# New England Chapter
# of the
# North American Lake Management Society

# Annual Meeting

## ABSTRACTS AND BIOGRAPHICAL SKETCHES FOR WORKSHOPS and TECHNICAL PRESENTATIONS

**Friday June 3rd, 2005**
**Workshop Day**

**Saturday June 4th, 2005**
**Technical Presentations**

**To be held at:**
**Plymouth State University**
**Boyd Science Center**

**Abstracts are in alphabetical order by Presenter's last name**

# Workshop Abstracts
# and
# Workshop Presenter Biographies

# Friday June 3, 2005
# 1pm to 5pm

## WORKSHOP I: NUISANCE ALGAL TAXONOMY AND ECOLOGY

**Instructor: Ken Wagner, ENSR Corporation**

Algae are an important part of a properly functioning natural aquatic system, but when algae become abundant, water uses and habitat are often impaired. All algae were not created equal, however, and proper identification is important to determining management strategy. With recent apparent increases in toxic algae and issues with taste and odor, understanding algae has become even more important. The complete workshop is intended to provide information on how to collect and recognize major groups of algae and common genera within those groups, how and why algae can become nuisances, and the basic options for control of algae in lakes. Since a half-day workshop cannot cover all aspects of algal taxonomy, ecology or control, we will focus on identifying common nuisance forms, their ecology, and potential control strategies. Participants are also encouraged to bring any algae samples with which they would like identification help. We will mix microscope work with lectures and discussion over a three hour period.

Biographical Sketch:

The workshop is taught by Dr. Ken Wagner, an experienced algal taxonomist and ecologist working in applied fields. He has many years of experience assessing algal problems, evaluating impacts and causes of algal nuisances, and developing algal management programs. Ken works for ENSR International, an environmental consulting firm, where he is involved in recreational lake management, water supply protection, storm and waste water impact assessment, and a variety of rehabilitation projects. He holds an undergraduate degree from that other NH school, Dartmouth College, and graduate degrees from Cornell University in NY.

# WORKSHOP II: INTEGRATION OF GPS & GIS INTO SAMPLING PROTOCOLS

Instructor: Scott Ashley, NH DES

The workshop will focus on the use of consumer grade GPS units to collect field environmental data for use in ArcView. A review and demonstration of utilities available on the internet for Garmin units will be conducted as well as a demonstration of how NHDES has put them to use in their field data collection procedures.

**Utility Review:**
A general overview of the **free or shareware** utilities available on the internet will be conducted, their function, and where they can be downloaded. Subsequent sections will give more in-depth examples on how some of those utilities can be used. Some of the utilities discussed will be:

**Windows Utilities**
DNR Garmin
Garmin AVX
OziExplorer
Mapedit
MyGPS
VB Garmin

**ArcView Extensions**
AV Garmin
DNR Garmin

**Communicating with Garmin or other GPS without buying software**
There are several free and shareware utilities available on the internet that will allow you to communicate with the GPS without the manufacturers proprietary software. There are even instructions on building your own cable. Some of these packages have features that do not exist within the commercial software such as importing waypoints as a text file.

**Creation of ArcView Shape information from GPS data**
Demonstrate the use of free and shareware utilities to bring GPS information (Tracks and Waypoints) into ArcView in the form of shape files.

**Creation of GPS waypoint information from Arcview Shape information**
Demonstrate how to take ArcView information and import it to a GPS unit for use.

**Some of the ways DES has put this to work.**
I will demonstrate how I put some of the above utilities to work at NHDES.
Scott T Ashley NHDES Biology Section

Biographical Sketch:
Scott is a Field Biologist and Database Administrator for the Watershed Bureau's Biology Section. Scott is proficient in fortran, C and Visual Basic programming languages. Scott also coordinates all ArcView mapping activities for the Biology Section.

## WORKSHOP III: SQUAM LAKE BOAT TOUR

Instructor: This boat tour will be led by a Squam Lakes Science Center Naturalist

From geologic to cultural change, the story of Squam is still unfolding today. Explore the lakes with an experienced Science Center naturalist as we search for wildlife, including the Common Loon and Bald Eagle. We will observe Loon behavior and communication first-hand. Learn about the interactions that occur among the lake, people, and wildlife as you take in the surrounding landscape. Come away with an enhanced appreciation and understanding of the lake and the wildlife that call it home.

**Note: There is a $25 additional fee associated with this workshop. The fee includes the cost for the tour, and shuttle service to and from the Squam Lakes Science Center from Plymouth State University.**

**WORKSHOP IV: PROTECT YOUR LAKE OR POND BY PLANTING NATIVE VEGETATION: A WORKSHOP ON VEGETATED BUFFERS**

Instructor: Anne Monnelly, MA DCR

Abstract: This workshop will introduce participants to a variety of landscaping approaches that can be used to protect nearby water bodies from runoff. Using two recent publications: The Massachusetts Buffer Manual, and More Than Just A Yard, the course will teach participants how native vegetation can be used to attract wildlife, stabilize shoreline erosion, filter and remove pollutants from runoff, and add visual beauty to a property. Several case studies will be reviewed so that participants learn about the logistics along with the environmental benefits, including costs, labor, site preparation and timing of planting. Each participant will receive a copy of the 2 manuals used in the course.

Biographical Sketch:

Anne received her Masters Degree in Aquatic Ecology from the University of Michigan, School of Natural Resources and Environment. She has over ten years of experience in the field of water resources protection and management. Anne joined the Massachusetts Department of Conservation and Recreation (DCR) Office of Water Resources in September 2001 as an aquatic ecologist with the Lakes and Ponds Program. Anne's work with DCR includes managing a grant program for lake and pond restoration, and providing statewide technical assistance and education/outreach on lake management issues including stopping the spread of invasive species, stormwater management, and lake watershed planning.

## WORKSHOP V: TOOLS OF THE TRADE

Instructor: Jim Straub, MA DCR

This workshop will allow for the opportunity to use a wide array of limnological equipment and sampling tools *in situ* while you have a leisurely float out on Squam Lake or other local waterbody.

Tools and equipment you can expect to encounter in this workshop include: Seechi Disk, Van Dorn sampler, Eckman Dredge, Hydrolab Surveyor 4a, (cond, temp, d.o. and pH)
Weed rake, Kerber sampler, and plankton net.

Due to the nature of the workshop, attendance will be limited to 12 participants.

A $10 fee is being charged for this workshop to cover shuttle service to and from PSU and the selected waterbody.

Biological Sketch:
Jim is an aquatic biologist who is responsible for the health of lakes and ponds in the Massachusetts state park system. Jim provides technical assistance on lake management issues to DCR Forests and Parks, carries out water quality testing, vegetation identification and monitoring. He also provides this assistance to local groups and towns. Jim previously worked for the South Florida Water Management District where he was involved with the monitoring of the water quantity and quality throughout the Everglades.

