Aquatics

SPRING 2013

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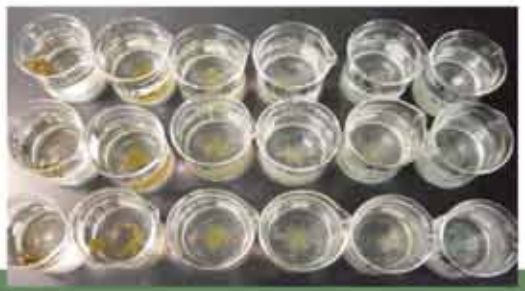

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An osprey in flight clutching a water hyacinth plant. Read more about the osprey, or fish hawk, on page 5. Photo by Tim Donovan, FWC Media Service.

Applicator JimBeau Wilmoth
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Florida's Fish Hawk—the Osprey

Every member of FAPMS is likely to recognize the osprey. The osprey, or fish hawk, is a year-round resident of Florida ponds, rivers, lakes, and coastal waterways. It is one of the most widespread birds of prey and can be found on every continent except Antarctica. Ospreys subsists almost entirely on live fish and hunt by diving feet first into the water's surface after hovering from 30 to 100 feet in the air. The scientific name of the osprey is *Pandion haliaetus*—the species name, *haliaetus*, is derived from the Greek for sea eagle.

Hyacinth control or transport? An osprey lines its nest with water hyacinth on Lake Talquin. Photo by Tim Donovan, FWC Media Services.

The osprey weighs three to four pounds, has a wingspan of up to six feet, and is approximately two feet long. The bird is dark brown on top and white underneath. It has a white crown and head, with a dark stripe extending back from yellow eyes. The bill is dark and sharply curved. Ospreys have long black talons and barbed pads on their feet, with reversible outer toes to help them grip slippery fish. When an osprey emerges from the water with its catch, it uses its feet to turn the fish headfirst to reduce wind resistance.

Nests are large, built of sticks, and lined with bark, grass, algae, and sometimes, water hyacinths. Nests are built in trees, on utility poles, channel markers, and artificial nesting platforms. Nests are often used year after year by the same monogamous mating pair.

Ospreys typically lay three eggs which both parents help to incubate for 35 to 40 days. The eggs do not hatch all at once—the first chick can hatch up to five days before the last one. Females care for the chicks while males provide food. The offspring fledge after 50 to 55 days but depend on their parents for food for another 8 weeks. The typical lifespan of an osprey in the wild is 7 to 10 years although some can live as long as 20 to 25 years.

Although there are currently no conservation concerns, the osprey is federally protected by the Migratory Bird Treaty Act (16 U.S.C. 703-712) and state protected by Chapter 68A of the Florida Administrative Code (F.A.C.). It is unlawful to take, possess, buy, sell, purchase, or barter any migratory bird (including the osprey), including feathers or other parts, nests, eggs, or products. **But you can take all the photographs you want!**

Source material from animals.nationalgeographic.com/animals/birds/osprey/ and birds.audubon.org/species/osprey

—by Karen Brown, Editor

IN MEMORIUM

John Gallagher passed away at the age of 95 in Raleigh, NC on April 2, 2013. He was a pioneer in the new discipline of weed science and spent his career furthering the profession. John was particularly supportive of the advancement of students in weed science and assisted in the early career development of young faculty at many institutions.

John was born and raised in New York City and joined the U.S. Navy in 1939, serving until 1945. He attained the rank of chief petty officer, chief fire control on the USS Foote, DD511 in the South Pacific. During a move to intercept the southward movement of a Japanese task force, John's destroyer was torpedoed and attacked by kamikaze, killing 19 men and losing the rear 55 feet of the ship, including the rudder and propeller. Other destroyers surrounded the crippled USS Foote to protect it from likely being sunk.

John Gallagher—a fine example of the "Greatest Generation"

Following the war, John attended college and ultimately received a B.S. degree in Agronomy from Penn State University in 1954, at which time he joined Amchem Products as a weed control specialist. He soon became very knowledgeable and an expert in the "aquatics" arena, conducting large scale milfol control programs with TVA in the 1960s and 70s. He continued to work in aquatics even after Amchem was purchased by Union Carbide in 1977. In the late 70s he led the program to register fenac for hydrilla control, but due to increased registration requirements of the USEPA required under FIFRA, the herbicide was dropped from further consideration for aquatic use.

During his 35 year career he worked with and knew well the early weed scientists, including Klingman, Ennis, Frank, Steenis, Mullison, Warren, Crafts and others who founded the new discipline of "Weed Science" and organized the Weed Science Society of America in 1956. He was President of the Northeast Weed Science Society in 1968, President of the Southern Weed Science Society in 1982 and served on the Board of Directors of the Aquatic Plant Management Society from 1965 to 66, as well as serving on several APMS committees. In recognition for his contributions to weed science, he was awarded the Southern Weed Science Society Distinguished Service Award, elected as a fellow of the Weed Science Society of America and voted to an honorary membership in the APMS. Always ready with a smile and an encouraging word, he received the Max McCowen Friendship Award from APMS in 1997.

Highly ethical and dedicated, John took particular interest in assisting and mentoring numerous graduate students and young faculty. He regularly attended student presentations at society meetings and usually gathered 6 to 8 graduate students from several universities for an unforgettable dinner at numerous venues where he would talk business, but more often discussed world events, opportunities in weed science and particularly good food, fine wine and Irish music. His influence, assistance and advice to students and young faculty – including this writer, but also Langeland, Brower, Spencer, Rhoades, Kay, Getsinger and many others – is gratefully appreciated.

John served on a National Academy of Sciences (NSF) panel advising on aquatic weed control in Sudan as the only "Industry representative" on the panel; he was selected for his broad knowledge of aquatic weed control. He also worked with the Egyptian Ministry of Irrigation on aquatic weed control problems in channels in the Nile Delta.

