DaVinci Grant Program, Summer 2013
Proposal

Institute for Scholarship in the Liberal Arts (ISLA)
University of Notre Dame
Notre Dame, Indiana 46556

Project Title:

Stakeholder Mindset and Ecological Impact: Do Personal Beliefs and Values of Lake Papakeechie and Lake Wawasee Residents Influence Lake Stewardship?

Grant Applicant: Hannah Becker, Sophomore; Major in Anthropology, Minor in Sustainability

Supervising Faculty Mentor: Professor Anthony S. Serianni (Chemistry and Biochemistry)

Supporting Faculty Mentors: Professor John Sitter (English); Professor Daniel Lapsley (Psychology)

Non-Faculty Mentor: Dr. Ann R. Serianni (PhD, Psychology (social), University of Michigan, Institute for Social Research)

Project Location: Three-Lakes Region (Lakes Syracuse, Wawasee and Papakeechie), Syracuse, Indiana

Local Sponsors: Lake Papakeechie Sustainability Initiative (LAPSI) (a subcommittee of the Papakeechie Protective Association (PPA)), Syracuse, Indiana

Introduction. This interdisciplinary project combines fundamental limnological studies of an Indiana lake (Lake Papakeechie (LP), Syracuse, Indiana) and its surrounding watershed with social psychological studies of two contrasting, adjoining lake communities (Lake Papakeechie and Lake Wawasee (LW)). The project breaks new ground within the target community (LP residents) by educating, encouraging and empowering its residents to become self-sufficient environmental stewards of their lake and the greater watershed. Because the project is broad in scope and longitudinal in character, work performed during the eight-week project period will build an initial foundation upon which future studies will rest. The project is composed of two parts: (1) development and implementation of new lake limnological studies in collaboration with the Lake Papakeechie Sustainability Initiative (LAPSI), an emerging lake sustainability group, and (2) concurrent social psychological studies of the values and attitudes of residents about lake management/ecology in two adjoining lake communities, one in which lake environmental studies are well established (LW), and the other where these studies are under development (LP). Superimposed on this difference in environmental stewardship are significant disparities in the socio-economic status of the two communities, in the size and status (public *vs.* private) of the two lakes, and in the relative environmental impacts of one lake on the other (water flows from LP into LW). These disparities have led to an unhealthy lack of communication, cooperation and collaboration between the two lake communities, resulting in the less-than-ideal management of the two lakes and their surrounding watershed. The overall aim of the project is to couple lake limnology and watershed ecology studies with social psychology work, in an effort to better understand the lake communities, facilitate improved communication between them, thus leading to the prospect of better ecological management and outcomes.

Background. Lake Papakeechie (LP) in Syracuse, Indiana (~45 miles southeast of Notre Dame) is a private, 179-acre inland lake. It is a lake with significant history; for example, the famous cultural anthropologist, Margaret Mead, wrote many of her books while residing in a small cottage on LP. LP is managed by the Papakeechie Protective Association (PPA), which was founded in 1928. In 2012, the PPA completed a $1.1-million-dollar project to replace a

2500-ft dam separating LP from the largest natural lake (3060 acres) in Indiana, Lake Wawasee (LW). Disconcertingly, despite this huge financial investment in the future, the PPA remains largely passive in its ecological management of LP. This posture contrasts with that of the Wawasee Property Owners Association (WPOA) on LW, which spawned the Wawasee Area Conservancy Foundation (WACF) in 1991 to manage LW and its environs. Thus, the two lake communities, LP and LW, have adopted very different attitudes about the value and importance of lake management. It is unclear why this difference exists, and importantly, what might be done to bring the two communities into convergence. However, the need for such convergence is critical. For example, while LP is ~17 times smaller than LW, its ecological impact on the latter is significant, since water flows north from LP into LW, with about 20% of the water flowing into LW provided by LP. Efforts to manage LW must therefore include monitoring of the LP feed water, but since the water quality is unknown, such efforts are far less effective than they otherwise might be.

In 2012, a new environmental group on LP formed with the approval of the PPA. The Lake Papakeechie Sustainability Initiative (LAPSI) is actively developing new lake-management policies on LP. The primary mission of LAPSI is to establish thorough and long-term monitoring of LP with respect to the major ecological indices of lake health[1]: water pH, water turbidity, water temperature, microbiological profiles, phosphate and nitrate concentrations, dissolved oxygen, and other measurables. Importantly, LAPSI aims to fulfill its scientific mission through the use of lake resident volunteers (citizen-scientists) who will be trained to collect and analyze the scientific data over many years. LAPSI raised $4000 in donations in 2012 to support the construction of a small laboratory in the PPA Building, and to purchase scientific equipment and supplies. This level of donations is expected to continue for the next 3-4 years. One of the two Aims of the proposed project is to initiate the first systematic limnological studies of LP in its 110-year history.

While implementation of a lake management program by LAPSI represents a major step forward for the LP/LW watershed, its long-term success hinges on the active involvement of citizen-scientists in the two communities. An obstacle to communication exists between these

two groups, which may ultimately undermine community-based efforts to manage the watershed. How can this barrier be overcome? It is the contention of this proposal that establishing a social psychological profile of the two communities is a productive path forward, as suggested by prior studies correlating social psychology with environmentalism,[2] lake ecology,[3] and lake management.[4] We contend that the two communities have common environmental aspirations, but fail to work cohesively because of misguided notions about the beliefs and values each hold. The second Aim of this proposal has two parts: (1) To prepare and conduct an initial survey of LP and LW lake residents to identify the beliefs and values that both hold in common and those that differ in each community. Armed with this new information, both communities may be better able to find common ground on which to build a long-term relationship involving the watershed they share in common. (2) To determine whether beliefs and values are related to (a) LP and LW residents' behaviors that impact water quality, such as the use of lawn fertilizers and pesticides, removing aquatic plants from the shoreline, constructing seawalls etc., and (2) for LP residents, measures of water quality on LP.

