

AQUAPHYTE

A NEWSLETTER ABOUT AQUATIC, WETLAND AND INVASIVE PLANTS

Center for Aquatic and Invasive Plants

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Macrophyte Communities Within the Channelized Kissimmee River: Expectations for Restoration

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The Kissimmee River, located in Central Florida, flows from Lake Kissimmee to Lake Okeechobee. Historically, the Kissimmee meandered 166 km, exhibiting continuous in-channel flow and frequent over-bank flow. The 1.5 to 3 km wide floodplain surrounding the river was typically inundated for prolonged periods throughout the year (Toth, 1993). Between 1962 and 1971, the US Army Corps of Engineers constructed a regional flood control project, for which a straight canal (C-38) was dredged through the river and floodplain. Dredging of C-38 cut off sections of the old river channel and confined flow within a 90-km long, 100-m wide, and 9-m deep waterway. This canal was divided by water control structures into 5 impoundments with stabilized water levels (Goodrick et al, 1974). Although channelization and the hydrologic manipulations provided flood protection for the region, the ecological integrity of the river/floodplain ecosystem was degraded, altering vegetative communities and associated fauna.

Prior to channelization, continuous flows confined aquatic vegetation to littoral edges of the river channel. Although there is little information available on specific vegetation characteristics of the river prior to 1962, some features can be derived from aerial photographs and historical flow regimes. The morphology of the river dictated variations in flow along and across the channel. Highest flow velocities occurred along outside bends of channel meanders, leading to a deeper channel in these areas. Plant species growing along the outer bends were well adapted to deep water with high flows and included *Nuphar lutea* (spatterdock), *Sagittaria triata* (American cupscale), and *Polygonum densiflorum* (smartweed). Conversely, inner margins of channel meanders had lower velocities, these depositional zones exhibited prominent sand bar formations. Species colonizing inside bends had to tolerate varying water levels, and included *Sagittaria lancifolia* (arrowhead) and

Pontederia cordata (pickerelweed). Other common species distributed throughout the river channel included *Scirpus cubensis* (Cuban bulrush), *Panicum hemitomon* (maidencane), and *Hydrocotyle umbellata* (pennywort). During periods of low flow, floating species, such as *Pistia stratiotes* (water lettuce) and *Eichhornia crassipes* (water hyacinth) likely accumulated along the edge of littoral beds (Toth et al, 1995). Additionally, floating mats of vegetation would often accumulate in cut-off oxbows and backwater areas that received little or no flow. Species common to these mats included *Scirpus cubensis*, *Lemna* spp. (duckweed), *Eichhornia crassipes*, *Pistia stratiotes*, and *Luziola fluitans* (watergrass) (Pierce et al, 1982).



The Historic Kissimmee River

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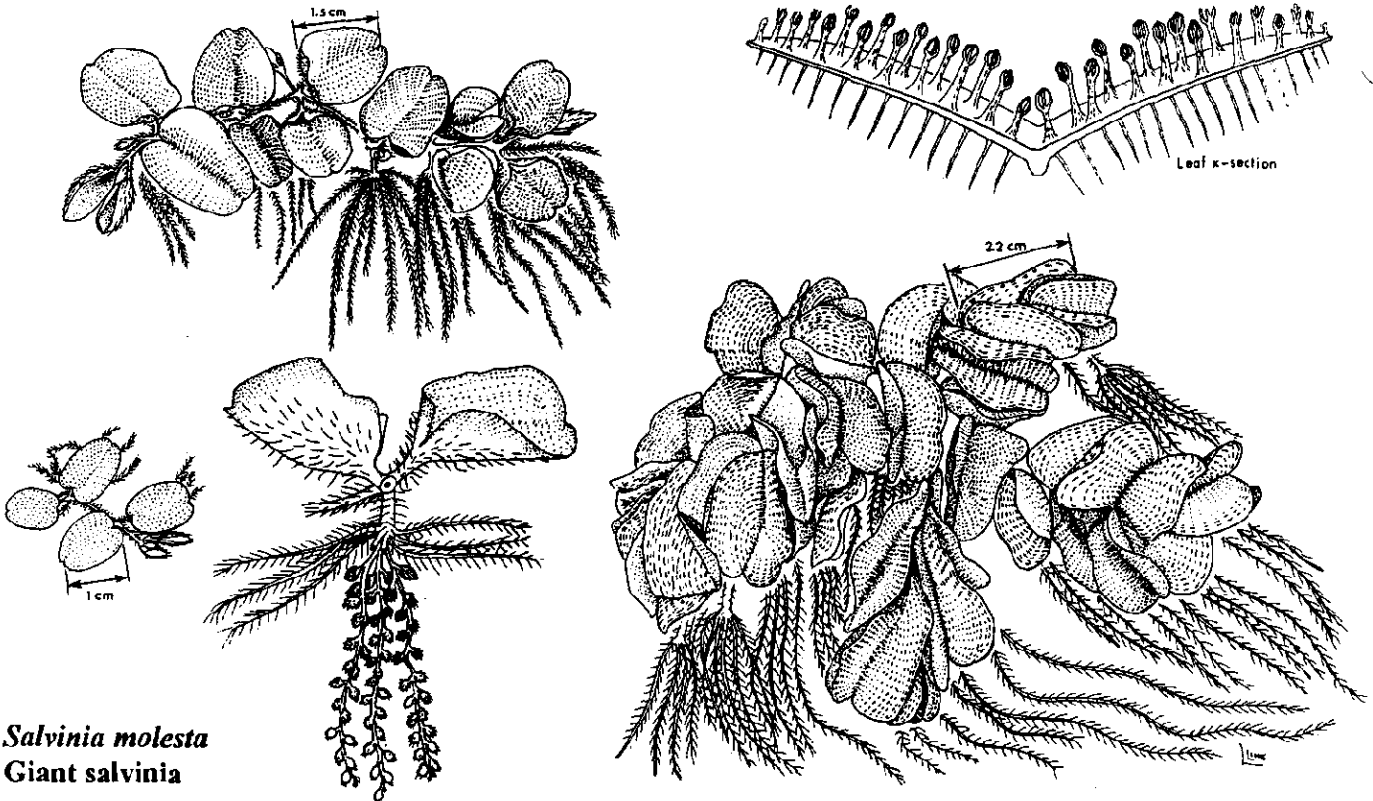
Dr. Randall K. Stocker, Director
Center for Aquatic and Invasive Plants

Center Director Named to Federal Invasives Committee

The Invasive Species Advisory Committee (ISAC) advises the Federal Invasive Species Council as it pursues the implementation of a National Invasive Species Management Plan, as ordered by the President in Executive Order 13112. The Secretary of the US Department of the Interior, Bruce Babbitt, appointed thirty-two people from government, academia, environmental groups and private companies to serve on ISAC. Among them is Randall K. Stocker, Ph.D., Director of the Center for Aquatic and Invasive Plants of the University of Florida.

