



The Goodwin-Niering Center for Conservation Biology and Environmental Studies



Reflection Papers for the Class of 2002

Leys Bostrom

La Asociación de Familias Productoras El Yüe Carbón 1, Talamanca, Costa Rica

During the summer of 2001, I worked with one (out of the 1,000) local organizations that produce organic bananas on the southeastern coast of Costa Rica. I lived with a Costa Rican woman who is the president of the group with which I worked, and her family. This internship was organized in part through The Institute for Central American Development Studies (ICADS), a center that focuses on the many social and environmental issues within Central America. Specifically, it draws attention to the roles of women's issues, economic development, environmental studies, public health, education, human rights, and wildlife conservation.

I chose to work with The Association of Family Producers "El Yüe" Carbón 1, Talamanca (*La Asociación de Familias Productoras El Yüe Carbón 1, Talamanca*), which began as a group of women seeking a way to better their quality of life and economic situation. As a Gender and Women Studies major at Connecticut College, I hoped to broaden my knowledge about the struggles that women face in another country. I was interested in how these women initiated such a project and what sort of obstacles they might have encountered. I learned, for example, that the cultural *male machismo* was one of the most difficult obstacles for the women to overcome on an individual level. However, the power of these women becomes obvious upon learning that they have been successful on many levels. Today they have about 600 banana plants on a half-hectare of land. Their farm is certified organic, which means that they use no chemicals during any process of the cultivation of this fruit. Continuing to seek better economic gains, they are investigating the addition of chickens, pigs, medicinal plants, and/or tropical fruits and flowers to their farm. In September 2001, they plan to initiate the experimental phase of exporting some of their organic bananas to Germany. This is part of their effort to share and encourage what they believe to be a healthy and sustainable method of production.

Despite the progress and growth of this organization, their financial situation has not improved much: each bunch of bananas sells for less than \$0.30. Thus, upon my arrival in the small town of Hone Creek, where the plantation is located, I was greeted by feelings of pride, but also frustration. The maintenance of the plantation, cultivation of the bananas, and organization of the group is a lot of work for the small profit that is gained. The women expressed interest in the possibility of tourists visiting their plantation for a small fee. Visitors would be able to learn about the harsh differences between organic and conventional bananas, as well as about the uses of various tropical fruits, flowers, and native medicinal plants. In an effort to initiate this activity, I suggested that their group would benefit from a brochure that could be used to

advertise their association and its goals. I compiled many pictures, became educated about the processes of cultivating bananas and maintaining the plantation, and learned more about the organization in order to create the brochure. During the final part of my internship I went to various places, including several hotels and travel groups, to discuss the possibility of tourists visiting this plantation. The women and I began building a path for the tourists to walk along and made bilingual signs to describe each plant. By the time I left, I felt a new sense of energy and drive coming from the women (and men) of this organization. They seemed to have a renewed hope for the future and success of their goals.

These people also shared with me their intense knowledge of their land and its uses. I watched one of the women, for example, pick a particular stalk of a certain palm tree and split it apart, revealing strands that she showed me how to boil and weave into baskets. She later showed me various plants that were used to color such material. I was impressed with her vast knowledge of the uses of every plant that we found in this region of Costa Rica. Modern luxuries such as refrigerators, ovens, stoves, telephones, medical clinics, cars, and store-bought foods, are all still new to this area, some having been introduced only a few years ago. Thus, the importance of the preservation and sustainability of their natural resources is well understood. There is an intimate connection between using chemicals on banana plantations and the health-effects upon the people, their domestic animals, and their everyday life. The understanding of this relationship is what is lacking with the conventional banana plantations owned mostly by corporations such as Chiquita, Dole, and The Standard Fruit Company. The owners of these plantations, who condone the use of numerous potent chemicals for the production of their bananas, do not directly suffer the consequences. It is the plantation workers who become sterile, whose wives become sick, who suffer from various respiratory problems, and who receive no workers' rights or benefits.

It was an incredible experience to learn about the intense and growing controversy regarding the production of bananas by foreign labor. My work raised many questions about the issues surrounding human labor rights, the use of chemicals for food production, and the lack of U.S. citizens' knowledge of the consequences of the artificial and unnatural big, yellow banana they buy. For my senior integrative project, I am going to do a photographic essay in which I hope to show part of the process involved in the production of organic bananas. My photos will focus mostly on the association with which I worked closely and I will supplement other parts of the story with writing. I want to explore the culture against which these women struggled in order to initiate such a project, as well as the differences between organic and conventional production in terms of environmental sustainability.

