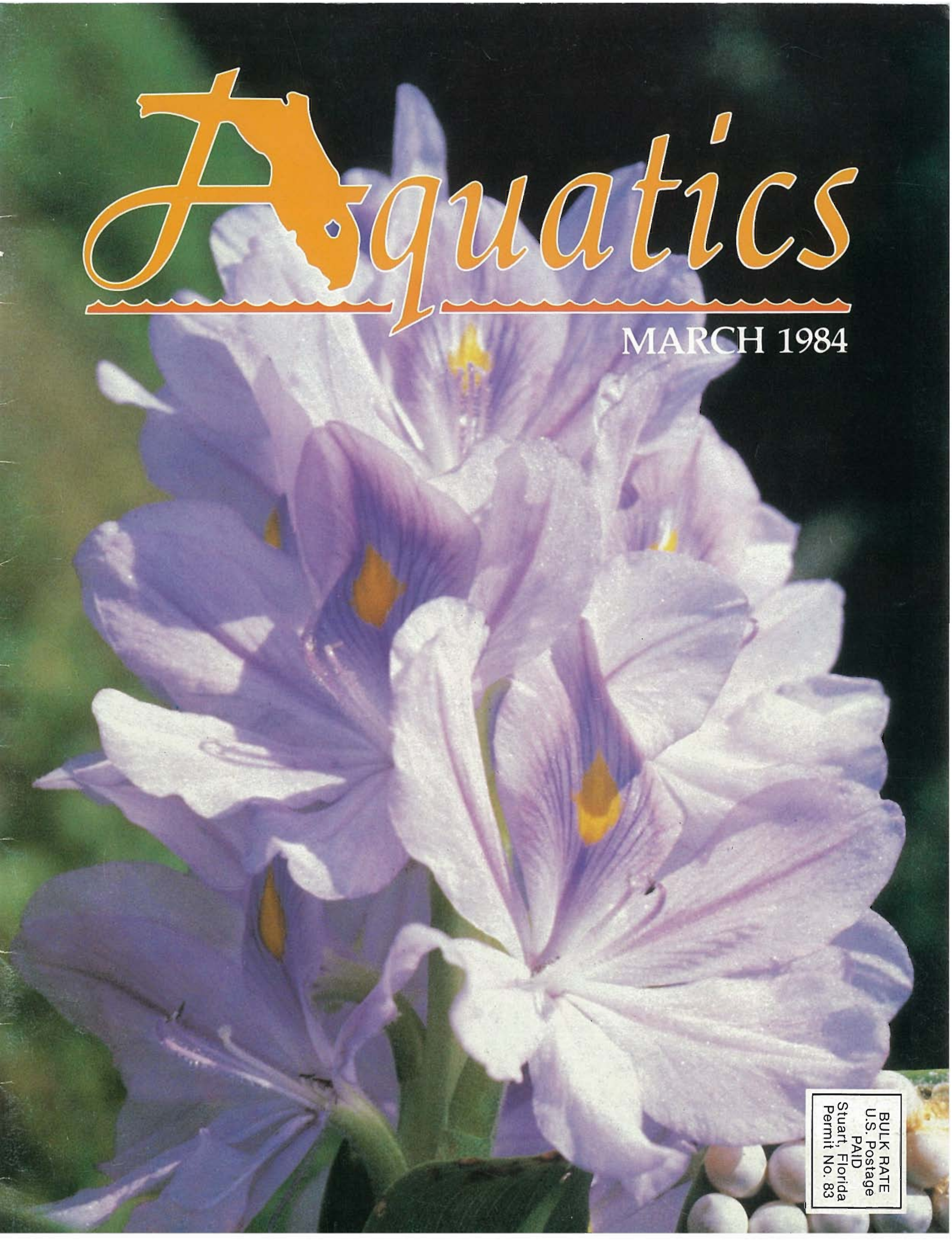
Aquatics

MARCH 1984



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EDITORIAL

The By-Laws of this Society very clearly state our purpose.

Let's review the purposes of this Society and see how well we have met our objectives.

These are the objectives of the Florida Aquatic Plant Management Society, Inc. as recorded in the By-Laws:

ARTICLE IV — OBJECTIVES

Section 1. The objective of this Society shall be:

1. To provide a common forum in which to meet, discuss, exchange ideas and information, and to assist all aquatic plant managers including private, commercial profession, especially as they relate to Florida circumstances. To assist research scientists, legislators, planners, state and federal governmental agencies, lawyers, engineers, education institutions, students, and others concerned with the general aims of this Society.

2. To encourage and assist in:

a. Gathering and making available to supervisory and field personnel the most advanced information in all methods of aquatic plant management.

b. Research and development of chemical aquatic plant control.

c. Research and development of mechanical control of aquatic plants.

d. Research and development of biological control of aquatic plants.

e. Research and development of any other method or combination of methods that are potentially practical for field use.

f. Protection of water quality in the State, and upgrading in general the aquatic ecosystem.

g. Making available to the media, accurate information for education of the public as to the need, safety, advantages, and limitations of aquatic plant control.

h. Development of legislation and administrative rules beneficial to the aquatic plant management discipline.

i. Cooperation with other organizations as may be useful to aims of this Society.

How well are we doing in meeting these objectives?

Personally, I think the Society has done an outstanding job in meeting the objectives established by the "Founding Fathers."

The three most prominent vehicles for meeting our objectives have been and will continue to be the annual meeting, Aquatics *and our newsletter. We will soon be involved in encouraging and recognizing the knowledge and professionalism of the "hands-on" applicator by offering a supplemental certification program. We are*

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THE COVER

This beautiful inflorescence of the water hyacinth is the reason for its introduction to the U.S. If not for constant control activities this noxious weed would again dominate our waterways. Photo by Jeff Schardt -DNR

Aquatics

MARCH 1984/Volume 6, NO. 1

CONTENTS

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 David P. Tarver, Editor, "AQUATICS" Magazine, 2416 McWest St., Tallahassee, Fla. 32303

Florida's 1983 Water Hyacinth Survey

by

Jeff Schardt

Most of Florida experienced severe drought conditions during 1980 and 1981. As rainfall returned to normal in 1982, water began increasing to historic levels in most of Florida's lakes and rivers. Sediments which had been exposed for a year or more were once again covered with water in 1982 and remained submerged during 1983.

One of the effects on water hyacinths *(Eichhornia crassipes)* caused by dewatering is the germination of seeds and rapid regrowth when water is returned. Water hyacinths had been under maintenance control for several years throughout most of the state; however, many managers were concerned that when the dried lakes and wetlands were again inundated, hyacinth problems would greatly expand. Most water bodies which were surveyed in 1982 were still at low water levels. During 1983, nearly all were filled and many underwent dramatic hyacinth increases.

Each year, the Florida Department of Natural Resources surveys more than one million acres of water for aquatic plant coverage. From this inventory, problem species can be detected and management efforts directed toward waters and plants of major concern. This article exclusively addresses water hyacinth populations across the state and associated problems within selected waters. Emphasis is placed on the major changes in populations during the past two years. Survey techniques were outlined in "Florida's 1983 Hydrilla Survey," *Aquatics* magazine, December 1983, Volume 5, Number 4.

A total of 427 water bodies were surveyed in 1982: 300 lakes, 55 rivers and creeks, and 72 canal systems. Water hyacinths were the third most abundant aquatic plant with 8,466 acres reported in 239 water bodies at the time of the survey. Only hydrilla (42,055 acres) and cattails (14,773 acres) covered more surface acres of public waters than water hyacinths. Six species were found in more water bodies than this troublesome floating plant.

The survey was expanded in 1983 to encompass nearly 500 water bodies. Approximately 1.33 million acres were inspected: 355 lakes, 69 creeks and rivers, and 73 canal systems. Because data processing is not complete as of this writing, the report herein must be considered preliminary.

Nearly 20,500 acres of water hyacinths were found in 280 water bodies in 1983; an increase of roughly 12,000 acres and 41 more systems versus 1982. Most of the acreage increase occurred in three systems: Lake Okeechobee increased by 5,000 acres, Orange Lake by more than 2,000 acres and the St. Johns River system increased by nearly 2,500 acres (the St. Johns River system is composed of 20 major lakes, tributary creeks and canals).

Table 1 compares 1982 hyacinth presence and acreage data with 1983 results. Statewide totals are presented graphically in Figures 1 and 2. Hyacinths were found in 52% of the lakes inspected in both years. Although the percentage of affected water bodies remained constant, nearly 10,000 more acres of this species were found in lakes in 1983. Ninety-eight percent of the increase occurred in existing populations in lakes which were inspected in 1982. Of the 55 lakes new to the survey in 1983, 25 contained hyacinths but totalled only 224 acres. Lakes Jessup (Seminole County) and Marian (Osceola County) accounted for most of the acreage (100 and 61 acres respectively).

Water hyacinth presence increased in rivers from 57% in 1982 to 65% during 1983. Total river coverage in 1983 was 3,421 acres — a 1,500 acre increase over 1982. Some of the increase occurred in systems not included in the 1982 survey. All twelve rivers and creeks new to the survey in 1983 supported hyacinths, adding about 200 acres to the total. Three rivers for which hyacinths were not recorded in 1982 contained a total of ten additional acres; however, most of the increases occurred from populations which were inventoried in 1982.

Acreage increases were not as dramatic in canal systems since all were under intensive maintanance programs. Virtually no change occurred in the number of canals affected by hyacinths — 74% were affected in 1982 and 75% in 1983. A 600 acre increase in coverage was reported for 1983. Most of the increase (380 acres) occurred in Collier County canals. Two new canal systems were added to the 1983 survey — both contained hyacinths for an additional 54 acres. One system from 1982 was deleted after determining it was not maintained for general public benefit.

Although more than 70 water bodies were added to the survey in 1983, the majority of the increased hyacinth acreage occurred within waters inspected during 1982. Of the 213 waters containing hyacinths, common to both surveys, 117 had increased populations, 81 had reductions and 40 populations remained the same. Forty-four significant changes were recorded.

Significance, for the purpose of this report had to meet two criteria: 1) an increase or decrease of at least 25 acres from 1982 values, and 2) at least a 25% change in coverage. The ten greatest changes are listed in Tables 2 and 3.

Hyacinth coverage was significantly greater in 24 water bodies during 1983, increasing by 12,695 acres. Again, seed germination brought on by the refilling and inundation of most of the hydro-soil left dry by droughts of 1980 and 1981 seems to be the most likely explanation of the tremendous growth. The thousands of acres of new hyacinths in Lake Okeechobee are thought to be water level related as are the hundreds of acres of new coverage in Lakes George and Monroe and the St. Johns River. Water level rose along the length of the St. Johns, flooding wetlands and flushing plants into the main channel. As a result, the St. Johns system with adjoining lakes had an increase of nearly 2,500 acres of hyacinths — the main channel coverage grew by almost 1,400 acres.

