

Aquatics

MARCH 1979





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Aquatics

FIRST EDITION

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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 William L. Maier, Editor, AQUATICS Magazine, Dept. of Natural Resources, Crown Bldg., 202 Blount St., Tallahassee, Fla. 32304.

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COVER

Hydrilla — the number one aquatic weed problem in Florida is exemplified by this picture showing a severe infestation which prohibits normal usage of this natural resource.

A WORD FROM THE PRESIDENT

Congratulations to those responsible for this first issue of *Aquatics*. If you have never been involved in an effort like this, it will be hard to visualize the work required — but please take our word for the fact that we are indebted to many and especially the editors, reviewers and publishers of *Aquatics* for the hours they have spent in preparation for and of this magazine.

Several months ago, Chuck Hargrove conceived the idea of our Society generating a quarter magazine similar to this and was promptly handed the jobs of editor, designer, promoter and planner. In October 1977, Chuck was given a nice promotion by his company and moved away from Florida but he had established the concepts that have guided the production of *Aquatics* as you now have it.

At the request of the Board of Directors, Paul Deets and Bill Maier accepted the positions of editor and co-editor respectively. Through no fault of theirs, these gentlemen were unable to bring a magazine to press so another printer in a different city was engaged. Due to the change in location, Paul handed his duties over to Harold Brown while Bill Maier remained as the other half of the team. Thank you, Paul, for your willing service to this Society.

Aquatics is designed to be a reliable source of information for everyone interested in aquatic plant control and related pursuits. Each issue will feature a problem aquatic plant, its history, characteristics, identification, possible beneficial uses and methods of control. Special departments will deal with ideas from "the man who holds the spray gun", new developments from industry, articles from regulatory agencies, discussion of legislation and administrative rules affecting aquatic weed control and progress reports from the research community. The range of subjects can and will be amplified to serve the changing needs of our Society.

To insure quality and accuracy, the contents of *Aquatics* will be reviewed by men who are qualified in the subjects under discussion. Additionally, the companies whose advertising appears on these pages are sources for the products and services you may require in your program — so we expect *Aquatics* to be a regular meeting place for producer and consumer.

The Florida Aquatic Plant Management Society has come a long way in the two plus years since its inception because you, the membership, wanted it to succeed. The Society will continue to grow and become more useful if everyone will add his ideas and work in a spirit of cooperation.

We urge you to assist your present and future Board of Directors by making suggestions for the improvement of the Society and this magazine, pay your dues on time, invite your friends to join, send the names and addresses of interested persons whom you would like to receive *Aquatics* on a regular basis including your county commissioners, sports clubs, environmental organizations, libraries, purchasing agents, etc. We have a good thing going, so let's make it even better!

We personally thank each one who has contributed articles for this first issue and the editors, reviewers, advertisers, and printers for their pleasant cooperation. We expect the same spirit to continue for the benefit of all concerned.

Let us have your comments concerning *Aquatics*.

Sincerely,

Leslie E. Bitting, Sr.

Harold F. Brown

Leslie E. Bitting, Sr. President 1978

Harold F. Brown, President 1979

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EDITORIAL

by

William L. Maier

This publication may well prove to be one of the greatest milestones ever reached by a society in such a short time. Better than that, it is also the first publication on aquatic plant management strictly dedicated to the needs of the people actually involved in the daily chore of controlling aquatic weeds. There is a lot of pride and expertise throughout the state of Florida, and this publication is one avenue of communications.

It is extremely important that you as a reader and worker help your society in maintaining this magazine. We solicit your participation, whether it be in the form of an article or simply a letter and/or time in assisting with each and every issue. We are dedicated to the field operations and are not intending to publish scientific papers.

If you or your agency has any information it would like to share with others involved in the control of aquatic plants, we encourage you to submit this for publication in *Aquatics*. The editors and reviewers as well as the Board of Directors will be more than glad to assist you in the preparation of any articles. In many cases the most insignificant short cut for you might turn out to be of great benefit to your neighbor.

We would like to include in our publication a question and response section. This can only be generated by letters to the editors. We will then seek to answer those questions by contacting the best source possible. These will then be published on a regular basis.

As you can see, this publication offers many benefits to the aquatic community, and with active participation can be molded into a tremendously useful reference to fit your everyday needs.

A special recognition is due to all who spent a lot of time and effort in developing this publication and to those who have prepared the information for this first issue.

Please plan to submit and share your methods and ideas for our next issue in June.



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HYDRILLA *The Number One Problem*

by
Michael J. Mahler, Biologist
Bureau of Aquatic Plant Research and Control
Florida Department of Natural Resources



This picture of hydrilla in the Withlacoochee River clearly shows the growth potential that this aquatic plant can have in most waters throughout Florida.

INTRODUCTION

Hydrilla (*Hydrilla verticillata* Royle), an exotic plant of recent introduction into Florida, is proving to be one of the most noxious plants of the aquatic environment. This plant may render a body of water useless in a very short period of time by forming dense mats of vegetation frequently covering the entire water surface.

It is believed that hydrilla is native to East Africa with a center of distribution or origin in south-eastern Uganda and northwestern Tanzania. In its native range, hydrilla may have evolved in a habitat of alternating wet-dry seasonal phases and with a tremendous diversity of herbivorous fishes such as Tilapia. Therefore, in Africa, hydrilla is not a problem and historically has never attained weed status. An absence of these two factors in Florida plays a significant role in the

establishment and severity of problems caused by this plant.

