

**26th Annual Western Aquatic Plant
Management Society Meeting**

March 25 – 27, 2007

Coeur d'Alene Resort ~ Coeur d'Alene, Idaho



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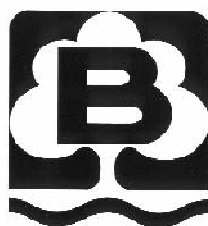
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PROGRAM

Sunday, March 25th

- 2:00 – 9:00 Exhibitor Setup – **Bay 1A & 1B**
- 6:00 – 7:00 Reception – **Casco/Kidd/N Cape**
- 7:00 – 9:00 Board Meeting/Dinner – **Board Room 6**

Monday, March 26th

- 6:30 – 8:00 Breakfast – **Bay 1A & 1B**
- 8:00 – 8:05 Conference Welcome – Lars Anderson, President, WAPMS – **Casco/Kidd/N Cape**
- 8:05 – 8:25 **Idaho Milfoil Program Development** - Representative Eric Anderson, Idaho State Legislature
- 8:25 – 8:30 **AERF Milfoil Symposium Introduction** - Carlton Layne, Executive Director AERF
- 8:30 – 9:00 **Why Control Aquatic Nuisance Species?** - Dr. William Haller, University of Florida
- 9:00 – 9:30 **Biology of EWM and Advantages/Disadvantages of Control Methods** - Dr. John Madsen, Mississippi State University
- 9:30 – 10:00 **EPA and Aquatic Herbicides - No Unreasonable Adverse Effects on Man or the Environment** – Don Stubbs, U.S. EPA
- 10:00 – 10:30 **Selective Control of EWM Using Herbicides** - Dr. Kurt Getsinger, USACE
- 10:30 – 10:45 Break – **Bay 1A & 1B**
- 10:45 – 11:15 **Toxicology of Herbicides** - Dr. John Rodgers, Clemson University

- 11:15 – 11:20 **AERF Milfoil Symposium Conclusion** - Carlton Layne, Executive Director
AERF
- 11:20 – 11:40 **Eurasian Watermilfoil and the Use of Submergent Aquatic Plant Community Diversity in the Assessment of Lake Trophic Status and Water Quality Conditions** - Jere Mossier, Jere Mossier Productions/UnderWater Images
- 11:40 – 12:00 **Is Eradication a Realistic Goal? Washington's Experiences** - Kathy Hamel,
Washington
Department of Ecology
- 12:00 – 1:00 Lunch (On Your Own)
- 1:00 – 1:05 **Idaho EWM Session** - Dave Lamb, Idaho EWM Task Force – **Casco/Kidd/N Cape**
- 1:05 – 1:25 **Idaho State Department of Agriculture's EWM Program** - Matt Voile, Idaho
State Department of Agriculture
- 1:25 – 1:45 **The Idaho State Milfoil Control Program; 2006 Review Committee Findings and Recommendations** - Amy Ferriter, Idaho State Department of Agriculture
- 1:45 – 2:05 **Using Educational Programming for Control of Eurasian Watermilfoil (*Myriophyllum spicatum* L.) in the Inland Empire** - Nina Eckberg,
Kootenai County
- 2:05 – 2:25 **Bonner County Aquatic Weed Control Project 2006** - Brad Bluemer,
Bonner County
- 2:25 – 2:45 **2006 Coeur d'Alene Tribe Milfoil Control Efforts** - Dave Lamb,
Coeur d'Alene Tribe
- 2:45 – 3:05 **EWM Control at Cocolalla & Cave Lakes, 2006** - Sandy Daniel, Idaho EWM
Task Force
- 3:05 – 3:20 Break – **Bay 1A & 1B**
- 3:20 – 3:40 **Methodologies and Techniques for the Identification of Control Areas and for Aquatic Herbicide Applications for the Control of Eurasian Watermilfoil in Idaho** - Thomas Moorhouse, Clean Lakes, Inc.
- 3:40 – 4:00 **Using Adaptive Water Resource Management to Target Eurasian Watermilfoil on the Lake Pend Oreille/Pend Oreille River System** - Terence
McNabb, AquaTechnex, LLC
- 4:00 – 4:20 **Feasibility of Managing or Eradicating Eurasian Watermilfoil and Curlyleaf Pondweed in Lake Tahoe: Lessons from 10 Years of Monitoring** - Lars
Anderson, USDA-ARS
- 4:20 – 4:40 **Controlling Eurasian Watermilfoil and Brazilian Elodea in a Shallow Coastal Lake, Lessons Learned** - Jenifer Parsons, Washington Department of
Ecology

4:40 – 5:00 **Use of Milfoil Weevil, *Euhrychiopsis lecontei*, as a Biological Control Agent for Eurasian Watermilfoil: Issues and Applications in the Western U.S.** - Marty Hilovsky, EnviroScience, Inc.

5:00 – 5:05 Closing Remarks

6:00 – 8:00 President's Reception – **Bay 1A & 1B**

Tuesday, March 27th

6:30 – 8:00 Breakfast – **Bay 1A & 1B**

8:00 – 8:05 General Session III Welcome - Scott Shuler, Vice President, WAPMS – **Casco/Kidd/N Cape**

8:05 – 8:25 **New Technologies for the Control of Emergent Aquatic Vegetation in Flood Control Channels** - Tyler Fowler, Clean Lakes, Inc.

8:25 – 8:45 **Controlling Purple Loosestrife, *Lythrum salicaria*, in California's Sacramento/San Joaquin River Bay-Delta Watershed** – David Kratville, California Department of Food and Agriculture

8:45 – 9:05 **Garden Loosestrife (*Lysimachia vulgaris*), A Spreading Threat in Western Watersheds** – Katie Messick, King County

9:05 – 9:25 ***Ludwigia* Control in the Laguna de Santa Rosa, California with Glyphosate, Triclopyr, & Mechanical Methods** - Thomas McNabb, Clean Lakes, Inc.

9:25 – 9:45 **Control of Various Emergent and Submerged Aquatic Weeds with Imazamox and Penoxsulam in Western Washington** - Kim Patten, Washington State University

9:45 – 10:05 **Clearcast (Imazamox) Western Aquatic EUP Update** – Joseph Vollmer, BASF

10:05 – 10:25 **Eurasian Watermilfoil and Sago Pondweed Response to Imazamox** – Dr. Scott Nissen, Colorado State University

10:25 – 10:40 Break – **Bay 1A & 1B**

10:40 – 11:00 **Control of Wetland Weeds Using JK Injection Technology** – Ron Crockett, Monsanto

11:00 – 11:20 **Algae are Aquatic Plants Too – We Demand Equal Treatment** – Paul Westcott, Applied Biochemists

11:20 – 11:40 **Evaluation of Barley Straw as an Alternative Algae Control Method in a Northern California Rice Field** – David Spencer, USDA-ARS

11:40 – 12:00 **Efficacy of Benthic Barriers as a Control Measure for Eurasian Watermilfoil** – Karen Laitala, University of Idaho