Following his retirement, John devoted himself full time to traveling with his wife and spent even more time working on his horticultural plantings around their house, maintaining numerous annual and perennial flower beds, rose gardens and other landscape plants because he abhorred mowing grass. He continued to serve others by becoming a Master Gardener with the North Carolina State University Extension Service, where he continued to teach people even in retirement. A fine example of the "Greatest Generation," John's contributions to weed science will remain forever and memories of him will be long cherished by those who knew him.

Contributions may be made in his name to the FAPMS Scholarship and Research Foundation, Inc., c/o Joe Joyce, 9916 SW 13th Place, Gainesville, FL 32607.

Contributed by Bill Haller – April 4, 2013

Herbicide Screening for Activity on Fluridone-Resistant Hydrilla

By William T. Haller

In the Winter 2012 issue of *Aquatics*, I discussed the changing registration requirements and related high costs of registering new herbicides for aquatic use. These increased costs forced the agrichemical industry to develop herbicides for large national and international markets, where the potential returns on investments are significant. The US EPA estimated that the global market for herbicides in 2007 was approximately $15 billion, while the US market accounted for around $5.8 billion in sales. Total sales of aquatic herbicides in the US are unknown, but likely range from 40 to $60 million, or only 0.09% of total US herbicide sales. Because the aquatic weed control market is so small, the owners of products that could have utility as aquatic herbicides were reluctant to invest the resources needed to obtain aquatic labels for them. Thus, if the aquatic weed control industry was to register new herbicides with additional modes of action that could be used in resistance management programs, we realized that we would have to do much of the initial work ourselves. Most companies had not screened herbicides against aquatic weeds since the 1970s, so we started a screening program around 10 years ago to identify herbicides that could be used to control fluridone-resistant hydrilla.

The screening program was funded by the Florida Department of Environmental Protection (later the Florida Fish and Wildlife Conservation Commission), the US Army Corps of Engineers (USACE) and various universities in coordination with the agrichemical industry. Coordination with herbicide "registrants", or the companies holding the original patents on particular herbicides, was critically important because registrants control the data and the ultimate use of the herbicide.

Figure 1. Hydrilla pots (2.5 L) 8 weeks after treatment with an herbicide at concentrations up to 640 ppb. The 50-60% growth reduction at the 40-80 ppb treatments triggers additional studies to confirm these results and initiate selectivity studies. (Photo by L. Gettys)

Once screening studies showed that a herbicide had the potential to control hydrilla, expanded pond studies were conducted under experimental use permits (EUPs) obtained by the registrants from the Florida Department of Agriculture and Consumer Services and the US EPA. The Experimental Use Permit (EUP) testing phase of these efforts was also supported by water management districts, county weed control programs and funding from the Osceola County (FL) "US EPA Demonstration Project on Hydrilla and Hygrophila in the Upper Kissimmee Chain of Lakes (EPA Grant Number x796433105)." These EUP studies will be described in detail in future issues of *Aquatics*; in this article, our focus is the screening programs conducted at the University of Florida.

Evaluation and screening of herbicide activity on aquatic weeds was conducted by the US Department of Agriculture (USDA) at the IFAS Ft. Lauderdale Research Center in Davie, FL in the 1960s and 1970s. Initial screenings were conducted in 1–gallon glass jars treated with 1, 5 and 10 ppm of a test herbicide, with hydrilla response visually evaluated over a 4 to 6 week period. Temperature was controlled in the growth room, and light was kept at a very low level to prevent the excessive algal growth that interfered with visual evaluations. Blackburn and Weldon screened over 800 herbicides in the laboratory and found that only 37 (including silvex, acrolein, endothall, diquat, fenac, bromacil, copper sulfate and sodium arsenite) had sufficient activity to warrant further testing. The short evaluation period, low light conditions, and relatively high herbicide concentrations tested raised concerns that this process selected fast-acting contact herbicides and eliminated slow-acting systemic herbicides such as fluridone and other enzyme inhibitors. For example, we later learned that fluridone most effectively controls fast-growing hydrilla and requires long contact times (greater than 6 weeks) to provide good control.

The USACE Aquatic Plant Control Research Program (APCRP) in Vicksburg, MS also evaluated herbicides for aquatic weed control under the direction of Howard Westerdahl and later Kurt Getsinger. They utilized large, modified walk-in coolers with much higher light

intensities; plants were cultured in large aquaria and grew very well, so evaluations could be extended well beyond the 6-week period used by Robert Blackburn and Lyle Weldon. The development of these growth chambers occurred in the early to mid-1970s, a time when the agrichemical industry moved away from screening herbicides for aquatic activity, and the USACE facilities were used to study contact:dose relationships and to conduct other research, rather than for herbicide screening.

When we began to screen herbicides for aquatic use in the early 2000s, we knew we had to develop a relatively quick assay and we had to treat hydrilla when it was actively growing, which requires light conditions equivalent to at least 30 to 50% full sunlight. We had access to shadehouses in summer and greenhouses in winter, but also needed to prevent flooding (and the resulting dilution) of treated tanks and had to extend the photoperiod to greater than 12 hours during winter, since hydrilla grows much better under long-day conditions. Hydrilla was grown in plastic-covered shadehouses during the summer (April to September), and in greenhouses with supplemental lighting from October to March.

Twenty-five gallon mesocosms (nursery tubs without holes) were used as test containers. Each mesocosm received three 2.5 L plastic pots without holes that were filled with builders sand, amended with 2.6 g of controlled-release fertilizer, and planted with five apical sprigs of hydrilla. When hydrilla growth reached the surface of the mesocosms (usually after 2 to 3 weeks), they were treated once with a single test herbicide at the concentrations described below. After 8 weeks of exposure, all live plant material in each mesocosm was harvested, dried and weighed to determine hydrilla's response to the herbicide. Plants typically could not be maintained in mesocosms for longer than 8 weeks because the decaying hydrilla resulting from exposure to herbicides caused algae to grow and made it difficult to evaluate treatment effects.

