Aquatics

SPRING 2017

A Publication of the Florida Aquatic Plant Management Society

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Aquatics

SPRING 2017 Volume 39, Number 1

COVER

Red root floater (*Phyllanthus fluitans*) plants covering a backwater area of the Peace River. Photo by Michael Sowinski, Florida Fish and Wildlife Conservation Commission. See story on page 5.

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To become a member of FAPMS and receive *Aquatics* magazine, please visit the website at: www.fapms.org

The mission of FAPMS is "To Preserve Florida's Aquatic Heritage." FAPMS was formed in 1976 and provides a forum for those interested in aquatic plant management to meet, discuss and exchange ideas and information.

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From the President

By Andy Fuhrman

Over the past few aquatic plant management meetings I have attended, there has been a recurring theme. There is a concern about the future. More specifically, there is concern over the lack of young aquatic plant managers. We are fortunate to be in an industry unlike any other. What we do is vital for many reasons. However, none of what we do is possible without the most important element, the people who actually work in the field. This is not a problem that should be taken lightly. It is up to us to recruit the future. I am confident we all know people who are unhappy in their current employment situation. Reach out to your friends and family and explain what you do. Most people have no idea of the importance of our profession. Invite these people to our conference, share *Aquatics* magazine with them, have them spend a day with you at work, or just show them pictures of what you do and they will see the amazing opportunity that lies ahead of them.

FAPMS is dedicated to making sure someone is looking out for your future. The first part of the FAPMS mission is, "To provide a common forum in which to meet, discuss, exchange ideas and information for everyone interested in the management of the aquatic ecosystem. Assist all Aquatic Plant Management personnel: private, commercial and public in all aspects of their profession so that Florida's aquatic plant managers may become the most knowledgeable and educated professionals possible." In order for us to achieve our mission, it is imperative that every person in our industry is a member. This is YOUR society. It is only $35 for a year's membership. If you know people who aren't members, urge them to join. This society isn't possible without you.

The program committee is already working hard on this year's conference scheduled for October 17-19 and we would love to have the largest attendance ever. I look forward to seeing everyone in Orlando and, if you ever have any feedback, please reach out to me.

Andy Fuhrman, President FAPMS, 954-382-9766; afuhrman@allstatemanagement.com

Red Root Floater Update

Figure 1. Red root floater plants covering a backwater area of the Peace River.

Figure 2. Close-up showing red root floater plant growing in damp soil.

By Michael Sowinski

In August 2010, Dr. George Wilder from the Naples Botanical Garden in Naples, Florida, discovered red root floater (*Phyllanthus fluitans*) growing in a canal attached to the Peace River in Desoto County west of Fort Ogden, and reported his findings to the Florida Fish and Wildlife Conservation Commission (FWC). Since the initial discovery, FWC biologist Michael Sowinski, along with the Southwest Florida Water Management District (SWFWMD), found individual plants to large populations (Figure 1) of the small floating plant scattered along roughly thirty-one river miles of the Peace River. Some highlights since the initial discovery:

- The current known range is approximately five miles north of the Town of Arcadia south to the first known populations growing in Charlotte

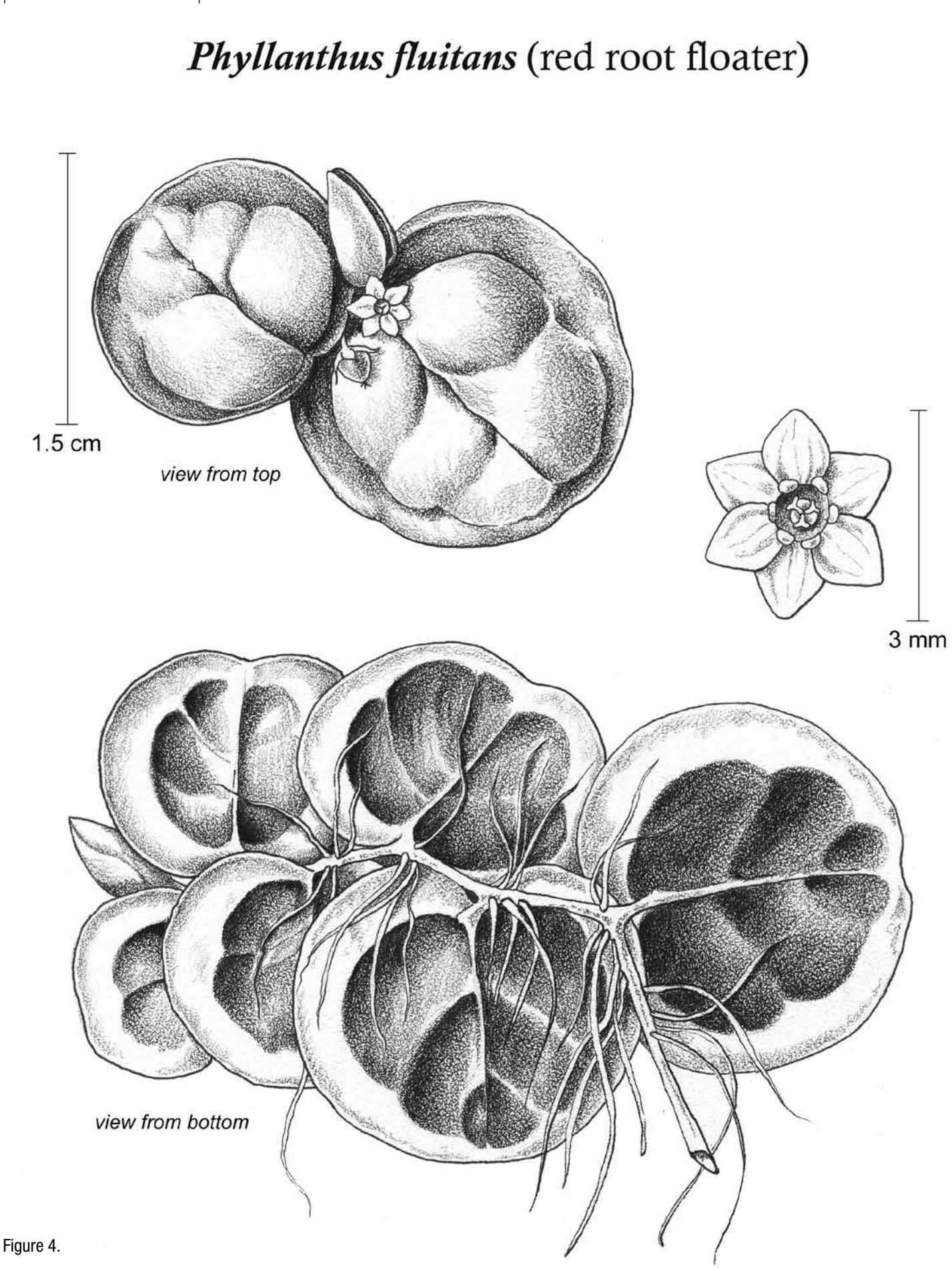
Phyllanthus fluitans (red root floater)
1.5 cm
view from top
3 mm
view from bottom

