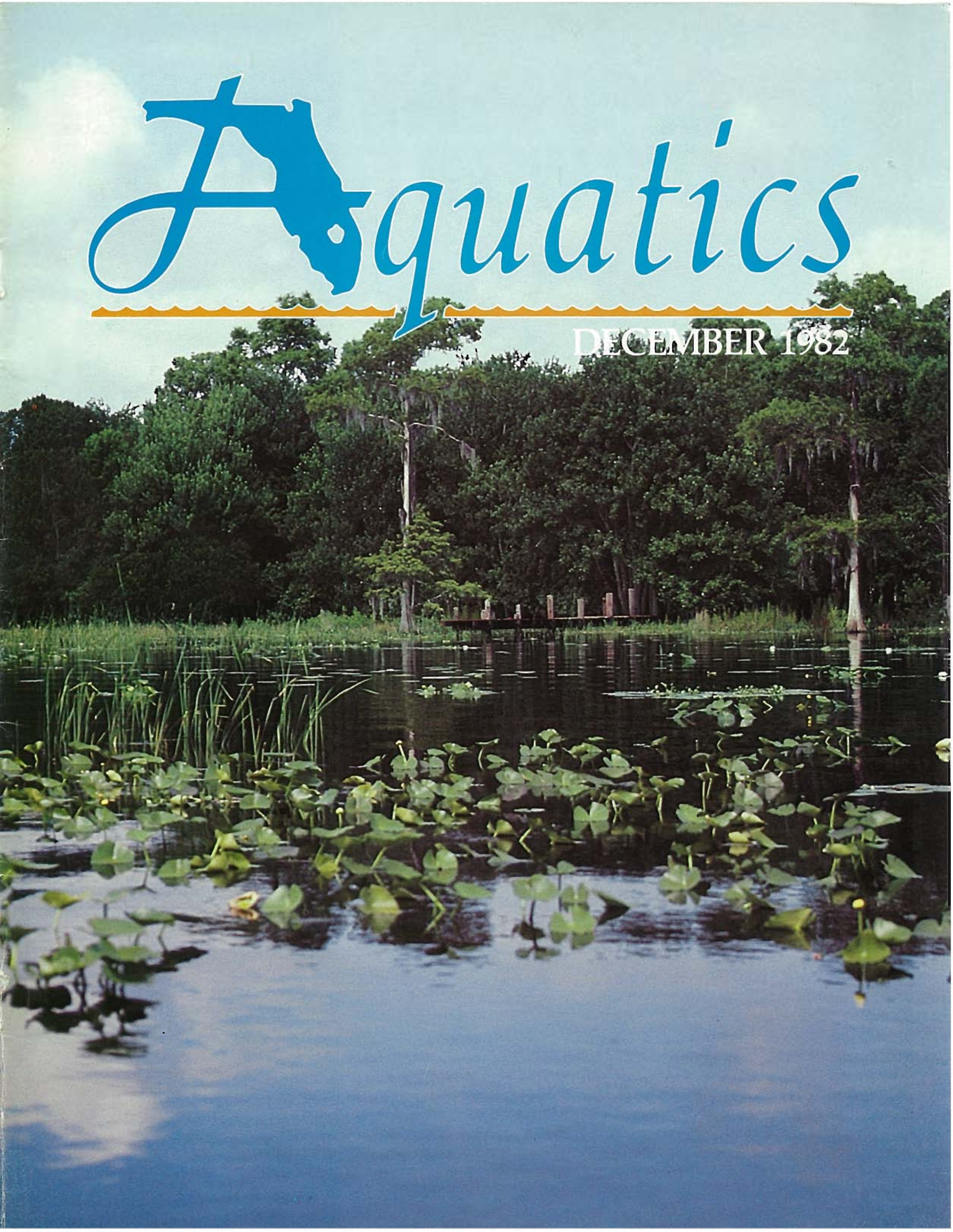
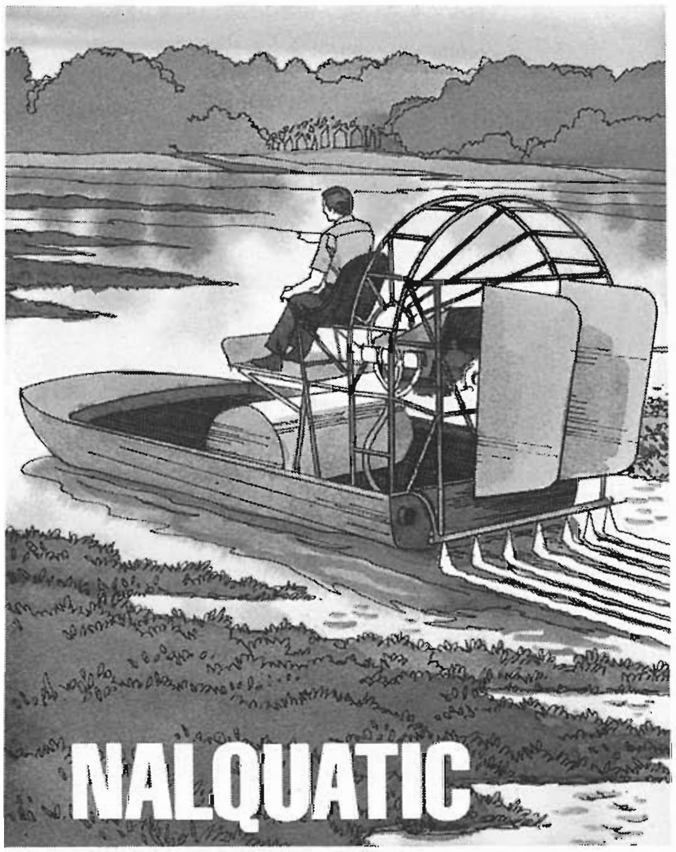
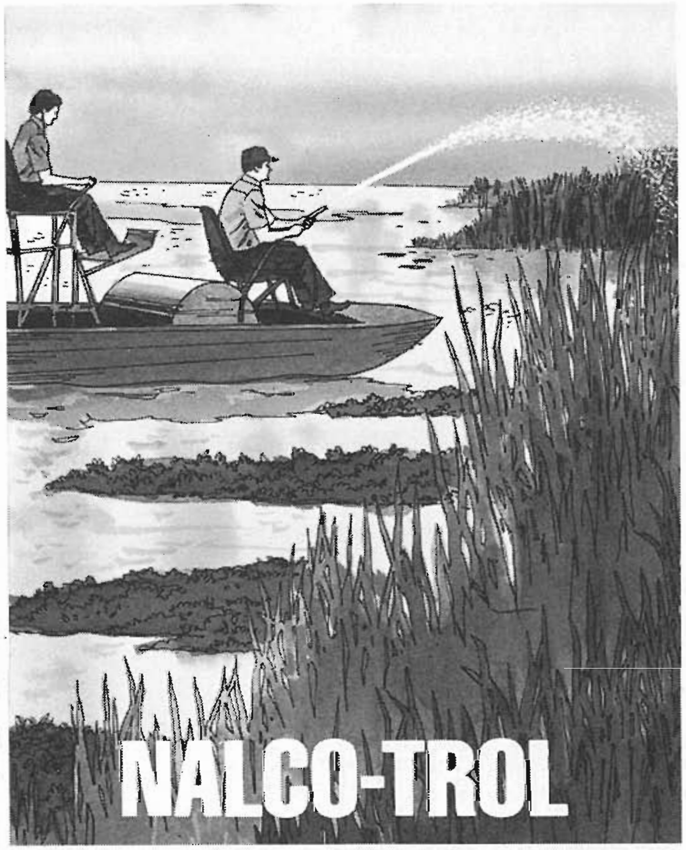
Aquatics

DECEMBER 1982



GOOD NEWS FOR AQUATIC WEED FIGHTERS:





DUAL HERBICIDE APPLICATION TOOLS THAT WORK

Nalco-Trol® and Nalquatic® are good news for the aquatic weed control specialist. Bad news for troublesome aquatic weeds like hyacinth and hydrilla.

When applying herbicide to terrestrial or floating weeds, Nalco-Trol drift retardant and deposition aid delivers more herbicide to the treatment area—better deposition and coverage, minimum drift. For submerged weeds, new Nalquatic aquatic herbicide carrier puts the herbicide on the weed surface and sticks it there for maximum contact effect.

Nalco-Trol and Nalquatic—the most effective herbicide application tools the professional aquatic weed control specialist can use. Both can be applied with all types of aerial or surface equipment. Get complete details and use directions by requesting our free Nalco-Trol and Nalquatic product bulletins.

Ag Products Div.: Regional Office
Route 3, Box 1328-E
Old Lake Unity Road
Leesburg, Fla. 32748

NALCO

NALCO CHEMICAL COMPANY
AG PRODUCTS DEPARTMENT
2901 BUTTERFIELD RD., OAK BROOK, IL 60521

NALCO Trademarks of Nalco Chemical Company

EDITORIAL

Aquatics *has been in publication since March, 1979.* Aquatics *is designed to be a reliable source of information for everyone interested in aquatic plant control and related pursuits, producer and consumer.* Aquatics *is a product of the Society. Together we have grown over the years due to the spirit of cooperation among the membership.* Aquatics *has brought the Society state, national and international recognition. We, the Society, its membership and aquatic plant management in Florida are the leaders throughout the world.*

As editor the past two years, I have strived to keep the magazine as informative and interesting as possible. Aquatics *is a success today because of the interest, pride and contributions from the membership. I thank everyone who has contributed. It has been both a privilege and honor to serve as editor.*

As David Tarver takes over the helm as editor, I urge you to continue with the same spirit of cooperation that has brought us to where we are today. We have a good thing going, let's make it even better.

