

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

Prepared for:

Las Vegas Wash Coordination Committee

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TABLE OF CONTENTS

Acknowledgements.....	ii
Introduction.....	1
Methods.....	2
Results.....	7
Discussion.....	11
Summary.....	13
Recommendations.....	13
Literature Cited.....	14

TABLES

Table 1: Results of paired <i>t</i> -test comparisons of avian species richness and abundance after 26 censuses from 12 February 2005 through 29 January 2006 versus 26 censuses from 12 February 2006 through 29 January 2007.....	15
Table 2: Overall, breeding, and non-breeding bird species abundances (absolute and relative) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007.....	16
Table 3: Overall, breeding, and non-breeding bird species frequencies (absolute and relative) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007.....	28
Table 4: Results of repeated measure comparisons of 36 bird species abundances after 26 censuses from 12 February 2005 through 29 January 2006 versus 26 censuses from 12 February 2006 through 29 January 2007 in the Wash.....	41

FIGURES

Figure 1: Study area and census point locations in the Wash.....	46
Figure 2: Comparisons of bird species richness (2a) and abundance (2b) per census event at 28 census points in the Wash from 12 February 2005 to 29 January 2006 and from 12 February 2006 to 29 January 2007.....	47

Figure 3: Comparison of average total and seasonal bird species richness (3a) and abundance (3b) at 28 census points in the Wash for 12 February 2005 to 29 January 2006 and 12 February 2006 to 29 January 2007.....	48
Figure 4: Comparisons of average perennial cover at 28 census points for fall 2005 versus fall 2006.....	49
Figure 5: Comparisons of average physiognomic cover classes at 28 census points for fall 2005 versus fall 2006.....	50
Figure 6: Comparisons of average vertical perennial structural heterogeneity at 28 census points for fall 2005 versus fall 2006.....	51
Figure 7: Comparisons of horizontal perennial structural heterogeneity for habitats at 28 census points for fall 2005 versus fall 2006.....	52
Figure 8: Regressions of tamarisk (TAMA) (8a) and native broadleaf (8b) perennial cover with mean perennial height for habitats at 28 census points in the Wash for fall 2006.....	53
Figure 9: Regressions of tamarisk (TAMA) (9a) and native broadleaf (9b) with perennial structure for habitats at 28 census points in the Wash for fall 2006.....	54
 APPENDICES	
Appendix 1: UTM coordinates (WGS84) for bird census point-count monitoring stations along the Wash.....	55
Appendix 2: Abundance and frequency of all bird species observed after 26 point-count sessions at 28 census stations along the Wash from 12 February 2006 through 29 January 2007.....	56

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, 11 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 wildlife of the Wash, including fish. 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. These baseline data were used to develop the "Las Vegas Wash Wildlife Management Plan" which was finalized in March 2008 and is being implemented.

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, for which annual surveys are also conducted.

Consequently, San Bernardino County Museum biologists (SBCM) 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. Baseline conditions are reported in Braden et al. (2007). 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 second year of data collection by SBCM and changes in avian habitats and avian diversity of the Wash from year one to year two.

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 (in most areas), occurs extensively as well. Lesser amounts of native vegetation are also present. Conspicuous native vegetation includes but is not limited to Goodding 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. While most native broadleaf perennials are still largely restricted to revegetation sites, Goodding willows are beginning to disperse along banks, sandbars, and weir faces downstream of these sites.

While habitat disturbances in the form of dirt roads, illegal trash dumping, and homeless encampments were found throughout the study area in 2005, the latter two were largely eliminated by 2006. Temporary habitat clearings associated with channel stabilization projects and revegetation plots, are also increasingly common along the length of the study area.

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 29 census points spread strategically along the Wash for the majority of 2005 and 2006 (Figure 1, Appendix 1). However, one point was lost due to private

property access issues and three points were added by the end of year two, leaving a total of 31 census points. 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 census points were censused on average every two weeks. One census of the 31 census points required two consecutive days to sample all 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 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. The observers conducted 26 census events from 12 February to 29 January in both 2005 and 2006, yielding a total of 52 census events over the two year period.

Avian Analyses - Analyses of the avian data are necessarily preliminary, as the data cover just two years, the minimum needed to begin tracking changes between years yet insufficient to define the range of yearly variations in avian abundances, frequencies, and distributions over time. In addition, only 28 of the 32 census points have continuous data for the two years of data collection, so inferential avian analyses are necessarily confined to data from those 28 points. Avian analyses are focused on describing and comparing avian community diversity, the abundance of individual species, and the spatial and temporal distribution of bird diversity for the first two years of data collection 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. 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. The purpose is to examine potential changes in the number of species and individuals using Wash habitats between years one and two. Avian richness and abundance between years were compared by paired *t*-tests.

Potential changes in avian diversity from year one and year two were 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. Nevertheless, the breeding season as defined does include some 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 over-wintering 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 confounded 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 among census events for the previously defined periods. Seasonal comparisons were performed using paired *t*-tests.

Individual species abundances, spatial distribution, and temporal distribution -

Individual species' abundances were compiled as absolute and relative abundances for the year, the breeding season, and the non-breeding season of the respective years. 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 of each species observed at each of the 28 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 is a measure of how evenly individuals were distributed among the species present during the given time periods (e.g. overall, breeding, and non-breeding periods for each year). Relative abundances were calculated as a percentage of all the individuals observed for the given time periods that could be attributed to each species.

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 28 where a specific species was detected during the given time periods for each year. Absolute frequency is the sum of the total number of census points where a species was detected during the given time period for each year.

Between year changes in individual species abundances - The second year of data provides the first opportunity to examine potential differences in individual bird species abundances between the two years of data collection. This is an important opportunity since changes in bird species abundances may indicate a response by birds to changes in vegetation structure and composition associated with habitat revegetation and enhancement efforts.

To perform the above comparisons, individual species abundances were calculated as the sum of the maximum number of individuals of each bird species detected per census event. Resident bird species would have a maximum of 26 values for each year of data collection derived from the 26 census events per year, thus enabling pairwise comparisons of 26 values between year one and year two (52 values in all). Comparisons of migrant species values between years were more problematic. First, migrant species can be expected to occur in the Wash for some, but not all of the 26 censuses per year. Second, the dates on which any one of these migrant species first and

last appears in the Wash can and does change between the years. These two reasons involve a common denominator, specifically, how to define the period (dates of occurrence) of each year when any migrant species of interest could reasonably be expected to occur in the Wash. To solve this problem, and to enable more statistically powerful pairwise comparisons, we defined the occurrence periods as the dates for the earliest and latest observation of the migrant species of interest, regardless of year. For example, the first and last dates for Lucy's Warbler in year one are 26 March 2005 (census 4) and 28 August 2005 (census 15). The same dates for year two are 1 April 2006 (census 4) and 9 September 2006 (census 16). Therefore, we defined the period for comparing year one and year two abundances for Lucy's Warbler as 26 March (census 4) to 9 September (census 16), regardless of year. Pairwise comparisons were performed by paired *t*-test when the data met parametric assumptions. Otherwise Wilcoxon ranked sum tests (non-parametric) were used.

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 disadvantage of this conservative approach is that some predominately aerial species, such as swallows, swifts, ducks and raptors can be undercounted or worse, not counted at all. On the one hand, the study is designed to establish quantitative data sets suitable for inferential comparisons and long-term monitoring, which require an inferential and thus conservative approach. On the other hand, a second objective of this study is to enumerate all bird species utilizing the Wash. The second objective is met by Appendix II, which reports abundance and frequency for all bird species observed regardless of whether they were flying over the census point or were beyond 100 m from the census point. The first objective of the study is met by analyses and inferential comparisons presented in the text, tables and figures of this report. These data and results are based on the conservative approach. Specifically, the numbers, occurrences, frequencies, and inferential comparisons were calculated using 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 in late September of year one to define the baseline conditions at the census points and again in early October of year two to document potential 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 data were collected using six 20 m transects at each census point. Three transects were arrayed in a radial pattern at 120° 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 heterogeneity, 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 28 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. Plotting the proportional diversity indices for each of the 28 census points assessed horizontal perennial structure and heterogeneity of the Wash.

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 event for years one and two is graphed in Figure 2a. Except for a peak in species richness in early May of year one approaching 50 species for that census event, species richness was relatively stable across the years. The peak in species richness in early May year one likely corresponds to a temporary influx of migratory species but was insufficient to result in a significant difference in average species richness per census event between years one and two ($t = 0.128$, d.f. = 25, $P = 0.899$; Table 1, Figure 3a).

Total abundance per census event for years one and two is graphed in Figures 2b. The lowest abundances occurred in February through late April of year one. These abundances were likely due to undefined annual variability in spring migration, though other factors are possible. Whatever the cause, these differences were insufficient to result in a significant difference in overall average abundances per census event between years one and two ($t = -0.798$, d.f. = 25, $P = 0.432$; Table 1, Figure 3b).

Comparisons of average seasonal bird species diversity for year one versus year two are also graphed in Figure 3. Consistent with overall average species richness per census event, there was no significant difference in average species richness per census event during the 2005 breeding season versus the 2006 breeding season ($t = 0.905$, d.f. = 11, $P = 0.385$; Table 1, Figure 3a). The average number of bird species per census event during the 2005 breeding season was 34.3 (s.d. = 5.03) versus 32.8 (s.d. = 4.55) in 2006. Likewise consistent with the overall abundance, there was no significant difference in average abundance per census event during the 2005 breeding season versus the 2006 breeding season ($t = 0.008$, d.f. = 11, $P = 0.994$; Table 1, Figure 3b). The average abundance per census event during the 2005 breeding season was 293.0 (s.d. = 83.5) in 2005 versus 292.8 (s.d. = 55.8) in 2006.

Similarly for the non-breeding season, there was no significant difference in average species richness per census event during the 2005 non-breeding season versus the 2006 non-breeding season ($t = 0.947$, d.f. = 8, $P = 0.371$; Table 1, Figure 3a). The average number of species per census event during the non-breeding season was 32.1 (s.d. = 4.68) for 2005 versus 30.3 (s.d. = 4.53) for 2006. Neither was there a significant difference in average abundance per census event during the 2005 non-breeding season versus the 2006 non-breeding season ($t = 0.825$, d.f. = 8, $P = 0.433$; Table 1, Figure 3b). The average abundance per census event during the 2005 non-breeding season was 292.1 (s.d. = 76.5) in 2005 versus 274.9 (s.d. = 44.6) in 2006.

In summary, the results indicate no significant changes, either overall or seasonally, in avian diversity (richness and abundance) in the Wash between year one and year two.

Individual species abundances, spatial distributions, and temporal distributions -

Individual species' abundances for years one and two are reported in Table 2. Year one

censuses detected 114 species (129 counting flyovers and species outside the count radii) and 1,253 individuals. Year two censuses detected 107 species (121 counting flyovers and species outside the count radii) and 1,176 individuals. Eleven unique species (including flyovers) were detected in year two.

In year one, 11 of the 114 species observed accounted for 51.2% of the individuals observed. Twenty-four of the 114 species accounted for 74.7% of individuals observed. The ten most abundant species in year one were Red-winged Blackbird (10.5% of total individuals detected), Mourning Dove (7.8%), Abert's Towhee (5.7%), Yellow-rumped Warbler (4.7%), White-crowned Sparrow (4.2%), Lucy's Warbler (3.7%), Song Sparrow (3.4%), Yellow-headed Blackbird (3.2%), Wilson's Warbler (2.9%), and Ruby-crowned Kinglet (2.6%).

Year two results had minor differences from year one, but overall were not dissimilar. In year two, 11 of the 107 species observed accounted for 49.7% of the individuals observed. Twenty-four of 107 species accounted for 74.5% of individuals observed. The ten most abundant species in year two were American Coot (8.2% of total individuals detected), Red-winged Blackbird (7.7%), Mallard (4.9%), Song Sparrow (4.5%), Abert's Towhee (4.4%), White-crowned Sparrow (4.4%), American Pipit (3.9%), Lucy's Warbler (3.1%), Brown-headed Cowbird (2.9%) and Ruby-crowned Kinglet (2.9%). Overall, year one versus year two abundances suggest few qualitative changes in bird species abundances have occurred between the years and overall, the bird species abundances were relatively stable between the years.

Breeding season annual differences were likewise uneventful. In the year one breeding season 21 of the 89 species observed accounted for 75.3% of the individuals observed. In the year two breeding season 22 of the 77 species observed accounted for 74.7% of the individuals observed. The ten most abundant species in the year one breeding season were Mourning Dove (11.9% of the total individuals detected), Abert's Towhee (7.8%), Lucy's Warbler (5.6%), Song Sparrow (5.2%), Yellow-headed Blackbird (4.8%), Wilson's Warbler (4.4%), Brown-headed Cowbird (3.6%), Red-winged Blackbird (3.5%), Common Yellowthroat (3.4%) and Yellow-breasted Chat (3.4%). The ten most abundant species in the year two breeding season were Song Sparrow (7.3%), Abert's Towhee (7.0%), Red-winged Blackbird (5.1%), Lucy's Warbler (4.9%), Brown-headed Cowbird (4.7%), Common Yellow-throat (4.3%), Bewick's Wren (3.8%), Yellow-breasted Chat (3.6%), Blue Grosbeak (2.9%) and Black-tailed Gnatcatcher (2.9%). The biggest changes in year one versus year two breeding season abundances occurred with Mourning Dove and Yellow-headed Blackbird. Absolute and relative abundance of Mourning Dove in the year one breeding season were 98 and 11.9% respectively. In year two, the same values were 16 and 2.2%. For Yellow-headed Black birds, the corresponding year one values were 40 and 4.8%. Year two values were 6 and 0.3%. The differences in year one versus year two breeding season abundances for both species can be traced to single observational events. A single observation of a flock of Mourning Dove (88 individuals) perched within the count radius at point two on 3 June 2005 grossly inflated the absolute and relative abundances for this species in 2005. Similarly, a single observation of 40 Yellow-headed Blackbird at point twenty-nine on 16 July 2005 grossly inflated absolute and relative abundances for this species. Occasional aggregations of flocking birds are to be expected and should not be over emphasized,

unless of course the aggregations become more than occasional, which is not the case in this study.

Non-breeding season annual differences were also uneventful. In the year one non-breeding season 13 of 65 species observed accounted for 74.9% of the individuals observed. In the year two non-breeding season 12 of 60 species observed accounted for 74.7% of the individuals observed. The ten most abundant species in the year one non-breeding season were Red-winged Blackbird (19.5%), Yellow-rumped Warbler (8.7%), White-crowned Sparrow (7.8%), Abert's Towhee (5.3%), Song Sparrow (5.3%), American Pipit (4.7%), Ruby-crowned Kinglet (4.7%), American Coot (4.0%), Bewick's Wren (3.8%) and Marsh Wren (3.2%). The ten most abundant species in the year two non-breeding season were Red-winged Blackbird (13.5%), American Coot (13.0%), Mallard (8.1%), American Pipit (6.8%), Abert's Towhee (5.2%), Ruby-crowned Kinglet (5.0%), White-crowned Sparrow (4.9%), Song Sparrow (4.1%), Yellow-rumped Warbler (3.7%) and Gadwall (3.6%).

