



# Investigating Iron Concentration in Groundwater Following a Lake-Draining Sinkhole Event



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## Background

- Tallahassee lakes Lafayette, Miccosukee, Iamonia, and Jackson are all sinkhole lakes. These lakes have occasional dry-down events where lake water flows through the sinkhole into the substrate. Since June 2021, there have been seven dry-down events, including one occurring in February 2022
- The chemical impacts on the downgradient aquifer the water flows through is not thoroughly studied.
- We hypothesize that iron will vary over time as a result of passing lake water in the subsurface, and that these changes will be related to elevated iron from oxidative weathering of clay minerals.

## Methods

- Following the February 2022 sinkhole event, collect daily samples from the FSU EOAS Groundwater Well.
- Determine the iron concentration using a colorimetric procedure.
- Sample Prep:
  - Acidify the sample well water to pH 2 using HCl.
  - Add 10 mL of acidified sample to cuvette.
  - Add iron colorimetric reagents.
  - Wait 3 minutes to allow the reaction to occur.
  - Analyze the sample with a LaMotte SMART2 colorimeter.
- Correlation analysis between iron and major ion elements previously measured using ion chromatography.

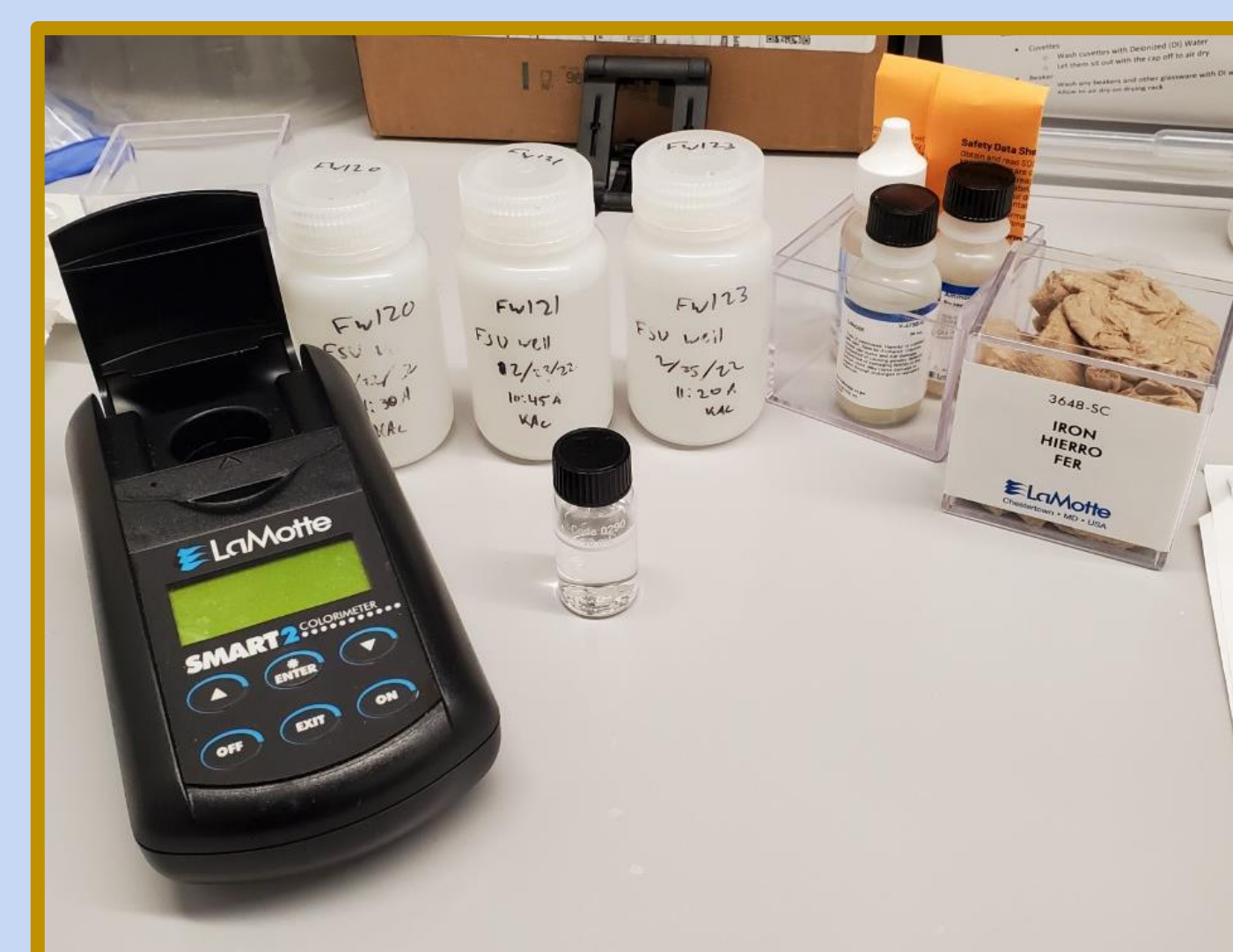


Photo of LaMotte colorimeter, sample well water bottles, and iron testing kit. Used in the "Sample Prep" step of the methods section.

## References

Katz, B. G., Plummer, L. N., Busenberg, E., Revesz, K. M., Jones, B. F., & Lee, T. M. (1995). Chemical evolution of groundwater near a Sinkhole Lake, Northern Florida: 2. Chemical Patterns, mass transfer modeling, and rates of mass transfer reactions. *Water Resources Research*, 31(6), 1565–1584.

Lammers, J. (2021, June). History and Chronology of Lake Draining Episodes Leon and Jefferson Counties, Florida [web log]. Retrieved March 1, 2023, from [https://blog.wfsu.org/blog-coastal-health/wp-content/uploads/2021/06/Leon-Lakes-Draining-Chronology\\_June-2021-1.pdf](https://blog.wfsu.org/blog-coastal-health/wp-content/uploads/2021/06/Leon-Lakes-Draining-Chronology_June-2021-1.pdf).

