NOR' EASTER

The Newsletter of the Northeast Aquatic Plant Management Society

Vol. 5 Fall Winter 2006

President's Message Lawrence Eichler

Dear NEAPMS Members and Friends,

Fall is ending and winter is here once again, the field season has ended and we are starting to think about next year. If you are wondering how to keep up with changes in the regulatory picture, advances in aquatic plant management, or the latest in invasive species, you are in luck. The NEAPMS annual conference provides a wealth of information on aquatic plant management, the latest on invasive species, and a chance to share experiences with folks from throughout the region. Our 2007 Conference will move to The Grand Summit Hotel in Mount Snow, Vermont for January 15-17th, 2007. In addition to all the winter recreational opportunities that make Vermont famous, nearby Bennington offers a wealth of shopping and cultural activities. Plan to come early, bring the family, and stay late to take advantage of these opportunities.

NEAPMS held its 2006 annual conference in Providence, RI last January, as a joint meeting with the Northeastern Weeds Science Society (NEWSS). We had a combined attendance of over 250 people and by all accounts, it was a great conference. Problems with aquatic vegetation, whether exotic or native, continue to plague our region. The society was formed to bring together individuals who can make a difference in addressing these problems. We continue to foster an open exchange between regulators, applicators, manufacturers, and researchers. The fact that our membership is nearly evenly divided among these groups is an indication that we are on track. With attendees from 20 US states and a Canadian province, it is apparent that our message has broad appeal. We are also expanding our scholarship program for both graduate and undergraduate students while supporting the APMS/AERF graduate student scholarship program.

As always, our annual conferences are enhanced and, in many cases, made possible by the support of our generous sponsors. In particular, I would like to thank the Aquatic Ecosystem Restoration Foundation (AERF), whose continued support has enabled us to bring a number of state regulatory people and presenters to our conferences.

See you all at Mount Snow, VT next month !

Respectfully,
Lawrence Eichler

Register for Conference !!

8th Annual NEAPMS Conference

NORTHEAST AQUATIC PLANT MANAGEMENT SOCIETY

ANNUAL CONFERENCE JANUARY 16 & 17th, 2007

NEAPMS Welcome Reception January 15th, 7pm

Grand Summit Resort at Mount Snow West Dover, Vermont

We invite you to attend the Eight Annual Conference of the Northeast Aquatic Plant Management Society. As usual, a full program of informative papers and presentations on aquatic plant management issues will be presented, plus this year you have the added opportunity of participating in the famous Mount Snow Festivities outside. Come early, stay late!

Several exhibitors will be present to better acquaint you with their products and services. Recertification credits will be available for a number of Northeastern States for Certified Applicators. A Social Hour and Banquet Dinner will close out our day on Wednesday. Awards will be given to individuals in our membership during our banquet.

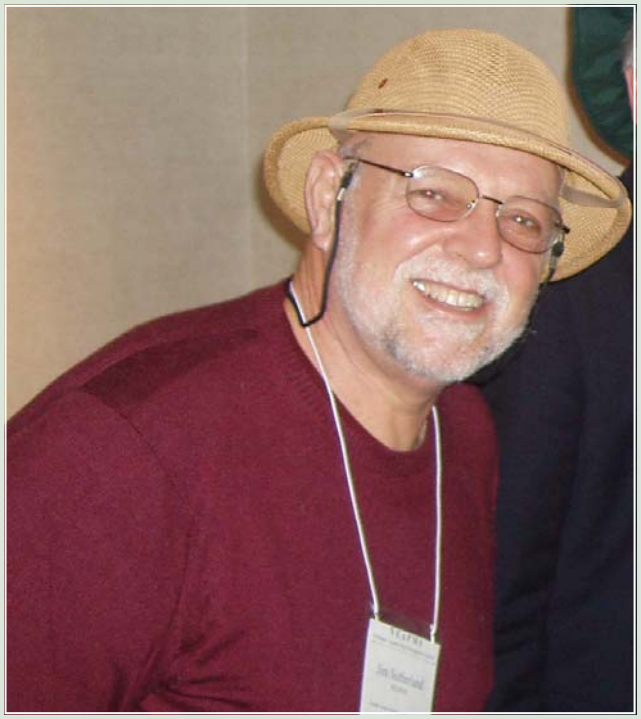
Your conference registration fee includes the full two-day program, two lunches, the Social Hour, and Dinner. Continental breakfast will also be served each morning. Due to the popularity of the Welcome Reception in 2005 and 2006, we are again offering the reception on Monday evening before our meeting. Please plan to join us on Monday night from 7:00 to 9:00pm for a light buffet and cash bar.

