Water Pollution in the Hattiesburg Area

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Purpose/Hypothesis

The purpose of this research project is to test the water pollution in various areas of Hattiesburg. The levels of dissolved oxygen, alkalinity and nitrates in tap water and ground water were tested in Lamar and Forrest counties. Water from a fish tank provided the control. The hypothesis is that the water quality in Lamar County will be better than water quality in Forrest County.

Method

1. Water samples from a household of Bent Creek sub-division, a Pond on Cole Road, the Walker Science building in University of Southern Mississippi, Lake Byron, a Fish tank, and another household on 14th Avenue in Hattiesburg were collected.

2. CHEMetrics water analysis kit was used to test alkalinity, nitrate and dissolved oxygen in each sample. (Detail of each test is attached). Three trials were run for each test in every sample.

3. The results were analyzed using average readings and graphs to determine the water pollution in Hattiesburg area.

4. The alkalinity and dissolved oxygen readings were reported using hydrology protocol on the GLOBE website.

Materials and Procedures

NITRATE TEST

MATERIALS:

• LaMotte Nitrate Nitrogen Test Kit 3615 which includes:

o Mixed acid reagent

o Nitrate Reducing Reagent

o Dispenser cap

o Spoon, 0.1g, plastic

o Test Tubes, 5&10 mL, glass, with 2 caps

o Water Sample Bottle

o Pipet, plastic, 0.5mL

o Axial Reader

o Distilled Water Ampoule

o Nitrate-Nitrogen Comparator

o Distilled Water (only required for high range test)

PROCEDURES: LOW RANGE (0-1.0 ppm NITRATE NITROGEN)

1. Fill the water sampling bottle with the sample water.

2. Fill one test tube with 5mL of sample water.

3. Dilute to 10mL with Mixed Acid Reagent. Cap and Mix.

4. Wait two minutes

5. Use the 0.1 g spoon to add one level measure of Nitrate Reducing Reagent.

6. Cap tube. Invert it slowly and completely 30 times in 1 minute.

7. Wait ten minutes.

8. Insert test tube into Axial Reader. Fill 2 test tubes with 10 mL line with sample water. Place in Axial Reader. Match sample color to color standard. Multiply by 4.4 and record as ppm Nitrate.

Note: If the sample matches with 1.0 ppm, perform the high range test.

PROCEDURES: HIGH RANGE (0-10 ppm Nitrate Nitrogen)

1. Use the 0.5mL pipet to add 0.5mL of the water sample to a test tube.

2. Fill one test tube with 4.5mL of distilled water.

3. Dilute to 10mL with Mixed Acid Reagent

4. Wait two minutes.

5. Use the 0.1g spoon to add one level measure of Nitrate Reducing Reagent.

6. Cap the tube. Invert it slowly and completely 30 times in 1 minute.

7. Wait ten minutes.

8. Insert test tube into Axial Reader. Fill two test tubes with 10mL of sample water and place in the Axial Reader. Match Sample color to a color standard. Multiply the reading by 10. To convert to Nitrate, multiply the product by 4.4. record as ppm Nitrate.

ALKALINITY TEST

MATERIALS:

• Alkanity CHEMets® Kit code 4491-DR-01 which includes:

o BCG-MR Indicator tablets

o Alkalinity Titration Reagent

o Test tube with cap.

o Direct Reading Titrator,0-200 range

o Alkalinity Endpoint Color Chart

PROCEDURES:

1. Fill the titration tube with 5ml sample water.

2. Add one indicator tablet.

3. Cap and Swirl until tablet dissolves. Solution will turn blue –green.

4. Fill Direct Reading Titrator with Alkalinity Reagent B.

5. Insert the titrator in the center hole.

6. While gently swirling press the plunger to titrate until the solution color changes from blue-green to purple. Consult Alkalinity color chart.

7. Read the test result directly from the scale. Record as ppm Total Alkalinity in ppm Calcium Carbonate.

DISSOLVED OXYGEN TEST

MATERIALS:

• Oxygen CHEMets® Kit Dissolved Oxygen Kit K-7512 which includes:

o CHEMETS® self-filling ampoules for Colorimetric Analysis

o Plastic Sample Cup

o Color standards (used as a comparison)

PROCEDURES:

1. Fill the sample cup with 25 mL of the sample water.

2. Place the ampoule, tip first, into the sample cup.

3. Snap the tip, and the ampoule will fill, leaving a bubble for mixing.

4. Mix the ampoule by inverting it several times, allowing the bubble to travel from end to end.

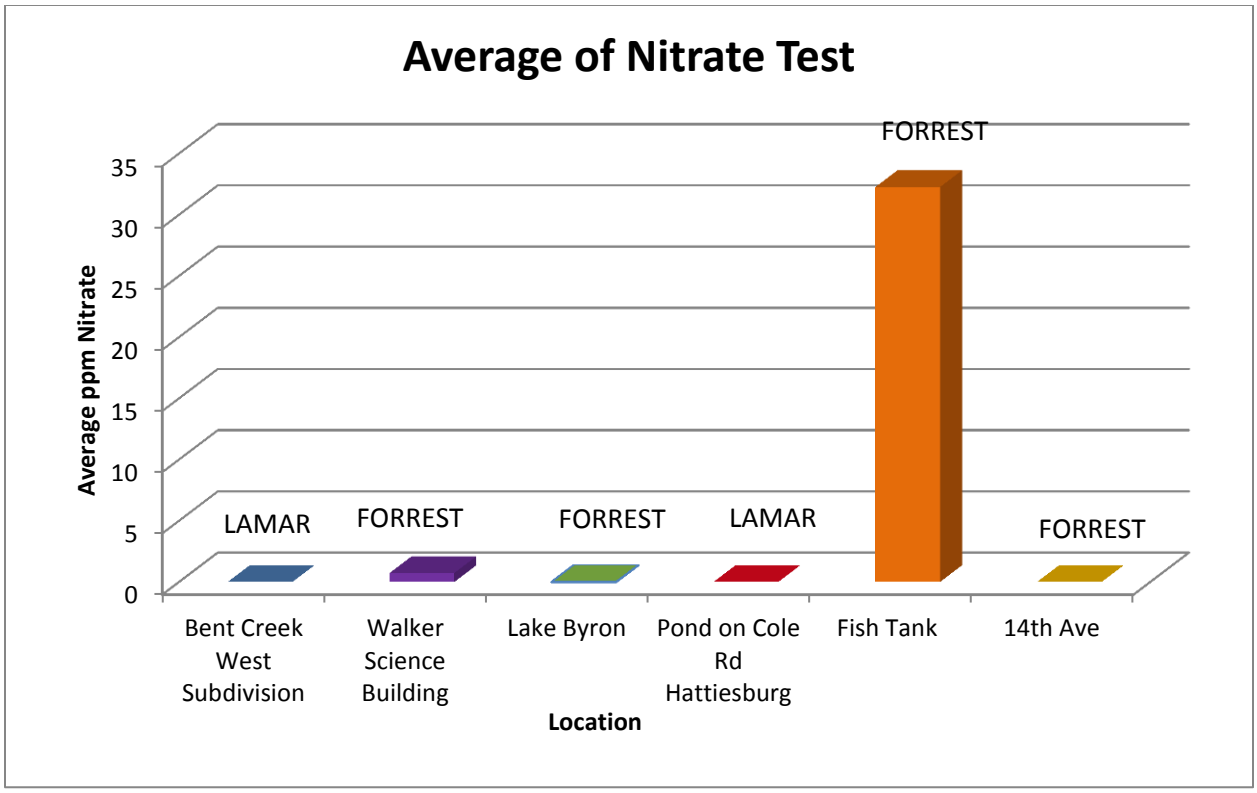
5. Dry the ampoule and wait two minutes for color development.

6. Obtain a test result by placing the ampoule between the color samples until the best color standards until the best color match is found.