Marjorie Lundgren
The Nature Conservancy, Connecticut

The Nature Conservancy (TNC) is one of the largest conservation organizations in the world today. Their goal is to "save the last great places" on Earth (TNC, 2001). They work in a variety of ways, which include collaborating with landowners to show how putting conservation easements or donating their land to The Nature Conservancy can be beneficial, both to them and

the Conservancy. Land of particular interest will be purchased with Nature Conservancy funds in order to monitor the land themselves, or to donate it to local land trusts.

One particular interest, the Quinebaug Highlands forest block, is a 34,000-acre Nature Conservancy project area that borders the northeastern corner of Connecticut and southern Massachusetts. Spanning tracts of Windham, Tolland, and Worcester counties, this forest block is characterized by rural communities and contiguous forests relatively unfragmented by roads. Much of this forest block is already protected and managed by state and local agencies, universities and private non-profit organizations. The Nature Conservancy's main efforts are focused on protecting the privately owned parcels of land (TNC 2001).

As a Goodwin-Niering Center for Conservation Biology and Environmental Studies certificate student, I spent this past summer as the invasive species monitoring and control intern at the Quinebaug Highland forest block for the Connecticut chapter of The Nature Conservancy. Because of the upland habitat of the project area, we surveyed terrestrial invasive species, while focusing on the most abundant invasive species to that region. A list of 10 invasive plant species was considered when assessing the presence of invasive species in an area. These species include Japanese barberry (*Berberis thunbergii*), multiflora rose (*Rosa multiflora*), Asiatic bittersweet (*Celastrus orbiculatus*), winged euonymus (*Euonymus alatus*), buckthorn (*Rhamnus cathartica*), autumn olive (*Elaeagnus umbellata*), Russian olive (*Elaeagnus angustifolia*), Japanese knotweed (*Fallopia japonica*), bush honeysuckle (*Lonicera maackii*), and garlic mustard (*Alliaria petiolata*).

The presence and extent of non-native invasive species in the Quinebaug Highlands Forest block was assessed by examining plots along roads and trails complemented by interior forest plots. The forest interior plots were circular, measuring 15 meters in diameter. At each plot the rapid forest inventory, established by The Nature Conservancy, was conducted. This survey included forest type, condition, and forest composition, noting the most abundant species in each layer of the woods. For the roadside analysis, plots were established every mile down paved roads, dirt roads, and trails. These plots were placed parallel with the road, three meters off the road edge, measuring 5 by 5 meters in area. Spread of these invasive plants was measured back into the forest, perpendicular to the plot.

Present land use and population density were estimated by assigning an appraisal number. These numbers were defined according to surrounding land use. Spatial analysis of the extent of the invasive species was conducted by calculating an index of invasiveness for each plot. These numbers were then placed on a linear scale and bracketed into a 0-7 rating system. Using this index of invasiveness, polygons were established on a Geographic Information Systems (GIS) map for the whole project area. These polygons were color coded by their index of invasiveness rating, creating a priority system for removal of invasive species.

The purpose of this study was to examine the extent to which non-native invasive species threaten natural and managed habitats of this region. Further, this study focused on specific species, while also examining overall trends in invasive species distribution relative to current and past land use. This information was used to better understand how these factors might promote or inhibit the spread of these species. Lastly, this study sought to locate an area free of

invasive species, which we would later recommend to The Nature Conservancy for protection from encroachment by non-native invasive plant populations.

My internship with The Nature Conservancy this summer greatly enhanced my knowledge of forest ecology, non-native invasive plant species, Geographic Information Systems, and the workings of a conservation organization. My original objectives were met in that I greatly increased my plant identification skills for the local flora. Not only have I become aware of the introduced invasive species in Connecticut, but I have also broadened my knowledge on native species. Seeing both native and non-native species coexisting within the forest block this summer, I was able to witness the negative effects that these invasive species play on a large-scale ecosystem level.

For my senior thesis I plan to do a thorough literature review on the issue of non-native invasive species and their role in conservation. Further, I will do literature reviews for the ten specific invasive species that were focused on during my internship. I plan to perform statistical analysis and use Geographic Information Systems as a tool to analyze the numerical and spatial data collected during my summer internship.