Herbicides to be evaluated were selected based upon their general chemistry, half-life in water (if known), toxicity to fish and invertebrates and mechanism of degradation (photolysis, microbial breakdown, hydrolysis etc.). If a herbicide was used in terrestrial applications at rates of a few ounces per acre, we tested the product at concentrations of 0, 10, 20, 40, 80, 160, 320 and sometimes 640 ppb. If the test herbicide was used terrestrially at greater than 0.5 pounds per acre, we evaluated higher concentrations such as 0, 50, 100, 200, 400, 600, 800 and sometimes 1,200 ppb. All treatment concentrations were replicated in at least 3 mesocosms; if activity was noted, tests were repeated to refine treatment concentrations and to confirm earlier results.

Dry biomass of fluridone-susceptible hydrilla treated with fluridone is typically reduced by at least 50% after 8 weeks of exposure to fluridone. Thus, our trigger for increased interest and further testing of slow-acting modes of action was a 50% or greater reduction in hydrilla dry weight after 8 weeks of exposure. This threshold was established in an effort to identify the slow-acting, enzyme-inhibiting herbicides that have a long contact exposure period similar to fluridone.

There are around 225 herbicides registered for use in the United States; over the past decade, we have evaluated about 100 of these alone and conducted another 75 to 100 studies of herbicide combinations. Our testing of approximately 100 herbicides revealed that only 8 to 10

Table 1. Herbicides registered for aquatic use by the USEPA from 2001 to present after the discovery of fluridone-resistant populations of hydrilla in Florida.

Herbicide	Date	MOA	Primary Use
Imazapyr	2001	ALS*	Aquatic grasses, cattail, phragmites; no submersed use
Triclopyr	2002	AUX	Emergent broadleaf weeds and Eurasian watermilfoil
Carfentrazone	2004	PPO*	Primary use is for waterlettuce control at this time; very short half-life in water
Penoxsulam	2007	ALS*	Whole-lake treatment and combined with endothall for hydrilla control; control of several floating aquatic weeds
Imazamox	2008	ALS*	Plant growth regulation on hydrilla, control of curlyleaf pondweed, Chinese tallow, wild taro
Flumioxazin	2010	PPO*	Hydrilla, cabomba, hygrophila, floating weeds; best in low-pH water
Bispyribac	2011	ALS*	Whole-lake treatment and combined with endothall for hydrilla control; control of several floating aquatic weeds

* = New mode of action for aquatic use

ALS: Acetolactate synthase enzyme inhibition prevents the formation of plant specific amino acids

PPO: Protoporphyrinogen oxidase (protox) enzyme inhibition results in leaky plant membranes and chlorophyll and carotenoid destruction

have activity on hydrilla; of these, only 4 will likely be used for hydrilla control. The results of this new testing are very similar to those reported by Blackburn and Weldon in 1970, who found that only around 5% of the products they tested had activity on hydrilla at concentrations up to 10 ppm. Thus, our studies provide further evidence that few herbicides effectively control hydrilla.

The registration of 7 new aquatic herbicides with 2 new modes of action (Table 1) over the past decade is due to exceptional cooperation and hard work by many people in state and federal agencies, as well as the support of the registrants of these products.

The registration data for imazapyr and triclopyr were submitted by the registrants to the USEPA in the late 1990s. Imazapyr has no submersed aquatic use and triclopyr is not effective on hydrilla, and their registration was unrelated to the development of fluridone-resistant hydrilla populations. Penoxsulam was under investigation for several years, with much of the development work done by the registrant. Research and development of carfentrazone, imazamox, flumioxazin and bispyribac was conducted primarily by state and federal agencies. With the exception of triclopyr and imazapyr, testing with all of these products continues in order to evaluate selectivity on non-target species, to identify most effective application methods, to study foliar/submersed applications to floating and emergent plants, etc. It is obvious that the registration of 2 new modes of action for aquatic use will be important in resistance management programs. In addition, these new products have given applicators the ability to control hydrilla with whole-lake treatments (once limited to fluridone) and may provide new, more effective means to control hygrophila, water meal/duckweed, cabomba and other troublesome weeds on which these products have not been evaluated at this time.

The development of fluridone-resistant populations of hydrilla, along with the backlog of untested herbicides, combined to facilitate the registration of a large number of herbicides in a relatively short time frame. This phenomenon is very unlikely to be repeated in the future, but that does not mean that our work is done. We continue to evaluate new products that are under development or testing by the agrichemical industry. Most of these products have a long patent life remaining and, if selective, are potential products that could be incorporated into resistance management plans. Applicators are responsible for alternating or rotating modes of action and must remain concerned about the possibility of losing a product to resistance. The well of potential new aquatic herbicides is in danger of running dry, and in a few short years we will have to rely upon the aquatic potential of the 2 to 5 new terrestrial products produced each year by the agrichemical industry.

To be continued in a future issue of *Aquatics*…

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New Aquatic Herbicide Treatments in Western Orange County: Clipper™ and Tradewind™

By Alicia Knecht

Greetings to all of the aquatics folks! When it comes to herbicides, the aquatics market is considered small, yet these products are extremely valuable to resource managers. The herbicides that aquatic resource managers have at their disposal determine their management plans and long term goals. It is important to use these herbicides responsibly by always implementing best management practices. Product rotation is one example of a good management practice and is essential to prevent the development of herbicide resistance. By altering the chemistries used to target sensitive plants, different modes of action work to impact plants in distinct ways. This article evaluates the effectiveness of Clipper™ (flumioxazin) and Tradewind™ (bispyribac) for controlling hydrilla in lakes and canals in western Orange County. All of the waterbodies described are designated as Outstanding Florida Waters except for Lake Mann (see next page).

LAKE CHASE

Lake Chase is a 140 acre lake within the Butler Chain of Lakes. To avoid the overuse of Aquathol™ (potassium endothall), Orange County and FWC decided to add Clipper™ to the management plan in order to rotate the modes of action that affect the target plant (hydrilla). Clipper™ is pH dependent, and treatments were monitored throughout the day to ensure the effectiveness of the herbicide. The pH in Lake Chase ranges from 7.5 to 8; therefore, Clipper™ was a suitable alternative to Aquathol™.

