

# AQUAPHYTE

A NEWSLETTER ABOUT AQUATIC, WETLAND AND INVASIVE PLANTS

## Center for Aquatic and Invasive Plants

with support from

The Florida Department of Environmental Protection,  
Bureau of Invasive Plant Management  
The St. Johns River Water Management District

**UF** UNIVERSITY of  
**FLORIDA**  
IFAS Extension

Volume 26 Number 1 Fall 2006

Gainesville, Florida

ISSN 0893-7702

## VICTOR ALAN RAMEY

JUNE 21, 1948 - NOVEMBER 24, 2005

**V**ictor Alan Ramey, founder of **AQUAPHYTE**, the Aquatic Plant Information Retrieval System (**APIRS**), and creator of a large array of educational products for those in the aquatic plant management arena, passed away unexpectedly on November 24<sup>th</sup>, 2005.

Vic started the **AQUAPHYTE** newsletter back in 1981, which currently is sent to approximately 1,000 subscribers in more than 70 countries. Sadly, in our 26<sup>th</sup> year of publication, this is the first edition without his editorial contributions and without his name listed as editor.

Vic worked for the University of Florida / IFAS Center for Aquatic and Invasive Plants Information Office for more than 25 years. During that time, he conceived of and created the **APIRS** database at a point when very little was known about electronic databases. Considering that the Information Office was virtually a one-man operation at its inception, it is especially remarkable that the database was created so long ago. Vic had a knack for creatively visualizing a concept, and then finding a way of making it a reality, far more than anyone else I have ever known. **APIRS** has been heavily used by researchers, resource managers and others around the world for 20 years now. With advances in online technology, the database was made available on the Internet via our website several years ago, and has grown to contain more than 66,000 records. Even with many commercial databases online today, **APIRS** is accessed frequently by researchers around the world, and continues to be available for free.

In addition to the major accomplishments listed above, Vic commissioned and produced a large set of aquatic plant line drawings, now available on DVD; he traveled around Florida to obtain an extensive photographic collection; and he created the popular *Aquatic Plant Identification Deck* and the companion *Grasses, Sedges, and Rushes Identification Deck*. He also produced a series of aquatic plant educational videotapes, including the 7-part *Aquatic Plant Identification Series*, multiple aquatic herbicide applicator training videos, general education videos for students, homeowners and lake- and riverfront property owners, and the clever *Careers in Florida's Freshwater Environments* video for middle and high school students. None of us had video production experience at the time. But once Vic decided that this would be an excellent teaching tool, he applied for and received a grant, hired one videographer, and took us out into the field to create video programs for five years.

More recently, Vic and his team produced a set of large-format aquatic and invasive plant photomurals, and the two newest products, aquatic and invasive plant fold-out recognition guides or "pocket posters" to use as road maps to plant identification in the field. Along the way, there were peripheral items such as the *Freshwater Plants* poster, *Aquatic Plant Coloring Book*, aquatic themed mouse pads and more.



Vic accumulated all of this information into the world's largest aquatic plant website at [plants.ifas.ufl.edu](http://plants.ifas.ufl.edu). This website, one of the first, if not the first, to go online from the University of Florida, has been active for 11 years and grown to many hundreds of individual pages. We didn't know how to create a website eleven years ago, but again, Vic's visionary thinking told him the Internet was the future of information dissemination and so we hired one young, inexperienced person and figured it out from the ground up.

Vic's most recent project was to bring all of his accomplishments together into a far-reaching educational program. The goal was to create school lesson plans, labs, activities and more for children of all ages, and programs for Florida Park Service rangers, biologists and volunteers, in order to teach as many people as possible about aquatic, wetland and invasive plants in Florida, a subject Vic described as "dear to our hearts." The program is called *Florida's Invasive Plant Education Initiative* (<http://plants.ifas.ufl.edu/education>), a joint effort by the Center for Aquatic and Invasive Plants and the Bureau of Invasive Plant Management of the Florida Department of Environmental Protection. It has been enthusiastically received by teachers and park service personnel alike, especially as the topic of invasive species has come to the forefront of environmental concerns.

The team members that Vic left behind continue to work on these new projects as well as the established programs at the Information Office of the Center for Aquatic and Invasive Plants. It is important to all of us to continue his legacy, the work that was dear to his heart, of providing the best educational resources and information services on aquatic and invasive plants to the people of Florida and around the world. We intend to fulfill this commitment to the very best of our abilities as a tribute to Vic and his dedication to excellence in everything he did.

To learn more about Vic Ramey, to see photographs and comments from his many friends and associates, or to add your own thoughts, go to: <http://plants.ifas.ufl.edu/vicblog.html>

by Karen Brown, Vic's co-worker of 22 years

## In the Classroom and In the Parks - Phase II

Florida's first ever Invasive Plant Education Initiative dove into its second year this autumn after earning high marks for last year's initial developmental phase (see "In the Classroom and In the Parks," *Aquaphyte* Winter 2005). The initiative was the brainstorm of Vic Ramey who passed away unexpectedly last November, leaving behind a remarkable legacy of educational materials and resources – and some extra large shoes to fill.

Vic's excitement about the project made his loss particularly tragic for CAIP staff and colleagues as it represented the culmination of his life's work at the Center. Fortunately, Jeff Schardt (who co-authored the Initiative) and Don Schmitz, both with the Florida Department of Environmental Protection (DEP), Bureau of Invasive Plant Management, continued their moral and financial support of the project. While it was a difficult year to be sure, we were all proud to pay tribute to Vic's vision by successfully completing Phase I. After a bit of regrouping / reorganizing, we now find ourselves well into Phase II.

**The main objective of the initiative** is to use the abundance of audio-visual materials, field guides, publications, websites, databases and other projects that Vic and his team produced over the years and integrate them into a far-reaching educational program for Florida citizens, starting with young science students. We also wanted to adapt the same information in "outdoor classrooms" for visitors throughout the state, via our state parks.

**During Phase I of the Project**, our strategy was to introduce the invasive plant issue/topic to upper elementary, middle and high school science teachers through a series of training workshops, with the hopes that participating teachers would become interested and energized by the subject and carry that enthusiasm back to their classrooms.

The workshops included field trips to various aquatic and upland sites for plant collection and identification as well as classroom labs and lectures about the ecological and economic impacts that 130+ non-native, invasive plants are having throughout Florida's natural areas. Teachers also reviewed and critiqued curricula as it was being developed, and helped us identify additional materials needed to teach the subject.

By the end of June, more than 120 educators had participated in the workshops. All were pre-tested on their knowledge about native and invasive plants, and then post-tested at the end of the workshops for increased knowledge and comprehension. The 22-question tests showed gain scores of +7.8, a good indication that the workshops were significantly improving knowledge about the subject. In addition, it seems our greatest accomplishment was in creating interest and enthusiasm for native and invasive plants; according to workshop evaluations, teachers enjoyed the field trips and hands-on activities just as much as their students do. As one teacher commented during a workshop, "I was aware of some of the invasive species, but the number of problem plants is astounding..."

Information gleaned from these sessions helped immensely as we worked to develop a core curricula. For example, when asked about a preferred media/format for presenting lessons, their top request was for PowerPoint™ presentations – a popular audio-visual software program used by many professionals for presentations at seminars and conferences. We had no idea it also was being used by so many teachers, at all levels. As a result, our four main lessons were developed in this format (see sidebar).

**The CAIP Education Initiative Team** consisted of myself and two high school science teachers/curricula specialists, Cynthia Holland and Elaine Taylor, who were brought onboard to help write the lessons and activities and to insure that all materials met Florida Sunshine State Standards and benchmarks. Web specialist Beth DeGroot designed a new user-friendly education website that is being used to disseminate the lessons and activities in three different formats (Microsoft Word documents, PDFs, and html), as they are completed/reviewed this year. Student assistants Marco Downs, Laura Gutane, Joshua Huey, and Ian Richard provided graphic and desktop production assistance for the printed materials and PowerPoint™ lessons.

### **A New Education Web Site:** <http://plants.ifas.ufl.edu/education>

In addition to the new curricula and various teaching resources provided on our education web site, the pages also serve as a portal or pathway for teachers (and students) to navigate and utilize the much larger companion website, *Plant Management in Florida Waters* (<http://plants.ifas.ufl.edu/guide>). This "guide" was created a few years ago, also with the support of the DEP Bureau, to help answer citizens' questions on hundreds of topics related to Florida's freshwater environments including – but not limited to – plant management, water management, wildlife, ecology, etc. However, according to some teachers, it was hard to know where to start. Therefore, the related lessons and activities are designed to "point" teachers in the right direction and use the Guide as a resource.

### **Four PowerPoint™ presentations were developed as part of the core curricula:**



**1. *A Fish Tale*** – Becca the bass narrates this colorful lesson about the delicate balance between oxygen, plants and fish in freshwater environments.



**2. *Silent Invaders: A True Story About Native, Non-native and Invasive Plants in Florida*** – a basic introduction to the concept of native versus non-native and invasive plants including methods of seed dispersal; with lots of photos.



**3. *Why Manage Invasive Plants?*** – provides a brief history of invasive plant management in Florida, featuring two of the most troublesome aquatic plants: hydrilla and water hyacinth. Real life plant management scenarios are discussed along with the concept of maintenance control.

**4. *Viva La Difference!*** – A lesson on trophic states and how they can help us explain the unique qualities found in Florida lakes. (*currently under review*)

Copies of these lessons are viewable as PDF files on the website; complete PowerPoint™ versions with Q&A are available upon request: [http://plants.ifas.ufl.edu/education/powerpoint\\_ms.html](http://plants.ifas.ufl.edu/education/powerpoint_ms.html)

**For Phase II of the project**, our team will be actively distributing the newly developed curricula to teachers throughout Florida and evaluating its effectiveness in the classroom, as well as piloting a variety of public outreach materials in a number of state parks (brochures, banners, hands-on activities, etc.) .

