Protecting Little Sebago: A Model College-Lake Association Sustainable Partnership

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Abstract

Saint Joseph's College of Maine and the Little Sebago Lake Association have worked together for more than a decade on various community-identified projects and problems. This article reviews the 2021 Protecting Little Sebago collaborative project between Saint Joseph's College and the Little Sebago Lake Association and identifies best practices for sustaining reciprocal partnerships, not just between colleges and lake associations, but between any learning institution and community-based group or organization.

Keywords: college collaboration; community-based-learning; community-based-research; lake; sustainability

Introduction

Saint Joseph's College (SJC) is a four-year liberal arts college in rural Standish, Maine, approximately 20 miles northwest of Portland. The campus sits on 474 acres, including 2,500 feet of waterfront on Sebago Lake, the second largest lake in Maine. The college's identity and mission as a Sisters of Mercy institution are closely interwoven with the beauty and environmental quality of the Lakes Region, and maintaining these qualities is essential to preserving its identity and critical to the economic viability of the area. Environmental stewardship is an integral part of Saint Joseph's College's ethos and is expressed through its commitment to sustainability and community.

Little Sebago Lake Association (LSLA) represents the landowners on Little Sebago Lake, a body of water that extends seven miles from the western town of Gray into the northern town of Windham. The lake is fed by tributaries originating in the eastern town of Raymond. Little Sebago Lake originally drained westerly into Sebago Lake, but in the mid-1800s was diverted into the Pleasant River for early waterpower projects. It currently occupies approximately 2,009 acres with a perimeter of about 30 miles. Little Sebago Lake hosts a community of more than 1,200 shoreland residential dwellings, plus public recreational access through a public boat launch. LSLA does not formally collect demographic information, but it is estimated that 75 percent of residents have college degrees, 30 percent are over the age of 65, 90 percent identify as White, and approximately 60 percent are year-round residents. LSLA is led by a Board of 15 elected directors and assisted by countless volunteers who work to protect the lake and its surrounding watershed.

Saint Joseph's College and the Little Sebago Lake Association have worked together for more than a decade on various community-identified projects and problems. This article provides an overview of their 2021 collaborative project, Protecting Little Sebago, and identifies best practices for sustaining reciprocal partnerships, not just between colleges and lake associations, but between any learning institution and community-based group or organization. The aim is to provide a positive narrative for college-community relationships, one that tells the story of institutions that share resources and expertise for community benefit while providing students experiential learning opportunities beyond the typical college classroom.

Teaching, Learning, Collaborating

Community-based learning and community-based research (CBL/R)

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are distinctive forms of engaged scholarship and hallmarks of teaching and learning at Saint Joseph's College. The college defines community-based learning as "an experiential pedagogy that engages students in solving problems within their communities as part of their academic studies" (Saint Joseph's College of Maine, n.d.). This strategy provides opportunities for deeper understanding and integration of theories and course content, transforming learners from passive recipients to active participants in their education and community (Dewey, 1938; Kolb, 1984).

Community-based research is a partnership approach to traditional research, with the communities and academic experts (faculty and students) collaborating as full partners in all stages of the process (Hall, 1992; Murphy et al., 1997). For the purposes of this article, community-based learning and research are referenced as two aspects of the same practice—a reciprocal teaching and learning collaboration that engages students and faculty with community to meet a community-defined need.

Saint Joseph's College adheres to three central principles that both define CBL/R and acknowledge the potential challenges of partnering campuses with communities for collaborative problem solving. These principles differentiate CBL/R from conventional academic research and pedagogical strategies as follows:

- CBL/R is an experiential learning strategy linked to course/lab/internship/capstone outcomes that offers students and faculty hands-on projects/problem-solving with community.
- CBL/R is a collaboration between students, faculty, and community. The processes and outcomes must be equitable and reciprocal.
- CBL/R is active and participatory. Together the students, faculty, and community work to solve a problem—social, economic, or environmental—not simply gain knowledge for knowledge's sake.

The collaborative nature of CBL/R makes it a highly effective mode of teaching and learning for all participants (Strand, 2000). As equal members of college-community "teams," students learn active listening skills, analyze problems and issues, and collaborate to find and implement mutual solutions—all essential skills for professional futures that will emphasize teamwork, cooperation, and critical thinking (pp. 88-89). Communities benefit from the training and resources brought to the collaboration, both of which help to build capacities, support research capabilities, and encourage self-sufficiency. While the collaboration often enhances the quality of academic research, the community brings ideas, perspectives, language, and knowledge that can support the learning process (Nyden et al., 1997).

