

Avian Diversity, Vegetation Composition, and Vegetation Structure of the Las Vegas Wash: Year One - Final Report

Prepared for:

Las Vegas Wash Coordination Committee

Prepared by:

Gerald T. Braden, Lynn Crew, and Aaron Miller

**San Bernardino County Museum
Biological Sciences Division
2024 Orange Tree Lane
Redlands, CA 92374**

August 2007

TABLE OF CONTENTS

Introduction.....	1
Methods.....	2
Results.....	6
Discussion.....	12
Recommendations.....	13
Literature Cited.....	14

FIGURES

Figure 1: Study area and avian census point locations in the Wash.....	3
Figure 2: Average number of bird species (richness) per census event (2a) and average number of individuals (abundance) detected per census event (2b) at 29 census points in the Wash.....	7
Figure 3: Average total and seasonal avian richness (3a) and abundance (3b) at 29 census points in the Wash.....	8
Figure 4: Average perennial cover for habitats at 29 census points in the Wash.....	9
Figure 5: Average physiognomic cover classes for habitats at 29 census points in the Wash.....	9
Figure 6: Vertical (6a) and horizontal (6b) perennial structural heterogeneity for habitats at 29 census points in the Wash.....	10
Figure 7: Regression of tamarisk (7a) and native broadleaf (7b) perennial cover with mean perennial height for habitats at 29 census points in the Wash.....	11
Figure 8: Regression of tamarisk (8a) and native broadleaf (8b) perennial cover with perennial structure (vegetation hits) for habitats at 29 census points in the Wash.....	11

TABLES

Table 1: Overall, breeding, and non-breeding rank order of bird species abundances after 26 point-count sessions at 29 census stations along the Wash..... 15

Table 2: Overall, breeding, and non-breeding rank order of bird species frequencies after 26 point-count sessions at 29 census stations along the Wash..... 21

APPENDICES

Appendix 1: UTM coordinates (WGS84) for bird census point-count monitoring stations along the Wash..... 27

Appendix 2: Abundance and frequency of all bird species observed after 26 point-count sessions at 29 census stations along the Wash..... 29

INTRODUCTION

The lower Las Vegas Wash (Wash) is located on the southeastern side of the Las Vegas Valley, flowing west to east through Las Vegas and Henderson, Nevada and terminating at Lake Mead. Historically, the Wash was an ephemeral stream, draining spring flows and periodic storm flows from the Las Vegas Valley to the Colorado River. The Wash drainage has since been modified by significant land use changes associated with urbanization and industrialization. The discharge of highly treated wastewater and urban runoff as a result of the valley's increasing population has turned the Wash into a perennial stream. These flows, which began with the initial discharge of treated wastewater in the 1950s, created over 2000 acres of wetlands by the 1970s. However, over subsequent decades, increasing stream flows from urban sources and large storm events resulted in significant channel head cutting beginning at Lake Mead and moving west up the Wash. The wetlands were eroded to less than 200 acres.

The Las Vegas Wash Coordination Committee (LVWCC), a multi-agency and citizen stakeholder group, was created in 1998 to stabilize and enhance the Wash. By 2000, the LVWCC had prepared the Las Vegas Wash Comprehensive Adaptive Management Plan (CAMP), which outlined a strategy for achieving this mission. This plan describes activities to be conducted to reduce head cutting in the Wash. These activities include constructing 22 erosion control structures perpendicular to the Wash channel, 10 of which are currently in place, and lining sections of the channel with riprap to stabilize the banks. As a result, stream flow will be distributed more evenly across the channel and at reduced velocities. Intensive revegetation plans were devised and are being executed by the Las Vegas Wash Project Coordination Team (Wash Team), the implementation arm of the LVWCC, to mitigate the impacts of erosion control construction. Nearly 200 acres will need to be revegetated with native plants to mitigate the impacts of the stabilization program. Revegetation efforts, planned and implemented coincident with the placement of erosion control structures, are an ongoing effort. The Wash Team also conducts revegetation activities in association with grants, through which they are planting approximately 200 additional acres of wetland, riparian and upland habitat along the Wash.

Bank stabilization, channel modifications, and revegetation efforts in the Wash are directed towards stabilizing the channel and improving the ecological function of the waterway. These activities will also enhance wildlife and recreational resource values. Associated with these efforts is the need to define baseline wildlife resources and to monitor improvements to those resources through time. Together, baseline information and long-term monitoring are essential elements to determining the success of the stabilization and enhancement project. Additionally, the CAMP directs the Wash Team to develop a management plan for the fish and wildlife of the Wash. Consequently, the Wash Team has conducted or directed others to conduct extensive monitoring of the biological resources along the Wash, including amphibian, bat, fish, reptile, and small mammal surveys, as well as an ongoing avian monitoring program, to establish baseline inventories.

As of 2004, avian monitoring in the Wash was limited to a modified area search bird census conducted at a single site, the Bostick Weir. Although this census presented a detailed picture of the avian community at that site, baseline information and long-term monitoring were still needed for the avian community along the length of the lower Wash. Such monitoring would be necessary to provide data on how stabilization efforts were affecting birds along the

entire project area. Additionally, it would provide greater opportunity to detect federally endangered or threatened species, such as the Southwestern Willow Flycatcher and Yuma Clapper Rail, should they appear in the Wash.

Consequently, San Bernardino County Museum biologists were contracted by the Wash Team in 2005 to initiate avian and vegetative data collection at multiple sites along the lower Wash. The resulting data serve two purposes. First, the data define the baseline avian and habitat resources. Second, the data sets enable future monitoring to evaluate changes in avian and habitat resources as the bank and channel stabilization and revegetation efforts proceed. This document reports on the first year of data collection.

METHODS

Study Area - The linear study area covers approximately 8.7 kilometers of the Wash (Figure 1). Habitats in the study area are a complex mix of creosote dominated Mojave Desert upland scrub and wet linear desert riparian. Tamarisk (*Tamarix ramosissima*), an invasive, non-native species, occurs the length of the study area and is the dominant perennial. Common reed, (*Phragmites australis*), also an invasive non-native species, occurs extensively as well. Lesser amounts of native vegetation are also present. Conspicuous native vegetation includes but is not limited to Goodding's willow (*Salix gooddingii*), sandbar (aka narrow-leaved) willow (*S. exigua*), seep willow (*Baccharis salicifolia*), Fremont cottonwood (*Populus fremontii*), honey mesquite (*Prosopis glandulosa*), screwbean mesquite (*P. pubescens*), arrowweed (*Pluchea sericea*), cattail (*Typha domingensis*), bulrush (*Schoenoplectus spp.*), saltgrass (*Distichlis spicata*), and native forbs. Native broadleaf perennials are largely restricted to revegetation areas.

Habitat disturbances in the form of dirt roads, illegal trash dumping, and homeless encampments are found throughout the study area. Temporary habitat clearing, associated with channel stabilization projects and the preparation of revegetation plots, is for the most part confined to the lower half of the study area at the present time.

Avian Data Collection - Avian data were collected using a standard five-minute point-count methodology (Ralph and Scott 1981, PSW 1995, Braden 1997). Censuses consisted of five-minute counts of all birds seen or heard within a 100 m radius of each point. There were a total of 29 census points spread strategically across the Wash (Figure 1, Appendix 1). Census points were placed at locations where erosion control structures were already in place, at locations where erosion control structures are planned for future years, at revegetation locations, and at locations with as yet undisturbed vegetation, usually tamarisk dominated. In short, census points were distributed to capture the present and anticipated habitats associated with present and planned channel modifications and revegetation efforts.

Censuses were conducted from sunrise to 10:00 AM PST and were coincident with the dawn chorus. The 29 census points were censused every two weeks. One complete census required two consecutive days to sample all 29 points, hereafter referred to as a census event. The order in which the points were sampled was rotated between census events to minimize potential temporal autocorrelation. Data collection for the census events was limited to two observers to minimize observer bias. Observers alternated data collection among the census

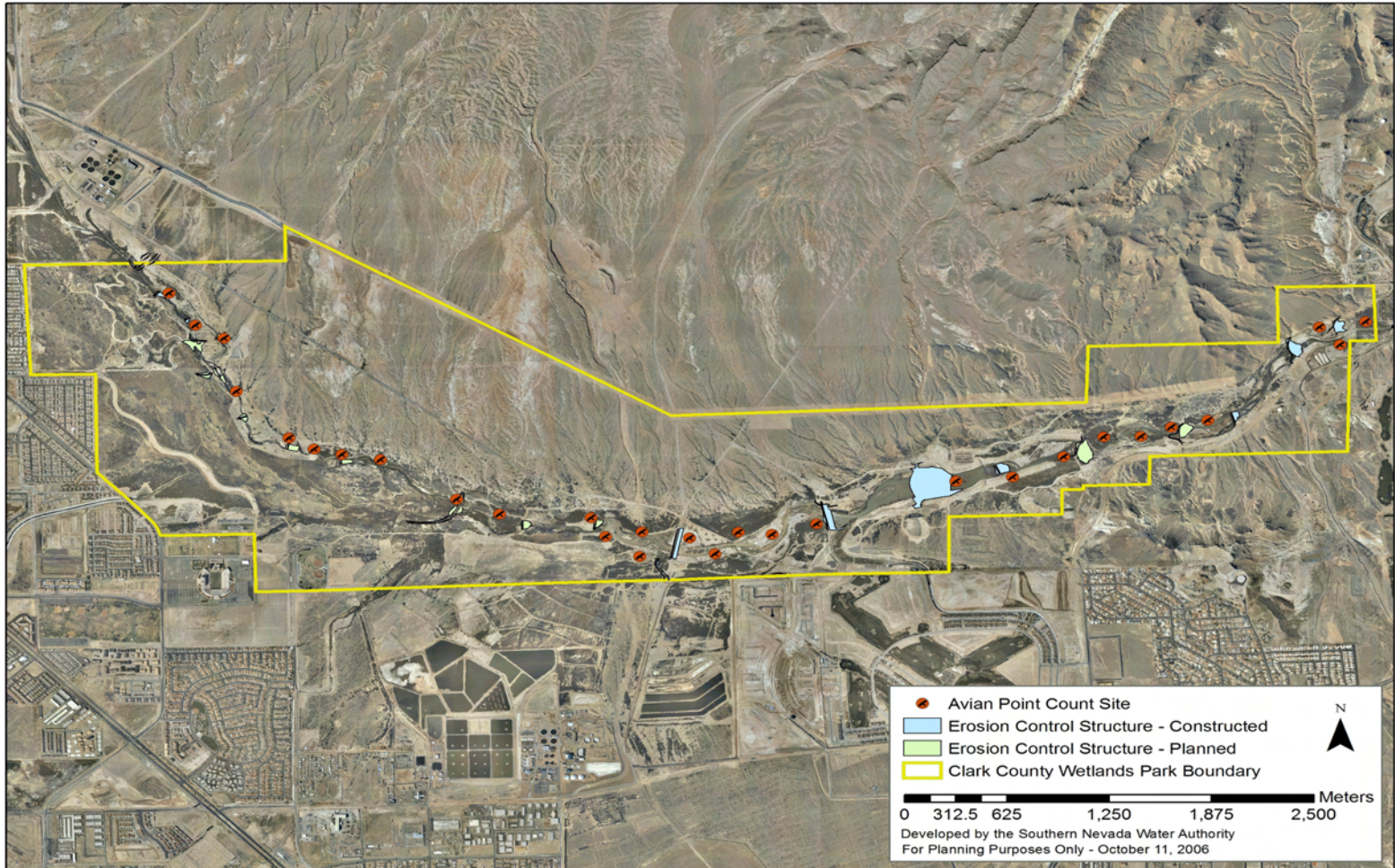


Figure 1: Study area and avian census point locations in the Wash.

events. Both observers had a minimum of 10 years experience identifying southwestern avian species by sight and sound, previous experience with the census methodology, and were familiar with the study area. There were 26 census events used in this report. Census events cover the period from 12 February 2005 through 29 January 2006.

