

# A Q U A P H Y T E

A NEWSLETTER ABOUT AQUATIC, WETLAND AND INVASIVE PLANTS

## Center for Aquatic and Invasive Plants (CAIP)

with support from

The Florida Fish and Wildlife Conservation Commission,  
Invasive Plant Management Section



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## The CAIP Information Office

By Karen Brown, Information Office Coordinator

The CAIP Information Office serves as the outreach arm of the University of Florida/Institute of Food and Agricultural Sciences Center for Aquatic & Invasive Plants (CAIP). With the evolution of Internet technology, our efforts have changed a lot in the thirty plus years we've been serving the Center and its stakeholders. It's amazing to look back and see where we started and where we are today. The format of everything we've done has changed many times, but that really only interests us veterans. In with the new is what we try to do and we are fortunate to have a diverse group in our Information Office that keeps us up to date.

The CAIP website continues to be our primary outreach tool. While many users simply have our home page bookmarked, other users find us through a "back door" when they search the Internet for information about an invasive species and are directed to one of our Plant Information & Images pages. Others are looking for line drawings or species identification videos. Some are searching for management options, weed alerts and other publications, or announcements of professional meetings. Our extensive website has all of these tools and we are continually updating it with new information and materials. Our home page features upcoming events, recent publications, ongoing cooperative projects and more. Our site navigation bar features Plant Information & Images which opens to a drop down menu (see image).



The scientific and common name pages open to an alphabetized list that also indicates whether a plant species is native or non-native. Clicking on a plant name provides an encyclopedic trove of information and images for that species, although content varies widely based on the importance of the species in Florida's public waters and lands. The most comprehensive pages include plant origin, date and method of introduction to Florida, an identification video, toxicity to livestock (where relevant), legal prohibitions (both federal and state), the category of invasiveness according to the Florida Exotic Pest Plant Council (FLEPPC) Plant List Committee

(composed of twelve botanists from around the state), a link to the UF/IFAS Assessment of Non-Native Plants in Florida's Natural Areas, a link to the relevant recognition card from our plant identification deck, Invasive and Non-Native Plants You Should Know, a link to a page from the book, *Identification and Biology of Non-Native Plants in Florida's Natural Areas* – Second Edition by CAIP Professor Emeritus Kenneth Langeland, any

The CAIP website receives a tremendous number of visits. During the past 12 months, it had almost half a million visitors and almost one-and-a-half million page views.

## CAIP Information Office Staff

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available control publications (usually written by UF extension faculty), and any available full-scale management plans (usually written by UF faculty but sometimes by task forces from FLEPPC or other professional managers). Any additional links or resources are provided, as well. Users who simply want to view a weed alert or plant ID video or line drawing can choose those options from the drop down menu under Plant Info & Images.

The APIRS Database continues to be a freely available, heavily used collection of annotated bibliographic records. During the past 12 months, the database had almost 2,000 users and over 8,000 page views. For a sampling of citations, see **From the Database** on page 10. Longtime science reader Mary Langeland and program assistant Anne Taylor add new records, re-catalog important old records, add information on finding publications, and work on fine-tuning the database holdings on a continual basis. The database is currently approaching 89,000 records and can be searched using the Search All Fields function or by individual fields. Basic search examples are provided on the main search page, and Advanced Search Strategies are provided via a link at the top and bottom of the main search page. Literature searches also can be requested by contacting Karen Brown.

Site visitors can also read or download prior issues of **AQUAPHYTE**, use our **Plant Glossary**, check out **Invasive Plant Laws** (state and federal), view the publications and products we offer for sale (to cover the cost of reprinting), and see free publications that can be downloaded and printed.

Going back to the home page, viewers should see three images on the right side. The first image links to **Plant Management in Florida Waters**. This website explains why and how aquatic plants are managed in Florida waters and guides users through the many factors considered by state biologists when developing aquatic plant management plans for Florida public waters. Ninety-six percent of Florida's 466 public waters inventoried in 2012-2013 contained one or more exotic plants. According to the Florida Fish & Wildlife Conservation Commission (FWC), the agency charged with managing these plants, the top 12 invasive aquatic plants are aquatic soda apple (*Solanum tampicense*), giant salvinia (*Salvinia molesta*), hydrilla (*Hydrilla verticillata*), hygrophila (*Hygrophila polysperma*), napier grass (*Pennisetum purpureum*), para grass (*Urochloa mutica*), torpedograss (*Panicum repens*), water hyacinth (*Eichhornia crassipes*), water lettuce (*Pistia stratiotes*), water spinach (*Ipomoea aquatica*), West Indian marsh grass (*Hymenachne amplexicaulis*), and wild taro (*Colocasia esculenta*). These plants are ranked using the Annual Report of the Status of the Aquatic Plant Maintenance Program in Florida Public Waters by FWC. In 2013, hydrilla was found in 187 public water bodies and it covered 28,610 acres. Many of these plants are under maintenance control but still have the potential to become serious problems without vigilant oversight. These top 12 invaders are profiled in **Section 1** "Why Manage Plants?" of the Plant Management site. While the information provided is similar to that provided on the CAIP primary website pages, the Plant Management in Florida Waters website was created to work as a stand-alone site. Section 1 also includes information about native and non-native plants, aquatic and wetland plants in Florida, a photo history of Florida steamboats and water hyacinth management, scenic postcards depicting scenes of Florida waters from the turn of the last century through the mid-1900s.

**Section 2**, Overview of Florida Waters, presents information on waterbody types, water quality, shared uses and functions and the potential for conflicts, and fish and wildlife.

**Section 3**, Control Methods, provides an in-depth look at the various control methods used in aquatic plant management. Illustrations and video clips show biological control agents, mechanical control equipment, and some aspects of chemical control.

**Section 4**, Developing Management Plans, is the most content-intensive section. It shows how information from other sections of the website is incorporated into comprehensive management strategies for water bodies in which FWC issues permits or enters into contracts to provide aquatic plant control. Integrated pest management (IPM) is presented in terms of interactions among water uses, plant types, available technologies, current environmental conditions, and funding.

**Section 5**, Research and Outreach, provides just that, with categories for citizens, educators, and plant managers. There are also frequently asked questions and a video gallery.

The Plant Management in Florida Waters website was revised and relaunched two years ago and garnered 48,000 visits and over 100,000 page views during the past year, a 27% increase from a year ago.

The second image links to the **Florida Invasive Plant Education Initiative & Curriculum**. This program is aimed at educators and their students and is coordinated by Katie Walters with the assistance of Lynda Dillon and Gary Kreitzer, and with Charlie Bogatescu handling the web site and providing graphic design assistance. See Katie's article on page 4.

