

Sustainability of a Largemouth Bass Population in Lake Archer

Abstract

Even though Largemouth bass (*Micropterus Salmoides*) can live in almost any body of fresh water, they have a very limited population in Lake Archer. The purpose of this project is to grow a population using a rearing tank connected to the lake with pumps. A 350-gallon rearing tank is set up by Lake Archer and is ready for the introduction of fish. Once the fish are large enough, they will be released into the pond to see if their population is sustainable. The fish will be tagged for identification purposes prior to releasing them into the pond. After release, the fish will be recaptured for further data collection. This semester was spent by averaging weekly water testing values and comparing it to a healthy pond ecosystem. Before the bass can enter the tank, the water quality needs to be measured and compared to Lake Archer and by using traps to catch fish, crayfish, and other inhabitants of the pond we can further prove the sustainability of Lake Archer. In addition, this allows us to continue a population survey and estimate.

Background

Lake Archer is a 1-acre man-made pond located on the campus of Delaware Valley University. Lake Archer has lots of organisms living within it, yet a very limited number of largemouth bass. This could be due to a few different factors. Lake Archer is overrun with an invasive population of crayfish, known as the rusty crayfish. The crayfish are likely consuming plant matter that is vital to the survival of largemouth bass. This is why it is vital to have an accurate population survey and estimate of Lake Archer. Largemouth bass also have specific water quality requirements, this is why it is important to conduct weekly tests on the water as well as creating a map of the bottom by depth. Largemouth bass have a 5-stage life cycle. The first stage is the larvae stage, followed by fingerling, fry, juvenile, and adult. Each stage represents different ages, sizes as well as different food requirements.