Figure 4.

County near Harbor Heights (2016).

- The 2016 Charlotte County population probably survived the salt/brackish water due to the above average rainfall in the central Florida region, causing the salt wedge to shift further down river, allowing freshwater to expand south.
- Over the last six plus years a total of 62 acres have been treated. The population seems to fluctuate each year with only two acres treated in both 2013 and 2015. At the most, 16 acres were treated in both 2012 and 2016 with the aquatic labeled herbicide diquat dibromide (trade name Knockout TM).
- In November 2015 red root floater plants were found rooted and growing in damp soil in the Peace River flood plain (Figures 2 and 3).

Red root floater, along with water lettuce (*Pistia stratiotes*), water hyacinth (*Eichhornia crassipes*), and burhead sedge (*Oxycaryum cubense*), are being continuously managed on the Peace River to prevent these problematic species from covering backwater areas, blocking ambient light penetration to the bottom and hampering navigation. Although it is highly unlikely red root floater will be eradicated from the Peace River, FWC and SWFWMD personnel will continue to monitor and treat populations to prevent the spread of this species to nearby private and public waters. For more information, please see the Winter 2011 edition of *Aquatics* magazine or enter "Phyllanthus fluitans Florida" in your favorite search engine.

Michael Sowinski is a Biological Scientist III for the Florida Fish and Wildlife Conservation Commission, Invasive Plant Management Section in Bartow; 863-534-7074; Michael.Sowinski@MyFWC.com

Figure 3. Close-up showing a pulled up red root floater plant exposing underground roots.

Figure 4. FAPMS, Inc. funded this botanical illustration of red root floater (see page 6). The illustration was completed by botanical illustrator Mindy Lighthipe, under the guidance of the UF/IFAS Center for Aquatic & Invasive Plants.

In Memorium

GARY R. BUCKINGHAM

December 1942 – January 2017

Gary R. Buckingham, Retired USDA-ARS Research Entomologist and a world-renowned expert in biological control of weeds, passed away on January 16, 2017 in Richmond, CA. Gary received a Bachelor of Science in Agriculture with distinction in Entomology from Purdue University in 1964. He then earned his Ph.D. in Entomology from the University of California's Division of Biological Control, Berkeley, in 1975. In 1970, Gary was sent to the USDA-ARS lab in Rome, Italy by the UC Division of Biological Control, to study biological control of field bindweed (*Convolvulus arvensis*), and yellow starthistle (*Centaurea solstitialis*). In 1972, he was hired by the ARS as Research Entomologist and Leader at the Rome lab. His studies included insects attacking thistles, Dalmatian toadflax (*Linaria dalmatica*), and opium poppy (*Papaver somniferum*).

In 1977, Gary was transferred to Gainesville, Florida where he spent the next 25 years. Gary was a member of the ARS, Invasive Plants Research Laboratory (formerly Aquatic Plant Control Research Unit), in Ft. Lauderdale, Florida but worked at the quarantine facility of the Florida Biological Control Laboratory at the Division of Plant Industry (DPI), Gainesville. He was also a Courtesy Assistant Professor in the University of Florida Department of Entomology and Nematology in Gainesville.

Gary's research included studies of the biology and host range of foreign insects with potential for biological control of the Australian weeds, melaleuca (*Melaleuca quinquenervia*), and Old World climbing fern (*Lygodium microphyllum*), both of which threaten the Everglades and south Florida ecosystems. He had extensive foreign experience having conducted explorations and field collections in 20 countries for insects to control weeds as well as insect pests. Gary also made highly significant research contributions to the ARS' efforts to use insects to control alligatorweed (*Alternanthera philoxeroides*), Eurasian watermilfoil (*Myriophyllum spicatum*), hydrilla (*Hydrilla verticillata*), and waterhyacinth (*Eichhornia crassipes*). Gary retired from the ARS in 2004.

Throughout his career, Gary published numerous research papers and other publications highlighting his studies and gave numerous talks at national and international scientific meetings. News of Gary's death brought several tributes from friends and associates, such as, "If TAG [USDA-APHIS' Technical Advisory Group on Biological Control of Weeds] received a petition to release a biocontrol agent from Gary Buckingham, you could guarantee 100% it was safe to release" (Al Cofrancesco, USACOE Environmental Laboratory, Vicksburg). "His science was impeccable, both novel and unbelievably thorough. Above all, Gary was a true Gentleman" (Matthew Purcell, USDA ARS Australian Biological Laboratory, Brisbane).

