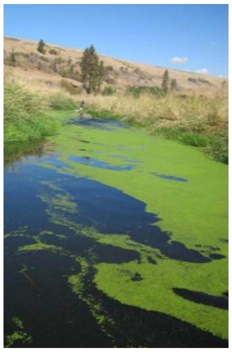
30th Annual
Western Aquatic Plant Management Society
Annual Conference

March 28 – March 30, 2011

The Westin Hotel ~ Westminster, Colorado
10600 Westminster Blvd, Westminster, CO 80020
Phone: (303) 410-5000
Fax: (303) 410-5005



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The objectives of the Society shall be to:

1. Establish a forum for the exchange of information on aquatic vegetation management techniques, strategies, and research through periodic meetings and other appropriate means.
2. Cooperate with local, state, regional, and national agencies, both public and private, in the identification of and solution to aquatic vegetation problems.
3. Promote uniformity and coordination of activities among agencies concerned with the regulatory aspects of aquatic plant management.
4. Encourage scientific research and assist in promoting the control and management of aquatic plants through scientifically sound procedure.
5. Recognize and promote scientific advancement of the members and facilitate the education of aquatic plant scientists through scholarship and other assistance programs.
6. Extend and develop public interest in, and understanding of, aquatic plant management problems and solutions.
7. Cooperate with local chapters and other organizations with similar and related interests.

The Western Aquatic Plant Management Society geographic region includes the states of:
Alaska, Arizona, California, Colorado, Hawaii, Idaho, Oregon, Nevada, New Mexico, Montana, Utah, Washington, and Wyoming

WAPMS Meetings Sites and Presidents

2011	Westminster, CO	Thomas Moorhouse
2010	Seattle, WA	Robert Leavitt
2009	Honolulu, HI	Tom McNabb
2008	Tahoe City, CA	Scott Shuler
2007	Coeur d'Alene, ID	Ross O'Connell/ Lars Anderson
2006	San Diego, CA (25th Meeting)	Jenifer Parsons
2005	Denver, CO	George Forni
2004	Bellevue, WA	Terry McNabb
2003	Sacramento, CA	Shaun Hyde
2002	Coeur d'Alene, ID	Mike Mizumoto
2001	Las Vegas, NV	Ron Crocket
2000	Bozeman, MT	Valerie Van-Way
1999	Reno, NV	Stuart Perry
1998	San Diego, CA	Kathy Hamel
1997	Seattle, WA	Mark Sytsma
1996	Portland, OR	Vanelle Peterson
1995	Sacramento, CA	Fred Ryan
1994	Coeur d'Alene, ID	Paul Beatty
1993	Tucson, AZ	Lars Anderson
1992	Salt Lake City, UT	David Spencer
1991	Seattle, WA	Richard Thiery
1990	Sparks, NV	Tom McNabb
1989	Honolulu, HI	Barbra H. Mullin
1988	Fresno, CA	Fred Nibling
1987	Boise, ID	Winn Winkyaw
1986	San Diego, CA	Randall Stocker
1985	Phoenix, AZ	Nate Dechoretz
1984	Spokane, WA	Les Sonder
1983	Las Vegas, NV	Terry McNabb
1982	Denver, CO	First Business Meeting Terry McNabb (President); Paul Beaty (VP)
1981	Formation Interest meeting, San Diego, CA - Floyd Colbert and Lars Anderson (Co-chairs)	

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PROGRAM

Monday, March 28

2:00 - 6:00 Registration

2:00 - 6:00 Exhibitor Setup (Standley II)

4:00 - 5:00 Board Meeting (Waverly Room)

6:00 - 8:00 **President's Reception**, The Westin Hotel, Westminster, Colorado, hosted by Tom Moorhouse, President, WAPMS (Standley II)

Tuesday, March 29

7:00 - 8:00 **Coffee and Pastries** (Standley II)

Session I (Standley I): Moderator: Toni Pennington (Vice-President, WAPMS), Tetra Tech, Inc.

8:00 - 8:10 **Welcome:** Tom Moorhouse (President, WAPMS), Clean Lakes, Inc., Coeur d'Alene, ID.

8:10 – 8: 40 **Keynote:** Tom Remington, Director, Colorado Division of Wildlife, Denver, CO.

8:40 – 9:00 **Colorado's Aquatic Nuisance Species Program – Focus on Plants.** Elizabeth Brown, Invasive Species Coordinator, Colorado Division of Wildlife, Denver, CO.

9:00 – 9:20 **WAPMS: A 30 Year History.** Lars W.J. Anderson, USDA-ARS Exotic and Invasive Weed Research, Davis, CA.

9:20 – 9:40 **Update from the Aquatic Ecosystem Restoration Foundation.** Carlton Layne, Executive Director, Aquatic Ecosystem Restoration Foundation, Marietta, GA.

9:40 - 10:10 **Updates: States, APMS, Western Regional Panel, others…**

10:10 - 10:40 **Break** (Standley II)

Session II (Standley I): Regional Issues. Moderator: Scott Nissen, Colorado State University

10:40 - 11:00 **Tamarisk in the News: Recent Developments That Impact Land Management.** Rebecca Carlson, Tamarisk Coalition, Grand Junction, CO.

11:00 - 11:20 **Dams and Water Management on Southwestern Rivers: An Invitation to Non-native, Invasive Riparian Plants.** Michael Harvey, Tetra Tech, Inc., Fort Collins, CO.

11:20 - 11:40 **South American Spongeplant: A Threat Worse Than Water Hyacinth?** Patrick Akers, California Department of Food and Agriculture, Sacramento, CA.

11:40 – 12:00 **Aquatic Herbicide Trials for Selective Control of Eurasian Watermilfoil and Curlyleaf Pondweed in Noxon Rapids Reservoir: 2009-2010.** Kurt D. Getsinger[1], John D. Madsen[2], Ryan Wersal[2], John G. Skogerboe[1], Justin Nawrocki[3], and Rob J. Richardson[3]. [1]U.S. Army Engineer Research and Development Center, Vicksburg, MS; [2]Geosystems Research Institute, Mississippi State University, Mississippi State, MS; [3]Crop Science Department, North Carolina State University, Raleigh, NC.

