



# Aquatics

Spring 1996

Bulk Rate  
U.S. Postage  
PAID  
Tallahassee, FL  
Permit No. 407

# QUALITY PRODUCTS FOR WATER QUALITY

## Algae and Aquatic Weed Control and Maintenance Products



A patented, concentrated liquid formulation for use in contained lakes and ponds. EPA registered for aquatic plant growth control. Contains a blend of blue and yellow dyes to block out specific light rays critical to photosynthesis. No restrictions on swimming, fishing, irrigation or stock watering. Leaves water a pleasing blue color.



A patented, concentrated liquid algaecide with a wide range of labeled use sites. Contains chelated copper which stays in solution to continue controlling a broad range of algae well after application. No water use restrictions following treatment.



A granular chelated copper algaecide ideally suited for treatment of bottom growing algae and spot treatments along docks, beaches, boat launches and fishing areas. Controls growth before it reaches the surface.



A liquid aquatic herbicide that effectively controls a broad range of underwater, floating and emergent aquatic weeds. Kills quickly on contact. Ideal for small area treatments.



A granular aquatic herbicide which selectively controls some of the most troublesome aquatic plants such as water milfoil, coontail, and spatterdock. Gradual release and systemic action ensures complete kill of the entire plant.



A liquid chelated copper algaecide formula in a concentration suitable for dosing stock water tanks, troughs and small ponds. Treated water can be used immediately for stock watering.



The exact formulation of Cutrine-Plus Liquid, but labeled specifically for use in fish and shrimp aquaculture facilities. Provides use instructions for ponds, tanks and raceway systems.



A dilute Aquashade formulation in 2 oz. and 8 oz. packaging for ornamental applications in garden ponds, fountains and aquariums. Provides algae control at a drop per gallon or one ounce per 1,000 gal.



A silicone defoamer to suppress, eliminate and prevent foaming within a wide variety of systems. Use in pesticide spray mixtures, industrial ponds, fountains and even water park rides.

Available From Quality Distributors Throughout the United States and Worldwide



applied biochemists inc

SURFACE WATER / SPECIALTY PRODUCTS



People and products dedicated to algae control and aquatic weed problems

6120 W. Douglas Ave. • Milwaukee, WI 53218 • 1-800-558-5106

LETTER TO THE EDITOR

Following in my father's footsteps, I have made something of an avocation restoring old homes. At the time of purchase, most have been eyesores (handy-man specials in the understated jargon of realtors) in otherwise respectable surroundings. Each had fallen into disrepair, some desperately so, because of inadequate maintenance.

Although reasons for loss of maintenance repair vary; insufficient funds, inclement weather, distractions or other priorities, ignorance, negligence or just plain apathy, the results are usually the same; a habitat with diminished usefulness or value requiring extensive restoration. Managers of these properties did not intend to run them down, but through the years had become accustomed to or comfortable with the deterioration and saw little reason to improve their condition. I have never lived in a house for more than a few years after completing a renovation, but even in those short periods it becomes evident that without continuous maintenance, all of the effort and expense of restoration is soon lost.

Waterhyacinth/waterlettuce control is analogous to home repair. Successful management requires frequent inspections and prompt maintenance to prevent today's problems from becoming tomorrow's crises. In 1964, T.W. Miller, Jr., Director of the Lee County Waterhyacinth District, explained the benefits of "...continued surveillance in order to prevent (waterhyacinth) infestations from getting out of hand." In the same year, W.E. Wunderlich, Chief of the U.S. Army Corps of Engineers (Corps) aquatic growth section in Louisiana, observed that "All those engaged in this important work realize only too well that any let up in the present (waterhyacinth control) activities would result in a very short time to the return to the nightmarish conditions of yesteryear."

The nightmarish conditions to which Mr. Wunderlich referred were the 266,000 acres of waterhyacinth infesting southeastern waters in 1959 (half of that in Florida). At the same time, the Corps had completed a five-year pilot project testing the effect of year-round, frequent waterhyacinth control operations in reducing the devastation caused by waterhyacinth. The project was deemed a success. The strategy was adopted and evolved into today's maintenance control philosophy.

Few managers remain from the days when waterhyacinth choked Florida waterways, but it is contingent upon the current generation of managers to preserve the low level of floating plants achieved by our predecessors. To that end, maintenance control is not just an honorable notion - it is the law. The Department of Environmental Protection and the Corps have made floating plant management the highest priority and fund control of these plants above all others in Florida public waters. An excellent example of a maintenance control program is conducted by the Lake County Mosquito and Aquatic Plant Management Division. One full time and one auxiliary crew manage 41 water bodies covering more than 68,000 acres of water. Although 27 water bodies contain waterhyacinth or waterlettuce, only 5.1 acres were reported during the 1995 survey; the largest population covered less than

*Continued on page 20*



*Sagittaria stagnorum* provides an attractive bloom of showy white flowers on the littoral shelf of this Sarasota water retention pond. Photo by John Rodgers, DEP, Tampa, FL.

# Aquatics

Spring 1996/Vol. 18, No. 1



## CONTENTS

**Spatterdock-Understanding a Neglected Native**  
by Brian Smith, Ken Langeland and Neil Hill ..... 4

**Please Help Us Find Aquatic Soda Apple.**  
by Alison Fox and Andrew Wigginton ..... 11

**When Bad News is Good News: Searching for Lyngby Management**  
by Elsie D. Gross and Dean F. Martin ..... 17

**Aquatic Herbicide Applicator Certification**  
by Ken Langeland and O. Norman Nesheim ..... 18

<b>FLORIDA AQUATIC PLANT MANAGEMENT SOCIETY</b>	<b>Editor</b> Ken Langeland IFAS/Center for Aquatic Plants 7922 N.W. 71st Street Gainesville, FL 32653-3071 (352) 392-9614, SC 622-9614, Fax (352) 392-3462	Tallahassee, FL 32310 (904) 488-5631, Fax (904) 488-1254  Vera Gasparini, Director (2nd Year) 4169 Leafy Glade Place Casselberry, FL 32707 (800) 207-1440  Ed Harris, Director DEP 5882 S. Semoran Blvd. Airport Business Center Orlando, FL 32822 (407) 275-4004 or SC 343-4004 Fax 275-4007	<b>Auditing</b> Keshav Setaram (407) 836-7400  <b>Awards</b> John Teevans (941) -597-1505  <b>By Laws</b> Francois Laroche (941) 687-6193  <b>Equipment Demonstration</b> Steve Smith (941) 357-4011  <b>Governmental Affairs</b> Mike Hulon (407) 846-5304  <b>Historical</b> Bill Haller (904) 392-9615  <b>Local Arrangements</b> Shelly Redovan (941) 694-2174  <b>Mailing List Coordinator</b> Jackie Smith (407) 791-4720  <b>Merchandising</b> Kieth Andrew (941) 694-2174  <b>Nominating</b> Bria Nelson (904) 796-7211  <b>Program</b> Alison Fox (941) 392-1808  <b>Publicity</b> Ernie Feller (407) 847-5067  <b>Scholarship</b> Joe Joyce (904) 392-1971
<b>OFFICERS AND DIRECTORS, 1995</b>	<b>President</b> Don Doggett Lee County Mosquito Control 13060 Idylwild Rd Ft. Myers, FL 33905 (813) 694-2174, Fax (813) 694-6959  <b>President Elect</b> Ernie Feller 80 South Hoagland Blvd. Kissimmee, FL 34741 407/847-5067 FAX 407/847-7429  <b>Secretary</b> Nancy Allen, USACE APCOSC, Crystal River P.O. Box 387 Crystal River, FL 34423 (352) 795-2239, Fax (352) 795-1082  <b>Treasurer</b> Catherine Johnson 688 Andover Circle, Winter Springs, FL 32708 (407) 380-2024 Fax (407) 359-1237  <b>Past President</b> Mike Hulon, GFC 600 N. Thacker Ave., Suite A-1 Kissimmee, FL 34741 (407) 846-5304, Fax (407) 846-5310	<b>DIRECTORS-AT-LARGE</b>  Keshav Setaram, Director (3rd Year) Orange Co. Environmental Protection Dept. 2002 E. Michigan St. Orlando, FL 32806 (407) 836-7400, SC 356-7400, Fax (407) 836-7499  Ron Hyatt, Director (3rd Year) 8700 Gardenia Dr. Seminole, FL 34647 (813) 391-0856 Fax (813) 319-2299  William Christian, Director (3rd Year) East Volusia Mosquito Control District 600 South Street New Smyrna Beach, FL 32168 (904) 428-2871, Fax (904) 423-3857  Jeff Schardt, Director (1st Year) DEP Innovation Park, Collins Building 2051 East Dirac Drive	Steve Smith, Director (1st Year) South Florida Water Management District Okeechobee Field Station 1000 NE 40th Ave Okeechobee, FL 33472 (941) 357-4011 Fax (941) 467-9086  Brad Mann 100 NE 40th Ave. South Florida Water Management District Okeechobee, FL 33416 (941) 357-4030 FAX (941) 467-9086  Jay Heidt aqua-terra Services Inc. PO Box 6698 Seffner, FL 33584-6698 (813) 654-1790 Fax (813) 654-1790  <b>COMMITTEE CHAIRS</b>  <b>Advisory Committee</b> Representative, Ken Langeland (352) 392-9614

The Florida Aquatic Plant Management Society, Inc. has not tested any of the products advertised or referred to in this publication, nor has it verified any of the statements made in any of the advertisements or articles. The Society does not warrant, expressly or implied, the fitness of any product advertised or the suitability of any advice or statements contained herein.  
 1996 FAPMS, Inc. All rights reserved. Reproduction in whole or in part without permission is prohibited.  
 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.



Figure 1. Spatterdock (*Nuphar* spp.) in flower and fruit development.

# SPATTERDOCK

## ↳ Understanding a Neglected Native

by

Brian Smith, Ken Langeland and Neil Hill

IFAS/Center for Aquatic Plants/Department of Agronomy University of Florida

### Introduction

Ken Smith and his young son Chance were quietly combing through the spatterdock leaves on Orange Lake looking for holes in the stems. Chance would yell to his dad every time he saw one and his father would come to the bow of the boat, peel back the stalk, and pick out the 'bonnet worm'. When they guesstimated a hundred were in the coffee can they motored to

their favorite bream area and started fishing. Insects, birds, fish, and fisherman all love spatterdock. Various insects have evolved life cycles around the emergent and submerged habitat provided by spatterdock. Waterfowl feed on the abundant seed produced and wading birds use the leaves like platforms to hunt insects and small fish. The shade from the leaves and a tangle of submersed stems give

some protection to small fish and fry, but also are feeding zones for predatory fish. In soft bottomed lakes, fish, such as bass and bream, supposedly use the rhizomes that anchor the spatterdock for spawning sites. With so much aquatic activity revolving around spatterdock, its no wonder fisherman target spatterdock too.