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Impacts of DIQUAT ON SPATTERDOCK When Targeting Invasive Floating Vegetation:

Quantifying Observations from Resource Managers

By Dean Jones, Ryan Moore, and Michael Netherland

Water hyacinth (*Eichhornia crassipes)* and water lettuce (*Pistia stratiotes*) are considered two of the world's worst weeds and Florida's most invasive aquatic plant species. These free-floating plants remain the highest management priority in the Florida Fish and Wildlife Conservation Commission (FWC) State Funded Aquatic Plant Control Program. Their free-floating nature allows these plants to become established in a wide range of habitats and they are frequently found intermingled throughout beds of rooted aquatic vegetation, included native vegetation.. This creates a management challenge. If left alone, the invasive floating plants can have negative impacts on the native vegetation and will spread to new sites. On the other hand, management to target the floating plants can result in impacts to the native vegetation.

Although numerous methods of controlling water hyacinths and water lettuce have been employed through the years, aquatic herbicides are the most widely utilized option. While new chemistries and strategies are being evaluated by the aquatics industry, the standards that have been utilized for over 50 years are 2,4-D and diquat. 2,4-D is a systemic herbicide registered for use in 1959 that provides good control of water hyacinth. Diquat is a contact herbicide registered for use in 1962 that affords good control of both water hyacinth and water lettuce.

Applicators know that both herbicides can result in short-term non-target injury to native plants. Additionally, research

Figure 1: Spatterdock field on north shore of Lake Kissimmee filled with water hyacinths and water lettuce. Photo by Dean Jones.

Figure 2. Short term brown-out following a diquat application along the west shore of Lake Kissimmee outside the Kissimmee State Park Cove. Photo by Dean Jones.

and observations have shown some highly valued native emergent species, including fragrant water lily (*Nymphaea odorata*), giant bulrush (*Schoenoplectus californicus*) and spatterdock (*Nuphar advena*), to be more susceptible to 2,4-D and 2,4-D/diquat combinations when compared to use of diquat alone. Hanlon and Haller (1990) described the time course of impacts of 2,4-D treatments on spatterdock in the March issue of *Aquatics* magazine. Diquat alone can result in browning of surface leaves of most emergent vegetation but, given the lack of translocation of this product, rapid recovery from well-established underground storage tissue is customary. The short term impacts to all vegetation following a diquat application for floating plants can be highly visual and lead to stakeholder complaints regarding non-selective control. Aquatic plant management professionals understand that this browning of rooted emergent vegetation is temporary and rapid recovery of most native plants quickly follows.

Reduced impacts to native vegetation and more freedom from wind restrictions led resources managers working on the Kissimmee Chain of Lakes to switch to diquat alone for maintenance control of both water hyacinth and water lettuce around 2010. In many cases, the invasive floating plants are intermixed in large beds of spatterdock (Figure 1). These extensive spatterdock beds are often key areas for fishing and waterfowl hunting. Stakeholders from bass fishing and duck hunting organizations periodically complain about the damage to spatterdock following a floating plant treatment (Figure 2). Although anecdotal experience suggests the damage is short term, there is no quantitative data to support this claim. In addition, many stakeholders who complain of non-target impacts do not return to these sites in a time frame that allows them to observe recovery. The purpose of this study was to collect data to document the impacts of diquat on spatterdock following operational management of invasive floating plants. The results will support aquatic plant managers and provide quantitative information to stakeholders regarding the time-course for spatterdock recovery.

In late May 2015, following a stakeholder complaint for an area treated on the south side of Brahma Island, three areas around the NW quadrant of Lake Kissimmee were selected for monitoring operational management of water hyacinths and water lettuce in spatterdock. Within a series of larger treatment areas (ranging in size from 242 to 736 acres), monitoring plots were established that were 2.5 acres in size (Figure 3). Two of these plots were designated as treatment plots and the remaining plot near the Pig Trail was designated as the untreated reference plot. Everglades Snail Kite activity around the reference plot rendered that area off limits for treating at that time. In addition to visual surveys of the larger treatment area, intense monitoring was conducted in the smaller plots. Point intercept grids were created within the plots at a spacing that yielded approximately 10 points per acre for a total of 26 sample sites per plot.

Pre-treatment data was collected on May 29, 2015. The plots were treated on June 1, 2015. Post-treatment surveys were conducted at 1, 7, 10, 14 and 24 days after treatment (DAT). At each of the 26 sites, a one-square-meter quadrat was deployed to ensure standardization of the ratings. The data collected included species frequency, percent area covered by vegetation and percent green canopy analyzed by Canopeo™.

Canopeo™ is an application developed by Oklahoma State University for use in

Figure 3. All treatment plots (white polygons) and monitoring plots (yellow polygons) contained dense spatterdock and invasive floating plants. Red circle delineates the snail kite buffer zone.

agriculture. Simply put, it is a rapid and accurate green cover measurement tool that analyzes a downward facing photo (Figure 4). This was the first attempt to incorporate this tool into aquatic plant management monitoring or research. Although this process does not delineate species, it does provide quantifiable data on the percent of green cover or living tissue instead of a visual estimate. Given that diquat can result in rapid injury (browning) to emergent plants, this presented the opportunity to contrast visual percent area covered data with data collected using Canopeo™.

Results:

The percent frequency of occurrence data demonstrate widespread initial coverage of water hyacinth and spatterdock in all plots as well as dense coverage of water lettuce in treatment plots 1 and 2 (Table 1). Although good overall control of invasive floating plants was observed in plot 2, partial control was documented in plot 1. Since this was an operational treatment, an additional application was applied to plot 1 on June 23rd, confounding the initial application data. The focus will therefore be on Plot 2 results which show a conventional treatment outcome with significant reductions in water hyacinth and water lettuce frequency. Spatterdock frequency of occurrence remained above 95% throughout the trial while water hyacinth frequency was reduced to 7% coverage and water lettuce frequency was reduced to 0% coverage by 24 DAT.