**Note: There is a $10 additional fee associated with this workshop. The fee covers shuttle service to and from the workshop location (a local lake, likely Squam) from Plymouth State University.**

# Technical Abstracts
# and
# Presenter Biographies

# Saturday June 4, 2005

# 9am to 5pm

## What is the Federal Government doing about invasive species?

**Ship Bright, Executive Director**
**Maine Lakes Conservancy**

Ship Bright, Executive Director and Founder of the Maine Lakes Conservancy Institute is a member of the Federal Invasive Species Advisory Committee [ISAC] and currently serves as its Chairman. ISAC is the citizen/expert advisory board to the National Invasive Species Council [NISC] which is comprised of the President's cabinet Secretaries and Administrators.

Ship will update us on recent federal actions and trends regarding the invasive species issue throughout the country along with some species that are "on the move" such as Asian Carp. He'll also provide an inside look at the realpolitiks of the economic, social, and political issues surrounding invasives. If this sounds a bit boring you'll be amazed at what the far right is saying about invasive species:

> *"Invasive Species" is the radical Greens' and international socialists' key to controlling every square inch of land in the United States…It's very easy to see how Invasive Species legislation will open the door to almost total federal and international control over private property in the United States..*

While federal agencies are working hard to protect America's environment and economy there are viewpoints and political forces that are stunning to learn about.

Biographical Sketch:

Ship is the Executive Director and Founder of the Maine Lakes Conservancy Institute [MLCI] a 501[c]3 nonprofit environmental education organization devoted to understanding, preserving and sustaining the health and values of Maine's freshwater natural resources. He presently serves on the US Federal Invasive Species Advisory Committee which he presently chairs and is heavily involved with invasive aquatic species issues at the state level. Ship served as Deputy Commissioner for the Maine Department of Conservation for two Governors where he managed the legislative and political program.

After graduating from Bates College in 1978 Ship served for five years as a United States Naval Officer. After his Honorable Discharge he owned and operated a real estate company in mid-coast maine. He has an MBA from Southern New Hampshire University and an MPA from Harvard's John F. Kennedy School of Government where he studied environmental/natural resource policy and economic development. He is married, has four children and lives on Pemaquid Lake in Nobleboro, Maine. He is a registered Maine Guide and a certified Ski Instructor.

# New Hampshire's Lake Host Program:
# Preventing the Spread of Exotic Aquatic Plants through Education

Nancy Christie, President, NH Lakes Association

**The purpose** of the Lake Host Program is to prevent the introduction and spread of exotic aquatic plants (such as variable milfoil) in New Hampshire's surface waters by means of trained Lake Hosts stationed at public motorboat access sites. Lake Hosts:

1. educate the boating public about the issue of exotic aquatic plants
2. conduct courtesy boat and trailer inspections on vessels both entering, and leaving, public waters and encourage boaters to do "self-inspections"
3. remove and properly dispose of any vegetation

Initiated with funding from the National Oceanic and Atmospheric Administration (NOAA), the New Hampshire Lakes Association launched the Lake Host Program in 2002 as a collaborative effort involving state agencies, lake and watershed associations, and local municipalities. In 2003 and 2004, federal and local dollars and in-kind support leveraged $165,000 and $150,000 respectively, in state monies for the program. The required minimum local match for each participating organization in 2004 was 33% of their grant request amount (up to $4,000 per ramp).

The Lake Host program has proven effective in educating the boating public and preventing the spread of exotic aquatic plants, with 27 "saves" recorded over the past three years.

**2002, 2003 and 2004 Lake Host Program Statistics**

| | 2002 | 2003 | 2004 |
|---|---|---|---|
| Number of Participating Organizations | 38 | 46 | 51 |
| Number of Paid Lake Hosts | 102 | 149 | 190 |
| Number of Trained Volunteer Lake Hosts | 59 | 167 | 216 |
| Number of Lakes and Ponds with Lake Hosts | 37 | 45 | 50 |
| Number of Ramps Covered | 45 | 59 | 61 |
| Number of Boats Inspected | 15,878 | 26,583 | 31,629 |
| Number of "Saves" (exotics removed from boats) | 4 | 7 | 16 |
| Federal Funds | $ 260,100 | $10,000 | $85,300 |
| State Funds | 0 | $165,000 | $150,000 |
| Local Funds (hard cash and cash-equivalents) | $ 37,155 | $112,382 | $151,238 |

Biographical Sketch:

Nancy has been President of the New Hampshire Lakes Association since January 1999. She administers the Lake Host program, including the hiring of a seasonal Lake Host Program Coordinator and 200 seasonal employees.

Nancy holds a B.A. in biology from Antioch College in Ohio and a Master of Science from Antioch New England Graduate School, Keene, NH.

# A Study of the Economic Value of the Surface Waters of New Hampshire

**Jacquie Colburn, Lakes Program Coordinator, NH DES**

**Abstract:**
An ongoing study in New Hampshire, titled *A Study of the Economic Value of the Surface Waters of New Hampshire* has produced some interesting findings regarding the economic value of the state's inland freshwaters. The overarching goal of the Study has been to provide policymakers with accurate and useful information about the economic value of the State's surface waters and the factors that underlie and impact that value.

On behalf of a stakeholder group consisting of state agencies, rivers groups, lake associations, and other interested parties, the New Hampshire Lakes Association secured the services of an expert economist to perform the study.

To date, the Study has been conducted in three phases:

1. **Phase I** (completed in 2001) reviewed existing literature and methodologies and provided the "road map" for Phases II and III of the Study.
2. **Phase II** (completed in 2003) estimated a range of dollar values for five key lake and river uses based on existing environmental conditions. Boating, fishing, swimming, waterfront property taxes, and drinking water supplies annually contribute $1.8 billion to the state's economy.
3. **Phase III** (Part A was completed in 2004 - Part B will be completed in 2005) Part A ascertained public opinion about the relative importance of different freshwater attributes when New Hampshire residents decide to use the State's surface waters for recreational purposes, and how residents' attitudes and behaviors would change if these freshwater attributes were altered.

While it is generally recognized that the inland surface waters of New Hampshire are valuable natural and economic resources, prior to this Study the extent to which these resources contribute to the state's economic well-being had not been determined.

Biographical Sketch:
Jacquie has administered the NH Lakes Management and Protection Program since 1992. One of the cornerstones of the Lakes Program is the technical assistance and outreach it provides to the citizens and visitors, municipalities, lake associations and other organizations throughout the state. The Lakes Program often participates in addressing statewide lake-related issues. As the Lakes Coordinator, she represents the department and the commissioner to a variety of committees and organizations throughout the State including, the NH Legislature, the Public Waters Access Advisory Board, and the International Sister Lakes Program with Israel. She obtained her Bachelor and Masters Degrees from the University of Connecticut.