Finally, the third image links to the **IFAS Assessment of Non-Native Plants in Florida's Natural Areas**. This website uses "literature-based assessment tools to evaluate the invasion risk of non-native species that occur in the state, new species proposed for introduction, and novel agricultural and horticultural selections." Their "overarching goal is to reduce non-native plant invasions in Florida and throughout the Southeast US for protection of natural and agricultural areas." This project was begun when it became apparent that some of the plant species being promoted for landscape use by the university's horticulture department becoming invasive in Florida natural areas. A science-based assessment was created to demonstrate different levels of invasiveness in different regions of the state before a species could be referred to by faculty members as invasive. The Assessment has since grown into a highly used and trusted tool. Recently, the website was completed overhauled and redesigned to be much easier to use. Be sure to visit and view the 800+ species, easily searchable by common or scientific name, with results that can be filtered by origin, conclusion, growth form, and more. Over 1500 pictures (all open source or credited) were compiled and species information includes growth form, origin, and links to other websites. The database is directly linked to the web site so any time a species is added or updated in the database, the species web pages are automatically built or updated and available for public viewing.

Please tour our suite of websites and send us your feedback.

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## At the Center 2014–2015

By Dr. William T. Haller, Acting Director

A major event here at the UF/IFAS Center for Aquatic & Invasive Plants (CAIP) in 2014 was the retirement of Dr. Ken Langeland, followed by seeking administrative approval to hire a new faculty member to continue his important extension/research programs in invasive plant management.

Dr. Langeland retired in May 2014 following 28 years of research and the development of pioneering extension programs in both aquatic and natural area weed biology and management. A search of the APIRS database by author name = Langeland reveals nearly 500 citations which is indicative of a highly productive career. In addition, many of his publications on the UF/IFAS Extension website (EDIS) were among the highest 10% of documents downloaded or viewed on the entire website.

Ken was also a “Charter” member of the university’s internal IFAS Invasive Plant Working Group formed by the IFAS Deans for Research and Extension to standardize faculty and staff recommendations on use and planting of potential invasive plants in Florida. The invasive potential of plants was to be assessed based upon scientific data where possible and gave rise to the development of the **UF/IFAS Assessment of Non-Native Plants in Florida’s Natural Areas** (<http://assessment.ifas.ufl.edu/>). Over time several faculty and staff members have made significant contributions. The Assessment is currently being directed by Drs. Luke Flory and Deah Lieurance and can be accessed directly from our website as described on page one of this newsletter. The Assessment website is updated continuously and has very recently been upgraded to make it much more user friendly.

The first half of Ken’s career at UF was primarily involved in working with aquatic weeds, after which he undertook the challenge of developing information on natural area weeds, particularly, but not limited to, research on Old World climbing fern (*Lygodium microphyllum*). This species, first noted in the mid-1980s, continues to expand in Florida and is difficult to control despite release of biocontrol agents and use of herbicides.

In March 2014 the UF/IFAS administration authorized a faculty position with similar extension/research responsibilities to those of Dr. Langeland. The position has the Agronomy Department as its academic home and we appreciate the Agronomy Faculty and Chair for their support of filling this need in the weed science area. Following a nationwide search and interviews of the top ranked candidates, the position was accepted by Dr. Stephen Enloe.

Stephen has nationwide experience in the biology and control of invasive plants having completed his undergraduate degree in agronomy at North Carolina State, a Master’s degree at Colorado State University and ultimately his PhD degree from the University of California-Davis in 2002. Following receipt of his Doctorate he has worked in both extension and research, first at the University of Wyoming for 5 years, followed by 6 years of experience at Auburn University where he achieved the rank of Associate Professor. He has numerous extension and research publications and worked with a very diverse range of invasive plants in natural areas, forestry, range, rights-of-way, and agronomic crops. We welcome Stephen to the Weed Science group at the UF/IFAS and look forward to his contributions to CAIP and our stakeholders for many years to come.

UF/IFAS has several Research and Education Centers (RECs) across the state, from Homestead to Pensacola. This issue of AQUAPHYTE highlights the research program of Dr. Lyn Gettys (Agronomy Department) at the Ft. Lauderdale REC.

Dr. Stephen Marble (Environmental Horticulture Department) began his research and extension career in Florida at the Mid-Florida REC in Apopka, Florida in July 2014. Stephen will be developing research and educational programs on invasive species and weeds primarily in landscape, turf and ornamentals. We look forward to covering Stephen’s program in a future edition of AQUAPHYTE and referring homeowners and others with weed problems in their landscapes to him. Stephen can be contacted at [marblesc@ufl.edu](mailto:marblesc@ufl.edu).

The high quality, dedication and cooperation of the weed science group at the UF/IFAS across several departments – entomology, horticulture, botany, soil science, fisheries, agronomy and others over the past 35 years – has allowed the CAIP and IFAS to assume a leading national role in the study of invasive plant biology and the development of management programs. The education staff of the CAIP is expanding the highly successful PLANT CAMP, Lakeville and other educational programs to other states in the southeast and hopefully to northern states in the near future. Most biologists and ecologists believe that prevention of introductions and ultimately the need for management programs for invasive species lies with teaching young people the dangers and adverse impacts that invasive species have in this country. A critical component of the success of the Florida invasive plant management and educational programs has been the cooperation between the Land Grant College and the state management agencies, primarily the Florida Fish and Wildlife Conservation Commission (FWC), as well as the regional water management districts and other stakeholder groups. The Invasive Plant Management Section of the FWC has provided very significant funding for many CAIP programs including, but not limited to, the educational effort for secondary school teachers and students, the APIRS database, graduate student education, the plant evaluation and assessment project, and many research projects on the biology and ecology of invasive species, as well as biological control efforts and studies on the selectivity, and registration of new aquatic herbicides. The value of the cooperation of the CAIP staff and affiliated faculty at the UF with the FWC and other stakeholder groups cannot be over-emphasized.

A new graduate student at the Center this year is Joshua Woods who completed his Bachelor of Science degree in biology at Manchester College in Indiana and is now working with Dr. Mike Netherland on a Master of Science (MS) degree. Also this year, Carl Della Torre departed CAIP to move to the Ft. Lauderdale REC to complete his MS degree with Dr. Lyn Gettys. Leif Willey received his MS degree and is now working with Aquatic Systems, a commercial weed and pond management firm in south Florida.