12:00 - 1:30 **Lunch on Own**

Session III (Standley I): Emerging Problems and Current Research I. Moderator: Thomas Moorhouse, Clean Lakes, Inc.

1:30 - 1:50 **A Review of Demonstration and Research Project Activities to Evaluate a Littoral Zone Treatment Technology for the Control of Submerged Aquatic Vegetation.** Thomas J. McNabb and Thomas G. Moorhouse, Clean Lakes, Inc., Coeur d'Alene, ID.

1:50 - 2:10 **Dissipation of Triclopyr and Rhodamine WT Dye Under Flowing Water Condition.** Toni Pennington[1], Harry Gibbons[2], Mark Heilman[3], Scott Shuler[3], and Terry McNabb[4]. [1]Tetra Tech, Portland, OR; [2]Tetra Tech, Seattle, WA; [3]SePRO Corporation, Carmel, IN; [4]Aquatechnex, Lansing, MI.

2:10 - 2:30 **Herbicide Absorption and Translocation by Eurasian Watermilfoil and Hydrilla.** Joseph D. Vassios[1], Scott Nissen[1], and Tyler Koschnick[2]. [1]Colorado State University – Department of Bioagricultural Sciences and Pest Management, Fort Collins, CO; [2]SePro Corporation, Carmel, IN.

2:30 - 2:50 **Preliminary Comparisons of Bacterial Populations Associated with Rhizospheres in Monocultures of Hydrilla (*Hydrilla verticillata*), Eurasian Watermilfoil (*Myriophyllum spicatum*), Brazilian Waterweed (*Egeria densa*), and in Mixed Culture with the North American Native American Pondweed (*Potomogeton nodosus*)**. Lars W.J. Anderson and Doreen Gree, USDA-ARS Exotic and Invasive Weed Research, Davis, CA.

2:50 - 3:20 **Break** (Standley II)

Session IV (Standley I): Vendor Moment: Moderator: Cody Gray, United Phosphorus, Inc.

3:20 – 4:20 Vendors take approximately 5 minutes to highlight products and services

4:20 – 5:00 **Annual Business Meeting** (Standley I)

6:00 - 8:30 **WAPMS Annual Banquet** (The Lake House)

Wednesday, March 30

7:00 - 8:00 **Coffee and Pastries (**Standley II**)**

Session V (Standley I): NPDES Permitting and Applicator Safety. Moderator: Robert Leavitt, California Department of Food and Agriculture

8:00 - 8:20 **EPA's Proposed General NPDES Permit for Applications of Pesticides of U.S. Waters.** Lisa Luebke, U.S. Environmental Protection Agency Region 8, Denver, CO.

8:20 – 8:40 **Status of the NPDES Permit in Colorado.** Gary Beers, Colorado Department of Public Health and Environment, Denver, CO.

8:40 – 9:10 **Applicator Safety…It's a Choice.** Thia Walker, Extension Specialist – Pesticide Safety Education, Colorado State University, Fort Collins, CO.

9:10 – 9:30 **Update: California's NPDES Permit.** Victoria Hornbaker, California Department of Food and Agriculture, Sacramento, CA.

9:30 – 9:50 **Additional State NPDES Permit Updates**

9:50 - 10:20 **Break (**Standley II**)**

Session VI (Standley I): Emerging Problems and Current Research II. Moderator: Lars Anderson, USDA-ARS

10:20 - 10:40 **Models for Predicting Macrophyte Distributions in a Shallow Mesotrophic Lake.** Rich Miller and Mark Sytsma, Portland State University, Center for Lakes and Reservoirs, Environmental Sciences and Management, Portland, OR.

10:40 - 11:00 **Measuring Hydrilla Survey Efficiency with Artificial Hydrilla Targets.** Patrick Akers, California Department of Food and Agriculture, Sacramento, CA.

11:00 – 11:20 **Morphological and Genetic Taxonomic Analysis of Native and Nonnative Watermilfoil in Reservoirs of the Lower Clark Fork River System.** John D. Madsen[1], Joshua C. Cheshier[1], Vipaporn Phuntumart[2], Ryan Thum[3], and Mark Welch[4]. [1]Geosystems Research Institute, Mississippi State University, Mississippi State, MS; [2]Department of Biological Sciences, Bowling Green State University, Bowling Green, KY; [3]Annis Water Resources Institute, Grand Valley State University, Grand Rapids, MI; [4]Department of Biological Sciences, Mississippi State University, Mississippi State, MS.

11:20 - 11:40 **Amphibian Exposure to Aquatic Herbicides.** Amy Yahnke[1], Christian Grue[2], Marc Hayes[2], Sasha Troiano[1]. [1]University of Washington – Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fisheries Sciences, Seattle, WA; [2]Washington Department of Fish and Wildlife – Habitat Program, Olympia, WA.

11:40 - 1:00 **Lunch on Own**

Session VII (Standley I): New Tools and New Applications. Moderator: Tom McNabb, Clean Lakes, Inc.

1:00 - 1:20 **Emerging Use Patterns for Clearcast Aquatic Herbicide in the Western U.S.** Scott Shuler, Mark Heilman, Shaun Hyde, Dave Blodget, SePRO Corporation, Carmel, IN.

1:20 - 1:40 **Clipper Herbicide: A New Tool for Aquatic Weed Management.** Todd Mayhew, Valent Professional Products, Gilbert, AZ.

1:40 - 2:00 **Cascade and Teton Use in Irrigation Canals: What We've Learned the First Year.** Cody J. Gray, PhD, United Phosphorus, Inc., Peyton, CO.

2:00 - 2:20 **Field and Laboratory Evaluation of Bispyribac-Sodium (Tradewind®) Under the Experimental Use Permit (EUP) for Aquatic Plant Management.** James Petta, Valent USA Corporation, Walnut Creek, CA.

2:20 - 2:50 **Break (**Standley II**)**

Session VIII (Standley I): Moderator: Andrea Austel, Cygnet Enterprises, Inc.