Further development of the education website also is on the list, along with the creation of a resource website for state park personnel to stay informed on the latest invasive plant news and to help them share information with visitors and park neighbors about invasive plant species in their region.

There's much to be done before Vic's goal is achieved of "continuing the initiative until every science teacher, student, park ranger, and park docent volunteer are knowledgeable of the invasive plants in their areas and have the resource materials necessary to help them identify, contain, control and even prevent more plant invasions in the unique natural areas of the Sunshine State."

However, with his vision front and center, Phase II is off to a good start.

*by Amy Richard*

## Highlights from the Florida Invasive Plant Education Initiative — Phase I



The Center for Aquatic and Invasive Plants (UF/IFAS) held invasive plant teacher workshops at the Florida Association of Science Teachers Conference in Orlando in November, 2005, and at an environmental science workshop at the University of Florida in June, which was co-hosted by UF's Center for Precollegiate Education and Training. Workshops included field trips to various aquatic and upland sites for plant collection and identification activities as well as classroom labs and lectures. Another one is slated for mid-October in Gainesville.



A walking, talking invasive plant (Amy Richard a/k/a *Amelia exotica*) made a visit to our nation's capital this winter to raise awareness about invasive plants during National Invasive Weed Awareness Week (NIWAW). In March, she visited Cedar Key Elementary School to test-run the *Silent Invaders* lesson about native, non-native and invasive plants. Following the lesson, students made leaf prints with a variety of plants. Later that month, *Amelia* made several appearances at spring garden festivals in the greater Gainesville area.



Cedar Key Elementary students were eager to share stories about plants and to make leaf prints.

# Aquatic Plant Aficionados Flock to Florida

by Paula Biles

In July the annual Symposium of the International Waterlily & Water Gardening Society (IWGS) attracted a diverse group from all across the globe. Besides the US, eight countries were represented, plus Puerto Rico. Approximately 150 attendees came for either a few days or the entire six-day event. They represented the entire spectrum of the aquatic plant field, from academics to growers to hobbyists to botanical gardens personnel. Everyone enjoyed and learned from the lectures and tours, which all were focused on aquatic plants and water gardens. Of special interest were the trips to commercial growers and private gardens, typically off-limits to most people.

Since the IWGS Symposium is held in a different location every year, it had been 16 years since the group last visited Florida. To show off the true aquatic nature of the state there were field trips to see the real Florida. These included an airboat ride in the Everglades, where this complex ecosystem could be seen up close. Attendees got a chance to see why the “River of Grass” is so important to Florida’s environment. While being whisked across the surface of the water, they viewed a sample of the Everglades’ 300 species of birds, over 1,000 plants, and numerous alligators.

Another natural area visited was the Grassy Waters Preserve on the edge of the Everglades, which overflows with aquatic plants, both above and below the water surface. It was a living example of how crucial Florida wetlands are to filter rainwater and provide drinking water for the State’s rapidly growing population.

The last natural ecosystem toured was a freshwater spring in central Florida. Swimming and kayaking in the crystal clear waters of Wekiva Springs was a real eye-opener. People were fascinated to learn that spring water in Florida is always 72° F (22° C), which feels cold in the hot summer and warm in the winter. Even more amazing was snorkeling over dense forests of submersed aquatic plants, which often extend down 10-40 feet (3-12 meters). There were countless fish, including numerous large plecostomous, and other aquatic fauna. A famous naturalist called this unique aquatic environment a “liquid bowl of light” and attendees got to see why.



Discussions during bus rides were most interesting and animated. Many people carried notebooks with them to capture suggestions, plant names, and ideas.

Several attendees were aquatic plant growers and retailers, so visits were arranged to aquatic nurseries and a tissue culture company. One grower was the largest producer of pond and aquarium plants in the US, as well as a hybridizer of water lilies. A special display of water lilies was organized just for the group. This once in a lifetime exhibit was a display of over 50 varieties of blue and purple water lily hybrids and species, which allowed visitors to view them side by side. Since this had never been done before, and will probably never be repeated, it was an excellent way to observe the variations between different cultivars of lilies, some of which are hard to distinguish. The photographic opportunities were outstanding since the tanks were above ground and each lily was well labeled.

The seminars on Education Day provided the largest opportunity for learning. Seven international experts spoke on aquatic plant propagation, growing lotuses in China, aquatic plant fertilization, artistic aspects of water garden design, pond pests and predators, tissue culture of aquatic plants, and water hyacinth problems in Florida. Some attendees who couldn’t attend the full Symposium came just for the day to benefit from the vast expertise presented.

The IWGS also was very pleased to have a graduate student from the University of Florida, Dustin Meador, attend the Education Day lectures. The IWGS raises money through sponsorships and auctions to fund research in aquatic plants. This year they began awarding



a student scholarship to attend Education Day at the Symposium, and Dustin was the recipient. He was the perfect person to begin this program; his strong interest in aquatics and his enthusiasm for the field was contagious. Having him in attendance also gave a boost to fundraising efforts (the auction and sale) to support future research and student scholarships.

The auction and sale included numerous items, including pond products, aquatic plant books and catalogs, artwork, a lotus poster designed just for the Symposium, IWGS publications, and even a digital camera. Members, sponsors, and generous donors donated the items. The money raised goes to a very good cause and individuals who bought items or won them in the auction were delighted to help support future aquatic plant research grants.

Besides the tours, lectures, and fundraising, there were other components to the Symposium. Winners were announced for the IWGS annual New Waterlily Competition and the annual Aquatic Art Competition, with slide shows of the best hybrids plus winning artwork from several categories and age groups. (Check the IWGS website for details about next year's competitions.)

The only event that can top the success of this year will be the 2007 Symposium next July in Bangkok and Chiang Mai, Thailand. The event is being hosted by representatives from Kasetsart University, King Rama IX Park, Queen Sirikit Botanical Garden, and the Rajamangala Institute of Technology. Besides the educational lectures on aquatic plant topics, visits are planned to the Royal Flora International Horticultural Exposition, some Buddhist temples, the National Elephant Institute, Nong Nooch Tropical Gardens, and the weekend market. The Society's first trip to Asia is going to attract a wide audience from around the world and we invite *Aquaphyte* readers to attend.

The IWGS is an organization of international membership dedicated to the furtherance of all aspects of water gardens and their associated plants. Since 1984 the IWGS has supported and promoted education, research, and conservation in these areas. (They are the International Society of Horticulture Science (ISHS) appointed International Registrar of *Nelumbo* and *Nymphaea*.)

Please visit [www.iwgs.org](http://www.iwgs.org) for information, pictures, research grant applications, Aquatic Art Competition details, the 2007 Thai Symposium, other activities, and membership information.



1<sup>st</sup> place, *Black & White Illustration* by teen Julia Rega of Bradenton, Florida

## MEETINGS

**California Invasive Plant Council (Cal-IPC) Conference, Research & Management: Bridging the Gap**, October 5-7, 2006, Sonoma County, California. [www.cal-ipc.org](http://www.cal-ipc.org)

**30th Annual Florida Aquatic Plant Management Society (FAPMS) Meeting**, October 30 - November 2, 2006; St. Petersburg, Florida. [www.fapms.org](http://www.fapms.org)

**Public Land Acquisition & Management Partnership Conference**, November 1-2, 2006, Jacksonville, Florida. [www.ces.fau.edu/plam2006](http://www.ces.fau.edu/plam2006)

**33rd Annual Conference on Ecosystems Restoration and Creation**, Hillsborough Community College November 2-3, 2006, Plant City, Florida. <http://www.hccfl.edu/depts/detp/ecoconf.html>

**North American Lake Management Society (NALMS) 2006 International Symposium**, Nov 8-10, Indianapolis, Indiana. <http://www.nalms.org>

**11th Annual Invasive Species Workshop**, Florida Panther/Ten Thousand Islands Refuges & The Rookery Bay National Estuarine Research Reserve, December 1, 2006. Takako\_hashimoto@fws.gov or (239) 353- 8442 x 222

**SE-EPPC Annual Symposium**, co-hosted by the Georgia Exotic Pest Plant Council, March 20-22, 2007, Athens, Georgia. Chris Evans at [cevans@uga.edu](mailto:cevans@uga.edu) or [www.gaeppe.org](http://www.gaeppe.org)

**29th Annual Wisconsin Lakes Convention**, April 26-28, 2007, Green Bay, Wisconsin. [http://www.uwsp.edu/cnr/uwexlakes/Click on Conventions](http://www.uwsp.edu/cnr/uwexlakes/Click%20on%20Conventions).

**2007 Aquatic Weed Control Short Course**, University of Florida-IFAS, Aquatic, Upland and Invasive Weed Control; Aquatic Plant Identification, May 14-18, 2007, <http://conference.ifas.ufl.edu/>

**47th Annual Meeting of the Aquatic Plant Management Society (APMS)**, July 15-18, 2007, Nashville, Tennessee. [www.apms.org](http://www.apms.org)

**30th Congress of the International Association of Theoretical and Applied Limnology**, August 12-18, 2007; Montreal, Quebec Canada. [www.sil2007.org](http://www.sil2007.org)

## UF / IFAS Aquatic Weed Control Short Course

**T**he University of Florida / IFAS Extension Aquatic Weed Control Short Course was well attended again this year, with more than 400 field personnel, resource managers and researchers registered. The course, which covers aquatic, upland and invasive weed control and aquatic plant identification, is the largest single education effort of this type by IFAS (the Institute of Food and Agricultural Sciences).