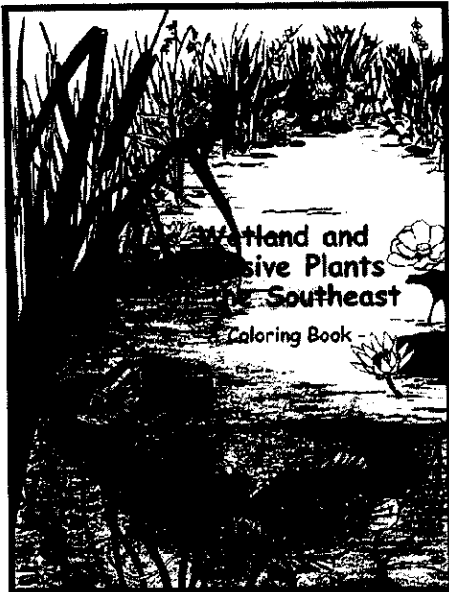
More information about ISAC and its membership, the President's Executive Order, the National Management Plan and minutes of ISAC meetings may be read on the Center's web site:
<http://plants.ifas.ufl.edu/committee.html>

NEW! Line Drawing Available



Salvinia molesta
Giant salvinia

This line drawing was just completed by Laura Line, Center for Aquatic and Invasive Plants, University of Florida. Please feel free to use this line drawing for warnings, ID manuals, brochures, reports, proposals, web sites ...



NEW! - A COLORING BOOK - Wetland and Invasive Plants of the Southeast

Finally! Here is the coloring book we've gotten so many requests for: *Wetland and Invasive Plants of the Southeast - A Coloring Book* - This "coloring book" can be colored (use of color pencils is especially pleasing), but it is also a fine collection of line drawings including your favorite native wetland plants, beautiful and useful as they are, and non-native invasive plants, the ones we love to hate.

The Coloring Book will appeal to science, nature and botany students, young and old, middle school to college; nature lovers and outdoorspeople; waterfront homeowners, and may be especially appreciated by management and regulatory agency personnel, from field workers to desk jockies.

This coloring book of drawings by A. Murray and Laura Line was compiled by Vic Ramey. It includes 84 plant drawings: 59 native wetland plants and 25 non-native wetland and terrestrial plants. It

costs \$4.95, plus S/H. To order, contact IFAS Publications, PO Box 110011, Gainesville, FL 32611-0011; 800-226-1764 and ask for **Publication Number SP-276**.

NEW! FREE COLOR CATALOG of APIRS Products

Here is the brand new, 24-page catalog of the products produced by the Information Office of the Center for Aquatic and Invasive Plants, in color, free of charge. The catalog includes:

- information about the APIRS database, what it is, how to use it, who to call;
- full descriptions of the ID decks, the videotape programs, the drawings, the poster, the slides, including plant names, both common and scientific;
- order forms; phone numbers

To request a free catalog, contact APIRS using information on the back page of this newsletter.

CENTER FOR AQUATIC AND INVASIVE PLANTS

CATALOG OF APIRS EXTENSION PRODUCTS AND SERVICES

A multi-disciplinary unit, the Center conducts research, teaches students and provides extension and other educational materials and services to government, industry, and the general public.

• Clients include environmental management agencies, private companies, science teachers and students, advocacy organizations and homeowners associations.

• The Center maintains the Information Office and the Aquatic Wetland and Invasive Plant Information Retrieval System (AWIRS), an international database of more than 50,000 research articles and reports about plants.

• In addition, the Center maintains a web site, and produces free and for-sale educational cards about aquatic wetland and invasive plants and their management.

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Channelization of the Kissimmee River

After channelization, aquatic vegetation communities changed significantly due to stagnant water conditions within remnant river channels. One of the most striking effects was increased coverage of the exotic species *Pistia stratiotes* and *Eichhornia crassipes*. Although these species were present prior to channelization, continuous flows likely restricted their growth, particularly during moderate to high flow regimes. After flow to remnant channels was eliminated, these species proliferated and now often cover the entire width of remnant river channels. *Eichhornia crassipes* and *Pistia stratiotes* are treated with herbicides several times a year to maintain navigation through these channels.

Lack of flow to remnant river channels has allowed the distribution and coverage of *Scirpus cubensis* to increase, and it is now one of the most abundant species within remnant channels. *Scirpus cubensis* forms mats that may host a variety of other forbs and small shrubs, including aquatic species as well as species typical of drier conditions. Secondary colonization by *Ludwigia* spp. (primrose willow), *Eupatorium capillifolium* (dog-fennel), *Pontederia cordata*, *Sagittaria lancifolia*, *Typha domingensis* (cat-tail), and many other species is common on the floating mats.

In addition to *Scirpus cubensis*, other common aquatic species include *Salvinia minima* (water spangles), *Lemna* spp., *Hydrocotyle umbellata*, *Polygonum densiflorum*, and *Nuphar lutea*. Of these, the floating and mat-forming species are the most abundant within remnant channels. Because there is no flow, species distribution is independent of channel morphology, often covering the entire width of the river channel. This is particularly common during summer months, at the peak of the growing season. The overabundance of aquatic vegetation in remnant river channels, particularly *Scirpus cubensis*, not only prevents light from reaching the water column below, but also contributes large deposits of organic matter to the

remnant channels. In some areas, the organic layer may reach one meter thick, covering the sandy substrate and increasing the biological oxygen demand in the surrounding waters (Koebel, 1995).

Over the past two decades, demonstration projects have been conducted to determine the feasibility of restoring the Kissimmee River to pre-channelization conditions. These projects provide some insight into expected responses of the vegetation community to restoration. During 1984 and 1985, three weirs were placed across the C-38 canal to force water through adjacent remnant channels. The reestablishment of flow in the river channel decreased the width of vegetation mats in mid-channel areas; however, when flow subsided *Eichhornia crassipes* and *Pistia stratiotes* often rapidly expanded (Miller, 1990).

In 1994, a 300-m section of C-38 was backfilled, diverting the majority of flow through the channel adjacent to one of the demonstration project weirs. Based on aerial photographs of this channel six months after flow was restored, several changes in the macrophyte community were documented. Mats of *Scirpus cubensis* were flushed out by high flows and replaced by narrower littoral beds composed primarily of *Nuphar lutea* and *Polygonum densiflorum*. While the overall width of macrophyte beds decreased, this effect was more prominent on outer bends, which had narrower littoral zones compared to the inner bends of channel meanders. Inner bends had a higher occurrence of *Pontederia cordata* and *Sagittaria lancifolia*, while outer bends supported more *Panicum hemitomon*. Although these projects likely do not show the full effects of restoration on the macrophyte community within river channels, they indicate the potential for restoring these communities to historic conditions.