2:50 - 3:10 **Sensitivity of Native Aquatic Plant Species to Imazamox (Clearcast™) and Penoxsulam (Galleon™).** John D. Madsen, Ryan M. Wersal, and Cheryl McLaurin, Geosystems Research Institute, Mississippi State University, Mississippi State, MS.

3:10 - 3:30 **The R.E.D. for Copper Products and 2,4-D BEE Resulting in Label Changes for 2012: Discussion Related to Application Science.** William Ratajczyk, Applied Biochemists, Reedsburg, WI.

3:30 - 3:50 **SeClear…Not Just Another Copper Algaecide.** West Bishop, Mark Heilman, Tyler Koschnick, Cole Hulon, Michael Shaner, and Haywood Perry. SePRO Corporation, Carmel, IN.

3:50 - 4:10 **Two New Tools for Dealing with Excessive Planktonic Algae Blooms.** Terry McNabb, Aquatechnex, LLC.

4:10 - 4:30 **Nutrient Fluctuations Induced Through Manipulation of Aeration in a South Florida Retention Pond.** Amanda Quillen, PhD, Vertex Water Features, Pompano Beach, FL.

4:30 MEETING ADJOURNED

2:50 - 5:30 Vendor and Exhibitor Breakdown

4:30 WAPMS Board meeting (Standley I)

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ABSTRACTS
In Alphabetical Order by Presenting Author

MEASURING HYDRILLA SURVEY EFFICIENCY WITH ARTIFICIAL HYDRILLA TARGETS. Patrick Akers, California Department of Food and Agriculture, Integrated Pest Control Branch, 1220 N Street, Room 341, Sacramento, CA 95814, pakers@cdfa.ca.gov.

People who work on eradicating pests sooner or later run into the question, "How do I know when I've found them all?" This is related to the question, "I found *X* individuals, but how many are really out there?" Typically, we do surveys without ever knowing the answers; we only observe trends of survey results through time. One way to approach these questions would be to do standardized survey activities in an area with a known distribution of the target pest. The results provide an estimate of the proportion of targets that are found, or, put differently, the probability of finding a single target with a single bout of survey activity. This estimate allows for addressing the two questions. The problem is, how do we establish a search area with a known distribution of pests? One option would be to do an absolutely accurate census of an infested area, but this is extremely difficult. Alternatively, we could go into an uninfested area and set out a known distribution of targets that we could then survey. This is relatively simple, but introducing individuals of an invasive species into uninfested areas is potentially dangerous. The problem then becomes identifying a replacement that can act as a stand-in for the true target. We have developed a promising target for our "hooking" surveys for hydrilla and will discuss it and some of the preliminary results.

SOUTH AMERICAN SPONGEPLANT: A THREAT WORSE THAN WATER HYACINTH? Patrick Akers, California Department of Food and Agriculture, Integrated Pest Control Branch, 1220 N Street, Room 341, Sacramento, CA 95814, pakers@cdfa.ca.gov.

Spongeplant, *Limnobium laevigatum*, looks and acts like water hyacinth in many ways, but it has some additional characteristics that may make it even more difficult to manage. Specifically, it produces abundant seeds that can apparently survive for at least three years, and they produce abundant seedlings and young plants that are very small. As a result, the plant seems to spread more readily than hyacinth, it is more difficult to exclude from areas, and it comes back quickly

from the seeds even if an area is thoroughly cleared. Therefore, it requires persistent long-term follow-up to keep areas free of plants. Although spongeplant was slow to take off in California, it is now spreading with alarming ease despite efforts to contain or slow it.

PRELIMINARY COMPARISONS OF BACTERIAL POPULATIONS ASSOCIATED WITH RHIZOSPHERES IN MONOCULTURES OF HYDRILLA (*HYDRILLA VERTICILLATA*), EURASIAN WATERMILFOIL (*MYRIOPHYLLUM SPICATUM*), BRAZILIAN WATERWEED (*EGERIA DENSA*) AND IN MIXED CULTURE WITH THE NORTH AMERICAN NATIVE AMERICAN PONDWEED (*POTAMOGETON NODOSUS*). Lars W.J. Anderson and Doreen Gee, USDA-ARS Exotic and Invasive Weed Research. One Shields Ave. Mail Stop #4, Davis, CA, lwanderson@ucdavis.edu.

The ability of non-native aquatic plants to establish successfully and dominate communities of native plants has been attributed to a variety of conditions and plant traits (characters): absence of "controlling" competitors, herbivores and pathogens, rapid growth rate, low-light requirement, efficient uptake and assimilation of nutrients, production of canopy structure that excludes native plants, and potential production of allelochemicals. Little attention has been given to the potential role and interactions of rhizosphere microbial communities in the invasion process in aquatic plants. We used DGGE (denaturing gradient gel electrophoresis) to examine differences in rhizosphere-associated bacteria communities in three highly invasive, non-native plants (*Hydrilla verticillata*, *Myriophyllum spicatum* and *Egeria densa*) and one N. American native pondweed (*Potamogeton nodosus*). Microbial communities were sampled and characterized using DGGE from monocultures of each species grown separately in the same source sediment, and in samples associated with co-mingled rhizopheres (i.e. adjacent roots in mixed cultures) where the native and one non-native were allowed to growth together. Although many microbial populations appear to be similar regardless of growing conditions, some showed PCR products that were dissimilar. This suggests that there may be differences in the functional types of bacteria in native and non-native plants, and that these communities may change as a consequence of physical proximity. Further analysis of the differences in functionality is underway to determine if there is a potential benefit to invading species regarding, for example, nutrient acquisition (e.g. nitrogen), or interference with nutrient uptake in native plants.

SeClear...NOT JUST ANOTHER COPPER ALGAECIDE. West Bishop, Mark Heilman, Tyler Koschnick, Cole Hulon, Michael Shaner, and Haywood Perry, SePRO Corporation – SePRO Research and Technology Campus, 16013 Watson Seed Farm Rd., Whitakers, NC 27891, westb@sepro.com.