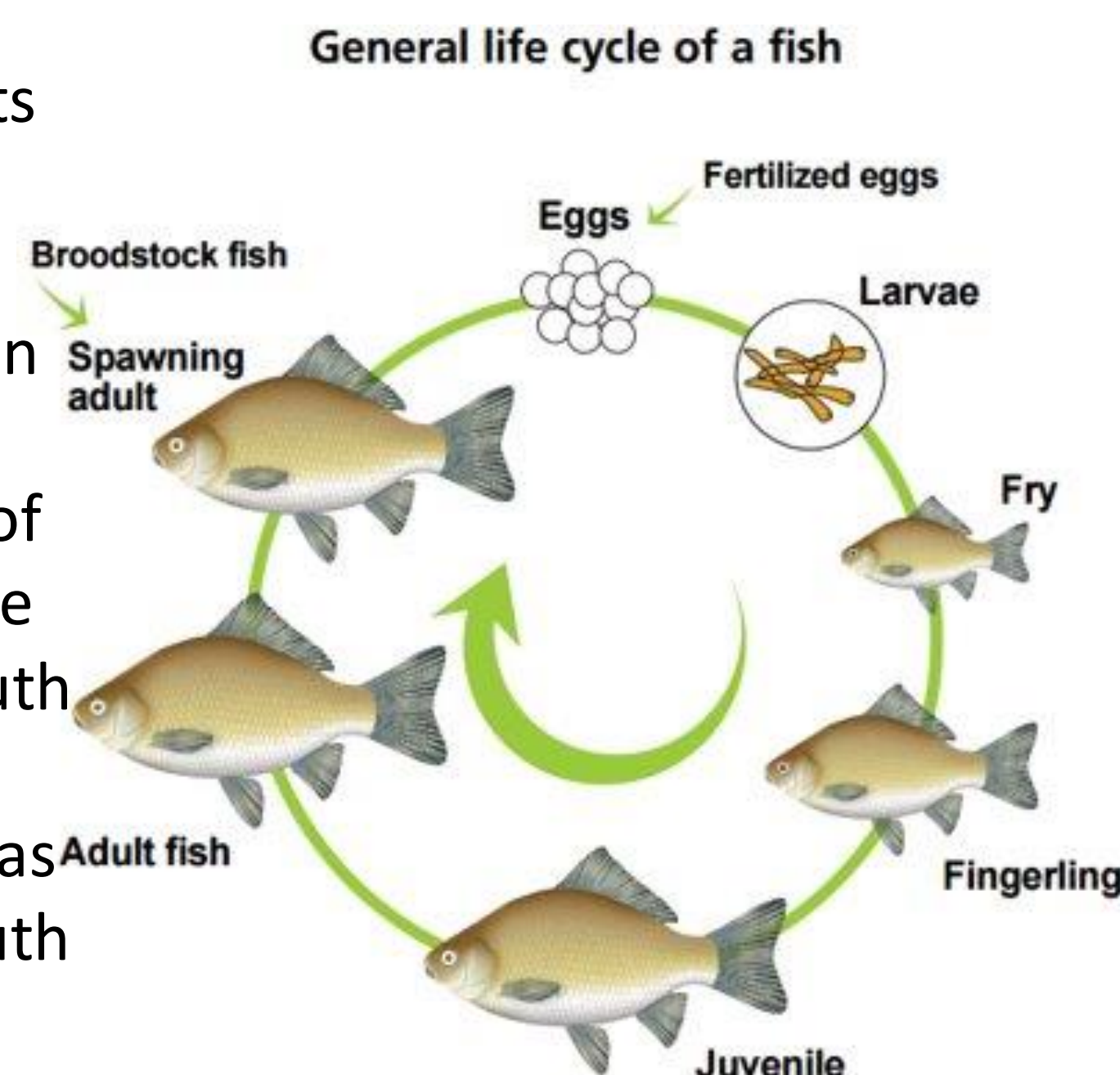


Figure 1 shows the General life cycle of a fish. This chart Shows the growth of the fish from the egg stage to the Spawning adult phase

Methods

Tank Set-Up: Several models of the tank were tested this semester. Three different phases were experimented with before we found what inflow and drainage systems work best. The current model is the result of most of this semesters' work.

5-in-1 Test Strip conducted weekly on the pond water and tank water throughout the semester. The water that flows into the pond from a drainage pipe. Tests included: pH, GH, KH, Nitrate, and Nitrite.

Chemical Tests: wide range pH, nitrate, ammonia, and phosphate levels were conducted weekly. Inflow was also tested.

Turbidity: was measured using a turbidity tube that allowed for determination of clarity up to 120 cm.

Trapping: Traps baited with cat food were placed in 3 trapping locations in the pond. The trapping locations were selected from sampling several locations around the pond and determining where they are most abundant.

Bathymetry: In the fall semester, the depth was recorded every 3 feet along a transect. Transects are 6 feet apart. This will be continued over the summer and next semester.



References

- Steed, E. (n.d.). *Micropterus salmoides* (American black bass). Animal Diversity Web. Retrieved April 25, 2023, from https://animaldiversity.org/accounts/Micropterus_salmoides/
- U.S. Department of the Interior. (n.d.). *Invasive Rusty Crayfish* (U.S. National Park Service). National Parks Service. Retrieved April 25, 2023, from <https://www.nps.gov/articles/invasive-rusty-crayfish.htm>

