ABSTRACTS AND BIOGRAPHIES FOR PRESENTATIONS

AT THE

7TH ANNUAL CONFERENCE

OF THE

NORTHEAST AQUATIC PLANT MANAGEMENT SOCIETY

4-5 JANUARY 2006

WESTIN PROVIDENCE

PROVIDENCE, RHODE ISLAND

abstracts and biographies are listed in order of presentation at the conference

EVALUATION OF REGISTERED AND EUP HERBICIDES FOR CONTROL OF VARIABLE MILFOIL

Michael D. Netherland, Ph.D.
US Army Engineer Research and Development Center
University of Florida Center for Aquatic and Invasive Plants

Variable milfoil (*Myriophyllum heterophyllum* Michx.) is considered invasive in the Northeast US, and resource managers have expressed an interest in determining the aquatic herbicides that are most effective in controlling both pioneer and established infestations of the plant. We have initiated laboratory and mesocosm evaluations of 7 registered active ingredients (carfentrazone, copper, diquat, endothall, fluridone, triclopyr, and 2,4-D), and two acetolactate synthase (ALS) inhibitors that have recently received Experimental Use Permits in aquatics (imazamox and penoxsulam). Contact herbicide evaluations have focused on developing concentration and exposure time (CET) relationships, evaluations of 2,4-D and triclopyr have focused on CET relationships, response to formulation, and minimum rates required to achieve plant control. Fluridone and the ALS inhibitors have been evaluated to determine the minimum concentrations necessary to inhibit growth and pigment production. Preliminary results suggest that low doses (100 to 400 ppb) and extended exposures (7 to 21 days) of 2,4-D and triclopyr can be highly effective for control of variable milfoil. These treatments proved more effective than high dose (2 to 3 ppm) and shorter-term exposures (6 to 18 hours). Variable milfoil also tends to be quite susceptible to fluridone and the ALS inhibitors at rates in the range of 8 to 20 ppb. As with other nuisance plants, extended exposures of 60 to 100+ days to these concentrations will be necessary to provide control. In addition, studies suggest the phenology of variable milfoil will require that these treatments be applied early in the season prior to or just as the plants start to come out of winter dormancy. Contact herbicide evaluations are ongoing and will be reported at the meeting.

Mike Netherland is a Research Biologist for the US Army Engineer Research and Development Center. He is located at the University of Florida Center for Aquatic and Invasive Plants and is a courtesy Associate Professor in the Department of Agronomy. Dr. Netherland received an M.S. in Botany and Plant Pathology from Purdue University and his Ph.D in Agronomy from the University of Florida. His dissertation topic evaluated the response of hydrilla tubers to various forms of management. From 1998 to 2003 Mike was employed by the SePRO Corporation as the Research Director for Aquatics. Both public and private sector research has focused on the response of exotic and native submersed plants to experimental and EPA registered herbicides. Dr. Netherland has worked with *Myriophyllum* spp. since 1988, and has conducted extensive research at the laboratory, mesocosm, and field-scale evaluating various control methods.

EVALUATION OF AN HERBICIDE APPLICATION ON VEGETATED HABITAT AND THE STRUCTURE OF A FISH AND MACROINVERTEBRATE COMMUNITY IN MINNESOTA LAKES

Jeremy G. Slade and Eric D. Dibble
Department of Wildlife and Fisheries, Mississippi State University,

Macrophytes provide important habitat complexity mediating structure of aquatic communities in lakes. We investigate the hypothesis that removal of exotic, invasive macrophytes because of changes in this complexity will alter fish and macroinvertebrate populations. A four lake experiment was conducted in the Minneapolis, Minnesota metropolitan area (June 2003-September 2004) to measure herbicide effects on the structure of the aquatic community. A BACI (before–after/control–impact) sampling design was used to evaluate change in structural habitat (stem frequency) by removing two exotic plant species (*Myriophyllum spicatum* and *Potamogeton crispus*) and its effect on the abundance and richness of fish and macroinvertebrates. As an experimental treatment, a low-dose, species-specific herbicide application was made to remove the two species in two of the lakes. Pre- and post-treatment fish and macroinvertebrate population data were collected, and the treatment effect was evaluated using repeated measures two-way analysis of variance. A multi-sampling approach using popnets, boat-mounted electrofishing, and seining was deployed to ensure accuracy in fish data. Our data documented significant loss of the two exotic species however no treatment effect was noted on macrophyte stem frequency, or abundance and richness of the fish and macroinvertebrate community. No change in stem frequency was noted due to the immediate replacement by native macrophytes. Temporal (seasonal) effect in the abundance and richness of macrophyte, fish, and macroinvertebrate communities was noted. We conclude that there was no immediate effect of removing the habitat complexity on the fish and macroinvertebrate community by using an herbicide to remove two exotic macrophytes in the four Minnesota Lakes.

Jeremy Slade is a recent graduate from the Department of Wildlife and Fisheries, Mississippi State University (MSU). Completed degree August 2005: Master's of Wildlife and Fisheries Science. Performed Master's work on fish-plant relationships pre- and post- herbicide application in four Minnesota lakes. Currently employed by the Department of Wildlife and Fisheries, MSU as a Research Associate and contracted (work) for United States Army Corps of Engineers, US Army Research and Development Center (ERDC), Vicksburg, MS. Married June 4, 2005 in Quito, Ecuador to wife Cristina.

