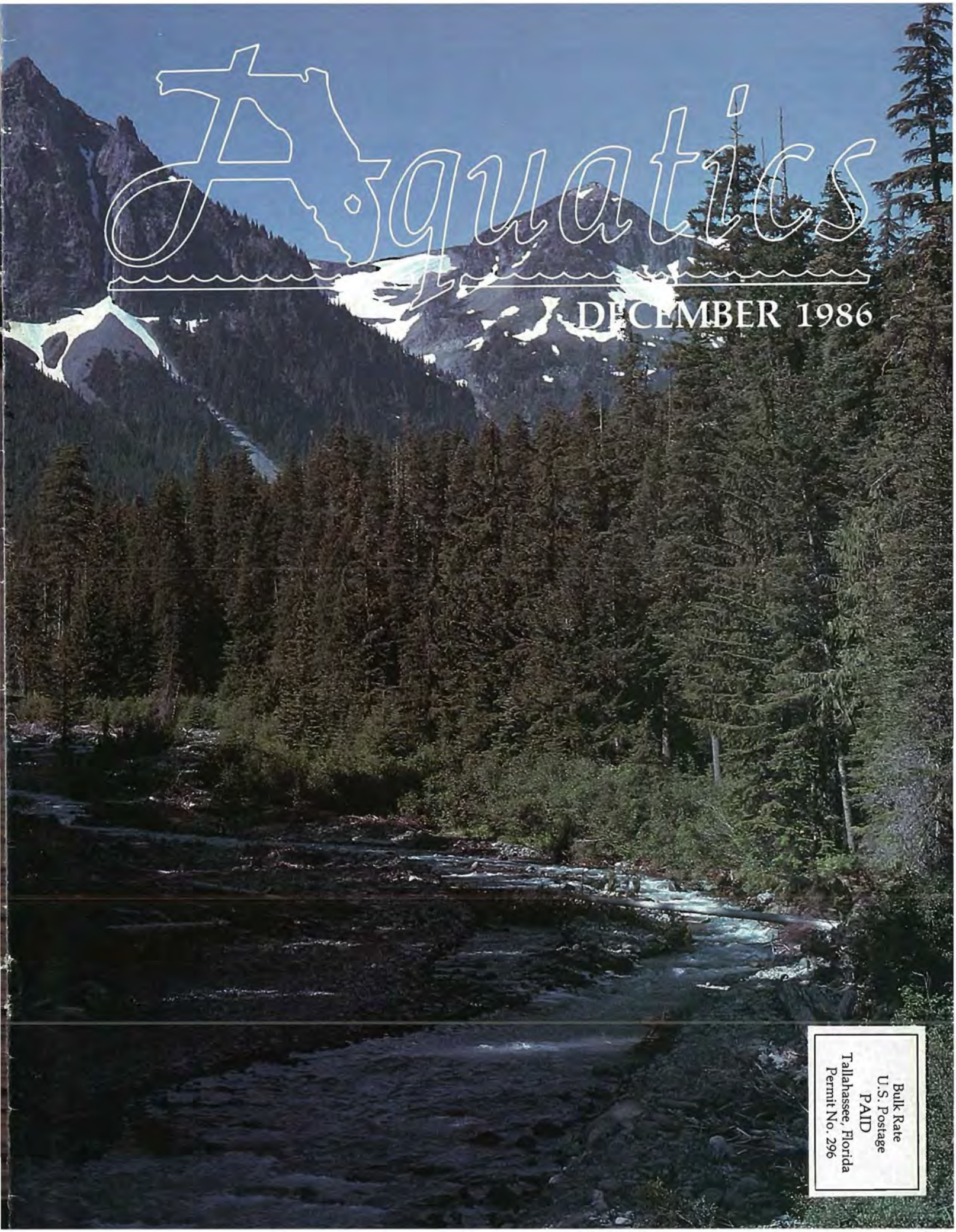
Aquatics

DECEMBER 1986



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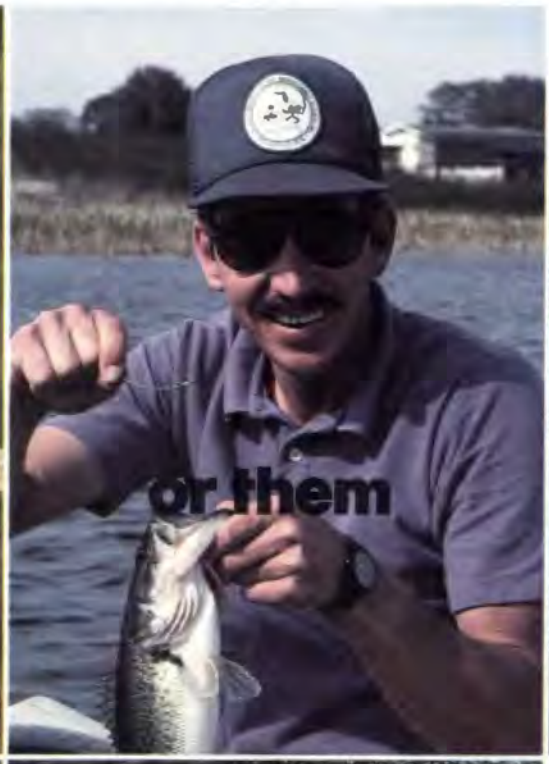

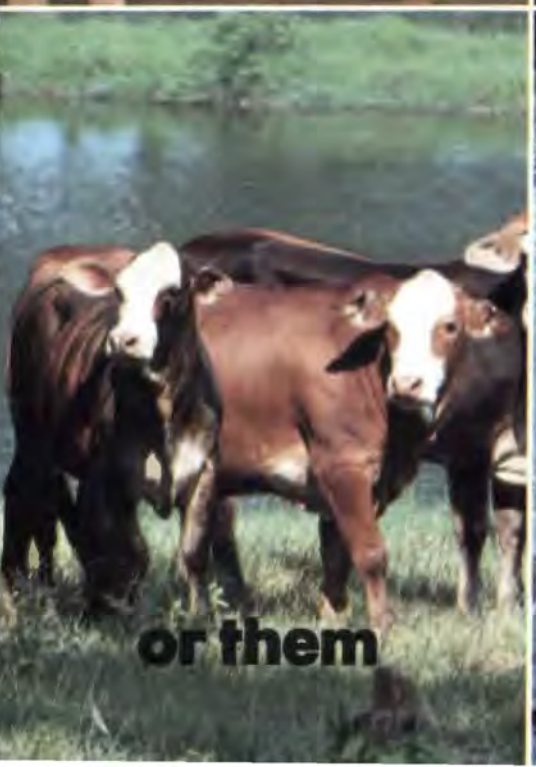

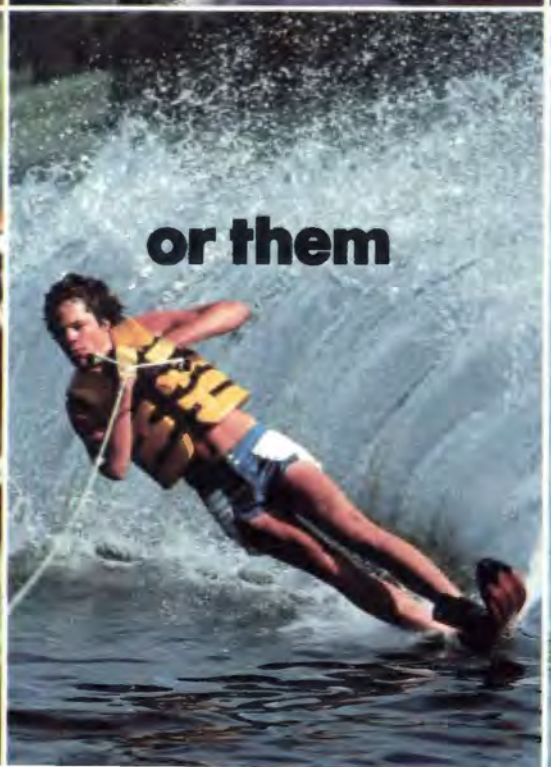

EDITORIAL

During the past few months, there have been persistent rumors, comments, and innuendoes concerning proposed legislation to transfer the responsibility as lead agency for aquatic plant management to the Florida Game and Freshwater Fish Commission from the Florida Department of Natural Resources. This is an issue of concern to aquatic plant managers who are responsible for the management of multi-use water resources. The concern being that aquatic plant management goals will be dictated only by fishery and wildlife concerns and other water uses will receive less emphasis.