Frequency of occurrence data does not take plant health into account, yet this information can be teased out of the percent vegetation coverage and Canopeo™ data. Percent coverage of vegetation and Canopeo™ green canopy results showed good initial agreement prior to the diquat treatment, but diverged strongly during the first week of treatment (Figure 5). This divergence indicates that Canopeo™ is detecting the injury (browning) to the vegetation immediately following the diquat application. By 14 DAT, these values started to converge again suggesting recovery in the green canopy. While this recovery was "observed" in the field, the value of Canopeo™ ratings is the ability to quantify the recovery.

Results from plot 2 Canopeo™ data reveal that green cover measurements increased from just 3% at 3 DAT to 38% by 24 DAT. Given the near complete loss of invasive floating vegetation in this plot, the green cover is almost exclusively due to spatterdock recovery. While Nuphar surface leaves showed severe initial injury following the diquat application, the plants had largely recovered by 24 DAT (Figure 6; see page 14).

In contrast, the spatterdock and water hyacinth frequency remained similar in the untreated reference plot through the course of the evaluation. Likewise, untreated reference plants also showed strong agreement between visual coverage ratings and the Canopeo™ cover data throughout the study.

This study was repeated in December

Figure 4. A digital picture of the sample point is taken and incorporated into Canopeo™ to determine the percent green cover. In this case, injured water hyacinth fills the grid, but Canopeo™ only detects and calculates the amount of green tissue in the grid (18.25%).

Plant Species	5/29 (pre-treat)	6/2	6/8	6/11	6/15	6/25
Plot 1 – Diquat 2 qts /acre						
Water hyacinth	81	76	92	92	88	53*
Water lettuce	88	96	96	65	50*	50*
Nuphar	100	100	100	100	96	96
Plot 2 – Diquat 2 qts/acre						
Water hyacinth	50	42	53	46	15*	7*
Water lettuce	73	65	80	19*	7*	0*
Nuphar	92	96	96	88	92	96
Untreated Control						
Water hyacinth		71	71		73	73
Water lettuce		0	0		0	0
Nuphar		100	100		100	92

Table 1. Percent frequency of occurrence of spatterdock, water hyacinth, and water lettuce in two plots treated with diquat and one untreated reference plot. Samples were collected pretreatment (5/29) through 24 DAT (n=26 observations per plot). Asterisks at each sample date indicate a reduction in frequency of occurrence compared to the pretreatment condition according to a t-test ($\alpha = 0.05$). The control plot was not sampled on 5/29 or 6/11.

to determine if there is a differential response during a fall/winter diquat application (data not shown). All results followed similar trends to those observed in the June treatment with minor exceptions. The initial browning did not peak until 4 DAT, spatterdock injury was not as severe and the reduction in water hyacinth frequency was not noted until 35 days after treatment, indicating a delayed reduction in treatment effect compared to the June application. Correspondingly, given the reduction in water hyacinth biomass by 35 DAT, the recovery of the green canopy noted in January was almost exclusively due to spatterdock.

Results from the June and December 2015 treatments suggest that spatterdock rapidly recovered following diquat applications. While this was obvious from viewing the treatment areas during multiple separate dates following the application, the objective was to quantify these "observations" and provide data that demonstrates the time-course of injury and recovery. Based on Canopeo™ and coverage data, the spatterdock was initially impacted by the diquat applications, however, significant recovery was noted between 14 and 35 days following application. The June application resulted in more severe initial visual injury to the spatterdock, but also resulted in faster recovery (14 to 24 days) when compared to the December application (35 days). Depending on when a stakeholder might have visited these sites, they could have concluded anything from widespread severe injury to spatterdock to no impact at all. It is also important to note while sampling efforts focused on a small subplot within the larger management area, visual observations suggest these results were consistent in the larger management zone. The complete report submitted to the FWC Invasive Plant Management Section, including all the December data and figures, is available upon request.