The sheer size of some lakes (for example Kissimmee, 35,000 acres and Istokpoga, 28,000 acres) lessened the impact of expanding hyacinth populations. Water hyacinths increased from 35 to 470 and 500 to 785 acres respectively in these systems, but were confined primarily to small communities scattered throughout the lakes. In other systems such as Orange Lake, West Lake Tohopekaliga (Toho) and Lake Hatchineha, hyacinths were left uncontrolled in 1983 in favor of treating other species or concentrating on different systems. Intensive management efforts are planned for Orange Lake and Lake Hatchineha in 1984.

Twenty water bodies had significant hyacinth reductions in 1983 for a total loss of 1,455 acres. The ten greatest reductions were due to management efforts primarily using different formulations of 2,4-D. The three largest decreases, Crescent Lake (200 acres — 31%), Lake Poinsett (180 acres — 100%) and Lake Dexter (155 acres — 56%) were a result of an increased effort by the U.S. Army Corps of Engineers to control water hyacinths in the upper St. Johns River basin. Control was achieved strictly using 2,4-D. The Suwannee River Water Management District reduced hyacinths in the Suwannee River and Peacock Lake by 100 acres (66%) and 74 acres (99%) respectively using 2,4-D. Lakes Trafford (Collier County Aquatic Plant Control) and Lawne (Orange County Pollution Control Department) had reduced hyacinth populations due to management efforts with 2,4-D.

The Polk County Environmental Services reduced the Lake Rosalie hyacinth population by 74 acres (99%) by applying 2,4-D and Diquat. Seventy acres (87%) of hyacinths were removed from the Ed Medard Reservoir by the South Florida Water Management District using Diquat. Caloosahatchee River hyacinth figures may have dropped in part because of Lee County Hyacinth Control efforts with 2,4-D, but are probably a result of altered survey techniques. Only the main channel was surveyed in 1983 whereas the channel and many oxbows, creeks and coves were inspected in 1982.

Table 4 lists the ten water bodies with the largest hyacinth populations along with their problem ratings. These ten systems account for more than 14,500 acres or roughly 71% of the water hyacinths found in Florida waters. Six of these waters were among the top ten containing water hyacinth populations in 1982 — each supported a much larger population in 1983. Conspicuously absent from the 1982 list are Lakes Crescent, Poinsett and Dexter — all managed by the Corps of Engineers, Jacksonville District.

Six of the top ten hyacinth populations posed severe water use restrictions. No severe nor moderate problem rating was assigned to any of the remaining four because of the size of the waters in relation to the plant populations. Left uncontrolled, each system could suffer from hyacinth problems in 1984 as all four waters had population increases of greater than 400 acres in 1983.

Statewide, severe problems attributed strictly to hyacinths increased from 17 reported in 1982 to 60 in 1983. Moderate problems increased from 6 to 17.

continued on page 8

TABLE 1
Water Hyacinth Presence and Coverage in Lakes, Rivers and Canals

	Number				Acres	
	1982		1983		1982	1983
	Surveyed	Present	Surveyed	Present		
Lakes	300	155	355	183	5,281	15,068
Rivers	55	31	69	45	1,916	3,421
Canals	72	53	73	52	1,269	1,878
Total	427	239	497	280	8,466	20,367

TABLE 2
Ten Largest Water Hyacinth Population Increases During 1983

Water Body	1982	1983	Increase
1 Lake Okeechobee	380	5,292	4,912
2 Orange Lake	75	2,150	2,075
3 St. Johns River*	1,205	2,600	1,395
4 West Lake Toho	15	604	589
5 Lake George	220	760	540
6 Lake Monroe	100	550	450
7 Lake Kissimmee	35	470	435
8 Lake Hatchineha	43	446	403
9 Collier County Canals	220	600	380
10 Lake Istokpoga	500	785	285

* River channel only.

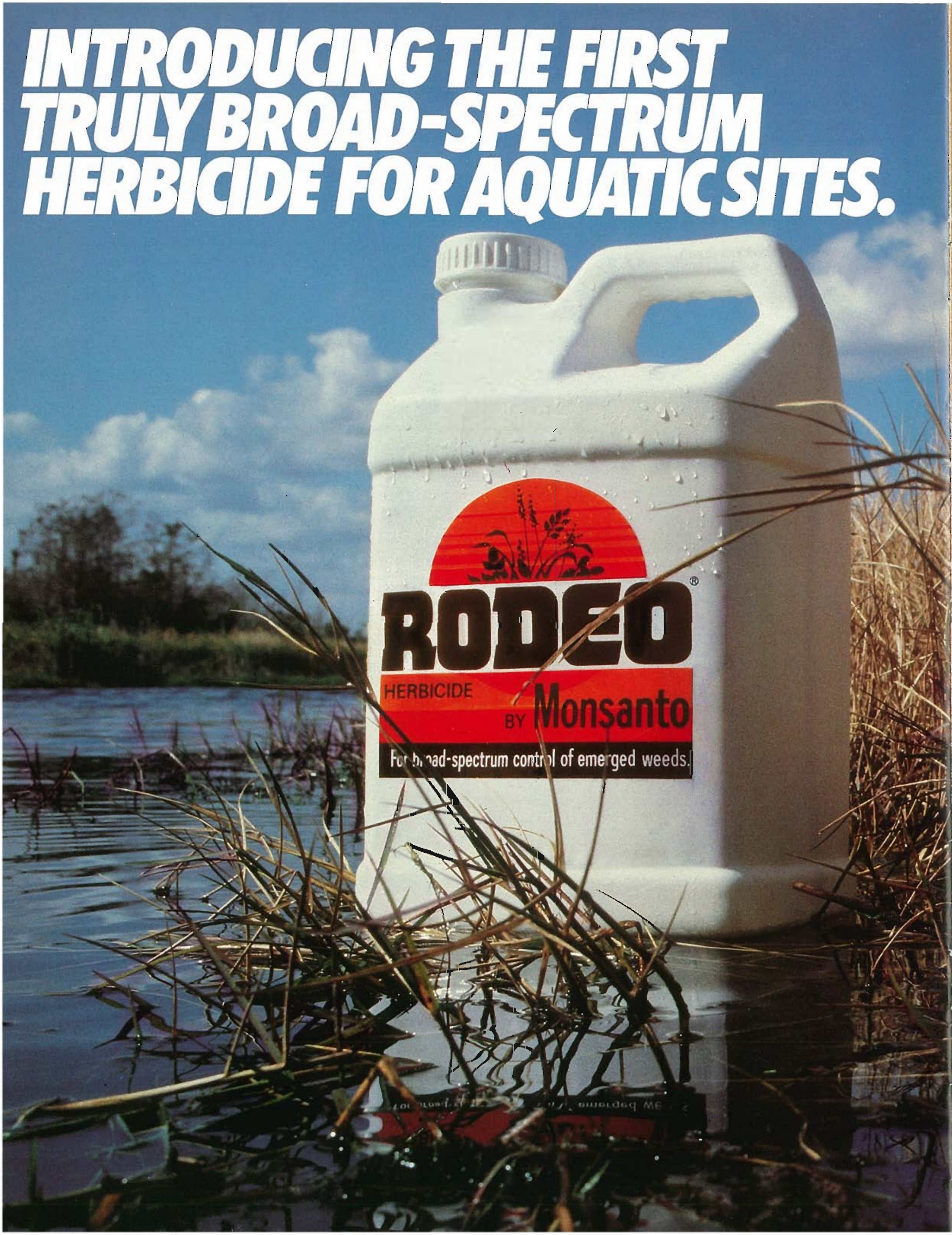
TABLE 3
Ten Largest Water Hyacinth Population Decreases During 1983

Water Body	1982	1983	Decrease
1 Crescent Lake (Putnam Co.)	650	450	200
2 Lake Poinsett	180	0	180
3 Lake Dexter	275	120	155
4 Suwannee River	150	50	100
5 Lake Trafford	112	36	76
6 Caloosahatchee River	75	.5	75
7 Lake Rosalie	75	1	74
8 Peacock Lake	75	1	74
9 Ed Medard Reservoir	80	10	70
10 Lake Lawne	156	18	62

TABLE 4
Ten Largest Water Hyacinth Populations

Water Body	Acreage	Rating*
1 Lake Okeechobee	5,292	1
2 St. Johns River†	2,600	0
3 Orange Lake	2,150	1
4 Lake Istokpoga	785	1
5 Lake George	760	0
6 Rodman Reservoir	725	1
7 West Lake Toho	604	1
8 Collier County Canals	600	1
9 Lake Monroe	550	0
10 Lake Kissimmee	470	0

* 1 = Severe problem, 2 = moderate, 0 = no problem
† River channel only.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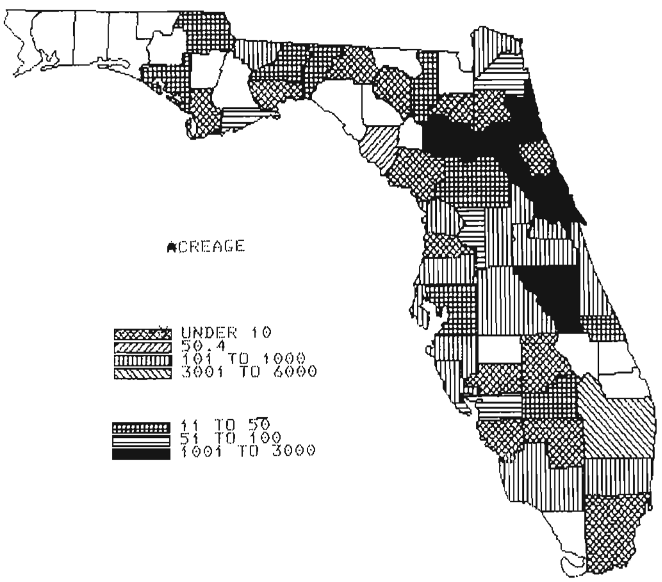


Figure 1
Water Hyacinth Distribution and Abundance by County

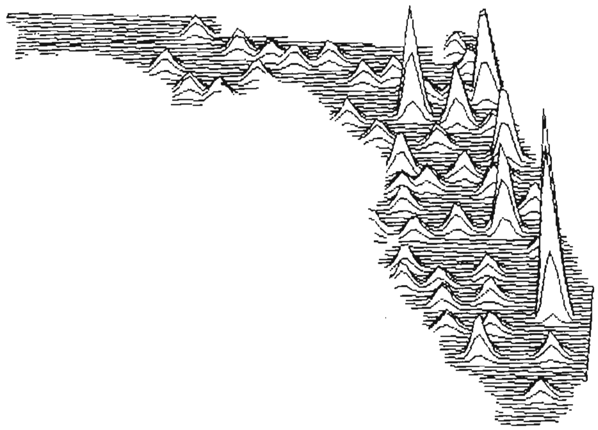


Figure 2
Relative Water Hyacinth Distribution and Abundance by County

continued from page 5

The 1984 water hyacinth management season could prove to be one of the most costly and time consuming in recent years. Management efforts were increased in 1983 in many areas yet hyacinths more than doubled their coverage throughout the state. Water levels have remained high and nutrient input continues to rise in Florida waters. Some assistance may have been granted by recent hard frosts in north and central Florida, but only concentrated management efforts will reduce and hold populations to tolerable levels. □

At places where stupidities flourish,
Wisdom is considered a weed.