Presentations included the behavior and fate of ALS inhibiting herbicides in the aquatic environment, surfactants, algae management, biological control, herbicide toxicology, registration and formulations, and much more.

Continuing Education Units (CEUs) were offered for attending the course to assist participants in becoming certified, or maintaining their certification, as pesticide applicators in Aquatic and Natural Area categories through the Florida Department of Agriculture and Consumer Services. Concurrent sessions were offered for currently licensed applicators needing CEUs and for those needing review or training. Special sessions were offered in the calculations necessary for herbicide equipment calibration, and "hands on" practice. Boom sprayers, hand-gun sprayers, and a dry material spreader/applicator were demonstrated. Tests were administered on site during the final day of the course.

A large collection of live plants was displayed throughout the meeting and for a special plant identification session, courtesy of Don Doggett of the Lee County Hyacinth Control District.

According to a survey, approximately half of the attendees were experiencing the short course for the first time, indicating a strong need to continue presenting the course into the future. The next course is scheduled for May 14-18, 2007. For information, go to: <http://conference.ifas.ufl.edu/>



Don Doggett (R), assisted by Ken Sonne, collects and displays dozens of aquatic plants for identification training. Both work for the Lee County Hyacinth Control District.



## Aquatic Plant Management Society Meets in Oregon

The 46th annual meeting of the Aquatic Plant Management Society (APMS) was held in beautiful Portland, Oregon in July. Taking place in the heart of the Pacific Northwest, home to a rich tradition of Native American culture, the meeting was opened with a "ceremonial welcome" by Rod McAfee, a 75 year-old Pima Native American. He stressed the importance of meetings and said that coming together strengthens beliefs. He further stated that, "Once you stop learning, that is the end." Learning is what followed for over 200 attendees with two and a half days of oral presentations, posters, student papers, networking socials, and more.

Oral presentation sessions included the following categories: Pesticide Regulatory Issues; Invasive Plant Monitoring, Physiology, and Management; Invasive Species and Aquatic Habitat Management; Herbicide Developments and Invasive Plant and Algae Issues; and Vegetation Challenges.

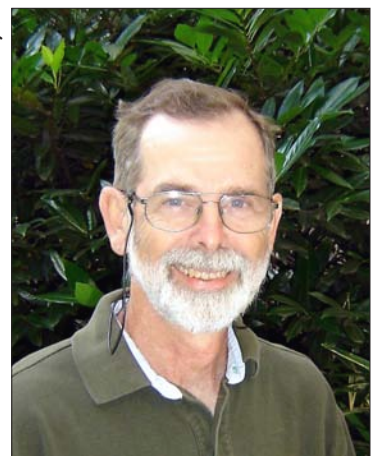
The APMS has a strong ethic of student support and solicited students for both oral and poster presentations. Cash awards were presented for the top three oral presentations, and the top poster. Over a dozen students participated by presenting their original research findings on topics such as the biology and ecology of aquatic and wetland plants, control methods, and restoration projects. Winners in the oral presentation category were Julie G. Nachtrieb, University of North Texas; Christopher R. Mudge, University of Florida, Center for Aquatic and Invasive Plants; and, tied for third place, Atul Puri, University of Florida, Agronomy Department and Center for Aquatic and Invasive Plants; and Steven W. Wells, Portland State University, Center for Lakes and Reservoirs. The winner of the poster presentation was Mark Swinton, Rensselaer Polytechnic Institute. All presentation abstracts are available on the APMS website.

Dr. David L. Sutton, long-time member of the Society, president in 1990, past-editor of the *Journal of Aquatic Plant Management* and contributor to the science of aquatic plant biology and management during his long career with the University of Florida, was presented with the President's Award by outgoing president Mr. Jeffrey D. Schardt.

Next year's 47th Annual Meeting will be held July 15 - 18, 2007 in Nashville, Tennessee. Please visit: [www.apms.org](http://www.apms.org)



Outgoing APMS President, Mr. Jeffrey Schardt (Florida Dept. of Environmental Protection, Bureau of Invasive Plant Management)



Dr. David L. Sutton, Retired



The Orinoco river overflows the levees in the Upper and Middle Delta during seasonal flooding.

## The Orinoco Delta, Venezuela: A Landscape of Wetlands

by Giuseppe Colonnello, Marcos Salcedo and Belkis Rivas  
*trans. Chet Van Duzer*

The Orinoco Delta covers about 22,000 km<sup>2</sup> of a territory that remains largely undisturbed by humans, due mainly to the difficulty of creating agriculture or industry in land that is flooded for much of the year. The region includes a great diversity of aquatic communities, both freshwater and estuary, and provides habitat for a great diversity of birds, fish, mammals, amphibians, and reptiles. The plains of the delta cover, in whole or in part, two areas that have been decreed Areas of Special Administration, including the 265,000 ha National Park “Mariusa,” which is included in the Biosphere Reserve “Delta of the Orinoco” whose extension is 1,125,000 ha.

The main geofoms found in the Delta are thick natural dikes, sands, and in the associated depressions, clays, slime, and organic materials. Most of the deltaic plains of the Orinoco are occupied by extensive wetlands dominated by communities of mostly aquatic animals and plants. The landscape is, in general, composed by ligneous formations in the higher positions and herbaceous in the depressions. Many of the arboreal, bushy, and ligneous plants can be considered aquatic, as the soil and roots of the plants are always saturated with water.

The rains, which surpass 2000 mm annually on the coast of the Delta, together with the overflow of the rivers and the influence of the tides, determine the extension, depth and duration of the flooding of the land. The physical and chemical properties of the water in the wetlands varies with the annual hydrologic cycle, so that in the same environment one can observe a succession of different water types (white: high content of sediments in suspension, pH neutral or basic; black: low content of sediments and nutrients, pH acid; and clear, an intermediate condition). These phenomena determine the distribution of the plant communities of the Delta.

*Continued on page 14*

## MARY'S PICKS

Items of special interest to our reader/cataloger,  
Mary Langeland ~

\* **Microbial degradation of paintings.** By O. Ciferri. 1999. *Applied and Environmental Microbiology* 65(3):879-885.

"When the hypogean rooms of the Domus Aurea in Rome were opened to visitors in 1951, very rapidly green crusts appeared on the frescoes in lighted areas; their development was so rapid that, in 1981, illumination had to be discontinued. A study of the microbial community composing such crusts showed a predominance of cyanobacteria (two species of *Lyngbya*, accompanied by unidentified bacteria) and chlorophytes (species of *Chlorella*, *Pseudococcomyxa*, and *Pseudopleurococcus*) . . . the two species of *Lyngbya* were by far the predominant ones."

\* **Consumption of pondweed rhizomes by Yellowstone grizzly bears.** By D.J. Mattson, S.R. Podruzny, and M.A. Haroldson. 2005. *Ursus* 16:41-46.

"Bears excavated wetlands with pondweeds when they were free of standing water, most commonly during October and occasionally during spring prior to the onset of terminal snowmelt. . . . These results add to the documented diversity of grizzly bear food habits and, because pondweed is distributed circumboreally, also raise the possibility that consumption of pondweed by grizzly bears has been overlooked in other regions."

\* **Nutrient farming: the business of environmental management.** By D.L. Hey, L.S. Urban, and J.A. Kostel. 2005. *Ecological Engineering* 24(4):279-287.

"Credit markets for flood storage, nitrogen, phosphorus, carbon, atrazine, sediment, and many other constituents would economically motivate landowners to restore wetlands. The resulting high-quality open space would provide for recreation, wildlife habitat, and biodiversity. . . . The nitrogen market will create a new land-economics paradigm and new opportunities for landowners, particularly farmers."

\* **Biological control of three floating water weeds, *Eichhornia crassipes*, *Pistia stratiotes*, and *Salvinia molesta* in the Republic of Congo.** By G. Mbatia and P. Neuenschwander. 2005. *BioControl* 50:635-645.

The damage by floating water weeds and the subsequent improvement of the conditions was evident from observations and, more poignantly, from testimony of the interviewed women and men, both Bantu and Pygmies. They uniformly described the hardships imposed on their livelihood from the closure of their waters by floating weeds and the subsequent relief and joy, when - against all expectations - the weed cover was reduced.

\* **Control of circadian rhythm-regulated nyctinastic movement in water lily (*Nymphaea stellata* Willd.) flowers.** *J. Horticultural Science & Biotechnology* 80(2):167-170. 2005.

Immersing the flower stalks of a water-lily in certain solutions, including salt and Rinso laundry detergent, can induce them to remain open for 14 - 28 hours, so that exploitation as cut flowers can now be considered.

\* **Effect of the Lower Kihansi Hydropower Project and post-project mitigation measures on wetland vegetation in Kihansi Gorge, Tanzania.** By C.H. Quinn, H.J. Ndangalasi, J. Gerstle and J.C. Lovett. 2005. *Biodiversity and Conservation* 14(2):297-308.

"Riparian wetlands in Kihansi Gorge, part of the Tanzanian Eastern Arc range of mountains, are maintained by spray from large waterfalls rather than from ground water or flooding." The wetlands "provide the only known habitat for the Kihansi Spray Toad, *Nectophrynoides asperginis*." This article describes a sprinkler system installed in an attempt to recreate the conditions required for survival of the toad.

\* **Archimedes and a too simple model of competition between a macrophyte and phytoplankton - a satirical play for two limnologists.** By H.L. Golterman. 2002. *Hydrobiologia* 472(1-3):107-117.