## Feb. 2022 Lake Jackson Dry-Down

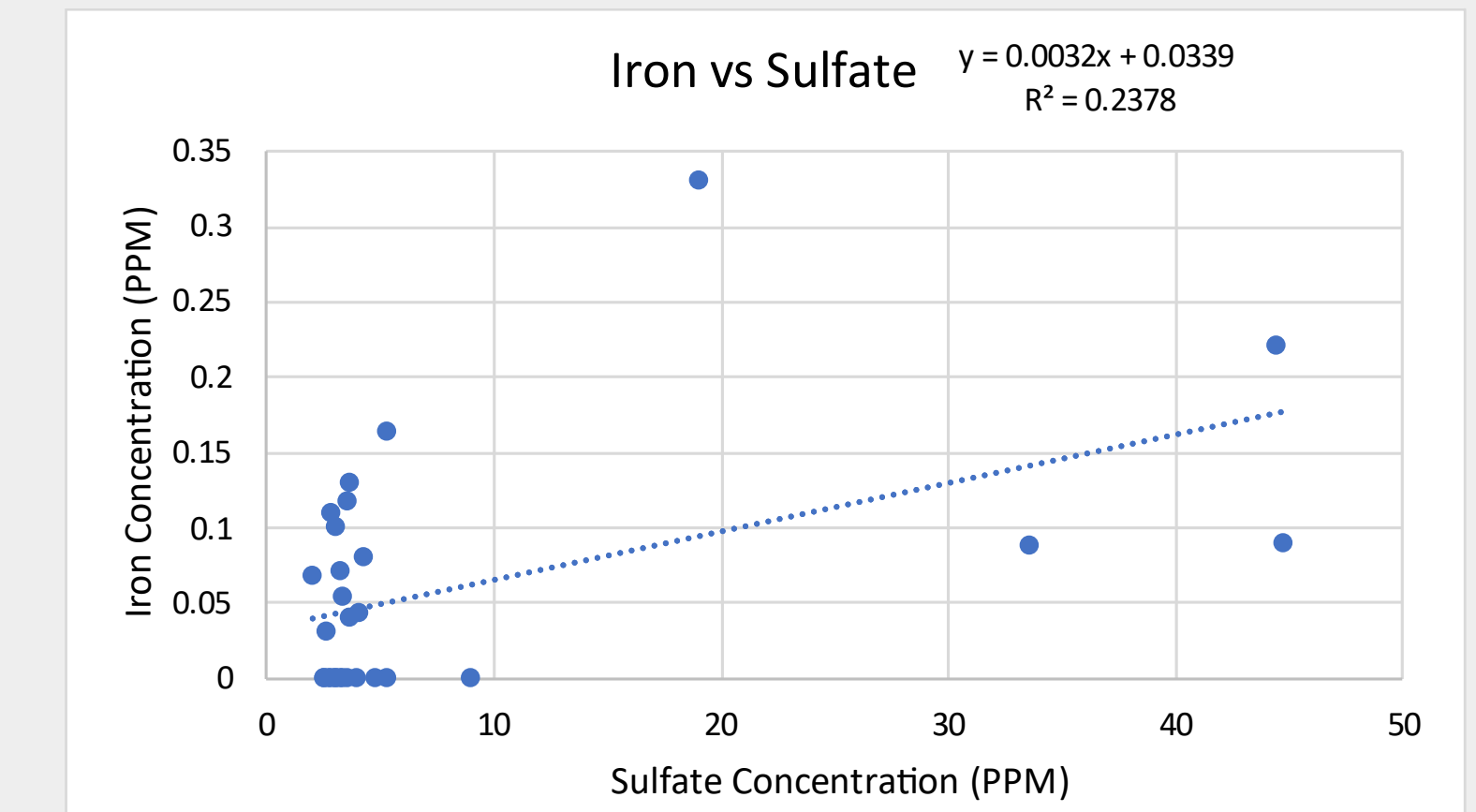
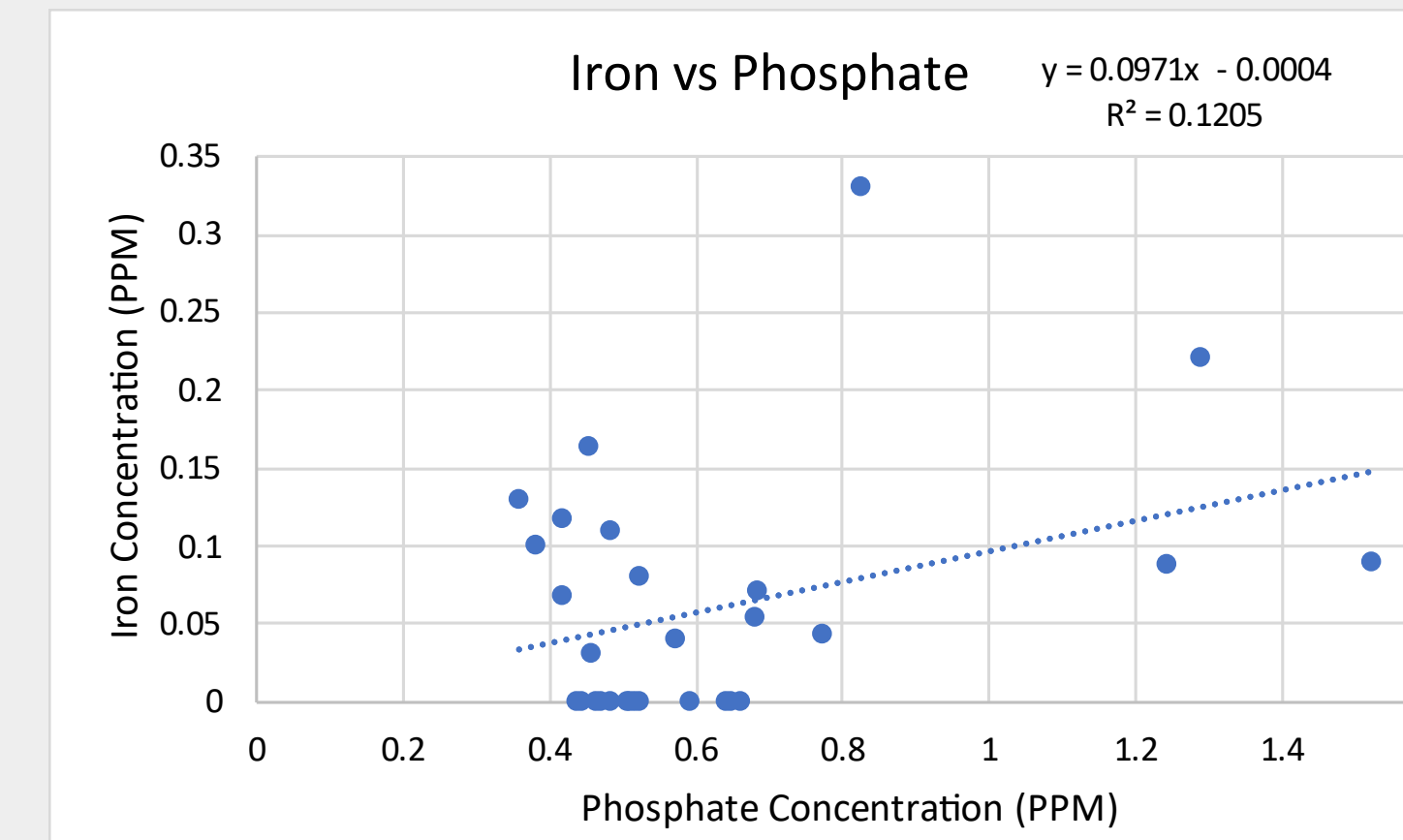
