SERVICE-LEARNING IN A RURAL WATERSHED
UNITY COLLEGE AND LAKE WINNECOOK:
A COMMUNITY PERSPECTIVE

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ABSTRACT

The Unity College service-learning project focuses on improving local watershed health by offering services to multiple community partners such as the local lake association, state resource management agencies and other community education entities. Our model of service-learning in a rural setting is issue centered rather then agency placement centered. Service-learning encompasses both class activities and projects by individual students, such as: environmental monitoring, fisheries and wildlife data collection and statistical analysis, cooperation with state fisheries and wildlife agencies to improve sport fisheries and wildlife production, student initiated environmental research projects, educational outreach in local schools and at lake association annual meetings, development of educational displays for the local community center, recording and interpretation of local history, research and interpretation of land use changes in the watershed since 1940, and study of impacts of poor water quality on taxation and community development. The community benefits from the college’s service-learning program in many ways, including better informed community decisions on watershed issues resulting from college student enthusiasm to research new information about the community. The community also benefits from the college service-learning activities that educate adults within the community and children in local schools about environmental issues including shoreline erosion, fisheries and wildlife management, lake ecology and community impacts on the watershed. Additionally the college and community come together to complete labor-intensive erosion control projects and to celebrate achievements resulting from student and community collaboration.

INTRODUCTION

Unity College, a small independent liberal arts college with a mission of environmental stewardship, uses Lake Winnecook and its watershed as a laboratory for social science and science classes. The college supports the Lake Winnecook Water Quality Project (LWWQP) which coordinates experiential learning and student engagement with service in the local community of three villages surrounding Lake Winnecook. This college service-learning project brings together the community, the local lake association, environmental resource agencies, and the college by providing focus, energy, and academic expertise.

Serving as president of the local lake association and as a student attending Unity College provides me an opportunity to make a difference within my community while joining, educating, and learning with others in the community about water quality within Lake Winnecook and its watershed. This article presents the perspective of a community partner that has reaped the benefits from the service-learning activities of the local college. This community “voice” is more personal than the customary academic “voice” that publishes articles. Nevertheless, it is a “voice” that should be heard if service-learning programs that support community-based watershed efforts are to be relevant to society and the local communities that comprise our society.

PERSONAL INVOLVEMENT

My interest with Lake Winnecook began as a child of five years old with a net and a pair of old sneakers exploring every square inch of shoreline and capturing anything that moved, crawled, hopped, or crept across my path. Lake Winnecook was a place where I became interested in nature and had the chance to play in an area that, being a small child, seemed as large as an ocean. In 1973 everything I perceived was simple and clean.

As an adult I have become aware of the struggle most Maine lakes share as we place greater pressures on our environment. Canoeing along the shore of Lake Winnecook today I am increasingly unaware of residents’ names. The number of residences has increased through the years; seasonal camps have been transformed to year around homes. Each new residence and the greater population living on the Lake Winnecook shore and throughout the watershed seems to correspond to the amounts of contaminants that have
taken a toll on water quality. Traveling to the lakeshore on old and new unpaved roads, one can observe paths of fine silty sand that eventually make direct journey into the lake. Today there is a greater use of Lake Winnecook resources with activities like boating and jet-ski use. Lakeshore land development includes construction and maintenance of private housing, each with large cultivated lawns that extend to the lakeshore, a recreational park, and a golf course.

It is hard to imagine what the village of Unity looked like in the past, yet the lake is a reminder of local history. The lake is a focus by which the community reconstructs the past and shares responsibility for protection of resources for the future. Many residents speculate why Lake Winnecook has problems with an increase in algae blooms and poor water clarity during the hot summer months every year. Property owners on Lake Winnecook have been dismayed by declining water quality and a perceived link to static or reduced property values even as property tax rates increase. Public perceptions and resource agency monitoring recently caused the state of Maine to designate Lake Winnecook a “priority” lake. It is often hard for many residents to realize that a lake and its watershed are comprised of many ecological niches in which resident plants and animals are delicately balanced within their physical environment. Every improperly installed culvert or ditch line, every inadequate road maintenance plan, every defective septic system, and every misuse of fertilizer or herbicide will ultimately effect the ecological balance of Lake Winnecook. Collectively we are all responsible, as a group, not just one person or the residents on one camp road, but rather the whole lake community and visitors that use the water resources of Lake Winnecook and its watershed.