Restoration of the Kissimmee River began in June 1999. During the 11-year construction period the C-38 canal will be backfilled to reconnect remnant river channels and restore continuous flow. Overall, 35 km of C-38 will be backfilled, restoring 70 km of continuous river channel. Two water control structures will be removed and water levels will be managed to reestablish historic hydrologic conditions.

Several expectations for changes due to restoration can be formulated based on the effects of the weirs and backfill projects, along with knowledge of the historic Kissimmee River. Once flow is reestablished, vegetation coverage is expected to decrease and be limited to the littoral fringes of the river channel. Along inside bends of channel meanders, vegetation beds likely will remain within 5 meters of the bank; along outside bends of channel meanders, where flows will be higher, vegetation beds will remain within 3 meters of the bank.

In addition to changes in macrophyte bed width, dominant plant species also are expected to change. Floating and mat-forming species that currently dominate will be replaced by emergent species, particularly those that are adapted to flowing conditions and varying water levels. These beds will likely include *Nuphar lutea*, *Polygonum densiflorum*, *Sacciolepis striata*, and *Panicum hemitomon*. The distribution of these species will depend on channel morphology. Emergent species tolerant of varying hydroperiods will dominate along inner bends, where sand bar formation is likely, while deep-water emergent species will be more common along outer margins of channel meanders.

Changes in the macrophyte communities of the Kissimmee River are expected to occur within one to three years following backfilling of the C-38 canal (Dahm et al, 1995). Currently, flow has been reestablished in two channels that were stagnant for nearly 30 years. As construction continues, the remnant channels will be reconnected into a single continuous river channel. Although it is not possible to restore the entire length of the Kissimmee River, this restoration effort will reconnect 70 km of river channel and reestablish over 14,000 ha of floodplain wetlands. The benefits of this project extend beyond the vegetation communities by providing habitat for birds, fish, and other wildlife.

SUMMARY OF MACROPHYTE COMMUNITY CHANGES WITHIN THE KISSIMMEE RIVER

Historic Conditions

1. Vegetation within river channels was confined to narrow littoral zones.
2. Littoral zones were composed of emerged, submersed, and floating species. Dominant plants included *Nuphar lutea*, *Polygonum densiflorum*, *Sacciolepis striata*, and *Panicum hemitomon*.
3. The deepest areas occurred along outer bends where flows were highest; these areas hosted species better suited to such conditions (e.g. *Nuphar lutea* and *Polygonum densiflorum*). Inner bends were shallower with characteristic sandbars.

Current Conditions

1. Vegetation extends well into mid-channel areas and often covers the entire channel width. There is no variation in vegetation width due to channel morphology.
2. Floating and sprawling species dominate. Although 55 species have been identified in the channels, only 7 of these account for over half of the total coverage. The most abundant species are *Scirpus cubensis*, *Salvinia minima*, *Lemna* spp., *Pistia stratiotes*, and *Hydrocotyle umbellata*.
3. Distribution of vegetation within the channels is independent of channel morphology.

After Backfilling & Restoration of Hydrology:

Initial High Flows/Short-term Expectations

1. High flows will flush thick mats of *Scirpus cubensis* out of the channel, clearing mid-channel areas.
2. Floating species, such as *Pistia stratiotes*, also will be removed.

Continuous Flows Over Time/Long-term Expectations

1. Vegetation will be confined to a narrow littoral zone. Along inner bends of channel meanders, vegetation will be within 5 meters of the bank. Along outer bends of channel meanders, vegetation will be within 3 meters of the bank. Vegetation along straight runs will be within 3 to 5 meters of the bank.
2. Emerged species, such as *Nuphar lutea*, *Polygonum*

densiflorum, and *Sacciolepis striata* will become dominant. Floating and sprawling species will remain, but will diminish and be confined to backwater areas.

3. The composition of macrophyte beds will vary depending on morphology of the channel. Outer bends will support deep-water emerged species, such as *Nuphar lutea*, *Polygonum densiflorum*, and *Sacciolepis striata*. Inner bends will have marsh vegetation, such as *Pontederia cordata* and *Sagittaria lancifolia*.

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New Journal:

BIOLOGICAL INVASIONS

Kluwer Academic Publishers has begun publication of a new quarterly journal, *Biological Invasions*, with the first volume for 1999 just released. According to editor-in-chief James T. Carlton, "Our hope is to seek the threads that bind for an evolutionary and ecological understanding of invasions across terrestrial, fresh water, and salt water environments. Specifically, we offer a portal for research on the patterns and processes of invasions across the broadest menu: the ecological consequences of invasions as they are deduced by experimentation, the factors that influence transport, inoculation, establishment, and persistence of non-native species, the mechanisms that control the abundance and distribution of invasives, and the genetic consequences of invasions." Other topics welcomed include invasion biodiversity and biogeography, the theoretical basis of the release and use of biocontrol species and genetically modified organisms, and management and policy issues.

Subscription prices: Institutions NLG 505.00/USD 252.50; Individuals NLG 200.00/USD 100.00 (postage included).

For more information, contact Kluwer Academic Publishers, PO Box 17, 3300 AA Dordrecht, The Netherlands, or PO Box 358, Accord Station, Hingham, MA 02018-0358. E-mail: kluwer@wkap.com WWW: <http://www.wkap.nl>

Books/Reports

GUIDE TO THE VASCULAR PLANTS OF FLORIDA, by R.P. Wunderlin. 1998. 808 pp.

(Order from University of Florida Press, 15 NW 15 ST, Gainesville, FL 32611; 800-226-3822. \$35.00 plus T/S/H.)

This book, written by one of Florida's eminent botanists and published under the sponsorship of the Florida Native Plant Society, has quickly become THE means to key out more than 4,000 taxa of native and non-native ferns, fern allies and seed plants in Florida. No pictures and no drawings; it does give synonymy, common names, habitats, frequency, distribution in the state and time of flowering. This book is seriously required by serious plant people in the Sunshine State. It complements Wunderlin's *Atlas of Florida Vascular Plants*.

LIFE OUT OF BOUNDS -- Bioinvasion in a Borderless World, by C. Bright. 1998. 288 pp.

(Order from W.W. Norton & Company, 500 Fifth Avenue, New York, NY 10110. The WorldWatch Environmental Alert Series. WWW: <http://www.wwnorton.com>)

Another in the recent flood of books which seek to call attention to invasions by non-native species, this one also is about "how human activity is stirring up the Earth's organisms--whether viruses, weeds, or whatever--and about why the consequent levels of biotic mixing tend to injure our societies and the natural world... Bioinvasion is now a profound and global challenge to our economic system, to our technical conservation skills, and to our ethics--our ability to recognize a right to existence in other living things."

