Influential Factors of Waterfowl Habitat Selection

for Field Biology EPOB 4630
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by

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and
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Abstract

Data was collected on waterfowl, American coot, and Pied-billed Grebe on the Sawhill Ponds Wildlife Preserve in Boulder, Colorado. Four ponds were compared for their abundance of birds. Dabbling ducks (*Anas platyrhynchos, Anas strepera, Anas Americana, Anas clypeata, Anas discors, Anas crecca, Anas cyanoptera, Aix sponsa*), diving ducks (*Aythya collaris, Mergus merganser*), geese (*Branta canadensis*), grebes (*Podilymbus podiceps*), and coot (*Fulica americana)* were observed. The study found that pond area and amount of vegetation had a significant positive correlation to the number of waterfowl at the site. The number of macroinvertebrates was determined to have a negative correlation to number of waterfowl, but wasn't significant. Pond area and cover positively influenced the prescence of macroinvertebrates but was also not significant. Using this data, some species of waterfowl were found to have a significant preference toward certain sites.

Introduction

Studies over the last five years have researched the effect of biotic and abiotic factors on the species richness of waterfowl. A study on fish impacts revealed that when fish were removed from gravel lakes, the macroinvertebrate populations increased leading to an overall increase in waterfowl usage (N. Giles, 1994). Anther study looked at various pond features and found that pond area was the most significant factor in numbers of aquatic birds present (Savard, Boyd, Smith, 1994). Food selection, in particular submerged macroyphytes, and nest sites are also critical factors in habitat selection (Wicker, Endres, 1995). Other studies have examined the influence of abiotic factors, such as percent of dissolved nitrogen and phosphorus. While some influence by abiotic factors was found, one author admitted that more work needs to be done on experimental approaches in the relationship between waterfowl and habitat (Savard, Boyd, Smith, 1994).

The Sawhill Ponds are a result of a gravel mining operation and reclamation project. The mining operation left sixteen ground cavities in the region, which were of different sizes and depths. Groundwater and precipitation filled in these areas and created a pond environment. As a result, a wide variety of wetland wildlife are attracted to the area. Specifically, waterfowl and other water birds have been observed using this habitat.

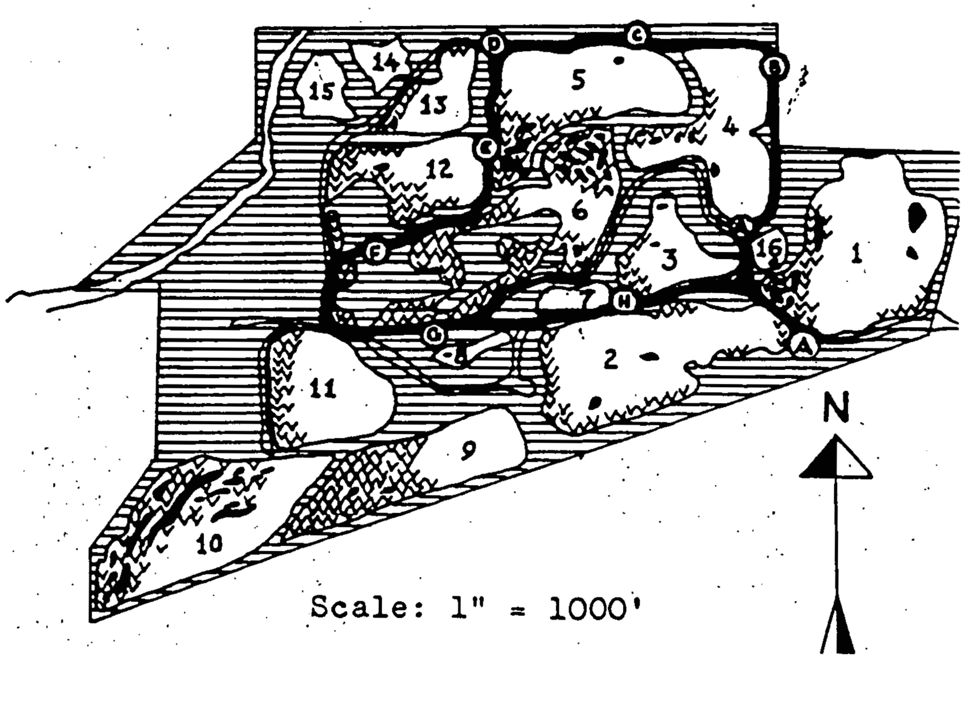
This study will contribute to wetland research and management by providing more data and information on the relationship between waterfowl and the habitat that they use. Freshwater aquatic systems are crucial for survival and breeding of migrating waterfowl, but because of development and increased recreational use, these areas are shrinking. The agencies that manage this fragile resource need as much information as possible to make informed decisions on how to best balance these uses. Based on previous research, this study should show that pond area and food abundance will have a significant positive impact on waterfowl habitat selection.