The current state program was organized in 1979 in response to recommendation from the American Assembly Conference which recognized the need for coordination of the program by a single lead agency but delegation of control responsibilities to local and regional entities. It was felt that local and regional agencies would be more responsive to local needs for aquatic plant control. This was never intended to imply that fish and wildlife concerns would be neglected, but that it would be balanced with other issues such as flood control, navigation and public health.

Under current procedures, all agencies are given the opportunity for input into management plans in order to balance all water use interests. Rather than a change in legislation and a total upheaval of what is considered to be a model program throughout the rest of the U.S., efforts should be made to increase interagency interactions and planning in those areas where multi-use management conflicts are perceived. History has taught us that when reasonable managers objectively discuss an issue, the ultimate solution to an aquatic plant problem is not that different.

ABOUT THE COVER

It's a long way from Lake Okeechobee, but believe it or not, they do have aquatic weed problems out West too. This stream is snow melt from Mount Ranier, WA.

Photo By: David Tarver

Aquatics

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

CONTENTS

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

EDITORIAL: Address all correspondence regarding editorial matter to Daniel Thayer, Editor, "Aquatics" Magazine, 7922 N.W. 71st Street, Gainesville, Fl. 32606.

Water Paspalum

by
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13081 North Military Trail
Delray Beach, Florida 33445

Grass

Pile the bodies high at Austerlitz and Waterloo.
Shovel them under and let me work —
I am the grass; I cover all.

And pile them high at Gettysburg
And pile them high at Ypres and Verdun.
Shovel them under and let me work.
Two years, ten years, and passengers ask the conductor:
What place is this?
Where are we now?

I am the grass.
Let me work.

— *Carl Sandburg*

Introduction and Taxonomy

Sandburg's *Grass* has a sort of morbid omnipotence. Florida water managers have grasses that get out of hand, yet rarely do they conceal our dead. But, the aquatic grasses growing in Florida's waters and wetlands do succeed in establishing themselves through, on and in spite of many other species.

For instance, wetland dredging activity in Florida is now and forevermore will be followed by introduction of littoral native aquatic plants as mandated by DER permit rules and mitigation policy. However, even as the aquatic nurseryman leaves such sites, torpedograss (*panicum repens*) often invades; insinuating itself through the desired plants and spoiling the look and intent of the revegetation project. Since the new plants were placed there carefully, and at great expense, extremely conservative methods have to be used for the grass control. The state of the art method for such work is still hand-weeding.

A native grass which does not encroach to the same degree is *Paspalum repens* Berg., or synonomously *Paspalum fluitans* (Ell.) Kunth. This truly aquatic species is commonly called water paspalum and its genus includes 21 other aquatic species in the southeastern U.S.[1] At least 48 members of the genus are found in all habitat types nationwide.[2] Among all members of the genus one of the most commonly encountered is Bahia grass (*Paspalum notatum*) which, although native to South America, has been widely introduced in this region as a turf and right-of-way grass due to its dense sod-forming growth. Many other members of the genus are aquatic or semi-aquatic and most are perennial. Water paspalum, however, is termed an annual since any individual plant will not survive more than one year.

