Abstract
Shakamak State Park, established in 1929, is located in the center of Clay, Greene, and Sullivan counties in Indiana. Lake Shakamak, located within the park, is a 52 acre impoundment constructed in 1930 when drainage through the railroad grade was blocked. Lake Shakamak, and neighboring Lake Lenape are currently considered sub-impoundments, both of which drain directly into a third impoundment constructed in 1969, Lake Kickapoo. Lakes Shakamak and Lenape trap significant amounts of sediment and nutrients that enter the system from the surrounding landscape before they enter Lake Kickapoo.

Nutrient utilization is evident in the comparison of dissolved oxygen levels amongst the lakes. Lake Shakamak is the most eutrophic of the three impoundments with dissolved oxygen values of 5 ppm 6 ft below the water surface. Here we present preliminary findings of a paleolimnological eutrophication study using fossil diatoms and geochemical analyses from sediment cores collected from Shakamak, Lenape, and Kickapoo Lakes.

The goal of our study is to better understand anthropogenic impact on the ecosystem throughout the history of these closely-related lakes. This research provides an analysis of the current trophic status of the lakes as well as the context for how the nutrient status of the lakes has changed through time and potential identification of sources of nutrients loading to the system. Several underground coal mines preexist near the drainage basin that may have an influence on the water quality.

Objective
To determine preliminary findings of paleolimnological eutrophication through the analysis of fossilized diatoms and to compare results between all three lakes.

Field Work
- Griffith Cores of Lake Shakamak and Lenape were obtained
- One short core (HTH) of Lake Kickapoo was obtained

Lab Work
- Extruded cores at every 0.5 cm
- Wet weight and dry weight were recorded
- Organic content was removed via hydrogen peroxide, then rinsed
- Valves per gram were determined by adding microspheres to samples
- Microscope slides were mounted using naphrax media
- Each slide was counted to at least 300 diatoms, except for slides with low abundances

Conclusions
- Images show algal accumulations on the borders of Lake Shakamak and Kickapoo, but are not prevalent in Lake Lenape
- Elevated turbidity in Lake Lenape are contributed to the abundance of Fragilaria
- Eutrophic conditions in Lake Lenape are contributed to the abundance of Aulacoseira
- Fragilaria diatoms are abundant in all lakes, due to average depths of Shakamak and Lenape ranging from 10-15m in depth
- Diatoms that favor phosphate were in low concentration at the initiation of Lake Shakamak could possibly be related to changes in load-use throughout the lake’s existence

Future Work
- Create a higher resolution data set
- Have geochemical analysis done on sediment core samples

Acknowledgements
- Indiana Division of State Parks and Reserves
- ISU Paleolimnology Lab
- Field assistance: Matt Brindle, Cory Portwood, Erika Smith
- Lab assistance: Jared Foster
- Indiana State Center for Student Research and Creativity
- Background Image courtesy of westerndiatomimages.com