Methods

Study Area and Equipment

The study area is the Sawhill Ponds Wildlife Preserve in Boulder Colorado. Surveys were conducted during April 1996. The vegetation is characterized by open grassland with mixed stands of cottonwood, willow, and cattail. Four ponds were selected randomly. These were pond numbers one, five, twelve, and fourteen (see fig. 1). To observe the waterfowl, a pair of porro prism binoculars, a pair of roof prism binoculars, and a spotting scope were used. Macroinvertebrates were captured with a seine net and counted with a naked eye in a holding pan. The <u>Golden Guide to Field Identification of North American Birds</u> was used to identify bird species.

Figure 1.



Bird Survey and Data Collection

Surveys were conducted over a three week period. Each pond was visited for a total of nine times. Three times at 6:00 a.m., three times at noon, and three times at 6:00 p.m. Effort was made to minimize disturbing the waterfowl at each site, by using vantage points and optical equipment. At each site, the number and species of all visible waterfowl was recorded. To collect data on macroinvertebrate numbers, a net was moved through the water for a distance of approximately three feet along the shore line. This collection of organisms was placed in a pan and the total number of organisms was counted. Pond sizes were ranked relative to one another with the largest being assigned a value of four, while the smallest a value of one. Also, the amount of vegetation was ranked on a similar system, with the pond with the most vegetation being given the rank of four and the least with a value of one.

Data Analysis

The data was analyzed using the JMP statistical computer package. The total number of birds per pond was compared to pond area, vegetation cover, and macroinvertebrates using nominal logistic regression analysis. Macroinvertebrates were compared to pond area and vegetation cover also using regression analysis. Distribution of waterfowl among the four ponds was analyzed using analysis of variance (ANOVA).

Results

Pond Area and Waterfowl Distribution

A comparison of pond area and waterfowl abundance found that there is a positive correlation between these two factors. The ponds observed were found to have increased numbers of waterfowl and diversity as the pond area increased. A p-value $<.05$ ($p= .0001$) was obtained and significance established (see fig. 2).

Pond Vegetation Cover and Waterfowl Distribution

Pond vegetation cover was compared with the number of waterfowl present. A positive correlation was found. As the amount of vegetation cover increased, the number and diversity of waterfowl also increased. To obtain significance, a p-value $<.05$ ($p = .0001$) was determined (see fig. 3).

Macroinvertebrates and Waterfowl Distribution

The number of macroinvertebrates was used in a comparison with three types of data; pond size, pond vegetation cover, and total number of birds. When used to compare pond area and vegetation cover, the data showed that there is a positive correlation between both area and cover with respect to total number of macroinvertebrates. This value was not significant however ($p = .054$). The comparison for total birds and macroinvertebrates gave a negative correlation, but again there was no significance ($p = .29$) (see figures 4-6).

Waterfowl Pond Preference

An analysis of variance showed that some waterfowl have a preference of one pond over the others. Canada Goose, American Coot, American Widgeon, Cinnamon Teal, Gadwall, Pied-billed Grebe, and Mallards were found more frequently on certain ponds over others. These waterfowl had a significant preference to which pond they inhabited most often (see fig. 7). In general, these birds inhabited larger, more vegetated ponds.

Conclusion

This study is a preliminary look at the waterfowl composition of Sawhill Ponds Wildlife Preserve. According to the original hypothesis, pond area did in fact have a significant impact on waterfowl habitat selection, however, the presence of macroinvertebrates did not show any significance in waterfowl distribution. There was a positive correlation between pond area and cover to numbers of macroinvertebrates but, a negative correlation was found between macroinvertebrates and waterfowl numbers. Because of the lack of significance, the presence of macroinvertebrates at the site was not a contributing factor to the habitat selection of the waterfowl. Other food sources such as macrophytes, fish, or seeds may be consumed more. Pond vegetation cover was not originally thought to be a contributing factor, but the data shows that it is a significant factor at this site.