Memories of counting boulders from the edge of a canoe to a depth of ten feet below the water’s surface, playing in the water for hours, or eating white perch I caught are all memories that are difficult to recreate due to the changes in water quality throughout my lifetime. In recent summers lake transparency is much reduced, children are frequently prohibited from entering the green water, and fish mortality is often reported. Today changes are being made to improve Lake Winnecook but unfortunately the changes are slow, sometimes too gradual for the community to realize that anything is being done to improve water quality toward the conditions long remembered.
THE SETTING

Cultural History

The Lake Winnecook watershed has undergone many transitions of land use practice since my ancestors from Plymouth MA, who were among the first European settlers, arrived in 1785. Forests of old growth pine were cleared with ox chain and axe to create homesteads and were cut for lumber at sawmills on each of the tributary streams. Stories that were told described virgin pine trees so large that a yoke of oxen could be turned on a single stump. In fact, one tree from the Unity area was chosen as a mast for the USS Constitution. Vast stretches of relatively flat land with tillable sandy soils (Tinsley 1975) were cleared throughout the area leaving much of the shoreline and surrounding area of Lake Winnecook barren of forest. Early deforestation so changed the landscape that in the 1830’s agriculture was intensive on subsistence farms and forests were an unusual feature of the landscape (Vickery 1954).

Industry developed during the early part of the 20th century to support advances in local agricultural productivity. One example was a cannery established near the southern shore in 1923 to process and pack peas, beans, and carrots. Seasonal cannery effluent, approaching 2500 m$^3$ per day, was piped directly to the lake until 1952. That disposal of untreated cannery waste into the lake corresponded to noticeable decline in water quality (Cooper 1942). Community memory continues to accuse the cannery for lake water quality deterioration even now, fifty years after the cannery closed.

Subsistence agriculture declined after World War II although commercial dairy farms and poultry production enjoyed expansion until twenty years ago. Forests recovered (Figure 2), but a new forestry industry harvested regenerated forest with mechanized equipment more intrusive to the land than axes and oxen. A new population appreciated the lake and open land for aesthetic values that in turn led to new construction particularly along the shore of Lake Winnecook. Changes since 1950 that accelerated after 1970 included installation of indoor plumbing and associated wastewater disposal in most camps, conversion of seasonal camps to permanent dwellings, and new construction of larger permanent homes. And still nutrients accumulate in the lake.

At present, approximately 500 seasonal and permanent dwellings are located within a ring of paved roads that encircle the lake. A large majority of those residences are less than 20 m from high water with perhaps 10 percent surrounded by water and another 20 percent situated within 5 m of the shore. At times water systems, wastewater systems, access roads, storage buildings, and other associated facilities are flooded in a typical water year (Tinsley 1975). Such flooding had a total duration of nearly a month with lake stage fluctuations reaching maxima in February, late March, and again in late April during the year 2000.

Water Quality

Lake Winnecook is like many other lakes in Maine, yet the lake is distinctive because it supports nuisance blooms of planktonic blue-green algae for a longer season than most lakes, from May through November. Lake Winnecook is a 1000 ha natural lake with no outlet control structure. The lake is shallow, dimictic, and mesotrophic. It is characterized by tannic acid stain and nuisance blooms of Cyanobacteria. Second order streams are tributary from east, north, and northwest. A fourth order stream is sometimes tributary at southwest depending on relative stage of stream and lake. At typical lake and stream stage this stream flows past Lake Winnecook, but at stream stage higher than lake elevation, the stream is a major tributary to the lake. The fourth order stream contributes water from a watershed east and southeast of the lake. Lake stage fluctuates 2 m with highest lake levels in late winter and spring and lowest stage usually in September. The outlet toward the west, 25 Mile Stream, is tributary to the Sebasticook River that is tributary to the Kennebec River at Waterville. Lake Winnecook is in biophysical zone 10, the Central Interior, (McMahon 1991) and has a modified maritime climate.

A strong perception in the public conscience is that transparency of lake water reflects water quality. Maine Department of Environmental Protection supports this public perception through its interpretation that Secchi disk transparency serves as an excellent indicator of water quality and parallels total phosphate concentration. The longest continuous series of data about water quality in Lake Winnecook is through Secchi disk transparency. Lake Winnecook Secchi disk transparency is influenced during the recreation season by blooms of blue-green algae (Cyanobacteria).