The setting: In the year 350 BC, Archimedes bought a new house with a fine pond which he wanted to fill with a macrophyte. He went to a Sicilian garden center and found the macrophyte he liked. And so begins a dialogue between Archimedes and an ecological modeller.

\* **Control costs, operation, and permitting issues for non-chemical plant control: case studies in the San Francisco Bay-Delta region, California.** By B.K. Greenfield, M. Blankinship, and T.J. McNabb. 2006. *J. Aquatic Plant Manage.* 44:40-49.

"Five case studies were evaluated to determine cost and implementation issues for alternative plant control methods in waters of the San Francisco Bay-Delta region. The primary case study examined control costs, operation, and endangered species permitting for mechanical shredding of water hyacinth . . ." A very detailed and, hence, interesting analysis.

\* **When do herbivores affect plant invasion? Evidence for the natural enemies and biotic resistance hypotheses.** By J.L. Maron and M. Vila. 2001. *Oikos* 95(3):361-373.

"The degree to which native herbivores provide biotic resistance to either exotic plant establishment or spread may be greatly determined by their functional and numerical responses to exotic plants, which we know little about. Generalist herbivores, through direct effects on seed dispersal and their indirect effects in altering the outcome of native - non-native plant competitive interactions, may have more of a facilitative than negative effect on exotic plant abundance."

\* **Loss of diversity and degradation of wetlands as a result of introducing exotic crayfish.** By C.F. Rodriguez, E. Becares, M. Fernandez-Alaez and D. Fernandez-Alaez. 2005. *Biological Invasions* 7:75-85.

"The introduction of the allocthonous Louisiana red swamp crayfish (*Procambarus clarkii*) in Chozas (a small shallow lake situated in Leon (North-West Spain)) in 1996 switched the clear water conditions that harboured an abundant and a quite high richness of plants, invertebrates, amphibians and birds to a turbid one followed by strong losses in abundance and richness in the aforementioned groups."



## **BOOKS/REPORTS, ETC.**

### **WEEDS OF THE SOUTH-EAST**

#### **- AN IDENTIFICATION GUIDE FOR AUSTRALIA.**

By F.J. Richardson, R.G. Richardson and R.C.H. Shepherd. 2006. 438 pp. ISBN 0958743932. \$69.95 www.weedinfo.com.au, richardson@weedinfo.com.au

Supported by the Weed Societies of Victoria, NSW and SA and the Council of Australasian Weed Societies, a comprehensive weed ID guide for the south-east region.

Written in easy-to-understand language, it covers over 2000 weeds (including many new and emerging problem species) with more than 1600 colour photos.

### **NATURAL AND CONSTRUCTED WETLANDS**

#### **- NUTRIENTS, METALS AND MANAGEMENT.**

Edited by J. Vymazal. 2005. 417 pp. ISBN 90-5782-153-2. € 128. Backhuys Publishers, backhuys@backhuys.com, www.backhuys.com

The latest in a series on constructed and natural wetlands, this book contains 28 peer-reviewed papers, plus discussions, presented at the 2003 workshop entitled *Nutrient Cycling and Retention in Natural and Constructed Wetlands V*, attended by 42 researchers from 16 countries. The topic of nutrients was the theme of the original 1997 workshop. In 1999, the topics of water balance in wetlands, wetland restoration and ecological functional assessment of wetlands were added. In 2001, the topics were again broader and included heavy metals retention, removal and compartmentalization, reed beds for sludge dewatering, the influence of watershed management on mass cycling, and the use of GIS for wetland evaluation.

### **AQUATIC WEEDS:**

#### **PROBLEMS, CONTROL AND MANAGEMENT.**

By Drs. S.M. Mathur, A.N. Mathur, Dr. Y.C. Bhatt, Dr. R.K. Trivedy, Er. Pramod Mohnot. Himanshu Publications, New Delhi, India. aryabook@datainfosys.net

Aquatic Weeds: Problems, Control and Management presents thirty five articles, research papers and reviews from well-known scientists of this field. The book deals with a large number of aquatic weeds, most prominently water hyacinth; problems created by water hyacinth in various parts of India, its mechanical and biological control, its utilization in pollution control, fodder, fuel, biogas generation, paper and pulp, composting and various other uses. Many papers deal with Indian research on mechanical harvesting & chopping of water hyacinth. For other aquatic weeds, the topics covered are: management; allelopathy; biological control, and utilization.

### **THE HUDSON RIVER ESTUARY.**

Edited by Jeffrey S. Levinton, State University of New York, Stony Brook. ISBN-10: 0521844789. 2006. 488 PP. \$90.00

A comprehensive look at the physical, chemical, biological and environmental management issues important to understanding the Hudson River Estuary. Chapters cover ecosystem-level processes and biological interactions; and environmental issues such as fisheries, toxic substances, and the effect of nutrient input from densely populated areas.

### **RIVER PLANTS – THE MACROPHYTIC VEGETATION OF WATERCOURSES – SECOND REVISED EDITION.**

By S.M. Haslam. 450 PP. ISBN 0 955074045. £ 25. www.forresttext.co.uk/

This is a revised and updated edition of a book that, for many years, has been the definitive guide to understanding the macrophytic vegetation of watercourses. It was the first and is still the most comprehensive account of aquatic plants in relation to their environment, and to the components of that ecosystem. Written for naturalists, botanists, ecologists, and students of limnology and hydrobiology. With over 100 line drawings by P. A. Woolseley, plus photos.

### **DANUBE DELTA - GENESIS AND BIODIVERSITY.**

By Claudiu & Maria M. Tudorancea (Eds). 2006 (February). 444 pages, hardbound (*Biology of Inland Waters*). ISBN 90-5782-165-6. € 156

H. B. N. Hynes, Distinguished Emeritus Professor of the University of Waterloo, Ontario, Canada says, "I believe that this is the first book in any language that attempts to deal comprehensively with the limnology and general biology of a river delta." He also states that, although there is a variety of viewpoints and some overlap in content, "... there is also a thread of concern throughout the text about the general eutrophication of the waters caused by human activity . . ." Chapters cover Danube Delta geology, geomorphology and geochemistry; physiography and climate; the hydrological regime in the deltaic sector; chemistry; ecosystems; phytoplankton and its primary production; aquatic macrophytes; zooplankton structure and productivity in lacustrine ecosystems; benthic fauna; structure and function of the Oligochaeta communities in lentic ecosystems; weed-bed fauna; benthic microbial communities; ichthyofauna; avifauna; and finally, the human presence in the Danube Delta.

### **THE GEOLOGY, BIODIVERSITY AND ECOLOGY OF LAKE HÖVSGÖL (MONGOLIA).**

By Clyde E. Goulden, Tatiana Sitnikova, Jon Gelhaus & Bazartseren Boldgiv (Eds). 2006 (February). 526 pp. (*Series: Biology of Inland Waters*). ISBN 90-5782-162-1. € 176

Lake Hövsgöl, one of the large ancient lakes of Asia, is located in northern Mongolia. It is Mongolia's largest freshwater lake and the 16th largest naturally formed lake in the world by water volume. Hövsgöl is estimated to be at least five million years old. The Mongolian Academy of Sciences is particularly interested in maintaining the area as a crucial international research site supporting ecosystem studies and the interactions and impacts of climate change and nomadic pastoral use. The climate, the watersheds, and the lake water are being monitored for potential change and negative impacts. An international team formed of scholars from many countries such as USA, Russia, Japan, Taiwan and others along with their Mongolian colleagues are working there on a truly international and interdisciplinary project. The book is divided into four parts: Biodiversity, Ecology, Water Chemistry and Physics, and Geology and Climate.

## FROM THE DATABASE

Here is a sampling of the research articles, books and reports which have been entered into the aquatic, wetland and invasive plant database since Winter 2005. The APIRS database contains more than 66,000 citations. To use the free database online, go to <http://plants.ifas.ufl.edu/> and click on APIRS Online Database.

To obtain articles, contact your nearest academic library, or a document delivery service. Full text of records cited in APIRS is not stored electronically.

**AGUIAR,F.C., FERREIRA,T.,  
ALBUQUERQUE,A., BERNEZ,I.**

Invasibility patterns of knotgrass (*Paspalum distichum*) in Portuguese riparian habitats. WEED TECHNOL. 19(3):509-516. 2005.

**ALLEN,M.S.**

Aquatic plants and fisheries: making sense of conflicting evidence. AQUATICS 27(2):4-8. 2005.

**ANDERSEN,T., PEDERSEN,O.,  
CHRISTENSEN,C., JACOBSEN,N.**

*Cryptocoryne* of the Nam Lik watershed in northwestern Laos. AQUATIC GARDENER 19(1):24-32. 2006.

**ANNEN,C.A., TYSER,R.W.,  
KIRSCH,E.M.**

Effects of a selective herbicide, sethoxydim, on reed canarygrass. ECOL. RESTORATION 23(2):99-102. 2005.

**ARIAS,R.S., NETHERLAND,M.D.,  
SCHEFFLER,B.E., PURI,A., DAYAN,F.**

Molecular evolution of herbicide resistance to phytoene desaturase inhibitors in *Hydrilla verticillata* and its potential use to generate herbicide-resistant crops. PEST MANAGEMENT SCI. 61(3):258-268. 2005.

**ARMOUR,R.K., KENNEDY,D.M.**

Comparative palynomorph signals of vegetation change preserved in an adjacent peat swamp and estuary in north-west Nelson, New Zealand. NEW ZEALAND J. BOT. 43(2):451-465. 2005.

**ARMSTRONG,J.E.**

Fringe science: are the corollas of *Nymphoides* (Menyanthaceae) flowers adapted for surface tension interactions? AMERICAN J. BOT. 89(2):362-365. 2002.

