The Western Aquatic Plant Management Society

Abstracts
19th Annual Meeting
Bozeman, Montana
March 2000

Field Evaluation of Degree-Day Based Equations for Predicting Sprouting of Hydrilla Turions and Tubers. David Spencer* and Gregory Ksander. USDA-ARS Exotic and Invasive Weed Research Unit, Weed Science, Davis, CA.

Sediment temperatures at three depths and two sites in Clear Lake, California were recorded between August 1997 and August 1999. Water temperatures ca 0.3 m above the sediment surface were recorded at five additional sites from March 1998 to August 1999. Sediment temperature data at one site were used to calculate accumulated degree-days. Sprouting of monoecious hydrilla (*Hydrilla verticillata* L. f. Royle) turions and tubers was estimated using previously developed equations relating sprouting to accumulated degree-days. There was good agreement between sprouting predictions and field data on the presence of hydrilla in weed rake casts. Small differences among water temperatures at the five sites and strong relationships between water and sediment temperatures indicate that sprouting should be similar in hydrilla beds found along the western and southern shores of upper Clear Lake. These results also indicate optimal timing for surveys of hydrilla abundance and the application of hydrilla management techniques.

Giant Salvinia Integrated Management in Southern California Irrigation Drains. Scott M. Stenquist* U.S Fish & Wildlife, Portland, OR and Nate S. Dechortez. California Food and Agriculture, Sacramento, CA.

Giant salvinia, *Salvinia molesta*, was first located on the Colorado River system on Aug. 4, 1999. The plant also occurred on the Side/Outfall Irrigation Drains near Blythe, CA. California Department of Food and Agriculture and the U.S. Fish and Wildlife Service, Portland, OR developed a partnership for giant salvinia management. The State provided technical assistance to irrigation districts; the Service provided $10K in funding for area-wide monitoring and surveillance by remote sensing, ground inspection, and geographic inspection of aquatic areas. Management techniques used were: chemical management (diquat) and mechanical removal.

Improved Control of Hydrilla Using Aquathol K in Combination with Other Herbicides and Copper. Toni G. Pennington[1] and John G. Skogerboe[2], 1. Aquatic Ecosystem Restoration Foundation, Flint, MI 48503. 2. US Army Engineer Research and Development Center, Lewisville Aquatic Ecosystem Research Facility, Lewisville, TX.

A greenhouse study was conducted to evaluate combinations of herbicides and copper for improved control of hydrilla (*Hydrilla verticillata* (L.f.) Royle). Varying concentrations of Aquathol K (dipotassium salt of endothall) used singularly and in combination with Hydrothol 191 (dimethylalkylamine salt of endothall), Cutrine (chelated copper), or Reward (diquat) were applied to hydrilla grown in 50-L aquaria. Herbicide/copper combinations were applied using a 24-hour dissipation half-life and shoot biomass was used to determine efficacy at 3 and 6 weeks after treatment (WAT). Combinations of Aquathol K (1 mg/L endothall ai) + Cutrine (0.5 mg/L copper ai) and Aquathol K (1 mg/L endothall ai) + Reward (0.5 mg/L diquat ai) provided 95 to 100% control, similar to the maximum rate of Aquathol K (3.0 mg/L endothall ai) alone. Field

demonstrations conducted on Toledo Bend Reservoir, Louisiana, evaluated two-hectare plots treated with Aquathol K applied alone and in combinations with Cutrine, Hydrothol 191, or Reward. Water quality data and shoot biomass were collected pretreatment and 3, 8, and 12 WAT. Treatment combinations of Aquathol K (1.0 mg/L endothall ai) + Cutrine (0.5 mg/L copper ai) and Aquathol K (1.5 mg/L endothall ai) + Reward (1 gal/acre 0.25 mg/L diquat ai) resulted in greater than 90% control of hydrilla. Dissolved oxygen concentrations increased in treated plots following herbicide application compared to an untreated reference plot.

Giant salvinia, Salvinia molesta, A Threat To Southwestern Waters, Bob Pitman, FWS, Albuquerque, NM.

In August, 1999, giant salvinia was found in the Lower Colorado River by biologists from the Imperil National Wildlife Refuge, Martinez Lake, Arizona. This fast growing aquatic fern, native to South America waters, has been introduced around the world where it has caused serious economic impact and ecological damage. Under ideal conditions this invasive species forms dense surface mats which shade and crowd out native plants. These surface mats prohibit fishing, boating and other water uses. Oxygen levels are reduced to zero in waters where the entire surface is covered.

