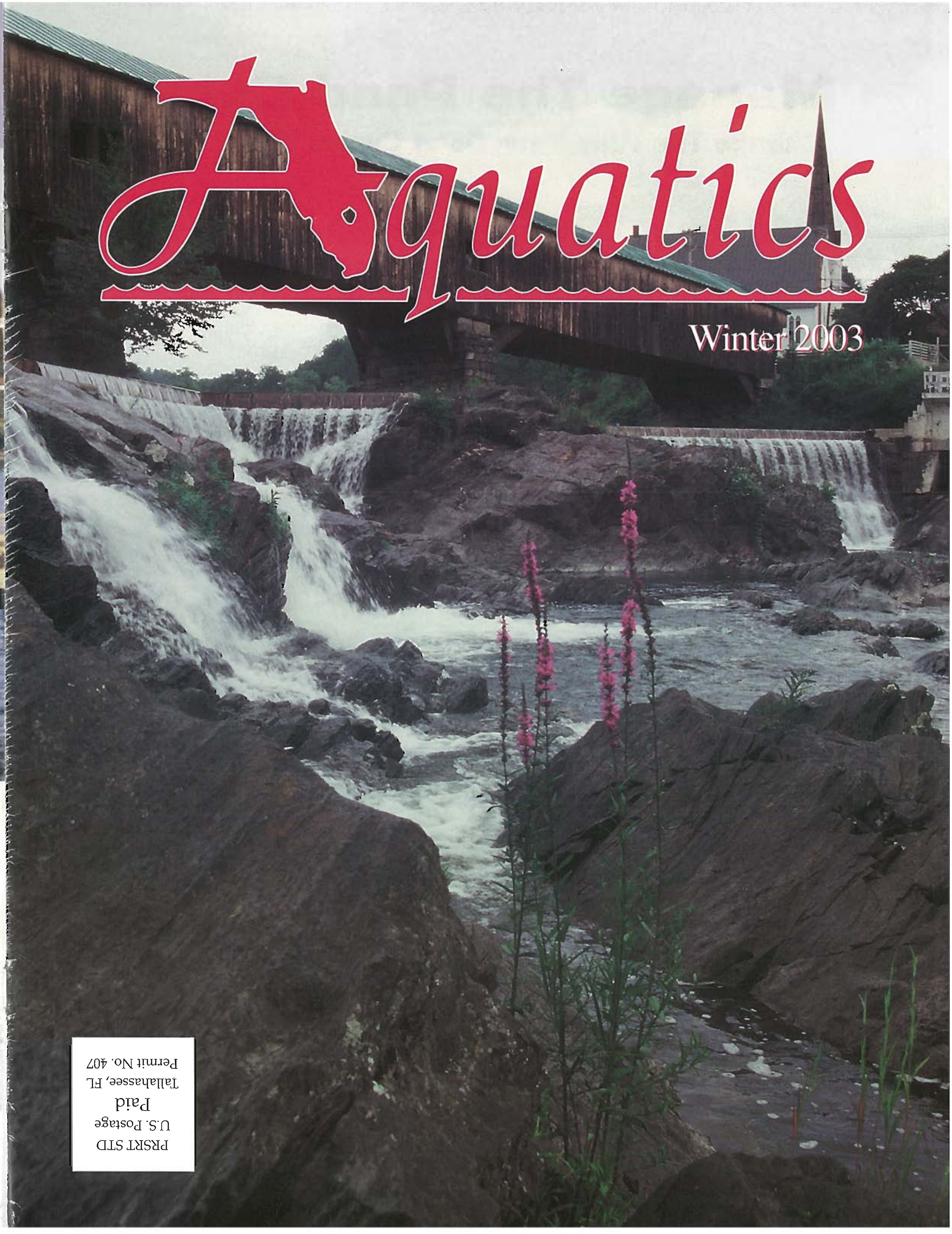
Aquatics

Winter 2003



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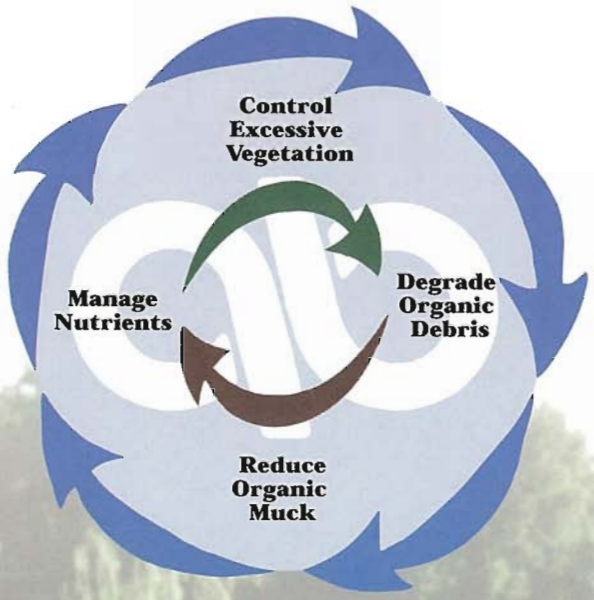

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Cardinal lobelia. Photo by Jess Van Dyke

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Covered Bridge in Bath, NH. Note the purple loosestrife in the forground. Photo by Jeff Schardt

Aquatics

Winter 2003/Vol. 25, No. 4

Contents

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EDITORIAL: Address all correspondence regarding editorial matter to Judy Ludlow Aquatics Magazine.
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Assessing Florida Lakes *via a* Floristic Quality Index

Floating aquatic plant problem in Lake Munson. Photo by Jess Van Dyke.