Criticism and self-criticism...
applied to peoples' words and actions
to determine whether they are fragrant flowers or poisonous weeds.
— *Mao Tse-Tung*

We bring forth weeds when our quick minds lie still.
— *Shakespeare*

Now in this age of knowledge
Where did I wrongly go?
All advice was taken, but...
I should have used a hoe.

Oh, you who plan and reap and sow
Guard well your acres from this foe.
Nor vigil cease, nor labor spare,
Lest weeds become harsh tyrants there.

Reprinted from Vol. 12 No. 1. 1984 WSSA Newsletter.

The Status of Undesirable Aquatic Weeds in Georgia During 1983

by W. Wayne Thomaston
Georgia Department of Natural Resources
Game and Fish Division — Fort Valley, Georgia

INTRODUCTION

Obnoxious aquatic weeds have the potential of becoming a major problem in Georgia except in Lake Seminole where there is already an extremely serious problem. The Corps of Engineers carries out the weed control program in Lake Seminole. Most of the problem species now exist in relatively small acreages scattered throughout the state. There is a potential for their rapid growth and dispersion. If these weeds are left unchecked, they will pose a serious threat to agriculture, recreation, navigation, and industry in the state. It is important that control methods be taken now because it would be more feasible to control these weeds before they become firmly established.

The weeds that are expected to give the most problems are *Hydrilla verticillata* (Royle), alligator weed, *Alternanthera philoxeroides* (Mart.); water hyacinth, *Eichhornia crassipes* (Mart.); giant cutgrass, *Zianaopsis sp.* (Michx.); eurasion watermilfoil, *Myriophylum spicatum* (L.); *Egeria densa,* and *Lyngbya sp.*, a species of filamentous algae. In some localized areas these have already become problems.

Hydrilla

Hydrilla, at the present time, is primarily confined to Lake Seminole. However, it has been located in Radium Springs in Dougherty County and a small pond in Worth County. The ten acres in Radium Springs, a small tributary of the Flint River, has been treated several times with various herbicides. When this weed was initially identified there, it covered 100% of the area. Control ranged from 80% to 100% but regrowth was immediate. In order to keep it controlled for a season, it requires 2-3 treatments annually.

Alligator Weed

Alligator weed had been in Lake Seminole for many years. It has now spread statewide. The Alligator Flea Beetle has been used on the weed. There was some evidence of damage in the northern part of the state but the cold winters usually kill all the beetles. They have been partially successful in controlling the weed in the southern part of the state. Beetles were collected from Ebenezer Creek near Savannah where they have done a fair job of control.

Water Hyacinths

Water hyacinths have been in Lake Seminole for several years and cause some problems. They have also infested Lake Worth near Albany. There are also small patches up and down the coastal section of the state. However, cold weather apparently has been preventing it from spreading further north or causing a serious problem.

Giant Cutgrass

There are several thousand acres of giant cutgrass in Lake Seminole causing severe problems in certain area. There is an estimated 100 acres of cutgrass in Lake Worth, located near Albany, Georgia. There is an estimated 50 acres of cutgrass in Lake Jackson, located near Atlanta. It is also scattered throughout the state in small patches. In some localized areas. it prevents the property owners from using their docks unless it is cleared out. Some effort has been made to control this in Lake Jackson on an experimental basis around boat docks.

Egeria

Egeria is in the Savannah River near Augusta, Georgia and is causing some problems. It has also recently been found in the Chattahoochee River north of Columbus, Georgia in Goat Rock Reservoir. Egeria has recently been found in the Ocmulgee River north of Macon. There is an estimated 20-mile stretch of the river where it causes some problems. The Juliette Milling Company has problems when it breaks loose and floats into the intake of a small generating plant and prevents the flow through of water. Egeria has also been found growing in Lake Juliette which is a new impoundment located near the Ocmulgee River. Water is pumped into the impoundment from the river as a supplemental source of water. There is a band around the shoreline about 25 feet wide around the bank for approximately 3 miles. This prevented fishing from the shoreline in an area that is popular for bank fishermen. A treatment with chelated copper compound in October 1983 appeared to be successful.

Lyngbya

Lyngbya is a filamentous algae that has become well established at Lake Blackshear near Cordele, Georgia and is causing a considerable problem. Lyngbya, although present in other lakes, is not a severe problem. Lyngbya has been partially controlled using several different algicides. Aquazine was used at a concentration of 1 part per million and this would give almost 100% control if used early in the spring. However, in about three weeks to one month, the algae would reappear. Apparently, this is all the time it requires to reinfest 100% of an area. As the summer progresses, it becomes progressively harder to control Lyngbya with any type of herbicide. Usually by August nothing will control it. Normally, about three applications applied about one month apart gives adequate control for the spring and summer.

A publicly-owned fishing lake located near Milledgeville, Georgia, 8 acres in size, has been infested with Lyngbya for several years. In December 1982, Diquat was applied at the rate of one gallon per acre. This same application was repeated in January 1983. At that time, the only indication that Lyngbya was present was very small amounts on the bottom of the lake. There was no regrowth in the summer as had been in the past. This will be repeated in different ponds when the situation arises. There is a possibility that winter treatments of these algaes will be successful. □

An Update on the State Water Hyacinth Control Program in Louisiana

by Larry H. Hartmann
Regional Biologist
Aquatic Plant Research & Control Section
Louisiana Department of Wildlife and Fisheries
Baton Rouge

Since its introduction into the United States by Japanese merchants during the 1884 World Cottom Exposition in New Orleans, the water hyacinth *(Eichhornia crassipes)* has firmly established itself in the nation's drainage systems from coast to coast. The extensive network of bayous, coastal marsh and swampland in South Louisiana adjacent to New Orleans seemed to provide an ideal "foster home" for the South American exotic. Today, almost 100 years later, the water hyacinth remains the number one aquatic plant problem in the state, restricting recreational activities such as hunting and fishing, interfering with navigation, and influencing siltation of waterways.

Responsibility for the management of this and other species of problem aquatic plants is charged to the Louisiana Department of Wildlife and Fisheries' Aquatic Plant Research & Control Section.

Organized as a major section of the Department's Fish Division, the Aquatic Plant Research & Control Section employs both research and management programs, as well as providing technical guidance to the public.

Three Regional Biologists and one statewide Research Biologist (under the supervision of the Section Coordinator) conduct studies pertaining to the monitoring of plant populations in the various drainage basins and lakes of the state, the testing of chemical and biological control agents, and the development of new or improved methods of aquatic plant management. Section biologists also provide technical assistance to private landowners and governmental agencies in solving aquatic vegetation problems and formulating individual management programs.

Approximately 60 boat crew personnel stationed at 20 different locations across the state are engaged in the application of herbicides to control water hyacinth infestations in public waterways. Each spray crew location is supervised by a crew leader who is responsible for the normal day-to-day work schedules, crew work production, and paperwork. Public complaints are received directly by the crew leaders or are referred to them by the main office, and are handled as soon as possible. Otherwise individual drainage areas are worked in a systematic fashion. More than 95% of all control measures taken by the Section are directed against the water hyacinth alone. Crew leaders answer directly to their Regional Biologist in all matters concerning their assigned geographical areas.

In addition to ground application crews, a statewide helicopter spraying contract, subject for renewal annually, is employed in the battle to control hyacinth populations. Currently, a Bell Jet Ranger helicopter is being utilized to work remote coastal marsh areas and large lakes with extremely heavy water hyacinth infestations. Aerial application allows control in areas poorly accessible by standard spray boats and gives a big boost to ground crews in water bodies in which massive hyacinth populations are getting out of control.

Although some mudboats and airboats are used, spray boats are mostly 15 feet custom-built welded skiffs, of heavy gauge aluminum and with bows pointed to knife through dense hyacinth mats. Outboards used are mostly in the 40-50 horsepower range. Each skiff is fitted with an air-cooled engine powered 10 or 20 gpm piston pump and chemical supply tanks.

An overboard water intake and metered chemical injection system eliminates mixing and the need to carry bulky spray tanks, allowing maximum crew production. A typical boat crew may treat from 15-45 acres of water hyacinths per day.

With use comes wear and breakage. The Section services most downed equipment in order to cut down on repair time and expense. A well-equipped warehouse, staffed by mechanics and maintenance repairmen, provides the spray crews with vehicle, outboard and pump repair, special equipment fabrication and a chemical and equipment storage depot.

During the 5-year period from July 1, 1978 through June 30, 1983, the Aquatic Plant Research & Control Section treated a total of 241,974 acres of water hyacinths, for an average of over 48,000 acres annually. Of this 241,974 acres, 43,571 acres (18%) were treated by aerial application.

There has been a 227,400 acre increase in water hyacinth infestation during the last two years. The 1981 acreage estimate was 340,250 acres. Estimates in 1982 were 434,200 acres and 1983, 567,650 acres. This increase is directly attributable to an extended period of above normal seed germination, two consecutive mild winters and extremely high water levels from December 1982 through June 1983. The effects of the current relatively severe winter is looked upon with the anticipation of perhaps helping (along with the Section's stepped up spray program) to reverse this trend.

The Louisiana Department of Wildlife and Fisheries is continuing in its fight to manage the state's water hyacinth populations. Without continued generous legislative support, manpower and equipment, this fight could take a sudden turn around for the worse, virtually paralyzing many of the state's waterways within a relatively short period of time. □

Hydrilla in Texas

by Lou Guerra

Texas Parks and Wildlife

The year 1983, was the year that hydrilla finally became established in Texas. It spread from the periodically filled irrigation canals of tropical South Texas to the timbered Pineywoods of Northeast Texas on the Louisiana border.