PAUL C. MYERS

THE COVER
Lake Arbuckle, Polk County

Photo by Jeff Mangel

Aquatics

DECEMBER 1982/VOLUME 4, NO. 4

FLORIDA AQUATIC PLANT MANAGEMENT SOCIETY, INC. ★ ESTABLISHED 1976 ★

CONTENTS

The Florida Aquatic Plant Management Society, Inc., has not tested any of the products advertised in this publication nor has it verified any of the statements made in any of the advertisements. The Society does not warrant, expressly or implied, the fitness of any product advertised or the suitability of any advice or statements contained herein.

© 1982 FAPMS, INC. All rights reserved. Reproduction in whole or in part without permission is prohibited.

The Aqua-Vine Section of "Aquatics" has been added to provide information on current events and recent publications from industry and government to increase the dissemination of aquatic plant control techniques and regulatory changes. Complete copies of reports mentioned in this section can be obtained on request to the respective authors or the Editor of "Aquatics."

AQUATICS: Published quarterly as the official publication of the Florida Aquatic Plant Management Society. This publication is intended to keep all interests informed on matters as they relate to aquatic plant management, particularly in Florida.

CORRESPONDENCE: Address all correspondence regarding editorial matter to Paul C. Myers, Editor, "AQUATICS" Magazine, 310 E. Thelma St., Lake Alfred, FL 33850.

Queen of the Water Lilies

by
John A. Rodgers
Biologist, Department of Natural Resources

The South American water lilies, *Victoria amazonica* (Popp) Sowerby (syn. *V. regia*) and *Victoria cruziana* D'Orb. (Syn. *V. trickeri*) are extraordinary aquatic plants. What other plant has a leaf that can support the weight of a small child, a flower which blooms white one night and purple the next, the prestige of having the top portion of London's Crystal Palace structured after its venation and the esteem of being named after Britain's Queen Victoria?

Victoria belongs to the family Nymphaeaceae and consists of only the above two species. *Victoria amazonica*, commonly called the royal water lily, is native to Guiana, Bolivia and the Amazon River basin in Brazil. *Victoria cruziana* is frequently named the Santa Cruz water lily or "Mays del Aqua" and is native to Uruguay, Paraguay, and northern Argentina.

Although *Victoria* does not occur in any public water bodies in Florida, both species are well known to aquatic botanists. Their large floating leaves can expand up to 2 m. in diameter and the morphological structure of the leaf is unique to any other aquatic plant. Along the underside of the leaf, radiating outwards from the central petiole are 8-10 rigid veins or ribs. These primary thick ribs protrude downward 8 cm into the water near the petiole, gradually becoming smaller toward the leaf margin. Acute secondary veins branch off the primary veins while circular lateral veins interconnect these structural veins.

Slide 1: The rim lined, massive leaves of Victoria *can expand up to 2 m in diameter.*

This system of venation provides great mechanical strength and firmness. In addition, the veins are air-filled which gives the leaves remarkable buoyancy. Joseph Paxton first demonstrated the strength of *Victoria* leaves in 1851 during an exhibition by placing his daughter, weighing 47 lbs., and a 15 lb. metal object on a single leaf 1.4 m. in diameter. The leaf easily supported the weight, and the child remained completely dry.

Slide 2: Numerous veins provide great mechanical strength and buoyancy to the floating leaves.

The entire underside of the leaf, as well as the total length of the petiole, is covered with numerous sharp spines or prickles. These spines are 1-2 cm long and probably evolved as a protective device against herbivores. Handling this plant, even during its immature stages, is rather difficult.

There is no deep sinus at the leaf base as displayed in tropical water lilies such as *Nuphar* and *Numphaea*. And unlike the peltate leaves of *Nelumbo spp*., the circular leaves of *Victoria* have turned up edges that form a continuous rim. This leaf rim is usually higher in *V. cruziana*, often extending 20 cm. in height. The vertical rim does not form an exact right angle with the leaf surface but curves so that the concave side receives wind or wave action. The structure provides increased resistance to leaf tear and prevents immersion by small waves. While this is an advantage over flat, floating leaves without rims, one may initially think that this would aid in the accumulation of water. To alleviate this problem, two wedge-shaped water outlets, or pitchers, are located along the rim opposite one another. The pitchers act as overflow devices, draining any water received from rain or large waves.

The upper and lower leaf surfaces in *V. cruziana* are uniform green, whereas in *V. amazonica* the upturned edges and under surface is purple-red. At maturity, the leaf blade of *V. amazonica* is larger, but its leaf rim is not as high. Because of its native range, *V. cruziana* is reported to be more cold tolerant than *V. amazonica*.

The flower of *Victoria* measures up to 40 cm. in diameter and consists of 4 large, spiny sepals and numerous, spirally arranged petals. Initial opening of the bud occurs at the onset of night, closing in the early morning before daylight. The flowers of *V. cruziana* and *V. amazonica* are white the first day, but the former species turns a deep pink the following day while the latter species turns a deep rose color the second day of antithesis. Flowering is not seasonal, but dependent entirely on water levels.

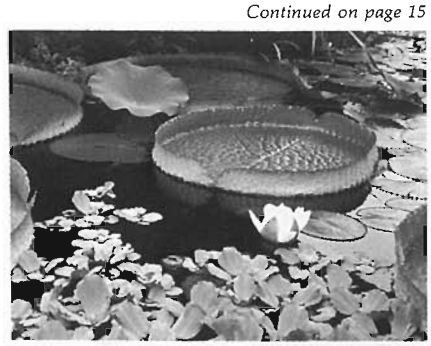
The opening of the enormous flower gives off a considerable amount of heat along with a strong scent. Studies have shown that during the opening of the bud the temperature of the air closely surrounding the bud increases 10° C from the heat evolved. Pollination occurs principally by a beetle (*Cyclocephala hardyi*), apparently attracted to the pineapple-butterscotch scent and heat exhaled by the opening of the flower. After pollination, the peduncle curves downwards and pulls the flower under the water. The fruit then ripens in about six weeks. Gelatinous seeds soon float to the water surface, where they remain adrift for a day. The gelatinous cover then washes off and the seeds sink to the bottom. An inferior ovary, numerous carpels and as many as 320 stamens comprise the floral parts of the flower.

Reproduction also takes place vegetatively from rhizomes. The thick rhizomes remain dormant during the dry season, but rapidly produce new leaf-shoots when conditions improve. Adventitious root cluster, between 15-20 in mature plants, are well developed along the numerous vascular bundles of the rhizomes.

Joseph Paxton's experiments in the mid-1880's also revealed the rapid vegetative growth of these two giant water lilies. After becoming the first person to successfully cultivate a seedling to a mature flowering plant, he observed an individual plant develop over 150 leaves and 126 flowers in just one year. Caspary's (1850) research demonstrated the vigorous growth rate of *Victoria* with data showing leaf width increases up to 36.7 cm/day.

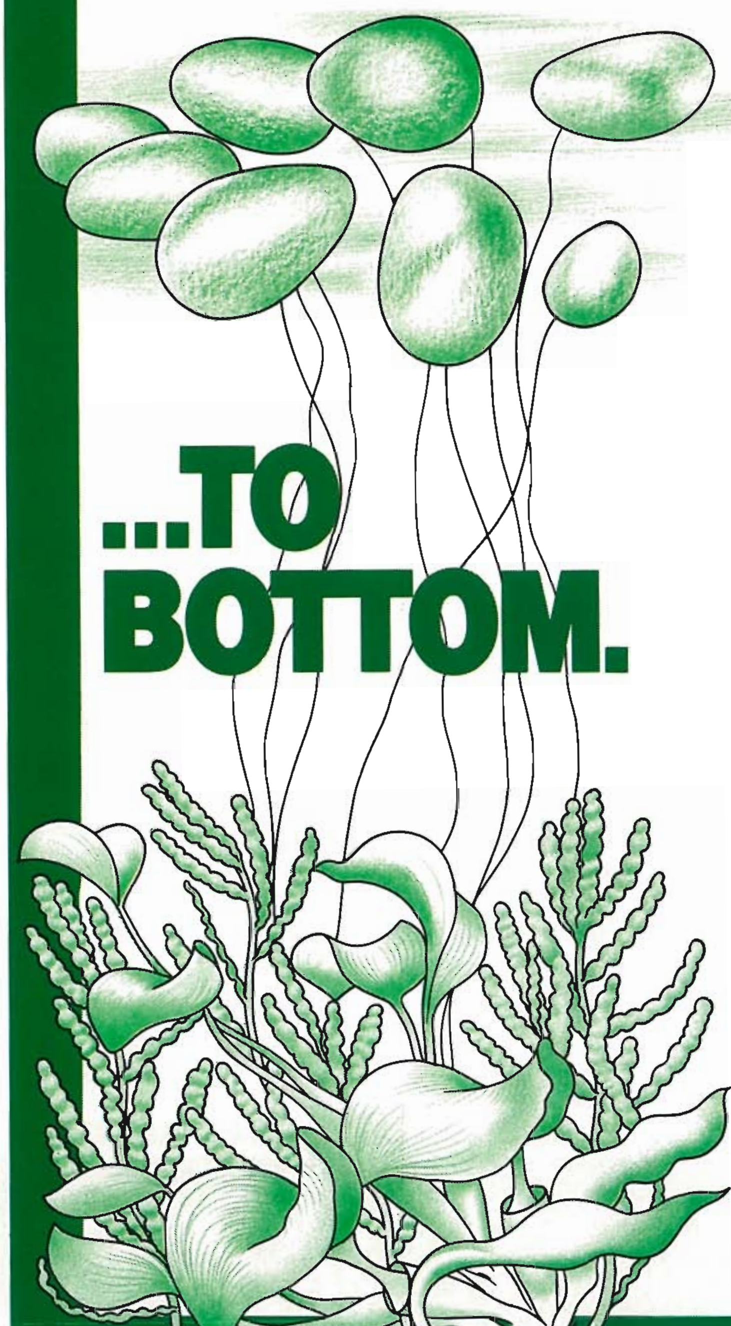
Exuberant growth rates are not unusual for aquatic plants and one should not automatically label such species as noxious weeds. Other data such as growth requirements and growth habits must be considered. Unlike other water lilies, elongation of the petioles and peduncles does not occur in *Victoria*. As a result, this aquatic plant is restricted to

Continued on page 15



Slide 3: Victoria *flowers are white during the first night, changing to a pink or purple color the second night.*

DIQUAT CLEARS OUT WATER WEEDS FROM TOP...