During the spring of 2011, hydrilla expanded throughout the perimeter of the lake and extended to approximately 9 feet in water depth. The perimeter (approximately 40 acres) was treated with a combination of Clipper™ at 100 ppb and Reward™ (diquat) at 200 ppb. Hydrilla was successfully controlled within approximately ten days, and by 30 days after treatment (DAT) only a few decaying sprigs were found. As of December 2012, there was a minimal amount of hydrilla present and most of that was isolated to high-traffic areas.

Impacts to several native plant species such as Illinois pondweed, southern naiad, coontail, fragrant water lily and spatterdock were documented. Eelgrass was abundant throughout the lake and was not impacted. Leaves on the fragrant water lily and spatterdock appeared discolored after the treatment and were eventually lost. It should be noted that these impacts may not be solely attributed to the Clipper™ and Reward™ treatment, as there was a Sonar™ (fluridone) treatment in an adjacent lake with significant flow into Lake Chase. Most of the native plants listed above rebounded within one growing season; however, the submersed aquatic plants had not reached the densities that were present prior to treatment (based on a December 2012 survey).

Lake Chase–Hydrilla 8 DAT

Lake Chase–Fragrant water lily 8 DAT

Lake Chase–Spatterdock 8 DAT

LAKE POCKET

Lake Pocket is located at the southern end of the Butler Chain. It is a tannic 128 acre lake with a pH that ranges from 7.5 to 7.8. Typically, hydrilla doesn't grow in this lake, but in the early spring of 2011, it had established along the southern shoreline. FWC and Orange County decided to treat two eight-acre blocks with Clipper™ and Reward™. One block was treated at 100 ppb Clipper™ and 200 ppb Reward™, and the other block with 200 ppb Clipper™ and 200 ppb Reward™. Within approximately ten days, hydrilla was absent in both blocks and only a few decaying stems were found. The treatments were successful, and hydrilla was not present in December 2012.

The submersed plant communities in Lake Pocket were sparse prior to the treatment. Eelgrass was isolated to very shallow waters, and minimal amounts

Continued on page 12

Outstanding Florida Waters

Floridians are lucky to have a state with so many beautiful waterways. An Outstanding Florida Water (OFW) is a waterbody deemed worthy of special protection because of its natural attributes (e.g., excellent water quality, or exceptional ecological, social, educational, or recreational value). These areas must be formally designated by law. Outstanding Florida Waters generally include surface waters in the following areas:

- National Parks
- National Wildlife Refuges
- National Seashores
- National Preserves
- National Marine Sanctuaries and Estuarine Research Reserves
- National Forests (certain waters)
- State Parks & Recreation Areas
- State Preserves and Reserves
- State Ornamental Gardens and Botanical Sites
- Environmentally Endangered Lands Program, Conservation and Recreational Lands Program, and Save Our Coast Program Acquisitions
- State Aquatic Preserves
- Scenic and Wild Rivers (both National and State)
- "Special Waters" *(see list below)*

"Special Waters" OFWs include 41 of Florida's 1700 rivers, several lakes and lake chains, several estuarine areas, and the Florida Keys:

"Special Waters" OFWs		
Apalachicola River	Homosassa River System	Santa Fe River System
Aucilla River	Kingsley Lake & Black Creek (North Fork)	Sarasota Bay Estuarine System
Blackwater River	Lake Disston	Shoal River
Butler Chain of Lakes	Lake Powell	Silver River
Chassahowitzka River System	Lemon Bay Estuarine System	Spruce Creek
Chipola River	Little Manatee River	Suwannee River
Choctawhatchee River	Lochloosa Lake	Tomoka River
Clermont Chain of Lakes	Myakka River (lower part)	Wacissa River
Crooked Lake	Ochlocknee River	Wakulla River
Crystal River	Oklawaha River	Weekiwachee Riverine System
Econlockhatchee River System	Orange Lake, River Styx, and Cross Creek	Wekiva River
Estero Bay Tributaries	Perdido River	Wiggins Pass Estuarine System
Florida Keys	Rainbow River	Withlacoochee Riverine and Lake System
Hillsborough River	St. Marks River	

Many areas managed by the state or federal government, including parks, wildlife refuges, preserves, marine sanctuaries, state or national forests, scenic and wild rivers, or aquatic preserves, are designated as OFWs. Generally the waters within these managed areas have OFW designations because the managing agencies have requested this special protection. In addition, a waterbody demonstrated to be of exceptional significance may be designated as an OFW regardless of whether it is within an area managed by the state or federal government. Anyone who wishes to propose waters for an OFW designation may submit a petition to the Department of Environmental Protection (DEP) in accordance with Chapter 120 of the Florida Statutes. Waters are designated OFW to prevent the lowering of existing water quality and to preserve the exceptional ecological and recreational significance of the waterbody.

Authority:

Section 403.061(27), Florida Statutes, grants the DEP the power to establish rules that provide for Outstanding Florida Waters. DEP is the agency that designates a waterbody as an OFW; however, each OFW must be approved by an arm of DEP known as the Environmental Regulation Commission (ERC). The ERC is a seven member citizen's body appointed by the Governor. For more information, contact the DEP Standards and Assessment Section at (850)245-8064 or view the DEP Water Quality Standards website at www.dep.state.fl.us/water/wqssp

A complete listing of Outstanding Florida Waters is provided in Rule 62-302.700 (9) of the Florida Administrative Code. Use your browser to search the underlined text.

—by Karen Brown, Editor

Lake Pocket–Hydrilla 8 DAT

Lake Pocket–Fragrant water lily 8 DAT

Lake Pocket–Spatterdock 8 DAT

of nitella and bladderwort were present. The Clipper™ and Reward™ treatments negatively impacted spatterdock and fragrant water lily. The leaves were extremely discolored and eventually disintegrated. Populations of spatterdock and fragrant water lily declined, and these plants had not returned to their pre-treatment densities as of December 2012.