- 12:00 – 1:00 Lunch (On Your Own)
- 1:00 – 1:05 General Session IV Welcome – Jenifer Parsons, Past-President, WAPMS – **Casco/Kidd/N Cape**
- 1:05 – 1:25 **Investigating the Susceptibility of Eurasian Watermilfoil (*Myriophyllum spicatum*) and a Milfoil Hybrid (*M. spicatum* X *M. sibericum*) to Aquatic Herbicides** – Angela Poovey, USACE
- 1:25 – 1:45 **Concentration/Exposure Time Relationships for Reducing Biomass of Sago Pondweed (*Stuckenia pectinatus*) with Two Formulations of Endothall** – Jeremy Slade, Mississippi State University
- 1:45 – 2:05 **An Ecological Approach to Aquatic Plant Management** – R.M. Smart, USACE
- 2:05 – 2:25 **Permitting Aquatic Plant Management in Washington State** – Kelly McLain, Washington Department of Ecology
- 2:25 – 2:45 **Invasive Species Information System and Technology Transfer** – Jeffery Stokes, USACE
- 2:45 – 3:00 Break – **Bay 1A & 1B (Exhibitor Teardown 3:00 – 5:00)**
- 3:00 – 3:20 **Expanding & Updating the USGS Nonindigenous Aquatic Species Database** – V.M. Howard, Portland State University
- 3:20 – 3:40 **High-Accuracy Mapping of *Egeria densa* Using Satellite Imagery** – Catherine Huybrechts, Endpoint Environmental
- 3:40 – 4:00 **Reward Herbicide: Enhancing the Molecule for Effective Weed Management** – Jim Petta, Syngenta Professional Products
- 4:00 – 4:30 Annual Business Meeting
- 4:45 – 5:15 Board Boat for Dinner Cruise
- 5:15 – 7:30 Dinner Cruise

The Purpose of the WAPMS is to:

- Promote the management of non-native and nuisance aquatic vegetation.
- Encourage scientific research.
- Promote student scholarships.
- Provide scientific advancement and knowledge to its members.
- Extend and develop public interest in aquatic plant management activities.

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**ABSTRACTS
Oral Presentations
(In Order of Presentation)**

EURASIAN WATERMILFOIL AND THE USE OF SUBMERGENT AQUATIC PLANT COMMUNITY DIVERSITY IN THE ASSESSMENT OF LAKE TROPHIC STATUS AND WATER QUALITY CONDITIONS. Mossier, Jere, Ph.D., M.S., B.S., Aquatic Ecologist, Jere Mossier Productions/UnderWater Images, P.O.Box 1415, Hayden, Idaho, 83835, ph. 208.683.8112, mail@jeremossier.com, www.jeremossier.com.

Eurasian Watermilfoil (*Myriophyllum spicatum/exalbescens*) is an extremely invasive and prolific submergent aquatic macrophyte species that can aggressively compete and displace other more desirable submergent aquatic macrophyte species in many freshwater lakes. In most circumstances, the interactive dynamics, species diversity and management of submergent aquatic plant communities in lakes can provide a basis to assess lake trophic status ranging from oligotrophic to eutrophic conditions. The determination of the trophic status of a lake is both a science and an art. The use of the number of prevalent species of submergent aquatic plants in conjunction with other limnological parameters such as secchi depth, chlorophyll "a", total phosphorus, the maximum depth of submergent macrophyte growth and dissolved oxygen/water temperature profiles during August, have been shown to collectively be an accurate and cost effective means to ascertain lake trophic status in temperate lakes. The delineation of the succession of submergent plant communities is extremely useful in determining changes that occur in lake conditions. The harvesting of Eurasian water milfoil as a control measure, along with bottom barriers, dredging and chemical herbicides will be addressed as related to underwater plant community succession. Underwater video from Hayden Lake, Idaho taken over a 20 year period demonstrates significant changes in submergent aquatic plant communities. Eurasian watermilfoil in Lake Pend Oreille and Coeur d'Alene Lake, Idaho, is aggressively invading and displacing once diverse submergent plant communities. Underwater photos, video and scientific data from Wisconsin, Minnesota and Idaho lakes are used to further illustrate and discuss these matters.

IS ERADICATION A REALISTIC GOAL? WASHINGTON'S EXPERIENCES. Kathy Hamel Washington State Department of Ecology. Water Quality Program, P.O. Box 47600, Olympia, WA 98504-7600. Phone: (360) 407-6562 e-mail: kham461@ecy.wa.gov

The author discusses the strategy employed by Washington's Aquatic Weeds Program in dealing with invasive plants such as Eurasian watermilfoil (*Myriophyllum spicatum*) and hydrilla (*Hydrilla verticillata*). Two projects are presented where the project goal is eradication. Long

Lake in Thurston County was treated with the aquatic herbicide fluridone in 1991 to eradicate a widespread infestation of Eurasian watermilfoil. Since that time, the County and the lake group have been using hand pulling and installation of bottom barrier to manage remaining milfoil populations. Hydrilla was discovered in the Pipe and Lucerne lake system near Seattle in 1995. Immediate efforts were undertaken to eradicate this only hydrilla infestation in the Pacific Northwest. To date, ongoing efforts include annual fluridone treatments along with diver and snorkeler surveys and hand pulling. Eradication is close. No hydrilla plants have been discovered in Lucerne Lake for the past two years and only two hydrilla plants were seen in Pipe Lake in 2006.

THE IDAHO STATE MILFOIL CONTROL PROGRAM; 2006 INITIAL EFFORTS AND 2007 PROGRAM MODIFICATIONS. Matt Voile, Agricultural Section Manager with the Idaho Department of Agriculture

In late 2005, Idaho State Representative Eric Anderson and others began the development of a State-wide Eurasian watermilfoil control program and the process which would lead to the allocation of \$4 million to jump start an eradication/control program. A considerable and concentrated effort by the Idaho Department of Agriculture, other State Agencies, and stakeholders led to the basic formation of the program and the announcement of funding availability in April of 2006. Applications were received from 23 agencies or entities and 14 projects were funded at an initial total cost of \$2.5 million. Although a wide variety of projects were proposed, including research and education, it was primarily those projects which were focused on actual control treatments that were funded. Project work and final reports had to be completed by November 30, 2006. The total final cost of the 2006 work was \$2.4 million due to various amendments and some EDRR treatments that were added. In anticipation of a subsequent round of project applications in 2007, the ISDA formed an outside Review Committee to interview program participants and formulate recommendations for program improvements. This review focused on programmatic operation at the Agency level and not the efficacy of various forms of applied treatments (see Amy Ferriter abstract).

THE IDAHO STATE MILFOIL CONTROL PROGRAM; 2006 REVIEW COMMITTEE FINDINGS AND RECOMMENDATIONS. Amy Ferriter, Invasive Species Coordinator with the Idaho State Department of Agriculture, Boise, ID. PO Box 790, 2270 Old Penitentiary Road, Boise, ID 83701. Phone: 208-332-8686 E-mail: aferriter@idahoag.us

In response to the continuing economic and environmental crises created by Eurasian Watermilfoil in Idaho's waters, the Idaho State legislature appropriated \$4 million to the Idaho State Department of Agriculture (ISDA) for eradication and control of Eurasian Watermilfoil. The Legislature directed these funds to be expended over a two-year period beginning July 1, 2006, and ending June 30, 2008. In 2006, available project funding was distributed to as many high-priority projects throughout the state as possible in an equitable and meaningful allocation. In an effort to improve Idaho's EWM control program, ISDA commissioned a Peer Panel Review (Review) to provide an assessment of the State's program and provide programmatic recommendations to ISDA. The Panel was Chaired by Dr. Joseph Joyce, Ph.D., Executive Associate Vice President for Agriculture and Natural Resources, University of Florida. The 6-member Panel included aquatic plant managers from Florida, California and Minnesota who have expertise in the control and management of submersed aquatic vegetation nationally and internationally. Collectively, the six panelists have more than 160 years of experience in aquatic plant management and have published more than 400 papers on the subject. To ensure their independence, the panelists were free of any connection to business interests or organizations in

Idaho. The scope of the Review included an evaluation of ISDA-funded projects to control Eurasian Watermilfoil in Idaho's lakes and waterbodies. The Review identified areas where the program has been successful and assessed strategic, programmatic, and organizational options to minimize the costs and increase the effectiveness of the program in future years.

