# The Effect of Great Lakes Water Level Fluctuation on Northern Michigan Wetland Bird Populations

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The Ecology of Wetlands
Prof. Barbara Madsen
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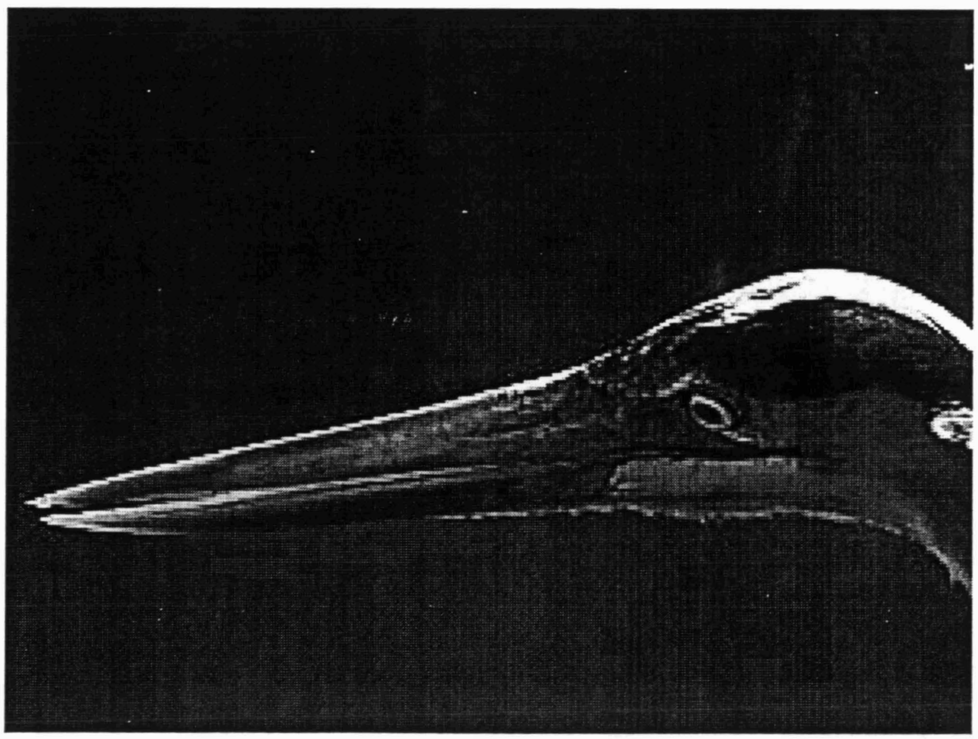

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## Introduction

Throughout the world, diverse avian populations continuously utilize wetlands. The abundance of the resources, including shoreline habitat and food, has resulted in bird species that are adapted exclusively to this habitat and others that use this habitat only during portions of their life cycle or during migration. Today, we witness many adaptations which maximize benefit from this semi-aquatic life style, including: anatomical and morphological adaptations (including rear leg placement for swimming, bone and lung modifications for diving, water resistant plumage), adapted feeding tactics, modified migratory flight paths, and life history adaptations (Weller). These adaptations have created a dependency upon wetland habitat availability for sustained population levels.

The effect of birds on wetland habitat is critical for the ecosystem. They are responsible for seed dispersal of many plants, and also for the dispersal of many invertebrates. In addition to the transfer of seeds and organisms, the birds have an effect on many wetland soils through their waste products, which can serve as nutrient deposits (WB). Birds are also critical to wetlands because they draw the attention of humans to the environment. Many critical pieces of wetland legislation have resulted from the pressure of waterfowl hunters who are concerned with the decline in habitat and the potential ramifications on their recreation. They are also critical to local economies, and then residents may choose to maintain wetlands for their recreational value rather than convert them for another use. Groups such as Ducks Unlimited and Audubon are able to work on a national level to preserve wetlands.

In northern Michigan, coastal marshes nurture a diversity of plants and animals. The variance in perennial Great Lakes' water levels has sustained a myriad of plant species. With the long-term cycling of low and high water levels, many changes in micro-habitat occur which result in a shift of the entire biotic community. Plants are directly affected by nutrient availability and water saturation, thus becoming good indicators of many chemical and geophysical properties of the soil in the immediate area surrounding them. Bird populations are directly affected by plant presence and by the availability of insects, invertebrates, small mammals and other birds, which makes them an indicator of the entire productivity of an ecosystem (Weller). The cycling of water levels also has effects on the macro-habitat by significantly affecting the amount of shoreline which is nesting and foraging habitat for birds and therefore the bird populations. This effect was studied through the observation of bird species diversity and abundance at several northern Michigan coastal marsh sites and was compared to historical records to determine if Great Lakes' water levels had an effect on bird species diversity and abundance.

## Material and Methods

Analysis of bird abundance and species diversity occurred at Cheboygan Marsh and Cecil Bay. Each site was visited on two occasions and observations were made on the birds and surrounding habitat. This was accomplished through the use of observation points determined by proximity to other observation points and types of vegetation present. At each point, approximately five minutes was spent to determine the species present as visually observed or through the recognition of a bird's song. This data was then compared with Lake Huron water levels obtained from the Army Corps of Engineers website. Forty-one indicator species that inhabit Great Lakes shorelines, which were identified with the help of Dr. Francesca Cuthbert, were then analyzed through the use of historical records of the University of Michigan Biological Station. Data ranged from 1909 to 1946. The remaining data between 1947 and 1999 is at the University of Minnesota.

These methods of collecting data both of the present and past have potential for error. First, our analysis of this year's bird populations did not occur until late July and early August. At this time of year, some species have already begun to migrate. Also, most species are no longer breeding and as a result are less territorial and are easier to overlook due to their lack of vocalization and territorial behavior. Second, we were not able to visit each site at various times during the day. As a result of this, we may have overlooked several species.

The historical records also have potential for error in the analysis. Though records began in 1909, transportation was not available, and the sites that we are able to observe today were not accessible until about 1920. Various ornithologists were responsible for the collection of this data. This may have added a variance of personal biases. Frequently specific numbers observed were not recorded, particularly before 1930. Instead, only the species observed were indicated or ambiguous terms were used including few and several. Also, sometimes only young were observed. In order to analyze total abundance, quantitative data was required. Few was taken to mean between three and five birds and several was taken to mean between four and seven depending on the context of the observations and the species. In the case when only young were noted, two was added to that total to represent the parents. In other cases, when more than one record for a location existed during a given year, the largest number of birds present was used. In some cases, especially when migratory flocks were observed, the number of birds indicated does not reflect the number of birds that inhabited the wetlands during the course of the summer. As a result of each of these assumptions, the total abundance data, especially before 1930 when total individual population numbers began to be recorded when possible, is best viewed as relative. In order to reduce the variance between personal biases, one person analyzed all of the historical records.

## Results

The Lake Huron water levels from 1918 to the present are presented in table 1 and graphs 1 and 2. Levels of Lake Huron annually fluctuated at levels between 175.5 and 177.5 meters and the cycles were of duration's ranging between six and twelve years with the average being about nine (USACE). Fluctuation also occurred on a monthly scale to a lesser extreme, but this was not analyzed because only the July lake levels were correlated to bird populations in this analysis.

It was observed that the diversity of the bird populations was inversely proportional to lake levels as demonstrated in graph 3. The corresponding data is represented in chart 2. As the water rose the diversity of birds decreased, and, likewise, as the water dropped the diversity of the populations increased. In the SYSTAT analysis, these results turned out to be very significant with a p value of 0.004 (Graph 4).

Conversely, as the water levels rose the total bird abundance was directly affected (Graph 5). The corresponding data is represented in chart 3. During high water years the abundance of birds recorded was high. In the SYSTAT analysis of this correlation, the results were also very significant with a p value of 0.006 (Graph 6). Analysis was also done on the correlation between water levels and both species diversity and abundance which produced a p value of 0.042 (Graph 7).

In an additional investigation two individual species presence or absence was correlated with lake levels. The Piping Plover was recorded in years with water levels less than 176.5 meters, except in years directly following periods of water levels less than 176.5 meters (Graph 8). The presence of the Sanderling was recorded in every year that the Piping Plover was, except preceding 1926 (Graph 9).

Please view table 4 for a list of birds observed during the year 2000 at Cecil Bay and Cheyboygan Marsh.

## Discussion

Shorebirds are known to exhibit an entire spectrum of territorial behavior. Many are likely to be seen alone (such as the Spotted Sandpiper, Solitary Sandpiper, and Wilson's Plover), and many travel in large, cohesive flocks (including the Stilt Sandpiper, Red Knot, and Dowitcher )(4). Most of the shorebirds exhibit territorial behavior which falls somewhere in between. The causes for their variant behavior may range from location, food availability, habitat availability, or even something as minute as time of day (4). Essentially, they balance the energy costs and the benefits of their actions and then choose act in the more energy efficient manner (5). The behavior of birds varies with territory size and this corresponds directly with fluctuation of lake levels.

Water level seems to be an indicator of habitat availability for the shorebirds involved in our study. When the water level is low more habitat is available. The shorebirds including Plovers and Sandpipers utilize coastal mudflats for their foraging (4). When these mudflats become extended due to low water, habitat opens for the invertebrates that the shorebirds feed on. This has direct effect on the bird populations. This is not to say that when there is more habitat the population numbers rise, merely that there will be a greater diversity of birds found at a particular site due to the reduction of interspecial competition. As resource rich habitat opens, energy spent in competition for resources becomes less efficient. It does not make sense, energetically, for a bird to protect resources beyond those for which it has a need.

Similarly, as the lake levels rise, habitat decreases. As habitat decreases for the invertebrate populations they may be forced into smaller, more concentrated areas. These concentrated areas of invertebrate become a densely abundant food resource for the birds. Sites that contain high numbers of resources attract high numbers of competitors, becoming impossible to defend (Gill).

"Sanderlings do not defend their feeding territories on California beaches, when prey is either abundant or scarce. Beach space with dense concentrations of prey is not defensible because no single Sanderling can keep the hordes of other Sanderlings away. Low prey densities are also not worth defending. Sanderlings, however, vigorously defend beach territories at intermediate prey concentrations. The size of the territories they defend then reflects the necessary defense effort. . . The territory they defend is affected by two additional factors, tide and predation risk. The territorial behavior of the Sanderling is manifest only at low tide; at high tide this sandpiper feeds or roosts in flocks (Gill)."

This behavior witnessed on the California beaches is directly related to the behavior we see in the Great Lakes populations. As opposed being affected by daily tidal fluctuations, the shorebirds have been effected by annual water level fluctuations. As the water levels rise, the density of the population increases and thus the abundance at which the birds are recorded increases. To take this one step further, the reason why diversity is inversely related to abundance is perhaps due to a greater need for interspecial competition, as opposed intraspecial competition (in this communal feeding situation). Birds are more likely to flock with those of their own species as opposed to those of other species.

The results have also been broken down into two individual species, the Piping Plover and Sanderling for analysis of only presence or absence. The Piping Plover is a particularly sensitive bird. It has extremely specific requirements when it is looking for a territory. If the cobble is only slightly too large, or if there is perhaps just slightly too much sand the Plovers will not be able to successfully raise their brood. The results that we see indicate that if the water level is over 176.5 meters then the Plover will not be able to successfully reproduce. They were noted in high level years only after many consecutive low level years. This may be due to reproductive success of previous years. If a bird has been reproductively successful in an area then it is highly likely that they will return there. Even though the conditions were probably less than ideal in 1942, the

Piping Plover had found appropriate conditions in that area for the previous ten years, and thus returned as a learned response (4). Even though the water level dropped again in 1943 the Piping Plover was not found. It is possible that because it did not encounter reproductive success in 1942, and it would not return to the same nesting area.

The Sanderling exhibited parallel behavior. It was found under the same conditions and also displayed a similar delayed effect. It was found in the high year of 1942 but not in the year after, even though the water level dropped. The reasons for the behavior of the Sanderling are likely to be the same as for the Piping Plover.

Through systat analysis, these results were all found to be significant. Without thorough statistical analysis for nonrandom data sets nothing more can be deduced from those results. Significant correlation's were found between water level and species diversity, water level and abundance, and also species diversity, abundance and water level. In dealing with historical data, it is difficult to do a more specific analysis and still remain accurate. We know that they were surveying general areas for general bird populations, limiting the conclusions we can come to pertaining to individual species. As this project continues, it may be possible to obtain more specific results when analyzing later years.

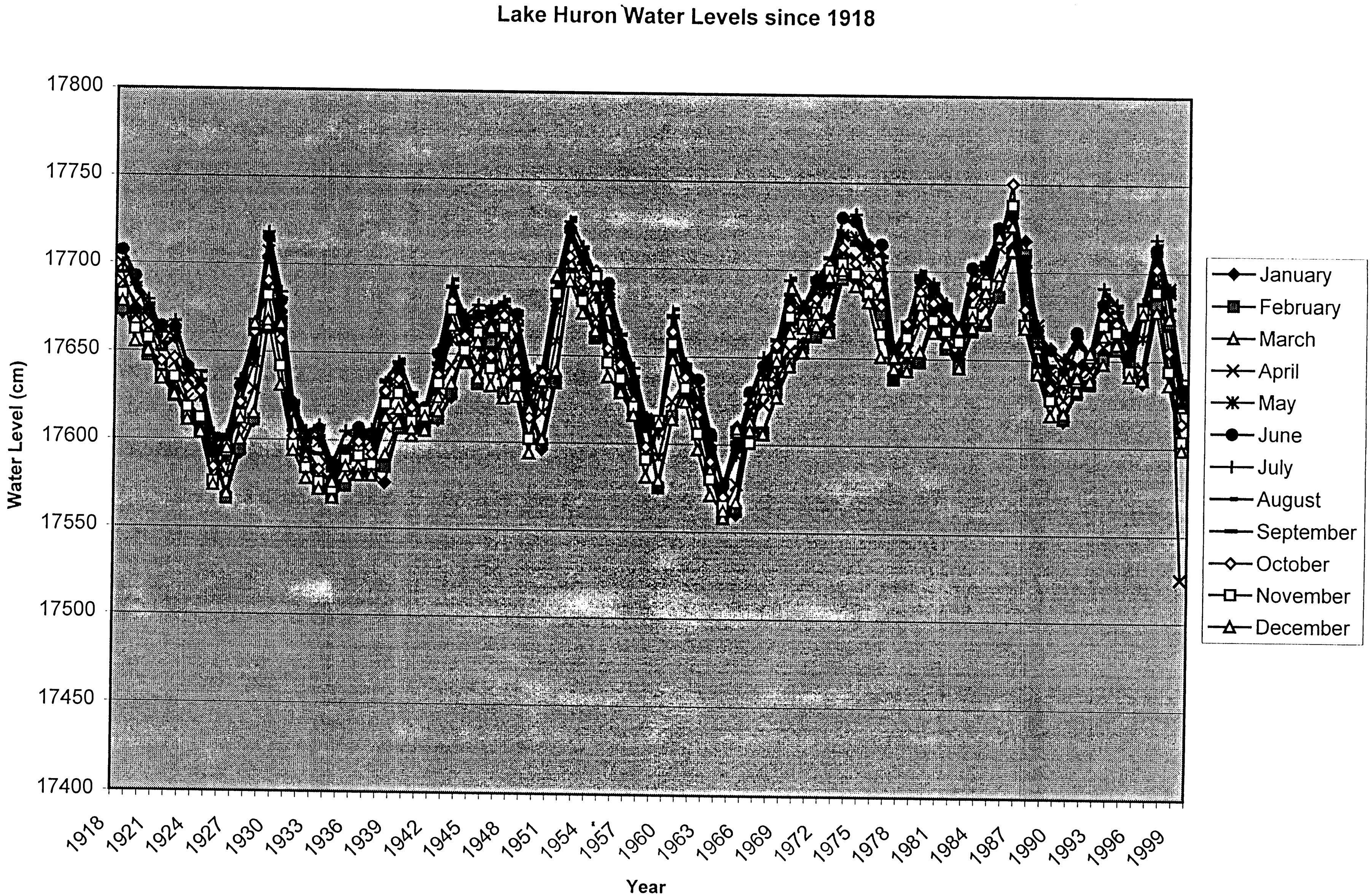
## Conclusions

Great Lakes water levels have been shown to exhibit cyclic behavior with depths ranging from 175.5 meters to 177.5 meters, with a period of about 9 years per cycle. Bird diversity has been found to have a highly significant inverse relationship with water level as a result of habitat availability. Bird abundance has been found to have a highly significant direct relationship to water level also a result of habitat availability. Similar findings have been observed with Sanderling population density in relation to tidal water levels. Individual species have been shown to return to the Great Lakes region after low level years which indicates probable reproductive success, and not to return after high water level which indicates possible reproductive failure.