Hydrilla was first brought into this country by the aquarium industry around 1959 and was sold under the name "star-vine" or "oxygen plant." Careless release of this aquarium plant into south Florida's canals is thought to be the means by which hydrilla was first introduced. Since that time it has spread to most of Florida's major watersheds and has adversely affected many of the state's prime fishing areas. In these areas hydrilla control cost taxpayers millions of dollars annually. Problems with hydrilla are not limited to Florida with its presence being reported in Texas, Alabama, Georgia, Louisiana, Iowa, South Carolina, and most recently California.

DESCRIPTION

Hydrilla belongs to the frog's-bit family, Hydrocharitaceae and is

closely related to other noxious aquatic plants such as *Lagarosiphon* (African elodea), *Egeria* (Brazilian elodea), and *Stratiotes aloides* (Water aloe). In appearance, hydrilla resembles *Lagarosiphon* and *Egeria* and they are often confused with one another. *Lagarosiphon* and *Stratiotes* have not yet been detected in the United States primarily because of state (Florida) and federal laws prohibiting the importation of these species. In Florida, *Egeria* and hydrilla are often misidentified.



Hydrilla verticillata Royle

Hydrilla differs from Brazilian elodea in that leaves of hydrilla normally have sharply toothed margins and spines on the underside of the midrib. Under most conditions, hydrilla is distinctly scabrous or harsh in texture. Brazilian elodea leaves have minutely serrated margins, midveins without spines and are very smooth in texture. One of the easiest ways to distinguish the two is by touch. Hydrilla, when drawn through the hand feels harsh, brittle, and scratchy; whereas, Brazilian elodea will feel quite smooth.

The leaves of hydrilla are usually dark green, 8 to 18 mm long, 4 mm wide and are in whorls of three to five. Flowers are produced in the early fall and arise singularly from a spathe near the growing tip and occur on or above the water surface. They are very inconspicuous and measure no more than 4-5 mm across. Male plants are not presently found in Florida; therefore, seeds are not produced and reproduction is entirely by vegetative means such as fragmentation, turions, and tubers. Turions, or winter buds, are produced in the leaf axils and tubers are produced at the ends of rhizomes. Peak turion and tuber production occurs during specific seasonal periods, between September and April.

Due to environmental and physico-chemical conditions of a water system, hydrilla can vary in appearance. The hydrilla in Lake Jackson, for instance, is very flaccid and smooth to the touch, light green with long, thin leaves, but the spines on the underside of the midrib are almost always present. In comparison, the hydrilla found in Manatee Springs is very stiff and appears to be almost plastic. This plant must be examined carefully to make a positive identification.

Hydrilla only requires approximately 0.5 to 0.75% of full sunlight for photosynthesis while native plants need at least 1.5% sunlight. Therefore, hydrilla can grow to greater depths and in darker waters than native vegetation. This species has been observed growing in water over 15 meters deep. Also, due to its low light requirement, hydrilla begins growing earlier in the morning than native species. It utilizes most of the available CO₂ released from the plants during nightly respiration. This occurs before other

plants can become active, thus inhibiting their growth.

Hydrilla also restricts photosynthesis of competing plants when large mats are formed at the water surface. These mats block out almost all sunlight, usually resulting in a monotypic stand of hydrilla.

Optimum stands of hydrilla occur in early fall and usually become greatly reduced by midwinter. New growths of the plant usually begin in the spring and are surfaced out by midsummer. The biomass of severe infestations may reach as much as 15 tons per acre. Dense stands of hydrilla also affect sport fish populations. It provides cover for small forage fish where predators such as bass cannot feed upon them. This results in an over-population of small forage fish which results in a stunted game fish population.

HABITAT

Hydrilla is found in drainage and irrigation canals, freshwater lakes and ponds, and often in flowing or tidal streams, particularly in calcareous sites.

Hydrilla can thrive in a variety of water conditions; from clear to highly turbid, alkaline to slightly acidic, oligotrophic to highly eutrophic, and in shallow to deep waters. This plant can tolerate moderate amounts of salinity to about 33% sea strength and the tubers can withstand extreme dry conditions. One group of earthen ponds used in some early hydrilla experiments were dewatered for over four years and within a few months following refill the ponds were again dominated by hydrilla. These factors, coupled with hydrilla's competitiveness, enable the plant to completely dominate a water body in a short period of time.

DISTRIBUTION

This plant is found virtually throughout most of the world. In the United States, Florida has the greatest infestations of hydrilla. Its presence has also been verified in Georgia, Louisiana, Texas, Iowa, and most recently California and South Carolina. Hydrilla probably is in several other states, but has not yet been detected or confirmed. This species is native to east central Africa and has spread to South Africa, Asia, Australia, New Zea-

land, and Europe.

In Florida, many prime fishing lakes and rivers have become infested by this pest; Orange Lake, Lake Jackson, Lake Okeechobee, Lake Seminole, East and West Lakes Tohopekaliga, the St. Johns River, Crystal River, Homosassa Springs, Salt Springs, and many others. Spread of hydrilla is most commonly facilitated by fragments attached to boats or boat trailers. Only one whorl of leaves is required on a piece of stem to produce a new plant. Many new infestations occur around boat ramps in lakes and streams. Virtually every major lake or river system in the state has the potential to be infested by this noxious aquatic plant.