Congratulations !!

The NYSDEC, “past and present” took the two top NEAPMS awards at our 2006 NEAPMS Annual Conference last January. Jim Sutherland, newly retired from the NYSDEC and our treasurer received the Outstanding Member Award for his long-term contribution to our organization. Jim below has, and continues to, serve in most of the offices of our organization.

Scott Kishbaugh to the right, checking out that milfoil, received the well deserved Aquatic Plant Science Award from the Society. Scott, known for his work as “Head” of CSLAP (Citizens Statewide Lake Assessment Program) also directs LCI (The Lake Classification and Inventory Program) for the NYSDEC.

Scott



Jim

And last, but not to be outdone, our very own Ken Wagner was elected President of NALMS (North American Lake Management Society). Ken, a Senior Water Resources Manager at ENSR was elected for a three year term. and is seen to the right in tradition head dress after assuming the office of President. Ken is a mainstay with the NEAPMS and an active leader in our organization and we wish Ken the best.

Ken

Monday January 15, 2007

7:00 – 9:00 PM **NEAPMS Welcome Reception** A light buffet and cash bar will be offered

Tuesday January 16, 2007

8:15 – 9:30 AM **Continental Breakfast**

8:15 – 9:45 AM **Registration/Exhibits**

9:45 – 10:00 AM **Welcome** Larry Eichler, NEAPMS President

10:00 – 10:30 AM **Keynote Address: Orifice P. Nozzlehead** Carlton Layne, AERF

10:30 – 11:00 AM **Formulation Technology: Why All Aquatic Herbicides Are Not the Same**
Jim Petta, Syngenta

11:00 – 11:30 AM **Early Spring Application of Low Rates of Endothall Combined with 2,4-D for Selective Control of EWM and Curlyleaf Pondweed** John Skogerboe, USACE ERDC

11:30 – 12:00 PM **Evaluations of Imazamox, Penoxsulam, and Other Herbicides for Aquatic Plant Management** Rob Richardson, NCSU

Noon – 1:00 PM **Lunch**

Tuesday January 16, 2007, continued.

1:00 – 1:30 PM **Industry Updates from Sponsors and Exhibitors**

1:30 – 2:00 PM **Evaluations of Aquatic Herbicides for Control of Variable Milfoil**
Mike Netherland, USACE ERDC

2:00 – 2:30 PM **Milfoil Suction Harvest/Plant Replacement Project on Lake Massasecum**
Wendy Gendron, ENSR Corporation

2:30 – 3:00 PM **Warmer Lake Ecology: What Will it Mean When Your Lake Heats Up?**
Michael Martin, Cedar Eden Environmental

3:00 – 3:30 PM **Break/Exhibits**

3:30 – 4:00 PM **NEAPMS Business Meeting/APMS Updates**

4:00 – 4:30 PM **Understanding Eurasian Watermilfoil: Nutrients, Growth, and Invasion**
Mark Swinton, DFWI/RPI- *Student Presenter*

4:30 – 5:00 PM **Hydrocharitaceae: The Frogbit Family–Friend or Foe?** C. Barre Hellquist, MCLA

5:00 – 5:45 PM **Plant and Algae Workshop** Bob Johnson, Cornell University and Ken Wagner, ENSR

5:45 – 6:30 PM **Attitude Adjustment Reception**

6:30 – 9:00 PM **NEAPMS Banquet & Awards**

9:00 – Wee Hours **NEAPMS Hospitality Suite**

Please Donate to Silent Auction for Scholarship Fund

Silent Auction at the NEAPMS Annual Meeting

A tradition at NEAPMS annual meetings, the silent auction is an avenue for our Chapter to support future aquatic plant managers and needed research. All proceeds from this event as well as our banquet raffle benefit the NEAPMS scholarship fund.

Auction proceeds from our 7th annual meeting in Providence, RI combined with raffle ticket income, added a total of $1,837 to the scholarship fund. Income from these events was similar to our 6th annual meeting.