...TO BOTTOM.

Water weeds that clog Florida's waterways are sunk when treated with ORTHO DIQUAT Herbicide-H/A. DIQUAT is a broad spectrum herbicide that kills both floating and submerged weeds—even the tough ones like hydrilla, water lettuce and water hyacinth. And DIQUAT works fast—in just a few days after application you can see dramatic results.

DIQUAT interrupts photosynthesis in plants. And DIQUAT is economical to use. It can be used to spot-treat small areas, or control larger infestations. When surface spraying, apply with ORTHO X-77® Spreader for best results.

Licensed applicators: see supplemental label for complete details.

ORTHO DIQUAT. It sends water weeds straight to the bottom.

Chevron

ORTHO

Chevron Chemical Company

DIQUAT
Herbicide-H/A

Hydrilla Goes to Washington

William T. Haller
Center for Aquatic Weeds
University of Florida
Gainesville, Florida 32611

The introduction and spread of various weeds is one of the most interesting topics of conversation at almost any gathering of weed scientists. Plants, which have ultimately become weeds, have been introduced by scientists, among others, hoping to expand forage or crop production; and who hasn't heard the story of the lady who tossed waterhyacinth into the St. Johns River! Plant and animal pests have many means of accidental or purposeful introduction into our country.

The most serious aquatic weed problems in the United States are of foreign origin. There is no argument about waterhyacinth and hydrilla, and many taxonomists also believe Eurasian watermilfoil was introduced into the U.S. around the turn of the century. Waters from extreme southern Florida to central Canada are susceptible to growing at least of one of these three species; waterhyacinth in the south, Eurasian milfoil in the north, and hydrilla to date found growing in the central and southern U.S.

Hydrilla was first discovered in Florida in the late 1950's. An article in the Hyacinth Control Journal (May, 1969 p.48) indicates that hydrilla was introduced by the aquarium trade. Certainly, no one could have predicted how serious a problem it could become in our natural waters. Even scientists were baffled by its sudden appearance in Florida, where it was called Florida Elodea, thought to be a new species of *Elodea*, before it was finally properly identified in about 1964 or 1965.

It was no surprise that hydrilla had spread to several southern states by 1980, however, we were quite shocked to find it one summer day in our nation's capital.

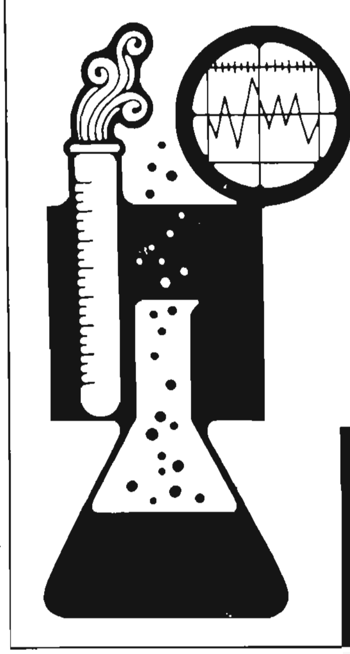
In August 1980, Dr. M. A. Beshir, from the Sudan, K. Langeland, D. Thayer, and myself drove all night to Washington for a meeting with EPA officials, to visit a reported hydrilla find in Maryland, collect hydrilla from North Carolina, and to attend the South Carolina APMS meetings. While walking past Park Lake in Constitution Gardens, it was suggested that Langeland check out the vegetation in the concrete bottom of the 4-5 acre pond. Upon seeing hydrilla in the lake, his historic first words should be left to the reader's imagination. It should also be noted that wading in Park Lake at 7 a.m. is strictly prohibited, as so clearly pointed out by the Park Police.

Further investigation revealed that lilies and several other aquatic plants had been purposely planted in wooden boxes in the lake as part of a total ecosystem concept which was designed to reduce phytoplankton blooms in the pond. The Capital National Park Service had purchased what they and the plant supplier called *Anacharis* or *Egeria*, one of many advertised oxygen plants. Somehow, hydrilla ended up in the system!

A survey of an ornamental pond in front of the U.S. Department of Interior offices turned up water lettuce, waterhyacinth, and even a few sprigs of hydrilla. After several phone calls seeking further information, and after again being told by the Park Police that wading in Park Lake is illegal (fortunately, a different policeman), we traveled north to Lilypons Water Gardens, a few miles northwest of Frederick, Maryland. Lilypons is a major supplier of aquatic plants in the northeast and also has a facility for growing and selling plants near Brookshire, Texas. The hundred or so acres of ponds at Lilypons are planted with many species of beautiful aquatic plants. Also growing in many of the ponds was a plant that had tubers and appeared very much like hydrilla.

In a bulletin published in 1976, Hydrilla — A Rapidly Spreading Aquatic Weed Problem, I indicated that hydrilla was probably growing in many areas of the U.S. and was being improperly identified as *Egeria* or *Elodea*, from which it is difficult to positively identify due to the widely varying morphology which hydrilla is noted for producing. To complicate matters, recent research done by scientists in the Netherlands finds that hydrilla from Washington, D.C., has a different chromosome number than hydrilla from Florida (Pieterse, Personal Communication). Also, plants from Washington, D.C., grown in Dr. Thai Van's labs at Ft. Lauderdale, have produced male flowers (Van, personal communication). Prior to this discovery, it was believed that we only had the female plant in the U.S. Nevertheless, hydrilla is being found around the country and is still most probably in several areas where it is being misidentified.

The current status (as gossip has it) of hydrilla is listed in the accompanying table and the most recent 1982 "finds" are explained below.



AT YOUR SERVICE . . .
THE PROFESSIONAL AQUATIC WEED CONTROL SPECIALISTS — DISTRIBUTORS
PENNWALT, CHEVRON, 3M, NALCO, A & V, JOHN BEAN & OTHERS

COVERING FLORIDA FROM —

TAMPA
5414 N. 56th Street
P.O. Box 1096
Tampa, FL 33601
(813) 626-2111

MIAMI
2490 N.W. 41st Street
P.O. Box 420981 Allapattah Station
Miami, FL 33142
(305) 635-0321

JACKSONVILLE
1845 Wright Avenue
Jacksonville, FL 33207
(904) 398-3759

TOLL FREE WATTS IN FLORIDA: 1-800-282-9115

SMCP **Southern Mill Creek PRODUCTS COMPANY, INC.**
TAMPA • MIAMI • ATLANTA

Table 1. Current status of hydrilla spread in the United States as best can be ascertained

State	Date	Watershed	Contact	Comments
Florida	1959-60	nearly all	several	New discoveries elicit little excitement anymore in Florida.
Iowa	1971-72	ornamental pond	R. Blackburn	Bob identified the plant in a small pond and reported it in the Hyacinth Control Society Newsletter. It has now been eradicated from the pond and hydrilla is currently not known to occur in Iowa.
Louisiana	1973	several	James Manning	First found in Spanish Lake near New Iberia, found the next year in North Louisiana in Lake Sibley. Several lakes throughout the state currently infested, most serious is increasing infestation in 181,000 acre Toledo Bend Reservoir, where Texas and Louisiana are arguing about which state plants came from.
Texas	1976	several	Lou Guerra	First found in reflection pool at the Houston zoo, properly identified in 1978. Hydrilla now in San Marcos River; Rayburn, Conroe, and Livingstone Reservoirs. Widespread along coast from Brownsville to Louisiana border.
South Carolina	1979 and 1982	Lake Marion	Howard Roach	The spread and competition of hydrilla against *Egeria* will prove interesting in this extremely important fishery-recreational system of 110,000 acres with mean depth of 13 feet.
California	1978	Lake Ellis	Richard Yeo	Well over a million dollars were spent to clean the bottom and fumigate the soil to eradicate hydrilla from Lake Ellis — final results not in yet.
	1979	Lake Murray Imperial Valley		Lake Murray is the water supply for San Diego. Hydrilla occurs in a couple other lakes in the San Diego area. It is of major concern in the agriculture areas of California.
Georgia	1978	Radium Springs	Wayne Thomaston	Hydrilla has been in Lake Seminole on the Georgia, Alabama, and Florida border since the 1960's, however, the hydrilla in Radium Springs is the first major discovery in the central Georgia area. Continued rumors of hydrilla in Lake Eufaula could not be documented.
North Carolina	1980	Wake County (Neuse River)	Neil Rhodes	Hydrilla was first found in lakes in the Ulmstead State Park and since in several ponds and lakes around Raleigh.
	1982	Hyco Reservoir (Roanoke River)	David Schiller	The Hyco Reservoir is upstream of several major recreational reservoirs on the Virginia-North Carolina border.
Alabama	1980	Coffeyville Reservoir (Tombigbee River)	David Bayne	The spread of hydrilla in these locations could be very extensive.
	1981	Guntersville Reservoir (Tennessee River)	Leon Bates	
District of Columbia	1980	several ornamental ponds	Ken Langeland	See Text
Delaware	1981	several reservoirs	Roy Miller	Originally believed to be *Elodea*, finally identified to be in about one-third of Delaware's 25 to 30 freshwater impoundments (lakes).
Maryland	1982	Potomac River	K. Steward	See Text

AQUATIC WEED CONTROL

SPECIALIST IN CONTROL OF HYACINTHS, HYDRILLA AND OTHER AQUATICS

1. Microfoil boom for low drift liquid applications.
2. Specially designed mechanical slinger for application of dry chemicals and pellets.