**BALCI,P., GUNSALUS,B.**

Measurement of success in watershed wetland restoration: a case study of the Loxahatchee watershed. PROC. THIRTY FIRST ANNU. CONF. ON ECO-

SYS. RESTORATION AND CREATION, CANNIZARO,P.J., ED., HILLSBOROUGH COMM. COLLEGE, TAMPA, FL, PP. 65-74. 2004.

**BARTH WAL,S., NAUTIYAL,  
R., GANESAN,M., VENKATARA-  
MANAN,K.S., ET AL**

Effect of salt stress on rooting of *Casuarina equisetifolia* cuttings. J. TROP. FOREST SCI. 17(1):170-172. 2005.

**BARTON,B.J., BACH,C.E.**

Habitat use by the federally endangered Mitchell's satyr butterfly (*Neonympha mitchellii mitchellii*) in a Michigan prairie fen. AM. MIDL. NAT. 153(1):41-51. 2005.

**BAYNE,D.R.**

Giant lyngbya-a pond owner's nightmare. SOUTHERN PONDS WILDLIFE 4(2):20-23.2005.

**BIANCHINI,I., PACOBAHYBA,L.D.,  
CUNHA-SANTINO,M.B.**

Aerobic and anaerobic decomposition of *Montrichardia arborescens* (L.) Schott. ACTA LIMNOL. BRAS. 14(3):27-34. 2002.

**BILGIN,A., YALCIN,E., KUTBAY,H.  
G., KILINC,M.**

Nutrient concentrations and biomass in lake vegetation and nutrient limitation in lakes of northern Black Sea region of Turkey. EKOLOGIA - BRATISLAVA 22(3):33-44. 2003.

**BLEDZKI,L.A., ELLISON,A.M.**

Population growth and production of *Habrotrocha rosa donner* (Rotifera: Bdelloidea) and its contribution to the nutrient supply of its host, the northern pitcher plant, *Sarracenia purpurea* L. (Sarraceniaceae). HYDROBIOLOGIA 385:193-200. 1998.

**BOEDEL TJE,G.**

The role of dispersal, propagule banks and abiotic conditions in the establishment of aquatic vegetation. PHD THESIS, DEPART. AQUATIC ECOLOGY ENVIRON. BIOLOGY, RADBOUD UNIV., NIJMEGEN, THE NETHERLANDS, 224 PP. 2005.

**BURNS,J.H., MILLER T.E.**

Invasion of chinese tallow (*Sapium biferum*) in the Lake Jackson area, northern Florida. AM. MIDL. NAT. 152(2):410-417. 2004.

**BUTLER,J.L., ATWATER,D.Z.,  
ELLISON,A.M.**

Red-spotted newts: an unusual nutrient source for northern pitcher plants. NORTHEASTERN NAT. 12(1):1-10. 2005.

**CZERPAK,R., PIOTROWSKA,A.,  
KROTKE,A.**

Biochemical activity of auxins in dependence of their structures in *Wolffia arrhiza* (L.) Wimm. ACTA SOC. BOT. POLONIAE 73(4):269-275. 2004.

**DAHLGREN,J.P., EHRLEN,J.**

Distribution patterns of vascular plants in lakes - the role of metapopulation dynamics. ECOGRAPHY 28(1):49-58. 2005.

**DAOUST,R.J., CHILDERS,D.L.**

Ecological effects of low-level phosphorus additions on two plant communities in a neotropical freshwater wetland ecosystem. OECOLOGIA 141(4):672-686. 2004.

**DOBBS,F.C., ZIMMERMAN,R.C.,  
DRAKE,L.A.**

Occurrence of intracellular crystals in leaves of *Thalassia testudinum*. AQUATIC BOTANY 80:23-28. 2004.

**DEBERRY,D.A., PERRY,J.E.**

Primary succession in a created freshwater wetland. CASTANEA 69(3):185-193. 2004.

**DENOTH,M., MYERS,J.H.**

Variable success of biological control of *Lythrum salicaria* in British Columbia. BIOL. CONTROL 32(2):269-279. 2005.

**DING,W., CALZ., TSURUTA,H.**

Factors affecting seasonal variation of methane concentration in water in a freshwater marsh vegetated with *Carex lasiocarpa*. BIOL. FERTIL. SOILS 41(1):1-8. 2005.

**EKLOF,J.S., DE LA TORRE CASTRO,  
M., ADELSKOLD,L., JIDDAWI,N.S.,  
ET AL**

Differences in macrofaunal and seagrass assemblages in seagrass beds with and without seaweed farms. ESTUARINE, COASTAL SHELF SCI. 63(3):385-396. 2005.

**ELLISON,A.M., GOTELLI,N.J.**

Nitrogen availability alters the expression of carnivory in the northern pitcher plant, *Sarracenia purpurea*.

PROC. NAT. ACAD. SCI. 99(7):4409-4412. 2002.

**FANG,X., SUBUDHI,P.K., VENUTO,B.C., HARRISON,S.A., ET AL**

Influence of flowering phenology on seed production in smooth cordgrass (*Spartina alterniflora* Loisel.).

AQUATIC BOTANY 80(2):139-151. 2004.

**FAY,M.F., COWAN,R.S., SIMPSON,D.**

Hybridisation between *Schoenoplectus tabernaemontani* and *S. triqueter* (Cyperaceae) in the British Isles.

WATSONIA 24:433-442. 2003.

**FERRITER,A., DOREN,B.,****GOODYEAR,C., THAYER,D., ET AL**

The status of nonindigenous species in the south florida environment.

SOUTH FL. ENVIRON. REPORT, SOUTH FLORIDA WATER MANAGE. DIST., WEST PALM BEACH, FL., CHAPTER 9, 102 PP. 2006.

**FINDLAYS,S., WIGLAND,C., NIEDER,W.C.**

Submersed macrophyte distribution and function in the tidal freshwater Hudson River.

IN: THE HUDSON RIVER ESTUARY, EDS., J.S. LEVINTON, J.R. WALDMAN, CAMBRIDGE UNIV. PRESS, NEW YORK, PP. 231-241. 2006.

**FONTAINE,C., DAJOZ,L., MERIGUET,J., LOREAU,M.**

Functional diversity of plant-pollinator interaction webs enhances the persistence of plant communities.

PLOS BIOL. 4(1):7 PP. 2006.

**FREDRIKSEN,S., CHRISTIE,H., BOSTROM,C.**

Deterioration of eelgrass (*Zostera marina* L.) through destructive grazing by the gastropod *Rissoa membranacea* (J. Adams).

SARSIA 89(3):218-222. 2004.

**GABREY,S.W., AFTON,A.D.**

Composition of breeding bird communities in Gulf Coast Chenier Plain marshes: effects of winter burning.

SOUTHEAST. NATURALIST 3(1):173-185. 2004.

**GARBEY,C., THIEBAUT,G., MULLER,S.**

Morphological plasticity of a spreading aquatic macrophyte, *Ranunculus peltatus*, in response to environmental variables.

PLANT ECOL. 173(1):125-137. 2004.

**GARCIA-ROSSI,D., RANK,N., STRONG,D.R.**

Potential for self-defeating biological control? Variation in herbivore vulnerability among invasive *Spartina* genotypes.

ECOL. APPL. 13(6):1640-1649. 2003.

**GEVREK,M.N., SAMANCI,B., YAGMUR,B., ARABACI,O., ET AL**

Studies on the adaptation of *Azolla mexicana* in the Aegean and the Mediterranean regions.

PLANT PROD. SCI. 7(1):50-54. 2004.

**GLOMSKI,L.A.M., NETHERLAND,M.D.**

Quantifying the impact of Aquashade dye for growth regulation of submersed aquatic vegetation.

AQUATICS 27(2):14-18. 2005.

**GOSELAIN,V., HUDON,C., CATTANEO,A., GAGNON,P., ET AL**

Physical variables driving epiphytic algal biomass in a dense macrophyte bed of the St. Lawrence River (Quebec, Canada).

HYDROBIOLOGIA 534(1-3):11-22. 2005.

**GRZYBOWSKI,M., SZAREK,J., SKIBNIEWSKA,K.A., SAWICKA-KAPUSTA,K., ET AL**

The characteristics of plants in the littoral zone of Lake Szlag Wielki in the Ilawa Lake District threatened by pesticide tomb.

FRESENIUS ENVIR. BULL. 14(5):357-362. 2005.

**GU,B.**

Eutrophication and restoration of Lake Apopka, USA.

J. LAKE SCI. 17(1):1-8 (IN CHINESE; ENGLISH SUMMARY). 2005.

**HAVENS,K.E., FOX,D., GORNAK,S., HANLON,C.**

Aquatic vegetation and largemouth bass population responses to water-level variations in Lake Okeechobee, Florida (USA).

HYDROBIOLOGIA 539:225-237. 2005.

**HE,S.-G., JOYCE,D., WANG,M.-Z.**

Characterization of polyamine oxidase from the aquatic nitrogen-fixing fern *Azolla imbricata*.

PLANT SCI. 169(1):185-190. 2005.

**HEILMAN,M.**

Penoxsulam (sp1019) - potential new herbicide for large-scale aquatic plant management applications.

IN: UF-IFAS EXTENSION, AQUATIC WEED CONTROL SHORT COURSE 2005., MAY 16-20, FORT LAUDERDALE, FL, PP. 99-103.2005.

**HUSSNER,A., LOSCH,R.**

Alien aquatic plants in a thermally abnormal river and their assembly to neophyte-dominated macrophyte stands (River Erft, Northrhine-Westphalia).

LIMNOLOGICA 35(1-2):18-30. 2005.