Currently, two NEAPMS scholarships are underway. They include a $5,000 award to Ryan Thum and Michael Bronski of Cornell University for watermilfoil DNA analysis and a $5,000 award to Cayelan Carey of Dartmouth College for *Gloeotrichia echinulata* bloom mechanisms research. See page 7, for first update on Michael's research and more to come at annual meeting and next newsletter. Cayelan has also finished her project and is in the process of writing and submitting research papers, and we will hear more from Cayelan and her research in the future.

The success of the silent auction is dependent on the generosity and participation of Chapter members. Please consider bringing an item to our upcoming 8th annual meeting to donate to the silent auction. "Tools of the trade" or items representing your neck of the northeast (or beyond) are welcome.

Look for a display of silent auction items in the Exhibitor Room at our January meeting at The Grand Summit Resort at Mount Snow and get your bidding pens ready. Support the NEAPMS Scholarship Fund!

Thank You !! 7th Annual Meeting Silent Auction Donators !!

Allied Biological, Inc., Ann Bove, Aquatic Control Technology, Inc., BASF, Burden Aquatics, Inc., Clean Lakes, Inc., Elizabeth Herron, Mount Snow, Paul Lord, Syngenta, UAP Timberland, and Wildlife Supply Company

Wednesday January 17, 2007

7:30 – 8:30 AM **Continental Breakfast**

8:30 – 9:30 AM **Panel Discussion- Fish Eye View: Plant Management from the Fisheries Perspective**
Panelists TBD

9:30 – 10:00 AM **Water Chestnut Control and a Caged Fish Study of the Aquatic Herbicide Glyphosate**
Eric Paul, NYS DEC and Bob Fahy, Upstate Applicators

10:00 – 10:30 AM **Comparison of Fish Community Characteristics in Waneta and Lamoka Lakes After a Whole Lake Fluridone Treatment in Waneta Lake** Matthew Sanderson, NYS DEC

10:30 – 11:00 AM **Break/Exhibits**

11:00 – 11:30 AM **Responses of Sentinel Non-target Species to Copper-Containing Algaecides**
Brenda Johnson, Clemson University

11:30 – 12:00 AM **Do Algae Spill Their Guts After Treatment with Algaecides? A Test of the "Leaky Cell" Hypothesis.** John Rogers, Clemson University

12:00 – 12:30 PM **Cyanobacteria–Can They Make You Blue, or Green, or Dead?**
Ken Wagner, ENSR Corporation

12:30 – 1:30 PM **Lunch**

1:30 – 2:00 PM **Industry Updates/Mini Presentations**

2:00 – 2:30 PM **Using GIS to Map Invasive Aquatic Plants in CT** Roslyn Selsky, CT Ag Experiment Stn

2:30 – 3:00 PM **Expanding the Spatial Efficacy of Macrophyte Monitoring: Lessons Learned from Application of Hydroacoustics** Jeremy Farrell, DFWI/RPI- *Student Presenter*

3:00 – 3:30 PM **Geographic Patterns of Multilocus Genetic Variation in Variable Milfoil**
Ryan Thum, University of Illinois

3:30 – 4:00 PM **The Development of Microsatellite Markers as Tools for Management of Milfoils**
Michael Bronski, Cornell University- *Student Presenter working with a NEAPMS Scholarship*

4 PM **Wrap up and adjourn**

Project Summary of the recipient of our first Scholarship, Michael Bronski, now a Cornell University Graduate, working with Dr. Ryan Thum. Michael and Ryan are presenters discussing Milfoil Genetics at our January 2007 Annual Conference.

Introduction & Background

The invasive water-milfoil *Myriophyllum heterophyllum* is a major economic and ecological pest throughout lakes of New England. The majority of management studies have focused on the removal and prevention of milfoil. However, little is known about the population genetics of the invasion. Population genetic studies have the potential to identify the number of lineages that have invaded, as well as the geographic locations from which the invasive lineages are derived. The identification of such lineages can then be used in comparative ecological and genetic studies.

The necessary first step in any population genetic study is the development of appropriate genetic markers for the questions being asked because different classes of molecular markers vary in their rates of molecular evolution. For example, nuclear DNA sequences from the internal transcribed spacers (ITS) of the ribosomal DNA complex have been used to distinguish among native versus invasive water-milfoils. However, ITS does not show any significant pattern of variation within *M. heterophyllum*, so this marker is not appropriate for questions about patterns of genetic variation within and among *M. heterophyllum* populations.