Cyanobacteria begin to bloom in late May as a spring pulse of diatoms and other chrysophytes declines. Bloom concentrations can continue into the following February, under winter ice. A typical bloom sequence begins as *Microcystis* concentrates at the surface in
June and continues to be abundant through September. Straight and spiral filament species of *Anabaena*, present throughout the summer, become dominant in August and make a gradual decline into late autumn. *Aphanizomenon* typically replaces other species as lake temperature cools with autumnal mixing. *Aphanizomenon* may develop only moderate populations or may overwhelm other species and continue at bloom concentrations under winter ice until early February. *Aphanizomenon* may be a recent indicator of declining water quality; Rabeni (1974) did not report *Aphanizomenon* in a study of the lake during June through August only.

The lake supports sport fisheries for centrarchids, esocids, other panfish, and stocked brown trout (*Salmo trutta*). For ten years the lake has been stocked annually with prespawn *Alosa pseudoharengus* (alewife) as part of an effort to restore anadromous fish stocks in the Kennebec River watershed. Stacking density approaches six adult alewife per hectare with both adults and fall juveniles emigrating toward the sea by early November.

The 118th Maine Legislature designated Lake Winnecook as a “nonpoint source priority watershed” in 1997 (Public Law 1997 Chapter 519 (38MRSA 2013)) due to blooms and a sensitivity to change. That designation was based for most part on volunteer Secchi disk monitoring data, infrequent water sample collection and analysis by agency personnel, documented development of anoxia in the hypolimnion most summers, periodic or continuous total phosphorus concentrations in excess of 20 ppb, changes in the tax base in surrounding towns, and human population estimates (see also <http://janus.state.me.us/dep/blwq/docwatershed/prilist5.pdf>).

**HISTORY OF FRIENDS OF LAKE WINNECOOK, INC.**

Some residents in the Lake Winnecook watershed were frustrated by the slow response of local governments and apparently remote and unconcerned state bureaucracies responsible for natural resources management. In 1987 several concerned members of the community formed Friends of Lake Winnecook, Inc. (FOLW), a local lake association, “to preserve, enhance, and protect the beauty of Lake Winnecook and its adjacent area.” Since then, about 200 individuals have been members at some time, and the FOLW has generated annual membership ranging from 60-100 individuals.

Since its early years, the lake association has sponsored speakers at an annual meeting, an annual loon count (with Maine Audubon Society), volunteer Secchi disk monitoring (with Volunteer Lake Monitoring Project), and research and monitoring by local high school pupils and college students (with Waldo County Soil and Water Conservation District). The FOLW has encouraged cooperation among the three rural towns that share Lake Winnecook’s resources.

Despite a few early successes, FOLW struggled for active members and struggled to make a difference. Public outreach and education remained a lake association objective that was seldom implemented. A member recently described the prior success of the association as “subtle but unspectacular.”

**SERVICE-LEARNING**

**A Partnership - The Lake Winnecook Water Quality Project (LWWQP)**

Unity College approached the FOLW in 1997 with a proposal to develop service-learning curricula for several classes that could enhance the lake association’s restoration efforts. The lake association accepted the invitation of the college because previous faculty reports about lake ecology given at lake association meetings were of great interest to its members and the academic expertise was acknowledged, appreciated, and needed.

In order to better define how service-learning could assist the FOLW’s efforts, several Unity College faculty and staff worked closely with a few dedicated FOLW members to develop a preliminary lake association needs list. The college sent this list to faculty accompanied by a request that faculty consider whether they could incorporate service-learning projects into their course curricula. During the first year of the partnership, faculty identified six courses in which service-learning projects could be integrated that would address some of the FOLW’s needs.

**Benefits of Service-learning to the Community**

The initial successes of Unity College’s service-learning program at Lake Winnecook, which are described in more detail below, include:

- increased participation of the community on the campus and on Lake Winnecook restoration efforts,
- a sense of accomplishment for both community partners and students,
- an extraordinary transformation from a few core lake association members struggling to demonstrate any accomplishment to a dynamic association with many members dedicated to keeping Lake Winnecook resources as viable as possible, and
- a new focus of staff and financial resources by State
natural resource agencies to assist with restoration efforts, research projects, and collaborative learning within the community.

The community was invigorated by the enthusiasm at the college and the activities that were observed in the watershed. Community education and outreach products developed by the students such as posters, maps, art, and brochures are now on display and educating residents that pass through the town office and the community center. Presentations of results and findings by students and faculty stimulated renewed interest within the community in the lake as a valuable resource. These efforts were moving FOLW beyond “subtle but unspectacular.”