## Expanding your Monitoring Program to meet your objectives.

Bob Craycraft, UNH Cooperative Extension

Description: Many volunteer monitoring programs, local lake associations, watershed associations and municipalities are involved either directly or indirectly (i.e. using the data to make informed decisions) in the collection of water quality data. While these entities do share the common goal of protecting water quality, the specific problems vary among water bodies that range from issues such as heavy developmental pressures, excessive erosion, agricultural runoff, etc. Some monitoring programs are implemented to specifically address these local concerns from the program inception. However, other programs are implemented to generate baseline data or to answer one question, yet the specific concern shifts to another perceived problem. This session is intended to address the issue of expanding your monitoring program to meet your current and changing objectives. Different monitoring approaches discussed will range from the addition/modification of your core set of measurements, the exploration of spatial and temporal options that might provide better insight into variations among sampling locations and over time, and then a brief discussion of more comprehensive options that address more of a comprehensive watershed approach.

This session will be designed to give you a general overview of some of the strategies and options that might be available to help you and to provide you with some ideas that you can discuss further with you local volunteer water quality monitoring coordinator.

Biographical Sketch:

# New England Lakes and Ponds Survey: A Probability-based Approach to Comprehensively Assess Lentic Waterbodies in the New England Region

**Meredith Decelle, US EPA**

With the realization of the importance of preserving our ecological resources, a need has arisen for comprehensive water quality assessments at the state, regional, and national level. In response to this need, the United States Environmental Protection Agency (EPA), in conjunction with New England Interstate Water Pollution Control Commission (NEIWPCC), state environmental agencies, and members from academia, will undertake a four to six-year study involving the design and implementation of a biological and chemical monitoring effort to assess the ecological condition of lakes and ponds within New England.

This study is a randomized probabilistic sampling design that will augment and enhance more traditional statewide monitoring efforts that target specific issues/locations. Selection of the lakes and ponds to be sampled is accomplished through the use of a probability-based approach, which allows for a subset of the population to be statistically representative of the entire population. Such an approach allows for an unbiased and comprehensive assessment of lakes and ponds in the New England region, providing insight into the overall status and health of these ecological resources.

Accepted methodologies and established protocols will be used to conduct the following types of monitoring at each selected location: Biological assessments of fish, benthic macro-invertebrate assemblage assessments, zooplankton and phytoplankton collection and analysis, aquatic macrophyte surveys, bathymetry work, physical habitat assessments, water and sediment chemistry analysis, characterization of surrounding land use, and screening for emerging contaminants such as endocrine disrupting compounds (EDCs), personal pharmaceutical care products (PPCPs), and polybrominated diphenyl ethers (PBDEs).

The data will be used to address current environmental issues, meet long-term programmatic needs (i.e. 305(b) reporting requirements), and to investigate existing trends in water quality and ecological conditions.

Biographical Sketch:

# Message in the Mud: Does *Chaoborus americanus* indicate fish absence in Maine ponds?

**Katie DeGoosh[1*], Emily Schilling[1], Cynthia Loftin[2], Katherine Webster[3]**

Landscape barriers deposited after the last glacial retreat left some ponds in Maine naturally void of fish populations. With over 6,000 ponds in Maine (many of which have been stocked with fish) it is unclear how many may have been naturally fishless. Here we assess the presence of *Chaoborus americanus* (Diptera) as a means to identify these naturally fishless ponds. *C. americanus* is most commonly found in ponds without fish, and their mandibles remain in lake sediments as indicators. In 2004, we gillnetted, minnow-trapped and collected sediment cores from twenty-two lakes throughout the state, in areas of high and low elevation. To reflect the current fish conditions, the top of each core was processed, and *Chaoborus* mandibles were identified. The abundance of *C. americanus* is significantly higher in ponds without fish. However, *C. americanus* was only found in eight out of ten fishless ponds, *and* it was also found in three fish ponds. We may not be able to verify the absence of fish by *Chaoborus americanus* alone in Maine ponds, and further information on lake morphometry, chemistry, and history of fish stocking should be considered to fully understand these systems. This research has implications for assessing historical fish presence using sediment cores, and may help guide the management of historically fishless ponds.

Biographical Sketch:
Katie DeGoosh is a graduate student at the University of Maine. She will receive her M.S. in Ecology and Environmental Science in December, 2005. She graduated from Russell Sage College with B.A in Biology in 2002. She has experience working with both the NYS DEC as well as the NH DES Limnology Center.

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# RECREATIONAL BOATING USE ASSESSMENT SQUAM LAKES, NEW HAMPSHIRE

Christopher P. Devine, Executive Director, Squam Lakes Association

ABSTRACT

Inland or freshwater lakes are utilized for a variety of recreational boating activities. The Squam Lakes in central New Hampshire are a popular destination for both residents of and visitors to New Hampshire to participate in recreational boating. Recreational boating translates to a need for available surface water acreage. Excess usage produces user conflict from overcrowding which compromises both safety and enjoyment. Importantly there are economic consequences from over usage as tourism and property values become negatively affected. In 1988, the Squam Lakes Association (SLA) began collecting boating use data on the Squam Lakes in Central New Hampshire. The census activities were organized by the SLA and volunteers were used to conduct the census. The boating censuses were conducted on two different but related aspects: static boat surveys and active boat surveys. A recreational boating use assessment was performed using both a broad or average approach and a detailed or empirical approach. The intent of using these two approaches was to quantify actual use in a non-subjective manner and then compare actual use data to recently published research data. Using the results of both approaches a reasonable assessment of use levels in comparison to recreational carrying capacity can be made. Observation supported by boating use data indicate that the lakes are presently at a level of use that translates to a density of 15 acres per boat and approaching optimum carrying capacity when calculating use from density standards applied to each of the four boating types.

Biographical Sketch:

***Christopher Devine*** is the Executive Director of the Squam Lakes Association, a non-profit organization founded in 1904 for the purpose of conserving the Squam Lakes Watershed. He has a bachelor of geosciences degree with a major in geology from the University of Arizona and is a Certified Professional Geologist. Prior to joining the association he was an environmental consultant specializing in the hydrogeologic aspects of solid and hazardous waste site investigation and remediation at locations throughout the United States. He has served as an adjunct professor at Plymouth State University and actively participates in the planning and development of their Center for the Environment. His current focus at the Association includes invasive aquatic plant management, land conservation, recreational use evaluation and management, and water quality and ecological monitoring. Contact Chris at chrisdevine@squamlakes.org or by phone (603) 968-7336.

