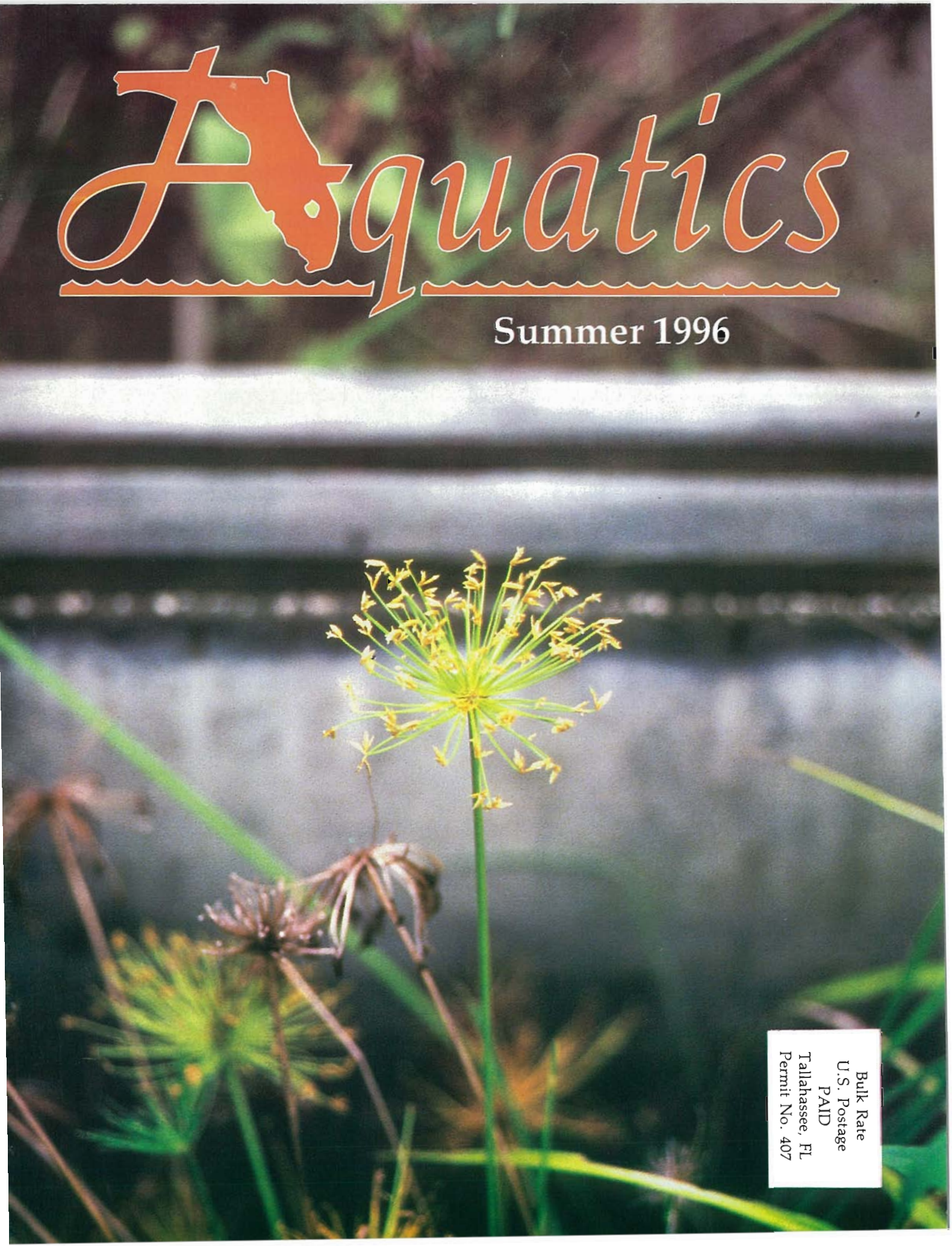

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Letter to the Editor

In recent years infestations of exotic aquatic plants, namely *Hydrilla verticillata*, have increased dramatically in Florid's waters. During the same period, federal and state funding for managing aquatic plants has been insufficient. Last year's Society sponsored Hydrilla Workshop & Field Days were beneficial but no legislation addressing a dedicated funding source was passed. Therefore, last October, the Board of Directors of the Florida Aquatic Plant Management Society voted to hire a professional lobbyist to assist in this area. Mr. Tom Herndon, a former appropriations staff director and state budget director was selected for the job.

A busy legislative session just ended. The good news is: We received $15 million! This is an all-time high. $1 million is for melaleuca, $2 million will go for floating plant control, this leaves $12 million which will be earmarked primarily hydrilla for. This new legislation, CS/SB 1986, represents a giant step forward. The funding source is a Florida Department of Transportation mitigation program. This program is expected to generate $35-40 million each year. The money is split between SWIM projects and aquatics. The bad news is: Each year we will have to battle for these dollars. There is no guarantee as to an amount which will be allocated to aquatics. So there is still much work to be done.

Mr. Herndon played a vital role and was very instrumental in helping to pass this legislation. More importantly, however, was the impact of the members of this society. The phone calls, faxes, and letters to Tallahassee were testimony to your dedication of preserving Florida's natural resources. You are to be commended.

Donald W. Doggett
President

Have you seen this plant? Read further in this issue. Photo by Dave Demmi, Bureau of Aquatic Plant Management, Bartow, FL.

Aquatics
Summer 1996/Vol. 18, No. 2

CONTENTS

AQUATICS (ISSN 1054-1799): Published quarterly as the official publication of the Florida Aquatic Plant Management Society Registration No. 1,579,647. This publication is intended to keep all interested parties informed on matters as they relate to aquatic plant management particularly in Florida. To become a member of FAPMS and receive the Society newsletter and Aquatics magazine, send $20.00 plus your mailing address to the Treasurer.

EDITORIAL: Address all correspondence regarding editorial matter to Ken Langeland *Aquatics* Magazine.

Wetland Plant Micropropagation
Issues and Opportunities

by
Mike Kane
Department of Environmental Horticulture
University of Florida

Expanding Markets For Wetland Plants

The recognized importance of wetlands for maintaining water quality, recharging groundwater, providing unique wildlife habitats and storing flood waters has stimulated development of a commercial market for wetland plants. Demand for wetland plants has been generated by their increased use: 1) in wetland and lake restoration/mitigation projects; 2) as biological filters for excess nutrients, heavy metals or organics in runoff or artificial wetland effluent treatment systems; and 3) for aesthetic purposes in retention pond and water garden aquascaping. Over the past decade, these expanding markets have promoted rapid development of a lucrative aquatic/wetland-plant industry in Florida.