Spatterdock (*Nuphar* spp.) is also called yellow cow-lilies, water

# Algae control we can all live with...thanks to HYDROTHOL 191.

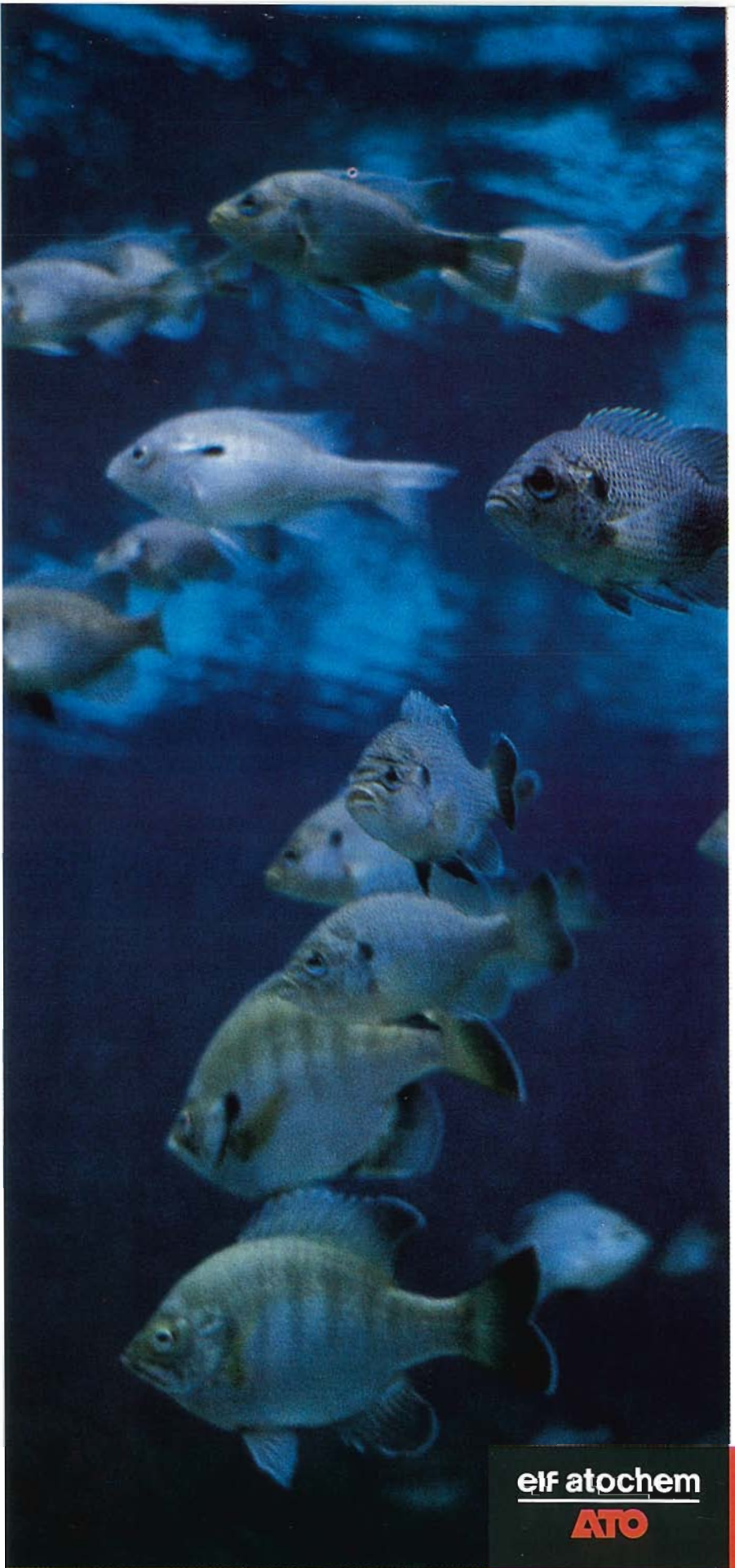
When you need to control algae in your lake, pond or canal, you want an algicide that's effective without being hazardous to fish or other aquatic life forms. That's why you should rely on HYDROTHOL® 191 Aquatic Algicide and Herbicide.

HYDROTHOL 191 works quickly on contact against Cladophora, Pithophora, Spirogyra and Chara. In both still and moving water. And, when applied at the recommended 0.2 ppm, HYDROTHOL 191 won't kill fish.

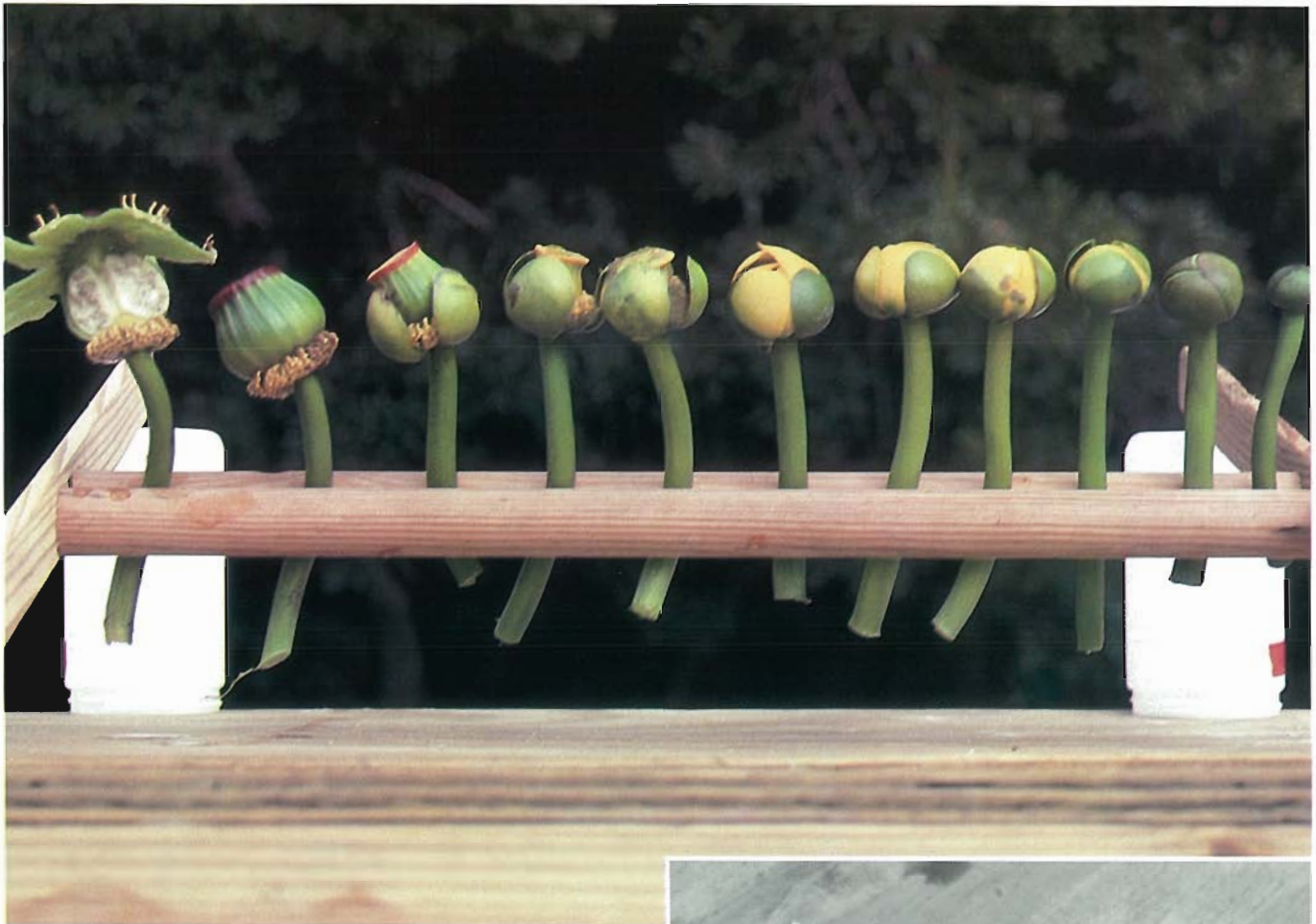
HYDROTHOL 191 is broken down by microorganisms into naturally occurring by-products based on the elements carbon, hydrogen and oxygen. It won't leave residues, accumulate in the hydrosol or the food chain, or discolor your water.

As with any chemical product, you should read and follow label instructions carefully. Application by a certified applicator is recommended. We've taken great care to provide the information needed to help you enjoy algae free water in an environmentally compatible way. Talk to your distributor or Elf Atochem Representative today about HYDROTHOL 191.

Elf Atochem North America, Inc.  
Three Parkway, Philadelphia, PA 19102.  
215-587-7219.



elf atochem  
**ATO**



Above: Figure 2. Developmental stages of spatterdock from bud formation, flower, fruit maturation and seed release..

Right: Figure 3. Mature spatterdock fruit releasing seed sac.



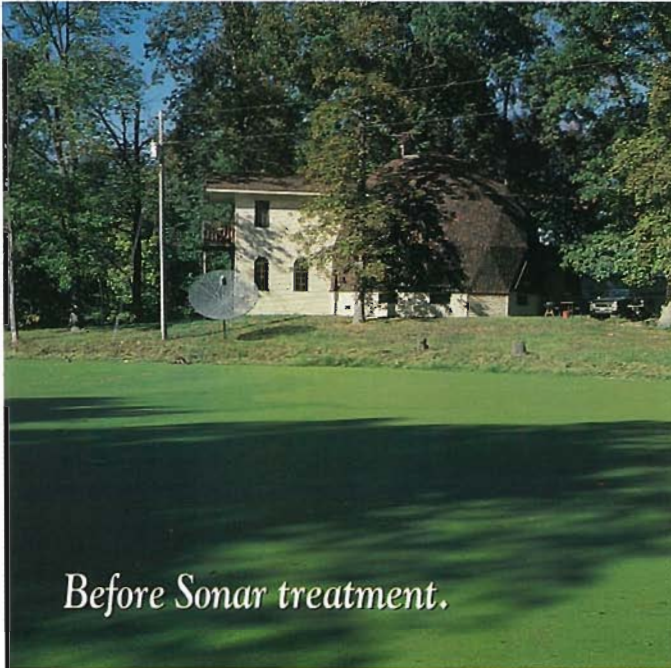
lilies, bonnets, nuphar, and pads. Spatterdock is found throughout Florida in habitats ranging from small ponds to large lakes and drainage canals to slow & moving rivers. The plant is easy to identify with its large heart shaped leaves and unique yellow flowers (Figure 1). Spatterdock is described botanically as a large, perennial aquatic herb with alternating submersed, floating, or emergent heart shaped leaves. Flowers are present in late spring through early fall and are borne at or above the water surface. They are noted for having a few thick green to yellowish green petal-like sepals and many bright yellow petals. Spatterdock is anchored to the bottom by long thick rhizomes which can measure greater than six inches in diameter.