[TNC] The Nature Conservancy 2001. Quinebaug Highland Project Area
(<http://nature.org/wherewework/northamerica/states/connecticut/work/art5053.html>)

Laura Rowe
Massachusetts Institute of Technology

“All we have yet discovered is but a trifle in comparison with what still lies hid in the great treasury of Nature” - Anton von Leeuwenhoek, 1679

The study of medicine, plants, and their effects on the body, coupled with a fascination of people, cultures, and how they live has been the driving force within me to pursue the academic discipline of ethnobotany. After self-designing a major in ethnobotany with a focus specifically on how other cultures find and use medicines from plants, I decided there were two avenues I wanted to explore. I wanted to understand how anthropological and human rights issues were being confronted and what was being done to solve such issues. Further, I wanted to understand how medicinal/pharmaceutical research that involved natural products was conducted. I was able to explore both sides of this discipline by interning at two very different organizations over the past two summers.

Last summer I worked for a non-profit human rights organization in Cambridge, Massachusetts called Cultural Survival. There I gained valuable experience in researching human rights issues and current violations specifically concerning the Pehuenche Indians of Chile. This past summer I was able to experience the other side of such ethnobotanical issues that were concerned mainly with pharmaceutical research. I interned at the Massachusetts Institute of Technology in Cambridge, MA where I worked under the supervision of the professor of Biomaterial Sciences and Engineering, Prof. Cho Kyun Rha, on an ongoing research project called the Malaysian-MIT Biotechnology Partnership Program (MMBPP). Initiated in 1999, the MMBPP is a collaboration between MIT and Malaysia's research institutions and universities aimed at building the

foundations for a sustainable biotechnology industry in Malaysia. The program couples the unique biodiversity of Malaysia with the cutting-edge technology of MIT in order to harness the medical benefits of Malaysia's botanicals. It is being implemented under the auspices of the Ministry of Science, Technology, and the Environment of Malaysia. Studies are currently being conducted both at MIT and in Malaysia with regular information exchanges. MIT also works to train Malaysian scientists in their technologies.

Two of the different projects that fall under MMBPP are Natural Product Discovery and Oil Palm Biotechnology. Natural Product Discovery is directed towards finding techniques for the development and commercialization of natural products based on the indigenous Malaysian plants *Tongat Ali* (*Eurycoma longifolia*) and *Pegaga* (*Centella asiatica*). Oil Palm Biotechnology research is being conducted with the goal of cloning oil palm tissue cultures for eventual product commercialization. For the months of June, July, and August, I worked closely with Dr. Rebecca Fry, a post-doctorate at MIT, on various aspects of the commercialization of a component of vitamin E found in palm oil from Malaysia. Prof. Rha is currently working in conjunction with a professor in Malaysia to create a company that would market a dietary supplement called Juvenessence, which could be used as an antioxidant. What makes Juvenessence unique is the presence of tocotrienol (a component of vitamin E) as opposed to just tocopherol, which is less bioactive than tocotrienol. I worked closely with Malaysian scientists and business experts to evaluate the business plan of this new dietary supplement. I researched other dietary supplements and nutraceuticals (any substance that may be considered a food or part of a food and provides medicinal or health benefits, including the prevention and treatment of disease) already on the market that would be potential competitors. I then researched the potential health benefits that tocotrienol would offer to consumers and how it might be marketed in the United States as well as in Malaysia. I contacted distributors and sites for toxicity tests and stabilization tests and was responsible for researching FDA procedures and protocols that pertained to dietary supplements. I conducted a literature search and produced a booklet that explained how this compound affected the body and in what ways it was beneficial. I attended meetings, participated in conferences, and researched the competitiveness of these natural products with modern medicine. In mid-July, Prof. Rha, Dr. Fry, and a number of Malaysian scientists traveled to Malaysia to present the business plan to the Prime Minister and to various biotechnology companies with the hope of gaining potential venture capitalists. Once they returned, I worked with them to put together a presentation that explained the steps involved from natural product discovery and development to the actual commercialization of nutraceuticals.