Data

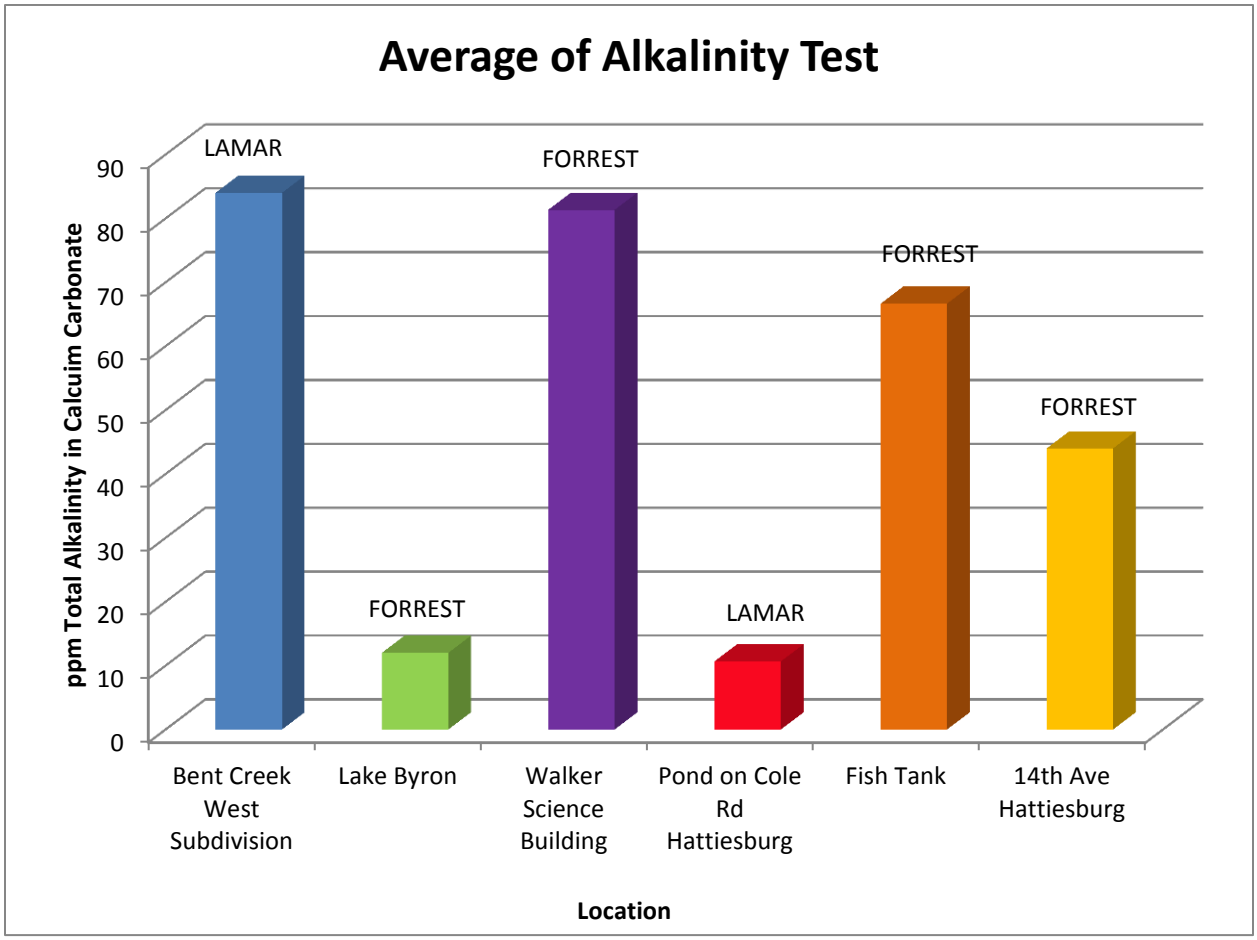
RESULTS OF NITRATE TEST

Location	Trial 1	Trial 2	Trial 3	Average
Bent Creek West Subdivision Hattiesburg (LAMAR)	**0 ppm Nitrate**	**0 ppm Nitrate**	**0 ppm Nitrate**	**0 ppm Nitrate**
Walker Science Building (FORREST)	**.44 ppm Nitrate**	**1.76 ppm Nitrate**	**0 ppm Nitrate**	**.73 ppm Nitrate**
Lake Byron (FORREST)	**0 ppm Nitrate**	**0 ppm Nitrate**	**0 ppm Nitrate**	**0 ppm Nitrate**
Pond on Cole Rd Hattiesburg (LAMAR)	**0 ppm Nitrate**	**0 ppm Nitrate**	**0 ppm Nitrate**	**0 ppm Nitrate**
Fish tank (FORREST)	**26.4 ppm Nitrate**	**35.2 ppm Nitrate**	**35.2 ppm Nitrate**	**32.26 ppm Nitrate**
14th Ave Hattiesburg (FORREST)	**0 ppm Nitrate**	**0 ppm Nitrate**	**0 ppm Nitrate**	**0 ppm Nitrate**


Average of Nitrate Test
Average ppm Nitrate
35
30
25
20
15
10
5
0
LAMAR
FORREST
FORREST
LAMAR
FORREST
FORREST
Bent Creek West Subdivision
Walker Science Building
Lake Byron
Pond on Cole Rd Hattiesburg
Fish Tank
14th Ave
Location