Hydrilla seems to thrive in all types of aquatic conditions from a basic water pH range of 8.4 to an acid 6.8. Water quality, color, turbidity and/or depth seem to offer no growth barriers.

Infestations for the most part can be attributed to boat traffic, except in a few isolated cases. In a city lake in San Antonio the hydrilla infestation is due to the dumping of tropical fish and plants. Exotic aquarium fish in city lakes seem a good indicator on sources of infestation and hydrilla could be bought in 90% of aquarium shops.

A real problem is beginning to appear and that is the occurrence of hydrilla in public drinking water supply lakes where herbicides are not often permissable except under a "spot treatment" situation. These lakes will constitute our major problems in the future.

Extensive work continues all over the state in an effort to find a suitable economical solution to the hydrilla menace. While people are aware, funding is difficult to obtain.

Hydrilla now occupies the major favored fishing areas in lakes Toledo Bend, Livingston, Steinhagen and Rayburn. Hydrilla laid dormant for years on lakes Toledo Bend, Rayburn and Steinhagen.

1983 marks the year of a mild winter, excess water, an early spring, with accompanying warm soil and water temperatures and this is the year hydrilla exploded in Texas. The total hydrilla acreage increased from 1,500 to 12,000 acres.

Conditions are now optimum for hydrilla to increase. Boat traffic, fragmentation and climatic conditions will now favor a real explosion that may be extremely difficult to control. □

L.V. Guerra Branch Chief
Aquatic Habitat Enhancement
November 17, 1983

Control of Floating Species With 2,4-D and Diquat

by Dan Thayer
Biologist Supervisor I
Department of Natural Resources

THe freefloating aquatic weed species water hyacinth *(Eichhornia crassipes)* and water lettuce *Pistia stratiotes* often coexist in similar habitats making their control difficult. The primary reason for control difficulties is due to variation in plant morphology and physiology between the two species. The leaves of the water hyacinth grow in a rosette arrangement and have an associated petiole which may be greatly extended when plants compete for space, producing the large "bull-hyacinths." Leaves of the water hyacinth are smooth, somewhat circular, and have no leaf pubescence (hair). Water lettuce plants also grow in a rosette; however, leaves are attached directly with no associated petiole. Leaves of the water lettuce plant are wrinkled and densely pubescent.

The contact herbicide 6,7-dihydrodipyrido pyrazinediium dibromide (diquat) gives excellent control of water lettuce at low rates while water hyacinth control may only be marginal at similar rates. However, the systemic herbicide dimethylamine salt of 2,4-dichlorophenoxy acetic acid (2,4-D) gives excellent control of water hyacinth with little to no effect on water lettuce. Consequently, diquat is often used at higher rates in water lettuce and water hyacinth communities to avoid treating the same area twice with two different herbicides. This type of application can be expensive and may require followup treatments.

It has long been accepted that mixing systemic herbicides with contact herbicides is inutile, in that the contact herbicide destroys the cell membranes upon contacting the leaf surface restricting the systemic herbicide from diffusion and translocation within the plant. However, water hyacinths are only marginally affected by low rates of diquat where water lettuce is extremely sensitive, thus a mixture of diquat at low rates in combination with 2,4-D may result in significant control of both species in one treatment. Due to the fact that 2,4-D is relatively inexpensive and lower rates of diquat may be used, this type of application may be both economical and effective for controlling both plant species. An experiment was therefore designed to test the effectiveness of mixing both 2,4-D and diquat for the control of mixed species of water hyacinth and water lettuce.

A turnpike canal was chosen as the experimental site due to accessibility, presence of both plant species, and because no herbicide work was planned for the site in the near future. Floating frames were made from furring strips producing a grid of two foot square units totaling 32 in all. The frame was anchored on the upstream side to prevent movement. Each of the two food square units were stocked with equal numbers of water hyacinth and water lettuce plants. Plants were chosen on the basis of size, age, and overall condition, selecting for plants that were a smaller stature and easier to handle. Any dead leaves on the plants were removed prior to stocking to prevent rating the results as herbicidal.

Chemical treatments consisted of herbicide combination at various rates (Table 1). Treatments were sprayed using a hand pumped "Thiokol Spray Pal," non-aerosol home and garden sprayer. Treatments were made when the wind velocity was at a minimum and when mixed at an equivalent rate of 100 gallons water per acre and a technical grade nonionic surfactant was added at a rate of one quart per acre. Each of the treatments were replicated three times. Herbicide injury ratings were based on a one to 10 rating scale where one equals no effect and 10 equals total kill. Ratings began immediately and continued every other day for a period of 21 days post-treatment.

TABLE 1
Herbicide treatment rates applied to water hyacinth and water lettuce.

Treatment	Chemical and Rates
1	diquat @ ¼ pt/A + 2,4-D @ ¼ pt/A
2	diquat @ ½ pt/A + 2,4-D @ ½ pt/A
3	diquat @ 1 pt/A + 2,4-D @ 1 pt/A
4	diquat @ 2 pt/A + 2,4-D @ 2 pt/A
5	diquat @ 4 pt/A + 2,4-D @ 4 pt/A
6	diquat @ ⅛ pt/A + 2,4-D @ ¼ pt/A
7	diquat @ ¼ pt/A + 2,4-D @ ¼ pt/A
8	diquat @ ½ pt/A + 2,4-D @ ½ pt/A
9	diquat @ 1 pt/A + 2,4-D @ 2 pt/A
10	diquat @ 2 pt/A + 2,4-D @ 4 pt/A

TABLE 2
Percent control* of water hyacinth and water lettuce with varing treatment rates of diquat and 2,4-D.

Treatment	%Kill Water hyacinth	% Kill Water lettuce
1	47	93
2	77	100
3	88	97
4	98	100
5	100	100
6	**	**
7	**	**
8	**	**
9	**	**
10	**	**

* Percent control based on an average of three replications per treatment and two reviewers.
** Data not analyzed to date.

Treatments one to five have been completed and the data analyzed (Table 2), while treatments six to 10 are presently being finalized. Results for the first five treatments indicate no compatibility problems between the diquat and 2,4-D. Water lettuce proved to be sensitive to diquat at very low rates. Even at a rate of one quarter pint per acre, diquat injured more than 90% of the green tissue on the water lettuce. As the rate of diquat increased from one quarter pint per acre to one half pint per acre, water lettuce control increased to 100 percent.

Water hyacinth were not as easily affected by the lower treatment rates. At the higher rates of diquat plus 2,4-D, initial burn resulted from the diquat, but no more than 40 percent of the green plant tissue was burned. After seven days the results of the 2,4-D were evident with a rate of one pint per acre giving approximately 90 percent control.

Although not all the data is in, it appears that a ratio of two parts 2,4-D plus one part diquat is the best combination for good control of mixed plant stands. The best rate to use would depend on the accuracy of the application. These results indicate that a treatment of 2,4-D at two pints per acre plus diquat at one pint per acre is adequate: however, excellent coverage was not a problem. With general field application equipment, the treatment rate that would probably be most effective would be 2,4-D at four pints per acre and diquat at two pints per acre.

This conclusion is supported by Larry Chandler of the South Florida Water Management District, Okeechobee Field Station, and also Tom Brooks at the Kissimmee Field Station, who have successfully employed this treatment in their program for years. The author would like to thank Paul Myers for the experiment idea and Jeff Mangel for his participation and assistance. □

Section 403.271 Florida Statutes To Be Revised

by
Brian Nelson

The Department of Natural Resources is planning to introduce legislation this year to revise the Aquatic Plant Importation, Transportation, and Cultivation Statute, Section 403.271. This statute authorizes the Department to conduct an aquatic plant regulation program to prevent the importation of noxious exotic species, and to control the careless spread of noxious species already established.

There are currently 170 persons and businesses permitted under this program. Permittee's include aquarium plant dealers, persons involved in habitat creation or restoration projects utilizing aquatic vegetation, and persons cultivating or transporting aquatic plants for research purposes. Aquarium plant dealers receive the greatest amount of attention under this program because they frequently import exotic species. The prohibited species *Salvina molesta* was recently discovered during an inspection of one of these dealers. Other persons and businesses are permitted so that they are familiar with the Department's rules and regulations concerning aquatic plants, expecially the prohibited plant list.

The present statute has made it difficult for the Department to regulate some activities which could result in the movement and release of additional exotic species within the state. The proposed revision corrects this problem by authorizing the permitting and inspection of all persons involved in the aquatic plant business, prohibits the importation, possession, or sale of prohibited species, and allows the seizure of aquatic plants possessed in violation of these provisions. The passage of this revised statute will allow the adoption of more effective and workable rules for the protection of Florida's valuable aquatic resources.

The draft of the proposed revision states:

A Bill To Be Entitled

Be It Enacted By the Legislature of the State of Florida:

Section 1. Section 403.271, Florida Statutes, 1981, is amended to read:

403.271 Aquatic plants; definitions; permits; powers of department; penalites.—

(1) As used in this section relating to aquatic plants:

(a) "Department" means Department of Natural Resources.

(b) "Person" includes natural persons, public or private corporations, governmental entities, and every other kind of entity.

(c) "Aquatic plant" is any plant growing in, or closely associated with, the aquatic environment, and includes floating, emersed, submersed and ditch bank species, including any part or seed thereof.

(d) "Noxious aquatic plant" means any part (including but not limited to seeds or reproductive parts) of any aquatic plant which has the potential to hinder the growth of beneficial plants, interfer with irrigation or navigation, or adversely affect public welfare or the natural resources of the State of Florida.

(2) No person shall engage in any business involving the importation, transportation, cultivation, collection, sale or possession of any aquatic plant species without a permit or exemption issued by the Department. No person shall import, transport, cultivate, collect, sell or possess any noxious aquatic plant listed on the prohibited aquatic plant list established by the Department, without a permit issued by the Department. No permit shall be issued until the Department has determined that the proposed activity poses no significant threat or danger to the waters, wildlife, natural resources or environment of the state.

(3) The Department shall have the following powers:

(a) To make rules governing aquatic plants and their importation, transportation, cultivation, collection and possession as may be necessary for the eradication, control or prevention of the dissemination of noxious aquatic plants.

(b) To make, publish, and revise lists of aquatic plant species, regulated under this section (including those exempted from such regulation), provided reasonable opportunity is afforded the Department of Agriculture and Consumer Services, and the Game and Fresh Water Fish Commission to comment on such lists prior to their becoming effective.

(c) To evaluate aquatic plant species through research or other means.

(d) To declare a quarantine against any area, place, nursery, or body of water or portion thereof within this state to prevent the spread of any noxious or potentially noxious aquatic plant.