SUMMARY

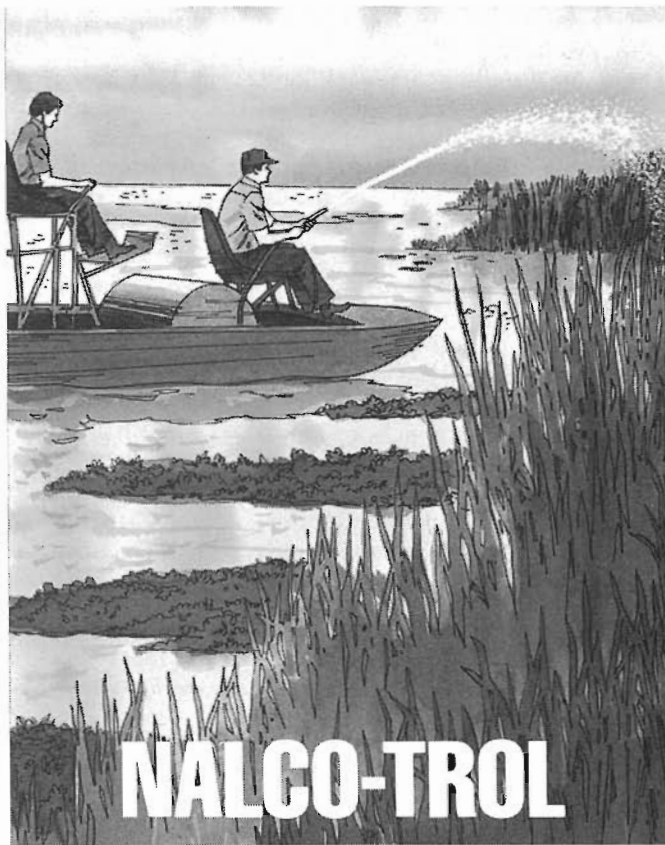
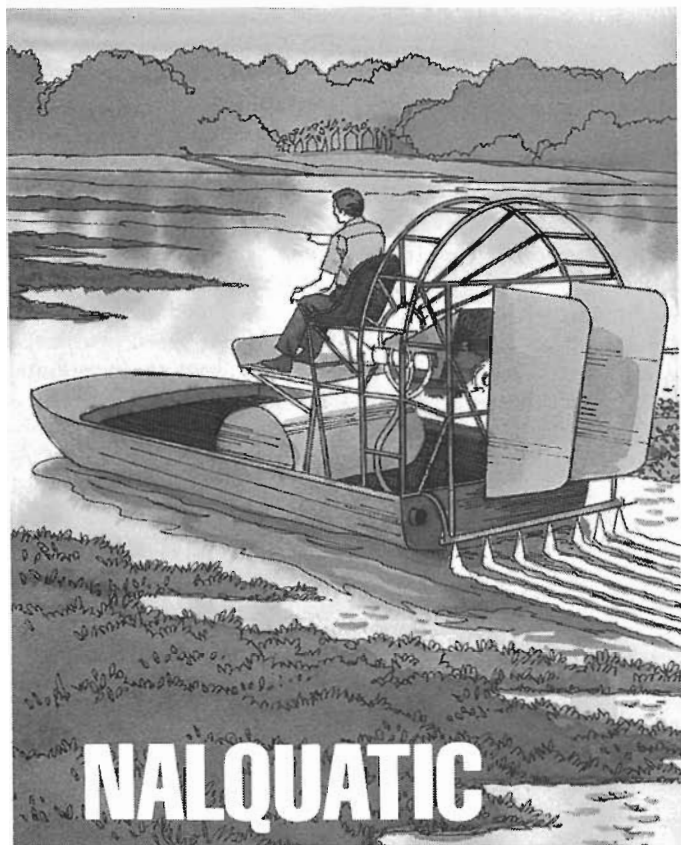
Hydrilla is rapidly becoming one of the most economically important aquatic plants in Florida. The attempts to control this species are costing Floridians an estimated \$8 million a year. This represents about one-third of all money spent on aquatic weed control in the state; both public and private. The majority of future expansion of aquatic weed control in Florida will be primarily aimed at hydrilla control.

Early detection of hydrilla is one of the most important aspects of its control. Hydrilla can be more effectively managed if it is dealt with early in its infestation of a water body either by chemical, mechanical, biological, physical, or a combination of control methods. This species will never be completely eradicated, therefore, it will require a constant management program.

California and Texas (as well as the Tennessee Valley Authority) are now upgrading their aquatic weed programs in order to detect and treat hydrilla before it becomes a statewide problem. This plant is a potential problem for almost all the waters of the United States. □

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WHY CONTROL AQUATIC WEEDS

by
*Vernon V. Vandiver, Jr.

*IFAS Extension Aquatics Weed Specialist, Agriculture Research Center, Fort Lauderdale, Fl.

In the state of Florida, we have about 34.7 million acres of land. Contained within this area there are 2.5 million acres of fresh water. In Florida many segments of our population rely to some extent on the use of our fresh water resources. Today more and more attention is being given to the management of our natural resources. We are all well aware that our natural resources are limited and a great deal of care must be exercised in order to utilize a natural resource in such a manner that it will be available for the use of future generations. Our fresh water systems in Florida are no exception. We must manage these in a manner that will protect and maintain these for future use. One important aspect of the management of our fresh


waters in Florida would be the aquatic plant management programs that are associated with each given body of water.

The waterhyacinth is an aquatic plant which is very familiar to most Florida residents. It is native to the Amazon basin in South America, but for most of this century it has been causing problems in many of Florida's major lakes and rivers. This floating plant has been the object of control programs by various governmental agencies attempting to limit the spread and growth of its infestations. Attempts to control the plant have been quite varied over a period of years, as various means of mechanically controlling the plant were attempted and proven to be rather unsuccessful. Mechanical control methods are generally expensive and quite slow in treating large infestations.