Individual species' frequencies for year one and year two are reported in Table 3. In year one, Abert's Towhee, Black Phoebe, Ruby-crowned Kinglet, Song Sparrow, and Yellow-rumped Warbler were the most evenly distributed species, occurring at all 28 census points. Twenty-one species were found at 75% or more of the census points.

Similar to abundances, year two frequency results had minor differences from year one, but overall were not dissimilar. In year two, Abert's Towhee, Bewick's Wren, Black Phoebe, and White-crowned Sparrow were the most evenly distributed species, occurring at all 28 census points. Twenty species were found at 75% or more of the census points. Overall, the year one and year two frequency results suggest a few qualitative changes in bird species frequencies have occurred between the years, but overall, bird species frequencies were relatively stable between the years.

Individual bird species comparisons - Statistical comparisons between the 36 most abundant species of years one versus two are reported in Table 4. There were significant changes for 8 of 36 species considered. Four of those eight species declined, while four increased. Yellow-rumped Warbler, Lucy's Warbler, Killdeer and Lincoln Sparrow had significant declines from year one to year two. American Coot, Marsh Wren, Gadwall and Verdin had significant increases from year one to year two.

Overall, three of the four species that declined were over-wintering species typically associated with thick scrubby habitats, especially tamarisk thickets. Three of the species that increased are typically associated with open water or marsh habitats. Results suggest, but are in no way conclusive, that tamarisk control and revegetation projects and control structure placements may be affecting abundances for a handful of bird species utilizing the Wash.

Vegetation Analyses

Vegetation composition and structure – Comparisons of changes in overall and species specific perennial tree cover for 2005 versus 2006 are plotted in Figure 4. Overall, there was no significant change in average tree cover among years. Tree cover averaged 40.8% (s.d. = 20.1) in 2005 and 34.3% (s.d. = 23.9) in 2006. The large standard deviations indicate that tree cover is unevenly distributed among the census points.

There was a significant reduction of average tamarisk cover from 35.9% (s.d. = 22.3) in 2005 to 29.3% (s.d. = 24.9) in 2006 ($t = 2.307$, $d.f. = 27$, $P = 0.029$). The large standard deviations indicate that tamarisk cover is unevenly distributed among the census points. Reductions in tamarisk cover from 2005 to 2006 are most parsimoniously ascribed to ongoing tamarisk removal projects. Overall, though, the predominant perennial tree cover is still tamarisk

There were no significant changes in native, cottonwood, Gooding willow, sandbar willow, or mesquite tree cover between 2005 and 2006. Native tree cover averaged 3.7% (s.d. = 7.2) in 2005 versus 4.0% (s.d. = 8.2) in 2006. Cottonwood tree cover averaged 0.9% (s.d. = 2.8) in 2005 versus 1.1% (s.d. = 3.6) in 2006. Gooding willow tree cover averaged 1.8% (s.d. = 4.3) in 2005 versus 1.3% (s.d. = 2.9) in 2006. Sandbar willow tree cover averaged 1.1% (s.d. = 3.6) in 2005 versus 1.7% (s.d. = 4.2) in 2006. Mesquite tree cover averaged 1.1% (s.d. = 4.2) in 2005 versus 1.0% (s.d. = 3.9) in 2006. The lack of change in these tree covers is most parsimoniously explained by the early successional stages of the native perennial revegetation efforts following tamarisk removal.

Physiognomic cover types are graphed in Figure 5. The forb cover class decreased significantly from an average 9.4% (s.d. = 13.0) in 2005 to an average 4.5% (s.d. = 7.0) in 2006 ($W = -160.0$, $P = 0.010$, $n = 28$). The grass cover class decreased significantly from 2.7% (s.d. = 5.2) in 2005 to 0.7% (s.d. = 1.7) in 2006 ($W = -67.0$, $P = 0.035$, $n = 28$).

There were no significant changes in the tree, shrub, and cattail cover classes between 2005 and 2006. The tree cover class averaged 40.8% (s.d. = 20.1) in 2005 and 34.3% (s.d. = 23.9) in 2006. The shrub cover class averaged 23.9% (s.d. = 18.4) in 2005 and 19.4% (s.d. = 19.5) in 2006. The cattail cover class averaged 3.6% (s.d. = 9.3) in 2005 and 2.3% (s.d. = 5.1) in 2006.

Vertical perennial structure is graphed in Figure 6. Overall, there was a significant reduction of vertical perennial structure from an average of 488.4 hits/rod in 2005 to an average of 387.4 hits/rod in 2006 ($t = 2.392$, $d.f. = 27$, $P = 0.024$). The significant decrease in overall vertical structure is attributable to decreases in the 2 – 4 m and 4 – 6 m height classes. Average perennial hits in the 2 – 4 m height class were significantly higher in 2005 (131.3 hits/rod) versus 2006 (102.0 hits/rod) ($t = 2.305$, $d.f. = 27$, $P = 0.029$). Average perennial hits in the 4 – 6 m height class were also significantly higher in 2005 (62.6 hits/rod) versus 2006 (42.2 hits/rod) ($W = -147.0$, $P = 0.011$, $n = 28$). Reduced perennial cover associated with tamarisk removal projects most parsimoniously explains reductions in vertical perennial structure.

Horizontal perennial structure and heterogeneity at the census points are plotted in Figure 7. The widely scattered points indicate an uneven (heterogeneous) distribution of perennial structure in horizontal space across the census point habitats. For example, census points 3, 25, and 29 scored < 2 in the horizontal proportional distribution of perennial hits among the six transects per census point, indicating perennial structure for these census points was clumped and unevenly distributed horizontally across all six transects per census area. In contrast, census points 9, 19 and 21 scored > 5 indicating perennial structure was evenly distributed in horizontal space at these census points. Overall, there was no significant correlation between horizontal perennial structure and census point habitats, indicating that overall perennial habitats in the Wash are patchily

distributed (clumped) in horizontal space. Heterogeneous distribution of perennial structure in horizontal space is believed to potentiate high bird species diversity due to increased niche space.

The relationships between average perennial height and average tamarisk and average native broadleaf cover are plotted in Figure 8. There was a significant correlation between mean perennial height and percent tamarisk cover ($P < 0.001$, $r^2 = 0.64$), indicating that tamarisk accounts for 64% of the variation in perennial height across the Wash. There was no significant correlation between average perennial height and percent native broadleaf cover ($P = 0.952$, $r^2 = 0.000$) indicating that overall, native broadleaf perennials have not yet achieved sufficient height to contribute to perennial habitats in the Wash.

The relationships between mean perennial structure (hits) and mean tamarisk and mean native broadleaf cover are plotted in Figure 9. There was a significant correlation between mean perennial hits and percent tamarisk cover ($P < 0.001$, $r^2 = 0.58$), indicating that tamarisk accounts for 58% of the variation in perennial structure across the Wash. There was no significant correlation between average perennial hits and percent native broadleaf cover ($P = 0.952$, $r^2 = 0.000$) indicating that native broadleaf perennials were not yet a significant contributor to perennial structure in the Wash.

DISCUSSION

Vegetation composition and structure – Long-range plans for the Wash entail continuing tamarisk control and native plant revegetation efforts in concert with the placement of erosion control structures in the channel, activities that were already underway during years one and two. Tamarisk control and revegetation activities have had limited success so far, but the programs are still young. Tamarisk continues to dominate the Wash in percent cover, perennial height, and perennial structure (Figures 4, 8 and 9). Nevertheless, there was a significant reduction in tamarisk cover from year one to year two, most certainly attributable to the tamarisk control program. There was no increase in native riparian cover in the same time period. Increases in any one species of native perennial cover averaged $< 5\%$ in year two, and none were significantly different from year one. However, this is likely due to the infancy of the revegetation efforts.

Coincident with reduced tamarisk cover, there were significant reductions in overall vertical perennial structure. Data analyses indicate the reductions occurred predominately in the 2 – 4 m and 4 – 6 m height classes. Significant decreases in vertical perennial structure in the 2 – 4 m and 4 – 6 m height classes from year one to year two are likely consequences of tamarisk removal programs. These decreases in perennial structure were not unexpected since tamarisk is the dominant perennial in the Wash. Revegetation efforts following tamarisk removal were still in early successional phases in year two, and therefore likely unable to compensate for significant decreases in the 2 – 4 m and 4 – 6 m height classes.

Significant reductions in the grass and forb physiognomic cover classes were unanticipated but likely consequences of tamarisk removal. In retrospect, these decreases make some sense. Forbs and grasses in the Wash are most commonly associated with tamarisk patches. Tamarisk removal techniques entail removing tamarisk cover to the

mineral earth by bulldozers, and thus the removal of intervening forb and grass cover was inevitable. Reductions of forb and grass cover are likely to be temporary, dependent on successful revegetation at the removal sites. At the time the vegetation data for this report were collected, revegetation plots were either bare or in early successional stages. Revegetated plots are likely to mature over the years, and there is a reasonable expectation that forb and grass cover types will recover coincident to habitat maturation. Both cover class values were less than 10%, regardless of year. Thus significant but temporary diminutions of these cover classes may be inconsequential in the long term.

Tamarisk removal notwithstanding, vertical and horizontal perennial structures remain heterogeneous across the Wash. 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 (Figure 6). The distribution of perennial structure in horizontal space is equally patchy and discontinuous across the Wash (Figure 7). Physiognomic cover is likewise heterogeneous with cover types distributed in decreasing order among trees, shrubs, forbs, and minor components of grasses and cattail (Figure 5). Heterogeneity in vertical structure, horizontal structure, and physiognomic cover types suggest the Wash still supports a diversity of habitats (niche space), which provides for a diverse avian community. The avian community diversity in the Wash for years one and two are concordant with this expectation.

Avian community diversity - Changes in vegetation composition and structure in the Wash from year one to year two, which are likely attributable to tamarisk control, appear to have had little discernable affect on the avian community of the Wash. Overall avian diversity (abundance and richness) was unchanged from year one to year two (Figures 2 and 3, Table 1). The number of species utilizing the Wash was not significantly different in years one versus two. The number of individuals utilizing the Wash was not significantly different in years one versus two. Neither was there any indication of significant changes in seasonal (breeding/non-breeding) richness or abundance between years one versus two.

There were subtle qualitative changes in the abundances of individual bird species between years one and two (Tables 2 and 4) but most differences, except for a few species discussed below, were neither significant nor meaningful. For example, the relative abundance of Red-winged Blackbird in year one was 10.5% versus 7.7% in year two. Abert's Towhee relative abundance was 5.7% in year one versus 4.2% in year two. White-crowned Sparrow relative abundance in year one was 4.2% versus 4.4% year two. Song Sparrow relative abundance was 3.4% in year one versus 4.5% in year two. Differences in abundance, with the exception of a few species were small and subtle. Similar subtle qualitative differences occurred in species frequencies (Table 3).

As mentioned in the preceding paragraph, significant changes in abundance did occur for eight species (Table 4). Interpretation of these changes is preliminary, being based on two years of data, and therefore unable to accurately account for normal annual variation. Given these caveats, three of four species that decreased from year one to year two (Yellow-rumped Warbler, Lucy's Warbler and Lincoln Sparrow) are associated with upland habitats and may have been affected by tamarisk removal. Three of four species that increased from year one to year two (American Coot, Marsh Wren and Gadwall) are associated with open water or marsh habitats, habitats which likely increased in

association with the placement of control structures across the Wash. The preponderance of the evidence suggest that control structure placements and tamarisk removal/revegetation efforts may be having an affect on abundances for a few bird species, but the overall avian community is unchanged. Again though, it is important to emphasize that the data are limited to two years and interpretations of the data are preliminary.

SUMMARY

Tamarisk cover, perennial structure in the 2 – 4 m and 4 – 6 m height classes, and forb and grass physiognomic cover types all decreased from year one to year two. Changes were likely due to tamarisk removal projects currently underway in the Wash. Changes in structure and physiognomic cover types are likely to be compensated for by revegetation efforts that follow tamarisk removal. Revegetation sites for the most part were in early successional phases at the time of data collection.

Bird species diversity was largely unchanged from year one to year two, with the exception of changes in abundance for eight species. Changes in abundances for these eight species may be related to tamarisk removal projects and/or the placement of erosion control structures, or to annual variation in bird species abundance unrelated to these factors. Data are insufficient at this time to decipher normal and expected variations in bird species abundances from effects attributable to anthropogenic activities in the Wash.

RECOMMENDATIONS

1) Continue bi-weekly avian monitoring and annual vegetation monitoring. Habitat changes are occurring in the Wash. These changes will likely have effects on the avian community. Environmental factors that affect avian communities are little understood for arid riparian systems, or for avian communities in general. Information obtained is directly applicable to local conservation efforts as well as the general body of scientific knowledge.

2) Continue tamarisk removal and revegetation projects. Tamarisk removal projects are common throughout the west. Associate revegetation with native broadleaf perennials is the stated goal of most removal efforts, but much of this revegetation has been less than successful for a variety of reasons. Lack of long-term commitment, typically based on funding, has confounded completion of the projects. The LVWCC and its partners have established infrastructure and funding agreements to ensure that the goals of stabilizing the Wash and improving its ecological function are met. Thus, habitat manipulation and revegetation activities in the Wash present a unique opportunity to examine the affectability of tamarisk removal and revegetation projects over the long term.

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Table 1: Results of paired *t*-test comparisons of avian species richness and abundance after 26 censuses from 12 February 2005 through 29 January 2006 versus 26 censuses from 12 February 2006 through 29 January 2007 in the Wash.

	2005 - 2006		2006 - 2007		<i>t</i>	<i>d.f.</i>	<i>P</i>
	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>			
Richness							
Overall ¹	32.7	5.18	32.5	4.84	0.128	25	0.899
Breeding ²	34.3	5.03	32.8	4.55	0.905	11	0.385
Non-breeding ³	32.1	4.68	30.3	4.53	0.947	8	0.371
Abundance							
Overall	271.7	85.4	284.8	49.6	- 0.798	25	0.432
Breeding	293.0	83.5	292.8	55.8	0.008	11	0.994
Non-breeding	292.1	76.5	274.9	44.6	0.825	8	0.433

1 – 26 censuses from 12 February through 31 January of each year. 1 census = 1 five-minute count at each of 28 census points.

2 – 12 censuses from 15 March through 31 August of each year. 1 census = 1 five-minute count at each of 28 census points.

3 – 9 censuses from 1 October through 31 January of each year. 1 census = 1 five-minute count at each of 28 census points.