Virtually every paragraph in the book recounts another story of an invader wreaking havoc. The book also presents the latest in clever eco-terminology: "ecological narcotics" (pesticides), "super organism" (pests acting together), "functional extinctions" (species eliminated by other invading species), "chronic emergency" (Lake Victoria), "green cancer" (a European vine in New Zealand), and "revenge invasions" (managed anti-invasions), etc.

GUIDE TO IDENTIFICATION OF HARMFUL AND POTENTIALLY HARMFUL FISHES, SHELLFISHES AND AQUATIC PLANTS PROHIBITED IN TEXAS, by R.G. Howells. 1999. 370 pp.

(Order from Robert Howells, Texas Parks & Wildlife, Heart of the Hills Research Station, HC 07, Box 62, Ingram, TX 78025; 830-866-3356. Author's E-mail: rhowells@kfc.com)

This is an exceptional compilation of information about and drawings of dozens of non-native species in Texas, from lampreys, freshwater stingrays and tilapia, to snails, clams and crayfishes, to salvinia, hydrilla and lagarosiphon. Each species treatment includes synonymy, range, description, biology, commercial importance, reasons for restrictions, similar species, technical notes and references. This loose-leaf, low-budget book (what do you want for free?!) also includes the laws and regulations that Texas uses to quell the invasion of these non-native species.

ECOLOGY OF THE PLANTED AQUARIUM -- A Practical Manual and Scientific Treatise for the Home Aquarist, by D. Walstad. 1999. 194 pp.

(Order from BookMasters, Inc., 800-247-6553, or check the Atlas Books website: <http://www.bookmasters.com/marktplc/00388.htm> \$29.95 plus S/H.)

This is the "how to and why" of creating a low-tech planted aquarium ("low-tech" because, as Professor Wetzel says, aquarium "gadgets are mostly quite useless"). Based on science but engagingly written, the hard-cover book includes chapters on how plants act as water purifiers; allelopathy in aquatic plants; bacteria and plants; plant nutrition and ecology; substrate requirements and selection; emerged plants in the aquarium; algae control and practical maintenance Q&A. The best part is that, in the "practical setup" section, the author tells exactly what to do, in simple terms, in lists of instructions that one can read and understand. Hooray!

WETLANDS FOR THE FUTURE--Contributions from INTECOL'S V International Wetlands Conference, edited by A.J. McComb and J.A. Davis. 1998. 777 pp.

(Order from Gleneagles Publishing Company, POB 41, Glen Osmond, South Australia 5064, Australia; E-mail: bwilliam@camtech.net.au US\$60.00 plus S/H)

This is the proceedings of the 1996 INTECOL conference in Western Australia. The 56 papers are in several sections: The Future of Wetlands, General Features; Wetlands in Areas of Low Rainfall; Shallow Estuaries in Coastal Marshes; Wetland Function and Processes; Nutrient Dynamics; Biomonitoring; Remote Sensing; Ecological Theory and Wetland Vegetation; and Wetland Creation in Modified Landscapes.

NUTRIENT CYCLING AND RETENTION IN NATURAL AND CONSTRUCTED WETLANDS, edited by J. Vymazal. 1999. 198 pp.

(Order from Backhuys Publishers, Postbus 321, 2300 AH Leiden, The Netherlands; E-mail: backhuys@euronet.nl US\$61.00 plus S/H)

This is a collection of 16 papers presented at the 1997 workshop in Trebon, the Czech Republic. The papers are about nutrient cycling in natural and constructed wetlands, carbon transformation, retention and capacity, loading rates, etc.

ALIEN SPECIES IN NORTH AMERICA AND HAWAII -- Impacts on Natural Ecosystems, by G.W. Cox. 1999. 387 pp.

(Order from Island Press, POB 7, Covelo, CA 95428; 800-828-1302. Pspcr: \$30.00)

This book by a professor of ecology discusses "biotic pollution" and "provides a comprehensive overview of the invasive species phenomenon, examining the threats posed and the damage that has already been done." Chapters examine how exotic species are dispersed, patterns of invasion, the theory of invasive capability and policy issues. No pictures. No graphs.

MEDITERRANEAN WETLANDS AT THE DAWN OF THE 21ST CENTURY,

edited by Th. Papayanis and T. Salathe.
1999. 136 pp.

(Order from MedWet, Tour du Valat, Arles, France. E-mail: secretariat@tour-du-valat.com)

The Mediterranean Wetlands Initiative (MedWet), which grew out the Ramsar Convention on Wetlands, is a collaboration of Mediterranean countries and was established after the realization that the basin's wetlands were being seriously degraded and destroyed at a rapid rate. This colorful booklet presents the "Mediterranean Wetlands Strategy" to involve local entities in the "demand for the wise use of wetlands."

VARIOUS WETLANDS PUBLICATIONS BY MEDWET.

(These books have various prices. Contact MedWet for more information: MedWet Project, Tour du Valat, Le Sambuc, 13200 Arles, France; E-mail: secretariat@tour-du-valat.com)

These are some of the lavishly-illustrated and colorful publications of the MedWet publication series, under the Conservation of Mediterranean Wetlands project:

* **CHARACTERISTICS OF MEDITERRANEAN WETLANDS**, by F. Pearce and A.J. Crivelli. An introduction to wetland types, vegetation and animals, economic activities, threats to wetlands, and their hydrological management.

* **FUNCTIONS AND VALUES OF MEDITERRANEAN WETLANDS**, by J. Skinner and S. Zalewski.

A review of the "wealth between land and water", their functioning, wetland economic uses, and the "economics of wetlands".

* **AQUATIC EMERGENT VEGETATION -- ECOLOGY AND MANAGEMENT**, by F. Mesleard and C. Perennou.

Basic information on management, including more complete "technical fact-sheets" on emergent species.

* **VEGETATION OF TEMPORARY MARSHES -- ECOLOGY AND**

MANAGEMENT, by P. Grillas and J. Roche.

A review of temporary marshes, the life of plants, structure and dynamics of vegetation and conservation and management needs.

* **WETLANDS AND WATER RESOURCES**, by F. Pearce.

A review of the water cycle, uses and abuses of water, and choices for conserving water when there is not much to go around.

* **SALINAS AND NATURE CONSERVATION**, by N. Sadoul, J. Walmsley and B. Charpentier.

A review of the history of salt production in the Mediterranean, the "biological richness" of salinas, management of birds and salinas, and salinas conservation.

* **CONSERVATION OF FRESHWATER FISH**, by P.S. Maitland and A.J. Crivelli.

A review of fish taxonomy and habitats, fisheries, threats to fish, and management options as they relate to the Mediterranean area.

* **AQUACULTURE IN LAGOON AND MARINE ENVIRONMENTS**, by E. Rosecchi and B. Charpentier.

A review of the history of aquaculture in the Mediterranean basin, and the economic role aquaculture has in the area.