Only with the introduction of certain herbicides in the last 30 years, have effective control programs for this plant evolved. Today, though the plant is still rather widespread in Florida, it is considered to be under reasonably effective management programs in most areas. In many cases, the plant is now limited to marginal growth in bodies of water and large infestations of waterhyacinth completely blocking bodies of water are seen relatively infrequently. This situation could change rapidly if there should be a relaxation in the herbicide spraying program.

During the last few years, we have been seeing an increasing amount of publicity concerning Florida's aquatic weed problems and the control of these weed problems. This increased interest in aquatic weed problems in Florida is due in a large part to the spread of submerged aquatic weed infestations throughout a greater part of our fresh waters in the state. This spread is due largely to one plant, hydrilla.

Hydrilla is termed an exotic plant, as it is not native to Florida or even to the United States. Spread of ex-



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otic plants is one factor which has caused an increase in Florida's aquatic weed problems in recent years. Aquatic plants which are perhaps not major problems in other parts of the world, once introduced into Florida, may then spread throughout the state, and become major weed problems. In many cases these plants outcompete native vegetation and degrade the quality of our waters.

The spread of a non-native species in the state is most likely due to a number of factors; however, one major factor would be the lack of checks and balances on its population that were present in its native habitat. The lack of these checks and balances may allow the non-native organism to spread and rapidly become a major problem, something that it may not have been in its native habitat. These aquatic weed problems which now exist in Florida can quickly degrade an aquatic area and restrict the use and enjoyment of the body of water. By keeping an area under a well-managed aquatic plant control program, the negative impact of these native and exotic weeds can be held to a minimum. Once an aquatic area has been severely degraded by excessive weed growth and control measures are taken there is a greater negative impact on the overall system than if the aquatic plant growth had been maintained on a more acceptable level.

One might ask why have aquatic weed control programs, why not just allow a system to remain in its natural state? This would be fine if the systems could remain in their natural state; however, as mentioned above, the introduction of many exotic plants from other parts of the world have already altered the natural balance in our systems. This is demonstrated in the case of waterhyacinth, which has been with us for many years, and in the case of hydrilla, which is a recent introduction. Since these waters are already altered because of the exotic plants and other man-related events, it is necessary to exert some control measures on the system if we are to restore and maintain some degree of balance.

Our fresh waters are important to many people in Florida in a number of ways. In one of our more basic needs, municipal water supplies, aquatic weed growth can affect the

ability to move surface water in certain parts of the state where canals constitute the primary mechanism for supplying fresh water to large municipalities. This would be especially true in the southern part of the state where one of the key bodies of water in supplying fresh water to the lower east coast of the peninsula is Lake Okeechobee. From the lake a series of surface water canals have been constructed which move fresh water into the regions of the coast where a great amount of fresh water is utilized.

A major use of the canal systems in many of the flatland areas of the state is for flood control. Noxious aquatic weed growth can severely restrict the movement of water in flood control canals. In the event of high rainfall, such as during hurricanes, aquatic weed growth in the flood control systems can severely restrict the ability to move water in and out of areas as a part of an overall flood control system. Thus, it is necessary to maintain relatively weed-free systems in order to operate the flood control systems as they have been designed. These canals also serve as a site for recreational boating and fishing in these areas. Aquatic weed infestations can also restrict these activities.

In many parts of the state our natural lakes are also becoming infested with aquatic weed problems, mainly hydrilla. These infestations can limit the use of these natural waters for recreational boating, swimming, fishing, and generally degrade the appearance of these bodies of water. This can have a severe impact on a local area which may have a large extent of its economy tied to various uses of a major body of water located nearby. This impact can be felt in a number of ways such as loss of activity around fish camps, marinas, motels, and related recreational businesses. Also, an area may experience a decline in general tourism which had been related to the outdoor recreational use of water. Much of Florida's outdoor recreation is related to some extent to the use or enjoyment of our fresh water resource. This outdoor recreation industry in Florida, which has many water-related activities, has annual expenditures in excess of \$4 billion per year. From this figure we can quickly see the inherent value of our fresh water.

Another area which can quickly feel the impact of aquatic weed infestations is the real estate industry. Much of Florida's real estate is attractive because of the close proximity of fresh water which can be enjoyed by the residents. Once this fresh water resource is made unavailable through excessive aquatic weed growth, real estate sales and values have been shown to decline. This is only logical as in addition to our warm climate, the availability of fresh water seems to be an important aspect of living in Florida. When this fresh water resource is no longer attractive, there is certain to be a decrease in the value of surrounding land.

Another major segment of Florida's economy which is closely tied to the use of fresh water is agriculture. The management of surface water in the flatland areas of the state is especially important. This is important both from the aspect of irrigation and also for flood control in the agricultural areas. The ability to move water in and out of an agricultural area at will is very important in these regions. Aquatic weed infestations can limit the ability to utilize these areas for agricultural purposes. Thus it is necessary to maintain relatively weed-free situations or at least maintain a certain degree of control over the weed populations in these areas in order to be able to utilize our surface waters for agricultural purposes.

One other major value of Florida's fresh waters is the aesthetic value of having attractive water. This is true when we speak about waters that are in close proximity to homes, apartments, and condominiums. This would also include waters associated with golf courses, parks, and other recreational areas. It is important to the managers of these areas to have waterways which are as attractive as the surrounding land.