The grasses world-wide comprise one of the largest and most economically important plant families. People, and many other animals as well, utilize grasses (especially the cereal grains) as major components of their diets. Grasses inhabit every conceivable ecological zone from the sub-arctics to the sub-tropics. Thirteen-hundered and ninety-eight (1398) grass species have been identified in the U.S. of which 156 are introduced species.[3]

Growth, Structure and Habitat

Water paspalum can grow as a floating plants with its bushy roots tangling in other vegetation but not necessarily rooting in soil. Spongy stem tissue allows the plant to float with most of its mass just below the waterline. Usually the aerial parts of the plant are under two feet high. Flower stalks are aerial. The inflorescence looks like a bottlebrush with its bristles set at right angles. When flowering heavily the plant resembles parrot's feather *(Myriophyllum aquaticum)*. Leaf sheaths loosely surround the thick stems and are lightly covered with soft hairs. Long (4-12"), fibrous roots emerge at each node.

Water paspalum, as it floats, will attach or entangle onto surrounding plants or structures in the quiet backwaters of rivers and streams and protected areas of lakes and ponds. The plant clumps assume a colonial appearance as they grow outward from

Continued on page 6

Sonar delivers great results. Almost anywhere. Large recreational lakes. Golf course ponds. Drainage canals. Even drinking water reservoirs.

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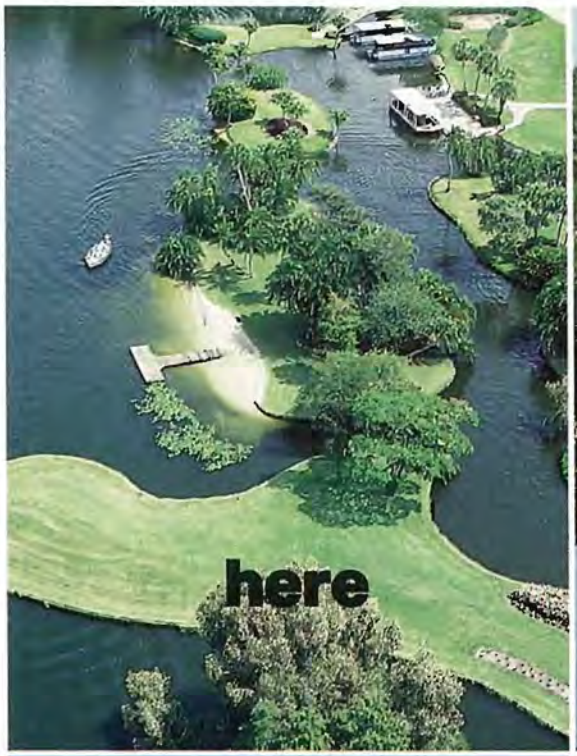