Avian Analyses - Analyses of the avian data are necessarily preliminary, as the data cover just a single year. Avian analyses are focused on describing the baseline avian community diversity, the abundance of individual species, and the spatial and temporal distribution of bird diversity in the Wash.

Avian community diversity - Avian community diversity is defined as the number of species (richness) and the number of birds (abundance) for each census event plotted against time. The purpose is to graphically (and quantitatively) examine the number of species and individuals using Wash habitats at specific points in time for the first year of data collection. The number of species was calculated as the number of species detected per census event. The number of individuals was calculated as the total number of unique individuals per census event using the 29 points as the sample units.

Avian diversity was also examined seasonally, specifically the breeding and non-breeding seasons. The breeding season was somewhat arbitrarily defined as the period from 15 March through 31 August. The breeding season was defined on the basis of the time of year when resident and migrant bird species that breed in Wash habitats were most likely to be present and breeding. The breeding season as defined will include migrant species that migrate through the Wash but are not known to breed in the Wash. The non-breeding season was defined as the period from 1 October through 31 January. The non-breeding season was conservatively defined based on the time of year when overwintering birds would most likely be present and resident birds would likely not be breeding. February and the first two weeks of March were not included in the breeding or non-breeding seasons periods because breeding resident species coincident with overwintering migrant species confound any seasonal definition (breeding/non-breeding) during this time period. September was not included in the seasonal analyses because resident birds, such as Verdin, Black-tailed Gnatcatcher, and Abert's Towhee, to mention a few, can have extended breeding periods, overlapping with migratory (non-breeding) periods of the migratory species. Average richness and abundance for the breeding season were calculated as the average number of species and average number of individuals respectively among census events between 15 March and 31 August. Average richness and abundance for the non-breeding season were similarly calculated for the pre-defined non-breeding season.

Individual species abundances, spatial distribution, and temporal distribution - Individual species' abundances were compiled as absolute and relative abundances for the entire year, the breeding season, and the non-breeding season. The breeding and non-breeding seasons have been previously described and provide the temporal (seasonal) component to the analyses. Absolute abundances were calculated as the sum of the maximum number of individuals observed at each of the 29 census points for the given period (e.g. overall, breeding, and non-breeding periods). Absolute abundance is a conservative measure of the total number of unique individuals of a species observed for the given time periods.

Relative abundance was calculated as a percentage of all the individuals observed for the given time periods that could be attributed to each species. Relative abundance is a measure of how evenly individuals are distributed among the species present during the given time periods.

Absolute and relative frequencies are measures of how widely a species was distributed across the Wash and provide the spatial component to the analyses. Relative frequency was calculated as the percentage of census points out of 29 where a specific species was detected during the given time periods. Absolute frequency is the sum of the total number of census points where a species was detected during the given time period.

Data analyses considerations - The standard point-count methodology calls for excluding birds that fly over a census point from any analyses and, for excluding birds that were detected > 100 m from the census points. The rationale for excluding birds that flew over the census points is to reduce the possibility of double-counting birds and bird species that may occur at two or more census points during a census event. The rationale for excluding birds detected > 100 m from the census points is to reduce detection biases. These approaches are justified in that errors in abundance, occurrence, and frequency are controlled or at least minimized to the extent possible, an important consideration for accurate inferential comparisons. The down side of this conservative approach is that some predominately aerial species, such as swallows, swifts, ducks and raptors can be under counted or worse, not counted at all.

Choosing only one of the two approaches in counting birds conflicts with different objectives of this study. On the one hand, the study is designed to establish quantitative data sets suitable for inferential comparisons and long-term monitoring. This objective requires a conservative approach to data collection that minimizes double counting and ameliorates differences in species' detectability. On the other hand, a second objective of this study is to document all species known to utilize the Wash, favoring the more liberal approach. The conflict between having data suitable for inferential comparisons versus a total accounting of species richness was solved by doing both. Appendix 2 documents the relative abundance and frequency for all species observed, including those that flew over the census point(s) during the standard five minute count and those species > 100 m from the census points. In short, Appendix 2 is a list of all species observed in the Wash within the time period covered by this report. Analyses presented in the tables and figures of this document are based on the conservative approach. Specifically, the numbers, occurrence, and frequencies were calculated on data sets that excluded birds that flew over the census points and those birds detected beyond the 100 m count radius.

Vegetation Data Collection - Vegetation (habitat) data were collected to define the baseline conditions at the census points and to document changes in vegetation coincident with channel modifications and subsequent revegetation efforts. Vegetation data collections were designed to quantify vegetative characteristics that are known or suspected of influencing bird diversity. More specifically, perennial species composition, the distribution of perennial structure in horizontal and vertical space, and the heterogeneity (patchiness) of perennial structure in horizontal and vertical space can reasonably be expected to influence bird species diversity coincident with channel modifications and subsequent revegetation efforts.

Vegetation measurements were obtained in September of 2005. Vegetation data were collected using six 20 m transects at each census point. Three transects were arrayed in a radial

pattern at 120 degree angles, initiating 20 m distant from the census point. The remaining three transects were appended 20 m past the distal ends of the first three transects for a total of six transects per census point. Perennial species occurrence, perennial height, and vertical perennial structure were recorded at 2 m intervals along each 20 m transect, for a total of 60 stations per census point. Perennial height was measured to within 0.1 m using a 9.5 m survey rod. Perennial height accuracy was limited to 0.5 m when perennial height exceeded the height of the survey rod, which was an infrequent occurrence. Perennial structure was measured as the number of vegetation contacts (hereafter referred to as hits) at 1 m vertical intervals along the survey rod.

Vegetation Analyses - Vegetation data were analyzed to calculate variables that described the perennial composition, physiognomy, vertical and horizontal structure, and the present influence of native broadleaf versus tamarisk on perennial height and structure for the Wash.

Perennial composition at the census point was expressed as the percentage cover out of 60 sampling stations associated with individual tree species. Perennial cover of the Wash was calculated as the average cover for each species of tree using the census point as the sample unit.

Cover types were used to describe the physiognomy of the Wash. Cover types consisted of trees, shrubs, forbs, grasses, and cattails expressed as a percentage of the 60 sampling stations per census point. Cover types for the Wash were calculated as the average physiognomic cover types using the census point as the sample unit.

Vertical structure was calculated by summing the number of rod hits at the 60 sampling stations in 2 m foliage height classes beginning with the 0 - 2 m foliage height class and ending with the 8 - 10 m height class. Vertical foliage structure and heterogeneity for the Wash were calculated by summing hits within vertical foliage height classes for the 29 census points.

Horizontal perennial structure and heterogeneity were assessed using the proportional diversity formula $1/\sum p_i^2$ (Hill 1973) where p_i is the proportion of perennial rod hits at each of six transects per census point. The result is a value from one to six. Proportional distribution values increase as the distribution of perennial structure becomes more evenly distributed in horizontal space. Horizontal perennial structure and heterogeneity of the Wash were assessed by plotting the proportional diversity indices for each of the 29 census points.

Relative contributions of non-native and native perennial (tree) species to the composition and structure of habitats in the Wash were assessed by plotting mean perennial height and total rod hits against tamarisk cover and native broadleaf cover using the census point as the sample unit. A significant linear relationship is an expression of whether native and/or non-native perennial tree species dominate the perennial composition and structure of Wash habitats. The correlation coefficient is an indicator of the strength of that dominance. The purpose for these comparisons is to track changes in the relative contribution of native versus non-native tree species to Wash habitats as clearing and revegetation efforts continue.

RESULTS

Avian Analyses

Avian community diversity – Total species richness per census is graphed in Figure 2a. Except for a peak in species richness in early May approaching 50 species per census event, species

richness was relatively stable across the one year of data collection. The peak in species richness in early May likely corresponds to a temporary influx of migratory species. Total abundance of birds per census event indicated a large degree of inherent variation (Figure 2b). The lowest abundances occurred in February through late April. The highest sustained abundances occurred from May through August. Abundances during this period were likely due to spring and fall migration and annual breeding season productivity.

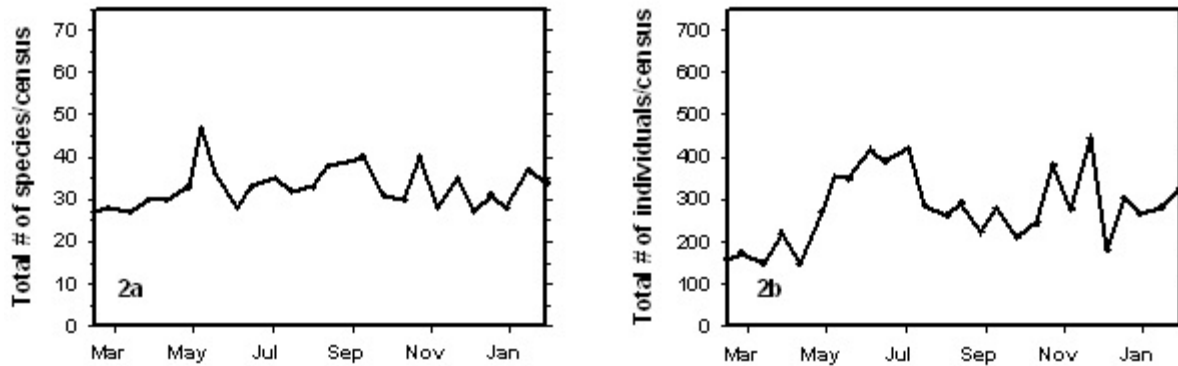


Figure 2: Average number of bird species (richness) per census event (2a) and average number of individuals (abundance) detected per census event (2b) at 29 census points in the Wash.

Average total, breeding, and non-breeding species richness are plotted in Figure 3a. Small differences in average total, breeding, and non-breeding species richness per census event were not significant ($F = 0.616$, $d.f. = 2$, $P = 0.545$), indicating no seasonal differences in the average number of species per census. At any season of the year there were on average 33.0 (std = 4.93, $n = 26$) species observed per census event. The same pattern was evident in bird abundances (Figure 3b). On average, 281.3 (std = 84.4, $n = 26$) individual birds were observed per census event with no significant differences among groups (seasons) ($F = 0.351$, $d.f. = 2$, $P = 0.706$). Results indicate the Wash supports a large number of species and individuals year round.

Individual species abundances, seasonal abundance, and spatial distribution - Overall, point count censuses detected 114 species (129 species including flyovers [Appendix 2]) and 1,281 individuals (Table 1). Abundances were unevenly distributed. The six most abundant species, Red-winged Blackbird, Mourning Dove, Abert's Towhee, Yellow-rumped Warbler, White-crowned Sparrow, and Lucy's Warbler, accounted for 36.2% of the total bird abundance. The 10 most abundant species accounted for 48.4% of the total bird abundance. The 25 most abundant species accounted for 75.5% of the total bird abundance. Forty-eight species had two or less individuals detected. Uneven absolute abundances notwithstanding, the overall relative abundance of any single species never exceeded 10.3%, mostly due to the large number of species that were present.