USE OF THE AQUATIC HERBICIDE RENOVATE™ (TRICLOPYR) IN *PHRAGMITES AUSTRALIS* CONTROL PROGRAMS

David Roach, All Habitat Services, LLC
Co-Authors
Shaun Hyde, SePRO Corporation
Stephen Living, All Habitat Services, LLC

SePRO Corporation, in cooperation with All Habitat Services, LLC, has conducted experimental trials to evaluate the effectiveness of the aquatic herbicide Renovate (triclopyr TEA) to control the invasive species *Phragmites australis.* Renovate is a proven systemic aquatic herbicide used for selective control of broadleaf (dicots) and woody plants. Field development work from 2003-2005 has demonstrated a significant ability to control invasive *Phragmites* (monocot) populations. The effectiveness of Renovate early in the growing season and the opportunity of rapid recovery of desirable grass (monocot) species provides a new and valuable tool in the management of *Phragmites australis*. Important benefits include; an expanded management window, release of desirable monocot species, reduced biomass, compressed restoration timelines, and perennial rhizome suppression. The presentation will include a discussion of current Phragmites control programs, pre-treatment and post-treatment observations from Renovate field evaluation projects, as well as information on the future potential of Renovate prescriptions in Phragmites management programs.

™ Trademark of Dow AgroSciences LLC, manufactured for SePRO Corporation.

David Roach is the General Manager of All Habitat Services, LLC, an innovator in the field of wetland and upland habitat management. He holds commercial supervisory pesticide applicator licenses for categories of Aquatic Pest, Right of Way, Bird, Mosquitoes and Biting Flies, and Public Health in Connecticut and Aquatic Pest and Public Health in New York. David works collaboratively with manufacturers and government scientists to develop highly effective, wise use prescriptions. He has 10 years experience in both vegetation management and public health mosquito management programs.

ALUMINUM TREATMENT FOR PHOSPHORUS AND ALGAE CONTROL: WHAT, WHY, WHERE AND WHEN.

Kenneth J. Wagner, Ph.D, CLM
ENSR, International

The use of aluminum compounds as coagulants has long been practiced in the water and wastewater industries, so use of aluminum is neither novel nor new. Their use to bind up phosphorus in lakes dates back about 35 years, with many more treatments in the last decade or two and considerable lessons learned. Multiple factors must be evaluated when developing an aluminum dosing program, including the target location of phosphorus (incoming water, standing lake water, sediment reserves), the amount of phosphorus to be inactivated, existing water chemistry (especially pH and alkalinity), and potentially sensitive receptor populations in the aquatic environment. In general, the aluminum dose to effectively inactivate phosphorus in the target location will be 10 to 100 times the available phosphorus concentration, with several methods used to determine available phosphorus. Longevity of results depends upon the length of time it takes for inactivated phosphorus to be replaced. Where internal recycling is the primary source of phosphorus, reduced levels are expected for more than a decade and have lasted for over 20 years in real cases. Where external inputs are dominant, improvement can be expected for 3 to 5 times the detention time of the system, which may be as short as a season. While aluminum can be toxic to aquatic fauna in its reactive form, reactions occur quickly and result in non-toxic forms that bind phosphorus and some other contaminants in a largely permanent manner. Approaches for minimizing toxicity include keeping the pH between 6.0 and 8.0 SU, with a strong preference for pH levels between 6.5 to 7.5 SU, keeping the applied aluminum level <5 mg/L over the depth of mixing in the water column and applying sequential doses over several weeks where higher doses are needed, treating in a spatial patchwork pattern that provides horizontal refuges, and treating at greater depth to provide a surficial refuge. Program development and execution will be illustrated with actual example cases.

Dr. Wagner holds a B.A. in Environmental Biology from Dartmouth College and M.S. and Ph.D. degrees in Natural Resource Management from Cornell University. He had four years of experience with the New Jersey Department of Environmental Protection between his undergraduate and graduate degree programs, working primarily with the Division of Water Resources in lake and stream assessment and management. He has since gained 20 years of experience with northeastern US consulting firms, working on a variety of water resources assessment and management projects. Projects have included discharge permitting for municipal and industrial clients, non-point source pollution inventories and control programs, waste load allocation studies, impact assessments and restoration/mitigation design. Many lake assessment and management projects have been completed under his direction, including a wide variety of plant and algae management projects. Dr. Wagner is an Adjunct Professor at Springfield College, edited the final version of the Generic Environmental Impact Report for Lake Management in Massachusetts and prepared a user-friendly companion guide for use by laypersons and Conservation Commissions. Dr. Wagner is a Certified Lake Manager through NALMS and is also a member of the Editorial Board of the Journal of Lake and Reservoir Management.

With regard to aluminum treatments, Ken has been involved in a number of treatment planning efforts, treatment observation and monitoring efforts, and treatment evaluations. He has worked to advance applied methods of dose determination, treatment monitoring, and assessment of longevity of effects. Working with several applicators in the northeast, he has assisted in alum treatments for multiple lakes and performed follow up assessments intended to streamline future efforts, enhance effectiveness and efficiency, and minimize adverse impacts.