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Results

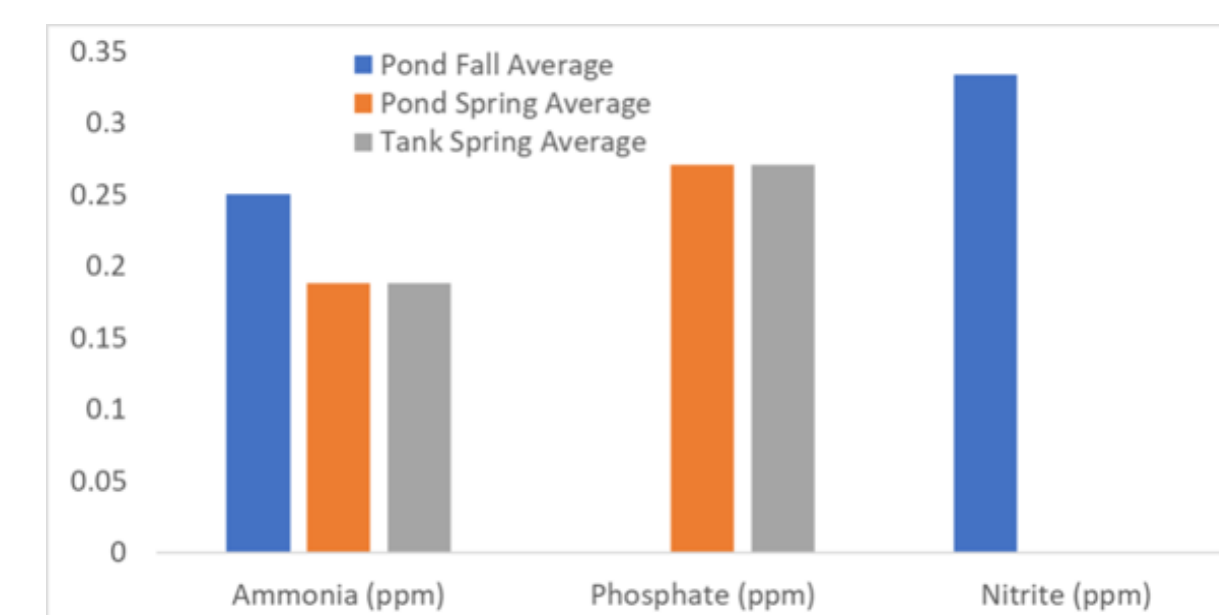


Figure 5: Compares the averages of the chemical test from Fall 2022 and Spring 2023. Ammonia, Phosphate, and Nitrate.

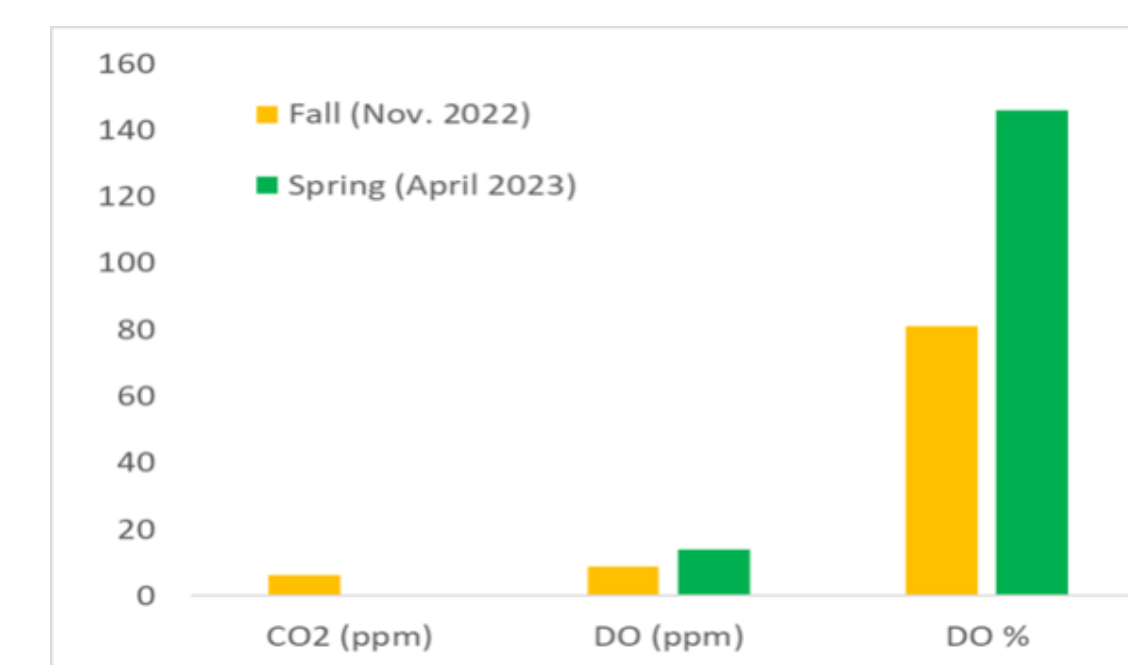


Figure 3: Bar graph comparing CO2, Dissolved Oxygen (ppm) and oxygen saturation of Lake Archer in November 2023 and April 2023.