Lake Griffin, one of five lakes in the Ocklawaha chain, in Central

Florida has experienced a dramatic change in the spatterdock population. In 1953, spatterdock occupied 50% of the lake surface but declined to <1% in 1992. Reasons for this disappearance are not understood. However, plans to draw down lake Griffin in 1992 led to interest in re-establishing spatterdock communities and the need for methods of propagation. In small areas, such as aquascapes, rhizome sections are used for planting. However, for a large area, using rhizomes would be impractical due to the difficulty and destructive nature of collecting rhizomes from another habitat, the bulk of the material, preventing spoilage of tons of rhizomes, and

because rhizome sections float, which causes difficulty in anchoring thousands of sections to the lake bottom. Due to these foreseen problems, studies were focused on the potential of using seed for revegetation. Seed would be easier to handle but using them posed some questions. How does one collect seed? What are the temperature, light, and sediment requirements for seed germination and seedling growth and development? Can seed be stored and if so what is the best manner?

# The reasons to treat Duckweed with Sonar® are perfectly clear.



*Before Sonar treatment.*



*After Sonar treatment.*

## Nothing works better on Duckweed.

Left uncontrolled, Duckweed can ruin a lake or pond. With just one application, Sonar controls Duckweed for up to two years. No other aquatic herbicide is more effective on Duckweed.

## Environmentally friendly.

While Sonar is deadly for Duckweed, it won't harm fish and animals that live in and around your pond. Plus, Sonar has no recreational restrictions on water use after application so you can swim, boat and fish safely.

## Easy to use.

Sonar is quick and easy to apply. It takes just five minutes to treat an acre of water.

## Proven effective on most aquatic weeds.

Sonar is also effective on difficult-to-control weeds like milfoil, hydrilla, waterlily and pondweed. The choice of professionals for

years, Sonar is the most effective and cost-efficient treatment you can buy for the selective, long-term control of undesirable weeds.



**Call today.** If Duckweed has destroyed the beauty of your pond or lake, clear things up with Sonar, or for a **FREE** 8-page Sonar Brochure and to learn where you can purchase Sonar, call:

**1-800-419-7779.** Internet: <http://www.sepro.com>

Or clip this coupon and mail or fax to:  
 SePRO Corporation  
 11550 North Meridian Street, Ste. 180  
 Carmel, IN 46032-4562  
 fax 1-317-580-8290



NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

DAYTIME PHONE ( ) \_\_\_\_\_

POND \_\_\_\_\_ LAKE \_\_\_\_\_ SIZE IN ACRES \_\_\_\_\_

TYPE OF WEED PROBLEM \_\_\_\_\_

## Seed Collection

In the wild, spatterdock produces a fruit on the flower stalk, the fruit develops (Figure 2), and once mature splits from the base upwards releasing gelatinous seed sacs which float for one to three days (Figure 3). The seed sacs then burst and release seed to the lake bottom. Spatterdock produces seed from late spring through early fall so there is no specific period when mass seeds are released. Therefore, it is impractical to search large expanses of spatterdock for free floating seed sacs, because they are never present in large numbers and time consuming to locate. However, it was found that seed can be collected by picking fruit from the wild and allowing the fruit to after-ripen in water containment. It was best to select only mature fruit for collection because immature fruit did not develop seed once detached from the stalk. Mature fruit have orange to red mottles on the crown, distended side walls and the sepals have been shed (second from left Figure 2). After-ripening is a process best done in containment in order to facilitate seed collection. The mature fruit can be floated for one to two weeks until seed are deposited to the bottom. After this, miscellaneous fruit debris are skimmed, decanted, and/or rinsed from the mature seed. Mature seed are dark green to black and about the size and shape of popcorn kernels (Figure 4). One fruit can produce 80 to 250 seeds with an average of 185 seeds per fruit. Approximately, two gallons of seed can be collected from 48-60 quarts of mature fruit. Notably, large populations of 'rat-tailed maggots' [*Tubifera* sp.] can occur during the after-ripening apparently developing from eggs deposited on or within the fruit. Furthermore, the rotting fruit emits a foul odor within a week.

### Temperature Requirements

Once a seed source was secured, the next step was to determine the



Figure 4. Collected spatterdock seed.

temperature requirements for germination. flowing water thermocline was set up at the U.S. Fish & Wildlife facility in Gainesville, FL. The thermocline was calibrated to provide a constant temperature gradient of 10 to 30 C (50 to 77 F). Seeds were placed in the thermocline in 2.5 C temperature intervals and left undisturbed for one month. Nuphar did not germinate at or below 12.5 C (54 F). Germination was best at 25 C (77 F) with > 80% germination. It was also found that fresh seed, as compared to seeds stored in refrigeration, germinated best.

### Sediment Requirements

Lake Griffin is a muck bottom lake with dark water. Could the Nuphar seedlings develop in the

muck and grow in the limited light? Core samples collected from other Nuphar communities in Rodman Reservoir, Orange Lake, and the Suwannee River found Nuphar growing on a sand substrate overlain with a thick layer of flocculent organic matter. Studies using various mixtures of sand and peat suggested Nuphar germinated and developed best when the peat content was 33% or more. Nuphar would grow on sand but germination was significantly reduced. Presumably, Nuphar would grow in the muck bottom.

### Light Requirements

To determine the influence of light quantity on Nuphar growth, pre-germinated seed were planted in peat and placed in aquaria filled



with water. Aquaria were set under greenhouse conditions of 20 to 25 C (68-77 F). The aquaria were variously shaded to reduce the natural light by 62, 72, 89, 96, 98, and 99%. Growth was evaluated over a 290 day period. In the first month, shade did not effect growth and development. However, as the study progressed the plants growing under 96 to 99% light reduction grew best (increase in biomass). After six months, plants growing under <96% shade became stressed and by the end of the study all those plants died. Plants growing under 96% or more shade maintained a healthy green color and had excellent root development. The growth rate of Nuphar was extremely slow. After nine months, plants averaged only 6 cm tall and had a shape resembling miniature leaf lettuce, which is often referred to as the 'cabbage stage'. The slow growth rate was observed in other studies as well. Information gathered from the light studies indicate that during early development Nuphar is best suited for low light environments. Dark conditions, such as found on the lake bottom, do not appear to be restrictive to Nuphar establishment.

**Seed Storage**

When large quantities of seed are required, seed storage may be necessary. Nuphar seed were stored dry in paper bags, damp in plastic containers with moistened towels, and wet in sealed bottles filled with water to determine the best conditions for storage. Dry seed lost viability quickly and damp storage had fungal problems and was difficult to maintain. Seed stored wet can be kept one month at room temperature (68 F) without a significant loss in seed viability (75% germination). The best manner to store seed long-term was wet at 5 C (42 F), however, seed viability dropped from 75% to 25% when stored six months. When long term storage is expected, refrigeration is necessary because seed stored at room temperature germinated and rotted in storage. More detailed

studies are necessary to best maintain seed quality in storage. For example, the temperature range needs to be narrowed down and the influence of pH and plant growth regulators on stored seeds should be investigated.

**Seedling Growth**

There is a high degree of variability in the growth and development of Nuphar which appears to be genetic. Some seedling will remain submerged in a rosette less than two inches tall for over nine months, while others planted at the same time and under identical conditions will produce emergent leaves and grow relatively quickly. Planting many seeds/seedlings seems necessary to compensate for seedling variability and natural mortality. Transplanting single seedlings is not only tedious but can cause tremendous damage to a very fragile seedling. In order to

minimize handling damage it was best to transplant small mats of dense Nuphar seedlings, similar to sod. Furthermore, it seemed mats of Nuphar seedlings, which had been fertilized and maintained healthy, had an advantage over single seedlings started from seed.

As in the case of any study, a few questions were answered but many were posed. For example, how long or how much growth must occur before the first rhizome is produced? What stimulates the production of the first emergent leaf? Can Nuphar seedlings be selected for fast growth and development? How does water quality influence Nuphar communities? The challenge of always having new questions to investigate is what keeps the field of aquatic plant sciences interesting.

Published as IFAS Circular AGR 94.

**1996 SCHOLARSHIP GRANT**

The South Carolina Aquatic Plant Management Society is seeking applications for its annual scholarship grant. If an appropriate applicant is found, the Society will award a \$2,000 grant at its Annual Meeting in August 1996. Grant funds may be used by the recipient to cover any costs associated with education and research activities.

Eligible applicants must be enrolled as full-time undergraduate or graduate students in an accredited four year college or university in the United States. Course work or research in the area of aquatic plant management or aquatic ecology related to the Southeast is also required.

Applications must be received no later than April 1, 1996 and will be evaluated on the basis of relevant test scores (ACT, SAT, GRE, etc.), high school and/or college grades, quality and relevance of research or course work a proposed budget, information obtained from references, and other related considerations. Other factors being equal, preference will be given to applicants enrolled in Southeastern and South Carolina academic institutions.

The successful applicant may be requested to present an oral report on research activities at the Society's Annual Meeting.

Persons interested in applying for the scholarship grant should contact Danny Johnson, S. C. Department of Natural Resources, 1201 Main Street, Suite 1100, Columbia, South Carolina 29201, phone (803) 737-0800 for additional information on application procedures.



Aquatic soda apple stem with elongate leaves and clusters of green, immature fruit.