# At the End of the Pipe: Issues & Impacts Associated with Urban Waterbodies

Jen Drociak, Urban Ponds Restoration Program/NH DES

**Abstract:**

What would you do if you had seven degraded waterbodies, one staff person, $1 million and 5 years to "fix" the problems associated with 50 years of stormwater runoff, development and otherwise neglect? From 2000 - 2005, seven waterbodies in Manchester have been evaluated and monitored for restoration potential. Goals of the program include: 1) Returning the ponds to their historic uses; 2) Promoting public awareness, education, and stewardship; 3) Reducing pollutant nutrient inputs and improving water quality; 4) Maintaining or enhancing biological diversity; and 5) Providing improved recreational uses.

Each of the seven ponds has been evaluated for water quality improvements, outreach/education opportunities, recreation opportunities, land preservation opportunities, and other management tasks. The result is a clearly defined set of goals and prioritized projects within each category. Specific restoration projects have been identified, funded, and implemented through this project. This presentation will review the process of baseline monitoring efforts (non-point source, water quality and biological surveys), comprehensive inventories, project prioritization, planning, and implementation over the past 5 years within the city of Manchester.

Biographical Sketch:

Jen has been on the Manchester Conservation Commission for four years and involved with the Manchester Urban Ponds Restoration Program for five. She has acted as program advisor for the past three years where she has organized data sampling/collection, project planning/implementation, and outreach/education.

Jen has interned for the Biology Section of the New Hampshire Department of Environmental Services (NHDES) working for the Lake Assessment Program, Volunteer Lake Assessment Program, Shoreland Protection Program, and Exotic Species Program. She has worked for the NHDES NH Coastal Program since 2002 where she coordinates salt marsh restoration monitoring. She also coordinates the NH Marsh Monitors: Volunteer Salt Marsh Monitoring Program and is also charged with coordinating data collection, entry, and analysis.

Jen holds a Bachelor of Science degree in Environmental Science from the University of New Hampshire and continues to take graduate-level classes at the University of New Hampshire.

## Title: Mercury in NH freshwater fish

**Bob Estabrook, Chief Biologist, NH DES**

The purpose of this talk is to provide a general overview to the public on the issue of mercury in fish and why people should be concerned. It will begin with a general discussion of mercury: what is it, where does it come from, how does it get into the food chain and what is its impact on humans and other fish consumers. The fish consumption advisory because of mercury will also be discussed.

A discussion of the results of mercury testing in NH freshwater fish will follow. We will discuss what species tend to have higher mercury levels, areas of NH that tend to have higher fish-mercury levels and information on trends. We will close with a brief summary of efforts to reduce the amount of mercury discharged to the environment.

Biographical Sketch:
Bob is the Chief Aquatic Biologist for the NH Department of Environmental Services where he has worked for over 30 years.

# Assuring Credibility in Volunteer Monitoring Programs

**Linda Green, Program Director, URI Watershed Watch, University of Rhode Island Cooperative Extension**

The ultimate goal of most volunteer monitoring programs is to ensure that well-trained volunteers collect high quality data and that the data are used. Despite decades of demonstrating that volunteers can and do collect representative data, government agencies, scientists and often the general public are sometimes reluctant to use data not collected by "experts". Therefore volunteer water quality monitoring programs must work especially hard to build and maintain credibility – some have even said, "twice as hard for half the recognition." This session provides an overview of quality assurance and quality control issues and provides examples of methods used by many programs to substantiate the credibility of their data. Water quality monitoring data are typically gathered to support decision-making, whether it is for encouraging waterfront residents to convert lawns into vegetated buffers, for enacting local ordinances to strengthen wetlands protection or storm water management, or for regulatory action. In order to be useful, monitoring data must provide relevant information - if the concern is potential bacterial contamination, measuring turbidity or dissolved oxygen won't help much. And the data must be credible, which usually means that it is documented and defensible. Data of unknown quality are essentially useless, and useless data can potentially corrupt the decision-making process. Incorporate a Quality System into your monitoring program!

Biographical Sketch:

Linda is Program Director of the seventeen-year old URI Watershed Watch Program, a cornerstone of the University of Rhode Island Cooperative Extension Water Quality Program, and has been since its inception. This science-based volunteer water quality monitoring program promotes active volunteer monitoring, informal educational outreach and generates virtually all the of the RI lake water quality monitoring data.

On a regional level she is a founding member of the New England Regional Monitoring Collaborative, and chairs the volunteer monitoring focus group of Cooperative Extension's New England Region Water Quality Program. She is the RI representative and treasurer of the NE chapter of the North American Lake Management Society.

She shares leadership of a national Extension project to expand and enhance volunteer monitoring in Extension programs across the country. She is a member of the editorial board of *The Volunteer Monitor* newsletter. In 1999 she received an Environmental Merit Award from the US Environmental Protection Agency for her work with volunteer monitors. In 1994 she was voted URI Cooperative Extension Educator of the Year. She holds a BS in Natural Resources and an MS in Resource Chemistry from the University of Rhode Island.

# Cyanobacteria and Toxic Algae

**Jim Haney, UNH Department of Zoology**

Biographical Sketch:

# Rare, Threatened, and Endangered Aquatic Plants in New England

**C. Barre Hellquist, MA College of Liberal Arts**

Rare plants present a problem when lakes and ponds are being evaluated for weed control. Each state has a list of threatened and endangered species that one should be aware of when surveying a waterbody prior to invasive weed control. Many species are rare throughout new England such as: Potamogeton ogdenii and Stuckenis filiformis. Other species such as Sagittaria teres are locally abundant, but rare nationally. Potamogeton vaseyi and Potamogeton hillii are listed in only certain states. All species present problems when encountered in lake to undergo weed control.

C. Barre Hellquist, Ph.D.
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Biographical Sketch:
Dr. Hellquist is a retired Professor and Department Chairperson at the Massachusetts College of Liberal Arts. He received his Ph.D. in Botany from the University of New Hampshire. He is the coauthor of the Aquatic and Wetland Plants of Northeastern North America. His research interests are the taxonomy and ecology of the Potamogetonaceae and Nymphaeaceae of the World. Dr. Hellquist presently is involved in studies of *Potamogeton clystocarpus*, a “rare endemic" of the Davis Mountains in West Texas, and studies on the Nymphaeaceae of Australia.

# Resources Available for Lake Monitoring Programs

**Elizabeth Herron, Program Coordinator, URI Watershed Watch, University of Rhode Island Cooperative Extension**

Volunteer monitoring can be a tremendous asset to lake water quality protection efforts. A variety of resources are available to assist in developing new programs or expanding existing programs. This presentation will introduce a number of those resources, as well as highlight several of the institutional support-system available in New England.