USING EDUCATIONAL PROGRAMMING FOR CONTROL OF EURASIAN WATERMILFOIL (*MYRIOPHYLLUM SPICATUM* L.) IN THE INLAND EMPIRE. Nina Eckberg, Chair-Inland Empire Cooperative Weed Management Area (IECWMA), 10905 N Ramsey Rd, Hayden ID 83835. e-mail: neckberg@kcgov.us

Eurasian watermilfoil (*Myriophyllum spicatum* L.) is an aquatic plant that has been designated a noxious weed in the State of Idaho. Control measures are conducted using the integrated pest management (IPM) approach, which gives project managers the 'toolbox of methods' for control implementation. A first priority in IPM, prevention, is the method of Eurasian watermilfoil (hereafter EWM) control that many managers use. Within the prevention method is educational programming. The Inland Empire Cooperative Weed Management Area (IECWMA) has used all avenues of education to teach the public, elected officials and vegetation managers about EWM control. Workshops, seminars, publications, news articles and public service announcements have all been used during past projects. In 2006, with the generous support of the State of Idaho Legislature and the Idaho State Department of Agriculture (ISDA), grant money was allocated to the IECWMA for hiring an underwater video production company to capture the EWM projects in the IECWMA. The collected material was to develop a comprehensive report that visually gave the viewer a glimpse of how EWM projects are put into operation. A 10-minute DVD was made from fourteen hours of DV video tape and over 1,000 still photographs. This DVD is presented today with permission from the ISDA and the IECWMA, copyright owners of the material.

BONNIER COUNTY AQUATIC WEED CONTROL PROJECT 2006 Brad Bluemer, Bonner County Weed Superintendent, e-mail: bbluemer@co.bonner.id.us; office phone 208-263-3175.

This presentation will be about Idaho's historic attempt to stop the spread of a weed like no other state has before, in Bonner County. It includes a description of what was involved, what was to be accomplished or goals, how it was done, problems encountered, disappointments, and results of work done at the end of the season. Complete evaluations will not be known until the summer of 2007 for everything treated in the project.

2006 COEUR d'ALENE TRIBE MILFOIL CONTROL EFFORTS. David Lamb, Lake Ecologist with Coeur d'Alene Tribe. 850 'A' Street, Po Box 408, Plummer, ID 83851 Phone: 208-686-6206 E-mail: dlamb@cdatribe-nsn.gov

As a result of aquatic vegetation survey efforts performed in 2004 and 2005, it was known that Eurasian watermilfoil (*Myriophyllum spicatum*), as well as a *M. spicatum* x *M. sibiricum* hybrid, was present in Coeur d'Alene Lake, primarily in the area referred to as the Lower Lakes which are lateral to the St. Joe River at the south end of Coeur d'Alene Lake proper. This is an area which is within the jurisdiction of the Coeur d'Alene Tribe. When funding became available in early 2006 from the State of Idaho's newly formed Milfoil Control Program, the Tribe requested and received a grant to conduct milfoil survey efforts and various control treatments. This presentation will describe the project activities which included Tribal divers and support staff

spending 13 days inspecting approximately 15 miles of shoreline in Coeur d'Alene Lake and the Lower Lakes, a contracted herbicide applicator performing a treatment over 366 acres in Chatcolet and Round Lakes using the liquid 2,4-D formulation DMA 4 IVM, a contract diver and suction extraction setup removing an estimated 3,100 pounds of milfoil from approximately 46 acres and Tribal divers hand removing a small amount of milfoil from the two high-use boat launch / marina areas. Because this was the first project of its kind to be undertaken on Tribal waters, it was expressly designed to treat only key infestation areas and demonstrate to the Tribal Council and the public that this work could be effective in the removal of milfoil while being protective of Tribal resources. Protection of important cultural plants such as the Water Potato, as well as native fish and water quality was paramount to the successful completion of this project.

EWM CONTROL AT COCOLALLA & CAVE LAKES, 2006. Daniel, Sandy. Business Manager, Dave's Weed & Pest Control, 78 E. River Spur Rd, Priest River, Idaho, 83856, ph 208-661-3238, e-mail joeschmenge@verizon.net.

The Cocolalla Lake Association developed a plan and received grant funding to eradicate Eurasian watermilfoil (EWM) in Cocolalla Lake, an 800-acre lake in Bonner County, Idaho. Navigate®, a granular 2,4-D product, was applied in an early-season treatment in July, 2006. A pre-treatment survey indicated approximately 65 acres were infested; actual treatment was planned for 80 acres to ensure coverage of all areas, and to allow for higher rates in more heavily infested areas. Post-treatment surveys were completed at intervals through the remainder of the growing season. In a similar effort, approximately 250 acres of EWM was treated in Cave Lake, a 600-acre lake in Kootenai County, Idaho. The infestation in Cave Lake was discovered as a direct result of the Idaho Milfoil Task Force's continued physical surveying of Idaho waterways. With the emphasis on EDRR (Early Detection, Rapid Response), a treatment for Cave Lake was accomplished within approximately 3 weeks from time of discovery. Treatment was followed by three visual and water-sampling surveys.

METHODOLOGIES AND TECHNIQUES FOR THE IDENTIFICATION OF CONTROL AREAS, AND FOR AQUATIC HERBICIDE APPLICATIONS FOR THE CONTROL OF EURASIAN WATERMILFOIL IN IDAHO. Thomas G. Moorhouse¹, Thomas J. McNabb²
¹Clean Lakes, Inc., 2102 E. Front Street, Coeur d'Alene, ID 83814, tmoorhouse@cleanlake.com 208-929-2757, ²Clean Lakes, Inc., 2150 Franklin Canyon Road, Martinez, California 94553, tmcnabb@cleanlake.com.

In 2006, the Idaho State Legislature appropriated \$4 million to the Idaho State Department of Agriculture (ISDA) for eradication and control of Eurasian watermilfoil (*Myriophyllum spicatum*) (EWM) in Idaho. The Legislature directed these funds to be expended over a two-year period beginning July 1, 2006, and ending June 30, 2008. As directed by H.B. 869 (2006), ISDA will expend the funds as grants to support on-the-ground EWM eradication and control projects. To maximize efficiencies and insure compliance with the both State and Federal rules and regulations that govern aquatic plant control activities, the proper identification of control area parameters (acreage, water depth, water flows, water uses, etc..) is essential for each project site. In addition, there are various products and product formulations available for the control of EWM, as well as various application techniques available for each of the formulations. A review of available methodologies to properly document treatment sites as well as available technologies for aquatic herbicide applications will be presented.