Hydrilla in Lake Munson, Leon County, Florida. Photo by Jess Van Dyke.

by Russ Frydenborg
DEP Bureau of Laboratories

"Wow, this place is really hammered," remarked Jess van Dyke as we launched the airboat at the Munson Landing boat ramp. Jess, a seasoned lakes biologist, had done what comes naturally to experienced environmental professionals. First, he had rapidly surveyed the area and noted that a few well-known indicators of human disturbance were dominant. Then, he assessed the health of the lake based on best professional judgment. "I agree, Jess, look at all that *Hydrilla* and hyacinth," I replied. "What we're working on is developing a method where any trained person can reach the same conclusion as an expert like you." The purpose of today's trip was to contribute to one of DEP's ongoing missions: to develop rapid methods capable of objectively detecting human impairment in lakes.

Biological Assessment

The Clean Water Act charges us to protect and restore the "physical, chemical, and biological integrity" of the nation's waters. Jim Karr, the "father of the index of bio-integrity" assessment methodology, defines biological integrity as "the ability of an aquatic ecosystem to support and maintain a balanced, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitats within a region." Due to the unpredictable and transient nature of stormwater runoff (Florida's number one pollution source), many environmental programs have begun to directly measure the health of the biological community, rather than relying on water quality testing alone. Biological communities are ideal impairment indicators because they are sensitive to human disturbance, integrate cumulative impacts over time, react to synergistic effects, and provide a direct evaluation of the resource condition. But because biological systems are quite complex, it is important to establish an assessment methodology that is objective and legally defensible. The general procedure to develop scientifically valid biological assessment tools includes the following steps:

1. Classify aquatic systems into meaningful units.
2. Sample target biota across a human disturbance gradient.
3. Select relevant biological attri-

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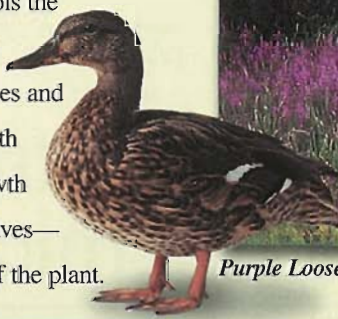

Renovate was developed to control submersed, emersed and floating aquatic plants such as:

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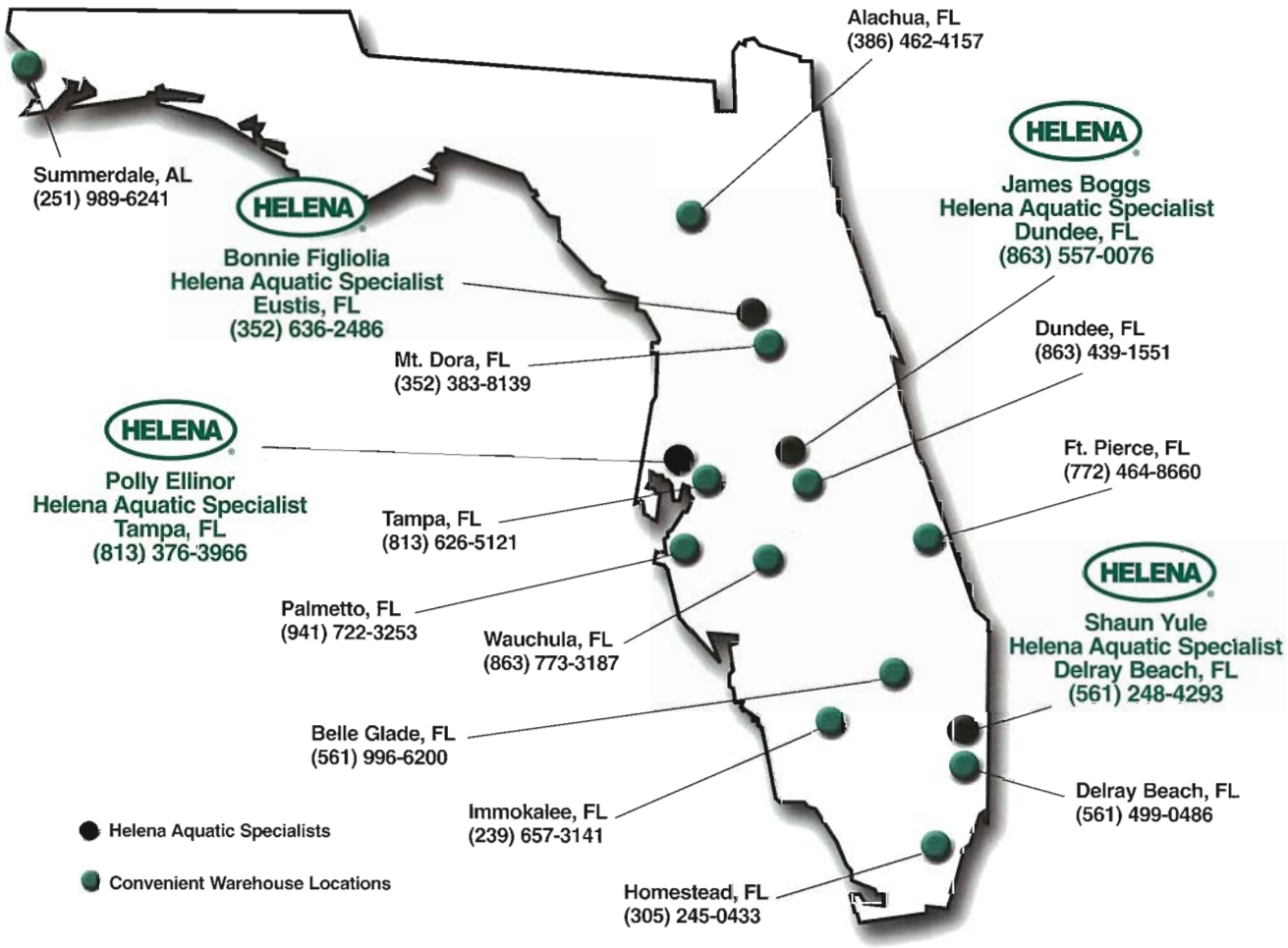