KEYNOTE ADDRESS FOR JOINT SEMINAR WITH NORTHEAST WEED SCIENCE SOCIETY

Carlton Layne
Aquatic Ecosystem Research Foundation

Carlton R. Layne received his BA Degree in Biology from Clarion State University, Clarion, PA and an MS Degree in Criminal Justice from Rollins College in Winter Park, FL. Carlton spent 5 years with the USDA, Agricultural Marketing Service, and 30 years with the US EPA in the Pesticides & Toxic Substances Branch. While with US EPA, Carlton was an Inspector, Grant Monitor, and Regional and National Training Officer (1973-1990), Chief of the Region 4 Pesticides Section (1990-1999), and a National Pesticides Expert (2000-2003). Currently, Carlton is the Executive Director of the Aquatic Ecosystem Research Foundation. Carlton is Past President of the Florida Aquatic Plant Management Society and Past Director Aquatic Plant Management Society.

INTEGRATED AQUATIC WEED MANAGEMENT IN TURFGRASS AREAS

Jack Whetstone, Ph.D.
Clemson University

This presentation will focus on integrated aquatic weed control methods for ponds located in turfgrass areas, such as golf courses. Proper methods for controlling aquatic weeds when ponds are being used as irrigation sources will be detailed. Chemical and non-chemical control strategies will be discussed.

Jack Whetstone is an Associate Professor in the Department of Forestry and Natural Resources at Clemson University. He is also affiliated with the South Carolina Sea Grant Extension Program and works in a cooperative program with the South Carolina Department of Natural Resources. Jack is a Past-President and Past Member of the Year of the South Carolina Aquatic Plant Management Society. He coordinates and develops continuing education programs for certified aquatic applicators in South Carolina and is the coauthor of "Applying Aquatic Herbicides in South Carolina: A Training Manual for Aquatic Applicators". In 2004 Jack received the Distinguished Public Service Award from the Cooperative Extension Service in South Carolina and in 2005 he received the Superior Outreach Award for Sea Grant Extension Programs

BIOLOGICAL CONTROL OF AQUATIC WEEDS 1959-2005

Judy F. Shearer, Ph.D.
US Army Corps of Engineers Research and Development Center

In 1959 the US Army Corps of Engineers (USACE) and the USDA initiated a joint effort to find classical biological control agents for aquatic weeds. Five years later a host specific insect, the alligatorweed flea beetle, was approved for release. Over the next approximate 30 year period 11 additional insect agents were approved for release for management of alligatorweed, waterhyacinth, waterlettuce, and hydrilla. Very limited overseas pathogen surveys have been conducted and while a few potential agents have been identified no releases have been made. Overseas projects on water chestnut and Eurasian watermilfoil although initiated were suspended. Since 1995 USACE funding for overseas research has not been forthcoming forcing the agency to curtail searches for any new classical agents for aquatic weeds. To a very limited extent the USDA has continued to look for agents for hydrilla and Brazilian elodea. One other introduced agent, the grass carp, has been utilized in several states since 1963, primarily for management of hydrilla.

Native and naturalized insects and pathogens have been researched as augmentative and inundative biocontrol agents for aquatic weeds. Most notable among the insect agents are the native weevil, *Euhrychiopsis lecontei*, and the naturalized moth, *Acentria ephemerella*, on Eurasian watermilfoil and the naturalized weevil, *Cyrtobagous salviniae* on giant salvinia. Starting in the 1960's several indigenous and naturalized fungi have been studied for potential development into mycoherbicides for management of aquatic plants. Among the most promising of these agents is the fungal pathogen, *Mycoleptodiscus terrestris*, used alone or with a number of herbicides in an integrated approach for management of hydrilla and Eurasian watermilfoil.

PhD in Botany (Mycology) from Iowa State University, Ames, Iowa 1988.

Present position: Research plant pathologist for the US Army Corps of Engineers Research and Development Center (USACE-ERDC), Vicksburg, MS. Research interests are biological control of aquatic weeds using plant pathogens, endophytic fungi of aquatic macrophytes, and developing invasive species information systems.

Presently working on developing a bioherbicide for management of hydrilla. It is a cooperative venture between USACE, Agricultural Research Service- United States Department of Agriculture- National Center for Agriculture Utilization Research (ARS-USDA-NCAUR) in Peoria, IL, and SePRO Inc. of Carmel, IN.
Aquatic market with the launch of Habitat® herbicide providing the opportunity to develop new business in the aquatic marketplace.

THE SUCCESSFUL CONTROL OF JAPANESE KNOTWEED IN A RIPARIAN SETTING

Art Gover, Ph.D.
Penn State

Coauthors
K.Budd, J.M. Lentz, R.R. Johnson.

Tinicum Creek, a PA DEP 'Exceptional Value' waterway in Bucks County, PA, and its tributary Swamp Creek, were infested with Japanese knotweed (*Polygonum cuspidatum* Sieb. and Zucc.). Japanese knotweed is a rhizomatous perennial of Asian origin that commonly infests riparian corridors, as well most almost any other setting where it is introduced. Knotweed can exceed 3 m in height, and grows in dense, clonal stands that approach mononculture, Preexisting plant communities are disturbed or eliminated and access to the stream is impaired, if not prevented.