USING ADAPTIVE WATER RESOURCE MANAGEMENT TO TARGET EURASIAN MILFOIL ON THE LAKE PEND OREILLE/PEND OREILLE RIVER SYSTEM.

McNabb, Terence M. Aquatechnex, LLC, PO Box 30824, Bellingham, WA 98228, ph. 360.527.1271, email terry@aquatechnex.com.

Adaptive Water Resource Management is a concept that has direct application to large scale aquatic plant management operations. A recent presentation by Dr. John Rodger of Clemson University outlined the steps involved in this process. First, risk assessment is performed to answer the question do we have a problem and where it is? Second, an action vs. no action analysis needs to be performed. Third, the manager must consider all management or control options available. Fourth, the manager should implement viable options. Fifth, the manager should monitor results. Lastly, the manager should adjust the program as necessary based on monitoring. The program designed and implemented in Bonner County, Id to target the invasive weed Eurasian Milfoil follows this prescription. Aerial and boat survey technologies were deployed to assess the scope of the milfoil problem in these waters. All treatment options were considered and four herbicide technologies were found to be viable and within the cost constraints of the program. The treatments were performed, and follow up monitoring was performed to assess the results. GIS technologies were utilized through all steps of this process to document and analyze results and make recommendations for future operations. This paper will discuss this process and the program results.

FEASIBILITY OF MANAGING OR ERADICATING EURASIAN WATERMILFOIL AND CURLYLEAF PONDWEED IN LAKE TAHOE: LESSONS FROM 10 YEARS OF MONITORING. Lars Anderson, Doreen Gee and Amy Klug. USDA- ARS Exotic and Invasive Weed Research. One Shields Avenue Mail Stop #4, Davis, CA 95616

Beginning in 1995, the US Department of Agriculture, Agricultural Research Service Aquatic Weed Research Laboratory (Davis, CA) conducted aerial-photographic and boat surveys of the entire 72-mile shoreline of Lake Tahoe. Five subsequent surveys, the most recent of which was completed in fall, 2006, revealed that Eurasian watermilfoil has gradually spread to the small marinas that have some protection from high-energy wave action, and which have suitable (sandy to highly organic) sediments. Though absent from earlier surveys, curlyleaf pondweed was detected in South Lake Tahoe at two high (boat) traffic sites in 2003 surveys, and has spread in an eastwardly direction over the past three years. Eurasian watermilfoil has exhibited a relatively gradual expansion, but curlyleaf pondweed appears poised for very rapid dispersal and increased invasions via boats and near-shore currents that can carry plant fragments and turions. However, the total invaded area infested with Eurasian watermilfoil (ca. 140-150 acres) is comprised of several sub-acre sites; one marina accounts for ca. 125 acres. Curlyleaf pondweed is in ca. 20 acres in two marinas, and has produced several very small stands along the south shore. Based upon the site/size distributions and configurations of the infested shoreline and marinas, successful management- and even eradication- is possible with judicious muliti-year use of diver/hand-suction removal, selective herbicide applications within isolated areas, coupled with strict, well-enforced prohibitions against further introductions by boats and shoreline construction equipment (e.g. pier/buoy/dock installations and repairs) and an effective public education program. Without such action, the further spread of curlyleaf pondweed and Eurasian watermifoil is likely, and Lake Tahoe will remain susceptible to new aquatic nuisance species invasions. It will also continue to provide a source for further infestations of other Sierra lakes.

CONTROLLING EURASIAN MILFOIL AND EGERIA IN A SHALLOW COASTAL LAKE; LESSONS LEARNED Parsons, J. K., Hamel, K. S. and Marx, G. E; Washington State Department of Ecology, 15 W Yakima Ave, Suite 200, Yakima, WA 98902. jenp461@ecy.wa.gov

Loomis Lake, a long narrow shallow lake on the coast of Washington State, had a submersed plant community dominated by the invasive non native species Eurasian milfoil (*Myriophyllum spicatum* L.) and egeria (*Egeria densa* Planch.). In 2002 the lake was treated with the liquid formulation of the aquatic herbicide fluridone (brand name Sonar AS®). We monitored aquatic plant frequency and biomass before herbicide application and for 3 years after the treatment. One year after treatment there was very little submersed plant growth. We attributed this situation to poor light penetration caused by wind induced sediment entrainment. Two years after treatment the submersed plants were starting to recover, including the two invasive species. Diver hand pulling targeted the recovering invasive species, but was hampered by continued poor visibility. By the third year after treatment the native submersed species were continuing to recover, however additional herbicide treatments were required to keep the growth of Eurasian milfoil and egeria in check. This aquatic weed control regimen met with less success, especially against Eurasian milfoil, than other lakes in Washington that have undergone similar treatments. We believe that the lake's morphology and shallow depth, with a fetch running the length of the lake exposed to the stormy conditions of the Washington coast, combined to create poor conditions for recovery of native plant species and for monitoring invasive species regrowth.

USE OF THE MILFOIL WEEVIL *EUHRYCHISPSIS LECONTEI* AS A BIOLOGICAL CONTROL AGENT FOR EURASIAN WATERMILFOIL: ISSUES AND APPLICATIONS IN THE WESTERN U.S. Hilovsky, M. EnviroScience, Inc, 3781 Darrow Road, Stow, OH 44224, (330)688-0111, Fax: (330)688-3858, mhilovsky@enviroscienceinc.com

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. Feeding and fecundity studies have demonstrated that this weevil is a milfoil specialist and strongly prefers Eurasian watermilfoil over the native species of milfoil with which it has presumably coevolved. Over the past eight years, more than 95 lakes in 12 states have been successfully stocked with the milfoil weevil, resulting in documented declines in Eurasian watermilfoil with corresponding increases in native plant diversity in most lakes studied. This paper presents several case studies from the eastern U.S. and examines technical and regulatory challenges associated with large-scale stocking of milfoil weevils in the western U.S. and Canada.

NEW TECHNOLOGIES FOR THE CONTROL OF EMERGENT AQUATIC VEGETATION IN FLOOD CONTROL CHANNELS Tyler D. Fowler, Jay Kasheta, Clean Lakes, Inc., 2150 Franklin Canyon Road, Martinez, California 94553. 1-877-FIX-LAKE.

In 2006, the MarshMog was developed as a more reliable and versatile technology for the application of aquatic herbicides to emergent aquatic vegetation (cattails & bulrush) in flood control and wetland systems. In flood control channels, it is often desirable to reduce emergent vegetation biomass following control to allow for unobstructed water movement and drainage. To meet this objective, better suited wetland site technologies were developed and tested to

mechanically grind standing emergent vegetation just above soil level to reduce biomass following herbicide treatment. A review of the implementation of these technologies for the Guadalupe River Vegetation Control Project, Santa Clara Valley Water District, San Jose, California will be reviewed and compared to historical control methods.

CONTROLLING PURPLE LOOSESTRIFE, *LYTHRUM SALICARIA* IN CALIFORNIA'S SACRAMENTO/SAN JOAQUIN RIVER BAY-DELTA WATERSHED.