Two in particular will be focused on – Cooperative State Research Education Extension Service (CSREES) Volunteer Water Quality Monitoring National Facilitation Project Guide for Growing CSREES Volunteer Monitoring Programs, and the tools of the New England Regional Monitoring Collaborative (NERMC.)

The Guide for Growing was designed as factsheet modules that can be used alone or in combination to direct program coordinators to the questions and answers to be addressed in order to create effective programs for meeting local needs. The Guide distills the knowledge and advice contained in many excellent resources produced by a wide spectrum of agencies and organizations nationwide. By incorporating frequent references and links to materials from Cooperative Extension and other programs, it provides a comprehensive document to help support CSREES-affiliated volunteer monitoring efforts. Guide modules include:

- Why Volunteer Water Quality Monitoring Makes Sense for CSREES;
- How to use the Guide to Growing CSREES Volunteer Monitoring Programs;
- Designing Your Monitoring Strategy: Basic Questions and Resources to Help Guide You;
- Training Volunteer Water Quality Monitors Effectively;
- Assuring Quality Data;
- Volunteer Management and Program Support;
- Outreach Tools; and
- Finding Support and Funding for Local Efforts.

The NERMC resources focus on specific monitoring methods designed to facilitate watershed-based monitoring efforts and sharing of information between programs. NERMC offers basic training materials (videos and manuals) and workshops designed to train watershed monitoring groups to carry out four types of assessments:

1) *Watershed Natural Resources Inventory,*
2) *Habitat Assessments,*
3) *Benthic Macroinvertebrate Assessment,*
4) *On-site Nonpoint Source Pollution Evaluation* ('Following the Flow')

When these resources are integrated with local institutional supports (such as state agency, university or non-profit service providers) volunteer monitoring can provide citizens and communities with tools to improve their knowledge of the status and factors affecting their local

water quality. This knowledge engages stakeholders in programs related to changes needed at the farm, home/camp and community level to ensure water quality protection.

Biographical Sketch:
Elizabeth has been with the URI Watershed Watch program (URIWW), the largest volunteer water quality monitoring program in Rhode Island, for a more than a decade. As program coordinator she helped URIWW to become the principle source of fresh surface water data for the state of Rhode Island and southeastern Connecticut. Through the New England Regional Monitoring Collaborative, Cooperative State Research Education Extension System Water Quality program and NALMS, she promotes community watershed education and stewardship through volunteer water quality monitoring, locally, regionally and nationally.

## Use of the Milfoil Weevil *Euhrychiopsis lecontei* as a Biological Control Agent for Eurasian Watermilfoil: Response of Native Plant Communities in Northern Lakes.

**Martin Hilovsky, EnviroScience, Inc**

Field and laboratory experiments have demonstrated the potential of a native aquatic weevil, *Euhrychiopsis lecontei*, to be used as a biological control agent for the exotic aquatic weed, Eurasian watermilfoil (*Myriophyllum spicatum*). The milfoil weevil (*E. lecontei*) is widely distributed across much of the northern U.S. and Canada, including Illinois. Feeding studies have demonstrated that this weevil is a milfoil specialist and strongly prefers Eurasian watermilfoil over the native species with which it has presumably coevolved. Over the past seven years, more than 75 lakes in 12 states have been successfully stocked with the milfoil weevil, resulting in well-documented declines in Eurasian watermilfoil in most lakes studied. This project examines the response of the native macrophyte community in several Michigan and New Jersey lakes to the introduction of weevils from 1999 to 2004. Preliminary results indicate that species composition in beds once dominated by Eurasian watermilfoil can change dramatically over a short period of time. Results from the 2001 through 2004 field seasons will be presented which indicate that native macrophytes in these lakes have rebounded and recolonized large areas once dominated by milfoil.

Biographical Sketch:

Martin is an environmental scientist with undergraduate and graduate degrees in Aquatic Ecology from Kent State University. For the past 15 years he has lead EnviroScience, Inc.; an Ohio-based ecological consulting firm. For the past eight years he and EnviroScience's lake division have been investigating the use of native weevils for control of Eurasian watermilfoil.

## Sebago Lake: Yours, Mine and Ours

**Paul Hunt, Environmental Manager, Portland Water District**

Sebago Lake is one of Maine's most important natural resources because it is used by so many for so much. It is a drinking water supply for nearly a quarter of a million people, a treasured vacation destination, the setting for some of Maine's most desired seasonal and year-round homes, and a renowned cold water fishery. Tens of thousands of people launch their boats into the lake every yea, supporting dozens of profitable water-related businesses on and near the lake.

The ideal drinking water supply lake is clean, deep, naturally low in nutrients and surrounded by a fence and undeveloped land. Sebago Lake meets the first three critera but not the last two. A lake can provide both drinking water and recreational opportunities, but not without compromise and probably not without conflict.

I will describe some of the recent efforts, some more successful than others, to balance protection and access on Sebago Lake.

Biographical Sketch:

Paul Hunt is the Environmental Manager for the Portland Water District, managing the District's water and wastewater laboratories and directing the Watershed Control Program for Sebago Lake. Prior to this Paul created and supervised the Source Protection Section of the Maine Drinking Water Program.

## Successes and uncertainties for the Clean Air Act of 1990: trends in surface water acidification from the northeast US.

**Steve Kahl, Director, Center for the Environment, Plymouth State University**

The goal of Title IV of the Clean Air Act Amendments of 1990 (CAAA) was to reduce the adverse effects of acidic deposition through reductions in annual emissions of sulfur dioxide and nitrogen oxides. Sulfur deposition has been decreasing since at least 1970, with an acceleration in the rate of decline as a result of the CAAA. Changes in nitrogen deposition have been minimal. Expected decreases in sulfate in surface waters have occurred in all regions. Nitrate is largely unchanged. Modest recovery in pH and alkalinity is occurring in some areas. This is a reversal of the slight trend toward acidification seen as recently as the mid-1990s. However, uncertainties in overall chemical response in surface waters, perhaps related to other stressors such as climate change, make assessment of the timeframe for recovery uncertain. Given the modest trends and slow rates of change, long-term monitoring networks such as EPA TIME/LTM and NADP are essential tools for policy assessment and evaluation of the effects of atmospheric deposition.