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## An update from the Florida Invasive Plant Education Initiative

By Katie Walters, Coordinator, Education Initiative

The Florida Invasive Plant Education Initiative provides teachers with the training and resources necessary to bring invasive species lessons into the classroom. We provide four curriculum modules, an annual professional development workshop for educators (PLANT CAMP), online resources, in-class presentations, and educational materials and games. Regular communication and collaboration with teachers ensures our materials remain relevant and able to be used in the classroom. Our continuing partnership with the Florida Fish and Wildlife Conservation Commission (FWC) and organizations such as the Florida Aquatic Plant Management Society (FAPMS), the Aquatic Plant Management Society (APMS), and the Aquatic Ecosystem Restoration Foundation (AERF), allow us to offer these materials and workshops at no cost to Florida educators. Over 300 teachers have attended our workshops who, in turn, have taught approximately 70,000 Florida students over the last 9 years!

### NEW–Common Core State Standard Activities

The Education Initiative partnered with a former PLANT CAMP teacher to develop 15 reading activities that encourage higher-order thinking. Students are introduced to the vocabulary of native, non-native, and invasive. They are also introduced to the categories of submersed, emersed, floating-leaved, and free-floating as ways to classify aquatic plants. These reading activities are in line with the Florida Standards and the Common Core State Standards for English Language Arts, currently adopted by 43 states. Educators can download these and all of our activities from the curriculum section of our website at <http://plants.ifas.ufl.edu/education/curriculum>

### PLANT CAMP 2014 Report

PLANT CAMP 2014 was a huge success thanks to all our sponsors, presenters and, of course, our teacher participants! Teachers work hard all week and are sent home with stacks of materials to use in their classrooms. On their evaluations, all participants reported they either “strongly agreed” or “agreed” that PLANT CAMP increased their knowledge on invasives and the important role education has to play in addressing this issue. A full 100% of teacher participants planned to teach about aquatic invasive plants and share what they learned with other teachers.

This year we bid farewell to FWC’s Invasive Plant Management Section Administrator Jeff Schardt. Jeff was central to the organization and implementation of PLANT CAMP from its inception. He worked tirelessly to improve the week-long workshop, getting more agencies and presenters involved, planning the content of the agenda, and developing materials for classroom use. He will be enjoying a well-deserved retirement and will be missed – but thanks to all his



*With field guides in hand, teachers race to win the Plant ID Challenge.*

hard work, PLANT CAMP will continue on!

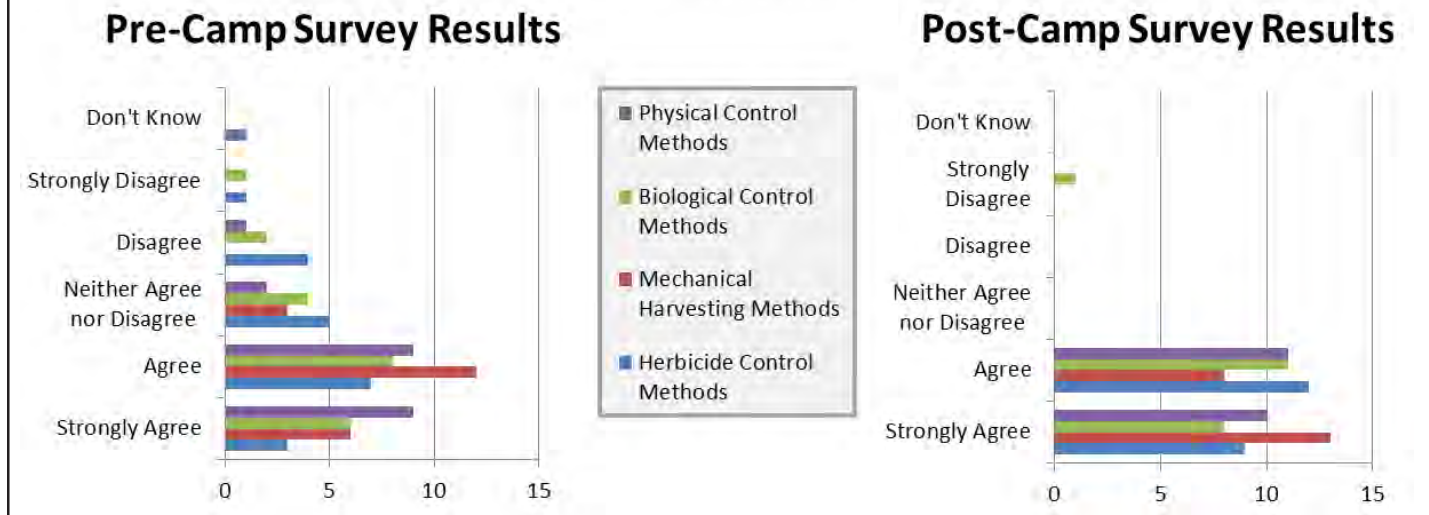
Each year we administer a pre- and post-test of 8 knowledge-based questions to teacher participants. We also ask that they complete a pre- and post-survey to determine awareness and acceptance of plant management methods. Pre- and post-test results were encouraging. Overall, the teachers greatly improved their scores. The highest percent gain was seen on a plant identification question where 6 teachers answered correctly pre-camp and 19 answered correctly post-camp. There was a 61% gain on the correct definition of a non-native plant, showing an understanding that non-native plants are not necessarily invasive, and a 27% gain on the correct definition of a native plant.

The survey (results next page) asked the teachers’ opinion on methods of invasive plant management – chemical, mechanical, biological, and physical. Below is a chart showing the pre- and post-survey results on the question – “Do you agree or disagree that the following methods are necessary for controlling invasive plants?” The pre-survey shows



*Christia Hewlett, Nicole Richards, Melody Carson (left to right) work together to identify and track invasive plants using the EDDMapS App. Read more about EDDMapS on page 15.*

*PLANT CAMP Participants' Opinions on Methods Necessary for Controlling Invasive Plants*



a variety of opinions; at least one participant chose every option with the exception of “strongly” favoring herbicides and “strongly” opposing mechanical or physical methods. The post-survey shows a more closely aligned response. After spending a week learning about invasive plants and their management, the participants indicated they “strongly” or “somewhat” favored all methods and “strongly agreed” or “agreed” that nearly all methods were necessary.