# Please Help Us Find Aquatic Soda Apple.

by

Alison Fox and Andrew Wigginton  
Center for Aquatic Plant, UF/IFAS

7922 NW 71st Street, Gainesville, FL 32653

## Introduction

There can be few vegetation managers in Florida who have not heard about Tropical Soda Apple (*Solanum viarum*) and the problems that this "weed from hell" is causing in pastures and other upland sites. Those of us who deal primarily with aquatic and wetland habitats must have been relieved to hear that tropical soda apple doesn't tolerate flooding and so is not a threat to our state's extensive wetlands. Well, don't relax too much. One of the more recent weedy immigrants to Florida is a very close relative, Aquatic Soda Apple (*Solanum tampicense*).

Despite its name, aquatic soda apple is found in wetland habitats, not necessarily tolerating continuous flooding, and its fruits are pea-sized berries rather than the larger "apples" of species such as *S. viarum*. These two features are among the:

### Distinguishing characteristics of aquatic soda apple.

1. Aquatic soda apple occurs in regularly flooded **wetlands** such as along rivers and in cypress domes. It does not grow in uplands such as pastures or oak hammocks where tropical soda apple and other weedy *Solanum* species occur.
2. Leaves are **elongate** (up to 6 inches long and 1 to 2 inches wide) with **indented** edges and **prickles** on the veins of both leaf surfaces.
3. The sprawling **stems** are up to 1/2 inch wide and **6 to 15 feet long**, and are covered in **curved prickles**. The leaf and stem prickles snag and interlock so that the relatively

insubstantial individual plants bend and tangle together to create a robust and impenetrable thicket. Aquatic soda apple stems can clamber over small trees and bushes up to a height of 15 feet.

4. **White and yellow**, tomato-like **flowers** develop into clusters of up to 11 **berries**, each 1/4 inch in diameter. These turn from a solid green to orange and finally to deep **red** as they ripen. This fruit size and the solid green immature color distinguish this species from most other prickly members of the *Solanum* genus.

## Locations

Aquatic soda apple is believed to originate from Mexico, the West Indies, and Belize. It was first reported in Florida in **Charlotte County**, in a marsh south of **Punta Gorda**, in 1983. Property owners at **Fisheating Creek Wildlife Refuge (Highlands Co.)** first noticed this species in the cypress swamp along the creek in 1985 and this is now one of the largest (possibly up to 150 acres) and densest populations known in Florida. This infestation probably extends eastward towards



Path cut through a solid stand of aquatic soda apple at Fisheating Creek.

Lake Okeechobee into Glades Co.

Aquatic soda apple was identified along the Peace River near Arcadia (DeSoto Co.) in 1991 and is now known to infest many of the local tributaries of the Peace River. Most recently, aquatic soda apple was reported in Lee Co. in a cypress head off Daniels Road, south of Ft. Myers. Confirmation of this site also led to its discovery in the nearby Six Mile Cypress Slough County Park.

The currently known locations of aquatic soda apple are all within a fairly limited area of adjacent counties in southwestern Florida: Highlands/Glades; DeSoto; Charlotte; Lee. It is important to determine whether this plant has spread outside this area. If not, a critical management objective should be, at minimum, to contain it within this area.

**The Problem**

The large number of prickles on aquatic soda apple and its ability to form dense stands make it an unwanted inhabitant of areas in which people require access to water resources. In situations where there was previously little understory vegetation, such as the cypress swamp along Fisheating Creek, the presence of aquatic soda apple has significantly changed the habitat. It is still not certain exactly what impacts this may have on wildlife utilization.

It has yet to be established how competitive this species is with other plants, so its potential for invasion and ecological impacts in vegetated sites is not precisely known. However, its presence among ferns in parts of the Fisheating Creek site, and amongst a variety of wetland species in the cypress head in Lee County, indicate that aquatic soda apple can invade and survive within existing vegetation.

Being an exotic species, it is important that its potential for invasion and domination in various types of wetland habitat be determined. The identification and description of all sites containing

# VEGETATION SEDIMENTS SAND SLUDGE



## VERSI-DREDGE®

*The Proven Value.*

Designed specifically for cleaning lakes, ponds, lagoons, marinas, waterways, etc., the VERSI-DREDGE transportable hydraulic dredge will remove submerged sediments with less water than traditional heavy equipment. The VERSI-DREDGE is a cost-effective and efficient approach to underwater solids removal.

Job proven in aquatic vegetation, sludge, sand, fly ash, coal fines and most other sediments, the VERSI-DREDGE excavates to 22 feet and can pump up to 1 mile without a booster, depending on material and elevation.

The VERSI-DREDGE is portable, and can be towed behind a truck. For further information on the VERSI-DREDGE and our complete line of technical and customer support services, please call **1-800-800-4010** or FAX us at 1-913-829-2989.

Financing and rental available.



**IMS**

**INNOVATIVE MATERIAL SYSTEMS, INC.**  
Dredges, Pumps & Pumping Systems  
Olathe, Kansas, U.S.A.

\* Patent Pending

**NEW!**  
The IMS WEEDMASTER\*  
cutterhead for removing cattail,  
floating weed masses,  
milfoil & hyacinth.

aquatic soda apple is a vital part of this evaluation process and the quicker we can decide how significant a threat this plant will be, the quicker and more cheaply we can take effective action to control it.

## Biology

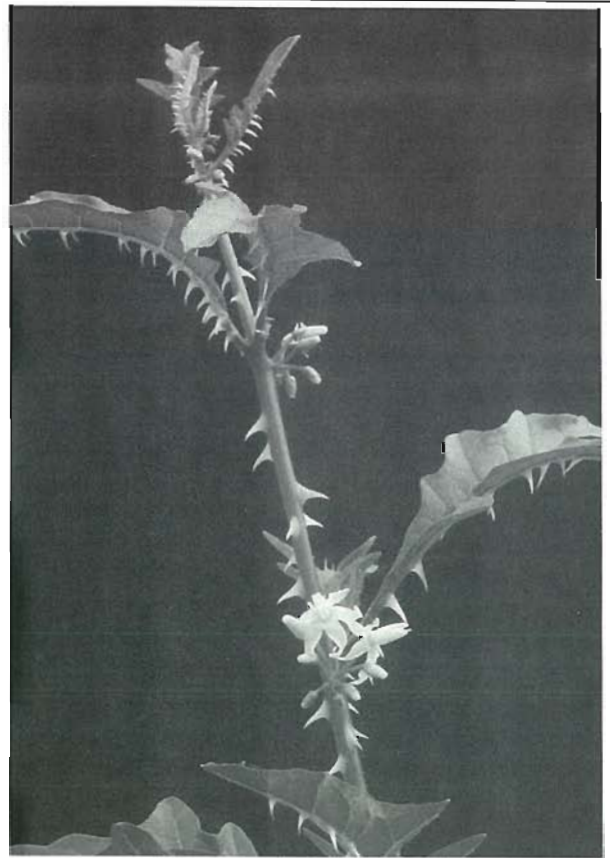
A few isolated plants at Fisheating Creek grow in full sunlight, but most aquatic soda apple appears to grow in the shade of the cypress canopy. Plants in the sun tend to have smaller leaves, more prickles and greater flower and fruit production. Such plants may produce up to 250 berries a year, with a total of over 8,500 seeds. Under suitable conditions, over 90% of these seeds can germinate, even after several months of storage or freezing. Although the rate of seed production is much reduced for shaded plants (only 350 seeds per year), there is no doubt that aquatic soda apple is very capable of reproducing from seed. These seeds may also survive from year to year in the soil.

Aquatic soda apple plants appear to be very susceptible to frost damage. Even plants protected by shade cloth, in large pots, or in water-saturated soil were completely killed by two periods with temperatures below freezing in Gainesville. However, the freezing tolerance of the seeds indicates that in north Florida this species would behave as an annual plant. It survives as a perennial plant in areas that do not experience frosts.

In addition to reproduction and dispersal via seed, aquatic soda apple plants can regenerate from stem sections that are placed in soil or water. Sections as short as 1 inch can produce leaves and roots, if the section includes a leaf scar and, hence, a dormant bud. Regrowth from cut stumps is also possible, if a stem length of at least two inches protrudes from the ground. Aquatic soda apple does not appear to have rhizomes, nor is it capable of regenerating from root sections, as tropical soda apple can.

## Control

Mechanical control is unlikely to be effective in the types of wetland habitats affected, and manual removal would require cutting stems to ground level. Small scale herbicide tests have indicated that glyphosate and 2,4-D are effective at maximum labelled rates, but further tests are needed to establish lower rates, the least unpleasant application methods (remember the prickles), and to evaluate impacts to non-target plants. Triclopyr also shows promise but it is not currently registered for aquatic sites. Long-term manage-



Flowers and prickles on aquatic soda apple.

## INTRODUCING SunWet™ NONIONIC SPRAY ADJUVANT

SunWet is a new generation, natural spray adjuvant that's kind to the environment while still doing a terrific job enhancing performance of postemergence herbicides. SunWet increases wetting and penetration of herbicides so you get better control of aquatic weeds, nuisance vegetation and undesirable brush.

Call your local distributor or

**800-228-1833**

 **BREWER  
International**

P.O. Box 6006 • Vero Beach, FL 32961  
Toll-Free: 800-228-1833 • Fax: 407-778-2490

Made from a 100% blend  
of Methylated Sunflower Oil  
and Emulsifiers

sprout in cleared areas. Several pathogens and insects have been found damaging aquatic soda apple, and we hope that if long-term management is needed we may benefit from the biological control efforts being directed towards tropical soda apple.

**Conclusions**

There is a dilemma for researchers and vegetation managers who work with exotic species that are new to our state. If little is known about a plant, it is difficult to predict how much of a problem it might become. Thus, there is an immediate need to gather information about basic biology and management methods. It is also most cost effective to control, even attempt to eradicate, a species when its distribution is still limited. If a plant is a recognized problem in other countries (as *Mimosa pigra* is in Australia) there should be no hesitation to immediately give priority to such research

and control efforts. If such prior experience does not exist, however, as in the case of aquatic soda apple, there is a hesitation to create panic, and potentially "cry wolf". But too much delay can result in unacceptable expansion of an infestation.

There are many research and management questions that we need to address before we can confidently predict what impact aquatic soda apple might have in Florida, and before we can determine how to eliminate it. We have made a start in answering these questions but for part of our progress we need help.

