

**Chapter 1 – Los Cerritos Wetlands Biology**  
**by**  
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**Introduction**

The Los Cerritos Wetlands is an area of tidal salt marsh located in the urban matrix of the Long Beach coastal area. Tidal marshes are biologically important interfaces between freshwater terrestrial and marine ecosystems. There have been estimates that up to 90% of California wetlands have been converted into other land uses which makes this wetland an area of special importance. There are many inhabitants of the Los Cerritos Wetlands including cordgrass, pickleweed, fiddler crabs, topsmelt and stingrays. The tidal marsh serves as a spawning area for many types of commercial fishes such as halibut and salmon. Located on the Pacific Flyway, the Los Cerritos Wetlands are also especially important as a foraging site for migratory birds and home to many species of waterfowl.

Birds are an important biological tool for environmental scientists because they are good bio-indicators. A high abundance of bird species is a sign of the high quality of a habitat. The integrated geological, hydrological, and social systems impact the biology of an ecological community. Birds will not continue to forage in a habitat that is not functioning properly. Many bird species are protected under the Endangered Species Act (ESA) and the Migratory Bird Treaty Act (MBTA) which are designed to help protect the habitat of these birds (table 1).

Table 1: Bird species documented at Los Cerritos Wetlands during March and April of 2006 that are protected by the MBTA

|                             |   |
|-----------------------------|---|
| American avocet             | <i>Recurvirostra americana</i>            |
| Double-crested cormorant    | <i>Phalacrocorax auritus</i>              |
| American crow               | <i>Corvus brachyrhynchos</i>              |
| Long-billed curlew          | <i>Numenius americanus</i>                |
| Mourning dove               | <i>Zenaida macroura</i>                   |
| Long-billed dowitcher       | <i>Limnodromus scolopaceus</i>            |
| Short-billed dowitcher      | <i>Limnodromus griseus</i>                |
| Great egret                 | <i>Ardea (=Casmerodius) alba (=albus)</i> |
| Snowy egret                 | <i>Egretta thula</i>                      |
| Peregrine falcon            | <i>Falco peregrinus</i>                   |
| Marbled godwit              | <i>Limosa fedoa</i>                       |
| Common goldeneye            | <i>Bucephala clangula</i>                 |
| Eared grebe                 | <i>Podiceps nigricollis</i>               |
| California gull             | <i>Larus californicus</i>                 |
| Ring-billed gull            | <i>Larus delawarensis</i>                 |
| Red-shouldered hawk         | <i>Buteo lineatus</i>                     |
| Red-tailed hawk             | <i>Buteo jamaicensis</i>                  |
| Green (=green-backed) heron | <i>Butorides virescens (=striatus)</i>    |
| Anna's hummingbird          | <i>Calypte anna</i>                       |
| American kestrel            | <i>Falco sparverius</i>                   |
| Killdeer                    | <i>Charadrius vociferus</i>               |
| Western kingbird            | <i>Tyrannus verticalis</i>                |
| Mallard                     | <i>Anas platyrhynchos</i>                 |
| Black-crowned night-heron   | <i>Nycticorax nycticorax</i>              |
| Osprey                      | <i>Pandion haliaetus</i>                  |
| Black phoebe                | <i>Sayornis nigricans</i>                 |
| Semipalmated plover         | <i>Charadrius semipalmatus</i>            |
| Western sandpiper           | <i>Calidris mauri</i>                     |
| Savannah sparrow            | <i>Passerculus sandwichensis</i>          |
| Barn swallow                | <i>Hirundo rustica</i>                    |
| Cliff swallow               | <i>Hirundo pyrrhonota</i>                 |
| Caspian tern                | <i>Sterna caspia</i>                      |
| Forster's tern              | <i>Sterna forsteri</i>                    |
| Least tern                  | <i>Sterna antillarum</i>                  |
| California (=brown) towhee  | <i>Pipilo crissalis (=fuscus)</i>         |
| Whimbrel                    | <i>Numenius phaeopus</i>                  |
| Willet                      | <i>Catoptrophorus semipalmatus</i>        |
| Greater yellowlegs          | <i>Tringa melanoleuca</i>                 |
| Lesser yellowlegs           | <i>Tringa flavipes</i>                    |

Los Cerritos Wetlands also provide habitat for two endangered bird species, the California least tern, *Sterna antillarum browni* (fig. 1), which is state and federally endangered and the Belding's savannah sparrow, *Passerculus sandwichensis beldingi* (fig. 2), which is state endangered.



Figure 1: California Least Tern



Figure 2: Belding's Savannah Sparrow

The objective of our study was to survey the abundances of bird species in the Los Cerritos Wetlands. The abundances of bird species in the Los Cerritos Wetlands have not been recorded since 1980 when the Department of Fish and Game was researching the status of the wetlands at request of the California Coastal Conservancy. Our goal was to continue the collection of data for bird abundances in the wetlands. A collection of bird surveys can tell us if bird abundance declines in the future due to habitat degradation or if restoration work will help increase bird species numbers. We compared current bird species numbers with historical data from the California Department of Fish and Game to determine if numbers have drastically changed.

## **Methods**

The survey was conducted from the northern edge of Steam Shovel Slough at the Los Cerritos wetlands (fig. 3-10). This section of the wetlands was located on the Bixby property. The Steam Shovel Slough area was separated into six observation transects with a limited recording area (table 2). The purpose of these divisions was to try and relate the presence of particular species to the different habitats in the wetland.

Bird surveys were conducted at various tides from one to two days per week throughout the months of March and April of 2006. The observers consisted of the Cal State Long Beach Environmental Science and Policy Capstone Project biology team, members of the Los Cerritos Wetland Stewards and Cal State Long Beach graduate students with experience in bird watching. Each observer was equipped with binoculars, data collection sheets, counters, field guides, field notebooks, cameras, and hand held GPS systems (Garmin Etrex). Birds were observed at the six different points for 20 minutes. We used a modified Point Count Survey Protocol (Esteban Fernandez-Juricic, 2000).

In each observation, the biotic factors such as the species, the number of individuals seen, the habitat, the location, and their behavior were recorded on a data sheet. In addition, abiotic factors such as weather condition, humidity, wind, temperature, tide, and time were recorded. Since no other bird counts have been conducted at the Los Cerritos Wetlands since 1980, emphasis was placed on the various types of species that use the wetlands.

Once the surveys were performed, the observations were organized by date recorded and location. Totals for each day and a grand total were calculated with the total amount of species observed, species, locations, and total amount of birds observed.

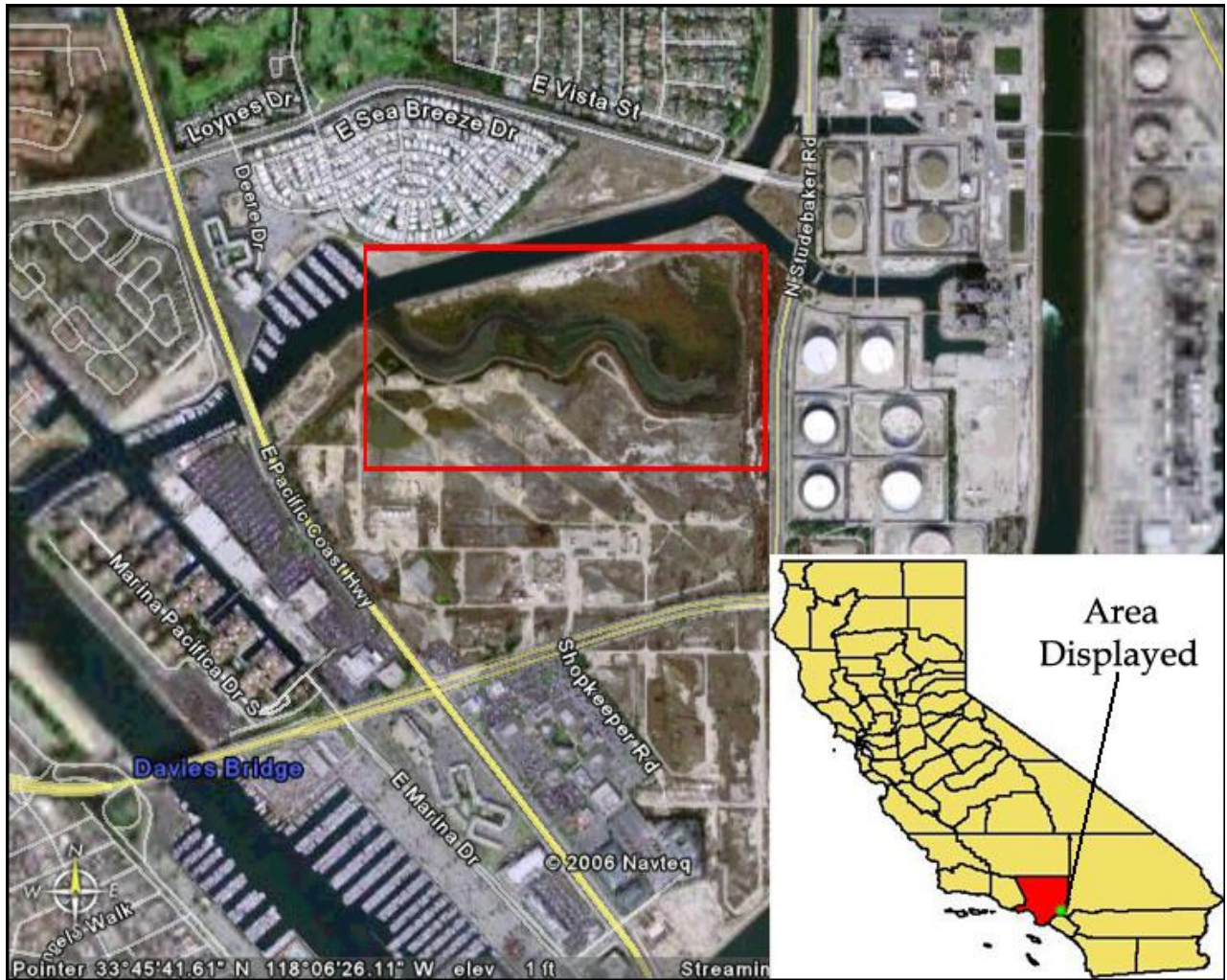


Figure 3: Steam Shovel Slough (Red Quadrant) located in Los Cerritos Wetlands in Long Beach, CA.

Table 2: Geographic Co-ordinates of birding points during 2006 study

| Point # | Name              | Latitude  | Longitude  |
|---------|-------------------|-----------|------------|
| 1       | Fisherman's Point | 33°45.888 | 118°06.711 |
| 2       | Watcher's Hill    | 33°45.902 | 118°06.628 |
| 3       | Myoporum          | 33°45.905 | 118°06.549 |
| 4       | Molosma           | 33°45.924 | 118°06.470 |
| 5       | Cement Slabs      | 33°45.898 | 118°06.283 |
| 6       | Steeps            | 33°46.030 | 118°06.204 |