**NEW—Instructional Video on Lakeville**

Lakeville is an interactive curriculum unit that introduces students to the real-world scenario of managing a freshwater ecosystem. This role-play activity demonstrates the interrelation of social, political, economic, and ecological concerns. Students play the role of a stakeholder (anglers, developers, farmers, politicians, nature lovers, etc.) or an organism (native, non-native, and invasive plants and animals) as part of a hypothetical local freshwater ecosystem called Lakeville. The activity challenges students to integrate their new understanding of the impacts of invasive species with an understanding of how natural resource management decisions are made (and, hopefully, how better decisions can be made). The Lakeville Unit is made up of three sessions, with the last session being the role-play activity. We have recently produced an instructional guide and video to help teachers implement the Lakeville Unit in their classroom. The video was produced based on feedback from teachers who have used the activity in their classrooms. It covers the logistics of set-up as well as helpful content hints, including questions to ask the students to spark discussion. The video is available online at <http://plants.ifas.ufl.edu/education/lakeville-session-3> and DVDs are available by contacting us at [caip-education@ufl.edu](mailto:caip-education@ufl.edu)

**Spreading outside Florida**

This summer, two teachers from the Carolinas traveled to Florida to join us at our annual PLANT CAMP workshop. These teachers wanted to get ideas on how to take our Florida-based program into North and South Carolina. Until this summer, all of our curricula lessons were specific to Florida – both in content and in education standard alignment. Now that several states have adopted the same (or similar) education standards, it is easier to adapt our lessons to be used in other states. With the sponsorship of the South Carolina Chapter of the Aquatic Plant Management Society and the help of our PLANT CAMP motivated educators, the Florida Education Initiative adapted our *Lakeville* curriculum unit for the Carolinas. Both states received 5 teacher kits complete with all the materials needed to implement the lesson. All materials are also hosted on iTunes U, an application that allows teachers and students to access course materials with their iPads.

**If you would like to find out more about the Education Initiative**

Visit our site: [plants.ifas.ufl.edu/education](http://plants.ifas.ufl.edu/education) and follow the link to join our list-serv and check us out on Facebook and Twitter.



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The CAIP Invasive Plant Education Team:  
Lynda Dillon, Program Assistant  
Charlie Bogatescu, Web/IT Specialist  
Gary Kreitzer, Curricula Demonstrator

## Aquatic Activities at the UF/IFAS Fort Lauderdale Research & Education Center

By Lyn A. Gettys, Assistant Professor of Agronomy

The University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS) has an active aquatics program in south Florida. The Fort Lauderdale Research & Education Center (FLREC) is situated within a tropical climate that enables us to do aquatic plant research year-round and we are finishing up our third full year of research. We have a number of research projects that focus on the biology and control of aquatic invasive species, while other projects aim to provide guidance for nursery and restoration managers. A sampling of these projects includes:

### Vegetative reproductive biology of crested floating heart (*Nymphoides cristata*)



*Nymphoides cristata*

Photo by Vernon Vandiver, University of Florida (2010)

The goal of these studies is to investigate how substrate composition and fertility affect production of ramets by crested floating heart, one of Florida's newest prohibited aquatic plants (see image on back page). We are also studying the influence of desiccation and burial depth on ramet sprouting in this floating-leaved aquatic weed.

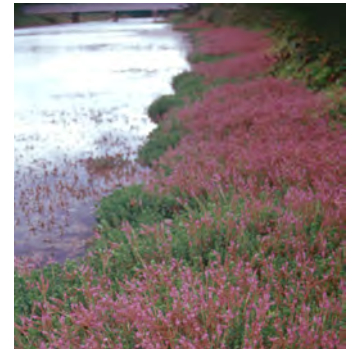
### Integrated pest management for control of waterhyacinth (*Eichhornia crassipes*)

We are evaluating the effects of combining the herbicide 2,4-D with three biological control insects – the long-established weevils *Neochetina eichhorniae* and *N. bruchi* and the newly introduced leaf-hopper *Megamelus scutellaris*. Our first run of this research revealed synergy between the control methods, and we are conducting the second year of this research in cooperation with Dr. Phil Tipping at the U.S. Department of Agriculture Invasive Plants Research Laboratory in Davie, Florida.

### Biology and control of rotala (*Rotala rotundifolia*)

Research is being conducted by Carl Della Torre III, a master's level graduate student at the FLREC. Carl is

investigating the effects of substrate composition and fertility on vegetative reproduction of rotala, one of south Florida's most serious canal weeds. He recently completed near-comprehensive studies to determine the effects of foliar and submersed aquatic herbicide applications on this new invader and is in the process of planning field trials to verify the results of these mesocosm studies.



*Rotala rotundifolia*

Photo by Colette Jacono (2002)

Carl presented his research on rotala at the annual Southeast Exotic Pest Plant Council in Athens, GA and tied for first place in the graduate student poster competition.

### Greenhouse production and mitigation potential of native wetland plants

The first part of this project aims to provide guidance for commercial growers of native aquatic and wetland plants so these desirable species can be produced more efficiently. We are evaluating the growth of native species under a range of substrate and fertility regimes and are also comparing the growth of these plants using bottom irrigation and overhead irrigation. The second component of this project is focused on nutrient uptake by native species grown in floating islands. The goal of these studies is to determine which species could be useful phytoremediation agents to remove nutrients from aquatic systems.

**Upcoming projects** include evaluation of ecotypes of giant bulrush (*Schoenoplectus californicus*) to identify differences in preferred growing conditions; studying the effects of propagule size, planting density and seasonality on field establishment of bulrush; providing plant material and guidance for restoration of springs near Crystal River; and a number of field trials to evaluate the effects of various aquatic herbicides alone and in combination on rotala and crested floating heart.

**Upcoming events** include the Annual UF/IFAS FLREC Open House (Jan 24<sup>th</sup> in Davie), a full-day aquatics session at the Florida Mosquito Control Association's Dodd Short Course (Jan 28<sup>th</sup> in Altamonte Springs), the Florida Weed Science Society annual meeting (March 2<sup>nd</sup> & 3<sup>rd</sup> in Haines City) and the UF/IFAS and FWC Invasive Plants Section Research Review (March 4<sup>th</sup> & 5<sup>th</sup> in Orlando).

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## Retirement of Note

By William Haller and Karen Brown

### Dr. George Bowes, Professor Emeritus Biology (Botany)

University of Florida, Gainesville

*Aquatic Botany* is the International Scientific Journal dealing with Applied and Fundamental Research on Submerged, Floating and Emergent Plants in Marine and Freshwater Ecosystems, published by Elsevier. Volume 118, August 2014 was a special issue paying tribute to Dr. George Bowes. Bowes served on the editorial board of *Aquatic Botany* from 1982 to 1995, and as Editor-in-Chief until 2013, for a total of 31 years of service to both contributors and readers of that highly esteemed publication.