This internship provided me with a wonderful opportunity to see what goes on not only concerning pharmaceutical research but also what must occur in the commercialization and marketing of natural products and nutraceuticals. It was extremely valuable in that it exposed me to the rigors of chemical analysis and extraction, as well as to the obstacles that must be overcome when trying to introduce such a dietary supplement on the market. It definitely opened my eyes to another side and a different realm of the discipline of ethnobotany. This experience has made me stop and question what kind of education I want to pursue in the future. It has sparked my interest in the field of pharmacology/ethnopharmacology and has made me ask questions about cultural compensations, Intellectual Property Rights, and patents. I will incorporate these questions and the knowledge gained at MIT into a senior honors thesis on

Intellectual Property Rights, specifically related to the problems anthropologists and ethnobotanists face today regarding indigenous compensations and the preservation of ethnobotanical knowledge.

The purpose of my thesis is to explore the problems anthropologists and ethnobotanists face while conducting research on indigenous/traditional knowledge. With the uprise of the commercialization of genetic resources and enterprises based upon biodiversity prospecting, there has been an increased interest in traditional knowledge resulting in the inevitable problem of intellectual property rights and appropriate compensation to indigenous cultures. To date, most indigenous people have not received the benefits that come from the appropriation of their knowledge, including profits that result from drug development by major pharmaceutical companies. The research that I will conduct for my thesis will focus on contemporary solutions that can be established for the successful use of indigenous knowledge by the global drug industry.

Jessica C. Schwartz
Vanasse Hangen Brustlin, Inc., Massachusetts

This summer I worked for Vanasse Hangen Brustlin (VHB) Inc, an engineering, planning and applied sciences firm located just outside of Boston in Watertown, Massachusetts. VHB provides land development and environmental services to a wide variety of public, private and institutional clients. During my eleven-week internship, I worked closely with both the Environmental Department and the Geographic Information Systems (GIS) Department on various integrated projects.

My internship was an extremely valuable learning experience in several ways. I fulfilled my original goal of becoming familiar with GIS through an online course and constant usage of the program in my daily work routine. I gained valuable field experience that enriched my knowledge of local flora and fauna. I also became familiar with the permitting process of the National Environmental Policy Act (NEPA), and other state and federal regulatory policies. In general, I was introduced to the ways a consulting firm utilizes technology to comply with environmental standards when permitting large land-development projects. Prior to my internship I took an online course, "Introduction to ArcView." This course was extremely valuable in the beginning of my internship as I began to learn and use ArcView on a daily basis. My co-workers in the GIS Department were continually helping me develop ArcView skills through assorted tasks that ranged from geolocating supermarkets to plotting large-scale graphics.

The majority of my time was spent working on a project that permitted wireless telecommunication towers. Each new site was processed in a multi-step fashion, first through NEPA requirements, and then often through a secondary visual impact report constructed for town authorities. NEPA requires that wireless telecommunication towers do not have a significant impact on wetland, floodplain, archeological, and/or national, state, or local historical sites. Using GIS we located each new site on a topographic base and then "turned on" various environmental layers to make a NEPA map. In this way it was possible to see if the proposed

site was situated in a floodplain, a wetland, or even adjacent to a vernal pool. The NEPA maps were used in balloon tests to aid in documenting the potential visual impact of the tower. In order to simulate the proposed tower, a red weather balloon four feet in diameter was raised to the height of the proposed tower and then located from various historical sites in the area. Either the balloon would be “visible” from the historical site or “not visible.” We relied heavily on GIS-produced maps to locate the site, and document each photo location. While I was there we began to use a Global Positioning System (GPS) unit routinely to insure the accuracy of our data collections. We submitted our findings to agencies such as the Bureau of Indian Affairs, Department of Fish and Wildlife Services, and Massachusetts Historical Commission for official confirmation of “no impact” statements.

For the visual impact reports, GIS was used as a modeling tool to predict visibility. Using Spatial Analyst, digitized forest coverages were modeled against digital elevation data to predict where the tower would be visible within the study area. Visible areas were field verified and edited accordingly. This permitting process was extremely challenging because it required such a diversity of work, but also it was rewarding when a site was finished.

At VHB, I was also involved in a rare-species study on an inactive railroad bed located south of Boston. As team of three, we would spend a day in the field collecting frogs and salamanders from pit traps, and radio tracking turtles along five miles of rail bed. The environmental team was extremely knowledgeable of the local flora and fauna. I especially enjoyed working in the field because it was a continual learning experience. In addition to cell tower permitting, and the rare-species study, I was involved in stream surveying, shoreline studies, and a corridor analysis. Each project was exciting because of the subtle intricacies of the data collection, analysis, and final product.