Table 2: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

<u>Species</u>	<u>2005 – 2006</u>			<u>2006 – 2007</u>		
	<u>Overall Abundance Abs. (Rel.)</u>	<u>Breeding Abundance Abs. (Rel.)</u>	<u>Non-breeding Abundance Abs. (Rel.)</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 (10.5)	29 (3.5)	132 (19.5)	91 (7.7)	37 (5.1)	91 (13.5)
Mourning Dove (<i>Zenaida macroura</i>)	98 (7.8)	98 (11.9)	3 (0.4)	16 (1.4)	16 (2.2)	0 (0.0)
Abert's Towhee (<i>Pipilo aberti</i>)	71 (5.7)	64 (7.8)	36 (5.3)	52 (4.4)	51 (7.0)	35 (5.2)
Yellow-rumped Warbler (<i>Dendroica coronata</i>)	59 (4.7)	4 (0.5)	59 (8.7)	25 (2.1)	21 (2.9)	25 (3.7)
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	53 (4.2)	8 (1.0)	53 (7.8)	52 (4.4)	21 (2.9)	33 (4.9)
Lucy's Warbler (<i>Vermivora luciae</i>)	46 (3.7)	46 (5.6)	0 (0.0)	36 (3.1)	36 (5.0)	0 (0.0)
Song Sparrow (<i>Melospiza melodia</i>)	43 (3.4)	43 (5.2)	36 (5.3)	53 (4.5)	53 (7.3)	28 (4.1)
Yellow-headed Blackbird (<i>Xanthocephalus xanthocephalus</i>)	40 (3.2)	40 (4.8)	1 (0.2)	11 (0.9)	2 (0.3)	0 (0.0)
Wilson's Warbler (<i>Wilsonia pusilla</i>)	36 (2.9)	36 (4.4)	3 (0.4)	21 (1.8)	21 (2.9)	0 (0.0)
American Pipit (<i>Anthus rubescens</i>)	32 (2.6)	0 (0.0)	32 (4.7)	46 (3.9)	1 (0.1)	46 (6.8)

Table 2 continued: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

Species	2005 – 2006			2006 – 2007		
	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>
Ruby-crowned Kinglet (<i>Regulus calendula</i>)	32 (2.6)	13 (1.6)	32 (4.7)	34 (2.9)	18 (2.5)	34 (5.0)
Brown-headed Cowbird (<i>Molothrus ater</i>)	30 (2.4)	30 (3.6)	0 (0.0)	34 (2.9)	34 (4.7)	0 (0.0)
Bewick's Wren (<i>Thryomanes bewickii</i>)	28 (2.2)	22 (2.7)	26 (3.8)	33 (2.8)	28 (3.8)	22 (3.2)
Common Yellowthroat (<i>Geothlypis trichas</i>)	28 (2.2)	28 (3.4)	1 (0.2)	31 (2.6)	31 (4.3)	0 (0.0)
Yellow-breasted Chat (<i>Icteria virens</i>)	28 (2.2)	28 (3.4)	0 (0.0)	26 (2.2)	26 (3.6)	0 (0.0)
American Coot (<i>Fulica americana</i>)	27 (2.2)	11 (1.3)	27 (4.0)	96 (8.2)	18 (2.5)	88 (13.0)
Blue Grosbeak (<i>Passerina caerulea</i>)	23 (1.8)	23 (2.8)	0 (0.0)	21 (1.8)	21 (2.9)	0 (0.0)
Marsh Wren (<i>Cistothorus palustris</i>)	22 (1.8)	15 (1.8)	22 (3.2)	31 (2.6)	14 (1.9)	24 (3.6)
Gadwall (<i>Anas strepera</i>)	21 (1.7)	1 (0.1)	21 (3.1)	24 (2.0)	1 (0.1)	24 (3.6)
Gambel's Quail (<i>Callipepla gambelii</i>)	20 (1.6)	20 (2.4)	4 (0.6)	16 (1.4)	16 (2.2)	5 (0.7)
Black Phoebe (<i>Sayornis nigricans</i>)	19 (1.5)	12 (1.4)	19 (2.8)	22 (1.9)	11 (1.5)	22 (3.2)

Table 2 continued: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

Species	2005 – 2006			2006 – 2007		
	Overall Abundance Abs. (Rel.)	Breeding Abundance Abs. (Rel.)	Non-breeding Abundance Abs. (Rel.)	Overall Abundance Abs. (Rel.)	Breeding Abundance Abs. (Rel.)	Non-breeding Abundance Abs. (Rel.)
Black-tailed Gnatcatcher (<i>Polioptila melanura</i>)	18 (1.4)	18 (2.2)	13 (1.9)	21 (1.8)	21 (2.9)	3 (1.9)
House Finch (<i>Carpodacus mexicanus</i>)	15 (1.2)	15 (1.8)	4 (0.6)	11 (0.9)	10 (1.4)	11 (1.6)
Mallard (<i>Anas platyrhynchos</i>)	15 (1.2)	5 (0.6)	10 (1.5)	58 (4.9)	4 (0.6)	55 (8.1)
Verdin (<i>Auriparus flaviceps</i>)	15 (1.2)	15 (1.8)	13 (1.9)	18 (1.5)	18 (2.5)	13 (1.9)
Yellow Warbler (<i>Dendroica petechia</i>)	14 (1.1)	14 (1.7)	0 (0.0)	11 (0.9)	11 (1.5)	0 (0.0)
Killdeer (<i>Charadrius vociferus</i>)	13 (1.0)	13 (1.6)	7 (1.0)	9 (0.8)	9 (1.2)	3 (0.4)
Orange-crowned Warbler (<i>Vermivora celata</i>)	13 (1.0)	4 (0.5)	9 (1.3)	14 (1.2)	4 (0.6)	14 (2.1)
Western Sandpiper (<i>Calidris mauri</i>)	12 (1.0)	12 (1.4)	0 (0.0)	1 (0.1)	0 (0.0)	0 (0.0)
Bushtit (<i>Psaltriparus minimus</i>)	11 (0.8)	2 (0.2)	11 (1.6)	8 (0.7)	0 (0.0)	8 (1.2)
Brewer's Sparrow (<i>Spizella breweri</i>)	10 (0.8)	0 (0.0)	3 (0.4)	11 (0.9)	11 (1.5)	0 (0.0)
Crissal Thrasher (<i>Toxostoma crissale</i>)	10 (0.8)	10 (1.2)	9 (1.3)	7 (0.6)	7 (1.0)	4 (0.6)

Table 2 continued: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

<u>Species</u>	<u>2005 – 2006</u>			<u>2006 – 2007</u>		
	<u>Overall Abundance Abs. (Rel.)</u>	<u>Breeding Abundance Abs. (Rel.)</u>	<u>Non-breeding Abundance Abs. (Rel.)</u>	<u>Overall Abundance Abs. (Rel.)</u>	<u>Breeding Abundance Abs. (Rel.)</u>	<u>Non-breeding Abundance Abs. (Rel.)</u>
Lesser Goldfinch (<i>Carduelis psaltria</i>)	10 (0.8)	6 (0.7)	4 (0.6)	12 (1.0)	6 (0.8)	1 (0.2)
American Avocet (<i>Recurvirostra americana</i>)	9 (0.7)	9 (1.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Blue-gray Gnatcatcher (<i>Poliopitila caerulea</i>)	9 (0.7)	9 (1.1)	2 (0.3)	7 (0.7)	7 (1.0)	0 (0.0)
Great-tailed Grackle (<i>Quiscalus mexicanus</i>)	8 (0.6)	4 (0.5)	8 (1.2)	19 (1.6)	19 (2.6)	8 (1.2)
Lincoln's Sparrow (<i>Melospiza lincolni</i>)	7 (0.6)	1 (0.1)	7 (1.0)	2 (0.2)	2 (0.3)	1 (0.2)
Savannah Sparrow (<i>Passerculus sandwichensis</i>)	6 (0.5)	6 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Snowy Egret (<i>Egretta thula</i>)	6 (0.5)	5 (0.6)	6 (0.9)	1 (0.1)	0 (0.0)	1 (0.2)
Black-headed Grosbeak (<i>Pheucticus melanocephalus</i>)	5 (0.4)	5 (0.6)	0 (0.0)	2 (0.2)	2 (0.3)	0 (0.0)
Cinnamon Teal (<i>Anas cyanoptera</i>)	5 (0.4)	5 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Greater Roadrunner (<i>Geococcyx californianus</i>)	5 (0.4)	4 (0.5)	5 (0.7)	8 (0.7)	8 (1.1)	1 (0.2)
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	5 (0.4)	5 (0.6)	2 (0.3)	4 (.3)	4 (0.6)	1 (0.2)

Table 2 continued: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

Species	2005 – 2006			2006 – 2007		
	Overall Abundance Abs. (Rel.)	Breeding Abundance Abs. (Rel.)	Non-breeding Abundance Abs. (Rel.)	Overall Abundance Abs. (Rel.)	Breeding Abundance Abs. (Rel.)	Non-breeding Abundance Abs. (Rel.)
Say's Phoebe (<i>Sayornis saya</i>)	5 (0.4)	3 (0.4)	5 (0.7)	6 (0.5)	6 (0.8)	3 (0.4)
Spotted Sandpiper (<i>Actitis macularius</i>)	5 (0.4)	5 (0.6)	1 (0.2)	7 (0.6)	7 (1.0)	2 (0.3)
Anna's Hummingbird (<i>Calypte anna</i>)	4 (0.3)	4 (0.5)	1 (0.2)	2 (0.2)	2 (0.3)	0 (0.0)
Black-necked Stilt (<i>Himantopus mexicanus</i>)	4 (0.3)	4 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Green Heron (<i>Butorides virescens</i>)	4 (0.3)	4 (0.5)	1 (0.2)	6 (0.5)	6 (0.8)	2 (0.3)
Northern Flicker (<i>Colaptes auratus</i>)	4 (0.3)	0 (0.0)	4 (0.6)	5 (0.4)	0 (0.0)	5 (0.7)
Northern Shoveler (<i>Anas clypeata</i>)	4 (0.3)	0 (0.0)	1 (0.2)	2 (0.2)	0 (0.0)	0 (0.0)
Phainopepla (<i>Phainopepla nitens</i>)	4 (0.3)	0 (0.0)	4 (0.6)	3 (0.2)	0 (0.0)	3 (0.4)
White-winged Dove (<i>Zenaida asiatica</i>)	4 (0.3)	4 (0.5)	1 (0.2)	3 (0.2)	3 (0.4)	0 (0.0)
American Kestrel (<i>Falco sparverius</i>)	3 (0.2)	3 (0.4)	0 (0.0)	2 (0.2)	2 (0.3)	0 (0.0)
Belted Kingfisher (<i>Megaceryle alcyon</i>)	3 (0.2)	0 (0.0)	3 (0.4)	2 (0.2)	1 (0.1)	2 (0.3)

Table 2 continued: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

Species	2005 – 2006			2006 – 2007		
	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>
Black-chinned Hummingbird (<i>Archilochus alexandri</i>)	3 (0.2)	3 (0.4)	0 (0.0)	4 (0.3)	4 (0.6)	0 (0.0)
Chipping Sparrow (<i>Spizella passerina</i>)	3 (0.2)	1 (0.1)	0 (0.0)	6 (0.5)	0 (0.0)	0 (0.0)
Costa's Hummingbird (<i>Calypte costae</i>)	3 (0.2)	3 (0.4)	0 (0.0)	5 (0.4)	5 (0.7)	0 (0.0)
Dark-eyed Junco (<i>Junco hyemalis</i>)	3 (0.2)	2 (0.2)	1 (0.2)	5 (0.4)	0 (0.0)	5 (0.7)
Greater Yellowlegs (<i>Tringa melanoleuca</i>)	3 (0.2)	0 (0.0)	3 (0.4)	6 (0.5)	1 (0.1)	3 (0.4)
Lazuli Bunting (<i>Passerina amoena</i>)	3 (0.2)	2 (0.2)	0 (0.0)	2 (0.2)	2 (0.3)	1 (0.2)
Sharp-shinned Hawk (<i>Accipiter striatus</i>)	3 (0.2)	0 (0.0)	3 (0.4)	1 (0.1)	0 (0.0)	1 (0.2)
Western Bluebird (<i>Sialia mexicana</i>)	3 (0.2)	0 (0.0)	3 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)
Western Kingbird (<i>Tyrannus verticalis</i>)	3 (0.2)	3 (0.4)	0 (0.0)	7 (0.6)	7 (1.0)	0 (0.0)
Barn Owl (<i>Tyto alba</i>)	2 (0.2)	2 (0.2)	0 (0.0)	2 (0.2)	2 (0.3)	0 (0.0)
Bell's Vireo [Arizona] (<i>Vireo bellii arizonae</i>)	2 (0.2)	2 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Table 2 continued: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

Species	2005 – 2006			2006 – 2007		
	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>
Black-crowned Night-Heron (<i>Nycticorax nycticorax</i>)	2 (0.2)	2 (0.2)	0 (0.0)	2 (0.2)	2 (0.3)	2 (0.3)
Brown-crested Flycatcher (<i>Myiarchus tyrannulus</i>)	2 (0.2)	2 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cedar Waxwing (<i>Bombycilla cedrorum</i>)	2 (0.2)	0 (0.0)	1 (0.2)	1 (0.1)	0 (0.0)	0 (0.0)
Common Moorhen (<i>Gallinula chloropus</i>)	2 (0.2)	1 (0.1)	2 (0.3)	2 (0.2)	2 (0.3)	2 (0.3)
Cooper's Hawk (<i>Accipiter cooperii</i>)	2 (0.2)	1 (0.1)	0 (0.0)	2 (0.2)	0 (0.0)	2 (0.3)
Great Blue Heron (<i>Ardea herodias</i>)	2 (0.2)	2 (0.2)	1 (0.2)	3 (0.2)	2 (0.3)	2 (0.3)
Hermit Thrush (<i>Catharus guttatus</i>)	2 (0.2)	1 (0.1)	2 (0.3)	4 (0.3)	1 (0.1)	2 (0.3)
Horned Lark (<i>Eremophila alpestris</i>)	2 (0.2)	2 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Long-eared Owl (<i>Asio otus</i>)	2 (0.2)	2 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Northern Rough-winged Swallow (<i>Stelgidopteryx serripennis</i>)	2 (0.2)	2 (0.2)	0 (0.0)	5 (0.4)	5 (0.7)	0 (0.0)
Pied-billed Grebe (<i>Podilymbus podiceps</i>)	2 (0.2)	0 (0.0)	2 (0.3)	2 (0.2)	1 (0.1)	2 (0.3)

Table 2 continued: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

Species	2005 – 2006			2006 – 2007		
	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>
Red-tailed Hawk (<i>Buteo jamaicensis</i>)	2 (0.2)	0 (0.0)	2 (0.3)	1 (0.1)	1 (0.1)	1 (0.2)
Rock Wren (<i>Salpinctes obsoletus</i>)	2 (0.2)	1 (0.1)	2 (0.3)	2 (0.2)	2 (0.3)	1 (0.2)
Sora (<i>Porzana carolina</i>)	2 (0.2)	0 (0.0)	2 (0.3)	1 (0.1)	1 (0.1)	1 (0.2)
Spotted Towhee (<i>Pipilo maculatus</i>)	2 (0.2)	1 (0.1)	2 (0.3)	2 (0.2)	0 (0.0)	2 (0.3)
Summer Tanager (<i>Piranga rubra</i>)	2 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Virginia Rail (<i>Rallus limicola</i>)	2 (0.2)	2 (0.2)	2 (0.3)	2 (0.2)	1 (0.1)	2 (0.3)
Warbling Vireo (<i>Vireo gilvus</i>)	2 (0.2)	2 (0.2)	0 (0.0)	2 (0.2)	2 (0.3)	0 (0.0)
Western Wood-Pewee (<i>Contopus sordidulus</i>)	2 (0.2)	2 (0.2)	0 (0.0)	2 (0.2)	2 (0.3)	0 (0.0)
White-faced Ibis (<i>Plegadis chihi</i>)	2 (0.2)	2 (0.2)	0 (0.0)	13 (1.1)	13 (1.8)	0 (0.0)
American Robin (<i>Turdus migratorius</i>)	1 (0.1)	0 (0.0)	1 (0.2)	1 (0.1)	0 (0.0)	1 (0.2)
Ash-throated Flycatcher (<i>Myiarchus cinerascens</i>)	1 (0.1)	1 (0.1)	0 (0.0)	1 (0.1)	0 (0.0)	0 (0.0)

