DIATOM INFERRED LAKE LEVEL AND HABITAT TRANSITION IN THREE WILD RICE (*ZIZANIA PALUSTRIS)* LAKES ON THE FOND DU LAC RESERVATION

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Zizania palustris, otherwise known as wild rice, is a large food source and also an important part of the Ojibwe culture. In the 20th century, wild rice production in the lakes on the Fond du Lac Band of Lake Superior Chippewa Reservation declined in wild rice production. The reasons for the decline are not well understood; however, land use change in the region, the sensitivity of wild rice to increased fluctuations in water levels, and diminishing water quality are all thought to play a role. Man-made ditching in the early part of the 20th century, intended to drain the wild rice lakes on the Reservation, provides an interesting case study in how land use change and nutrient loading may affect wild rice production.

The research described here is part of a larger NSF funded project (Manoomin) that focuses on student outreach, education and primary research. Teams of Native undergraduate student researchers with the help of expert mentors complete much of the primary research and data analysis. Sediment cores were taken from Dead Fish, Perch, and Rice Portage lakes with the assistance of students from the Reservation and surrounding area. Student interns counted diatom valves using standard taxonomic references and the results were analyzed by comparing relative abundances of planktonic/benthic diatoms and lake specific training sets. Pollen, phytoliths, and sediment geochemistry were used as additional indicators of lake depth and habitat transition in these shallow wild rice lakes. The primary objective of this research is to better understand how nutrient conditions have changed as the lakes have filled in with sediment and become shallow enough to support abundant benthic diatoms and submergent/emergent vegetation.

Preliminary data suggest that lake depth decreased in all three lakes sometime between 3000-2000 cal. yr. BP and again as recently as 100 years ago. Recent decreases in lake depth could be the result of increased sediment loading after the surrounding areas were ditched in the 1910s. The diatom communities at all three lakes are currently dominated by benthic taxa and have been for more than 2000 years. More recently, benthic diatom community compositions have shifted away from species previously observed in high abundance throughout the analyzed sediment cores, suggesting potential increases in nutrient levels and changes in habitat availability over the last 100 years. Significant increases in nutrient availability in these shallow wild rice lakes can confound lake depth reconstructions, because shallowing and nutrient loading are linked and can lead to similar shifts in the diatom species assemblage. However, planktonic diatoms (mainly *Aulacoseira* and *Stephanodiscus*) present in low abundance throughout the last 3000 years are

now almost completely absent, suggesting decreases in lake depth could be a response to a shift in water balance, as well as increased sediment loads.

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