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butes that provide a reliable signal about human effects.
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Floristic Quality Assessment

"So let me get this straight," said Jess, "we have the lake divided up into twelve 'slices of pie', and all we do is write down the taxa we see in each slice, recording the dominant or co-dominant species." "You've got it," I affirmed. Jess then replied, "I like these data sheets with the preprinted names of the most common plants, but what is that number next to each name?" "Like you've already pointed out, good botanists have always known that there's information associated with each plant. That's been summarized into a single number, called the Coefficient of Conservatism, or C of C."

The Coefficient of Conservatism, or C of C, is a value assigned to a particular plant by a panel of expert Florida botanists. Mark Brown, with the University of Florida Center for Wetlands, was in charge of conducting this research. The C of C indicates the degree to which a given plant species exhibits ecological specialization or tolerance to human disturbance. The coefficients range from 0 to 10. A species with a high C of C would be sensitive to human-induced environmental stress, as well as have a high degree of fidelity to a narrow range of ecological conditions. Most species found in unaltered ecosystems have high C of C scores. Conversely, a low C of C score indicates species that are found where human activity has substantially altered the system. By standardizing the sampling and interpretation framework, using the C of C and other attributes of the floral community, we can create a useful assessment tool. Collectively, this process is referred to as Floristic Quality Assessment.

Here are the steps for developing a FQA:

1. Compile a list of plants growing in an area to be assessed, independent of community type.
2. Assign a Coefficient of Conservatism (C of C) to an individual species, by consulting a group of expert botanists, using an iterative process known as the Delphi Technique.
3. Determine the mean Coefficient of Conservatism for each plant.
4. Compute the Floristic Quality Assessment Index as the mean C of C score as a function of taxa occurrence.

Back on the Lake

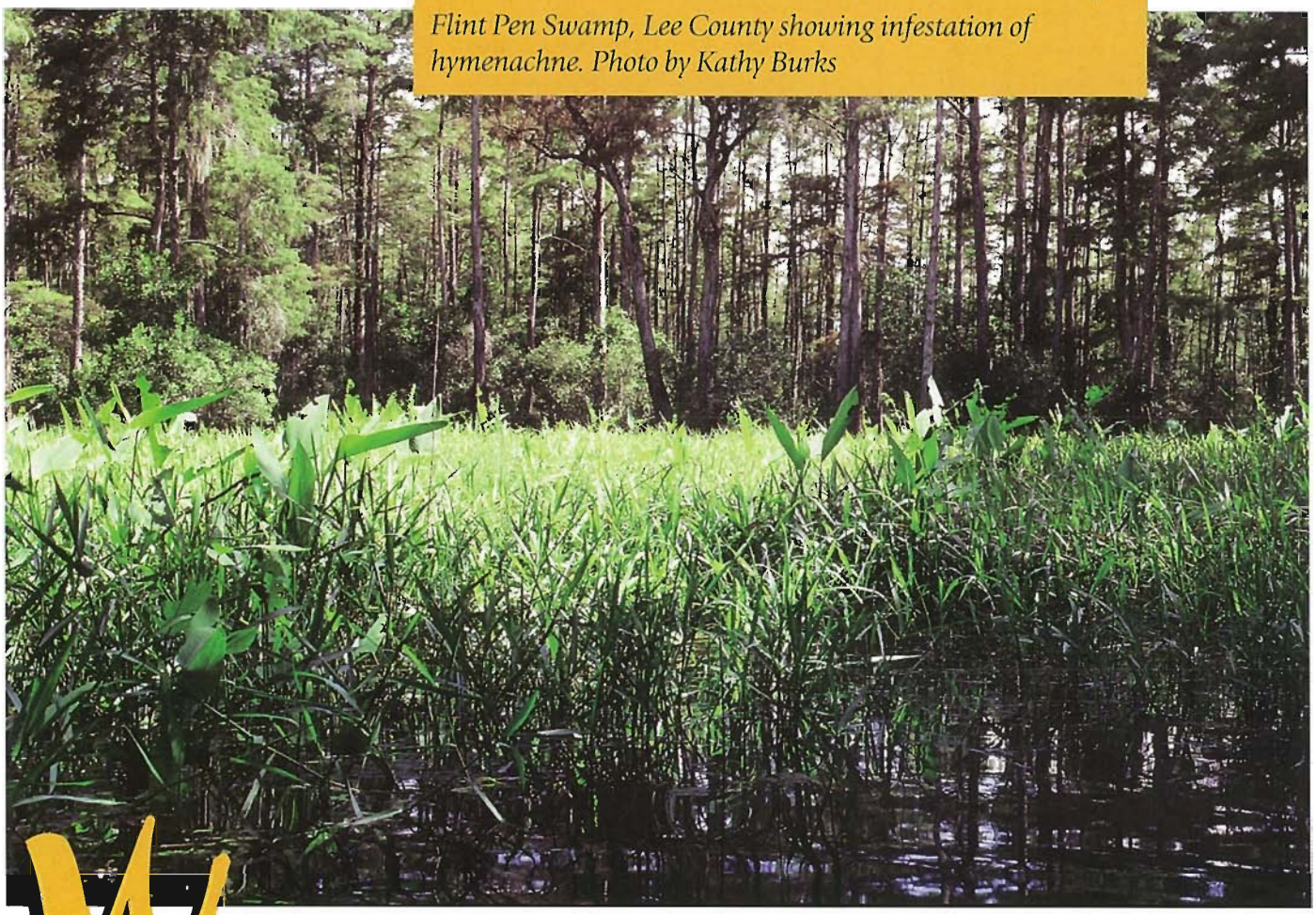
"OK," called Jess over the racket of the airboat, "we've got *Hydrilla, Eichhornia, Alternanthera, Lemna minor, Mikania scandens, Taxodium ascendens,* and *Itea virginica* in this quadrant." "Yeah," I yelled, "those scores are 0, 0, 1, 3.8, 2, 7.2, and 7.1." Jess turned off the engine and asked, "So if we get these same plants throughout the other eleven segments, what's the final score and what does it mean"? "There are still a few things we need to work out with Leska, like how to weigh the dominant plants in the score, and how to account for the delayed response seen in some of the plants," I answered. "The cypress and Virginia willow both have good C of C scores, yet I'm sure they were here long before the water quality declined in this lake. Also, there are other attributes, such as whether the plant is annual or perennial, its growth habit, and its wetland status, that may end up being part of the assessment."