Historical analysis without contact with the researcher leads to a few assumptions on the part of the investigators. Assumptions were made dealing with sampling techniques. It was assumed that the classes were not seeking out specific species while ignoring others to a great extent. It was also assumed that everything present was noted and that all of the notes taken on each of the sites was available for our review.

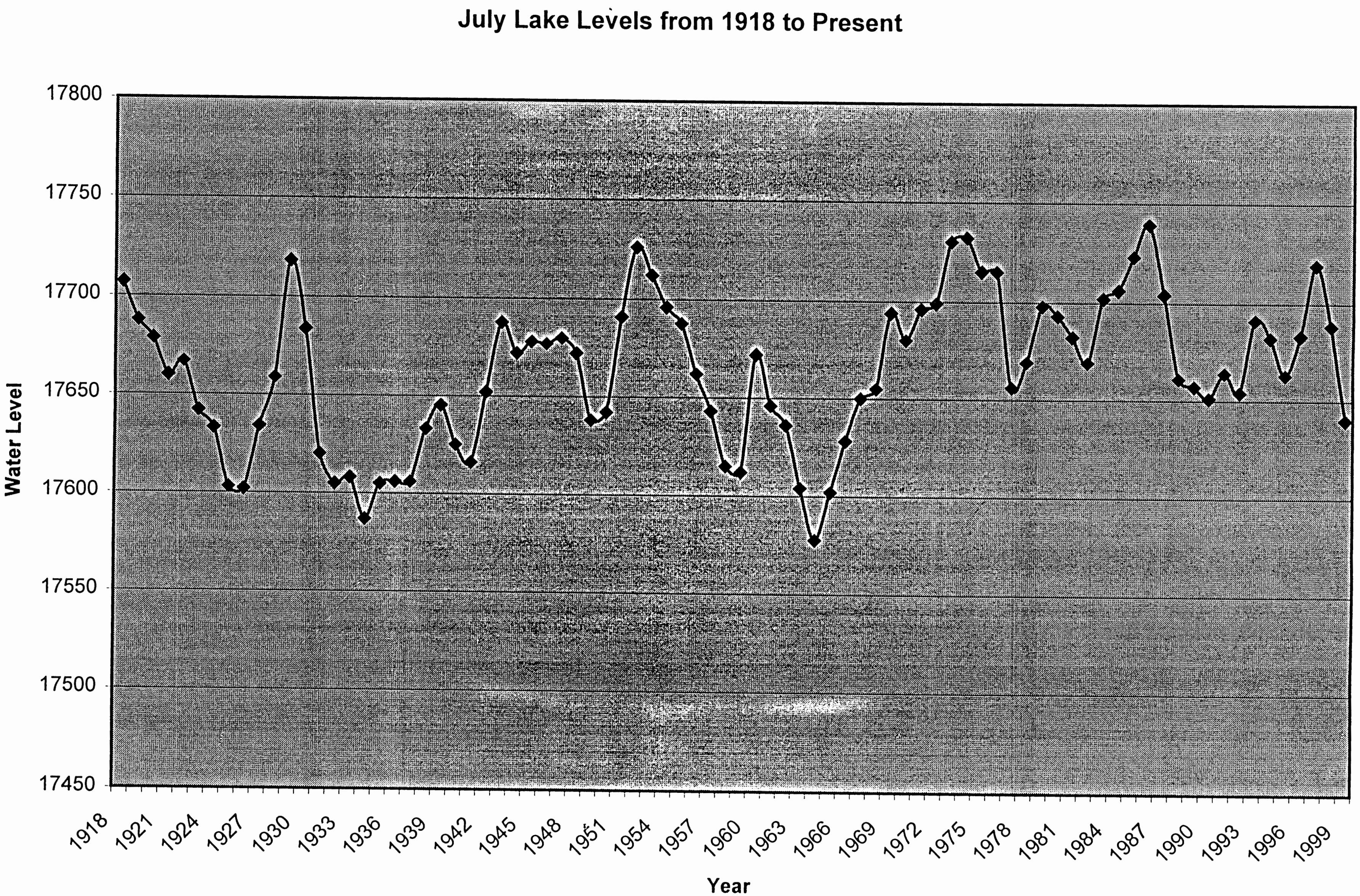
This research requires further study for confirmation and pursuit of further data. The next step would be to do a similar analysis of records between the years of 1946 and the present. This may prove to be more difficult to analyze because of the increased amount of human influence. Studies could also elaborate by including more types of indicator species, or simply different types of indicator species. Reproductive success compared between high and low level water years would also provide useful information. The data obtained through this study has many potential applications including assisting endangered species such as the Piping Plover. It also has potential long term application as water levels may change throughout the world's Oceans as a result of the increased ice cap melting due to global warming and an enhanced Greenhouse effect. Further study is required and will prove beneficial to preserving wetland habitats and the birds who live there.

Graph 1



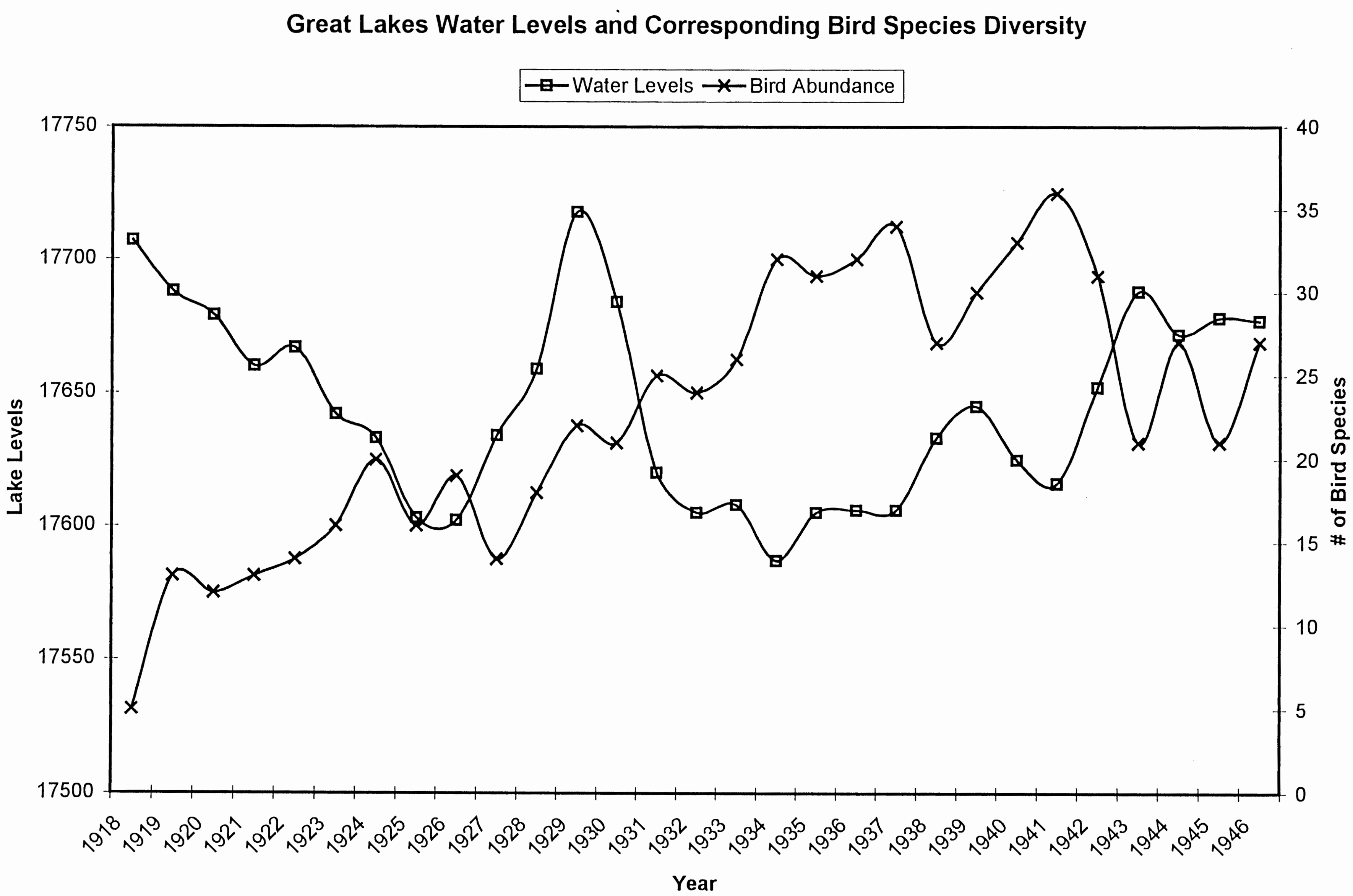
Lake Huron Water Levels since 1918
17800
17750
17700
17650
17600
17550
17500
17450
17400
Water Level (cm)
1918
1921
1924
1927
1930
1933
1936
1939
1942
1945
1948
1951
1954
1957
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999
Year
January
February
March
April
May
June
July
August
September
October
November
December

**Graph 2**



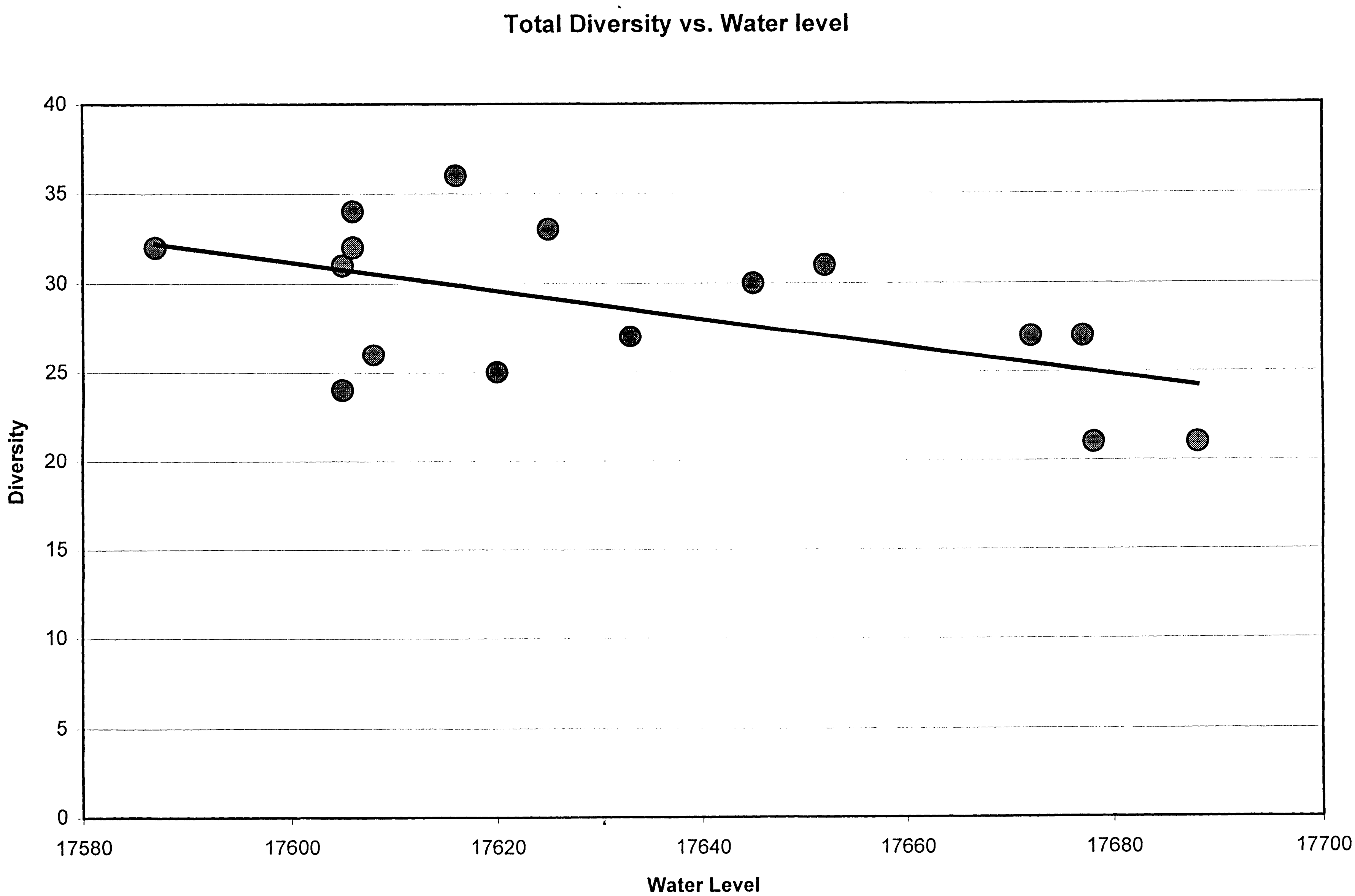
July Lake Levels from 1918 to Present
17800
17750
17700
17650
17600
17550
17500
17450
Water Level
1918
1921
1924
1927
1930
1933
1936
1939
1942
1945
1948
1951
1954
1957
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999
Year

**Graph 3**



Great Lakes Water Levels and Corresponding Bird Species Diversity
Water Levels
Bird Abundance
Lake Levels
# of Bird Species
Year
17750
17700
17650
17600
17550
17500
40
35
30
25
20
15
10
5
0
1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946

Graph 3b

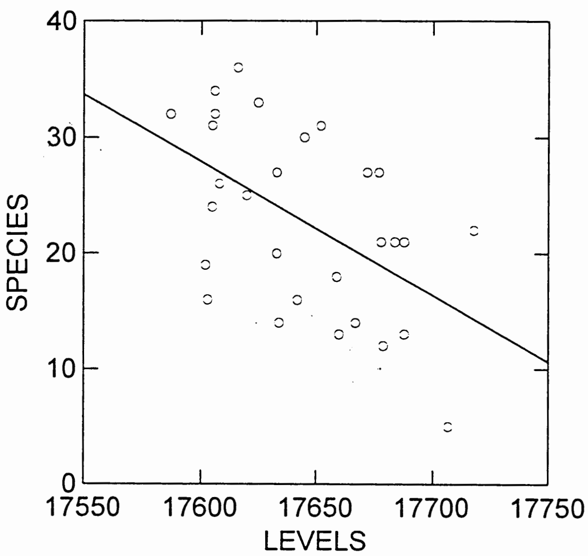


Total Diversity vs. Water level
40
35
30
25
20
15
10
5
0
Diversity
17580
17600
17620
17640
17660
17680
17700
Water Level


13

File: \\UMBS_NT_SERVER\Classes\Ornithology\Sharon\birdsystats.syo

**Graph 4**




53 case(s) deleted due to missing data.