Sources of Wetland Plants

Currently, two primary sources satisfy the demand for wetland plants: nursery-grown containerized plants (seed or division propagated) and bare-root transplants collected from natural populations. Many environmental restoration or aquascaping consultants have built containerized plant nurseries to supplement supply and also offer contract growing services. Another revegetation approach involves the transfer of displaced wetland mulch containing seed, rhizome and/or tuber stock to mitigation sites. However, one drawback with using either displaced wetland mulch or wetland-harvested transplants is the introduction of weedy species which can lead to increased maintenance costs.

Bare-root wetland transplants provide a low-cost solution for wetland plant demand. In Florida, the majority of the species used for restoration are obtained through field collection. This activity is regulated by permit but difficult to monitor. Thus, over-collection and subsequent damage to wetland populations have occurred in some areas. Resistance has increased against allowing damage to donor aquatic/wetland plant populations. For example, as of late 1995, harvesting of three over-collected native aquatic species including *Sagittaria kurziana* from

Figure 1. Rapid plant production by micropropagation.

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Florida public lands for the purpose of direct sale is now prohibited. Future restrictions limiting collection of other species will likely lead to increased dependence on sustained harvesting from more restricted populations on private lands (so-called "in-ground nurseries") and nursery production of containerized plants. This trend raises issues related to those species targeted for use in wetland restoration/mitigation.

Wetland Plant Propagation: Issues & Realities

Nursery production for restoration/mitigation often raises two ecologically important concerns: 1) the lack of knowledge and maintenance of genotypic diversity *within* vegetatively propagated species and 2) the potential negative results following introduction of genetically inappropriate plants to revegetation sites. The latter is also a concern when wild-harvested bare-root transplants are used. Some regulatory agencies have attempted to set guidelines that limit plant collections of either bare-root transplants or propagules for nursery production from populations within a set radial distance