Since it is necessary to manage effectively the aquatic vegetation in our waters, it is extremely important to maintain aquatic weed control programs in areas which have weed infestations. The specific program necessary will be unique to a given area, but will depend on such factors as type of weeds present, nature of body of water, size of the weed infestation, and use to be made of the water. □

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SPEAKING UP

In order to obtain comment and better know the thinking of our membership, as well as give them a chance to express this thinking, we mailed the following questions to a random sampling of our membership. Following the questions are a few of the comments received.

Question: What are your feelings on existing and proposed Federal, State and Local laws and regulations pertaining to aquatics?

Comments:

(1) The industry needs both Federal, State, and local laws, but the requirements of such laws should be closely coordinated to avoid duplication. There is always a possibility of regulating an industry to the point that it kills the industry. This can easily happen in the aquatic industry because of the many governmental agencies that are involved in establishing the laws. Florida could be used as an example of a state that has divided aquatic plant control regulations between too many governmental agencies. It is my feeling that one agency should be assigned the responsibility of developing and enforcing regulations. The regulations can be developed with input from all of the governmental agencies, but must be enforced by one agency. The industry cannot serve all matters. Division of responsibility is creating a major problem in an industry that is already poorly developed.

(2) Too many agencies want to look at, handle and control the Hot Aquatic Potato but do not want to take the heat of responsibility, should something go wrong or their way be accepted.

(3) A lot of the laws pertaining to aquatics are just and reasonable however I'm not familiar with ALL the laws and/or regulations. I think at times we are over regulated and it seems to me that some of the regulations just override and get mixed with other regulations.

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In compliance with the Federal Insecticide, Fungicide and Rodenticide Act as amended in 1972 (FIFRA 1972), for more than two years, pesticide applicators in Florida have been involved in training, testing and certification.

Within this time, approximately 6,000 commercial pesticide applicators have been trained. Approximately 1,200 of these were in aquatic categories. It is estimated there are still 6,000 commercial applicators left to be certified. We are now coming into a period in the next few months where most of those previously licensed will have to be re-certified. The amount of tax monies, as well as individual and company monies, expended is tremendous, not to mention the loss of work time involved in the process.

To top all this, the newly revised

FIFRA 1978 further transfers more responsibility to the applicator in recommending and applying pesticides. Concurrently, more and more formulators are adding the restriction that certain pesticides be applied only by certified applicators.

It would also seem the environmentalists, who would abolish pesticides, have made a strategic change in their efforts. Whereas for the last twelve to fifteen years we have had a constant fight in the Federal and State Legislatures to keep our industry viable and just as we would *seem* to have a break in the new FIFRA and a breathing spell, you may feel this is sounding good. Don't bet on it!

It is apparent from events in the last few months their efforts will now be intensified in the courts. Example - Forestry operations with

2,4,5-T in the 1978 season have some \$750,000,000.00 (that's millions not thousands) in legal claims against them. We have one such litigation already filed in Florida and probably one pending in the Sanford area.

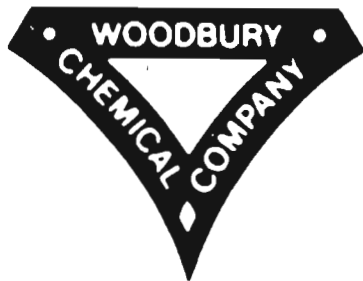
If you think the legislative fight was expensive, just wait until you get in court or watch your insurance premiums in the next year or two.

There has been much conversation on this subject and the whole pesticides industry is concerned.

It is therefore even more important that our applicators and all persons in our area become better informed and more professional in their operations. Nobody wants to get trapped because he didn't know or made an honest mistake.

With this in mind, we have, in behalf of our FAPMS, the Florida Agricultural Aviation Association and other certified applicators, initiated a study group to develop a draft rule for the Florida Department of Agriculture and Consumer Services which we feel will aid everyone in the re-certification process. We offer the following as a brief outline of our thinking to date.

continued on page 18



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THE USE OF POLYMERS IN THE APPLICATION OF AQUATIC HERBICIDES

Robert J. Gates
Director, Special Support Division
Southwest Florida Water Management District
Brooksville, Florida 33512

INTRODUCTION

In very recent years the slow migration of polymer additives, such as plasticizers and stabilizers from polymer materials, has been well established by researchers. Only recently this phenomenon has been utilized in development of a wide variety of controlled release herbicide-polymer formulations. In addition to long term control the controlled release formulations, such as "Inverts" and "Polymers", have certain distinct advantages over other formulation methods of application, such as granulars, pellets, wettable powders, etc. They (a) minimize herbicide residues available to the environment, (b) maintain toxic concentration of herbicides in close proximity to the target organism, (c) increase the efficacy results and longevity of the herbicide by protecting it from environmental degradation, and (d) decrease application cost because lesser amounts of herbicide and fewer applications are required.

Those of you that are involved in making decisions for the use of a specific application method on submerged aquatics, such as *Hydrilla verticillata* or *Eurasian watermilfoil*, should evaluate the most recent breakthrough in polymer technology. This carrier is known as polycarbaryl polymer (Nalquatic) which has now made it possible to use aerial applications (helicopter only) on submerged aquatics. It assists the total mix to break the surface tension of the water surface, improves the sinking capabilities, and creates a confinement (shrouding) around the plant structure for close contact translocation of the herbicides on the target plant. It is important to note that

the applied process and viscosity produces a slow release, therefore, like inverts the total water column is not necessary to calculate acre feet, or parts per million, for successful control.

The use of aircraft to spray herbicides onto weeds in waterways offers many advantages over other methods of delivery. Speed, accuracy, economy, and more uniform coverage can be expected when targets are remote, complex, large and difficult for access by boat or from ground equipment. Today the pilot must qualify with "Certification", be familiar with identifying the aquatic and terrestrial plants, and to also understand their relationship as to susceptibility of chemicals applied.