OVER 20 YEARS EXPERIENCE IN CONTROL OF FLORIDA AQUATIC PLANTS THROUGH USE OF HELICOPTERS AND AIRBOATS

STAR AVIATION

STAR AVIATION, INC.
Associate of Orlando Helicopter Airways, Inc.
P.O. Box 2802, Orlando, FL 32802
305-323-1756 — 841-3480

Alabama. After several years of a strong prevention and public education campaign, and among arguments as to whether or not it would grow in the TVA system, Leon Bates and Terry Goldsby confirmed that hydrilla is firmly entrenched in a 16-mile stretch of Gantersville Reservoir in the Tennessee River System.

Maryland. Dr. K. Steward found naturalized populations of hydrilla growing in the Potomac River near Mount Vernon and also in an abandoned canal near Washington.

South Carolina. Although Howard Roach found a hydrilla plant in Lake Marion three years ago, it evaded rediscovery until this year when several hundred acres were found near Packs Landing. With Lake Marion being several hundred thousand acres in size and having extensive *Egeria* growth, hydrilla was difficult to find.

In the past 25 years, hydrilla has phenomenally spread to 11 states and the District of Columbia. Further, unconfirmed sightings have been made in three other states. All of the states from Delaware south along the East and Gulf Coasts, with the exception of Virginia and Mississippi, have confirmed hydrilla populations. In addition to the year-round hydrilla problem in Florida, the northern range will also face problems in the summer months when hydrilla growth and heavy demands for recreational use of the waters coincide.

Male Hydrilla Recently Found in the United States

by
Vernon V. Vandiver, Jr.[1], *Thai K. Van*[2], *and Kerry K. Steward*[2]

Florida, unfortunately, has had a long history of being where many aquatic weed infestations first occur in the United States. This may again be the case with a recent discovery at the IFAS Agricultural Research and Education Center, Fort Lauderdale.

In September 1982, Dr. Thai K. Van identified male (staminate) flowers of Hydrilla [*Hydrilla verticillata* (L. fil.) Royle] on plants growing at the USDA Aquatic Plant Management Laboratory which is located at the AREC, Fort Lauderdale.

The discovery was the result of Richard Conant, Biological Technician with the USDA in Fort Lauderdale, observing some "debris" floating on the water surface of a concrete tank in which Hydrilla was growing. He brought the plant material to the attention of Dr. Van who determined that it was the staminate flowers of Hydrilla. The staminate flowers of this plant form in the axils of the submersed leaves and upon maturity are released and rise to the water surface.

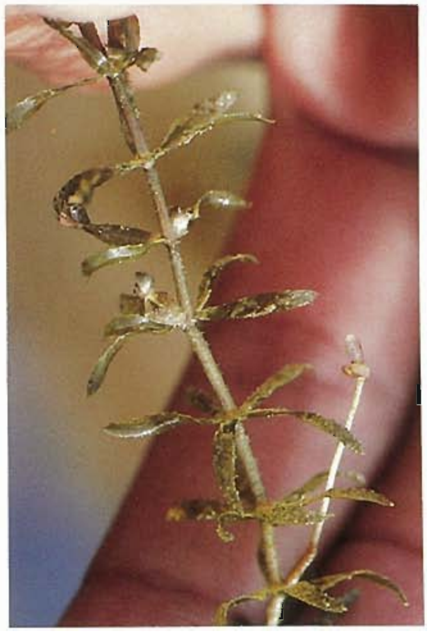


Figure 1. Hydrilla shoot with both a mature female flower at the base and a male flower shown in the leaf axil near the tip.

The plant specimens were later sent to the University of Florida Herbarium for confirmation. A voucher specimen of the plant has been filed in the Herbarium and has been assigned the University of Florida accession number FLAS 147390.

The Hydrilla plants which produced the staminate flowers were not collected originally in Florida, but had actually come from Washington, D.C. The plants were collected from the Kenilworth Aquatic Gardens in Anacostia Park, Washington, D.C., approximately 1 year ago at the request of Dr. Kerry Steward. They had been cultured in the outdoor aquarium on the station in Fort Lauderdale since that time for the purpose of obtaining flowers for positive identification. Care is being taken to continue to isolate and contain the plants after the staminate flowers were identified.

Hydrilla is known to display a great amount of variability in its morphology, or form and structure. Everyone familiar with it can likely recall having seen some variation in the vegetative portion of the plant, such as leaf size and shape. Another way in which Hydrilla is variable is in its sexual characters.

Figure 2. Close-up view of the spathes which contain the male flowers of Hydrilla.

Hydrilla has imperfect or unisexual flowers, thus the male and female flower parts occur in separate flowers. Monoecious is a botanical term applied to plants which have both the male and female reproductive structures (stamens and carpels) on the same plant but not in the same flower. Dioecious plants are those plants which produce the stamens and carpels on separate plants. In various parts of the world, Hydrilla has been reported to occur both in a monoecious form and in a dioecious form.

Regardless of whether the Hydrilla in question is dioecious or actually monoecious, we know of no previous reports of any Hydrilla flowers with male reproductive structures having been collected from anywhere in the United States. The discovery of male hydrilla in this country is significant as it means that we now have the potential for seed production in the United States.

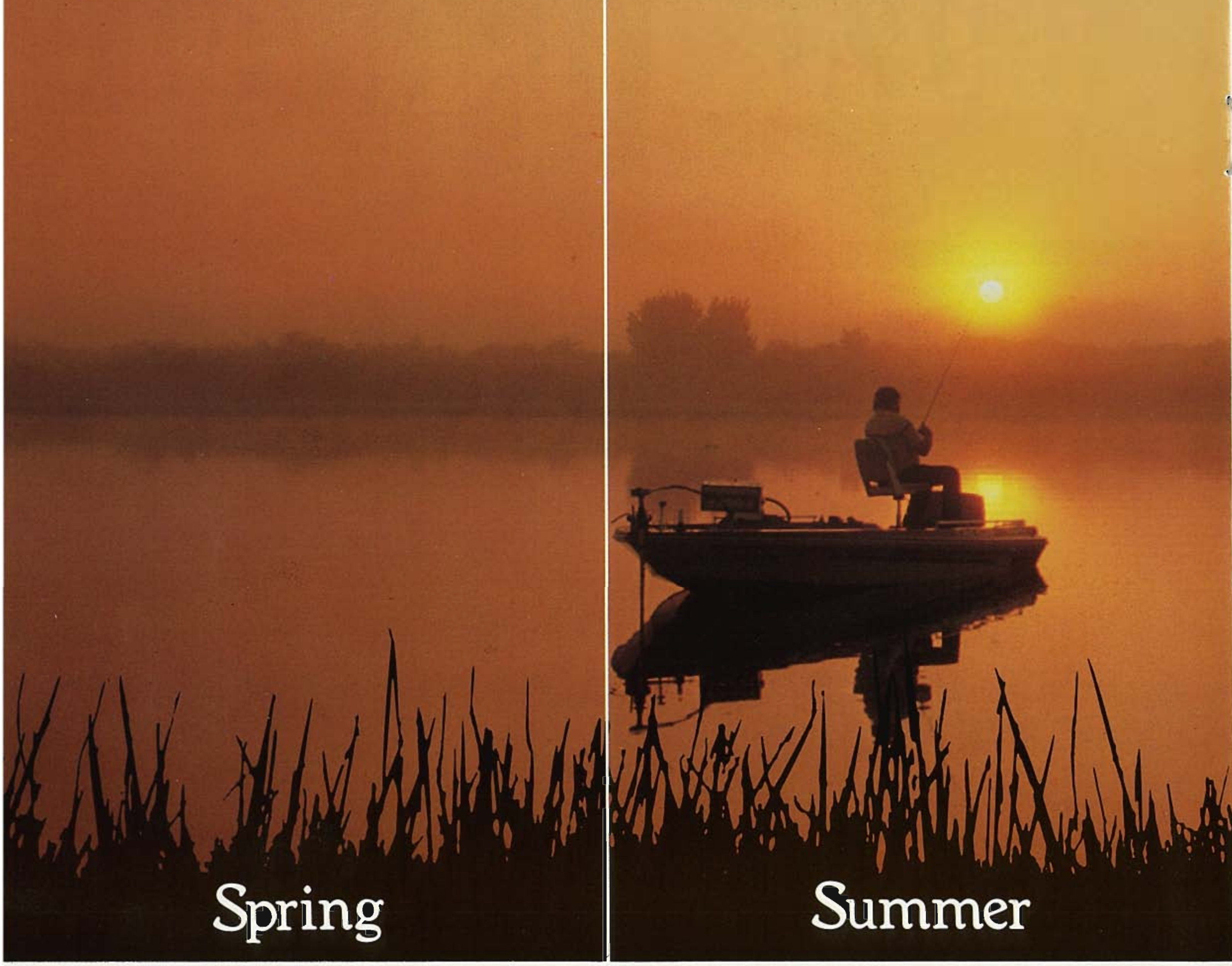
[1]*Associate Professor, Agronomy and Extension Aquatic Weeds Specialist, AREC Fort Lauderdale, IFAS, University of Florida.*
[2]*Plant Physiologist and Research Leader, USDA Aquatic Plant Management Laboratory, Fort Lauderdale.*

THE PERFECT INVERT OIL
• places herbicide on target
• has a consistent invert
• economical 1-2 gal. per surface acre
• ready to use — no diesel oil needed
• no xylene-like additives
• best oil with Minnesota-Wanner equip.
• pleasant citrus odor
There is only one invert oil that fits this description:
I'VOD® INVERT OIL
Why don't you call us today for a field demonstration:
(305) 562-0555
JLB International Chemical, Inc.
P.O. Box 6006, Vero Beach
Florida 32960

AQUATIC HERBICIDE BREAKTHROUGH

Sonar EPA Experimental Use Permit No. 1471-EUP-67

Sonar®
gently puts the balance back in nature.



At last there's a new generation aquatic herbicide that manages a host of undesirable vascular plants without mismanaging the good life. Sonar® from Elanco.

Weed management.

One treatment of Sonar provides control during the critical growing season of many submersed and emersed aquatic weeds.

Weeds controlled include hydrilla, elodea, water milfoil, pond weeds, torpedograss, paragrass, southern naiad and numerous other troublemakers.