Figure 3. Basal shoot buds of Pontederia *used to establish cultures.*

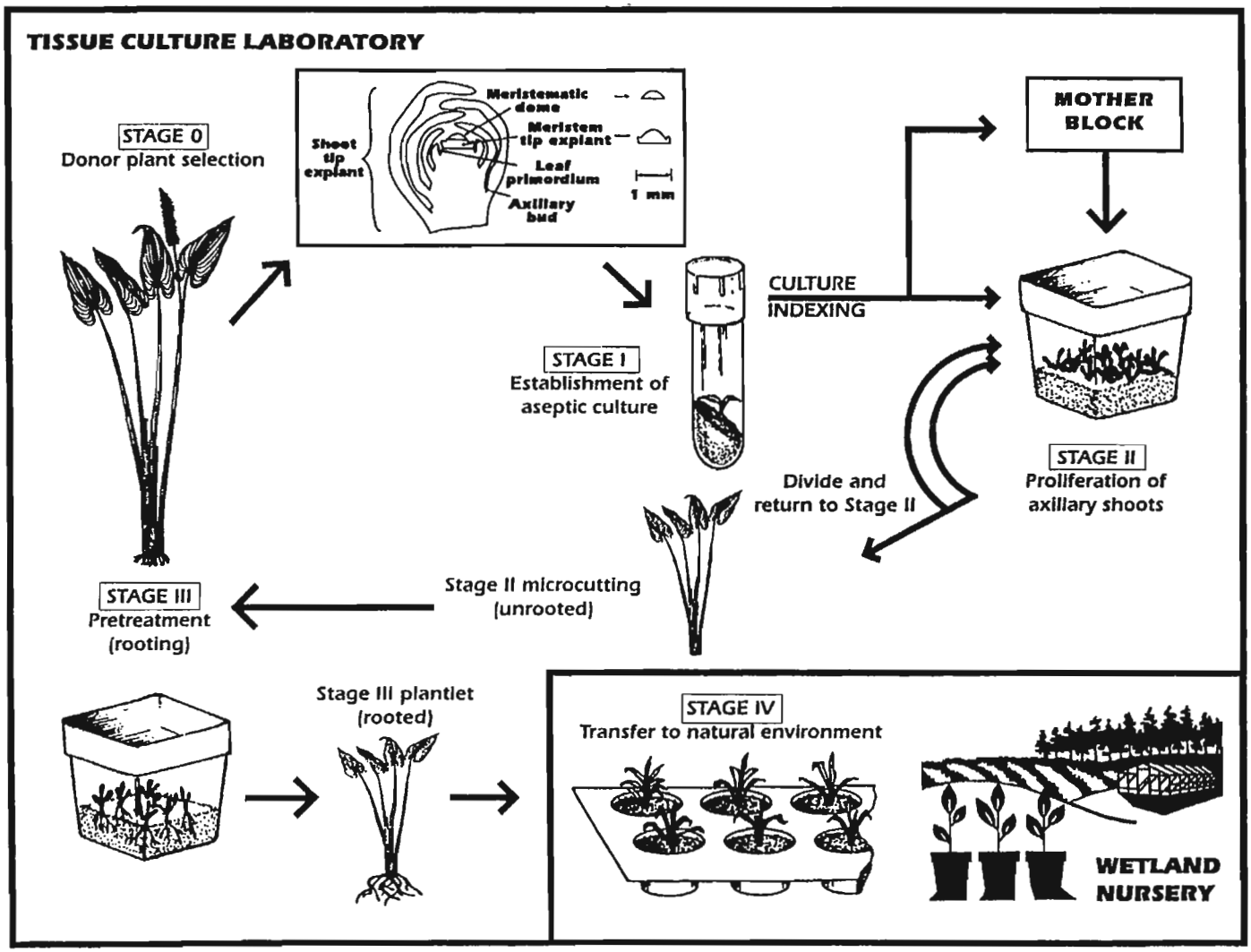

Figure 2 (flow chart). Micropropagation stages for Pontederia

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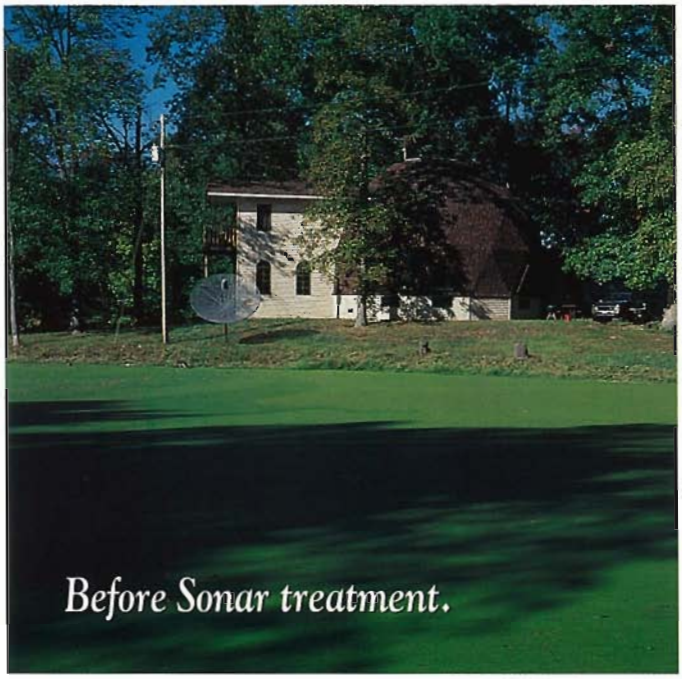

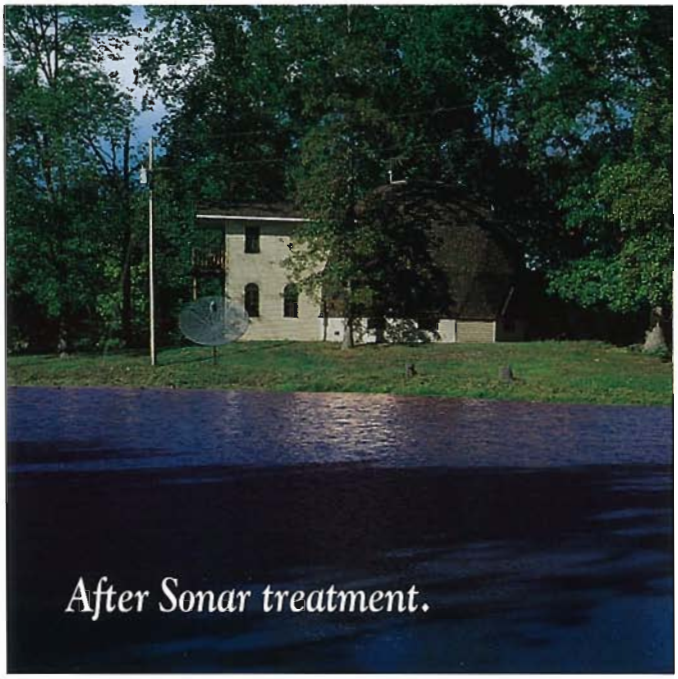

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Figure 4. Stage I shoot culture of Pontederia.

from each project site. Revegetation projects strictly specifying use of plant materials obtained on-site are becoming more prevalent.

The reality is that limiting collecting distance alone does not ensure that physiologically adaptable plants will be used. Studies of freshwater and saltmarsh species indicate that morphologically and physiologically distinct populations (ecotypes) can develop over short distances in response to habitat differences. Reciprocal transplant studies using mature freshwater wetland plants from localized populations have shown that limited adaptability (no survival) to changes in water depth and soil type can occur in transplants from some populations whereas transplants from other populations have wider adaptability. Thus, the practice of selecting and propagating ecotypes from populations physiologically "matched" to particular site conditions may more effectively ensure restoration/mitigation project success.

How will nurseries face the challenge of producing these "specialized" plants? Clearly, more efficient propagation methods will be required for selection, rapid production, reliable scheduling and extended storage of species and specific ecotypes. Toward this

Figure 5. Stage II shoot multiplication can be achieved in various culture vessels.

Figure 6. Stage III rooting of Pontederia.

Figure 7. Three-week-old rooted plantlets.

end, Dr. Dave Sutton at the University of Florida's Fort Lauderdale Research and Education has developed many efficient propagation aquatic /wetland plants procedures. These challenges probably cannot be met using traditional propagation methods alone. One solution could be the complementary use of plant micropropagation technology for wetland-plant production.

What is Micropropagation?

Plant micropropagation is the rapid vegetative multiplication of plants in culture vessels on a sterile nutrient medium under controlled light and temperature conditions in a laboratory (Figure 1). This technique is also called ***in vitro*** ("in glass" under sterile conditions) **propagation** or commonly **plant tissue culture**. The technique is used to efficiently produce many commercially valuable plants including ornamental plants. In fact, with 17 commercial micropropagation

laboratories, Florida is the biggest commercial producer of tissue cultured plants in the country. Most foliage plants that you might purchase in your local garden shop are produced this way. Benefits of the micropropagation process include rapid year-round production and long term storage. The question has been: Can the technology be applied to wetland plant production? Since 1989, we have examined the feasibility of this approach through laboratory and greenhouse research conducted in the Environmental Horticulture Department at the University of Florida. We have successfully developed micropropagation procedures for numerous herbaceous wetland plants including *Pontederia cordata* (pickerelweed) and *Sagittaria latifolia*.