(e) To make rules governing the application for, issuance of, suspension of, and revocation of permits.

(f) To enter into cooperative agreements with any person, local government, state agency or agency of the United States as necessary or desirable to carry out and enforce the provisions of this section.

(g) To purchase all necessary supplies, material and equipment and accept all grants and donations useful in the implementation and enforcement of the provisions of this section.

(h) To enter upon and inspect any aquatic plant nursery or other facility or place where aquatic plants are cultivated, held, packaged, shipped, stored, sold, and any vehicle of conveyance, to ascertain whether the provisions of this section and Department regulations are being complied with, and to seize and destroy, without compensation, any aquatic plants imported, transported, cultivated, collected or otherwise possessed in violation of this section or Department regulations.

(i) To conduct a public information program, including, but not limited to, erection of road signs, in order to inform the public and interested parties of this section and its associated rules, and of the dangers of noxious aquatic plant introductions.

(4)(a) Any person violating the provisions of this section is guilty of a misdemeanor of the second degree, punishable as provided in § 775.082 or § 775.083.

(b) All law enforcement officers of the state and its agencies with power to make arre :s for violations of state law shall enforce the provisions of this section.

If you have any questions concerning the statute revision or the aquatic plant regulation program, please write:

Florida Department of Natural Resources
Bureau of Aquatic Plant Research and Control
Attn: Mr. Brian Nelson
3900 Commonwealth Boulevard
Tallahassee, Florida 32303

Nutrient Removal Potential of Aquatic Plants

by K. R. Reddy[1]

Most of the freshwater bodies in Florida are eutrophic as a result of nutrient loading from urban and agricultural activities and many of these water bodies are infested with aquatic weeds. Aquatic plants utilize the problem nutrients such as nitrogen and phosphorus and produce copious amounts of biomass which can be potentially used for some beneficial purposes. Researchers have recently recognized that with proper management, aquatic plants can be effectively used to reduce the pollutant levels of water bodies and potentially use the resulting biomass for production of gaseous fuels, cattle feed, or organic soil amendments. The concept of using aquatic plants for treating sewage effluent is gaining the attention of local and state agencies in various parts of the United States (Alabama, California, Florida, Mississippi, Louisiana, and Texas).

The Institute of Food and Agricultural Sciences (IFAS), University of Florida, through its Center for Environmental Programs has initiated a research program at the Agricultural Research and Education Center (AREC), Sanford, Florida, to evaluate the potential use of aquatic plants in reducing the pollutant levels of wastewaters. More recently, IFAS, through its Center for Biomass Energy Systems, in cooperation with the Gas Research Institute (GRI), Chicago, Illinois, has expanded this research program to utilize waste nutrients to produce aquatic plant biomass for possible conversion to energy. Successful completion of this program will result in developing aquatic plant systems for water treatment with potential use of biomass for energy production.

This paper summarizes the results of one study conducted at AREC-Sanford, FL, to determine the potential of freshwater aquatic plants in removing nitrogen and phosphorus from wastewaters. Among the aquatic plants evaluated include: water hyacinth (*Eichhornia crassipes* [Mart] Solms), water lettuce *(Pistia stratiotes)*, pennywort *(Hydrocotyle umbellata* L.), common duckweed *(Lemna minor* L.), giant duckweed *(Spirodela polyrhiza* L.), azolla *(Azolla caroliniana* L.). salvinia *(Salvinia rotundifolia* L), and egeria *Egeria densa* Planch). These plants were cultured in a 1000-liter aquaculture system at a nutrient enriched water detention time of 7 days. This study was conducted during June 1982 to February 1983 to include both summer and winter effects on nutrient removal.

Data on growth rate of aquatic plants during the study period are shown in Table 1. Water hyacinth growth rate was found to be highest followed by water lettuce, pennysort, salvinia, common duckweed, egeria, giant duckweed, and azolla. On an annual basis, the biomass yields represent about 40 t (dry wt)/acre per year for water hyacinth (highest among large leaf floating plants). Biomass yields of small leaf floating plants (duckweed, azolla, and salvinia) were in the range of 3 to 10 t (dry wt)/acre per year. It should be noted that the biomass yield estimates do not include the growth data for the period of March through May. This is an active growing period for aquatic plants and the potential annual yields are probably higher than those presented in Table 1.

Data on nitrogen and phosphorus removal potential of aquatic systems are presented in Table 2. All plant systems were found to be efficient in the removal of ammonium nitrogen N (NH_4-N) and were less efficient in nitrate nitrogen (NO_3-N) removal. Ammonium removal from the system was due to plant uptake and nitrification (microbial oxidation of NH_4^+ to NO_3^-). In a natural system, NO_3^- is also lost due to denitrification (microbial reduction of NO_3^- to gaseous end products such as N_2O and N_2). In our experimental system, underlying sediment was not present to enhance denitrification, thus resulting in poor efficiency in NO_3^- removal. Nitrogen removal by the system was significantly correlated with the plant density and growth rate of aquatic plants. The following relationship was observed between nitrogen removal rate and growth rate and plant density of aquatic plants:

$$N = 17.63\ GR + 0.662\ PD + 263.7 \quad [1]$$

$$R^2 = 0.771^{**} \quad n = 193$$

where N = nitrogen removal rate, mg N m^{-2} day^{-1}, GR = growth rate of aquatic plant, g dry wt m^{-2} day^{-1}; PD = plant density, g dry wt m^{-2}.

Phosphorus removal was found to be independent of growth rate and plant density of aquatic plants (Table 2). The following relationship was observed between phosphorus removal rate and growth rate and plant density of aquatic plants.

$$P = 1.43GR + 0.028PD + 112.4$$

$$R^2 = 0.524^{**} \quad n = 228 \quad [2]$$

where, P = phosphorus removal rate, mg P m^{-2} day^{-1}; GR and PD are same as described in equation [1]. Small leaf floating plants were also found to be efficient in phosphorus removal, even though their growth rates were not as high as large leaf floating plants. Plant uptake alone cannot account for all of the phosphorus removal, indicating the possibility of chemical precipitation. Nitrogen and phosphorus removal ratios (6 to 7) were higher for systems with large leaf floating plants, indicating high nitrogen removal efficiency as compared to phosphorus removal. Nitrogen and phosphorus removal efficiency ratios of small leaf floating were found to be in the range of 2 to 4. These results suggest that a combination of large and small leaf floating plants in mono or polyculture systems can make an efficient treatment system for nitrogen and phosphorus removal.

In conclusion, this study revealed that aquatic plants can be effectively used in removing nitrogen and phosphorus from wastewaters. Since nutrient removal was found to be dependent on growth rate of aquatic plants, wastewater treatment systems may not function effectively during the winter months. However, providing greenhouse conditions or alternating with cold tolerant plants such as pennywort can improve the nutrient removal efficiency of the system. Although the results obtained in this study can be applied to treat sewage effluents, further studies should be conducted to test the growth patterns of aquatic plants cultured in various types of wastewaters. Currently, research is in progress at our Research Center to develop techniques to maximize the growth rate of aquatic plants while achieving maximum nutrient removal efficiency. □

[1]Associate Professor, University of Florida, Institute of Food and Agricultural Sciences, Agricultural Research and Education Center, P.O. Box 909, Sanford, FL 32771.

TABLE 1

Growth characteristics of aquatic macrophytes cultured in nutrient enriched water (June 14, 1982, to February 28, 1983).

Aquatic Plant	Growth Rate Mean ± SD	Plant Density Mean ± SD	N
	G (DW) m^{-2} day^{-1}	G (DW) m^{-2}	
Water hyacinth	24.9 ± 14.5	1118 ± 601	35
Water lettuce	15.0 ± 11.8	455 ± 308	32
Pennywort	6.0 ± 5.2	456 ± 148	34
Common duckweed	3.4 ± 2.9	75 ± 37	32
Giant duckweed	2.2 ± 1.5	59 ± 29	27
Salvinia	6.0 ± 4.4	151 ± 67	31
Azolla	1.7 ± 1.3	53 ± 25	32
Egeria	3.1 ± 3.6	304 ± 74	31

TABLE 2

Nitrogen and phosphorus removal by aquatic macrophyte systems (June 14, 1982 to February 28, 1983).

Aquatic Plant	NH^4-N Mean ± SD	NO^3-N Mean ± SD	Inorganic N Mean ± SD	Soluble P Mean ± SD	N/P Ratio	N
	—mgNm $^{-2}$	day $^{-1}$—	—mgm $^{-2}$	day^{-1}—		
Water hyacinth	963 ± 168	368 ± 665	1330 ± 731	188 ± 57	7.1	35
Water lettuce	935 ± 167	-55 ± 553	880 ± 588	150 ± 38	5.9	32
Pennywort	931 ± 142	41 ± 425	961 ± 408	151 ± 37	6.4	34
Common duckweed	520 ± 155	-96 ± 295	426 ± 279	119 ± 33	3.6	32
Giant duckweed	637 ± 96	-345 ± 188	291 ± 158	111 ± 35	2.6	27
Salvinia	674 ± 97	-488 ± 204	225 ± 207	100 ± 42	2.3	31
Azolla	—	—	—	102 ± 33	—	32
Egeria	882 ± 123	-540 ± 216	342 ± 244	182 ± 59	1.9	31

Nitrogen and phosphorus loading to water hyacinth, water lettuce, pennywort, and egeria systems was 2000 ± 340 mg N m^{-2} day^{-1} (NH_4-N = 1000 mg N m^{-2} day^{-1}; NO_3-N = 1000 mg N m^{-2} day^{-1}) and 230 ± 56 mg P m^{-2} day^{-1}, respectively. Nitrogen and phosphorus loading to the remaining system was 1500 ± 260 mg N m^{-2} day^{-1} and 175 + 43 mg P $m^{-2}$$day^{-1}$, respectively. Azolla system did not receive nitrogen.

continued from page 2

continually involved with legislative and administrative changes through our Board of Directors, Legislative Affairs Committee and representation on the Aquatic Plant Advisory Council. This year will undoubtably be the year of "water recognization" in Florida. Water shortages, flooding, ground water contamination and pesticides in water are expected to receive more attention and litigation than ever before. As managers who work with the aquatic ecosystem, we should openly and eagerly inform those involved with environmental concerns of our professionalism and dedication to preserve Florida's water heritage. Through our continued efforts in aquatic plant control waters are open to fishing, swimming, boating, and other recreational activities. This is being accomplished with an environmental conscious attitude and through environmentally approved management techniques.

The Society should and will continue to meet the needs of the aquatic plant management community. We are reliant upon the insight and abilities of the membership to continue in meeting our objectives.