The partnership blossomed. As more students and faculty realized that the community service model provided an excellent base for both teaching and learning, more classes participated in service-learning. Meanwhile the FOLW identified additional individuals in the community who became partners to college service-learning projects. Some of these interested citizens became new members of the FOLW. These partners responded to questions from students and faculty. They invited students into their homes or to sites of interest on the lake and in the watershed. They attended a few classes as participants and consultants, and they provided an audience for student presentations of class products.

As FOLW became empowered to propose ideas, the excitement built. FOLW proposed to the college an expanded needs list, including many items never previously addressed by resource agencies, the lake association, or the college (see <http://www.unity.edu/winnecook/needs.html> for a detailed needs list). Since the college first approached the FOLW just four years ago, more than twenty courses have provided services to the Lake Winnecook community. For example, students have (See Table 1 for a complete list of classes, service-learning projects, and partner benefits to date):

- conducted water quality monitoring in the lake and tributary streams,
- monitored groundwater in a sand and gravel aquifer,
- initiated a natural resources inventory,
- identified social issues that influence lake water quality,
- recorded oral histories of the watershed,
- conducted environmental education lessons and water quality skits in the area schools,
- engaged in public outreach to educate and mobilize the public, and
- developed a plain English ‘rule book’ for property owners that explains, in lay terms, agency regulations concerning the lake and its shorelands.

Groups of college students and faculty at the FOLW meetings and active in watershed assessment and restoration activities were prominent compared to the previously infrequent visits to the watershed by natural resource agencies. The focus and time contributed by the faculty and students to Lake Winnecook restoration efforts were instrumental in engaging natural resource agencies and getting these agencies to finally commit staff and financial support. For example, the Cooperative Extensions Service expanded its Watersheds Stewards Program to the Lake Winnecook area and provided 30 hrs of training to 16 lake association members, 12 college students, and 14 other members of the community. These new Watershed Stewards then conducted a watershed survey with other college students. That survey led to the community and the college jointly planning for a Day of Service that has resulted in the completion of 16-erosion control projects by more than 200 members of the local community and college. Maine Dept. of Environmental Protection (DEP) then requested water quality monitoring at Lake Winnecook by college faculty and students at frequent intervals as part of the DEP project to complete a nutrient management plan. The increased activity on Lake Winnecook by natural resource agencies in turn, stimulated additional college activity and participation by community members. As environmental awareness has increased within the community, local citizens have gained a greater understanding of the complexity of environmental impacts.

Lessons Learned

Lake Winnecook and the watershed provide a central theme for both service and learning. One important component to early success of the service-learning partnership was the creation of a staff position at the college that was dedicated to support the service-learning program. College staff convinced faculty to think about service and learning in the community, secured external funding for curriculum development and faculty release from teaching responsibilities, facilitated meetings and training sessions, organized assessment of individual courses and curricular offerings, and provided enthusiasm from the perspective of a larger service base on the co-curricular side of campus.

A second important component to early success was the development of the extensive FOLW needs list. Some
needs were easy to resolve with enthusiasm, time, and expertise. Some needs will never be addressed by the college or the lake association, yet the entire FOLW needs list provided stimuli for discussion, planning, and collaboration among organizations that previously had not worked together. By having an issue centered service-learning project within walking distance of campus, the transportation issues have been greatly reduced.

In a typical service-learning situation individual students travel to a partner’s location or office. That does not work very well at Unity because distances to partners’ offices are so great, students often do not have time to travel, there is no public transportation, and many students have no personal transportation. The Unity College model is issue and place centered rather than agency placement centered. Therefore, students work at the lake, on campus, and in the community rather than at agency headquarters. This model fits our rural setting.

Limnology student with dragonfly collected for the Maine Damselfly and Dragonfly Survey of Maine Department of Inland Fisheries and Wildlife.
Photo Credit: David Potter, Professor Fisheries Unity College
Lake Winnecook is within walking distance of campus, learning and service are primary, contact with agency partners is secondary. Partners communicate routinely with students by mail, E-mail, or by personal visits to campus or to a field site to meet classes. Part of the success of this service-learning program is that the partners conduct the long distance travel while college activities are local. For example one of the college’s partners is the Maine Department of Inland Fisheries and Wildlife, located in Sidney, Maine, more than 30 miles away. For this agency, college classes collect local fisheries and limnological data and information about recreational sport fishing at the lake. State fisheries biologists visit campus or meet with classes at the lake rather than insisting that students travel to the agency office. Each year students from fisheries classes collect alewives and record length and weight for each fish. Students in statistics class manipulate the data to produce graphs, descriptive statistics and inferential statistics about the alewife populations. All data and analyses are submitted to the state fisheries management agencies. Finally agency personnel are invited to visit classes to lead a reflective discussion on the impact of student work on Lake Winnecook fisheries management.