* **MANAGEMENT OF NEST SITES FOR COLONIAL WATERBIRDS**, by C. Perennou, N. Sadoul, O. Pineau, A. Johnson, and H. Hafner.

A review of the characteristics of a breeding colony, principles for creating a new colony site, and "technical fact-sheets" on artificial breeding structures, attracting birds to an artificial site, and species accounts of 18 water birds.

A GREAT LAKES WETLAND FLORA, by S.W. Chadde.
1998. 569 pp.

(Order from PocketFlora Press, RR1 Box 206A, Calumet, MI 49913; 906-296-0506. \$44.95 plus S/H.)

The author calls this book "a complete, illustrated guide to the aquatic and wetland

plants of the Upper Midwest," and that's what it is. Besides family keys to wetland plants, the book includes a section which describes wetland types, an illustrated glossary and a plant list that shows each plant's "wetland indicator status". This field guide includes descriptions of more than 900 species and covers life form, plant characteristics, preferred habitat, and notes about "special status". Each plant is illustrated with a line drawing. The drawings are generally good, having been adapted from various publications, but small. There are no photos.

KILLER ALGAE--The True Tale of a Biological Invasion, by A. Meinesz. 1999. 360 pp.

(Order from The University of Chicago Press, 5801 S. Ellis Avenue, Chicago, IL 60637; WWW: <http://www.press.uchicago.edu> \$25.50 plus S/H.)

According to the blurb, this is the unrelenting "grim chronology" of how governments, scientists and conservation groups were found to be incapable of recognizing and stopping a biological nightmare. It is the story of how a marine alga *Caulerpa taxifolia* has now become the predator which is decimating the Mediterranean Sea. This plant fills the water from the surface to the lowest limits of vegetation and, since it is highly toxic, no animals check its growth. *Caulerpa* is shading out and smothering all other plant life and crowding out animals. Can anything be done to stop this actual ecological disaster?

SAFEGUARDING AMERICAN PLANT RESOURCES -- A Stakeholder Review of the APHIS-PPQ Safeguarding System, by the National Plant Board.
1999. 184 pp.

(Download PDF file of this publication from: <http://www.aphis.usda.gov/npb/safegard.html>)

A global marketplace, where borders are irrelevant, dramatically increases the risk of invasive plant pest introductions. Is APHIS-PPQ up to the task of safeguarding America from invasive plants? This report lists many specific changes recommended by stakeholders of the system.

Books/Reports-Cont'd.

CATALOGO DE ANGIO-SPERMAS ACUATICAS DE MEXICO, Hidrofitas estrictas emergentes, sumergidas y flotantes, by A. Lot, A. Novelo, M. Olvera, P. Ramirez. 1999. 161 pp. (In Spanish)

(Order from Dr. Alejandro Novelo, Herbario Nacional, Departamento de Botanica, Universidad Nacional Autonoma de Mexico, Ciudad Universitaria, Apartado postal 70-233, Mexico, D.F. 04510; E-mail: lanovelo@servidor.unam.mx US\$25.00, includes shipping.)

This book is about the aquatic plants of Mexico, written by the pre-eminent aquatic botanists of that country. It includes basic information on life form, habitat, altitude and more, as well as dot maps of plant distribution in Mexico. The plants are illustrated by line drawings and in color photographs of their natural habitats.

INVASIVE SPECIES AND BIODIVERSITY MANAGEMENT, edited by O.T. Sandlund, P.J. Schei and A. Viken. 1999. 431 pp.

(Order from Kluwer Academic Publishers, 101 Philip Drive, Norwell, MA 02061. \$255.00 plus tax and S/H.)

This book is a collection of papers presented at "The Norway/United Nations Conference on Alien Species" in 1996. Various sections include papers on human dimensions, ecology of introductions, international pathways, management tools and a couple of country case studies. Together, these papers present a cogent history of the whys, hows and consequences of accidental and purposeful introductions, introductions such as the Nile perch into Lake Victoria, which "resulted in the loss of at least 200 cichlid species" in the lake. Among the more interesting titles are "Lag times in population explosions of invasive species: Causes and implications" by J.A. Crooks and M.E. Soule; and "Alien species and emerging infectious diseases: past lessons and future implications" by R.T. Bryan.

DISTRIBUTION AND HABITAT DESCRIPTIONS OF WISCONSIN LAKE PLANTS, by S.A. Nichols. 1999. 266 pp.

(Order from Wisconsin Geological and Natural History Survey, Map and Publications Office, 3817 Mineral Point Road, Madison, WI 53705-5100; 608-263-7389. \$15.00 plus tax and S/H. WWW: <http://www.uwex.edu/wgnhs>)

This spiral-bound field-book presents line drawings, Wisconsin distribution maps, water chemistry preferences, and other habitat information for more than 100 species of lake plants that range from the rare to the common. "The publication was designed to provide a basis for the in-depth study of lake plants," and should be helpful to ecologists, managers, teachers and students.

ALIEN SPECIES IN NORTH AMERICA AND HAWAII -- Impacts on Natural Ecosystems, by G.W. Cox. 1999. 387 pp.

(Order from Island Press, POB 7, Covelo, CA 95428; 800-828-1302. Cloth: \$60.00; paper: \$30.00. E-mail: bchurchill@islandpress.org)

A very good review of the latest literature, this book is "a call to action for every citizen conservationist; at stake are staggering economic costs and the preservation of our biodiversity." From air potato, melaleuca and silk reed to brown-headed cowbirds, feral hogs and blue tilapia, the author reviews the origins of and problems caused by many non-native species found in North America. The author states: "The public at large remains largely unaware of the seriousness of the threat...An education gap exists, and if we are to preserve the ecological uniqueness of the continent, this gap must be filled."

THE NATIONAL DIRECTORY OF WETLAND PLANT VENDORS, by the USDA Natural Resources Conservation Service, Coffeeville, MS. 1999. 84 pp.

(Available in hard copy from jgrabowski@ms.nrcs.usda.gov, or as a downloadable PDF (Acrobat 3.0 or higher) file from: <http://www.nhq.nrcs.usda.gov/BCS/PMC/pubs/wetlandvndors.html>)

This directory, updated from a previous version, lists wetland plant vendors by state, and lists obligate and facultative wetland plant species for which vendors were found, including seed and propagule vendors.

Aside from the fact that it also lists vendors of purple loosestrife, water hyacinth, water lettuce and torpedograss, among other non-native invasive plants, this is a very useful resource.

PROPAGATION AND ESTABLISHMENT OF AQUATIC PLANTS: A Handbook for Ecosystem Restoration Projects, by R.M. Smart and G.O. Dick. U.S. Army Corps of Engineers Technical Report A-99-4. 37 pp.

(Order from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.)

Straightforward and to-the-point, this "handbook" describes how to produce aquatic plant propagules and how to plant them in reservoirs. Plant growth requirements, container size, culture maintenance, planting depth, species selection and herbivore protection are covered. Practical information from people who do it regularly.