We ask that YOU help us find this plant. If, after reading the description above again, you think that you have located aquatic soda apple, please contact your regional DEP biologist, who we ask to contact Alison Fox, fax:(352) 392 1840. Be prepared to **identify the location** and extent of the plants, if possible try to

**provide a sample** of leaves and flowers or fruits, and be sure **not to spread it**.

We hope that we do not find aquatic soda apple outside south-west Florida, but we need as many people as possible to be looking for it. Establishing an accurate map of it's current distribution will go a long way towards estimating the potential threat that aquatic soda apple poses to our precious wetlands.

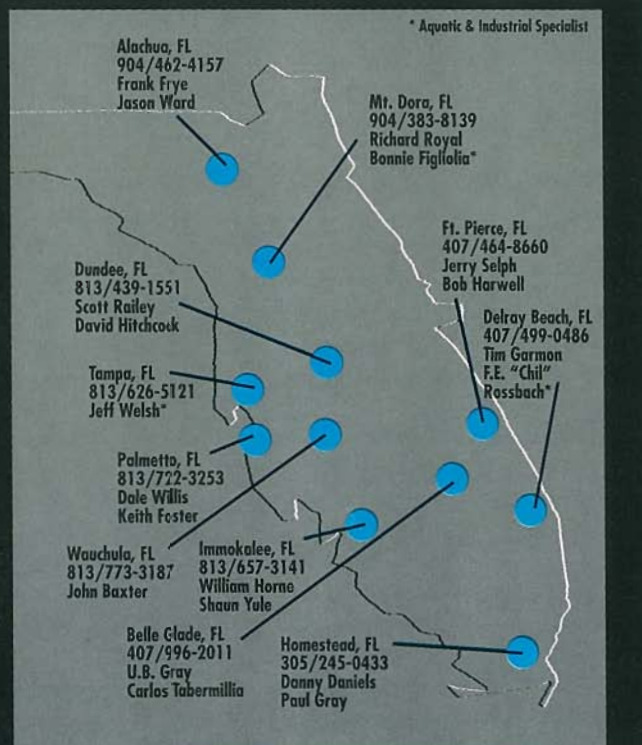
**Acknowledgements**

Preliminary studies were funded by a Research Project Enhancement Award from the Office of the Dean for Research at UF/IFAS. The cooperation of the owners of the Fisheating Creek Wildlife Refuge, Margaret Glenn, Brian Smith, Neil Hill and colleagues at UF, and Jackie Smith with DEP is greatly appreciated.

# Aquatic Weed Control Products From Helena Chemical Company

**Complete Line of Herbicides Including:**  
 Aqua-Kleen® Aquathol® Hydrothol® K-Tea™ Komeen®  
 Reward® Rodeo® Sonar® Weeder®  
**Complete Line of Adjuvants Including:**  
 Agri-Dex® Foamer™ Induce® Kinetic®

Aqua-Kleen® and Weeder® are registered trademarks of Rhone-Poulenc Ag Co.  
 Aquathol® and Hydrothol® are registered trademarks of ELF Atochem.  
 K-Tea™ and Komeen® are registered trademarks of Griffin Corporation.  
 Reward® is registered trademark of Zaneca Professional Products, a business unit of Zenca Inc.  
 Rodeo® is a registered trademark of Monsanto Agricultural Products Co.  
 Sonar® is a registered trademark of DowElanco Products Co.



**HELENA** People...Products...Knowledge...

Helena Chemical Company • 2405 N. 71st St • Tampa, FL 33619

# When Bad News is Good News: Searching for Lyngbya Management

by

Elsie D. Gross and Dean F. Martin  
 Institute for Environmental Studies  
 University of South Florida  
 Tampa, FL 33620

## Introduction

We had a disagreement with colleague a year or so ago. Considering the complexity of chemistry and chemists, that's not hard to understand. In this case, however, our disagreement was over the importance of negative results. We thought that a negative result (*Lyngbya majuscula* doesn't produce a chelator) was good news (we have a chance at another method for controlling). Our nameless faculty member didn't agree then, probably doesn't now, but we hope that you might see things differently. We think that the news makes for an interesting and optimistic story.

Let's tell it, and see what you think.

## Lyngbya as a Nuisance Aquatic

First, let's meet (or re-meet) the enemy.

Lyngbya, a benthic, filamentous blue-green alga (cyanobacterium) causes significant problems in natural waters of the southeast United States (Beer et al., 1986; Lembi, 1986; Speziale et al., 1988, 1991; Speziale and Dyck, 1992). In Florida, filamentous algae constitute the sixteenth most abundant aquatic plants in a 1988 survey (Schardt, 1989), and *L. majuscula* was one of seven algae in this group. Control of this species is difficult and relatively high concentrations of copper are required for its management. According to Schardt (pers. comm., 1990), no algicide licensed in Florida effectively controlled Lyngbya.

The control of Lyngbya is desired

for several reasons, including maintaining the favorable state of a lake. Lyngbya can form dense mats contributing to the eutrophication of freshwater lakes (Canfield and Hoyer, 1988; Canfield et al., 1989) and contributing to the buildup of plant detritus that can fill lakes and choke streams (Schardt, 1989). Excessive amounts of cyanobacteria in a lake can favor survival of rough fish over sport fish, decreasing the ecological and recreational value of the lake (Williams et al., 1985)

## Lyngbya as a miniature chemical factory

Lyngbya is a producer of chemicals that chemists find interesting. And control of Lyngbya is desirable as a means of controlling the chemicals that it produces. *Lyngbya* spp. produce geosmin (1,10-trans-dimethyl-trans-9-decanol), an earthy, moldy smelling compound first isolated from a culture of Streptomyces (Gerber and Lechevallier, 1965). Geosmin and methylisoborneol can be responsible for the muddy taste in surface water supplies (Gosselin et al., 1989) and off-flavor in catfish (Persson, 1984). Finally, during periods of abundant growth, geosmin, elaborated by floating mats of Lyngbya can be released into the air causing irritation of human respiratory membranes (Persson, 1984).

*Lyngbya* spp. also produce other chemicals including skin irritants that cause dermatitis or swimmers itch (Moikeha et al., 1971). A causative agent, Lyngbyatoxin A, was isolated from *Lyngbya majuscula*

growing at Kahala Beach, Oahu, Hawaii (Cardellina et al., 1979). Lyngbyatoxin A is also a potent tumor-promoting agent (Fujiki et al., 1984). Other tumor promoters, aplysiatoxin and debromoaplysiatoxin, were isolated by Kato and Scheuer (1974, 1976).

*Lyngbya* spp. also produce some useful compounds, that have antiviral, antibacterial, and cytotoxic effects (Martin et al., 1994).

Cyanobacteria, like *Lyngbya* spp., are able to produce complicated molecules called siderophores; these substances can chelate ferric iron, and change it from an insoluble compound like iron hydroxide to a water-soluble form that the organism can use. The ability to chelate iron is measured by the equilibrium constant for the reaction leading to the formation of the metal-chelate compound. One of our better chelating agents is called EDTA (it's added to some beers to prevent undesired cloudiness, and it may be added to blood samples, as mentioned in the Simpson trial), and it has an equilibrium constant of  $10^{25}$ , which is impressive, as constants go.

Siderophores, or natural chelators, fall into two groups. One group (the hydroxamates) has formation constants of  $10^{29}$  while a second group (catecholates) have formation constants of about  $10^{32}$  (Roughly, a million-million-million-million better) (Neilands, 1966).

What good are siderophores? Murphy and coworkers (1966) suggested that hydroxamate siderophores produced by cyanobacteria may antagonize the

growth of other microalgae and can be a factor in so-called blue-green algal blooms. These workers noted that twice in a eutrophic lake, the sudden dominance of cyanobacteria coincided with the production of siderophores and rapid uptake of iron. The increased demand for iron seemed to result from high rates of nitrogen fixation (the critical enzyme, nitrogenase, contains iron and molybdenum). Siderophores possibly act as carrier molecules transporting iron across membranes (Neilands, 1966; Armstrong and van Baalen, 1979; Cline et al., 1982; Munson, 1982).

There may be useful products that can be isolated from *L. majuscula*, but the present concern is focused on gaining information leading to potential control. One possibility is to limit the plant growth by controlling the availability of an essential element. We examined the iron dependence of the plant outside and under controlled laboratory conditions. In addition, we also considered the

possibility that *L. majuscula* is capable of synthesizing siderophores, potent iron-chelating agents (Neilands, 1967); the availability of these agents would probably preclude control of the plant by manipulation of iron levels.

#### Lyngbya and Iron

We looked at the iron requirements of *Lyngbya majuscula* (Gross and Martin, 1995), and we found an iron dependency in the laboratory, using a Warburg apparatus to measure rates of oxygen production. We thought that this could mean that if one could control iron levels -- conveniently, safely, and economically -- then one could control the growth of *Lyngbya*.

A couple of caveats. The results should be checked for real-world conditions, of course. More importantly, we might control the iron levels, but it would be a waste of time if *Lyngbya majuscula* produced siderophores. Say, we precipitated

iron in catfish ponds by judicious liming: *Lyngbya*-produced siderophore would just solubilize the iron, and the organism would grow anyway. So far as we knew, no one had searched for siderophores in *L. majuscula*, let alone found any. It was worth a try.

#### The Search for Siderophores

No one could have looked harder for siderophores from *L. majuscula* (Gross and Martin, 1995), though they might have looked faster or better. In short, after fifty different experiments, we couldn't find any siderophores by methods that others had found to be effective. We tried what we thought was an especially good approach. We purchased some genuine siderophore (rhodotorulic acid; Atkin et al, 1970) and mixed it with the *L. majuscula* media to see if we could find a siderophore if it were present. We could. We used a so-called universal chemical analysis (Schwyn and Neilands, 1987) to see

# Fatal Beauty

The water hyacinth is as insidious as it is beautiful. Left to its own devices, this proud beauty will continue to spread—eventually choking out waterways and making them unusable to man and uninhabitable to fish.