With Ellen McCarron and Ashley Oneal as contract managers, DEP has hired Leska Fore, nationally known bio-statistician, to calibrate the Floristic Quality Index against a quantified scale of human stress, known as the Human Disturbance Gradient or HDG. The HDG establishes environmental criteria, independent from the biology, to determine the relative degree of impairment caused by humans. The HDG consists of land use information, hydrologic measures, habitat assessment scores, and water quality data. The HDG can be used to determine which attributes of floristic community are effective discriminators of adverse human effects. These measures, known as metrics, should:

1. Provide meaningful measures of ecological structure or function.
2. Show strong and consistent correlation with human disturbance.
3. Be statistically robust, with low measurement error.
4. Represent multiple categories of biological organization.
5. Be cost-effective to measure.
6. Show responses that are not redundant with other metrics.

"So Jess, I appreciated your help today, especially your 'reality check' on how this assessment system works," I commented as we were back at the boat ramp. "Russ," replied Jess, "I can actually see how this system would standardize things and provide a meaningful evaluation of a lake's health. Our lakes certainly need more protection, especially from nutrient enrichment, since that's clearly linked with nuisance plant growth." All in all, it was a successful day.

(*Hymenachne amplexicaulis*)



Flint Pen Swamp, Lee County showing infestation of hymenachne. Photo by Kathy Burks

Wetland Weeds: West Indian Marsh Grass

Rodrigo Diaz[1], William A. Overholt[2] and James P. Cuda[3]

Introduction

Wetlands (including swamps, bogs, marshes, mires and lagoons) are important ecosystems that are found on every continent except Antarctica. Wetlands are recognized as valuable sources, sinks, and transformers of a multitude of chemical, biological, and genetic materials (Mitsch and Gosselink 1993), and play an increasingly important role in today's world due to urban and agricultural pollution, and modification of natural landscapes. Wetlands not only perform hydrologic and chemical services, which clean polluted water, protect shorelines, prevent floods and recharge ground water aquifers, but also support a great variety of biodiversity and complex food chains.

Florida's wetlands constitute one of the world's largest aquatic habitats. In a survey conducted in the 1980s, Dahl (1990) reported that Florida had lost 9.3 million acres of wetlands, the most of any state. Losses were due to drainage of land for agriculture, forested plantations and urban and rural development.

The Everglades, St. John's River, Big Cypress Swamp and other wetlands support a great variety of native flora and fauna. These vast aquatic habitats in Florida support thousands of birds, including ducks and coots as well as other wetland species such as limpkins, wood storks, snail kites, king rails, purple gallinules, black skimmers and a variety of gulls, terns, shorebirds, and others. A variety of native plant communities serve as refuges and food sources for the fauna that can be found in Florida wetlands. Among the important wetland plants are bur-marigold, maidencane, American lotus, pickerelweed, soft rush, alligator flag, scarlet rosemallow, hurricane-grass, fragrant waterlily, lizard's tail, red ludwigia, banana lily, and giant foxtail.

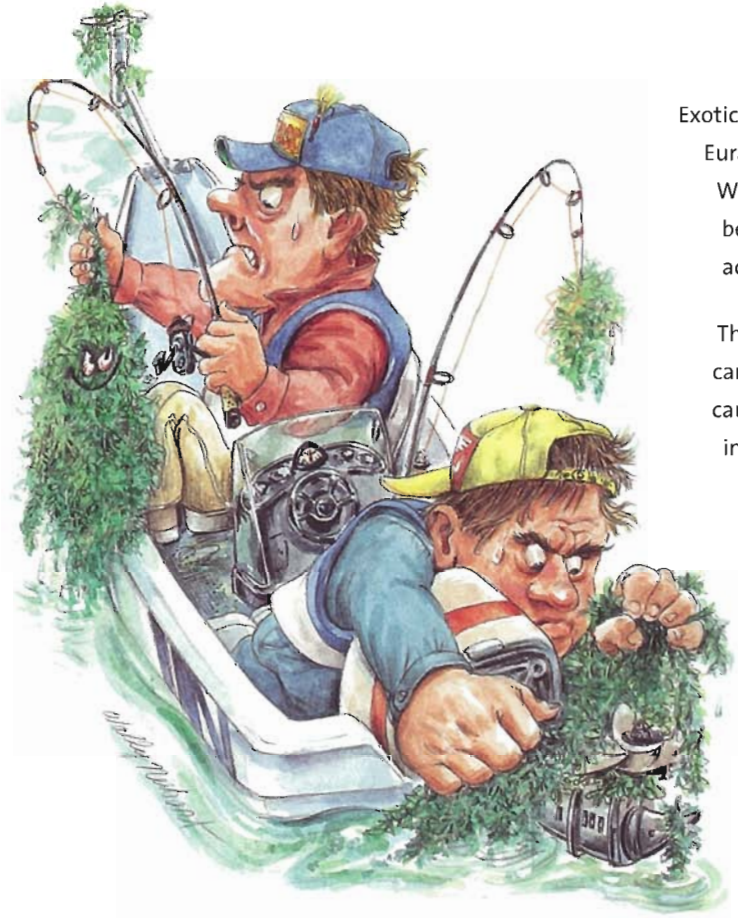
Invasion of exotic species poses

[1] Rodrigo Diaz, Ph.D student, Department of Entomology and Nematology, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