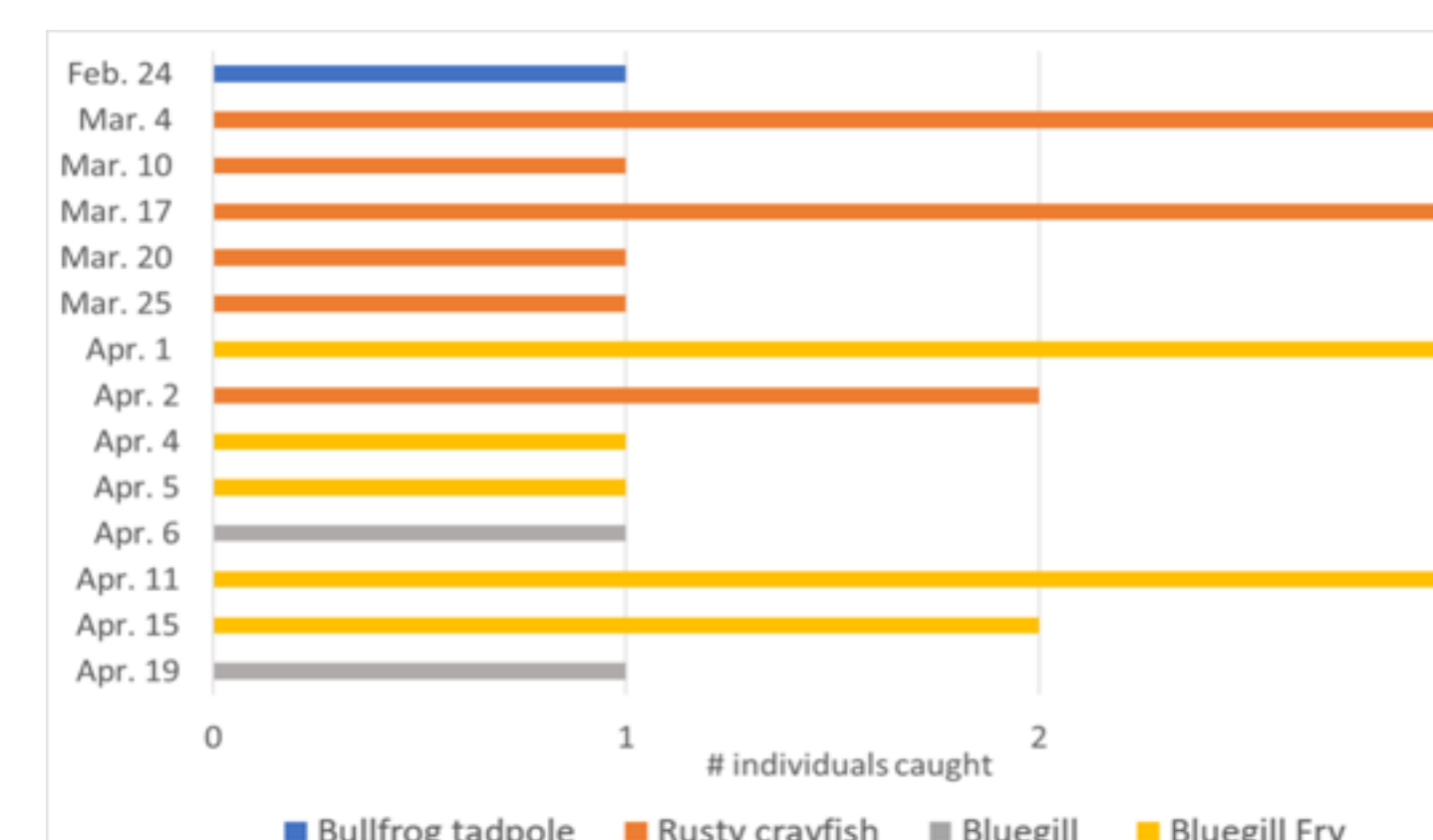


Figure 8: Compares species caught and number of individuals by date. (2/24/23-4/19/23)