Micropropagation Stages

What exactly does micropropagation process involve? There are four sequential stages required for the micropropagation. These stages are described in Figure 2 for *Pontederia*. Shoot buds are cut from the basal stem of a selected donor plant (Figure 3). The shoot tips are then surface sterilized in a dilute bleach solution to kill all surface microorganisms (bacteria and fungi) and then inoculated (Stage I) into a sterile enriched medium contained in glass culture tubes. The culture medium consists of mineral salts, sucrose, vitamins and plant-growth regulators to promote shoot growth. Cultures are grown under cool-white fluorescent lamps on culture benches in temperature controlled rooms. At this stage, each shoot tip grows out into a branched shoot (Figure 4). Stage I cultures that pass a sterility check (culture indexing) for the absence of microorganisms are transferred into larger culture vessels containing a Stage II medium that promotes rapid shoot multiplication. A variety of Stage II culture vessel sizes and shapes are available for use (Figure 5)

In Stage II, each cultured *Pontederia* bud produces a compact cluster of about 9 unrooted shoots

Figure 8. Survival and vigorous growth of various micropropagated Pontederia *genotypes 14 weeks after outplanting in a mitigation wetland in central Florida.*

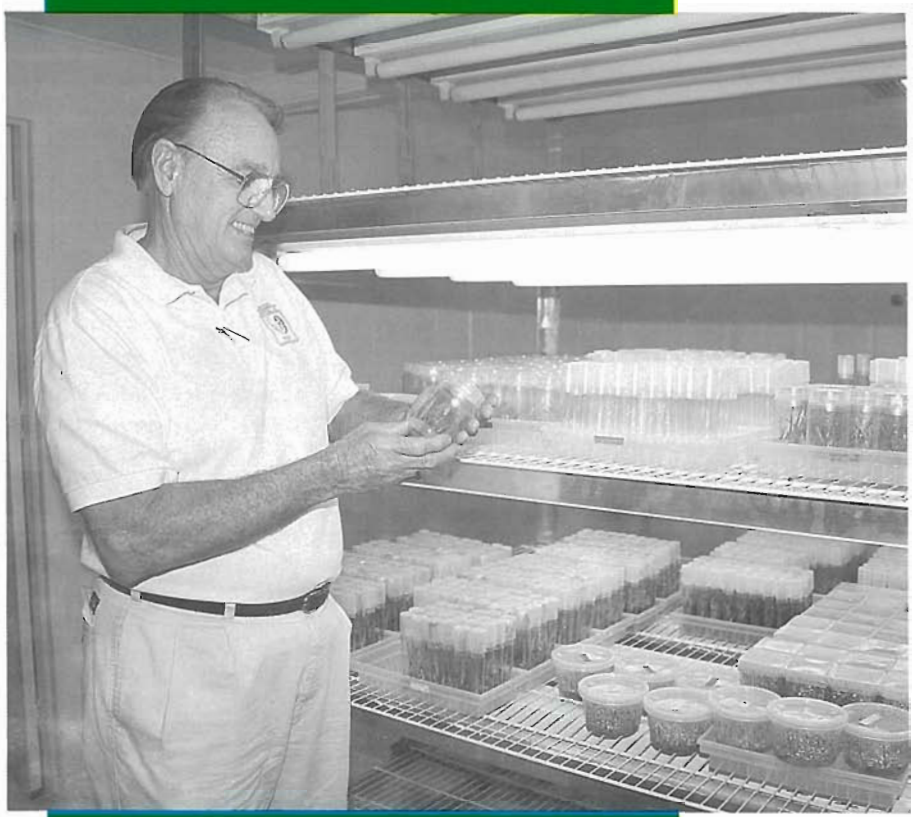

Figure 9. Commerical wetland micropropagation laboratory, Otto Bundy, Sr. President Horticultural Systems, Inc.

after 28 days. Stage II cultures are routinely divided and subcultured onto fresh medium to increase the number of cultures. Once cultures are established, more than 1200 shoots per ft² of culture bench space can be produced every 28 days! Another benefit is that *Pontederia* can be stored as slow growing mother block cultures at 38°F for up to 14 months without transfer. This allows the long term storage of a "living library" of wetland plant genotypes.

Depending on the wetland species, the shoot clusters produced during Stage II may be subdivided into individual unrooted **microcuttings** and transferred directly into soil (Stage IV). With *Pontederia*, 100% survival is achieved when microcuttings are first pre-rooted in sterile medium before being placed in soil (Figure 6). Rooted plantlets are removed from culture, rinsed, and then placed in plug trays containing a soilless potting medium. The trays are placed in the greenhouse under intermittent mist for 7 days and gradually moved over a 3-week period from partial shade to full sunlight. After 3 weeks a well established and vigorously growing plant is produced (Figure 7). Plants are ready for outplanting by the sixth week.

The Acid Test

One often stated myth is that tissue cultured wetland plants are weaker and more susceptible to disease than plants propagated by other methods. To dispel such myths, since 1990, we have planted more than 10,000 micropropagated *Pontederia* in several long-term mitigated wetland studies in central Florida and compared their growth with that of bare-root transplants. Except for several plants that literally floated away after planting, our survival rate has been 100%. Plant growth has been phenomenal (Figure 8)! Studies in which we examined the interaction of planting density and water fluctuation on establishment and growth of Florida *Pontederia cordata* genotypes indicate that genotype greatly influences adaptability to planting elevation and establishment.

Is Wetland Plant Micropropagation Feasible?

Our research indicates that it is. The micropropagation of diverse but adaptable genotypes of wetland species that are usually vegetatively propagated or wild collected would ensure planting diversity. The ability to rapidly produce and store extensive "libraries" of wetland-plant species and ecotypes originating from different regions of the United States will have a significant impact on how wetland plants are marketed. Plants selected for their unique capacity for nutrient, heavy metal or organic uptake will also be useful for custom designing artificial wetlands for effluent treatment. Finally, the availability of ecotypes adaptable to specific habitat conditions will facilitate eco-physiological studies of the factors affecting plant survival and growth performance following revegetation. Besides supplying plants, this "test tube baby" technology should help transform the art of wetland restoration into a science.

Is Wetland Plant Micropropagation A Commercial Reality?

Over the past three years two commercial wetland plant micropropagation laboratories in Florida, Horticultural Systems, Inc., Parrish and Great Explanttation, Inc., Alachua and one in Pennsylvania (Ecoscience, Moscow) have been constructed and are poised to capitalize on this emerging technology (Figure 9). These and other laboratories can be expected to quickly expand the palette of wetland plants available for habitat restoration.

So, is it One Word, Two Words, or Hyphenated?

By
David Girardin
St. Johns River Water Management District
Palatka, Florida

So, it all started like this. I was sitting in my office contemplating my navel one day, when I came across a memo to me from the senior editor of the grand exalted office of the executive director of the St. Johns River Water Management District. It seems that one of the authors in the Environmental Sciences Division was questioning why waterhyacinth and waterlettuce were being written as one word and not two.

As I read the memo, it slowly dawned on me that not only did I not have the foggiest idea why two perfectly good words had been combined into one word, but I also do not understand the internal workings of the Ford coil. But because Ford Motor Company no longer puts a coil on their cars, I decided to research why waterhyacinth and waterlettuce were now one word.