Eigenvalues of unit scaled X'X

| | 1 | 2 |
|---|---|---|
| | 1.946 | 0.054 |

Condition indices

| | 1 | 2 |
|---|---|---|
| | 1.000 | 6.014 |

Variance proportions

| | 1 | 2 |
|---|---|---|
| CONSTANT | 0.027 | 0.973 |
| SPECIES | 0.027 | 0.973 |

Dep Var: LEVELS   N: 29   Multiple R: 0.523   Squared multiple R: 0.274

Adjusted squared multiple R: 0.247   Standard error of estimate: 31.197

| Effect | Coefficient | Std Error | Std Coef | Tolerance | t | P(2 Tail) |
|---|---|---|---|---|---|---|
| CONSTANT | 17698.802 | 17.900 | 0.000 | . | 988.760 | 9.9E-16 |
| SPECIES | -2.374 | 0.744 | -0.523 | 1.000 | -3.189 | 0.004 |

| Effect | Coefficient | Lower | < 95%> | Upper |
|---|---|---|---|---|
| CONSTANT | 17698.802 | 17662.074 | | 17735.530 |
| SPECIES | -2.374 | -3.901 | | -0.847 |

# Graph 4

Correlation matrix of regression coefficients

| | CONSTANT | SPECIES |
|---|---|---|
| CONSTANT | 1.000 | |
| SPECIES | -0.946 | 1.000 |

Analysis of Variance

| Source | Sum-of-Squares | df | Mean-Square | F-ratio | P |
|---|---|---|---|---|---|
| Regression | 9900.498 | 1 | 9900.498 | 10.173 | 0.004 |
| Residual | 26277.023 | 27 | 973.223 | | |

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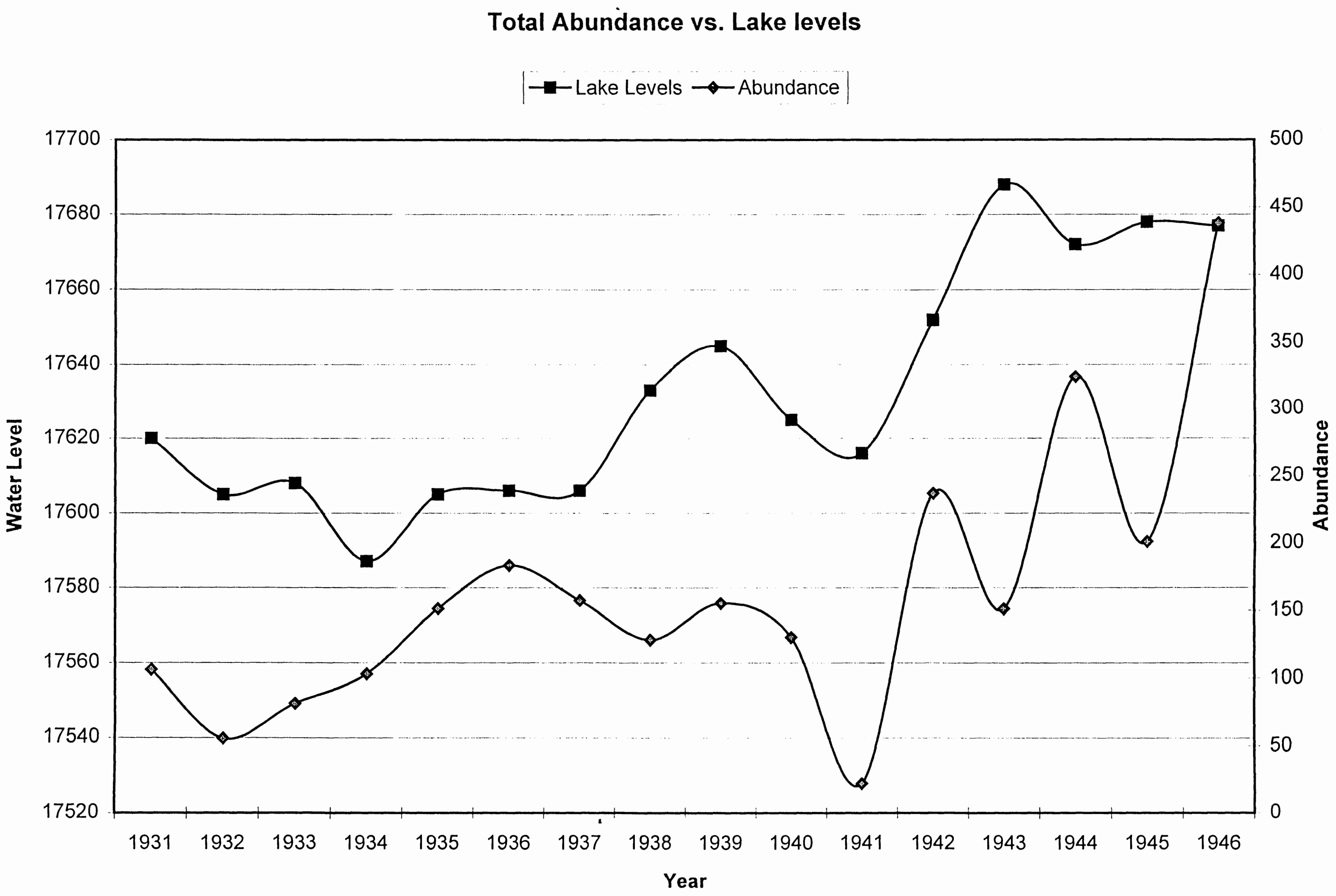
Durbin-Watson D Statistic 0.586
First Order Autocorrelation 0.666

82 cases and 2 variables processed and saved.

SYSTAT Rectangular file F:\Ornithology\Sharon\systatbirds.SYD,
created Tue Aug 15, 2000 at 20:23:54, contains variables:

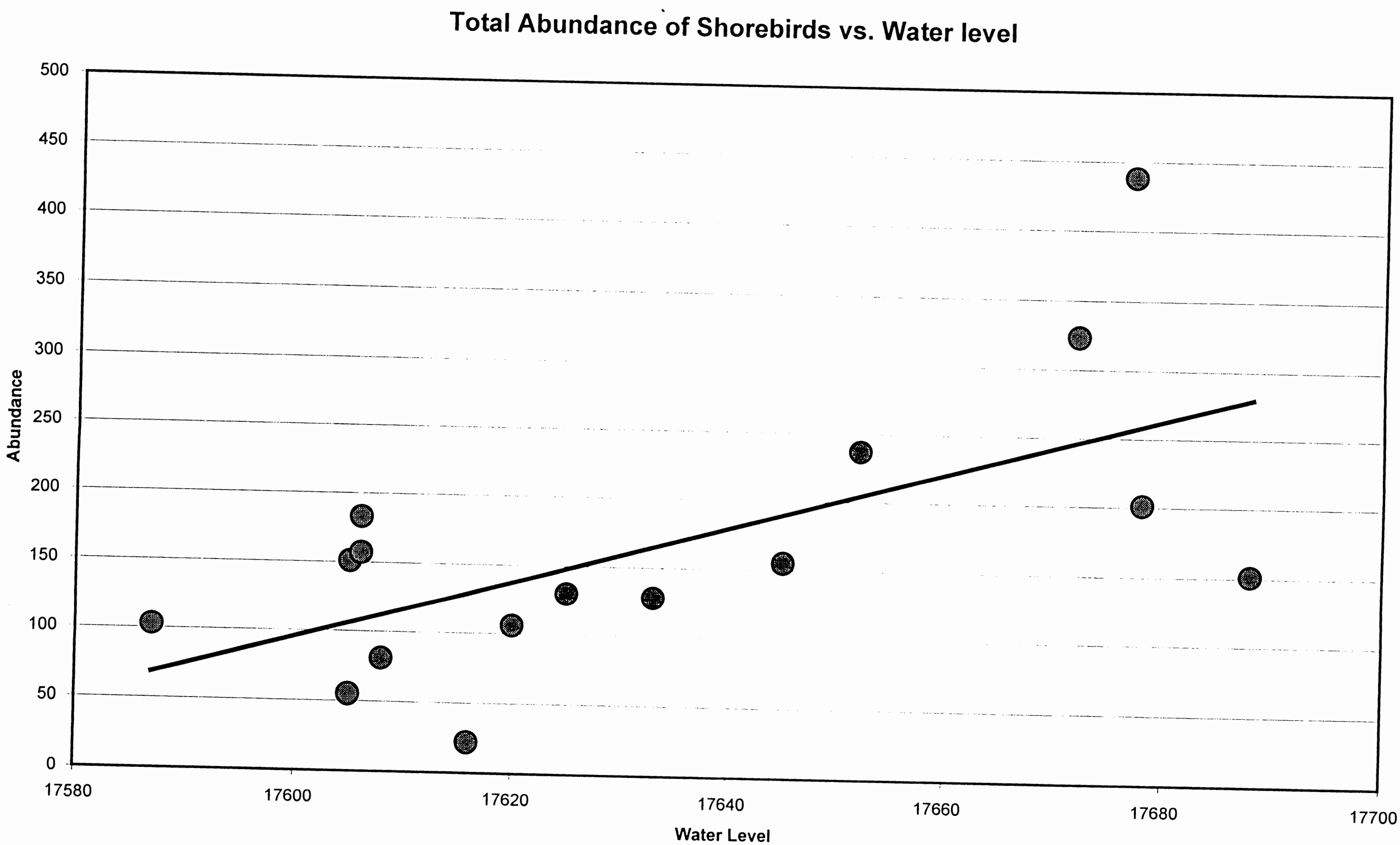
LEVELS SPECIES

**Graph 5**



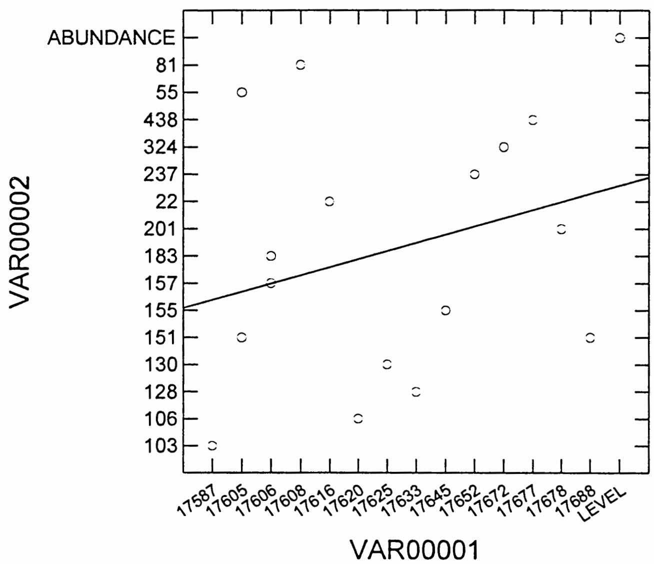
Total Abundance vs. Lake levels
Lake Levels
Abundance
Water Level
17700
17680
17660
17640
17620
17600
17580
17560
17540
17520
Abundance
500
450
400
350
300
250
200
150
100
50
0
1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946
Year

**Graph 5b**



Total Abundance of Shorebirds vs. Water level
Abundance
0
50
100
150
200
250
300
350
400
450
500
17580
17600
17620
17640
17660
17680
17700
Water Level

# Graph 6




2.000 1.53776E-06

Condition indices

| | |
|---|---|
| 1 | 2 |
| 1.000 | 1140.436 |

Variance proportions

| | 1 | 2 |
|---|---|---|
| CONSTANT | 7.68878E-07 | 1.000 |
| LEVEL | 7.68878E-07 | 1.000 |

Dep Var: ABUNDANCE N: 16 Multiple R: 0.652 Squared multiple R: 0.426

Adjusted squared multiple R: 0.384 Standard error of estimate: 80.181

| Effect | Coefficient | Std Error | Std Coef | Tolerance | t | P(2 Tail) |
|---|---|---|---|---|---|---|
| CONSTANT | -36644.129 | 11430.112 | 0.000 | . | -3.206 | 0.006 |
| LEVEL | 2.087 | 0.648 | 0.652 | 1.000 | 3.220 | 0.006 |

| Effect | Coefficient | Lower | < 95%> | Upper |
|---|---|---|---|---|
| CONSTANT | -36644.129 | -61159.282 | | -12128.976 |
| LEVEL | 2.087 | 0.697 | | 3.478 |

# Graph 6

Correlation matrix of regression coefficients

| | CONSTANT | LEVEL |
|---|---|---|
| CONSTANT | 1.000 | |
| LEVEL | -1.000 | 1.000 |

Analysis of Variance

| Source | Sum-of-Squares | df | Mean-Square | F-ratio | P |
|---|---|---|---|---|---|
| Regression | 66668.851 | 1 | 66668.851 | 10.370 | 0.006 |
| Residual | 90004.899 | 14 | 6428.921 | | |

------------------------------------------------------------------------------

*** WARNING ***
Case is an outlier (Studentized Residual = 3.281)

Durbin-Watson D Statistic 2.066
First Order Autocorrelation -0.222

17 cases and 6 variables processed and saved.

SYSTAT Rectangular file F:\Ornithology\Sharon\screwy data.SYD,
created Sat Sep 16, 2000 at 09:35:22, contains variables:

LEVEL ABUNDANCE VAR00003$ VAR00004$ VAR00005 VAR00006

1 case(s) deleted due to missing data.

Eigenvalues of unit scaled X'X

| 1 | 2 |
|---|---|
| 1.856 | 0.144 |

Condition indices

| 1 | 2 |
|---|---|
| 1.000 | 3.591 |

Variance proportions

| | 1 | 2 |
|---|---|---|
| CONSTANT | 0.072 | 0.928 |
| ABUNDANCE | 0.072 | 0.928 |

Dep Var: DIVERSITY N: 16 Multiple R: 0.166 Squared multiple R: 0.027

Adjusted squared multiple R: 0.000 Standard error of estimate: 4.595

| Effect | Coefficient | Std Error | Std Coef | Tolerance | t | P(2 Tail) |
|---|---|---|---|---|---|---|
| CONSTANT | 29.758 | 2.222 | 0.000 | . | 13.390 | 2.2E-09 |
| ABUNDANCE | -0.007 | 0.012 | -0.166 | 1.000 | -0.628 | 0.540 |

| Effect | Coefficient | Lower | < 95%> | Upper |
|---|---|---|---|---|
| CONSTANT | 29.758 | 24.991 | | 34.524 |
| ABUNDANCE | -0.007 | -0.032 | | 0.018 |

Correlation matrix of regression coefficients

CONSTANT ABUNDANCE

**Graph 6**

| | | |
|---|---|---|
| CONSTANT | 1.000 | |
| ABUNDANCE | -0.856 | 1.000 |

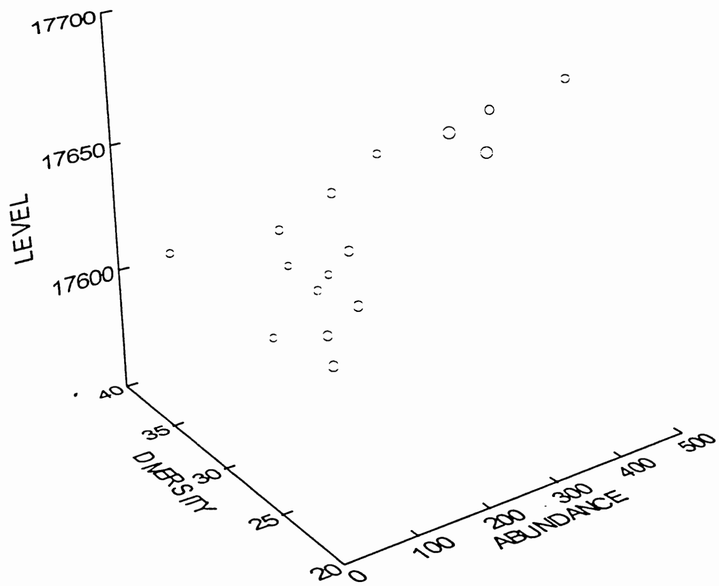
Analysis of Variance

| Source | Sum-of-Squares | df | Mean-Square | F-ratio | P |
|---|---|---|---|---|---|
| Regression | 8.337 | 1 | 8.337 | 0.395 | 0.540 |
| Residual | 295.601 | 14 | 21.114 | | |

*** WARNING ***
Case 16 has large leverage (Leverage = 0.542)

Durbin-Watson D Statistic 1.386
First Order Autocorrelation 0.280

GRAPH 7




1 case(s) deleted due to missing data.