Before working at VHB I was not aware that private consulting accomplished such important environmental work. All of these projects dealt with sensitive environmental issues, and required balanced ethical choices. I was extremely conscientious of my data analysis because the repercussions were much more immediate than for any research I had been involved in before. With the completion of any project, our results were passed directly to the engineers and planners that would see the project to fruition within a time span of six months or a year.

At VHB I gained the technical GIS skills that will become essential for my Senior Integrated Project. The purpose of my study is to analyze changes in tree species composition that have occurred over the past 50 years in the Connecticut College Arboretum. A secondary goal of this study is to have digital geographic information for the locations of official Arboretum boundaries, topography, permanent transect lines and markings, trails, stonewalls, water bodies, major roadways, and land tract names. This project will be done with a combination of methods; historical and current aerial photo interpretation, historical and current permanent transect data analysis, and field verification of current species composition. GIS software ArcView 3.2a will be used in all aerial photo interpretation.

Hannah Shayler
Freshwater Ecology Laboratory, Connecticut College

For my internship I spent the summer working as a research assistant for the Freshwater Ecology Laboratory at Connecticut College, under the direction of Dr. Peter Siver. Our laboratory primarily focuses on the use of microscopic algae, such as scaled chrysophytes and diatoms, as bioindicators of change in environmental conditions. Environmental stresses resulting from acidic deposition and changes in land use are of particular interest. Currently, regions of Cape Cod, the Ocala National Forest in Florida, and North Carolina are under investigation. Physical, chemical, and biological data are incorporated into environmental models of algal habitats to relate species distribution to environmental gradients. Paleolimnological inference models quantify changes in properties and species diversity over time. These studies allow for a correlation of algal biodiversity with the diverse characteristics of lake habitats along the eastern United States. This information will be used to improve lake management and conservation practices.

As a research assistant, my primary responsibilities included sample collection, sample preparation for various chemical analyses, and data collection and analysis, as well as daily lab maintenance. The summer began with a sampling trip down to North Carolina to gather sediment cores, water samples, and various data from nearly thirty lakes. In the field I was responsible for organizing equipment as well as gathering and processing samples and data. Additionally, I prepared samples for light and scanning electron microscopy for both the lab and my individual research. Acid digests the organic material so that the microscopic algae can be clearly viewed and studied. Scanning electron microscopy provides a detailed three-dimensional view of the structure of the organisms' siliceous cell walls so that minute comparisons can be made among individuals and populations.

Gathering the sediment cores is an integral and time-consuming part of paleolimnological research. Each core is obtained with the aid of a gravity corer holding a plastic tube, hung awkwardly over the edge of an unsteady canoe. The tube is then brought to shore so the core may be sectioned by depth and labeled for future use. Back in the lab each section is weighed and either dried and ground for elemental analysis or digested with acid to remove organic material for light and scanning electron microscopy. Water samples are processed and analyzed for various properties.

In addition to microscopy techniques, throughout the past two summers I have become familiar with other common laboratory analyses, such as determining the amounts of chlorophyll and various elements in water and sediment samples. I also became proficient in the identification of several genera of algae. In the case of the diatom genus *Brachysira*, the subject for my senior thesis, identifications were made at the species level. During the countless hours I spent in the field, in the lab, and using the scanning electron microscope, I easily accomplished my goal of further developing my repertoire of technical, research, and analytical skills.

I discovered that summer research is an ideal learning environment, as information is absorbed on a daily basis without the formality of the academic year. I found it very refreshing to immerse myself wholeheartedly into my research for a long day without having to study for exams or meet other academic requirements. The sampling trip down to North Carolina allowed me the opportunity to experience the initial sample collection in the field, a component of the research that I had not been involved with the previous summer. As a member of a small research team I was always engaged in daily activities and challenged to complete tasks thoroughly and efficiently, while gathering as much information as possible to be applied to my own research.

My work at Connecticut College has given me a strong background in environmental science and the necessary variety of skills. My time spent at the Semester in Environmental Science program at the Marine Biological Laboratory, Woods Hole, Massachusetts prepared me for the intensive aspects of field work and independent research. My involvement with the Goodwin-Niering Center and the Freshwater Ecology Lab has integrated all of these experiences with a network of people who provide information, assistance, and constructive criticism whenever necessary. In this way my interests have remained organized and motivated throughout my time at Connecticut College. Additionally, through Dr. Siver I have made a contact at the Canadian Museum of Nature in Ottawa, Canada, where I plan to spend time in January collaborating on my thesis research.