An exclusively-volunteer effort, including education and outreach, mechanical clearance, and backpack-based applications of the herbicides glyphosate and imazapyr to knotweed regrowth resulted in near-elimination of the knotweed in 12 miles of privately-owened stream bank after applications in 2001 and 2002. Subsequent annual follow-up monitoring applications have reduced surviving remnants and prevented re-establishment.

Art Gover is a Research Support Associate with the Roadside Vegetation Management Research Project, of the Department of Horticulture at the Penn State University. Roadside Project initiatives include management of specific weed species, such as tree-of-heaven, Japanese knotweed, and Canada thistle; evaluation of alternative plant materials for roadside conservation plantings; and comparisons of equipment, herbicides, and procedures. The Research Project also conducts two annual educational conferences, and provides continuing education training for PennDOT's personnel and contractors, as well as applicators in non-crop settings through industry and Cooperative Extension forums. Art is a member of the PA Invasive & Noxious Plant Working Group; a past-president of the Mid-Atlantic Exotic Pest Plant Council; and served on the Executive Committee of the Northeastern Weed Science Society.

THE 2002 FARM BILL AND ITS EFFECT ON INVASIVE PLANT MANAGEMENT IN NEW ENGLAND

Andrew Lipsky
USDA/NRCS

The U.S Department of Agriculture Natural Resources Conservation Service (NRCS) works with private landowners and state and local land managers to address invasive plant species problems by providing technical and financial assistance throughout the New England States. NRCS plays a direct role in managing and controlling invasive plant species by working with landowners to restore damaged fish and wildlife habitats as well as implementing invasive plant controls as part of agronomic activities, such as pasture improvement. Many of the Farm Bill programs, such as the Wildlife Habitat Incentive Program and Environmental Quality Incentive Program among others, provide significant resources to private landowners and land managers to control invasive plant outbreaks in the context of stated program and conservation management goals. Case studies of how Farm Bill programs can be used to manage invasive species from individual New England states will be presented. Case studies will highlight the type of conservation practices implemented by landowner, the effectiveness of the treatment if known, and how invasive species control fits into the overall project and Farm Bill program goals.

Andy Lipsky received a BS University of Vermont; and an MS University of Rhode Island-Environmental Science- He has worked in Southwestern U.S in a range of positions—Fisheries biologist and riparian specialist for the Arizona Game & Fish Department. He has also served as a rangeland specialist in AZ, forest technician in Oregon, and conducted EA's and T&E surveys for Navajo and Hopi Nations. In 1996 Andy decided to switch his focus from the dried up estuaries of the arid southwest to the watery bays of the Northeast. He Served as restoration ecologist for Save The Bay –Narragansett Bay RI for seven years working to develop state, regional and national estuarine restoration programs. Joined USDA-Natural Resources Conservation Service in 2001. As the state biologist, Andy is responsible for providing technical assistance to USDA clients and field staff engaged in the conservation of freshwater and marine aquatic habitats and terrestrial systems (early successional habitats) in RI and the northeast states. Andy has particular skills and over a decade of experience in the restoration ecology of coastal wetlands-diadromous fish passage- and submerged aquatic vegetation. Andy serves on the USDA National Employment Development Center teachers cadre of NRCS's *Fish and Wildlife Habitat Conservation* course. Andy is particularly interested in measuring performance of conservation practices on fish and wildlife communities through creative use of farmbill programs and encourage the use of farmbill programs to restore coastal/estuarine habitats. In his free time, Andy and his wife enjoy their 11 month old daughter and two dogs and sometimes fits in flyfishing on the bay.

AQUATIC WEED RESISTANCE – SHOULD I BE WORRIED?

Les Glasgow, Ph.D.
Syngenta Crop Protection

Les Glasgow leads the development and technical support of Syngenta herbicides in North America. He has worked extensively on the factors affecting herbicide behavior and on weed resistance to herbicides. He is currently the chair of the North American Herbicide Resistance Action Committee. Les has over 30 years experience in weed science and was employed previously with Elanco, Stauffer, ICI and Zeneca. He has a BS degree in Agricultural Science and a Ph.D in Weed Science from the University of Leeds, UK.

THE IR-4 PROJECT: NEW OPPORTUNITY FOR AQUATIC HERBICIDE REGISTRATION IN THE U.S.

Marija Arsenovic, IR-4 Project, Rutgers University

Co-Authors
R.E. Holm, Rutgers University
J.J. Baron, Rutgers University
D.L. Kunkel, Rutgers University
K.D. Getsinger, US Army Corps of Engineers Research and Development Center
W.T. Haller, University of Florida, Center for Aquatic and Invasive Plants
L.W. Anderson, USDA/ARS
D.R. Stubbs, US EPA/OPP.

The IR-4 Project is a publicly funded effort to support the registration of pest control products on minor or specialty crops. Its historic mission has been to provide pest management solutions to the growers of vegetables, fruits, ornamentals and herbs.

