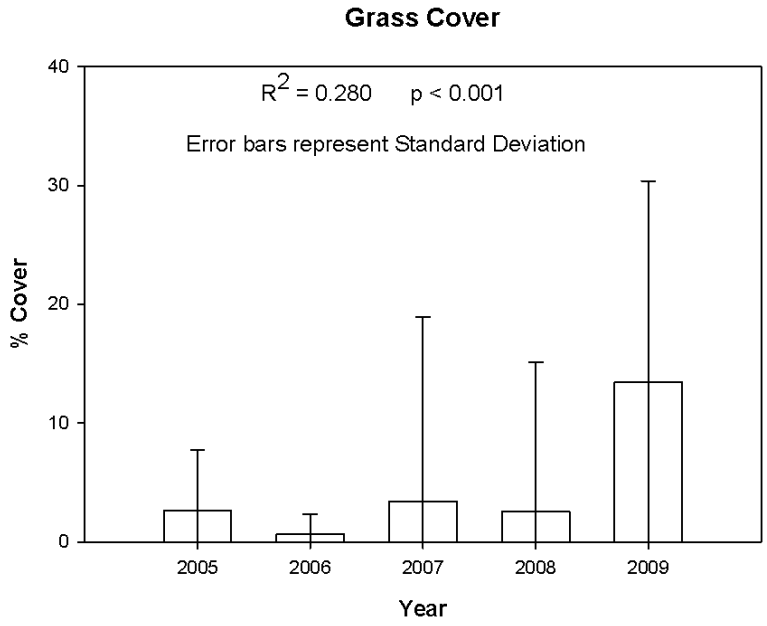


**Figure 18. Mean grass cover (%) in the Las Vegas Wash by year, 2005-2009.**

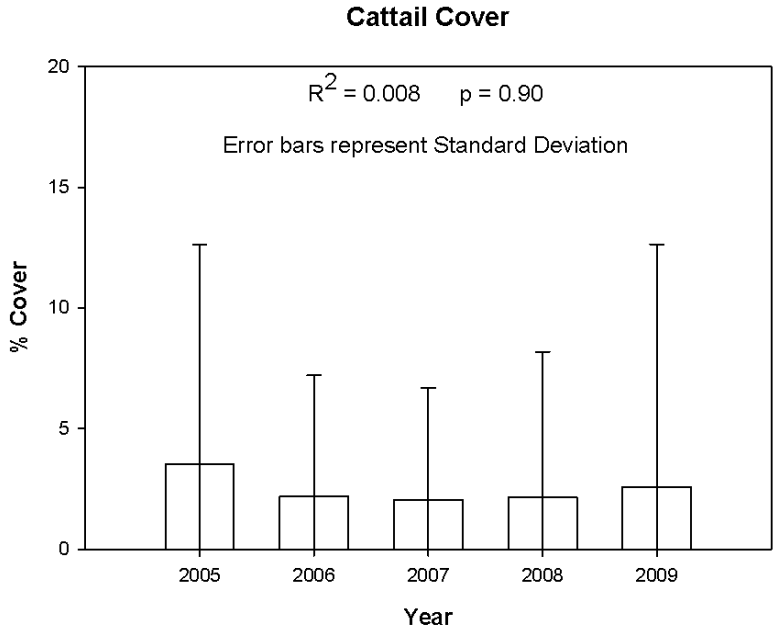


**Figure 19. Mean cattail cover (%) in the Las Vegas Wash by year, 2005-2009.**

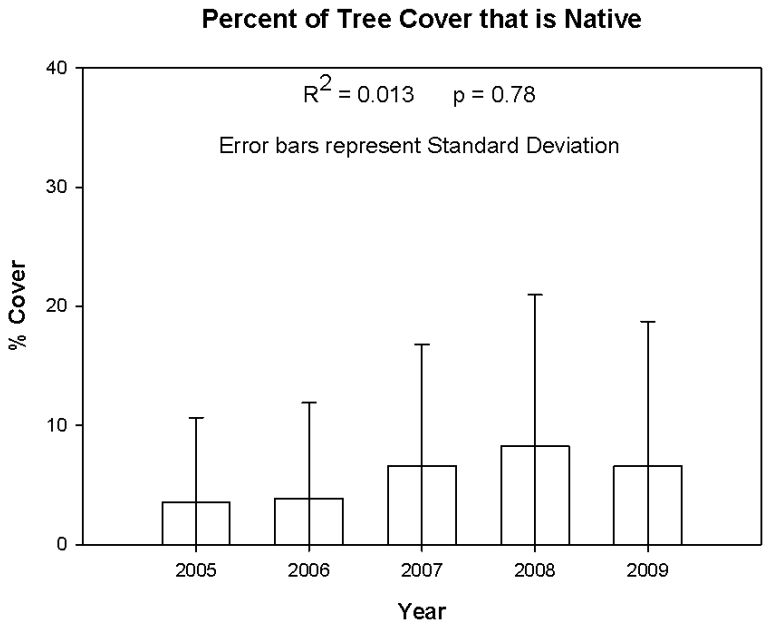


**Figure 20. Mean native proportion of tree cover in the Las Vegas Wash by year, 2005-2009.