Biographical Sketch:

*Steve Kahl is the founding director of the Center for the Environment and Professor of Environmental Science at Plymouth State University. From 1994 to 2004 Steve was director of the George J. Mitchell Center for Environmental and Watershed Research at the University of Maine, where he earned his Ph.D. in Watershed Geochemistry. His long-term acid rain research on northeastern lakes has been used by the Environmental Protection Agency to report to Congress on the effectiveness of the Clean Air Act (see http://plymouth.edu/pubilications.html).*

# New England Lakes and Ponds Project: Fish Tissue Contaminants

**Erica Kensey, NEIWPCC**

**Abstract**

The U.S. Environmental Protection Agency's (EPA) Office of Environmental Measurement and Evaluation (OEME) and New England Interstate Water Pollution Control Commission (NEIWPCC) along with other federal and state organizations are undertaking a study of lakes and Ponds across New England. The project will begin with a probabilistic stratified sampling of lakes and ponds across the region with the goal of evaluating each on a number of criteria to determine trophic state, biological integrity, and fishability.

One matter of growing concern is the threat of emerging contaminants including PBDE's (polybrominated diphenyl ethers) also known as brominated flame-retardants, triclosan /triclocarban, and EDC's (endocrine disrupting compounds) including antibiotics and ethyl estradiol. We anticipate including these compounds in our list of possible fish tissue contaminants. PBDE's have currently been banned in Europe and are presently being phased out in California. They are found in everything from computers to clothing and are bioaccumulating in animals as well as humans. Triclosan and triclocarban are similar chemical compounds added to many types of soap and other personal care products as an antibacterial agent. Some EDC's will be screened for by testing for an egg yolk protein precursor, vitellogenin, which is usually dormant in males unless they are exposed to estrogenic chemicals.

These compounds, their occurrence, fate, and transport are only beginning to be researched. The biological effects of these compounds polluting waterways are only now beginning to emerge after years of use and disposal. As a result many of these tests will be pilot or initial studies in the lakes and ponds we will survey. However this research will give a solid baseline for monitoring and future research at these locations.

Biographical Sketch:

Graduated from Saint Michael's College in May of 2004 with a BA in Biology and Environmental Studies. Currently working for NEIWPCC at the EPA New England regional laboratory on the New England Lakes and Ponds Project.

# The New Hampshire Department of Environmental Services Lakes Program Watershed Approach: How Volunteer Monitoring Efforts have Influenced Town Policy

**Andrea M. LaMoreaux, Coordinator, NH Volunteer Lake Assessment Program, NH DES**

This presentation is appropriate for all volunteer monitors who have wondered, at some point in their monitoring career, "Why do I keep sampling my lake or pond year after year? What does all of this data accomplish anyway? Am I really making a difference?"

The New Hampshire Department of Environmental Services (NHDES) Lakes Program Watershed Approach is a coordinating framework for water quality management that focuses efforts to address the highest water quality threats within a particular watershed to a lake or pond. Numerous NHDES programs are involved in assessing the quality and threats to the state's lakes and ponds. Recommendations from these programs are implemented to protect and improve lake quality. Volunteer monitoring efforts play a key role in the NHDES Lakes Watershed Approach. NHDES volunteer lake monitoring programs include the Weed Watchers Program, Volunteer Lake Assessment Program, and Clean Lakes Program.

This presentation will briefly discuss the NHDES Watershed Approach structure and will introduce the three key volunteer lake monitoring programs. The presentation will then focus on recent examples of how volunteer lake monitoring efforts have influenced town policy and play an integral role in protecting and improving the quality of New Hampshire's lakes and ponds.

Biographical Sketch:

Andrea LaMoreaux is the Coordinator of the Volunteer Lake Assessment Program for the New Hampshire Department of Environmental Services (NHDES), a program in which approximately 500 volunteers are trained how to sample the quality of 155 lakes and ponds throughout the State of New Hampshire. VLAP is a cooperative program between volunteer monitors and the NHDES which leads to local awareness of land use and human practices that may be detrimental to lake quality and also empowers communities in their decision-making regarding lake management issues. The data collected through VLAP is an invaluable resource in NHDES' mission to protect the quality of New Hampshire's lakes and ponds. Andrea obtained a Master's degree in Water Resource Management from Duke University in Durham, North Carolina.

# Preparing a Lake Management Plan

**Lee Lyman, President, Lycott Environmental, Inc.**

As more attention is focused on how and why a water body is managed, various interested parties find themselves justifying an aquatic plant management program to those that do not understand the need to manage. It is beneficial to have a lake management plan in place that addresses the environmental factors and a review of various management alternatives for in-lake and watershed management.

The management plan should include historical actions and the success and failure of such actions, as well as any studies, surveys and water quality data that have been obtained. Various maps should be prepared pertaining to the watershed, land use and aquatic vegetation. The problems should be defined, available solutions reviewed for applicability in a particular water body, and funding for both short- and long-term management addressed.

Biographical Sketch:

Mr. Lyman founded Lycott in 1971 to provide environmental consulting services to industries, private citizens, and governmental agencies. He has completed thousands of studies in lake and pond management, environmental impact analyses, wetlands assessments and hazardous waste.

Lycott has been a leader in the field of lake and pond management under Mr. Lyman's direction. Over the years, Lycott has effectively improved the quality and controlled the growth of nuisance aquatic plants in water bodies using lake management techniques such as herbicides and algaecides, drawdown, hydroraking, dredging, aeration, benthic screening and harvesting. Lee Lyman has been certified by the Massachusetts Pesticide Board since 1969 in the supervisory category.

Prior to forming Lycott, Mr. Lyman was the Director of the Pesticide Research Laboratory at the Massachusetts Division of Fisheries and Wildlife. During his six years with the Division, he conducted pioneering research in environmental contamination by pesticides and PCBs. Mr. Lyman was responsible for identifying PCB contamination throughout the northeastern United States, and was a prime motivator in the passage of legislation to discontinue use of non-degradable pesticides.

## An Internet Initiative: Investigating Aquatic Invasives With Middle Level Students

**Mary Ann McGarry, PSU Visiting Professor**

Description: Maine Lakes Conservancy Institute's (MLCI) curriculum initiative, with our nine middle level partner schools for 2004-2005, focused on exploring and sharing potential impacts of aquatic invasive species invasions. Through a series of introductory presentations, hands-on activities, research and mapping exercises, students communicated via the multidisciplinary MLCI Students' Portal website, www.mlci.org/students,

their understanding of how threatening aquatic invasives (Eurasian watermilfoil, zebra mussels, and illegally stocked fish) could impact lakes in their community. Curriculum activities and alignment with national science, geography, mathematical and technological educational standards, web entries showcasing students' products, related community initiatives, and results of pre and post student surveys on the invasive project will be shared.