Concerned about increasing invasive aquatic weeds problems, experts from the USEPA, the US Department of Agriculture, the US Army Corps of Engineers, land grant universities, scientific groups and IR-4 joined together to form the Aquatic Herbicide Working Group. A white paper entitled "New Missions for the IR-4 Project-Weed Control in Aquatic Sites and Irrigation Canals" was completed and approved by the IR-4 Project Management Committee. Stakeholder support for the concept was obtained in February 2005 at IR-4 Strategic Planning Conference. If resources are made available from sources outside current program funding, IR-4 will work with stakeholders to obtain registration of herbicides for use in irrigation canals and water bodies that supply irrigation water for production agriculture. Opportunity for collaborative project will be review and discuss.

Marija Arsenovic is research scientists at the IR-4 Project/Rutgers University, NJ. Currently, she coordinates herbicide registration studies in specialty crops (fruit & vegetables, and herbs & spices). In addition, Marija was recently appointed to manage new IR-4 Aquatic Herbicide Registration Program. Since late 1970's her research was focused on aquatic weed management and herbicide evaluation in field and vegetable crops. Marija has B.S. and M. Sc. in Plant Protection from the University of Novi Sad, Serbia & Montenegro, and PhD in Weed Science/Aquatic Weed Management from the University of Osijek, Croatia.

LAND USE PRACTICE IMPACTS ON NORTHEAST AQUATIC PLANT MANAGEMENT

Paul H. Lord, Cornell University Research Ponds
Robert L. Johnson, Cornell University Research Ponds

Aquatic plant managers need to be able to advise clients on long term corrections for problems fostering noxious aquatic plants. Land use impacts on aquatic plant management extend well beyond the obvious implications of nutrient availability uphill from water bodies. We discuss recent and past published research, our observations, and our research regarding sediments, ice salting, impervious surfaces, lawn care practices, and seawall construction impacts on northeast aquatic plant management particularly Eurasian watermilfoil (*Myriophyllum spicatum*) growth and algae blooms. Additionally, we examine and contrast patterns of Eurasian watermilfoil growth in Europe and in the northeast. Resources for mitigating land use impacts are identified and discussed and a CD with lakeside land use technique publications will be offered.

Paul Lord is a Cornell researcher employed to perform research on the biocontrol of Eurasian watermilfoil. He holds an MS in operations research from the Naval Postgraduate School, Monterey, CA and an MA in biology from SUNY-Oneonta. He is also a retired U.S. Marine lieutenant colonel and a 20-year SCUBA instructor. Lord serves on the board of directors for the Otsego Lake Association, on the board of directors for the Northeast Aquatic Plant Management Association, is the vice-chairman for the Town of Otsego planning board, and is a regular presenter at annual New York State Federation of Lakes conference. He has performed aquatic macrophyte surveys across New York State but the bulk of his research, dealing with interferences in the biocontrol of Eurasian watermilfoil, has taken place in Madison County, NY. He has written many technical reports summarizing his surveys of aquatic plants and their herbivores and other papers of more general interest: “Threats to the biodiversity of northeastern North American lakes: Aquariums and garden ponds”; “A preliminary examination of the contents of commercial aquatic microbial algae suppressing formulations”; and “Physiological mechanisms of selective aquatic herbicides”. Lord cares strongly about mitigating our impacts on the lakes we love.

WATER QUALITY AFFECTS DUE TO A CONTINUOUS LAKE WIDE MILFOIL (*MYRIOPHYLLUM HETEROPHYLLUM X PINNATUM*) CANOPY IN A SHALLOW CT LAKE.

George W. Knoecklein, Ph.D.
Northeast Aquatic Research

Lake of Isles, an 88 acre lake with maximum depth of 10 feet in North Stonington, CT., has a dense cover of hybrid variable leaved milfoil. In water shallower than about 5 feet the milfoil reaches the surface and produces aerial inflorescence. In water deeper than 5 feet the milfoil forms a canopy between 1 and 3 feet below the surface. Typically, water above the canopy is clear giving the impression that that the lake is nutrient poor. Water quality monitoring, started in 2001, initially did not include bottom water samples collected below the canopy. However, temperature and oxygen profile measurements showed that water below the canopy became anoxic and that temperature gradients existed in the canopy suggesting that that canopy prevented mixing of waters below the canopy.

Beginning in 2003 samples were collected from above, and below, the canopy with testing including total phosphorus, total dissolved phosphorus, nitrate/nitrite, ammonium, organic nitrogen, and total iron. The 2003 testing results revealed that phosphorus levels were generally <10 ppb above the canopy and >10 ppb, (maximum 39 ppb) below the canopy, and that total nitrogen was <800 ppb above the canopy but averaged 1,400 ppb (maximum 3,900 ppb) below the canopy. In 2004 two small, (2.2 and 3.8 acres) areas of milfoil were treated with 2, 4-D in order to test its effectiveness against the milfoil and to observe the water quality affects of removing a limited section of the milfoil canopy. Water testing in 2004 and 2005 including stations located within the two treatment beds.