We are developing microsatellite markers for use in population genetic studies of *M. heterophyllum*. Microsatellites Are well-suited to population level studies because they are highly variable. Microsatellites are simple sequence repeats of the four nitrogenous bases that compose DNA (A, G, C, T). For example, a dimeric repeat (repeat of a two base pair sequence) might contain the sequence CA repeated ten times, yielding the microsatellite CACACACA-CACACACACACA [denoted (CA)10; Figure 1].

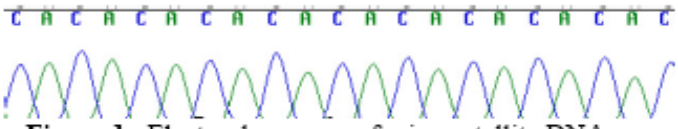


Figure 1. Electropherogram of microsatellite DNA sequence. The sequence shows a dimeric sequence (CA) repeated 10 times.

Microsatellites are highly variable in size because repetitive regions of DNA are extremely error prone during DNA replication because of a process known as strand slippage. If the original microsatellite was (CA)10, a mutation during DNA replication caused by strand slippage might produce the microsatellite (CA)9, or (CA)11. For a given locus then, populations may vary in their distributions of repeats for a given microsatellite. Because they differ in size, different microsatellite alleles at a given locus can be in size, different microsatellite alleles at a given locus can be easily distinguished using gel electrophoresis. For example, a (CA)10 allele will run faster than a (CA)11 allele on a gel because the (CA)10 allele is smaller. By genotyping multiple microsatellite loci for multiple individuals within and among populations, we can identify unique lineages and reconstruct patterns of ancestry among populations.

Bronski Project Summary continued

Here, I briefly describe the steps for the library construction and sequencing of the *M. heterophyllum* microsatellite library. Then, I briefly describe the primer design and genotyping steps that we are currently working on. I end the report with a summary of my educational experiences that resulted from my NEAPMS scholarship.

Microsatellite Library Development

The microsatellite library was constructed using a protocol developed by Steve Bogdanowicz at Cornell University. Steve Bogdanowicz and Ryan Thum assisted greatly in the library construction. To construct the microsatellite library, DNA was first extracted from a single milfoil sample (kindly provided by Robert Johnson). The extracted DNA was then digested (cut into small pieces) using restriction enzymes. Microsatellite DNA probes were then hybridized to the restricted DNA to enrich for fragments that contained a microsatellite. DNA fragments that did not hybridize with the probes were simply washed away and discarded. Next, the microsatellite-enriched population of DNA molecules was inserted into plasmids, which were then transformed (injected) into individual *E. coli* cells. The *E. coli* cells were then plated onto luria agar plates and allowed to incubate overnight. Each colony that grew on the plate represented a clonal population of an *E.coli* cell that took up a single piece of DNA which, in theory, contained a microsatellite (Figure 2). By cloning, we were therefore able to separate out hundreds to thousands of unique DNA fragments that could contain a microsatellite. We further enrich for microsatellite fragments by hybridizing radioactively-labeled microsatellite probes to the bacterial colonies. In this way, we could determine which *E. coli* colonies contained milfoil microsatellite DNA by exposing the radioactively-labeled plates to autoradiographic film. Clones that 'lit up' during the exposure were then picked for DNA sequencing.

DNA Sequencing of Microsatellite Clones

I picked several hundred positive colonies for DNA sequencing. For each colony, I used the polymerase chain reaction (PCR) to amplify the cloned DNA fragment. PCR products were then sequenced to determine the presence of a icrosatellite. DNA sequencing was performed using BidDye cycle sequencing chemistry (Applied Biosystems) and sequenced on an ABI3100 at Cornell University's Evolutionary Genetics Core Facility (EGCF). In total, I sequenced nearly 300 clones.

Each clone was carefully inspected to determine if it contained a microsatellite. Greater than 60% of the sequenced clones contained microsatellites. This percentage represents the minimum percentage of clones with microsatellites because I sequenced in