Because these were some of the first combination treatments done with Clipper™ and Reward™ in the field, FWC and Orange County were interested in documenting the differences in the results due to rates. In retrospect, the only difference noted with the increased rate of Clipper™ in the second block was a more rapid rate of impact. Overall, there did not appear to be any differences in efficacy or longevity between the two treatments.

CANALS ON THE BUTLER CHAIN

Several of the canals in the Butler Chain were treated over the past two years using combinations of Clipper™ and Reward™. FWC and Orange County typically used 200 ppb/200 ppb in the canals due to flow. Although these products function as contact herbicides, there was extended control in the canals. In the past, these canals were treated at least two or three times per year; however, using the above combination, the canals are currently only being treated once per year.

LAKE MANN

Lake Mann is located in western Orange County just south of the 417 toll road. The lake is 264 acres with an average depth of 11 feet. The dominant submersed plant communities shifted during the winter of 2011 from Illinois pondweed to hydrilla. Hydrilla displaced native plants in shallow water (less than 3 feet) and in deep water (greater than 11 feet). FWC and Applied Aquatic Management treated the entire lake using a combination of Tradewind™ at 30 ppb and Aquathol™ at 1 ppb in the spring of 2012. Eelgrass was still present and healthy at the time of treatment but was only found in shallow water.

Hydrilla in the shallow water showed signs of decay at 14 DAT and was completely controlled by 60 DAT. The deeper water hydrilla reacted differently. It did not show extensive signs of decay, but disappeared quickly between 14 and 21 DAT; as of January 2013, hydrilla was not present.

The treatment ultimately controlled eelgrass, southern naiad and the remaining Illinois pondweed. The control of eelgrass was unprecedented, and there was no plausible explanation for it. Many factors may have contributed to the demise of the eelgrass, such as low water levels, increased water temperatures and extended herbicide residues. The nitella, chara and bladderwort that were present before treatment continued to persevere, but eventually disappeared between October and November 2012. During a subsequent survey in January 2013, small amounts of eelgrass and Illinois pondweed were found in shallow water depths (less than 3 feet) along the northern and eastern perimeter; however, nitella, chara and bladderwort were still absent.

Fragrant water lily and spatterdock were impacted, and the leaves were discolored. Following the treatment, fragrant water lily tended to have black and pink leaves, while the spatterdock leaves displayed a pink discoloration. These plants were not completely lost and began to expand and regrow by November 2012.

Several other emergent plants were impacted, including bulrush, spikerush and sawgrass. The bulrush and sawgrass rebounded by approximately November 2012. The spikerush, on the other hand, had not recovered and some stands were controlled completely. Initially, the spikerush turned grayish-brown, and the outer edge of the band (most inundated by water) was adversely affected. In the areas where spikerush completely died, spatterdock and fragrant water lily appeared.

Although much more field work needs to be done to evaluate new aquatic herbicides such as Clipper™ and Tradewind™, both of these products are certainly valuable tools for lake managers. The efficacy and longevity of these treatments will continue to be monitored, but at this time it appears that rotating these herbicides into a management plan is reasonable and necessary in order to reduce the likelihood that herbicide resistance will develop.

I would like to acknowledge Orange County EPD, Applied Aquatic Management, all of the researchers and other individuals who made these treatments possible. Thanks to Amy Giannotti for editing this article. I appreciate everyone's hard work!

Alicia Knecht, FWC Regional Biologist, Invasive Plant Management Section; 321-246-0682; Alicia.Knecht@MyFWC.com

Lake Mann–Hydrilla shallow water 14 DAT

Lake Mann–Spikerush 90 DAT

Lake Mann–Hydrilla deep water 14 DAT

Lake Mann–Spikerush 120 DAT

Lake Mann–Fragrant water lily 28 DAT

Lake Mann–Bulrush stand (distance photo) 120 DAT

Lake Mann–Spatterdock 33 DAT

Lake Mann–Bulrush stand (close-up) 120 DAT

APPLICATOR ACCOLADES

JimBeau Wilmoth

By Tina Bond

JimBeau was a military brat and is originally from the Panama Canal Zone. His mother is from Columbia and his father is Cajun – quite a spicy mix! When he was living near the Panama Canal, he and his friends would take banana leaves and slide down the erosion control structures into Mira Flores Lake for some fun. The lake was 100% covered with hydrilla, although he did not know what it was at the time. One day he and a friend decided to go "banana sliding". His friend dove into the infested lake and never came back up. This was the moment when he vowed to kill hydrilla. He told his Dad, "I'm gonna kill that plant."

At 16 years of age, JimBeau came to Florida due to his father's health. In the mid-70s JimBeau started performing lakefront weed management in Highlands County. He moved to Winter Park and worked for Dr. Bill McClintock and Al Peronie as a deck hand and eventually became Interim Director of the Winter Park Aquatic Weed Control Program. He then accepted a position with the St. John's River Water Management District (SJRWMD) in their new hydrilla control operations program. The SJRWMD began studies on large-scale hydrilla treatments. JimBeau did not have the luxury of having a GPS to aid in the set-up of these large-scale plots. Instead, he had to use primitive methods of calibration which were very time-consuming. He helped SePRO (then Elanco) and the University of Florida conduct research on a brand new herbicide called Sonar® (fluridone). One of the application methods that JimBeau used was created by former FAPMS President Paul Myers. With the "Myers method" he was able to treat an average of 25 to 38 acres a day with a contact herbicide.

In 1981 JimBeau started Aqua Plant Control, Inc. in Gainesville, where he managed more than $35 million in aquatic weed treatments in the southeastern United States. From municipal waterways to world class golf resorts and private and commercial jobs, JimBeau has seen and done it all.

In addition to killing weeds, JimBeau holds black belts in Japanese Karate and Jiu Jitsu. He teaches martial arts at his church in Gainesville and really enjoys working with the kids there. His son, Austin, also has a black belt and helps him teach the students. Austin has worked with his Dad every summer since the age of 5 and eventually wants to run the family business. Having worked with JimBeau, I think he's off to a pretty good start! JimBeau also has a daughter, Crystal, and is happily married to Kimberly.

