Water Pollution and the Effects on Water Ecosystems

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INTRODUCTION

Major Besse Pond is located on Torrington High School's grounds, is only a few feet away from Route 8, a well traveled highway (Fig 1), and is very shallow from runoff sediment accumulation. In the warmer months, the pond's water quality appears very unhealthy due to algae blooms, geese and their excrement.

The purpose of this project was to test the quality of Major Besse Pond to determine if the proximity of the pond to Route 8 and the presence of nesting geese contributed to water contamination. To determine the cause for a visually "unhealthy," appearance and to help indicate contaminants, we sought to measure total dissolved solids, conductivity to determine salinity, nitrogen from geese, and other parameters. Our goal is to establish baseline data so that future students can track this data over time.

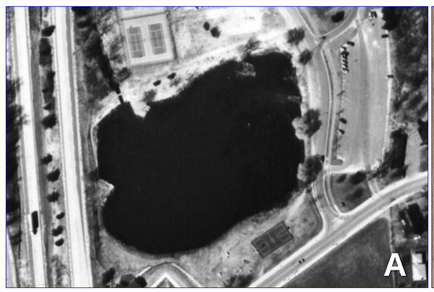
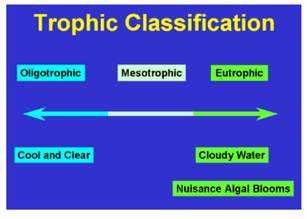


Fig 1. A: Major Besse Pond in 1970; B: Major Besse Pond in 2016. Notice sizable difference in area and shape. A& B photos provided by the City of Torrington. C: Geese and algae blooms in the pond.

Trophic Classification & Water Quality Parameters

- **The trophic state is defined as the total weight of biomass in a given water body at the time of measurement.**
- **Trophic State = Hypereutrophic (Nitrogen >1 ppm) Hypereutrophic ponds are generally more turbid and shallower due to the deposition of sediments, and also experience more algal blooms.**
- **Average Conductivity ≈ 4,350 µS/cm (Classified as Saline) The high conductivity indicates that the water is highly impacted by pollution.**

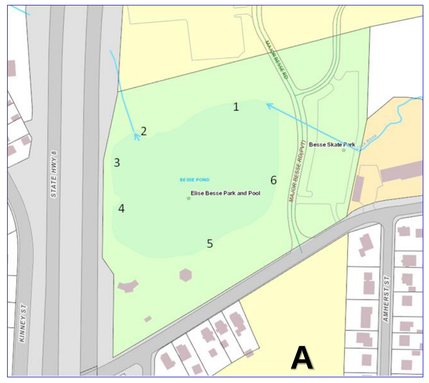


Trophic State	*Nutrient Concentrations*	
Oligotrophic	Phosphorous	0 - 0.01 ppm
	Nitrogen	0 - 0.2 ppm
Mesotrophic	Phosphorous	0.01 - 0.03 ppm
	Nitrogen	0.2 - 0.6 ppm
Eutrophic	Phosphorous	0.03 - 0.05 ppm
	Nitrogen	0.6 - 1.0 ppm
Hypereutrophic	Phosphorous	> 0.05 ppm
	Nitrogen	> 1 ppm

MATERIALS AND METHODS

Water Sampling

- **Between Oct 26, 2017 and December 1, 2017, 6 testing locations were identified in Major Besse Pond (Torrington, CT; Fig 3). Two samples were collected per location.**
- **Sample collection consisted of a collection cup attached to a pole to be able to reach the water from places that were not easily accessible**
- **Water samples were then brought to Mrs. Debany's classroom to conduct testing. Each sample was tested for a single parameter at a time to reduce any changes in levels or data**
- **The following instruments and test kits were used: Ubante TDS meter, ammonia test kit, phosphate test kit, nitrate test strips, pH test strips**



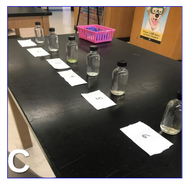


Fig 3. A: Map of Major Besse Pond sampling sites. Site locations included: near the inlet, outlet, and several points along the shore to determine any probable contributions to pollution. B: TJ collecting water samples near the inlet of the pond using the extended collection device. C: Samples awaiting testing in Mrs. Debany's classroom.

