Marion County Lake Research Synthesis

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Introduction

Marion County Lake and Park is located in south central Kansas (38.3152 -96.9916) about four miles southeast of the town of Marion, Kansas. The lake covers a total of 153 acres of water and provides an area with many recreational opportunities. For the past two years, NRES Capstone teams at Kansas State University have been working to collect data and information regarding the state of Marion County Lake, park and the surrounding watershed in order to assist lake managers in designing an effective and comprehensive lake management plan. While these reports contain quality data and useful information, they have yet to be combined or connected, making it difficult for lake managers to easily access key information. This report seeks to synthesize all the previously collected information and condense it into one overarching report that highlights the key findings Marion County Lake managers need.

Background

Marion County Lake has been struggling with various water quality issues, including excess nutrients causing eutrophic conditions which have led to recurring Harmful Algae Blooms (HABs). In addition to harming wildlife, these water quality problems have also been severely reducing the opportunity for public recreation on the lake. As there are over 200 households around the lake alone, these water quality issues are limiting a large number of people from utilizing the lake.

Key Findings

The primary land uses for the area surrounding the lake include:

- Warm-season grassland (43-58% of total land from 1990-2015)
- Cropland (37.4% of total land in the 1990s)
- Non-irrigated winter wheat (23-24.5% of total land from 2005-2015).
- Cool-season grassland (11.6% of total land in 2005).

The following key water quality indicators & benchmarks were identified:

- Total Nitrogen, Total Phosphorus, Total Suspended Solids, Total Dissolved Solids, Cyanobacterial Cell Count, Trophic State Index, Fecal Coliform and pH Balance.

Previous studies identified the following areas of concern:

- High TN and TP concentrations indicating excess nutrients
- High chlorophyll-a concentration and eutrophic waters
- High cyanobacterial cell count
- Presence of fecal coliform

These findings suggest that the overall water quality of the lake is poor, with high probability of HAB formation.

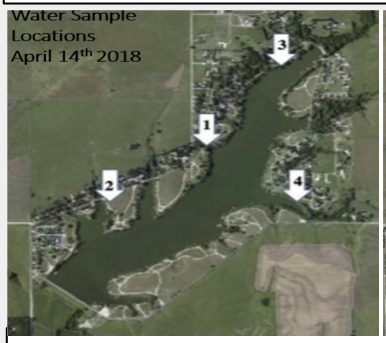


Fig 1 (Left): Locations of water quality data collected by Allen, J., Ddamulira, A., Maddox, C., Gerardy, H. for Marion County Park and Lake Sediment and Water Quality Study (2018).
Fig 2: (Right): Locations of water quality data collected by Wallace, H., Trigo, E., Keller, C. for Influences of Nutrient Accumulation, Sediment Loading, and Organic Matter on Water Quality in Marion County (2018).

Recommendations

In Lake

- Additional & recurring water quality and lake sediment samples should be taken at the same points around the lake throughout the year to obtain more accurate data of the lake's water quality.
- Implementation of in-lake treatment options for Harmful Algae Blooms
- Installation of floating waterbeds to help capture and remove excess nutrients
- Utilize the EPA CyAN application to track cyanobacterial concentrations in the lake over time.

Out of Lake

Promotion and implementation of both agricultural and urban best management practices including

Agricultural:

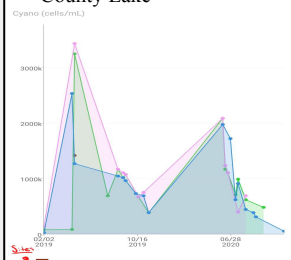
- Conservation tillage
- Crop nutrient, pest, grazing and irrigation management
- Conservation buffers
- Erosion and sediment control

Urban:

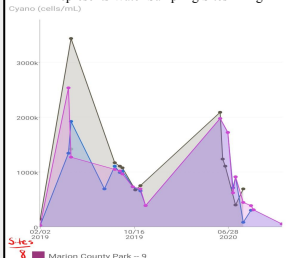
- Preventative landscaping practices
- Wise vehicle washing
- Pet waste disposal
- Proper disposal of household chemicals

EPA CyAN Application

The cyAN Application is a useful tool that can be used to track the concentration of cyanobacterial cells in the lake over time. Images. The following graphs represent the concentration of cyanobacteria in Marion County Lake



Represents Water Sampling Sites in Fig 1



Represents Water Sampling Sites in Fig 2

Sources

Allen, J., Ddamulira, A., Maddox, C., Gerardy, H. (2018). Marion County park and lake sediment and water quality study. Retrieved from https://www.k-state.edu/nres/capstone/NRES_S18_SedimentTeam.pdf

Wallace, H., Trigo, E., Keller, C. (2018). Influences of nutrient accumulation, sediment loading, and organic matter on water quality in Marion County. Retrieved from https://www.k-state.edu/nres/capstone/NRES_S18_InfluencesNutrient.pdf

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