Dr. Bowes was educated in England and received his PhD in 1967 from the University of London. He came to the University of Florida in 1972 and spent the rest of his career here in the Botany Department. In his photosynthesis research laboratory, he studied the ecophysiology of aquatic plants, including the management of weed species. In particular, he studied the submersed aquatic weed, *Hydrilla verticillata* and the molecular details of the *Hydrilla* C<sub>4</sub> system. Over the years, work by Dr. Bowes and his co-workers established *Hydrilla* as a C<sub>4</sub>-NADP-ME plant and "it is now one of the most completely studied C<sub>4</sub> plants on the planet" (Reiskind and Maberly, 2014). He also worked on marine macroalgae and terrestrial agronomic species during his career, thus contributing excellent science to the terrestrial, freshwater and marine disciplines. Dr. Bowes taught graduate courses in photophysiology of plant growth and ecology, and physiology of aquatic plants, as well as undergraduate courses. He was Chair of the Botany Department from 1998 to 2006.

Dr. Bowes remains active in marine research and, with colleagues from around Florida, recently published a review on the impact of global climate change on ocean acidification and its effect on seagrasses and macroalgae (Koch et al., 2013).

Dr. Bowes has been a highly esteemed colleague and contributor to CAIP's aquatic plant research efforts. We wish him a most fulfilling retirement.

Koch, M., Bowes, G., Ross, C., Zhang, X.-H. 2013. Climate change and ocean acidification effects on seagrasses and marine macroalgae. *Global Change Biology* 19:103-132.

Reiskind, J.B., Maberly, S.C. 2014. A tribute to George Bowes: Linking terrestrial and aquatic botany. *Aquatic Botany* 118:1-3.

October 28, 2014

To: William Haller, Acting Director, Center for Aquatic and Invasive Plants

Bill, I am very appreciative for all your help over the years. To be honest I'm not sure what track my research would have taken if you had not got me interested in aquatic "weeds."

Best wishes...George

## Upcoming Meetings

**January 20-22, 2015**

**Northeast Aquatic Plant Management Society**  
Saratoga Springs, NY  
[www.neapms.net/](http://www.neapms.net/)

**February 22-25, 2015**

**Midwest Aquatic Plant Management Society**  
Indianapolis, IN  
[www.mapms.org/](http://www.mapms.org/)

**March 30-April 1, 2015**

**Western Aquatic Plant Management Society**  
Portland, OR  
[wapms.org/](http://wapms.org/)

**April 8-10, 2015**

**Florida Exotic Pest Plant Council Symposium**  
Melbourne, FL  
<http://www.fleppc.org/>

**May 4-7, 2015**

**UF/IFAS Aquatic Weed Short Course**  
Coral Springs, FL  
<http://conference.ifas.ufl.edu/aw/>

**June 2015**

**The Third International Conference on Duckweed Research and Applications**  
Kyoto University, Japan  
<http://www.internationallemnaassociation.org/>

**June 8 - 11, 2015**

**Florida Lake Management Association Annual Symposium**  
Naples, FL  
<http://flms.net/>

**July 12-15, 2015**

**Aquatic Plant Management Society**  
Myrtle Beach, SC  
[apms.org/](http://apms.org/)

**September 14-18, 2015**

**14th International Symposium on Aquatic Plants**  
Edinburgh, Scotland  
<https://sites.google.com/site/aquaticplants2015/>

## MARY'S PICKS

*Items of special interest from APIRS Reader/Cataloger, Mary Langeland ~*

**CHO, H.J. (ED.), SPENCE, D., DAHL, J., JARRETT, R. & PRAJAPATI, I. 2014. PLANTS OF RETENTION PONDS AND DRAINAGE DITCHES: THE GREATER DAYTONA BEACH AREA. BETHUNE-COOKMAN UNIVERSITY, DAYTONA BEACH, FLORIDA. 196 PP.**

Cho's "Plants of Retention Ponds and Drainage Ditches" (2014) is available online at: <http://www.fleppc.org/Publications/IESAquaticPlants.pdf> (Note: may take a few minutes to download). Limited copies are available as a 5 1/2" x 8 1/2" hard copy, the pages of which appear to be waterproof. The 196-page field guide by Dr. Cho et al. offers excellent photographs of freshwater native and non-native plants found in and around urban water bodies such as stormwater retention/detention basins, drainage ditches and associated wetlands. Plant surveys were largely done in the Greater Daytona Beach, Florida urban area; however, some surveys covered areas in Deland and Deltona. Within the guide the plants are arranged by zones, from obligate wetland plants to facultative upland and upland species. Of the approximately 150 plants in the book, each plant has a page with several photographs for identification, as well as the taxonomy, growth form, native or non-native status and comments with information unique to the plant. [*Excerpts adapted from the field guide.*]

**A BEGINNER'S GUIDE TO WATER MANAGEMENT – AQUATIC PLANTS IN FLORIDA'S LAKES [INFORMATION CIRCULAR 111]. 2014. FLORIDA LAKEWATCH PROGRAM, UNIVERSITY OF FLORIDA, INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES, PROGRAM IN FISHERIES AND AQUATIC SCIENCES, GAINESVILLE, FLORIDA. 43 PP.**

"A Beginner's Guide to Water Management – Aquatic Plants in Florida Lakes" was first printed in October 2007 as an Extension publication available online at EDIS (Electronic Document Information Source) and revised in June 2014. The abstract describes the guide as follows: This circular represents a summary of current knowledge on aquatic plants and aquatic plant management strategies, highlighting the Florida situation. The major focus of this circular is the management of aquatic plants as opposed to dealing with nutrients, algae, or water clarity. Included are sections on 1) Aquatic Plant Biology, 2) Aquatic Plant Management Problems, and 3) Aquatic Plant Management Techniques. Section 1, Essentials of Aquatic Plant Biology, describes how aquatic plants fit into the ecology of Florida lakes. Understanding the role of aquatic macrophytes in water bodies, especially with regard to water quality and fisheries, is critical to the development of sound management plans. Section 2 addresses the question of whether there is a weed problem at a lake. This section focuses on how to define the problem and identify possible causes for the problem. Section 3 discusses the various aquatic plant management techniques that are currently available for managing nuisance growth of aquatic weeds. Specific attention is given to mechanical, chemical, and biological controls with discussion of the pros and cons of using these techniques. Available online at <http://edis.ifas.ufl.edu/pdffiles/FA/FA16300.pdf>

**FOXCROFT, L.C., PYSEK, P., RICHARDSON, D.M. & GENOVESI, P. (EDS.) 2013. PLANT INVASIONS IN PROTECTED AREAS: PATTERNS, PROBLEMS AND CHALLENGES [INVADING NATURE – SPRINGER SERIES IN INVASION ECOLOGY, VOLUME 7]. SPRINGER SCIENCE AND BUSINESS MEDIA, NEW YORK, NEW YORK. 661 PP.**

The editors set three main aims for this book: to determine the status of knowledge on plant invasions in protected areas and synthesize these insights; to integrate this with current models and theories of plant invasion ecology; and, to determine key knowledge areas for informing the development of successful management strategies. From the chapter entitled "Global Efforts to Address the Wicked Problem of Invasive Alien Species" by McNeely to one entitled "A Pragmatic Approach to the Management of Plant Invasions in Galapagos" by Gardener et al., this collection is a useful summary for protected area managers on important management issues. It is hoped that "reading the chapters of this book will lead to heightened levels of commitment by both decision-makers and managers to combatting the invasion of our priceless protected areas by alien species throughout the world." (Ian A. W. Macdonald, Extraordinary Professor, Sustainability Institute, School of Public Leadership, Stellenbosch University, South Africa).