**

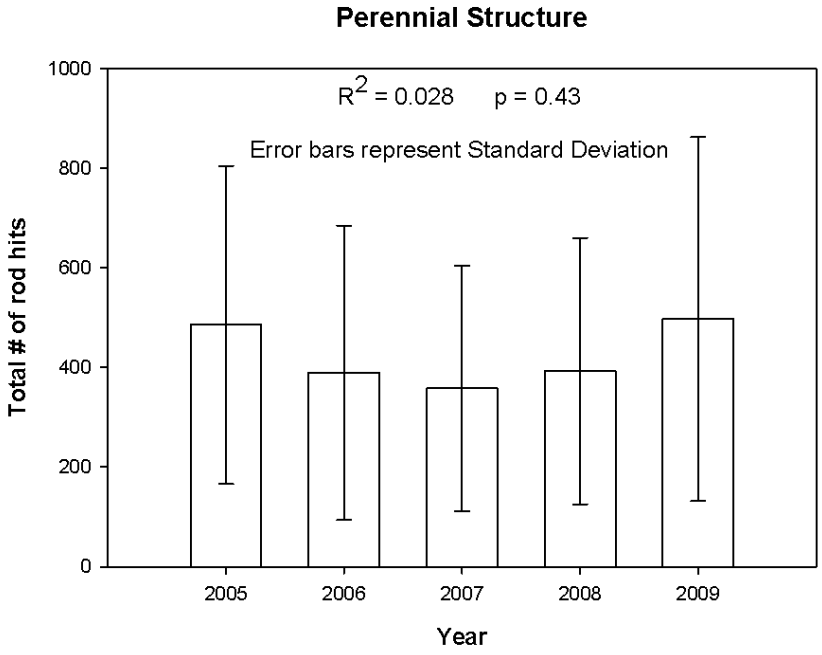


**Figure 21. Perennial plant structure (number of rod hits) in the Las Vegas Wash by year, 2005-2009.**

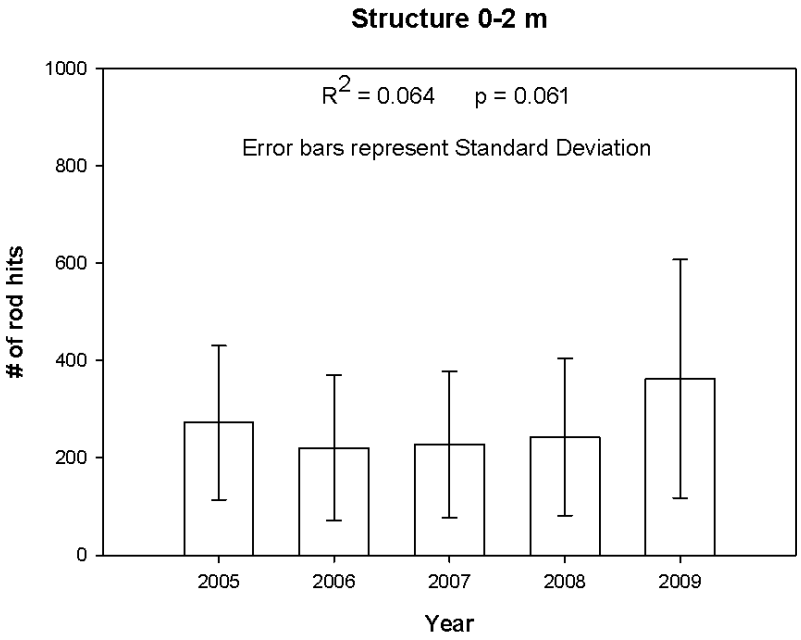


**Figure 22. Perennial plant structure in the 0-2 m height category (number of rod hits) in the Las Vegas Wash by year, 2005-2009.**