The risk of herbicides drifting onto susceptible crops has deterred many from using the air and this has kept more laborious methods in use. With equipment properly calibrated and proper viscosity, like 50W motor oil, drift is no longer a high risk factor to be concerned with. There is no nozzle shear, only a steady solid stream delivered with no more than a 2% lateral movement from boom to target.

Ground equipment is extremely important and must have certain specifications for the operation to be entirely satisfactory and effective. Correct batching of the material is necessary in the introduction of the polymer (Nalquatic) into the total mix to prevent a lumping condition. It should be done very slowly.


The improved electromechanical in-line metering pump will feed the polymer into the pump system, on the intake side, developing a delivery of materials with a consistency from zero to that of a thick paste.

PROCEDURE OF DEVELOPMENT

The District's first experimental attempt to go to the aerial application system began in September 1976, with the preliminary treatment on the Withlacoochee River for the control of *Hydrilla*. Subsequent treatments were accomplished on the Homosassa River on September 20, 1977 and on the Withlacoochee River November 29, 1977.

1. Aerial spraying of water weeds differs from most agriculture spraying in that flying is usually hampered by tree lines, bridges, power lines, and other obstacles. A helicopter was chosen because of its high maneuverability in being able to negotiate sharp turns and remain airborne at slow speeds while flying within 6 to 10 feet above the water surface.
2. To be drift free from an altitude of several feet, droplets used must be large or a straight path of liquid must be delivered from the boom nozzle.
3. After working unsuccessfully with "inverts" and because of the inability to break the surface tension of the water, polymers were then introduced to overcome this problem. The polymer product, known as Nalquatic, was developed by Nalco Chemical Company from these efforts and was introduced on the market in February 1977.
4. In March 1977 specifications were written to bring together the best equipment and combinations thereof that could be designed as necessary to handle the polymer by helicopter for controlled applications using herbicides.
5. BOOM EQUIPMENT
 - (a) For submerged weed control, a stainless steel boom spray system that will accept and discharge polycarbaryl polymers which will encapsulate the herbicide and assist sinking of mixed material into the weed bio-mass.
 - 1) This spray boom shall be capable of applying the polymer material in a continuous flow pattern in large droplets.
 - 2) Nozzle spacing on the boom shall not exceed 6" spacing per foot.
 - 3) The boom length shall not

continued on page 14



Amchem aquatic herbicides. 7 ways to make your lakes and streams look like the day they were created.

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Emulsavert[®] D. For ditchbank brush (annual, biennial, and perennial broodleaf weeds).

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Amitrol[™] T. Controls cattails, grasses and hyacinths in marshes

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For more information about Amchem's full line of aquatic herbicides, contact your local Amchem representative or write direct.

Any herbicide can be harmful if improperly used. Always read the label carefully before using.



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- be less than 20 foot.
- 4) Each nozzle orifice shall not be less than #8 or more than #10.
 - (b) The equipment must be capable of continuous operation with the following pressures and pump capacities.
 - 1) Nozzle valve pressure — 40 PSI.
 - 2) Nozzle orifice pressure — 2 PSI.
 - 3) Pump capacity of 50 gallons per minute.
 - (c) The equipment must be capable of the following output:
 - 1) Delivery of 20 gallons per acre on a 50 foot swath basis at a constant ground speed of 35 mph with a minimum of droplet size below 1500 microns. The system must be leak proof and easy to calibrate.
 - 2) Spare parts as specified.
 - (d) The system must include a positive cut-off valve to prevent over-spray while in flight. Must be adjustable for fast and accurate calibration.
 - (e) Tanks are to be provided with a tight fitting closure to prevent spillage.
 - (f) Threaded, rather than clamp type connections shall be used, except where vibration will not permit. All hoses used on the helicopter shall be non-collapsible and capable of withstanding pressure of 100 PSI.
 - (g) One new, or completely reconditioned, spare pump for helicopter power take off or any electrical type pump which may be part of the spray system shall be quickly available in order to prevent lost time in the event of a pump failure or breakdown.

6. GROUND SUPPORTING EQUIPMENT

- (a) Either one large truck mounted tank capable of holding at least 1000 gallons of water phase chemical, or two smaller trucks with mounted tanks which could be used in a shuttle operation in supplying the helicopter with necessary materials.
- (b) All trucks must be equipped

- with a 100 mesh filtering system.
- (c) Discharge pumps of 100 gallons per minute capacity.
- (d) A meter which measures gallons and tenths of gallons must be provided for recording materials used in the spray operations.
- (e) A minimum of one 1¼ to 2 inch diameter non-collapsible hoses at least 50 feet in length for delivery of the chemical into the helicopter tanks shall be provided. The hoses must be fitted with an instantaneous cut-off nozzle.
- (f) When the use of polymeric carrier is desired in the system, a flow meter pump will be required to feed and measure the material injected into the system at desired rates of 1½ gallons per hundred gallons spray mixture.

7. Choice of herbicides of course is extremely important as well as proper calibration.

The 30 day evaluations on these plots appeared to be approximately 90%, or more, acceptable. As the river clears and more velocity is generated the river should be open for several months. No lateral drift was experienced in any of the replication flights. No fish or fowl degradation was observed during the application and evaluation periods.