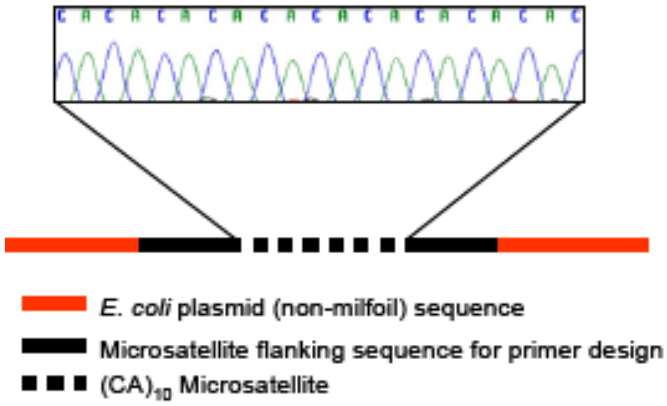


Figure 2. Shematic of a microsatellite clone. A piece of milfoil DNA enriched for microsatellites (black line) is inserted into a bacterial plasmid. After sequencing, the plasmid sequence is trimmed off and primers are made in the milfoil DNA flanking the microsatellite.

only one direction. Long fragments have not been fully sequenced yet (i.e., they need to be sequenced in the reverse direction), and complete sequences should reveal microsatellites in at least some of these long sequences.

Future Work: Primer Design & Genotyping

I carefully inspected each sequenced clone containing a microsatellite to determine whether there was enough flanking sequence to design primers (Figure 2). For example, in some clones, the microsatellite DNA sequence is located too close to the plasmid boundary. Primers cannot be developed for these sequences.

I am currently designing PCR primers in the flanking regions of the microsatellites for each clone that has sufficient flanking region to design primers. Generally, at least 50 base pairs of non-microsatellite DNA are required on either side of the microsatellite for successful primer design. After designing primers for a given clone, I will begin optimizing those primers for PCR. Once the primers are optimized, they will be tested on several *M. heterophyllum* individuals to determine whether they consistently amplify the microsatellite region. For example, individuals may differ not only in the microsatellite alleles, but in the DNA sequences flanking those alleles. If the flanking regions differ enough among individuals, then the PCR primers may not consistently work. After confirming that the PCR primers consistently work across individuals, I will begin genotyping individuals to determine whether any informative genetic variation exists for each microsatellite locus. We can then begin to answer the questions outlined in the introduction.

Educational Experience

Working on this project has exposed me to many issues related to invasion biology in general, and to the problem of milfoil invasions in particular. Prior to this research experience, I had no exposure to these issues. As a result, I have become aware of the concerns and challenges associated with the management of invasive species. I also learned about the unique contributions that genetic investigations can make to studies of invasive species. Intellectually it was very exciting to see how evolutionary tools, such as population genetic studies, could be brought to bear on the management and study of invasive water-milfoils.

My participation in this project has contributed greatly to my growth and education as a developing molecular biologist. The basic techniques that I employed on a daily basis, such as PCR and DNA sequencing, will be invaluable in my future molecular biological work. In addition, this experience has provided me with a microsatellite specific skill-set that will likely prove useful in my future research. Microsatellites are commonly employed to answer many of the evolutionary questions that are of general interest to me. My experience working with microsatellites on this project will prove advantageous in the likely event that I must develop microsatellites for another organism.

Although I graduated from Cornell at the end of this past summer, I look forward to participating further in this research. In particular, we plan to finish optimizing microsatellite loci and publish the results.

New Voluntary Aquatic Invasive Species Sticker Unveiled in Vermont

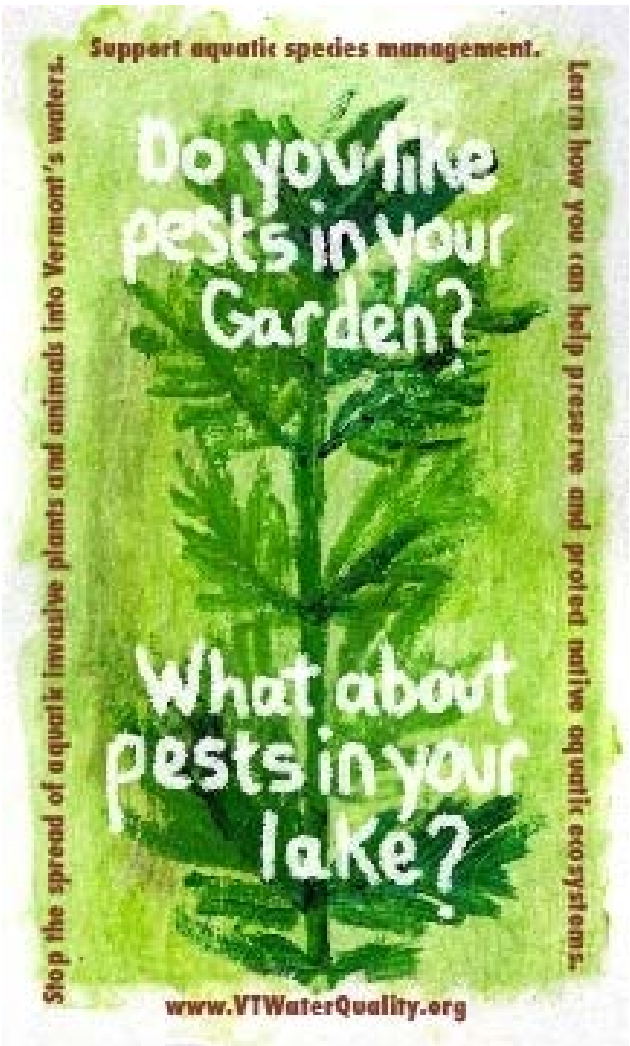
Ann Bove, VTDEC's Aquatic Invasive Species Program