Even though students only occasionally meet the agency partner, student often do meet with FOLW members on the college campus, in the field, at community meetings, in private homes, or even during a chat at the local store or laundromat. Students learn about the community perspective for agency activities, rules and regulations, development and taxation that expand on their academic work. These chance meetings provide an opportunity for reflection with the community partner and give the
students a different perception of learning, service, and their role in the community.

This is a different model than is customary in agency placement situations. The community members like the contact with students because they can ask questions about environmental topics and engage students in conversation about student learning and the community member’s life long interest in the topics. Perception on campus and in the community is that an educated citizenry will make good decisions. The campus and local communities find that the practical experiences of service-learning do indeed support informed community decisions about watershed issues.

The community has learned that it can serve an important role for improved water quality by providing partners, resources and audiences for college activities. Individual community members are learning what is needed to be the local partner for a service-learning class. A partner must be a real warm body who responds to class needs for information, is receptive to student and faculty questions, will visit the classroom, has questions for class, will meet the class at lakeshore, and will critique class projects and final class products in the context of the partner’s needs. Local partners are indispensable to student learning in this modeling of real world situations. The advantage of the local partners is that they are even more regularly available to the students than most agency personnel.

However, all partners must also realize that the service is primarily performed to enhance student learning. The service is not commonly performed as a contract, and the products will represent student accomplishments rather than professional products. This last point is contentious more with college faculty than with the community partners, for some faculty are reluctant to release products unless they meet faculty professional criteria.

The college and community have discovered from assessments by external reviewers (Madden 2000) and through continuous planning, implementation, and evaluation that there are numerous lessons within the progression of service-learning. Several of those lessons are:

- Service-learning projects must address a real need in the community
- Strong community college partnerships take time to develop; they are an investment
- Community service and service-learning must be an early expectation of students
- Community partners must be oriented to the goals of service-learning as an educational practice
- Engaged faculty are key to successful integration of a service-learning program
- Service-learning works best when faculty are active role models and are engaged in service activities
- Service-learning projects must fit the mission of the college and learning goals of the course
- Senior administrators must be committed to create an engaged campus
- Administrators must acknowledge and recognize to the entire community all faculty efforts to develop, to integrate, and to continue service-learning courses
- Each partner must establish clear expectations for students, staff, faculty, and community
- Service-learning projects are messy, evolving, open-ended, and sometimes unfinished
- Large, multi-year, trans-disciplinary projects facilitate student engagement and faculty networks
- Continuity of service projects is critical to community acceptance and success
- The successes that occur with student learning, community partnerships, and community change must be documented and celebrated as they occur.

**NEXT STEPS**

The local schools have recently asked the college to share service-learning expertise with K-12 teachers and students. The linking of the college and public schools by use of community-based service-learning pedagogy will provide an opportunity for broader community participation and impact that will greatly enhance student and community learning. The anticipated collaboration between the college and the public schools holds promise for watershed improvements and outreach education leading to better informed community decisions.

The college plans to enhance service-learning through development of summer programs when more community partners are in seasonal residence at Lake Winnecook. The college intends to continue the infusion of service-learning into the campus culture by further curriculum development, to assess student work in portfolios with active community partner participation and to enhance opportunities for undergraduate applied research that meets partners’ needs.

The college on the hill cannot, by itself, solve social,
cultural, and environmental problems in the community. If the community participates fully, the college can contribute toward the solutions that ultimately must arise within the community in order to be accepted. FOLW must facilitate the opportunities that service and learning provide in the community by serving as a liaison and cheerleader. FOLW must continue to serve as a community partner and to generate more community interest in the college's activities as they impact, influence, improve, and model water quality in Lake Winnecook, the watershed, and beyond.