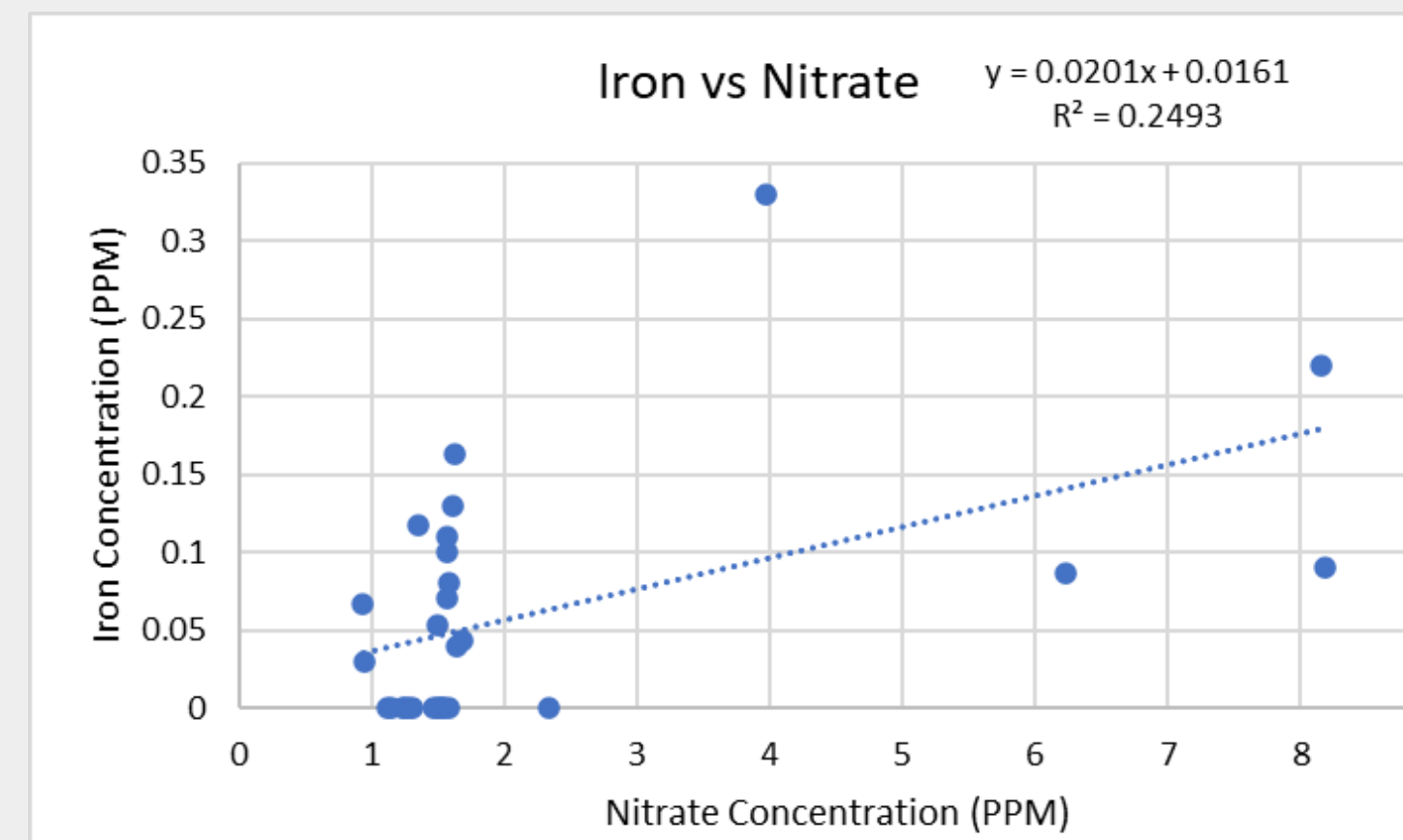