Intensive management of nuisance and harmful algal blooms has become a routine practice on many water bodies throughout the US. Disturbance of riparian areas, watershed runoff, and cultural practices in and around ponds and lakes have all increased levels of nutrients, especially phosphorus, available for algal growth. For many years, copper algaecides have been the primary, curative management option for algae control. Regular applications of copper algaecides are required to keep algal blooms under control and maintain reasonable water quality in many nutrient-enriched aquatic sites. While effective in algae knockdown, standard copper algaecide treatment does not address the underlying nutrient availability that drives a repeated cycle of rapid algal recovery and nuisance growth. Through an aggressive research effort into new technologies for algae and water quality management, a novel pending product—SeClear—has been identified as a potential new technology for improved sustainability in algae control. Combining the algaecide activity of copper with new proprietary formulation components designed to gradually reduce phosphorus availability in treated sites, SeClear represents a novel approach for future algal management. Recent developmental data documenting algae and nutrient management with SeClear will be discussed.

CASCADE AND TETON USE IN IRRIGATION CANALS: WHAT WE'VE LEARN THE FIRST YEAR. Cody J. Gray, Ph.D., United Phosphorus, Inc., 11417 Cranston Drive, Peyton, CO 80831, cody.gray@uniphos.com.

Cascade® Aquatic Herbicide and Teton® Aquatic Algicide and Herbicide were registered by the U.S. Environmental Protection Agency in 2010 for use in irrigation canals. Therefore, the 2010 growing season became the first year irrigation canal managers throughout the western U.S. could use these products for vascular plant and algae control in their management decisions. Cascade and Teton, both containing the active ingredient endothall, use was very successful for control of common problematic species including, sago pondweed [*Stuckenia pectinatus* (L.) Börner], horned pondweed (*Zannichellia palustris* L.) and various milfoil species (*Myriophyllum* spp.). If used according to labeled rate and directions, results were very consistent and predictable providing excellent control. A single Cascade application controlled vascular aquatic plants as far as 86 miles downstream from the application site providing season-long weed control. Misidentification of weed species infestations was the greatest problem found when using these products. Horned pondweed was commonly misidentified in irrigation canal systems as sago pondweed. Therefore, proper weed identification requires rate adjustments according to species present. This presentation will discuss general trends found during the 2010 growing season, discuss proper weed identification and recommendations for the 2011 growing season.

DAMS AND WATER MANAGEMENT ON SOUTHWESTERN RIVERS: AN INVITATION TO NON-NATIVE, INVASIVE RIPARIAN PLANTS. Michael D. Harvey, Surface Water Group, Tetra Tech Inc., 3801 Automation Way, Suite 100, Fort Collins, CO 80525, mike.harvey@tetratech.com.

The spread of non-native Tamarisk (*Tamarix* spp) and Russian olive (*Elaeagnus angustifolia*) along the riparian zones of the Middle Rio Grande in New Mexico and the Colorado (Grand Valley) and Green (Uinta Basin) Rivers since the 1930's has been facilitated by dam construction and resulting reductions in peak flows and sediment loads that have reduced the frequency of geomorphic disturbances that tend to favor the native species. Additionally, the dams have increased mid-range and baseflows that tend to favor the non-native species over the native willows (*Salix* spp) and cottonwoods (*Populus freemonti*). On the three rivers, the geomorphically-effective 2- to 10-year recurrence interval peak flows have been reduced by 20 to 30 percent, the annual sediment loads have been reduced by 30 to 90 percent and channel widths have been reduced by 15 to 60 percent. Flow releases from the dams to meet downstream interstate compact delivery, irrigation and municipal requirements have increased the magnitude of the mid-range (50 percent exceedence) and base flows (90 percent exceedence) by 14 to 40 percent. Once established, even high magnitude dam releases are incapable of generating high enough shear stresses to remove the non-native plants. Restoration of native vegetation species along riparian corridors on the water-short Middle Rio Grande in New Mexico has been achieved by mechanical removal followed by burning of non-natives, lowering of geomorphic surfaces to establish more native species-suited hydro-botanical regimes and herbicide application. To-date, hydrologic reconnection appears to have been the most successful, but also the most costly, technique.

TAMARISK IN THE NEWS: RECENT DEVELOPMENTS THAT IMPACT LAND MANAGEMENT DECISIONS. Rebecca Carlson, Executive Director, Tamarisk Coalition, Grand Junction, CO, rcarlson@tamariskcoalition.org.

Tamarisk, a non-native woody plant species, is considered invasive to riparian systems in the west. Tamarisk infestations can impact riparian systems in many ways. There are two complex issues involving tamarisk that have recently made headlines. One, regarding the use of the tamarisk leaf beetle as biological control, the other, a report on the predicted water use and wildlife impacts by tamarisk. The information surrounding both of these issues is important for land managers to understand in order to make decisions on the management of their river systems. In order to provide a broad perspective on the tamarisk leaf beetle situation, this discussion will include a background on tamarisk, a presentation on the current tamarisk leaf beetle distribution across the Colorado Plateau, update on the tamarisk leaf beetle moratorium, and the interaction between the beetle and the endangered southwestern willow flycatcher. The second component of the talk will focus on tamarisk water use based on two reports published by the USGS and the Seven Colorado River Basin States.

MORPHOLOGICAL AND GENETIC TAXONOMIC ANALYSIS OF NATIVE AND NONNATIVE WATERMILFOIL IN RESERVOIRS OF THE LOWER CLARK FORK RIVER SYSTEM. John D. Madsen[1], Joshua C. Cheshier[1], Vipaporn Phuntumart[2], Ryan Thum[3], and Mark Welch[4]. [1]Geosystems Research Institute, Mississippi State University, Mississippi State, MS, [2]Department of Biological Sciences, Bowling Green State University, Bowling Green, KY, [3]Annis Water Resources Institute, Grand Valley State University, Grand Rapids, MI, [4]Department of Biological Sciences, Mississippi State University, Mississippi State, MS, jmadsen@gri.msstate.edu.