My first move was to call the grand wizard of useless information at the University of Florida, Center for Aquatic Plants, IFAS, Dr. Ken Langeland. Of course, he was not in his office that day because he had slipped out the back door early in the morning just after reporting to work for a grueling day of fishing somewhere along the Gulf Coast. After several days of trying, however, I did catch him in his office. The only reason I was able to contact him, I later found out, was that he was asleep at his desk when I called. After several minutes of conversation, punctuated by yawns and grumbling, Ken agreed to fax me the relevant pages of the Council of Biology Editors (CBE) Style Manual, Fourth Edition, which was published right after the end of the War of Northern Aggression. This revered document clearly stated that potatoes were to be boiled for 30 minutes, mixed with the mayonnaise, salt, and cumin, then... No! No! that was the other revered document. The correct revered document stated, "Compound common names of plants may be hyphenated, run together, or appear as two words. Many botanists prefer to hyphenate the term or run the two elements together when the second part of the name *is not* taxonomically correct (for example, "cotton-grass" or "cottongrass") and to separate the elements when the second part *is* taxonomically correct (for example, "beach grass" because it is a grass)." Obviously, cottongrass is not a grass. I guess.

Ken, also, sent me a copy of the Weed Science Society of America's composite list of weeds. Herein was listed the industry standard, and both plants were one word (waterhyacinth and waterlettuce), because neither is a hyacinth or lettuce. I guess.

So, I gathered up my CBE sheets and my composite list and skipped over to the Taj Mahal to do battle with the evil editor. As I presented my evidence that all along the plant gurus had been right and just in their decision to spell these two words as one word, the editor calmly noted, "That is the fourth edition of the CBE and we now have the sixth edition." "So what!" I shouted. "I mean, how much difference could there be?" A lot, it turns out.

Well, it seems that now the grand poo-bah of the royal order of the CBE wants all such words hyphenated. "If a 2nd word is not taxonomically correct, it is hyphenated to the preceding word.

- Douglas-fir [not a fir]
- poison-oak [not an oak of the genus *Quercus]*
- skunk-cabbage [not in cabbage family]" Whatever all that means—?

Now I don't know how many of you have ever been on a boat, trapped in the cabin during a rainstorm in 6-foot seas with cabbage cooking, but I can tell you right now that skunk-cabbage might just be a good name for <u>that</u> stuff.

Well, back to the saga of the missing hyphen. Additionally, this sixth edition of the CBE states, "If a

group name consists of words that have 2 or more syllables, or if either element of a pair has 3 or more syllables, the name is hyphenated."

- evening-primrose
- morning-glory
- water-hyacinth
- water-lettuce

So I called the great swami of the Center for Aquatic Plants back and told him of these new developments. His immediate response was "Well, I'll be damned." I just love it when these guys talk science stuff. Ken, however, assured me that he would get in touch with the editor of the *Journal of Aquatic Plant Management*, Dr. W. T. Haller, and the committee chair of the search for new and more exotic vernacular names of plants of the Weed Science Society, Dr. Frank Forcella, for their comments. Dr. Haller's comments were mostly un-printable, except for the part about that pinhead Girardin from the water management district trying to create more trouble for him again. Dr. Forcella's, response was, "Well, I'll be damned." (It seems this science talk is catching.) "I guess we'll have to take this issue up at the next meeting. Say, when do you think that those intellectuals at CBE are going to make up their minds about anything?"

So for now, and to wrap things up, the general consensus is that waterhyacinth and waterlettuce will remain one word until the three industry standards—the University of Florida, Center for Aquatic Plants, IFAS; The *Journal of Aquatic Plant Management;* and the Weed Science Society of America—say to change them. So there!

Gee! I wonder what the fifth edition of the CBE had to say? Or what the future 8th edition might suggest. Anyway, one word, two words, or hyphenated, the only good waterhyacinth is a dead-water-hyacinth.

Editor's note: For those of you using Word Perfect, I just found out that the spell checker makes waterhyacinth two words, unhyphenated, which is incorrect by anyone's standards.

"Dwarf Papyrus" → NOT!

by
Kathy Craddock Burks
Bureau of Aquatic Plant Management
Florida Department of Environmental Protection (FDEP)

The flowerhead form of the exotic C. prolifer makes it a standout amongst our sedges. (Photo by K. C. Burks)

A sedge available in Florida as a water garden ornamental—carrying the moniker Dwarf Papyrus and sometimes the Latin label *Cyperus haspan*—*is* actually neither. The plant commonly carrying this nickname in Florida is definitely not a dwarf form of papyrus (*Cyperus papyrus* L.), nor is it a cultivar, form, or variety of C. *haspan* L., a pantropical species considered native to Florida. The correct Latin name for the species is *Cyperus prolifer* Lam. (synonyms include C. *isocladus* Kunth and C. *aequalis* Vahl). It is native to eastern and southern Africa, includingTanzania, Zanzibar, Mozambique, and South Africa (Thiselton-Dyer 1902, Khkenthal 1935).

Ordinarily, such a misapplication of a Latin name is not a matter of huge consequence. This one probably derives from ambiguities in horticultural references: "Cyperus haspan viviparus . . . maybe C. *prolifer*" (Graf 1976, 1985) and "Cyperus papyrus . . . 'Nanus': C. *isocladus*" (Bailey and Bailey 1976). However, in this case, correct identification of the plant as an exotic is worth attention, because the species has entered the flora of Florida (Carter et al. 1996) and could become a concern for managers of our waterbodies.

Naturalized, spreading populations of C. *prolifer* were first documented in 1993 by FDEP regional biologist Dave Demmi in three lakes surrounded by residential development in Highlands County: Francis, Huntley, and Lotela. Identification of a sample was confirmed by a specialist in sedge taxonomy, Richard Carter of Valdosta State University. One lakeside homeowner was so distressed that an innocent small planting had expanded into "strong colonies" she obtained a permit to control the population chemically. About the time she thought she had nearly eradicated it, she discovered several more colonies elsewhere on the lakeshore. In 1994, Demmi found a naturalized population in a fourth waterbody, Crooked Lake, also in Highlands County. Although some patches have been treated with herbicides, populations still exist in these lakes. Last year, FDEP regional biologist Rob Lovestrand reported two populations naturalized in Pasco County:

in King Lake and in a canal adjacent to a cypress strand, both in the Land O'Lakes area.