Table 2 continued: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

Species	2005 – 2006			2006 – 2007		
	Overall Abundance Abs. (Rel.)	Breeding Abundance Abs. (Rel.)	Non-breeding Abundance Abs. (Rel.)	Overall Abundance Abs. (Rel.)	Breeding Abundance Abs. (Rel.)	Non-breeding Abundance Abs. (Rel.)
Bendire's Thrasher (<i>Toxostoma bendirei</i>)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Blue-winged Teal (<i>Anas discors</i>)	1 (0.1)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Bullock's Oriole (<i>Icterus bullockii</i>)	1 (0.1)	1 (0.1)	0 (0.0)	4 (0.3)	4 (0.6)	0 (0.0)
Canyon Wren (<i>Catherpes mexicanus</i>)	1 (0.1)	1 (0.1)	0 (0.0)	1 (0.1)	0 (0.0)	1 (0.2)
Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Common Merganser (<i>Mergus merganser</i>)	1 (0.1)	1 (0.1)	0 (0.0)	2 (0.2)	0 (0.0)	1 (0.2)
Double-crested Cormorant (<i>Phalacrocorax auritus</i>)	1 (0.1)	1 (0.1)	0 (0.0)	2 (0.2)	2 (0.3)	1 (0.2)
Dusky Flycatcher (<i>Empidonax oberholseri</i>)	1 (0.1)	1 (0.1)	0 (0.0)	1 (0.1)	1 (0.1)	0 (0.0)
Eared Grebe (<i>Podiceps nigricollis</i>)	1 (0.1)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Golden-crowned Kinglet (<i>Regulus satrapa</i>)	1 (0.1)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
Gray Flycatcher (<i>Empidonax wrightii</i>)	1 (0.1)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Table 2 continued: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

Species	2005 – 2006			2006 – 2007		
	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>
Great Egret (<i>Ardea alba</i>)	1 (0.1)	1 (0.1)	1 (0.2)	1 (0.1)	0 (0.0)	1 (0.2)
House Sparrow (<i>Passer domesticus</i>)	1 (0.1)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
House Wren (<i>Troglodytes aedon</i>)	1 (0.1)	0 (0.0)	1 (0.2)	1 (0.1)	1 (0.1)	0 (0.0)
Ladder-backed Woodpecker (<i>Picoides scalaris</i>)	1 (0.1)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Least Bittern (<i>Ixobrychus exilis</i>)	1 (0.1)	1 (0.1)	0 (0.0)	1 (0.1)	0 (0.0)	1 (0.2)
MacGillivray's Warbler (<i>Oporornis tolmiei</i>)	1 (0.1)	1 (0.1)	0 (0.0)	1 (0.1)	0 (0.0)	0 (0.0)
Northern Harrier (<i>Circus cyaneus</i>)	1 (0.1)	0 (0.0)	1 (0.2)	1 (0.1)	0 (0.0)	1 (0.2)
Northern Mockingbird (<i>Mimus polyglottos</i>)	1 (0.1)	1 (0.1)	0 (0.0)	3 (0.2)	2 (0.3)	3 (0.4)
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	1 (0.1)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Osprey (<i>Pandion haliaetus</i>)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Pine Siskin (<i>Carduelis pinus</i>)	1 (0.1)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)

Table 2 continued: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

Species	2005 – 2006			2006 – 2007		
	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>
Red-naped Sapsucker (<i>Sphyrapicus nuchalis</i>)	1 (0.1)	1 (0.1)	1 (0.2)	1 (0.1)	0 (0.0)	1 (0.2)
Semipalmated Plover (<i>Charadrius semipalmatus</i>)	1 (0.1)	1 (0.1)	0 (0.0)	4 (.3)	4 (0.6)	0 (0.0)
Western Tanager (<i>Piranga ludoviciana</i>)	1 (0.1)	1 (0.1)	0 (0.0)	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)	2 (0.2)	1 (0.1)	0 (0.0)
Winter Wren (<i>Troglodytes troglodytes</i>)	1 (0.1)	0 (0.0)	1 (0.2)	1 (0.1)	0 (0.0)	0 (0.0)
Green-winged Teal (<i>Anas crecca</i>)	0 (0.0)	0 (0.0)	0 (0.0)	6 (0.5)	1 (0.1)	6 (0.9)
American Bittern (<i>Botaurus lentiginosus</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.1)	0 (0.0)
American Wigeon (<i>Anas americana</i>)	0 (0.0)	0 (0.0)	0 (0.0)	4 (0.3)	0 (0.0)	0 (0.0)
Black-throated Sparrow (<i>Amphispiza bilineata</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.1)	0 (0.0)
Canyon Towhee (<i>Pipilo fuscus</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.1)	0 (0.0)
Cassin’s Vireo (<i>Vireo cassinii</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.1)	0 (0.0)

Table 2 continued: Overall, breeding¹, and non-breeding² bird species abundances (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

Species	2005 – 2006			2006 – 2007		
	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>	Overall Abundance <u>Abs. (Rel.)</u>	Breeding Abundance <u>Abs. (Rel.)</u>	Non-breeding Abundance <u>Abs. (Rel.)</u>
Great Horned Owl (<i>Bubo virginianus</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	0 (0.0)	0 (0.0)
Hairy Woodpecker (<i>Picoides villosus</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	0 (0.0)	1 (0.2)
Northern Pintail (<i>Anas acuta</i>)	0 (0.0)	0 (0.0)	0 (0.0)	7 (0.6)	0 (0.0)	0 (0.0)
Lesser Nighthawk (<i>Chordeiles acutipennis</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.1)	0 (0.0)
Long-billed Dowitcher (<i>Limnodromus scolopaceus</i>)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.2)	2 (0.3)	0 (0.0)
Merlin (<i>Falco columbarius</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	0 (0.0)	1 (0.2)
Ring-billed Gull (<i>Larus delawarensis</i>)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.2)	0 (0.0)	0 (0.0)
Western Meadowlark (<i>Sturnella neglecta</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.1)	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 individuals detected.

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

Table 3: Overall, breeding¹, and non-breeding² bird species frequencies (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

<u>Species</u>	<u>2005 – 2006</u>			<u>2006 – 2007</u>		
	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>
Abert's Towhee (<i>Pipilo aberti</i>)	28 (100)	28 (100)	28 (100)	28 (100)	28 (100)	28 (100)
Black Phoebe (<i>Sayornis nigricans</i>)	28 (100)	24 (85.7)	26 (92.9)	28 (100)	23 (82.1))	27 (96.4)
Ruby-crowned Kinglet (<i>Regulus calendula</i>)	28 (100)	13 (46.4)	28 (100)	27 (96.4)	15 (53.6)	26 (92.7)
Song Sparrow (<i>Melospiza melodia</i>)	28 (100)	28 (100)	27 (97.4)	27 (96.4)	26 (92.9)	26 (92.9)
Yellow-rumped Warbler (<i>Dendroica coronata</i>)	28 (100)	5 (17.9)	28 (100)	27 (96.4)	9 (32.1)	27 (96.4)
Bewick's Wren (<i>Thryomanes bewickii</i>)	27 (96.4)	24 (85.7)	26 (92.9)	28 (100)	27 (96.4)	25 (89.3)
Brown-headed Cowbird (<i>Molothrus ater</i>)	27 (96.4)	27 (96.4)	0 (0.0)	27 (96.4)	27 (96.4)	0 (0.0)
Blue Grosbeak (<i>Passerina caerulea</i>)	27 (96.4)	27 (96.4)	0 (0.0)	24 (85.7)	24 (85.7)	0 (0.0)
Black-tailed Gnatcatcher (<i>Polioptila melanura</i>)	26 (92.9)	24 (85.7)	22 (78.6)	27 (96.4)	25 (89.3)	23 (82.1)
Common Yellowthroat (<i>Geothlypis trichas</i>)	26 (92.9)	26 (92.9)	1 (2.6)	25 (89.3)	25 (89.3)	0 (0.0)

Table 3 continued: Overall, breeding¹, and non-breeding² bird species frequencies (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

<u>Species</u>	<u>2005 – 2006</u>			<u>2006 – 2007</u>		
	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>
Lucy's Warbler (<i>Vermivora luciae</i>)	26 (92.9)	26 (92.9)	0 (0.0)	25 (89.3)	25 (89.3)	0 (0.0)
Marsh Wren (<i>Cistothorus palustris</i>)	26 (92.9)	13 (46.4)	24 (85.7)	23 (82.1)	15 (53.6)	20 (71.4)
Mourning Dove (<i>Zenaida macroura</i>)	26 (92.9)	26 (92.9)	2 (7.1)	22 (78.6)	20 (71.4)	0 (0.0)
Orange-crowned Warbler (<i>Vermivora celata</i>)	26 (92.9)	5 (17.9)	22 (78.6)	23 (82.1)	6 (21.4)	19 (67.9)
Verdin (<i>Auriparus flaviceps</i>)	26 (92.9)	21 (75.0)	20 (71.4)	27 (96.4)	27 (96.4)	16 (57.1)
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	26 (92.9)	8 (28.6)	24 (85.7)	28 (100)	12 (42.9)	25 (89.3)
Crissal Thrasher (<i>Toxostoma crissale</i>)	25 (89.3)	20 (71.4)	20 (71.4)	23 (82.1)	18 (64.3)	11 (39.3)
Yellow-breasted Chat (<i>Icteria virens</i>)	25 (89.3)	25 (89.3)	0 (0.0)	22 (78.6)	22 (78.6)	0 (0.0)
Gambel's Quail (<i>Callipepla gambelii</i>)	21 (75.0)	20 (71.4)	4 (14.3)	14 (50.0)	12 (42.9)	6 (21.4)
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	21 (75.0)	21 (75.0)	14 (50.0)	24 (85.7)	21 (75.0)	12 (42.9)
Wilson's Warbler (<i>Wilsonia pusilla</i>)	21 (75.0)	21 (75.0)	4 (14.3)	18 (64.3)	18 (64.3)	0 (0.0)

Table 3 continued: Overall, breeding¹, and non-breeding² bird species frequencies (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

<u>Species</u>	<u>2005 – 2006</u>			<u>2006 – 2007</u>		
	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>
Greater Roadrunner (<i>Geococcyx californianus</i>)	19 (67.9)	16 (57.1)	6 (21.4)	19 (67.9)	17 (60.7)	2 (7.1)
Lincoln's Sparrow (<i>Melospiza lincolni</i>)	18 (64.3)	3 (10.7)	18 (64.3)	8 (28.6)	2 (7.1)	2 (7.1)
American Pipit (<i>Anthus rubescens</i>)	17 (60.7)	0 (0.0)	17 (60.7)	17 (60.7)	3 (10.7)	17 (60.7)
American Coot (<i>Fulica americana</i>)	16 (57.1)	5 (17.9)	15 (53.6)	20 (71.4)	13 (46.4)	19 (67.9)
House Finch (<i>Carpodacus mexicanus</i>)	16 (57.1)	12 (42.9)	5 (17.9)	21 (75.0)	12 (42.9)	14 (50.0)
Killdeer (<i>Charadrius vociferus</i>)	16 (57.1)	13 (46.4)	10 (35.7)	16 (57.1)	13 (46.4)	4 (14.3)
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	16 (57.1)	12 (42.9)	5 (17.9)	9 (32.1)	6 (21.4)	2 (7.1)
Northern Flicker (<i>Colaptes auratus</i>)	16 (57.1)	0 (0.0)	14 (50.0)	19 (67.9)	0 (0.0)	16 (57.1)
Yellow Warbler (<i>Dendroica petechia</i>)	15 (53.6)	15 (53.6)	0 (0.0)	14 (50.0)	13 (46.4)	0 (0.0)
Blue-gray Gnatcatcher (<i>Polioptila caerulea</i>)	14 (50.0)	11 (39.3)	5 (17.9)	17 (60.7)	6 (21.4)	0 (0.0)

Table 3 continued: Overall, breeding¹, and non-breeding² bird species frequencies (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

<u>Species</u>	<u>2005 – 2006</u>			<u>2006 – 2007</u>		
	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>
Say's Phoebe (<i>Sayornis saya</i>)	14 (50.0)	7 (25.0)	8 (28.6)	14 (50.0)	10 (35.7)	6 (21.4)
White-winged Dove (<i>Zenaida asiatica</i>)	13 (46.4)	12 (42.9)	1 (3.6)	6 (21.4)	6 (21.4)	0 (0.0)
Belted Kingfisher (<i>Megaceryle alcyon</i>)	12 (42.9)	1 (3.6)	11 (39.3)	9 (32.1)	1 (3.6)	6 (21.4)
Gadwall (<i>Anas strepera</i>)	9 (32.1)	2 (7.1)	7 (25.0)	10 (35.7)	1 (3.6)	8 (28.6)
Greater Yellowlegs (<i>Tringa melanoleuca</i>)	9 (32.1)	0 (0.0)	9 (32.1)	3 (10.7)	1 (3.6)	2 (7.1)
Great-tailed Grackle (<i>Quiscalus mexicanus</i>)	9 (32.1)	7 (25.0)	2 (7.1)	12 (42.9)	11 (39.3)	4 (14.3)
Mallard (<i>Anas platyrhynchos</i>)	9 (32.1)	4 (14.3)	6 (21.4)	12 (42.9)	6 (21.4)	9 (32.1)
Spotted Sandpiper (<i>Actitis macularius</i>)	9 (32.1)	7 (25.0)	3 (10.7)	10 (35.7)	10 (35.7)	3 (10.7)
Bushtit (<i>Psaltriparus minimus</i>)	8 (28.6)	1 (3.6)	6 (21.4)	6 (21.4)	0 (0.0)	5 (17.9)
Lesser Goldfinch (<i>Carduelis psaltria</i>)	8 (28.6)	2 (7.1)	2 (7.1)	9 (32.1)	6 (21.4)	1 (3.6)

Table 3 continued: Overall, breeding¹, and non-breeding² bird species frequencies (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