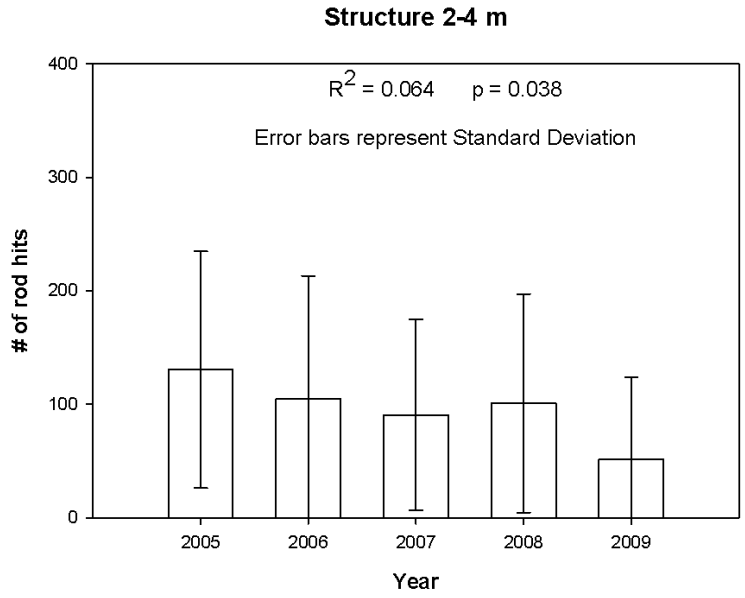


**Figure 23. Perennial plant structure in the 2-4 m height category (number of rod hits) in the Las Vegas Wash by year, 2005-2009.**

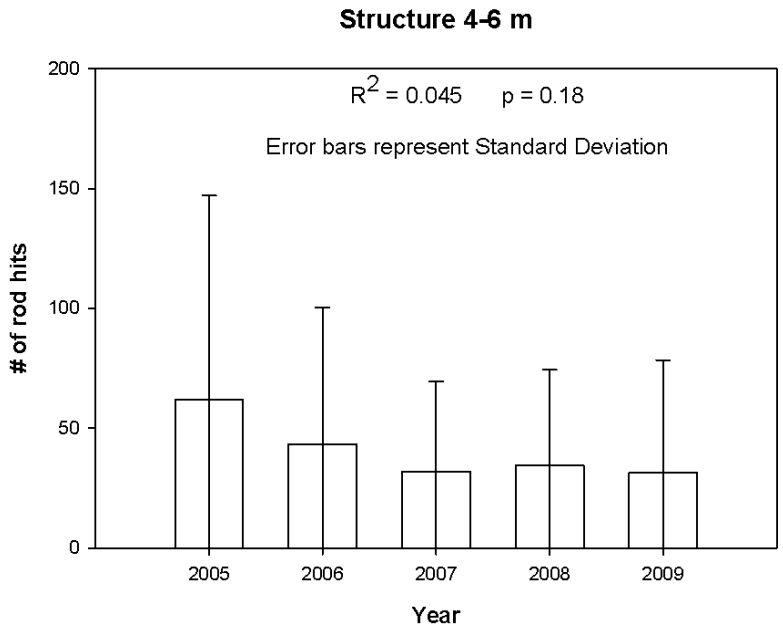


**Figure 24. Perennial plant structure in the 4-6 m height category (number of rod hits) in the Las Vegas Wash by year, 2005-2009.**