**JAGER-ZURN,I., NOVELA,R.A., PHILBRICK,C.T.**

Microspore development in Podostemaceae-Podostemoideae, with implications on the characterization of the subfamilies.

PL. SYST. EVOL. 256:209-216. 2006.

**KANKAALA,P., KAKI,T., MAKELA,S., OJALA,A., ET AL**

Methane efflux in relation to plant biomass and sediment characteristics in stands of three common emergent macrophytes in boreal mesoeutrophic lakes.

GLOBAL CHANGE BIOL. 11(1):145-153. 2005.

**KAPLAN,Z., FEHRER,J.**

Evidence for the hybrid origin of *Potamogeton x copperi* (Potamogetonaceae): traditional morphology-based taxonomy and molecular techniques in concert.

FOLIA GEOBOTANICA 39:431-453. 2004.

**KARUNARATNE,S., ASAEDA,T., TOYOOKA,S.**

Colour-based estimation of rhizome age in *Phragmites australis*.

WETLANDS ECOL. MANAGE. 12:353-363. 2004.

**KIZIEWICZ,B.**

Aquatic fungi growing on seeds of plants in various types of water bodies of Podlasie Province.

POLISH J. ENVIRON. STUDIES 14(1):49-55. 2005.

**KOSCHNICK,T.J., HALLER,W.T., NETHERLAND,M.D.**

Aquatic plant resistance to herbicides.

AQUATICS 28(1):4,6,8-9. 2006.

**LANGELAND,K.A.**

Is glyphosate use responsible for global decline in amphibians?.

WILDLAND WEEDS 9(3):10-11. 2006.

**LENSSSEN,J.P.M., DE KROON,H.**

Abiotic constraints at the upper boundaries of two *Rumex* species on a freshwater flooding gradient.

J. ECOL. 93(1):138-147. 2005.

**LES,D.H., MOODY,M.L., JACOBS,S.W.L.**

Phylogeny and systematics of *Aponogeton* (Aponogetonaceae): the Australian species.

SYSTEMATIC BOTANY 20(3):503-519

**LIMPENS,J., BERENDSE,F., KLEES,H.**

How phosphorus availability affects the impact of nitrogen deposition on sphagnum and vascular plants in bogs. *ECOSYSTEMS* 7(8):793-804. 2004.

**MACDONALD,G.**

Aquatic herbicides: how they work and why. IN: UF-IFAS EXTENSION, AQUATIC WEED CONTROL SHORT COURSE 2005., MAY 16-20, FORT LAUDERDALE, FL, PP. 227-231. 2005.

**MALLISON,C.**

Selective aquatic plant control using met-sulfuron-methyl, triclopyr, and 2,4-D. IN: UF-IFAS EXTENSION, AQUATIC WEED CONTROL SHORT COURSE 2005., MAY 16-20, FORT LAUDERDALE, FL, PP. 105-111. 2005.

**MORENO-CASASOLA,P., PLIEGO,G.**

Scientists and rural stakeholders develop enterprises designed to restore gulf wetlands (Mexico). *ECOL. RESTORATION* 23(2):120-121. 2005.

**MORRIS,K., HARRISON,K.A., BAILEY,P.C.E., BOON,P.I.**

Domain shifts in the aquatic vegetation of shallow urban lakes: the relative roles of low light and anoxia in the catastrophic loss of the submerged angiosperm *Vallisneria americana*. *MAR. FRESHWATER RES.* 55(8):749-758. 2004.

**MUDGE,C.R., KOSCHNICK,T.J., HALLER,W.T.**

Evaluation of water lettuce's susceptibility to diquat: concerns about resistance development. *AQUATICS* 28(1):10-11. 2006.

**MULLER,K., BORSCH,T.**

Phylogenetics of *Utricularia* (Lentibulariaceae) and molecular evolution of the trnK intron in a lineage with high substitutional rates. *PLANT SYST. EVOL.* 250(1-2):39-67. 2005.

**NAGASAKA,M.**

Changes in biomass and spatial distribution of *Elodea nuttallii* (Planch.) St. John, an invasive submerged plant, in oligomesotrophic Lake Kizaki from 1999 to 2002. *LIMNOLOGY* 5(3):129-139. 2004.

**NAGEL,J.M., GRIFFIN,K.L.**

Can gas-exchange characteristics help explain the invasive success of *Lythrum salicaria*? *BIOLOG. INVASIONS* 6(1):101-111. 2004.

**NANDAKUMAR,R., CHEN,L., ROGERS,S.M.D.**

Agrobacterium-mediated transformation of the wetland monocot *Typha latifolia* L. (broadleaf cattail). *PLANT CELL REP.* 23:744-750. 2005.

**PARISOD,C., TRIPPI,C., GALLAD,N.**

Genetic variability and founder effect in the pitcher plant *Sarracenia purpurea* (Sarraceniaceae) in populations introduced into Switzerland: from inbreeding to invasion. *ANNALS OF BOTANY* 95(1):277-286. 2005.

**NICO,L.G., MUENCH,A.M.**

Nests and nest habitats of the invasive catfish *Hoplosternum littorale* in Lake Tohopekaliga, Florida: a novel association with non-native *Hydrilla verticillata*. *SOUTHEASTERN NAT.* 3(3):451-466. 2004.

**NIES,G., REUSCH,T.B.H.**

Nine polymorphic microsatellite loci for the fennel pondweed *Potamogeton pectinatus* L. *MOLECULAR ECOL. NOTES* 4(4):563-565. 2004.

**O'BRIEN,C.**

Constructed mounds restore intertidal marsh and bird-nesting habitat on Galveston Island (Texas). *ECOL. RESTORATION* 23(2):121-122. 2005.

**PARISOD,C., TRIPPI,C., GALLAD,N.**

Genetic variability and founder effect in the pitcher plant *Sarracenia purpurea* (Sarraceniaceae) in populations introduced into Switzerland: from inbreeding to invasion. *ANNALS OF BOTANY* 95(1):277-286. 2005.

**PARKER,J.D., BURKEPILE,D.E., HAY,M.E.**

Opposing effects of native and exotic herbivores on plant invasions. *SCIENCE* 311:1459-1461. 2006.

**PELICICE,F.M., AGOSTINHO,A.A., THOMAZ,S.M.**

Fish assemblages associated with *Egeria* in a tropical reservoir: investigating the effects of plant biomass and diel period. *ACTA OECOLOGICA* 27:9-16. 2005.

**PFLUGMACHER,S.**

Promotion of oxidative stress in the aquatic macrophyte *Ceratophyllum demersum* during biotransformation of the cyanobacterial toxin Microcystin-Lr. *AQUATIC TOXICOLOGY* 70(3):169-178. 2004.

**PERET,A.M., BIANCHINI,I.**

Stoichiometry of aerobic mineralization (o/c) aquatic macrophytes leachate from a tropical lagoon (Sao Paulo - Brazil).

*HYDROBIOLOGIA* 528(1-3):167-178. 2004.

**PIERINI,S.A., THOMAZ,S.M.**

Effects of inorganic carbon source on photosynthetic rates of *Egeria najas* Planchon and *Egeria densa* Planchon (Hydrocharitaceae). *AQUATIC BOTANY* 78(2):135-146. 2004.

**POLLUX,B.J.A., SANTAMARIA,L., OUBORG,N.J.**

Differences in endozoochorous dispersal between aquatic plant species, with reference to plant population persistence in rivers. *FRESHW. BIOL.* 50(2):232-242. 2005.

**RAMEY,V., SCHARDT,J.**

Freshwater plants in the southeastern United States. UNIV. FLORIDA IFAS EXTEN., CENTER FOR AQUATIC AND INVASIVE PLANTS, RECOGNITION GUIDE FOR 133 PLANTS. 2005.

**REJMANEK,M., RICHARDSON,D.M., PYSEK,P.**

Plant invasions and invasibility of plant communities. *VEGETATION ECOLOGY*, E. VAN DER MAAREL, ED., BLACKWELL PUB., PP. 332-355. 2005.

**RICHARDS,C.L., HAMRICK,J.L., DONOVAN,L.A., MAURICIO,R.**

Unexpectedly high clonal diversity of two salt marsh perennials across a severe environmental gradient. *ECOLOGY LETTERS* 7(12):1155-1162. 2004.

**RICHARDSON,C.J., REISS,P., HUSSAIN,N.A., ALWASH,A.J., POOL,D.J.**

The restoration potential of the Mesopotamian marshes of Iraq. *SCIENCE* 307(5713):1307-1311. 2005.

**RITTER,N.P., CROW,G.E.**

A floristic and biogeographical analysis of the wetlands of the Bolivian cloud forest. *RHODORA* 107(929):1-33. 2005.

**ROMERO,M.I., AMIGO,J., RAMIL,P.**

*Isoetes fluitans* sp. Nov.: the identity of Spanish plants of '*I. longissimum*'. *BOT. J. LINN. SOC.* 146(2):231-236. 2004.

**ROUSSEAU,D.P.L., VANROLLEGHEM, .A., DE PAUW,N.**

Constructed wetlands in Flanders: a performance analysis. *ECOL. ENG.* 23(3):151-163. 2004.

**RYBCZYK,J.M., DAY,J.W., CONNER,W.H.**

The impact of wastewater effluent on accretion and decomposition in a subsiding forested wetland.

WETLANDS 22(1):18-32. 2002.

**SALMINA,L.**

Factors influencing distribution of *Cladium mariscus* in Latvia.

ANN. BOT. FENNICI 41(5):367-371. 2004.

**SCHMIEDER,K., LEHMANN,A.**

A spatio-temporal framework for efficient inventories of natural resources: a case study with submersed macrophytes.