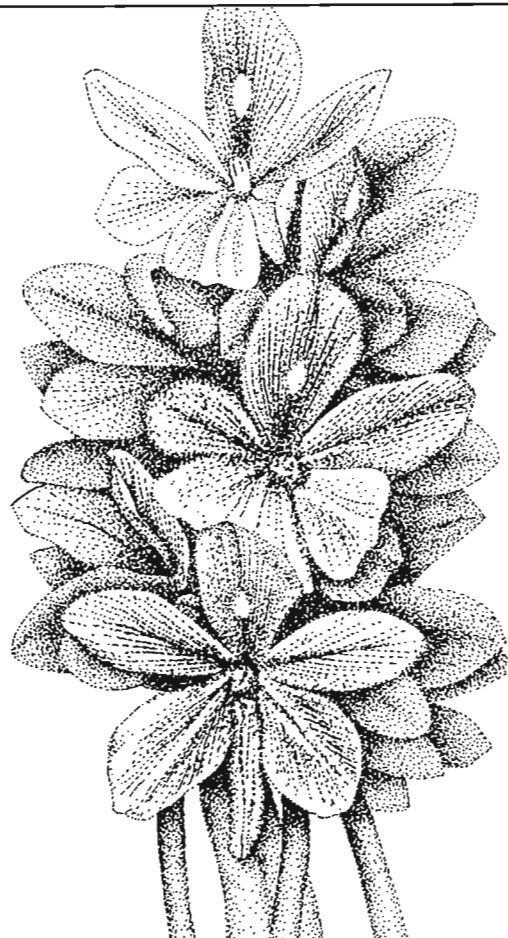
But you need not yield to this charming beauty. Reach for WEEDAR® brand 64 herbicide. WEEDAR 64 effectively controls water hyacinth, resulting in clean, usable waterways. Apply by surface or air when plants are actively growing and repeat applications as necessary to control regrowth.

You might say—WEEDAR 64 is fatal, to the fatal beauty. Ask your chemical supplier for WEEDAR® 64 herbicide.

**Weedar®**  
Brand Herbicide  
RHONE-POULENC

**RHONE-POULENC AG COMPANY**  
P.O. Box 12014, 2 T.W. Alexander Drive  
Research Triangle Park, NC 27709  
800/334-9745

WEEDAR is a registered trademark of Rhone-Poulenc.



if any was present and if it were at what level we could have detected it. The answer: 0.015 mM (one hundred thousandth of a mole).

**Good News, Bad News**

This is the point when we had divergent opinion with a colleague. When is bad news (chemists didn't find a chemical) good news (if the organism doesn't produce it, we have a fighting chance to manipulate iron levels and control *L. majuscula*)? His view was more focused: a project is supposed to have a positive result. We believe otherwise. If *L. majuscula* were able to produce siderophores at will and in quantity, there would be no hope that we can control the organism by manipulation of iron concentration. As it is, there are two reasonable approaches. First, for catfish lakes, the pH may be manipulated anyway by liming (Tucker and Boyd, 1985). Second, for residential lakes, those surrounded by homeowners, it may be feasible to practice environmental psychology, or behavior manipulation to convince the homeowners to invest in a management program designed to limit input of iron into the lake. For other lakes that don't fall into these two types, decisions about the wisdom of iron manipulation would need to be considered on a case-by-case basis.

The bottom line then, was the bad news really good news (as we think). Or was it just no news?

**Acknowledgments**

We are grateful for Barbara B. Martin's helpful comments.

**Literature Cited**

Armstrong, J. E. and C. Van Baalen. 1979. Iron transport in micro algae: the isolation and biological activity of a hydroxamate siderophore from the blue-green alga *Agmenellum quadruplicatum*. *J. Gen. Microbiol.* 111:253-262.

Atkin, C. L., J. B. Neilands, and H. J. Phaff. 1970. Rhodotorulic acid from species of *Leucosporidium*, *Rhodospiridium*, *Rhodotorula*, *Sporidiobolus*, and *Sporobolomyces*, and a new alanine-containing ferrichrome from *Cryptococcus melibiosum*. *J. Bacteriol.* 103(3):722-733.

Beer, S., W. Spencer and G. Bowes. 1986. Photosynthesis and growth of the filamentous blue-green alga *Lyngbya birgei* in relation to its environment. *J. Aquat. Plant Manage.* 24:61-65.

Canfield, Jr., D. E. and M. V. Hoyer. 1988. The eutrophication of Lake Okeechobee. *Lake and Reservoir Manage.* 4(2):91-99.

Canfield, Jr., D. E., E. Philips, and C. M. Duarte. 1989. Factors influencing the abundance of blue-green algae in Florida lakes. *Can. J. Fish. Aquat. Sci.* 46:1232-1237.

Cardellina II, J. H., F. Marner, and R. E. Moore. 1979. Seaweed dermatitis: structure of lyngbyatoxin A. *Science.* 204:193-195.

Cline, G. R., P. E. Powell, P. J. Szanislo, and C. P. P. Reid. 1982. Comparison of the abilities of hydroxamic, synthetic, and other natural organic acids to chelate iron and other ions in nutrient solution. *Soil Sci. Soc. Am. J.* 46:1158-1164.

Fujiki, H., M. Saganuma, H. Hakii, G. Bartolini, R. E. Moore, S. Takayama, and T. Sugimura. 1984. A Two-stage mouse skin carcinogenesis study of lyngbyatoxin A. *J. Cancer Rsch. and Clin. Oncol.* 108(1):174-176.

Gerber, N. N. and H. A. Lechevallier. 1965. Geosmin, an earthy-smelling substance isolated from actinomycetes. *Appl. Microbiol.* 13:935.

Gosselin, P., D. Joulain, P. Laurin, and F. Rouessac. 1989. Synthesis of earthy-mouldy smelling compounds-I. stereoselective synthesis of (±)-geosmin. *Tetrahedron Lett.* 30 (21):2775-2778.

Gross, E. D. and D. F. Martin, 1995. Iron dependence of *Lyngbya majuscula* and the search for siderophores. Unpublished manuscript

Kato, Y. and P. J. Scheuer. 1974. The aplysiatoxins. *Pure Appl. Chem.* 41:1-14.

Kato, Y. and P. J. Scheuer. 1976. The aplysiatoxins: reactions with acid and oxidants. *Pure and Appl. Chem.* 48:29-33.

Lembi, C. A. 1986. Algal identification. *Aquatics* 8(2):12-16.

Martin, D. F., B. B. Martin, and E. / D. Gross. 1994. An annotated bibliography of *Lyngbya*. *Florida Scient.* 57:75-87.

Moiikeha, S. N. and G. W. Chu. 1971a. Dermatitis-producing alga *Lyngbya majuscula* Gomont in Hawaii. II. Biological properties of the toxic factor. *J. Phycol.* 7:8-13.

**FRUSTRATED  
LAKE MANAGERS,  
.....  
IT'S YOUR  
CALL.**

**DON'T LET WEEDS PUT  
YOUR LAKE ON HOLD!**

Clogged propellers, choked channels and bays, herbicide concerns, and swimming risks are minimized with an Aquarius Systems Aquatic Plant Harvester.



Water Managers worldwide recognize Aquarius Systems as the industry leader - proven by our 30 years of experience. For a complete product line catalog...

**CALL TODAY  
1-800-328-6555**



**AQUARIUS  
SYSTEMS**  
A Division of OSD Products Inc.

220 N. Harrison St.  
North Prairie, WI 53153  
(414) 392-2162





Moikeha, S. N., G. W. Chu, and L. R. Berger. 1971. Dermatitis-producing alga *Lyngbya majuscula* Gomont in Hawaii. I. Isolation and chemical characterization of the toxic

Munson, 1982. Chemistry and biologic activity of hydroxamic acids -- an overview. Pp.1-13. In: Kehl, H. (Ed.) Chemistry and Biology of Hydroxamic Acids. S. Karger AG, Basel.

Murphy, T.P., D.R. S. Lean, and C. Nalewajko. 1976. Blue-green algae: their excretion of iron- selective chelators enables them to dominate other algae. Science 192:900-902.

Neilands, J. B. 1976. Hydroxamic acids in nature. Science 156:1443-1447.

Persson, P. E. 1984. Uptake and release of environmentally occurring odorous compounds by fish. Water Res. 18(10):1263-1271.

Schardt, J. D. 1989. 1988 Florida aquatic plant survey. Florida Department of Natural Resources, Tallahassee, Florida. 118 pp.

Schardt, J.D. 1990. Florida Department of Natural Resources, Tallahassee, FL., personal commun.

Schwyn, B. and J. B. Neilands. 1987. Universal chemical assay for the detection and determination of siderophores. Anal. Biochem. 160:47-56.

Speziale, B. J. and L. A. Dyck. 1992. *Lyngbya* infestations: comparative taxonomy of *Lyngbya wollei* comb. nov. (cyanobacteria). J. Phycol. 28:693-706.

Speziale, B.J., E. G. Turner, and L. A. Dyck. 1991. Physiological characteristics of vertically- stratified *Lyngbya wollei* mats. Lake and Reserv. Manage. 7(1):107-114.

Speziale, B. J., E. G. Turner, and L. A. Dyck. 1988. "Giant" *Lyngbya*. Aquatics 10(2):4-11.

Tucker, C. S. and C. E. Boyd. 1985. In: Channel Catfish Culture. Elsevier Science Publishers B.V., Amsterdam

Williams, V.P., D. E. Canfield, Jr., M. M. Hale, W. E. Johnson, R. S. Kautz, J. T. Krummrich

F. H. Langford, K. Langeland, S. P. McKinney, D. M. Powell, and P. L. Shafland. 1985.

Lake habitat and fishery resources of Florida. In: W. Seaman, Jr., Florida Aquatic Habitat and Fishery Resources, Florida Chapter, American Fisheries Association, Kissimmee, FL., pp. 43-119.

# AQUATIC WEED CONTROL, AQUATIC PLANT CULTURE AND REVEGETATION SHORT COURSE

**May 14-16, 1996**

**Fort Lauderdale Research and Education Center**

The Aquatic Weed Control, Aquatic Plant Culture and Revegetation Short Course, to be held at the Fort Lauderdale Rolling Hills Hotel on May 14-16, 1996, will offer aquatic plant managers and technicians new information on aquatic weed and plant identification and biology, as well as control techniques including biological control, herbicide characteristics, herbicide application and regulatory information.

### PROGRAM INFORMATION

Topics to be discussed include: plant identification, plant propagation and revegetation, biological control of weeds and herbicide technology. CEU points, as well as a commercial pesticide application certification examination, will be offered for short course participants.

### CONFERENCE ACCOMMODATIONS

The Rolling Hills Hotel is the official conference site. A special rate of \$45.00 per night with one to four people in a room is available for participants of the Aquatic Weed Short Course. (Rate is subject to 9% sales tax.) Reservations must be made by April 1, 1996 in order to assure availability at the group rate. To make reservations, call the hotel directly at 1-800-327-7735 and mention you are attending this course.