Species	2005 – 2006			2006 – 2007		
	Overall Frequency <u>Abs. (Rel.)</u>	Breeding Frequency <u>Abs. (Rel.)</u>	Non-breeding Frequency <u>Abs. (Rel.)</u>	Overall Frequency <u>Abs. (Rel.)</u>	Breeding Frequency <u>Abs. (Rel.)</u>	Non-breeding Frequency <u>Abs. (Rel.)</u>
Sharp-shinned Hawk (<i>Accipiter striatus</i>)	8 (28.6)	0 (0.0)	7 (25.0)	2 (7.1)	0 (0.0)	1 (3.6)
Green Heron (<i>Butorides virescens</i>)	7 (25.0)	5 (17.9)	2 (7.1)	16 (57.1)	14 (50.0)	4 (14.3)
Great Blue Heron (<i>Ardea herodias</i>)	7 (25.0)	5 (17.8)	3 (10.7)	12 (42.9)	3 (10.7)	6 (21.4)
Western Kingbird (<i>Tyrannus verticalis</i>)	7 (25.0)	6 (21.4)	0 (0.0)	5 (17.9)	4 (14.3)	0 (0.0)
Anna's Hummingbird (<i>Calypte anna</i>)	6 (21.4)	4 (14.3)	1 (3.6)	1 (3.6)	1 (3.6)	0 (0.0)
Brewer's Sparrow (<i>Spizella breweri</i>)	6 (21.4)	0 (0.0)	2 (7.1)	7 (25.0)	4 (14.3)	0 (0.0)
Dark-eyed Junco (<i>Junco hyemalis</i>)	6 (21.4)	2 (7.1)	2 (7.1)	7 (25.0)	0 (0.0)	0 (0.0)
American Kestrel (<i>Falco sparverius</i>)	5 (17.9)	3 (10.7)	0 (0.0)	2 (7.1)	2 (7.1)	0 (0.0)
Black-chinned Hummingbird (<i>Archilochus alexandri</i>)	5 (17.9)	5 (17.9)	0 (0.0)	11 (39.3)	11 (39.3)	0 (0.0)
Bell's Vireo [Arizona] (<i>Vireo bellii arizonae</i>)	5 (17.9)	5 (17.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Table 3 continued: Overall, breeding¹, and non-breeding² bird species frequencies (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

<u>Species</u>	<u>2005 – 2006</u>			<u>2006 – 2007</u>		
	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>
Chipping Sparrow (<i>Spizella passerina</i>)	5 (17.9)	2 (7.1)	0 (0.0)	2 (7.1)	0 (0.0)	0 (0.0)
Lazuli Bunting (<i>Passerina amoena</i>)	5 (17.9)	3 (10.7)	0 (0.0)	7 (25.0)	5 (17.9)	1 (3.6)
Northern Rough-winged Swallow (<i>Stelgidopteryx serripennis</i>)	5 (17.9)	4 (14.3)	0 (0.0)	6 (21.4)	5 (17.9)	0 (0.0)
Phainopepla (<i>Phainopepla nitens</i>)	5 (17.9)	0 (0.0)	5 (17.9)	8 (28.6)	0 (0.0)	6 (21.4)
Black-headed Grosbeak (<i>Pheucticus melanocephalus</i>)	4 (14.3)	3 (10.7)	0 (0.0)	4 (14.3)	3 (10.7)	0 (0.0)
Costa's Hummingbird (<i>Calypte costae</i>)	4 (14.3)	4 (14.3)	0 (0.0)	6 (21.4)	5 (17.9)	0 (0.0)
Common Moorhen (<i>Gallinula chloropus</i>)	4 (14.3)	3 (10.7)	2 (7.1)	4 (14.3)	4 (14.3)	1 (3.6)
Great Egret (<i>Ardea alba</i>)	4 (14.3)	1 (3.6)	2 (7.1)	2 (7.1)	0 (0.0)	1 (3.6)
Hermit Thrush (<i>Catharus guttatus</i>)	4 (14.3)	1 (3.6)	3 (10.7)	8 (28.6)	1 (3.6)	5 (17.9)
Rock Wren (<i>Salpinctes obsoletus</i>)	4 (14.3)	1 (3.6)	3 (10.7)	4 (14.3)	1 (3.6)	3 (10.7)
Red-tailed Hawk (<i>Buteo jamaicensis</i>)	4 (14.3)	0 (0.0)	4 (14.3)	4 (14.3)	0 (0.0)	2 (7.1)

Table 3 continued: Overall, breeding¹, and non-breeding² bird species frequencies (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

<u>Species</u>	<u>2005 – 2006</u>			<u>2006 – 2007</u>		
	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>
Savannah Sparrow (<i>Passerculus sandwichensis</i>)	4 (14.3)	4 (14.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Spotted Towhee (<i>Pipilo maculatus</i>)	4 (14.3)	1 (3.6)	3 (10.7)	4 (14.3)	0 (0.0)	3 (10.7)
Virginia Rail (<i>Rallus limicola</i>)	4 (14.3)	2 (7.1)	2 (7.1)	2 (7.1)	1 (3.6)	0 (0.0)
Warbling Vireo (<i>Vireo gilvus</i>)	4 (14.3)	4 (14.3)	0 (0.0)	4 (14.3)	3 (10.7)	0 (0.0)
Ash-throated Flycatcher (<i>Myiarchus cinerascens</i>)	3 (10.7)	3 (10.7)	0 (0.0)	1 (3.6)	0 (0.0)	0 (0.0)
Barn Owl (<i>Tyto alba</i>)	3 (10.7)	2 (7.1)	0 (0.0)	2 (7.1)	2 (7.1)	0 (0.0)
Black-crowned Night-Heron (<i>Nycticorax nycticorax</i>)	3 (10.7)	3 (10.7)	0 (0.0)	3 (10.7)	1 (3.6)	2 (7.1)
Cedar Waxwing (<i>Bombycilla cedrorum</i>)	3 (10.7)	0 (0.0)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)
Cooper's Hawk (<i>Accipiter cooperii</i>)	3 (10.7)	1 (3.6)	0 (0.0)	5 (17.9)	0 (0.0)	4 (14.3)
Northern Harrier (<i>Circus cyaneus</i>)	3 (10.7)	0 (0.0)	3 (10.7)	3 (10.7)	0 (0.0)	2 (7.1)
Snowy Egret (<i>Egretta thula</i>)	3 (10.7)	1 (3.6)	1 (3.6)	1 (3.6)	0 (0.0)	1 (3.6)

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	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>
Western Sandpiper (<i>Calidris mauri</i>)	3 (10.7)	3 (10.7)	0 (0.0)	2 (7.1)	0 (0.0)	0 (0.0)
Western Tanager (<i>Piranga ludoviciana</i>)	3 (10.7)	3 (10.7)	0 (0.0)	1 (3.6)	1 (3.6)	0 (0.0)
Western Wood-Pewee (<i>Contopus sordidulus</i>)	3 (10.7)	3 (10.7)	0 (0.0)	5 (17.9)	4 (14.3)	0 (0.0)
Yellow-headed Blackbird (<i>Xanthocephalus xanthocephalus</i>)	3 (10.7)	2 (7.1)	1 (3.6)	2 (7.1)	2 (7.1)	0 (0.0)
American Avocet (<i>Recurvirostra americana</i>)	2 (7.1)	2 (7.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Brown-crested Flycatcher (<i>Myiarchus tyrannulus</i>)	2 (7.1)	2 (7.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Common Merganser (<i>Mergus merganser</i>)	2 (7.1)	2 (7.1)	0 (0.0)	2 (7.1)	0 (0.0)	1 (3.6)
Double-crested Cormorant (<i>Phalacrocorax auritus</i>)	2 (7.1)	2 (7.1)	0 (0.0)	4 (14.3)	2 (7.1)	2 (7.1)
House Wren (<i>Troglodytes aedon</i>)	2 (7.1)	0 (0.0)	1 (3.6)	1 (3.6)	1 (3.6)	0 (0.0)
Northern Mockingbird (<i>Mimus polyglottos</i>)	2 (7.1)	2 (7.1)	0 (0.0)	9 (32.1)	7 (25.0)	3 (10.7)

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	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>
Pied-billed Grebe (<i>Podilymbus podiceps</i>)	2 (7.1)	0 (0.0)	2 (7.1)	5 (17.9)	1 (3.6)	3 (10.7)
Pine Siskin (<i>Carduelis pinus</i>)	2 (7.1)	0 (0.0)	2 (7.1)	0 (0.0)	0 (0.0)	0 (0.0)
Red-naped Sapsucker (<i>Sphyrapicus nuchalis</i>)	2 (7.1)	1 (3.6)	1 (3.6)	3 (10.7)	0 (0.0)	3 (10.7)
Sora (<i>Porzana carolina</i>)	2 (7.1)	0 (0.0)	2 (7.1)	2 (7.1)	1 (3.6)	2 (7.1)
White-faced Ibis (<i>Plegadis chihi</i>)	2 (7.1)	2 (7.1)	0 (0.0)	2 (7.1)	2 (7.1)	0 (0.0)
Winter Wren (<i>Troglodytes troglodytes</i>)	2 (7.1)	0 (0.0)	2 (7.1)	1 (3.6)	0 (0.0)	0 (0.0)
American Robin (<i>Turdus migratorius</i>)	1 (3.6)	0 (0.0)	1 (3.6)	1 (3.6)	0 (0.0)	1 (3.6)
Bendire's Thrasher (<i>Toxostoma bendirei</i>)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Black-necked Stilt (<i>Himantopus mexicanus</i>)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Bullock's Oriole (<i>Icterus bullockii</i>)	1 (3.6)	1 (3.6)	0 (0.0)	6 (21.4)	6 (21.4)	0 (0.0)

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	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>
Blue-winged Teal (<i>Anas discors</i>)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Canyon Wren (<i>Catherpes mexicanus</i>)	1 (3.6)	1 (3.6)	0 (0.0)	1 (3.6)	0 (0.0)	1 (3.6)
Cinnamon Teal (<i>Anas cyanoptera</i>)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Dusky Flycatcher (<i>Empidonax oberholseri</i>)	1 (3.6)	1 (3.6)	0 (0.0)	2 (7.1)	1 (3.6)	0 (0.0)
Eared Grebe (<i>Podiceps nigricollis</i>)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Golden-crowned Kinglet (<i>Regulus satrapa</i>)	1 (3.6)	0 (0.0)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)
Gray Flycatcher (<i>Empidonax wrightii</i>)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Horned Lark (<i>Eremophila alpestris</i>)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
House Sparrow (<i>Passer domesticus</i>)	1 (3.6)	0 (0.0)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)
Ladder-backed Woodpecker (<i>Picoides scalaris</i>)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

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<u>Species</u>	<u>2005 – 2006</u>			<u>2006 – 2007</u>		
	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>
Least Bittern (<i>Ixobrychus exilis</i>)	1 (3.6)	1 (3.6)	0 (0.0)	1 (3.6)	0 (0.0)	1 (3.6)
Long-eared Owl (<i>Asio otus</i>)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
MacGillivray's Warbler (<i>Oporornis tolmiei</i>)	1 (3.6)	1 (3.6)	0 (0.0)	1 (3.6)	0 (0.0)	0 (0.0)
Northern Shoveler (<i>Anas clypeata</i>)	1 (3.6)	0 (0.0)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Osprey (<i>Pandion haliaetus</i>)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Semipalmated Plover (<i>Charadrius semipalmatus</i>)	1 (3.6)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Summer Tanager (<i>Piranga rubra</i>)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Western Bluebird (<i>Sialia mexicana</i>)	1 (3.6)	0 (0.0)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)
“Western Type” (Cordilleran?) Flycatcher (<i>Empidonax occidentalis</i>)	1 (3.6)	0 (0.0)	0 (0.0)	2 (7.1)	1 (3.6)	0 (0.0)
Green-winged Teal (<i>Anas crecca</i>)	0 (0.0)	0 (0.0)	0 (0.0)	5 (17.9)	1 (3.6)	0 (0.0)

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	<u>Overall Frequency</u> <u>Abs. (Rel.)</u>	<u>Breeding Frequency</u> <u>Abs. (Rel.)</u>	<u>Non-breeding Frequency</u> <u>Abs. (Rel.)</u>	<u>Overall Frequency</u> <u>Abs. (Rel.)</u>	<u>Breeding Frequency</u> <u>Abs. (Rel.)</u>	<u>Non-breeding Frequency</u> <u>Abs. (Rel.)</u>
American Bittern (<i>Botaurus lentiginosus</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	1 (3.6)	0 (0.0)
American Wigeon (<i>Anas americana</i>)	0 (0.0)	0 (0.0)	0 (0.0)	2 (7.1)	0 (0.0)	1 (3.6)
Semipalmated Sandpiper (<i>Calidris pusilla</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	1 (3.6)	0 (0.0)
Black-throated Sparrow (<i>Amphispiza bilineata</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	1 (3.6)	0 (0.0)
Canyon Towhee (<i>Pipilo fuscus</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	1 (3.6)	0 (0.0)
Cassin's Vireo (<i>Vireo cassinii</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	1 (3.6)	0 (0.0)
Great Horned Owl (<i>Bubo virginianus</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	0 (0.0)	0 (0.0)
Hairy Woodpecker (<i>Picoides villosus</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	0 (0.0)	1 (3.6)
Northern Pintail (<i>Anas acuta</i>)	0 (0.0)	0 (0.0)	0 (0.0)	2 (7.1)	0 (0.0)	0 (0.0)
Lesser Nighthawk (<i>Chordeiles acutipennis</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	1 (3.6)	0 (0.0)

Table 3 continued: Overall, breeding¹, and non-breeding² bird species frequencies (absolute³ and relative⁴) after 26 censuses of 28 point-counts stations along the Wash from 12 February 2005 through 29 January 2006 and 12 February 2006 through 29 January 2007. Numbers do not include birds that flew over or were >100 m from the census stations. Species names follow the AOU checklist of North American Birds, 7th edition.

<u>Species</u>	<u>2005 – 2006</u>			<u>2006 – 2007</u>		
	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>	<u>Overall Frequency Abs. (Rel.)</u>	<u>Breeding Frequency Abs. (Rel.)</u>	<u>Non-breeding Frequency Abs. (Rel.)</u>
Long-billed Dowitcher (<i>Limnodromus scolopaceus</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	1 (3.6)	0 (0.0)
Merlin (<i>Falco columbarius</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	0 (0.0)	1 (3.6)
Ring-billed Gull (<i>Larus delawarensis</i>)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	0 (0.0)	0 (0.0)
Western Meadowlark (<i>Sturnella neglecta</i>)	0 (0.0)	0 (0.0)	0 (0.0)	2 (7.1)	1 (3.6)	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 a species was detected.

4- Percentage of census points where a species was detected relative to the total number of census points.

Table 4: Results of repeated measure comparisons of 36 bird species abundances after 26 censuses from 12 February 2005 through 29 January 2006 versus 26 censuses from 12 February 2006 through 29 January 2007 in the Wash. Comparisons are paired *t*-test (*t*) or Wilcoxon signed rank tests (*W*) depending on parametric assumptions.

<u>Species</u> ¹	<u>2005 – 2006</u>			<u>2006 - 2007</u>			<u><i>t</i> or <i>W</i></u>	<u><i>N</i></u>	<u><i>P</i></u>
	<u>Absolute Abundance</u> ²	<u>Mean or Median</u> ³	<u>SE</u> ⁴	<u>Absolute Abundance</u>	<u>Mean or Median</u>	<u>SE</u>			
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	132	9.5		91	12.0		83.0	26	0.297
Mourning Dove (<i>Zenaida macroura</i>)	98	7.0		16	4.5		-83.0	20	0.074
Abert's Towhee (<i>Pipilo aberti</i>)	71	29.5		52	29.0		13.0	26	0.872
Yellow-rumped Warbler (<i>Dendroica coronata</i>)	59	20.1	4.95	25	10.2	1.96	2.325	18	0.033
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	53	14.8	3.67	52	14.4	3.13	0.087	17	0.932
Lucy's Warbler (<i>Vermivora luciae</i>)	46	21.8	4.70	36	13.8	3.02	2.909	14	0.013
Song Sparrow (<i>Melospiza melodia</i>)	43	25.6	1.95	53	28.1	1.79	-1.621	26	0.118

Table 4 continued: Results of repeated measure comparisons of 36 bird species abundances after 26 censuses from 12 February 2005 through 29 January 2006 versus 26 censuses from 12 February 2006 through 29 January 2007 in the Wash. Comparisons are by paired *t*-test (*t*) or Wilcoxon signed rank tests (*W*) depending on violations of parametric assumptions.