Hydrilla

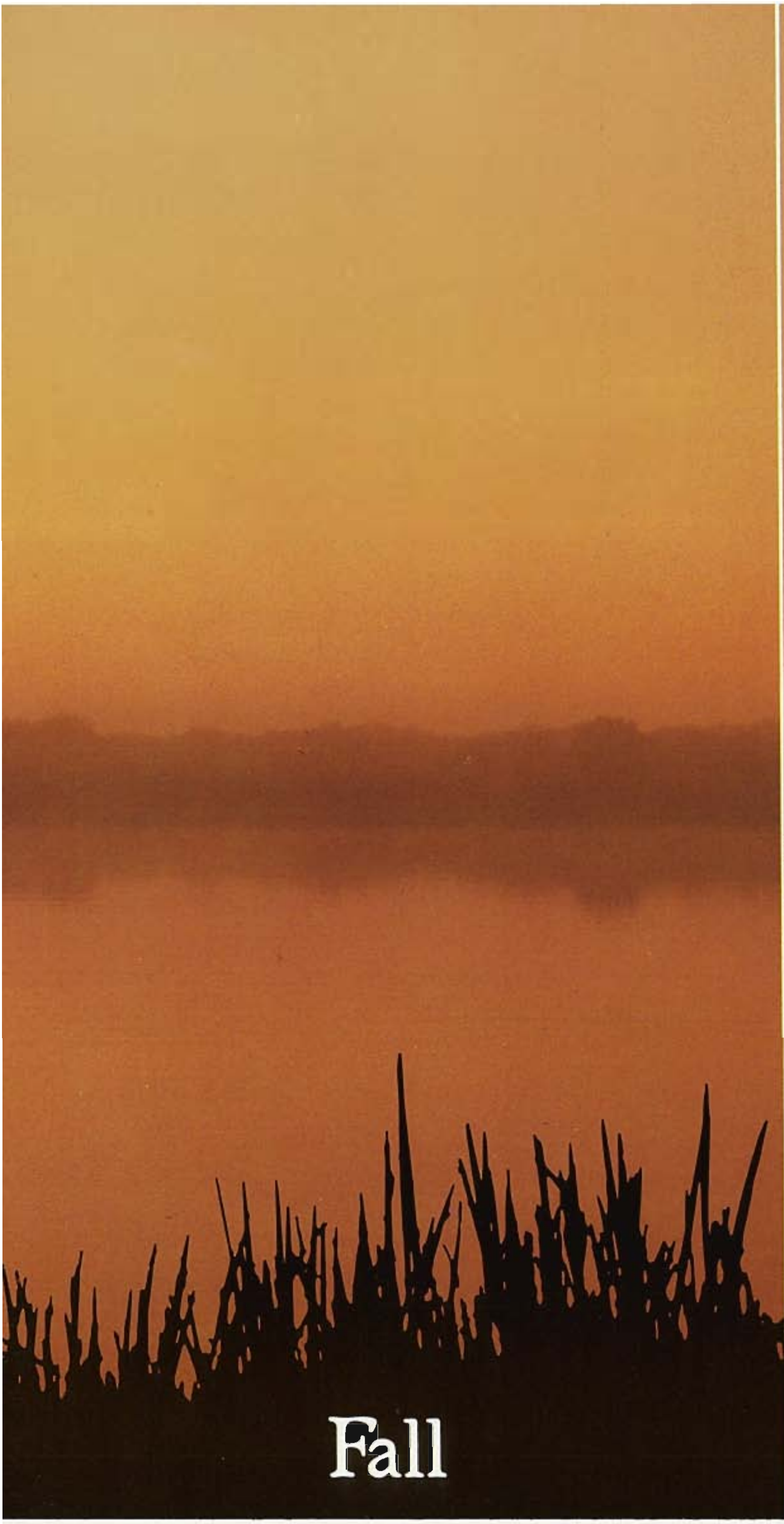
Elodea

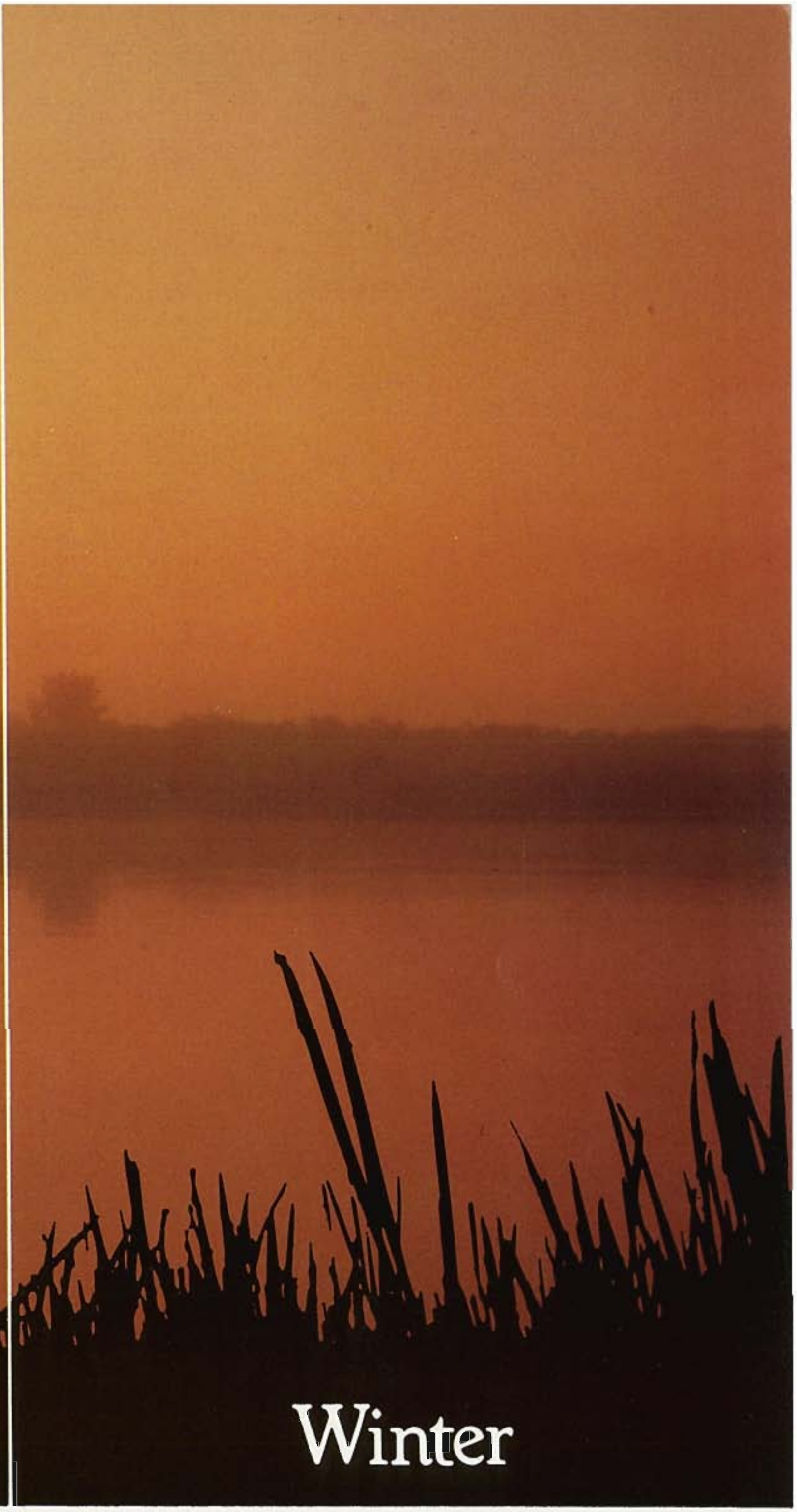
When you make Sonar part of your weed control program, you get effective management of your valuable water resources.

Slow but sure action.

Four to six weeks after treatment, Sonar takes its toll on undesirable vegetation. And because of its slow action, there is no rapid oxygen depletion. This makes Sonar highly compatible with the aquatic environment and makes fish kills a thing of the past. Applied as directed, Sonar will not harm fish,

Water milfoil





wildlife, or nearby trees and shrubs.

Flexible application.

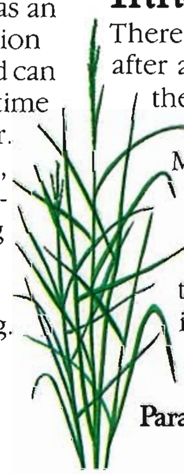
Sonar can be applied to the entire surface of a pond or up to ten percent of larger bodies of water. Depending on existing equipment and user preference, Sonar is available as an aqueous suspension or 5% pellet and can be applied any time during the year. For best results, the label recommends applying Sonar when weeds are actively growing.