JimBeau wants to express his thanks to a few people that have helped him succeed in his career: His Lord and Savior, his family, Bill McClintock, Bill Maier, Vernon Vandiver, Bill Haller, Ken Langeland, Chuck Cichra, Joe Joyce, Paul Myers, Carlton Layne, Dan Canfield, John Layer and Al Peronie. He apologizes for leaving anyone out, but he could have gone on forever!

Tina Bond works for Helena Chemical and may be reached at 863-243-4048 or BondT@HelenaChemical.com

The Florida Aquatic Plant Management Society
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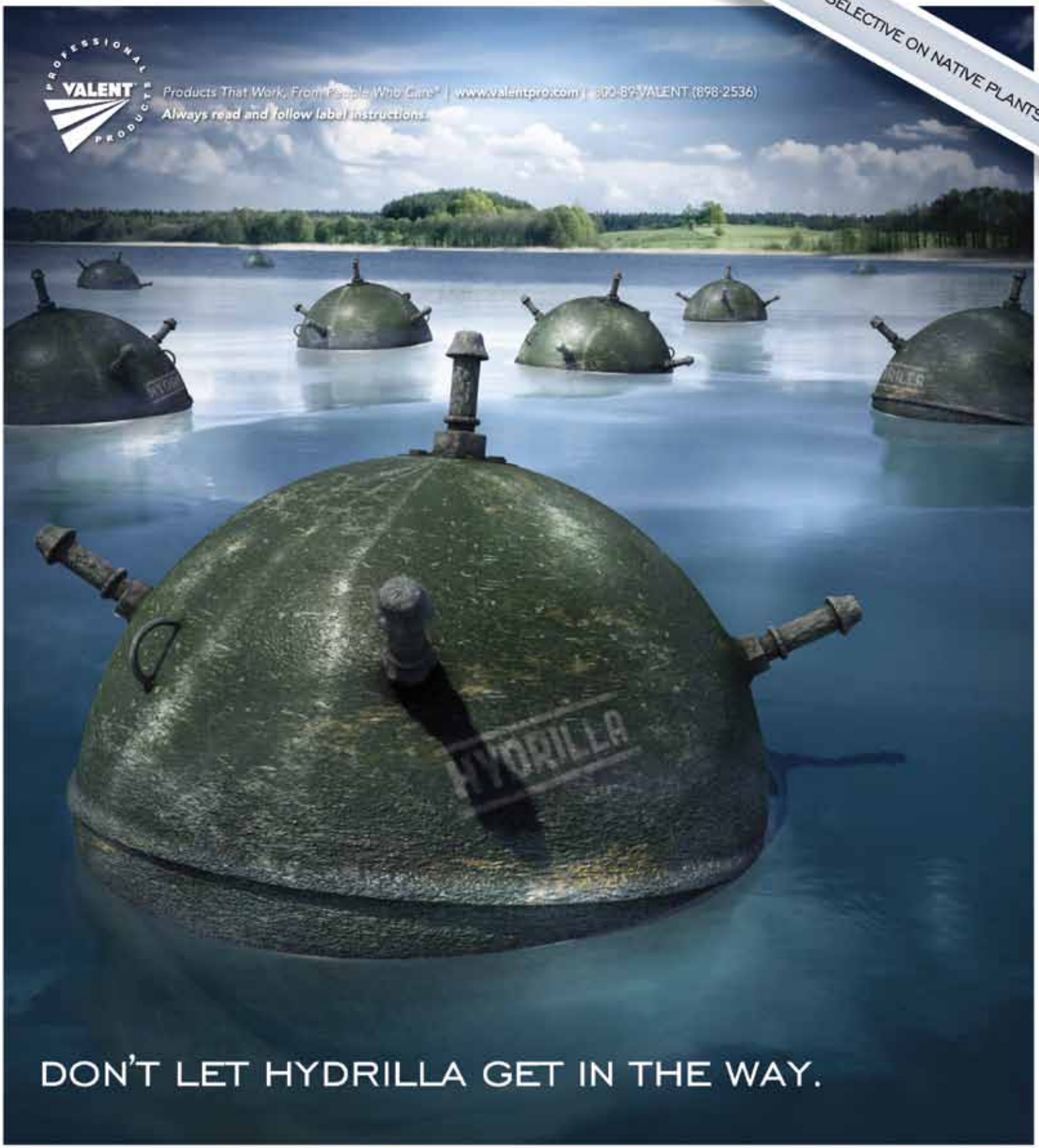
2. Financial need—determined based on need and the expected family contribution amount indicated on the processing results of a Student Aid Report (OMB No. 1845-0008). This report is available by completing a Free Application for Student Aid Form (go to www.fafsa.gov).
3. The applicant being a high school senior entering college the next academic year, attending junior college, or being a college undergraduate.
4. An evaluation of the quality of the application and required essay by the Scholarship Selection Committee composed of three FAPMS members and four FAPMS Scholarship and Research Foundation members.
5. Submission of a completed application by **June 1, 2013**.

Applications may be found on the Society's website: www.fapms.org
For more information, please contact Keshav Setaram: 407-891-3562



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AQUATIC HERBICIDE

Clear the way!

Dr. William C. Zattau Retires from US Army Corps of Engineers, Jacksonville District

By Angie L. Huebner

After many years of outstanding work and leadership in the field of invasive species management, Dr. William C. Zattau retired on 31 December 2012.