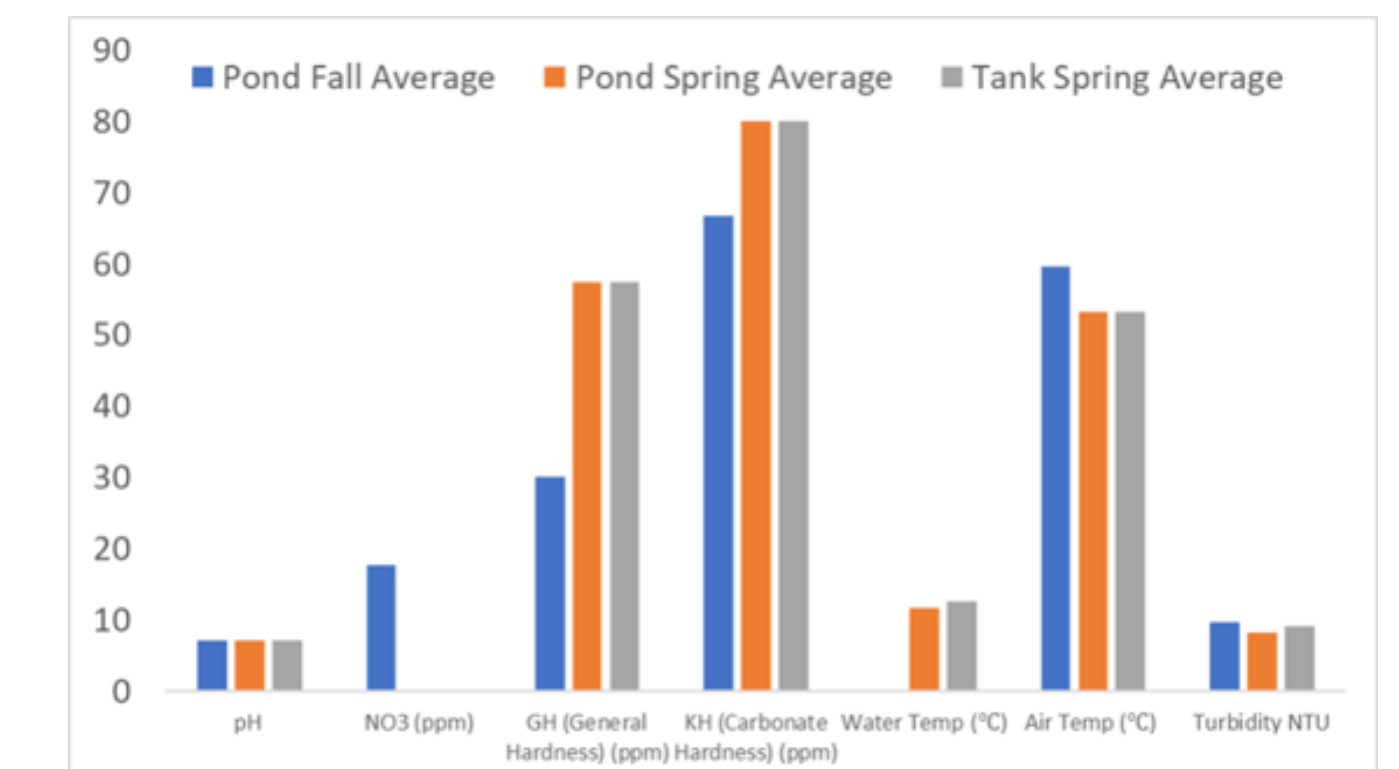


Figure 4: A comparison of the averages of the 5 in 1 test strip from Fall 2022 and Spring 2023

