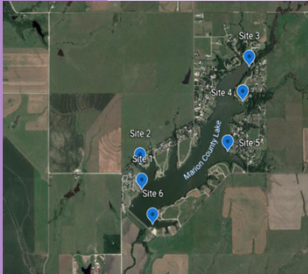


Analysis of Water Quality at Marion County Lake

Adelaide Manica¹, Jason Leftwich², Kholton Voboril³, Joshua Ward^{1*}, Laura Krueger⁴

¹: Parks Management and Conservation, ²: Agronomy, ³: Agricultural Engineering, ⁴: Biological and Agricultural Engineering

Site Map



- Located in Central eastern Kansas
- Southeast of Marion, Kansas
- Opened in 1940
- Historic problems with algae blooms
- Site of many previous studies

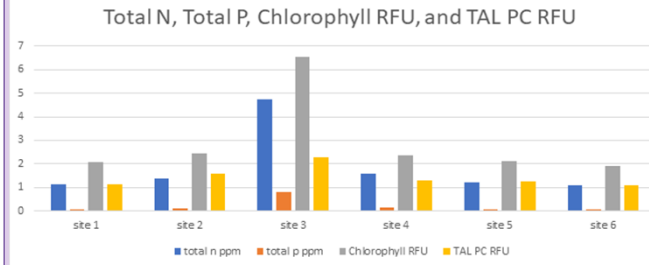
Research Objective

Our main objective of this research project was to analyze, locate, and single out the nutrient levels in different quadrants of Marion County Lake. This allowed us to take data from six study site locations along the shore to compare them. The nutrients we measured were phosphorus, nitrogen, chlorophyll fluorescence, optical dissolved oxygen, and total dissolved solids.

Method

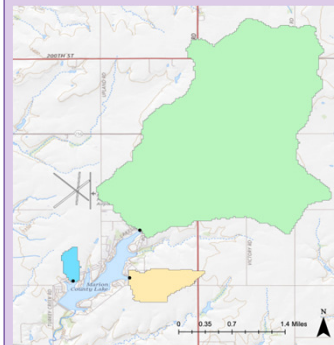
- Sites were predetermined using satellite images
- 200mL of water was drawn from each site using a dipper
- An on-site pH test was performed on each
- A SONDE-EXO measured Chlorophyll A, Oxygen saturation, conductivity, temperature, and turbidity
- 100mL sent to the KSU soils lab for testing, 100mL used to find TSS

Data



The values at each site seem consistent with the exception of site 3, Site 3 has a higher level of Chlorophyll RFU and Nitrogen in ppm

Land Use in Sub Watersheds



- Using Stream Stats, we were able to find information about the sub watersheds drainage area and land cover use
- We used this data to look at how land use affects runoff

	Site 2	Site 3	Site 5
Drainage Area (sq. mi)	0.07	4.33	0.24
Cultivated Crops and Hay (%)	0	31.44	36.78
Developed Land	13.6	7.88	12.9
Forested Land	0	1.043	0.862
Herbaceous Land	80.58	59.01	46.55
Impervious Land	4.18	1.02	2.3
Open Water	5.83	0.34	1.58
Wetland	0	0.28	1.29

Discussion

- Site 3 is an irregularity, it has the highest level of nutrients, suspended solids, and chlorophyll fluorescence
 - Further upstream
 - largest watershed
 - High percentage of cultivated crops
- Chlorophyll fluorescence is a measure of the cyanobacteria
 - Measured in RFU
- Optical Dissolved Oxygen measures the amount of dissolved oxygen
 - Generally, higher the RFU value, the lower the dissolved oxygen
- Conductivity measures how well a body of water can pass an electrical current through it
 - the higher the number correlates to the more polluted the body of water
- Increase in nearly all of the measured values from the 2018 NRES study
 - Indicates an increase in runoff

Conclusions

- Marion County lake shows evidence of runoff impacts as indicated by high levels of Nitrogen and Phosphorus indicate fertilizer/insecticide runoff
- There has been an increase in runoff levels since 2018 as indicated by levels of total suspended solids and nutrients
- Land dedicated to cultivated crops coupled with a high percentage of impervious surfaces indicate higher levels of runoff
- It is recommended to have some of the prevention method listed below to mitigate runoff

Prevention Methods

Modeling: Utilize models to track watershed conditions and monitor pollution sources
Regulation: Monitor certain pesticides and chemicals closely or ban them completely
Education: Educate agricultural workers about ecologically effective ways to apply chemicals

Future Research

While we focused on agricultural runoff for this research, other anthropogenic activities also contribute to runoff. It would be interesting to look at which activities contribute the most
 We looked at water quality but analyzing the impacts on biotic organisms in Marion County Lake would make a good research extension.