J. VEGETATION SCI. 15(6):807-816. 2004.

**SIROVA,D., ADAMEC,L., VRBA,J.**

Enzymatic activities in traps of four aquatic species of the carnivorous genus *Utricularia*.

NEW PHYTOLOGIST 159(3):669-675. 2003.

**SO,L.M., CHU,L.M., WONG,P.K.**

Microbial enhancement of Cu<sup>2+</sup> removal capacity of *Eichhornia crassipes* (Mart.)

CHEMOSPHERE 52(9):1499-1503. 2003.

**SOOKNAH,R.D., WILKIE,A.C.**

Evaluating floating aquatic macrophytes in improving the water quality of anaerobically digested flushed dairy manure wastewater.

IN: ANAEROBIC DIGESTION - ANAEROBIC BIO-CONVERSION FOR SUSTAINABILITY, PROC. 10<sup>TH</sup> WORLD CONGRESS, VOL. 4, INTERN. WATER ASSOC., LONDON, PP. 2170-2173. 2004.

**STUBBS,D.**

Endangered species and aquatic herbicide registrations.

IN: UF-IFAS EXTENSION, AQUATIC WEED CONTROL SHORT COURSE 2005., MAY 16-20, FORT LAUDERDALE, FL, PP. 29-35. 2005.

**SUMMERS,A.**

Secrets of the sacred lotus.

NATURAL HISTORY 115(3):40-41. 2006.

**SZAMREJ,I.K., CZERPAK,R.**

The effect of sex steroids and corticosteroids on the content of soluble proteins, nucleic acids and reducing sugars in *Wolffia arrhiza* (L.) Wimm. (Lemnaceae).

POLISH J. ENVIR. STUDIES 13(5):565-571. 2004.

**TANNER,C.C., NGUYEN,M.L.,**

**SUKIAS,J.P.S.**

Nutrient removal by a constructed wetland treating subsurface drainage from grazed dairy pasture.

AGRIC., ECOSYSTEMS ENVIR. 105:145-162. 2005.

**TAYLOR,C.M., DAVIS,H.G.,**

**CIVILLE,J.C., GREVSTAD,F.S., ET AL**

Consequences of an allee effect in the invasion of a Pacific estuary by *Spartina alterniflora*.

ECOLOGY 85(12):3254-3266. 2004.

**TEMPEL,D.J., CILIMBURG,A.B., WRIGHT,V.**

The status and management of exotic and invasive species in National Wildlife Refuge wilderness areas.

NATURAL AREAS J. 24(4):300-306. 2004.

**THOMAZ,S.M., SOUZA,D.C., BINI,L.M.**

Species richness and beta diversity of aquatic macrophytes in a large subtropical reservoir (Itaipu Reservoir, Brazil): the influence of limnology and morphometry.

HYDROBIOLOGIA 505:119-128. 2003.

**THORMANN,M.N., BAYLEY,S.E., CURRAH,R.S.**

Microcosm tests of the effects of temperature and microbial species number on the decomposition of *Carex aquatilis* and *Sphagnum fuscum* litter from southern boreal peatlands.

CAN. J. MICROBIOLOGY 50(10):793-802. 2004.

**VELIKOVA,V., PINELLI,P., LORETO,F.**

Consequences of inhibition of isoprene synthesis in *Phragmites australis* leaves exposed to elevated temperatures.

AGRIC. ECOSYS. ENVIR. 106(2-3):209-217. 2005.

**VIONNET,C.A., TASSI,P.A., MARTIN VIDE,J.P.**

Estimates of flow resistance and eddy viscosity coefficients for 2D modelling on vegetated floodplains.

HYDROL. PROCESS. 18(15):2907-2926. 2004.

**VOGEL,S.**

Contributions to the functional anatomy and biology of *Nelumbo nucifera* (Nelumbonaceae) I. Pathways of air circulation.

PLANT SYST. EVOL. 249(1-2):9-25. 2004.

**WEIS,J.S., SKURNICK,J., WEIS,P.**

Studies of a contaminated brackish marsh in the Hackensack meadowlands of north-eastern New Jersey: benthic communities and metal contamination.

MAR. POLL. BULL. 49(11-12):1025-1035. 2004.

**WHITTALL,J.B., HELLQUIST,C.B., SCHNEIDER,E.L., HODGES,S.A.**

Cryptic species in an endangered pondweed community (*Potamogeton*, Potamogetonaceae) revealed by AFLP markers.

AM. J. BOTANY 91(12):2022-2029. 2004.

**WORMAN,A., KRONNAS,V.**

Effect of pond shape and vegetation heterogeneity on flow and treatment performance of constructed wetlands.

J. HYDROLOGY 301(1-4):123-138. 2005.

**WADA,T.**

Strategies for controlling the apple snail *Pomacea canaliculata* (Lamarck) (Gastropoda: Ampullariidae) in Japanese direct-sown paddy fields.

JAPAN AGRIC. RESEARCH QUARTERLY (JARQ) 38(2):75-80. 2004.

**XIAN,Q., CHEN,H., ZOU,H., YIN,D., ET AL**

Allelopathic effects of four submerged macrophytes on *Microcystis aeruginosa*.

J. LAKE SCI. 17(1):75-80 (IN CHINESE; ENGLISH SUMMARY).2005.

**YAMAMURO,M., CHIRAPART,A.**

Quality of the seagrass *Halophila ovalis* on a Thai intertidal flat as food for the dugong.

J. OCEANOGRAPHY 61(1):183-186. 2005.

**YE,W.H., LI,J., CAO,H.L., GE,X.J.**

Genetic uniformity of *Alternanthera philoxeroides* in south China.

WEED RES. 43(4):297-302. 2003.

**ZEDLER,P.H., BLACK,C.**

Exotic plant invasions in an endemic-rich habitat: the spread of an introduced Australian grass, *Agrostis avenacea* J.f. Gmel., in California vernal pools.

AUSTRAL ECOLOGY 29(5):537-546. 2004.

**ZIMMO,O.R., VAN DER STEEN,N.P., GIJZEN,H.J.**

Comparison of ammonia volatilisation rates in algae and duckweed-based waste stabilisation ponds treating domestic wastewater.

WATER RES. 37(19):4587-4594. 2003.

**ZOMLEFER,W.B., GIANNASI,D.E., JUDD, W.S., KRUSE,L.M., ET AL**

A floristic survey of Fort Matanzas National Monument, St. Johns County, Florida.

SIDA 21(2):1081-1106. 2004.

**ZOMLEFER,W.B., GIANNASI,D.E.**

Floristic survey of Castillo de San Marcos National Monument, St. Augustine, Florida.

CASTANEA 70(3):222-236. 2005.

**APIRS** welcomes contributions of publications for the citation database, either as reprints or as PDF files.

Continued from page 7

The delta has been divided into Upper, Middle and Lower areas in accordance with the topographical, geomorphological, soil, and climatic gradients.

The plant communities inventoried thus far in the Orinoco Delta number more than 200, and may be separated into pastures, forests and thickets. The pastures are divided into:

i) Pastures located in coastal regions, with sandy, salty soil, in which species such as *Ipomoea pes-caprae*, *Vigna adenandra*, and *Eleocharis* spp. dominate.

ii) Pastures on mineral substrates, which are dominated by grasses, especially wide-leaved species. These are generally on alluvial soils and on the mineral soils of the dikes, in the middle and upper Delta. The dominant species are *Leersia hexandra*, *Hymenachne amplexicaulis*, *Sacciolepis striata*, *Sagittaria guyanensis*, and *Nymphoides indica*.

iii) Pastures on organic substrates, growing on swampy plains or peat of the lower Delta, dominated by Cyperaceae and ferns, such as *Lagenocarpus guianensis* and *Blechnum serrulatum*.

As part of the herbaceous vegetation one must include the communities of floating plants that form in lotic environments along the larger river channels. These are dominated by *Eichhornia crassipes*, *E. azurea*, *Paspalum repens* and *Echinochloa polystachya*. One may also find communities of aquatic plants in lakes and in lentic river environments, in which macrophytes like *Cabomba aquatica*, *Tonina fluviatilis*, and *Utricularia foliosa* grown among others. Almost 180 species of aquatic macrophytes have been reported in the Delta.

The forests are the most diverse communities of the Delta since they are located in various geomorphologic environments and soils. Each community consists of few species, due to the acidity and lack of oxygen of the soil. They are divided into:

i) Forests on the dikes along the main river channels in their sections of the Upper Delta, on mineral soils subject to occasional seasonal floods. The dominant species are *Spondias mombin* and *Inga edulis*. In the Middle and Lower Delta the soils are less sandy and the floods more prolonged. In these areas *Virola surinamensis* and *Macarobium acaciifolium* dominate.

ii) Swamp forests on slime-clayey plains heavily influenced by floodwaters from the rains and the river. Among the dominant species are *Macarobium acaciifolium* and *Mouriri guianensis*.

iii) Swamp forests on plains of peat in the Lower Delta. The dominant species are *Simaba orinocensis*, *Pterocarpus officinalis*, *Symphonia globulifera* and *Tabebuia insignis*.

iv) Also common in the Middle Delta are communities dominated by the Arecacea *Mauritia flexuosa*, locally called "moriche." They can reach high densities, forming true palm forests of great extension called "morichales."

Included among the forest communities are mangrove swamps, dominated by different species of the genus *Rhizophora*: *mangle*, *harrisonii* and *racemosa*, in addition to associations with the genera *Laguncularia* and *Avicennia*. These swamps are located along the coasts and along the edges of the river channels where tidal influence is strong.