It is an aquatic nuisance species with a world-wide reputation, all bad. Giant salvinia is popularly used in aqua-gardens around the country. Widely distributed through nurseries and used in backyard aqua-gardens, salvinia has easily escaped into streams, lakes, ponds and irrigation systems. It can readily be spread through water user activities such as boating and angling. It is also suspected that once established in ponds or open waters it may be spread by; turtles, fur bearing animals like, muskrats or nutria and even cattle, as well as ducks and other aquatic related birds to new waters. Giant salvinia exhibits all the worst characteristics of an aquatic nuisance species. It is very hardy and can survive long periods of drying, easily spread and reproduces vegetatively needing only a small plant part to start another dense growth. Perhaps worst of all, people find the plant appealing and desirable for aquariums or aqua-gardens.

When giant salvinia was collected on the Lower Colorado River (LCR) a Task Force was quickly formed to identify the source. The source was found in the Palo Verde Irrigation District (PVID) drain near Blythe, CA, several river miles upstream from the Imperial NWR. The LCR Task Force includes; several federal and state agencies, tribes, irrigation districts, water quality boards, food and agriculture departments, and Mexico. A Scientific Advisory Panel was formed to provide guidance for the Task Force. They estimated that 2 million plant parts, or buds, were flowing out of the PVID drain and into the LCR each day. These plants were distributed further through the irrigation systems collecting water at Imperial Dam near Yuma, Arizona. Via the All American Canal giant salvinia has spread to the Imperial Valley of California. Surveys for salvinia were conducted in Mexico January, 2000. These surveys were negative but will continue on a regular schedule.

The Task Force proposes to control this invasive aquatic species using herbicides. This work was started in the PVID drain by the California Department of Food & Agriculture in December, 1999, and will continue until eradicated. The prospect of eliminating giant salvinia in the LCR is unlikely. Herbicides will be used to keep infestations low combined with outreach asking assistance to help limit the spread of salvinia out of the Colorado River to other waters in the southwest. Irrigation districts, with closed systems, will rely on non-native, sterile, grass carp for control. Once approved for release, the biological control weevil, *Cyrtobagous salviniae*, may provide long term control.

Optimizing Sonar* Treatments with FasTEST*. Alicia Staddon, Carmel, IN.

The utilization of the FasTEST technology has enabled the aquatic industry to gain important knowledge and understanding concerning the use of the aquatic herbicide, Sonar. FasTEST is an ELISA method and delivers quick, reliable results. SePRO has used this monitoring tool to enhance Sonar treatments for over four years. Case studies will be presented demonstrating opportunities to optimize a wide array of Sonar treatments through its use.

Hydrilla Eradication in California. Nate Dechoretz and Ross O'Connell*, California Department of Food and Agriculture, Sacramento, CA.

Since 1976, the California Department of Food and Agriculture has maintained an aggressive program to prevent the establishment and widespread distribution of hydrilla (*Hydrilla verticillata*) in California. This program has been successful because of the cooperative effort among federal, state, county and private stakeholders. Eradication efforts are currently underway in Shasta, Lake, Yuba, Imperial, Mariposa, Madera, Calaveras and Tulare counties. The most recent infestation under eradication is in Yuba County and encompasses 10 small ponds and three miles of an irrigation district. The largest project is located in Clear Lake, a 43,000 acre lake approximately 120 miles north of Sacramento. Eradication activities include use of triploid grass carp in Imperial County in conjunction with physical or mechanical removal. Other projects utilize aquatic herbicides such as Sonar™ and/or Komeen™ in conjunction with physical and mechanical removal. Herbicides are generally applied at maximum label rate. However, number of applications and portion of the maximum label rate varies depending on the infested site and water conditions.

An Update on the Eradication of Hydrilla in the Imperial Valley. Michael Mizumoto. Imperial, CA.

The infestation of hydrilla in the Imperial Valley has been reduced from, at one time, encompassing over 600 miles of irrigation canals, reservoirs, drains, private ponds and deliveries to less than 0.75 miles in a single drain. While triploid grass carp remain the main weapon against hydrilla, and integrated method of fish, mechanical, and manual methods are being used to eliminate the final <1% of the hydrilla infestation.

In 1999, hydrilla was found in one canal, one private pond, 2 drains, and I delivery. Triploid grass carp were stocked into the pond and a mud pump (mechanical) and manual methods were used to remove hydrilla at the other sites. To maintain efforts in the rest of the Valley, a total of 13,908 triploid grass carp were stocked into Imperial Valley waters and as of February 29, 2000, hydrilla has been eliminated from all sites except one drain.

Use of Remote Sensing and Mapping Technologies to Manage Aquatic Weed Infestations. Terry McNabb. ReMetrix, Tumwater, WA .