Eigenvalues of unit scaled X'X

| 1 | 2 | 3 |
|---|---|---|
| 2.810 | 0.190 | 8.85072E-07 |

Condition indices

| 1 | 2 | 3 |
|---|---|---|
| 1.000 | 3.848 | 1781.881 |

Variance proportions

| | 1 | 2 | 3 |
|---|---|---|---|
| CONSTANT | 2.17941E-07 | 1.45401E-06 | 1.000 |
| ABUNDANCE | 0.017 | 0.559 | 0.424 |

**Graph ∅7**

| | | | |
|---|---|---|---|
| LEVEL | 2.17203E-07 | 1.42959E-06 | 1.000 |

Dep Var: DIVERSITY N: 16 Multiple R: 0.622 Squared multiple R: 0.386

Adjusted squared multiple R: 0.292 Standard error of estimate: 3.788

| Effect | Coefficient | Std Error | Std Coef | Tolerance | t | P(2 Tail) |
|---|---|---|---|---|---|---|
| CONSTANT | 1990.536 | 711.043 | 0.000 | . | 2.799 | 0.015 |
| ABUNDANCE | 0.015 | 0.013 | 0.350 | 0.574 | 1.221 | 0.244 |
| LEVEL | -0.111 | 0.040 | -0.790 | 0.574 | -2.758 | 0.016 |

| Effect | Coefficient | Lower < 95%> | Upper |
|---|---|---|---|
| CONSTANT | 1990.536 | 454.420 | 3526.651 |
| ABUNDANCE | 0.015 | -0.012 | 0.043 |
| LEVEL | -0.111 | -0.199 | -0.024 |

Correlation matrix of regression coefficients

| | CONSTANT | ABUNDANCE | LEVEL |
|---|---|---|---|
| CONSTANT | 1.000 | | |
| ABUNDANCE | 0.651 | 1.000 | |
| LEVEL | -1.000 | -0.652 | 1.000 |

Analysis of Variance

| Source | Sum-of-Squares | df | Mean-Square | F-ratio | P |
|---|---|---|---|---|---|
| Regression | 117.434 | 2 | 58.717 | 4.093 | 0.042 |
| Residual | 186.504 | 13 | 14.346 | | |

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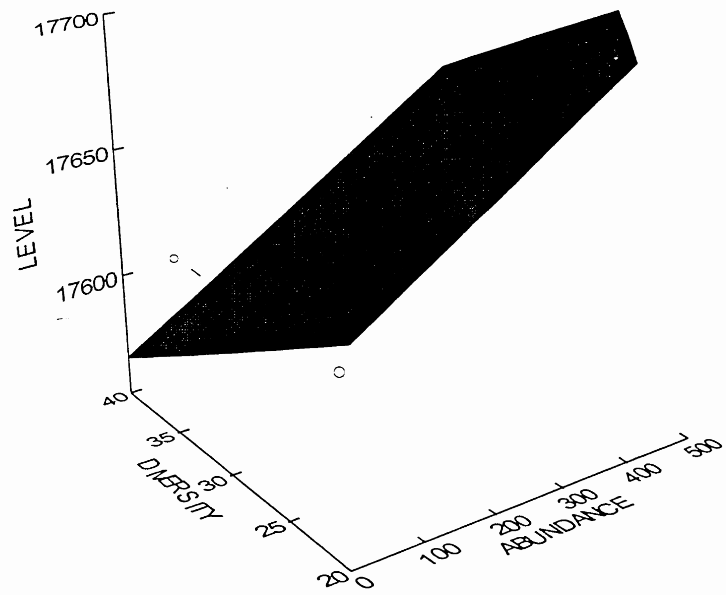
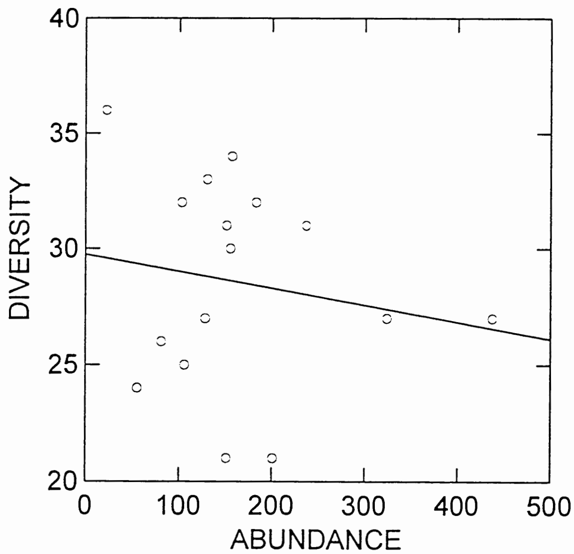
*** WARNING ***
Case 11 is an outlier (Studentized Residual = 2.877)
Case 16 has large leverage (Leverage = 0.557)

Durbin-Watson D Statistic 0.679
First Order Autocorrelation 0.614

**Graph ø7**

File: \\Umbs_nt_server\classes\Ornithology\Sharon\screwy.syo




```
1 case(s) deleted due to missing data.

Eigenvalues of unit scaled X'X
```

**Graph 7**

| | 1 | 2 |
|---|---|---|
| | 1.856 | 0.144 |

Condition indices

| | 1 | 2 |
|---|---|---|
| | 1.000 | 3.591 |

Variance proportions

| | 1 | 2 |
|---|---|---|
| CONSTANT | 0.072 | 0.928 |
| ABUNDANCE | 0.072 | 0.928 |

Dep Var: DIVERSITY N: 16 Multiple R: 0.166 Squared multiple R: 0.027

Adjusted squared multiple R: 0.000 Standard error of estimate: 4.595

| Effect | Coefficient | Std Error | Std Coef | Tolerance | t | P(2 Tail) |
|---|---|---|---|---|---|---|
| CONSTANT | 29.758 | 2.222 | 0.000 | . | 13.390 | 2.2E-09 |
| ABUNDANCE | -0.007 | 0.012 | -0.166 | 1.000 | -0.628 | 0.540 |

| Effect | Coefficient | Lower < 95%> | Upper |
|---|---|---|---|
| CONSTANT | 29.758 | 24.991 | 34.524 |
| ABUNDANCE | -0.007 | -0.032 | 0.018 |

Correlation matrix of regression coefficients

| | CONSTANT | ABUNDANCE |
|---|---|---|
| CONSTANT | 1.000 | |
| ABUNDANCE | -0.856 | 1.000 |

Analysis of Variance

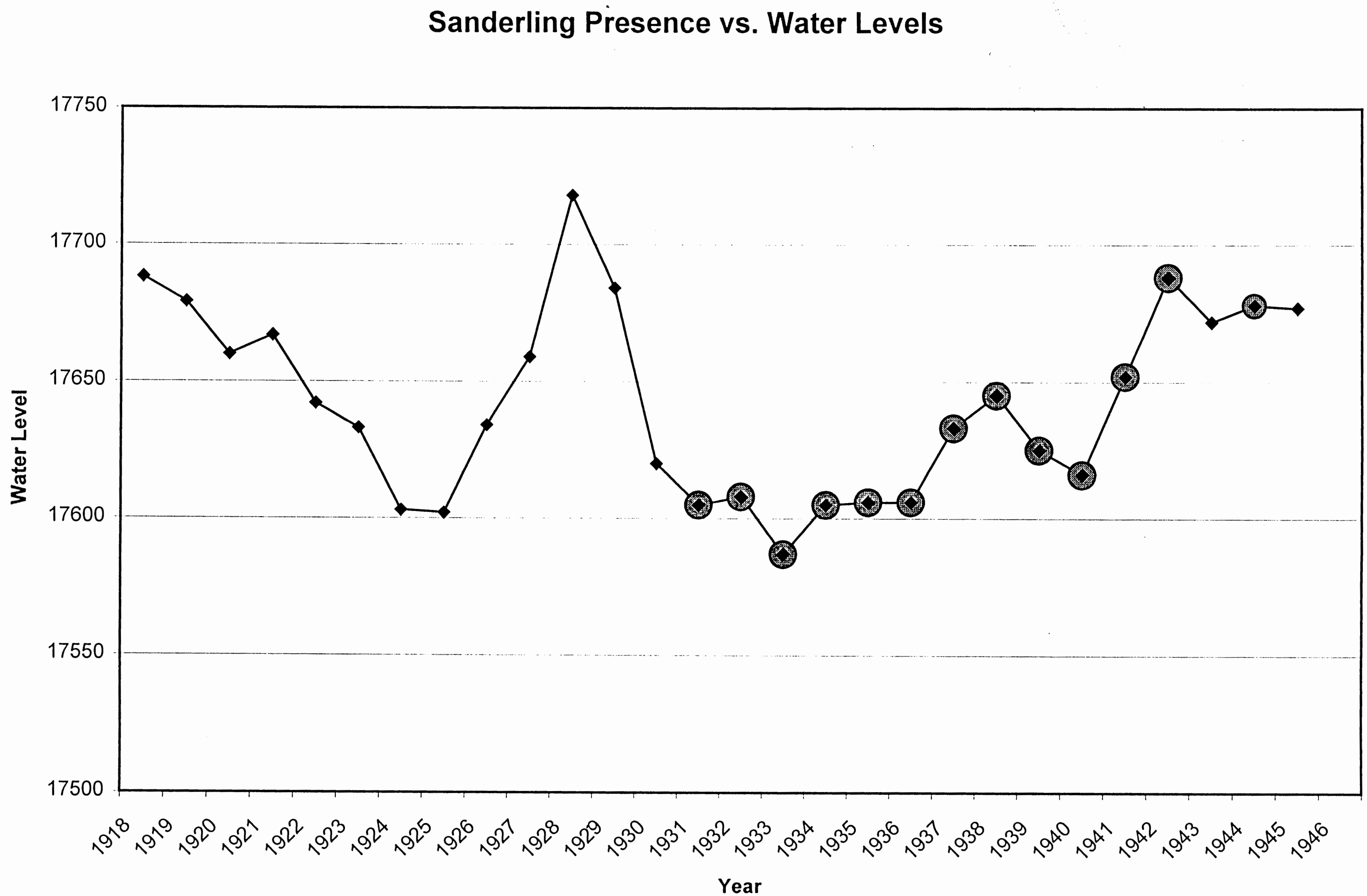
| Source | Sum-of-Squares | df | Mean-Square | F-ratio | P |
|---|---|---|---|---|---|
| Regression | 8.337 | 1 | 8.337 | 0.395 | 0.540 |
| Residual | 295.601 | 14 | 21.114 | | |

--------------------------------------------------------------------------------

*** WARNING ***
Case 16 has large leverage (Leverage = 0.542)

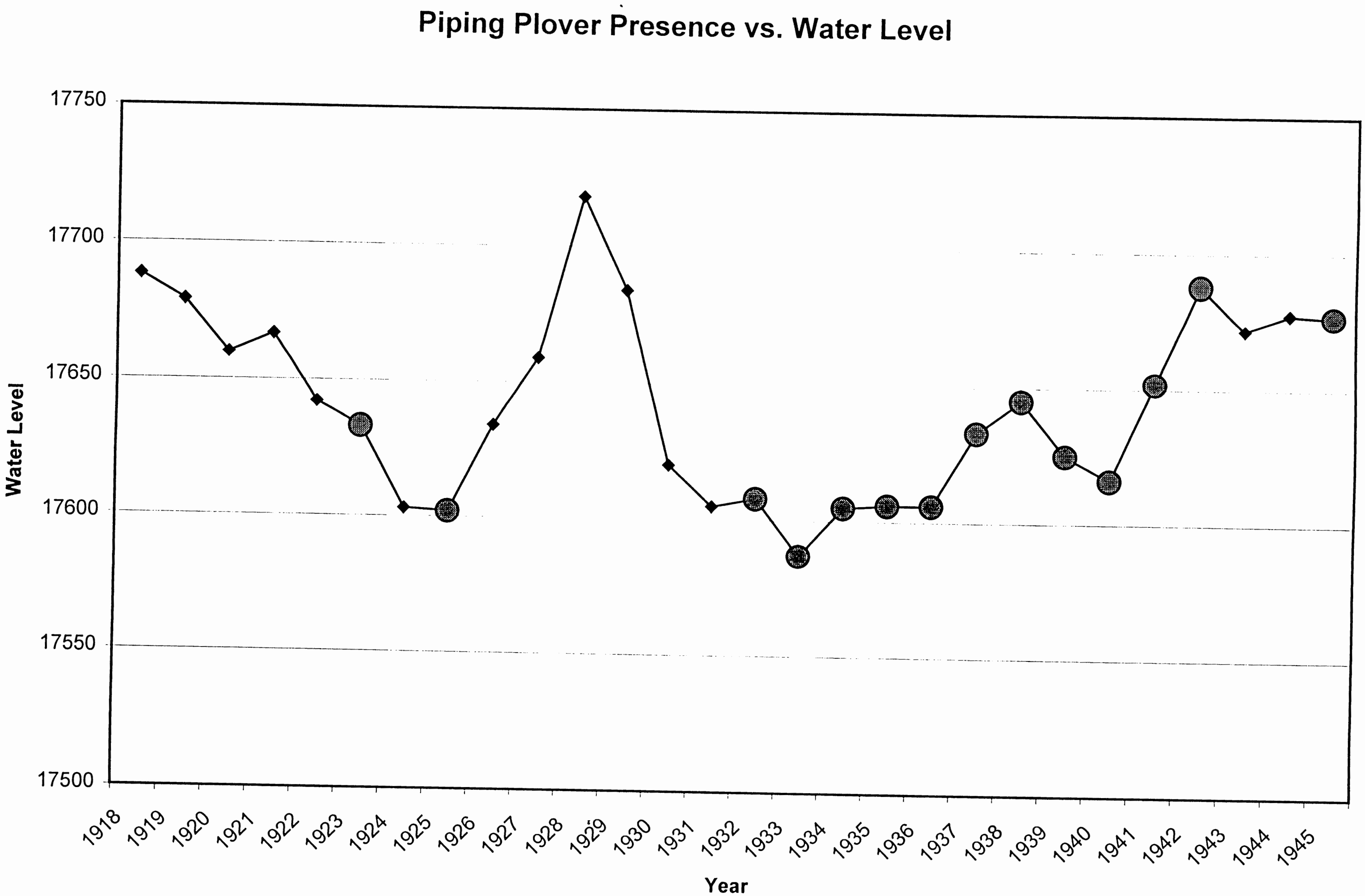
Durbin-Watson D Statistic 1.386
First Order Autocorrelation 0.280

Graph 8



Sanderling Presence vs. Water Levels
17750
17700
17650
17600
17550
17500
Water Level
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
Year

Graph 9


Piping Plover Presence vs. Water Level
17750
17700
17650
17600
17550
17500
Water Level
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
Year

25

**Table 1**

| Year | Jan | Feb | Mar | Apr | May | June | July | Aug |
|---|---|---|---|---|---|---|---|---|
| **1918** | 17671 | 17673 | 17680 | 17689 | 17699 | 17707 | 17707 | 17701 |
| **1919** | 17674 | 17668 | 17668 | 17677 | 17689 | 17692 | 17688 | 17683 |
| **1920** | 17650 | 17647 | 17649 | 17663 | 17668 | 17673 | 17679 | 17676 |
| **1921** | 17644 | 17642 | 17642 | 17654 | 17663 | 17664 | 17660 | 17654 |
| **1922** | 17627 | 17624 | 17628 | 17643 | 17657 | 17663 | 17667 | 17663 |
| **1923** | 17616 | 17613 | 17615 | 17622 | 17634 | 17641 | 17642 | 17640 |
| **1924** | 17606 | 17605 | 17606 | 17611 | 17624 | 17628 | 17633 | 17638 |
| **1925** | 17595 | 17592 | 17594 | 17593 | 17598 | 17600 | 17603 | 17599 |
| **1926** | 17569 | 17566 | 17569 | 17579 | 17588 | 17599 | 17602 | 17603 |
| **1927** | 17592 | 17594 | 17600 | 17608 | 17620 | 17630 | 17634 | 17631 |
| **1928** | 17610 | 17611 | 17615 | 17629 | 17644 | 17650 | 17659 | 17662 |
| **1929** | 17665 | 17663 | 17665 | 17686 | 17707 | 17715 | 17718 | 17713 |
| **1930** | 17664 | 17664 | 17666 | 17669 | 17676 | 17679 | 17684 | 17680 |
| **1931** | 17621 | 17617 | 17616 | 17617 | 17619 | 17620 | 17620 | 17614 |
| **1932** | 17594 | 17593 | 17591 | 17595 | 17602 | 17601 | 17605 | 17601 |
| **1933** | 17574 | 17573 | 17573 | 17583 | 17599 | 17606 | 17608 | 17602 |
| **1934** | 17570 | 17567 | 17567 | 17574 | 17581 | 17584 | 17587 | 17584 |
| **1935** | 17574 | 17574 | 17578 | 17585 | 17591 | 17594 | 17605 | 17604 |
| **1936** | 17583 | 17581 | 17585 | 17592 | 17601 | 17607 | 17606 | 17600 |
| **1937** | 17582 | 17582 | 17584 | 17586 | 17600 | 17604 | 17606 | 17604 |
| **1938** | 17576 | 17585 | 17592 | 17608 | 17616 | 17628 | 17633 | 17635 |
| **1939** | 17607 | 17607 | 17610 | 17615 | 17629 | 17640 | 17645 | 17646 |
| **1940** | 17609 | 17607 | 17603 | 17604 | 17612 | 17620 | 17625 | 17627 |
| **1941** | 17608 | 17608 | 17606 | 17609 | 17617 | 17619 | 17616 | 17611 |
| **1942** | 17612 | 17613 | 17617 | 17629 | 17638 | 17650 | 17652 | 17650 |
| **1943** | 17625 | 17627 | 17633 | 17643 | 17658 | 17677 | 17688 | 17692 |
| **1944** | 17657 | 17654 | 17654 | 17657 | 17664 | 17669 | 17672 | 17668 |
| **1945** | 17636 | 17633 | 17636 | 17645 | 17655 | 17672 | 17678 | 17674 |
| **1946** | 17656 | 17657 | 17665 | 17670 | 17670 | 17675 | 17677 | 17669 |
| **1947** | 17628 | 17628 | 17625 | 17639 | 17657 | 17672 | 17680 | 17681 |
| **1948** | 17648 | 17642 | 17647 | 17661 | 17672 | 17673 | 17672 | 17667 |
| **1949** | 17620 | 17619 | 17619 | 17626 | 17631 | 17634 | 17638 | 17634 |
| **1950** | 17596 | 17599 | 17602 | 17617 | 17627 | 17634 | 17642 | 17644 |
| **1951** | 17634 | 17634 | 17641 | 17658 | 17675 | 17682 | 17691 | 17693 |
| **1952** | 17695 | 17696 | 17696 | 17708 | 17717 | 17722 | 17726 | 17728 |
| **1953** | 17685 | 17682 | 17683 | 17691 | 17700 | 17707 | 17712 | 17711 |
| **1954** | 17663 | 17660 | 17664 | 17671 | 17683 | 17692 | 17696 | 17694 |
| **1955** | 17683 | 17678 | 17676 | 17682 | 17688 | 17691 | 17688 | 17679 |
| **1956** | 17631 | 17630 | 17632 | 17637 | 17650 | 17657 | 17662 | 17662 |
| **1957** | 17622 | 17619 | 17617 | 17620 | 17628 | 17635 | 17643 | 17638 |
| **1958** | 17615 | 17613 | 17612 | 17614 | 17612 | 17612 | 17615 | 17611 |
| **1959** | 17575 | 17575 | 17579 | 17592 | 17606 | 17611 | 17612 | 17612 |
| **1960** | 17614 | 17616 | 17614 | 17624 | 17650 | 17664 | 17672 | 17677 |
| **1961** | 17638 | 17631 | 17633 | 17636 | 17642 | 17644 | 17646 | 17645 |
| **1962** | 17620 | 17617 | 17619 | 17626 | 17634 | 17637 | 17636 | 17632 |
| **1963** | 17589 | 17585 | 17585 | 17594 | 17602 | 17606 | 17604 | 17603 |