RESULTS

The results observed, four to six weeks after application, are reported in Tables I, II, and III. The results indicated that the spray had been delivered with satisfactory accuracy in winding channels of the rivers to establish boat trails for navigation and flood control. A cross wind of 3 — 10 MPH was blowing during some of the flights. At no time did there ever appear to be more than a 2% lateral drift, with little if any break in the fluid stream after leaving the boom nozzle at 32 lbs. pressure, 30 MPH, 6 ft. off the weed beds.

SUMMARY

To summarize, let me repeat, the use of "polymers" has keyed in another herbicide carrier that can be used for better environmental management of aquatic weeds, with extremely low herbicide requirements. The polymer Nalquatic is Registered

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Atrazine	Invert Oil												
Banvel 720	Kommeen												
2-4-D	Paraquat												
Dalapon	Roundup												
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by EPA to be used in the waters of Florida. Like "inverts", certain herbicides are not compatible to use with the polymer. The immediate future does not indicate the introduction of many new herbicides; in fact the reverse is true since the requirements for labeling have become more strict and demanding. It is, therefore, essential that we all try to keep improving methods of application and at the same time use herbicides that we know are less detrimental to the environment and still obtain desired control levels.

Polymers have been successfully used in airboat applications. We are now working with an electro-mechanical in-line metering pump that will deliver to the weed target a mix from zero viscosity to that of thick paste. We believe, if this effort is successful, we will be able to determine the length of the herbicide release time by the range of thickness that is applied. The use of polymers in applying herbicides will overcome the many variables in variety of water conditions, such as tidal change, flowing and static water, depth, clarity and artificial water fluctuations.

Table I. September 14, 1976, the first flight.

WITHLACOOCHIEE RIVER

AQUATIC WEED —

Hydrilla-full mats, blocking navigation

PERSONNEL —

Pilot
Certified Mechanic
Foreman
Aquatic Weed Specialist

Weather — 83°, Clear

Wind — 0-6 MPH

Water Temperature — 74°

PH — 6.5

FORMULATIONS:

10 gals. Diquat)
20 gals. Komeen) 100 gals. of mix
1.5 gals. Nalquatic)

Rate Per Surface Acre = 20 gallons

CALIBRATION OF EQUIPMENT —

Simplex Boom, 32 lbs. boom pressure, airspeed 30 MPH, 6 ft. altitude = 20 gallons per surface acre.

POTENTIAL CAPABILITY

Tank capacity on helicopter = 80 gallons
 $\frac{80}{20} = 4$ surface acres

FLIGHT TIME — 5 minutes

$60 \div 5 = 12$ loads

12×4 acres = 48 acres per hour

48×8 hrs. = 384 acres

384 acres \times (4) 8 hr. days = 1536 acres per week

1536 acres \times 4 weeks = 6144 acres per month

LAKE NELSON — WITHLACOOCHIEE RIVER

20 acres = applied 400 gallons of mix

LAKE BONNET — WITHLACOOCHIEE RIVER

30 acres = applied 600 gallons of mix

WYSONG LOCK & SPILLWAY — UPSTREAM, MAIN RIVER CHANNELS

25 acres = applied 500 gallons of mix

COST PER ACRE

\$ 8,613.37 Herbicides

1,485.00 Aerial Contractor

93.60 Labor SWFWMD

28.08 Fringe Benefits

\$10,220.05 = \$136.26 Cost Per Acre
75

Control Evaluation 90-95% at the end of 6 weeks.

The regrowth of the Hydrilla began to reoccur in spotted locations and was first noted July 18, 1977. By August 31, 1978 the growth had topped out at the surface of the water completely restricting navigation.

Table II. September 20, 1977, the second flight

HOMOSASSA RIVER

AQUATIC WEED —

Hydrilla-heavy mats middle of river

Weather — 82°, Partly Cloudy

Wind — 3 MPH

Water Temperature — 80°

PH — 5.0

ACREAGE = 70 acres —

Gallons Applied — 1400 gallons

HERBICIDES USED:

140 gallons Diquat) 2 gallons Diquat
280 gallons Komeen) 4 gallons Komeen
20 gallons Nalquatic) Per Surface Acre

FLIGHT TIME — 2 hours 15 minutes

COST PER ACRE

\$7,679.80 Herbicides

1,398.50 Aerial Contractor

50.15 Labor SWFWMD

15.04 Fringe Benefits

\$9,143.49 = \$130.62 Cost Per Acre
70

CONTROL EVALUATION —

October 17, 1977 evaluation, 90 — 95% control. Mat deterioration evident. With this kind of control no additional evaluations were made.

Regrowth of Hydrilla began to reappear in the shallow waters approximately June 15, 1978, however, the main channel and deeper water remained open except for small areas through July 15, 1978.



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Table III. November 29, 1977, the third and last flight.

**HIGHWAY 48 SOUTH —
WITHLACOOCHEE RIVER**

AQUATIC WEED —

Hydrilla — River completely blocked to navigation.