My Honors Study will use scanning electron microscopy to correlate differences in the morphological structure of the diatom genus *Brachysira* with geographic distribution along environmental gradients. I will attempt to clarify current taxonomic distinctions and discrepancies within the genus. My senior project is a continuation of the work that I have accomplished as a part of the Freshwater Ecology Laboratory, demonstrating the extent to which this experience has influenced the direction of my studies. I hope that my individual research will complement and elaborate upon the data gathered by the lab over the last few years, illustrating the importance of a minute organism as an integral component of the freshwater ecosystems of the eastern United States.

Maria Sinnamon
Department of Environmental Protection, Connecticut

This summer I was a seasonal worker for the Department of Environmental Protection's (DEP) Water Management Bureau, Planning and Standards Division, in Hartford, Connecticut. The Bureau's mission is to protect and restore the surface waters and rivers of the state, to enhance recreation, to propagate fish and aquatic life, and to enhance the economic wellbeing of the state. Two of the ways it achieves its mission are through assisting municipalities in upgrading sewage treatment facilities and monitoring bathing waters at state beaches. As an intern, part of my responsibility was to collect water samples from state beaches and to perform microbiological analyses to test the water for bacteria. Connecticut was divided into four loops, with five to seven beaches on each loop. I drove with one other intern to the beaches in one of these loops. At the beaches we wore waders and waded out to our hips to scoop up the water samples in plastic bottles. Back in Hartford, we went to the Health Department's Microbiology Lab and conducted

bacterial testing. In two days we received the results and, if the bacterial levels were high enough, we had to retest the beach water. High levels of bacteria were caused by geese and other animal droppings combined with rain events that would have washed the bacteria into the water. Sometimes the decision was made to close the beach to the public.

I also took water samples from specific locations along the Naugatuck River and picked up effluent from the Waterbury sewage treatment plant. The Waterbury sewage treatment plant was upgraded last year from a secondary to a tertiary treatment plant. The plant dumps its effluent into the Naugatuck River so water quality was monitored to see the effects of the upgrade. I set up and monitored LC50 tests (the lethal concentration that kills 50% of fat head minnow fry and daphnia) using these water samples. The organisms were put into beakers of various concentrations of effluent and river water collected upstream of the plant. Ten fat head minnow fry were placed in each beaker and each day of the test I monitored them and recorded any deaths. I also set up copper tests, using copper nitrate concentrations instead of the effluent, to test the sensitivity of the fry and daphnia. Each test lasted three days and each day I recorded the dissolved oxygen content, the temperature, the conductivity, and the pH of all the test beakers. This monitoring was to ensure that only the toxicity of the sample caused any mortality and not any other factors. Unfortunately, we had problems with the organisms. The daphnia and fat head minnow fry had low survival rates in the controls (lab culture water) due to unknown reasons, so LC50 tests on the Waterbury effluent could not be conducted for the second half of the summer.

In the water toxicology lab I cared for the adult fat head minnow, the fry, and daphnia that were used in the tests. I also kept the lab clean and maintained by washing dishes, cleaning fish tanks, preparing lab culture water, making food for the organisms, and performing other maintenance tasks. Tracy Lizotte, my field supervisor, partnered me with other DEP workers to collect water samples. Al Iacobucci, an environmental analyst, was my supervisor in the water toxics lab and provided me with instructions. Since I worked in the water toxics lab last year, Al did not have to train me to set up and conduct the tests. My experience and ability to work well on my own, knowing what needed to be done in the lab and doing it without being told, allowed him the time to get other projects completed.

This summer I had the opportunity not only to return to the Naugatuck River and continue testing the water quality, but also to talk to people in the DEP who were involved with the Naugatuck River. I now have a better understanding of the state's involvement in the upgrade of the Waterbury Sewage Treatment Plant as well as some of the history of the Naugatuck River. For my senior project I plan to determine how the upgrade of the Waterbury sewage treatment plant has improved the water quality of the river and how sensitive species have reappeared as a result. I received data necessary for my project on the water quality before, during, and after the Waterbury sewage treatment plant upgrade, including dissolved oxygen and ammonia-nitrogen levels, percent survival of fathead minnows, and data on benthic macroinvertebrate communities. Even though the LC50 tests could not be conducted for the entire summer the tests will continue into the fall and there should be plenty of these post construction data. I will be analyzing the numbers of benthic macroinvertebrates and fish species that have returned to the river and relate them to the chemistry and toxicity data. I plan on receiving more recent data on the effluent and river water quality from my contacts at the DEP and I look forward to the interviews I will have with these professionals as I conduct research for my senior project.