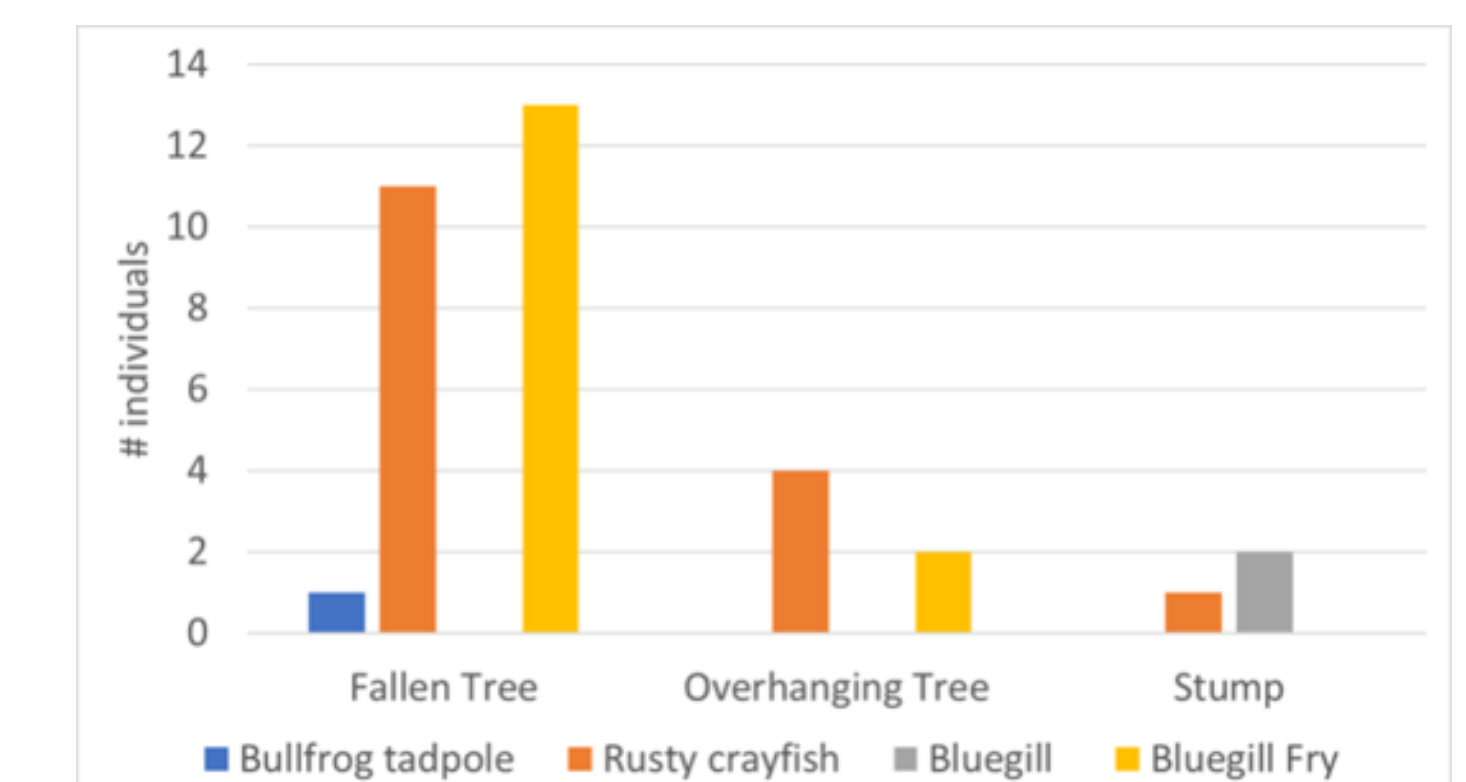


Figure 6: Compares the number of individuals of each species that was caught at each of the trapping locations.