Foxcroft et al. note that "The primary international forum for deliberations on plant invasions is the conference series on Ecology and Management of Alien Plant Invasions (EMAPI) which started in 1992. The concept of examining alien plant invasions in protected areas was initiated through a special session on the topic at the 10th EMAPI conference in Stellenbosch, South Africa, in 2009, and was followed up at the 11th EMAPI meeting in 2011 in Szombathely, Hungary. The seeds sown at these meetings grew into this book, which we hope presents a balanced synthesis of the current situation of invasive plants in protected areas and stimulates new work to deal with the massive challenges that lie ahead." [Adapted and excerpted from the book.]

**GILLET-KAUFMAN, J.L., LIETZE, V.-U., WEEKS, E.N.I. 2014. HYDRILLA INTEGRATED MANAGEMENT 2014 [IPM-207]. UNIVERSITY OF FLORIDA, DEPARTMENT OF ENTOMOLOGY AND NEMATOLOGY, GAINESVILLE, FLORIDA. 144 PP.**

According to the U.S. Environmental Protection Agency (EPA) "throughout Florida and at least twenty-seven other states, the invasive freshwater plant Hydrilla (*Hydrilla verticillata*) causes damaging infestations that choke out native plants, clog flood control structures, and impede waterway navigation and recreational use." The focus of the book is on hydrilla management in Florida, although the described tactics are known and used in many of the 28 states in the United States with hydrilla infestations. Divided into seven chapters, the book guides the reader through a general introduction to the problems associated with hydrilla; identification of the plant; instructions for early detection of infestations including federal and state laws and regulations;



detailed descriptions of available control tactics; proposals for integrated management plans; descriptions of insects and fish associated with hydrilla; and supplementary information including contacts for assistance when readers encounter infestations.

User groups range from lakefront homeowners to recreational visitors to aquatic plant managers to businesses that support ecotourism. The IPM guide for hydrilla is available as an online resource or a printable pdf file at the University of Florida Extension website: <http://edis.ifas.ufl.edu/in1044> Hard copies of this book are available in limited quantities. Contact the author at [gillett@ufl.edu](mailto:gillett@ufl.edu) [*Excerpts adapted from the field guide.*]

**MILLER, M.A., SONGER, K. & DOLEN, R. 2014. FIELD GUIDE TO WISCONSIN STREAMS: PLANTS, FISHES, INVERTEBRATES, AMPHIBIANS, AND REPTILES. THE UNIVERSITY OF WISCONSIN PRESS, MADISON, WISCONSIN. 335 PP.**

Wisconsin is home to 84,000 miles of streams and this field guide is useful for learning about the animals and identifying the plants in Wisconsin streams. A collaborative effort by dozens of biologists and ecologists, "Field Guide to Wisconsin Streams" is of value to anglers, teachers and students, amateur naturalists, and experienced scientists alike.

More than 1,000 images illustrate the species in the field guide, augmented by ecological and taxonomic notes, descriptions of look-alike species, and distribution maps. The guide identifies more than 130 common plants, all 120 fishes known to inhabit Wisconsin streams, 8 crayfishes, 50 mussels, 10 amphibians, 17 reptiles, 70 families of insects, and other commonly found invertebrates. [*Excerpts adapted from the field guide.*]

**QUINN, L.D., ENDRES, A.B. & VOIGT, T.B. 2014. WHY NOT HARVEST EXISTING INVADERS FOR BIOETHANOL? BIOLOGICAL INVASIONS 16:1559-1566**

The *Biological Invasions* article by Quinn et al. addresses the question which is also the title – Why not harvest existing invaders for bioethanol? This is not a new issue – how to utilize invasive plant biomass in a useful way to benefit both the environment and humans. Proponents suggest "...the plan could motivate the large-scale eradication of an array of troubling invaders, avoid land use conversion, resolve the food vs fuel debate, result in millions of gallons of clean-burning ethanol, and finally free us from our addiction to fossil fuels." In response to this supposedly win-win suggestion, the authors look in detail at the economic, logistic, and legal barriers currently preventing adoption of such a plan. The conclusions drawn are somewhat pessimistic given the barriers. Quinn et al. suggest "Perhaps as the biomass-to-ethanol industry matures over the next half century, technical innovations may reduce the currently insurmountable logistic and economic concerns associated with utilizing existing invasive feedstocks for viable sources of liquid fuel." [*Excerpts adapted from the article.*]

**CIRUJANO BRACAMONTE, S., MECO MOLINA, A., GARCÍA MURILLO, P. & CHIRINO ARGENTA, M. 2014. FLORA ACUÁTICA ESPAÑOLA. HIDRÓFITOS VASCULARES. REAL JARDÍN BOTÁNICO, CSIC, MADRID. 320 PP.**



*Stratiotes aloides baja*



Figura 223. Formaciones de *Posidonia oceanica*.



Figura 224. Restos de *Posidonia oceanica* tras la descomposición de las hojas. El oleaje y el rozamiento con el fondo originan bolas de diferentes tamaños, conocidas como pellets de mar, que son arrastradas a las playas.



Figura 225. *Posidonia oceanica*.