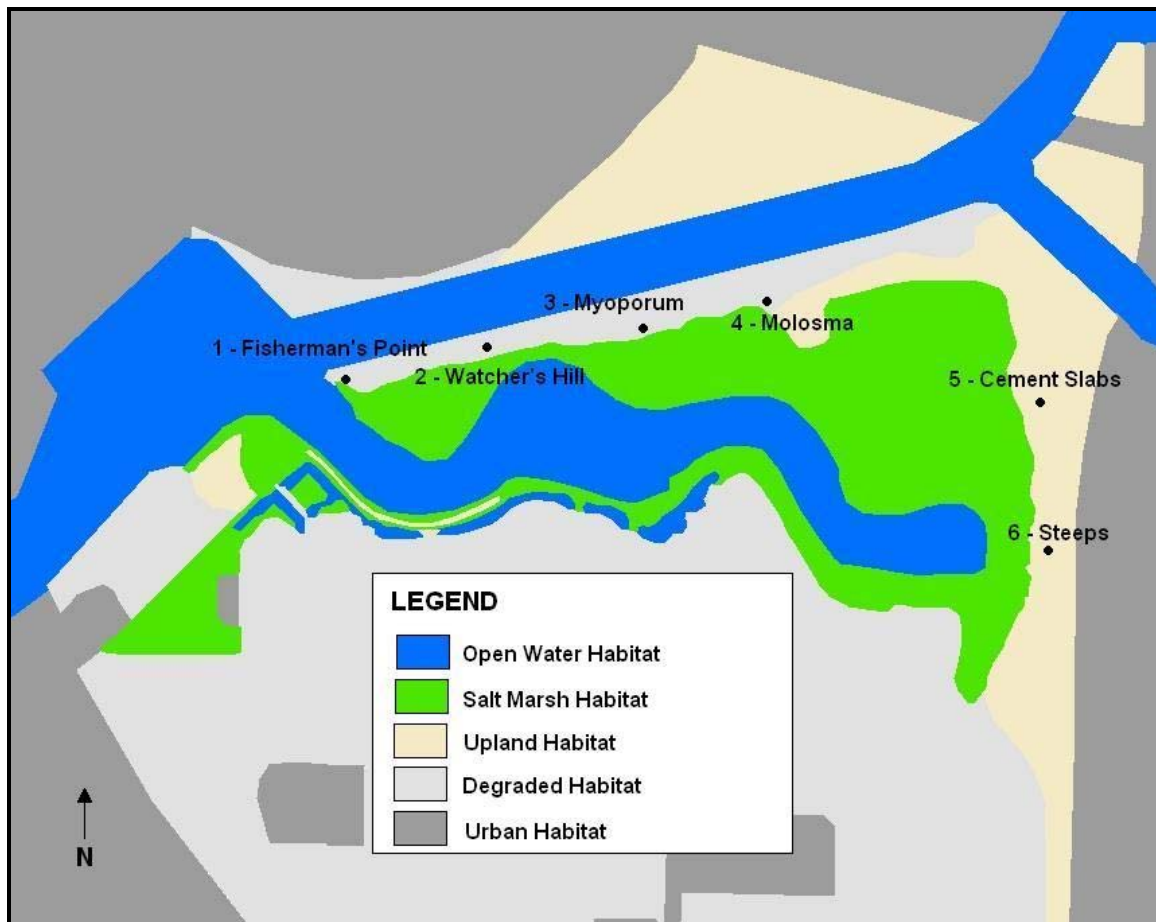


Figure 4: Map of birding points used during March and April 2006 Los Cerritos Wetlands bird survey



Figure 5: Bird Survey point 1 - Fisherman's point



Figure 6: Bird Survey point 2 - Watcher's hill



Figure 7: Bird Survey point 3 - Myoporum



Figure 8: Bird Survey point 4 - Molosma



Figure 9: Bird Survey point 5 - Cement Slabs



Figure 10: Bird Survey point 7 - Steeps

The bird species were categorized into six groups based on morphological characteristics, behavior and habitat and the relative abundances of each group were calculated (fig 11- 28).

#### Shorebirds:



Figure 11: Sandpiper



Figure 12: Willet



Figure 13: Dowitcher

#### Hérons and Egrets:



Figure 14: Black Crowned  
Night Heron



Figure 15: Great Blue Heron



Figure 16: Great Egret

#### Terns and Gulls:



Figure 17: Forster's Tern



Figure 18: Caspian Tern



Figure 19: Ring Billed  
Gull

Raptors:



Figure 20: Osprey



Figure 21: Red-Shouldered Hawk



Figure 22: Peregrine Falcon

Seabirds and Ducks:



Figure 23: Double-Crested Cormorant

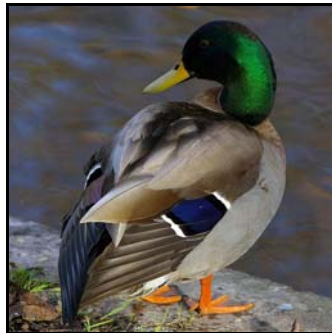


Figure 24: Mallard



Figure 25: Eared Grebe

Other:



Figure 26: Western Kingbird



Figure 27: Barn Swallow



Figure 28: European Starling

## Results

Total bird species richness and abundance (table 3) in 2006 were lower than 1980 values. The relatively steep slope of the species discovery curve (fig. 29) generated from the 2006 survey, showed that more species were observed per additional unit of effort (observer hours). A linear regression of this 2006 survey data (fig. 30) revealed a projected estimate of total species richness for the months of March and April equal to 57 ( $R^2 = 0.488$ ,  $P = 0.003$ ).

Table 3: Bird survey numbers in 1980 versus 2006

|                     | 1980  | 2006 |
|---------------------|-------|------|
| Total Censuses      | 16    | 8    |
| Survey Area (acres) | 300   | 40   |
| Species Richness    | 59    | 46   |
| Total Abundance     | 12200 | 2876 |

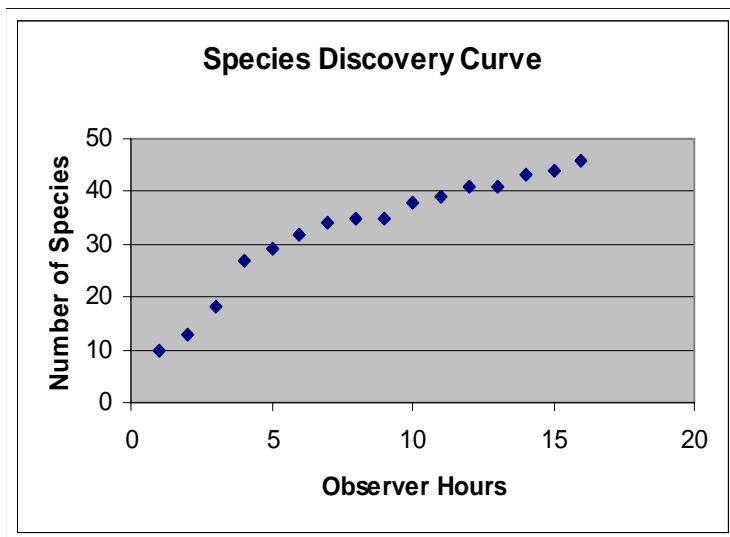


Figure 29: Species discovery curve from the 2006 bird survey conducted in Los Cerritos Wetlands

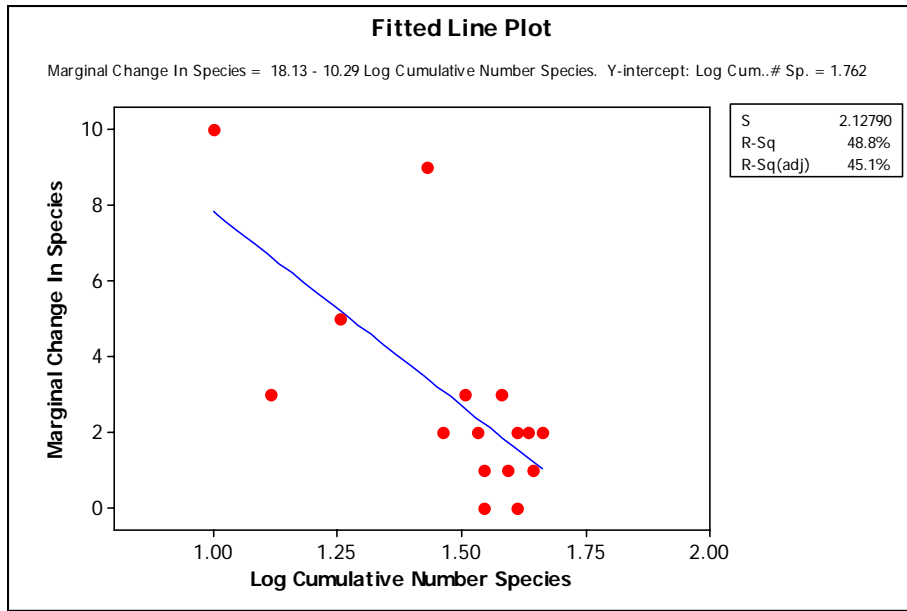


Figure 30: Linear regression of the 2006 survey data from Los Cerritos Wetlands

Species groups' relative abundance varied between the 1980 and 2006 studies (table 4 & fig. 31-32). Some similarities did occur between rank and percentage when comparing the former to the succeeding survey. In both surveys the most dominant group were the shorebirds. The second highest percentages were terns and gulls. Combined percentages of shorebirds, terns, and gulls accounted for >90% of the survey total in 1980 and 2006. Although the percentage of shore birds increased from 1980 to 2006, while the percentage of terns and gulls drastically declined from 1980 to 2006.

Heron and egrets had the fourth highest percentage in 1980 and 2006. In both surveys the percentage of herons and egrets was relatively small, although in 2006 their percentage had more than doubled from the 1980 survey. Raptors represented the lowest percentage in both surveys. In 1980 and 2000 the percentage of raptors remained relatively constant (increase of <0.15%).

Percentages of seabirds and duck type birds had no similarities in 1980 and 2006. In 1980, seabirds and ducks had the third highest percentage, while in 2006 they were second lowest. This was primarily due to a significant decrease in relative abundance of this group from 1980 to 2006. Also, the number of duck species declined (table 5-6) from 14 species in 1980 to two species in 2006.

Table 4: Number of species and abundance percentages of birds by type in 1980 vs. 2006

|                    | 1980         |            | 2006         |            |
|--------------------|--------------|------------|--------------|------------|
|                    | # of Species | Percentage | # of Species | Percentage |
| Shorebirds         | 22           | 47.73%     | 12           | 77.26%     |
| Terns and Gulls    | 8            | 43.62%     | 5            | 13.21%     |
| Heron and Egrets   | 4            | 0.57%      | 5            | 2.02%      |
| Raptors            | 6            | 0.48%      | 5            | 0.63%      |
| Seabirds and Ducks | 16           | 7.52%      | 6            | 1.11%      |
| Other Birds        | 3            | 0.07%      | 13           | 5.77%      |

In 2006, the category for other types of birds was comprised of birds that could not be grouped in any of the above categories. These consisted of upland habitat birds, edge species, and Belding's savannah sparrow, *Passerculus sandwichensis beldingi* (13 species total). In 1980, the other category birds consisted of Belding's savannah sparrow, and only two other species. There was an extreme increase in the relative abundance of these birds from 1980 to 2006 (table 4).

The 1980 and 2006 surveys were both dominated by a single species (fig. 33), although the dominant species was a different type in each survey. In 1980, ring-billed gulls, *Larus delawarensis*, accounted for a proportional abundance of 0.42; while sandpiper species, *Calidris* spp., accounted for 0.50 of the proportional abundance in 2006. In the 1980 survey, only 12 additional species had a proportional abundance  $\geq 0.01$ , while 46 species had a proportional abundance  $< 0.01$ . In 2006, only eight additional species had a proportional abundance  $> 0.01$ , while 37 species had a proportional abundance of  $< 0.01$ .

Table 5: Species Abundance and Percentages in 2006

|                       |           |         |
|-----------------------|-----------|---------|
| Shorebirds:           | Abundance | Percent |
| American Avocet       | 9         | 0.31%   |
| Dowitcher             | 46        | 1.60%   |
| Killdeer              | 5         | 0.17%   |
| Long-Billed Curlew    | 3         | 0.10%   |
| Long-Billed Dowitcher | 1         | 0.03%   |
| Marbled Godwit        | 64        | 2.23%   |
| Sandpiper             | 1443      | 50.17%  |
| Semipalmated Plover   | 10        | 0.35%   |
| Western Sandpiper     | 482       | 16.76%  |
| Whimbrel              | 24        | 0.83%   |
| Willet                | 133       | 4.62%   |
| Yellowlegs            | 2         | 0.07%   |
| Totals:               | 2222      | 77.26%  |

Hérons and Egrets:

|                           |    |       |
|---------------------------|----|-------|
| Black Crowned Night Heron | 1  | 0.03% |
| Great Blue Heron          | 18 | 0.63% |
| Great Egret               | 21 | 0.73% |
| Green Heron               | 1  | 0.03% |
| Snowy Egret               | 17 | 0.59% |
| Totals:                   | 58 | 2.02% |

Terns and Gulls:

|                  |     |        |
|------------------|-----|--------|
| Caspian Tern     | 44  | 1.53%  |
| Forster's Tern   | 187 | 6.50%  |
| Gull             | 143 | 4.97%  |
| Least Tern       | 4   | 0.14%  |
| Ring Billed Gull | 2   | 0.07%  |
| Totals:          | 380 | 13.21% |

Raptors:

|                     |           |         |
|---------------------|-----------|---------|
|                     | Abundance | Percent |
| American Kestrel    | 2         | 0.07%   |
| Osprey              | 7         | 0.24%   |
| Red-shouldered Hawk | 2         | 0.07%   |
| Red-tailed Hawk     | 6         | 0.21%   |
| Peregrine Falcon    | 1         | 0.03%   |
| Totals:             | 18        | 0.63%   |

Seabirds and Ducks:

|                          |    |       |
|--------------------------|----|-------|
| Common Goldeneye         | 1  | 0.03% |
| Cormorant                | 1  | 0.03% |
| Double-crested Cormorant | 15 | 0.52% |
| Eared Grebe              | 5  | 0.17% |
| Mallard                  | 8  | 0.28% |
| Pied-billed Grebe        | 2  | 0.07% |
| Totals:                  | 32 | 1.11% |