Kratville, D., R. P. Akers, California Department of Food and Agriculture, Integrated Pest Control Branch, 1220 N St., Rm 341, Sacramento, CA 95814, ph. 916.654.0768, fax 916.653.2403, dkratville@cdfa.ca.gov

The California Department of Food and Agriculture Purple Loosestrife Control Project (CDFA) is an eight-year project funded by the California Bay-Delta Authority to stop the spread and locally control the invasive plant purple loosestrife, *Lythrum salicaria*. An overview of the project area and distribution of purple loosestrife within the Sacramento/San Joaquin Rivers watershed and the San Francisco Bay-Delta shall be presented. The project utilizes an integrated approach combining chemical and classical biological control programs based on location and population size, which ranges from a few localized plants in the lower watershed to thousands of plants spread over many miles in the upper reaches. As of 2007 it is believed that all purple loosestrife populations in the state are accounted for and the resulting maps will be shared. Results will be presented of tests on the effect of herbicide applications on seed production and germination. In 2007 the CDFA plans to begin looking at salinity levels as a possible limiting factor in the distribution of loosestrife in the Bay-Delta watershed. The major emphasis of the project in its final stages is to continue mapping all know occurrences, control populations upstream to their major population centers and establishing biological control agents around the state.

GARDEN LOOSESTRIFE (*LYSIMACHIA VULGARIS*), A SPREADING THREAT IN WESTERN WATERWAYS. Katie Sauter Messick; Aquatic Weed Specialist, King County Noxious Weed Control Program, 201 S. Jackson St., Seattle, WA 98104, ph. 206.263.64612, fax 206.296.0192, katie.messick@metrokc.gov.

Garden loosestrife (*Lysimachia vulgaris*) is a rhizomatous perennial native to Eurasia that is widely distributed across the northern United States and southern Canada. It thrives in wetland and riparian areas with rhizomes that extend 10 feet (three meters) or more into the water. Considered naturalized in areas like New England, it may be that their cold winters are the only factor keeping it in check. Garden loosestrife is particularly worrying for several reasons. It is difficult to control, has been observed to outcompete purple loosestrife (*Lythrum salicaria*), and will form easily-overlooked thickets of non-flowering young plants before appearing in flower as a full blown infestation. Washington is the only state that has listed this plant as a noxious weed, although in several other states the climate should not limit its dispersal or establishment. In King County this invasive weed has established a number of large infestations that may provide some indication of its real potential in the west, and the challenges in controlling it. The King County Noxious Weed Control Program is currently working with government agencies, community groups and private landowners to control garden loosestrife. Control strategies vary according to the extent of the infestation and land ownership in each area. This talk will discuss these strategies as well as describing the plant and its invasive tendencies, delineating the extent of infestations and discussing real and potential damage.

LUDWIGIA CONTROL IN THE LAGUNA DE SANTA ROSA, CALIFORNIA WITH GLYPHOSATE, TRICLOPYR & MECHANICAL METHODS. Thomas J. McNabb¹, Julian Meisler². Clean Lakes, Inc. ¹ & The Laguna de Santa Rosa Foundation².

The Laguna de Santa Rosa Foundation (Foundation) spearheaded a three-year control effort aimed at reducing the area and density of the aquatic weed *Ludwigia* sp. within selected areas of the Laguna de Santa Rosa (Laguna) watershed in 2005. The infestation hampers efforts to control mosquito vectors of West Nile Virus (WNV) that pose a health threat to humans and wildlife; out-competes native wetland species; and is believed to impair both the water quality and the flood-control functions of the Laguna. First year control efforts spanned July-October, 2005 and resumed in June 2006. Control occurred at two sites comprising some 130 acres within the Laguna and included three principle elements: herbicide treatment, harvesting of biomass, and disposal of biomass. The three-year effort is the first step in a larger attempt to restore ecosystem process and function in the Laguna making it more resilient to invasion. While the Foundation does not expect that control efforts will remove 100% of *Ludwigia* from the Laguna, it does expect the control effort to reduce the *Ludwigia* population to a point where restoration of natural ecosystem processes and vegetation can maintain it as a minor rather than dominant component of the natural community. In this presentation we discuss the methods used to control *Ludwigia* in this challenging and complex wetland environment and present results of the 2005 and 2006 control efforts.

CONTROL OF VARIOUS EMERGENT AND SUBMERGED AQUATIC WEEDS WITH IMAZAMOX AND PENOXsulAM IN WESTERN WASHINGTON. Patten, K. & C. Metzger; Washington State University Long Beach Research and Extension Unit, 2907 Pioneer Road, Long Beach, WA 98631. ph. 360-642-2031. pattenk@wsu.edu.

Research was conducted at numerous ponds and drainage canals in southwest Washington on herbicide efficacy for various emergent and submerged aquatic weeds. Multiple foliar applications per season of imazapyr, imazamox, triclopyr, glyphosate, 2,4-d amine, and penoxsulam controlled Parrotfeather Milfoil (PM), *Myriophyllum aquaticum* ($\geq 95\%$). For a single application/year none of these herbicides provided lasting control (>12 months). Within the single season timing parameter, however, imazapyr (1.5 lb ai/ac) was the most consistently effective herbicide for PM. The most effective single application treatment for Water Primrose (WP), *Ludwigia hexapetala*, was imazapyr (1 to 1.5 lb ai/ac) and imazamox (0.5 lb ai/ac). Both achieved $>95\%$ control. Penoxsulam was not effective on WP, glyphosate was inconsistent, and control with triclopyr was only temporary. Floating Pennywort, *Hydrocotyle ranunculoid*, was controlled with foliar applications of imazamox (0.2 lb ai/ac) or penoxsulam (0.015 lb ai/ac). American Pondweed, *Potamogeton nodosus*, was controlled with imazamox applied either topically (0.25 lb ai/ac) or injected (~ 10 ppb). Injection treatment with penoxsulam (10 ppb 100 days) controlled Sago pondweed, *Stuckenia pectinata*, and Eurasian Water Milfoil, *Myriophyllum spicatum*. Final assessments on the above experiments are pending efficacy data on regrowth in 2007.

CLEARCAST™ (IMAZAMOX) WESTERN AQUATIC EUP UPDATE. Joseph Vollmer; Sr. Market Development Specialist, BASF Corp., 2166 North 15th Street, Laramie, WY 82072. Joseph.vollmer@basf.com

In 2005 and 2006, commercial EUP applications and research trials were conducted with CLEARCAST herbicide in Washington, Colorado and Texas on various submersed, emergent and floating species. CLEARCAST was tested at rates of 0.03 lbs ae to 0.5 lbs ae/A for foliar applications and 25 ppb to 200 ppb for injection trials. Efficacy was achieved on water hyacinth (*Eichhornia crassipes*), cattail (*Typha* spp.), common reed (*Phragmites* spp.), giant reed (*Arundo donax*), primrose (*Ludwigia* spp.), alligatorweed (*Alternanthera philoxeroides*), pennywort (*Hydrocotyle ranunculoides*), common salvinia (*Salvinia minima*), water lily (*Nymphaea* spp.), Chinese tallowtree (*Sapium sebiferum*), pondweeds (*Potamogeton* & *Stuckenia* spp.), water stargrass (*Heteranthera dubia*), Eurasian water milfoil (*Myriophyllum spicatum*), variableleaf milfoil (*Myriophyllum heterophyllum*) and several other species. Species selectivity can be altered by adjusting the CLEARCAST rate, application timing or application technique such as foliar vs. injection. Examples, efficacious foliar rates for control of cattail, hyacinth and lily had no effect on submersed species such as *Najas*, *Chara*, *Ceratophyllum*, *Potamogeton*, and *Ruppia* species. In contrast injection treatments used to control *Potamogeton crispus* did not affect cattail or lily. In non-target vegetation trials, over-the-top foliar as well as directed soil applications to cottonwood and willow trees caused only minor injury at the highest foliar rate of 0.5 lbs ae/A.