Data is presented in centimeters

**Table 1**

| Year | Sept | Oct | Nov | Dec |
|---|---|---|---|---|
| **1918** | 17694 | 17683 | 17682 | 17678 |
| **1919** | 17672 | 17666 | 17662 | 17655 |
| **1920** | 17673 | 17665 | 17657 | 17650 |
| **1921** | 17650 | 17644 | 17635 | 17634 |
| **1922** | 17656 | 17646 | 17635 | 17625 |
| **1923** | 17636 | 17629 | 17618 | 17611 |
| **1924** | 17633 | 17627 | 17612 | 17604 |
| **1925** | 17592 | 17584 | 17576 | 17574 |
| **1926** | 17602 | 17597 | 17593 | 17595 |
| **1927** | 17622 | 17621 | 17614 | 17612 |
| **1928** | 17660 | 17661 | 17665 | 17666 |
| **1929** | 17703 | 17690 | 17682 | 17668 |
| **1930** | 17669 | 17657 | 17642 | 17631 |
| **1931** | 17605 | 17602 | 17597 | 17594 |
| **1932** | 17595 | 17587 | 17584 | 17578 |
| **1933** | 17592 | 17583 | 17576 | 17572 |
| **1934** | 17582 | 17576 | 17572 | 17576 |
| **1935** | 17596 | 17591 | 17589 | 17585 |
| **1936** | 17602 | 17599 | 17591 | 17580 |
| **1937** | 17601 | 17592 | 17586 | 17580 |
| **1938** | 17634 | 17628 | 17621 | 17613 |
| **1939** | 17644 | 17635 | 17627 | 17618 |
| **1940** | 17626 | 17619 | 17611 | 17607 |
| **1941** | 17609 | 17612 | 17617 | 17614 |
| **1942** | 17644 | 17638 | 17633 | 17625 |
| **1943** | 17688 | 17680 | 17675 | 17666 |
| **1944** | 17664 | 17660 | 17652 | 17645 |
| **1945** | 17670 | 17666 | 17662 | 17657 |
| **1946** | 17660 | 17649 | 17642 | 17632 |
| **1947** | 17677 | 17672 | 17665 | 17656 |
| **1948** | 17657 | 17640 | 17632 | 17626 |
| **1949** | 17622 | 17614 | 17602 | 17594 |
| **1950** | 17643 | 17640 | 17634 | 17635 |
| **1951** | 17692 | 17693 | 17685 | 17695 |
| **1952** | 17722 | 17706 | 17694 | 17692 |
| **1953** | 17702 | 17692 | 17681 | 17674 |
| **1954** | 17690 | 17698 | 17695 | 17689 |
| **1955** | 17664 | 17654 | 17646 | 17638 |
| **1956** | 17656 | 17645 | 17637 | 17629 |
| **1957** | 17633 | 17624 | 17621 | 17616 |
| **1958** | 17607 | 17598 | 17591 | 17581 |
| **1959** | 17610 | 17610 | 17613 | 17612 |
| **1960** | 17673 | 17664 | 17657 | 17648 |
| **1961** | 17643 | 17638 | 17632 | 17624 |
| **1962** | 17626 | 17617 | 17606 | 17597 |
| **1963** | 17598 | 17590 | 17580 | 17571 |

Data is presented in centimeters

| Year | Jan | Feb | Mar | Apr | May | June | July | Aug |
|---|---|---|---|---|---|---|---|---|
| **1964** | 17563 | 17559 | 17558 | 17561 | 17574 | 17576 | 17578 | 17577 |
| **1965** | 17560 | 17562 | 17567 | 17577 | 17594 | 17600 | 17602 | 17604 |
| **1966** | 17610 | 17608 | 17613 | 17620 | 17626 | 17630 | 17628 | 17624 |
| **1967** | 17607 | 17607 | 17606 | 17623 | 17635 | 17645 | 17650 | 17648 |
| **1968** | 17629 | 17630 | 17627 | 17635 | 17640 | 17647 | 17655 | 17658 |
| **1969** | 17647 | 17647 | 17645 | 17654 | 17670 | 17682 | 17694 | 17695 |
| **1970** | 17659 | 17656 | 17653 | 17658 | 17668 | 17676 | 17680 | 17678 |
| **1971** | 17663 | 17662 | 17668 | 17676 | 17686 | 17694 | 17696 | 17696 |
| **1972** | 17673 | 17665 | 17665 | 17672 | 17688 | 17693 | 17699 | 17705 |
| **1973** | 17698 | 17695 | 17698 | 17710 | 17720 | 17730 | 17730 | 17729 |
| **1974** | 17695 | 17697 | 17700 | 17707 | 17719 | 17728 | 17732 | 17726 |
| **1975** | 17687 | 17686 | 17687 | 17692 | 17706 | 17714 | 17715 | 17710 |
| **1976** | 17676 | 17675 | 17687 | 17702 | 17711 | 17715 | 17715 | 17708 |
| **1977** | 17642 | 17638 | 17644 | 17656 | 17657 | 17655 | 17656 | 17654 |
| **1978** | 17648 | 17645 | 17643 | 17651 | 17661 | 17667 | 17669 | 17668 |
| **1979** | 17651 | 17648 | 17654 | 17671 | 17688 | 17695 | 17698 | 17700 |
| **1980** | 17678 | 17672 | 17668 | 17677 | 17684 | 17690 | 17693 | 17693 |
| **1981** | 17659 | 17656 | 17660 | 17667 | 17675 | 17680 | 17682 | 17681 |
| **1982** | 17651 | 17646 | 17645 | 17656 | 17662 | 17666 | 17669 | 17669 |
| **1983** | 17667 | 17666 | 17668 | 17676 | 17690 | 17702 | 17702 | 17698 |
| **1984** | 17670 | 17670 | 17672 | 17681 | 17691 | 17701 | 17706 | 17704 |
| **1985** | 17688 | 17686 | 17698 | 17714 | 17724 | 17725 | 17723 | 17719 |
| **1986** | 17714 | 17711 | 17712 | 17723 | 17728 | 17733 | 17739 | 17739 |
| **1987** | 17718 | 17710 | 17706 | 17707 | 17706 | 17707 | 17704 | 17699 |
| **1988** | 17663 | 17660 | 17657 | 17667 | 17670 | 17667 | 17661 | 17657 |
| **1989** | 17638 | 17633 | 17632 | 17641 | 17644 | 17656 | 17657 | 17654 |
| **1990** | 17615 | 17616 | 17619 | 17627 | 17635 | 17644 | 17651 | 17649 |
| **1991** | 17636 | 17631 | 17633 | 17648 | 17660 | 17666 | 17664 | 17659 |
| **1992** | 17638 | 17636 | 17638 | 17644 | 17653 | 17652 | 17654 | 17653 |
| **1993** | 17654 | 17651 | 17648 | 17658 | 17670 | 17682 | 17691 | 17688 |
| **1994** | 17657 | 17656 | 17659 | 17663 | 17670 | 17672 | 17682 | 17681 |
| **1995** | 17653 | 17649 | 17647 | 17649 | 17658 | 17664 | 17663 | 17664 |
| **1996** | 17637 | 17639 | 17639 | 17646 | 17663 | 17676 | 17683 | 17684 |
| **1997** | 17679 | 17682 | 17689 | 17695 | 17707 | 17713 | 17719 | 17716 |
| **1998** | 17674 | 17671 | 17674 | 17689 | 17691 | 17690 | 17688 | 17680 |
| **1999** | 17627 | 17628 | 17624 | 17525 | 17628 | 17634 | 17640 | 17636 |
| **2000** | N/A | N/A | N/A | N/A | N/A | 17610 | 17613 | N/A |

Data is presented in centimeters

| Year | Sept | Oct | Nov | Dec |
|---|---|---|---|---|
| **1964** | 17576 | 17570 | 17565 | 17562 |
| **1965** | 17607 | 17610 | 17607 | 17609 |
| **1966** | 17617 | 17608 | 17601 | 17608 |
| **1967** | 17640 | 17634 | 17634 | 17632 |
| **1968** | 17660 | 17657 | 17650 | 17648 |
| **1969** | 17686 | 17678 | 17673 | 17664 |
| **1970** | 17677 | 17673 | 17669 | 17667 |
| **1971** | 17690 | 17684 | 17676 | 17675 |
| **1972** | 17707 | 17703 | 17700 | 17696 |
| **1973** | 17721 | 17713 | 17704 | 17700 |
| **1974** | 17715 | 17704 | 17698 | 17691 |
| **1975** | 17707 | 17695 | 17687 | 17682 |
| **1976** | 17695 | 17680 | 17664 | 17651 |
| **1977** | 17653 | 17650 | 17650 | 17651 |
| **1978** | 17671 | 17670 | 17662 | 17654 |
| **1979** | 17696 | 17688 | 17683 | 17681 |
| **1980** | 17690 | 17682 | 17672 | 17665 |
| **1981** | 17680 | 17673 | 17666 | 17659 |
| **1982** | 17665 | 17662 | 17660 | 17667 |
| **1983** | 17693 | 17687 | 17677 | 17674 |
| **1984** | 17702 | 17696 | 17693 | 17688 |
| **1985** | 17720 | 17716 | 17719 | 17720 |
| **1986** | 17738 | 17750 | 17738 | 17726 |
| **1987** | 17690 | 17679 | 17670 | 17668 |
| **1988** | 17648 | 17642 | 17643 | 17642 |
| **1989** | 17647 | 17634 | 17627 | 17618 |
| **1990** | 17645 | 17641 | 17639 | 17639 |
| **1991** | 17648 | 17640 | 17638 | 17640 |
| **1992** | 17652 | 17649 | 17652 | 17654 |
| **1993** | 17683 | 17676 | 17670 | 17664 |
| **1994** | 17678 | 17671 | 17666 | 17659 |
| **1995** | 17655 | 17646 | 17644 | 17641 |
| **1996** | 17682 | 17680 | 17679 | 17677 |
| **1997** | 17712 | 17702 | 17689 | 17678 |
| **1998** | 17668 | 17655 | 17644 | 17636 |
| **1999** | 17624 | 17614 | 17604 | 17599 |
| **2000** | N/A | N/A | N/A | N/A |

Data is presented in centimeters

TABLE 2

| | Common Loon | Common Loon | | Pied-billed Grebe | | Great Blue Heron |
|---|---|---|---|---|---|---|
| Year | Cecil Bay | Waugoshance | | Wilderness Park | | Cecil Bay |
| 1924 | | | | | | |
| 1925 | 1 | | | | | |
| 1926 | | | | | | |
| 1927 | | | | | | |
| 1928 | | | | | | |
| 1929 | | | | | | |
| 1930 | | | | | | |
| 1931 | 4 | | | | | |
| 1932 | | | | | | |
| 1933 | | | | | | |
| 1934 | | | | | | |
| 1935 | | | | | | |
| 1936 | | | | 2 | | |
| 1937 | | | | | | |
| 1938 | 2 | 2 | | | | |
| 1939 | | | | | | |
| 1940 | | | | | | |
| 1941 | | | | | | |
| 1942 | | | | | | 6 |
| 1943 | | | | | | |
| 1944 | | | | | | |
| 1945 | | | | | | |
| 1946 | | | | | | |
| | | | | | | |
| Total | 7 | 2 | | 2 | | 6 |

| | Great Blue Heron | | American Bittern | American Bittern | American Bittern | |
|---|---|---|---|---|---|---|
| Year | Duncan | | Cecil Bay | Duncan | Waugoshance | |
| 1924 | | | | | | |
| 1925 | | | | | | |
| 1926 | | | | | | |
| 1927 | | | | | | |
| 1928 | | | | | | |
| 1929 | | | | | | |
| 1930 | | | | | | |
| 1931 | 1 | | | | | |
| 1932 | | | | | | |
| 1933 | | | | | | |
| 1934 | | | | | | |
| 1935 | | | | | | |
| 1936 | 3 | | | | | |
| 1937 | | | | | | |
| 1938 | | | | | | |
| 1939 | 12 | | | | | |
| 1940 | | | | | | |
| 1941 | | | | | | |
| 1942 | 2 | | 6 | 4 | | |
| 1943 | | | 1 | 1 | | |
| 1944 | | | | 3 | 1 | |
| 1945 | | | | 3 | | |
| 1946 | | | 5 | 12 | 1 | |
| | | | | | | |
| Total | 18 | | 12 | 23 | 2 | |

| | Mallard | Mallard | Mallard | | Common Black Duck | Common Black Duck |
|---|---|---|---|---|---|---|
| | | | | | | |
| Year | Cecil Bay | Duncan | Wilderness Park | | Cecil Bay | Wilderness Park |
| | | | | | | |
| 1924 | | | | | | |
| 1925 | | | | | | |
| 1926 | | | | | | |
| 1927 | | | | | | |
| 1928 | | | | | | |
| 1929 | | | | | | |
| 1930 | | | | | | |
| 1931 | 4 | | | | 2 | |
| 1932 | | | | | | |
| 1933 | | | | | | |
| 1934 | | | | | | |
| 1935 | | 6 | | | | |
| 1936 | | | 1 | | | 4 |
| 1937 | | | | | | 12 |
| 1938 | | | | | | |
| 1939 | | 1 | | | | |
| 1940 | | | | | | |
| 1941 | | | | | | |
| 1942 | | | | | | |
| 1943 | | | | | 2 | |
| 1944 | | 1 | | | | |
| 1945 | | | 5 | | 8 | 12 |
| 1946 | | 14 | 2 | | | 24 |
| | | | | | | |
| Total | 4 | 22 | 8 | | 12 | 52 |

| | Common Black Duck | Common Black Duck | | Green-winged Teal | Green-winged Teal |
|---|---|---|---|---|---|
| | | | | | |
| Year | Duncan | Grass | | Cecil Bay | Wilderness Park |
| | | | | | |
| 1924 | | | | | |
| 1925 | | | | | |
| 1926 | | | | | |
| 1927 | | | | | |
| 1928 | | | | | |
| 1929 | | | | | |
| 1930 | | | | | |
| 1931 | | | | 2 | |
| 1932 | | | | | |
| 1933 | | | | | |
| 1934 | | | | | |
| 1935 | | | | | |
| 1936 | | | | | 1 |
| 1937 | | | | | |
| 1938 | | | | | |
| 1939 | | | | | |
| 1940 | | | | | |
| 1941 | 2 | 2 | | | |
| 1942 | 12 | | | | |
| 1943 | 10 | | | | |
| 1944 | 23 | | | | |
| 1945 | 3 | | | | |
| 1946 | 10 | | | | |
| | | | | | |
| Total | 60 | 2 | | 2 | 1 |

| | Green-winged Teal | | Blue-winged Teal | Blue-winged Teal | Blue-winged Teal |
|---|---|---|---|---|---|
| Year | Duncan | | Duncan | Wilderness | Cecil Bay |
| 1924 | | | | | |
| 1925 | | | | | |
| 1926 | | | | | |
| 1927 | | | | | |
| 1928 | | | | | |
| 1929 | | | | | |
| 1930 | | | | | |
| 1931 | | | | | |
| 1932 | | | | | |
| 1933 | | | | | |
| 1934 | | | 20 | | |
| 1935 | | | 10 | 4 | |
| 1936 | | | 26 | | |
| 1937 | 1 | | 10 | 10 | |
| 1938 | | | 10 | | |
| 1939 | | | | 10 | |
| 1940 | | | | | |
| 1941 | | | 4 | | |
| 1942 | | | 10 | | |
| 1943 | | | | | 1 |
| 1944 | | | | 9 | |
| 1945 | | | | | |
| 1946 | 1 | | 1 | | |
| | | | | | |
| Total | 2 | | 91 | 33 | 1 |