Equally numerous are the thicket communities composed of low ligneous elements with ramified stems ascending no more than 4-5 m, lianas and some grasses. These are divided into:

i) Thickets growing on mineral soils with *Symmeria paniculada* and *Macarobium acaciifolium* or *Annona glabra*.

ii) Thickets growing on organic substrates of the Lower and Middle Delta with *Chrysobalanus icaco*; or with *Machaeriu lunatum* in clayey-silty substrates along the water courses.

iii) Thickets growing on the permanently saturated organic soils of the Lower Delta, with *Crudia glaberrima*.

iv) Thickets of halophytic species (mangroves).

There are some 600 species of birds in the Orinoco Delta, representing 43% of the species reported in the country. It is an area of great importance in regard to the biogeography of the species, since we find species from other parts of the country, as well as endemic species and subspecies.

Among the latter are: Black-dotted piculet (*Picumnus nigropunctatus*), Goleen-Olive woodpecker (*Piculus rubiginosus deltanus*), Chestnut woodpecker (*Ceuleus elegans deltanus*), Waved woodpecker (*Ceuleus undatus amacurensis*), Wedge-billed woodcreeper (*Glyphorhynchus spirurus amacurensis*), Plain-brown woodcreeper (*Dendrocincla fuliginosa deltana*), Straight-billed woodcreeper (*Xiphorhynchus picus deltanus*), and Spotted tody-flycatcher (*Todirostrum maculatum amacurensis*). Recent studies have identified the coastal area as an important zone of rest and feeding in the migratory route of sandpipers (Scolopacidae) and other migratory birds. Tourists from all over the world visit the region for its rich birdlife. This represents an important contribution to the local economy, giving employment to the native Waraos.

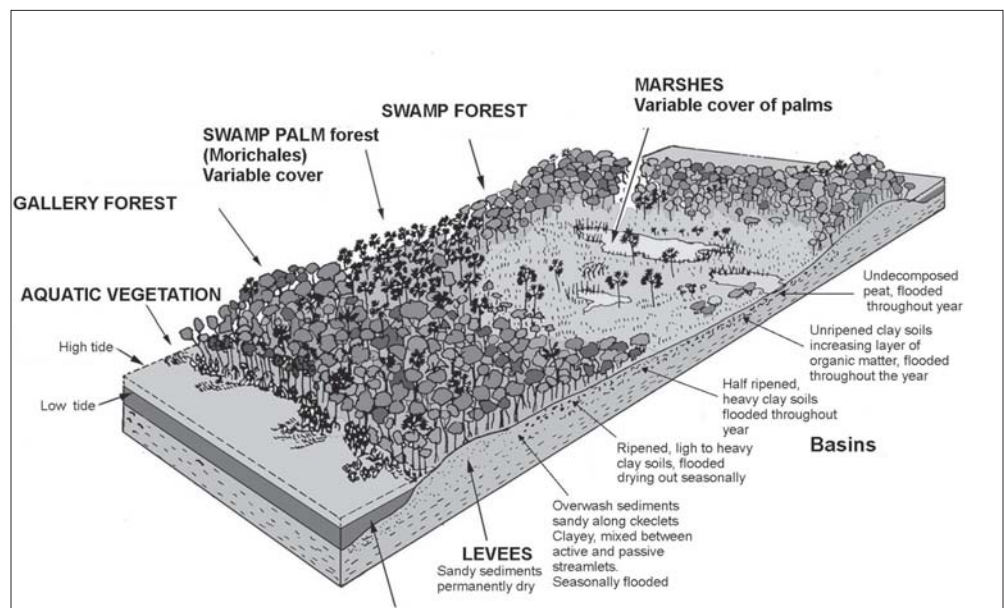


Figure 1. Schematic profile of a portion of the Delta, showing significant aspects of the geomorphology and vegetation.



Satellite image of part of the Upper Delta during flooding.

and-yellow Parrot (*Ara ararauna*), Yellow-crowned Parrot (*Amazona ochrocephala*), Black-headed Macaw (*Pionites melanocephala*), Seed-Finches (*Oryzoborus*) and Seed-eaters (*Sporophila*). Likewise several species of mammals that constitute basic resources for the diet and the socioeconomic stability of the Creoles and native population are threatened by a human population explosion in some areas. For example, paca (*Cuniculus paca*), acouchy (*Myoprocta*), capybara, manatees, and tapir are hunted for food, the several species of cats, such as jaguar (*Pantera onca*), ocelot (*Leopardus pardalis*), jaguarondi (*Puma jagouarondi*) and puma for the illegal sale of their skins, and capuchin monkeys for pets.

Recently the Programa de las Naciones Unidas para el Desarrollo (PNUD) and the Ministry of the Environment have completed the first part of a series of multidisciplinary studies. These studies will enable the creation of conservation and management strategies for the Special Areas so that the ecological integrity of the Orinoco Delta can be preserved.

From the biogeographic point of view, the great majority of mammals in the Orinoco Delta have been grouped inside the Bioregion of the Deltaic System, more particularly belonging to the Provincia Guyanese Deltana. A recent study confirmed the presence of 129 mammal species in the region, equivalent to 39% of the mammals in the country. This number is very significant considering the unusual flooding conditions in the Delta. The most diverse orders of mammals are bats (52%), rodents (16%), marsupials and carnivores (9% each). The Orinoco agouti (*Dasyprocta guamara*) is the only mammal endemic to the Delta, and is found only in the forests which are susceptible to flooding.

The majority of the mammal species live in wooded habitats, while a few live in open habitat. The totally or partly flooded swamp forest is the most diverse habitat (111 species), followed by the forest on the dikes (84 species) which contains burrowing species (armadillos) as well as species that live among the leafage (mouse opossums, small mice) and the mangrove swamp (43 species).

The deltaic plains, courses of free water, marshes, estuaries, pastures and mangrove swamps are among the most valuable ecosystems in terms of the environmental resources they provide. Nevertheless these environments are subject to serious damage in both their structure and operation from several causes, including the absence or lack of implementation of a management plan both in the protected areas and in the territory as a whole; high unemployment; the construction of dams in the main affluents of the Orinoco; extraction of mangroves, ranching, and timber-cutting; and burns to prepare land for agriculture. The areas most affected are those of easiest access, mostly in the Upper Delta, but also in the Lower Delta. The traffic in birds (on the part of the Creoles, Warao, and Guyanese) toward Guyana and Trinity is diminishing the populations of many species, particularly the Blue-



A floating meadow along a small channel in the Middle Delta. The main species are *Eichhornia crassipes* and *Paspalum repens*.

## APMS Journals Available

The Aquatic Plant Management Society (APMS) will send extra copies of older issues of the *Journal of Aquatic Plant Management* to anyone for the cost of shipping (within and outside of the US). Available copies include Vol. 1 (1962) through Vol. 41 (2003), with the exception of six issues no longer available: Volumes 3 (1964); 4 (1965); 5 (1966); 26 (July 1988); and 27 (both Jan and July 1989). Contact Linda Nelson, APMS Secretary, at [linda.s.nelson@erdc.usace.army.mil](mailto:linda.s.nelson@erdc.usace.army.mil) or 601-634-2656.

All issues up to and including 2003, including the out-of-print issues, are searchable online by keyword and/or author, with articles available for downloading as PDF files at [www.apms.org](http://www.apms.org). Current and future issues are available with a membership to the APMS. The peer-reviewed journal is issued twice yearly and has been published since 1962.

University of Florida  
Institute of Food and Agricultural Sciences  
Center for Aquatic and Invasive Plants  
Aquatic, Wetland and Invasive Plant  
Information Retrieval System (APIRS)  
7922 N.W. 71st Street  
Gainesville, Florida 32653-3071 USA  
(352) 392-1799 FAX: (352) 392-3462  
CAIP@ufl.edu  
<http://plants.ifas.ufl.edu>

ADDRESS SERVICE REQUESTED

NONPROFIT ORG.  
U.S. POSTAGE PAID  
GAINESVILLE FL  
PERMIT NO. 94

## AQUAPHYTE

**AQUAPHYTE** is the newsletter of the Center for Aquatic and Invasive Plants and the Aquatic, Wetland and Invasive Plant Information Retrieval System (APIRS) of the University of Florida / Institute of Food and Agricultural Sciences (IFAS). Support for **AQUAPHYTE** and the information system is provided by the Florida Department of Environmental Protection, Bureau of Invasive Plant Management, the St. Johns River Water Management District, and UF/IFAS.

**EDITOR: Karen Brown**

**AQUAPHYTE** is sent to managers, researchers and agencies in 71 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.

**UF** UNIVERSITY of  
**FLORIDA**  
IFAS Extension  
Center for Aquatic  
and Invasive Plants



*Victor Ramey and Kathy Burks discuss aquatic plant identification at last year's UF / IFAS Aquatic Weed Control Short Course.*

The fields of aquatic and invasive plant management and education suffered two major losses this past year when Vic Ramey (UF/IFAS) and Kathy Burks (Florida Natural Areas Inventory (FNAI)) passed away. Both were well known among Florida's aquatic and invasive plant management community, and will be sorely missed.

Kathy made many contributions to botany and conservation in Florida. She worked for the FL DEP Bureau of Aquatic Plant Management for ten years, and was one of the state's foremost experts on invasive plants. Kathy gave dozens of presentations, conducted workshops, provided expert plant identification services, and contributed to numerous papers, reports and books about aquatic and invasive plants. At FNAI, Kathy served as the invasive plant biologist responsible for mapping the distribution and abundance of invasive exotic plants in Florida. She worked with agencies and numerous private organizations to preserve and protect Florida's critical natural areas. We will miss Kathy's expertise and her dedication, but mostly we will miss her congenial friendship and enthusiasm for all things botanical.