Biographical Sketch:

# Phosphorus migration from a near-lake septic system in the Otsego Lake watershed

**Holly Meehan, SUNY Oneonta Biological Field Station**

As Otsego Lake, located in Otsego County, New York, is a phosphorus-limited water body, management efforts focus on reducing inputs of that nutrient. In order to provide a preliminary assessment of the severity of loading from lakeside septic systems, a system that is seemingly representative of many of those in close proximity to the water was evaluated in the spring and summer of 2003. Drive-point piezometers with Teflon liners were used to collect water moving below the leach field. Chloride, phosphorus, nitrate, and fecal coliform were monitored. Fecal coliform levels were not elevated, nor were odors or pooling evident, indicating that the system was in compliance with health code regulations. However, subsurface nutrient levels immediately adjacent to the lake were significantly higher than in the lake itself ($p<0.001$), with sites ranging from 31 to 2400 μg/L (2 to 200 time that of ambient lake water). Such elevated levels implicate near lake systems as nutrient sources. Current technologies allowing for nutrient removal from on-site systems seem appropriate near sensitive water bodies.

Biographical Sketch:

Holly Meehan is a graduate of the Watershed Management program at the State University of New York College of Environmental Science and Forestry. She has been involved in limnological research for five years, finding a niche in nutrient movement and alternative septic system use. Holly plans to begin her master's at the University of Rhode Island in the Watershed Science program in the fall of 2005.

# Onondaga Lake Oxygenation Demonstration Project

**David F. Mitchell, CLM and Kenneth** J. Wagner, CLM. ENSR International, Westford, MA and Willington, CT.

**Abstract**

Onondaga Lake, in central New York State, is considered one of the most polluted freshwater lakes in North America, principally due a combination of historic industrial discharge and sludge disposal as well as current inputs (BOD, nutrients) from a major metropolitan (Syracuse) wastewater treatment facility. Due to the latter, the lake suffers from an anaerobic bottom layer (hypolimnion) during periods of seasonal thermal stratification. The Onondaga Lake Oxygenation Demonstration Project was conducted by ENSR for the USACOE (Buffalo District) to determine the feasibility and suitability of lake-wide oxygenation. After review of the options and consideration of the advantages and disadvantages of each, the Technical Panel convened by ENSR identified the most appropriate approach involves creating a physically unbounded test area using four partial lift aeration units in the North Basin of Onondaga Lake. An extensive two-year monitoring program was proposed to look at the relative efficacy and effects of aeration. ENSR's presentation will provide background on current and historic Onondaga Lake conditions, a review of the alternative approaches and equipment used for lake aeration purposes, and the critical factors (sizing, pumping rates, cost) used in evaluating and selecting the final experimental design.

**Presenter**

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Biographical Sketch:

Dr. David Mitchell has 20 years of experience in water quality assessment, lake and watershed assessment and restoration, and ecological risk assessment. Dr. Mitchell has been project manager for many major lake and watershed assessment projects in the Northeast and has worked on diverse water quality and permitting issues nationwide. Dr. Mitchell received his Ph.D. from Cornell University and is a member of the inaugural class (1991) of Certified Lake Managers (CLM) certified by NALMS.

## Escape from Eutrophia?

**Bill Monagle, CLM, Executive Director. Cobbossee Watershed District, Winthrop, Maine.**

In the early 1960's, several of the lakes and ponds of the Cobbossee Stream watershed, a 217-square mile drainage basin, exhibited signs of eutrophication. Noxious seasonal blooms of blue-green algae (cyanobacteria) were the primary symptoms and excessive nutrient loading, particularly phosphorus, was the suspected culprit. In response, the Cobbossee Watershed District (CWD), Maine's first regional lake management district, was formed in 1971 to establish programs and guide local efforts to reverse the degradation of the impaired lakes and to develop programs to protect all of the 28 lakes of the CWD. This presentation will focus on two of these lakes, Cobbossee Lake and Annabessacook Lake, and the intensive research and vigorous lake and watershed management efforts applied to them. These efforts have been supported primarily by local municipal assessments, state and federal grants, and the support of local lake associations. Since the mid to late 1990's, these two lakes have exhibited dramatic improvements in Secchi disk transparency throughout the summer months and residents have enjoyed bloom-free conditions. Have we truly escaped the clutches of "Eutrophia"?

Biographical Sketch:

Bill Monagle has been the Executive Director of the Cobbossee Watershed District in Maine since 1992. Bill received his Bachelor and Master of Science degrees (zoology) from the University of Wisconsin-Milwaukee with research emphasis on the physical and biological dynamics of the nearshore and offshore zones of Lake Michigan. He is a member of the Water Resource Program Advisory Committee for the University of Maine and is currently Vice-President of the Maine Volunteer Lake Monitoring Program. He is also an active member of the North American Lake Management Society and a Certified lake Manager (NALMS).

# Volunteer Effort at Lower Suncook Lake, NH, to Track 2,4-D Treatment Results

**S. Edward Neister, Chairman, Milfoil Control Committee Suncook Lake, Barnstead, NH**

Suncook Lake Association (SLA) in Barnstead New Hampshire discusses their approach and results of their treatment for variable milfoil. Initial results indicate their approach may lead to complete removal of milfoil from their lake. Discussion will include the study of herbicide movement in the lake after treatment, its potential to contaminate wells, and the study of mechanisms that significantly reduce herbicide concentration.

The approach was to develop a plan that could lead to the long term control of milfoil in the lake. The plan used the latest technology to locate all milfoil plants in the lake. A significant part of the program was the use of many volunteers to complete the tasks required throughout the program. The combined estimate was $80,000 of donated time and resources in a $150,000 program. Tasks included; survey all property owners to locate all domestic well and water sources, hold informal public meetings to get everyone informed, send out certified mailings and notices, pull volunteer divers around the lake to complete the lake survey prior and post treatment, and assist the divers in the removal of plants that survived the treatment. A video recording was made to record milfoil destruction and the revival of the lake bottom during the program.

Results are very encouraging. All milfoil appears to have been removed by either the herbicide treatment or by diver removal. Herbicide was not found in any wells. 2, 4 -D appears to be very sensitive to techniques that cause its destruction in lake outflow streams and in water treatment discharges.

Biographical Sketch:

The management of the project was done by the members of the Milfoil Control Committee, Suncook Lake Association. Ed Neister is the current Chairman. He has a BS / MS in Physics from WPI / Northeastern. During his professional career, he has founded a laser company, a UPS company, and a company that is developing a unique method for removing pollutants from coal fired power plants. He has investigated waste water treatment techniques using new UV light sources and collaborated with UNH to do some laboratory research on its effectiveness. As chairman of the MCC, he used his skills to develop a program that could have the potential to remove all the milfoil from Suncook Lake. He developed and combined the tools that made underwater lake surveying simple and effective. Ed and his family have been on Lower Suncook Lake for 6 years and he is an active diver.