BIOLOGICAL CONTROL OF WATER HYACINTH -- The weevils *Neochetina bruchii* and *N. eichhorniae*...

by M.H. Julien, M.W. Giffiths and A.D. Wright. 1999. 87 pp.

(Order from Australian Centre for International Agricultural Research, GPO Box 1571, Canberra, ACT 2601, AUSTRALIA. ACIAR Monograph No. 60)

A well-made and colorful book full of photographs of water hyacinths (*Eichhornia crassipes*), it is mainly a how-to book for the rearing of *Neochetina* biological control weevils. The book is divided into sections describing the plant, its habitat and impact and utilization; the management of water hyacinths; descriptions of the weevils and their impacts on the weed; host-range testing; history of introductions; rearing and distribution; and post-release management.

GRASS CARP -- A Fish for Biological Management of Hydrilla and Other Aquatic Weeds in Florida, by D.L. Sutton and V.V. Vandiver, Jr. Bulletin 867. Revised 1998. 13 pp.

(Order from the APIRS office, 7922 NW 71 ST., Gainesville, FL 32653. (352) 392-1799. E-mail: varamey@nersp.nerde.ufl.edu)

This updated bulletin presents the grass carp, *Ctenopharyngodon idella*, and includes descriptions of the fish, a list of preferred foods, management techniques, removal techniques, and use of the fish in conjunction with restoration.

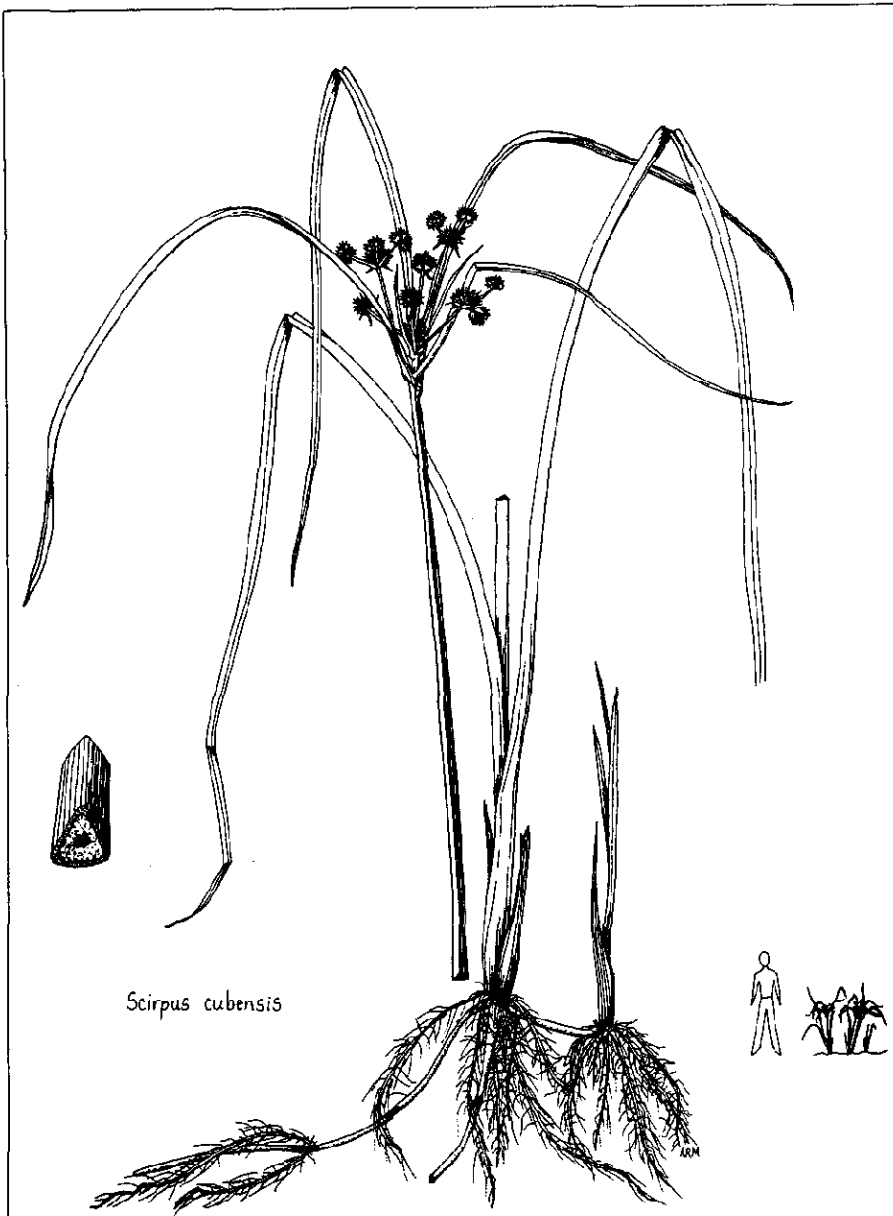
New Journal:

PLANTED AQUARIA, Dave Gomberg, Managing Editor.

(Order from PAM, 7 Gateview Ct., San Francisco, CA 94116; E-mail: pam@wcf.com \$20. one year, \$38. two years, add \$8. per year outside the U.S.)

Planted Aquaria, a quarterly magazine devoted to the hobby of keeping planted tanks, made its debut with the Spring 2000 inaugural issue. The editors plan to present information about planted tank management, aquatic plant nutrition and physiology, plant types and their relationships to other plants and animals, aquascaping, lighting, substrate, and more. The small format journal uses striking color photographs to show a multitude of planted aquaria from around the world. The first issue includes an article on "Style in the Planted Aquarium" which points out that the Dutch have been seriously keeping planted tanks for much longer than many other nations. They have "hotly competitive 'Aquarium Beautiful' contests" with "very specific rules and highly trained, very demanding judges."

Note: The editors of **AQUAPHYTE** solicit books, reports, proceedings, and other publications of interest to researchers, resource managers, students, professionals and the layperson interested in the fields of aquatic and wetland plants worldwide and upland invasive plants in Florida. Please send items to be considered for review to the attention of the editors at the address on the back page of this issue.



Scirpus cubensis
Cuban bulrush, Burhead sedge

Cuban bulrush (*Scirpus cubensis*) is not native to Florida, yet it is a major plant of the Kissimmee River valley in central Florida and of Paynes Prairie in northern Florida. This plant is native to tropical America and to Africa.

Scirpus cubensis is leafy and resembles a species of *Cyperus*. It might be noticed as a large colony of medium-height grasses growing in water, with spherical inflorescences only somewhat visible among the many leaves.

The plant has triangular, erect stems, to 3 feet tall. The leaves are long and ribbon-like, coming from the base of the plant, and longer than the inflorescence stem. The inflorescence has 1-to-several lumpy spherical heads, each head to 3/4 inch across. Just underneath the spherical heads are bracts, leaf-like and very long, arranged in a loose spiral.