Table 5: Species Abundance and Percentages in 2006 (continued)

Upland Birds:

|                            |     |       |
|----------------------------|-----|-------|
| American Crow              | 25  | 0.87% |
| Anna's Hummingbird         | 3   | 0.10% |
| Barn Swallow               | 22  | 0.76% |
| Belding's Savannah Sparrow | 19  | 0.66% |
| Black Phoebe               | 1   | 0.03% |
| California Towhee          | 1   | 0.03% |
| Cliff Swallow              | 7   | 0.24% |
| European Starling          | 33  | 1.15% |
| Hummingbird                | 1   | 0.03% |
| Mourning Dove              | 3   | 0.10% |
| Savannah Sparrow           | 3   | 0.10% |
| Swallow                    | 22  | 0.76% |
| Western Kingbird           | 26  | 0.90% |
| Totals:                    | 166 | 5.77% |

Table 6: Species Abundance and Percentages in 1980

Shorebirds:

|                      | Abundance | Percent |
|----------------------|-----------|---------|
| American Avocet      | 356       | 2.92%   |
| Black-Bellied Plover | 1708      | 14.00%  |
| Black-Necked Stilt   | 635       | 5.20%   |
| Common Snipe         | 14        | 0.11%   |
| Coot                 | 102       | 0.84%   |
| Dowitcher, spp.      | 1213      | 9.94%   |
| Dunlin               | 254       | 2.08%   |
| Greater Yellowlegs   | 20        | 0.16%   |
| Killdeer             | 141       | 1.16%   |
| Least Sandpiper      | 24        | 0.20%   |
| Lesser Yellowlegs    | 2         | 0.02%   |
| Longbilled Curlew    | 3         | 0.02%   |
| Marbled Godwit       | 40        | 0.33%   |
| Red Knot             | 2         | 0.02%   |
| Red Phalarope        | 1         | 0.01%   |
| Ruddy Turnstone      | 29        | 0.24%   |
| Sanderling           | 78        | 0.64%   |
| Sandpiper, spp.      | 340       | 2.79%   |
| Semipalmated Plover  | 12        | 0.10%   |
| Spotted Sandpiper    | 17        | 0.14%   |
| Western Sandpiper    | 776       | 6.36%   |
| Willet               | 56        | 0.46%   |
| Totals:              | 5823      | 47.73%  |

Hérons and Egrets:

|                  |    |       |
|------------------|----|-------|
| Great Blue Heron | 4  | 0.03% |
| Great Egret      | 33 | 0.27% |
| Green Heron      | 5  | 0.04% |
| Snowy Egret      | 27 | 0.22% |
| Totals:          | 69 | 0.57% |

Table 6: Species Abundance and Percentages in 1980 (continued)

Terns and Gulls:

|                  |      |        |
|------------------|------|--------|
| California Gull  | 25   | 0.20%  |
| Caspian Tern     | 111  | 0.91%  |
| Forster's Tern   | 38   | 0.31%  |
| Gulls, spp.      | 21   | 0.17%  |
| Heermann's Gull  | 1    | 0.01%  |
| Herring Gull     | 1    | 0.01%  |
| Ring-Billed Gull | 5124 | 42.00% |
| Western Gull     | 1    | 0.01%  |
| Totals:          | 5322 | 43.62% |

Raptors:

|                     |           |         |
|---------------------|-----------|---------|
|                     | Abundance | Percent |
| American Kestrel    | 42        | 0.34%   |
| Osprey              | 6         | 0.05%   |
| Red-Shouldered Hawk | 1         | 0.01%   |
| Red-Tailed Hawk     | 1         | 0.01%   |
| Turkey Vulture      | 3         | 0.02%   |
| White-Tailed Kite   | 6         | 0.05%   |
| Totals:             | 59        | 0.48%   |

Seabirds and Ducks:

|                        |     |       |
|------------------------|-----|-------|
| American Wigeon        | 3   | 0.02% |
| Black Scoter           | 4   | 0.03% |
| Blue Winged Teal       | 14  | 0.11% |
| Bufflehead             | 12  | 0.10% |
| Cinnamon Teal          | 190 | 1.56% |
| Ducks spp.             | 3   | 0.02% |
| Eared Grebe            | 1   | 0.01% |
| Greater Scaup          | 17  | 0.14% |
| Green Winged Teal      | 126 | 1.03% |
| Lesser Scaup           | 10  | 0.08% |
| Mallard                | 43  | 0.35% |
| Northern Shoveler      | 278 | 2.28% |
| Pied-Billed Grebe      | 1   | 0.01% |
| Pintail                | 203 | 1.66% |
| Red-Breasted Merganser | 5   | 0.04% |
| Ruddy Duck             | 8   | 0.07% |
| Totals:                | 918 | 7.52% |

Other Birds:

|                            |   |       |
|----------------------------|---|-------|
| Belding's Savannah Sparrow | 2 | 0.02% |
| Red Shafted Flicker        | 1 | 0.01% |
| Belted Kingfisher          | 6 | 0.05% |
| Totals:                    | 9 | 0.07% |

The extremely high proportional dominance of ring-billed gulls (1980) and sandpipers (2006) creates an uneven distribution among species proportions (fig. 33), in turn negatively affecting species diversity. Although, diversity in 1980 was superior to that of 2006 (Shannon-Wiener diversity index, (1980)  $H = 2.21 > (2000) H = 1.94$ ).

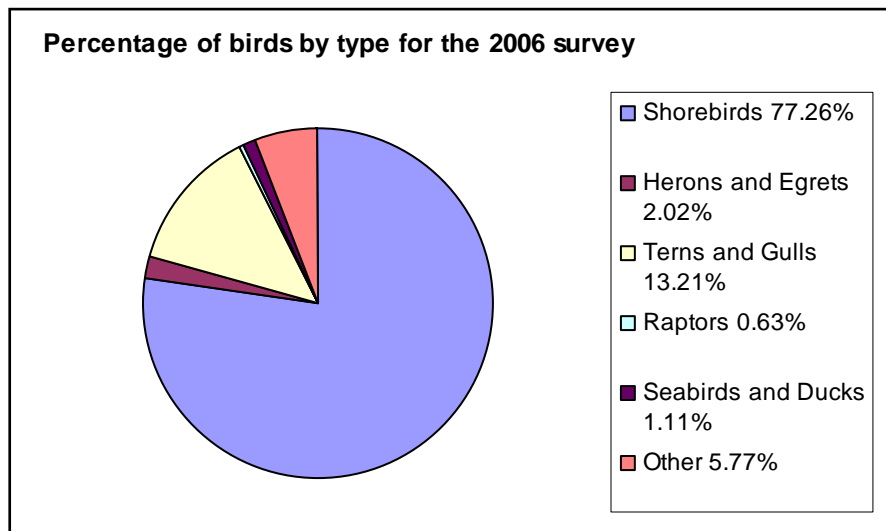


Figure 31: Percentage of birds by type, surveyed in 2006 at Los Cerritos Wetlands.

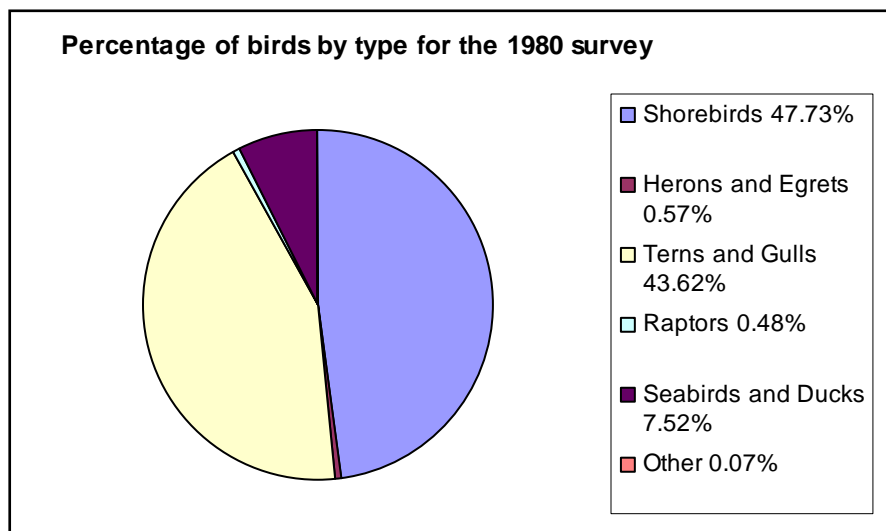


Figure 32: Percentage of birds by type, surveyed in 1979-80 at Los Cerritos Wetlands

In 2006 two endangered species were observed: The state endangered Belding's savanna sparrow, *P. sandwichensis beldingi*, and the state and federal listed least tern, *Sterna antillarum browni*. A total of 19 Belding's savanna sparrows recorded in the 2006, was a significant increase from the two that were recorded in 1980. The total abundance of least terns for 2006 was four, while no least tern sightings were recorded in 1980 survey.

Compared with historical Belding's Savannah Sparrow counts, the 2006 survey found 19 individuals during March and April compared with 19 pairs found during March-May of 2001 (table 7). Results indicate that this species is increasing in number.

Table 7: Breeding Pairs of Belding's savannah sparrow in California

| Location           | Number of Pairs |      |      |      |      |
|--------------------|-----------------|------|------|------|------|
|                    | 1977            | 1986 | 1991 | 1996 | 2001 |
| Los Cerritos Marsh | 5               | 2    | 9    | 4    | 19   |

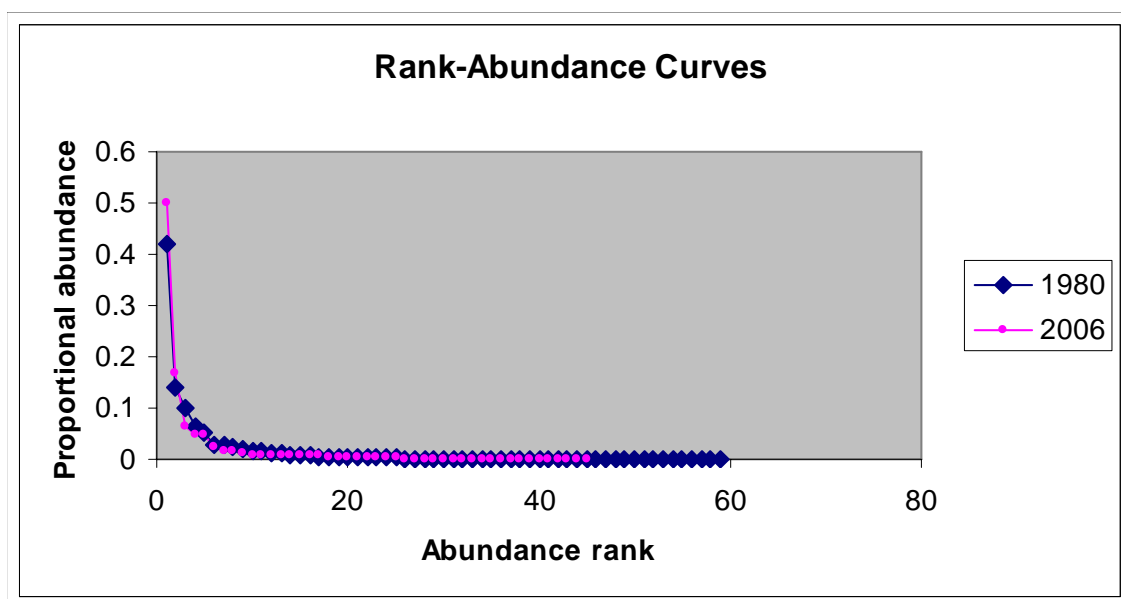


Figure 33: Rank-Abundance curve for bird species identified in the 1980 and 2006 survey

## Discussion

Our 2006 survey showed that total abundance and bird species richness in the Los Cerritos Wetlands have declined since 1980. This may have been a result of continued degradation of the salt marsh habitat. It is more likely the result of differences in the two studies. The 1980 study was conducted over a larger area, 300 versus 40 acres and consisted of eight additional surveys. The 1980 season also was conducted during migratory season for some birds that the 2006 study did not observe. The discovery curve calculated from our data indicates that higher bird abundances may have been found with more observation hours. A linear regression shows that we may have documented results as high as 57 bird species, only two species shy of the 1980 numbers.

Our survey found that shorebirds, terns and gulls dominated the types of birds observed. Over 90% of the bird species we encountered fell into these two groups. Small shorebirds were by far the most represented. These types of birds migrate to coastal wetlands in the winter and spring and travel in large flocks of hundreds or more. Los Cerritos Wetlands also provides a

large mudflat habitat over which our observation was concentrated which could have been the cause of the high shorebird numbers.