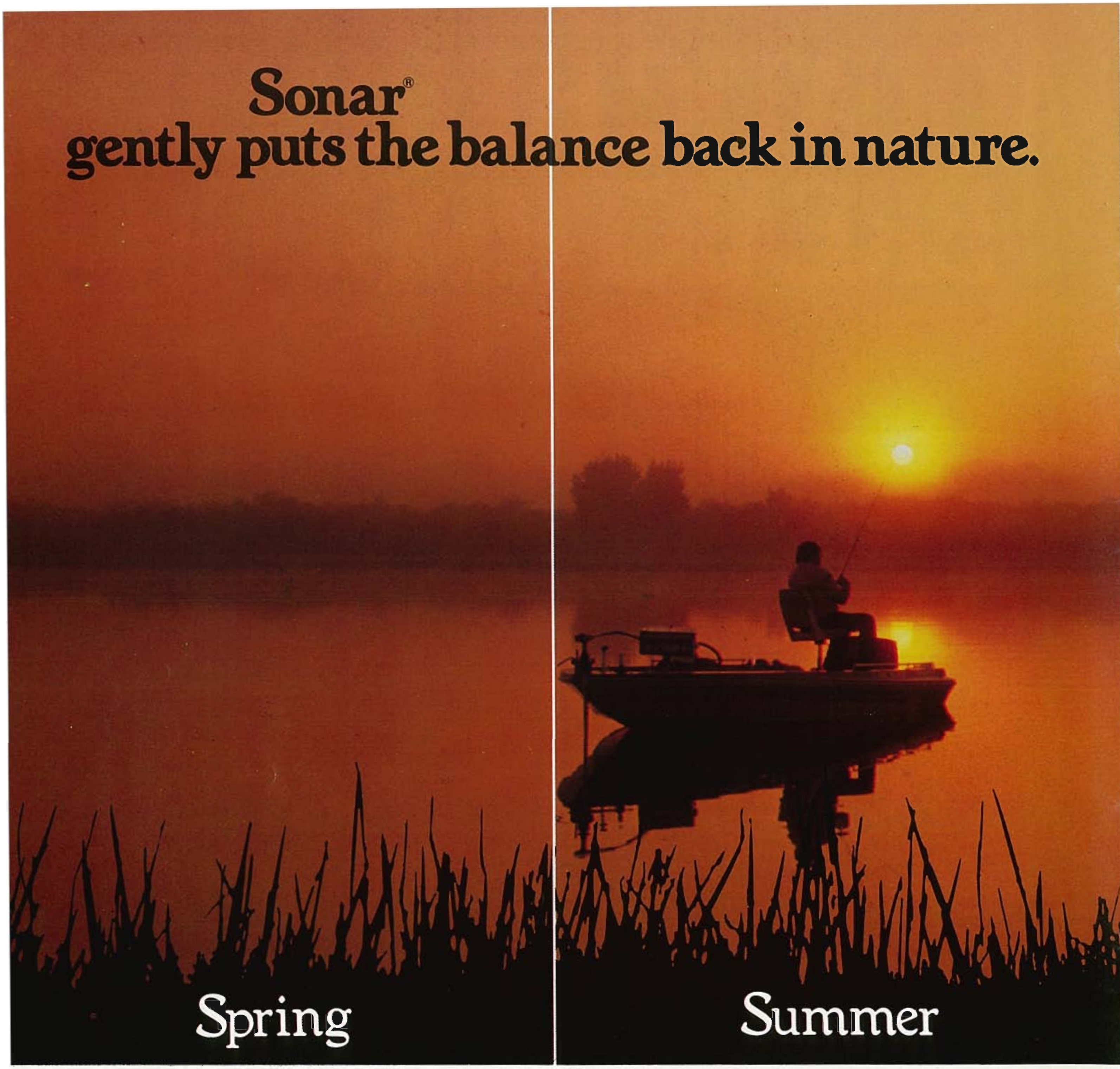
The committee sign-up list posted at the past Annual Meeting generated almost one-hundred names of those willing to actively work toward the goals of the Society. I urge those of you not contacted directly by the committee chairpersons to contact the appropriate chairperson and recommit your willingness to participate. Most committees are not limited as to the number of members. Chairpersons have been provided all the names of those who volunteered.

As your President this year, I along with the Officers and Directors stand ready to address the issues and carry out the objectives throughout the coming year. I urge you as members to provide input through the Officers and Directors and as participants on committees.

Paul Myers *President, FAPMS*

AQUATIC HERBICIDE BREAKTHROUGH

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



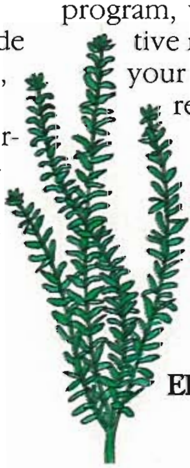
At last there's a new generation aquatic herbicide that manages a host of undesirable vascular plants without mismanaging the good life. Sonar® from Elanco.