| | Blue-winged Teal | | Osprey | Osprey | | Virginia Rail | Virginia Rail | | Sora | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Grass | | Duncan | Cecil Bay | | Duncan | Cecil Bay | | Cecil Bay | |
| 1924 | | | | | | | | | | |
| 1925 | | | | | | | | | | |
| 1926 | | | | | | | | | | |
| 1927 | | | | | | | | | | |
| 1928 | | | | | | | | | | |
| 1929 | | | | | | | | | | |
| 1930 | | | 1 | | | | | | | |
| 1931 | | | 2 | | | | | | | |
| 1932 | | | 1 | | | | | | | |
| 1933 | | | | | | | | | | |
| 1934 | | | | | | | | | | |
| 1935 | | | 1 | | | | | | | |
| 1936 | | | 1 | | | | | | | |
| 1937 | | | | | | | | | | |
| 1938 | | | | | | | | | | |
| 1939 | | | 1 | | | | | | | |
| 1940 | 4 | | 1 | | | 4 | | | | |
| 1941 | | | 1 | | | | | | 2 | |
| 1942 | | | | | | | | | | |
| 1943 | | | | | | | | | | |
| 1944 | | | | | | | | | | |
| 1945 | | | 1 | 1 | | | 1 | | | |
| 1946 | | | | | | | | | | |
| | | | | | | | | | | |
| Total | 4 | | 10 | 1 | | 4 | 1 | | 2 | |

| | Piping Plover | Piping Plover | Piping Plover | | Semipalmated Plover |
|---|---|---|---|---|---|
| | | | | | |
| Year | Duncan | Grass | Waugoshance | | Duncan |
| | | | | | |
| 1924 | | | | | |
| 1925 | | | | | |
| 1926 | | | | | |
| 1927 | | | | | |
| 1928 | | | | | |
| 1929 | | | | | 1 |
| 1930 | | | | | 3 |
| 1931 | | | | | 3 |
| 1932 | 6 | | | | 6 |
| 1933 | | | | | 4 |
| 1934 | 6 | | | | 4 |
| 1935 | 2 | | | | 6 |
| 1936 | 3 | | | | 6 |
| 1937 | 4 | 6 | | | 1 |
| 1938 | 10 | | | | 1 |
| 1939 | 4 | | 3 | | 3 |
| 1940 | 6 | 11 | 3 | | 3 |
| 1941 | 9 | | 10 | | 2 |
| 1942 | | | | | 3 |
| 1943 | 2 | 1 | | | |
| 1944 | | | | | 3 |
| 1945 | | | | | |
| 1946 | | | 9 | | 12 |
| | | | | | |
| Total | 52 | 18 | 25 | | 61 |

| Semipalmated Plover | Semipalmated Plover | | Killdeer | Killdeer | Killdeer | Killdeer |
|---|---|---|---|---|---|---|
| | | | | | | |
| Wilderness Park | Grass | | Duncan | Cecil Bay | Wilderness Park | Grass |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | 10 | 10 | 10 | |
| 1 | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | 10 | | | |
| 3 | 3 | | | | | |
| 4 | | | | | | |
| | | | 8 | 6 | 8 | |
| | | | 6 | | | 4 |
| | 3 | | 5 | 12 | 10 | 10 |
| | | | 8 | 4 | 8 | |
| 8 | | | 25 | | 15 | |
| | | | | | | |
| 16 | 6 | | 72 | 32 | 51 | 14 |

| | | American Golden-Plover | | Black-bellied Plover | Black-bellied Plover |
|---|---|---|---|---|---|
| | | | | | |
| Year | | Duncan | | Cecil Bay | Duncan |
| | | | | | |
| 1924 | | | | | |
| 1925 | | | | | |
| 1926 | | | | | |
| 1927 | | | | | |
| 1928 | | | | | |
| 1929 | | | | | 2 |
| 1930 | | | | | |
| 1931 | | | | 4 | 4 |
| 1932 | | | | | |
| 1933 | | | | | |
| 1934 | | | | | |
| 1935 | | | | | 1 |
| 1936 | | | | 5 | 2 |
| 1937 | | | | | 4 |
| 1938 | | | | | 4 |
| 1939 | | 1 | | | 12 |
| 1940 | | | | | |
| 1941 | | | | | |
| 1942 | | | | | 3 |
| 1943 | | | | | |
| 1944 | | | | | 1 |
| 1945 | | | | | |
| 1946 | | | | | |
| | | | | | |
| Total | | 1 | | 9 | 33 |

| | Black-bellied Plover | | Wilson's Snipe | Wilson's Snipe | Wilson's Snipe | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Year | Wilderness Park | | Duncan | Wilderness Park | Cecil Bay | |
| | | | | | | |
| 1924 | | | | | | |
| 1925 | | | | | | |
| 1926 | | | | | | |
| 1927 | | | | | | |
| 1928 | | | | | | |
| 1929 | | | | | | |
| 1930 | | | 2 | | | |
| 1931 | | | | | | |
| 1932 | | | | | | |
| 1933 | | | | | | |
| 1934 | | | 4 | | | |
| 1935 | 29 | | 2 | | | |
| 1936 | | | 4 | 2 | | |
| 1937 | 4 | | 4 | 4 | | |
| 1938 | 4 | | 6 | 6 | 6 | |
| 1939 | 6 | | | 3 | | |
| 1940 | 10 | | 4 | | | |
| 1941 | 8 | | 4 | | | |
| 1942 | 5 | | 1 | | | |
| 1943 | | | 4 | | | |
| 1944 | 2 | | 10 | | | |
| 1945 | | | 3 | | 3 | |
| 1946 | 15 | | 11 | 7 | | |
| | | | | | | |
| Total | 83 | | 59 | 22 | 9 | |

| | Upland Plover | Upland Plover | Upland Plover | | Spotted Sandpiper | Spotted Sandpiper |
|---|---|---|---|---|---|---|
| | | | | | | |
| Year | Cecil Bay | Duncan | Waugoshance | | Cecil Bay | Duncan |
| | | | | | | |
| 1924 | | | | | 8 | |
| 1925 | | | | | | |
| 1926 | | | | | | |
| 1927 | | | | | | |
| 1928 | | | | | | |
| 1929 | | | | | | |
| 1930 | | | | | | |
| 1931 | | | | | 6 | |
| 1932 | | | | | | |
| 1933 | | | | | 5 | 5 |
| 1934 | | | | | | 12 |
| 1935 | | | | | | |
| 1936 | 1 | 1 | | | 15 | 6 |
| 1937 | | | | | | |
| 1938 | | | | | | |
| 1939 | | | | | | |
| 1940 | | | | | | |
| 1941 | | 2 | | | | |
| 1942 | | | | | | |
| 1943 | | | | | 7 | 2 |
| 1944 | | 1 | | | 10 | 2 |
| 1945 | 1 | | | | 4 | 12 |
| 1946 | | | 1 | | 6 | 4 |
| | | | | | | |
| Total | 2 | 4 | 1 | | 61 | 43 |

| | Spotted Sandpiper | Spotted Sandpiper | | Solitary Sandpiper | Solitary Sandpiper |
|---|---|---|---|---|---|
| | | | | | |
| Year | Grass Bay | Waugoshance | | Cecil Bay | Duncan |
| | | | | | |
| 1924 | | | | | |
| 1925 | | | | | |
| 1926 | | | | | |
| 1927 | | | | | |
| 1928 | | | | | |
| 1929 | | | | | |
| 1930 | | | | | 1 |
| 1931 | | | | 3 | |
| 1932 | | | | | |
| 1933 | | | | | |
| 1934 | | | | | 1 |
| 1935 | | | | | 2 |
| 1936 | | | | | 3 |
| 1937 | | | | | |
| 1938 | | | | | |
| 1939 | | | | | |
| 1940 | | | | | |
| 1941 | | | | | 1 |
| 1942 | | | | | |
| 1943 | 6 | | | | 1 |
| 1944 | 1 | 3 | | | 15 |
| 1945 | | 3 | | 2 | |
| 1946 | | 12 | | | 1 |
| | | | | | |
| Total | 7 | 18 | | 5 | 25 |

| | Solitary Sandpiper | Solitary Sandpiper | | Willet | | Greater Yellow-legs |
|---|---|---|---|---|---|---|
| | | | | | | |
| Year | Wilderness Park | Grass Bay | | Duncan | | Duncan |
| | | | | | | |
| 1924 | | | | | | |
| 1925 | | | | | | |
| 1926 | | | | | | |
| 1927 | | | | | | |
| 1928 | | | | | | |
| 1929 | | | | | | |
| 1930 | | | | | | |
| 1931 | | | | | | |
| 1932 | | | | | | 1 |
| 1933 | 1 | | | | | |
| 1934 | | | | | | |
| 1935 | 2 | | | | | 1 |
| 1936 | 3 | 1 | | 1 | | 2 |
| 1937 | | 1 | | | | |
| 1938 | | | | | | |
| 1939 | | | | | | 1 |
| 1940 | 3 | | | | | |
| 1941 | 2 | 2 | | | | |
| 1942 | | | | | | 4 |
| 1943 | 2 | | | | | |
| 1944 | 14 | 15 | | | | |
| 1945 | | | | | | |
| 1946 | | | | | | |
| | | | | | | |
| Total | 27 | 19 | | 1 | | 9 |

| | Greater Yellow-legs | Greater Yellow-legs | Greater Yellow-legs | | Lesser Yellow-legs |
|---|---|---|---|---|---|
| | | | | | |
| Year | Wilderness Park | Grass | Cecil Bay | | Cecil Bay |
| | | | | | |
| 1924 | | | | | |
| 1925 | | | | | |
| 1926 | | | | | |
| 1927 | | | | | |
| 1928 | | | | | |
| 1929 | | | | | |
| 1930 | | | | | |
| 1931 | | | | | 2 |
| 1932 | | | | | |
| 1933 | | | | | |
| 1934 | | | | | |
| 1935 | | | | | |
| 1936 | 2 | | | | |
| 1937 | | | | | 4 |
| 1938 | | | | | |
| 1939 | | | | | |
| 1940 | 6 | | | | |
| 1941 | 1 | 1 | 1 | | |
| 1942 | 2 | | 1 | | |
| 1943 | 5 | | | | |
| 1944 | 1 | | | | |
| 1945 | | | | | |
| 1946 | | | | | 1 |
| | | | | | |
| Total | 17 | 1 | 2 | | 7 |

| | Lesser Yellow-legs | Lesser Yellow-legs | Lesser Yellow-legs | | Pectoral Sandpiper |
|---|---|---|---|---|---|
| | | | | | |
| Year | Duncan | Grass | Wilderness | | Duncan |
| | | | | | |
| 1924 | | | | | |
| 1925 | | | | | |
| 1926 | | | | | |
| 1927 | | | | | |
| 1928 | | | | | |
| 1929 | | | | | |
| 1930 | | | | | |
| 1931 | 3 | | | | |
| 1932 | 3 | | | | |
| 1933 | 6 | | | | |
| 1934 | 4 | | | | 8 |
| 1935 | 4 | | | | 2 |
| 1936 | 3 | | 4 | | |
| 1937 | | | | | 3 |
| 1938 | | | | | 3 |
| 1939 | 4 | | | | |
| 1940 | 4 | | 4 | | 3 |
| 1941 | 4 | 4 | 4 | | |
| 1942 | 6 | | 3 | | 10 |
| 1943 | | | 1 | | 1 |
| 1944 | 7 | 5 | 4 | | |
| 1945 | 2 | | | | |
| 1946 | 15 | | 6 | | 8 |
| | | | | | |
| Total | 65 | 9 | 26 | | 38 |

| | Pectoral Sandpiper | Pectoral Sandpiper | Pectoral Sandpiper | | Baird's Sandpiper |
|---|---|---|---|---|---|
| | | | | | |
| Year | Cecil Bay | Wilderness Park | Grass Bay | | Duncan |
| | | | | | |
| 1924 | | | | | |
| 1925 | | | | | |
| 1926 | | | | | |
| 1927 | | | | | |
| 1928 | | | | | |
| 1929 | | | | | |
| 1930 | | | | | |
| 1931 | | | | | |
| 1932 | | | | | |
| 1933 | | | | | 6 |
| 1934 | | | | | |
| 1935 | | | | | |
| 1936 | | 6 | | | |
| 1937 | 3 | | | | 4 |
| 1938 | | | | | |
| 1939 | | | | | 1 |
| 1940 | | | | | 2 |
| 1941 | | 4 | 4 | | |
| 1942 | | 3 | | | 2 |
| 1943 | | | | | |
| 1944 | | | | | |
| 1945 | | | | | |
| 1946 | | | | | 12 |
| | | | | | |
| Total | 3 | 13 | 4 | | 27 |

| | Baird's Sandpiper | | Least Sandpiper | Least Sandpiper | Least Sandpiper | Least Sandpiper |
|---|---|---|---|---|---|---|
| | | | | | | |
| Year | Wilderness Park | | Cecil Bay | Duncan | Wilderness Park | Grass |
| | | | | | | |
| 1924 | | | 3 | | | |
| 1925 | | | | | | |
| 1926 | | | | | | |
| 1927 | | | | | | |
| 1928 | | | | | | |
| 1929 | | | | 3 | | |
| 1930 | | | | 10 | | |
| 1931 | | | 1 | 6 | | |
| 1932 | | | | 14 | | |
| 1933 | | | | 8 | | |
| 1934 | | | | | | |
| 1935 | | | | 6 | | |
| 1936 | 3 | | | 8 | 6 | |
| 1937 | | | | 6 | | |
| 1938 | | | | | | |
| 1939 | | | | | | |
| 1940 | | | | | | 8 |
| 1941 | 1 | | | 4 | | |
| 1942 | | | 2 | 4 | 2 | |
| 1943 | | | | 2 | 3 | |
| 1944 | | | 3 | 8 | | |
| 1945 | | | | 2 | | |
| 1946 | | | | 15 | 5 | |
| | | | | | | |
| Total | 4 | | 9 | 96 | 16 | 8 |

| | | Red-backed Sandpiper | | Eastern Dowitcher | | Stilt Sandpiper | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Year | | Duncan | | Duncan | | Duncan | |
| | | | | | | | |
| 1924 | | | | | | | |
| 1925 | | | | | | | |
| 1926 | | | | | | | |
| 1927 | | | | | | | |
| 1928 | | | | | | | |
| 1929 | | | | | | | |
| 1930 | | | | | | | |
| 1931 | | | | | | | |
| 1932 | | | | | | | |
| 1933 | | | | | | | |
| 1934 | | | | 1 | | | |
| 1935 | | | | | | | |
| 1936 | | | | | | | |
| 1937 | | 4 | | 4 | | | |
| 1938 | | | | | | | |
| 1939 | | | | | | 3 | |
| 1940 | | 1 | | | | 3 | |
| 1941 | | | | 2 | | | |
| 1942 | | | | | | | |
| 1943 | | | | | | | |
| 1944 | | | | 1 | | | |
| 1945 | | | | | | | |
| 1946 | | | | 2 | | | |
| | | | | | | | |
| Total | | 5 | | 10 | | 6 | |

| | Semipalmated Sandpiper | Semipalmated Sandpiper | Semipalmated Sandpiper |
|---|---|---|---|
| | | | |
| Year | Duncan | Wilderness Park | Cecil Bay |
| | | | |
| 1924 | | | |
| 1925 | | | |
| 1926 | | | |
| 1927 | | | |
| 1928 | | | |
| 1929 | | | |
| 1930 | 6 | | |
| 1931 | 2 | | |
| 1932 | 6 | | |
| 1933 | 4 | | |
| 1934 | 6 | | |
| 1935 | 8 | | |
| 1936 | 6 | | |
| 1937 | 4 | 4 | 4 |
| 1938 | 5 | 6 | 4 |
| 1939 | 6 | 5 | 6 |
| 1940 | 8 | 4 | 5 |
| 1941 | 5 | 6 | |
| 1942 | 2 | | |
| 1943 | | | |
| 1944 | 10 | | |
| 1945 | | 3 | |
| 1946 | 9 | 6 | |
| | | | |
| Total | 87 | 34 | 19 |

| | Semipalmated Sandpiper | | Buff-breasted Sandpiper | | Sanderling | Sanderling |
|---|---|---|---|---|---|---|
| | | | | | | |
| Year | Grass | | Duncan | | Duncan | Grass |
| | | | | | | |
| 1924 | | | | | | |
| 1925 | | | | | | |
| 1926 | | | | | | |
| 1927 | | | | | | |
| 1928 | | | | | | |
| 1929 | | | | | | |
| 1930 | | | | | | |
| 1931 | | | 3 | | | |
| 1932 | | | | | 8 | |
| 1933 | | | | | 3 | |
| 1934 | | | | | 1 | |
| 1935 | | | | | 2 | |
| 1936 | | | | | 4 | |
| 1937 | | | | | 1 | |
| 1938 | | | | | | |
| 1939 | | | | | | |
| 1940 | | | | | 4 | |
| 1941 | 5 | | | | | 4 |
| 1942 | | | | | | |
| 1943 | | | | | | |
| 1944 | | | | | | |
| 1945 | | | | | | |
| 1946 | | | | | | |
| | | | | | | |
| Total | 5 | | 3 | | 23 | 4 |