In 1980 there was a more proportional abundance and higher species evenness. The abundance in 2006 was dominated by sandpiper species. This species had a high abundance, but low biomass which means it may be a typical low trophic level consumer in this community. However, dominance by one species in an ecosystem causes low species evenness and reduces bio-diversity. A more accurate positive identification of the different sandpiper species may increase species evenness. In 1980, species abundance was dominated by ring-billed gulls.

The smallest group in our study was the raptors, the birds of prey. There is a small habitat area for these bird types consisting of only telephone and electricity poles and a solitary flagpole located in the wetlands. The small abundance of raptors follows food web logic. The higher the species is in the trophic level, the lower number of individual birds will be present. Raptors represent the top consumers in the salt marsh food web so small numbers of the birds is natural.

The 1980 study found different percentages of bird groups than were found in the 2006 study. Seabird and duck, as well as tern and gull representation decreased, most likely due to focus on mudflats in the 2006 study. This also explains the large increase in percentage of shorebirds. The other bird group with an increase in representation were other or upland birds. This group includes the Belding's savannah sparrow whose numbers have been increasing since 1977. The increase in these numbers may be due to an increase in upland and degraded habitat. Many other bird species may have been flying through the wetland from the urban surroundings.

Our two focal species, the Belding's savannah sparrow and least tern were both observed on our survey. Belding's abundance increased from the 1908 survey as well as the 1977-2001 surveys. While our study was focused on individuals rather than nesting pairs the results indicate larger overall numbers than reported previous studies. This may indicate a growth in habitat. It may also be a result of increased awareness of this species due to the Endangered Species Act. Least Tern numbers also increased from no observations in 1980 to four sightings in 2006. The least tern nesting season was just beginning as our study ended so it was likely we could have had much higher abundances with more observation hours.

## **Conclusion**

Based on our survey, the Los Cerritos Wetlands contain a healthy ecological community. Compared to previous studies, we observed a decrease in viable habitat and a resulting decrease in certain types of bird species. To maintain the wetlands as a viable habitat and decrease any further degradation, we recommend that certain measures be taken to protect and provide for bird use. We recommend the building of gates to protect nesting birds from urban pet predation and possibly a Belding's savannah sparrow and least tern nesting preserve. To minimize human impacts we suggest creating a walkway with bird observation points to promote low-impact bird watching.

Our suggestions for future research include comparing bird abundances from Los Cerritos Wetlands to surrounding wetlands to determine possible relationships between bird abundances and habitat type. Other important aspects of wetland biology include fish, invertebrate, and plant abundances. All parts of the ecosystem are involved in providing a healthy community as well as the geologic, hydrologic, and social systems.

## **Acknowledgements**

Special thanks to our ESP 400 instructors, Dr. Hall, Dr. Holk, and especially Dr. Wijte for their instruction and guidance. Thanks to Taylor Parker and Matt Teutimez for their birding expertise and volunteer surveying hours. Most sincerely we thank Eric Zahn for his guidance, resources, knowledge and enthusiasm.

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## **Credits**

Belding's Savannah Sparrow photo, by L. Hays,  
<http://www.fws.gov/bolsachica/images/JPGs/bsslhq.jpg>

California Least Tern photo, by Bill Beebe,  
<http://www.fws.gov/bolsachica/images/JPGs/cltbeebeq.jpg>

Sandpiper photo, by Jim Lair, USGS Biological Resources,  
[http://biology.usgs.gov/features/photogal/images\\_pg/jlair1-sandpiper.jpg](http://biology.usgs.gov/features/photogal/images_pg/jlair1-sandpiper.jpg)

Willet photo, by Akkana Peck,  
<http://www.shallowsky.com/Birds/Waterbirds/willet.jpg>

Dowitcher photo, by Arthur Morris, Birds as Art  
[http://www.birdsasart.com/Short-billed-Dowitcher-winter-plum-w-sand-crab-\\_T9J9294-Blind-Pass,-Captiva-I,-FL.jpg](http://www.birdsasart.com/Short-billed-Dowitcher-winter-plum-w-sand-crab-_T9J9294-Blind-Pass,-Captiva-I,-FL.jpg)

Black Crowned Night Heron photo, by Doug Janson  
[http://mishami.image.pbase.com/u41/dougj/upload/16846394.147\\_4789CS.jpg](http://mishami.image.pbase.com/u41/dougj/upload/16846394.147_4789CS.jpg)

Great Blue Heron photo, by Denice Westpfahl,  
[http://www.aves.net/photo-index/Great-blue\\_Heron-juv\\_11oct04\\_nr-Chicago-IL\\_copyright-DeniceW-s.jpg](http://www.aves.net/photo-index/Great-blue_Heron-juv_11oct04_nr-Chicago-IL_copyright-DeniceW-s.jpg)

Great Egret photo, by Gene Oleynik, Fermilab,  
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Ring Billed Gull photo, by Marcus G. Martin,  
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Osprey photo, by Howard Towner,  
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Red-shouldered Hawk photo, by Ron Austing,  
<http://www.ronausting.com/images/00/rshawkflight00.jpg>

Peregrine Falcon photo, by Joe Cosack, PGC Photo,  
[http://www.pgc.state.pa.us/pgc/lib/pgc/wildlife/photolib/peregrine\\_falcon.jpg](http://www.pgc.state.pa.us/pgc/lib/pgc/wildlife/photolib/peregrine_falcon.jpg)

Double-Crested Cormorant photo, by Don Baccus,  
[http://donb.furfly.net/photo\\_cd/d/b20.jpg](http://donb.furfly.net/photo_cd/d/b20.jpg)

Mallard photo, by C. B. Gunn,  
<http://www.rosssea.info/pix/big/Mallard.jpg>

Eared Grebe photo, by Mike Danzenbaker  
<http://www.avesphoto.com/website/pictures/GRBEAR-1.jpg>

Western Kingbird photo, by Wind Cave National Park Nature & Science  
[http://www.nps.gov/wica/images/Western\\_Kingbird.jpg](http://www.nps.gov/wica/images/Western_Kingbird.jpg)

Barn Swallow photo, by Doug Backlund

[http://pie.midco.net/dougback/miscphotos/barn\\_swallow2.jpg](http://pie.midco.net/dougback/miscphotos/barn_swallow2.jpg)

European Starling photo, by D.P.H. Watson, CLO

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## **Appendices**

A. Los Cerritos Wetland Point Count Survey Protocol (Attached)

B. Bird Survey Recording Sheet (Attached)

C. Los Cerritos Wetland 2006 Bird Survey Data (Attached)

D. Determination of the Status of the Los Cerritos wetlands, Southern California Wetland Publications, California Department of Fish and Game, 1981. (Separate Document)

E. A Survey of the Belding's Savannah Sparrow in California 2001, Species Conservation and Recovery Program Report, June 2002. (Separate Document)

## **Chapter 1, Appendix A: Los Cerritos Wetlands**

### **INSTRUCTIONS - POINT COUNT SURVEY PROTOCOL**

#### **I. Preparation for Bird Surveys**

Practice estimating distances in the park; use flags at known distances for references, or use range finders. Work in pairs to estimate distance to birds and check actual distances. Run practice point counts in pairs and compare results at the end of a session.

#### **II. Point Count Protocol**

##### **A. Duration of point counts**

At each point, record all birds observed for 20 min. Use the watch timer to ensure that this time is strictly followed.

**Try** not to double count birds. For example, if you **hear or see** a bird two times during the count that you think is probably the same bird (go with your gut instinct), do not double count it. Be aware of small birds that will fly in groups and constantly move (i.e. sandpipers, sanderlings, dowitchers). Stay aware of your surroundings at all times and always stay focused when you are on the clock! This is what makes this type of survey challenging and fun.

##### **B. Timing of point counts**

Point counts traditionally begin at dawn and are completed within a 4-5 hour time span (e.g., in CA counts run from dawn to 11:00 am). We will vary the times that we will be doing our counts because we are working in the tidally influenced salt marsh. Due to the fact that you will primarily be watching shorebirds, the tide will be a factor affecting the diversity and richness of species at the marsh. Open mudflats (low tide) entice numerous probes and waders, while open water (high tide) will draw in your plungers and divers. They can all be present at anytime, but the majority of species will be present when there are both mud flats exposed and open water available. Be sure to keep track of the tide and if it is going in or out.

#### **IV. Data Sheets**

##### **A. Filling out data sheets**

***Please write neatly!*** DO NOT LEAVE ANY BLANK CELLS (except COMMENTS)! Check data sheet during lulls and at the end of each survey period for blanks.

B. Sample Data sheet information

**ABIOTIC FACTORS**

1. **DATA SHEET #:** Record a *unique* number for each data sheet. (*Note:* This is different than page number). This number can be combined with a letter code. For example, all Los Cerritos Wetland location data sheets could be numbered LCW1, LCW2,...LCW35. This should be done at the end of each day. This helps to keep track of all data sheets across locations and allows data sheets to be related to the database more easily.
2. **PAGE:** Number each page of a day's survey. (*Note:* This is different than the data sheet number). For example, if an observer uses 5 pages during a day's survey, number the pages 1-5. On the next survey day, begin with page 1. This enables us to keep data sheets in chronological order for each day.
3. **DATE:** numeric date format, DDMMYY (6 digits)
4. **OBS** (observer): 2 or 3-letter code (use the initials of your first and last name, or all three initials). Whichever you use, be consistent.
5. **LOC** (location): unique 4-letter code [e.g. FISHEMAN'S Point = FISH: the first four letters of the points name.
6. **VISIT #:** Each point will be surveyed multiple times per breeding season. Record whether it was the first or second survey etc: 1 = first time surveyed that year, 2 = second time surveyed that year etc.
7. **WEA** (Weather): Record the cloud cover/rain: **0** = clear; **1** = 30-70% cloud cover; **2** = >70% cloud cover; **3** = fog; **4** = drizzle; **5** = precip. (*A light drizzle is acceptable for point counts, but not a heavy rain*).
8. **HUM** (humidity): record in percent. Eric has a tool you can borrow if he isn't there!
9. **WIND:** **0** = none; **1** = leaves moving; **2** = branches moving; **3** = trunks swaying (do not do count if wind  $\geq 3$ ).
10. **TEMP** (temperature): Record in degrees Fahrenheit. Eric's tool again can help!
11. **TIME START/END:** Record the time, military format (e.g. 0600, 1200) that you begin *and* end the count.

**BIOTIC FACTORS**

12. **BIRD SP** (Bird species): Positively ID each bird...don't guess if you are unsure!!  
Count the bird as UNKNOWN if you cannot ID it at the time and be sure to make a drawing and write a description. This way you can ask you colleagues for help later. It is crucial to focus on endangered species. You will see plenty of Belding's Savannah Sparrows out there so pay close attention and do not confuse them with the regular

Savannah Sparrows. Also, look for least terns and pay close attention to their behavior. Do not confuse them with Forster's terns which are noticeably larger and have a different looking forehead

**13. NUM** (Number): Number of individuals detected. *record one entry per line unless it is a group, then record the group number.* Record all solitary or flocking species flying through or above the point count area. For large flocks, use the digital counters to get a quick count. Record the number after the you get the count.

**14. HAB** (Habitat): Record the habitat you initially pot the bird in. Specify with more detail if necessary

**MUD** = mudflats, **SHAL** = shallows, **AIR** = flying, **H2O** = water, **RR** = riprap, **MAN** = man-made object, **LAND** = Upland, **VEG** = Salt Marsh Plants

**15. BEH** (Behavior): Record the behavior of the bird when you initially spot it. If it changes, make a note.

**F** = Feeding, **R** = Resting, **W** = Flying, **P** = Perched, **C** = Preening, **\$** = Singing

**16. DIS** (Distance): Estimate distance in meters to each bird using the 6 distance categories (**10** = 0-10 m; **25** = 10 - 25 m; **50** = 25-50 m; **75** = 50-75 m; **100** = 75-100 m; **+** = >100 m). Record the *first* distance at which you detected the bird. Use the **Flyover** category for birds observed flying above the mudflat. *Note:* Birds observed >100 m are not used in the distance analysis, but will be used to create species lists. *Also Note:* For birds that are observed to fly through the canopy, record the distance that you *first* detected them.

**17. DET** (Detection): Record whether a bird was first detected aurally or visually.

**A** = auditory; **V** = visual.

**18. SEX:** Use for either sex or age. **M** = male, **F** = female, **I** = Immature, **J** = Juvenile (reserve for young of the year), **U** = unknown, **P**=Pair.