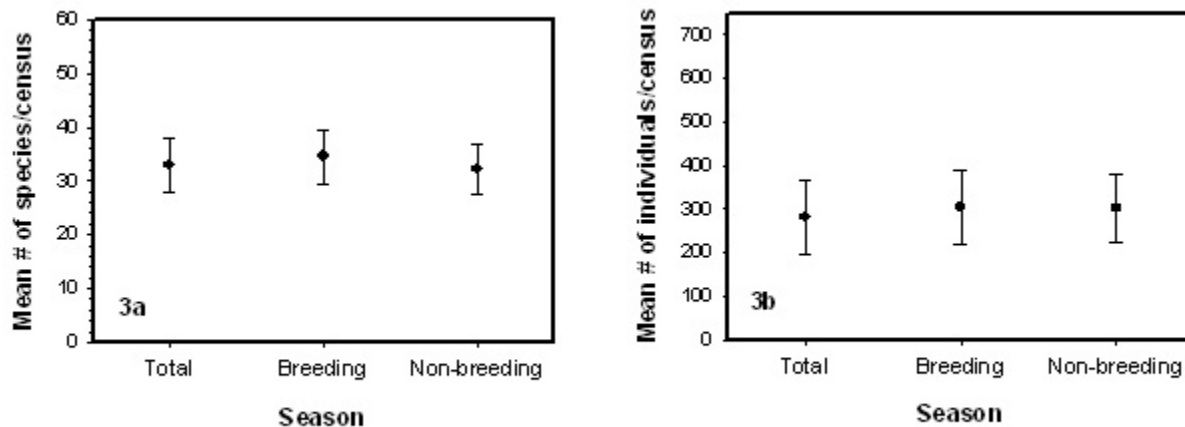


Figure 3: Average total and seasonal avian richness (3a) and abundance (3b) at 29 census points in the Wash.

Seasonally, there were 90 species and 842 individuals detected during the breeding season censuses and 66 species among 702 individuals in the non-breeding season. As might be expected, migratory birds had the highest seasonal variation in abundance, and resident bird species varied least (Table 1). For example neotropical migrants, such as Lucy’s Warbler, Wilson’s Warbler, Yellow-breasted Chat, Brown-headed Cowbird, and Blue Grosbeak were absent or nearly so during the non-breeding season. Highly sedentary species such as Abert’s Towhee, Black-tailed Gnatcatcher, Verdin, and Crissal Thrasher were present in roughly equal numbers regardless of season. Yet a third pattern was evident in birds that overwintered but did not breed in the Wash, such as Yellow-rumped Warbler, White-crowned Sparrow, Ruby-crowned Kinglet, and Lincoln’s Sparrow. The results indicate the Wash is an important resource to resident, migratory, and overwintering bird species.

Spatial bird species distributions are indicated by absolute and relative frequency for each species (Table 2). Abert’s Towhee, Black Phoebe, Ruby-crowned Kinglet, Song Sparrow, and Yellow-rumped Warbler were the most evenly distributed species, occurring at all 29 census points. Twenty-one species were found at 75% or more of the census points suggesting that the Wash provides broadly distributed appropriate habitats for a diverse avian community. Included in the twenty-one species with wide spatial distributions were resident and migrant species thought to be declining such as Blue Grosbeak, Crissal Thrasher, Lucy’s Warbler, and Yellow-breasted Chat. Also worth noting were the distributions of Loggerhead Shrike and Yellow Warbler across 51.7% and 55.2% of the census points respectively, and the occurrence of Arizona Bell’s Vireo across 20.7% of the census points. These three species, also believed to be in decline, are provided suitable habitat in the Wash. On a negative note, Brown-headed Cowbirds, which have been associated with songbird declines when nest parasitism rates are high, were observed at 96.6% of the census points.

Vegetation Analyses

Vegetation composition and structure - Wash habitats were heavily dominated by tamarisk (Figure 4). On average, tamarisk dominated 35.9% (s.d. = 22.1) of the census point habitats but was unevenly distributed as indicated by the large standard deviation. On average, Goodding willow accounted for the highest native broadleaf perennial at 1.8% of the perennial composition. Even when native broadleaf perennial species were combined, the average native perennial composition was 3.7% (s.d. = 7.1). The results indicate a condition where tamarisk dominates Wash habitats at the present time, which was expected given the relatively limited current extent of native perennial restoration.

Physiognomic cover types are graphed in Figure 5. Trees were the dominant physiognomic cover class averaging 40.6% (s.d. = 20.2) of the cover. Again, the large standard deviation indicates that trees, of any type, were patchily distributed. The shrub physiognomic class averaged 24.7% cover (s.d. = 18.7) and the forb cover class averaged 10.7% (s.d. = 14.1) cover. Grasses and cattail cover classes were both less than 5%. The results indicate that census point habitats can best be described in physiognomic terms as relatively open and patchy, dominated by trees, shrubs, and forbs, with grasses and cattail being minor but equally patchy physiognomic components.

Vertical perennial structure and heterogeneity are plotted in Figure 6a. Overall, the majority of the perennial structure occurred below the 4 - 6 m foliage height class and perennial structure was unevenly distributed vertically (among foliage height classes).

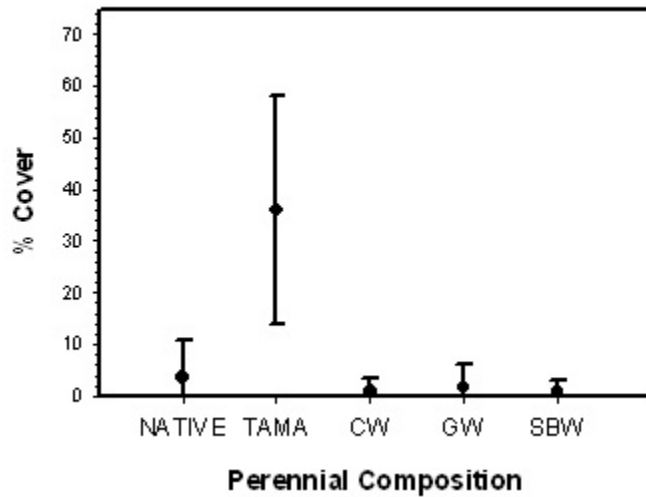


Figure 4: Average perennial cover for habitats at 29 census points in the Wash. Values are means and one standard deviation. CW= Cottonwood, GW = Goodding Willow, SBW = Sandbar Willow, TAMA = Tamarisk, Native =CW+GW+SBW.

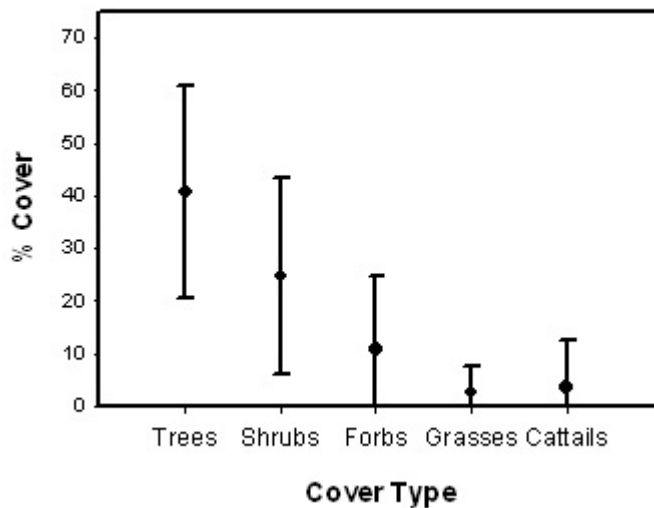


Figure 5: Average physiognomic cover classes for habitats at 29 census points in the Wash. Values are means and one standard deviation.

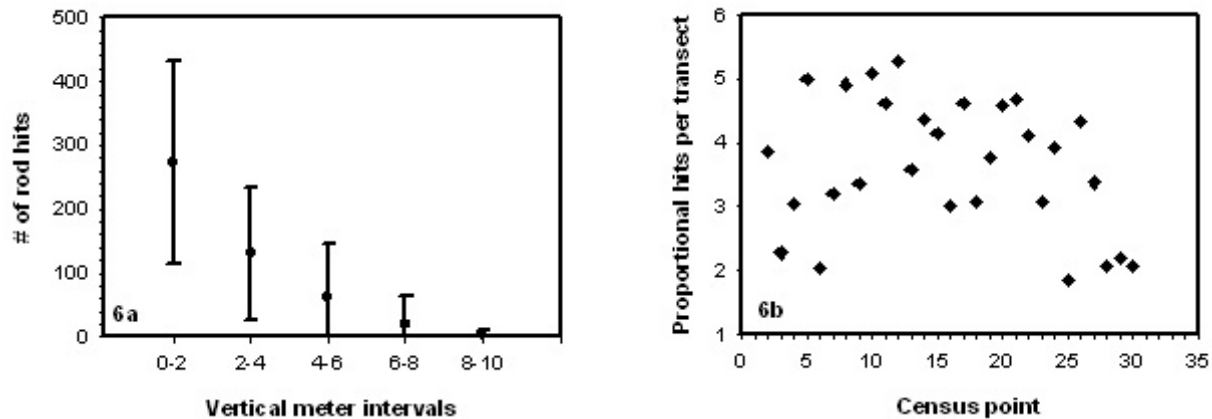


Figure 6: Vertical (6a) and horizontal (6b) perennial structural heterogeneity for habitats at 29 census points in the Wash. Vertical perennial structure values are means and one standard deviation. Horizontal structure values are proportional indexes (see text for details).

The greatest amount of perennial structure in vertical space was found in the 0 - 2 m foliage height class that averaged 272.5 rod hits (s.d. = 158.6) per census point. The next highest amount of perennial structure occurred in the 2 - 4 m height class (130.4 hits, s.d. = 104.4) followed by the 4 - 6 m height class (61.7 hits, s.d. = 85.5) and then the 6 - 8 m height class (19.4 hits, s.d. = 43.2). Perennial structure above 8 m was rare. The large standard deviation for all height classes indicates that vertical perennial structure was unevenly distributed among the census points. The results indicate that, on average, vertical perennial structure for Wash habitats had an impoverished overstory structure, an uneven distribution among the census points (patchy), and was confined for the most part below 6 m.

Horizontal perennial structure and heterogeneity at the census points are plotted in Figure 6b. The widely scattered points indicate an uneven (heterogeneous) distribution of perennial structure in horizontal space across the census point habitats. For example, census points 4, 9, and 11 scored greater than five in the horizontal proportional distribution of perennial hits among the six transects per census point, indicating perennial structure for these census points was evenly distributed horizontally across all six transects per census area. In contrast, census points 5, 27, and 29 scored near or below two, indicating perennial structure was clumped on a subset of the six transects per census point.

The relationships between mean perennial height and mean tamarisk or native broadleaf cover per census point are plotted in Figures 7a and 7b. The significant regression ($P < 0.001$) between perennial height and tamarisk cover (Fig. 7a) indicates that tamarisk cover explained 60% of the variation in perennial height across the census points. There was no significant relationship between mean perennial height and native broadleaf cover (Fig. 7b). The results indicate that, at this point in time, perennial heights across Wash habitats are largely a consequence of tamarisk cover and that native broadleaf perennials have no measurable contribution to perennial heights.