## The effects of shoreline development on habitat complexity of lake littoral zones in Maine

Kirsten L. Ness, UMaine

Increasing pressures from residential shoreline development threaten to alter littoral habitats of lake ecosystems. Shoreland zoning regulations were instituted in 1971 by the State of Maine to control development and alterations of lake riparian zones; however, the amount of protection provided by these regulations has not been evaluated. Our first goal is to evaluate the natural condition and habitat complexity of littoral habitats in small to moderate size, headwater drainage lakes in Maine. The second goal is to determine how shoreline development affects littoral habitat complexity. Lake littoral habitats are highly heterogeneous due to factors such as substrate composition, slope, and wave action. Physical variables, such as slope, aspect, and substrate type (shoreline and littoral) are used to define the natural riparian/littoral physical template in lakes with little or no shoreline development. This site specific template allows us to create expectations for habitat complexity, which is defined as a function of macrophyte community structure and coarse woody debris. The natural template can be applied to developed lakes to assess differences in habitat complexity between natural and developed conditions. Biological response variables to habitat complexity include macroinvertebrate community and macrophyte species assemblages. Results indicate positive relationships between structural groups of macrophytes and sediment composition in both undeveloped and developed lakes. Lakes with shoreline development also have less coarse woody debris. Results will be used to identify possible indicators of habitat change and the effects of increasing shoreline development intensity on littoral habitat complexity.

Biographical Sketch:
Kirsten received her B.A. in Biology with a concentration in Environmental Science from Colby College in 2002. She is currently a graduate student at the University of Maine, pursuing her Master's degree in Ecology and Environmental Science with a concentration in Water Resources.

Collaborators:
Senator George J. Mitchell Center for Environmental and Watershed Research, University of Maine

# Over 25 years Monitoring the Squam Lakes: Lessons Learned.

**Jeffrey Schloss, Extension Professor in Zoology and Water Resources Specialist, University of New Hampshire Center for Freshwater Biology**

Through the New Hampshire Lakes Lay Monitoring Program as well as faculty and student research trips we have been intensively monitoring the Squam Lakes since 1979. The Squam Lakes system is relatively unique due to its collection of embayments and its complicated bathymetry that includes shallow reef areas and connecting island chains that divide the lake into 18 functionally separate basins or "ponds". Many of these ponds act differently from one another and display varying levels of productivity. The sizable data base collected along with cutting edge GIS analysis has allowed us to tease out many of the predominant factors that control pond water clarity and algae growth (measured as chlorophyll). By developing predictive relationships between the various ponds and their basin/watershed characteristics accurate models have been developed. Those ponds or areas of the lake that do not fit the model predictions stand out and require further analysis. Further investigation into those areas has found explanations for those differences. Additional research undergone on Squam includes the development of a nutrient and water budget for the watershed and intensive plankton analysis. The budget analysis included estimates of septic system influence on the lake system. The plankton analysis disclosed areas important for forage fish species. All of our collaborative research has allowed for a greater understanding of the dynamic lake ecology that occurs in this system. This information has been compiled using GIS visualization for use by the lake association as well as the watershed communities.

Biographical Sketch:

Jeff, an Extension Professor and Water Resources Specialist at UNH, has been the coordinators of the NH Lakes Lay Monitoring Program since 1986. A past President of the North American Lake Management Society, Jeff teaches classes in lake management, watershed ecology and GIS. He advises volunteer groups from across the country and works with local communities.

## What you don't see can hurt you: The Ghost of Loadings Past: Internal Phosphorus Loading in Lakes

**Ken Wagner, ENSR, Willington, CT**

When dealing with algal problems, watershed management is almost always an important part of the solution, but it may not be the whole solution, or even the main need where internal phosphorus loading is the primary source for fueling algal blooms. Internal loading of nutrients is largely dependent upon sediment chemistry. Phosphorus is typically bound by iron, alum or calcium, each of which has different binding properties. Oxygen and pH levels are important modifiers of recycling, and decay in the sediment can also affect phosphorus availability. The interaction of sulfur chemistry with oxygen regime can further complicate internal phosphorus loading, as can storms that mix water layers. Many algae overwinter as resting stages that may absorb phosphorus from the sediment, allowing blooms even when phosphorus in the water column is low. Many algal mats start at the sediment-water interface, where they acquire phosphorus released by decay processes and trap gases until they become buoyant enough to float to the surface. Still other algae grow in the water column at points of density change, like the thermocline, and mix into the upper water layer later. A simple test of bottom sediment features and knowledge of general water column chemistry and weather patterns allows prediction of the potential magnitude of internal phosphorus loading and facilitates planning to mitigate any major impacts.

Biographical Sketch:
Ken works for ENSR International, an environmental consulting firm, where he is involved in recreational lake management, water supply protection, storm and waste water impact assessment, and a variety of rehabilitation projects. He holds an undergraduate degree from that other NH school, Dartmouth College, and graduate degrees from Cornell University in NY.

# LEAP – The Northern New England Lake Education and Action Project

**Laura Wilson, UMaine Cooperative Extension**

Non-point source (NPS) pollution from lakefront development, agricultural production, and other watershed land uses threatens water quality in northern New England lake watersheds. Existing education efforts have begun to address sediment in rural road runoff, septic systems maintenance, and the need for water resource monitoring. However, low-impact, low-maintenance landscaping, and vegetative buffers on shoreline properties are important but overlooked NPS pollution control practices. Oftentimes, landowners are unaware of their contributions to NPS pollution and are unable to identify and correct pollution sources. At the same time, lakeshore associations are often ill-prepared, lacking technical and extension/outreach skills to be effective in NPS pollution prevention.

The Lake Education and Action Project (LEAP) combines the best elements of NPS education, outreach and implementation programs from the University of Maine Cooperative Extension, University of New Hampshire Cooperative Extension, and University of Vermont Extension/Lake Champlain Sea Grant. Our intent is to merge proven techniques developed individually in each state to create a flexible and demonstrably successful program with applicability throughout the region. Emphasis is on:

a) Research-based education and support to lake association staff and leadership training to make members more effective in bringing about positive landowner behavioral change and reducing NPS impacts in their watersheds.

b) Summer and school programs to engage youth in assisting lake associations and landowners to identify and correct NPS pollution sources.

c) Expanding the role of existing volunteer efforts to include water monitoring and NPS assessments where collected data will drive local actions.

LEAP is funded by a USDA CSREES Water Quality (406) grant (2003-06) to the University of Maine.

Biographical Sketch:

Laura Wilson is an Assistant Scientist with the University of Maine Cooperative Extension. She delivers the Watershed Stewards Program, a lake education and community service program, and is a co-PD of LEAP. Laura received her B.S. in Water Resources Management from the University of New Hampshire, and her M.S. in Ecology and Environmental Sciences at the University of Maine.