Invasive aquatic and wetland plant species are having a major ecological impact on waters of the Western United States. One of the major problems that face water managers is documenting the extent of problem vegetation, the potential threat to the resource, developing programs to remove these plants and tracking the results of treatment options implemented. There are a number of new remote sensing and mapping technologies that are applicable to solving these problems. This paper will present case studies of how these technologies have been applied to assessing and managing infestations of Eurasian Milfoil, spartina and hydrilla. The paper will also

introduce new spaced based image collection and processing technologies that provide one meter resolution.

Updating Washington State's Aquatic Plant Management 1992 Supplemental Environmental Impact Statement (SEIS). Kathleen Emmett. Washington Department of Ecology, Olympia, WA.

The Department of Ecology permits the use of aquatic herbicides to manage nuisance and noxious aquatic plant species and algae under the provisions of the State Environmental Policy Act (SEPA). In 1980, the Department issued the Aquatic Plant Management Program Final Environmental Impact Statement, and in 1992, updated and supplemented the EIS (now the SEIS). The SEIS recommends an integrated approach to aquatic plant management and allows the use of copper, endothall, fluridone and glyphosate to control various types of aquatic plants. The Department uses this document to approve, deny, or add conditions to permits related to aquatic plant management. Currently, the Department is expanding the SEIS, to make it more responsive for the application of new, commercially available herbicides, and to evaluate their use with the most recent research available. Risk assessments evaluating six chemicals are underway. Application conditions that minimize or mitigate adverse human health and environmental impacts will be explored.

Update on the Activities of the Western Regional Panel on Aquatic Nuisance Species. Mark D. Sytsma, Portland State University, Portland OR .

The Western Regional Panel (WRP) on Aquatic Nuisance Species was formed as a result of the National Invasive Species Act. The WRP includes representatives from 20 western states and territories, four provinces, six federal agencies, tribes, and other interests. The WRP advises the National Aquatic Nuisance Species Task Force on priorities for aquatic nuisance species management in the West.

The Work Plan of the WRP includes development of a contact database for aquatic nuisance species management in the West and review of the USGS species database for accuracy. The status of these projects and the benefits of State participation in the WRP will be described.

The Ongoing Battle with the Invaders. Valerie Van Way, California Army Air National Guard, Environmental Programs, Sacramento, CA

Invasive non-native plants (INPs) have charged onto two California National Guard Training Sites, Camp Roberts (46,000 acres) and Camp San Luis Obispo (6,000 acres). This paper discusses the most common riparian invaders, *Arundo* and *Tamarix*, and what installation biologists have done to manage these and other natural resources, including the sensitive Chorro Bog Thistle, and Red-legged Frogs.

Eurasian Watermilfoil Control and Exotic Species Prevention in Seattle's Lake Youngs Reservoir. Rob Zisette. Herrera Environmental Consultants, 2200 Sixth Avenue, Suite 601, Seattle, WA 98121

Lake Youngs is a 283-hectare (700-acre) reservoir that provides drinking water to over one million people in the Seattle metropolitan area. Eurasian watermilfoil (*Myriophyllum spicatum*) was first observed in the reservoir in September 1992. A milfoil control program was initiated in 1993 by installing bottom barrier and hand-pulling plants in the infestation area located adjacent

to the boat launch on the east shore of the reservoir. Hand-pulling efforts continued in 1994 and 1995. A new infestation was detected on the west shore in 1996 that was controlled with a bottom barrier. Milfoil plants have not been detected in the reservoir in the past three years, indicating that the milfoil control program has achieved its goal of eradication without the use of herbicides. A program was also developed for preventing infestations of exotic plant and animal species in Seattle's drinking water reservoirs.

Triploid Grass Carp for Aquatic Weed Control in the Irrigation Operation Facilities on the Columbia Basin Project. Hugh McEachen. Pasco, WA.

In 1992 the State of Washington approved the use of triploid grass carp under a permit system administered through the Washington State Department of Fish and Wildlife. Triploid grass carp were being used in certain warmer waters in irrigation projects in Arizona and California, but little expertise existed in using the vegetation-eating fish in much cooler waters and in irrigation systems which are not operated year round.

Using the grass carp requires an initial investment of screening to ensure the fish are contained within the irrigation system. The screening and containment of the fish are important for successful weed control and to prevent their escape into other waters. Flowing water and cool temperatures requires careful monitoring to adjust fish stocking rates and the timing of introduction to meet the critical aquatic vegetation control requirements of Pacific Northwest irrigation conveyance systems***.***

Biological Control of Purple Loosestrife in the Columbia Basin. Craig Conley. Ephrata, WA.