Eurasian watermilfoil (*Myriophyllum spicatum* L.) was introduced to the Lower Clark Fork River system late in the decade of 2000, although it has been lower in the Pend Oreille River system for some time beforehand. The Lower Clark Fork River reservoirs (Thompson Falls, Noxon Rapids, Cabinet Gorge, and Pend Oreille Lakes, respectively, from upstream to downstream) have several native watermilfoil species, predominantly northern watermilfoil (*Myriophyllum sibiricum*). In 2008, we collected Eurasian watermilfoil and northern watermilfoil samples from six sites in each of the four reservoirs of the Lower Clark Fork River (only *M. sibiricum* was collected in Thompson Falls Reservoir, which did not have *M. spicatum*). We evaluated key morphological parameters on all specimens, including internode length, leaf length, leaflet length, number of leaflets per leaf, and stem thickness from six internodes per stem. Three independent laboratories performed three separate genetic analyses on all 42 specimens. Morphologically, reliable indicators between Eurasian watermilfoil versus northern watermilfoil were flattened (EWM) versus rounded (NM) apical meristem, flattened (EWM) versus rounded (NM) leaf tip, and more than 12 leaflet pairs (EWM) versus fewer than 12 leaflet pairs (NM). Genetic analysis from all three laboratories confirmed that morphological factors correctly identified the watermilfoil species. Also, genetic analysis did not indicate any evidence of hybridization of Eurasian watermilfoil with northern watermilfoil or any other native watermilfoil species.

SENSITIVITY OF NATIVE AQUATIC PLANT SPECIES TO IMAZAMOX (CLEARCAST™) AND PENOXSULAM (GALLEON™). John D. Madsen, Ryan M. Wersal, and Cheryl McLaurin. Geosystems Research Institute, Mississippi State University, Mississippi State, MS 39762-9627, jmadsen@gri.msstate.edu.

The objectives of this study were to determine the dose response of selected submersed and emergent native species to both imazamox (Clearcast™) and penoxsulam (Galleon™); and to evaluate exposure time response to imazamox. Studies were conducted in a mesocosm facility for 12 weeks beginning in June 2010, and conducted as completely randomized designs in 300 gallon tanks. Emergent plants were arrowhead (*Sagittaria latifolia*.), bulrush (*Scirpus acutus*), and white waterlily (*Nymphaea odorata*). The native submersed species were coontail (*Ceratophyllum demersum*), sago pondweed (*Stuckenia pectinata*), vallisneria (*Vallisneria americana*), elodea (*Elodea canadensis*), and American pondweed (*Potamogeton nodosus*); and Eurasian watermilfoil (*Myriophyllum spicatum*) to document invasive species response. Imazamox was applied at 200, 100, 50, and 25 parts per billion (ppb) for 1, 3, or 7 days. Penoxsulam was applied to the water column at 3, 6, and 12 ppb as a static exposure for 60 days. At 12 weeks after treatment (WAT), submersed plants were largely unaffected by imazamox across concentration and exposure times, with the exception of elodea. Arrowhead and bulrush were not affected 12 WAT with imazamox, but white waterlily was reduced at the maximum rate and exposure time with imazamox. Most native submersed plants were unaffected by penoxsulam exposure. Although reductions in biomass were observed for elodea, the plants were not chlorotic or necrotic; biomass reductions were due to the growth regulating effect of low doses of imazamox and penoxsulam. Floating and emergent plants were not affected by penoxsulam at the concentrations tested.

AQUATIC HERBICIDE TRIALS FOR SELECTIVE CONTROL OF EURASIAN WATERMILFOIL IN NOXON RAPIDS RESERVOIR. Kurt D. Getsinger[1], John D. Madsen[2], Ryan M. Wersal[2], John G. Skogerboe[1], Justin Nawrocki[3], and Rob J. Richardson[3]
[1]US Army Engineer Research and Development Center, Vicksburg, MS; [2]Geosystems Research Institute, Mississippi State University, Mississippi State, MS; [3]Crop Science Department, North Carolina State University, Raleigh, NC, jmadsen@gri.msstate.edu.

While management of invasive submersed aquatic plants in quiescent water is now generally predictable and consistent, managing these species in moving waters continues to present a challenge. We developed a study on Noxon Rapids Reservoir near Thompson Falls, MT, to selectively manage Eurasian watermilfoil and curlyleaf pondweed in a run of the river reservoir environment. Noxon Rapids Reservoir has seasonal and daily fluctuating flow rates dependent upon water discharge patterns related to hydropower production. Eurasian watermilfoil was found in 13% of the reservoir's littoral zone, or 323 acres, in 2009. Herbicide treatments were made with combinations of endothall and triclopyr in two plots (plots 1 and 3, 20.2 acres and 18.9 acres, respectively), with two plots (plots 2 and 4 – acres?) as untreated reference plots. Submersed plant communities were surveyed in all plots by the point intercept method before treatment, five and 52 wk after treatment (WAT) using from 30 to 38 points per plot. Dye and herbicide half lives were 33 h in plot 1 and16 h in plot 3. In plot 1, Eurasian watermilfoil frequency was 66% before treatment, 8% by 5 WAT, and 14% by 52 WAT, yielding an80% reduction. In plot 3, Eurasian watermilfoil frequency was 50% before treatment, 10% by 5 WAT and 3% by 52 WAT, for a 94% reduction by one year after treatment. Native plants decreased slightly in plot 1 by 5 WAT and increased in plot 1 by 52 WAT, while post-treatment effects were less at both 5 and 52 WAT in plot 3. While some native plant injury was measured in the year of treatment, by 52 WAT native plant diversity and frequency increased, and treatments were effective in reducing Eurasian watermilfoil distribution.

CLIPPER HERBICIDE: A NEW TOOL FOR AQUATIC WEED MANAGEMENT. Todd Mayhew, Field Market Development Manager, West,Valent Professional Products, 1143 N. Abilene Drive, Gilbert, AZ 85233, tmayh@valent.com.