The relationships between mean perennial structure (hits) and mean tamarisk or native broadleaf cover per census point are plotted in Figures 8a and 8b. The significant regression (P

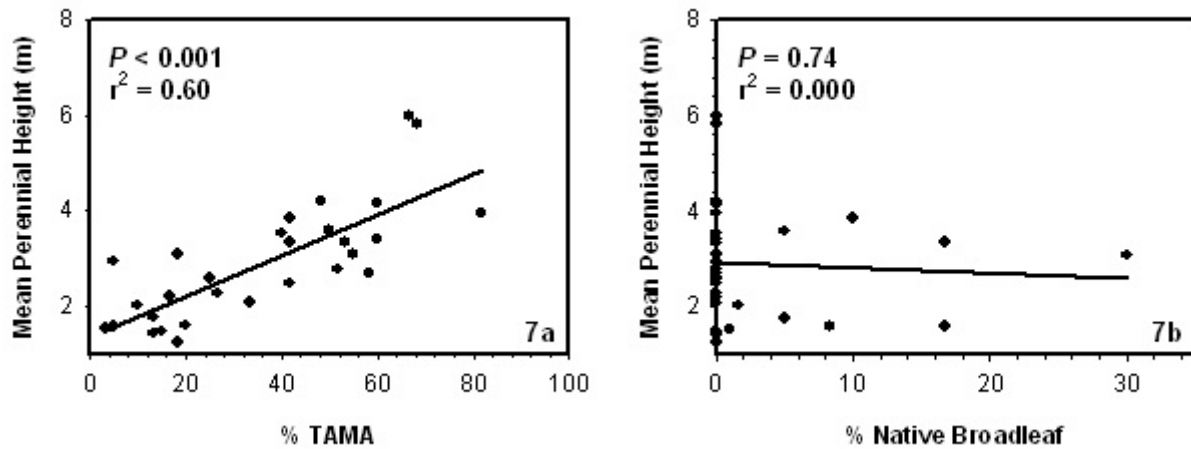


Figure 7: Regression of tamarisk (TAMA) (7a) and native broadleaf (7b) perennial cover with mean perennial height for habitats at 29 census points in the Wash.

< 0.001) between perennial hits and tamarisk cover (Fig. 8a) indicates that tamarisk cover explained 48% of the variation in perennial structure across the census points. There was no significant relationship between mean perennial hits and native broadleaf cover (Fig. 8b). The results indicate perennial structure across Wash habitats is largely a consequence of tamarisk cover and that native broadleaf perennials have no measurable contribution to foliage structure at the present time.

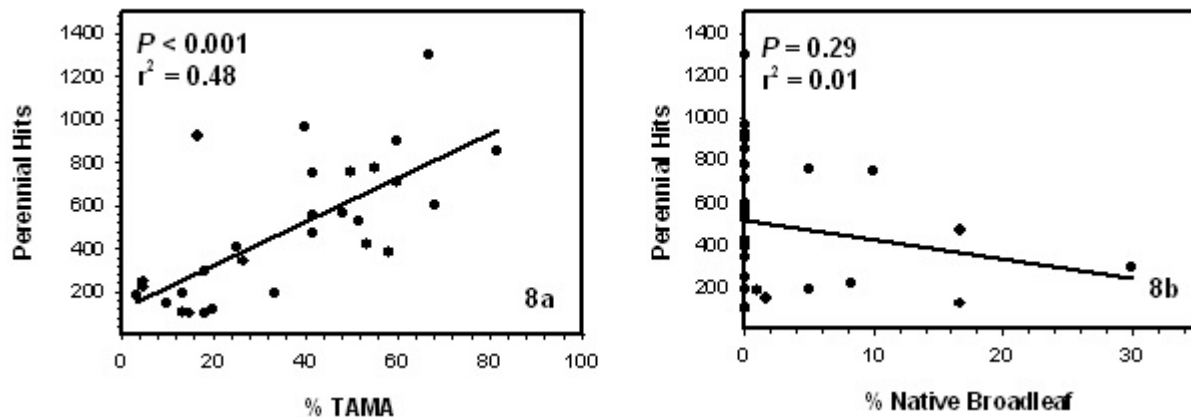


Figure 8: Regression of tamarisk (TAMA) (8a) and native broadleaf (8b) perennial cover with perennial structure (vegetation hits) for habitats at 29 census points in the Wash.

DISCUSSION

Long-range plans for the Wash call for the placement of approximately 22 erosion control structures perpendicular to the Wash to alleviate channel erosion and to rehabilitate the habitats above and below the erosion control structures, presently dominated by tamarisk, with native wetland, upland and riparian vegetation. These efforts will take several years to complete. The goal then for this first year of study was to initiate baseline data collection to quantify the current avian diversity and habitat composition/structure for the Wash. These data will be used to monitor changes in the Wash coincident with channel stabilization and revegetation efforts in the future. The present report covers a single year of avian and habitat data collection, so inferences from and analyses of this first year of data are necessarily and correctly limited in scope. The findings of this study should be cautiously applied and interpreted pending additional annual data collection and analyses. The present status of the avian community and habitat conditions are briefly discussed below.

Avian community diversity - First year avian census data indicate a robust avian community using the Wash. On average, there were 33 species observed per census event. Annually, 114 bird species were detected (129 species counting flyovers). Equally important is the finding that avian diversity in the Wash was the same year round indicating that Wash habitats are important to the avian community on a year round basis and not just during the breeding season.

The high year round avian diversity found in Wash habitats is most parsimoniously explained by the juxtaposition of permanent aquatic and upland habitats in an arid environment. Avian species using Wash habitats include a diverse mix of water birds, shore birds, and land birds (Table 1). The detection of diverse avian species year round indicates the importance of habitat resources of the Wash to avian species that differ dramatically in life history strategies, including migration, breeding, and overwintering requirements.

Also worth noting, breeding bird species using Wash habitats presently include both resident and neotropical species. Included in the suite of breeding species are Arizona Bell's Vireo, Blue Grosbeak, Crissal Thrasher, Loggerhead Shrike, Lucy's Warbler, Yellow-breasted Chat, and Yellow Warbler, all of which are thought to be in decline.

Vegetation composition and structure – Tamarisk currently dominates both the perennial composition and structure of the Wash while native broadleaf perennials contribute insignificant amounts to perennial composition and structure. Wash habitats are dominated by tree, shrub, and forb physiognomic cover classes, in that order. All cover classes are heterogeneous (patchy) and unevenly distributed across the Wash. The dominant cover class, tree cover, occurs on average on only 40.6% of the Wash habitats and also varies substantially across the Wash. Vertical and horizontal perennial structures are likewise heterogeneous. Vertical structure, when present, is largely confined to heights below 6 m with approximately half the structure confined to the first 0 - 2 m of vertical space. The distribution of perennial structure in horizontal space is equally patchy and discontinuous across the Wash.

The dominance of tamarisk, variability of physiognomic cover, and patchy distribution of perennial structure in vertical and horizontal space are all expected to change through time with the maturation of existing revegetation sites and the establishment and maturation of revegetation plots associated with the placement of new erosion control structures and grant-

funded projects. These anticipated changes in vegetation composition and structure through time are expected to affect the avian community. How the avian community will be affected cannot be known without additional data. The current working presumption is that the avian community diversity will, at worst, not deteriorate from the present levels of richness and diversity. At best, the avian community is posited to improve with the establishment of extensive and mature native habitats.

RECOMMENDATIONS

1) Continue biweekly avian monitoring. Biweekly censuses result in robust data sets suitable for inferential comparisons. Changes in the avian community are expected to occur coincident with channel modifications and revegetation. Censuses provide the data needed at appropriate sample sizes to detect changes in the avian community through time and for any season.

2) Continue annual vegetation monitoring. At present the Wash is dominated by tamarisk. Revegetation after channel modifications is expected to shift the perennial dominance to more natural conditions with native broadleaf and other native perennials dominating a significant portion of the habitats in the Wash. Vegetation monitoring is a good mechanism for quantitatively measuring the change from non-native to native habitats. Vegetation monitoring is also essential for correlating the affects of habitat modifications with changes in the avian community.

3) Continue revegetation efforts. Channel modifications severely disrupt habitat cover, composition and structure. Revegetation after channel modifications is essential to the avian community and, presents the opportunity to replace tamarisk habitats with native wetland, riparian and upland habitats.

LITERATURE CITED

AOU checklist of North American Birds, 7th edition.

Braden, G. T. 1997. Book Review: Monitoring bird populations by point counts. *California Fish and Game* 83:130-131.

Hill, M. O. 1973. Diversity and evenness: A unifying notation and its consequences. *Ecology* 54:427-432.

PSW. 1995. Pacific Southwest Research Station General Technical Report PSW-GTR-149. Monitoring bird populations by point counts. Ralph, C. J., J. R. Sauer, and S. Droege *Eds.* USDA iv+181 pages.

Ralph, C. J. and J. M. Scott. 1981. Estimating the numbers of terrestrial birds. C. John Ralph and J. Michael Scott *Eds.* *Studies in Avian Biology* No. 6.

Table 1: Overall, breeding¹, and non-breeding² rank order of bird species abundances (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	<u>Overall Abundance Abs. (Rel.)</u>	<u>Breeding Abundance Abs. (Rel.)</u>	<u>Non- breeding Abundance Abs. (Rel.)</u>
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	132 (10.3)	30 (3.6)	132 (18.8)
Mourning Dove (<i>Zenaida macroura</i>)	98 (7.6)	98 (11.6)	3 (0.4)
Abert's Towhee (<i>Pipilo aberti</i>)	75 (5.8)	67 (8.0)	37 (5.3)
Yellow-rumped Warbler (<i>Dendroica coronata</i>)	59 (4.6)	4 (0.5)	59 (8.4)
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	54 (4.2)	8 (0.9)	54 (7.7)
Lucy's Warbler (<i>Vermivora luciae</i>)	46 (3.3)	46 (5.5)	0 (0.0)
Song Sparrow (<i>Melospiza melodia</i>)	44 (3.4)	44 (5.2)	37 (5.3)
Yellow-headed Blackbird (<i>Xanthocephalus xanthocephalus</i>)	40 (3.1)	40 (4.7)	1 (0.1)
Wilson's Warbler (<i>Wilsonia pusilla</i>)	38 (3.0)	38 (4.5)	3 (0.4)
Ruby-crowned Kinglet (<i>Regulus calendula</i>)	34 (2.7)	14 (1.7)	34 (4.9)
American Pipit (<i>Anthus rubescens</i>)	32 (2.5)	0 (0.0)	32 (4.7)
Brown-headed Cowbird (<i>Molothrus ater</i>)	30 (2.3)	30 (3.6)	0 (0.0)
Common Yellowthroat (<i>Geothlypis trichas</i>)	30 (2.3)	30 (3.6)	1 (0.1)
Yellow-breasted Chat (<i>Icteria virens</i>)	29 (2.3)	29 (3.4)	0 (0.0)
Bewick's Wren (<i>Thryomanes bewickii</i>)	28 (2.2)	22 (2.6)	27 (3.8)
American Coot (<i>Fulica americana</i>)	27 (2.1)	11 (1.3)	27 (3.8)
Blue Grosbeak (<i>Passerina caerulea</i>)	23 (1.8)	23 (2.7)	0 (0.0)
Marsh Wren (<i>Cistothorus palustris</i>)	23 (1.8)	15 (1.8)	23 (3.3)
Gadwall (<i>Anas strepera</i>)	21 (1.6)	1 (0.1)	21 (3.0)
Black Phoebe (<i>Sayornis nigricans</i>)	20 (1.6)	12 (1.4)	20 (2.8)
Gambel's Quail (<i>Callipepla gambelii</i>)	20 (1.6)	20 (2.4)	4 (0.6)