Pond weeds

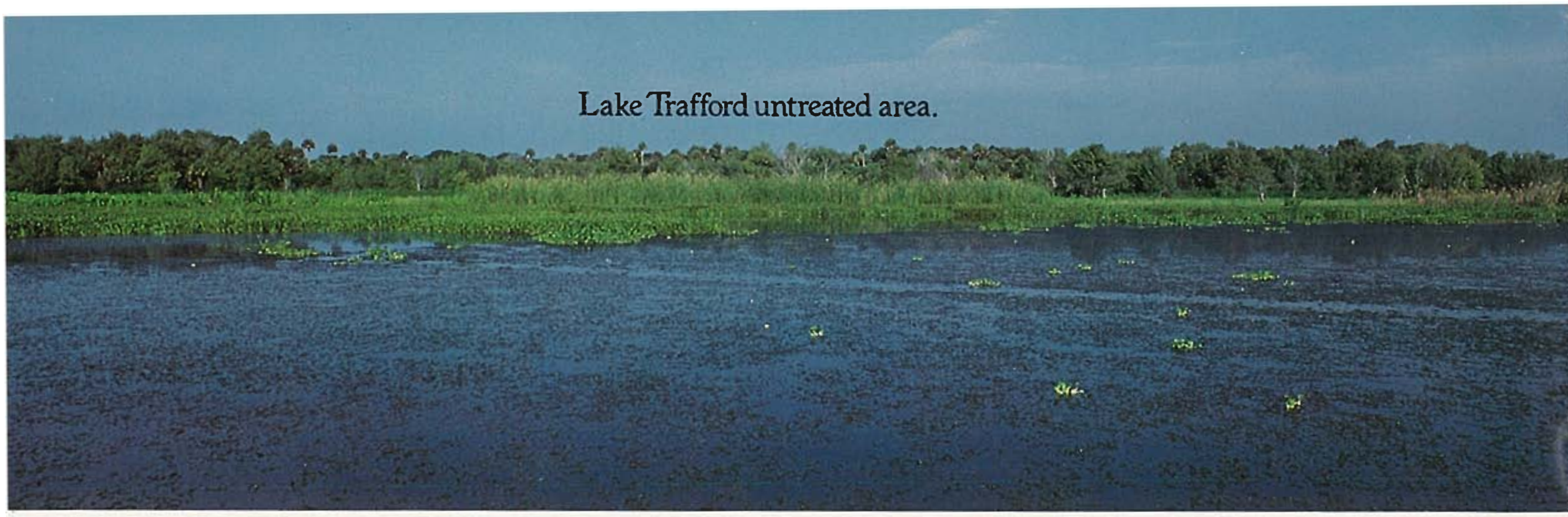
Torpedograss

Inherent value.

There are few restrictions after application, and they are detailed on the product label. Make Sonar part of your management program. It's the simple, gentle way to put nature back in balance.



Paragrass



Lake Trafford untreated area.

Lake Trafford test plot. Treated 3-17-81. Photographed 9-10-81.

Sonar® aqueous suspension can be applied to the water surface or under the water surface or placed along the bottom of the water just above the hydrosoil. Any conventional application equipment can be used.

Sonar 5% pellet can be applied to the water surface from the shore or from a boat. Refer to the Sonar label for complete application instructions.

Always follow label directions. Sonar is available in limited quantities under EPA Experimental Use Permit No. 1471-EUP-67.

For further information write or phone:

David P. Tarver, Aquatic Specialist, 2416 McWest Street, Tallahassee, FL 32303 (904) 386-8533

Elanco Products Company, A Division of Eli Lilly and Company, Indianapolis, IN 46285, U.S.A.

AQUA-VINE

Sixth Annual FAPMS Meeting Success Beyond Expectations

The annual meetings have become a highlight for many involved in aquatics. This year's meeting, held October 27-29 in Orlando, was no exception. Three hundred registered attendees came to participate, learn and enjoy. The attendance at the formal sessions and business meetings was impressive. Everyone involved in putting together the 1982 FAPMS Sixth Annual Meeting should take pride in a job well done.

Johnny Mason was named Applicator of the Year.

The 1983 FAPMS Officers are:

President	Carlton Layne
President-Elect	Paul Myers
Secretary	Mike Mahler
Treasurer	Jim McGehee
Editor of *Aquatics*	David Tarver
Directors	Larry Maddox, Lee Hale, Eddie Knight, Bobby Corbin, Ray Spirnock, Herb Cummings, Andy Price, Nick Sassic, Debbie Valin

Harold Brown Receives FAPMS Presidents Award

Mr. Harold Brown was presented the FAPMS Presidents Award at the 6th Annual FAPMS Meeting.

Harold was recognized and honored for his many contributions to the aquatic plant management profession through his active involvement in, to name a few, the Florida Aquatic Plant Management Society, National Agricultural Aviation Association, Florida Agricultural Aviation Association, Pesticide Technical Council and the Aquatic Plant Advisory Council.

People on the Move

Paul Myers has recently resigned as Assistant Director of Polk County's aquatic weed control programs. Paul now has his own business, Applied Aquatic Management, Inc., offering aquatic management services.

Mike Mahler has left his position with the Department of Natural Resources to take over Polk County's aquatic weed control programs.

Harry L. McGill Remembered

Harry L. McGill was a close and good friend of many of the members of the Florida Aquatic Management Society. We share in his memory.

Harry died at the age of 36 on March 29, 1982 in the city of Punta Gorda, Florida. Harry died from leukemia.

Harry earned his masters degree in Marine Science, graduating from the University of South Florida, Tampa and Florida State University, Tallahassee. After two years with the Florida Game and Fresh Water Commission and two years working for his master's degree at the University of South Florida in 1972 he accepted the directorship of General Development Corporation's aquatic weed control operations. Part of Harry's additional responsibility at GDC was the oversight of GDC's large Wildlife Preserve near Arcadia. In fact, he lived on the preserve with his wife, Mary and their two girls, Kelly and Sally. Working and playing on the preserve was dear to Harry's heart.

Five years with GDC ended in 1977 and, through H. L. McGill Biological Consultants, Harry provided harvesting, spraying and fisheries services to various agencies in Florida and Texas until his death.

Harry served as a member of the Board of Directors of the Aquatic Plant Management Society from 1975 to 1978. He was certified by Florida in aerial application, aquatic plant control, industrial weed control, turf, forest and ornamental pest control. He was a member of the Florida Aquatic Plant Management Society, The American Fisheries Society and The Florida Commercial Applicators Association.

Should anyone choose to commemorate Harry through a contribution, The Harry L. McGill Memorial Fund is being administered by the Barnett Bank, Punta Gorda, FL 33950. The Florida Aquatic Plant Management Society has sent $100 in his memory. The fund is for the benefit of his daughters, Kelly and Sally.

Of Agent Orange and Oysters

by
Jess M. Van Dyke
Senior Biologist
Bureau of Aquatic Plant Research & Control

If I had to be classified as either a "nozzle-head" or an "eco-freak," I would definitely be the latter. Though I have been in aquatics since 1971, I have intentionally avoided herbicides. Last year I left my research position for a job as regional biologist for northwest Florida with visions of long days on unspoiled rivers and an end to the meticulous repetition of research. Within weeks of that job change, I received a memo from my division director that made me feel a bit queasy. The memo stated that I was to prepare a work plan for treating an outbreak of Eurasian watermilfoil in Round Bay, part of the Apalachicola Bay System — and quickly. As you probably know, Apalachicola Bay is one of the most pristine and productive estuaries in the nation. It supports a seafood industry that is the mainstay of Franklin County's economy and has been designated as a National Estuarine Sanctuary.

In Round Bay, Eurasian watermilfoil had demonstrated its propensity for explosive range expansion. In the summer of 1980, Dr. Robert J. Livingston discovered a trace amount of milfoil. By August of 1981, DNR personnel estimated that there were 500 acres of milfoil in Round Bay. It was particularly disturbing that this rapid expansion occurred during a drought when the salinity in the area was at its highest level. According to information on salinity and water depth, the area in the Apalachicola Bay System conducive to the establishment of Eruasian watermilfoil is approximately 10,000 acres. I was impressed by the extent of the problem and importance of the environmental and economic stakes. My first step in developing a work plan was to read everything I could find on Eruasian watermilfoil and its content. I also contacted people all over the nation. My conclusions from this information search were that this exotic milfoil could dramatically alter the bay, and the only (slim) chance we had at eradicating an isolated infestation was with herbicides. The literature stated that milfoil was highly susceptible to 2,4-D, and 2,4-D was one of the oldest, safest, and most thoroughly studied organic herbicides. My head slowly began changing into the shape of a nozzle.

I wrote a draft of the work plan and met with Woody Miley, Apalachicola Bay Sanctuary Manager and old friend, and Dr. "Skip" Livingston, the man perhaps most responsible for the bay remaining in such good condition. Amazingly, we three had independently come to the same conclusion — treat in the spring of 1982 with a dimethylamine salt of 2,4-D. The pelletized butoxyethanol ester, though perhaps more effective on milfoil, was 100 times more toxic to oyster larvae.

On January 18, 1982, I submitted a precise, footnoted work plan to the Apalachicola Bay Sanctuary Committee which consisted of Dr. Elton Gissendanner (DNR), Pam McVety (DER), Brad Hartman (GFC), Skip Livingston (FSU), and Cecil Varnes and Bobby Howell, officials of Franklin County. The proposed work plan passed unanimously. So far, so good.

The next step was to obtain a 24(c) label for use of DMA 2,4-D at rates effective on milfoil. I had many skeptics and little time. We had to treat in April, prior to the seasonal abundance of shrimp larvae in Round Bay but after milfoil was in a rapid growth mode and most vulnerable to 2,4-D. Thanks to the cooperation of the Department of Agriculture and Consumer Services and the University of Florida, I had the 24(c) one month after submitting an application. Things were definitely rolling my way.

It is rare when it is easy to pinpoint a single event that torpedoes months of hard work and difficult decisions. This time it was a cinch. On March 11, 1982, the "Apalachicola Times" printed an article about the project stating "chemicals used in 2,4-D are the same found in Agent Orange," a classic halftruth. The wind suddenly changed in Franklin County. The focus of fear was shifted from Eruasian watermilfoil to 2,4-D, and I was on the defensive.

On March 16, 1982, Woody and I presented the work plan to the Franklin

WATER MANAGEMENT EXPERTS Recommend

CUTRINE-PLUS®

***BEST* ALGAE & HYDRILLA CONTROL!**

CUTRINE-PLUS, available in either liquid or granular, is tops for use in potable water reservoirs; lakes; farm, fish, fire and residential ponds; fish hatcheries; irrigation conveyance systems. This largest selling algaecide in liquid form **effectively controls** filamentous (pond scum, "moss") and planktonic (pea soup) algae. The granular is specially formulated to control chara, nitella and bottom growths of filamentous algae.

For HYDRILLA Control, CUTRINE-PLUS mixed with Diquat provides consistent results every time. CUTRINE-PLUS is **less corrosive . . . less cost** per acre . . . **immediate water use** after treatment!