The study demonstrated the need for further research into waterfowl habitat selection. The various factors analyzed in this study showed that while many variables exist in habitat selection, pond area and vegetation cover are of significant importance. One problem with analyzing this type of data is the realization that some of these independant factors are related to one another. For example, the number of macroinvertebrates declines significantly in the prescence of fish (Giles, 1994). Yet, macroinvertebrates are a critical food source for fledgling ducks (Staicer, 1994). Other influencing factors include submerged macrophytes (Wicker, 1995) and pond age. More specifically, older ponds might be more attractive to waterfowl because they have had more time for submerged aquatic vegetation to be colonized (Erwin, 1994). One factor that should be looked at more carefully in future studies is the time of year the study is done and at what phase migration is in. Some waterfowl in the spring consume more invertebrates while in the fall seeds are the chosen food source (Thorn, Zwank, 1994). There is the possibility that the waterfowl are eating enough macroinvertebrates to influence the total number collected by researchers. In addition, the topographic and spatial distribution of the macroinvertebrates in the pond should be studied. Pond chemistry, water depth, aquatic plant composition, and time of year also affect invertebrate numbers and variety. Numerous methods utilize the analysis of stomach contents to determine precisely what the waterfowl are eating. Finally, competition in the form of territorial behavior between waterfowl species can effect resource use (Savard, 1994). The goal then is to gain a better understanding of the relationships between habitat features and bird diversity and abundance in aquatic systems.