Weed management is an issue for most bodies of water. Over the years, few new active ingredients for weed management have been introduced in the aquatics market, leaving applicators few innovative weed control options. Clipper Aquatic Herbicide, which contains the active ingredient Flumioxazin, is a new product being developed by Valent U.S.A. Corporation for use in aquatics. Clipper has shown to be a valuable tool to manage weeds in water bodies and provides options to control several aggressive weeds such as hydrilla (*Hydrilla verticillata*), cabomba (*Cabomba caroliniana*), watermeal (*Wolffia sp*.), duckweed (*Lemna* sp.), water lettuce (*Pistia stratiotes*), giant salvinia (*Salvinia molesta*) and others. Due to the recent increase in reports of herbicide resistant weeds, aquatic applicators are looking for alternative weed control programs and classes of chemistry/modes of action. Experimental Use Permit (EUP) trials were established in 2007, 2008 and 2009 at several locations in the US to evaluate the potential use of Clipper as an aquatic herbicide. The objective of these trials was to evaluate the performance of Clipper applications to ponds that contained several difficult to manage aquatic weeds previously mentioned and filamentous algae. Aquatic weeds often have tremendous reproductive capabilities, thus implementation of control practices, which includes the use of a more effective products is critical in preventing widespread infestations. Data taken from these trials confirmed Clipper is an effective management options for controlling aquatic weeds.

TWO NEW TOOLS FOR DEALING WITH EXCESSIVE PLANKTONIC ALGAE BLOOMS. Terry McNabb, Aquatechnex, LLC, PO Box 30824, Bellingham, WA 98228, tmcnabb@aquatechnex.com.

As our nations lakes age, eutrophication is increasingly a major problem facing aquatic plant managers. The addition of key nutrients such as phosphorus algae species tend to thrive and as their populations increase they shade out macrophyte growth. Where cyanobacteria species dominate, these species pose a health threat to water users as well. Aquatechnex has for the past year been working with two new tools to assist lake managers in dealing with significant algae bloom conditions. Blue Water Satellite is a remote sensing system we have been using to detect, monitor and map cyanobacteria, chlorophyll a and phosphorus levels in lakes and watersheds. This technology replaces grab samples and uses LANDSAT imagery with proprietary image processing technologies to map these constituents. Each lake is sampled 5 times per surface acre. The resulting maps show concentrations present. We have used this technology to help agencies comply with total daily maximum load (TMDL) monitoring and to do historical analysis going back a number of years. Multiple lakes can be imaged using this system to limit costs, 1,000 acres can be sampled (5,000 data points) twice monthly for approximately $2k. A second tool is Phoslock, a product developed by the Australian government to remove and sequester phosphorus from lake water and sediments. This technology relies on pre treatment sampling to determine effective dosing rates. By removing phosphorus from the water column, this limits the carrying capacity of the lake to produce problem algae growth. A number of case study examples will be presented for each tool. These technologies have allowed us to provide cost effective monitoring and reset the nutrient loads in lakes we manage.

A REVIEW OF DEMONSTRATION AND RESEARCH PROJECT ACTIVITIES TO EVALUATE A LITTORAL ZONE TREATMENT TECHNOLOGY FOR THE CONTROL OF SUBMERGED AQUATIC VEGETATION. Thomas J. McNabb[1] and Thomas G. Moorhouse[2], Clean Lakes, Inc., PO Box 3548, Coeur d'Alene, Idaho, 83816, www.cleanlake.com, [1]tmcnabb@cleanlake.com, [2]tmoorhouse@cleanlake.com.

Demonstration and research investigation activities began in 2008 in the Pend Oreille River system in Northern Idaho to evaluate aquatic herbicide efficacy using a Littoral Zone Treatment Technology in run of the river systems. In 2008, research investigations were conducted in the Pend Oreille Lake and River system in Idaho, followed by investigations further upstream in the Clark Fork River system of Montana in 2009-2010. Liquid herbicide formulations of diquat, endothall, and triclopyr were evaluated in nineteen (19) plots, and water exchange evaluations to determine Contact and Exposure Time (CET) relationships were performed in a total of twenty three (23) plots using Rhodamine RWT dye. The 2008-2010 trials were designed to evaluate control efficacy of the various herbicide formulations on Eurasian watermilfoil and curlyleaf pondweed. In addition, applications of endothall were performed in two Florida locations in 2010 (Lake Seminole and Lake Underhill), to evaluate the technology for the control of hydrilla, and 2,4-D applications were performed in Long Lake Wisconsin for the control of Eurasian watermilfoil. A review of the findings will be presented.

MODELS FOR PREDICTING MACROPHYTE DISTRIBUTIONS IN A SHALLOW MESOTROPHIC LAKE. Rich Miller and Mark Sytsma, Portland State University Center for Lakes and Reservoirs, Environmental Sciences and Resources Department, PO Box 751, Portland, OR 97207, richm@pdx.edu.

Water quality improvements due to lake and watershed management activities can result in unintended consequences for macrophyte communities. For instance, increased water clarity or decreased water levels can increase lakes areas suitable for macrophyte growth. We modeled the impacts of water clarity and level changes on the macrophyte community in Siltcoos Lake, Oregon: a shallow, mesotrophic, water level regulated lake. Predictor variables used in the models included depth, slope, water clarity, and fetch. Response variables included species presence, absence, wet-weight biomass and canopy height. Model predictions indicate that small changes in water clarity or water level would have a large impact on the macrophyte community in the lake. For example, species presence-absence models indicate that a one meter drop in average water levels would increase suitable macrophyte habitat from 50 to 96% of the lake's surface area.

DISSIPATION OF TRICLOPYR (RENOVATE OTF) AND RHODAMINE WT DYE UNDER FLOWING WATER CONDITIONS. Toni Pennington[1a], Harry Gibbons[1b], Mark Heilman[2], Scott Shuler[2], and Terry McNabb[3]. [1a]Tetra Tech, Inc., 1020 SW Taylor, Suite 530, Portland, OR 97202, toni.pennington@tetratech.com; [1b]Tetra Tech, Inc., 1420 SW Fifth Ave., Suite 550, Seattle, WA, 98101; [2]SePRO Inc., 11550 North Meridian St., Suite 600, Carmel, IN 46032; [3]AquaTechnex, PO Box 30824, Bellingham, WA 98228.