For Complete Information Call or Write:

applied biochemists inc

TONY KIMBALL
3348 Waverly Dock Rd.
Jacksonville, FL. 32217
904: 268-3727

County Commission. We emphasized the potential harmful effects to the seafood industry of dense strands of milfoil. The commissioners and audience were concerned about 2,4-D. The decision was made to postpone the decision. A public referendum would be held on March 25. I began thinking we might weather the inevitable and justifiable public scrutiny. I was wrong.

On March 18, 1982, the "Apalachicola Times" printed a story entitled, "Fishermen, DNR Clash Over Milfoil Project." The Department of Natural Resources had recently closed much of the bay to oyster harvesting due to high fecal coliform bacteria counts. Issues were being confused, not necessarily in print, but in the minds of the people.

Continuing field investigations documented the existence of milfoil in an area other than Round Bay. Our position that milfoil was isolated had been destroyed.

The public meeting was held on March 25, 1982. I was impressed by the turnout and the strong protective spirit for the Apalachicola Bay. Based on the lack of guarantees and public sentiment, the Board of County Commissioners voted unanimously against the project.

We will abide by the will of the people of Franklin County. It's only fair; it's their livelihood at stake. If the milfoil doesn't continue to expand, their decision will have been the right one. As with most biological situations, anything can happen. To be honest, I have moments when I wish the bay will look like a well-fertilized pasture in a couple of years. But those thoughts quickly pass. I want the best for those hard-working fishermen and their beautiful bay. Also, I admit a sense of relief that I was let off the hook. Being in charge of the year's largest herbicide operation in one of the state's most sensitive areas was not exactly comforting.

In five months, I had reviewed the literature, written a work plan, presented the plan at four public meetings, obtained a 24(c), and gotten quite an education. One of the major lessons for me was that one should never underestimate the power of the press. Looking back, "step one" should have been a meeting with the editor of the local newspaper to ask for support. If that meeting was unsuccessful, I could have saved myself a great deal of time and effort.

I had approached the task of controlling the Eruasian watermilfoil in the Apalachicola Bay System as an environmentalist with a personal dislike of herbicides. As I studied, I reluctantly became convinced that, regardless of my personal feelings, a herbicide treatment of an isolated infestation of Eruasian watermilfoil was the right thing to do. That brings me to my second major lesson: It has become more difficult for me to classify people as "nozzle-heads" or "eco-freaks" — even when I look in the mirror.

Queen of the Water Lilies *continued from page 4*

shallow water lagoons, lakes and river banks. Occurring naturally in water only 2-3 ft. deep, this massive water lily has evolved as a species of limited distribution. *Victoria* can flourish in very shallow water, but only if the water level does not fluctuate or raise too high.

Rainfall in the Amazon region (2.5 million sq. mi.) averages 20-25 m. per year with floods causing the main river to rise between 3-6 m. and occasionally up to 15 m. Few aquatic plants can endure such extreme conditions except for floating plants and some annuals. In its native environment, *Victoria* occupies the surrounding marshes and the temporary inundate lowlands during the rainy season. Since *Victoria* is an annual, it has an advantage over perennials in these type areas. During the dry period, which means anything between mud to shallow lagoons and marshes, seeds are profusely produced. Distribution appears to be limited to South American but because of its leaf and flower size, *Victoria* is cultivated in numerous botanical water gardens throughout the United States and Europe.

In Paraguay, *V. cruziana* is called water corn because of its large, starch containing seeds. The seeds and rhizomes can be eaten raw, cooked or ground into flour. The underside leaf provides excellent habitat for invertebrates while the seeds are often fed upon by marsh birds and ducks.

Special thanks is extended to Peter Slocum, President of Slocum Water Gardens in Winter Haven, for his assistance in providing a specimen of *Victoria* for photographic purposes.

Florida Agricultural Research Institute

The Florida Agricultural Research Institute (F.A.R.I.) is assisting Florida farmers to properly use crop protection chemicals and correctly dispose of their containers, according to Russell K. Herring, 1982-83 Chairman of the Board of Directors.

"Each Florida Cooperative Extension Service County Director and each Florida agricultural commodity and trade association executive has received a complimentary, octagonal stamp with the imprint, 'Before Using Any Pesticide, STOP, and Read the Label.' The stamp can be used in correspondence to farmers, organization's members, and numerous other ways," said Herring.

Max Haigler, Chairman of FA.R.I.'s Pesticide Safety Education Committee noted, "Use of the stamp with red ink will remind Florida farmers that proper and safe utilization of chemicals and disposal of containers is necessary. These production inputs must continue to remain available to farmers in sufficient quantities and at affordable prices."

Heavy Weed Growth Ahead...

Clean, Open Water Behind

That's how it is when the HARVESTER makes its pass

You are looking at the most positive, most economical, cleanest method of aquatic weed control yet devised. Strong statement? We believe we can back it up.

POSITIVE — No need to wait days, or even hours to assess results. The HARVESTER reaches down, cuts and removes weeds *right now* — surely and efficiently as a combine gathers grain.

ECONOMICAL — Independent studies show that when it comes to the bottom line, you can't beat aquatic weed harvesting in the cost of work completed. Studies are available on request.

CLEAN — If water is clean enough for swimming before the HARVESTER makes its pass, it's clean enough for swimming in its wake.

LET US TELL YOU MORE — This HARVESTER is just one of many machines and systems pioneered by AQUAMARINE for effective waterweed control. Our track record shows every piece of equipment still in service. Let us help you select or design a system for you.

AQUAMARINE

AQUAMARINE CORPORATION
Subsidiary of DredgeMasters International
P.O. Box 616, 225 North Grand Avenue
Waukesha, WI 53187 • 414/547-0211

Combee Airboats Inc.

Full line of aluminum and fiberglass Airboats and Service
All sizes and types of airboats to meet your needs.

Combee Airboat Engine Options:
Aircraft power plants
Automotive power plants
High performance automotive belt drive power plants

Full Service Repairs:
Complete engine repairs by A&P certified mechanics
Aircraft to automotive change-overs
Complete metal work
Modification and repair to existing metal work
Stainless steel tank fabrication
Authorized Sensenich propeller dealer

Combee Airboats would like to make available to you our 19 years of experience in the manufacturing and service of airboats

Call or write today for additional information:

COMBEE AIRBOATS INC.
1210 33rd ST. N.W.
WINTER HAVEN, FL 33880
PHONE (813) 293-1917

AQUASHADE
AQUATIC PLANT GROWTH CONTROL

SIMPLE & NON-TOXIC & PROVEN to SUPPRESS HYDRILLA, weeds & algae

ECONOMICAL, as it is long lasting

USE in contained ponds to maintain the NATURAL BLUE COLOR

APPLY when growth is on bottom or AFTER herbicide for CONTINUING CONTROL

AQUASHADE INC., P.O. BOX 198,
ELDRED, NEW YORK 12732 (914) 557-8077

Effects of Surfactants on the Penetration of 2,4-D in Waterhyacinth

Daniel D. Thayer
and
William T. Haller
Center for Aquatic Weeds
University of Florida

In the late 1800's some of the earliest work using surfactants indicated an increase in toxicity of arsenical insecticides with the addition of soap as a surfactant. By the 1950's, the advantages of surfactants became apparent and led to their widespread use for increasing herbicidal activity. Today the technology of surfactants has gone from household detergents as wetting agents to complex synthetic formulations designed to accommodate a specific function such as wetting, spreading and sticking of herbicides to leaf surfaces as well as increasing the penetration of some herbicides into the leaf.

In the past year we have tested several surfactants commonly tank mixed with 2,4-D for waterhyacinth control to determine if the addition of surfactants could significantly increase the penetration of 2,4-D into the plants. The surfactants tested were Cide-Kick, Big Wet, X-77 and Herbex.

Radioactive 2,4-D was used to trace the movement of herbicide in the plant and spray solutions were mixed such that half the treatments had 2,4-D + surfactant in the spray and the remaining had only 2,4-D + water.

Single leaf applications were made per plant either with one of four 2,4-D-surfactant solutions or the 2,4-D-water solution. After a period of 2, 3, 4, and 6 hours the leaf that was treated and the leaf petiole were removed. Starting from the base of the leaf, every inch and a half of the petiole was sectioned and the amount of radioactive 2,4-D could then be determined. Assuming that any increase in translocation of the 2,4-D was related to an increase in penetration, we

Continued on page 18

A body of water is a living thing...

A delicate balance of plant and animal life. A varied assortment of creatures, many too tiny to see. A place to make peace with the world, and enjoy the wonders of nature.

But all this can change quickly. A slight shift in the environment and a tiny group of plants may suddenly burst into a teeming mass of choking weeds and slime. The effect is dramatic, as fish and other life forms struggle for survival in this hostile new world.

How to deal with these troublesome intruders? How to be sure that the delicate creatures already there may continue their existence unaffected?

The choice is Pennwalt Aquatic Herbicides. To quickly restore the natural balance. Without harming wildlife. Or human visitors.

AQUATHOL® K Aquatic Herbicide
AQUATHOL® Granular Aquatic Herbicide
HYDROTHOL® 191 Aquatic Algicide and Herbicide
HYDROTHOL® 191 Granular Aquatic Algicide and Herbicide

Liquid and granular formulations to control water weeds and algae on contact. And each is biodegradable.

Pennwalt Aquatics. Because an environment so precious should be treated with respect and care. After all, it's a living thing.