**19. COMMENTS:** This column is reserved for information that is not collected for every observation. Use it for interesting observations, ancillary information on unidentified species (e.g. description of song or call that may be used to identify post facto, two possible species), significant behaviors (e.g., nesting material, feeding young), non-avian observations (e.g., house cat) etc.

For behaviors related to breeding (e.g. nest building, feeding nestlings, etc.), please code these at the completion of the morning's survey. See list of codes below. *If coded, these data will be entered in the database.*

NE=nest found

CF=carrying food

FN=feeding nestlings

NB=nest building

NM=carrying nest material

TD=territory boundary dispute

FF=feeding fledglings  
 CP=copulation  
 CO=courtship behavior  
 FG=family group

Data sheet care checklist: to be completed at the end of each morning's survey.

- ☐ Legible
- ☐ No blanks
- ☐ Data sheet numbers
- ☐ Page numbers
- ☐ Put all data sheets in file box
- ☐ Fill in point count tally form

**VI. Equipment Check List:** Please check daily before leaving for field

|  |   |
|--|---|
| Day Pack<br>Binoculars<br>Notebook<br>Data sheets (clipboard)<br>Pencils (several)<br>Sharpee<br>Digital Counter | Colored Pencils<br>List of points to survey<br>Location of co-workers points<br>Field Guide<br>Watch<br>(CAR: cell phone, first aid kit, tool kit)<br>GPS |
|--|---|

**Personal Items:** Warm layers, gloves, hat, sunscreen, sunglasses, water bottles, snacks, treats?, insect repellent, misc. first aid items (band-aids, aspirin)

## Chapter 1, Appendix B: Bird Survey Recording Sheet

[illegible]





Appendix C: Bird Survey Data

| Date                     | Temp        | Tide           | Humidity | Wind                    | Weather   |
|--------------------------|-------------|----------------|----------|-------------------------|-----------|
| 3/24/2006                | 81.1°F      | 0ft - IN       | 38%      | 1                       | 0         |
| Location                 | Observer    |                |          | Start Time              | Stop Time |
| 1                        | BEC DAN ERC |                |          | 2:03                    | 2:23      |
| Bird Species             | Number      | Habitat        | Behavior | Comments                |           |
| Forster's Tern           | 6           | MAN H2O<br>AIR | W F R    | on boom                 |           |
| Willet                   | 3           | AIR SHAL       | F W      | short pointed beak      |           |
| Gull                     | 3           | MAN            | R        | on boom                 |           |
| Pied-billed Grebe        | 1           | H2O            | F        | brown                   |           |
| Marbled Godwit           | 2           | MUD            | F        | long curved beak        |           |
| Snowy Egret              | 1           | SHAL MUD       | F        | yellow legs/black beak  |           |
| Double-crested Cormorant | 1           | AIR SHAL       | W        |                         |           |
| Location                 | Observer    |                |          | Start Time              | Stop Time |
| 2                        | BEC DAN ERC |                |          | 2:30                    | 2:50      |
| Bird Species             | Number      | Habitat        | Behavior | Comments                |           |
| Marbled Godwit           | 10          | MUD            | F        |                         |           |
| Willet                   | 1           | SHAL           | F        |                         |           |
| Sandpiper                | 25          | MUD            | F        |                         |           |
| Forster's Tern           | 2           | AIR            | W F      |                         |           |
| Whimbrel                 | 1           | MUD            | F        |                         |           |
| Gull                     | 5           | AIR            | W        |                         |           |
| Location                 | Observer    |                |          | Start Time              | Stop Time |
| 3                        | DAN         |                |          | 2:55                    | 2:15      |
| Bird Species             | Number      | Habitat        | Behavior | Comments                |           |
| Snowy Egret              | 1           | SHAL           | F        |                         |           |
| Marbled Godwit           | 3           | SHAL           | W F      |                         |           |
| Willet                   | 5           | SHAL           | F        |                         |           |
| Sandpiper                | 30          | MUD AIR        | W F      |                         |           |
| Forster's Tern           | 4           | AIR H2O        | W F      |                         |           |
| Gull                     | 3           | AIR            | W        |                         |           |
| Location                 | Observer    |                |          | Start Time              | Stop Time |
| 4                        | BEC         |                |          | 2:55                    | 2:15      |
| Bird Species             | Number      | Habitat        | Behavior | Comments                |           |
| Sandpiper                | 125         | MUD AIR        | F W      |                         |           |
| Great Egret              | 1           | SHAL MUD       | F        |                         |           |
| Marbled Godwit           | 8           | MUD            | F        |                         |           |
| Willet                   | 2           | MUD            | F        | black/white under wings |           |
| Forester's Tern          | 2           | AIR            | F W      |                         |           |
| Location                 | Observer    |                |          | Start Time              | Stop Time |
| 5                        | BEC         |                |          | 3:25                    | 3:45      |
| Bird Species             | Number      | Habitat        | Behavior | Comments                |           |
| Caspian Tern             | 1           | AIR            | W        |                         |           |
| Willet                   | 1           | MUD            | F        |                         |           |
| Great Blue Heron         | 1           | AIR            | W        |                         |           |

| Location     | Observer |         |          | Start Time             | Stop Time |
|--------------|----------|---------|----------|------------------------|-----------|
| 6            | DAN      |         |          | 2:25                   | 2:45      |
| Bird Species | Number   | Habitat | Behavior | Comments               |           |
|              |          |         |          | no birds very low tide |           |

|                                   |     |
|-----------------------------------|-----|
| <b>Total Bird Number</b>          | 248 |
| <b>Number of Observed Species</b> | 12  |

|                                     |     |
|-------------------------------------|-----|
| <b>Number of Individual Species</b> |     |
| Caspian Tern                        | 1   |
| Double-crested Cormorant            | 1   |
| Forster's Tern                      | 14  |
| Great Blue Heron                    | 1   |
| Great Egret                         | 1   |
| Gull                                | 11  |
| Marbled Godwit                      | 23  |
| Pied-billed Grebe                   | 1   |
| Sandpiper                           | 180 |
| Snowy Egret                         | 2   |
| Whimbrel                            | 1   |
| Willet                              | 12  |

Extra page

| Date                     | Temp     | Tide        | Humidity | Wind               | Weather   |
|--------------------------|----------|-------------|----------|--------------------|-----------|
| 3/31/2006                | 65.8 °F  | 3ft - OUT   | 61%      | 1                  | 2         |
| Location                 | Observer |             |          | Start Time         | Stop Time |
| 1                        | DAN ERC  |             |          | 2:07               | 2:28      |
| Bird Species             | Number   | Habitat     | Behavior | Comments           |           |
| Double-crested Cormorant | 6        | MAN         | R        |                    |           |
| Gull                     | 15       | MAN AIR     | R W      |                    |           |
| Forster's Tern           | 11       | MAN AIR H2O | R W F    |                    |           |
| Snowy Egret              | 2        | MAN SHAL    | F R      |                    |           |
| Willet                   | 4        | AIR SHAL    | F W      |                    |           |
| Great Blue Heron         | 1        | LAND        | R C      |                    |           |
| Belding Savannah Sparrow | 2        | LAND VEG    | P        |                    |           |
| American Crow            | 1        | AIR         | W        |                    |           |
| Dowitcher                | 9        | AIR SHAL    | F W      |                    |           |
| Sandpiper                | 2        | MUD         | F        |                    |           |
| Marbled Godwit           | 1        | MUD         | F        |                    |           |
| Location                 | Observer |             |          | Start Time         | Stop Time |
| 2                        | DAN ERC  |             |          | 1:45               | 2:05      |
| Bird Species             | Number   | Habitat     | Behavior | Comments           |           |
| American Avocet          | 4        | SHAL MUD    | F        |                    |           |
| Marbled Godwit           | 5        | SHAL AIR    | F W      |                    |           |
| Willet                   | 38       | SHAL AIR    | F W      |                    |           |
| Forster's Tern           | 2        | AIR         | W        |                    |           |
| American Crow            | 4        | AIR         | W        |                    |           |
| Gull                     | 2        | AIR         | W        |                    |           |
| Sandpiper                | 100      | AIR MUD     | F W      |                    |           |
| Belding Savannah Sparrow | 2        | AIR         | W        |                    |           |
| Caspian Tern             | 2        | MUD         | R        |                    |           |
| Location                 | Observer |             |          | Start Time         | Stop Time |
| 3                        | KRS TLR  |             |          | 2:05               | 2:25      |
| Bird Species             | Number   | Habitat     | Behavior | Comments           |           |
| Willet                   | 2        | MUD         | F        | chasing each other |           |
| Sandpiper                | 21       | MUD AIR     | F W      |                    |           |

|                     |          |              |          |  |           |
|---------------------|----------|--------------|----------|--|-----------|
| Barn Swallow        | 7        | AIR          | W        |  |           |
| Marbled Godwit      | 4        | AIR          | W        |  |           |
| Snowy Egret         | 1        | SHAL         | F        |  |           |
| Forster's Tern      | 2        | AIR          | W        | flying over/hunting/no diving                        |           |
| Gull                | 2        | AIR          | W        | one western gull/other white w/ grey at top of wings |           |
| Location            | Observer |              |          | Start Time   | Stop Time |
| 4                   | KRS TLR  |              |          | 1:42   | 2:02      |
| Bird Species        | Number   | Habitat      | Behavior | Comments   |           |
| Sandpiper           | 50       | MUD          | F        | white belly/brown top/small dark legs                |           |
| American Crow       | 1        | AIR          | W        |  |           |
| Marbled Godwit      | 6        | AIR          | W        |  |           |
| Willet              | 2        | AIR MUD      | F W      |  |           |
| Western Kingbird    | 3        | AIR          | W        |  |           |
| Redtail Hawk        | 1        | AIR MAN      | W P      | circling/perched on 3 telephone poles/high           |           |
| American Avocet     | 1        | AIR MUD      | W        |  |           |
| Location            | Observer |              |          | Start Time   | Stop Time |
| 5                   | BEC MAT  |              |          | 2:10   | 2:30      |
| Bird Species        | Number   | Habitat      | Behavior | Comments   |           |
| Western Kingbird    | 4        | AIR LAND     | W P      | yellowbelly/lightgrey head                           |           |
| Cormorant           | 1        | AIR          | W        |  |           |
| Barn Swallow        | 10       | AIR          | W        |  |           |
| European Starling   | 3        | AIR          | W        |  |           |
| Location            | Observer |              |          | Start Time   | Stop Time |
| 6                   | BEC MAT  |              |          | 1:40   | 2:03      |
| Bird Species        | Number   | Habitat      | Behavior | Comments   |           |
| Great Egret         | 1        | AIR          | F W      | flew off w/ mudsucker in mouth                       |           |
| American Avocet     | 2        | MUD          | F        | bill curved up/rusty head(breeding)/white body       |           |
| Cliff Swallow       | 7        | AIR          | W        | brown/short tail                                     |           |
| Yellowlegs          | 1        | AIR MUD LAND | W R      | bobs head/white belly/grey back                      |           |
| Sandpiper           | 15       | AIR          | W        |  |           |
| Red-shouldered Hawk | 1        | AIR          | W        | black bars on tail and wings                         |           |
| Red-tailed Hawk     | 1        | AIR          | W        |  |           |

|                            |   |     |   |   |
|----------------------------|---|-----|---|---|
| California Towhee          | 1 | UP  | F |   |
|                            |   |     |   |   |
| American Kestrel           | 1 | AIR | W | chasing B. Sav. Sparrow/perched on telephone pole on Studebaker |
| Belding's Savannah Sparrow | 1 | AIR | W |   |

|                                   |     |
|-----------------------------------|-----|
| <b>Total Bird Number</b>          | 365 |
| <b>Number of Observed Species</b> | 24  |

| <b>Number of Individual Species</b> |     |
|-------------------------------------|-----|
| American Avocet                     | 7   |
| American Crow                       | 6   |
| American Kestrel                    | 1   |
| Barn Swallow                        | 17  |
| Belding's Savannah Sparrow          | 5   |
| California Towhee                   | 1   |
| Caspian Tern                        | 2   |
| Cliff Swallow                       | 7   |
| Cormorant                           | 1   |
| Double-crested Cormorant            | 6   |
| Dowitcher                           | 9   |
| European Starling                   | 3   |
| Forster's Tern                      | 15  |
| Great Blue Heron                    | 1   |
| Great Egret                         | 1   |
| Gull                                | 19  |
| Marbled Godwit                      | 16  |
| Red-shouldered Hawk                 | 1   |
| Red-tailed Hawk                     | 2   |
| Sandpiper                           | 188 |
| Snowy Egret                         | 3   |

|                  |    |
|------------------|----|
| Western Kingbird | 7  |
| Willet           | 46 |
| Yellowlegs       | 1  |