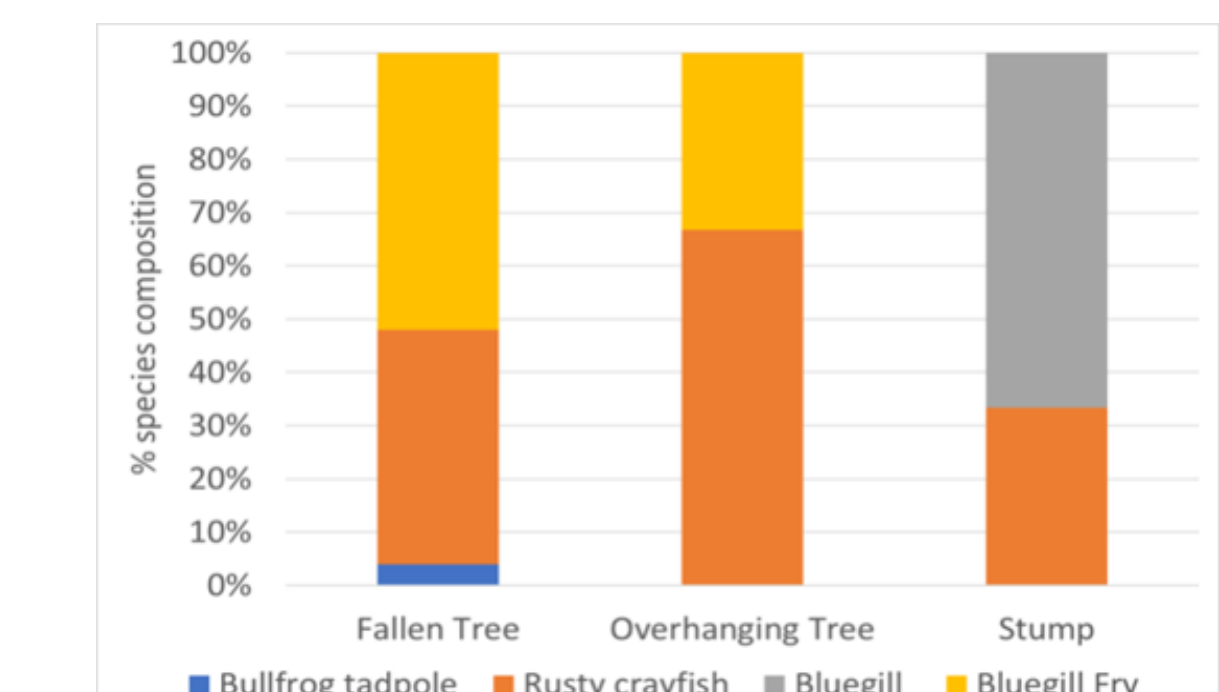


Figure 7: Compares species composition at each of the trapping locations.

Discussion

- All chemical factors are currently suitable for sustaining a population of largemouth bass. Testing will continue to capture seasonal changes.
- The pH falls within the ideal range for a pond which is between 6.8-8.2.
- A pond should have an ammonia value no greater than 0.50 ppm to be healthy.
- A healthy pond should have little to no nitrate and phosphate. The nitrate levels in Lake Archer are acceptable for largemouth bass.
- Nitrite on average is limited as well as phosphorous, and DO is high.
- The water quality of the tank and the lake are almost identical.
- Blue gill is an important food source for juvenile and adult largemouth bass. In the summer we hope to catch a larger diversity of fish and crayfish.
- The best system to run the tank was deemed to be an inflow 15 feet off the bank being pumped into the tank on an angle. Two drains for better circulation. T added to outflow for increased airflow.

Next Steps

Continuing the bathymetry process, water testing, and trapping. A population estimate of species caught will be conducted. We will start our population and continue its growth over the following semesters and plan to release them into the pond in spring 2024.