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

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

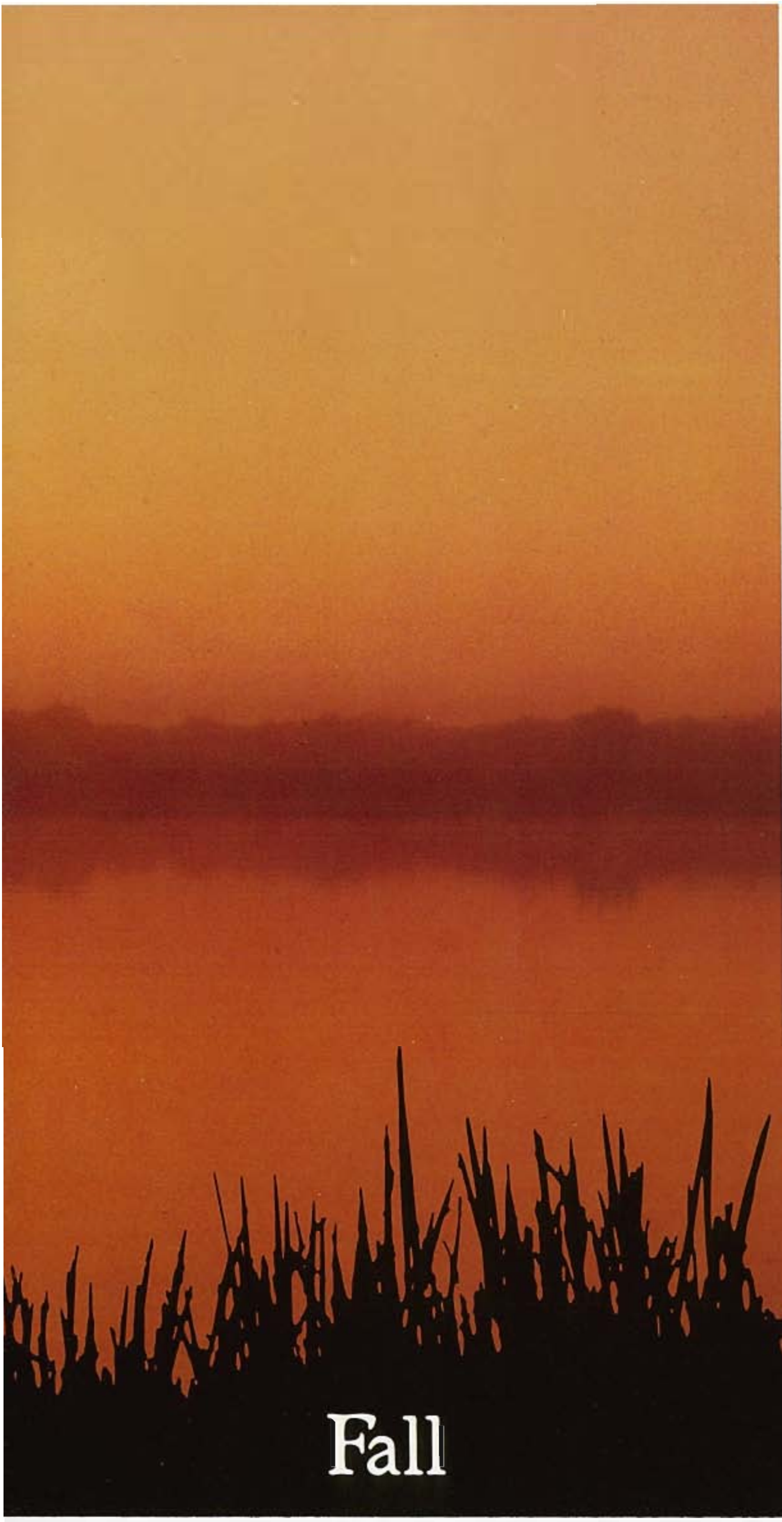


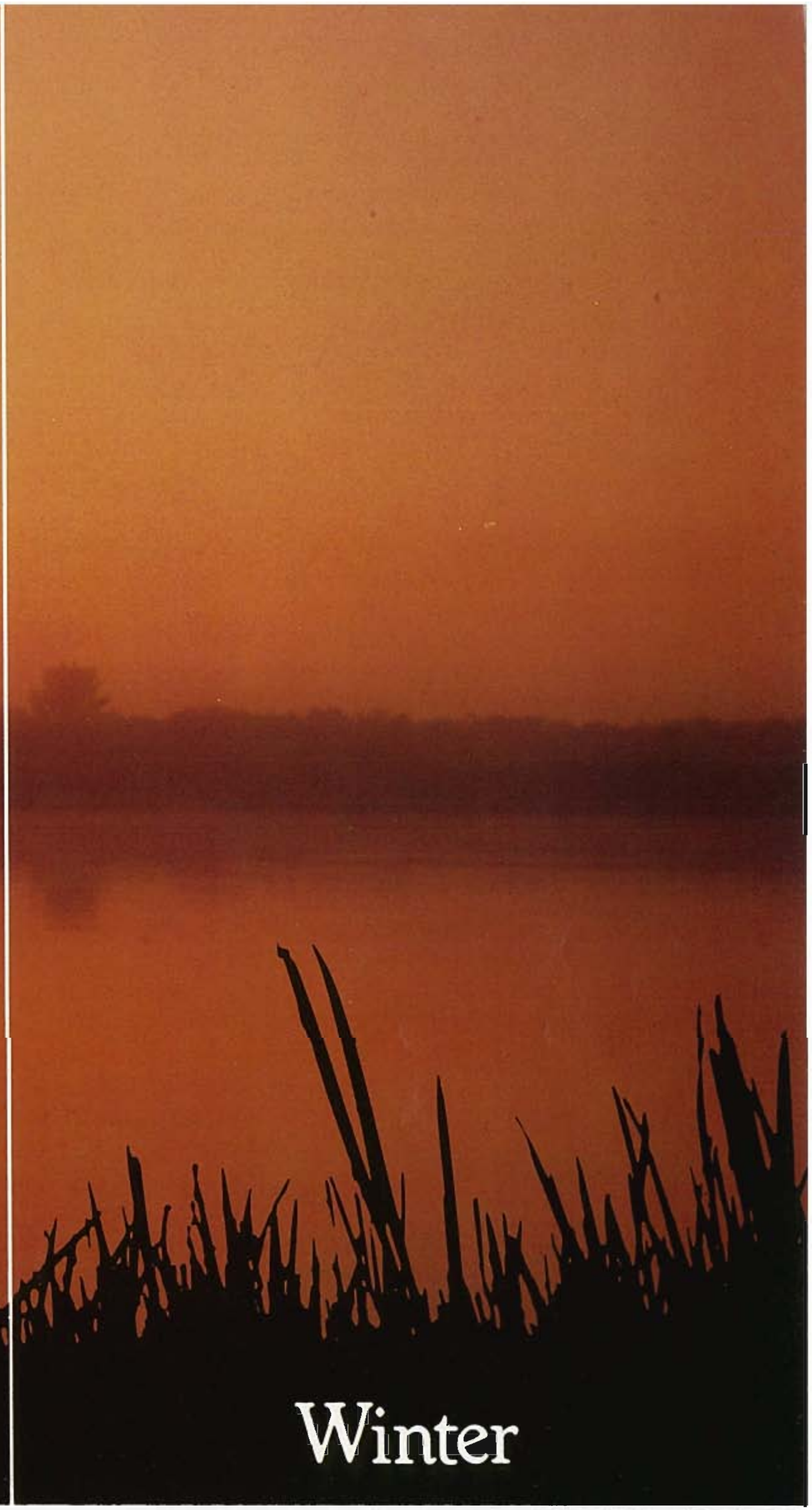
Elodea

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





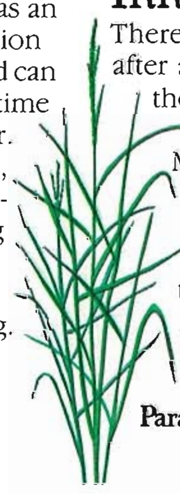
wildlife, or nearby trees and shrubs.

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

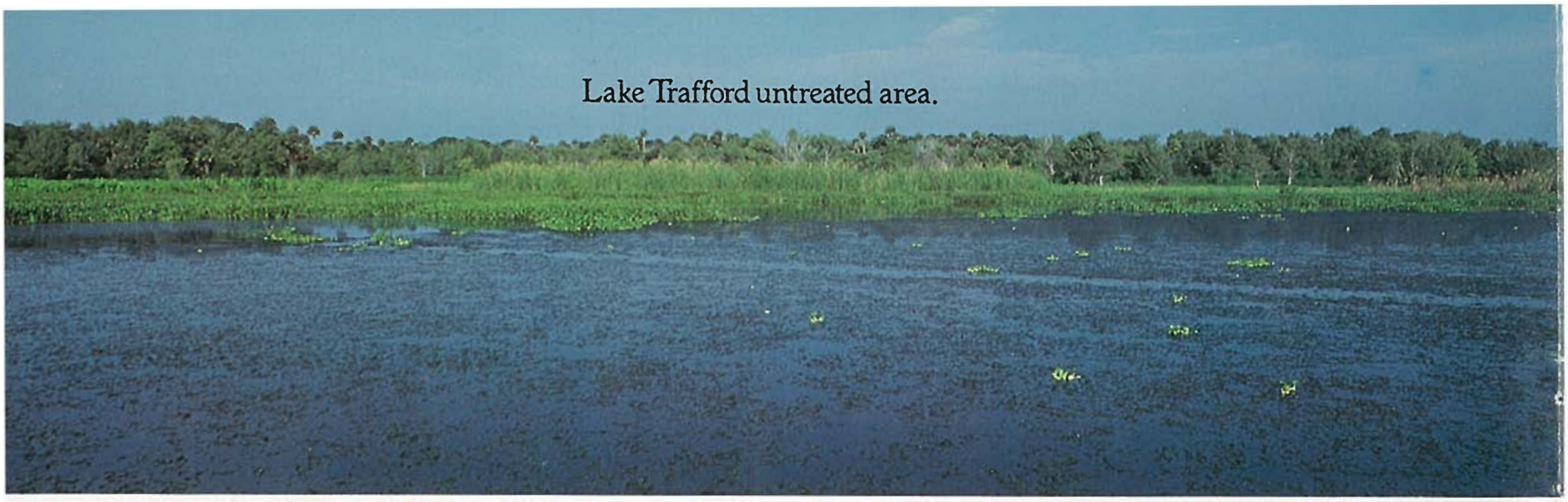
Torpedograss



Paragrass

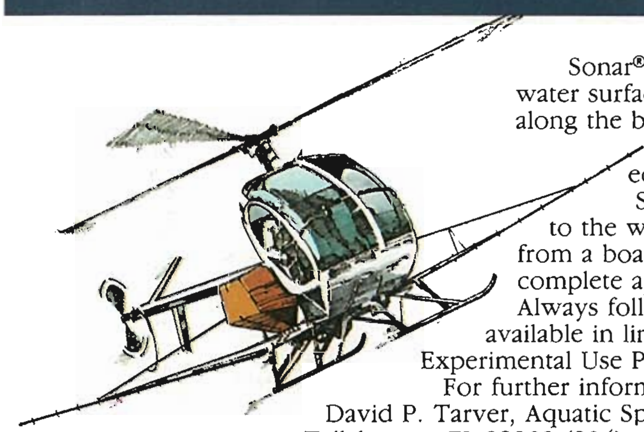
Inherent value.

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.



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) 562-1870

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

Redroot *Lachnanthes caroliniana* (Lam.) and Dandy.

by Mike Bodle
Biologist — Dept. of Natural Resources

Florida's wetlands are variously estimated to have either increased or decreased in acreage. Natural wetlands have definitely declined as they have been "reclaimed" for other, seemingly more pressing, uses by man. Drainage ditches, canal banks, retention areas, and condominium ponds are also termed by some as wetlands. This acreage has increased with human activity. The wetlands that men have "created" in Florida bear little resemblance to those which came to exist without our aid. Typically a few species of flora can be found in this latter type of wetland but they are just that: few. These few usually include "pioneer" species which are well adapted to invade disturbed sites. These species are familiar to those working in this latter type of "wetland" and often include torpedograss *(Panicum repens)*, cattail *(Typha* spp.) and bladderwort *(Utricularia* spp.) almost to the exclusion of other species. Depending upon the use and type of control to which disturbed sites are put, diversity of species may increase with age.

A species which does seem to reestablish itself in minimally controlled artificial wetlands is redroot *(Lachnanthes caroliniana* [Lam.] Dandy). A member of the bloodwort family *(Haemodoraceae)* redroot is common on shore and in litoral zones, but where its "feet" stay wet. The sole other member of the family is the golden-crest *(Lophiola americana* [Pursh] Wood). The range of *Lachnanthes* includes the southeastern United States coastal plain, peninsular Florida and Cuba. *Lophiola* extends down the eastern seaboard only into northern Florida. The seeds of both plants contain a pigment specific to the family, lachnanthecarpone. Chemical isolation of this pigment is, thankfully, not necessary for field identification of either plant.

Lachnanthes caroliniana growing along a Martin County pond shoreline.

Lachnanthes is a perennial plant which bears a congested bract of complete flowers at the top of a stalk. The term "complete" is applied to flowers which have both male and female parts. Botanically, at least, most humans I know would have to be termed incomplete. The terminal flowerheads have a yellow cast when in bloom due to the small yellow petals. Seeds and flowerheads are brown when the seeds are ripe. Other plants whose flowers are borne in umbrella-like umbels, such as Queen Anne's Lace, water hemlock, and cowbane resemble redroot strongly in floral appearance.

The rhizome of *Lachnanthes caroliniana is bright red, hence the common name: redroot.*

The plant growth habit resembles iris. Leaves clasp each other, growing along a basal axis and are long, tapering gradually to the tips. Also like iris, redroot has underground rhizomes which allow spreading asexual propagation. The roots and rhizomes are bright red to scarlet. It is from these rhizomes that the common name redroot arises.

The plant is found growing densely in disturbed, pine-bordered ditches as well as in pristine marsh areas. Flowering in Polk, Martin, Highlands, Okeechobee, Osceola and Palm Beach counties has extended from July to October. The leaves and flower stalks persist and remain upright through much of the winter. Seed dispersal is

continued on page 23

Status of Water Hyacinths in Texas

by L.V. Guerra
Branch Chief, Aquatic Habitat Enhancement

The largest number of acres of hyacinths (17,190) have been destroyed in the inland waters of the State of Texas. Hyacinths are now only a problem in the North Coastal part of the state and Toledo Bend Lake bordering on the great state of Louisiana.

The long extended freeze period throughout the state has frozen all the remaining plants except those under a tree or plant canopy cover. Normally shoreline freezes and heavy frost will slow the plant metabolism, but they survive.

A difficult time is expected as seed plants in shallow water areas will be very prolific and treatment response with permissable dosages will be slow. Winter rains and spring high water levels should create ideal conditions for a luxuriant plant explosion and growth.

There will probably be approximately 18,000 acres of hyacinths in the navigable and recreational inland waters, but no difficulties in treatment are anticipated. The southern or neo-tropical part of the state suffered some frost damage, but not of a lasting duration to curtail aquatic plants. □

AQUA-VINE

U.S. Army Corps of Engineers
In December 1983 John Studt assumed the position of Chief, Natural Resource Management Section (includes Aquatic Plant Control), at the Corps of Engineers, in Jacksonville. John is a biologist with a BS degree from Eastern Michigan University in biology and an MS degree in marine ecology from the University of South Florida. Prior to joining the NRM Section, he was in the Corps Regulatory Division (dredge and fill). After graduating from the University of South Florida in 1976 John worked for Florida Power Corporation in St. Petersburg, Florida. At Florida Power he was involved in designing, contracting, and managing environmental effects of power plants on the nearshore marine environment. His interests are in aquatic ecology particularly benthic ecology. John is married and has a 5 year old daughter and a 3 year old son.

New FAPMS Treasurer
Jim McGehee has resigned from his office of treasurer. During the January 18, 1984 FAPMS Board Meeting, Mike Dupes was placed in this position. Future correspondence to the treasurer should be addressed to Mike at 1477 Challen Ave., Jacksonville, Fla. 32205.