| Date                     | Temp     | Tide     | Humidity | Wind   | Weather   |
|--------------------------|----------|----------|----------|--|-----------|
| 4/5/2006                 | 55 °F    | 2ft - IN | 56%      | 2  | 1         |
| Location                 | Observer |          |          | Start Time   | Stop Time |
| 1                        | DAN      |          |          | 3:47   | 4:07      |
| Bird Species             | Number   | Habitat  | Behavior | Comments   |           |
| Gull                     | 18       | MAN AIR  | R W      |  |           |
| Forster's Tern           | 13       | MAN AIR  | R W      |  |           |
| Double-crested Cormorant | 1        | MAN      | R        |  |           |
| Eared Grebe              | 3        | H2O      | F        | chasing fish underwater                                      |           |
| Great Blue Heron         | 1        | SHAL     | R        |  |           |
| Snowy Egret              | 1        | LAND     | R        |  |           |
| American Crow            | 1        | AIR      | W        |  |           |
| Location                 | Observer |          |          | Start Time   | Stop Time |
| 2                        | DAN      |          |          | 3:25   | 3:45      |
| Bird Species             | Number   | Habitat  | Behavior | Comments   |           |
| Caspian Tern             | 2        | MUD      | R        |  |           |
| Snowy Egret              | 1        | MUD      | R        |  |           |
| Gull                     | 20       | MUD AIR  | W F R    | most resting can't fly in wind                               |           |
| Willet                   | 11       | MUD SHAL | F        |  |           |
| Dowitcher                | 3        | MUD      | F        |  |           |
| Sandpiper                | 15       | AIR      | W        |  |           |
| Great Egret              | 1        | SHAL     | F        |  |           |
| Forster's Tern           | 4        | AIR MUD  | W R F    |  |           |
| Marbled Godwit           | 2        | MUD SHAL | F        |  |           |
| American Crow            | 1        | AIR      | W        |  |           |
| Location                 | Observer |          |          | Start Time   | Stop Time |
| 3                        | KRS      |          |          | 3:45   | 4:05      |
| Bird Species             | Number   | Habitat  | Behavior | Comments   |           |
| Tern                     | 7        | MUD AIR  | W R      | orange feet/black heads/white chest/grey body/V-shaped wings |           |
| Gull                     | 2        | AIR      | W        | black/brown tipped wings                                     |           |
| Sandpiper                | 10       | AIR VEG  | W        | small dark grey/ flying into grass                           |           |
| Mallard                  | 1        | AIR      | W        | black/white w/ stripe on head                                |           |

|                    |          |         |          |  |  |
|--------------------|----------|---------|----------|--|--|
| Western Kingbird   | 1        | AIR     | W        | neon yellow belly  |  |
| Pied-billed Grebe  | 1        | H2O     | F        | duck-like/smaller/black/diving for fish for up to one minute |  |
| Willet             | 1        | AIR     | W        |  |  |
| European Starling  | 7        | AIR VEG | W        | pitch black/orange beaks flying into grass                   |  |
| Location           | Observer |         |          | Start Time   | Stop Time  |
| 4                  | KRS      |         |          | 3:20   | 3:40   |
| Bird Species       |          | Number  | Habitat  | Behavior   | Comments   |
| Sandpipers         |          | 54      | SHAL AIR | F W  |  |
| Long-billed Curlew |          | 3       | SHAL     | F  |  |
| Forster's Tern     |          | 3       | AIR      | W  | all white w/ curved wings                          |
| Location           | Observer |         |          | Start Time   | Stop Time  |
| 5                  | BEC      |         |          | 3:44   | 4:04   |
| Bird Species       |          | Number  | Habitat  | Behavior   | Comments   |
| Gull               |          | 2       | AIR      | W  |  |
| Swallow            |          | 2       | AIR      | W  |  |
| Killdeer           |          | 1       | LAND MUD | F  | black rings around neck and head/light brown wings |
| Osprey             |          | 1       | AIR      | W  | soaring over upland                                |
| Location           | Observer |         |          | Start Time   | Stop Time  |
| 6                  | BEC      |         |          | 3:18   | 3:38   |
| Bird Species       |          | Number  | Habitat  | Behavior   | Comments   |
| Sandpiper          |          | 250     | MUD      | F  |  |
| American Avocet    |          | 2       | MUD      | F  |  |
| Great Egret        |          | 1       | AIR MUD  | W R  |  |
| Willet             |          | 11      | MUD SHAL | F  |  |

|                                   |     |
|-----------------------------------|-----|
| <b>Total Bird Number</b>          | 458 |
| <b>Number of Observed Species</b> | 22  |

|                                     |   |
|-------------------------------------|---|
| <b>Number of Individual Species</b> |   |
| American Avocet                     | 2 |
| American Crow                       | 2 |

|                          |     |
|--------------------------|-----|
| Caspian Tern             | 2   |
| Double-crested Cormorant | 1   |
| Dowitcher                | 3   |
| Eared Grebe              | 3   |
| European Starling        | 7   |
| Forster's Tern           | 27  |
| Great Blue Heron         | 1   |
| Great Egret              | 2   |
| Gull                     | 42  |
| Killdeer                 | 1   |
| Long-billed Curlew       | 3   |
| Mallard                  | 1   |
| Marbled Godwit           | 2   |
| Osprey                   | 1   |
| Pied-billed Grebe        | 1   |
| Sandpiper                | 329 |
| Snowy Egret              | 2   |
| Swallow                  | 2   |
| Western Kingbird         | 1   |
| Willet                   | 23  |

| Date                       | Temp     | Tide     | Humidity | Wind   | Weather   |
|----------------------------|----------|----------|----------|--|-----------|
| 4/7/2006                   | 60 °F    | 0ft - IN | 60%      | 1  | 0         |
| Location                   | Observer |          |          | Start Time                                     | Stop Time |
| 1                          | KRS MAT  |          |          | 2:00   | 2:20      |
| Bird Species               | Number   | Habitat  | Behavior | Comments                                       |           |
| Forster's Tern             | 15       | MAN AIR  | R W F    | clicking sound/fish carrying/breeding behavior |           |
| Western Sandpiper          | 250      | MUD      | F        |  |           |
| Eared Grebe                | 2        | H2O      | F        | male + female                                  |           |
| Marbled Godwit             | 1        | MUD      | F        |  |           |
| Great Blue Heron           | 1        | MUD      | F        |  |           |
| Great Egret                | 1        | MUD      | F        |  |           |
| Ring-billed Gull           | 2        | MAN      | R        |  |           |
| Double-crested Cormorant   | 1        | AIR      | W        |  |           |
| Snowy Egret                | 1        | MUD      | F        | yellow feet                                    |           |
| Mallard                    | 1        | AIR      | W        |  |           |
| Location                   | Observer |          |          | Start Time                                     | Stop Time |
| 2                          | KRS MAT  |          |          | 2:25   | 2:45      |
| Bird Species               | Number   | Habitat  | Behavior | Comments                                       |           |
| Whimbrel                   | 1        | MUD      | F        |  |           |
| Western Sandpiper          | 25       | AIR      | W        |  |           |
| Forster's Tern             | 3        | AIR      | W        |  |           |
| Location                   | Observer |          |          | Start Time                                     | Stop Time |
| 3                          | BEC ERC  |          |          | 2:12   | 2:32      |
| Bird Species               | Number   | Habitat  | Behavior | Comments                                       |           |
| Forster's Tern             | 2        | AIR      | W        |  |           |
| Snowy Egret                | 1        | MUD SHAL | F        |  |           |
| Osprey                     | 2        | AIR      | W        | singing  |           |
| Sandpiper                  | 100      | MUD AIR  | F W      |  |           |
| Willet                     | 1        | MUD      | F        |  |           |
| Yellowlegs                 | 1        | MUD SHAL | F        |  |           |
| Belding's Savannah Sparrow | 2        | VEG      | W P      | heard one singing in veg about 20m away        |           |
| Great Egret                | 1        | AIR      | W        |  |           |

|                   |          |        |          |            |                             |  |
|-------------------|----------|--------|----------|------------|-----------------------------|--|
| Great Blue Heron  |          | 1      | MUD SHAL | F          |                             |  |
| Swallow           |          | 3      | AIR      | W          |                             |  |
| Marbled Godwit    |          | 1      | MUD SHAL | F          |                             |  |
| Location          | Observer |        |          | Start Time | Stop Time                   |  |
| 4                 | BEC ERC  |        |          | 1:50       | 2:10                        |  |
| Bird Species      |          | Number | Habitat  | Behavior   | Comments                    |  |
| Sandpiper         |          | 13     | AIR      | W          |                             |  |
| Swallow           |          | 1      | AIR      | W          |                             |  |
| American Crow     |          | 1      | AIR      | W          |                             |  |
| Location          | Observer |        |          | Start Time | Stop Time                   |  |
| 5                 | DAN TLR  |        |          | 2:20       | 2:40                        |  |
| Bird Species      |          | Number | Habitat  | Behavior   | Comments                    |  |
| Osprey            |          | 2      | AIR      | W          |                             |  |
| European Starling |          | 12     | LAND AIR | F W        |                             |  |
| Western Kingbird  |          | 4      | AIR MAN  | W          | on flagpole                 |  |
| Great Egret       |          | 1      | MUD      | F          |                             |  |
| American Crow     |          | 1      | AIR      | W          |                             |  |
| Sandpiper         |          | 24     | MUD AIR  | F W        |                             |  |
| Location          | Observer |        |          | Start Time | Stop Time                   |  |
| 6                 | DAN TLR  |        |          | 1:51       | 2:11                        |  |
| Bird Species      |          | Number | Habitat  | Behavior   | Comments                    |  |
| Barn Swallow      |          | 3      | AIR      | W          |                             |  |
| European Starling |          | 5      | AIR      | W          |                             |  |
| American Crow     |          | 1      | AIR      | W          |                             |  |
| Hummingbird       |          | 1      | AIR      | W          | flew very fast through post |  |

|                                   |     |
|-----------------------------------|-----|
| <b>Total Bird Number</b>          | 488 |
| <b>Number of Observed Species</b> | 22  |

|                                     |   |
|-------------------------------------|---|
| <b>Number of Individual Species</b> |   |
| American Crow                       | 3 |

|                            |     |
|----------------------------|-----|
| Barn Swallow               | 3   |
| Belding's Savannah Sparrow | 2   |
| Double-crested Cormorant   | 1   |
| Eared Grebe                | 2   |
| European Starling          | 17  |
| Forster's Tern             | 20  |
| Great Blue Heron           | 2   |
| Great Egret                | 3   |
| Hummingbird                | 1   |
| Mallard                    | 1   |
| Marbled Godwit             | 2   |
| Osprey                     | 4   |
| Ring-billed Gull           | 2   |
| Sandpiper                  | 137 |
| Snowy Egret                | 2   |
| Swallow                    | 4   |
| Western Kingbird           | 4   |
| Western Sandpiper          | 275 |
| Whimbrel                   | 1   |
| Willet                     | 1   |
| Yellowlegs                 | 1   |

| Date                       | Temp     | Tide      | Humidity | Wind   | Weather   |
|----------------------------|----------|-----------|----------|--|-----------|
| 4/10/2006                  | 73.4 °F  | 4ft - OUT | 44%      | 1  | 2         |
| Location                   | Observer |           |          | Start Time   | Stop Time |
| 1                          | BEC      |           |          | 9:45   | 10:05     |
| Bird Species               | Number   | Habitat   | Behavior | Comments   |           |
| Forster's Tern             | 6        | MAN H2O   | F R W    | org beak/blk tip repeated "chirp" 2 juveniles w/ wht forehead/blk beak |           |
| Gull                       | 1        | MAN AIR   | R W      |  |           |
| Double-crested Cormorant   | 4        | MAN AIR   | W R      | dark/lighter chest orange hook beak                                    |           |
| Caspian Tern               | 3        | MAN AIR   | W R      | pointy tail/harsher "caw" black head/orange beak                       |           |
| Location                   | Observer |           |          | Start Time   | Stop Time |
| 2                          | DAN      |           |          | 9:45   | 10:05     |
| Bird Species               | Number   | Habitat   | Behavior | Comments   |           |
| Forster's Tern             | 7        | AIR H2O   | W F      | diving for food  |           |
| American Crow              | 2        | AIR       | W        |  |           |
| Marbled Godwit             | 2        | AIR MUD   | R W      |  |           |
| Gull                       | 1        | AIR       | W        |  |           |
| Willet                     | 6        | VEG AIR   | W F      |  |           |
| Great Blue Heron           | 1        | AIR       | W        |  |           |
| Caspian Tern               | 2        | AIR       | W        |  |           |
| Sandpiper                  | 8        | AIR       | W        |  |           |
| Barn Swallow               | 2        | AIR       | W        |  |           |
| Location                   | Observer |           |          | Start Time   | Stop Time |
| 3                          | BEC DAN  |           |          | 10:15  | 10:35     |
| Bird Species               | Number   | Habitat   | Behavior | Comments   |           |
| Great Egret                | 2        | AIR       | W        |  |           |
| Willet                     | 14       | AIR       | W        |  |           |
| Sandpiper                  | 63       | AIR       | W        |  |           |
| Forster's Tern             | 3        | AIR       | W        |  |           |
| Belding's Savannah Sparrow | 1        | LAND VEG  | W P      |  |           |
| Swallow                    | 7        | AIR       | W        |  |           |
| Marbled Godwit             | 2        | AIR       | W        |  |           |