Water Quality Education

- **For outreach to Torrington High School, an educational campaign and brochure was distributed to students (Fig 4)**
- **The brochure informed about water quality and pollution, with the intent to educate and raise awareness of water pollution by connecting it to a local body of water.**

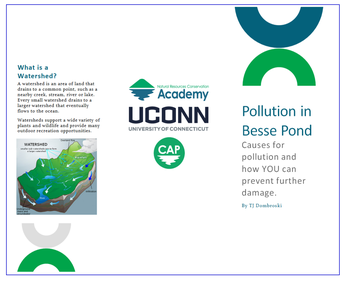
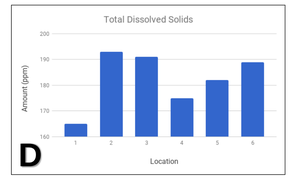
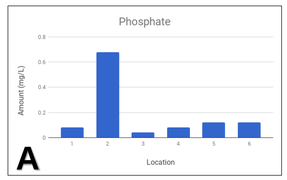
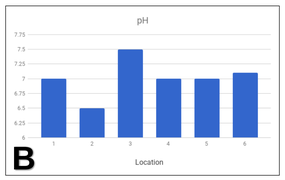


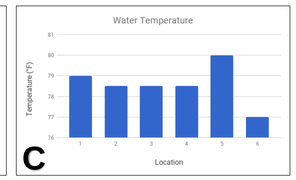
Fig 4. Water quality brochure distributed to students at Torrington High School

RESULTS









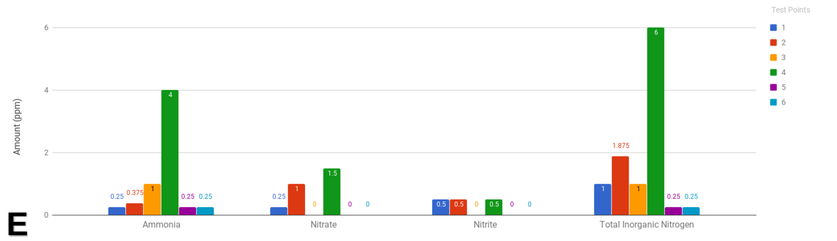


Fig 5. Graphs showing: (A) Phosphate; (B) pH; (C) Water Temperature; (D) Total Dissolved Solids; (E) Ammonia, Nitrate, Nitrite, Total Inorganic Nitrogen.

ANALYSIS & CONCLUSIONS

Through this research, the quality of Major Besse Pond was able to be determined. Overall, the chemical levels were surprisingly lower than expected initially. In areas closest to impervious surfaces or where there seemed to be more geese excrement, the levels of total dissolved solids, conductivity, and nitrogen were highest. The pond is hypereutrophic due to relatively high levels of nitrogen. This trophic level classification is supported by the cloudy appearance of the water and algal blooms that occur during warmer months. Also the pond's highest conductivity was 3,350 µS/cm over "normal" conditions, indicating a saline environment with impacted conditions. These findings show that the proximity of a busy roadway and the presence of geese are factors in polluting the pond water. Future work should determine if there are additional contributing factors.

What's Next?

I am coordinating with Mrs. Debany and Dr. Shannon to develop a lesson plan for a high school biology class and a data collection method for the future that will continue my research. We also plan to add another educational component, including class field studies, sample collection, and documentation.

ACKNOWLEDGEMENTS

This project and experience as a whole has taught me a lot about the environment, and the impact we have on it. I got to demonstrate my knowledge learned during the week long field experience at UConn, in my own community and spread my knowledge to others. I would like to thank Mrs. Debany, Dr. Shannon, Mr. Meinert from the UConn Torrington Branch, and most importantly Abby Beissinger, for their time and assistance in my research.

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