Managing invasive aquatic plants in areas of high water exchange such as rivers is challenging due to the reduced contact and exposure time (CET) between herbicides and plants. Granular formulations of aquatic herbicides allow for controlled release of the active ingredient and prolonged CET. Triclopyr is applied as liquid or granular formulations to selectively control broadleaf weeds, including Eurasian watermilfoil (*Myriophyllum spicatum*). We used acoustic Doppler current profiler (ADCP) technology to measure water velocity during concurrent applications of the granular formulation of triclopyr and Rhodamine WT dye in two 10-acre plots in the Pend Oreille River, ID. Velocity and concentrations of dye and triclopyr were measured 1, 4, 8, 12, 16, 24, 48, and 72 hours after treatment (HAT) from the top, middle, and bottom of the water column from 12 points within each plot. Empirical relationships were development to correlate herbicide delivery system (i.e., granular versus liquid [Rhodamine dye]) and water velocity to improve efficacy in controlling Eurasian watermilfoil under flowing water conditions. At the time of application, average water velocity in Plot 1 (located nearer the main channel) was 0.47 ft/s and 0.34 ft/s in Plot 2 (located slightly off-channel). Triclopyr concentration was highest near the bottom and, within the first 12 HAT, substantially higher in Plot 2 (mean maximum = 1.57 ppm) compared to Plot 1 (mean maximum = 0.51 ppm). Rhodamine dye was essentially removed from both plots within 24 HAT. Preliminary analyses indicate that measuring water velocity and direction may be used to predict CET relationships under flowing water conditions.

FIELD AND LABORATORY EVALUATION OF BISPYRIBAC-SODIUM (TRADEWIND®) UNDER THE EXPERIMENTAL USE PERMIT (EUP) FOR AQUATIC PLANT MANAGEMENT. James F. Petta, Joseph R. Chamberlin, Michael S. Riffle, Todd J. Mayhew, Jason C, Fausey, and Jill M.Calabro; Valent USA Corporation, Walnut Creek, CA 94596, jim.petta@valent.com.

Bispyribac-sodium, marketed under the tradename, Tradewind, has been tested since 2005 for use in aquatic plant management primarily in laboratory locations. In 2009 and 2010, Tradewind was able to be tested in pond situations under an Experimental Use Permit issued by the US Environmental Protection Agency. This paper will review the results of this field testing and its application to aquatic plant management programs under the recently approved Section 3 registration.

NUTRIENT FLUCTUATIONS INDUCED THROUGH MANIPULATION OF AERATION IN A SOUTH FLORIDA RETENTION POND. Amanda Quillen, Ph.D., Limnologist, Vertex Water Features, 2100 NW 33rd St., Pompano Beach, FL 33069, amanda@vertexwaterfeatures.com.

With the goal of understanding how aeration may help control algae growth and otherwise benefit a lake, several water quality parameters were tracked following both startup and shutdown of an aeration system in a 13-acre (5-hectare) retention pond. The existing system was turned off in the early spring of 2009, and the lake stratified normally as summer progressed. The system was restarted in June, after the lake had fully stratified. Water column biological oxygen demand (BOD), ammonia and phosphates declined, which may be attributed to the measured increase in oxidation-reduction potential (ORP) at the sediment-water interface resulting from increasing dissolved oxygen. The system was turned off again in April 2010, and nutrients at the sediment-water interface began increasing immediately as the lake restratified. Considerations before installing aeration, especially in reference to salinity gradients, application of bubble aeration to lakes with cold-water fisheries, and other Vertex investigations will also be discussed.

THE R.E.D. FOR COPPER PRODUCTS AND 2,4-D BEE RESULTING IN LABEL CHANGES FOR 2012: DISCUSSION RELATED TO APPLICATION SCIENCE. William Ratajczyk, Applied Biochemists,W175 N1116. billratajczyk@appliedb3 Stonewood Drive, Suite 234, Germantown, WI, billratajczyk@appliedbiochemists.com.

This presentation will review the Reregistration Eligibility Decisions for copper products and 2,4-D, specifically the BEE formulation, as they pertain to lake and pond management professionals in the Midwest. Data call in overview of process will be followed by specific label language including rate chart review. Specific wording will be discussed on how application patterns may be affected, posting and regulation; including relevance to the pending NPDES federal permit administered by western states.

EMERGING USE PATTERNS FOR CLEARCAST AQUATIC HERBICIDE IN THE WESTERN US. Scott Shuler, Mark Heilman, Shaun Hyde, and Dave Blodget; SePRO Corporation, 11550 North Meridian, Street, Suite 600, Carmel, IN 46032, scotts@sepro.com.

Clearcast (a.i. imazamox) herbicide is labeled for in-water, foliar and pre-emergent application to control variety of noxious aquatic and riparian weeds in and around aquatic and non-cropland sites. Recent laboratory studies and operational treatment programs have documented emerging use patterns with Clearcast. Clearcast provides effective control of curly leaf pondweed (*Potamogeton crispus*) with short exposure requirements typical of targeted, partial littoral treatments. Salt cedar (*Tamarix spp.)* seedlings can be controlled with greater selectivity hence providing improvements in habitat restoration programs. Common reed (*Phragmites australis*) and other emergent invasive weed species may be controlled with greater selectivity compared with current methodologies. Pre-emergent use of Clearcast in dewatered irrigation canals is providing control of both sago pondweed (*Stuckenia pectinata*) and horned pondweed (*Zannichellia palustris*). Finally, operational evaluations conducted in 2010 suggest pre-emergent applications of Clearcast can provide a new solution for weed control on canal ditch-banks. These and other emerging use patterns with Clearcast will provide new solutions to the unmet needs of weed managers in the Western U.S.

HERBICIDE ABSORPTION AND TRANSLOCATION BY EURASIAN WATERMILFOIL AND HYDRILLA. Joseph D. Vassios[1], Scott J. Nissen[1], and Tyler Koschnick[2]. [1]Colorado State University – Department of Bioagricultural Sciences and Pest Management, 1179 Campus Delivery, Fort Collins, CO 80523, jvassios@rams.colostate.edu; [2]SePro Corporation, Carmel, IN.

