Investigating the Influence of Pond Size and Water Quality on Water Bird Pond Visitation at the William J. Robertson Nature Preserve

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BACKGROUND

The maintenance of wetland habitats is increasingly important for both natural ecosystems and human communities[1]. Redevelopment of industrial and agricultural lands into wetlands has shown promise as an effective way to decrease contamination and provide necessary habitat for local species, but there is a need for further research into understanding how diverse biotic communities can establish in restored brownfields[2].

HISTORY OF THE WJRNP

The William J. Robertson Nature Preserve is located on property originally belonging to a cardboard factory. That factory operated from the late 1800s until its closing in 2006. In 2018, the city of Rittman decided to turn the property into a wetland preserve.

Figure 1. The WJRNP on a map of Ohio (left) and an aerial view of the main property of the WJRNP (right).

The cardboard company dug out 16 holes on the property, filled them with water, and used them to cool paper pulp. Now these have become healthy ponds, providing habitat for an impressive variety of plants and animals, including nearly 200 bird species.

RESEARCH QUESTION AND PURPOSE

Preliminary observations showed notable differences in water bird species and numbers utilizing adjacent ponds within the preserve. This study took an exploratory approach to determine the environmental factors with the strongest influence on the recorded differences in pond visitation by three functional groups of water birds.

What factors of pond size and water quality most strongly influence differences in water bird visitation between nine adjacent ponds at the WJRNP?

MEASURED VARIABLES

Independent (pond size):

- Pond area
- Amount of exposed shoreline
- Water depth

Independent (water quality):

- Water pH
- Dissolved oxygen
- Metal and phosphorus concentrations

Dependent:

Recorded number of birds per pond belonging to each of the following three functional groups:

- Dabbling waterfowl
- Predatory wading birds
- Insectivorous shorebirds

METHODOLOGY

- Bird observations and identification
- Soil and water sample collection
- Pond measurements
- Other water quality data from previous sampling done at the WJRNP
- Analysis of pond visitation by juvenile Canada geese

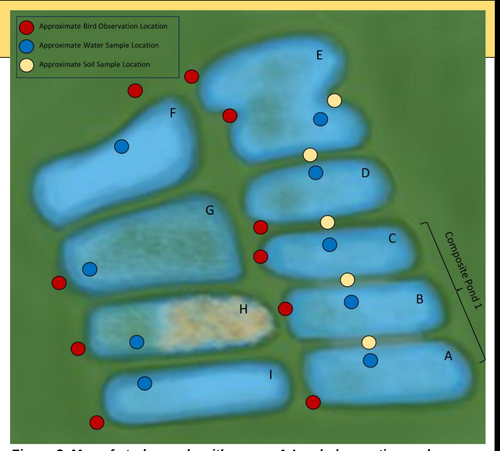


Figure 2. Map of study ponds with names A-I and observation and sampling locations labeled.

Statistical Analyses:

- Friedman tests and paired Wilcoxon signed-rank tests (for differences in mean pond visitation over 33 observations)
- Dominance analyses (to rank strength of environmental predictors of those differences)

RESULTS

- 15 species observed, 9 included in analysis
- Composite Pond 1: highest recordings of each functional group
- Pond H and G: highest of all element concentrations
- Youngest juvenile Canada geese recorded in Pond G and H; oldest juveniles recorded in Composite Pond 1 (the pond with the highest recordings of adults and juveniles combined)
- Amount of exposed shoreline and pond area ranked 1st and 2nd as visitation predictors for each bird group

Table 1. Total recordings per pond of species included in analysis.

Species Name	Comp 1	D	E	F	G	H	I
Canada Goose	1707	105	280	21	237	42	24
Mallard	70	2	7	0	179	0	1
Trumpeter Swan	32	0	0	0	0	0	0
Total Waterfowl	**1809**	**107**	**287**	**21**	**416**	**42**	**25**

Species Name	Comp 1	D	E	F	G	H	I
Double Crested Cormorant	6	0	1	3	0	0	6
Great Blue Heron	17	2	1	1	10	0	2
Great Egret	7	0	0	0	2	0	0
Total Wading Predators	**30**	**2**	**2**	**4**	**12**	**0**	**8**

Species Name	Comp 1	D	E	F	G	H	I
Killdeer	385	5	7	0	4	0	0
Least Sandpiper	13	1	0	0	0	0	0
Spotted Sandpiper	7	0	1	0	1	0	0
Total Shorebirds	**406**	**6**	**8**	**0**	**5**	**0**	**0**

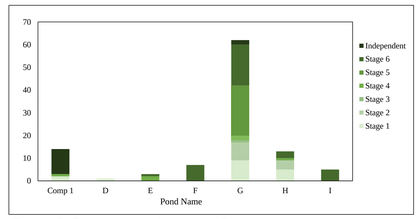
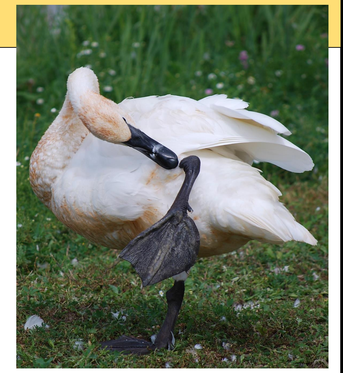


Figure 3. Recordings of juvenile Canada geese in each pond by developmental stages. *"Independent" juveniles were observed without parental accompaniment but were still visually distinguishable from adults.*

Figure 4. View of Composite Pond 1 facing northeast. *Composite Pond 1 had the largest amount of exposed shoreline and pond area and had the most frequent recordings of all three bird groups.*

DISCUSSION

- Mostly passive restoration has likely benefitted bird communities
- Open shoreline and large ponds facilitate water bird visitation but maintaining diversity in shoreline vegetation and pond size will invite more diverse groups
- Echoes the results of other studies: habitat diversity invites water bird diversity[3,4,5]



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