|                            |          |        |          |            |                           |  |
|----------------------------|----------|--------|----------|------------|---------------------------|--|
| Great Blue Heron           |          | 1      | AIR      | W          |                           |  |
| Location                   | Observer |        |          | Start Time | Stop Time                 |  |
| 4                          | KRS ERC  |        |          | 10:12      | 10:32                     |  |
| Bird Species               |          | Number | Habitat  | Behavior   | Comments                  |  |
| Great Blue Heron           |          | 2      | LAND AIR | W R        |                           |  |
| Western Kingbird           |          | 4      | VEG      | W P        |                           |  |
| Savannah Sparrow           |          | 1      | AIR      | W          |                           |  |
| Great Egret                |          | 2      | LAND AIR | W          |                           |  |
| Sandpiper                  |          | 55     | AIR VEG  | W R        | 10 sitting in vegetation  |  |
| Forster's Tern             |          | 2      | AIR      | W          |                           |  |
| Swallow                    |          | 2      | AIR      | W          |                           |  |
| Caspian Tern               |          | 3      | AIR      | W          |                           |  |
| Belding's Savannah Sparrow |          | 2      | VEG      | P          | heard more than 2 calling |  |
| Dowitcher                  |          | 34     | AIR      | W          |                           |  |
| Marbled Godwit             |          | 12     | AIR      | W          |                           |  |
| Willet                     |          | 1      | AIR      | W          |                           |  |
| Snowy Egret                |          | 1      | AIR      | W          |                           |  |
| Location                   | Observer |        |          | Start Time | Stop Time                 |  |
| 5                          | KRS      |        |          | 9:42       | 10:02                     |  |
| Bird Species               |          | Number | Habitat  | Behavior   | Comments                  |  |
| European Starling          |          | 1      | AIR      | W          |                           |  |
| Western Kingbird           |          | 5      | AIR      | W          |                           |  |
| Great Blue Heron           |          | 1      | AIR      | W          |                           |  |
| Sandpiper                  |          | 60     | AIR      | W          |                           |  |
| Forster's Tern             |          | 4      | AIR      | W          | flying/diving             |  |
| Great Egret                |          | 1      | VEG      | R          |                           |  |
| Marbled Godwit             |          | 1      | AIR      | W          | brown body                |  |
| Common Goldeneye           |          | 1      | AIR      | W          | had white stripe on butt  |  |
| Location                   | Observer |        |          | Start Time | Stop Time                 |  |
| 6                          | ERC      |        |          | 9:42       | 10:02                     |  |
| Bird Species               |          | Number | Habitat  | Behavior   | Comments                  |  |
| Forster's Tern             |          | 5      | AIR      | W F        |                           |  |
| Great Blue Heron           |          | 1      | AIR VEG  | F          |                           |  |
| Sandpiper                  |          | 3      | AIR      | W          |                           |  |

|                            |   |              |     |  |
|----------------------------|---|--------------|-----|--|
| Swallow                    | 2 | AIR          | W   |  |
| Anna's Hummingbird         | 1 | AIR          | W   |  |
| Western Kingbird           | 2 | AIR VEG MAN  | F P | perched on salicornia subterminalis and fence  |
| Belding's Savannah Sparrow |   |              |     | heard singing no visual                        |
| Osprey                     | 1 | LAND AIR MAN | F R | drinking rainwater/flew to telephone pole      |
| Great Egret                | 1 | LAND         | F   | feeding in degraded salicornia virginica patch |
| Mallard                    | 3 | AIR          | W   |  |

|                                   |     |
|-----------------------------------|-----|
| <b>Total Bird Number</b>          | 352 |
| <b>Number of Observed Species</b> | 22  |

|                                     |     |
|-------------------------------------|-----|
| <b>Number of Individual Species</b> |     |
| American Crow                       | 2   |
| Anna's Hummingbird                  | 1   |
| Barn Swallow                        | 2   |
| Belding's Savannah Sparrow          | 3   |
| Caspian Tern                        | 8   |
| Common Goldeneye                    | 1   |
| Double-crested Cormorant            | 4   |
| Dowitcher                           | 34  |
| European Starling                   | 1   |
| Forster's Tern                      | 27  |
| Great Blue Heron                    | 6   |
| Great Egret                         | 6   |
| Gull                                | 2   |
| Mallard                             | 3   |
| Marbled Godwit                      | 17  |
| Osprey                              | 1   |
| Sandpiper                           | 189 |
| Savannah Sparrow                    | 1   |
| Snowy Egret                         | 1   |

|                  |    |
|------------------|----|
| Swallow          | 11 |
| Western Kingbird | 11 |
| Willet           | 21 |

| Date                | Temp     | Tide   | Humidity | Wind       | Weather                               |
|---------------------|----------|--------|----------|------------|---------------------------------------|
| 4/17/2006           | 65 °F    | 3 - IN | 45%      | 2          | 0                                     |
| Location            | Observer |        |          | Start Time | Stop Time                             |
| 1                   | BEC      |        |          | 1:48       | 1:08                                  |
| Bird Species        |          | Number | Habitat  | Behavior   | Comments                              |
| Forster's Tern      |          | 16     | MAN AIR  | R W F C    | repeated chirp/2 were diving for fish |
| Gull                |          | 39     | MAN AIR  | R W        |                                       |
| Caspian Tern        |          | 2      | MAN AIR  | R W        | harsh "chip"                          |
| Location            | Observer |        |          | Start Time | Stop Time                             |
| 2                   | BEC      |        |          | 2:10       | 2:30                                  |
| Bird Species        |          | Number | Habitat  | Behavior   | Comments                              |
| Gull                |          | 7      | AIR      | W          |                                       |
| Snowy Egret         |          | 1      | SHAL     | F          | black beak/black legs/yellow feet     |
| Willet              |          | 9      | MUD      | R F        | black/white under wings               |
| Savannah Sparrow    |          | 2      | VEG      | P W        |                                       |
| American Crow       |          | 1      | AIR      | W          |                                       |
| Forster's Tern      |          | 3      | AIR MUD  | W R F      |                                       |
| Caspian Tern        |          | 2      | AIR      | W          |                                       |
| Swallow             |          | 1      | AIR      | W          |                                       |
| Location            | Observer |        |          | Start Time | Stop Time                             |
| 3                   | BEC      |        |          | 2:32       | 2:52                                  |
| Bird Species        |          | Number | Habitat  | Behavior   | Comments                              |
| Great Blue Heron    |          | 1      | VEG      | R          |                                       |
| Willet              |          | 10     | MUD VEG  | F          |                                       |
| Marbled Godwit      |          | 1      | MUD      | F          |                                       |
| Snowy Egret         |          | 1      | SHAL     | F          |                                       |
| Sandpipers          |          | 150    | MUD AIR  | F W        |                                       |
| Caspian Tern        |          | 6      | MUD      | R          |                                       |
| Forster's Tern      |          | 4      | MUD      | R          | 1 juvenile/white forehead             |
| Semipalmated Plover |          | 1      | MUD      | F          |                                       |
| Mallard             |          | 1      | AIR      | W          |                                       |
| Great Egret         |          | 1      | AIR      | W          |                                       |

| Location                  | Observer |         |          | Start Time             | Stop Time |
|---------------------------|----------|---------|----------|------------------------|-----------|
| 4                         | KRS      |         |          | 2:41                   | 3:01      |
| Bird Species              | Number   | Habitat | Behavior | Comments               |           |
| Forster's Tern            | 2        | AIR     | W F      |                        |           |
| Great Egret               | 1        | AIR     | W        |                        |           |
| Sandpipers                | 60       | AIR     | W        |                        |           |
| Black-crowned Night-Heron | 1        | VEG     | R        | hiding in grass        |           |
| Caspian Tern              | 1        | AIR     | W        |                        |           |
| American Crow             | 3        | AIR     | W        |                        |           |
| Western Sandpiper         | 7        | MUD     | C        |                        |           |
| Location                  | Observer |         |          | Start Time             | Stop Time |
| 5                         | KRS      |         |          | 2:13                   | 2:33      |
| Bird Species              | Number   | Habitat | Behavior | Comments               |           |
| Least Tern                | 4        | AIR     | W        |                        |           |
| Great Blue Heron          | 1        | MUD     | R        |                        |           |
| Great Egret               | 1        | H2O     | C        |                        |           |
| Western Sandpiper         | 40       | AIR     | W        |                        |           |
| Location                  | Observer |         |          | Start Time             | Stop Time |
| 6                         | KRS      |         |          | 1:47                   | 2:07      |
| Bird Species              | Number   | Habitat | Behavior | Comments               |           |
| Western Sandpiper         | 60       | MUD     | C        |                        |           |
| Whimbrel                  | 17       | MUD     | C        |                        |           |
| Snowy Egret               | 1        | H2O     | C        |                        |           |
| Semipalmated Plover       | 5        | MUD     | C        |                        |           |
| ?no positive ID?          | 1        | VEG     | W        | flew out of tall grass |           |

|                                   |     |
|-----------------------------------|-----|
| <b>Total Bird Number</b>          | 463 |
| <b>Number of Observed Species</b> | 18  |

|                                     |   |
|-------------------------------------|---|
| <b>Number of Individual Species</b> |   |
| American Crow                       | 4 |

|                           |     |
|---------------------------|-----|
| Black-crowned Night-Heron | 1   |
| Caspian Tern              | 11  |
| Forster's Tern            | 25  |
| Great Blue Heron          | 2   |
| Great Egret               | 3   |
| Gull                      | 46  |
| Least Tern                | 4   |
| Mallard                   | 1   |
| Marbled Godwit            | 1   |
| Sandpipers                | 210 |
| Savannah Sparrow          | 2   |
| Semipalmated Plover       | 6   |
| Snowy Egret               | 3   |
| Swallow                   | 1   |
| Western Sandpiper         | 107 |
| Whimbrel                  | 17  |
| Willet                    | 19  |

| Date                       | Temp     | Tide     | Humidity | Wind       | Weather   |
|----------------------------|----------|----------|----------|------------|-----------|
| 4/19/2006                  | 69 °F    | 1 - IN   | 51%      | 1          | 0         |
| Location                   | Observer |          |          | Start Time | Stop Time |
| 1                          | DAN      |          |          | 1:16       | 1:36      |
| Bird Species               | Number   | Habitat  | Behavior | Comments   |           |
| Forster's Tern             | 21       | MAN AIR  | R W F    |            |           |
| Gull                       | 16       | MAN AIR  | R W      |            |           |
| Caspian Tern               | 3        | MAN      | R        |            |           |
| Snowy Egret                | 1        | SHAL     | F        |            |           |
| Great Blue Heron           | 1        | AIR      | W        |            |           |
| American Crow              | 1        | AIR      | W        |            |           |
| Location                   | Observer |          |          | Start Time | Stop Time |
| 2                          | DAN      |          |          | 1:37       | 1:57      |
| Bird Species               | Number   | Habitat  | Behavior | Comments   |           |
| Caspian Tern               | 10       | SHAL AIR | R F W    |            |           |
| Forster's Tern             | 9        | SHAL AIR | W R      |            |           |
| Sandpiper                  | 5        | MUD      | F        |            |           |
| Willet                     | 2        | MUD      | F        |            |           |
| American Crow              | 1        | AIR      | W        |            |           |
| Great Egret                | 1        | AIR      | W        |            |           |
| Gull                       | 1        | AIR      | W        |            |           |
| Red-tailed Hawk            | 1        | AIR      | W        |            |           |
| Location                   | Observer |          |          | Start Time | Stop Time |
| 3                          | DAN      |          |          | 2:00       | 2:20      |
| Bird Species               | Number   | Habitat  | Behavior | Comments   |           |
| Whimbrel                   | 1        | MUD      | F        |            |           |
| Belding's Savannah Sparrow | 4        | VEG      | R W      |            |           |
| Caspian Tern               | 2        | MUD      | R        |            |           |
| American Crow              | 4        | AIR      | W        |            |           |
| Forster's Tern             | 6        | AIR      | W        |            |           |
| Great Egret                | 1        | AIR      | W        |            |           |
| Willet                     | 1        | MUD      | R        |            |           |
| Location                   | Observer |          |          | Start Time | Stop Time |