As the species name implies, the plant proliferates vegetatively as well as by seed. A new clump of more than a dozen stems can arise from just one old inflorescence that has fallen over into the water and taken root. Specimens of C. *prolifer* in our Tallahassee lab garden have also overwintered well (with some cold-weather browning), suggesting its adaptability above the frost line in Florida.

The species is fairly easy to distinguish in the field. Look for a stoutish *Cyperus* sedge (to 0.6 m or so in height), with many flowering stems and few or no leaves (it has mostly bladeless sheaths, brownish in color), and with no conspicuous leafy bracts subtending the inflorescence (it has bracts, but they're quite small). The inflorescence is distinctive: it has many slender, short primary rays, or branches (as many as 50-100), all of nearly equal length. (The native C. *haspan* has far fewer rays, of unequal length, often with secondary forking, and it usually has at least one noticeable leafy bract, about as long as the inflorescence.)

Occurrences of C. *prolifer* as an escapee from cultivation may not be limited to Highlands and Pasco Counties. It is available by catalog and has been known to be for sale in Big Pine Key, Miami, Winter Park, Sarasota, and Tallahassee. If you run across a naturalized population of "Dwarf Papyrus," please contact our office at (904) 487-2600. We would be glad to verify its identification and document its location.

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Southern Armyworm, *Spodoptera eridania* (Lepidoptera: Noctuidae),

Defoliation of Marsh Plants in Brevard County, Florida.

by Marc C. Minno, Kimberli J. Ponzio, and Kenneth L. Snyder
St. John's River Water Management District
P.O. Box 1429
Palatka,Florida 32178

Cuda (1995, *Aquatics*, vol 17(4):4-8) recently noted that larvae of the southern armyworm (*Spodoptera eridania* (Cramer)) periodically defoliate mats of floating pennywort (*Hydrocotyle ranunculoides* L.). Last summer, we observed large numbers of southern armyworm larvae feeding on water pennywort (*Hydrocotyle umbellata* L.) and southern water hemp (*Amaranthus australis* (A. Gray) Sauer)) in southern Brevard County. The site is the southern-most portion of the Three Forks Marsh Conservation

Figure 1. Southern Armyworm

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Griffin

Area, informally known as the Mary A Tract. This 2,500 acre property lies approximately 5 miles north of Blue Cypress Lake. Historically, the Mary A Tract was contiguous with the upper St. Johns Marsh, but had been diked and drained for pasture and row crops. The St. Johns River Water Management District acquired the property in 1985. Agricultural fields on the Mary A Tract were recently flooded in an attempt to restore the fresh water marshes that formerly covered the area. However, beginning in March 1995, the water was temporarily lowered to slightly below the ground surface in order to kill noxious weeds such as water hyacinth *(Eichhornia crassipes* (Mart.) Solms)) and hydrilla *(Hydrilla verticillata* L. O. During the drawdown, water pennywort and southern water hemp became very abundant.

On a visit to the Mary At Tract on 21 June, 1995, we surveyed about four acres on foot and found southern armyworm larvae to be very abundant in a few patches (Fig.1). The marsh was very dry due to lack of rain and high summer evapotranspiration rates. The caterpillars had eaten the leaf blades from the water pennywort, leaving only the petioles, in a patch about one half acre in size. Southern water hemp plants in an area about one quarter acre in size were also defoliated (Fig. 2) with only the midribs, petioles, and stems intact. Cuda's feeding studies demonstrated that southern armyworm larvae grew more slowly on water pennywort than on floating pennywort in the laboratory. Our observation of southern armyworm larvae causing severe defoliation to water pennywort under natural conditions suggests that the slower growth may not be ecologically significant.

Figure 2. Pigweed eaten by Southern Armyworm.

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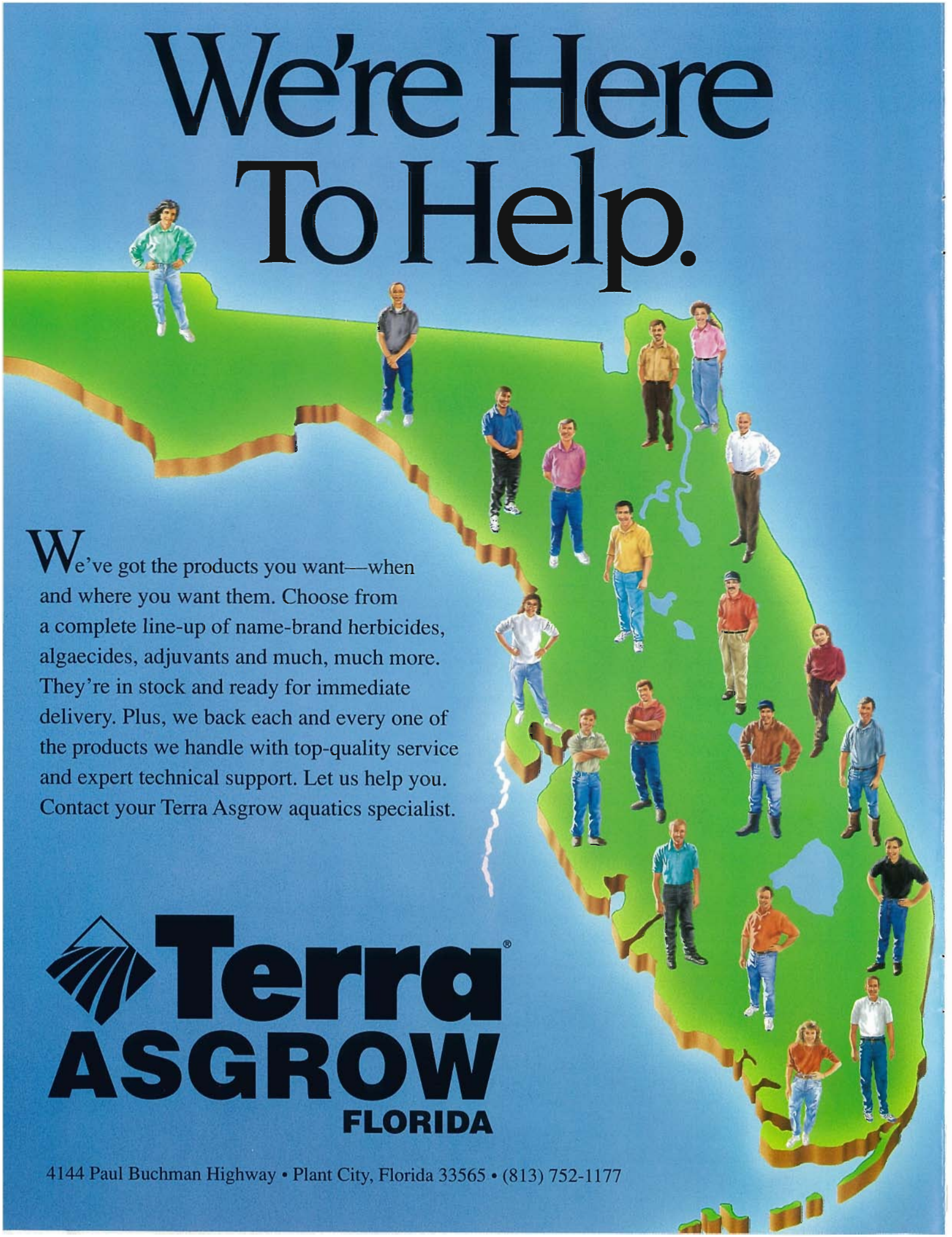