<u>Species</u> ¹	<u>2005 – 2006</u>			<u>2006 - 2007</u>			<u><i>t</i> or <i>W</i></u>	<u><i>N</i></u>	<u><i>P</i></u>
	<u>Absolute Abundance</u> ²	<u>Mean or Median</u> ³	<u>SE</u> ⁴	<u>Absolute Abundance</u>	<u>Mean or Median</u>	<u>SE</u>			
Yellow-headed Blackbird (<i>Xanthocephalus xanthocephalus</i>)	40	1.0		11	0.0		-16.0	9	0.359
Wilson's Warbler (<i>Wilsonia pusilla</i>)	36	1.5		21	1.0		7.0	12	0.791
Ruby-crowned Kinglet (<i>Regulus calendula</i>)	32	14.3	2.32	34	13.2	2.47	0.565	18	0.580
American Pipit (<i>Anthus rubescens</i>)	32	5.6	2.36	46	11.6	3.43	-1.883	14	0.082
Brown-headed Cowbird (<i>Molothrus ater</i>)	30	15.9	3.44	34	18.1	3.90	-1.347	12	0.205
Yellow-breasted Chat (<i>Icteria virens</i>)	28	16.2	2.48	26	14.8	3.00	0.569	11	0.582
Common Yellowthroat (<i>Geothlypis trichas</i>)	28	13.6	1.99	31	16.1	2.17	-1.728	16	0.105

Table 4 continued: Results of repeated measure comparisons of 36 bird species abundances after 26 censuses from 12 February 2005 through 29 January 2006 versus 26 censuses from 12 February 2006 through 29 January 2007 in the Wash. Comparisons are by paired t- test (*t*) or Wilcoxon signed rank tests (*W*) depending on violations of parametric assumptions.

<u>Species</u> ¹	<u>2005 – 2006</u>			<u>2006 - 2007</u>			<u><i>t</i> or <i>W</i></u>	<u><i>N</i></u>	<u><i>P</i></u>
	<u>Absolute Abundance</u> ²	<u>Mean or Median</u> ³	<u>SE</u> ⁴	<u>Absolute Abundance</u>	<u>Mean or Median</u>	<u>SE</u>			
Bewick's Wren (<i>Thryomanes bewickii</i>)	28	15.8	0.97	33	17.6	1.34	-1.192	26	0.244
American Coot (<i>Fulica americana</i>)	27	2.0		96	4.0		226.0	26	0.001
Blue Grosbeak (<i>Passerina caerulea</i>)	23	12.2	2.05	21	8.6	2.03	2.204	11	0.052
Marsh Wren (<i>Cistothorus palustris</i>)	22	9.8	1.46	31	12.2	1.54	-2.240	25	0.035
Gadwall (<i>Anas strepera</i>)	21	3.2	1.56	24	5.5	1.84	-2.178	13	0.050
Gambel's Quail (<i>Callipepla gambelii</i>)	20	4.8	1.26	16	2.7	0.76	1.471	21	0.157
Black Phoebe (<i>Sayornis nigricans</i>)	19	8.3	0.96	22	9.7	1.14	-1.284	26	0.211
Black-tailed Gnatcatcher (<i>Polioptila melanura</i>)	18	10.0		21	10.5		65.0	26	0.329

Table 4 continued: Results of repeated measure comparisons of 36 bird species abundances after 26 censuses from 12 February 2005 through 29 January 2006 versus 26 censuses from 12 February 2006 through 29 January 2007 in the Wash. Comparisons are by paired t- test (*t*) or Wilcoxon signed rank tests (*W*) depending on violations of parametric assumptions.

<u>Species</u> ¹	<u>2005 – 2006</u>			<u>2006 - 2007</u>			<u><i>t</i> or <i>W</i></u>	<u><i>N</i></u>	<u><i>P</i></u>
	<u>Absolute Abundance</u> ²	<u>Mean or Median</u> ³	<u>SE</u> ⁴	<u>Absolute Abundance</u>	<u>Mean or Median</u>	<u>SE</u>			
House Finch (<i>Carpodacus mexicanus</i>)	15	2.2	0.69	11	3.0	0.68	-0.793	24	0.436
Mallard (<i>Anas platyrhynchos</i>)	15	2.0		58	2.0		40.0	22	0.495
Verdin (<i>Auriparus flaviceps</i>)	15	7.6	0.77	18	9.7	1.00	-2.402	26	0.024
Yellow Warbler (<i>Dendroica petechia</i>)	14	5.4	1.04	11	3.9	1.18	0.091	11	0.929
Orange-crowned Warbler (<i>Vermivora celata</i>)	13	4.8	0.79	14	3.0	0.72	2.047	20	0.055
Killdeer (<i>Charadrius vociferus</i>)	13	4.0	0.77	9	2.1	0.42	2.335	25	0.028
Bushtit (<i>Psaltriparus minimus</i>)	11	3.2	1.25	8	2.2	0.92	0.569	10	0.583
Lesser Goldfinch (<i>Carduelis psaltria</i>)	10	2.5	0.98	12	3.3	1.34	-0.692	10	0.505

Table 4 continued: Results of repeated measure comparisons of 36 bird species abundances after 26 censuses from 12 February 2005 through 29 January 2006 versus 26 censuses from 12 February 2006 through 29 January 2007 in the Wash. Comparisons are by paired t -test (t) or Wilcoxon signed rank tests (W) depending on violations of parametric assumptions.

<u>Species</u> ¹	<u>2005 – 2006</u>			<u>2006 - 2007</u>			<u>t or W</u>	<u>N</u>	<u>P</u>
	<u>Absolute Abundance</u> ²	<u>Mean or Median</u> ³	<u>SE</u> ⁴	<u>Absolute Abundance</u>	<u>Mean or Median</u>	<u>SE</u>			
Crissal Thrasher (<i>Toxostoma crissale</i>)	10	3.8	0.46	7	2.9	0.38	1.263	26	0.218
Blue-gray Gnatcatcher (<i>Polioptila caerulea</i>)	9	1.5	0.65	8	1.9	0.78	-0.352	14	0.730
Great-tailed Grackle (<i>Quiscalus mexicanus</i>)	8	1.0		19	4.0		110	22	0.057
Lincoln's Sparrow (<i>Melospiza lincolni</i>)	7	3.1	0.56	2	0.8	0.22	3.371	15	0.005
Say's Phoebe (<i>Sayornis saya</i>)	6	1.4	0.34	6	1.8	0.34	-0.902	21	0.378
Spotted Sandpiper (<i>Actitis macularius</i>)	6	1.0	0.26	7	1.7	0.37	-1.632	19	0.120

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

2 – Maximum number of individuals detected on any one census.

3 – Median values reported for non-parametric comparisons (Wilcoxon signed rank tests). Mean values reported for parametric comparisons (paired t -test)

4 – Standard error. Not applicable to ranked (non-parametric) comparisons.

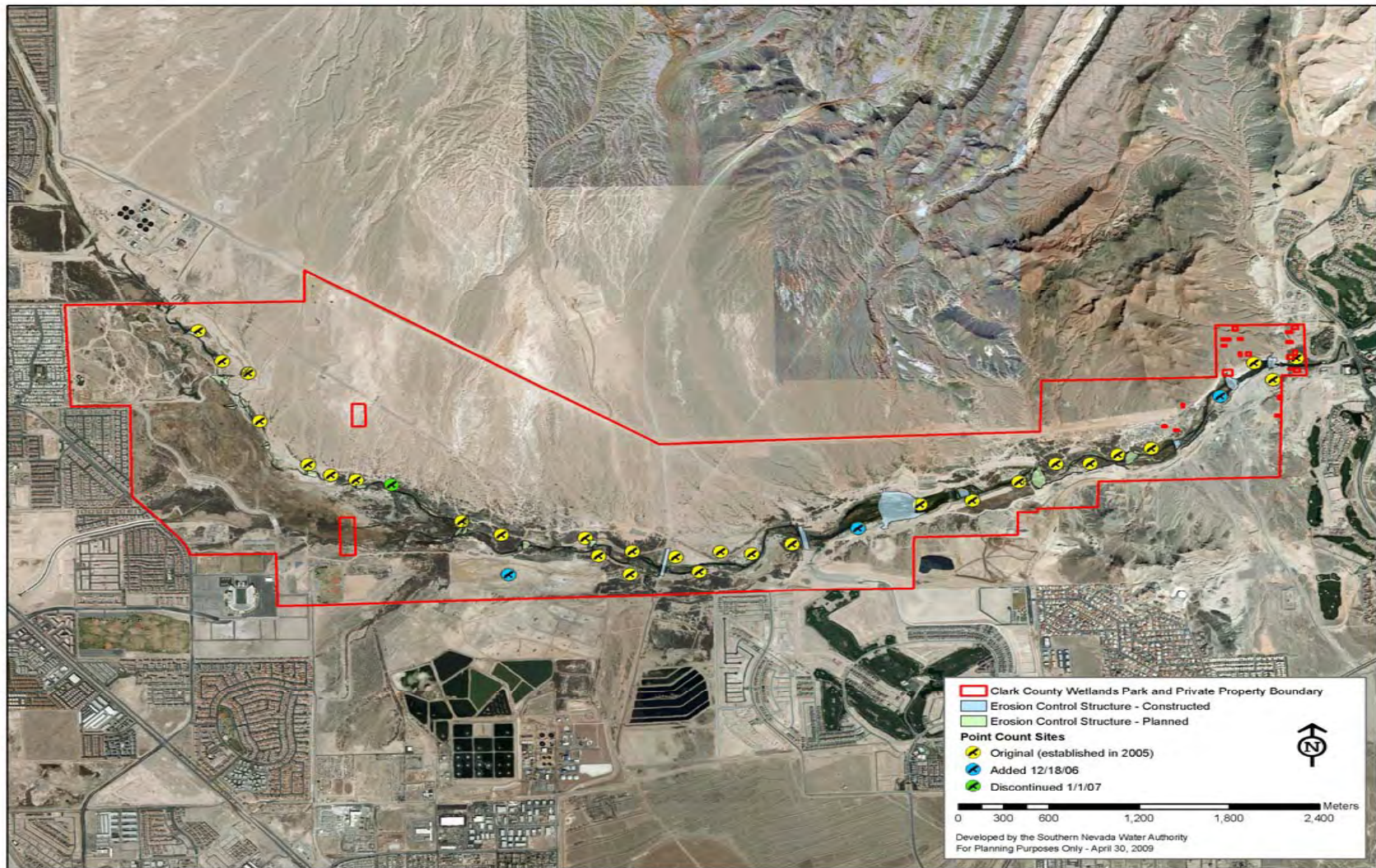


Figure 1: Study area and census point locations in the Wash.

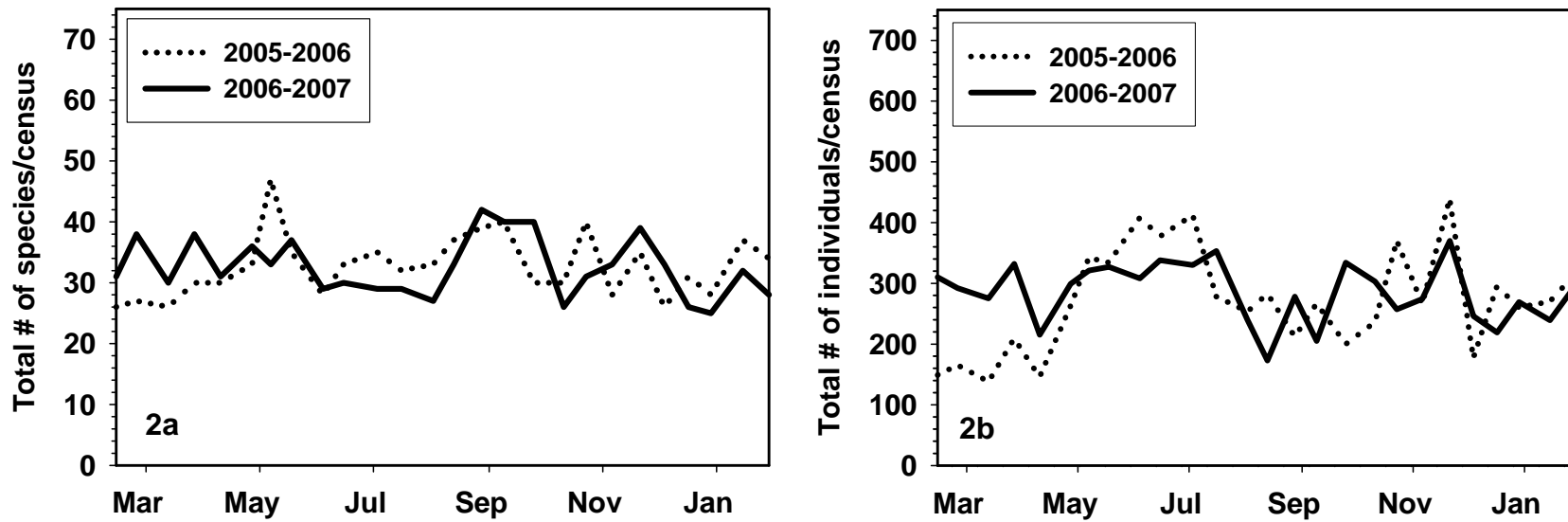


Figure 2: Comparisons of bird species richness (2a) and abundance (2b) per census event at 28 census points in the Wash from 12 February 2005 to 29 January 2006 and from 12 February 2006 to 29 January 2007.