The results of 2004 testing indicated that concentrations of phosphorus and nitrogen in bottom water remained high in both treatment areas even after the removal of the canopy in those areas. Oxygen profiles showed similar anoxic conditions in the treatment areas as observed in the control sites.

Preliminary assessment of the 2005 results indicate that bottom water nutrient levels were again higher than surface water levels at all sites and that similar anoxic conditions existed in the treatment areas despite the lack of a milfoil canopy.

The paper will discuss the 5 years of water quality monitoring at Lake Of Isles and the milfoil response to the 2, 4-D treatment.

George W. Knoecklein is currently founder and principal of Northeast Aquatic Research a limnological research company located in Mansfield, Connecticut. George obtained his PhD from University of Connecticut in 1997 studying under Dr. Peter Rich. His thesis involved anaerobic respiration in a eutrophic lake. George got his MS Degree from Michigan State University where he studied under Cal McNabb. At MSU, George worked on two clean lakes programs, Skinner Lake, Indiana, and Lake Lansing, Michigan. In 1985, George moved to Connecticut to join Ecosystem Consulting Service, Inc., as a limnologist in it's research division. At ECS, Inc. he directed limnological studies at over 50 recreational lakes and ponds, and 20 drinking water supply reservoirs, in the Connecticut-New York-New Jersey-Massachusetts area. Studies were initiated to determine the causes of eutrophication, and evaluate the feasibility of restoration methodologies. Specific studies focused on in-lake processes such as oxygen loss, nutrient regeneration, and blue-green algae population dynamics. George has been conducting lake diagnostic work in the Northeast since 1985.

A NEW STANDARD FOR DEFINING AQUATIC PLANT COMMUNITY COMPOSITION IN NEW YORK

Scott A. Kishbaugh, NYSDEC Division of Water
Paul H. Lord, Cornell University Research Ponds
Robert L. Johnson, Cornell University Research Ponds

Various traditional and a number of nontraditional survey methods are being used in New York State to define aquatic plant communities. Tradeoffs have been inherent in the choice of method with a general consensus that the better results require a greater investment in time although some methods are used specifically because they "fit" a particular water body better than other methods. The plethora of methods frustrates comparisons between studies and stymies good management. We have expanded upon the USACE rake toss methodology and believe it provides much greater information than other methods requiring similar effort and that it is a reasonable method for all water bodies. We are currently defining a three-tier system of use for this point intercept rake toss relative abundance method (PITRAM) in managing New York State lakes. An overview of the method and results obtained with its use will be depicted and a draft three tiered system for implementation of the method will be described.

Scott Kishbaugh is an Environmental Engineer in the Lake Services Section in the Division of Water in the NYS Department of Environmental Conservation. Since 1985, he has been the Director of the NY Citizens Statewide Lake Assessment Program, the states primary volunteer lake monitoring program. He also directs the Division of Water's lake and aquatic plant monitoring efforts, and provides technical advice for lake residents, lake associations, consultants, and other government agencies in lake and aquatic plant management. He is the senior author of Diet for a Small Lake: A New Yorkers Guide to Lake Management, and will be the senior author for the updated version of this book due for publication in early 2006. Scott serves on advisory panels for the Adirondack Park Invasive Plant Program, the NYS Federation of Lake Associations, and the USEPA Nutrient Criteria Development program, and is a past Board member of this Society. He received his bachelors and masters degrees in environmental engineering from Cornell University.

Paul Lord is a Cornell researcher employed to perform research on the biocontrol of Eurasian watermilfoil. He holds an MS in operations research from the Naval Postgraduate School, Monterey, CA and an MA in biology from SUNY-Oneonta. He is also a retired U.S. Marine lieutenant colonel and a 20-year SCUBA instructor. Lord serves on the board of directors for the Otsego Lake Association, on the board of directors for the Northeast Aquatic Plant Management Association, is the vice-chairman for the Town of Otsego planning board, and is a regular presenter at annual New York State Federation of Lakes conference. He has performed aquatic macrophyte surveys across New York State but the bulk of his research, dealing with interferences in the biocontrol of Eurasian watermilfoil, has taken place in Madison County, NY. He has written many technical reports summarizing his surveys of aquatic plants and their herbivores and other papers of more general interest: "Threats to the biodiversity of northeastern North American lakes: Aquariums and garden ponds"; "A preliminary examination of the contents of commercial aquatic microbial algae suppressing formulations"; and "Physiological mechanisms of selective aquatic herbicides". Lord cares strongly about mitigating our impacts on the lakes we love.