| 4                          | BEC      |          |          | 2:01  | 2:22      |
|----------------------------|----------|----------|----------|---|-----------|
| Bird Species               | Number   | Habitat  | Behavior | Comments  |           |
| Great Egret                | 1        | SHAL     | F        |   |           |
| Willet                     | 8        | MUD AIR  | F R W    |   |           |
| Forster's Tern             | 2        | AIR      | W        |   |           |
| American Crow              | 2        | AIR      | W        |   |           |
| Swallow                    | 4        | AIR      | W        |   |           |
| Marbled Godwit             | 3        | AIR      | W        |   |           |
| Caspian Tern               | 2        | AIR      | F W      | diving for fish   |           |
| Location                   | Observer |          |          | Start Time  | Stop Time |
| 5                          | BEC      |          |          | 1:37  | 1:57      |
| Bird Species               | Number   | Habitat  | Behavior | Comments  |           |
| European Starling          | 4        | MAN AIR  | W P      | black w/ yellow beak/perched on flagpole/playing "king of the hill" |           |
| Caspian Tern               | 1        | AIR      | W F      | diving for fish   |           |
| Red-tailed Hawk            | 1        | AIR      | W        | being chased away by 2 terns  |           |
| Great Blue Heron           | 1        | AIR MUD  | W R      | landed in mudflat   |           |
| Western Kingbird           | 1        | AIR LAND | W P      |   |           |
| Black Pheobe               | 1        | LAND     | P        |   |           |
| Location                   | Observer |          |          | Start Time  | Stop Time |
| 6                          | BEC      |          |          | 1:13  | 1:33      |
| Bird Species               | Number   | Habitat  | Behavior | Comments  |           |
| Sandpiper                  | 100      | MUD      | F        |   |           |
| Killdeer                   | 4        | MUD VEG  | F        | 2 stripes around neck   |           |
| American Kestrel           | 1        | AIR      | W        | flew from telephone poles on studebaker into marsh                  |           |
| Belding's Savannah Sparrow | 1        | VEG      | W        | heard calling/flew across vegetation                                |           |

|                                   |     |
|-----------------------------------|-----|
| <b>Total Bird Number</b>          | 229 |
| <b>Number of Observed Species</b> | 19  |

|                                     |  |
|-------------------------------------|--|
| <b>Number of Individual Species</b> |  |
|-------------------------------------|--|

|                            |     |
|----------------------------|-----|
| American Crow              | 8   |
| American Kestrel           | 1   |
| Belding's Savannah Sparrow | 5   |
| Black Pheobe               | 1   |
| Caspian Tern               | 18  |
| European Starling          | 4   |
| Forster's Tern             | 38  |
| Great Blue Heron           | 2   |
| Great Egret                | 3   |
| Gull                       | 17  |
| Killdeer                   | 4   |
| Marbled Godwit             | 3   |
| Red-tailed Hawk            | 2   |
| Sandpiper                  | 105 |
| Snowy Egret                | 1   |
| Swallow                    | 4   |
| Western Kingbird           | 1   |
| Whimbrel                   | 1   |
| Willet                     | 11  |

| Date                       | Temp     | Tide        | Humidity | Wind   | Weather   |
|----------------------------|----------|-------------|----------|--|-----------|
| 4/21/2006                  | 65 °F    | 1 - IN      | 61%      | 1  | 0         |
| Location                   | Observer |             |          | Start Time   | Stop Time |
| 1                          | BEC KRS  |             |          | 1:32   | 1:53      |
| Bird Species               | Number   | Habitat     | Behavior | Comments   |           |
| Green Heron                | 1        | MAN         | R        |  |           |
| Double-crested Cormorant   | 2        | MAN         | R        |  |           |
| Forster's Tern             | 13       | MAN AIR MUD | R W F    | males dving for fish and giving to females/2 juveniles |           |
| Gull                       | 6        | MAN AIR     | R W      |  |           |
| Snowy Egret                | 1        | SHAL        | F        |  |           |
| Long-billed Dowitcher      | 1        | SHAL        | F        |  |           |
| Whimbrel                   | 4        | SHAL        | F        |  |           |
| European Starling          | 1        | MAN         | P        | perched on fence                                       |           |
| Sandpiper                  | 100      | MUD         | F        |  |           |
| Osprey                     | 1        | AIR         | W        |  |           |
| Location                   | Observer |             |          | Start Time   | Stop Time |
| 2                          | BEC KRS  |             |          | 1:58   | 2:18      |
| Bird Species               | Number   | Habitat     | Behavior | Comments   |           |
| Forster's Tern             | 3        | AIR MUD     | W R      | 1 juvenile   |           |
| Great Egret                | 1        | AIR         | W        |  |           |
| Snowy Egret                | 1        | MUD         | R        |  |           |
| Western Kingbird           | 2        | AIR         | W        |  |           |
| Caspian Tern               | 2        | MUD         | R        |  |           |
| Location                   | Observer |             |          | Start Time   | Stop Time |
| 3                          | ERC CAR  |             |          | 1:52   | 2:12      |
| Bird Species               | Number   | Habitat     | Behavior | Comments   |           |
| Great Blue Heron           | 1        | SHAL        | F        |  |           |
| Snowy Egret                | 1        | SHAL        | F        |  |           |
| Forster's Tern             | 5        | AIR         | W F      |  |           |
| Belding's Savannah Sparrow | 1        | AIR VEG     | F        |  |           |
| Sandpiper                  | 5        | AIR         | W        |  |           |
| Great Egret                | 1        | SHAL        | F        |  |           |

| Location                   | Observer |         |          | Start Time      | Stop Time |
|----------------------------|----------|---------|----------|-----------------|-----------|
| 4                          | ERC CAR  |         |          | 1:30            | 1:50      |
| Bird Species               | Number   | Habitat | Behavior | Comments        |           |
| Great Blue Heron           | 1        | AIR     | W        |                 |           |
| Anna's Hummingbird         | 1        | AIR     | W        |                 |           |
| Mallard                    | 2        | AIR     | W        | male and female |           |
| Location                   | Observer |         |          | Start Time      | Stop Time |
| 5                          | DAN MAT  |         |          | 1:55            | 2:15      |
| Bird Species               | Number   | Habitat | Behavior | Comments        |           |
| Red-tailed Hawk            | 2        | AIR     | W        |                 |           |
| Red-shouldered Hawk        | 1        | AIR     | W        |                 |           |
| Peregrine Falcon           | 1        | AIR     | W        |                 |           |
| Mourning Dove              | 2        | LAND    | R        |                 |           |
| Belding's Savannah Sparrow | 1        | VEG     | P        |                 |           |
| Location                   | Observer |         |          | Start Time      | Stop Time |
| 6                          | DAN MAT  |         |          | 1:27            | 1:57      |
| Bird Species               | Number   | Habitat | Behavior | Comments        |           |
| Western Sandpiper          | 100      | MUD     | F        |                 |           |
| Great Blue Heron           | 1        | MUD AIR | W R      |                 |           |
| Semipalmated Plover        | 4        | MUD     | F        |                 |           |
| Belding's Savannah Sparrow | 2        | VEG AIR | W P      |                 |           |
| Anna's Hummingbird         | 1        | AIR     | W        |                 |           |
| Mourning Dove              | 1        | AIR     | W        |                 |           |

|                                   |     |
|-----------------------------------|-----|
| <b>Total Bird Number</b>          | 273 |
| <b>Number of Observed Species</b> | 23  |

|                                     |   |
|-------------------------------------|---|
| <b>Number of Individual Species</b> |   |
| Anna's Hummingbird                  | 2 |

|                            |     |
|----------------------------|-----|
| Belding's Savannah Sparrow | 4   |
| Caspian Tern               | 2   |
| Double-crested Cormorant   | 2   |
| European Starling          | 1   |
| Forster's Tern             | 21  |
| Great Blue Heron           | 3   |
| Great Egret                | 2   |
| Green Heron                | 1   |
| Gull                       | 6   |
| Long-billed Dowitcher      | 1   |
| Mallard                    | 2   |
| Mourning Dove              | 3   |
| Osprey                     | 1   |
| Peregrine Falcon           | 1   |
| Red-shouldered Hawk        | 1   |
| Red-tailed Hawk            | 2   |
| Sandpiper                  | 105 |
| Semipalmated Plover        | 4   |
| Snowy Egret                | 3   |
| Western Kingbird           | 2   |
| Western Sandpiper          | 100 |
| Whimbrel                   | 4   |

Extra page.

|                                  |           |
|----------------------------------|-----------|
| <b>Total # of Individual Sp.</b> | <b>46</b> |
| American Avocet                  | 9         |
| American Crow                    | 25        |
| American Kestrel                 | 2         |
| Anna's Hummingbird               | 3         |
| Barn Swallow                     | 22        |
| Belding's Savannah Sparrow       | 19        |
| Black Pheobe                     | 1         |
| Black-crowned Night-Heron        | 1         |
| California Towhee                | 1         |
| Caspian Tern                     | 44        |
| Cliff Swallow                    | 7         |
| Common Goldeneye                 | 1         |
| Cormorant                        | 1         |
| Double-crested Cormorant         | 15        |
| Dowitcher                        | 46        |
| Eared Grebe                      | 5         |
| European Starling                | 33        |
| Forster's Tern                   | 187       |
| Great Blue Heron                 | 18        |
| Great Egret                      | 21        |
| Green Heron                      | 1         |
| Gull                             | 143       |
| Hummingbird                      | 1         |
| Killdeer                         | 5         |
| Least Tern                       | 4         |
| Long-billed Curlew               | 3         |
| Long-billed Dowitcher            | 1         |
| Mallard                          | 8         |
| Marbled Godwit                   | 64        |
| Mourning Dove                    | 3         |
| Osprey                           | 7         |
| Peregrine Falcon                 | 1         |
| Pied-billed Grebe                | 2         |
| Red-shouldered Hawk              | 2         |
| Red-tailed Hawk                  | 6         |
| Ring-billed Gull                 | 2         |
| Sandpiper                        | 1443      |
| Savannah Sparrow                 | 3         |
| Semipalmated Plover              | 10        |
| Snowy Egret                      | 17        |
| Swallow                          | 22        |
| Western Kingbird                 | 26        |
| Western Sandpiper                | 482       |
| Whimbrel                         | 24        |

|                                  |           |
|----------------------------------|-----------|
| <b>Total # of Individual Sp.</b> | <b>42</b> |
| American Avocet                  | 9         |
| American Crow                    | 25        |
| American Kestrel                 | 2         |
| Black Pheobe                     | 1         |
| Black-crowned Night-Heron        | 1         |
| California Towhee                | 1         |
| Caspian Tern                     | 44        |
| Common Goldeneye                 | 1         |
| Cormorant                        | 1         |
| Double-crested Cormorant         | 15        |
| Dowitcher                        | 46        |
| Long-billed Dowitcher            | 1         |
| Eared Grebe                      | 5         |
| European Starling                | 33        |
| Forster's Tern                   | 187       |
| Great Blue Heron                 | 18        |
| Great Egret                      | 21        |
| Green Heron                      | 1         |
| Gull                             | 143       |
| Ring-billed Gull                 | 2         |
| Hummingbird                      | 1         |
| Anna's Hummingbird               | 3         |
| Killdeer                         | 5         |
| Least Tern                       | 4         |
| Long-billed Curlew               | 3         |
| Mallard                          | 8         |
| Marbled Godwit                   | 64        |
| Mourning Dove                    | 3         |
| Osprey                           | 7         |
| Peregrine Falcon                 | 1         |
| Pied-billed Grebe                | 2         |
| Red-shouldered Hawk              | 2         |
| Red-tailed Hawk                  | 6         |
| Sandpiper                        | 1443      |
| Savannah Sparrow                 | 3         |
| Belding's Savannah Sparrow       | 19        |
| Semipalmated Plover              | 10        |
| Snowy Egret                      | 17        |
| Swallow                          | 22        |
| Barn Swallow                     | 22        |
| Cliff Swallow                    | 7         |
| Western Kingbird                 | 26        |
| Western Sandpiper                | 482       |
| Whimbrel                         | 24        |

|                           |      |
|---------------------------|------|
| Willet                    | 133  |
| Yellowlegs                | 2    |
| Total # of Individual Sp. | 2876 |

2876

|                           |      |
|---------------------------|------|
| Willet                    | 133  |
| Yellowlegs                | 2    |
| Total # of Individual Sp. | 2876 |