ACKNOWLEDGMENTS

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AUTHOR

Mark Huard is the President of Friends of Lake Winnecook; he has served as president for the past two years. Mark’s family has resided in the Unity area since 1785. Mark is a senior at Unity College pursuing a BS in Environmental Science emphasis wildlife. Mark is researching mysid crustaceans in Moosehead Lake as an independent project funded by a local citizen group. Mark is a nontraditional student who served in the military before college; he will graduate May 2001.

REFERENCES

Cooper, G. P. A Biological Survey Of The Lakes And Ponds Of The Androscoggin And Kennebec River Drainage Systems In Maine. Maine Department of Inland Fish and Game. Fish Survey Report 5. 1942.


Maine Department of Environmental Protection. Unity Pond Secchi Disk Transparency Graphs and Summary of Chemical and Trophic State Parameters. Augusta, ME. 1999.


Unity College
Lake Winnecook Service-Learning Project

Community Partners

• Primary Partner

  - Friends of Lake Winnecook – lake association developed initial and subsequent needs list; membership acts as clients for project (FOLW)

• Supporting Partners

  - Maine Department of Environmental Protection – identified Lake Winnecook as priority watershed lake, assigned staff member, developed needs list (DEP)
  - Maine Department of Inland Fisheries and Wildlife - manages fishery (IF&W)
  - Maine Department of Marine Resources – monitors alewife fishery (DMR)
  - US Fish and Wildlife Service – manages National Wildlife Refuge in Unity area
  - Waldo County Cooperative Extension - conducted Watershed Stewards course
  - Waldo County Soil and Water Conservation District – supported education and monitoring
  - Sebasticook River Watershed Association – developed needs list (SRWA)
  - Maine School Administrative Districts 3 & 53 (MSAD #3 and MSAD #53)
  - Unity Area Birders – local ornithology club - sponsors area winter bird count (UAB)
  - Unity Barn Raisers – local community planning and development organization, supports project activities
  - Unity Historical Society – local community organization, supports project activities (UHS)
  - Maine Campus Compact – provided funding, education, training
  - SAGE Foundation – provided funding
<table>
<thead>
<tr>
<th>COURSE NAME</th>
<th>COURSE RUBIC</th>
<th>COMMUNITY PARTNER</th>
<th>NEED ADDRESSED</th>
<th>PRODUCT/SERVICE</th>
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</thead>
<tbody>
<tr>
<td>Introduction to Drama</td>
<td>AR 2003</td>
<td>FOLW, MSAD3, MSAD53</td>
<td>K-12 outreach in three elementary schools</td>
<td>Class developed drama presentations for elementary students in the three area schools surrounding the lake that educated about water quality issues.</td>
</tr>
<tr>
<td>Biology II: Evolution and Diversity</td>
<td>BI 1024</td>
<td>FOLW, UAB</td>
<td>Water quality monitoring and wildlife inventory</td>
<td>Students assumed responsibility for the Lake Winnecook Natural Resource and Recreation Inventory; annually conducted field observations.</td>
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<tr>
<td>Environmental Pollution</td>
<td>BI 3313</td>
<td>DEP, FOLW</td>
<td>Regular water quality monitoring in streams for DEP and education outreach in the watershed</td>
<td>Students regularly monitored stream water quality, tabulated and analyzed data, and presented educational poster sessions in local community.</td>
</tr>
<tr>
<td>Freshwater Ecology/Limnology</td>
<td>BI 3184</td>
<td>DEP, FOLW</td>
<td>Data for DEP nutrient management study</td>
<td>Class annually researched causes and effects of changes in water quality, final data sent to DEP; narrative presented to FOLW.</td>
</tr>
<tr>
<td>Ichthyology</td>
<td>BI 3233</td>
<td>IF&amp;W</td>
<td>Annual winter creel census</td>
<td>Students collect data on winter fishing pressure, angler success, and fish caught and released as part of the agency’s management plan.</td>
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<tr>
<td>Microbiology</td>
<td>BI 3654</td>
<td>FOLW</td>
<td>Concerns with bacterial contamination</td>
<td>Classes conducted bacterial sampling and culturing; reported results to FOLW.</td>
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<tr>
<td>Analytical Chemistry</td>
<td>CH 3334</td>
<td>DEP, FOLW</td>
<td>Baseline water quality study, sampling streams during storm events</td>
<td>Developed chloride probe, collected routine and storm event data; reported results routinely to DEP and annually to FOLW.</td>
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<tr>
<td>Environmental Education: Methods</td>
<td>ED 3414</td>
<td>FOLW, MSAD 3</td>
<td>Outreach education on water quality issues</td>
<td>Classes developed “Traveling Trunk” filled with interactive curriculum, water quality test kits, and literature on water quality issues for middle school classes.</td>
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<td>Instruction Evaluation Design</td>
<td>ED 2113</td>
<td>FOLW</td>