Table 1 continued: Overall, breeding¹, and non-breeding² rank order of bird species abundances (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non- breeding Abundance <u>Abs. (Rel.)</u>
Black-tailed Gnatcatcher (<i>Polioptila melanura</i>)	18 (1.4)	18 (2.1)	14 (2.0)
Verdin (<i>Auriparus flaviceps</i>)	16 (1.2)	16 (1.9)	13 (1.8)
Bushtit (<i>Psaltriparus minimus</i>)	15 (1.2)	2 (0.2)	15 (2.1)
House Finch (<i>Carpodacus mexicanus</i>)	15 (1.2)	15 (1.8)	4 (0.6)
Mallard (<i>Anas platyrhynchos</i>)	15 (1.2)	5 (0.6)	10 (1.4)
Orange-crowned Warbler (<i>Vermivora celata</i>)	14 (1.1)	4 (0.5)	9 (1.3)
Yellow Warbler (<i>Dendroica petechia</i>)	14 (1.1)	14 (1.7)	0 (0.0)
Killdeer (<i>Charadrius vociferus</i>)	13 (1.0)	13 (1.5)	7 (1.0)
Western Sandpiper (<i>Calidris mauri</i>)	12 (0.9)	12 (1.4)	0 (0.0)
Brewer's Sparrow (<i>Spizella breweri</i>)	10 (0.8)	0 (0.0)	3 (0.4)
Crissal Thrasher (<i>Toxostoma crissale</i>)	10 (0.8)	10 (1.2)	10 (1.4)
Lesser Goldfinch (<i>Carduelis psaltria</i>)	10 (0.8)	6 (0.7)	4 (0.6)
American Avocet (<i>Recurvirostra americana</i>)	9 (0.7)	9 (1.1)	0 (0.0)
Blue-gray Gnatcatcher (<i>Polioptila caerulea</i>)	9 (0.7)	9 (1.1)	3 (0.4)
Great-tailed Grackle (<i>Quiscalus mexicanus</i>)	8 (0.6)	4 (0.5)	8 (1.1)
Lincoln's Sparrow (<i>Melospiza lincolnii</i>)	7 (0.6)	1 (0.1)	7 (1.0)
Pine Siskin (<i>Carduelis pinus</i>)	6 (0.5)	0 (0.0)	6 (0.9)
Savannah Sparrow (<i>Passerculus sandwichensis</i>)	6 (0.5)	6 (0.7)	0 (0.0)
Snowy Egret (<i>Egretta thula</i>)	6 (0.5)	5 (0.6)	6 (0.9)
Black-headed Grosbeak (<i>Pheucticus melanocephalus</i>)	5 (0.4)	5 (0.6)	0 (0.0)
Cinnamon Teal (<i>Anas cyanoptera</i>)	5 (0.4)	5 (0.6)	0 (0.0)

Table 1 continued: Overall, breeding¹, and non-breeding² rank order of bird species abundances (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	Overall	Breeding	Non-
	Abundance	Abundance	breeding
	<u>Abs. (Rel.)</u>	<u>Abs. (Rel.)</u>	<u>Abundance</u>
			<u>Abs. (Rel.)</u>
Greater Roadrunner (<i>Geococcyx californianus</i>)	5 (0.4)	4 (0.5)	5 (0.7)
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	5 (0.4)	5 (0.6)	2 (0.3)
Say's Phoebe (<i>Sayornis saya</i>)	5 (0.4)	3 (0.4)	5 (0.7)
Spotted Sandpiper (<i>Actitis macularius</i>)	5 (0.4)	5 (0.6)	1 (0.1)
Anna's Hummingbird (<i>Calypte anna</i>)	4 (0.3)	4 (0.5)	1 (0.1)
Black-necked Stilt (<i>Himantopus mexicanus</i>)	4 (0.3)	4 (0.5)	0 (0.0)
Green Heron (<i>Butorides virescens</i>)	4 (0.3)	4 (0.5)	1 (0.1)
Northern Flicker (<i>Colaptes auratus</i>)	4 (0.3)	0 (0.0)	4 (0.6)
Northern Shoveler (<i>Anas clypeata</i>)	4 (0.3)	0 (0.0)	4 (0.6)
Phainopepla (<i>Phainopepla nitens</i>)	4 (0.3)	0 (0.0)	4 (0.6)
White-winged Dove (<i>Zenaida asiatica</i>)	4 (0.3)	4 (0.5)	1 (0.1)
American Kestrel (<i>Falco sparverius</i>)	3 (0.2)	3 (0.4)	0 (0.0)
Bell's Vireo [Arizona] (<i>Vireo bellii arizonae</i>)	3 (0.2)	3 (0.4)	0 (0.0)
Belted Kingfisher (<i>Ceryle alcyon</i>)	3 (0.2)	1 (0.1)	3 (0.4)
Black-chinned Hummingbird (<i>Archilochus alexandri</i>)	3 (0.2)	3 (0.4)	0 (0.0)
Chipping Sparrow (<i>Spizella passerina</i>)	3 (0.2)	2 (0.2)	0 (0.0)
Costa's Hummingbird (<i>Calypte costae</i>)	3 (0.2)	3 (0.4)	0 (0.0)
Dark-eyed Junco (<i>Junco hyemalis</i>)	3 (0.2)	2 (0.2)	1 (0.1)
Greater Yellowlegs (<i>Tringa melanoleuca</i>)	3 (0.2)	0 (0.0)	3 (0.4)
Lazuli Bunting (<i>Passerina amoena</i>)	3 (0.2)	2 (0.2)	0 (0.0)
Sharp-shinned Hawk (<i>Accipiter striatus</i>)	3 (0.2)	0 (0.0)	3 (0.4)

Table 1 continued: Overall, breeding¹, and non-breeding² rank order of bird species abundances (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	Overall	Breeding	Non-
	Abundance	Abundance	breeding
	<u>Abs. (Rel.)</u>	<u>Abs. (Rel.)</u>	<u>Abundance</u>
			<u>Abs. (Rel.)</u>
Warbling Vireo (<i>Vireo gilvus</i>)	3 (0.2)	3 (0.4)	0 (0.0)
Western Bluebird (<i>Sialia mexicana</i>)	3 (0.2)	0 (0.0)	3 (0.4)
Western Kingbird (<i>Tyrannus verticalis</i>)	3 (0.2)	3 (0.4)	0 (0.0)
Barn Owl (<i>Tyto alba</i>)	2 (0.2)	2 (0.2)	0 (0.0)
Black-crowned Night-Heron (<i>Nycticorax nycticorax</i>)	2 (0.2)	2 (0.2)	0 (0.0)
Brown-crested Flycatcher (<i>Myiarchus tyrannulus</i>)	2 (0.2)	2 (0.2)	0 (0.0)
Cedar Waxwing (<i>Bombycilla cedrorum</i>)	2 (0.2)	0 (0.0)	1 (0.1)
Common Moorhen (<i>Gallinula chloropus</i>)	2 (0.2)	1 (0.1)	2 (0.3)
Cooper's Hawk (<i>Accipiter cooperii</i>)	2 (0.2)	1 (0.1)	0 (0.0)
Great Blue Heron (<i>Ardea herodias</i>)	2 (0.2)	2 (0.2)	1 (0.1)
Hermit Thrush (<i>Catharus guttatus</i>)	2 (0.2)	1 (0.1)	2 (0.3)
Horned Lark (<i>Eremophila alpestris</i>)	2 (0.2)	2 (0.2)	0 (0.0)
Long-eared Owl (<i>Asio otus</i>)	2 (0.2)	2 (0.2)	0 (0.0)
Northern Rough-winged Swallow (<i>Stelgidopteryx serripennis</i>)	2 (0.2)	2 (0.2)	0 (0.0)
Pied-billed Grebe (<i>Podilymbus podiceps</i>)	2 (0.2)	0 (0.0)	2 (0.3)
Red-tailed Hawk (<i>Buteo jamaicensis</i>)	2 (0.2)	0 (0.0)	2 (0.3)
Rock Wren (<i>Salpinctes obsoletus</i>)	2 (0.2)	1 (0.1)	2 (0.3)
Sora (<i>Porzana carolina</i>)	2 (0.2)	0 (0.0)	2 (0.3)
Spotted Towhee (<i>Pipilo maculatus</i>)	2 (0.2)	1 (0.1)	2 (0.3)
Summer Tanager (<i>Piranga rubra</i>)	2 (0.2)	0 (0.0)	0 (0.0)

Table 1 continued: Overall, breeding¹, and non-breeding² rank order of bird species abundances (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non- breeding Abundance <u>Abs. (Rel.)</u>
Virginia Rail (<i>Rallus limicola</i>)	2 (0.2)	2 (0.2)	2 (0.3)
Western Wood-Pewee (<i>Contopus sordidulus</i>)	2 (0.2)	2 (0.2)	0 (0.0)
White-faced Ibis (<i>Plegadis chihi</i>)	2 (0.2)	2 (0.2)	0 (0.0)
American Robin (<i>Turdus migratorius</i>)	1 (0.1)	0 (0.0)	1 (0.1)
Ash-throated Flycatcher (<i>Myiarchus cinerascens</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Bendire's Thrasher (<i>Toxostoma benderei</i>)	1 (0.1)	0 (0.0)	1 (0.1)
Blue-winged Teal (<i>Anas discors</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Bullock's Oriole (<i>Icterus bullockii</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Canyon Wren (<i>Catherpes mexicanus</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)	1 (0.1)	0 (0.0)	0 (0.0)
Common Merganser (<i>Mergus merganser</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Double-crested Cormorant (<i>Phalacrocorax auritus</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Dusky Flycatcher (<i>Empidonax oberholseri</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Eared Grebe (<i>Podiceps nigricollis</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Golden-crowned Kinglet (<i>Regulus satrapa</i>)	1 (0.1)	0 (0.0)	1 (0.1)
Gray Flycatcher (<i>Empidonax wrightii</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Great Egret (<i>Ardea alba</i>)	1 (0.1)	1 (0.1)	1 (0.1)
House Sparrow (<i>Passer domesticus</i>)	1 (0.1)	0 (0.0)	1 (0.1)
House Wren (<i>Troglodytes aedon</i>)	1 (0.1)	0 (0.0)	1 (0.1)
Ladder-backed Woodpecker (<i>Picoides scalaris</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Least Bittern (<i>Ixobrychus exilis</i>)	1 (0.1)	1 (0.1)	0 (0.0)

Table 1 continued: Overall, breeding¹, and non-breeding² rank order of bird species abundances (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	Overall	Breeding	Non-
	Abundance	Abundance	breeding
	<u>Abs. (Rel.)</u>	<u>Abs. (Rel.)</u>	<u>Abundance</u>
			<u>Abs. (Rel.)</u>
MacGillivray's Warbler (<i>Oporornis tolmiei</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Northern Harrier (<i>Circus cyaneus</i>)	1 (0.1)	0 (0.0)	1 (0.1)
Northern Mockingbird (<i>Mimus polyglottos</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Osprey (<i>Pandion haliaetus</i>)	1 (0.1)	0 (0.0)	0 (0.0)
Red-naped Sapsucker (<i>Sphyrapicus nuchalis</i>)	1 (0.1)	1 (0.1)	1 (0.1)
Semipalmated Plover (<i>Charadrius semipalmatus</i>)	1 (0.1)	1 (0.1)	0 (0.0)
Western Tanager (<i>Piranga ludoviciana</i>)	1 (0.1)	1 (0.1)	0 (0.0)
“Western Type” (Cordilleran?) Flycatcher (<i>Empidonax occidentalis</i>)	1 (0.1)	0 (0.0)	0 (0.0)
Winter Wren (<i>Troglodytes troglodytes</i>)	1 (0.1)	0 (0.0)	1 (0.1)

1- Breeding season defined as 15 March through 31 August. Includes spring and fall migrant observations.