CBL/R's purpose is to explore ideas, discover solutions, and build capacity for a community-identified need, but it is important to emphasize that this is a fully collaborative process—community members work with faculty and students at every stage of the relationship. Everyone is a teacher, learner, and contributor, which creates, in many cases, a multifaceted long-term relationship between the campus and community (MacKinnon et al., 2018, pp. 47-48).

LSLA/SJC Protecting Little Sebago Project Narrative

While Saint Joseph's College and the Little Sebago Lake Association have intermittently worked together for over a decade, in late 2019 LSLA reached out to SJC faculty to ask for help with water quality measurements and assessing lake health. The lake had seen particularly high levels of algae for a few years. In particular, LSLA identified phosphorus and chlorophyll levels as parameters of interest, but both require laboratory facilities and significant expertise to measure.

[Phosphorus is a found naturally in waterways, but in excess leads to algae blooms. Measuring chlorophyll, the [green pigment in algae and plants, in the water column is a way to monitor the growth of algae before it is visible to the eye. SJC added pheophytin, a brown pigment that increases during the decomposition of organic matter, to the chlorophyll method as they are commonly measured together and tracking both gives some insight into the growth and death cycles. This article focuses on phosphorus as it is a causal factor for algae growth and can be directly compared to established reference ranges.]

Levels of phosphorus in lakes vary substantially by geography, hydrology, and level of human impact but Wetzel defines five classifications: 1.) ultra-oligotrophic with less than 5 ppb total phosphorus (TP); 2.) oligotrophic with 5-10 ppb TP; 3.) mesotrophic with 10-30 ppb TP; 4.) eutrophic with 30-100 ppb TP; and 5.) hypereutrophic with $>$100 ppb TP (Weltzel, 2001). The LSLA sought to regularly monitor the amount of phosphorus to quantify the range of concentrations seen throughout the summer at different depths of all three basins.

Tracking periods of high phosphorus levels would help determine a correlation with algal growth and begin to address where it may be coming from. Phosphorus can enter bodies of water from stream inputs, runoff, air deposition, and/or groundwater infiltration; most typically it comes from agriculture and septic runoff and soil erosion both directly into the lake and by way of the larger watershed. A complicating factor is the role of the lake sediments, which can retain or release phosphorus depending on conditions. Clearly LSLA had analysis needs that surpassed what volunteers without access to a chemistry laboratory could accomplish and more generally, they needed assistance in interpreting data (both their own historical data and the new measurements) to better understand the sources of phosphorus in Little Sebago.

After an initial meeting between the LSLA Board President and member representatives, SJC science faculty, and the Director of Community-Based Learning, it was clear that not only could SJC faculty and students help LSLA meet their needs, but a formal collaboration would also provide valuable student training in the field and potentially serve as a model for college-lake association partnerships in general. Over the next months the two groups developed a grant proposal, which was subsequently funded by the Davis Conservation Foundation in 2020.

The project was multifaceted and included four primary components:

1. Course-specific work during the academic year to build the water-quality monitoring activities on Little Sebago, specifically with regard to measuring total phosphorus and chlorophyll;
2. Student internships over the summer to implement developed capacities and monitor lake conditions on a regular basis over the growth season (May through September);
3. Analysis of data collected by the interns as well as historical measurements;
4. Creation of a white paper to document the development of the collaboration and outline best practices for lake association-college partnerships.

In spring semester 2021, an Environmental Chemistry course led by Drs. Johan Erikson and Lauren Sammes worked to develop and test method to measure total phosphorus (TP) in the lake water. During the summer session and into the fall, interns monitored lake conditions, collected samples, and implemented the established analytical method to create a dataset of biweekly TP measurements in the three basins at multiple depths. For the fall semester, an Analytical Chemistry course led by Dr. Emily Lesher applied the methodology to measure TP in the streams that drain into Little Sebago Lake. The Analytical Chemistry class also focused on disseminating the results of the project, not only presenting the work to the LSLA Board, but to the Gray Town Council, the Windham Town Council, and the SJC community. Students benefitted both from seeing authentic context for their work and understanding that the data was valued by a community organization and local municipalities.