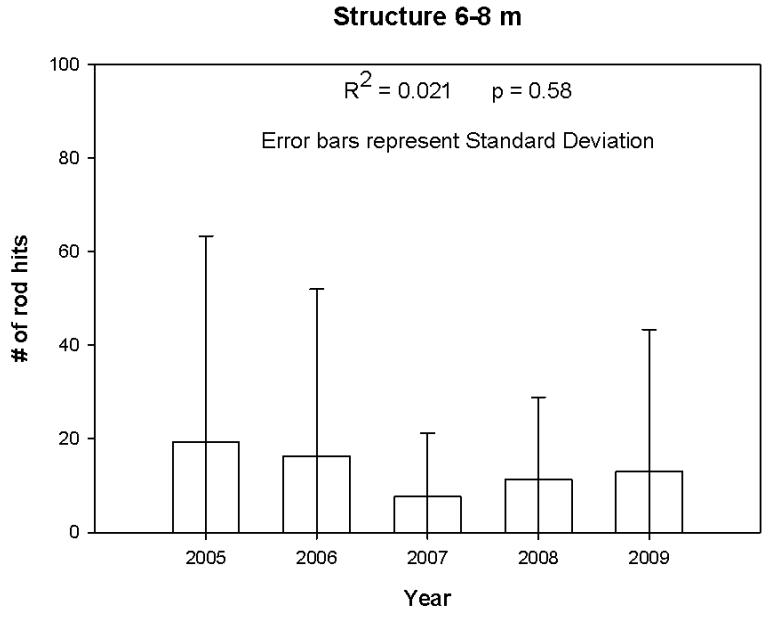


**Figure 25. Perennial plant structure in the 6-8 m height category (number of rod hits) in the Las Vegas Wash by year, 2005-2009.**

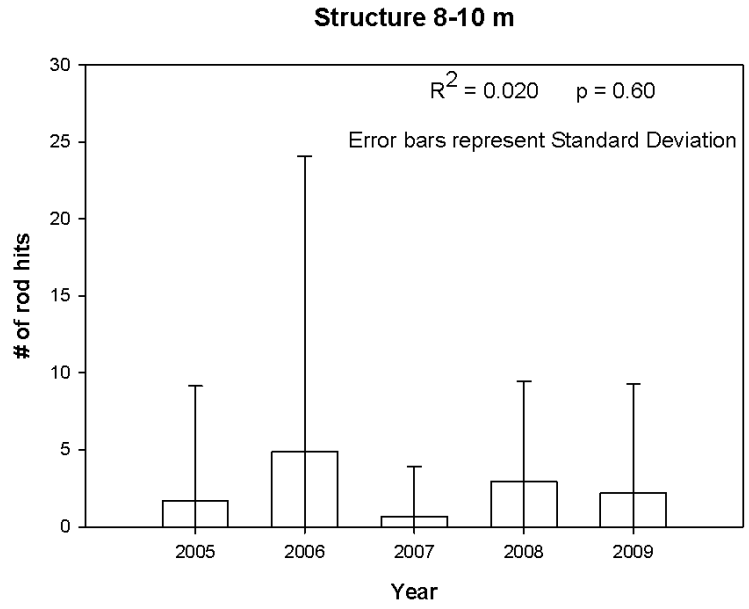


**Figure 26. Perennial plant structure in the 8-10 m height category (number of rod hits) in the Las Vegas Wash by year, 2005-2009.**

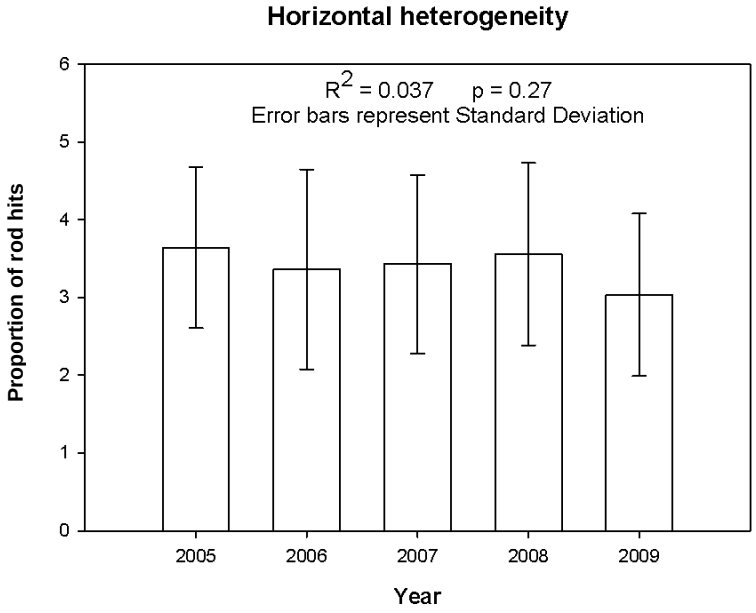


**Figure 27. Horizontal vegetation heterogeneity based on the proportional number of hits for each of six vegetation transects per survey point, in the Las Vegas Wash by year, 2005-2009.**