AGCHEM
PENNWALT
CHEMICALS ■ EQUIPMENT

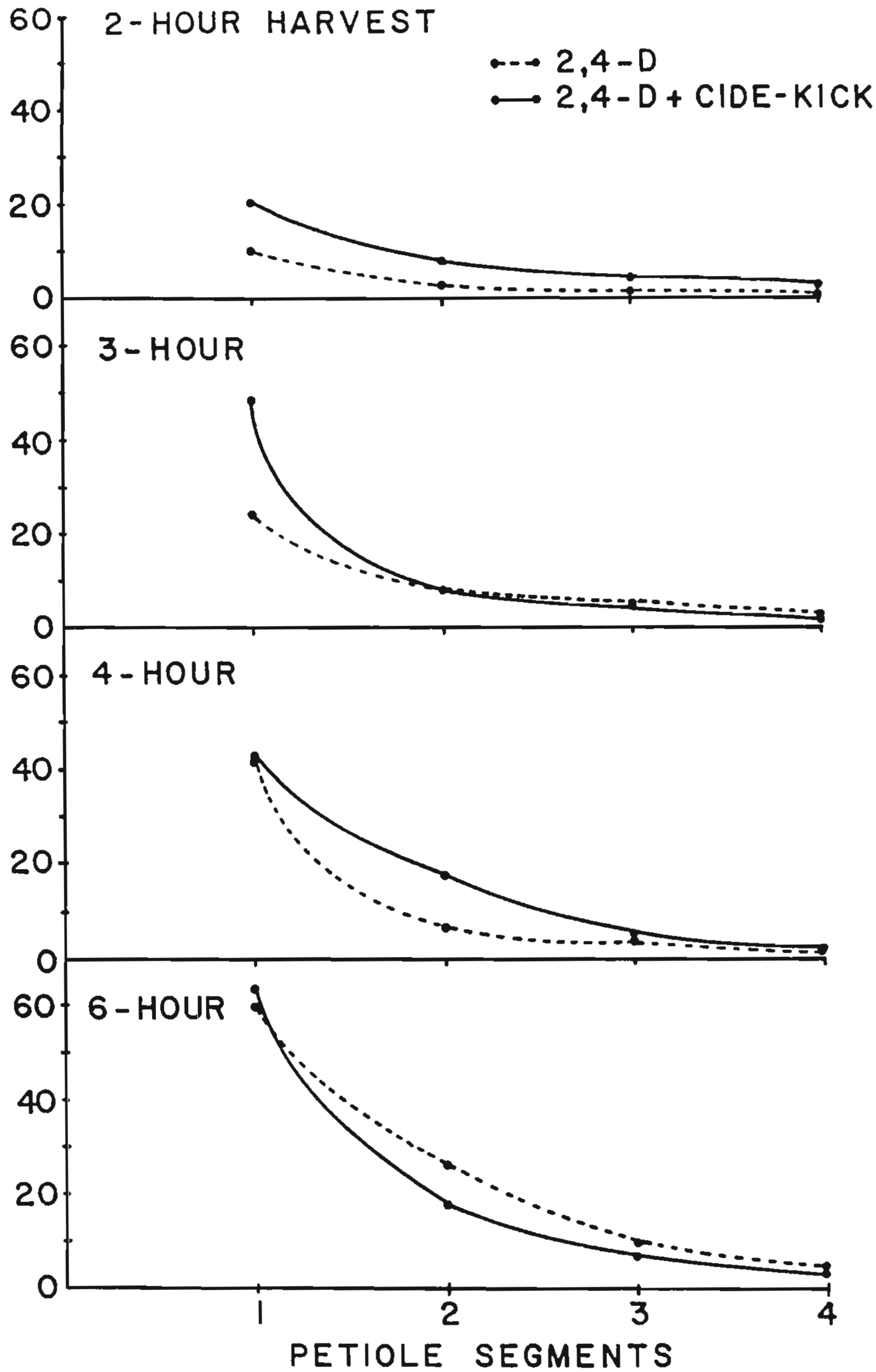


Figure 1. Effects of Cide-Kick on the penetration of 2,4-D through waterhyacinth leaves. Petiole segments were consecutively cut 1.5 inches in length from the treated leaf and labeled 1, 2, 3, & 4 respectively. The level of 2,4-D in the petiole was measured as DPM/ mg plant tissue.

Effects of Surfactants *continued from page 16*

could determine from the amount of radioactivity whether surfactants were effective at increasing herbicide penetration.

The results for the surfactant Big Wet and X-77 were similar to the results graphically illustrated for Cide-Kick (Figure 1). Initially the amount of radioactive 2,4-D in the petiole was significantly greater when a surfactant was added to the spray than when 2,4-D was applied alone. After 4 hours the levels of 2,4-D in the petiole were about the same for both 2,4-D + surfactant and 2,4-D + water treatments. The effect of Herbex on penetration was quite different than the other surfactants (Figure 2). Within the first few hours after treatment, there appeared to be no differences between the 2,4-D-Herbex and the 2,4-D-water treatment; however, after 3 hours it became obvious that the Herbex was significantly restricting either penetration and/or translocation of the 2,4-D into the petiole.

With the exception of Herbex, it appears as though the use of surfactants may increase the initial uptake of 2,4-D in waterhyacinths. This may be important in areas where wind chopped water, boat wake, or rains within 2 to 3 hours could wash herbicide sprays off shortly after application.

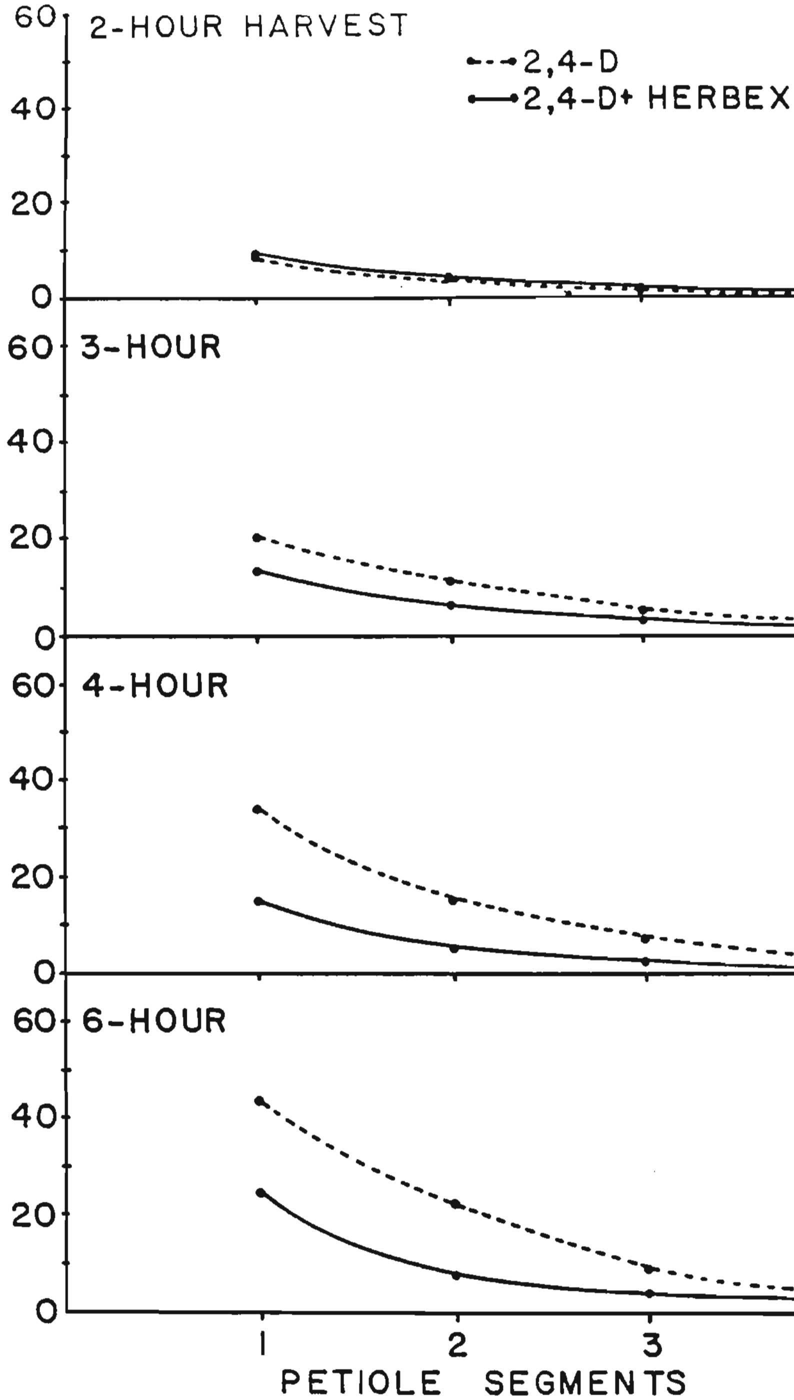


Figure 2. Effects of Herbex on the penetration of 2,4-D through waterhyacinth leaves. Petiole segments were consecutively cut 1.5 inches in length from the treated leaf and labeled 1, 2, 3, & 4 respectively. The level of 2,4-D in the petiole was measured as DPM/mg plant tissue.

Florida Aquatic Plant Management Society, Inc.
2555 S.E. Bonita Street
Stuart, Florida 33494

BULK RATE
U.S. Postage
PAID
Stuart, Florida
Permit No. 50

Aquatics

The official quarterly publication of the Florida Aquatic Plant Management Society

* * *

HERE'S WHAT *AQUATICS* READERS SAID AT THE FAPMS CONVENTION IN ORLANDO LAST OCTOBER:

"I want a Society membership just so I can get the magazine . . . "

"We get 3 copies of every issue just so we're sure everybody sees it in the plant and I have one to take home . . . "

"I consider *AQUATICS* the 'crown jewel' of the Society. It's really helped to *make* this organization . . ."

"You'd be pleasantly surprised at the number of responses we've had from our ads in *AQUATICS* . . ."

"This is the best publication of its type that I've ever seen . . ."

"There are a lot of people involved in this business and I don't know really how we'd contact them if we didn't have *AQUATICS* . . ."

"We've had many a call in the 4 years since *AQUATICS* was started for reprints of articles which have appeared in it . . ."

* * *

FLORIDA AQUATIC PLANT MANAGEMENT SOCIETY, INC. • ESTABLISHED 1976 •

Only $5.00 a Year
Please remit with order to:
AQUATICS
P.O. Drawer 2476
Stuart, Florida 33495