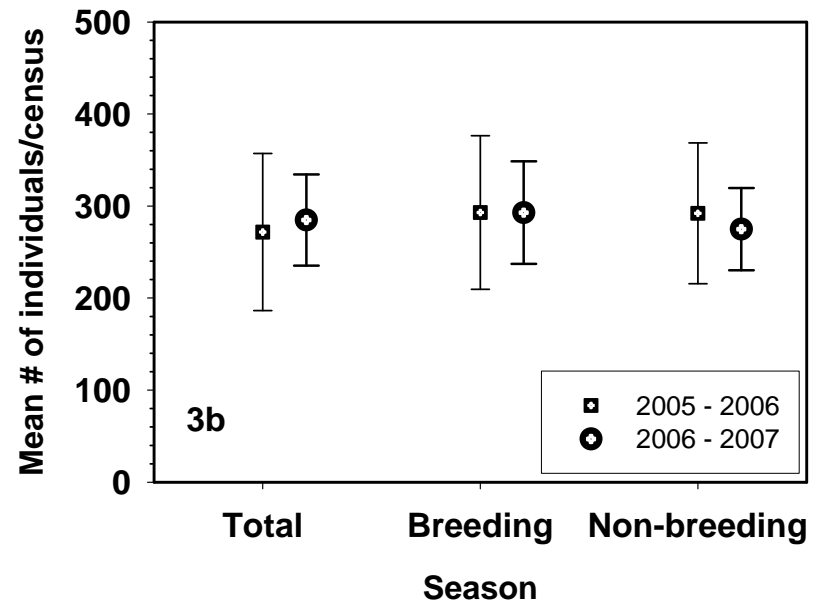
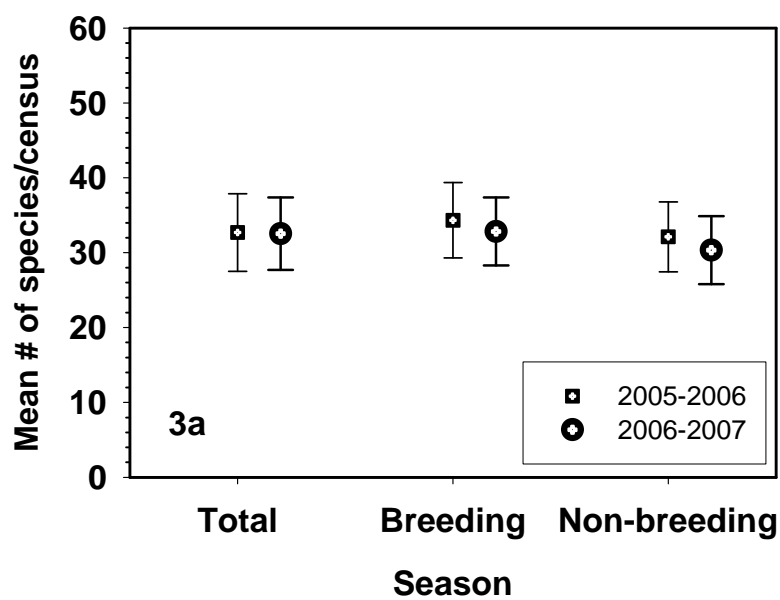


Figure 3: Comparison of average total and seasonal bird species richness (3a) and abundance (3b) per census event at 28 census points in the Wash for 12 February 2005 to 29 January 2006 and from 12 February 2006 to 29 January 2007. Breeding season defined as 15 March to 31 August. Non-breeding season defined as 1 October through 31 January. Symbols are means; error bars are +/- 1 standard deviation.

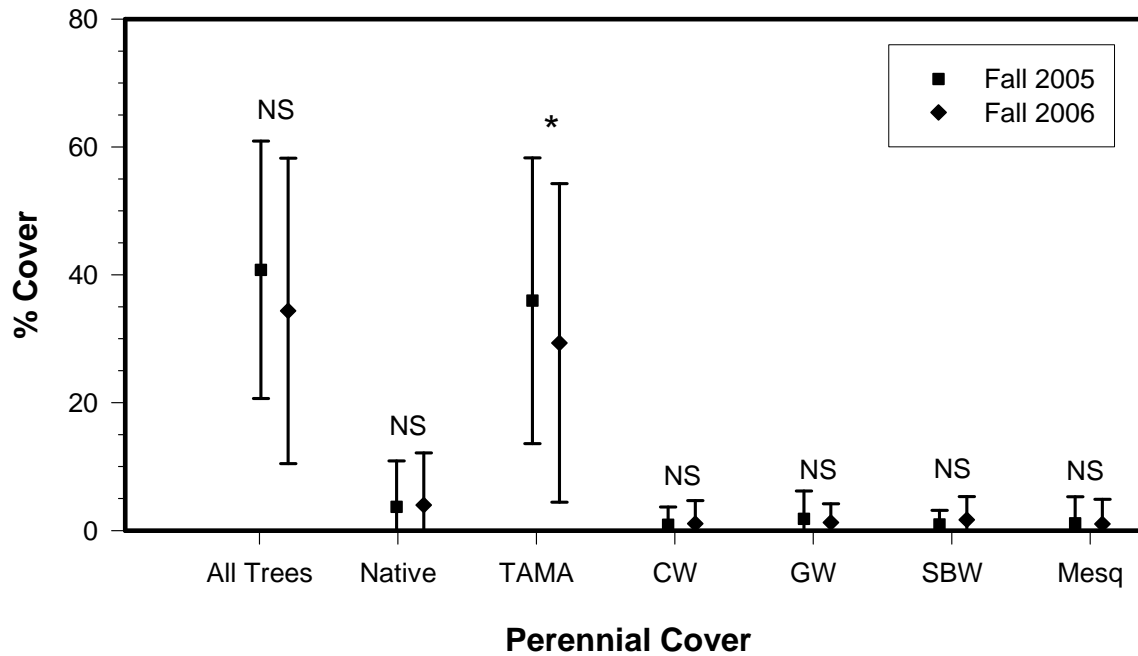


Figure 4: Paired *t*-test comparisons of average perennial cover at 28 census points for fall 2005 versus fall 2006. Symbols are means; error bars are +/- 1 standard deviation. CW= Cottonwood, GW = Goodding Willow, SBW = Sandbar Willow, TAMA = Tamarisk, Mesq = Mesquite, Native =CW+GW+SBW. * = $P < 0.05$. NS = not significant.

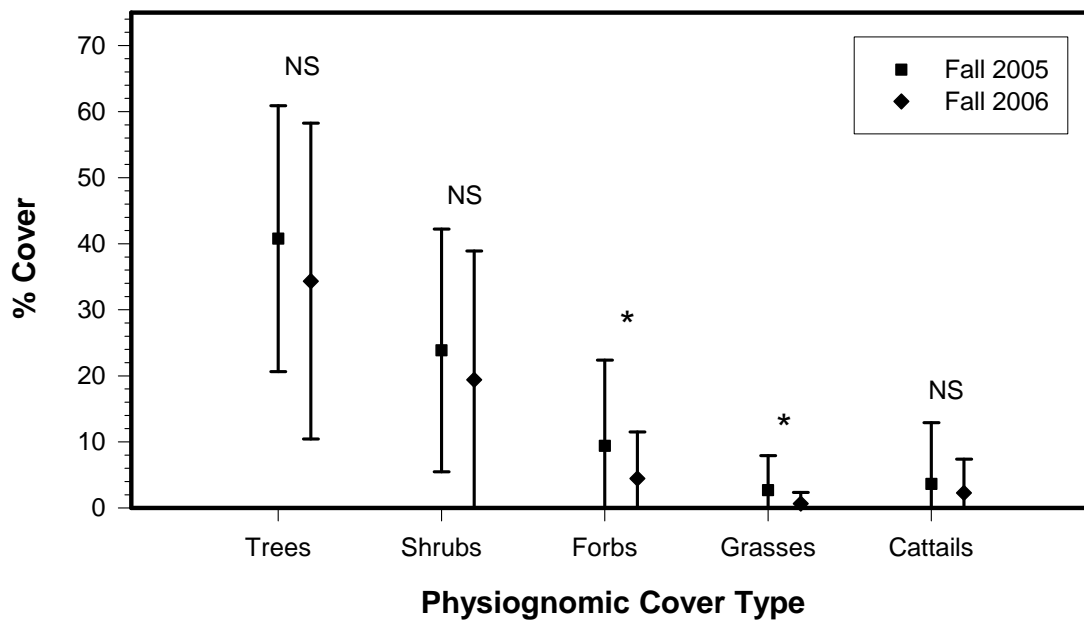


Figure 5: Paired *t*-test comparisons of average physiognomic cover classes at 28 census points for fall 2005 versus fall 2006. Symbols are means; error bars are +/- 1 standard deviation. * = $P < 0.05$. NS = not significant.

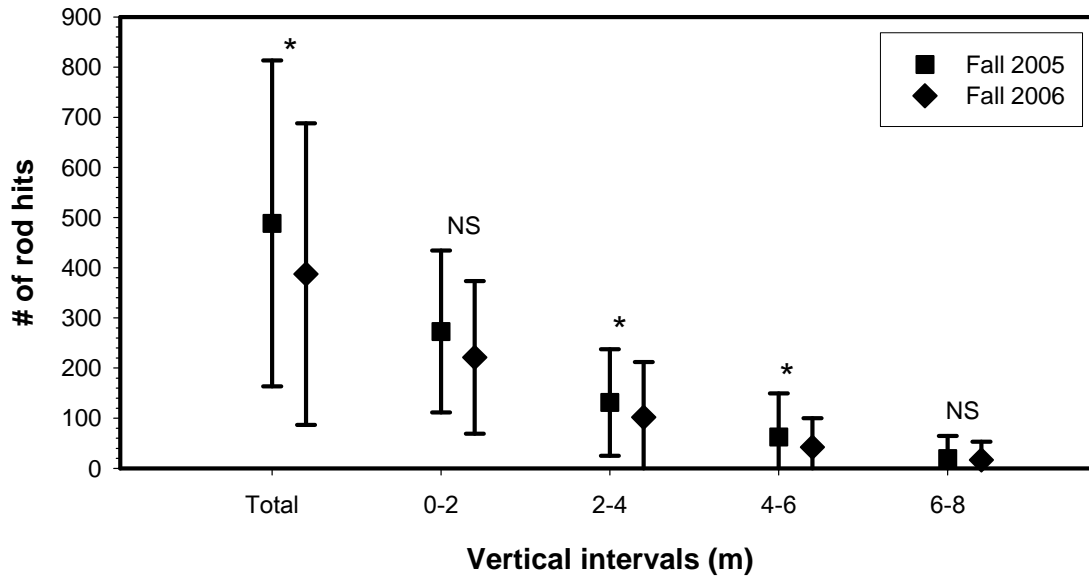


Figure 6: Paired *t*-test comparisons of average vertical perennial structural heterogeneity at 28 census points for fall 2005 versus fall 2006. Symbols are means; error bars are +/- 1 standard deviation. * = $P < 0.05$. NS = not significant.

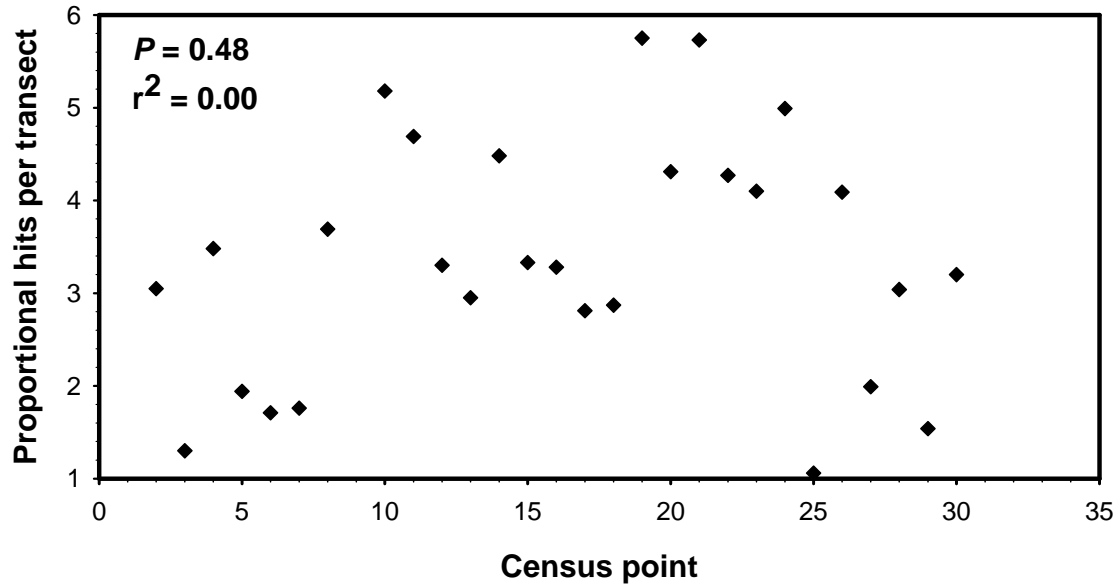


Figure 7: Comparisons of horizontal perennial structural heterogeneity for habitats at 28 census points for fall 2005 versus fall 2006. Values are proportional indexes (see text for details).

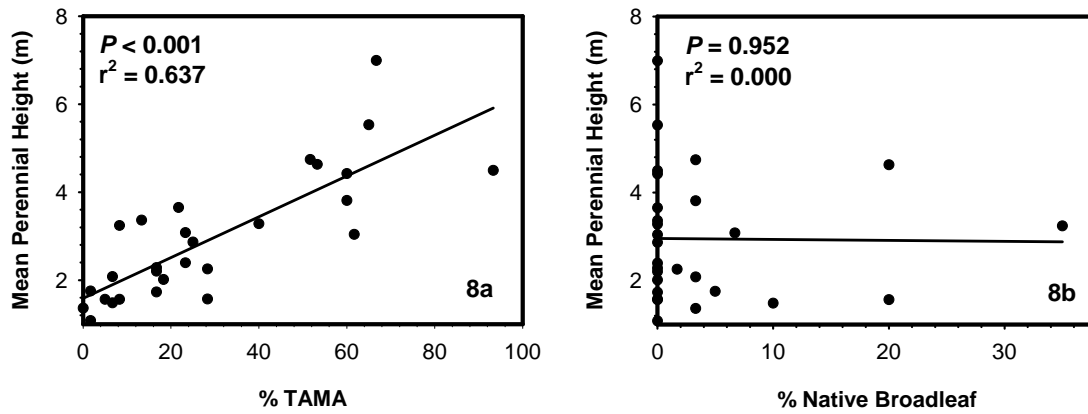


Figure 8: Regressions of tamarisk (TAMA) (8a) and native broadleaf (8b) perennial cover with mean perennial height for habitats at 28 census points in the Wash for fall 2006.

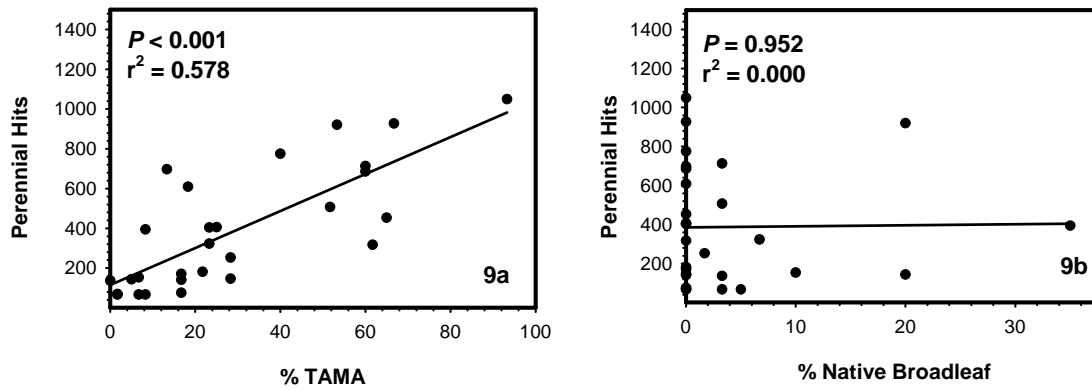


Figure 9: Regressions of tamarisk (TAMA) (9a) and native broadleaf (9b) with perennial structure for habitats at 28 census points in the Wash for fall 2006.