This past spring, Vermont launched it's first voluntary *aquatic invasive species sticker* program to support clean lakes and streams and contribute to local efforts to control aquatic pests.

A design contest held in January invited artists and students of Vermont to submit their artwork. A panel of judges representing the Vermont Agency of Natural Resources, the artist community and The Federation of Vermont Lakes and Ponds selected a painting done by a student of Johnson State College out of over 80 submissions.

This unique little sticker now has the big job of increasing public awareness about invasive species issues and offering everyone living in or visiting Vermont a simple opportunity to contribute financially to the management of invasive aquatic plants and animals and to show their support for clean lakes and streams.

The sticker is at the lower right and the price is $10. Nine dollars of every sticker sale goes directly into the grants-in-aid program that financially supports local management programs dedicated to controlling infestations or actively preventing aquatic invaders from spreading to uninfested waters. For more information on Vermont's aquatic invasive species sticker program, go to http://www.vtwaterquality.org/sticker.htm



Egeria najas, what is it?

C. Barre Hellquist
Department of Biology
Massachusetts College of Liberal Arts
North Adams, MA, 01247-4100

The genus Egeria, Hydrocharitaceae, consists of two Brazilian species E. densa Planchon and E. najas Planchon (Cook and Urmi-Konig 1984). Egeria densa, Brazilian waterweed, has long been available in the pet and watergarden trade as an oxygenating plant and is widely utilized in biology laboratories of high schools and colleges illustrating cytoplasmic streaming. Egeria densa is often marketed under the native genus Elodea or Anacharis. Egeria densa has proved to be a hardy plant in North America with populations established as far north as New Hamphsire and Vancouver Island, British Columbia (Catling and Wojtas 1986).

Egeria najas has recently been marketed in the United States as an oxygenating plant for the aquarium trade. It has been appearing in a few shops from Maine to Washington State. It is easily accessible from numerous internet sites. Presently there is no record of it becoming established in the wild. The main problem is its appearance. It looks more like the highly invasive, federally listed, species Hydrilla verticillata (L.f..) Royle than E. densa. All three species have (3-)4-6(-12) leaves in a whorl per node with E. najas and H. verticillata having distinct serrate leaf edges visible with the unaided eye. These two characteristics are the easiest to see, when making an identification of Hydrilla. Since E. densa is a prohibited invasive species in many states, E. najas will probably gain in popularity. The problem is little is known about its hardiness in United States waters. It definitely has the potential to spread in the southern states. In my greenhouse, it is well established and spreading.

Egeria najas in greenhouse

Please Bring Silent Auction Donations for NEAPMS Scholarship Fund

The following key is given to help in the identification of the three introduced species. The key is adapted from Catling and Mitrow 2001 and Kasselmann 2003.