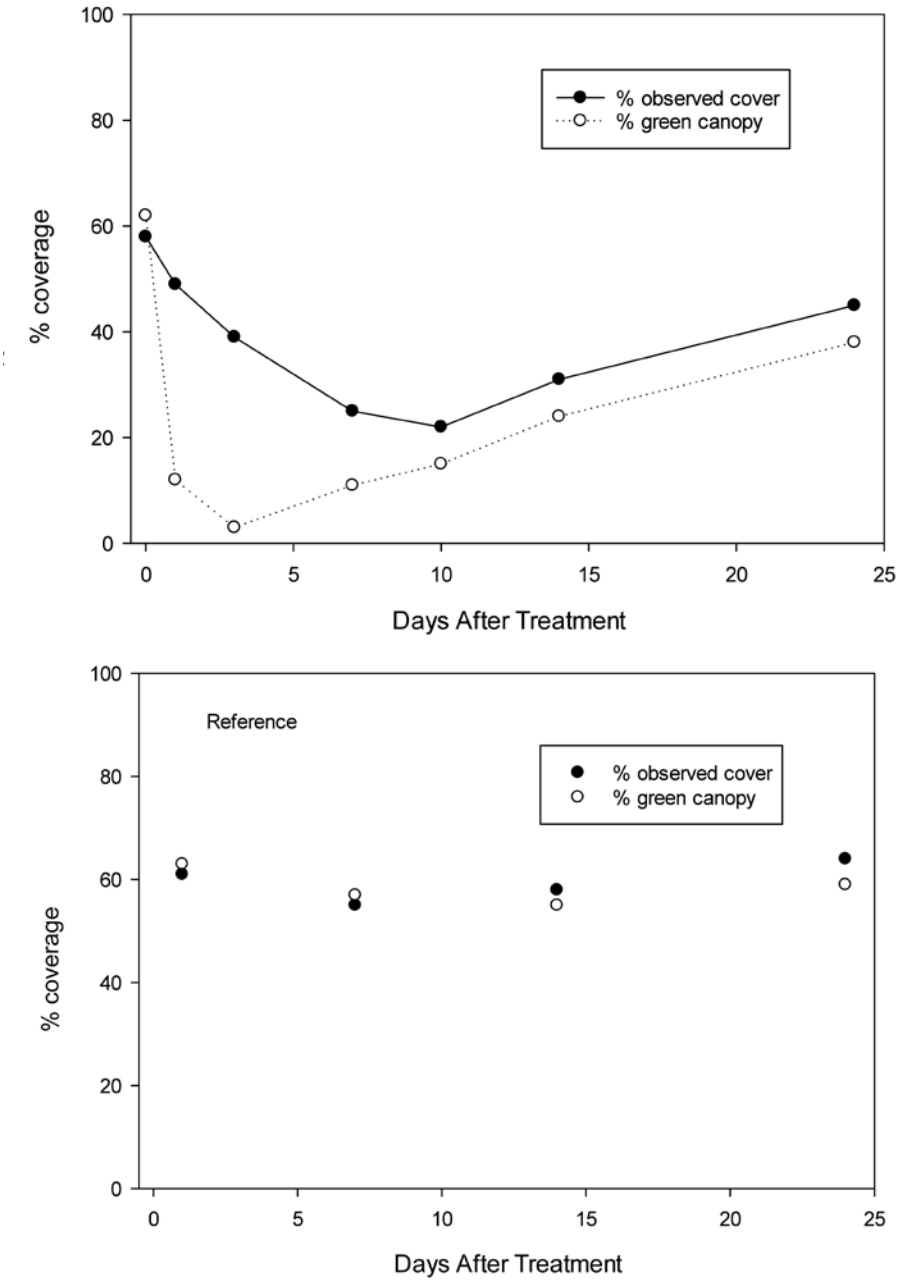

Figure 5. Percent vegetation cover and Canopeo™ ratings for plot 2 (top) and an untreated reference plot through 24 days following a diquat application for control of invasive floating plants. The native emergent plant spatterdock was the dominant native species. Each value represents the average of 26 readings within the plot.

With concern for protecting desirable, native aquatic vegetation and development of new herbicides, diquat remains a solid option for some situations. Although stakeholder complaints will likely continue, we have provided data to support a common management operation that can help educate stakeholders by providing quantitative information regarding the time-course for spatterdock recovery when targeting invasive floating plants with diquat.

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Ryan Moore (ryanm@gater-creek.com) is proprietor of Gator Creek Technologies, LLC and EcoAnalytics™.

Dr. Michael D. Netherland (mdnether@ufl.edu) is a Research Biologist for the US Army ERDC and a Courtesy Associate Professor at the University of Florida, Gainesville, FL.

References

Hanlon, C., and B. Haller. 1990. The Impact of 2,4-D Used in Water Hyacinth Control Programs on the Growth of Non-target Spatterdock. *Aquatics* magazine, Vol. 12(1):14-16, March 1990.

Continued on next page

Pre-Treatment

1 DAT

3 DAT

7 DAT

10 DAT

14 DAT

24 DAT

Figure 6. A pictorial timeline of spatterdock injury and recovery over a 24 day period following a summer diquat application for invasive floating plants. Photos by Ryan Moore.

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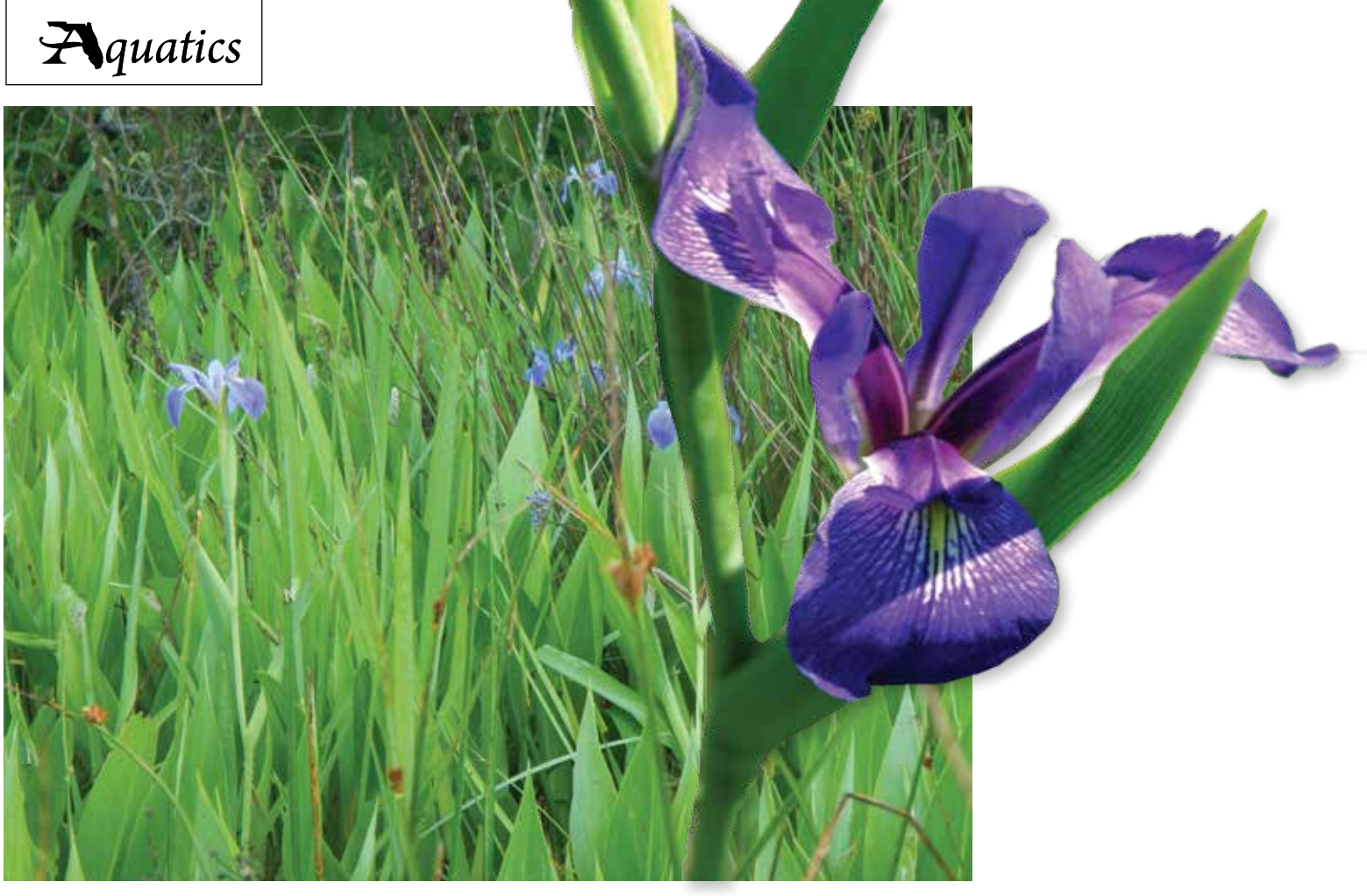
THESE ARE A FEW OF MY FAVORITE THINGS:

blue-flowered native aquatic plants

By Lyn A Gettys

Normally having the blues is a bad thing… but I love blue flowers, especially when they're attached to a native aquatic plant! My obsession with all "flora cerulean" goes back a long, long way. It all started with my Master's degree research at North Carolina State University, where I worked with Stokes aster (*Stokesia laevis*), a native garden ornamental that normally has powder-blue flowers. White-flowered and yellow-flowered variants had been discovered and part of my research focused on how flower color was inherited in the species. When I finished my MS, I still couldn't get enough of the blues, so I studied pickerelweed (*Pontederia cordata*) during my PhD research at the University of Florida. As with Stokes aster, a flower-color variant with white flowers had been found, and my investigations included determining how flower color was controlled and inherited in pickerelweed. You'd think after 6+ years of working with blue flowers, I'd be sick of them, but it's quite the opposite – in fact, I still ooh and aah when I encounter plants with cheerful, sunny-day, blue-sky flowers. I'd like to share the blues with you, so I hope you enjoy this photo essay with some of my favorite native blue-flowered aquatic plants!

Blue-eyed grass (*Sisyrinchium angustifolium*) is a low-growing perennial in the Iridaceae (iris) family. The plant grows in small clumps that can be up to 8" in height and spread and has bright-green, grass-like leaves. The leaves join at the base of the plant in a "fan" shape that is characteristic of other iris family members. The clear-blue flowers have a bright yellow center and six petals, each with an unusual notch at the tip of the petal. In addition to performing well in wetland areas and rain gardens, blue-eyed grass is useful as a low-maintenance landscape plant and makes a delightful border for native plantings.



Blue flag iris (*Iris virginica*) is also a member of the Iridaceae; in fact, the family derives its name from the genus *Iris*. Like blue-eyed grass, blue flag iris is a perennial with leaves that attach at the base of the plant in a fan. However, blue flag iris is much larger than its diminutive cousin and can produce leaves that are up to 3' long. The large, showy flowers range in color from powder blue to deep violet and are produced on stalks that are often longer than the tallest leaves of the plant. Blue flag iris happily grows in wetlands and along the margins of ponds, canals, and streams, but does well in more upland settings as well.

Stokes aster

- The journal article "Crop reports: Stokes aster" in HortTechnology (online at http://horttech.ashspublications.org/content/12/1/138.full.pdf+html?sid=d01cda1e-c5f2-487c-befb-a0862efab4bc)
- The webpage "UF/IFAS gardening solutions: stokes aster" (online at http://gardeningsolutions.ifas.ufl.edu/plants/ornamentals/stokes-aster.html)

Pickerelweed

- The article "A sampling of Florida's native aquatic plants", pages 28-30 in the Summer 2016 issue of Aquatics magazine (online at http://fapms.org/aquatics/issues/2016summer.pdf)
- The article "Characteristics of pickerelweed", pages 4-10 in the Winter 2002 issue of Aquatics magazine (online at http://fapms.org/aquatics/issues/2002winter.pdf)
- The EDIS publication "*Pontederia cordata* Pickerel weed" (online at http://edis.ifas.ufl.edu/pdffiles/FP/FP49000.pdf)

Blue-eyed grass

- The EDIS publication "Blue-eyed grass: *Sisyrinchium angustifolium*" (online at http://edis.ifas.ufl.edu/pdffiles/AG/AG40100.pdf)

Blue-flag iris

- The EDIS publication "*Iris virginica* Blue flag, blue flag iris" (online at http://edis.ifas.ufl.edu/pdffiles/FP/FP28800.pdf)
- The CAIP webpage "*Iris virginica*" (online at http://plants.ifas.ufl.edu/plant-directory/iris-virginica/)

Skyflower

- The EDIS publication "Skyflower: *Hydrolea corymbosa*" (online at https://edis.ifas.ufl.edu/pdffiles/AG/AG39700.pdf
- The article "Skyflower", pages 4-9 in the Winter 1999 issue of Aquatics magazine (online at http://fapms.org/aquatics/issues/1999winter.pdf)

All photos courtesy UF/IFAS: Lyn Gettys, Carl J Della Torre III, David Sutton, and Center for Aquatic and Invasive Plants