[2] Bill Overholt, Ph.D, Assistant Professor , Indian River Research & Extension Center, Institute of Food and Agricultural Sciences, University of Florida, Fort Pierce, 34945.

[3] Jim Cuda, Ph.D, Assistant Professor, Department of Entomology and Nematology, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

Too Many Weeds Spoil the Fishing



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

These invasive plants when left unmanaged can alter the ecosystem of lakes and reservoirs, causing a decline in the fishery, as well as interfering with other valued uses of waterbodies.

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a serious threat to Florida's sensitive ecosystems. International trade, tourism, and agricultural and urban disturbance have increased the probability of establishment of exotic plants. Exotic plant species in Florida wetlands spread rapidly due to floods, large interconnected waterway systems, and increased use of commercial and recreational boats. Fertilizer and sediment runoff from agricultural lands and waste water from beef and dairy operations contribute to successful establishment of aquatic exotic plants.

Wunderlin and Hansen (2003) reported 1,316 exotic plants species as naturalized in Florida, with 125 species being serious threats to natural areas. Of those, 65 are considered highly invasive because they are disruptive to native plant communities. West Indian Marsh Grass, *Hymenachne amplexicaulis* (Rudge) Nees (Poaceae), is one of many species currently invading sensitive wetlands in central and south Florida.

Origin and Spread in Florida

West Indian Marsh Grass is a native of South America and the West Indies and has spread to most countries of the neo-tropics. The pathway and timing of the introduction of this grass into Florida is uncertain; however, the first herbarium record was from a ponded pasture in Palm Beach County in 1957 (University of Florida Herbarium). This suggests that the grass could have been intentionally introduced as a forage. Alternatively, Hill (1996) speculated that migratory birds may have carried *H. amplexicaulis* seeds to Florida from nearby populations in the Caribbean islands. The next record was from a wet pasture in Collier county in 1977 (University of Florida Herbarium). Current records confirm that this grass is present in wetlands and rivers in 13 counties in central and south Florida.

Figure 1. West Indian Marsh Grass spreads by stolons and forms large stands.

West Indian Marsh Grass invades river banks, marshes and other areas which seasonally flood, and grows from stolons which can be fragmented by flowing water and transported great distances downstream. Therefore, seasonal flooding associated with summer rainfall in Florida facilitates spread of the plant. This grass also can be spread by seeds that are produced in large quantities and are highly viable. If the grass invades water storage facilities, additional spread of seeds and stolons can occur via secondary irrigation canals.

Australia Problem

West Indian Marsh Grass was brought from Venezuela to northern Australia as a forage grass in the 1970s. In 1980, the grass was already causing problems for sugarcane farmers, and park managers confirmed its presence in natural wetlands. Large infestations can be found in cane fields, water storages facilities, irrigation/drainage channels, roadside ditches and natural lagoons. In natural wetlands, *H. amplexicaulis* is threatening the habitat of magpie geese (*Anseranas semipalma* Latham) by displacing native plants such as *Oryza spp.*, *Eleocharis spp.* and *Ischaemum spp.* The Queensland fish industry reports that this grass is expected to reduce

Figure 2. Leaf base showing cordate structure

Figure 3. White pith in Stem (aerenchyma)

Figure 4. Spike-like panicle (ca. 30 cm)

total run-off volumes, and either diminish or stop natural water flows, and consequently reduce fish recruitment success. Plant managers in Australia have estimated the cost of West Indian Marsh Grass control at $652-688/ha using herbicide treatment. Currently, West Indian Marsh Grass covers more than 50,000 ha, and the Australian government has named this plant a "Weed of National Significance" (Csurches et al. 1999).

Impact on Wetlands

Wetlands are thought to be more susceptible to plant invasion than other ecosystems because of greater water and nutrient availability, and low plant diversity (Fox and Fox, 1986). West Indian Marsh Grass threatens wetland biodiversity, through simplification of both species and habitat diversity. Native plant communities are being displaced by competition with the weed, as is the case of maidencane (*Panicum hemitomon* Schult) and coast cockspur [*Echinochloa walteri* (Pursh) A.Heller], which provide refuge for wildlife. Large stands of West Indian Marsh Grass reduce the resources available for feeding, breeding and shelter of native fauna.

West Indian Marsh Grass has the potential to block irrigation channels and other waterways. It spreads rapidly from dense mats above or below the water, resulting in a reduction in light entering the wetland, depletion in oxygen levels, and in some cases, fish kills. Large wetlands such as the Everglades National Park, the Big Cypress Swamp and the St. Johns River are threatened by the invasion of this grass.

Figure 5. Ischnodemus variegatus adult

How to Recognize West Indian Marsh Grass

West Indian Marsh Grass can form large stands (Fig. 1) and is well adapted to flooding conditions. The plant is a stoloniferous, perennial grass, 1-2.5 m in height. Leaf blades are 10 – 50 cm long and up to 4 cm wide, mostly lanceolate and cordate at the base (Fig. 2). The glabrous stems are erect or ascending from a prostrate base and are filled with white pith (aerenchyma) (Fig. 3). The panicles are narrow, spike-like, cylindrical, 20-40 cm long (Fig. 4) (Bodgan 1977) and are present starting in July in central Florida.