I was very pleased with the positive response from the professionals in the Water Bureau concerning my project. Their willingness to talk to me about the upgrade and their opinions on the way in which the upgrade was conducted and its successes helped to give me some unique insight. Some felt that the upgrade happened too quickly at the expense of river water quality, but most agreed that at the present time water quality of the river is greatly improved. Some of these researchers have seen first hand some pollution-sensitive species present in the river now that had not been there in the past. I look forward to analyzing and presenting my findings in my final paper on this case study of improvement in the environmental quality of the Naugatuck River.

Emily Templin
Oregon Environmental Council (OEC), Oregon

A curiosity about the role of non-governmental organizations (NGOs) in environmental policy making led me to seek an internship with an environmental NGO. The Center for Conservation Biology and Environmental Studies provided me with the opportunity to explore my interests further with the Oregon Environmental Council (OEC). The mission of OEC is to restore and protect Oregon's clean water and air, now and for future generations. As the oldest statewide environmental advocacy group, OEC brings Oregonians together to create and promote socially just and economically sound environmental policies. Within the organization there are six programs that are directed by one staff member (legislative affairs, environmental equity, air and transportation, water, pesticides and toxics, and sustainable economy).

My learning objectives for the internship were to get first hand experience in seeing how environmental policy is created, and the role of non-government organizations in policy making. I wanted to become involved with one or two specific projects throughout my time there, so that I would be able to understand a topic fully and understand the research process that goes into policy making. I knew that my responsibilities would be that of a policy research intern, conducting policy research and completing some administrative work.

I was able to focus on two projects during my summer with OEC. I first worked on a "Healthy Schools Project" with the pesticides and toxics program director. The goal of my research was to determine if OEC should consider obtaining a grant and moving forward with a new healthy schools project. All of my research was preliminary, designed to determine the scope of environmental health problems in Oregon schools, and what is being done across the nation to address environmental health hazards in schools. I completed the research through the web, phone interviews, newspaper reports, and other primary resources. I was able to see the very beginning steps of a project, and how an organization determines what projects they want to take on. The results of my research indicate that there are many environmental health problems in Oregon's schools and there is no regulatory agency or personnel within the schools responsible for ensuring their environmental quality. After the extensive research that I completed, OEC did decide to apply for a grant to fund a healthy schools project. It was fortunate that I was able to be involved with the healthy schools project from its inception and to initiate the research for the organization.

The second half of the summer I worked with the water program director on a water conservation project that was already in its middle stages. The organization had received a grant to explore different water conservation policies and to create a water conservation task force team, representative of various constituencies, to help address water conservation issues throughout Oregon. I researched various water conservation policies that are being implemented nationwide, searched for model cities with notable water conservation policies, and searched for innovative funding sources for water conservation programs. I completed research through searching the web, interviewing staff of municipal water programs, reading city reports, and other primary resources. Though this project sounds simple, I found very few solid water conservation policies and programs. Upon completing the research I wrote the section of the water conservation white paper about policies and funding. Once the entire white paper is completed it will be published with me as co-author, and it will be used to lobby for water conservation projects in Oregon.

Through both projects I was able to work in different stages of environmental policy making, fulfilling my goal of wanting to see first hand the making of environmental policies. Not only did I complete research that is being put into policies, but also I experienced working in the office during the final weeks of the Oregon legislative session. I was able to follow the updates, listen to the daily activity, and witness the politics and energy put into passing a bill through the legislature. In fact, during this session the legislature passed a mercury reduction bill that was sponsored by OEC.

I also had the opportunity to attend the organization's strategic planning meeting. At this meeting, which was facilitated by independent consultants, OEC staff and board members discussed the future of OEC. I witnessed the OEC staff and board evaluate the organization's role in the community, discuss how they were and were not achieving their mission statement and what the organization needs to do to become more efficient. All in all the strategic planning meeting allowed me to witness the planning and discussion that determine the actions of non-governmental and non-profit organizations.