Mr. Glenn Wallace has assumed the position of Operations Foreman for the Florida Environmental Consultants, Inc. at Palatka, Fla. Glenn was formerly employed with the Orange County Weed Control Dept. in Orlando, Fla. His new position will take him to all parts of the southeastern U.S.

Applicator of the Year Recipients
The 1983 winners of the FAPMS's most distinguished award, "Applicator of the Year," was presented to John (Big John) Pierce and George Robinson during the 1983 Annual Meeting. Both are currently employed as Pollution Control Technicans for the Orange Co. Environmental Protection Department in Orlando, Fla. These two applicators are experienced in all types of aquatic plant management activities including biological, chemical and mechanical control. Prior to coming to the county's operations they were employed by the City of Winter Park in similar positions of weed control. John and George have worked hard and demonstrated the type professionalism of which our Society should be proud. They have indeed set high standards for the 1984 nominees of "Applicator of the Year."

Nick Sassic

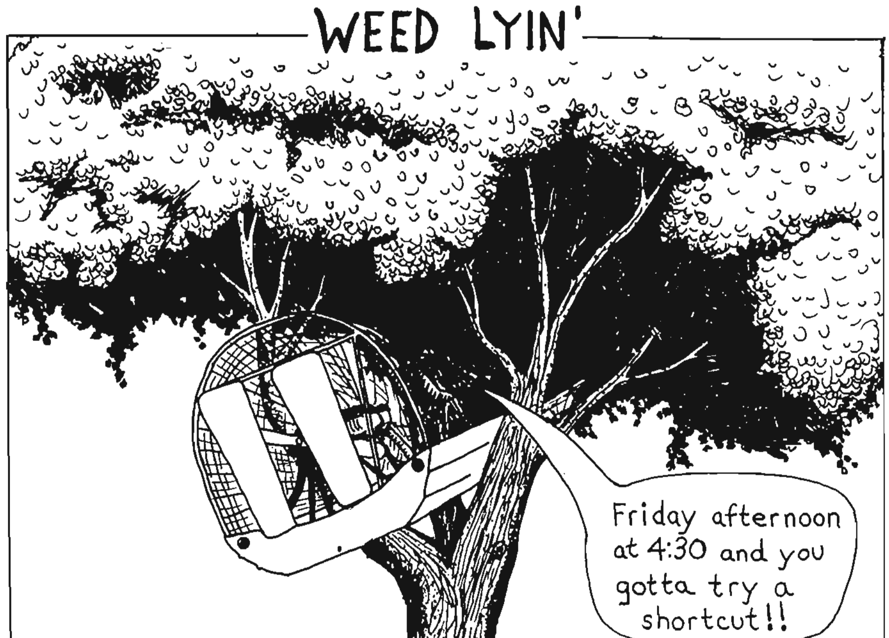
Letters to the Editor

Dear Editor:
Having just read Bill Haller's informative article on hydrilla in Florida, I was somewhat alarmed at his stating that viable seeds had been produced ". . . by male plants" in California. California may be recognized sometimes as a source of "fruits and nuts," but at least at this time *not* hydrilla seed, thank you!

To clarify this, I would like readers of *Aquatics* to know that we in the Wild West are indeed conducting studies on the *potential* for the monoecious plant to produce viable seed, but as yet have *not* observed any ovules containing embryos. These studies are being conducted on monoecious plants obtained from various locations in Maryland.

To date, no monoecious plants have been found in the remaining two infestations in California: The Imperial Irrigation District, Imperial County, CA and Lake Murray, San Diego County, CA. I hope this situation doesn't change, but we are starting research on the adaptability of monoecious "biotype" and its response to environmental variables. The increased threat of 1) genetic exchange, 2) seed disposal and 3) seed longivity which could be associated with the monoecious plant requires that we get to know its capabilities as soon as possible.

Sincerely,
Dr. Lars W. J. Anderson
Research Leader
USDA, AR,
Aquatic Weed Control
Research Laboratory, Botany
University of California
Davis, CA 95616



Dear Editor:
I refer to the article published in the December, 1983 issue of *Aquatics* by Kenneth Langeland and David Schiller, entitled "Hydrilla in North Carolina."

While I recognize that most readers of *Aquatics* are well aware that the active ingredient in Aquathol K is endothall, not 2,4-D, I want to make sure that there is no misunderstanding. Also, since inevitably the question will arise, I want to reassure the readers of *Aquatics* that endothall can *not* form dioxins, either in the manufacturing process, or after application. Dioxin (2, 3, 7, 8 — tetrachlorodibenzodioxin, also known as TCDD) is formed during the chlorination of phenol to prepare 2, 4, 6 — trichlorophenol. In order to form dioxin, it is necessary to have phenol, or a mono-or di-chlorinated phenol, plus clorinating conditions. Endothall is manufactured utilizing what is called a Diels-Alder reaction between furan and maleic anhydride. The resulting adduct is hydrogenated to endothall. Since the two reactions involved in preparing endothall do not contain a phenol or chlorinated phenol, and since chlorinating conditions are absent, and since neither of the starting materials for preparation of endothall is prepared by a reaction sequence involving a phenol, there is no conceivable source of dioxin contamination in endothall. Likewise, no phenols are involved in the preparation of potassium hydroxide (Aquathol® K Aquatic Herbicide) or dimethylcocoamine (Hydrothol® 191 Aquatic Herbicide and Algicide), and thus, these components cannot contribute dioxin to our endothall products. IN SUMMARY, THERE IS NO CONCEIVABLE SOURCE OF DIOXIN CONTAMINATION IN ENDOTHALL PRODUCTS EITHER FROM THE MANUFACTURING PROCESS OR AFTER APPLICATION TO WATER.

Endothall has been shown to be a valuable tool in the management of nuisance aquatic weeds and algae for over 23 years. Further, as reflected in its many years of use, and extensive toxicological testing conducted, endothall, when properly applied, causes no unreasonable adverse effects to man or the environment.

I hope you will publish this letter and that the above explanation satisfactorily allays any concerns the readership of *Aquatics* may have.

Sincerely,
PENWALT CORPORATION
AGCHEM DIVISION

Gary D. Curl
Product Manager

Position Wanted

Aquatic biologist/applicator desires position in aquatic weed control/research. 2 years college, 10 years experience in Aquatic Weed control, application techniques, mechanical harvesting, herbicide residues, fisheries, invertebrate ecology and limnology. Will relocate. Send inquiries to 3454 N.W. 10th Ave., Gainesville, FL 32605.

Graduate Student Assistantship

Graduate student assistantships in aquatic plant management are available for both Ph.D. and M.S. level programs at the Center for Aquatic Weeds, University of Florida. Fields of study include aquatic plant ecology and physiology, aquatic plant management, or related fields. Send resume and transcripts to Dr. William T. Haller, Center for Aquatic Weeds, 7922 N.W. 71st Street, Gainesville, FL 32607.

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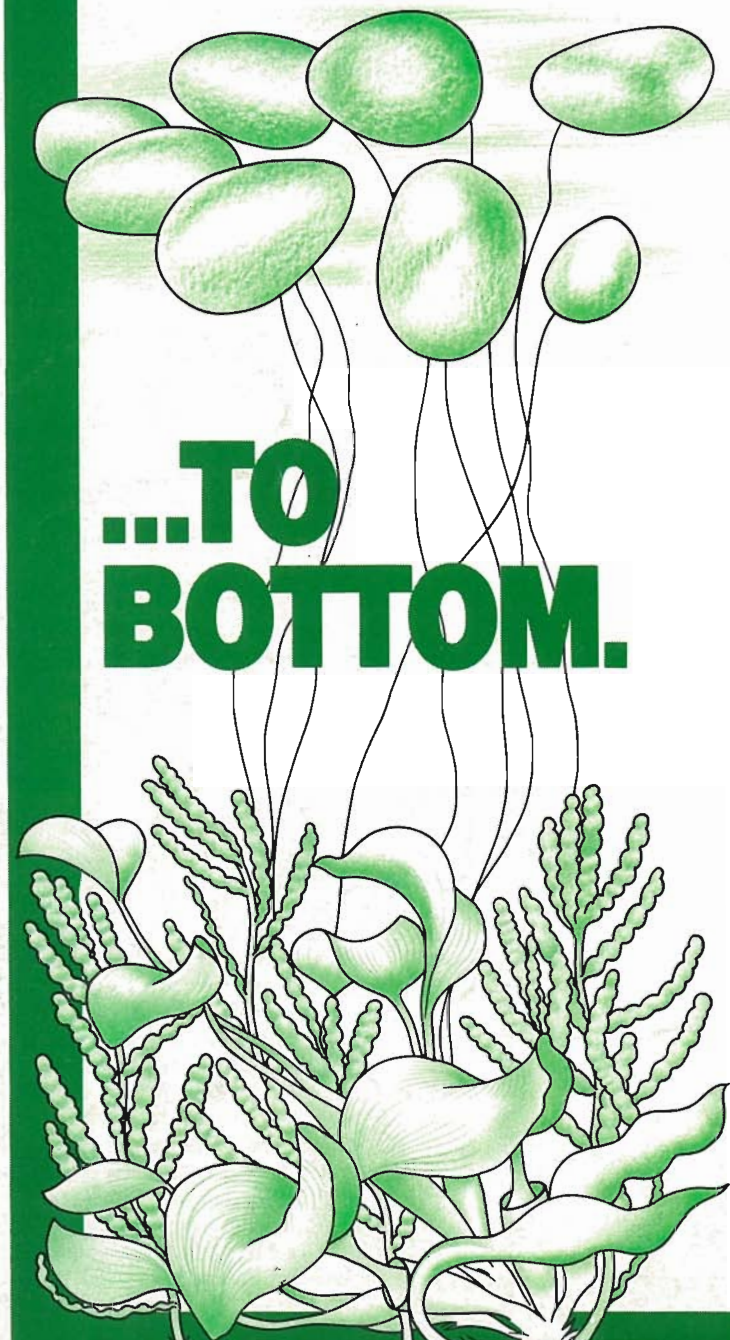
accomplished by the stout stems remaining capable of supporting seed-eating perching birds. New growth from the rhizome occurs in early spring. This growth consists of the complete above-ground portions of the plant, as in all herbaceous perennials.

It is rewarding to observe native Florida plants in undisturbed sites. Yet it can be as rewarding to see native plants re-assert themselves in places where former plant populations have been practically eradicated. We might not kill the fatted calf upon *Lachnanthes'* return to a disturbed site but perhaps a solemn Bud or two are in order. □

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.

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