Visualizing Industrial Organic Waste Located at Rib Lake, Wisconsin: A Geospatial Perspective Ground Penetrating Radar Test
Drake Bortolameolli (UWEC) Ben Degner (UWEC) Harry Jol (UWEC) Arlen Albrecht (UW-Extension)

ABSTRACT
Rib Lake is a north-central Wisconsin village located next to a lake, which once was a holding pond for the Rib Lake Lumber Company. The company processed 1.47 billion board feet of lumber during its 70 years of operation. The sawmill employees dumped all their byproducts into the lake. The practice of dumping into Rib Lake created a thick layer of waste on the lake floor. Logs buried in the waste are of high value due to their rarity and old age. Through the extraction of the logs, the village would be able to sell them in order to fund a cleanup program.

BACKGROUND INFORMATION
Ground Penetrating Radar (GPR) is a geospatial method, which uses electromagnetic pulses to image the subsurface. GPR is a noninvasive method that uses various frequencies on the electromagnetic spectrum. The pulses emitted from the transmitter travel through the subsurface, and when they encounter reflective objects in the subsurface, the time it takes for the signal to travel from the transmitter to the object and back to the receiver will determine how deep the object is.

RESULTS
The three top profiles were processed using PulseEKKO software and SEC Gain, while the bottom three profiles were processed using AGC Gain. Each color represents a different geological feature in the profile. ICE AND AIR are represented on the tops of the profiles. In profile number 3 the ICE may have small pockets of water trapped within the ice causing two DIFFRACTIONS in places where DIFFRACTIONS should not be occurring. The area we were collecting data in had about 1 meter of WATER. Below the water is at least 1 meter of WASTE. This waste layer is the presumed industrial waste that the employees from the timber company dumped directly into the lake. The waste thickness is unknown because the signal was being REFLECTED back and forth by either the ice or water. The north sides of almost all the profiles (left) have an area of very little reflectance. This UNKNOWN feature could be any different feature. It could be a very absorbent material or it could be because the water is too shallow for the signal to bounce off and get reflected again. We will not know for certain unless we core into the sediment.

Conclusion and Future Work
We ran 22 GPR lines across the ice each one measuring about 60 meters in length. Once reaching the end of one line all the equipment would be turned around and pulled back in the opposite direction. All lines were set so they all appear starting on the north side of the study area and going south. Our study area was a 60 meter by 60 meter grid, with spacing between each line being three meters. The frequency used was 100 MHz and we shot a pulse every 0.25 meters. The GPR profiles were then processed using PulseEKKO software at the University of Wisconsin-Eau Claire.

ACKNOWLEDGEMENTS
Support for the research was through the United States Department of Education, University of Wisconsin-Eau Claire Geography Department, Office of Technologies Services. Additional thanks go to O. Columbus Taylor County, Arlen Albrecht, Taza West and Steve Cluskey of the United States Department of Agriculture. Additional acknowledgments to Sara Miesnick who did much of the base work which this study was comprised of.

RESOURCES