| | Sanderling | | Herring Gull | Herring Gull | Herring Gull | Herring Gull | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Year | Wilderness Park | | Cecil Bay | Duncan | Grass | Wilderness Park | |
| | | | | | | | |
| 1924 | | | | | | | |
| 1925 | | | | | | | |
| 1926 | | | | | | | |
| 1927 | | | | | | | |
| 1928 | | | | | | | |
| 1929 | | | | | | | |
| 1930 | | | | | | | |
| 1931 | | | 3 | 1 | | | |
| 1932 | | | | | | | |
| 1933 | | | 2 | 2 | | | |
| 1934 | | | | | | | |
| 1935 | | | | | | | |
| 1936 | | | | | | | |
| 1937 | | | | | | | |
| 1938 | | | | | | | |
| 1939 | | | | | | | |
| 1940 | | | | | | | |
| 1941 | 10 | | 2 | 7 | 10 | 6 | |
| 1942 | 3 | | 5 | 1 | 2 | 5 | |
| 1943 | | | 5 | 1 | | | |
| 1944 | 2 | | 3 | | 5 | | |
| 1945 | | | 1 | 3 | | 4 | |
| 1946 | 18 | | | 30 | | 45 | |
| | | | | | | | |
| Total | 33 | | 21 | 45 | 17 | 60 | |

| | Ring-billed Gull | Ring-billed Gull | Ring-billed Gull | Ring-billed Gull | | Bonaparte's Gull |
|---|---|---|---|---|---|---|
| | | | | | | |
| Year | Cecil Bay | Duncan | Grass | Wilderness | | Cecil Bay |
| | | | | | | |
| 1924 | | | | | | 6 |
| 1925 | | | | | | |
| 1926 | | | | | | |
| 1927 | | | | | | |
| 1928 | | | | | | |
| 1929 | | | | | | |
| 1930 | | | | | | |
| 1931 | 3 | 12 | | | | 5 |
| 1932 | | 10 | | | | |
| 1933 | 10 | 6 | | | | |
| 1934 | 10 | 10 | | | | |
| 1935 | 10 | 10 | | | | |
| 1936 | 10 | 10 | | | | |
| 1937 | 10 | 10 | | | | 1 |
| 1938 | 10 | 10 | | | | |
| 1939 | 10 | 10 | | | | |
| 1940 | 10 | 10 | | | | |
| 1941 | 8 | 4 | 10 | 8 | | |
| 1942 | | 1 | 20 | | | |
| 1943 | 10 | 10 | | 10 | | |
| 1944 | 10 | 15 | | 10 | | |
| 1945 | 30 | 5 | | 6 | | |
| 1946 | | 1 | | 25 | | |
| | | | | | | |
| Total | 141 | 134 | 30 | 59 | | 12 |

| | Bonaparte's Gull | Bonaparte's Gull | | Common Tern | Common Tern | Common Tern |
|---|---|---|---|---|---|---|
| Year | Wilderness Park | Duncan | | Cecil Bay | Duncan | Grass |
| 1924 | | | | | | |
| 1925 | | | | | | |
| 1926 | | | | | | |
| 1927 | | | | | | |
| 1928 | | | | | | |
| 1929 | | | | | | |
| 1930 | | | | | | |
| 1931 | | | | 20 | 10 | |
| 1932 | | | | | | |
| 1933 | | 2 | | | 12 | |
| 1934 | | | | | | |
| 1935 | | | | 10 | | |
| 1936 | | 1 | | 23 | | |
| 1937 | | | | 30 | | |
| 1938 | | | | 35 | | |
| 1939 | | | | 40 | | |
| 1940 | | | | | | |
| 1941 | | | | | 20 | |
| 1942 | | | | 40 | 3 | 3 |
| 1943 | | | | 20 | 10 | |
| 1944 | | | | 50 | 6 | 3 |
| 1945 | | | | 10 | 6 | |
| 1946 | 1 | | | | | |
| | | | | | | |
| Total | 1 | 3 | | 278 | 67 | 6 |

| | Common Tern | | Caspian Tern | Caspian Tern | Caspian Tern | Caspian Tern | |
|---|---|---|---|---|---|---|---|
| Year | Wilderness | | Cecil Bay | Duncan | Grass | Wilderness Park | |
| 1924 | | | | | | | |
| 1925 | | | | | | | |
| 1926 | | | | | | | |
| 1927 | | | | | | | |
| 1928 | | | | | | | |
| 1929 | | | | | | | |
| 1930 | | | | | | | |
| 1931 | | | | | | | |
| 1932 | | | | | | | |
| 1933 | | | 2 | | | | |
| 1934 | | | | | | | |
| 1935 | | | | 3 | | | |
| 1936 | | | | | | | |
| 1937 | | | | | | | |
| 1938 | | | | | | | |
| 1939 | | | | | | | |
| 1940 | | | | | | | |
| 1941 | 2 | | 2 | 6 | 6 | 3 | |
| 1942 | 10 | | 2 | 1 | 6 | 16 | |
| 1943 | | | | 6 | 1 | | |
| 1944 | 10 | | | | | | |
| 1945 | 15 | | 5 | | | 18 | |
| 1946 | | | | | | 33 | |
| | | | | | | | |
| Total | 37 | | 11 | 16 | 13 | 70 | |

| | Black Tern | | Belted Kingfisher | Belted Kingfisher | Belted Kingfisher | Belted Kingfisher |
|---|---|---|---|---|---|---|
| | | | | | | |
| Year | Duncan | | Cecil Bay | Duncan | Grass | Wilderness Park |
| | | | | | | |
| 1924 | | | | | | |
| 1925 | | | | | | |
| 1926 | | | | | | |
| 1927 | | | | | | |
| 1928 | | | | | | |
| 1929 | | | | | | |
| 1930 | | | | | | |
| 1931 | | | | | | |
| 1932 | | | | | | |
| 1933 | | | | | | |
| 1934 | 10 | | | | | |
| 1935 | | | | | | |
| 1936 | | | | | | |
| 1937 | | | | | | |
| 1938 | | | | | | |
| 1939 | | | | | | |
| 1940 | | | | | | |
| 1941 | | | 1 | 2 | 2 | 1 |
| 1942 | | | 1 | 1 | | 2 |
| 1943 | 12 | | 2 | 2 | | |
| 1944 | 3 | | 2 | | 2 | 1 |
| 1945 | 5 | | | 4 | | |
| 1946 | 4 | | | 2 | | 2 |
| | | | | | | |
| Total | 34 | | 6 | 11 | 4 | 6 |

| | | Long-billed Marsh Wren | | Short-billed Marsh Wren | Short-billed Marsh Wren |
|---|---|---|---|---|---|
| | | | | | |
| Year | | Cecil Bay | | Duncan | Cecil Bay |
| | | | | | |
| 1924 | | | | | |
| 1925 | | | | | |
| 1926 | | | | | |
| 1927 | | | | | |
| 1928 | | | | | |
| 1929 | | | | | |
| 1930 | | | | 2 | |
| 1931 | | | | | |
| 1932 | | | | | |
| 1933 | | | | 3 | |
| 1934 | | | | 6 | |
| 1935 | | | | | |
| 1936 | | | | 3 | |
| 1937 | | | | 4 | |
| 1938 | | | | 4 | |
| 1939 | | | | 3 | |
| 1940 | | | | 3 | |
| 1941 | | | | 4 | 3 |
| 1942 | | | | | |
| 1943 | | | | | |
| 1944 | | 5 | | 4 | |
| 1945 | | | | | |
| 1946 | | | | 2 | |
| | | | | | |
| Total | | 5 | | 38 | 3 |

| | Total |
|---|---|
| | |
| Year | |
| | |
| 1924 | 17 |
| 1925 | 1 |
| 1926 | 0 |
| 1927 | 0 |
| 1928 | 0 |
| 1929 | 6 |
| 1930 | 25 |
| 1931 | 106 |
| 1932 | 55 |
| 1933 | 81 |
| 1934 | 103 |
| 1935 | 151 |
| 1936 | 183 |
| 1937 | 157 |
| 1938 | 128 |
| 1939 | 155 |
| 1940 | 130 |
| 1941 | 222 |
| 1942 | 237 |
| 1943 | 151 |
| 1944 | 324 |
| 1945 | 201 |
| 1946 | 438 |
| | |
| Total | 2871 |

TABLE 3

| Bird | 1909 | 1910 | 1911 | 1912 | 1913 | 1914 | 1915 | 1916 | 1917 | 1918 | 1919 | 1920 | 1921 | 1922 | 1923 | 1924 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | |
| Pied-billed Grebe | | 1 | 1 | 1 | | | 1 | | | | 1 | | 1 | 1 | 1 | 1 |
| Great Blue Heron | | 1 | | | 1 | | 1 | 1 | 1 | | 1 | 1 | | 1 | 1 | 1 |
| Green Heron | | | | | | | | | | | | | | | | |
| American Bittern | | 1 | 1 | | | | 1 | 1 | | | 1 | 1 | | 1 | 1 | 1 |
| Least Bittern | | | | | | | | | | | | | 1 | | 1 | 1 |
| Osprey | | | 1 | 1 | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Virginia Rail | | | | | 1 | | 1 | | 1 | 1 | 1 | | 1 | 1 | 1 | 1 |
| Sora | | | | | | | | | | | | 1 | 1 | | | |
| Florida Gallinule | | | | | | | | | | | | | 1 | | | |
| American Coot | | | | | | | | | | | | | | | | |
| Piping Plover | | | | | | | | | | | | | | | | 1 |
| Semipalmated Plover | | | | 1 | | | | | | | | | 1 | | | |
| Killdeer | | 1 | 1 | 1 | 1 | | 1 | 1 | | 1 | 1 | 1 | | 1 | 1 | 1 |
| Black-bellied Plover | | | | | | | | | | | | | | | | |
| Wilson's Snipe | | | | | | | | | | | | | | | | 1 |
| Upland Plover | | | | | | | | | | | | | | | | |
| Spotted Sandpiper | | 1 | 1 | 1 | | | 1 | 1 | 1 | | 1 | 1 | | 1 | 1 | 1 |
| Solitary Sandpiper | | 1 | 1 | | | | 1 | 1 | | | 1 | | | 1 | | |
| Willet | | | | | | | | | | | | | | | | |
| Greater Yellow-legs | | 1 | | | | | | | | | | | | | 1 | |
| Lesser Yellow-legs | | 1 | | | | | | | | | 1 | | 1 | | | |
| Pectoral Sandpiper | | | | | | | | | | | | | | | | |
| Baird's Sandpiper | | | | | | | | | | | | | | | | |
| Least Sandpiper | | | | | | | | 1 | | | | | 1 | | | 1 |
| Red-backed Sandpiper | | | | | | | | | | | | | | | | |
| Eastern Dowitcher | | | | | | | | | | | | | | | | |
| Stilt Sandpiper | | | | | | | | | | | | | | | | |
| Semipalmated Sandpiper | | 1 | | | | | | | | | | | 1 | | | |
| Buff-breasted Sandpiper | | | | | | | | | | | | | | | | |
| Sanderling | | | | | | | | | | | | | | | | |
| Herring Gull | | | | | | | 1 | 1 | 1 | | 1 | 1 | | 1 | 1 | 1 |
| Ring-billed Gull | | | | | | | | | | | | | | | 1 | 1 |
| Bonaparte's Gull | | 1 | | | | | | | | | | | | | | 1 |
| Common Tern | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 1 | | 1 | 1 | 1 |
| Caspian Tern | | 1 | | 1 | | | 1 | 1 | | | 1 | 1 | | 1 | 1 | 1 |
| Black Tern | | | | | | | | | | | | | 1 | | | 1 |
| Belted Kingfisher | | 1 | 1 | 1 | | | 1 | 1 | 1 | | 1 | 1 | | 1 | 1 | 1 |
| Long-billed Marsh Wren | | | | | | | | | | | | | 1 | | | |
| Short-billed Marsh Wren | | 1 | | | | | | | | | | | 1 | | | |
| Yellow Warbler | | | | 1 | | | 1 | | | | | 1 | | 1 | 1 | 1 |
| Red-winged Blackbird | 1 | 1 | | | | | 1 | | 1 | 1 | 1 | 1 | | 1 | 1 | 1 |
| Total Species Observed | 2 | 15 | 8 | 9 | 4 | 0 | 14 | 11 | 8 | 5 | 13 | 12 | 13 | 14 | 16 | 20 |

TABLE 3

| Bird | 1925 | 1926 | 1927 | 1928 | 1929 | 1930 | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 | 1938 | 1939 | 1940 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | |
| Pied-billed Grebe | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Great Blue Heron | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Green Heron | | | | | | | | | | | | | | | | 1 |
| American Bittern | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Least Bittern | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Osprey | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Virginia Rail | 1 | | | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Sora | 1 | | 1 | 1 | 1 | | | | 1 | 1 | | | 1 | 1 | 1 | |
| Florida Gallinule | | | | | | 1 | | | | | 1 | | | 1 | 1 | |
| American Coot | | | 1 | | 1 | 1 | 1 | | 1 | 1 | | | 1 | 1 | 1 | 1 |
| Piping Plover | | 1 | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Semipalmated Plover | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Killdeer | 1 | 1 | 1 | 1 | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Black-bellied Plover | | | | | | 1 | 1 | | | | 1 | 1 | 1 | 1 | 1 | 1 |
| Wilson's Snipe | | 1 | | | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Upland Plover | | 1 | | | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Spotted Sandpiper | 1 | 1 | 1 | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 |
| Solitary Sandpiper | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 |
| Willet | | | | | | | | | | | | 1 | | | | |
| Greater Yellow-legs | | | | | | | | 1 | | 1 | 1 | 1 | | | 1 | 1 |
| Lesser Yellow-legs | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 |
| Pectoral Sandpiper | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Baird's Sandpiper | | | | | | | | | 1 | | | 1 | 1 | | 1 | 1 |
| Least Sandpiper | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 |
| Red-backed Sandpiper | | | | | | | | | | | | | 1 | | | 1 |
| Eastern Dowitcher | | | | | | | | | | 1 | | | 1 | | | |
| Stilt Sandpiper | | | | | | | | | | | | | | | 1 | 1 |
| Semipalmated Sandpip | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Buff-breasted Sandpipe | | | | | | | 1 | | | | | 1 | | | | |
| Sanderling | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 |
| Herring Gull | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 |
| Ring-billed Gull | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Bonaparte's Gull | | 1 | | | | | 1 | | 1 | | | 1 | 1 | | | |
| Common Tern | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Caspian Tern | 1 | 1 | 1 | 1 | 1 | | | | 1 | 1 | 1 | | | 1 | 1 | 1 |
| Black Tern | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Belted Kingfisher | 1 | 1 | | 1 | | 1 | 1 | 1 | | 1 | 1 | | 1 | 1 | | |
| Long-billed Marsh Wren | | | | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Short-billed Marsh Wre | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Yellow Warbler | 1 | 1 | | 1 | 1 | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Red-winged Blackbird | 1 | 1 | | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Total Species Observed | 16 | 19 | 14 | 18 | 22 | 21 | 25 | 24 | 26 | 32 | 31 | 32 | 34 | 27 | 30 | 33 |