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AQUAVINE

Training Manual Cover Receives "Gold Award"

Aubrey Wynne, Billie Hermansen, and David Dishman, graphic artists for IFAS Media and Educational Services, received a "Gold Award" in the Agricultural Communicators in Education awards program, for the cover desighn of our "Aquatic Pest Control Applicator Training Manual." The cover, a computer enhanced photograph, described by the judges as "—energy and movement, which would make you want to open it up and read.—" was chosen from 403 entries. The manual, IFAS publication SM-3 can be purchased from: IFAS Publications Office, University of Florida, PO Box 110011, Gainesville, FL 32611-0001 (352/392-1764).

New Graduate Students at the CAP

Some new faces that you will see at this year's annual meeting are new Graduate Students at the IFAS Center for Aquatic Plants. Jennifer Gallagher, a Biological Sciences Graduate from Clemson, is interested in ecology and management of invasive wetland plants and will be persuing a Masters degree in Agronomy/Weed Science. Chance Dubose, another Clemson graduate (where are all these Clemson grads coming from?), with a degree in Wildlife, will be working on ecology and methods of filamentous algae control and persuing a degree in Agronomy/Weed Science with a minor in Fisheries and Aquatic Sciences. Mike Netherland, who has

FINAL Call for Papers - FAPMS 1996 Annual Meeting

October 8 - 10, 1996 are the dates. The Sheraton Harbor Place Hotel, Fort Myers is the place. And NOW is the time to submit your paper for the 20th Annual FAPMS Meeting. Don't be shy, this is our 20th meeting, so let's make it special, and that means hearing from YOU!

NOTE: DEADLINE FOR SUBMISSION IS July 31, 1996

Title:_____ _____

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Author(s):_____

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Abstract (75 words or less, to aid the program committee):

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Check as appropriate:

Applicator paper _____ You need: Slide projector _____ ;

Overhead projector _____ ; video projector _____.

Submit this form to: **Alison Fox - 1996 Program Chair**
Center for Aquatic Plants
7922 NW 71st Street,
Gainesville, FL 32653
Tel: (352) 392 1808;
Fax: (352) 392 1840

a Masters Degree in Botany from Perdue University will be working on physiology of hydrilla tuber dormancy/sprouting and persuing a PhD in Agronomy/Weed Science with a minor in Botany.

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For everyone else, the program with booklet costs $15.00 plus tax, shipping and handling. Order from IFAS Publications, University of Florida, IFAS Building 664, Gainesville, FL 32611-00001, (352) 392-1764. Specify IFAS Videotape #VT-1236

Visit Our Homepage

The Center for Aquatic Plants, University of Florida now maintains a homepage and access to APIRS, the Aquatic Plant Information Retrieval System on the Web. Our internet address (URL) is: http://aquat1.ifas.ufl.edu/

MEETINGS

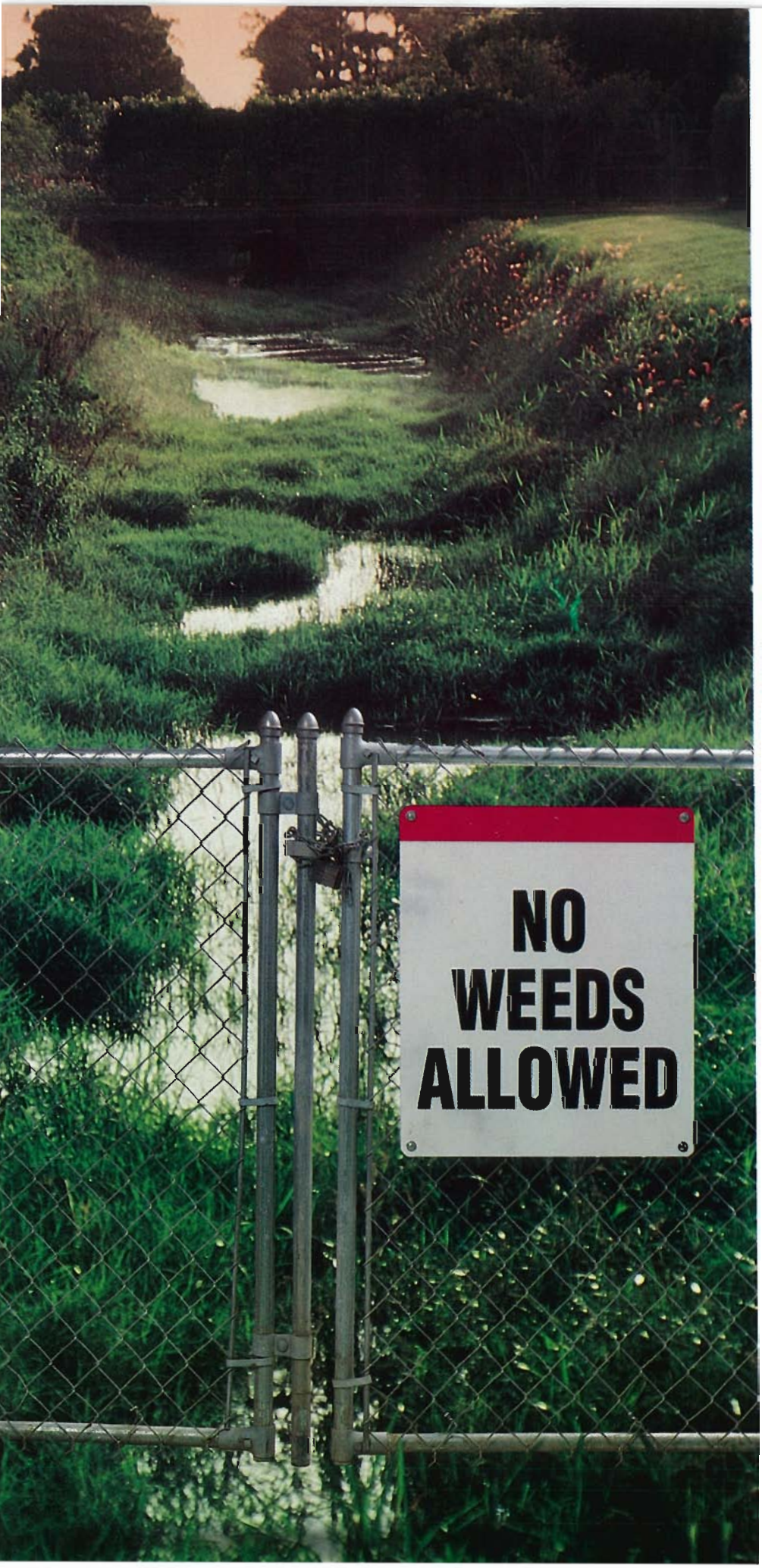
South Carolina Aquatic Plant Management Society Annual Meeting, Springmaid Beach Recreation and Conference Center, Myrtle Beach, South Carolina, August 21-23, 1996. Contact Tommy Bowen 704/874 5442.