"Spanish Aquatic Flora" (in Spanish) is a practical and scientific guide to all aquatic plants (vascular hydrophytes, both continental and marine) existing in Spain and is designed to be used by both experts and amateur botanists. This volume is richly illustrated with drawings and photographs and includes the description, ecology, distribution, etymology, common names, synonyms and many other interesting aspects of the 117 species, various subspecies and varieties which make up

the Spanish aquatic flora. Besides a section entirely dedicated to the invasive aquatic plants and another devoted to protected species, this publication contains an extensive bibliography and an index of scientific names. [*Synopsis provided by the author.*]

**SPENCER, L.J. & BOUSQUIN, S.G. 2014. INTERIM RESPONSES OF FLOODPLAIN WETLAND VEGETATION TO PHASE I OF THE KISSIMMEE RIVER RESTORATION PROJECT: COMPARISONS OF VEGETATION MAPS FROM FIVE PERIODS IN THE RIVER'S HISTORY. RESTORATION ECOLOGY 22(3):397-408.**

Although full re-establishment of the pre-channelization wetland mosaic has not yet occurred, according to Spencer and

## FROM THE DATABASE

The APIRS database now contains almost 89,000 annotated citations to the aquatic and wetland plant literature and to the literature on invasive species in Florida. The database is created from the contributions of researchers, and is used by researchers, worldwide. A small sample of recent additions to the APIRS collection is provided below. References cited include peer-reviewed research articles, government reports, books and book chapters, dissertations and theses, and gray literature such as abstracts from proceedings. To obtain full-text of citations, contact your nearest academic library or search online.

To use APIRS, go to [plants.ifas.ufl.edu/APIRS](http://plants.ifas.ufl.edu/APIRS) or contact Karen Brown at [kpbrown@ufl.edu](mailto:kpbrown@ufl.edu)

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Using high-resolution, regional-scale data to characterize floating aquatic nuisance vegetation in coastal Louisiana navigation channels

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WILDLAND WEEDS 16(1):4-5 [SPRING 2014] (AVAILABLE ONLINE)

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Geographic selection bias of occurrence data influences transferability of invasive *Hydrilla verticillata* distribution models

ECOLOGY AND EVOLUTION 4(12):2584-2593 [JUNE 2014]

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Effects of temperature on growth of *Vallisneria americana* in a sub-tropical estuarine environment  
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Pollen morphology of European bladderworts (*Utricularia* L., Lentibulariaceae)

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PUBLICATION EENY595; UNIVERSITY OF FLORIDA/IFAS EXTENSION, ENTOMOLOGY AND

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Biochemical and biophysical CO<sub>2</sub> concentrating mechanisms in two species of freshwater macrophyte within the genus *Ottelia* (Hydrocharitaceae)  
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BIOCHEMICAL SYSTEMATICS AND ECOLOGY 55:148-155 [2014]

## MARY'S PICKS

continued from page 9.

Bousquin, "Phase I of the Kissimmee River Restoration Project (KRRP) reestablished intermittent inundation of the river's floodplain by backfilling 12 km of the C-38 flood control canal in 2001." They compared floodplain vegetation maps of 2003 and 2008 aerial imagery to pre-channelization vegetation maps from 1954, 1974, and 1996 in order to evaluate broad-scale vegetation responses to Phase I restoration. Their results showed that "wetland plant communities expanded rapidly, more than doubling in area within 2 years after completion of Phase I, and that by 2008 wetlands had nearly recovered to pre-channelization levels." Prior to channelization, much of the floodplain was dominated by a broadleaf marsh (BLM) community associated with extended, deep annual flooding, while shorter-hydroperiod communities dominated the floodplain in 2003 and 2008. Prior to restoration construction, the reestablishment of BLM was predicted to be slow because suitable hydrology is dependent on project components that will not be in place until all restoration components are completed (projected for 2019). Hydrologic data indicate that the duration and variability of floodplain inundation have not yet achieved restoration targets over the entire Phase I study area. Other factors affecting vegetation responses are likely involved, including the age and viability of soil seed banks, the rarity of relict propagule sources following the channelized period, and competition from an invasive wetland shrub species. [Excerpts adapted from the article.]

**WILDE, S.B., JOHANSEN, J.R., WILDE, H.D., JIANG, P., BARTELME, B.A. & HAYNIE, R.S. 2014. AETOKTHONOS HYDRILLICOLA GEN. ET SP. NOV.: EPIPHYTIC CYANOBACTERIA ON INVASIVE AQUATIC PLANTS IMPLICATED IN AVIAN VACUOLAR MYELINOPATHY. PHYTOTAXA 181(5):243-260.**

The cyanobacterial species discussed in this article is in a new genus of uncertain family assignment. The authors name the new species *Aetokthonos hydrillicola* gen. et sp. nov. Research into the taxonomy of a novel cyanobacterial epiphyte in locations where birds, most notably bald eagles and American coots, are dying from a neurologic disease (Avian Vacuolar Myelinopathy or AVM) has been ongoing since 2001. Field investigations revealed that all sites where birds were dying had extensive invasive aquatic vegetation with dense colonies of an unknown cyanobacterial species growing on the underside of leaves. Morphological evaluation indicated that this was a true-branching, heterocystous taxon falling within the former order Stigonematales. However, 16S rRNA gene sequence demonstrated that it did not match closely with any described genus or species. More recent sequence analysis of the 16S rRNA gene and associated ITS region from additional true branching species resulted in a unique phylogenetic placement distant from the other clades of true-branching cyanobacteria. [Excerpts adapted from the article.]

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## Mosaic Plant, *Ludwigia sedioides*

By Dr. William T. Haller, Acting Director



*Ludwigia sedioides*  
Photo by Scott Zona

In the past five to seven years, the Southeastern United States has seen a tremendous increase in the spread of the floating leaved plant, *Nymphoides cristata* (crested floating heart) which is widely used in the water garden industry. Florida has not had problems with the native *Nymphoides aquatica*, but *N. cristata* is proving to be very difficult to control. In the past decade or so, *Ludwigia sedioides* has been sold in the ornamental industry. We can find little information on its biology or growth other than anecdotal information on water garden suppliers' websites which mention it as "...an easy grower, spreads rapidly, great for surface coverage, grows in full sun to partial shade..." etc. It has not been noted in natural waters of the U.S., but it apparently can grow into USDA hardiness zone 8 which encompasses the entire gulf coast region of the country. Other *Ludwigia* species are a problem in the U.S., including *Ludwigia hexapetala* and *L. grandiflora*.



*Ludwigia sedioides*  
Photo by Lyn Gettys

We obtained and planted 15 *L. sedioides* plants in a 900 liter tank and three months later the tank contains well over 100 plants that nearly cover the entire water surface. A graduate student at the CAIP is considering comparing the competitiveness and biology of *L. sedioides* to the known invasive *Nymphoides cristata*. Any information from our readers will be appreciated. Please contact William T. Haller at whaller@ufl.edu.

## 14th International Symposium on Aquatic Plants

The **14th International Symposium on Aquatic Plants** will be held in the beautiful Playfair Library in Edinburgh, the historical capital of Scotland, between 14-18 September 2015. The aim of the conference is to promote debate in all issues relating to science and management of aquatic and riparian vegetation. Ten special sessions are being organized, including a session on Vegetation and Dams.