Muskrat House Abundance, Water Level Management, and Cattail Control within Upper St. Lawrence River Tributary Wetlands

Jason Toner
Masters Candidate
SUNY ESF, Environmental and Forest Biology

Coauthors
John Farrell, Ph.D., SUNY ESF
Jerry Mead, SUNY ESF

Wetlands containing a diversity of habitat types (submersed aquatic vegetation, floating emergent vegetation, robust emergent vegetation, and sedge meadow habitat) are desirable from both an ecological and economic perspective. Each of these habitats provides necessary resources for a wide array of wetland species and the loss of habitat types along the wetland gradient can have notable effects. Lake Ontario and the St. Lawrence River wetland vegetation communities are currently dominated by *Typha* spp. Water level management, via the series of dams that create the Seaway, annually encourages *Typha* spp. growth and domination by maintaining favorable water depths. Concurrently, fall through winter water levels prohibit significant establishment of an important *Typha* spp. consumer, the muskrat (*Ondatra zibethicus*). Muskrats act as ecosystem engineers and create heterogeneous habitat through the use of *Typha* spp., both for lodge construction and for subsistence. These behaviors often result in open water habitat utilized by a number of wetland species. One species that historically preferred shallow sedge meadow habitats for spawning, *Esox lucius* (northern pike), has declined. This decline is partially attributed to reduced access to preferred habitat and resulting increased deep water spawning (in depths exceeding 3 meters) over submersed aquatic vegetation. Numerous wetland species would benefit from water level management practices, such as water control structures, that reduce *Typha* spp. abundance. We present an assessment of muskrat populations, *Typha* spp. consumption estimates, and water level analyses resulting from current efforts to create and maintain habitat diversity by managing St. Lawrence River tributary water levels.

Jason Toner was born, raised, and educated in New York State. Graduated from Paul Smiths College with an Associate in Applied Science in 1994. Graduated from Cornell University with a Bachelor of Science (with a fisheries and aquatic science concentration) in 1997. Jason is in the process of completing a Master of Science program at SUNY Environmental Science and Forestry with Dr. John Farrell. He is also in a Masters program at LeMoyne College to become certified to teach high school Biology. He currently works part-time for Bob Johnson at the Cornell Research Ponds and substitute teach.

PORTRAIT OF THE HEALTH STATUS OF LAKES:

Camille Rivard-Sirois
RAPPEL

Following the request made by several resident associations, since 2004, RAPPEL, has developed a new protocol for diagnosing the condition of the lakes in the Eastern Townships (Quebec), primarily Lake Memphremagog. The project consists of building a realistic portrait of the lakes' health status and identifying their problem areas. Two of the critical symptoms of accelerated eutrophication; silting up and sea weed invasion (both macrophyte and periphyton), are analyzed in combination with physiochemical analyses reports of the quality of water collected in recent years. Through the introduction of this study, RAPPEL hopes to educate the locals on the importance of keeping Lake Memphremagog healthy, as an important ecological, economic and social interest for the Eastern Townships.

Camille Rivard-Sirois is a Biologist from Sherbrooke University in Quebec, Canada. She is currently the Quality Assurance Coordinator for lakes and waterways with RAPPEL, which is a Collective Association for the Environment, Lakes, and Waterways of Eastern Townships and the Upper St. Francois Basin.

BIOLOGICAL CONTROL OF EURASIAN WATERMILFOIL BY THE MOTH AND WEEVIL: FACT AND FICTION

Robert L. Johnson, Manager, Cornell University Research Ponds

Coauthors
Paul H. Lord, Research Support Specialist, Cornell University Research Ponds
Joellen M. Riggs, Research Technician, Cornell University Research Ponds

The control of excessive growth of the submersed aquatic invasive Eurasian watermilfoil (*Myriophyllum spicatum*) by indigenous insect herbivores is well documented in Canadian, North Eastern and North Central US lakes. Two insects, a pyralid moth (*Acentria ephemerella*) and a weevil (*Euhrychiopsis lecontei*) are most often associated with severe herbivore damage to this plant pest. Control studies in Vermont, Minnesota and New York using laboratory containers and field enclosures show significant decreases in the growth of watermilfoil caused by herbivory. Our analysis of long-term field monitoring of Eurasian watermilfoil growth in Sterling Pond, Cayuga, Chautauqua and Dryden Lakes continues to implicate moth and weevil herbivory as the major reason for seasonal and long-term plant damage limiting watermilfoil growth. The importance of a potential robust native plant community able to compete with damaged watermilfoil appears to be a requirement in documented natural declines of Eurasian watermilfoil in Vermont, Minnesota and New York. These findings contributed to attempts to rear and use specific life stages of these two insects to augment and consequently increase their in-lake populations. Populations feeding on watermilfoil need to be enormous, at greater that 0.6 moth life stages and 2.0 weevil life stages on each apical meristem to cause substantial watermilfoil damage. We will present several examples of moth and weevil augmentations and analyze potential for success or failure. A lack of understanding of the biological control agent's biology appears to be a major factor in failed population increases. We will explore these misconceptions and suggest new facts.

Robert L. Johnson is the Manager of the Cornell University Research Ponds that support research, teaching and Cornell Cooperative Extension activities in Aquatic Ecology. Personal research utilizes the Research Ponds and numerous lakes throughout New York State to concentrate on investigating factors that influence aquatic plant growth. Current studies focus on the aquatic plant pest, Eurasian watermilfoil, and assess the effects that insect herbivores have on its growth in New York Lakes. In addition, since 1966, a major task is to provide aquatic plant information through outreach programs in New York State to Cornell Cooperative Extension, New York Department of Environmental Conservation, lake associations, soil and water conservation districts and watershed groups.

TEN YEARS OF VARIABLE WATER MILFOIL CONTROL IN BASHAN LAKE. WHAT HAVE WE LEARNED?