Weather — 69°, Cloudy

Wind — 6-10 MPH

Water Temperature — 74°

PH — 6.2

ACREAGE = 30 acres

Gallons Applied — 600 gallons

HERBICIDES USED:

360 gallons Komeen) 12 gallons Komeen
9 gallons Nalquatic) Per Surface Acre

FLIGHT TIME — 1 hour 10 minutes

COST PER ACRE

\$3,246.75 Herbicides

534.00 Aerial Contractor

25.04 Labor SWFWMD

7.51 Fringe Benefits

\$3,813.30 = \$127.11 Cost Per Acre

30

**HIGHWAY 44 NORTH —
WITHLACOOCHEE RIVER**

ACREAGE = 30 acres

Gallons Applied — 600 gallons

HERBICIDES USED:

480 gallons Komeen) 16 gallons Komeen
12 gallons Nalquatic) Per Surface Acre

FLIGHT TIME — 1 hour 5 minutes

COST PER ACRE

\$4,329.00 Herbicides

534.00 Aerial Contractor

25.00 Labor SWFWMD

7.50 Fringe Benefits

\$4,895.50 = \$163.18 Cost Per Acre

30

The work done on November 29, 1977 produced a little longer period of control than the September flight shown in Table II. Higher rates of Komeen were used in both plots, 12 gallons and 16 gallons per surface acre respectively. Regrowth began to re-establish very fast during the last two weeks of August 1978. □

SPEAKING UP continued from page 10

Question: What are your feelings on the professionalism of Florida's aquatic applicators?

Comments:

(1) The Florida applicator has come a long way, but he still has a long way to go before the industry can say it has reached professional status. Certification cannot be classified as professionalism. Many applicators have taken the position that certification is a professional status, but this should not be considered as such. Few people have been refused certification, however, to qualify them as professionals in aquatic plant management is a mistake.

Applicators need guidelines on what is required for classifying an individual as a professional in aquatic plant management. The field of aquatic application is made up of people trained in every existing trade or profession. Under today's standards, the newspaper delivery boy can be a professional applicator, as well as a college research graduate trained in *aquatic environmental management*.

I have used the term aquatic environmental management because to be a professional we

must be qualified in this field. We cannot isolate aquatic weed control from the total ecology of the aquatic environment. This is the reason that regulations appear to be so difficult in the aquatic plant management field. The professional applicator must be able to think and react with his control program to the total aquatic environment. This can only be done with proper training in many related fields.

The majority of the applicators in Florida cannot be classified as professionals. We have many people classified as aquatic plant management professionals in positions of authority that assist in establishing regulations, and providing world wide assistance that do not understand the total concept of aquatic environmental management. *Progressing yes, but professionals no.*

(2) Some are 100% professional in aquatics. Some others are 100% professional — about 80-90% of this being professional con artists.

(3) I believe we as applicators are better qualified than ever, and due to the establishment of F.A.P.M.S. we will be even better qualified. □

In addition to the University Applicator Training and Testing Program, we would establish a one-day training seminar in each of the five water management district areas. Each of these training sessions would be given points toward re-certification. EXAMPLE: If 100 points is needed for bi-annual re-certification, you could have the following options for re-certification:

- 1. Successfully complete the examination for the categories required 100 points

2. Attend approved training short-courses (aquatic)

A. First Year

- (1) 1 short-course, 25 points Water Management District
- (2) FAPMS annual meeting and short-course 25 points

B. Second year

- (1) Same as A. (1) 25 points
- (2) Same as A. (2) 25 points

The above A. and B. for two years would automatically qualify you for re-certification.

We believe this type of practical training, first at the water management district level which the particular individual will be operating within, holds many advantages.

First, it would reduce travel and other expense as each individual could drive to the meeting in the morning and return home that evening.

Second, it would establish better communications of the persons operating in the particular water management district (commercial applicators, water management districts, 298 districts, U.S. Corps of Engineers, etc.)

Third, practical operational techniques, or a "show and tell" type instruction, could be accomplished.

Fourth, operations, policies and environmental factors peculiar to the local operating area could be more closely covered without the confusion of diverse conditions and multiple water management district S. O. P. becoming involved.

Fifth, property owners, agricultural operators and other local residents holding aquatic permits and conducting operations in the particular district could be invited to attend thereby expanding the knowledge of the seminar and establishing better communications with the local residents.

Then at the statewide meeting (short-courses), F.A.C., F.S., State standards, Federal rules and statutes and all factors related to the State-at-large could be covered for a comprehensive annual update for all persons in the particular categories as well as have the exposure to new operational techniques and other matters from the state as a whole.

At this point, everyone we have talked with is enthused about this type training and re-certification. We are now soliciting your input and suggestions. Let us know and we will keep you informed as things progress. □

Harold F. Brown
Applicators Representative —
Florida Pesticide Applicators Council,
Florida Pesticide Technical Council

Governor Graham has appointed Jacob D. Varn the new Secretary of the Department of Environmental Regulation.



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FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMERS AFFAIRS: One Agricultural Products Supervisor; five Agricultural Products Specialists; one Clerk Typist III. Contact Mr. Raymond Sprinock, Administrator, Pesticide Section, Department of Agriculture and Consumer Services, Mayo Bldg., Tallahassee, Fl. 32304. 904/487-2130

DEPARTMENT OF NATURAL RESOURCES: *Biologist II, Tallahassee; *Clerk Typist III, Tallahassee; (*Pending approval.) Contact Mr. William L. Maier, Administrator, Control Section Bureau of APR&C, Department of Natural Resources, 202 Blount St., Tallahassee, Fl. 32304. 904/488-5631

LAKES AND WATERWAYS MANAGEMENT SERVICE: Biologist with interest in a career in aquatic plant control. Contact Mr. Tom Denike, President, 400 N.E. 27th St., Pompano Beach, Fl. 33064. 305/943-0481

Anyone interested in listing positions available or desired may do so by contacting the editors of **AQUATICS**.

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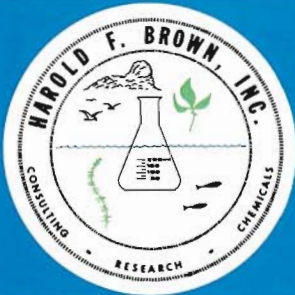
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