<td>Outreach education on water quality issues</td>
<td>Class trained FOLW volunteers to use “Traveling Trunk”.</td>
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<td>Advanced Oral Communications</td>
<td>EH 2123</td>
<td>FOLW, MSAD 3&amp;53, SRWA</td>
<td>Outreach education on water quality issues</td>
<td>Students presented environmental education topics in local elementary schools.</td>
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<td>Composition II: The Published Writer</td>
<td>EH 1223</td>
<td>FOLW</td>
<td>Preparation of educational materials and reports</td>
<td>Class groups developed or edited educational materials about environment issues for FOLW.</td>
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<td>Introduction to Aerial Photography</td>
<td>FY 2483</td>
<td>FOLW, Local Town Offices, UHS</td>
<td>Information necessary for local comprehensive plans</td>
<td>Class conducted study of history and patterns of development in the watershed; written reports submitted to partners of the project. Future class anticipates developing a web page to increase community access to the information.</td>
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<td>Geology of</td>
<td>GL 2003</td>
<td>DEP</td>
<td>Mapping of groundwater vulnerability</td>
<td>Class conducted water testing of ground water downstream of Unity.</td>
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<tr>
<td>Course</td>
<td>Instructor</td>
<td>College</td>
<td>Description</td>
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<tr>
<td>Environmental Problems</td>
<td></td>
<td></td>
<td>Research on social transformations that impact water quality</td>
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<tr>
<td>Environmental History of the World</td>
<td>HY 3103</td>
<td>UHS</td>
<td>Students conducted interviews with older community members knowledgeable with lake history and transcribed those oral histories for community partners. Information will also be used in outreach education activities.</td>
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<td>FOLW</td>
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<td>Great Issues in World Civilization</td>
<td>HU 4123</td>
<td>Unity Barn Raisers FOLW</td>
<td>Information on public priorities and social issues affecting water quality</td>
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<td></td>
<td></td>
<td>FOLW</td>
<td>Students examined and prepared written recommendations on the social, economic and political aspects influencing public priorities affecting water quality and community development.</td>
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<tr>
<td>Statistics I</td>
<td>MA 2243</td>
<td>FOLW</td>
<td>Statistical analysis of available data for outreach education and agency review to better enable decision making</td>
<td>Class developed statistical reports using data collected in various college classes. Reports submitted to DEP, IF&amp;W and FOLW.</td>
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<td>DEP</td>
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<td>IF&amp;W</td>
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<tr>
<td>Statistics II</td>
<td>MA 3253</td>
<td>FOLW</td>
<td>Statistical analysis of available data for outreach education and agency review to enable better decision making</td>
<td>Class developed statistical reports using data collected in various college classes. Reports submitted to DEP, IF&amp;W and FOLW.</td>
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<tr>
<td>Land and Water Law</td>
<td>PL 3233</td>
<td>FOLW</td>
<td>Outreach education for lakeshore property owners</td>
<td>Students drafted simplified rulebook of lakeshore regulations from state and federal sources for use by property owners.</td>
</tr>
<tr>
<td>Introduction to Interpretation</td>
<td>PM 3133</td>
<td>FOLW</td>
<td>Outreach education on water quality issues</td>
<td>Students developed and presented slide presentations and interpretive walks for the public.</td>
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<td>Advanced Interpretation</td>
<td>PM 4123</td>
<td>FOLW</td>
<td>Planning for water quality improvement efforts</td>
<td>Developed a draft Comprehensive Interpretive plan for FOLW.</td>
</tr>
<tr>
<td>Fisheries Science and Techniques</td>
<td>WF 3324</td>
<td>IF&amp;W</td>
<td>Information and data about fish community dynamics, fish populations and fish introductions</td>
<td>Class conducts annual surveys in Lake Winnecook and tributary; compiles data to describe fisheries; submits reports to partners.</td>
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<td>North American Wildlife</td>
<td>WF 2133</td>
<td>USFWS</td>
<td>Waterfowl data for Lake Winnecook Natural Resource Inventory</td>
<td>Students annually collect data for Natural Resource Inventory and submits statistically summaries to the partners.</td>
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<td>IF&amp;W</td>
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