

Healthy Freshwater Conditions for Turtles

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Abstract

Upper Lake's location is less than a mile from our school. It's a lake that locals visit frequently and is a home to various animals. It was observed at the lake that Red Eared Sliders are a common turtle. After researching, we came to a conclusion that Red Eared Sliders and Mary River turtles require similar water chemistry such as dissolved oxygen, pH, and Nitrogen. However, the Mary River turtle is endangered due to the lack of dissolved oxygen in its environment. With a series of tests and data collected at the lake, we wanted to find out if Upper Lake showed symptoms of possibly becoming an unhealthy lake based off the needs of the freshwater turtles and water chemistry. From our observations, we concluded that the Upper lake is a healthy lake that meets the requirements of freshwater turtles, based off Dissolved Oxygen, Nitrates, and pH. Future research is needed to expand our time limit to allow several years for collecting data, so that we can say with confidence that many generations of Red Eared Sliders could thrive in the ecosystem.

Research Questions

While at Upper Lake gathering data, we noticed turtles basking on rocks and in the lake. We wondered what conditions in a lake cause turtles to become endangered. We compared the Mary River Turtle, a critically endangered species from Australia, and the Red-Eared Slider, a common breed native to East Texas. We planned on testing the water chemistry to determine if Upper Lake was a suitable environment for the freshwater turtles, based on the data to be collected. We asked the questions, How does the water chemistry in Upper Lake compare to ideal levels for the Red Eared Slider?

Based on the conditions of the endangered Mary River Turtle, does the Upper Lake show symptoms of deterioration?

Hypothesis #1

The Upper Lake would have ideal water chemistry to meet the Red Eared Sliders living requirements.

Hypothesis #2

Based on the conditions that threaten the Mary River Turtle, Upper city lake will have stable, healthy water chemistry.

Investigation Plan

We started out by testing Upper Lake's pH, Nitrate, temperature, and Dissolved Oxygen. After we tested the levels, we recorded the data onto the GLOBE website. We then researched what the ideal levels are for freshwater species (like the Red Eared Slider and the Mary River Turtle), and compared them to the levels at Upper Lake. Finally, we looked at what was causing the Mary River Turtle population to dwindle, and researched whether our own lake showed signs of threatening its turtle population, based on the data we collected. We also tested the dissolved oxygen in upper lake and our lower lake to see if dissolved oxygen changes due to the dam.

Research Method

Our team went to Upper Lake to test the pH, Dissolved Oxygen, temperature and Nitrate levels in the lake. Following the protocols* for each test, we collected multiple samples from the lake and tested them all to investigate our research questions.

To test for Dissolved Oxygen, we first had to fill up the water sampling bottle. Then, we added 8 drops of Manganous Sulfate Solution and 8 drops of Alkaline Potassium Sulfate Solution. We capped the water sampling bottle and mixed the solutions thoroughly. After allowing the precipitates to settle in the bottle, we added 8 drops of sulfuric acid. We, once again, capped the bottle and mixed the solutions together until the reagent and precipitates dissolved. We then filled up the test tube to the 20 millimeter line, and filled a titrator with Sodium Thiosulfate. Titrate until the sample color turns pale yellow, and then add 8 drops of starch indicator. Continue titrating until the blue color disappears and the solution is colorless. Finally read the results to find the Dissolved Oxygen level.

To test for Nitrate, we first filled up the test tube to the 5 milliliter with water from the lake. We then had to add one Nitrate tablet, cap the test tube, and mix the solution until the tablet dissolved. Then, we added Nitrate #2 tablet and capped the test tube, once again mixing until the second tablet dissolved. After waiting 5 minutes, we inserted the Nitrate-Nitrogen Octa-Slide viewer and inserted the Octa-Slide viewer into the test tube. Finally, we matched the color of the sample to the color standard record as ppm.

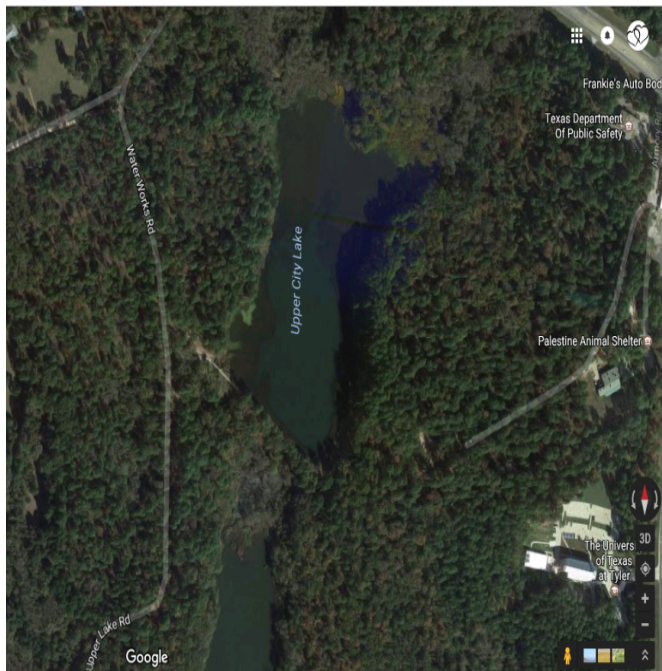
To test for pH, we first placed the Axial reader on the table top with the open side facing the operator, with the mirror facing the operator. Then, we positioned the Octet Compactor in the open slot of the Axial Reader, with the labels facing the operator and the bottom of the compactor flat on the surface. We filled two test tubes to the 10 milliliter line, to be the blank samples. We then filled the third test tube with sample water according to the test procedure instructions. We tested the one test tube according to procedure, left the other two to be used as blanks, and removed the test tube caps after adding the reagents and mixing. Then, we inserted ampoule of distilled water into the square hole on the left side of the Octet Compactor, and inserted 2 test tubes with the untreated samples into the slot in the Axial reader on either side of the treated sample. Finally, we slid the Octet Compactor down even to the top of the Axial reader and held the compactor up to natural sunlight, and compared the colors of the center test tube to the color on the compactor.