In the early 1980's the invasive plant purple loosestrife, *Lythrum salicaria*, dominated several thousand acres of wetland habitat associated with drainages and surface water return flows from the Columbia Basin Irrigation Project in central Washington State.

By the late 1980's a state committee developed a coordinated resource plan to control the spread of this invasive plant and begin implementing a strategy to bring the spread under control. An additional tool, biological control, was added in 1992 when three insects species were released into the loosestrife infestation on the Columbia Basin wetlands.

The initial impacts of these insect species, *Galerucella calmeriensis*, *Galerucella pusilla*, and *Hylobius transversovittatus* were minimal at best and difficult to document. However, in 1997 the *Galerucella* species began to make some dramatic impacts at the release sites. Numbers of the *Galerucella* have continued to increase and the potential for control looks promising.

Control of Submerged Aquatic Vegetation in Irrigation Conveyance Systems With Clearigate Aquatic Herbicide. Paul Westcott and Brian Lind Applied Biochemists-Surface Water Division, Laporte Water Technologies, Inc., Germantown, WI

Submerged aquatic vegetation can adversely affect the delivery of water through irrigation canals, ditches, and laterals. There are a limited number of products labeled for controlling aquatic growth in moving water systems and some of these present unacceptable water use restrictions or potential hazards to the applicator. Clearigate is a non-restricted use, broad-spectrum aquatic herbicide/algaecide. Clearigate is labeled for use in crop and non-crop irrigation conveyance systems, potable water reservoirs, lakes, farm, golf course, industrial, and swimming ponds. Clearigate imposes no water use restrictions during or after application.

Clearigate is a chelated copper formulation containing an emulsified surfactant/penetrant to enhance uptake into plant tissue. Control of Sago Pondweed (*Potamogeton pectinatus*) in irrigation canals can be achieved by applying Clearigate at 1 PPM copper for a contact period of 3 to 4 hours. A variety of application techniques may be employed with Clearigate including metering pumps, gravity drip systems, and conventional spray equipment.

A Review of the White Bluffs Salt Cedar Control Project. Roger Nelson and Ron P. Crockett*, State of Washington Dept. of Fish & Wildlife, Othello, WA, and Monsanto, Vancouver, WA.

Salt Cedar, *Tamarix ramosissima* and *T. parviflora* exists within a relatively small area of south central WA state along the northern banks of the Columbia River. The potential for spread outside the current area exists. Efforts in the mid-1990's to develop a control plan led to the formation of the White Bluffs Salt Cedar Task Force. Through the efforts of the Task Force and funding support from the Washington State Legislature, The Washington State Dept. of Fish & Wildlife initiated a control project using aerial and ground applications of RodeoÒ and ArsenalÒ herbicide mixtures. A total of nearly 500 acres were treated during the period 1998-1999. Ownership has shifted from WA state to U.S Fish & Wildlife in 2000, and it is recommended that control efforts are continued with the new ownership.

Ò Rodeo is a Registered Trademark of Monsanto Co, St. Louis, MO, and Ò Arsenal is a Registered Trademark of American Cyanamid Co, Wayne, N.J.

Chemical Control of Spartina alterniflora - an Evaluation of Herbicides and Surfactants. Kim Patten, Washington State University, Long Beach, WA.

The chemical control program for spartina in Willapa Bay, WA is limited to the use of Rodeo®. Control of spartina using the maximum aerial broadcast rate of 3.75 qt/ac Rodeo has been minimal. Rodeo® applied at the 5% (v/v) rate with 1% R11 (v/v) at the 90 gpa spray volume, however, has been successful and is currently the standard chemical control protocol. This protocol is restricted to hand application from airboats using high pressure sprayers. It has high chemical cost and is limited to treating about 5ac/day/boat.

For the past several years, we evaluated the effect of surfactant and surfactant concentration on the efficacy of Rodeo® for spartina control applied at different rates and spray volumes. Rodeo® applied at high rates (5%) and high spray volumes (80-100 gpa) has good control regardless of surfactant type or concentration. For Rodeo® rates of 2.5% and/or low spray volumes (40 gpa) a 1% Silwet or 2% R11 surfactant rate resulted in the best spartina control. The addition of a 3% (v/v) of pelagonic acid to the surfactant mix usually improved control under marginal spray conditions (low spray volume or Rodeo® rate). Clethodim, fluazifop-P, imazapyr, quizalofop-P were also evaluated for spartina control. Fluazifop-P (3.2 pt/ac) and imazapyr (3 and 6 pt/ac) had the most consistent efficacy. Combinations of Rodeo® (3.7 qt/ac)+ imazapyr (3 or 6 qt/ac) resulted in better control than either material alone. Imazapyr or imazapyr + Rodeo® combinations were effective when applied at low spray volume (6 gpa) using a controlled droplet applicator (CDA), while Rodeo® (3.6 or 7.2 qt/ac) was not.