Control Methods

According to invasive plant managers from the South Florida Water Management District, herbicides offer only short term control of the grass, as there is substantial regrowth from stolons and seeds after herbicide treatment. Other control methods include manipulation of water levels (drying or drowning the plant), use of heavy machinery, solar sheeting and shading by tall vegetation.

Ischnodemus variegatus

In December 2000, a biologist at Myakka River State Park discovered an insect feeding and causing considerable damage to the grass. The insect was later identified as Ischnodemus variegatus (Signoret) (Lygaeidae: Blissinae) by scientists at the FDACS Division of Plant Industry (Halbert 2000) (Fig. 5) This insect is a new record for Florida and is found throughout the neo-tropics. Damage by I. variegatus is easily recognized by the red-purplish blotches on the leaves. Heavily damaged plants turn brown and die. Further research is required to confirm whether I. variegatus has potential as a biological control agent.

How You Can Help

Residents interested in protecting Florida's aquatic habitats can help by identifying locations where West Indian Marsh Grass occurs. Knowing the current distribution of the grass can improve our management efforts in invaded areas and prevent its spread to non-invaded areas. If you find new stands of West Indian Marsh Grass, please contact the local land manager, or agencies such at the Cooperative Extension Service, the relevant water management district, or the Department of Environmental Protection (Table 1).

This research was supported by the Florida Agricultural Experiment Station, and approved for publication as Journal Series No. T-00644

Editors Note: The 2003 DEP Annual Inventory of Aquatic Plants in Florida's public waters reports 185 acres of Hymenachne amplexicaulis in 15 public waters.

Table 1. Telephone numbers and contact persons to report populations of West Indian.

INSTITUTION	Name/Phone Number
South Florida Water Management District	Mike Bodle, 561-687-6132
Southwest Florida Water Management District	Bryan Nelson, 800-423-1476 x 4537
Indian River Research & Education Center	Bill Overholt, 772/468-3922 x 143
Department of Environmental Protection	850-245-2809

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Wunderlin, R. P., and B. F. Hansen. 2003. Atlas of Florida Vascular Plants (www.plantatlas.usf.edu/).[S. M. Landry and K. N. Campbell (application development), Florida Center for Community Design and Research.] Institute for Systematic Botany, University of South Florida, Tampa.

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Announcing Aquatic Plant Management in Florida Waters, A Web Site For The Interested Public.

http://plants.ifas.ufl.edu/guide

The First COMPLETE Web Site About Aquatic Plant Management in Florida

by Vic Ramey

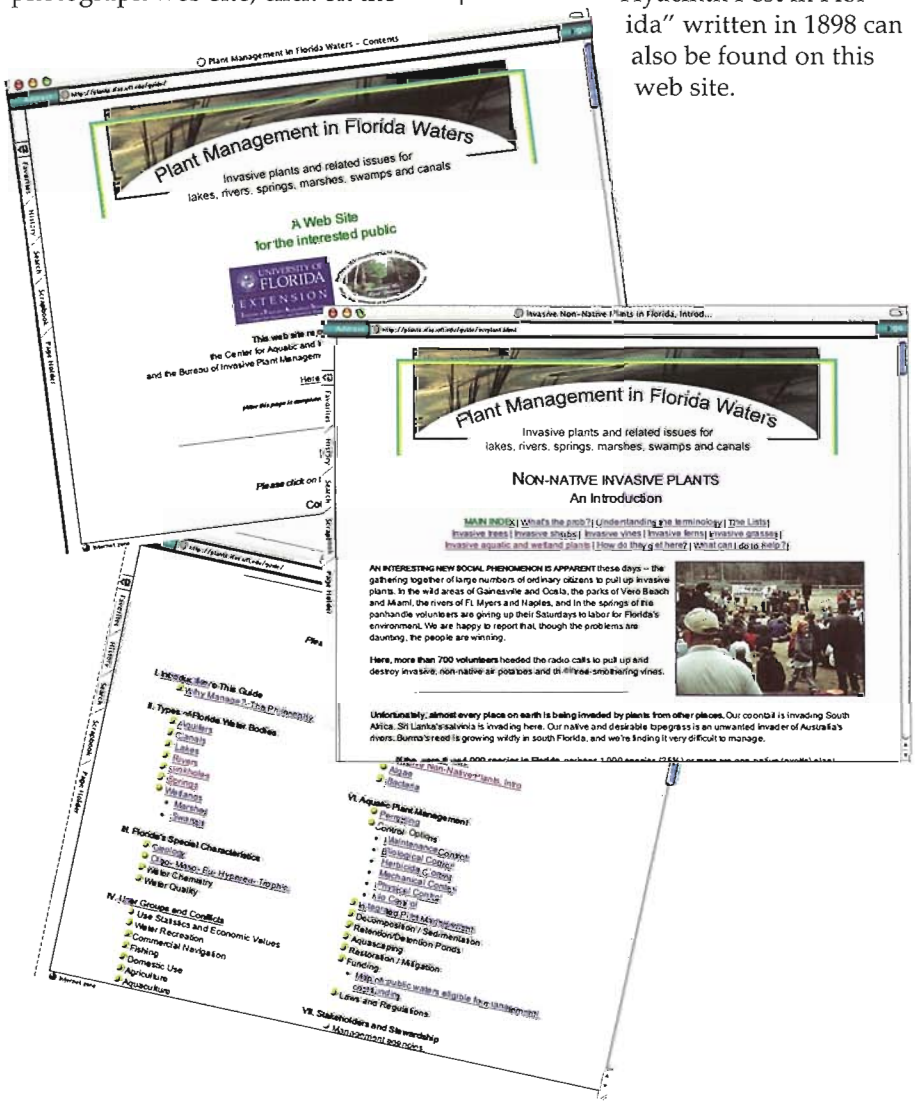
Florida is home to 8,000 lakes, 1700 rivers, thousands of miles of canals, 400 springs, a half-dozen aquifers, millions of acres of marshes and swamps, and 14 million people. Each lake, each river and each acre of marsh is unique, often home to native plants and animals, often threatened by non-native invasive plants, and often surrounded by happy homeowners, many of whom have their own ideas about what their water body should be like. Talk about aquatic plant management problems!