Location

Upper lake, Palestine, TX

Longitude: 31.768383783946195

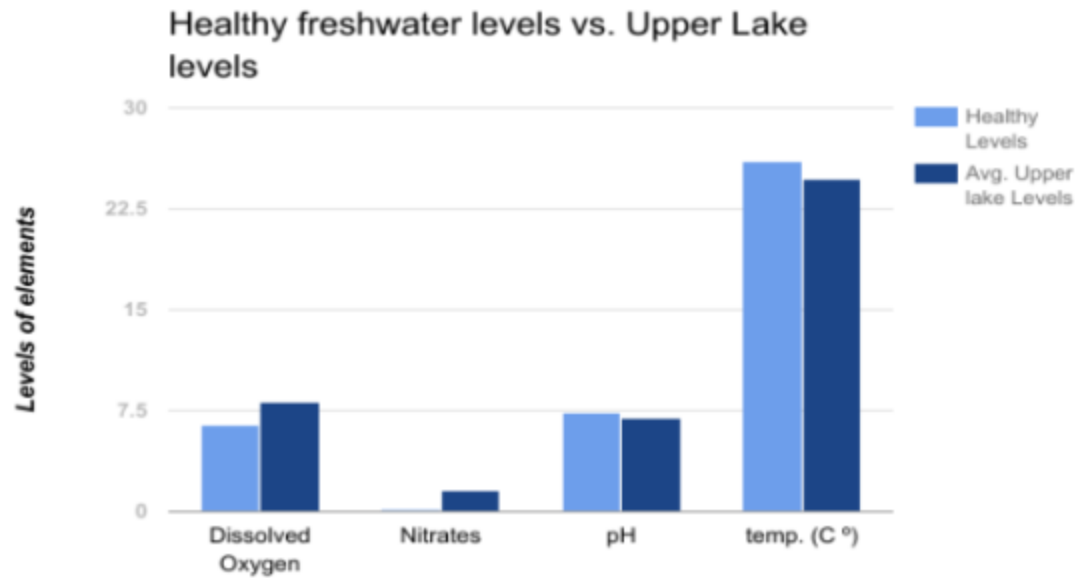
Latitude:95.66486583232421



GLOBE Data

	pH avg over 1 years	pH range	Dissolved oxygen avg over 1 year	Dissolved oxygen range	Nitrate avg over 1 year	Nitrate range	Avg Temp. in C° over a year
Upper Lake	7	7-7	8.2 mg/L	7.1	1.6 mg/L	1	24.75° C
Ideal Levels	7.4	6-8	6.5 mg/L	6.5-12 mg/L	.15	0.0-0.3 mg/L	23.8-30 C

Data Summary



Data Analysis

After extensive research we found that the “ideal” pH level for freshwater turtles is 7-8 , which means Upper Lake is borderline acidic, but still in a healthy range. When we compared our dissolved oxygen levels to what’s considered an “ideal” level of at least 7.5 mg/L, (according to Minnesota Pollution Control Agency) we found that our lake is considered healthy in this area as well. An acceptable nitrate level is considered at least under 1 mg/L (according to Sharon Behar), so our lake has considerably high nitrate levels compared to a healthy pond or lake. 10 dissolved oxygen levels were recorded in Upper Lake within a year; the average of this data is 8.2 mg/L, and the range is 7.1. 3 pH levels were recorded within a year; the average of this was 7, and the range is 0. 4 nitrate levels were recorded within a year; the average was 1.6, and the range was 1. After interpreting this data, we found that Upper Lake had healthy pH and dissolved oxygen levels, but had a high level of nitrates.

Conclusion

We found that the primary reason the Mary River Turtle is endangered is because of dams and impoundments in their habitats. When testing both Upper Lake and Lower Lake we discovered there is no change in dissolved oxygen due to the dam, both were 8ppm. Still water in dams have a decrease in oxygen, which causes poor water quality for the Mary River Turtle. Because the water quality is declining in oxygen, the time that turtles can spend diving for food is reduced, and turtles are exposed to predators more frequently when they come up for air. The nesting areas are also affected by dams. Conditions in impoundments don't create the sand banks needed for nesting. Dams that block access to nesting sites seriously hinder breeding success, which could eliminate the population entirely. Red eared sliders are reproducing and thriving in their environment at Upper Lake, but similar problems (such as lack of sufficient dissolved oxygen) that the Mary River Turtle faces could potentially cause problems in population if they occurred in Upper Lake. The level of dissolved oxygen in Upper Lake is sufficient for the Mary River Turtle and the Red Eared Slider. The pH is also in healthy range for both species of turtles, as well as the temperature. The nitrates, however, are marginally higher than what is recommended for a healthy pond. In excess levels, nitrates can cause rapid algae growth and fluctuations in dissolved oxygen (for example, high levels of oxygen during the day and extremely low levels at night, as a result as oxygen consuming bacteria feeding on dead algae). To fully conclude that Upper Lake shows no symptoms of deteriorating, long term research and monitoring would be necessary.

Unless nitrate levels rise in the future and cause drastic dissolved oxygen fluctuation, Upper Lake does not show signs of deteriorating or endangering the turtle population. The Mary River Turtle and the Red Eared Slider could survive and thrive in Upper Lake, so therefore, our hypothesis was correct.

Limitations/ Sources of error

We have only been collecting data since March of 2016, but we were able to access some data from last April. Collecting samples over a longer period of time would increase confidence in our results.

Field Photos



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