2- Non-breeding season defined as 1 October through 31 January.

3- Total number of individuals detected.

4- Percentage of individuals detected per species relative to the total number of individuals detected.

5- Species' names follow the AOU checklist of North American Birds, 7th edition.

Table 2: Overall, breeding¹, and non-breeding² rank order of bird species frequencies (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	Overall Frequency <u>Abs. (Rel.)</u>	Breeding Frequency <u>Abs. (Rel.)</u>	Non- breeding Frequency <u>Abs. (Rel.)</u>
Abert's Towhee (<i>Pipilo aberti</i>)	29 (100)	29 (100)	29 (100)
Black Phoebe (<i>Sayornis nigricans</i>)	29 (100)	25 (86.2)	27 (93.1)
Ruby-crowned Kinglet (<i>Regulus calendula</i>)	29 (100)	14 (48.3)	29 (100)
Song Sparrow (<i>Melospiza melodia</i>)	29 (100)	29 (100)	28 (96.6)
Yellow-rumped Warbler (<i>Dendroica coronata</i>)	29 (100)	5 (17.2)	29 (100)
Bewick's Wren (<i>Thryomanes bewickii</i>)	28 (96.6)	25 (86.2)	27 (93.1)
Brown-headed Cowbird (<i>Molothrus ater</i>)	28 (96.6)	28 (96.6)	0 (0.0)
Blue Grosbeak (<i>Passerina caerulea</i>)	28 (96.6)	28 (96.6)	0 (0.0)
Black-tailed Gnatcatcher (<i>Polioptila melanura</i>)	27 (93.1)	25 (86.2)	23 (79.3)
Common Yellowthroat (<i>Geothlypis trichas</i>)	27 (93.1)	27 (93.1)	1 (3.4)
Lucy's Warbler (<i>Vermivora luciae</i>)	27 (93.1)	27 (93.1)	0 (0.0)
Marsh Wren (<i>Cistothorus palustris</i>)	27 (93.1)	13 (44.8)	25 (86.2)
Mourning Dove (<i>Zenaidura macroura</i>)	27 (93.1)	26 (89.7)	2 (6.9)
Orange-crowned Warbler (<i>Vermivora celata</i>)	27 (93.1)	7 (24.1)	23 (79.3)
Verdin (<i>Auriparus flaviceps</i>)	27 (93.1)	22 (75.9)	21 (72.4)
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	27 (93.1)	8 (27.6)	25 (86.2)
Crissal Thrasher (<i>Toxostoma crissale</i>)	26 (89.7)	20 (69.0)	21 (72.4)
Yellow-breasted Chat (<i>Icteria virens</i>)	26 (89.7)	26 (89.7)	0 (0.0)
Gambel's Quail (<i>Callipepla gambelii</i>)	22 (75.9)	21 (72.4)	6 (20.7)
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	22 (75.9)	18 (62.1)	14 (48.3)
Wilson's Warbler (<i>Wilsonia pusilla</i>)	22 (75.9)	22 (75.9)	4 (13.8)
Greater Roadrunner (<i>Geococcyx californianus</i>)	19 (65.5)	16 (55.2)	6 (20.7)

Table 2 continued: Overall, breeding¹, and non-breeding² rank order of bird species frequencies (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	Overall Frequency Abs. (Rel.)	Breeding Frequency Abs. (Rel.)	Non- breeding Frequency Abs. (Rel.)
Lincoln's Sparrow (<i>Melospiza lincolnii</i>)	19 (65.5)	3 (10.3)	19 (65.5)
American Coot (<i>Fulica americana</i>)	17 (58.6)	5 (17.2)	16 (55.2)
American Pipit (<i>Anthus rubescens</i>)	17 (58.6)	0 (0.0)	17 (58.6)
House Finch (<i>Carpodacus mexicanus</i>)	17 (58.6)	13 (44.8)	5 (17.2)
Northern Flicker (<i>Colaptes auratus</i>)	17 (58.6)	0 (0.0)	15 (51.7)
Killdeer (<i>Charadrius vociferus</i>)	16 (55.2)	13 (44.8)	10 (34.5)
Yellow Warbler (<i>Dendroica petechia</i>)	16 (55.2)	16 (55.2)	0 (0.0)
Blue-gray Gnatcatcher (<i>Polioptila caerulea</i>)	15 (51.7)	12 (41.4)	6 (20.7)
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	15 (51.7)	11 (37.9)	5 (17.2)
Say's Phoebe (<i>Sayornis saya</i>)	15 (51.7)	7 (24.1)	9 (31.0)
White-winged Dove (<i>Zenaida asiatica</i>)	13 (44.8)	12 (41.4)	1 (3.5)
Belted Kingfisher (<i>Ceryle alcyon</i>)	12 (41.4)	3 (10.3)	11 (39.9)
Great-tailed Grackle (<i>Quiscalus mexicanus</i>)	10 (34.5)	7 (24.1)	3 (10.3)
Bushtit (<i>Psaltiriparus minimus</i>)	9 (31.0)	1 (3.4)	7 (24.1)
Gadwall (<i>Anas strepera</i>)	9 (31.0)	2 (6.9)	7 (24.1)
Greater Yellowlegs (<i>Tringa melanoleuca</i>)	9 (31.0)	0 (0.0)	9 (31.0)
Lesser Goldfinch (<i>Carduelis psaltria</i>)	9 (31.0)	2 (6.9)	2 (6.9)
Mallard (<i>Anas platyrhynchos</i>)	9 (31.0)	4 (13.8)	6 (20.7)
Spotted Sandpiper (<i>Actitis macularius</i>)	9 (31.0)	7 (24.1)	3 (10.3)
Sharp-shinned Hawk (<i>Accipiter striatus</i>)	8 (27.6)	0 (0.0)	7 (24.1)
Anna's Hummingbird (<i>Calypte anna</i>)	7 (24.1)	5 (17.2)	1 (3.5)
Great Blue Heron (<i>Ardea herodias</i>)	7 (24.1)	5 (17.2)	3 (10.3)

Table 2 continued: Overall, breeding¹, and non-breeding² rank order of bird species frequencies (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	Overall Frequency Abs. (Rel.)	Breeding Frequency Abs. (Rel.)	Non- breeding Frequency Abs. (Rel.)
Western Kingbird (<i>Tyrannus verticalis</i>)	7 (24.1)	6 (20.7)	0 (0.0)
Bell's Vireo [Arizona] (<i>Vireo bellii arizonae</i>)	6 (20.7)	6 (20.7)	0 (0.0)
Brewer's Sparrow (<i>Spizella breweri</i>)	6 (20.7)	0 (0.0)	2 (6.9)
Dark-eyed Junco (<i>Junco hyemalis</i>)	6 (20.7)	2 (6.9)	2 (6.9)
Green Heron (<i>Butorides virescens</i>)	6 (20.7)	4 (13.8)	2 (6.9)
Phainopepla (<i>Phainopepla nitens</i>)	6 (20.7)	0 (0.0)	6 (20.7)
American Kestrel (<i>Falco sparverius</i>)	5 (17.2)	3 (10.3)	0 (0.0)
Black-chinned Hummingbird (<i>Archilochus alexandri</i>)	5 (17.2)	5 (17.2)	0 (0.0)
Chipping Sparrow (<i>Spizella passerina</i>)	5 (17.2)	2 (6.9)	0 (0.0)
Lazuli Bunting (<i>Passerina amoena</i>)	5 (17.2)	3 (10.3)	0 (0.0)
Northern Rough-winged Swallow (<i>Stelgidopteryx serripennis</i>)	5 (17.2)	4 (13.8)	0 (0.0)
Spotted Towhee (<i>Pipilo maculatus</i>)	5 (17.2)	2 (6.9)	3 (10.3)
Warbling Vireo (<i>Vireo gilvus</i>)	5 (17.2)	5 (17.2)	0 (0.0)
Ash-throated Flycatcher (<i>Myiarchus cinerascens</i>)	4 (13.8)	3 (10.3)	0 (0.0)
Black-headed Grosbeak (<i>Pheucticus melanocephalus</i>)	4 (13.8)	3 (10.3)	0 (0.0)
Costa's Hummingbird (<i>Calypte costae</i>)	4 (13.8)	4 (13.8)	0 (0.0)
Common Moorhen (<i>Gallinula chloropus</i>)	4 (13.8)	3 (10.3)	0 (0.0)
Great Egret (<i>Ardea alba</i>)	4 (13.8)	1 (3.4)	2 (6.9)
Hermit Thrush (<i>Catharus guttatus</i>)	4 (13.8)	1 (3.4)	3 (10.3)
Rock Wren (<i>Salpinctes obsoletus</i>)	4 (13.8)	1 (3.4)	3 (10.3)

Table 2 continued: Overall, breeding¹, and non-breeding² rank order of bird species frequencies (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	Overall Frequency Abs. (Rel.)	Breeding Frequency Abs. (Rel.)	Non- breeding Frequency Abs. (Rel.)
Red-tailed Hawk (<i>Buteo jamaicensis</i>)	4 (13.8)	0 (0.0)	4 (13.8)
Savannah Sparrow (<i>Passerculus sandwichensis</i>)	4 (13.8)	4 (13.8)	0 (0.0)
Virginia Rail (<i>Rallus limicola</i>)	4 (13.8)	2 (6.9)	2 (6.9)
Barn Owl (<i>Tyto alba</i>)	3 (10.3)	2 (6.9)	0 (0.0)
Black-crowned Night-Heron (<i>Nycticorax nycticorax</i>)	3 (10.3)	3 (10.3)	0 (0.0)
Cedar Waxwing (<i>Bombycilla cedrorum</i>)	3 (10.3)	0 (0.0)	1 (3.4)
Cooper's Hawk (<i>Accipiter cooperii</i>)	3 (10.3)	1 (3.4)	0 (0.0)
Snowy Egret (<i>Egretta thula</i>)	3 (10.3)	1 (3.4)	1 (3.4)
Western Sandpiper (<i>Calidris mauri</i>)	3 (10.3)	3 (10.3)	0 (0.0)
Western Tanager (<i>Piranga ludoviciana</i>)	3 (10.3)	3 (10.3)	0 (0.0)
Western Wood-Pewee (<i>Contopus sordidulus</i>)	3 (10.3)	3 (10.3)	0 (0.0)
Yellow-headed Blackbird (<i>Xanthocephalus xanthocephalus</i>)	3 (10.3)	2 (6.9)	1 (3.4)
American Avocet (<i>Recurvirostra americana</i>)	2 (6.9)	3 (10.3)	0 (0.0)
American Robin (<i>Turdus migratorius</i>)	2 (6.9)	0 (0.0)	2 (6.9)
Brown-crested Flycatcher (<i>Myiarchus tyrannulus</i>)	2 (6.9)	2 (6.9)	0 (0.0)
Common Merganser (<i>Mergus merganser</i>)	2 (6.9)	2 (6.9)	0 (0.0)
Double-crested Cormorant (<i>Phalacrocorax auritus</i>)	2 (6.9)	2 (6.9)	0 (0.0)
House Wren (<i>Troglodytes aedon</i>)	2 (6.9)	0 (0.0)	1 (3.4)
Northern Mockingbird (<i>Mimus polyglottos</i>)	2 (6.9)	2 (6.9)	0 (0.0)
Pied-billed Grebe (<i>Podilymbus podiceps</i>)	2 (6.9)	0 (0.0)	1 (3.4)