We are in the 18th month of a 24-month production of Aquatic Plant Management in Florida Waters, A Web Site For The Interested Public. Much of it is online already, awaiting your attention. ("We" are the University of Florida Center for Aquatic and Invasive Plant Management and the Florida DEP Bureau of Invasive Plant Management.)

The Guide is there to help explain Florida's watery ecosystems, the need for their management, and the methods used for their management. The goal of the web site is:

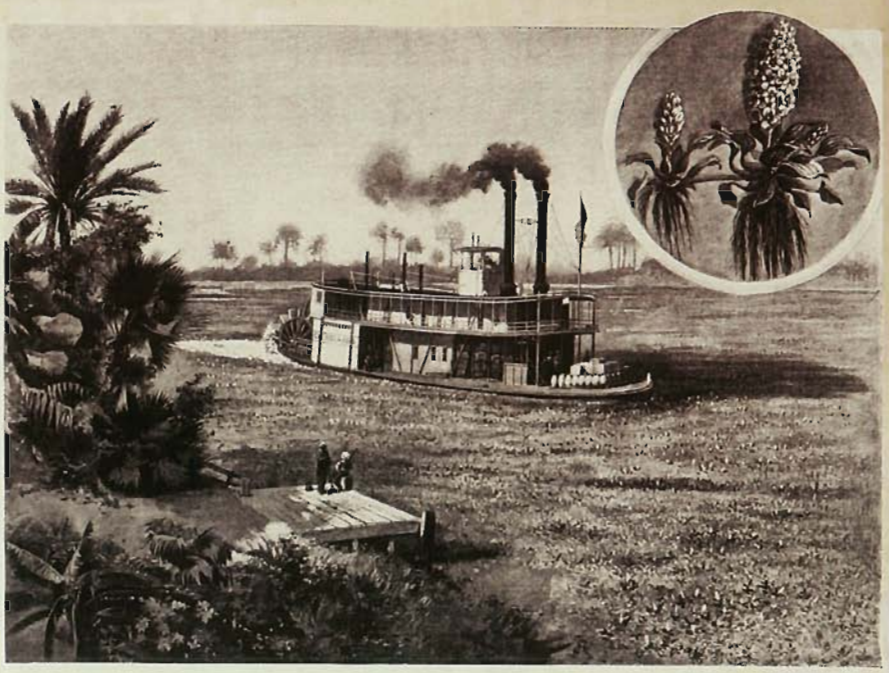
- to help citizens, long-time and recently-arrived, understand plants and their management in Florida waters
- to help field workers, office supervisors, management agencies, elected boards and government officials, eco-advocacy groups, legislators and others understand plants and their management in Florida waters

Come visit this 500+ page, 3,000 photograph web site, click on the major topics, or scroll down to the large index of keywords. Below is a sampling of the website at http://plants.ifas.ufl.edu/guide. The following article "The Water-Hyacinth Pest in Florida" written in 1898 can also be found on this web site.



THE WATER-HYACINTH PEST IN FLORIDA

HARPERS WEEKLY, MARCH 19, 1898



WATER-HYACINTHS IN THE ST. JOHNS RIVER, FLORIDA.

It seems strange to denominate so beautiful a flower as most of us regard the hyacinth a pest, and yet too much of a good thing, not properly placed, frequently becomes noxious; thus it is with the water-hyacinth in Florida. Its beauty can be seen from the vignette, which represents the hyacinth in full bloom, and its pestiferous qualities will have to be imagined from the following description.

It is not actually known when or how this flower was first introduced into Florida, although statistics tell us that it was found in the St. Johns River about 1890, in a pond somewhere near Palatka. The settlers tell us that in cleaning out this pond some of the plants were thrown into the river, they grew, and were so beautiful that settlers transplanted them to different parts of the river, to beautify their places, and thus the seemingly irreparable mistake was made.

The hyacinth is a native of south America, has a thick bushy root, and floats on the top of the water without

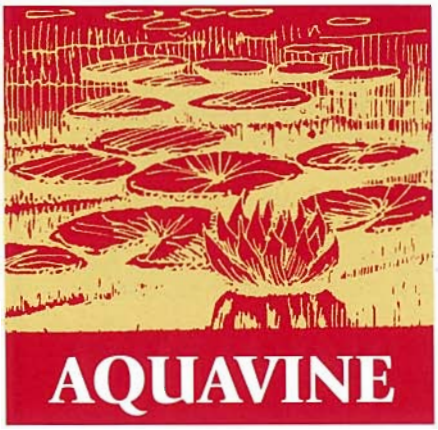
any apparent attachment to the bottom. If it could be kept near the shore no danger need be apprehended but wind and storms sent it floating out into the middle of the stream in such large masses that navigation is seriously impeded, and the captains of the river craft are beginning to look upon it with growing fear and horror.