EURASIAN WATERMILFOIL AND SAGO PONDWEED RESPONSE TO IMAZAMOX Nissen, S.J., J. D. Vassios, & G. Brunk; Department of Bioagricultural Sciences and Pest Management, Colorado State University, Ft. Collins, CO 80523

The invasive, Eurasian watermilfoil (*Myriophyllum spicatum*), currently infests 45 states including Colorado and negatively impacts recreation lakes and irrigation canals. The native, sago pondweed (*Potamogeton pectinatus* L.), is a recurring problem in irrigation canals along the Front Range and the eastern plains of Colorado. Irrigation districts are currently using backhoes to dredge canals in order to maintain water flow. Laboratory, greenhouse and field studies were conducted to evaluate the response of these two aquatic weeds to the herbicide, imazamox. In small tank studies, we found that Eurasian watermilfoil was sensitive to 200 ppb imazamox, while emerged sago pondweed was not susceptible even at concentrations of 800 ppb. Using radiolabeled imazamox, we established that imazamox absorption by Eurasian watermilfoil reached a maximum between 6 and 12 hour after exposure to 200 ppb and that whole plant absorption peaked at approximately 1%. Soil applied imazamox did reduce sago pondweed biomass by 95% when shoots emerged through treated soil. This indicates that imazamox could be used to treat dry irrigation ditches in the fall or spring and provide sago pondweed control the following irrigation season. Imazamox was used to treat two small lakes heavily infested with Eurasian watermilfoil. Weed control and imazamox dissipation were monitored from mid May to August. Imazamox treatments significantly reduced Eurasian watermilfoil growth, keeping these lakes completely open all summer. Imazamox concentrations in these lakes decreased rapidly after application due to photodegradation. The half-life of imazamox in these aquatic ecosystems was approximate 4 days.

CONTROL OF WEBLAND WEEDS USING JK INJECTION® TECHNOLOGY Ron P. Crockett, Monsanto Co., Vancouver, WA 98682

The JKinjection system has been developed as a unique new tool to control hollow-stem weed species. The JKinjection tool delivers a pre-set volume of herbicide into the stems of targeted weeds, and is essentially a closed delivery system. The use of the JKinjection tool allows land managers and weed control specialists a novel new approach to controlling many weeds growing in wetland situations including: Giant cane, *Arundo donax*, Japanese Knotweed *Polygonum cuspidatum*, Bohemian knotweed, *Polygonum bohemicum* yellow flag iris, *Iris psuedocarpus*, giant hogweed *Heracleum mantegazzianum*, and castorbean, *Ricinus communis*. A description of application options, injection techniques, control strategies used for landscape-size projects, and results of applications will be discussed.

ALGAE ARE AQUATIC PLANTS TOO – WE DEMAND EQUAL TREATMENT! James C. Schmidt and Paul Westcott Southwest Regional Manager, Applied Biochemists 15420 N 29th Ave. Phoenix, AZ 85053, Phone:(602) 896-8288, Fax: 602) 564-1688, e-mail: paulwestcott@appliedbiochemists.com

Concurrent with the increased attention being given to invasive aquatic plants and animals, there has been growing concern and activity addressing Harmful Algal Blooms (HAB's) at Federal, state and local levels. Algae have grabbed the headlines in many parts of the country with reports of toxins, fish kills, bad-tasting water, malodorous beaches, negatively impacted fishing areas and even dead birds. This increased media attention and public awareness has demanded answers and actions. Applied Biochemists in conjunction with Clemson University and other researchers have cooperated with public and private stakeholders over the past 6 years in advancing the science of algae control and management. Our focus and objective has been to optimize the use of U.S. EPA Registered Algaecides to manage algal problems within acceptable margins of safety to both man and environment. This Targeted Algal Management has involved development of effective algaecide screening protocols; corresponding toxin measurements; determination of impacts on non-target organisms; post-treatment residue levels; field trials to verify laboratory results and establishment of successful operational treatment programs. A database and matrix is being compiled in conjunction with this work comparing control information on different genera, formulations, rates and water qualities.

EVALUATION OF BARLEY STRAW AS AN ALTERNATIVE ALGAE CONTROL METHOD IN A NORTHERN CALIFORNIA RICE FIELD. Spencer, D. F.¹ & C. A. Lembi² ¹USDA-ARS Exotic & Invasive Weeds Research Unit, Department of Plant Sciences, MS 4, 1 Shields Avenue, Davis, CA 95616, ph. 530-752-1096, fax 530.752.4604, dfspencer@ucdavis.edu; ² Department of Botany and Plant Pathology, Purdue University, 915 West State Street, West Lafayette, Indiana 47907, ph. 765.494.7887, fax 765.494.0363, Lembi@purdue.edu.

California rice fields are shallow water systems with depths usually less than 15 cm. Excessive algal growth often characterizes a significant proportion of them. Especially troublesome are species of green algae and cyanobacteria which interfere with rice growth by becoming entangled with the seedlings and subsequently uprooting them when the algal mats dislodge from the sediment. We sought to determine if an application of barley straw to a rice field would reduce excessive algal biomass during the crucial 30-day period of seedling establishment following initial flooding of the rice field. Measured water temperature in the rice field was

greater than the 20 C threshold for decomposition of the barley straw and production of the hypothesized growth-inhibiting chemical, for a considerable portion of the experimental period. The dry weight of algae present at the sampling points varied considerably ranging from 0 to 286 g m⁻². Relative to controls, mean dry weight of algae was not affected by barley straw on either of two sampling dates.

EFFICACY OF BENTHIC BARRIERS AS A CONTROL MEASURE FOR EURASIAN WATERMILFOIL. Karen Laitala, Timothy S. Prather; Plant Science Division, University of Idaho, P.O. Box 442339, Moscow, ID 83844-2339, ph. 208.886.6236, lait3225@uidaho.edu.

Eurasian watermilfoil (*Myriophyllum spicatum* L.) is a non-native aquatic macrophyte found throughout much of the United States and Canada. In Idaho, where the estimated area of infestation exceeds 7,000 acres, excessive Eurasian watermilfoil growth now dominates some littoral communities, forming dense vegetative canopies near the water's surface that impact ecological interactions among lake biota, impede recreational activities, obstruct water flow, and adversely affect lake aesthetics. A study was established in Coeur d'Alene Lake near Plummer, ID to evaluate optimum coverage time, maintenance requirements, and non-target aquatic community response to removable fabric weed barriers as a control measure for Eurasian watermilfoil. A randomized complete block experimental design with four replications and five treatments including an untreated check was implemented. Above sediment biomass was collected within each sub-plot pre- and post- treatment. Analysis of variance repeated measures was conducted to determine the effect of benthic barrier duration on Eurasian watermilfoil biomass. Benthic barrier placement reduced Eurasian watermilfoil biomass 100% 8 weeks after treatment. A study was also established in a walk-in growth chamber to evaluate the effect of sediment depth on Eurasian watermilfoil establishment and growth. The study was arranged in a randomized complete block design with five sediment depth treatments and four replications. Analysis of variance repeated measures was conducted to determine the effects of sediment depth on above sediment plant biomass production and root biomass production. Both above sediment plant growth and root production exhibited a general trend of increased production with increased sediment depth.