Appendix I: UTM coordinates (WGS84) for bird census points along the Wash.

<u>Point</u>	<u>Easting</u>	<u>Northing</u>	<u>Comments</u>
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	Discontinued after 16 December 2006
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	
26	11 685583	3997260	
27	11 685297	3997211	
28	11 683511	3995911	Point added on 7 May 2005
29	11 683083	3996075	Point added on 7 May 2005
30	11 681457	3995654	Point added on 18 May 2005
31	11 680347	3995514	Point added on 17 December 2006
32	11 682670	3995884	Point added on 17 December 2006
33	11 685078	3996947	Point added on 17 December 2006

Appendix II: Abundance and frequency of all birds observed after 26 census events along the Wash from 12 February 2006 through 29 January 2007. Includes birds detected outside census point ^a radii and birds that flew over the census points. An unknown number of observations may be double counted.

<u>SPECIES</u>	<u>ABUNDANCE</u>		<u>FREQUENCY</u>	
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴
Canada Goose (<i>Branta canadensis</i>)	1	< 0.1%	1	3.1%
Gadwall (<i>Anas strepera</i>)	40	2.0%	14	43.8%
American Wigeon (<i>Anas americana</i>)	4	0.2%	2	6.3%
Mallard (<i>Anas platyrhynchos</i>)	107	5.4%	23	71.9%
Green-winged Teal (<i>Anas crecca</i>)	6	0.3%	5	15.6%
Cinnamon Teal (<i>Anas cyanoptera</i>)	1	< 0.1%	1	3.1%
Northern Pintail (<i>Anas acuta</i>)	7	0.4%	2	6.3%
Common Merganser (<i>Mergus merganser</i>)	25	1.3%	8	25.0%
Gambel's Quail (<i>Callipepla gambelii</i>)	21	1.1%	17	53.1%
Pied-billed Grebe (<i>Podilymbus podiceps</i>)	2	0.1%	6	18.8%
Double-crested Cormorant (<i>Phalacrocorax auritus</i>)	9	0.5%	17	53.1%
American Bittern (<i>Botaurus lentiginosus</i>)	1	< 0.1%	1	3.1%
Least Bittern (<i>Ixobrychus exilis</i>)	1	0.1%	1	3.1%
Great Blue Heron (<i>Ardea herodias</i>)	4	0.2%	20	62.5%
Great Egret (<i>Ardea alba</i>)	3	0.2%	5	15.6%
Snowy Egret (<i>Egretta thula</i>)	9	0.5%	6	18.8%
Green Heron (<i>Butorides virescens</i>)	6	0.3%	18	56.3%
Black-crowned Night-Heron (<i>Nycticorax nycticorax</i>)	4	0.2%	7	21.9%
White-faced Ibis (<i>Plegadis chihi</i>)	26	1.3%	6	18.8%
Turkey Vulture (<i>Cathartes aura</i>)	1	0.1%	1	3.1%

Appendix II continued: Abundance and frequency of all birds observed after 26 census events along the Wash from 12 February 2006 through 29 January 2007. Includes birds detected outside census point ^a radii and birds that flew over the census points. An unknown number of observations may be double counted.

<u>SPECIES</u>	<u>ABUNDANCE</u>		<u>FREQUENCY</u>	
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴
Osprey (<i>Pandion haliaetus</i>)	3	0.2%	6	18.8%
Northern Harrier (<i>Circus cyaneus</i>)	6	0.3%	10	31.3%
Sharp-shinned Hawk (<i>Accipiter striatus</i>)	3	0.2%	5	15.6%
Cooper's Hawk (<i>Accipiter cooperii</i>)	3	0.2%	8	25.0%
Red-tailed Hawk (<i>Buteo jamaicensis</i>)	2	0.1%	7	21.9%
American Kestrel (<i>Falco sparverius</i>)	1	< 0.1%	4	12.5%
Merlin (<i>Falco columbarius</i>)	1	< 0.1%	1	3.1%
Peregrine Falcon (<i>Falco peregrinus</i>)	1	< 0.1%	1	3.1%
Prairie Falcon (<i>Falco mexicanus</i>)	1	< 0.1%	1	3.1%
Virginia Rail (<i>Rallus limicola</i>)	2	0.1%	2	6.3%
Sora (<i>Porzana carolina</i>)	1	< 0.1%	2	6.3%
Common Moorhen (<i>Gallinula chloropus</i>)	2	0.1%	4	12.5%
American Coot (<i>Fulica americana</i>)	196	10.0%	24	75.0%
Killdeer (<i>Charadrius vociferus</i>)	9	0.5%	20	62.5%
Black-necked Stilt (<i>Himantopus mexicanus</i>)	1	< 0.1%	1	3.1%
Greater Yellowlegs (<i>Tringa melanoleuca</i>)	6	0.3%	7	21.9%
Spotted Sandpiper (<i>Actitis macularius</i>)	7	0.4%	11	34.4%
Semipalmated Sandpiper (<i>Calidris pusilla</i>)	4	0.2%	1	3.1%
Western Sandpiper (<i>Calidris mauri</i>)	1	< 0.1%	2	6.3%
Long-billed Dowitcher (<i>Limnodromus scolopaceus</i>)	2	0.1%	1	3.1%

Appendix II continued: Abundance and frequency of all birds observed after 26 census events along the Wash from 12 February 2006 through 29 January 2007. Includes birds detected outside census point ^a radii and birds that flew over the census points. An unknown number of observations may be double counted.

<u>SPECIES</u>	<u>ABUNDANCE</u>		<u>FREQUENCY</u>	
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴
Ring-billed Gull (<i>Larus delawarensis</i>)	278	14.1%	13	40.6%
White-winged Dove (<i>Zenaida asiatica</i>)	3	0.2%	8	25.0%
Mourning Dove (<i>Zenaida macroura</i>)	21	1.1%	25	78.1%
Rock Pigeon (<i>Columbia livia</i>)	4	0.2%	2	6.3%
Greater Roadrunner (<i>Geococcyx californianus</i>)	9	0.5%	21	65.6%
Barn Owl (<i>Tyto alba</i>)	1	< 0.1%	2	6.3%
Great Horned Owl (<i>Bubo virginianus</i>)	1	< 0.1%	1	3.1%
Lesser Nighthawk (<i>Chordeiles acutipennis</i>)	2	0.1%	5	15.6%
White-throated Swift (<i>Aeronautes saxatalis</i>)	4	0.2%	4	12.5%
Black-chinned Hummingbird (<i>Archilochus alexandri</i>)	4	0.2%	11	34.4%
Anna's Hummingbird (<i>Calypte anna</i>)	2	0.1%	1	3.1%
Costa's Hummingbird (<i>Calypte costae</i>)	5	0.3%	6	18.8%
Belted Kingfisher (<i>Megaceryle alcyon</i>)	6	0.3%	17	53.1%
Red-naped Sapsucker (<i>Sphyrapicus nuchalis</i>)	1	< 0.1%	3	9.4%
Hairy Woodpecker (<i>Picoides villosus</i>)	1	< 0.1%	1	3.1%
Northern Flicker (<i>Colaptes auratus</i>)	7	0.4%	22	68.8%
Western Wood-Pewee (<i>Contopus sordidulus</i>)	2	0.1%	5	15.6%
Dusky Flycatcher (<i>Empidonax oberholseri</i>)	1	< 0.1%	2	6.3%
“Western Type” (Cordilleran?) Flycatcher (<i>Empidonax occidentalis</i>)	2	0.1%	2	6.3%

Appendix II continued: Abundance and frequency of all birds observed after 26 census events along the Wash from 12 February 2006 through 29 January 2007. Includes birds detected outside census point ^a radii and birds that flew over the census points. An unknown number of observations may be double counted.

<u>SPECIES</u>	<u>ABUNDANCE</u>		<u>FREQUENCY</u>	
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴
Black Phoebe (<i>Sayornis nigricans</i>)	23	1.2%	30	93.8%
Say's Phoebe (<i>Sayornis saya</i>)	6	0.3%	15	46.9%
Ash-throated Flycatcher (<i>Myiarchus cinerascens</i>)	1	< 0.1%	2	6.3%
Western Kingbird (<i>Tyrannus verticalis</i>)	7	0.4%	5	15.6%
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	5	0.3%	12	37.5%
Solitary (Plumbeous) Vireo (<i>Vireo plumbeus</i>)	1	< 0.1%	1	3.1%
Warbling Vireo (<i>Vireo gilvus</i>)	2	0.1%	5	15.6%
Common Raven (<i>Corvus corax</i>)	3	0.2%	8	25.0%
Violet-green Swallow (<i>Tachycineta thalassina</i>)	3	0.2%	4	12.5%
Northern Rough-winged Swallow (<i>Stelgidopteryx serripennis</i>)	40	2.0%	25	78.1%
Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)	8	0.4%	7	21.9%
Barn Swallow (<i>Hirundo rustica</i>)	5	0.3%	3	9.4%
Verdin (<i>Auriparus flaviceps</i>)	19	1.0%	29	90.6%
Bushtit (<i>Psaltriparus minimus</i>)	8	0.4%	6	18.8%
Rock Wren (<i>Salpinctes obsoletus</i>)	3	0.2%	9	28.1%
Canyon Wren (<i>Catherpes mexicanus</i>)	1	< 0.1%	1	3.1%
Bewick's Wren (<i>Thryomanes bewickii</i>)	35	1.8%	30	93.8%
House Wren (<i>Troglodytes aedon</i>)	1	< 0.1%	1	3.1%
Winter Wren (<i>Troglodytes troglodytes</i>)	1	< 0.1%	1	3.1%
Marsh Wren (<i>Cistothorus palustris</i>)	34	1.7%	26	81.3%

Appendix II continued: Abundance and frequency of all birds observed after 26 census events along the Wash from 12 February 2006 through 29 January 2007. Includes birds detected outside census point ^a radii and birds that flew over the census points. An unknown number of observations may be double counted.

<u>SPECIES</u>	<u>ABUNDANCE</u>		<u>FREQUENCY</u>	
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴
Ruby-crowned Kinglet (<i>Regulus calendula</i>)	34	1.7%	30	93.8%
Blue-gray Gnatcatcher (<i>Poliophtila caerulea</i>)	8	0.4%	18	56.3%
Black-tailed Gnatcatcher (<i>Poliophtila melanura</i>)	23	1.2%	30	93.8%
Western Bluebird (<i>Sialia mexicana</i>)	8	0.4%	1	3.1%
Hermit Thrush (<i>Catharus guttatus</i>)	4	0.2%	8	25.0%
American Robin (<i>Turdus migratorius</i>)	1	< 0.1%	1	3.1%
Northern Mockingbird (<i>Mimus polyglottos</i>)	3	0.2%	11	34.4%
Crissal Thrasher (<i>Toxostoma crissale</i>)	11	0.6%	25	78.1%
American Pipit (<i>Anthus rubescens</i>)	54	2.7%	27	84.4%
Cedar Waxwing (<i>Bombycilla cedrorum</i>)	1	< 0.1%	1	3.1%
Phainopepla (<i>Phainopepla nitens</i>)	4	0.2%	9	28.1%
Orange-crowned Warbler (<i>Vermivora celata</i>)	14	0.7%	25	78.1%
Lucy's Warbler (<i>Vermivora luciae</i>)	37	1.9%	26	81.3%
Yellow Warbler (<i>Dendroica petechia</i>)	12	0.6%	14	43.8%
Yellow-rumped Warbler (<i>Dendroica coronata</i>)	44	2.2%	30	93.8%
MacGillivray's Warbler (<i>Oporornis tolmiei</i>)	1	< 0.1%	1	3.1%
Common Yellowthroat (<i>Geothlypis trichas</i>)	33	1.7%	27	84.4%
Yellow-breasted Chat (<i>Icteria virens</i>)	35	1.8%	27	84.4%
Wilson's Warbler (<i>Wilsonia pusilla</i>)	1	< 0.1%	1	3.1%

Appendix II continued: Abundance and frequency of all birds observed after 26 census events along the Wash from 12 February 2006 through 29 January 2007. Includes birds detected outside census point ^a radii and birds that flew over the census points. An unknown number of observations may be double counted.

<u>SPECIES</u>	<u>ABUNDANCE</u>		<u>FREQUENCY</u>	
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴
Summer Tanager (<i>Piranga rubra</i>)	23	1.2%	19	59.4%
Western Tanager (<i>Piranga ludoviciana</i>)	3	0.2%	2	6.3%
Spotted Towhee (<i>Pipilo maculatus</i>)	2	0.1%	4	12.5%
Canyon Towhee (<i>Pipilo fuscus</i>)	1	< 0.1%	1	3.1%
Abert's Towhee (<i>Pipilo aberti</i>)	56	2.8%	32	100.0%
Chipping Sparrow (<i>Spizella passerina</i>)	6	0.3%	2	6.3%
Brewer's Sparrow (<i>Spizella breweri</i>)	13	0.7%	8	25.0%
Black-throated Sparrow (<i>Amphispiza bilineata</i>)	1	< 0.1%	1	3.1%
Song Sparrow (<i>Melospiza melodia</i>)	58	2.9%	31	96.9%
Lincoln's Sparrow (<i>Melospiza lincolnii</i>)	2	0.1%	9	28.1%
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	55	2.8%	31	96.9%
Dark-eyed Junco (<i>Junco hyemalis</i>)	5	0.3%	7	21.9%
Black-headed Grosbeak (<i>Pheucticus melanocephalus</i>)	2	0.1%	4	12.5%
Blue Grosbeak (<i>Passerina caerulea</i>)	24	1.2%	26	81.3%
Lazuli Bunting (<i>Passerina amoena</i>)	2	0.1%	7	21.9%
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	157	8.0%	31	96.9%
Yellow-headed Blackbird (<i>Xanthocephalus xanthocephalus</i>)	26	1.3%	9	28.1%
Brewer's Blackbird (<i>Euphagus bonariensis</i>)	4	0.2%	1	3.1%
Western Meadowlark (<i>Sturnella neglecta</i>)	1	< 0.1%	2	6.3%

Appendix II continued: Abundance and frequency of all birds observed after 26 census events along the Wash from 12 February 2006 through 29 January 2007. Includes birds detected outside census point ^a radii and birds that flew over the census points. An unknown number of observations may be double counted.

<u>SPECIES</u>	<u>ABUNDANCE</u>		<u>FREQUENCY</u>	
	<u>Absolute</u> ¹	<u>Relative</u> ²	<u>Absolute</u> ³	<u>Relative</u> ⁴
Great-tailed Grackle (<i>Quiscalus mexicanus</i>)	25	1.3%	20	62.5%
Brown-headed Cowbird (<i>Molothrus ater</i>)	46	2.3%	29	90.6%
Bullock's Oriole (<i>Icterus bullockii</i>)	4	0.2%	6	18.7%
House Finch (<i>Carpodacus mexicanus</i>)	19	1.0%	26	81.3%
Lesser Goldfinch (<i>Carduelis psaltria</i>)	15	0.8%	12	37.5%

a – Number of census points per census event varied from 29 to 32.

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.