

Collaborative Research: Track 2: *Manoomin*, investigating the past, present, and future conditions of wild rice lakes on the Fond du Lac Band of Lake Superior Chippewa Reservation

Wild rice (*manoomin*; *Zizania palustris*) is at the center of Chippewa culture and identity. Some lakes on the Fond du Lac Reservation (FDL) are no longer hospitable to *Z. palustris*. However, the conditions necessary for its growth, its historical habitats, and the causes of recent changes are not well understood. The members of the Reservation are passionate about understanding historical conditions for wild rice growth, current challenges for restoring and enhancing its habitat, and ensuring future production. The answers to these questions will be sought **as a collaborative effort** between Fond du Lac Tribal Community College (FDLTCC), middle and high school student researchers, and the University of Minnesota (UMN) through the multiproxy analysis of multiple sediment cores from six lakes on the reservation, combined with geophysical profiling, remote sensing and visualization, and historical research. These efforts supplement FDL Resource Management Center's (FDLRMC) long-term modern lake sampling and monitoring program.

We propose to build upon the successful science camps, *gidakiimanaaniwigamig* (Our Earth Lodge, hereafter "*gida*"), for Fond du Lac middle- and high-school students that have been running as a collaboration between FDLTCC and UMN for the past five years. Students from grades 5-12 and undergraduates will participate in the proposed research through monthly meetings, internships, and pre-REU programs. We will support students in their significant transitions: middle to high school, high school to college, and tribal college to 4-year college. The college to graduate school transition will be supported through cooperation with the existing Purdue OEDG program.

Intellectual merit: Best practices for improving math and science learning by Native Americans include 1) cultural context, 2) relevance, 3) a holistic approach that considers the entire student, 4) involvement of the community, family, and elders, 5) a communal learning environment, and 6) problem-based or real-world-based activities. Our proposed research and education program involves all six elements of the best practices, beginning with a community need – to understand the conditions historically beneficial to growth of wild rice – and enlisting students to ask and answer real research questions. We will directly involve grade 5-12 and tribal college students and their teachers in the collection and analysis of lake sediment cores with the goal of reconstructing past lake levels, nutrient concentrations, and wild rice abundance and distribution. This project has clear relevance to students and their communities, and also provides an opportunity for student researchers to collect historical information from their families and elders. Several Minnesota academic research facilities will contribute oversight and mentorship of individual student intern research projects that together form the larger *Manoomin* research scheme. The scientific activities take advantage of the free and low-cost field and laboratory capabilities and training/education structure of LacCore, the National Lacustrine Core Facility, UMN, funded by NSF.

Broader Impacts: In the last five years, *gida* has not only led to a new crop of well-prepared undergraduates at FDLTCC, but has changed the FDLTCC academic culture. This is seen in the current effort to create a science concentration track at FDLTCC in response to increasing emphasis on science, technology, engineering, and mathematics on the part of the Reservation Board. With the inclusion of activities specifically aimed at tribal college students, we will build upon past successes and increase the number of Native American students successfully transitioning to four-year colleges in the STEM fields and the geosciences in particular. Monthly Friday evening public forums will involve teachers, families of the *gida* participants, and members of FDLRMC. UMN undergraduates will work with the *gida* participants and FDLTCC students, gaining both research and mentorship experience, and a better understanding of Native American culture. Detailed external evaluation will occur simultaneously with *Manoomin* program progress.