1. Leaves with minute serrations (requiring magnification) with straight margins…..…*Egeria densa* and *Elodea* spp.

1. Leaves with distinct serrations (seen with unaided eye) with leaf margins concave or straight between serrations.

   2. Flowers inconspicuous, usually 1.5 mm or less in size, lacking nectarines. Leaves usually 3-6 (-12) per whorl along stem, linear to attenuate, straight or slightly concave between serrations; the mid-vein occasionally with prickles on lower surface; scales in leaf axils ca. 0.5 mm long, usually with a fringe of orange-brown hairs; internodes usually longer than leaves. Plants forming persistent tubers……....*Hydrilla verticillata*

   2. Flower conspicuous, usually 15-20 mm long, with nectarines. Leaves usually 4-6 per whorl along stem. Concave between serrations; the mid-vein lacking prickles on lower surface; scales in leaf axils absent or up to .36 mm long, lacking a fringe of orange-brown hairs; internodes shorter than leaves. Plants lacking persistent tubers…….. ……..……..…….. *Egeria najas*

References:

Catling, P. M. and G. Mitrow. 2001. *Egeria najas* at the Canadian border and its separation from the related aquatic weeds *Egeria densa* and *Hydrilla verticillata* (Hydrocharitaceae). Ben Electronic News. http://www.ou.edu/cas/botany-micro/ben/ben278.html

Catling, P. M. and W. Wojtas. 1986. The waterweeds (Elodea and Egeria Hydrocharitaceae) in Canada. Can J. Bot. 64 (8): 1525-1541.

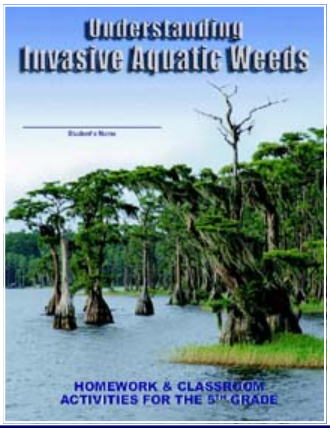
Kasselmann, C, 2003. Aquarium Plants. Krieger Publishing Company, Malabar, Florida. 518 pp.

APMS Student Activity Booklets Available

Check out the APMS Student Activity Booklet "Understanding Aquatic Invasive Aquatic Weeds" at:

http://www.apms.org/activity.htm

This 16 page booklet contains information and activities about aquatic ecology and the major weeds affecting North American aquatic ecosystems.



Graduate and Undergraduate
Scholarships and Stipends Available !!!

The Northeast Aquatic Plant Management Society announces the availability of scholarship monies for students pursuing degrees in AQUATIC PLANT MANAGEMENT.

Graduate scholarships can range up to $2500.00 per year for two or three years (maximum), depending on the degree pursued.

Undergraduate students interested in participating in an internship in Aquatic Plant Management can be eligible for a stipend to pay for salary and/or related expenses during the internship.

For more detailed information visit the NEAPMS website at www.neapms.net

or contact Amy Smagula at

603-271-2248 or asmagula@des.state.nh.us

Silent Auction and Raffle Tickets Register today

Buy Raffle Tickets at the Conference

Donate Items to the NEAPMS
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(800) 245-7669

Northeast Aquatic Plant Management Society

2007 Conference Registration Form

January 16 & 17, 2007

www.mountsnow.com

Name: _____

Affiliation: _____

Address: _____

_____

Phone: _____ **Fax:** _____

E-mail: _____

Government Personnel In Need of Funding Assistance? Yes No

If you circled yes, a NEAPMS representative will be in contact with you.

If you are granted a registration waiver, we do ask that you pay the $40 membership fee to become a member of the Society.

Student

There is no registration fee for students. Check here if you are a student _____

Individual Registration: $_____

$125.00 includes one conference registration fee and membership for 2007

Sustaining Membership: $_____

$500.00 includes one conference registration fee, one membership for 2007, one exhibit space, a link on the NEAPMS webpage, and a Bronze sponsorship credit.

Late Fee: $_____

Add $25 to registration fee if registering at the door.

Total Enclosed: $_____

Send in this Registration Now !!!
+ $25 to register at the door

Hotel reservations can be made online or by calling 1-800-451-4211. For online reservation information please visit the NEAPMS website for a link to the hotel site at www.neapms.net. Please be sure to reference the NE Aquatic Plant Management Society. Rates are $89.00/night, plus tax for single or double rooms.

Reservations must have been made by December 17th to receive the conference rate, check with hotel.

Please mail this completed form and a check payable to NEAPMS to:

NEAPMS

PO Box 142

Chester, NJ 07930

Mission Statement

The Purpose of the Society shall be to assist in the management of aquatic vegetation, to provide for the scientific and educational advancement of members, to encourage scientific research in all facets of aquatic plant management, to promote and exchange of information among members and to extend and develop public understanding in the discipline.

Check out our website:

http://www.neapms.net

Northeast Aquatic Plant Management Society

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