As I was sailing up the river on the old steamer Everglades, as represented in the sketch, toward Jacksonville, I noticed this great green mass. As we sailed farther up, it became so thick that the vessel advanced with difficulty. The illustration shows how our steamer struck the mass. We backed and pushed, and finally extricated ourselves. The small stern-paddle boats can hardly push their way through these large masses, and at times are completely blocked. I have seen vessels going at full speed brought to a complete standstill.

These plants are capable of doing considerable damage in many ways other than that of endangering navigation. They propagate so fast and grow so rank that the narrow creeks running into the larger river are so thoroughly covered, from bank to bank, that boards can be laid across that would easily bear a person, so it is quite impossible to expect anything short of a dredging-machine to penetrate them. One can also see how much danger may lie concealed under this dense mass. It imperils the health of the neighborhoods in which it rows so rank, being washed up on the bank, carrying with it the refuse that has been caught among its tangled mass, and decaying, sends forth odors that are neither the most pleasant to inhale nor the most healthful to breathe. Then, too, the hyacinth is destroying the timber industry, as it is impossible to float the logs, and it is menacing the livelihood of the fishermen, by preventing them from spreading their nets as has been their custom in the past; and not only are the fishermen prevented from catching the fish, but the fish get under these large masses and multiply with marvelous rapidity. The fish dying in large numbers, rise to the surface, and floating on the water, lodge amongst the other decaying matter on the banks, and constitute a dangerous menace to the health of that part of the country in which the hyacinth is getting to be so abundant.

The query is how to get rid of the pest. An agent from the Agricultural Department of the United States has been sent to Florida to ascertain, if possible, what can be done. It has been suggested that perhaps if the red spider or some natural enemy of the plant were deposited there it would be effectual in ridding Florida of the pest; but after this work had been accomplished, and the Floridians had got rid of their dreaded hyacinth, they might possibly find a more formidable enemy in the newly imported exterminator.

But certain it is something must be done or the rivers will soon be completely choked, navigation stopped entirely, and the water-hyacinth will take its place as one of the plagues of modern times.



APMS Journals for Sale!

The Aquatic Plant Management Society, Inc. (APMS) has complete sets of back-issues of the Journal of Aquatic Plant Management for sale. The set of journals represents forty years of research into the management of aquatic plants. The semi-annual Journal was first published in August 1962, with the most recent issue being Volume 41, 2003. Sets are priced at $250.00, plus postage. Contact Dr. Linda Nelson, USAERDC-WES, 3909 Halls Ferry Road, Vicksburg, MS, 39180-6199, 601-634-2656 or Linda.s.Nelson@erdc.usace.army.mil

North American Lake Management Society, Southeastern Lake Management Conference, "Working Together-Sharing Resources." March 7-9, 2004 Wild Dunes Resort, Isle of Palms, South Carolina, Contact Suzanne Thomas-Cole, 864-287-3297 for more information.

Florida Lake Management Society 2004 Conference and Meeting, "A Tail of Many Waters: Florida's Limnic Resources." June 7-10, 2004 Saddlebrook Resort, Tampa, Florida, Contact Dr. Jim Griffin SWFWMD, 352-796-7211 for more information.

Fourth International Weed Science Congress, Durban, South Africa, June 20-24, 2004. Contact Christiaan Mulder at mindmelt@icon.co.za

Thirteenth International Conference on Aquatic Invasive Species, Ennis, Ireland, November 19-23, 2004, Contact Elizabeth Muckle-Jeffs, 800-868-8776, or profedge@renc.igs.net, or visit www.aquatic-invasive-species-conference.org

Moving On:

Catherine Johnson, formerly with the USACE in Orlando Florida has accepted a position with Orange County as the Watershed Action Volunteer Coordinator. Her responsibilities will be to recruit, train and retain volunteers for waterway cleanups, water quality monitoring, educational outreach programs, and special events. Catherine is excited about this challenging and rewarding career opportunity. Good Luck Catherine!! She can be reached at 407-836-1400, Catherine.Johnson@ocfl.net

Biologist Dave Demmi apparently was not alone during his aquatic plant survey of Lake Placid, Highlands County, Florida!

Below is an excerpt from the Florida Status Report, 2003, 17th Eastern black Bear Workshop about Florida's Black bear. This report can be found at www.wildflorida.org/bear/default.htm click on "Online Reports and Presentations."

"Black bears in Florida continue to exist in a mosaic of 6 core, 2 remnant, and several peripheral areas that vary in size, distribution, habitat, and isolation. The Florida Fish and Wildlife Conservation Commission (FWC) refers to the 6 core areas as the Apalachicola, Big Cypress, Eglin, Ocala, Osceola, and St Johns River bear populations and the 2 remnant areas as the Chassahowitzka and Glades/Highlands bear populations. Peripheral areas with potential to hold bears include the Blackwater River State Forest, Big Bend, and Greenswamp. Core populations appear to be stable to increasing, but the smaller, remnant populations face an uncertain future because of habitat loss and fragmentation from human development. The

Black Bear footprints on Lake Placid, Highlands County, FL, Photo by Dave Demmi.

FWC lists the black bear in Florida as threatened statewide except for those in Apalachicola National Forest and Baker and Columbia Counties, where bears were considered a game animal until seasons were closed in 1994. Since 1994, black bears retain no special status in these aforementioned areas. The United States Fish and Wildlife Service (USFWS) declined to list the Florida black bear (Ursus americanus floridanus) as a federally threatened species, but the U.S. District Court directed the agency to re-evaluate the adequacy of existing regulations for ensuring the conservation of the subspecies." For more information contact:

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Bear Management Section
Florida Fish and Wildlife
Conservation Commission
620 S. Meridian St.
Tallahassee, FL 32399-1600
Phone (850) 413-7379
thomas.eason@fwc.state.fl.us

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