Greg Bugbee
Connecticut Agricultural Experiment Station

Variable water milfoil is an invasive aquatic plant that can restrict the recreational use of lakes and eliminate desirable native aquatic plants. It is found in all northeastern states except Vermont. Since 1994, the Connecticut Agricultural Experiment Station (CAES) has been monitoring the milfoil problem in Bashan Lake, East Haddam, CT, and testing management options. The goal is to rid the lake of variable milfoil and allow native plants to repopulate. The Connecticut Department of Environmental Protection (CTDEP), the United States Department of Agriculture, the town of East Haddam and the Bashan Lake Association have supplied CAES with grants to study the use of the herbicide 2,4-D. This herbicide has the advantage of being a granular product suitable for spot treating milfoil while not harming many native plants. In 2000, CAES procured a USEPA experimental use permit (EUP) to test the use of the ester formulation of 2,4-D in Bashan Lake. The EUP required notification of those irrigating with lake water to not us the water until tests showed 2,4-D levels were below 100 ppb. The success of this protocol contributed to the permanent change in the labeling for product containing 2,4-D ester (Navigate and AquaKleen). From 2000 - 2005 areas of Bashan Lake were treated with 2,4-D (2,4-D ester). Tests have discovered that a late summer application of 2,4-D are likely as effective as the traditional spring treatments and the rate can be reduced to 75 – 100 lbs/acre. Most treated areas stay nearly milfoil free for at least two years and sometimes much longer. Certain shallow areas with mucky bottoms can show regrowth within a year. Because these areas are often in coves that collect floating plant fragments from untreated portions of the lake, more permanent control will require eliminating all remaining milfoil. Regrowth is also possible from uncontrolled roots or seeds. New GIS linked underwater video equipment is allowing more accurate assessments of where the milfoil is occurring and how well it is being controlled. In 2004, large areas not known to contain milfoil were discovered with the video equipment in water 3 – 6 meters deep. This milfoil could be the source of plant fragments. In September 2004 2,4-D was applied to a large deep-water area of milfoil in the eastern portion of the lake and little regrowth was apparent the following year. In September 2005, a similar treatment was performed in the northern portion. Lake water has been tested for 2,4-D following treatments. Typically highest 2,4-D concentrations occur near the bottom in the treatment areas and levels are above the irrigation limit of 100 ppb for less than three weeks. Yearly tests on nearby groundwater wells have not detected 2,4-D.

Greg Bugbee has been employed since 1979 in the Department of Soil and Water at the Connecticut Agricultural Experiment Station (CAES) in New Haven, CT. Currently an assistant scientist researching techniques for managing nuisance aquatic vegetation with emphasis on targeted herbicides applications. Research includes; successful control of variable water milfoil with 2,4-D and procurement of experimental use permit (EUP) to allow 2,4-D use in lakes when irrigation is restricted until water tests show 2,4-D levels are below 100 ppb. The current 2,4-D label reflects this change. Successful control of cabomba with granular fluridone slow release pellets (SRP) and documentation of delayed release rates in organic sediment. Principal investigator in CAES Invasive Aquatic Plant Program that is currently surveying aquatic vegetation in Connecticut's lakes and ponds, correlating with water quality and making information available to the public via web page (www.caes.state.ct.us/AquaticPlants). In charge of the CAES soil testing laboratory and answering public inquiries regarding soil, fertilizers and turf management.

A UNIQUE COMBINATION OF AGENCIES AND COMPANIES WORKING TOWARDS SUCCESSFUL MANAGEMENT OF INVASIVE PLANTS

Lee Lyman
Lycott Environmental, Inc.

For a number of years the residents and community of Halifax, MA have struggled with the invasive plants Fanwort (*cabomba caroliniana*) and Variable milfoil (*Myriphyllum spicatum*) in the eastern basins of Monponsett Ponds. After years of studing and implementing various management techniques, it was decided that the most effective means of solving the problem would be to conduct a treatment with the herbicide Sonar AS.

A number of hurdles had to be overcome, including a denial by the Conservation Commission in the Town for treatment that was overruled by a superceding Order of Conditions from the Department of Environmental Protection in Lakeville.

Additionally, Natural Heritage Endangered Species Program (NHESP) determined there were endangered and threatened species in the water bodies, both dragonfly and fresh water mussels. With a unique cooperation and assistance from a second consultant, Baystate Environmental Consultants, Inc. (BEC), and an expert recognized by NHESP, a program was put together for the two endangered species by the cooperative efforts of these organizations including Lycott Environmental, Inc. Studies were conducted on the fresh water mussels before, during and after the treatment and for the dragonfly nymphs that were collected and exposed to various concentrations of Sonar. This unique combination of private and public entities working together has proven to be very successful in treating and managing the Milfoil and Fanwort in the eastern section of Monponsett Pond without detrimental impacts to the non-target organisms.

Lee Lyman is president and founder of Lycott Environmental Incorporated, which provides lake and pond management services. Lee majored in Biology at American International College in Springfield, Massachusetts and began his career as an aquatic biologist with the Massachusetts Division of Fisheries and Wildlife, subsequently becoming its director of the pesticide research laboratory. Lee has published several articles on pesticides, herbicides and lake management techniques.