Methodology and Description of Collaboration. Aim 1. Guidance for limnological studies will be provided by Supervising Faculty Mentor Professor Anthony S. Serianni. Lake water tests will be conducted at 50 GPS-defined locations on LP. These tests will be conducted twice during the 8-week project period, once early (~Week 2) and once late (~Week 7). In one set of tests (*E. coli*), water samples will be obtained at the 50 GPS-defined sites using sterile bottles submerged and filled at a defined depth. *E. coli* levels will be determined using pre-manufactured Petri dishes (*Coliscan Easygel*; Micrology Laboratories LLC, Goshen, IN) inoculated with lake water and incubated in an oven at 37 ^{o}C for 24 hours. Visual inspection allows a quantitative determination of the amount of *E. coli* in the water. In addition to *E. coli* tests, water tests at the same 50 GPS-defined locations will measure water pH (acidity) and temperature (measured simultaneously using an electronic meter equipped with a dual probe), and water turbidity (using a Secchi disc). Measurements will be made, or water samples taken, from a rowboat equipped with a GPS device. Samples of water feeding into LP, and of water entering LW from LP, will also be analyzed to compare water properties before and after

resident use. All equipment, supplies and reagents required to conduct these water tests will be provided by LAPSI. Scientific protocols for each test will be written to facilitate the subsequent training of lake residents. The results of these studies will be compared to the very limited water quality data collected by the PPA over the past 5 years, and to data collected from a LP water quality study conducted by Grace College in June-August 2007.[5]

Aim 2. Primary guidance for the social psychological studies will be provided by Dr. Ann R. Serianni and Professor Daniel Lapsley, with support provided by Professor John Sitter. A social psychological survey of LP and LW residents will be prepared and administered to establish human belief and value profiles on both lakes. A random sampling of residents of both lakes will be made, and equal percentages of the total residents of each lake will be sampled. The first step of the project will be to prepare (write) a survey instrument. Professor John Sitter will insure that the survey language is precise and accurately conveys the intent of the questions. Four categories of questions will be designed. The first will address demographics (*e.g.,* age, level of education, length of time on lake, *etc*.). The second will probe ecological beliefs, values and ideals. The third category will provide information on where the residents see themselves in the future. The nature of their expectations is expected have a profound effect on whether or not they maintain and sustain the lake ecology. The fourth category will address the socio-political differences between LP and LW. Since LP feeds into LW, there could be confusion about water ownership. Residents of LP may not believe they need to take an interest in the quality of the water entering LW because it only flows one way. The residents' perceptions of each other may provide insight into their definition of ownership. While both lakes have organizations that focus on the management of the watershed (WACF and LAPSI), these organizations currently do not coordinate on their activities, which may negatively impact ecological outcomes. The results of this survey will better define the beliefs and values of the residents of both lakes, promote better mutual understanding, and thereby promote improved management of the watershed.

Schedule. Work will be conducted from June 17th - July 12th (4 weeks), and from July 29th - August 23rd (4 weeks). I will live in Syracuse, Indiana during each week of the project, and travel to Zionsville, Indiana (~140 mi) on weekends. I will prepare written protocols in

collaboration with Professor Serianni for the four types of lake measurements discussed above during Week 1. I plan to conduct the first round of water testing in Weeks 2-3; making pH/temperature measurements, turbidity measurements, and collecting water for the *E. coli* tests in the morning hours of each day. Water samples will be brought back to PPA/LAPSI lab to prepare the petri dishes for the *E. coli* tests by midday. During Week 4, I will prepare the survey questions in collaboration with Dr. Ann Serianni, Professor Daniel Lapsley and Professor John Sitter, and consult with the PPA and WACF about identifying survey targets on each lake. Weeks 5-6 will be used to collect the second set of lake water measurements. Weeks 7 and 8 will be used to conduct the survey and summarize and interpret the data.

Statement of Research Goals. It is hoped that this work will specifically benefit the LP community as it develops its policies and practices on lake stewardship. The final results of this study will be shared with the LP and LW communities through the PPA (and possibly WACF) website, and if possible, published in an suitable public medium.

I aim to use the results of this research as part of my Senior Capstone Project, which is required for my Sustainability Minor. I plan to return to LP in Summer 2014 to conduct the same set of limnological measurements, and to conduct follow-up interviews with LP and LW lake residents. By funding my room and board, and travel, this grant will provide the means to deepen in my lifelong interest in the environment.

Budget. Funds ($4468) are requested for housing ($3080) and food ($800) costs, and for travel between Syracuse and Zionsville, Indiana ($588).

References

1. Kalff, J. *Limnology*, Prentice Hall, **2002**.
2. Oisho, S.; Graham, J. Social Ecology: Lost and Found in Psychological Science, *Perspectives on Psychological Science* **2010**, *5*, 356-377.
3. Janssen, M. A., An Exploratory Integrated Model To Assess Management of Lake Eutrophication, *Ecological Modelling* **2001**, *140*, 111-124.
4. Nannini, L, *Social Dimensions of Lake Ecology: Stakeholder Perception Surveys Used To Design Effective Lake Management Plans*, Masters Theses, Paper 39, 2011.
5. *Comparative Study of Kosciusko County Lake Water Quality*, Supplemental Report on Lake Papakeechie, Grace College and Seminary, **2007**.