Fig. 2

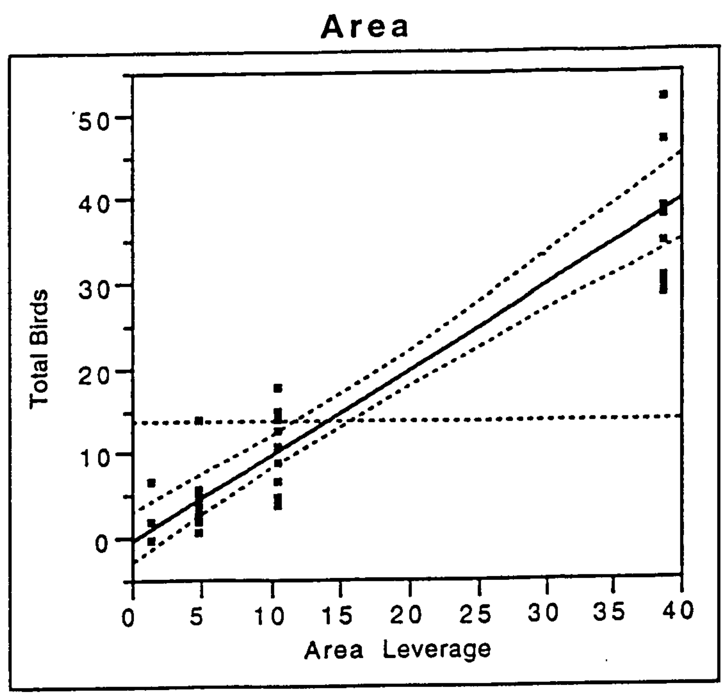

Area
Total Birds
50
40
30
20
10
0
0
5
10
15
20
25
30
35
40
Area Leverage

Fig. 3

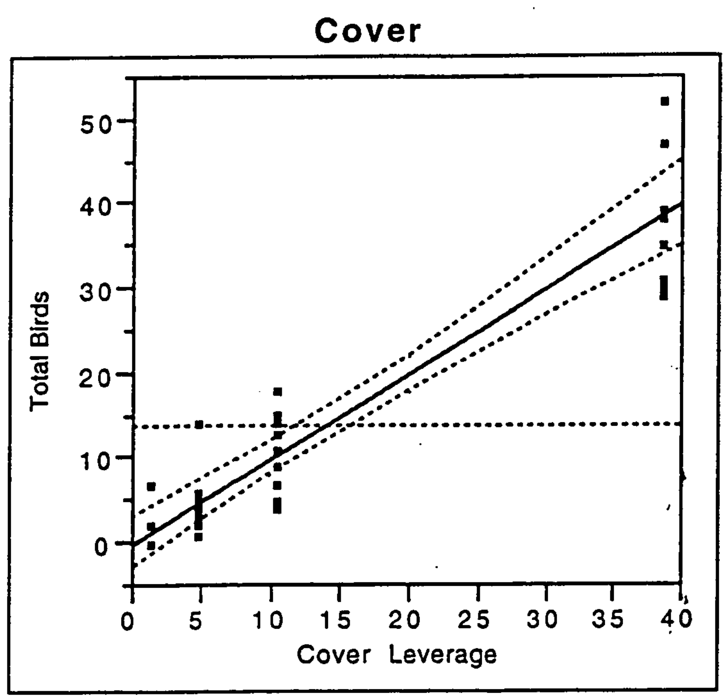

Cover
Total Birds
50
40
30
20
10
0
0
5
10
15
20
25
30
35
40
Cover Leverage

Fig. 4

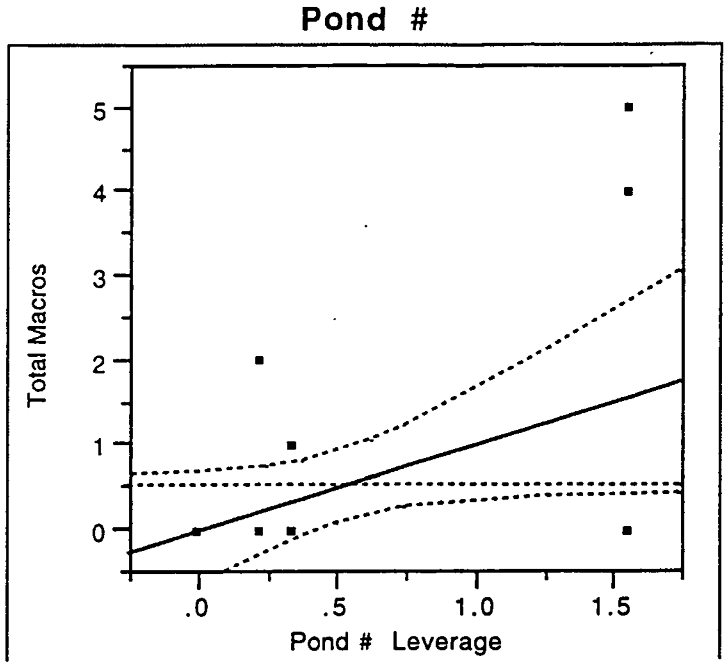


Fig. 5

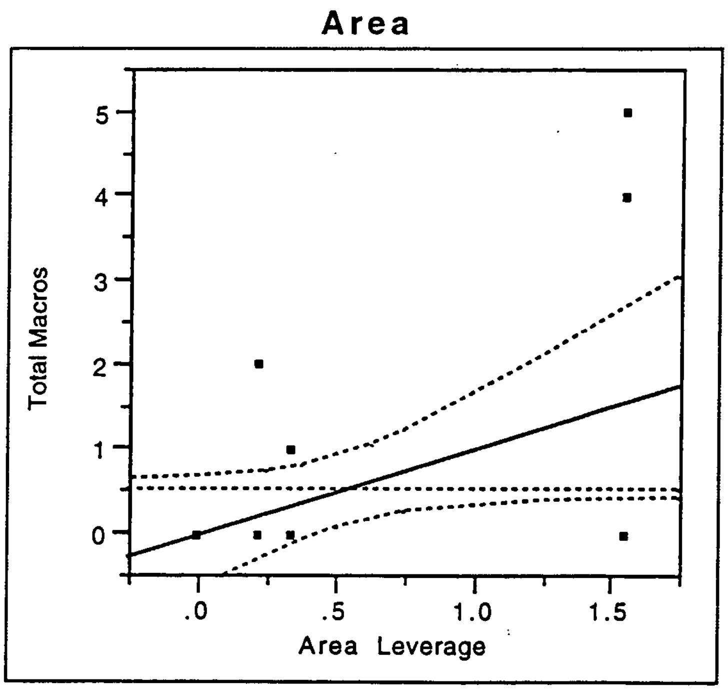
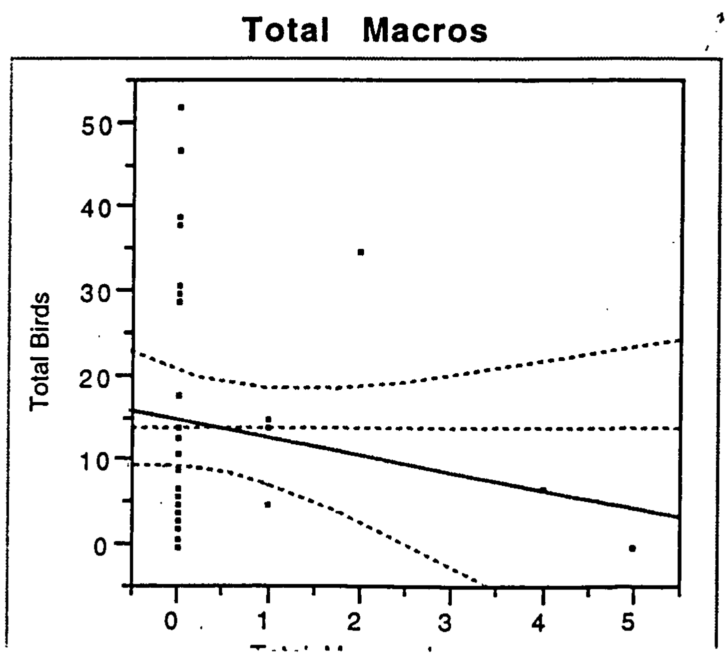