Student interns played vital roles in the success of the SJC/LSLA partnership. Over the summer, student interns worked in the field with LSLA president Pam Wilkinson and volunteer water quality specialist Rick Sullivan, guided by Drs. Emily Lesher and Greg Teegarden. The student interns implemented the previously tested method for measuring TP and established a method for measuring chlorophyll in the lake water samples. Biweekly, they went out on the water and collected samples from the two or three depths (surface, bottom, and middle for the upper and middle basins; the shallower lower basin had just surface and bottom samples collected).

They also assisted in the routine water quality measurements (Sechi disk clarity, dissolved oxygen, and temperature profiles) that LSLA volunteers have been collecting for decades. Additionally, they collected sediment core samples from each basin to analyze element ratios, which indicate whether sediments retain phosphorus or are prone to release it back into the lake.

The enhanced water quality monitoring led to a better understanding of phosphorus dynamics in the lake. The first conclusion the data revealed is that while the phosphorus level fluctuates over the season, there are concentrations over 30 ppb (in the eutrophic classification) at a few time points, in the Upper and Middle basins, in the deepest water at the bottom of the lake.

Anoxia has been documented by the volunteer water quality monitors in the lake for years. Anoxia, or depletion of oxygen, results in the deepest parts of the lake from thermal stratification, and the degradation of organic matter such as the algae that often occurs in response to high phosphorus levels. Furthermore, anoxia can actually create additional phosphorus input by chemically reducing the sediments, which dissolves iron-containing particles and releases surface-bound phosphorus to the water in contact with the bottom of the lake. This is referred to as internal loading.