Winning the War Against Spartina - What Will It Cost and What Will It Take. Kim Patten*, Washington State University, Long Beach, WA and Miranda Wecker, Olympic Natural Resource Center- Marine Program, Forks, WA.

Spartina alterniflora has infested between 10 and 15K acres of tidal mud flats of Willapa Bay, WA. The rate of spread per year has been approximately 10-20% (varies according to location). For the 1997-1999 biennium State and Federal agencies have spent $1,117,000 for the control (kill) of approximately 500 acres of this aquatic weed. This equates to roughly $2.2K control cost per acre and a rate of control of 2.5% per year. To maintain status quo will cost up to $4.5 million/year. To control all the spartina in one year (10 to 15K acres) will require $22 to 33 million. Other than resources, the factors limiting success have been the lack of a cost-effective control programs, regulatory constraints, and third party lawsuits by environmental groups. Research to develop cost-effective chemical controls have been stymied by difficulties to obtain short-term water quality permits, ESA concerns, aquatic registration issues, and a minimal amount of resource invested in research. Advances in biological and mechanical control, however, have been significant. A bio-control program utilizing a leaf hopper will be implemented 2000/2001. The project is politically popular, but research to evaluate risk assessments has being time consuming and costly, and field efficacy is still pending. The Willapa Wildlife Refuge has implemented a successful mechanical control program using an amphibious flail mower (Quality Mower) which mows at one acre/hour. Ultimately, a full complement of control measures (biological, mechanical and chemical) and a significant increases in resources will be need to prevent spartina from causing an ecological disaster in Willapa Bay.

Off-Target Impacts to Eelgrass (Zostera Japonica) from Treatments to Control Smooth Cordgrass (Spartina Alterniflora) in Willapa Bay, Washington. Walter W. Major III*, Christian E. Grue, James M. Grassley, and Loveday Conquest. Washington Cooperative Fish and Wildlife Research Unit and School of Fisheries, University of Washington, Seattle, WA.

We studied impacts to eelgrass of four methods to control smooth cordgrass (Spartina) at four sites in Willapa Bay, Washington. Clonal infestations were treated by mowing or hand spray of Rodeo (42.1 L ha-1) or a combination of these two methods. Aerial application (8.77 L ha-1) to Spartina meadow was also investigated. Impacts to eelgrass were evaluated at 1 and 5 m from treated clones and 1, 3 and 10 m from the meadows edge by measuring eelgrass shoot densities and percent cover pretreatment and 1 yr post treatment. Results based on stem densities indicate methods utilized to control clone sized infestations of Spartina did not differ significantly in their off-target impacts. Impacts based on changes in percent cover were more varied between sites, but were similar between sampling locations within sites. Aerial application of the herbicide resulted in no significant effects on eelgrass. The single most deleterious phenomena to the recurring annual eelgrass is the spread of spartina itself. Control measures should be based on efficacy and logistical constraints and not off-target impacts to eelgrass.

Sonar Use in Western States to Manage Exotic Plants: Hydrilla, Eurasian Watermilfoil, and Egeria. Tyler Koschnick. SePro Co., Roseville, Ca.

Several invasive noxious weeds are currently causing severe problems in lakes throughout the western states. Sonar* has been used extensively over the past to manage some of these exotic plants such as hydrilla, Eurasian watermilfoil, and most recently Egeria. It is relatively unique among aquatic herbicides due to its mode of action and that it allows for the ability to manage vegetation on a large scale basis in a variety of environments including ponds, rivers, lakes, etc. Although Sonar has been proven to control several of these species, some challenging systems and treatment objectives are requiring the development of optimal timing, rates, and treatment strategies to expand the uses of Sonar. The objectives of this paper are to present data and discuss recent developments with Sonar use to control and sometimes eradicate exotic species.

An Update on Montana's Purple Loosestrife Weed Control Program. Barbra Mullin. Montana Department of Agriculture. Helena, MT.

Purple Loosestrife is an invasive weed of concern in Montana. The state has formed a Purple Loosestrife Task Force and developed a Purple Loosestrife Control Plan. The Plan has recently been updated. Elements of the Plan include: Stop the sale of loosestrife within commercial horticultural channels, landowner education, and herbicide applications and limited insect bio-control release programs.