The meeting has been arranged under the auspices of the International Society of Limnology (SIL) and the European Weed Research Society (EWRS). An International Scientific Committee will oversee the conference and its outputs.

For more information, please visit the website. We will be tweeting regular updates on the conference from our twitter account using the #aquaticplants15 hashtag.

<https://sites.google.com/site/aquaticplants2015/>



Playfair Library  
Edinburg Scotland

### EDDMapS – Early Detection and Distribution Mapping System

**EDDMapS** is a web-based mapping system for documenting invasive species distribution. It is fast, easy to use and doesn't require Geographic Information Systems experience. It was launched in 2005 by the Center for Invasive Species and Ecosystem Health at the University of Georgia to develop more complete distribution data of invasive species across North America.

The goal of EDDMapS is to maximize the effectiveness and accessibility of the immense numbers of invasive species observations recorded each year. As of November 2014, EDDMapS had over 2.6 million records.

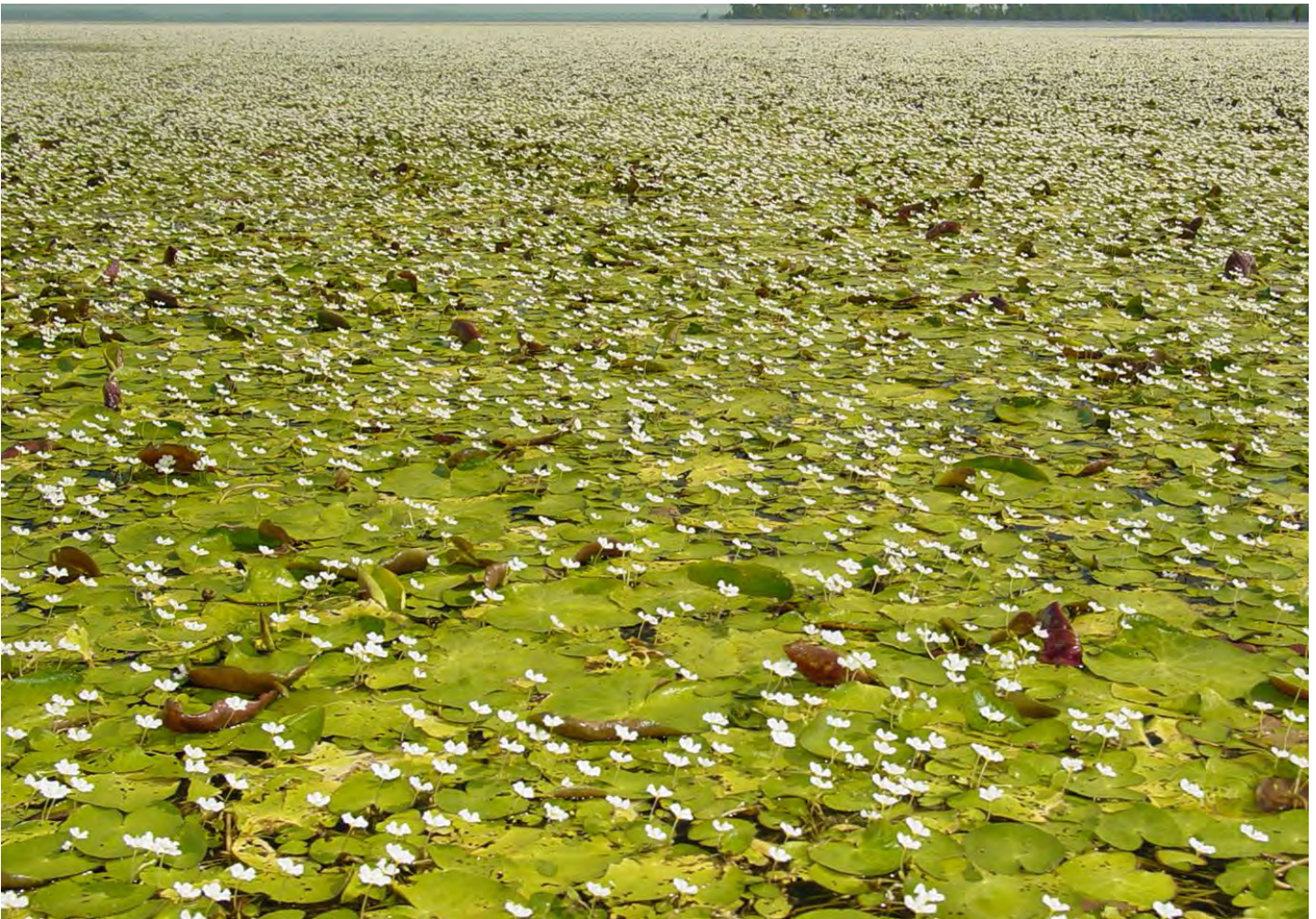
EDDMapS combines data from other databases and organizations as well as volunteer observations to create a North American network of invasive species distribution data that is shared with educators, land managers, conservation biologists, and beyond. This data will become the foundation for a better understanding of invasive species distribution around the world.

Users simply enter information from their observations into the standardized online data form which allows specific information about the infestation and images to be added. Data entered is immediately loaded to the website, allowing real time tracking of species. Being able to see the current data of a species as it moves into a new area helps to facilitate Early Detection and Rapid Response (EDRR) programs which can help stop or control an invasive species before it becomes an unmanageable problem.

Free smartphone apps make identifying, collecting and reporting the invasive species across North America even easier. Online training videos make learning to use them quick and easy.

All data is reviewed by state verifiers to ensure accuracy. The data is made freely available to scientists, researchers, land managers, land owners, educators, conservationists, ecologists, farmers, foresters, state and national parks.

**Visit EDDMapS at [www.eddmaps.org/](http://www.eddmaps.org/)**



*Nymphoides cristata* infestation – see article on page 6

Photo by Larry McCord, Santee Cooper  
Eutaw Creek, South Carolina (2009)

## AQUAPHYTE

**AQUAPHYTE** is the newsletter of the Center for Aquatic and Invasive Plants (CAIP) and the Aquatic, Wetland and Invasive Plant Information Retrieval System (APIRS) of the University of Florida / Institute of Food and Agricultural Sciences (UF/IFAS). Support for CAIP is provided by the Florida Fish and Wildlife Conservation Commission, Invasive Plant Management Section, and UF/IFAS.

EDITOR: Karen Brown

**AQUAPHYTE** is sent to managers, researchers and agencies in numerous countries around the world. Comments, announcements, news items and other information relevant to aquatic and invasive plant research are solicited.

Inclusion in **AQUAPHYTE** does not constitute endorsement, nor does exclusion represent criticism, of any item, organization, individual, or institution by the University of Florida.



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