### PUBLICATION SALES

Aquatic weed and aquatic plant extension publications from the University of Florida's Institute of Food and Agricultural Science (IFAS) will be available for sale at the conference registration desk. You will be able to choose from plant identification books, pesticide training manuals, educational videos and weed control guides, just to name a few.

### REGISTRATION INFORMATION

The EARLY registration fee for the short course is \$80 if registration and payment is received by March 29, 1996. After that date, the LATE registration fee of \$120 will apply. The registration fee includes the educational program, course materials, an IFAS hat, a conference portfolio, three continental breakfasts, a deli luncheon, refreshment breaks, a social and barbecue at the FLREC on Tuesday, May 14, and a poolside reception on Wednesday, May 15, at the Rolling Hills Hotel.

For registration information contact:  
IFAS Office of Conferences/University of  
Florida  
PO Box 110750/Gainesville, FL 32611-  
0750  
Phone: (352) 392-5930/Suncom: 622-5930  
Fax: (352) 392-9734  
E-Mail: BAMT@GNV.IFAS.UFL.EDU  
BITNET: BAMT@IFASGNV

For program information contact:  
Dr. Vernon Vandiver  
Ft. Lauderdale Research and Education  
Center  
3205 College Avenue/Ft. Lauderdale, FL  
33314  
Phone: (305) 475-8990/Suncom: 444-1011  
Fax: (305) 475-4125  
BITNET: VVV@IFASGNV

# Aquatic Herbicide Applicator Certification

by

**Ken Langeland and O. Norman Nesheim**

**Professor, Agronomy and Pesticide Information Coordinator, University of Florida, Institute of Food and Agricultural Sciences.**

## Introduction

The Florida Pesticide Law administered by the Florida Department of Agriculture and Consumer Services (FDACS) requires all persons who apply or supervise the application of pesticides classified as restricted use to be certified and licensed by the Department. FDACS has established a certification and licensing category for persons who apply herbicides for the management of aquatic plants. According to the rule, the category, called Aquatic Pest Control is "applicable to individuals using or supervising the use of restricted use pesticides used or applied to any standing or running water, including banks or shorelines." Although no aquatic herbicides are currently classified as restricted use, it is recommended that anyone who uses herbicides for management of aquatic plants be certified. Aquatic Pest Control is one of FDACS largest applicator categories with over 1,400 applicators licensed. Many agencies or individuals who contract with applicators for the control of aquatic plants specify that the applicator be certified/licensed. Many employers require applicators who use herbicides for the control of aquatic plants to be certified/licensed. A license is issued to an individual who has met the certification requirements of FDACS. These certification requirements are met by successfully completing testing to assure that the individual is knowledgeable and competent in the use and supervision of restricted use pesticide application.

## License Classification

Certified aquatic herbicide applicators may be licensed as either public applicators or com-

mercial applicators. A public applicator is a licensed applicator employed by a public or governmental agency. A public applicator license is only valid when performing work for the public or governmental agency. A commercial applicator is a licensed applicator who is licensed to apply restricted use pesticides on any property provided they are certified in the category for which the applications are made. A commercial applicator is usually a contract applicator. The fees for a four year license are \$35 for a public applicator and \$90 for a commercial applicator.

## Certification Requirements

Certification requirements are the same for both public and commercial aquatic herbicide applicators. Two examinations must be passed, a **general standards (core) examination**, which tests general knowledge of proper pesticide use and safety and the **Aquatic Pest Control category examination**, which tests specific knowledge of applying herbicides in aquatic environments. A passing score on both examinations is required before the license can be issued.

## Examination Locations

Examinations are administered at University of Florida, Institute of Food and Agricultural Sciences, County Cooperative Extension Offices. The general standards (Core) examination can be taken by appointment at any Extension Office. The Aquatic Pest Control category examination is offered in 25 counties. If the Extension office in your county does not administer the exam, they should be able to help you locate the nearest county that does. If they cannot, contact one of the numbers provided

at the end of this fact sheet.

The FDACS Certification and Licensing Office will notify you if you passed or failed the examination. If you passed, you will receive a license application. If you failed, you will need to retake the examination.

## Preparing for Examinations

Prior to taking examinations, the following training materials should be studied:

### General Standards (Core)

**Exam** - All questions are based on information contained in: "Applying Pesticides Correctly - A Guide for Pesticide Applicators," IFAS Publication SP-1.

### Aquatic Pest Control Category Exam

All questions are based on information contained in: "Aquatic Pest Control Applicator Training Manual (revised 1995)," IFAS Publication SM-3.

All information contained in SM-3, excluding plant identification information is also available on the following videotapes: "Aquatic Pest Control Applicator Training; Part I," IFAS Catalog No. VT-1068.

"Aquatic Pest Control Applicator Training; Part II," IFAS Catalog No. VT-1069

"How to Determine Areas and Amount of Aquatic Herbicide to Use," IFAS Catalog No. VT-310.

All publications and videotapes may be purchased from IFAS Publications, IFAS Building 664, Gainesville, FL 32611-0001, 352/392-1764. Videotape programs may be borrowed free of charge from: Information Office, Center for Aquatic Plants, University of Florida, 7922 NW 71st Street, Gainesville, FL. 32611

# Looking for a better solution to aquatic weed and algae control?

It seems as if you've tried it all. You've sprayed. You've scooped. You've pulled them out by hand. Now take a whack at these nuisances with Komeen® aquatic herbicide and K-Tea™ algaecide.

Both Komeen and K-Tea now have new, expanded labels to include more weeds and algae. Komeen controls weeds such as Hydrilla, Water Hyacinth, Pondweed, Coontail, and Southern and Northern Naiads. K-Tea controls both planktonic and filamentous algae. And both are highly effective in virtually any type of water, even if it's hard or alkaline.

And not only do Komeen and K-Tea mow down aquatic weeds and algae, they require no re-entry or set-back restrictions, buffer zones or holding periods. After treatment you can use your water immediately for fishing, swimming, watering livestock and drinking.

See for yourself why Komeen and K-Tea are a cut above the rest. Contact Griffin Corporation, Rocky Ford Road, Valdosta, GA 31601, (912) 242-8635.

© 1994 Griffin Corporation. Komeen® is a registered trademark and K-Tea™ is a trademark of Griffin Corporation. Always read and follow label directions.

**Griffin**



# We're Here To Help.



**W**e've got the products you want—when and where you want them. Choose from a complete line-up of name-brand herbicides, algaecides, adjuvants and much, much more. They're in stock and ready for immediate delivery. Plus, we back each and every one of the products we handle with top-quality service and expert technical support. Let us help you. Contact your Terra Asgrow aquatics specialist.

 **Terra**<sup>®</sup>  
**ASGROW**  
**FLORIDA**

4144 Paul Buchman Highway • Plant City, Florida 33565 • 1-888-837-7235

**Additional Information**

For answers to additional questions that cannot be answered by your County Cooperative Extension Office contact the following offices:

- For information pertaining to licenses and license renewals contact: FDACS Certification and Licensing Office, Tallahassee (904)488-6838.
- For information pertaining to examination locations, training programs and materials contact the IFAS Pesticide Information Office, Gainesville (352)392-4721, The IFAS Fort Lauderdale AREC (305)475-8990, or the IFAS Center for Aquatic Plants in Gainesville (352)392-9613.

*Reprinted from IFAS Fact Sheet PI-19. For additional copies contact the IFAS Pesticide Information Office.*

**Letter**

*Continued from page 3*

a half acre in 2,400 acre Johns Lake.

Frequent reconnaissance and control efforts steadily reduced floating vegetation levels to a combined statewide total of less than 5,000 acres from 1989 through 1994. Then, in 1995, waterhyacinth and waterlettuce levels tripled from 3,600 to more than 11,200 acres in public waters despite more than 31,000 acres being controlled. This explosion is widely attributed to the adverse weather conditions of 1994 and 1995. However, with the exception of inadequate funding, each of the aforementioned conduits to loss of home maintenance repair have become increasingly evident in the floating vegetation maintenance program.

Waterhyacinth is present in nearly 65% of Florida's public waters. With doubling times of as little as two weeks, plants can quickly grow out of control. The time to prevent late summer waterhyacinth (and waterlettuce) problems is in the winter and early spring. As W.E.

Wunderlich pointed out as long ago as 1968, "For each plant destroyed during the winter it can be assumed to be equal to 500 plants in the summer." If plants are not under control by late spring, rapid growth, frequent summer rains, and corresponding low dissolved oxygen levels can delay control and force managers into a catch-up mode for the remainder of the year. Program costs escalate, damage to native vegetation from live waterhyacinth and waterlettuce and from control operations increase, and more herbicides must be applied. Large floating plant populations and subsequent large scale treatments almost always draw negative attention to the entire aquatic plant management program. Even if problems seem confined to one waterbody or region, any negative attention created by the problem is felt statewide. In extreme cases, access and navigation can be impeded resulting in lost recreational opportunities and economic hardships to local businesses. Occasionally, catastrophic weather events flush massive amounts of floating plants into lakes or rivers. However, if contingency plans are already in place to temporarily reassign crews or activate private company contractors, swift deployment can quickly regain maintenance control.

**FIRST 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: \_\_\_\_\_

Author(s): \_\_\_\_\_

Organization: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_

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

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

Highlands County plant management staff was cut by 40% and additional duties were assigned to the remaining crews. Realizing that they could no longer meet maintenance control contract obligations the county relied temporarily upon private company labor then worked, with help from the Bureau of Aquatic Plant Management, to convince Highlands County Commissioners to reinstate the previously deleted crew. The 45,000 acres of public waters managed by the county are in good shape now and are expected to be under excellent maintenance control by early 1996.

With today's seemingly never-ending staffing and budget cuts, we must continually reassess the aquatic plant management program to ensure we accomplish program priorities. We at the Bureau have been preoccupied in trying to head off the hydrilla funding crisis and in so doing have allowed waterhyacinth and waterlettuce to become too much of a factor in Florida public waters. Managers at all levels from field crews to policy

makers must commit to the program by reviewing waters under their jurisdiction, finding any floating plant problems, and assessing the reasons for any loss of control. If inadequate funding, staffing or education is at the root of problems, the bureau will provide assistance to resolve these areas.

More than \$9.0 million have been allocated for 1996 to begin the lengthy process of bringing hydrilla under control statewide. Efforts are underway to petition for sufficient funding to maintain this restoration once achieved. However, we must at the same time keep our house in order in regards to floating vegetation. Unusually cold weather has neutralized much of the 1995 floating plant standing crop. It is incumbent upon us as proprietors of Florida's public waters to keep them in good maintenance repair.