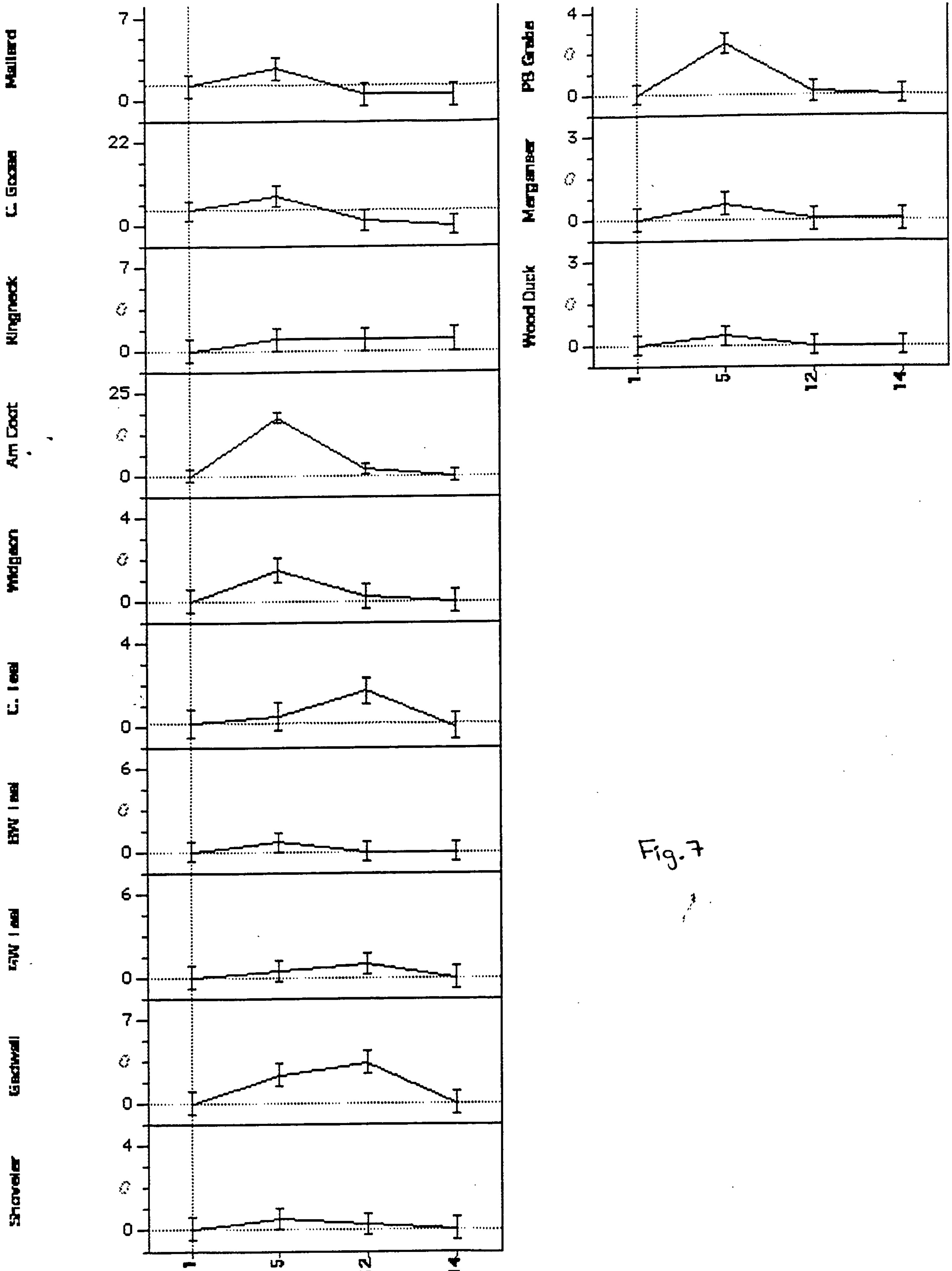


Fig. 6





Mallard
C. Goose
Ringneck
Am Coot
Widgeon
C. Teal
BW Teal
GW Teal
Gadwall
Shoveler
PB Grebe
Merganser
Wood Duck
7
0
22
25
4
6
3
1
5
12
14

Fig. 7

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Sawhill Ponds - A Wildlife Preserve brochure, 1996, City of Boulder Mountain Parks

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