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Skyflower (*Hydrolea corymbosa*) is a member of the Hydrophyllaceae (waterleaf) family. Encountering skyflower in the field is unusual; in fact, I searched far and wide for several years in an effort to find source material for our aquatic plant collection at the Fort Lauderdale Research and Education Center. I finally managed to get my hands on some after my son spotted the bright-blue flowers in a roadside ditch while we were on the way to a landfill in Palm Beach County. I was able to dig up some of the plants and added them to our collection (I think of this as my reward for cleaning my mother's patio, which necessitated the trip to the landfill). Skyflowers are easy to overlook if they are not flowering because, most of the time, they are not particularly showy. The leaves are glossy, medium- to dark-green, lanceolate (sword-shaped), and sessile (attaching directly to the stem of the plant without a petiole or leaf stalk). Young plants may be vine-like with trailing stems, but more mature plants are shrub-like and can reach around 3' in height. Skyflower can form woody stems and may die back to the ground during the winter. Although plants may not merit a second glance most of the time, they are impossible to ignore when they are in bloom. Each flower has five brilliant blue petals and five sets of anthers bearing bright orange pollen. Skyflower grows well in moist soil and would undoubtedly be a welcome addition to rain gardens and other seasonally wet landscapes, but finding plant material for use in wetland restoration projects or ornamental plantings is a challenge.

For more information about the plants described in this article, please see the resources on page 18.

STUDENT SCHOLARSHIPS

NEAPMS Student Scholarships

The Northeast Aquatic Plant Management Society provides stipend funds designed to encourage and involve exceptional undergraduate students in the field of Aquatic Plant Management. Awards may be used to defray living expenses for summer internships with a group or organization whose main focus is Aquatic Plant Management. For more information, visit www.neapms.org/undergraduate-student-stipend.

The Northeast Aquatic Plant Management Society also provides scholarship funds designed to encourage and involve exceptional graduate students in the field of Aquatic Plant Management. Awards may be used as a stipend, for research budget expenses (travel, supplies, etc.), to defer fees, to defray living expenses for summer research, or any combination of these items. Scholarship funds are awarded (upon availability) each January following the NEAPMS annual board meeting. For more information, visit www.neapms.org/graduate-student-scholarship-award.

SCAPMS Student Scholarship

The **South Carolina Aquatic Plant Management Society** is seeking applications for its annual Phillip M. Fields Scholarship Award. The Society intends to award a $4,000 scholarship to the successful applicant in the fall of 2017. Scholarship funds are provided directly to the student and may be used by the recipient to cover costs associated with education and research expenses. Eligible applicants must be enrolled as full time undergraduate or graduate students in an accredited college or university in the United States. Course work or research in an area related to the biology, ecology or management of aquatic plants in the Southeast is also required.

Applications must be received no later than June 1, 2017 and will be evaluated on the basis of relevant test scores (ACT, SAT, GRE, etc.), college grades, quality and relevance of course work or research, a proposed budget, information obtained from references, and other related considerations. Other factors being equal, preference will be given to applicants enrolled in Southeastern and South Carolina academic institutions. The successful applicant may be requested to present an oral report on research activities at the annual meeting of the Society. Note: All application information is to be submitted electronically. For more information, visit www.scapms.org/scholarship.html

FMCA Student Scholarships

The T. Wainwright Miller, Jr. **Florida Mosquito Control Association** Scholarship is managed and awarded by the Foundation. The purpose of the Scholarship is to encourage and assist students having a major in Biological, Ecological and/or Entomological studies who are seeking degrees relevant to arthropod control, with particular emphasis on Public Health fields.

The Cyrus R. Lesser Memorial Scholarship Fund is managed and awarded by the Florida Mosquito Control Foundation. The purpose of the scholarship is to foster future learning in the field of mosquito control and vector biology. Awards will be made annually and governed by five (5) trustees of various mosquito control entities. The trustees shall make selections after review of all applications, without consideration towards sex, race, age, or religion. This Scholarship shall be awarded to the recipients at the Florida Mosquito Control Association Fall Annual Meeting in November each year.

For more information, visit www.floridamosquito.org/Public/For_The_Public/FMCA_Scolarships/Public/For_the_Public/FMCA_Scholarships.aspx

WSSA Student Awards

The **Weed Science Society of America** John Jachetta Undergraduate Research Award provides up to $2,000 to support research projects conducted by undergraduate students over at least one quarter or one semester of the academic year. The grant can be used as a stipend or to defray the cost of research supplies. Any undergraduate student interested in weed science can work with a sponsoring university instructor to submit a proposal to WSSA for consideration.

The Weed Science Society of America is offering up to (6) Annual Meeting Grants to qualifying graduate student members for their first attendance at the WSSA annual meeting. These grants will provide for annual meeting registration fees as well as up to four nights lodging while at the meeting. Students and/or their graduate advisor are responsible for all remaining costs incurred to attend the WSSA annual meeting, including travel and meals.

For more information, visit wssa.net/society/awards-2.

MAPMS Graduate Student Research Grant

The **Midwest Aquatic Plant Management Society** Robert L. Johnson research grants will be competitively awarded to

qualified graduate students pursuing a degree in aquatic plant management or related field at any accredited university or college, or independent research which contributes to the mission of the Society. MAPMS will consider all applications pertaining to research dealing with aquatic plant management, including ecology or biology of aquatic plants, and chemical, mechanical, or biological control of aquatic weeds. Winners will be announced at the annual conference each year, and all recipients are required to present their research findings at the annual conference the following year. For more information, visit www.mapms.org/students/robert-l-johnson-memorial-research-grant.

APMS Graduate Student Research Grant

Student initiatives are among the most important core values of the **Aquatic Plant Management Society**. High on the list of student support programs is the Graduate Student Research Grant offered by APMS in the area of aquatic plant management and ecology. This academic grant is co-sponsored by APMS and the seven regional APMS chapters: Florida, MidSouth, Midwest, Northeast, South Carolina, Texas, and Western. For more information, visit www.apms.org/resources/graduate-student-research-grant.

MSAPMS Student Scholarship

The **MidSouth Aquatic Plant Management Society** is seeking applications for the 2017 graduate student scholarship to be awarded at the 2017 annual meeting. We request that the successful applicant attend the meeting and give a presentation of research progress and results as they are available. One scholarship of $2,000 will be awarded to a qualified student applicant enrolled and studying aquatic plant science or other relevant research. For more information, visit www.msapms.org/students/scholarship.html.