Table 2 continued: Overall, breeding¹, and non-breeding² rank order of bird species frequencies (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	Overall Frequency Abs. (Rel.)	Breeding Frequency Abs. (Rel.)	Non- breeding Frequency Abs. (Rel.)
Pine Siskin (<i>Carduelis pinus</i>)	2 (6.9)	0 (0.0)	2 (6.9)
Red-naped Sapsucker (<i>Sphyrapicus nuchalis</i>)	2 (6.9)	1 (3.4)	1 (3.4)
Sora (<i>Porzana carolina</i>)	2 (6.9)	0 (0.0)	2 (6.9)
White-faced Ibis (<i>Plegadis chihi</i>)	2 (6.9)	2 (6.9)	0 (0.0)
Winter Wren (<i>Troglodytes troglodytes</i>)	2 (6.9)	0 (0.0)	2 (6.9)
Bendire's Thrasher (<i>Toxostoma benderei</i>)	1 (3.4)	0 (0.0)	0 (0.0)
Black-necked Stilt (<i>Himantopus mexicanus</i>)	1 (3.4)	1 (3.4)	0 (0.0)
Bullock's Oriole (<i>Icterus bullockii</i>)	1 (3.4)	1 (3.4)	0 (0.0)
Blue-winged Teal (<i>Anas discors</i>)	1 (3.4)	1 (3.4)	0 (0.0)
Canyon Wren (<i>Catherpes mexicanus</i>)	1 (3.4)	1 (3.4)	0 (0.0)
Cinnamon Teal (<i>Anas cyanoptera</i>)	1 (3.4)	1 (3.4)	0 (0.0)
Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)	1 (3.4)	0 (0.0)	0 (0.0)
Dusky Flycatcher (<i>Empidonax oberholseri</i>)	1 (3.4)	1 (3.4)	0 (0.0)
Eared Grebe (<i>Podiceps nigricollis</i>)	1 (3.4)	1 (3.4)	0 (0.0)
Golden-crowned Kinglet (<i>Regulus satrapa</i>)	1 (3.4)	0 (0.0)	1 (3.4)
Gray Flycatcher (<i>Empidonax wrightii</i>)	1 (3.4)	1 (3.4)	0 (0.0)
Horned Lark (<i>Eremophila alpestris</i>)	1 (3.4)	1 (3.4)	0 (0.0)
House Sparrow (<i>Passer domesticus</i>)	1 (3.4)	0 (0.0)	1 (3.4)
Ladder-backed Woodpecker (<i>Picoides scalaris</i>)	1 (3.4)	1 (3.4)	0 (0.0)
Least Bittern (<i>Ixobrychus exilis</i>)	1 (3.4)	1 (3.4)	0 (0.0)
Long-eared Owl (<i>Asio otus</i>)	1 (3.4)	1 (3.4)	0 (0.0)
MacGillivray's Warbler (<i>Oporornis tolmiei</i>)	1 (3.4)	1 (3.4)	0 (0.0)

Table 2 continued: Overall, breeding¹, and non-breeding² rank order of bird species frequencies (absolute³ and relative⁴) after 26 point-counts at 29 census stations along the Wash from 12 February 2005 through 29 January 2006⁵. Numbers do not include birds that flew over or were >100 m from the census stations.

<u>Species</u>	Overall Frequency Abs. (Rel.)	Breeding Frequency Abs. (Rel.)	Non- breeding Frequency Abs. (Rel.)
Northern Harrier (<i>Circus cyaneus</i>)	1 (3.4)	0 (0.0)	1 (3.4)
Northern Shoveler (<i>Anas clypeata</i>)	1 (3.4)	0 (0.0)	1 (3.4)
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	1 (3.4)	1 (3.4)	0 (0.0)
Osprey (<i>Pandion haliaetus</i>)	1 (3.4)	0 (0.0)	0 (0.0)
Semipalmated Plover (<i>Charadrius semipalmatus</i>)	1 (3.4)	0 (0.0)	0 (0.0)
Summer Tanager (<i>Piranga rubra</i>)	1 (3.4)	0 (0.0)	0 (0.0)
Western Bluebird (<i>Sialia mexicana</i>)	1 (3.4)	0 (0.0)	1 (3.4)
“Western Type” (Cordilleran?) Flycatcher (<i>Empidonax occidentalis</i>)	1 (3.4)	0 (0.0)	0 (0.0)

1- Breeding season defined as 15 March through 31 August. Includes spring and fall migrant observations.

2- Non-breeding season defined as 1 October through 31 January.

3- Total number of census points where the species was detected.

4- Percentage out of 29 census points where a species was detected.

5- Species' names follow the AOU checklist of North American Birds, 7th edition.

APPENDIX 1: UTM coordinates (WGS84) for bird census point-count monitoring stations along the Wash in Las Vegas, Nevada. Point numbers begin at number 2.

Point¹	Easting	Northing
2	11 678281	3997474
3	11 678442	3997235
4	11 678692	3996744
5	11 679013	3996406
6	11 678616	3997137
7	11 679018	3996361
8	11 679334	3996273
9	11 679570	3996237
10	11 680035	3995940
11	11 680297	3995831
12	11 680855	3995805
13	11 681168	3995700
14	11 681755	3995697
15	11 681962	3995682
16	11 681154	3995520
17	11 680944	3995664
18	11 681618	3995528
19	11 682240	3995759
20	11 683735	3996255
21	11 683983	3996405
22	11 684397	3996470
23	11 684619	3996530
24	11 684212	3996407
25	11 685427	3997088

APPENDIX 1: Continued: UTM coordinates (WGS84) for bird census point-count monitoring stations along the Wash in Las Vegas, Nevada.

Point	Easting	Northing
26	11 685583	3997260
27	11 685297	3997211
28	11 683511	3995911
29	11 683083	3996075
30	11 681457	3995654

1 - No point 1 established at the time of this report.

APPENDIX 2: Abundance, frequency and estimated breeding status for all bird species observed after 26 point-count sessions at 29 census stations along the Wash from 12 February 2005 through 29 January 2006. Numbers include birds that flew over the census stations and/or were >100 m from the census stations. Some birds and bird species may have been double counted.

SPECIES	ABUNDANCE		FREQUENCY		BREEDING
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴	<u>Status</u> ⁵
Snow Goose (<i>Chen caerulescens</i>)	1	0.05	1	3.4	N
Gadwall (<i>Anas strepera</i>)	56	2.60	13	44.8	N
American Wigeon (<i>Anas americanus</i>)	1	0.05	1	3.4	N
Mallard (<i>Anas platyrhynchos</i>)	96	4.45	19	65.5	Y
Blue-winged Teal (<i>Anas discors</i>)	15	0.70	4	13.8	N
Cinnamon Teal (<i>Anas cyanoptera</i>)	5	0.23	1	3.4	Y
Northern Shoveler (<i>Anas clypeata</i>)	4	0.19	1	3.4	N
Northern Pintail (<i>Anas acuta</i>)	1	0.05	1	3.4	N
Common Merganser (<i>Mergus merganser</i>)	5	0.23	7	24.1	N
Gambel's Quail (<i>Callipepla gambelii</i>)	20	0.93	25	86.2	Y
Pied-billed Grebe (<i>Podilymbus podiceps</i>)	2	0.09	2	6.9	P
Eared Grebe (<i>Podiceps nigricollis</i>)	1	0.05	1	3.4	N
Western Grebe (<i>Aechmophorus occidentalis</i>)	1	0.05	1	3.4	N
Double-crested Cormorant (<i>Phalacrocorax auritus</i>)	7	0.33	19	65.5	P
Least Bittern (<i>Ixobrychus exilis</i>)	1	0.05	1	3.4	L
Great Blue Heron (<i>Ardea herodias</i>)	3	0.14	13	44.8	P
Great Egret (<i>Ardea alba</i>)	3	0.14	8	27.6	P
Snowy Egret (<i>Egretta thula</i>)	7	0.32	9	31.0	P
Green Heron (<i>Butorides virescens</i>)	4	0.19	8	27.6	L
Black-crowned Night-Heron (<i>Nycticorax nycticorax</i>)	4	0.19	7	24.1	P
White-faced Ibis (<i>Plegadis chihi</i>)	62	2.88	6	20.7	N

APPENDIX 2 continued: Abundance, frequency and estimated breeding status for all bird species observed after 26 point-count sessions at 29 census stations along the Wash from 12 February 2005 through 29 January 2006. Numbers include birds that flew over the census stations and/or were >100 m from the census stations. Some birds and bird species may have been double counted.

SPECIES	ABUNDANCE		FREQUENCY		BREEDING
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴	<u>Status</u> ⁵
Turkey Vulture (<i>Cathartes aura</i>)	1	0.05	1	3.4	N
Osprey (<i>Pandion haliaetus</i>)	7	0.32	12	41.4	P
Northern Harrier (<i>Circus cyaneus</i>)	3	0.14	6	20.7	N
Sharp-shinned Hawk (<i>Accipiter striatus</i>)	4	0.19	10	34.5	N
Cooper's Hawk (<i>Accipiter cooperii</i>)	3	0.14	6	20.7	L
Red-tailed Hawk (<i>Buteo jamaicensis</i>)	3	0.14	10	34.5	L
American Kestrel (<i>Falco sparverius</i>)	3	0.14	5	17.2	P
Peregrine Falcon (<i>Falco peregrinus</i>)	1	0.05	3	10.3	N
Prairie Falcon (<i>Falco mexicanus</i>)	1	0.05	1	3.4	N
Virginia Rail (<i>Rallus limicola</i>)	2	0.09	4	13.8	Y
Sora (<i>Porzana carolina</i>)	2	0.09	2	6.9	L
Common Moorhen (<i>Gallinula chloropus</i>)	2	0.09	4	13.8	Y
American Coot (<i>Fulica americana</i>)	51	2.37	19	65.5	Y
Semipalmated Plover (<i>Charadrius semipalmatus</i>)	1	0.05	1	3.4	N
Killdeer (<i>Charadrius vociferus</i>)	16	0.74	20	69.0	Y
Black-necked Stilt (<i>Himantopus mexicanus</i>)	4	0.19	2	6.9	N
American Avocet (<i>Recurvirostra americana</i>)	9	0.42	4	13.8	Y
Greater Yellowlegs (<i>Tringa melanoleuca</i>)	7	0.32	15	51.7	N
Spotted Sandpiper (<i>Actitis macularius</i>)	5	0.23	12	41.4	P
Western Sandpiper (<i>Calidris mauri</i>)	12	0.56	4	13.8	N
Ring-billed Gull (<i>Larus delawarensis</i>)	338	15.7	15	51.7	N

APPENDIX 2 continued: Abundance, frequency and estimated breeding status for all bird species observed after 26 point-count sessions at 29 census stations along the Wash from 12 February 2005 through 29 January 2006. Numbers include birds that flew over the census stations and/or were >100 m from the census stations. Some birds and bird species may have been double counted.