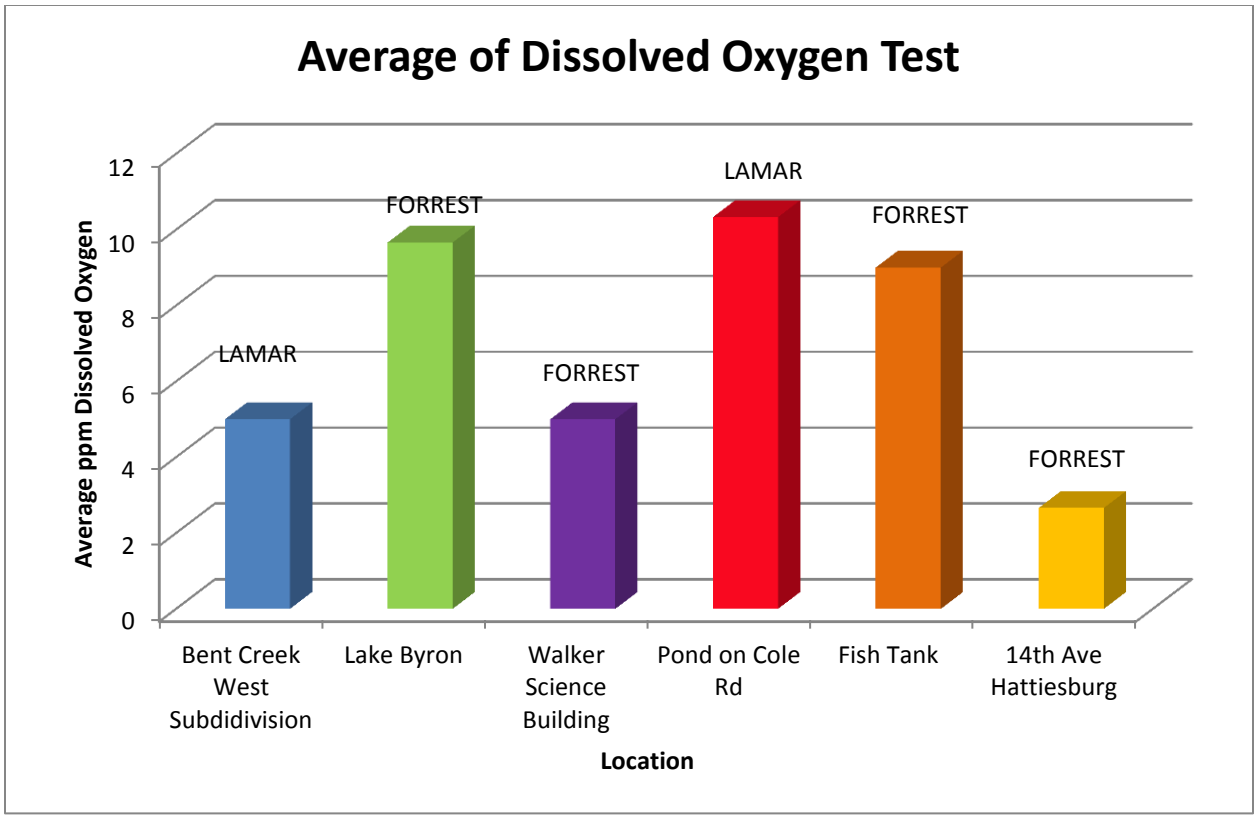
RESULTS OF ALKALINITY TEST

Location	Trial 1	Trial 2	Trial 3	Average
Bent Creek West Subdivision Hattiesburg (LAMAR)	84 ppm Total Alkalinity in Calcium Carbonate	84 ppm Total Alkalinity in Calcium Carbonate	84 ppm Total Alkalinity in Calcium Carbonate	84 ppm Total Alkalinity in Calcium Carbonate
Lake Byron (FORREST)	12 ppm Total Alkalinity in Calcium Carbonate	12 ppm Total Alkalinity in Calcium Carbonate	12 ppm Total Alkalinity in Calcium Carbonate	12 ppm Total Alkalinity in Calcium Carbonate
Walker Science Building (FORREST)	72 ppm Total Alkalinity in Calcium Carbonate	88 ppm Total Alkalinity in Calcium Carbonate	84 ppm Total Alkalinity in Calcium Carbonate	81.33 ppm Total Alkalinity in Calcium Carbonate
Pond on Cole Rd Hattiesburg (LAMAR)	8 ppm Total Alkalinity in Calcium Carbonate	12 ppm Total Alkalinity in Calcium Carbonate	12 ppm Total Alkalinity in Calcium Carbonate	10.66 ppm Total Alkalinity in Calcium Carbonate
Fish tank (14th Ave) (FORREST)	68 ppm Total Alkalinity in Calcium Carbonate	68 ppm Total Alkalinity in Calcium Carbonate	64 ppm Total Alkalinity in Calcium Carbonate	66.66 ppm Total Alkalinity in Calcium Carbonate
14th Ave Hattiesburg (FORREST)	44 ppm Total Alkalinity in Calcium Carbonate	44 ppm Total Alkalinity in Calcium Carbonate	44 ppm Total Alkalinity in Calcium Carbonate	44 ppm Total Alkalinity in Calcium Carbonate