My experience with OEC allowed me to see how non-governmental organizations operate, their role in informing the community and influencing the legislative process. This year I will continue to explore the role of such organizations by studying how communities become activated and how they catalyze change. More specifically, I am pursuing the healthy schools project in my honor's thesis titled "Social and political mobilization: Routes to successful changes in environmental health conditions in Connecticut and Oregon schools." The aim of the project is to determine how communities and non-governmental organizations have been successful in mobilizing to reduce environmental health hazards in schools. Theories of social mobilization will be applied to determine what has made movements effective. Case studies from Connecticut and Oregon will be used to determine how social movements have formed around environmental health hazards in schools, and what the responses from the schools and government agencies have been.

Rachael Towers

Mashantucket-Pequot Museum and Research Center, Connecticut

My internship at the Mashantucket-Pequot Museum was academically challenging and rewarding, as well as interesting and enjoyable. I worked with the research department, which provides the museum with archaeological, ethnographic, ethnobotanical, and historical information. Various other departments and individuals sought assistance from the research department, for the information necessary to improve exhibits, plan special events, and trace genealogies. I also utilized the research library, which has an extensive collection of books, microfilm, and periodicals.

The projects that I worked on, though different from my original plans to assist in a recreation of an eighteenth century farm, allowed me to have a multi-disciplinary, and thus more comprehensive, internship experience. During the first half of my internship, I spent most of my time assisting Toby Glaza, Senior Researcher, in his fieldwork on the Relict Vegetation Study. In this project, several archaeological sites on the reservation were surveyed for their plant populations. These sites, which bore the remains of homesteads, were compared with random plots from the undisturbed surrounding area, in order to determine the extent of human impact on the environment. My duties in this project consisted of recording the plants that were present and helping to locate and set up plots to survey. During this portion of my internship, I learned much about botany and ethnobotany; I was able to recognize many plants I had previously not known, and learn some of their primary uses. In addition, I learned about the histories of the sites and the families who had lived there, which allowed me to put the botanical and ethnobotanical information into context.

While at the archaeological sites, I also worked on another aspect of my internship, which was gathering plant specimens for the research department's herbarium. I continued the herbarium project throughout the internship, having more time to devote to it after the fieldwork for the Relict Vegetation Study was completed. For this project, I gathered, identified, pressed, dried, and mounted the plant specimens. Towards the end of the internship, in late July, I expanded this project to include seed samples. I enjoyed this project for several reasons. First, I was able to use plant identification skills I had learned from taxonomy class. Second, I learned the ethnobotanical significance of many of the plants and seeds I gathered. Finally, the learning environment was very beneficial: I worked essentially independently, and I enjoyed the outdoors, hands-on environment.

I devoted another portion of my internship time to a library research project, working in conjunction with Jason Mancini, staff archaeologist. For this project, I researched non-native plant uses from the mid-1700s until the early twentieth century. The information I gathered can be used to make comparisons between native and non-native ethnobotany, and see the patterns of exchange and influence of natives and non-natives on one another. I split my research time between the research library at the museum and the Connecticut College library, which has a more extensive collection of journals, such as the *Journal of American Folklore*, from which I gathered a great deal of information. I also worked at the Indian and Colonial Historical Society

in Old Mystic. There, I transcribed a nineteenth century manuscript, “Medicinal Recipes,” which contained instructions for making many botanical medicines.

My internship was certainly a valuable experience and went well beyond my expectations. I left with much more knowledge of botany, ethnobotany, and the Mashantucket-Pequot tribe, as well as many more skills, from developing an effective research methodology to pressing and mounting plants. In addition, the museum staff members I worked with were friendly and helpful, and were interested in making sure my internship was beneficial, successful, and enjoyable.

My internship also gave me adequate preparation for my senior independent project. While looking for books and articles for the museum research, I came across several sources that would be useful for this project. I had not known about many of these sources, such as several of the journals in the Connecticut College library, the names of authors who have written on the subject, and the names of anthropologists who have studied various New England tribes. For this senior project, I am continuing to study the ethnobotany of native New England, but narrowing the scope to focus on the spiritual and religious aspects. This includes researching the plants used in rituals and ceremonies, the significant plants found in mythology, and plants that have spiritual meanings attached to them. I am also comparing these data to environmental philosophy and religious theory, with the goal of providing a multi-disciplinary theoretical perspective on the topic.