The middle lake area showed evidence of internal loading in both

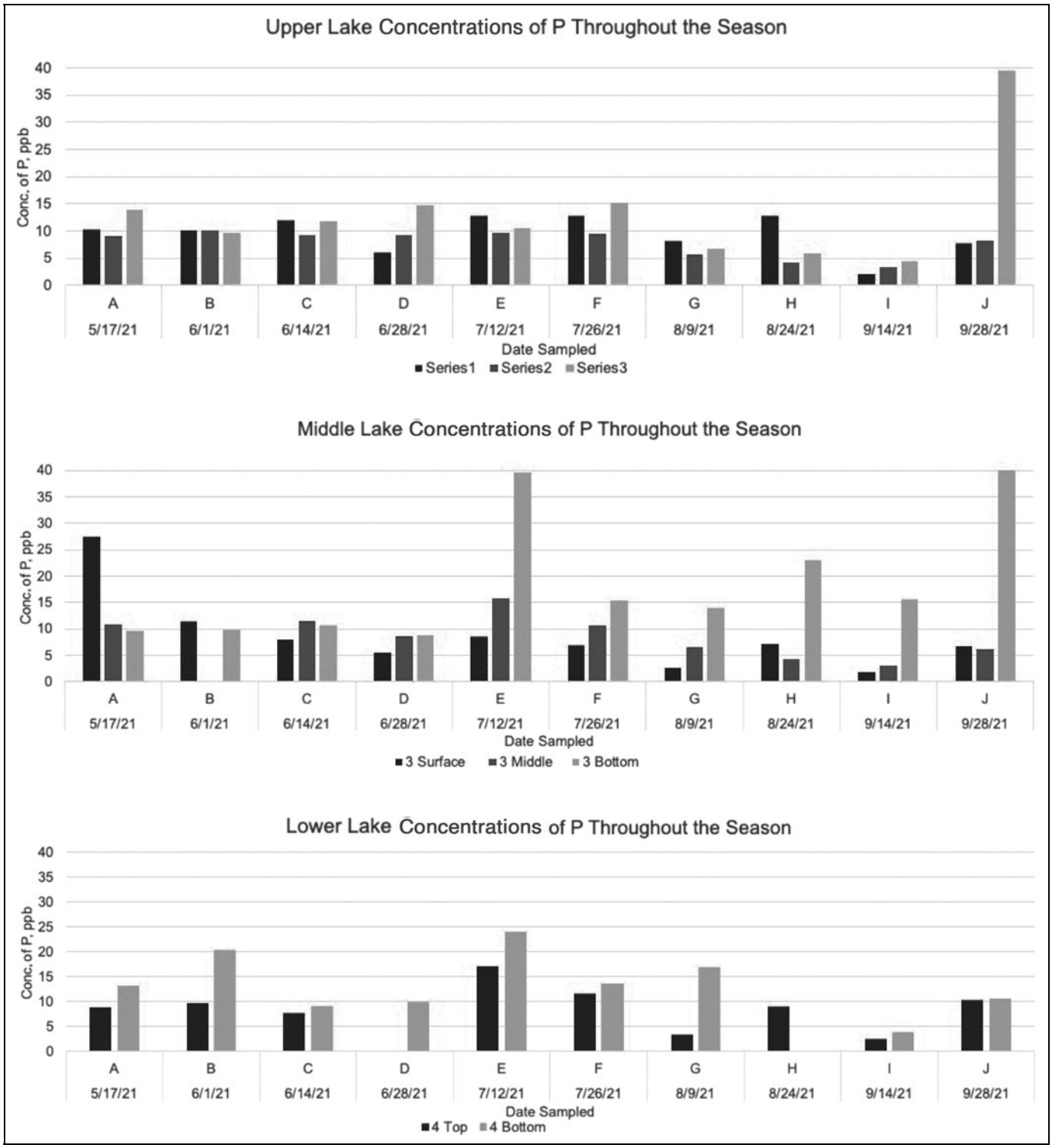

Figure 1. Phosphorus samples taken by students from three areas of Little Lake Sebago between May and September 2021. Phosphorus concentrations normally range from 5–15 ppb.

the sediment chemistry analysis (results not shown) and in the water measurements, with TP concentrations elevated from 07/12/2021 on, reaching nearly 80 ppb at the bottom of the lake on 09/28/21. (See Figure 1.)

There was no conclusive evidence of internal loading for the upper or lower lake. The sediments of the upper lake are more resistant to internal loading/phosphorus release, and the bottom-grab samples were primarily low, except for the sample taken on 09/28/

2021. The lower lake sediments are also prone to phosphorus release, but bottom water-grab samples were generally low in phosphorus.

Interpretation of these results paints a partial picture of phosphorus dynamics in Little Sebago. The phosphorus levels above 30 ppb observed in the Upper and Middle basins are concerning and likely to produce algae blooms. Interestingly, lake residents reported fewer and less severe blooms in 2021 compared to previous years, which is an indication that the causes of blooms are multi-faceted and are impacted by weather and hydrology. Nevertheless, the results suggest that phosphorus inputs from both the watershed and the lake sediments are impacting overall concentrations. The students were able to offer the following recommendations to LSLA:

- Continue enhanced monitoring during active months.
- Expand stream inlet testing.
- Push for more protective local ordinances, such as shoreline zoning.

The LSLA/SJC Protecting Little Sebago project laid the groundwork for continued collaboration beyond the scope of this single project, and the benefits for both entities were substantial. SJC interns benefitted from being fully immersed in a data collection effort and seeing the reality of the relationship between lake water quality and the human interactions with the lake. LSLA benefitted from increased water monitoring and a season's worth of data collected and assessed. The summer internships model will likely continue for future data collection and analysis.

Best Practices

The Protecting Little Sebago project modeled a successful college-community partnership. Drawing on the extensive CBL/R experience of the Saint Joseph's College faculty and its dedicated pedagogically centered CBL/R program, assessment of the LSLA/SJC 2021 project, and feedback from Little Sebago Lake Association members, a series of best practices have been identified for successful collaborations between colleges and communities. This list is far from exhaustive, but its objective is to provide guidelines for colleges and communities to work together in reciprocal and equitable ways as they collaborate to address community needs.

BP1: Outline goals and strategies together. At the beginning of a partnership, emphasis must be on the collaborative process. By working together to identify the community's goals and discussing how they fit with student learning outcomes, a strong foundation can be laid for both the current project and any future collaborations between the campus and community. A clear and shared understanding of project goals and team member contributions will do much to further early progress, as diverging agendas for outcomes can unintentionally hijack an organization's needs (Shefner & Cobb, 2002, pp. 275-276). Collaboration during the planning phase of a project is critical.

BP2: Share power as equitably as possible. Once the collaborative process has been established, it is important to maintain this mutuality by working together to define the project. The community's voice is particularly important in shaping the research question or project direction. Sharing power can present challenges to college-community collaborations (Shefner & Cobb, 2002, p. 292), so the campus partners (for instance, the faculty members and CBL/R director/coordinator) need to pay close attention to this aspect. When community members feel they have less voice in the relationship, the research is likely to be less valuable to them and the partnership may feel unbalanced and obligatory, rather than mutually collaborative as intended (Shefner & Cobb, 2002; Strand, 2000).