Average of Alkalinity Test
ppm Total Alkalinity in Calcuim Carbonate
90
80
70
60
50
40
30
20
10
0
LAMAR
FORREST
FORREST
FORREST
LAMAR
FORREST
Bent Creek West Subdivision
Lake Byron
Walker Science Building
Pond on Cole Rd Hattiesburg
Fish Tank
14th Ave Hattiesburg
Location

RESULTS OF DISSOLVED OXYGEN TEST

Location	Trial 1	Trial 2	Trial 3	Average
Bent Creek West Subdivision Hattiesburg (LAMAR)	5 ppm Dissolved Oxygen	5 ppm Dissolved Oxygen	5 ppm Dissolved Oxygen	5 ppm Dissolved Oxygen
Lake Byron (FORREST)	10 ppm Dissolved Oxygen	9 ppm Dissolved Oxygen	10 ppm Dissolved Oxygen	9.66 ppm Dissolved Oxygen
Walker Science Building (FORREST)	5 ppm Dissolved Oxygen	5 ppm Dissolved Oxygen	5 ppm Dissolved Oxygen	5 ppm Dissolved Oxygen
Pond on Cole Rd Hattiesburg (LAMAR)	10 ppm Dissolved Oxygen	11 ppm Dissolved Oxygen	10 ppm Dissolved Oxygen	10.33 ppm Dissolved Oxygen
Fish tank (14th Ave) (FORREST)	9 ppm Dissolved Oxygen	9 ppm Dissolved Oxygen	9 ppm Dissolved Oxygen	9 ppm Dissolved Oxygen
14th Ave Hattiesburg (FORREST)	7 ppm Dissolved Oxygen	8 ppm Dissolved Oxygen	7 ppm Dissolved Oxygen	2.66 ppm Dissolved Oxygen


Average of Dissolved Oxygen Test
Average ppm Dissolved Oxygen
12
10
8
6
4
2
0
LAMAR
FORREST
FORREST
LAMAR
FORREST
FORREST
Bent Creek West Subdidivision
Lake Byron
Walker Science Building
Pond on Cole Rd
Fish Tank
14th Ave Hattiesburg
Location

Analysis

The results of the Nitrate test for all water samples except for water sample collected from Walker Science Building, with an average of .773 ppm Nitrate. The Fish Tank had an average of 32.26 ppm Nitrate. The dissolved oxygen test average results for Bent Creek West and Walker Science Building were 5ppm dissolved oxygen whereas the 14th Ave had the lowest reading of 2.66ppm dissolved oxygen. The pond on Cole Rd showed the highest average of 10.33 ppm dissolved oxygen, Lake Byron had 9.66 ppm dissolved oxygen, and the Fish Tank had an average of 9 ppm dissolved oxygen. The Alkalinity Test showed that the pond on Cole Rd had the lowest average of 10.66 total alkalinity in CaCo3. In household water samples, 14th Avenue's average was the lowest, 44 ppm, total alkalinity in CaCo3, which was lower than the alkalinity average of the Fish Tank water sample, 66.66 ppm total alkalinity in Calcium Carbonate. These results were analyzed with graphs as shown in data to draw conclusions.

Conclusions

Among household water samples, the nitrate test shows traces of Nitrate contamination in Walker Science Building which may be due to leakage of sewage lines and require frequent water testing and examination. The 14th Avenue in Forrest County had lowest average of dissolved oxygen and is not a good indicator of water quality. This may be due to old and corroded water lines and need replacement. The dissolved oxygen, alkalinity and nitrate test results show that water in Lamar County has better quality than water in Forrest County. These results and analysis support the hypothesis.

Discussion and Implications

The data and results from this research will help to improve the quality of water supply in the Hattiesburg area. It will give an idea about water supply quality to this community. It can help the city to regulate and monitor water quality in this area. This data will help water quality control managers to take necessary measures to improve the quality of water supply and to reduce water pollution in our city. This experiment can be greatly expanded by using more water sources from surrounding towns. The water samples can be tested for more substances, such as lead or sulfur. This project can expand further by using other tests inl GLOBE hydrology protocol, and by sharing and discussing the results on GLOBE website and conference.

Acknowledgements

- Dr. Sherry Herron
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References

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