FAPMS Student Scholarships

The **Florida Aquatic Plant Management Society** William L. Maier Jr. Memorial Scholarship will be awarded to a graduate student who is 1) enrolled in an accredited university or college located in Florida, 2) a U.S. citizen, and 3) majoring in a field of study directly related to the management of freshwater, aquatic vegetation for the ecological benefit of aquatic or freshwater environments. For more information, visit www.fapms.org/scholar/maier_scholar.html.

The Paul C. Myers Applicator Dependent Scholarship provides scholarships to deserving dependents of FAPMS members. The scholarship is based on: 1) The applicant's parent or guardian having been a FAPMS member in good standing for at least three consecutive years, 2) Financial need, 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, and 5) Submission of a completed application form by the closing date. For more information, visit www.fapms.org/scholar/myers_scholar.html.

Calls for Papers 2017

Call for Papers - MidSouth Aquatic Plant Management Society

Interested in giving an oral or poster presentation about field studies, research-based trials, or industry updates? The MSAPMS membership would love to hear about your work on aquatic and wetland management, including biology and ecology of these species. Please contact the MSAPMS Program Chair, Jeremy Slade at Jeremy.slade@uniphos.com or 662.617.4571. **Submission deadline is June 16, 2017.** For more information, visit www.msapms.org/conferences/2017.

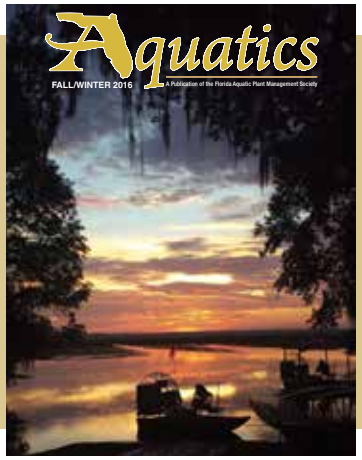
Call for Papers - Florida Aquatic Plant Management Society

The FAPMS 41st Annual Training Conference will be held October 16-19, 2017 in Lake Buena Vista, FL. We are looking for papers on herbicide application and mechanical techniques (aquatic, natural area, and right-of-way), mixtures, innovative control measures, re-vegetation projects, new exotic plant introductions, research projects, etc. We welcome talks from researchers, scientists, applicators, and other field personnel – in short, anyone involved in aquatics! You don't have to be a professional speaker in order 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 other members. **Submission deadline is July 31, 2017.** For more information, visit www.fapms.org/meeting/meet17/2017meeting.html.

Call for Papers - Texas Aquatic Plant Management Society

You are invited to give a presentation at the 2017 TAPMS Annual Conference **November 27-29 in San Antonio**. Twenty 20-minute presentations covering all aspects of aquatic resource management: including the biology of aquatic plants, ecology of aquatic habitats, biological and chemical control on aquatic plants, as well as the management and restoration of aquatic and wetland ecosystems are welcome. Presentations should not be used to advertise a specific product, brand, or service- but rather education for attendees. For more information, visit www.tapms.org/2017-conference-agenda.

Hey, plant managers!



The **FAPMS Annual Photo Contest** will take place at the 2017 Annual Conference in Lake Buena Vista, October 16th – 19th.

Keep your phones/cameras ready for that perfect field shot. Categories are **Aquatic Scenes** and **Aquatic Operations**. New this year: contest winners will receive a **CASH PRIZE**. Winning photos also will be printed in *Aquatics* magazine so download them in their original size. (Note: emailing photos tends to automatically downsize them for faster sending. Ask for help if you need it!) You might even get lucky and get your photo on the cover of *Aquatics* magazine! See the Fall/Winter 2016 and Winter 2012 issues for cover shots from previous photo contest winners. View all previous issues at fapms.org/aquatics/issues.html *Good luck!!!*

Calendar of Events 2017 & 2018

June 6 – 9
Florida Lake Management Society
(www.flms.net)
Captiva, FL

July 16 – 19
Aquatic Plant Management Society
(www.apms.org)
Daytona Beach, FL

July 26
FTGA-UF/IFAS Great CEU
Round-Up
(www.ftga.org)
Multiple sites in FL

August 1 – 2
Southern Weed Science Society
2017 Student Weed Contest
(www.swss.ws)
Vero Beach, FL

August 20 – 24
American Fisheries Society 147th
Annual Meeting
(afsannualmeeting.fisheries.org)
Tampa, FL

September 11 – 13
MidSouth Aquatic Plant
Management Society
(www.msapms.org)
Birmingham, AL

October 16 – 19
Florida Aquatic Plant
Management Society
(www.fapms.org)
Lake Buena Vista, FL

October 22 – 26
20th International Conference on
Aquatic Invasive Species
(www.icais.org)
Fort Lauderdale, FL

November 6 – 9
North American Lake Manage-
ment Society (www.nalms.org)
Westminster, CO

November 27 – 29
Texas Aquatic Plant
Management Society
(www.tapms.org)
San Antonio, TX

January 9 – 11
Northeast Aquatic Plant Manage-
ment Society (www.neapms.org)
Portsmouth, NH

January 21 – 24
Southern Weed Science Society
(www.swss.ws)
Atlanta, GA

January 29 – February 1
Weed Science Society of America
(wssa.net)
Arlington, VA

February 26 – March 1
Midwest Aquatic Plant
Management Society
(www.mapms.org)
Cleveland, OH

Don't Miss It!!!

Florida Aquatic Plant Management Society
established in November 1976

41ST Annual
FAPMS Training Conference
Oct 16-19, 2017
Buena Vista Palace Hotel and Spa in
Lake Buena Vista, Florida

Visit fapms.org for details!

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