FROM THE DATABASE

Here is a sampling of the research articles, books and reports which have been entered into the aquatic plant database since October 1999.

The database has more than 51,000 citations. To receive free bibliographies on specific plants and/or subjects, contact APIRS using the information on the back page or use the database online at <http://plants.ifas.ufl.edu/>

To obtain articles, contact your nearest state or university library.

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Comparative study of wastewater purification efficiencies of two emergent helophytes: *Typha latifolia* and *Juncus subulatus* under arid climate.

WATER, SCIENCE & TECHNOL. 39(10-11):123-126. 1999.

Akimoto, M., Shimamoto, Y., Morishima, H.

The extinction of genetic resources of Asian wild rice, *Oryza rufipogon* Griff.: a case study in Thailand.

GENETIC RESOURCES AND CROP EVOLUTION 46(4):419-425. 1999.

Ansede, J.H., Pellechia, P.J., Yoch, D.C.

Selenium biotransformation by the salt marsh cordgrass *Spartina alterniflora*: evidence for dimethylselenoniopropionate formation.

ENVIRON. SCI. TECHNOL. 33(12):2064-2069. 1999.

Arrington, D.A., Toth, L.A., Koebel, J.W.

Effects of rooting by feral hogs *Sus scrofa* L. on the structure of a floodplain vegetation assemblage.

WETLANDS 19(3):535-544. 1999.

Balogh, K.V., Presing, M., Hiripi, L., Voros, L.

Stable carbon and nitrogen isotope ratios of dissolved humic substances in a shallow reservoir covered by macrophytes.

INTERNAT. REV. HYDROBIOL. 83:203-206. 1998.

Barreto, R.W., Torres, A.N.L.

Nimbya alternantherae and *Cercospora alternantherae*: two new records of fungal pathogens on *Alternanthera philoxeroides* (alligatorweed) in Brazil.

AUSTRALIAN PLANT PATHOL. 28(2):103-107. 1999.

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Atmospheric fluxes of toxic metals and environmental changes in the Venice Lagoon as recorded by salt marshes.

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Investigating dairy lagoon effluent treatability in a laboratory-scale constructed wetlands system.

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Using monitoring data to choose planting sites for underwater grasses.

VOLUNTEER MONITOR 11(1):16-17. 1999.

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Milfo (Version 1.0): A simulation model for growth of Eurasian watermilfoil - user's guide.

INSTR. REPT. A-99-1, U.S. ARMY CORPS OF ENGINEERS, WATERWAYS EXPT. STATION, AQUATIC PLANT CONTROL RESEARCH PROGRAM, VICKSBURG, MS, 23 PP. 1999.

Bohnenstiehl, K.

Riparian vegetation inventory and mapping at Moenkopi Wash, Hopi Indian Reservation, using color-infrared, aerial photography, softcopy photogrammetry, digital orthophotos, multispectral airborne scanner data and a GIS database.

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Vertebrates removed by mechanical weed harvesting in Lake Keesus, Wisconsin.

J. AQUATIC PLANT MANAGE. 37:34-36. 1999.

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A multi-proxy trophic state reconstruction for shallow Orange Lake, Florida, USA: possible influence of macrophytes on limnetic nutrient concentrations.

J. PALEOLIMNOL. 21(2):215-233. 1999.

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Maritime quillwort, *Isoetes maritima* (Isoetaceae), in the Yukon Territory.

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Potential for biological control of cogongrass (*Imperata cylindrica*) with Lepidoptera larvae.

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Nymphoides cristata (Roxb.) Kuntze, new to the U.S. and occurring as a pest plant in Florida.

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Life histories of Charophytes from permanent and temporary wetlands in eastern Australia.

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Seasonal changes in the germination of buried seeds of *Monochoria vaginalis*.

WEED RESEARCH 39(2):107-115. 1999.

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Biological control of parrot's feather, *Myriophyllum aquaticum* (Vell.) Verdc. (Haloragaceae), in South Africa.

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The use of treatment wetlands for petroleum industry effluents.

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AQUATIC TOXICOL. 45(2-3):159-170. 1999.

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Odds 'n' Ends

The **Invasive Species Advisory Committee (ISAC)** advises the Federal Invasive Species Council as it pursues the implementation of a National Invasive Species Management Plan, as ordered by the President in an Executive Order issued February 3, 1999. Here is a web page that presents the full text of President Clinton's Executive Order regarding invasive species, the "Stakeholder Review" of APHIS, and the minutes of the ISAC meetings. <http://plants.ifas.ufl.edu>, click on "Federal Invasive Species Advisory Committee."

Re-plant tape grass! *Vallisneria americana* is known as tape grass, eel grass and American wild celery. It is a very important submersed plant that provides food for ducks and other birds and stabilizes lake and river bottoms; it is native, primarily of eastern North America, from Nova Scotia to the Gulf of Mexico. Hydrilla infestations and other unfortunate events destroy tape grass meadows. During restoration, eco-managers often want to re-plant the favored tape grass. Here is a web page which provides comprehensive information about the plant's taxonomy, reproduction, phenology, ecology, productivity and propagation: <http://www.npwr.usgs.gov/resource/literatr/wildcel/wildcel.htm>

"A Weed of National Significance." Cabomba, *Cabomba caroliniana*, has been named as a "Weed of National Significance" in Australia, and a "national strategy is being developed for cabomba, as part of the Australian National Weed Strategy." Native to America, cabomba has recently infested several water storage dams, and "is a concern with regard to blocking water flow, reducing water quality and reducing access for boating and swimming. It has also been observed to outcompete native aquatic plants, with subsequent effects on native fish and invertebrates." For more information, contact Mr. Rodney Edwards, Queensland Department of Natural Resources, E-mail: rodney.edwards@dnr.qld.gov.au

Report Non-Native Pest Plants in Florida. The Exotic Pest Plant Database is an online database which may be queried to obtain lists of field occurrences of pest plants in Florida public lands and waters. Or you may report a field occurrence yourself. The database is a collaborative effort of the Florida Exotic Pest Plant Council and the Florida Department of Environmental Protection's Bureau of Invasive Plant Management. http://www.fleppc.org/database/data_intro.htm

Bay Grasses in Classes. Or is it Classes in Bay Grasses? In Maryland, the state Department of Natural Resources involves students from 70 elementary, middle and high schools in growing plants for and transplanting them into Chesapeake Bay. The web site for the project includes project data, bay grass information (including an online key), maps of restoration sites, as well as science teacher questions and answers about the requirements for growing plants. http://www.dnr.state.md.us/bay/sav/grass_clas.html