INVESTIGATING THE SUSCEPTIBILITY OF EURASIAN WATERMILFOIL (MYRIOHYLLUM SPICATUM) AND A MILFOIL HYBRID (M. SPICATUM x M. SIBIRICUM) TO AQUATIC HERBICIDES. Angela G. Poovey¹, Michael D. Netherland²; and Jeremy Slade³; ¹US Army Engineer Research and Development Center, CEERD-EP-P, 3909 Halls Ferry Rd., Vicksburg, MS, phone: 601 634 3542, email:Angela.G.Poovey@erdc.usace.army.mil, ²US Army Engineer Research and Development Center, Gainesville, FL, ³Mississippi State University, Starkville, MS

A nuisance throughout the US, Eurasian watermilfoil (*Myriophyllum spicatum*) is an exotic submersed plant that forms dense monotypic stands that choke waterways, restrict recreation, impact fisheries, reduce biodiversity, and degrade water quality. Although aquatic herbicides are successful in controlling this invasive plant, anecdotal reports of reduced efficacy have been circulated due to the presence of milfoil hybrids, including the hybridization of Eurasian watermilfoil with the native northern watermilfoil (*M. sibiricum*) in the Great Lakes and Pacific Northwest regions. To verify whether milfoil hybrids are inherently more or less susceptible to herbicide applications, we have initiated a series of small-scale studies evaluating the comparative response of *M. spicatum* x *M. sibiricum* and its parental species *M. spicatum* to fluridone, 2,4-D, and triclopyr over a range of concentrations and exposure times. These initial trials were conducted with plants collected from Minnesota. Overall, the data showed that the

different milfoil genotypes were susceptible to all the herbicides tested, and there were no consistent or significant differences in response between the Eurasian and hybrid milfoils. This testing should be expanded to include other hybrid milfoil populations as well as Eurasian watermilfoil populations with a long history of herbicide management. It is also possible that environmental factors and/or plant vigor may play bigger roles than genotypic variation in the operational chemical control of Eurasian watermilfoil and *M. spicatum* x *M. sibiricum*.

CONCENTRATION/EXPOSURE TIME RELATIONSHIPS FOR REDUCING BIOMASS OF SAGO PONDWEED (*STUCKENIA PECTINATUS*) WITH TWO FORMULATIONS OF ENDOTHALL. Slade, Jeremy G.¹, Angela G. Poovey², and Kurt D. Getsinger². ¹Research Associate, Department of Wildlife and Fisheries, Mississippi State University, 3909 Halls Ferry Road, Vicksburg, MS 39180; ²Research Biologists, U.S. Army Engineer Research and Development Center, 3909 Halls Ferry Road, Vicksburg, MS 39180. Corresponding author's email: jeremy.g.slade@erdc.usace.army.mil.

Sago pondweed (*Stuckenia pectinatus* (L.) Böerner) is a submersed macrophyte that frequently grows to nuisance levels in water conveyance systems throughout the western United States. Two separate small-scale studies were performed to evaluate efficacy of two liquid formulations of the herbicide endothall on sago pondweed. A total of thirty-two endothall concentration and exposure time (CET) combinations were evaluated. Using the formulations Aquathol K and Hydrothol 191, endothall concentrations ranged from 1.0 to 10.0 mg ai/L and 0.5 to 5.0 mg ae/L, respectively, while exposure times ranged from 3 to 24 hours. All endothall CET combinations significantly reduced sago pondweed shoot biomass compared to the untreated reference. Furthermore, nineteen endothall CET combinations controlled sago pondweed by at least 90 percent. In a third small-scale study, six endothall CET combinations were evaluated for recovery of sago pondweed growth following herbicide exposure. Eight weeks after treatment, sago pondweed biomass remained significantly less compared to the untreated reference for all treatments. Once endothall CET relationships are established, recommendations can be developed for field applications to control nuisance populations of sago pondweed in areas where herbicide contact times are restricted, such as irrigation canals and drainage channels.

AN ECOLOGICAL APPROACH TO AQUATIC PLANT MANAGEMENT. Smart, R. M. and M. J. Grodowitz; U.S. Army Engineer Research and Development Center, Lewisville Aquatic Ecosystem Research Facility, Lewisville, TX 75057, 972-436-2215 ext 21, msmart@LAERF.org; U.S. Army Engineer Research and Development Center, Vicksburg, MS 39180-6199, 601-634-2972, grodowm@wes.army.mil

A simple, yet often used concept of integrated pest or plant management (IPM) is one where all available management options are considered as part of a toolbox or arsenal. These “tools/weapons” are then used singly or in combination in an effort to maximize control without impacting the use of one or more strategies. While this approach can be effective, it tends to provide only short-term control by neglecting the underlying environmental and other causative factors that lead to the development of the infestation. A more prudent and ecologically compatible approach would be the use of an ecosystem-based IPM program that relies heavily on ecosystem management and restoration strategies to eliminate or reduce problem infestations while addressing these causative factors. Key components of an ecological approach to managing aquatic plants are the use of host-specific biological control agents and the introduction (or reintroduction) of competitive native plants. Most of the economically important invasive/nuisance aquatic plants are introduced species that have escaped their host-

specific herbivores and pathogens. In addition to their high intrinsic rates of increase this lack of sustained feeding and resultant damage allows the formation of extensive monospecific infestations. In a great many cases, the proliferation of non-native aquatic plants occurs in response to a disturbance event that creates an empty niche. By reestablishing a complex of host-specific herbivores and pathogens and implementing re-vegetation using native plants, non-native invasive species can be held at non-problem levels.

PERMITTING AQUATIC PLANT MANAGEMENT IN WASHINGTON STATE. Kelly McLain, Washington State Dept. of Ecology, P.O. Box 47600, Olympia, WA 98504-7600, kelm461@ecy.wa.gov.

Washington State has regulated aquatic plant control for close to 25 years. Since 2002, Washington State has been issuing NPDES permit coverage for government entities and individuals wishing to control aquatic plants in lakes, streams, rivers, reservoirs, and irrigation ditches. Aquatic plant control has been placed into three different categories: lakes, noxious emergent weeds, and weed control in irrigation systems. The author will review federal court cases, the recent EPA rule on aquatic pesticides, and the eventual path of Washington's permitting program, including justification for additional state oversight when pesticides are applied to water.

INVASION SPECIES INFORMATION SYSTEMS AND TECHNOLOGY TRANSFER
Stokes, J., Software Developer for U.S. Army Engineering Research and Development Center Invasive Species Branch, 3909 Halls Ferry Rd., Vicksburg, MS 39180, ph. 601.634.2976, Jeffery.a.stokes@erdc.usace.army.mil.