BP3: Be clear, deliberate, and respectful in all communications. Communication is an essential element of effective partnerships. CBL/R brings people together with different world views, experiences, and perspectives, and requires that they engage in conversations to accomplish often challenging and complex tasks. All participants must strive to understand and be understood, and this means avoiding "alienating rhetoric" (Freire, 1970, p. 77) or disciplinary jargon, clarifying meanings, identifying assumptions and recognizing what might not be obvious to everyone involved, and "working to develop a common discourse that will make future partner interactions inclusive and productive" (Strand et al., 2003, p. 9).

BP4: Be flexible and accepting of different organizational perspectives. Successful partnerships learn not only how to communicate across sociocultural divides, but they must recognize and navigate institutional constraints that could potentially impede a successful collaboration. "Community organizations and higher education institutions are very different in size, financial stability and cash flow, organizational structure and accountabilities, levels of bureaucracy, interorganizational relations, and reward structures" (Strand et al., 2003, p. 9). Campuses typically operate on semester schedules and have priorities that dictate deadlines and due dates, while community partners may be impacted by staff availability and

time constraints. Both campuses and community partners may be navigating funding access or parameters. Although these factors can challenge the establishment of strong CBL/R partnerships, clear communication, recognition of differences, and flexibility will go a long way toward helping college-community collaborators work through challenges (p. 9).

BP5: Remember that the community always comes first. The most obvious objective of a CBL/R college-community partnership is to address an issue or solve a problem. However, academic and community needs and interests may very well diverge beyond their mutually identified goals. On the campus side, faculty need to ensure that they are providing their students with valuable learning experiences. They also recognize the inherent value of CBL/R in both student recruitment and retention. On the community side, partners are seeking support, understanding, and positive change. They need good quality data, reports, or other products that are useful, and may also have to consider internal aspects such as community politics or financial obligations. For successful college-community relationships, the collaboration must meet the community's interests or needs, enhance organizational capacities, and focus on the mutual benefits of working together for the common good (Strand et al., 2003, p. 9).

BP6: Develop and share a mutual long-term perspective. An important aspect of successful CBL/R partnerships is the co-development of a future vision. This can be achieved by recognizing that short-term CBL/R projects can make incremental contributions toward the future goal of positive and lasting change. Long-term goals typically fall into three general areas:

1. Helping the college be both more relevant to the community and more effective in educating students to be active, engaged, and knowledgeable citizens (Shefner & Cobb, 2002, p. 293).
2. Helping the community partner gain more knowledge, access more resources, and become more resilient (Hayhurst et al., 2013, pp. 607-608).
3. Helping all participants acquire knowledge and skills that they can then bring to future projects, collaborations, and experiences (Strand et al., 2003, p. 10).

Since most one-time CBL/R projects have modest impact, keeping a long-term perspective helps partners on both sides remain committed to the ongoing work needed for a fruitful and sustainable partnership.

Conclusion

The most successful CBL/R partnerships are reciprocal teaching and learning experiences. Both college and community partners increase skills and knowledge, so when a project is completed, future partnerships can potentially be even more productive. If students and faculty acquire technical skills and new knowledge, they are able to bring these assets to the next project. If community members learn processes and strategies for working effectively with students and faculty, these will go far in ensuring the success of future college-community collaborations (Strand et al., 2003, pp. 9-10).

CBL/R prepares students for lives of engaged citizenship, with motivation and capacity to deliberate, act, and lead in pursuit of an equitable and sustainable future (Campus Compact, n.d.). As place-based institutions with resources and capacities, colleges have the power to contribute to the health, strength, and resilience of their communities. Together, colleges and communities can cocreate collaborative partnerships through CBL/R projects to solve problems, address difficult issues, and work for positive change.

Authors' Contributions

Emily Lesher designed the project, guided collection and analysis of lake data, and was the primary community contact. Kimberly Post interviewed project participants, reviewed existing community engagement research, and compiled best practices. She also took the lead in writing the manuscript with input and project narrative from Lesher.

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Author Disclosure Statement

The authors declare that they have no relevant or material financial interests that relate to the research described in this article.

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