I'm not a plant, but will aquatic herbicides harm me? Regarding the use of aquatic herbicides in our waters and wetlands, Dr. Carole Lembi says it's reasonable to wonder "whether the use of chemicals in your body of water will be safe to you and safe to the environment? That is a legitimate concern that all of us should have before we apply any chemical to control some pest. How toxic is the chemical... How persistent is the chemical... Will it cause cancer?" Dr. Lembi, of Purdue University, attempts to answer these questions in a web-based tutorial and narrated slide show. <http://www.btny.purdue.edu/aquatic/aquaticherb.html>

Aquatic plants in Utah?! Although Utah is the 2nd driest U.S. state, receiving only 13 inches of precipitation annually, the state does have aquatic and wetland resources that it wants to protect. Thus, the Utah Aquatic Nuisance Species Action Team, members of which represent about a dozen public and private organizations in that state. The "primary threats" they list include purple loosestrife (*Lythrum salicaria*), Eurasian water milfoil (*Myriophyllum spicatum*) and zebra mussel (*Dreissena polymorpha*). One place you can get information about Utah's ANS program is at: <http://www.nr.state.ut.us/dwr/ans.htm>

Hyacinth-induced paralysis. Africa's Lake Victoria, covering 27,000 square miles, is the second largest freshwater lake in the world. Unfortunately, it now has the exotic floating aquatic weed, water hyacinth (*Eichhornia crassipes*), massive mats of which paralyze port and fishing cities in Kenya, Tanzania and Uganda. Aquarius Systems, manufacturers of aquatic plant harvesting equipment, has won a grant from the World Bank to clear away and dispose of some of the worst mats. For pictures of the problem, and for more information, go to: <http://www.water-hyacinth.com>

Current topographic maps for free. Interactive topo maps for the entire United States are now on-line. The user can pinpoint very exact coordinates at resolution scales from 1:25,000 to 1:200,000. Maps are in color and may be printed. (You need the latest browser version, and, obviously, the fastest possible connection.) <http://www.topozone.com>

MEETINGS

40th ANNUAL CONFERENCE, AQUATIC PLANT MANAGEMENT SOCIETY.

July 16-20, 2000. Handlery Hotel and Resort, San Diego, California.

This is the oldest scientific society dedicated to the ecology and management of aquatic plants, especially non-native and invasive aquatic and wetland species such as hydrilla, Eurasian watermilfoil, purple loosestrife, giant salvinia and water hyacinth. The conference includes sessions on aquatic plant ecology and physiology, chemical control, biological and mechanical control, Eurasian watermilfoil biology and control, as well as case studies from around the US and from Africa, Australia, Europe and South America.

Contact: WWW: <http://www.apms.org> For hotel reservations, call 800-676-6567 or WWW: <http://www.handlery.com>

SECOND INTERNATIONAL CONFERENCE ON PLANTS AND ENVIRONMENTAL POLLUTION.

November 26-30, 2001. National Botanical Research Institute, Lucknow, India.

This conference is sponsored by the International Society of Environmental Botanists. Various conference themes include Climate Change and Agricultural Production; Environmental Pollution and Biodiversity; Environmental Biotechnology; Plant Response to Environmental Pollution; Environmental Impact Assessment; and Environmental Education, Legislation and Economic Impact.

Contact: WWW: <http://www.icpep.org> or E-mail: nbri@lwl.vsnl.net.in

MEETING 2000—MIDSOUTH AQUATIC PLANT MANAGEMENT SOCIETY.

October 18-20, 2000. Lakepoint Resort State Park, Lake Eufaula, Alabama.

This meeting, which will take place in the Eufaula National Wildlife Refuge on the Georgia-Alabama border, is for environmental managers from public agencies and private companies, as well as for citizens interested in the management of lakes, rivers and wetlands of the mid-southern United States.

Contact: Ken Weathers, AL Dept. Cons. Natural Resources, POB 310-292, Enterprise, AL 36331, 334-347-9467; E-mail: dist6@alaweb.com

INVASIVE PLANTS AND ANIMALS IN IOWA: A SYMPOSIUM.

October 6-7, 2000. Iowa State University, Ames, Iowa.

This symposium will provide an up-to-date summary of invasive species in Iowa, provide an overview of their impact, and provide information about control programs that are used or are under development.

Contact: WWW: <http://www.ag.iastate.edu/departments/aecl/invasives>

GREATER EVERGLADES ECOSYSTEM RESTORATION SCIENCE CONFERENCE – DEFINING SUCCESS.

September 25-29, 2000. Naples Beach Hotel, Naples, Florida.

Sponsored by the South Florida Ecosystem Restoration Task Force, this is "a forum for physical, biological and social scientists to share their knowledge and research results concerning greater Everglades ecosystem restoration." Primary topics include: Hydrology and Hydrologic Modeling; Ecology and Ecological Modeling; Water Quality and Water Treatment Technologies; and Social and Human Sciences.

Contact: E-mail: john_curnutt@usgs.gov

2000 ANNUAL MEETING, FLORIDA AQUATIC PLANT MANAGEMENT SOCIETY.

October 3-5, 2000. Holiday Inn, Cocoa Beach, Florida.

FAPMS has issued its "Call for Papers" on herbicide application techniques and innovative control methods.

Contact: Florida DEP's Cathy Widness at 561-791-4720, or E-mail her: widnessc@mail.state.fl.us

7TH INTERNATIONAL CONFERENCE: WETLAND SYSTEMS FOR WATER POLLUTION CONTROL.

November 11-16, 2000. Grosvenor Resort, Lake Buena Vista, Florida.

This conference will provide a forum for the synthesis and interpretation of the current status of treatment wetlands. The purposes are to recognize the interdisciplinary nature of the topic, the diversity of researchers involved; the need to synthesize research information; the need to transfer that information to the managers for solving problems; and to look at future designs of treatment wetlands.

Contact: WWW: <http://www.ifas.ufl.edu/~conferweb/wpc/>

NALMS 2000: CELEBRATING 20 YEARS OF PEOPLE LINKING LAKES AND WATERSHED MANAGEMENT.

November 8-10, 2000. Wyndham Hotel Miami-Biscayne Bay, Miami, Florida.

Preliminary session topics include: Can We Restore Shallow Eutrophic Lakes?; Management of Fish Populations in Lakes & Reservoirs; Recreational Use Issues; Harmful Algal Blooms in Surface Waters; Restoration Case Studies; Managing Water Resources for Competing Needs; Innovative Techniques for Lake Management; Littoral Zone Function & Value; Sediment Removal for Lake Restoration Effects.

Contact: Terry Thiessen, POB 5443, Madison, WI 53705-5443, Phone: (608) 233-2836, Fax: (608) 233-3186, E-mail: thiessen@nalms.org, WWW: www.nalms.org/symposia/miami/miami.htm Hotel information: 305-374-0000, WWW: <http://www.wyndham.com/BiscayneBay/default.cfm>

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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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