Information is one of the essential elements in devising an effective aquatic plant management plan. Useful information is oftentimes difficult and time consuming to obtain. This is due in part to the vast amount of information available, and that this information is often times in various locations. Researchers at the U.S. Army Engineering Research and Development Center (ERDC) have developed computer information systems to help resolve this problem. These systems allow users easy and rapid access to critical information such as plant biology, ecology, and descriptive characteristics on nearly 200 invasive plant species. They also contain information on mechanical, biological, and chemical control options for each plant species. Currently two systems dealing with invasive plant species; the Aquatic Plant Information System (APIS) and the Noxious and Nuisance Plant Management Information System (PMIS). These systems are currently available on CD as well as the Web. A handheld version of APIS for use on Windows-based PDA's/Smartphones will be available in the near future. To obtain copies of these systems please email Michael Grodowitz at michael.j.grodowitz@erdc.usace.army.mil.

EXPANDING & UPDATING THE USGS NONINDIGENOUS AQUATIC SPECIES DATABASE

Howard, V.M. (student) & M. Sytsma; Aquatic Bioinvasions Research and Policy Institute/Center for Lakes and Reservoirs, Portland State University PO Box 751-ESR Portland OR 97207-0751, ph. 503.725.2937, fax 503.725.3834, vhoward@pdx.edu.

The Aquatic Bioinvasions Research and Policy Institute in the Center for Lakes and Reservoirs at Portland State University (PSU) has collaborated with the US Geological Survey (USGS) on a national database of freshwater aquatic invasive species. Under the collaboration, PSU will maintain the aquatic plant section of the USGS' NAS database, focusing on new plant invasion in the Pacific Northwest while adding new specimen records nationwide. The USGS' Florida

Integrated Science Center will continue to focus on the database's animal section. The NAS database is the central repository of accurate and spatially referenced biogeographic accounts of freshwater nonindigenous aquatic animals and plants in the USA, permitting scientists and managers to better understand invasion pathways and to identify areas potentially vulnerable to invasion. The program's website (<http://nas.er.usgs.gov>) allows viewing of interactive maps; data queries by state or hydrologic drainage; access to general fact sheets and photographs; reporting of new sightings and sign-up for automatic alerts by species group or specific states of interest. Input and feedback from users will help to keep the information housed in the database current, accurate and useful for all those interested in the spread and management of invasive plants.

HIGH-ACCURACY MAPPING OF *EGERIA DENSA* USING SATELLITE IMAGERY.

Huybrechts, Catherine; Endpoint Environmental, 678 – 3RD Ave., San Francisco, CA 94118-3907, phone (415) 668-4222, fax (415) 668-5222, catherine@endpointenvironmental.com.

An economizing means of mapping *Egeria densa* is with the use of commercially-available satellite imagery. However, traditional image processing techniques can be time-consuming and are subject to variable rates of accuracy due to differences in training-levels between image interpreters. To address the challenges associated with interpreting satellite imagery to map *Egeria densa*, San Francisco-based Endpoint Environmental created a semi-automated image-processing algorithm called the EDIPA (*Egeria densa* Image Processing Algorithm) Model. The EDIPA Model is capable of identifying 90 percent of *Egeria densa* coverage in high-resolution satellite imagery. The EDIPA Model, a quick-response mapping algorithm, is not empirically-derived but alternately uses an iterative adaptive strategy. Quick-response mapping algorithms are useful tools in the repository of image-processing methods. Managers and stakeholders who desire a reduction in the resources traditionally required to accurately map *Egeria densa* coverage, leverage the EDIPA Model.

FORMULATION TECHNOLOGY: WHY ALL AQUATIC HERBICIDES ARE NOT THE SAME.

Petta, J. F., R. Cush. Syngenta Professional Products, Inc. 410 Swing Road, Greensboro, NC 27418, ph. 361-215-0551, jim.petta@syngenta.com

This paper reviews the various formulations used in aquatics. Details are provided as to the “why” different formulations are used; why the active ingredient plays a significant role in the formulation type; and what inert ingredients are added and for what purpose. The importance of these inerts and possible impurities is reviewed. These various components make up the products we use in aquatics, and understanding their purpose and composition will assist aquatic plant managers with herbicide decisions.

ABSTRACTS

Poster Presentation

USING INTEGRATED PEST MANAGEMENT FOR EURASIAN WATERMILFOIL (*MYRIOPHYLLUM SPICATUM* L.) CONTROL IN THE INLAND EMPIRE. Nina Eckberg, Chair-Inland Empire Cooperative Weed Management Area (IECWMA), 10905 N Ramsey Rd, Hayden ID 83835
e-mail: neckberg@kcgov.us

Eurasian watermilfoil (*Myriophyllum spicatum* L.) is a non-native, aquatic plant that can be found thriving in the waterways of North Idaho, specifically in Benewah and Kootenai Counties. These counties are part of the Inland Empire Cooperative Weed Management Area (IECWMA) which has committed to controlling Eurasian watermilfoil (hereafter EWM) in the region. Programs for control were first formulated in 1998 when positive identification of EWM was made in Spirit Lake and Hayden Lake in Kootenai County. In 2005, EWM was discovered in Lake Coeur d'Alene (in the Coeur d'Alene Tribe waters) in Benewah County and in 2006, it was found in the Coeur d'Alene River and chain-lake system (Cave and Medicine Lakes), again in Kootenai County. Control programs for EWM consist of integrated pest management (IPM) strategies: prevention, through public education programs; mechanical, using diver dredging techniques and hand-pulling by landowners; physical barriers via geo-textile fabric that shade the plants; chemical control with aquatically labeled herbicides. All methods of control are scheduled with wildlife habitat conservation concerns at the forefront of implementation. In Spirit Lake, the initial EWM infestation in 1998 was 40 acres (16.17 hectare) but is now 90% controlled! In 1998, surveys of Hayden Lake found 700 acres (283.29 hectare) of EWM, but in 2006 inspection found 389 acres (157.16 hectare). No fish kill or waterfowl nesting disruption has been observed during the eight years of projects in the IECWMA. Ongoing control programs in the Inland Empire will continue to use IPM strategies for Eurasian watermilfoil.

APPLIED ECOLOGY OF EURASIAN WATERMILFOIL (*MYRIOPHYLLUM SPICATUM* L.) IN FALL RIVER. Thaddeus Hunt¹, Joseph M. DiTomaso¹, David F. Spencer²; ¹Department of Plant Sciences, Mail Stop 4, One Shields Avenue, University of California, Davis 95616; ²USDA ARS Exotic & Invasive Weeds Research Unit, Department of Plant Sciences, Mail Stop 4, One Shields Avenue, University of California, Davis 95616
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The Fall River in Shasta County, CA is a host to the exotic weed Eurasian Watermilfoil (*Myriophyllum spicatum*). In 2003, the aquatic weed infestation resulted in decreased flow rates leading to a broken levee and the flooding of 3000 acres of grazing land. \$200,000 was spent on plant harvesting downstream to restore flow to the river. In addition, the species is a hindrance for the local trout fishery and downstream power generation. We are mapping its distribution in the river and comparing sediment and plant characteristics between invaded and uninvaded locations in order to determine potential limitations for its spread. We are also monitoring nonstructural carbohydrates stored in root tissues to identify periods when reserves are lowest so that control operations may be optimally timed. Currently, nutrient addition experiments measuring biomass return and Rapid Light Curves (RLCs) indicate possible Nitrogen or Phosphorous limitation at two of 6 sites sampled for comparison of sediment characteristics between invaded and uninvaded sites. Also, root stored nonstructural carbohydrate lows appear to coincide with spring regrowth and flower development in midsummer.



Notes