TABLE 3

| Bird | 1941 | 1942 | 1943 | 1944 | 1945 | 1946 |
|---|---|---|---|---|---|---|
| | | | | | | |
| Pied-billed Grebe | 1 | 1 | | | | |
| Great Blue Heron | 1 | 1 | | | | |
| Green Heron | 1 | 1 | | | | |
| American Bittern | 1 | 1 | 1 | 1 | 1 | 1 |
| Least Bittern | 1 | 1 | 1 | 1 | 1 | 1 |
| Osprey | 1 | 1 | 1 | 1 | 1 | |
| Virginia Rail | 1 | 1 | | 1 | 1 | 1 |
| Sora | 1 | 1 | 1 | 1 | 1 | 1 |
| Florida Gallinule | 1 | | | | | |
| American Coot | 1 | | | | | |
| Piping Plover | 1 | 1 | 1 | | | 1 |
| Semipalmated Plover | 1 | 1 | | 1 | | 1 |
| Killdeer | 1 | 1 | 1 | 1 | 1 | 1 |
| Black-bellied Plover | 1 | 1 | | 1 | | 1 |
| Wilson's Snipe | 1 | 1 | 1 | 1 | 1 | 1 |
| Upland Plover | 1 | 1 | 1 | 1 | 1 | 1 |
| Spotted Sandpiper | | 1 | 1 | 1 | 1 | 1 |
| Solitary Sandpiper | 1 | 1 | 1 | 1 | 1 | 1 |
| Willet | | | | | | |
| Greater Yellow-legs | 1 | 1 | 1 | 1 | | |
| Lesser Yellow-legs | 1 | 1 | 1 | 1 | 1 | 1 |
| Pectoral Sandpiper | 1 | 1 | | 1 | | 1 |
| Baird's Sandpiper | 1 | 1 | | | | 1 |
| Least Sandpiper | 1 | 1 | 1 | 1 | 1 | 1 |
| Red-backed Sandpiper | | | | | | |
| Eastern Dowitcher | 1 | | | 1 | | 1 |
| Stilt Sandpiper | | | | | | |
| Semipalmated Sandpip | 1 | 1 | | 1 | 1 | 1 |
| Buff-breasted Sandpipe | | | | | | |
| Sanderling | 1 | 1 | | 1 | | |
| Herring Gull | 1 | 1 | 1 | 1 | 1 | 1 |
| Ring-billed Gull | 1 | 1 | 1 | 1 | 1 | 1 |
| Bonaparte's Gull | 1 | | | | | 1 |
| Common Tern | 1 | 1 | 1 | 1 | 1 | 1 |
| Caspian Tern | 1 | 1 | 1 | 1 | 1 | 1 |
| Black Tern | 1 | 1 | 1 | 1 | 1 | 1 |
| Belted Kingfisher | 1 | 1 | 1 | 1 | 1 | 1 |
| Long-billed Marsh Wren | 1 | 1 | 1 | 1 | 1 | 1 |
| Short-billed Marsh Wre | 1 | 1 | 1 | 1 | 1 | 1 |
| Yellow Warbler | 1 | | | | | |
| Red-winged Blackbird | 1 | | | | | |
| Total Species Observed | 36 | 31 | 21 | 27 | 21 | 27 |

**Table 4**

Birds Seen at Cecil Bay

American Crow, Common Loon, Double-crested Cormorants, Gray Catbird, Red-breasted Nuthatch, Cedar Waxwing, Eastern Kingbird, American Goldfinch, Caspian Tern, Ring-billed Gull, Herring Gull, Mute Swan, Black-capped Chickadee, Red-eyed Vireo

Birds Seen at Cheboygan Marsh

Common Loon, Double-crested Cormorant, Great Blue Heron, Mute Swan, Canada Goose, Mallard, Red-breasted Merganser, Turkey Vulture, Osprey, Killdeer, Rose-breasted Grosbeak, Song Sparrow, Red-winged Blackbird, Brown-headed Cowbird, American Goldfinch, Ring-billed Gull, Herring Gull, Caspian Tern, Common Tern, Mourning Dove, Belted Kingfisher, Northern Flicker, Eastern Kingbird, Tree Swallow, Barn Swallow, Blue Jay, American Crow, Black-capped Chickadee, American Robin, Gray Catbird, Cedar Waxwing, Warbling Vireo, Red-eyed Vireo, Yellow Warbler, Common Yellowthroat

*APPENDIX ONE:*

<u>**Summary of Breeding Habitat Preferences for Northern Michigan Wetland Birds**</u>
(information gathered from Michigan's Breeding Birds Survey and the Birder's Handbook)

**Common Loon** *(Gavia immer)* – The Loon nests on the edges of lakes ranging from 4 ha to >1000 ha, requiring a substantial amount of fish and a large percentage of shoreline unoccupied by humans ( BBM). Sheltered bays or coves present the preferred space for nursery care. A low level of human activity on the lake is extremely important through the May-June nesting season. The Great Lakes provide important feeding grounds for non-breeding birds in the summer, and also migrating birds during migration.

***Pied-billed Grebe*** *(Podilymbis podiceps)*– This Grebe is tolerant of smaller lake areas (as small as half an acre), requiring emergent vegetation in which they build their nests, and water substantially deep (at least 30 cm) for foraging. They make their nests using the emergent vegetation to create a floating structure. They nest in shallow water, so fluctuating water levels, wave action, and predation by raccoons are the most frequent causes of breeding failure.

**Double-crested Cormorant** *(Phalacrocorax auritus)* – The Cormorant is a colonial breeder, placing up to twenty nests in a single tree. Due to their high breeding population density these birds are safest nesting on small, off shore islands vacant of predators. When this idyllic condition is not present Cormorants will nest on the rocky coast of larger lakes and, possibly, rivers. They are diving birds, propelled by webbed feet, so they are able to utilize a prey base at any depth.

***American Bittern (Botaurus lentiginosus)***- This heron relative nests in large marshes on lake or pond edges. This bird utilizes *Typha* and *Scirpus* primarily, but will nest in *Chamaedaphne* and even upland hayfields when nothing else seems readily available. The nests are slightly elevated, usually in shallow water, but occasionally on land. The Bittern is known for its secretive behavior.

***Least Bittern*** *(Ixobrycus exilis)* – In comparison with the American Bittern, the Least prefers deeper water (though still remaining under 1 meter) and heavier emergent vegetation. Cattails, bulrushes, wild rice, burweed, water smartweed and reeds are the main feeding sites for this Bittern. The nests are platforms emerging up to ¾ of a meter above the water, and are often found in "scattered colonies". While these nests are built higher, they still remain concealed by tall, semi-aquatic vegetation. The Great Lakes coastal marshes provide prime habitat for these birds.

***Great Blue Heron*** *(Ardea herodias)*– These birds are the quintessence of a colonial nester. In Michigan all nests are found in trees (mostly deciduous hardwoods in the south, and conifer forests with softer deciduous trees in the north), though in other areas these birds may nest on the ground. The variable diet of the Great Blue Heron provides it with a relatively flexible habitat range, though, while nesting, these birds will always choose an area where fish and amphibians are present in reasonable numbers.

***Green-backed Heron*** *(Butorides striatus)* – This Heron strongly prefers edge habitat of wetter woodlands. The interior of a large stand is never used, even if the forest floor may be wet. The nest is elevated, and usually placed in a thick, shrubby tree. Nests by be found alone or in colonies. The colonies in Michigan never contain more than twenty pairs.

**Black-crowned Night-heron** *(Nycticorax nycticorax)* – The Night-heron is considered a transitional bird. It is found in younger forests that contain more shrubs than larger trees. As these shrubs may be replaced with a more mature forest, the birds will be replaced with the Great Blue Heron or Great Egrets. This bird nests in colonies that seem to be perennially inhabited. The birds will keep returning to the same site until the more mature forest takes over and, essentially, evicts them.

**Mute Swan** *(Cygnus olor)*– The Mute Swan feeds primarily on submerged vegetation. This forces it to nest on marshy edges of lakes or ponds. The water depth is very important to them, as it determines their foods source and abundance. They will often use the abandon house of the muskrat as a nest. If a nest is built, it is built in a dense cattail stand and consists of vegetation and muck creating a "nest mound".

**Canada Goose** *(Branta canadensis)*– Geese require a decent amount of open water to make a comfortable nesting habitat. Its nests are similar to those of the mute swan, in cattail stands and often consisting of abandoned muskrat houses or beaver lodges. The second requirement for the geese is an upland area suitable for grazing.

**Wood Duck** *(Aix sponsa)*– This Duck is a cavity nester, nesting in trees up to one mile away from their food and water source. The young are taken to well sheltered wet areas for foraging. As they grow older, they are found more commonly in open water. Nearly all (90%) of the sightings of this duck occur during foraging in open water, or open wetlands.

**Green-winged Teal** *(Anas crecca)*– This dabbling duck nests upland, but usually within 100 meters of the water. The simple requirement these birds insist upon for brood rearing is a high protein diet. Mudflats, shallow wetlands and flooded fields provide a sufficient habitat.

**American Black Duck** *(Anas rubripes)*– This duck is considered to be an upland species, though nests are never found further than a few meters away from water. Forested swamps are often used, and the nest may be found in tree cavities, on sedge hummocks, bog mats or even muskrat houses. The water level near the nest needs to be stable. In areas were drought affects the water level near the nest, breeding failure is likely to occur. Beaver floodings provide good habitat conditions for brood rearing.

**Mallard** *(Anas platyrhynchos)*– The perfect habitat for the Mallard might be a wetland complex, consisting of a large permanent pool surrounded by a few shallows which may or may not be dried up. The small shallows are often used for courtship, and if a female nests by one without a permanent pool she may have to lead her hatchlings great distances for food. The Mallard is a quirky bird though. Nest have been found in deep forest interior, ornamental landscape plantings, and even in raised flower boxes.

**Blue-winged Teal** *(Anas discors)*– This bird nests with grasses or sedges, preferably bluegrass. The nest is made within 100 meters of a semi-permanent water source. Seasonal wetlands are sufficient. The abundance of aquatic insects and other invertebrates is essential.

**Red-breasted Merganser** *(Mergus serrator)*– Islands covered with dense shrubs close to shore in the northern Great Lakes, or larger inland rivers provide the main habitat for the Red-breasted Merganser. This bird likes to nest in the middle of a clump of red osier dogwood or elder. The nest is then lined with feathers (possibly from other waterbirds).

***Osprey*** *(Pandion haliaetus)*– In Michigan's Lower Peninsula, the Osprey nests mainly on the nesting platforms provided in appropriate habitat. This habitat includes large expanses of open water, shallow enough for fishing. Shoreline marshes provide a perfect situation, as do inland conifer swamps. In a natural setting, Osprey's have been known to nest a couple miles from the nearest foraging site. This probably occurs when the proper tree for the nest isn't found elsewhere.

***Virginia Rail*** *(Rallus limicola)*– This rail, like others, requires only freshwater and emergent vegetation. A large variance in the size of the water body utilized is often seen. They have been seen in roadside ditches, and also large coastal marshes. These birds are capable of using extremely small areas of habitat. The population density can be extremely high (5 Virginia Rail and 4 Sora in a half an acre). While both of these birds utilize similar habitats, the Virginia Rail seems to prefer it a bit drier.

***Sora*** *(Porzana carolina)*– As stated above, the single requirement this bird has is shallow freshwater and emergent vegetation. This bird likes slightly wetter conditions than the Virginia Rail. This bird feeds on the seeds of Sedges and Bulrushes. It is well adapted to foraging through deeper waters, and is occasionally seen walking on the floating leaves of *Nymphaea* and *Nuphar*.

***Common Moorhen*** *(Gallinula chloropus)*– This bird prefers deeper waters with more densely packed vegetation. Like most other waterfowl, this bird relies heavily on invertebrates and insects found in the shallows, but is able to incorporate large amounts of plant matter into its diet. The nests are built on the surface of the water, held stable by surrounding vegetation. The nests may sit 10 cm above the water, and may be built up during times of flood. The water snake is an important predator of the eggs.

***American Coot*** *(Fulica americana)*– Marshy areas or deep bogs surrounded by dense vegetation is appropriate habitat for the Coot. During breeding this bird always nest by fresh water, though during migration it may be found on salt water. This bird is extremely territorial, frequently attacking larger birds and mammals that enter its territory. This behavior is less for resource protection than for pair bonding.

**Sandhill Crane** *(Grus canadensis)* – A variety of wetland types provide suitable habitat for the Sandhill Crane. Leatherleaf and Sphagnum are common components of the nest, as nutrient poor fens are a common site. Urbanization has edged up to the habitat of this bird. They are now often seen near newer suburbs, Golf courses and other types of development. These birds utilize a large territory for foraging, and are very territorial. They have been known to defend a territory of up to 53 hectares. Upland areas are suitable for foraging.

***Piping Plover*** *(Charadrius melodus)* – This small shorebird is very particular about its nesting site. It requires a sandy shore with scattered cobble in which to lay it's eggs. The Piping Plover pushes the cobble together to form a small nest, and then relies on its inconspicuous coloration for protection against predators. The habitat of this Plover has been disappearing rapidly, and this is reflected in the population numbers. This bird is endangered and has little hope of surviving in the Great Lakes region.

**Killdeer** *(Charadrius vociferus)*– This plover relative is known for its use of open areas for foraging and for nesting. Disturbed shorelines and uplands provide suitable habitat as long as daily human activity isn't too obtrusive. Its versatility when it comes to nest sites has allowed for this bird to see great success recently.

**Spotted Sandpiper** *(Actitus macularia)–* General open areas in close proximity to permanent or temporary bodies of water provide acceptable nesting habitat for this shore bird. Its foraging is done anywhere an abundance of invertebrates may be found.

***Common Snipe*** *(Gallinago gallinago)–* This shorebird nests in organic soils often including peat and sphagnum. Michigan is in the southern range of this birds breeding habitat. The vegetation surrounding nesting areas is usually discontinuous, consisting of sparse shrub cover with sedges and *Chamaedaphne*. Much of the suitable habitat in Michigan has been destroyed, and overall records reflect this in its population size.

**Sanderling** *(Calidris alba)* - This groundnester uses the lichens and sedge scraps from dryer sedge wetlands to cushion its eggs. The Sanderling does well with exposed shoreline. It gleans marine invertebrates of the ground (within 10mm of the surface). As lake levels decrease, this bird should appear.

**Ring-billed Gull** *(Larus delawarensis)–* This bird has an extraordinary capacity for adapting to different habitat types. They always nest on islands, sometimes barren of all vegetation, other times, filled with dense cover. When they nest on a vegetated island they often kill off the plants with their feces. The average nest density is about 4,500 per hectare. The numbers can rise from there, possibly up to a phenomenal 20,000 nests per hectare. The nests are placed on the ground and very close together. They have recorded the greatest population growth over the longest period of time for any great lakes species.

**Herring Gull** *(Larus argentatus)*– Once the most abundant Gull of the Great Lakes, the Herring Gull has since been replaced by the Ringed-billed. Ground predators have caused problems for these birds, and are now only nesting on isolated off-shore islands. This gull, unlike the Ring-billed, requires larger territories for nesting. Usually containing light vegetation content, occasionally this nest is found as a simple depression in the sand.

**Caspian Tern** *(Sterna caspia)*– For nesting, this bird requires a sandy or light cobbled beach with little predation. Any large body of water with a decent fish population will provide suitable foraging habitat.

**Common Tern** *(Sterna hirundo)*– Historically, the Common Tern prefers identical habitat to the Caspian Tern. Due to extensive loss of suitable habitat in Michigan, this bird has been pushed into marshy areas. The higher water levels of the 1980's caused a significant decline in breeding sites, and thus, the population of the Common Tern.

***Black Tern*** *(Chlidonias niger)*– The prime habitat for the Black Tern is amongst the dense vegetation surrounding smaller pools in marshes. The water level requirements of this Tern are strict; they have been known to colonize and abandon areas drier or wetter conditions are produced (this is what has taken place at the Cheboygen Marsh). Large areas of open water are not preferred by this bird. Human impact has destroyed much of the suitable habitat in the Midwest.

***Sedge Wren*** *FF(Cistothorus platensis)–* Upland wet meadows, and sedge covered wetlands provide prime habitat for this small songbird. Since humans have converted much of this habitat into farmland, this wren has been found nesting in the wetter of the hayfields. *Solidago*, *Aster* and Vervain are often present in the territory defended during the late breeding season.

***Marsh Wren*** *(Cistothorus palustris)–* Narrow-leaved Cattail and cord-grass wetlands tend to attract high numbers of the Marsh Wren. The male is very territorial, and may build up to six separate nests to attract multiple mates. The condition of the territory he is guarding determines his aggression. Once very abundant in Michigan, this species has experienced an obvious decline in its population.

***Yellow Warbler*** *(Dendroica petechia)–* Streams and ponds providing shores with dense shrub layers make up the ideal habitat for the Yellow Warbler. These passerines feed on caterpillars and other insects abundant in this shrubby habitat.

***Swamp Sparrow*** *(Melospiza georgiana)–* This Sparrow prefers wetlands of sedges, grasses, and cattails. Occasionally a nest will be found in a shrubby wetland. Seeds and insects are both used for feeding. Little is known about the specific behavior and requirements of this bird, while it maintains an extremely secretive life style.

***Red-winged Blackbird*** *(Agelaius phoeniceus)–* Dense roadside cattail stands provide the quintessence of what we consider to be prime Red-winged Blackbird habitat. While this is the most common place that we see them, they, in fact, nest in a wide variety of habitats ranging from saltwater to freshwater, stream sides to dry fields, even swamps and pastures. Males are very visibly territorial, though populations seem to form in loose colonies. Though seemingly very abundant today, records show that the Red-winged Blackbird has experienced a 15% population decline since 1966.

*Italicized and bold print denotes the best indicators of habitat and most likely to be sensitive to water level changes

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