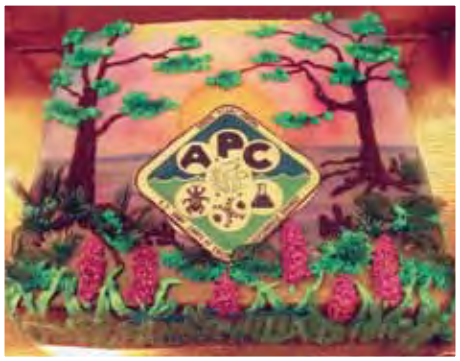
Dr. Zattau earned his Ph.D. at Clemson University, where he completed research on *Leptolengia* sp., a potentially virulent fungal pathogen in mosquito larvae. His research was designed to determine the potential of *Leptolegnia* as a biological control agent for mosquitoes and was funded by the World Health Organization in an effort to help prevent the spread of diseases such as malaria, yellow and dengue fever. His research indicated that early larval stages of *Aedes aegypti*, the principal mosquito vector of dengue viruses, experienced 100% mortality within 24 hours of exposure to *Leptolegnia* sp. Three other species of mosquito were also identified to be equally susceptible to the fungus. It was determined the fungus was most effective at temperatures of 28°C (82°F) or lower and had no effect on larvae in water over 30°C (86°F). The results of Dr. Zattau's research demonstrated the potential for *Leptolegnia s*pp. as a biological control for mosquitoes in temperate climates.

It was this research and his expertise in working with fungi that led Dr. Zattau to work with the US Army Corps of Engineers Waterways Experiment Station, currently known as the Engineer Research and Development Center (ERDC), in Vicksburg, MS. Dr. Zattau was part of a team that performed seminal research on biological control of invasive aquatic plants. He participated in studies of wetland restoration techniques involving the use of fungal species to promote native wetland plant establishment. Dr. Zattau also led field expeditions to collect and observe organisms in little-known habitats of the upper Midwestern United States. He designed and conducted a historic continental survey of pathogens impacting *Myriophyllum spicatum* (Eurasian watermilfoil). The survey included 50 water bodies in 10 states: Alabama, California, Florida, Louisiana, Washington, Texas, New York, North Carolina, Vermont and Wisconsin. The sample sites represented a geographic and climatic cross-section of aquatic ecosystems throughout the continental United States. Hundreds of samples were taken from ponds, lakes, reservoirs, rivers and canals, resulting in the isolation of over 792 fungi and bacteria associated with Eurasian watermilfoil. This work provided the foundation for the pathogen research that is currently being conducted on submersed aquatic vegetation and was one of Dr. Zattau's most significant contributions to the field of aquatic plant management.

On Lake Okeechobee (2012). Photo by Jeffrey D. Schardt, FWC.

In 1987, following his research at ERDC, Dr. Zattau began his career with the US Army Corps of Engineers, Jacksonville District as the lead biologist in the Operations Division, Aquatic Plant Control Section (APC). His work in developing and testing new methods, chemicals and adjuvants launched the Jacksonville District into the forefront in aquatic plant control. Dr. Zattau also managed the USACE APC Operations Support Center and edited and published the Center's journal. This journal not only addressed the issues and problems related to aquatic plants but also provided solutions and extended the information to technical experts throughout the USACE.

Dr. Zattau's exemplary work as a biologist propelled him to the Chief position of the APC Section. In this position, he oversaw a team of biologists and implemented the Removal of Aquatic Growths Project and the APC Program on the St. Johns River, Lake Okeechobee and the Okeechobee Waterway. He also oversaw and led a transformational change that has truly taken the section from good to



Dr. Zattau's retirement cake.

great. Understanding the problems and threats of invasive plants to the nation, he constantly sought ways to improve approaches, streamline processes and extend information. Dr. Zattau was instrumental in the development of an aquatic plant control program for Puerto Rico. He was a co-founder and the initial Chair of the Everglades Restoration Noxious Exotic Weed Task Team, which was the forerunner of all current invasive species activities associated with the Comprehensive Everglades Restoration Program (CERP). His foresight led him to convert the APC Section to the Invasive Species Management (ISM) Branch. This conversion was completed to ensure all invasive species issues were addressed within the Jacksonville District USACE projects. As a result of his outstanding leadership skills and abilities, Dr. Zattau was selected as the Deputy of Operations Division; while serving in this capacity, he also served as the ISM Branch Chief. Dr. Zattau led the team in incorporating invasive species management into CERP projects, a monumental accomplishment since

invasive species management historically was not included in these projects. Due to his expertise and leadership abilities, Dr. Zattau was selected as the first chair of the USACE Invasive Species Leadership Team which, under his guidance, developed the first USACE Invasive Species Policy. This policy provides guidance for all USACE business lines which include 436 Natural Resource Management projects and over 12 million acres of public lands and waters.

Throughout his career, Dr. Zattau also demonstrated his ability to develop new leaders in the field of invasive species management, impart his knowledge and passion upon them, and mentor them into the future leaders this field needs for tomorrow. He had a keen eye for identifying and developing the strengths and skills of his employees. He was able to recruit, develop and retain exceptional talent. Dr. Zattau left a legacy, not only in the extraordinary work he accomplished as a biological scientist in his field, but, in leaving the Corps stronger than when he entered it by helping individuals to become the best they can be.

At his retirement reception, USACE Jacksonville District Commander Colonel Alan Dodd presented the Bronze de Fleury Medal to Dr. Zattau for his significant contributions to the USACE and for his 25+ years of outstanding and selfless service. The de Fleury Medal was first created by the Continental Congress to honor Francois de Fleury, a French soldier who fought with General George Washington during the Revolutionary War. This medal is awarded to individuals who have provided significant contributions to Army engineering. There are four levels of the de Fleury Medal: Steel, Bronze, Silver and Gold.

Congratulations to Dr. Zattau on a lustrous career in the field of invasive species management and with the USACE! We wish him well in the next chapter of his life. *Hooah!*

Angie L. Huebner works in the Invasive Species Management Branch at the USACE, Jacksonville District and can be reached at Angie.L.Huebner@usace.army.mil

On Lake Okeechobee (2012). Photo by Jeffrey D. Schardt, FWC.