The invasive species Eurasian watermilfoil (*Myriophyllum spicatum*) (EWM) and hydrilla (*Hydrilla verticillata*) are submersed species that are found across much of the United States. Both are perennial, but exhibit an annual growth habit, forming dense mats that can impact water quality. An ongoing series of experiments have been examining herbicide absorption and translocation in these species using radiolabeled herbicides. Herbicides evaluated include fluridone, penoxsulam, and triclopyr. For the first experiments, translocation to the roots was examined following herbicide exposure in the water column. Plants were treated with 10 ppb fluridone, 10 ppb penoxsulam, or 1 ppm triclopyr plus radiolabeled herbicide. Plants were then harvested over a 192-hour time course. Experiments were also conducted to examine translocation to shoots following root exposure to the same three herbicides. Plants each received 200,000 dpm of radiolabeled herbicide, and were harvested over a 192-hour time course. Upon completion of all experiments, plants were harvested, dried, oxidized, and radioactivity quantified using liquid scintillation spectroscopy. Overall, herbicide absorption by EWM was two to four times greater than hydrilla. Shoot to root translocation of all herbicides was relatively limited with 97% and 87% or greater remaining in the shoots for EWM and hydrilla, respectively. For both species, triclopyr showed the greatest absorption over the 192-hour time course. Following root exposure, fluridone absorption was greatest, but translocation to shoots was greater for penoxsulam and triclopyr (approximately 20%).

EVALUATION OF ENDOTHALL FOR CONTROL OF EURASIAN WATERMILFOIL (*MYRIOPHYLLUM SPICATUM*) IN IRRIGATION CANALS (POSTER).
Joseph D. Vassios[1], Scott J. Nissen[1], and Cody Gray[2]. [1]Colorado State University – Department of Bioagricultural Sciences and Pest Management, 1179 Campus Delivery, Fort Collins, CO 80523, jvassios@rams.colostate.edu; [2]United Phosphorus, Inc., Peyton, CO.

Although Eurasian watermilfoil (*Myriophyllum spicatum*) (EWM) is commonly found in lakes and ponds, it can prove especially difficult to control in flowing water systems. Endothall is labeled for EWM control, and in 2010 two endothall formulations, dipotassium salt (DPSE) and the mono(N,N-dimethlalkylamine) salt (MSE), were approved for use in irrigation canals. While DPSE will only provide control of aquatic weeds, MSE can also provide algae control. While these herbicides have been shown to provide good control of sago pondweed (*Stuckenia pectinata*) in flowing water systems, little work has been done to examine EWM efficacy in these situations. During summer 2010, two field-scale demonstration studies were conducted. The first site was the Leggett Canal near Boulder, CO, which contained EWM, sago pondweed, and elodea (*Elodea canadensis*). The second site was the Minnequa Canal that originates outside of Florence, CO, which contained only EWM. Herbicides combinations were to the Leggett Canal (2.75 ppm DPSE + 0.25 ppm MSE for 8 hours) and the Minnequa Canal (1.8 ppm DPSE + 0.2 ppm MSE for 12 hours). Water samples were taken during treatment to confirm application rates. Following herbicide applications, both canals were monitored with visual ratings and photographs over 28 DAT. EWM control was >80% at both sites and nearly 100% control of sago pondweed and elodea was observed at the Leggett Canal. Both sites will continue to be monitored during 2011 to evaluate residual control.

APPLICATOR SAFETY…IT'S A CHOICE. Thia Walker, Extension Specialist – Pesticide Safety Education, Colorado State University – Department of Bioagricultural Sciences and Pest Management, 1177 Campus Delivery, Fort Collins, CO 80523-1177, thia.walker@colostate.edu.

The days of wearing shorts, tennis shoes, and fashionable sunglasses when making aquatic applications should be a thing of the past. Research has shown that chronic (long-term) exposure to any chemical may have detrimental side-effects. This 30-minute presentation will uncover how an applicator can improve their safety based on choices they make before, during, and after the application. While labels will always direct the pesticide applicator to the appropriate choice of personal protection equipment (PPE), improved safety is now a choice an applicator can make by selecting the best formulation that will work for the target pest and for the safety of the applicator. The presentation will also cover how applicators can improve their safety through pre-application preparations, use of improved application technology, and post-application procedures. This presentation is approved for continuing education credit (1 credit in 'Applicator Safety') for Certified Applicators licensed through the Colorado Department of Agriculture, and may be approved by other states.

AMPHIBIAN EXPOSURE TO AQUATIC HERBICIDES. Amy Yahnke[1a], Christian Grue[1], Marc Hayes[2], Sasha Troiano[1]; [1]University of Washington – Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, Box 355202, University of Washington, Seattle, WA 98195, [1a]aey@u.washington.edu; [2] Washington Department of Fish and Wildlife – Habitat Program, 600 Capitol Way North, Mailstop 43143, Olympia, WA 98501-1091.

A conflict between native amphibians and aquatic weed management in the Pacific Northwest (PNW) is largely unrecognized. The basis for this lack of recognition is that most native stillwater-breeding amphibian species in the PNW move into upland habitats during the summer, when weed-control measures are typically applied in aquatic habitats. However, for aquatic species, such as the Washington State Endangered Oregon spotted frog (*Rana pretiosa*) and the larvae of some salamanders that are present in wetland habitats throughout the summer, aquatic weed management may pose a risk. As a consequence of such management, those species may be vulnerable to herbicide exposure. Though acute toxicity of herbicides used to control aquatic weeds tends to be low, the direct effects of herbicide tank mixes (active ingredient, surfactant, and dye) on Oregon spotted frogs is unexamined. To address this gap, we exposed juvenile

Oregon spotted frogs to mixtures of the herbicide Imazapyr (Polaris AQ, 28.7 % AI), Agri-Dex surfactant, and Hi-Light dye in a 96-hour static-renewal test. Concentrations were those associated with low (3.5 liters/hectare) and high (7.0 liters/hectare) volume applications of Polaris AQ to control of reed canarygrass (*Phalaris arundinacea*). Following the exposure, frogs were reared for two months in clean water to identify potential latent effects on growth. Endpoints evaluated included feeding behavior during the exposure and grow-out, growth, and hepatosomatic index. We recorded no mortalities. Additionally, we found no significant differences in either growth or liver:body mass ratios between the herbicide-exposed and control frogs. Behavioral results will be presented.

Notes