SPECIES	ABUNDANCE		FREQUENCY		BREEDING
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴	<u>Status</u> ⁵
White-winged Dove (<i>Zenaida asiatica</i>)	9	0.42	16	55.2	Y
Mourning Dove (<i>Zenaida macroura</i>)	109	5.06	27	93.1	Y
Rock Pigeon (<i>Columbia livia</i>)	1	0.05	1	3.4	L
Greater Roadrunner (<i>Geococcyx californianus</i>)	5	0.23	19	65.5	Y
Barn Owl (<i>Tyto alba</i>)	2	0.10	3	10.3	L
Long-eared Owl (<i>Asio otus</i>)	2	0.09	1	3.4	P
Lesser Nighthawk (<i>Chordeiles acutipennis</i>)	1	0.05	2	6.9	Y
White-throated Swift (<i>Aeronautes saxatalis</i>)	5	0.23	2	6.9	N
Black-chinned Hummingbird (<i>Archilochus alexandri</i>)	4	0.19	6	20.7	Y
Anna's Hummingbird (<i>Calypte anna</i>)	4	0.19	7	24.1	Y
Costa's Hummingbird (<i>Calypte costae</i>)	3	0.14	4	13.8	Y
Belted Kingfisher (<i>Ceryle alcyon</i>)	4	0.19	19	65.5	N
Red-naped Sapsucker (<i>Sphyrapicus nuchalis</i>)	1	0.05	2	6.9	N
Ladder-backed Woodpecker (<i>Picoides scalaris</i>)	1	0.05	1	3.4	L
Northern Flicker (<i>Colaptes auratus</i>)	5	0.23	21	72.4	N
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	1	0.05	1	3.4	N
Western Wood-Pewee (<i>Contopus sordidulus</i>)	2	0.09	3	10.3	N
Dusky Flycatcher (<i>Empidonax oberholseri</i>)	1	0.05	1	3.4	N
Gray Flycatcher (<i>Empidonax wrightii</i>)	1	0.05	1	3.4	N

APPENDIX 2 continued: Abundance, frequency and estimated breeding status for all bird species observed after 26 point-count sessions at 29 census stations along the Wash from 12 February 2005 through 29 January 2006. Numbers include birds that flew over the census stations and/or were >100 m from the census stations. Some birds and bird species may have been double counted.

SPECIES	ABUNDANCE		FREQUENCY		BREEDING
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴	<u>Status</u> ⁵
“Western Type” (Cordilleran?) Flycatcher (<i>Empidonax occidentalis</i>)	1	0.05	1	3.4	P
Black Phoebe (<i>Sayornis nigricans</i>)	20	0.93	29	100.0	Y
Say’s Phoebe (<i>Sayornis saya</i>)	8	0.37	17	58.6	Y
Ash-throated Flycatcher (<i>Myiarchus cinerascens</i>)	1	0.05	4	13.8	P
Brown-crested Flycatcher (<i>Myiarchus tyrannulus</i>)	2	0.10	3	10.3	P
Western Kingbird (<i>Tyrannus verticalis</i>)	3	0.14	9	31.0	P
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	9	0.42	16	55.2	L
Bell’s Vireo [Arizona] (<i>Vireo bellii arizonae</i>)	3	0.14	6	20.7	Y
Solitary (Plumbeous) Vireo (<i>Vireo plumbeus</i>)	1	0.05	1	3.4	N
Warbling Vireo (<i>Vireo gilvus</i>)	3	0.14	5	17.2	N
Common Raven (<i>Corvus corax</i>)	5	0.23	13	44.8	P
Horned Lark (<i>Eremophila alpestris</i>)	2	0.09	1	3.4	N
Northern Rough-winged Swallow (<i>Stelgidopteryx serripennis</i>)	27	1.25	28	96.6	P
Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)	18	0.84	10	34.5	P
Barn Swallow (<i>Hirundo rustica</i>)	12	0.57	6	20.7	P
Verdin (<i>Auriparus flaviceps</i>)	16	0.74	27	93.1	Y
Bushtit (<i>Psaltriparus minimus</i>)	15	0.70	9	31.0	P
Rock Wren (<i>Salpinctes obsoletus</i>)	3	0.14	7	24.1	P
Canyon Wren (<i>Catherpes mexicanus</i>)	1	0.05	1	3.4	N

APPENDIX 2 continued: Abundance, frequency and estimated breeding status for all bird species observed after 26 point-count sessions at 29 census stations along the Wash from 12 February 2005 through 29 January 2006. Numbers include birds that flew over the census stations and/or were >100 m from the census stations. Some birds and bird species may have been double counted.

SPECIES	ABUNDANCE		FREQUENCY		BREEDING
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴	<u>Status</u> ⁵
Bewick's Wren (<i>Thryomanes bewickii</i>)	28	1.30	28	96.6	Y
House Wren (<i>Troglodytes aedon</i>)	1	0.05	2	6.9	N
Winter Wren (<i>Troglodytes troglodytes</i>)	1	0.05	2	6.9	N
Marsh Wren (<i>Cistothorus palustris</i>)	25	1.16	27	93.1	Y
Golden-crowned Kinglet (<i>Regulus satrapa</i>)	1	0.05	1	3.4	N
Ruby-crowned Kinglet (<i>Regulus calendula</i>)	34	1.58	29	100.0	N
Blue-gray Gnatcatcher (<i>Poliophtila caerulea</i>)	9	0.42	15	51.7	P
Black-tailed Gnatcatcher (<i>Poliophtila melanura</i>)	19	0.88	27	93.1	Y
Western Bluebird (<i>Sialia mexicana</i>)	3	0.14	1	3.4	N
Hermit Thrush (<i>Catharus guttatus</i>)	2	0.09	4	13.8	N
American Robin (<i>Turdus migratorius</i>)	1	0.05	2	6.9	N
Northern Mockingbird (<i>Mimus polyglottos</i>)	1	0.05	2	6.9	P
Bendire's Thrasher (<i>Toxostoma benderei</i>)	1	0.05	1	3.4	N
Crissal Thrasher (<i>Toxostoma crissale</i>)	10	0.46	27	93.1	Y
American Pipit (<i>Anthus rubescens</i>)	43	2.00	28	96.6	N
Cedar Waxwing (<i>Bombycilla cedrorum</i>)	2	0.09	3	10.3	N
Phainopepla (<i>Phainopepla nitens</i>)	4	0.19	6	20.7	Y
Orange-crowned Warbler (<i>Vermivora celata</i>)	14	0.65	27	93.1	N
Lucy's Warbler (<i>Vermivora luciae</i>)	46	2.13	27	93.1	Y
Yellow Warbler (<i>Dendroica petechia</i>)	15	0.70	16	55.2	Y

APPENDIX 2 continued: Abundance, frequency and estimated breeding status for all bird species observed after 26 point-count sessions at 29 census stations along the Wash from 12 February 2005 through 29 January 2006. Numbers include birds that flew over the census stations and/or were >100 m from the census stations. Some birds and bird species may have been double counted.

SPECIES	ABUNDANCE		FREQUENCY		BREEDING
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴	<u>Status</u> ⁵
Yellow-rumped Warbler (<i>Dendroica coronata</i>)	73	3.39	29	100.0	N
MacGillivray's Warbler (<i>Oporornis tolmiei</i>)	1	0.05	1	3.4	N
Common Yellowthroat (<i>Geothlypis trichas</i>)	32	1.48	29	100.0	Y
Yellow-breasted Chat (<i>Icteria virens</i>)	29	1.35	27	93.1	Y
Wilson's Warbler (<i>Wilsonia pusilla</i>)	38	1.76	22	75.9	N
Summer Tanager (<i>Piranga rubra</i>)	2	0.09	1	3.4	P
Western Tanager (<i>Piranga ludoviciana</i>)	2	0.09	3	10.3	N
Spotted Towhee (<i>Pipilo maculatus</i>)	2	0.09	5	17.2	P
Abert's Towhee (<i>Pipilo aberti</i>)	75	3.48	29	100.0	Y
Chipping Sparrow (<i>Spizella passerina</i>)	3	0.14	5	17.2	N
Savannah Sparrow (<i>Passerculus sandwichensis</i>)	6	0.28	4	13.8	P
Brewer's Sparrow (<i>Spizella breweri</i>)	10	0.46	6	20.7	N
Song Sparrow (<i>Melospiza melodia</i>)	45	2.09	29	100.0	Y
Lincoln's Sparrow (<i>Melospiza lincolnii</i>)	7	0.32	19	65.5	N
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	54	2.51	27	93.1	N
Dark-eyed Junco (<i>Junco hyemalis</i>)	3	0.14	6	20.7	N
Black-headed Grosbeak (<i>Pheucticus melanocephalus</i>)	5	0.23	4	13.8	N
Blue Grosbeak (<i>Passerina caerulea</i>)	24	1.11	28	96.6	Y
Lazuli Bunting (<i>Passerina amoena</i>)	3	0.14	5	17.2	P

APPENDIX 2 continued: Abundance, frequency and estimated breeding status for all bird species observed after 26 point-count sessions at 29 census stations along the Wash from 12 February 2005 through 29 January 2006. Numbers include birds that flew over the census stations and/or were >100 m from the census stations. Some birds and bird species may have been double counted.

SPECIES	ABUNDANCE		FREQUENCY		BREEDING
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴	<u>Status</u> ⁵
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	178	8.26	29	100.0	Y
Yellow-headed Blackbird (<i>Xanthocephalus xanthocephalus</i>)	92	4.27	7	24.1	Y
Western Meadowlark (<i>Sturnella neglecta</i>)	1	0.05	1	3.4	N
Great-tailed Grackle (<i>Quiscalus mexicanus</i>)	32	1.52	20	69.0	Y
Brown-headed Cowbird (<i>Molothrus ater</i>)	54	2.51	28	96.6	Y
Bullock's Oriole (<i>Icterus bullockii</i>)	1	0.05	1	3.4	P
House Finch (<i>Carpodacus mexicanus</i>)	17	0.79	23	79.3	Y
Lesser Goldfinch (<i>Carduelis psaltria</i>)	13	0.60	8	27.6	L
Pine Siskin (<i>Carduelis pinus</i>)	7	0.32	5	17.2	N
House Sparrow (<i>Passer domesticus</i>)	1	0.05	1	3.4	L

1- Total number of individuals detected.

2- Percentage of individuals detected per species relative to the total number of individuals detected.

3- Total number of census stations at which a species was detected.

4- Percentage of census stations where a species was detected out of 29 census stations.

5- Breeding status is an estimate that will require confirmation beyond this study. "Y" - Visual confirmation of nests, fledglings, or an exceedingly high likelihood of breeding in the Wash. "L" - Likely to be breeding in the Wash, but no direct observation as of this report. "P" - Possibly breeding in the Wash but breeding may vary among years and/or locations. "N" - Highly unlikely to breed in the Wash.