Jeff Schardt  
DEP, Bureau of Aquatic Plants

# AQUAVINE



## Reward® Water Use Restrictions Lowered

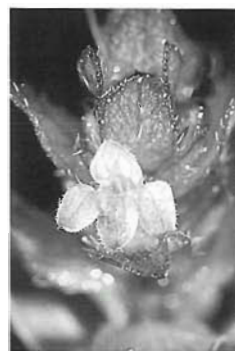
The waiting times for using water after application of Reward® Aquatic and Noncrop Herbicide have been lowered from 10 days to between 3 days and 1 day for drinking, depending on application rate, from 1 day to 0 days for swimming, from 14 days to 1 day for livestock consumption, from 5 days to between 3 days and 1 day for irrigation of turf and nonfood crops, from 14 days to 5 days for irrigation of food crops. There is no fishing restrictions after applying the product.

## ERRATA

Our cover photos got switched for the Winter 95 issue. The cover that appeared is a grist mill outside Clarksville Georgia, not a hydro-electric plant at Ausable Chasm.

In Jim Cuda's article, "Utilization of Pennyworts (*Hydrocotyle* spp.) as Food Plants by the Southern Armyworm, *Spodoptera eridania* (Cramer) (Lepidoptera: Noctuidae)," published in *Aquatics* 17(4), headings for Table 1 should have read "Average," n for instar 1 under HYRA should have been 28 and the values for instar 1 should not have shown significance.

The photograph on page 4, of 17(3) is not East Indian Hygrophyla as indicated. Right is a correct picture of the plant.



## MEETINGS

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

Weed Science Society of America 1997 Annual Meeting, Orlando, FL, Clarion Hotel, February 2-6, 1997.

Florida Weed Science Society Annual Meeting, Hilton Ocala, February 29-March 1, 1996. Contact Bert McCarty, President 904/392-7938.

Florida Exotic Pest Plant Council 11th Annual Meeting, Ramada Inn, Tallahassee, May 7-9, 1996. Contact Jackie Smith, Program Chair 407/791-4720.

Aquatic Weed Control, Aquatic Plant Culture, and Revegetation - UF/IFAS Short Course, Fort Lauderdale, May 14-16, 1996. See info. elsewhere in this issue.

Seventh Annual Florida Lake Management Society's Conference: Decision Making in Lake Management, Ocala / Silver Springs Hilton, May 22-24, 1996.

# For smooth sailing through tough aquatic weeds

## AQUA-KLEEN®

Granular Aquatic Herbicide

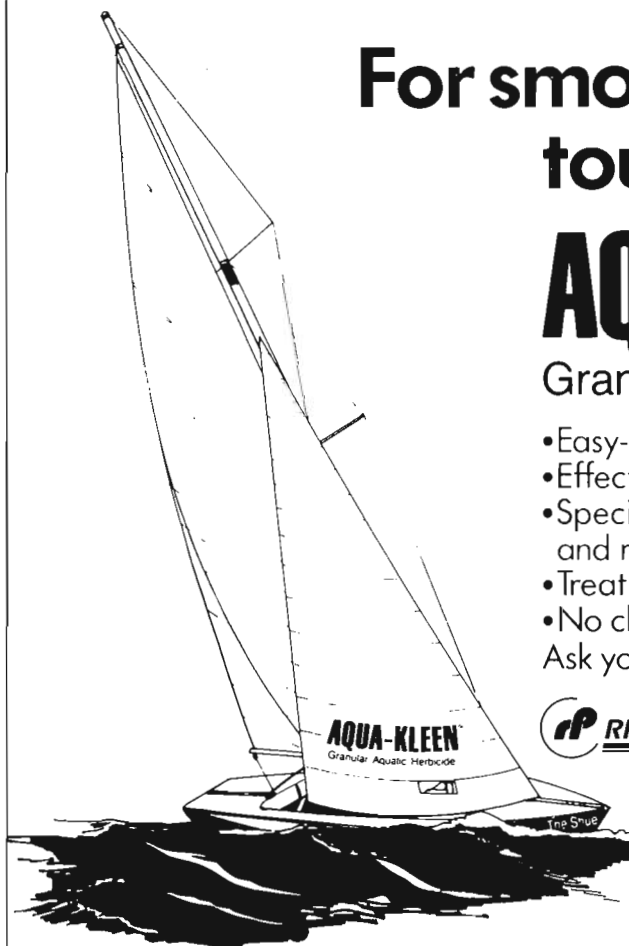
- Easy-to-use, needs no special equipment.
- Effective and economical.
- Specially designed granules quickly sink to the bottom and release chemical into critical root zone.
- Treat large or small areas.
- No chemical buildup in bottom sediment.

Ask your chemicals supplier for AQUA-KLEEN® or write:



**RHONE-POULENC AG COMPANY**  
P.O. Box 12014, 2 T.W. Alexander Drive  
Research Triangle Park, NC 27709

AQUA-KLEEN is a registered trademark of Rhone-Poulenc.



# Next time, use Rodeo.<sup>®</sup>

You can try mowing weeds, brush and floating vegetation.

Or pulling it out by hand.

You can even put up fences and barbed wire.

But you won't keep tough vegetation from coming back — unless you use Rodeo<sup>®</sup> herbicide.

Rodeo controls more than 170 species of emerged grasses, broadleaf weeds and brush. It works all the way to the roots, for complete control and lasting results.

No other aquatic herbicide offers a better environmental profile, either.

Rodeo is fully labeled for aquatic areas. Including lakes, rivers, estuaries, reservoirs, and, of course, ditchbanks. No wonder conservationists choose Rodeo in the fight to save wildlife habitats from invasive weeds.

Best of all, with Monsanto, you can always count on complete service and support. We'll even put it in writing.

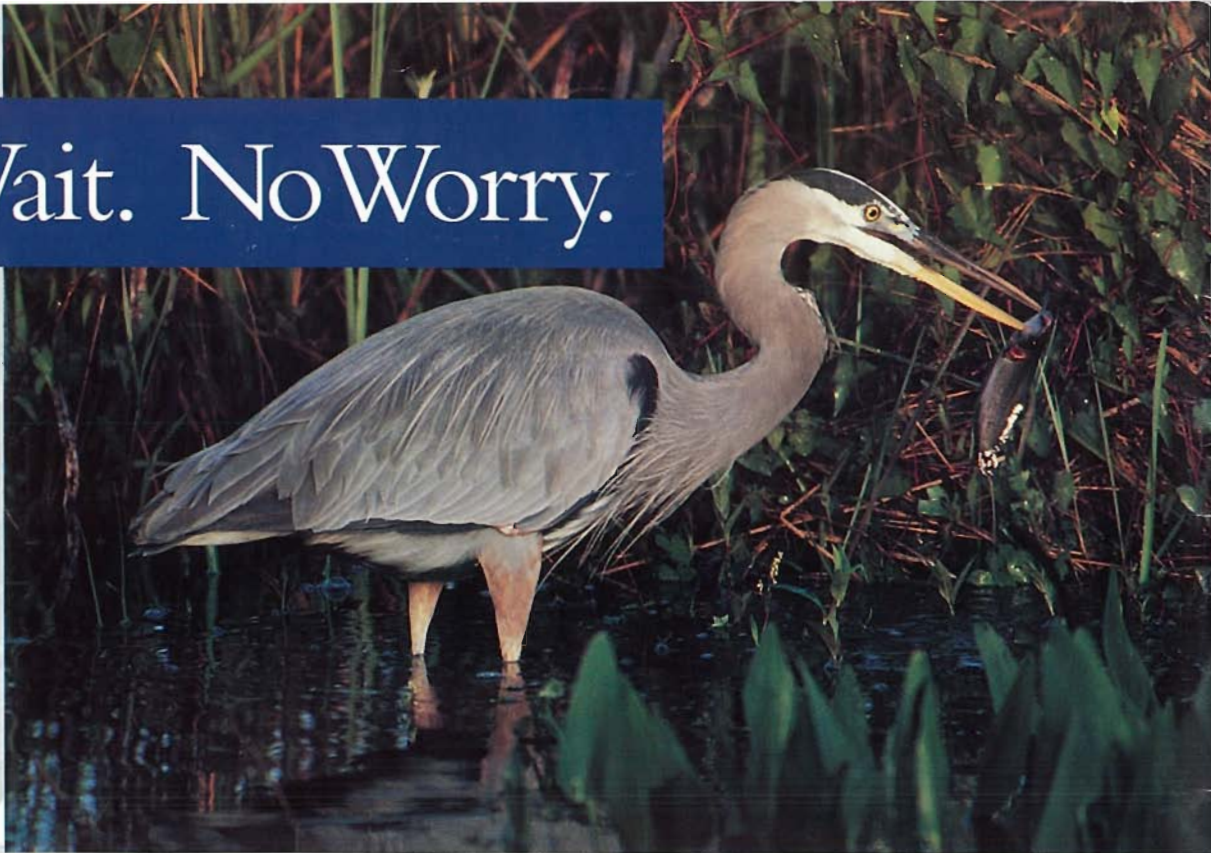
For FREE information on the link between Rodeo and better vegetation management, call today: 1-800-332-3111.

**RODEO<sup>®</sup>**  
EMERGED AQUATIC WEED AND BRUSH HERBICIDE  
BY **Monsanto**



ALWAYS READ AND FOLLOW LABEL DIRECTIONS FOR RODEO HERBICIDE. Rodeo<sup>®</sup> is a registered trademark of Monsanto Company.  
©1996 Monsanto Company  
2/96 ROD-67001

# No Wait. No Worry.



**REWARD®. THE NO-WAIT,  
NO-WORRY HERBICIDE FOR  
AQUATIC WEED CONTROL.**

**R**EWARD never makes you wait. Once applied, it spreads quickly through the water and makes fast contact with aquatic weeds.

Absorbed by unwanted plants in just minutes, REWARD controls floating weeds in less than 10 days and submersed weeds in less than 30. Without worry about toxicity to fish or wildlife. For your aquatic weed problems above and below the surface.

REWARD, for broad-spectrum aquatic weed control without the wait and the worry.

**For more information, contact your Zeneca representative, or call 1-800-759-2500.**



**REWARD®**  
Herbicide

**ZENECA** Professional Products

Always read and follow label directions carefully.  
REWARD® is a trademark of a Zeneca Group Company.  
©1996. Zeneca Inc. A business unit of Zeneca Inc.