UF-IFAS/FTGA Great CEU Round-Up 2013

The University of Florida-IFAS and the Florida Turfgrass Association (FTGA) will be co-hosting the 2013 Great CEU Round-Up on July 10th. The Round-Up will be held at participating Florida Extension Offices via Polycom (live video) and will offer up to 6 CEUs for full-day participation. The FTGA will be handling pre-registrations at their website: www.ftga.org/ Additional information will be sent out via the Aquatics list-serv as the event nears. All CEU events are posted on the Aquatics list-serv as they become available. To sign up for the list-serv, send a request to kpbrown@ufl.edu

FAPMS 37th Annual Training Conference

October 14 – 17, 2013 – St. Augustine, Florida

CALL FOR EXHIBITORS

FAPMS is now accepting exhibitor applications for the 37th Annual FAPMS Conference being held October 14 – 17 in St. Augustine. There are a number of sponsorship levels (Grand, Diamond, Platinum, Gold and Silver) to choose from.

The meeting will provide an excellent forum for you to exhibit your goods and services and to interact with key individuals and organizations involved in aquatic plant management in Florida. A Vendor Registration Form and additional conference information can be found on the FAPMS website: www.fapms.org.

Vendor support has always been critical to the success of this meeting and 2013 will be no exception. Your generous contributions will be most appreciated!

The final date to sign up for any sponsorship level (excluding Silver) is September 14th. Please direct questions to FAPMS Vendor Committee Chair, Melissa Barron at 407-257-8043 or melissa.barron@syngenta.com

CALL FOR AQUATIC PLANT MANAGER PAPERS

NOW is the time to start thinking about presenting a paper at the FAPMS 37th Annual Training Conference. You stand to win a plaque and a cash award ($300 – 1st place; $200 – 2nd place; $100 – 3rd place) and the first place winner's paper will be published in *Aquatics* magazine. FAPMS provides the incentive—the rest is up to you!

We are looking for papers on herbicide application techniques, mechanical techniques (aquatic and right-of-way), herbicide mixtures, innovative control measures, re-vegetation projects, new invasive plant introductions, research projects, safety issues, and more. You don't have to be a professional speaker to present a paper! Remember, FAPMS was formed for the aquatic plant manager and the annual training conference is a chance to share what you have learned with your colleagues.

DEADLINE FOR SUBMISSION IS JULY 31, 2013

Please fill out the abstract submission form at www.fapms.org/meeting/meet13/2013callforpapers.pdf and submit your paper to:

Mike Hulon
FAPMS Program Chair
P.O. Box 4034
Lake Wales, FL 33859
Fax: (863) 696-2922
E-mail: texasaquaticmh@aol.com

CALL FOR PHOTOS

The annual **VIC RAMEY PHOTO CONTEST** will also be held at the Annual Training Conference in St. Augustine. The contest was created to inspire photographs that promote education, discussion and competition towards the Society's objective of aquatic plant management. There are two categories: **Aquatic Scene** (any natural aquatic scene); and **Aquatic Operations** (operation equipment, application method, or field applicator).

Requirements for entry:

- Photos must be taken by a FAPMS member during the contest year.
- Photos must be submitted as a 5" x 7" or 8" x 10" print, with or without mat or frame.
- Back of photo must contain photographer's name, contact number, photo category, location of photo, and description or title.

Prizes are first, second, and third place ribbons for each category.

Photos are judged on category relevance (40%), creativity or artistic impression (40%), composition and arrangement (10%), and focus and sharpness (10%). Judges are selected from attending conference members. Photo entries may be submitted at the registration desk.

NOTE: Winning photos may be used in *Aquatics* magazine at the editor's discretion if they are also available as .jpg files in sufficient resolution. (see Photo tips on page 17 of the Winter 2012 issue). Set your camera to 1MB or 5 megapixels or higher for best results. Photos will be posted on the FAPMS website if an electronic version is submitted.

Good luck, photographers!

FWC-IFAS Research Review 2013

The Florida Fish and Wildlife Conservation Commission's (FWC) Invasive Plant Management Section and the University of Florida-IFAS Center for Aquatic and Invasive Plants held its first Research and Outreach Review Meeting since the economic downturn at the UF-IFAS Plant Science Research and Education Unit in Citra, Florida on March 12 and 13, 2013. The purpose of this meeting was to exchange current scientific research and outreach information on invasive plant management in Florida. The 1.5 day research and outreach review was attended by approximately one hundred participants and included university and government scientists, federal, state, and local government resource managers, and outreach professionals. Presentations are available in PDF file format under Tab 5 (Publications) of the Plant Management in Florida Waters website: plants.ifas.ufl.edu/manage

Calendar of Events 2013

May 6–9
UF/IFAS Aquatic Weed Control Short Course
Coral Springs, FL
www.conference.ifas.ufl.edu/aw/

May 13–15
NALMS 21st Annual Southeastern Lakes & Watershed Management Conference
Columbus, GA
www.nalms.org

Continued on page 21

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Calendar of Events 2013 Continued

May 21–23
Florida & Southeast Exotic Pest Plant Council
Annual Conference
Panama City Beach, FL
www.fleppc.org

June 17–20
Florida Lake Management Society
24th Annual Conference
Southeast NALMS Regional Conference
Daytona Beach Shores, FL
http://flms.net/

July 10
Great CEU Round-Up
UF-IFAS/Florida Turfgrass Association
Polycom Training at participating Florida Extension Offices
www.ftga.org/

July 14–17
Aquatic Plant Management Society
53rd Annual Conference
in conjunction with the
Texas Aquatic Plant Management Society
San Antonio, TX
www.apms.org

September 16–18
Mid-South Aquatic Plant Management Society
Tunica Resorts, MS
www.msapms.org/

October 14–17
Florida Aquatic Plant Management Society
37th Annual Training Conference
St. Augustine, FL
www.fapms.org

October 30–November 1
North American Lake Management Society
33rd International Symposium
San Diego, CA
www.nalms.org

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Exotic invasive aquatic plants such as Hydrilla, Eurasian Watermilfoil and Curlyleaf Pondweed, can be detrimental to a healthy fishery in lakes across the country.

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and the Florida Fish & Wildlife Conservation Commission
Invasive Plant Management Section