## Conclusion

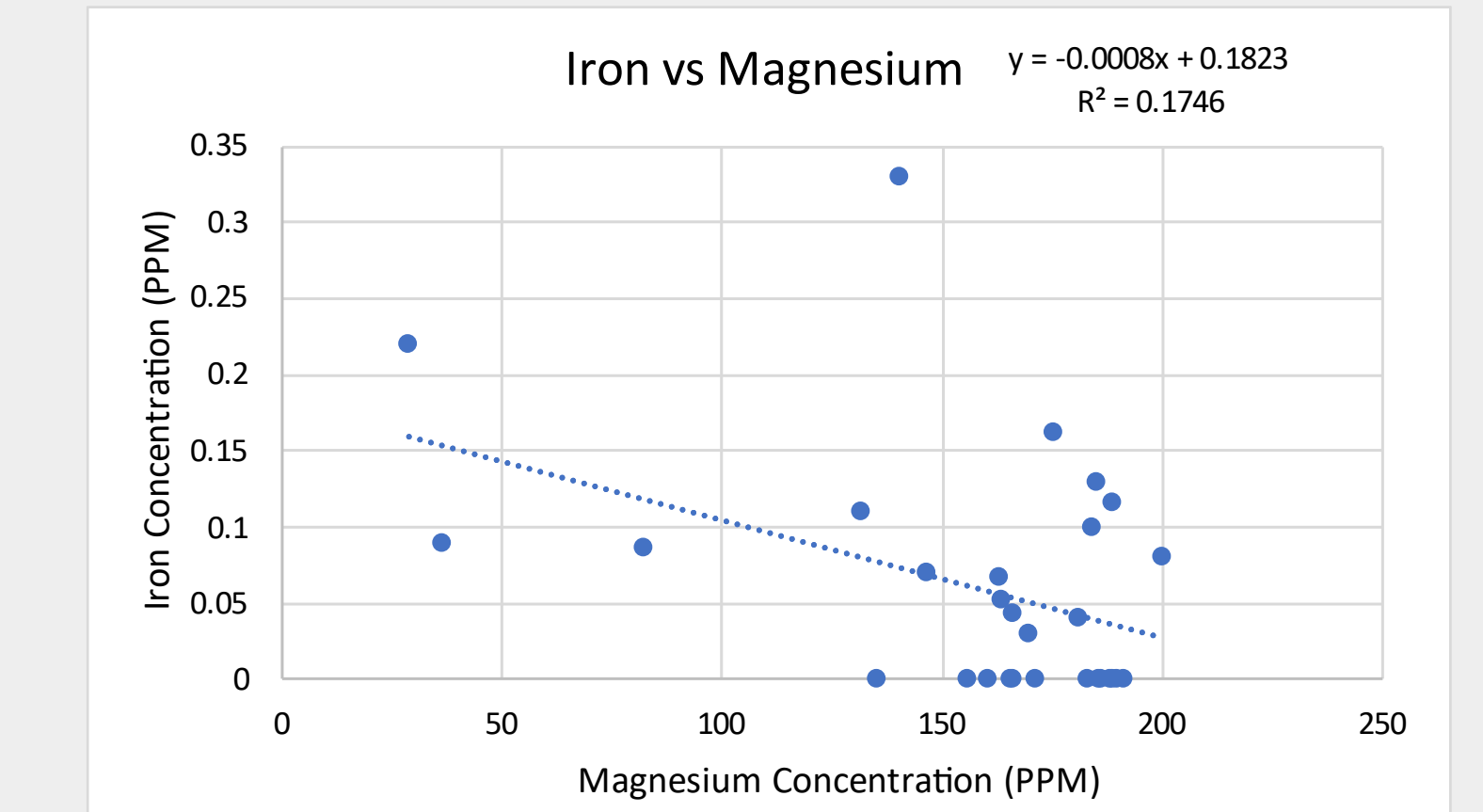
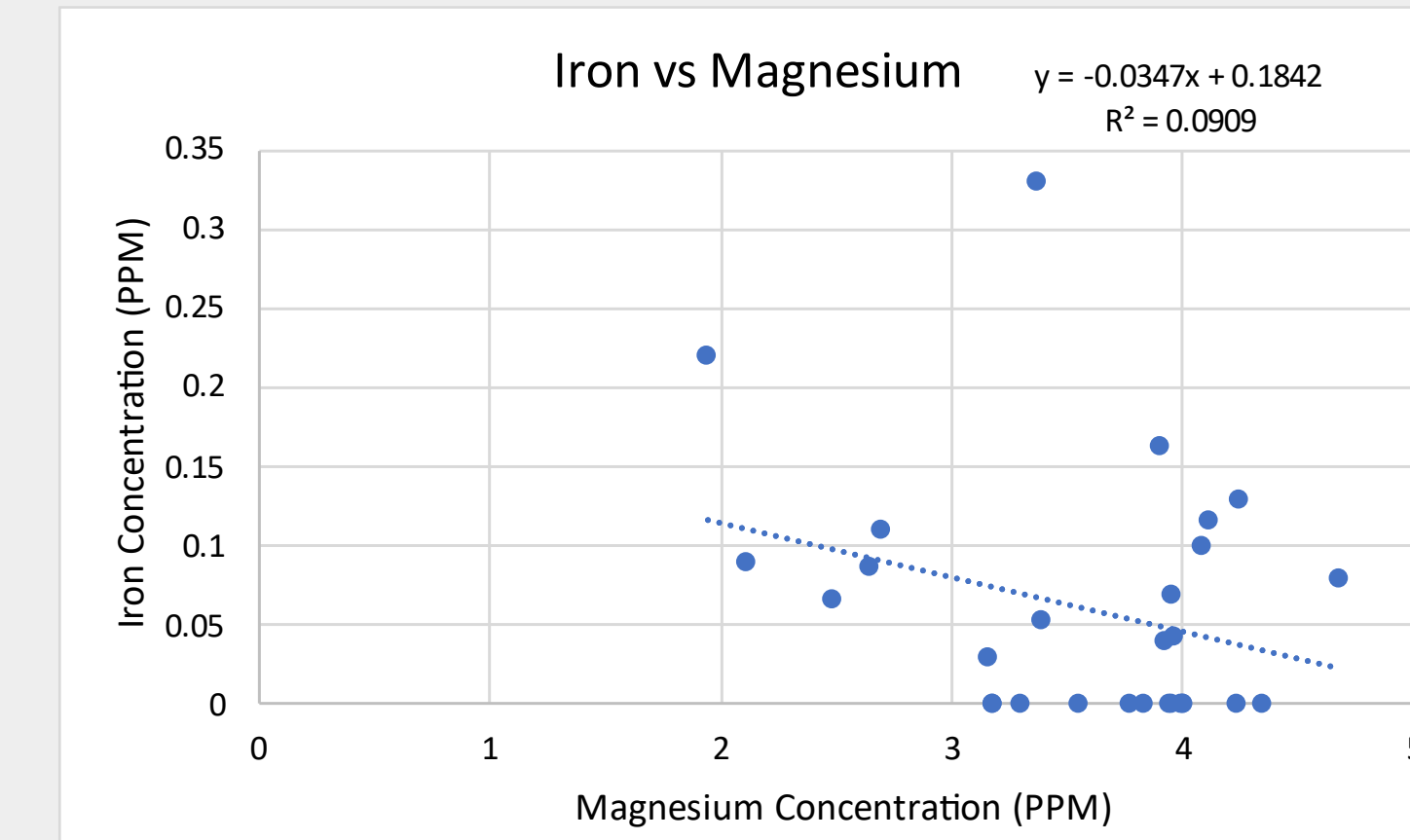
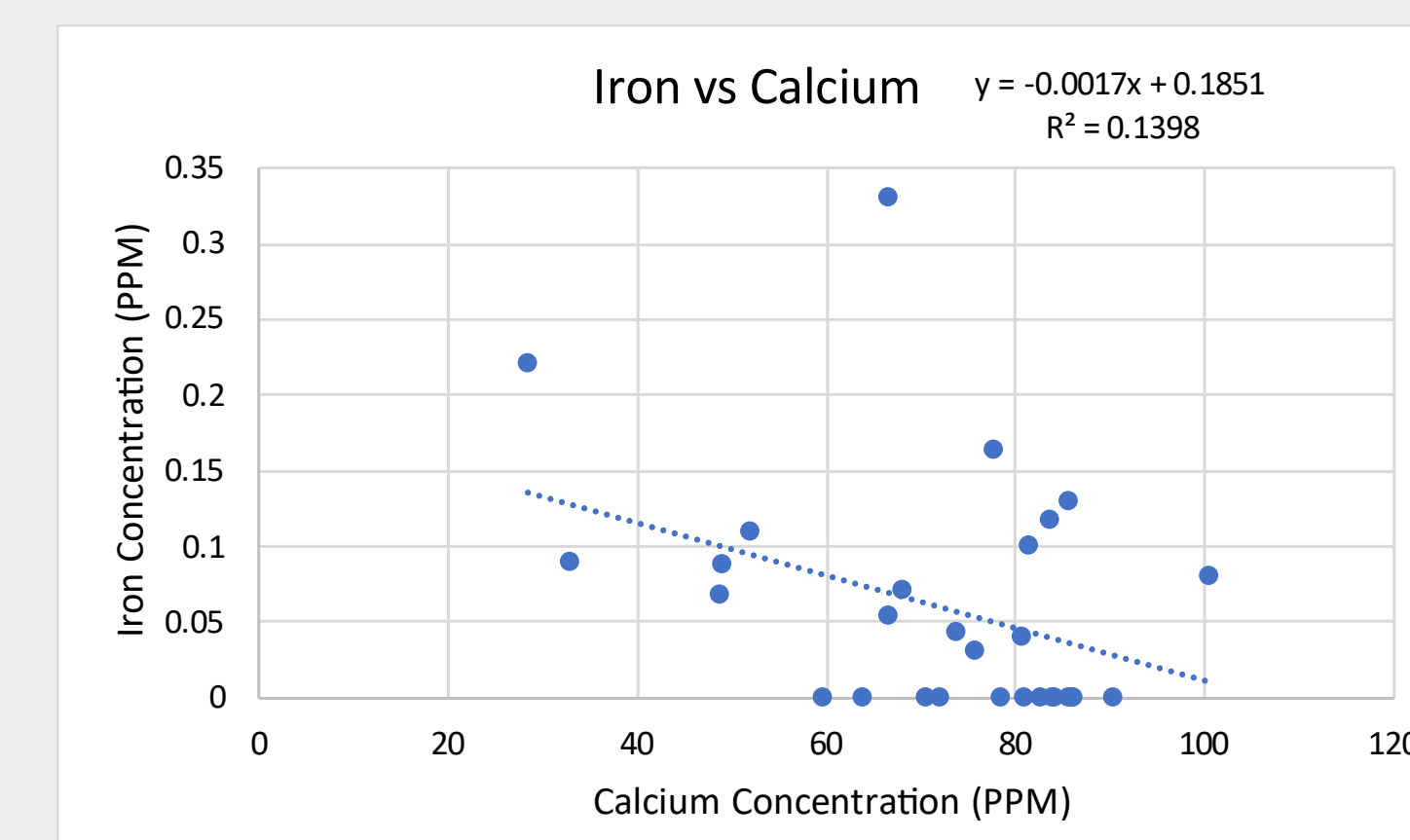
- These results indicate that iron concentrations do change following the sinkhole events
- The lake water causes change to redox sensitive major ions and minor ions
- Iron concentration peaks immediately after the sinkhole event and eventually lowers to zero following the event. indicating that it could be used as a natural tracer of infiltrated lake water.
- Oxidative weathering reactions of clay minerals

## Results

### Redox Sensitive Elements



### Carbonate System Elements



Our results confirm our hypothesis that iron concentrations will vary as infiltrated lake water flows past our groundwater well as a result of oxidative weathering reactions of clay minerals.

- There is a positive correlation between oxidized species of major elements (blue bordered graphs) and iron content, which indicates that oxidizing reactions are occurring.
- There is a negative correlation from elements which would be expected to be diluted by the lake water (red bordered) and the iron content.