Florida Aquatic Plant Management Society Annual Meeting, Sheriton Harbor Ploace Ft. Myers, Florida, October 8-10, 1996. Contact Don Doggett, President 941/694-2174.

Midsouth Aquatic Plant Management Society Annual Meeting, Gulf Shores, Alabama, October 16-18, 1996. Contact Stan Cook 334/242- 3883.

North American Lake Management Society 16th Annual International Symposium "People, Lakes, and Land," Minneapolis, Minnisota, November 13-16. Contact NALMS at 303/781-8287.

Southern Weed Science Society of America 1997 Annual Meeting, Hyatt Regency, Houston, TX , Jamuary 19-10. Contact Ann Weise, Rhone-Poulenc; 2609 Schooner, Plano, TX 75074.



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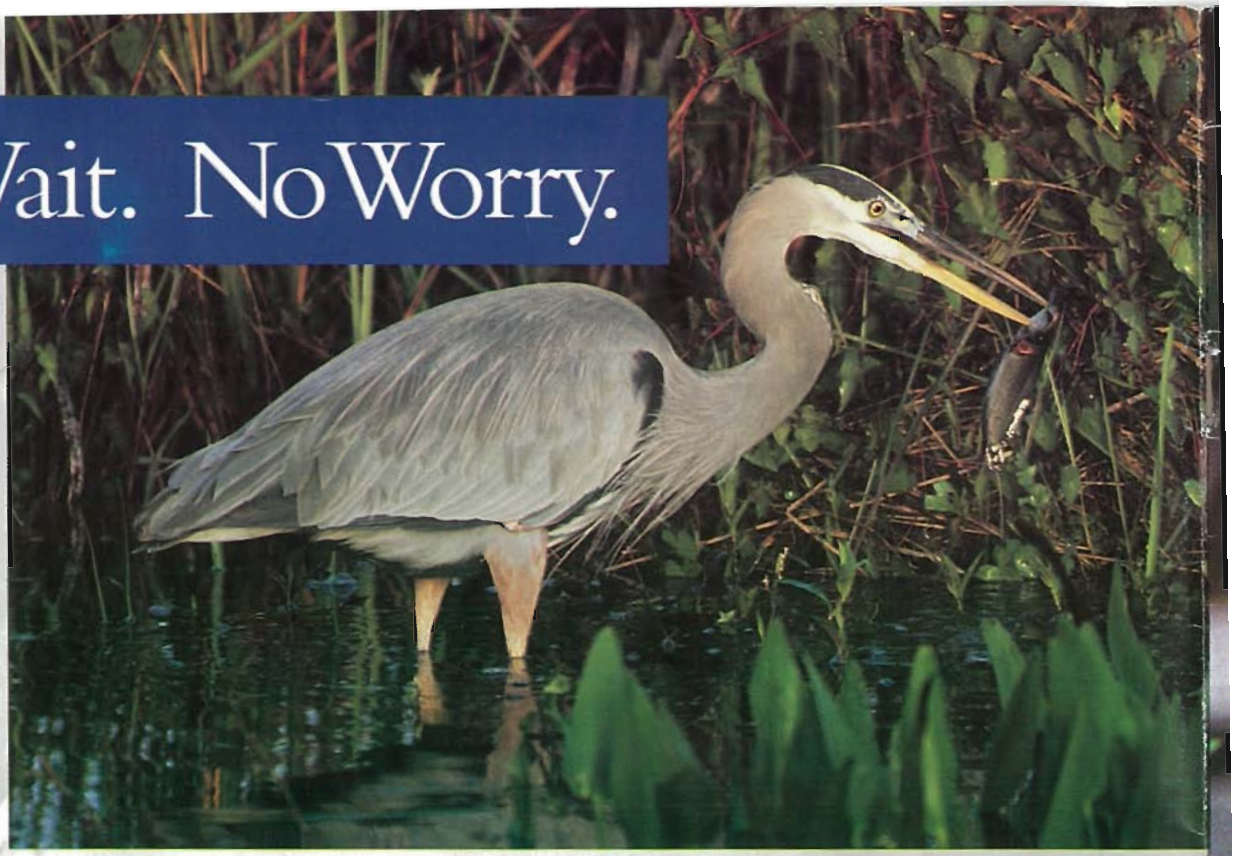

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