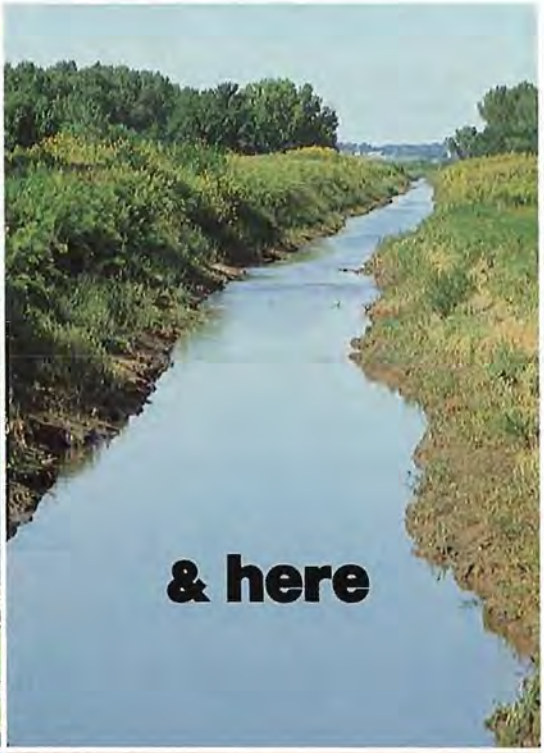

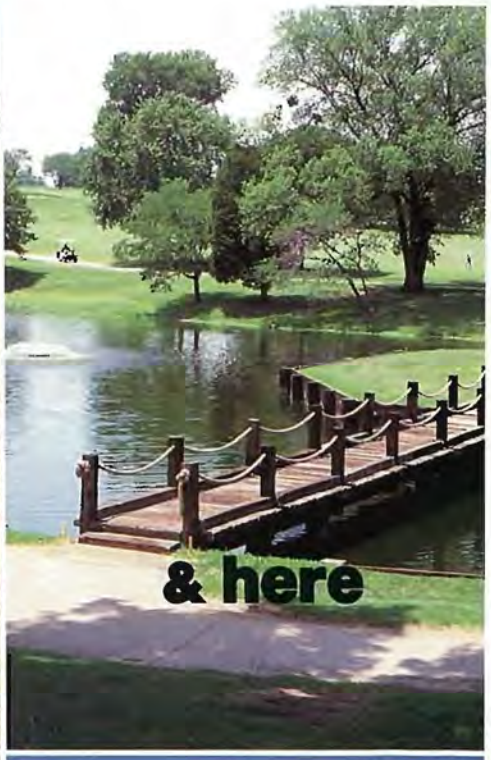

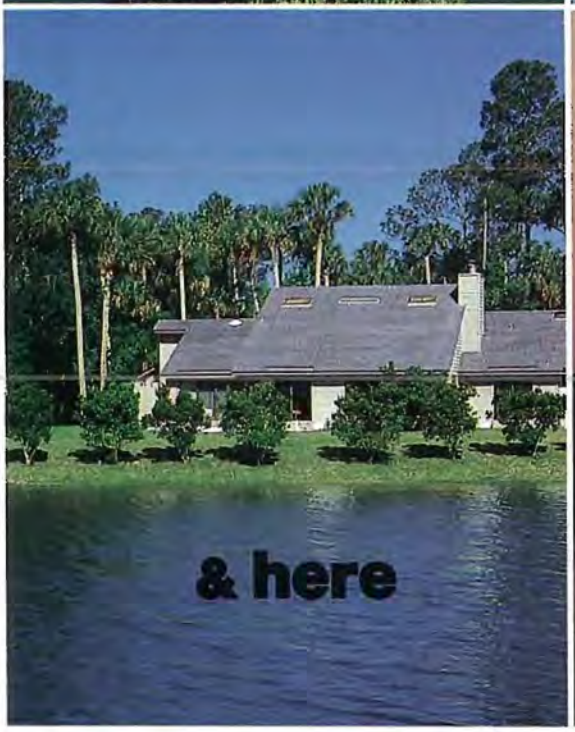

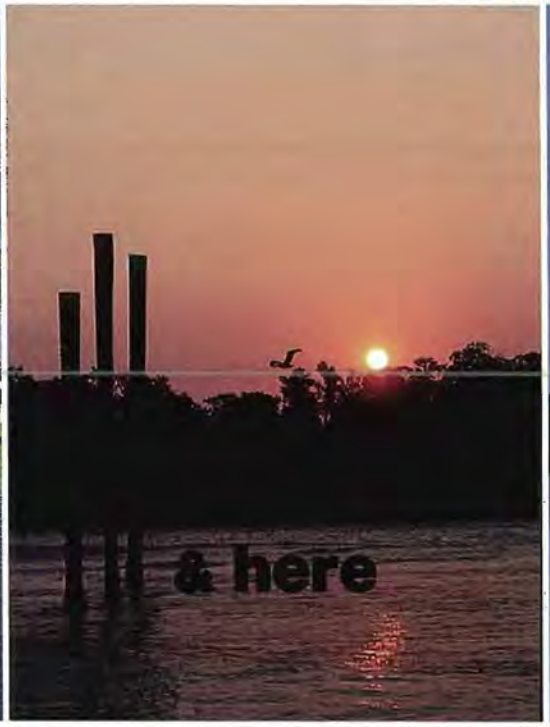

shore. By the end of the Floridian growing season plants often extend well across slow-moving waterways. This plant's growth habit allows it to readily paticipate in the formation of dreaded "floating islands."

Distribution

Water paspalum occurs from the Ohio River valley on down to tropical America. Serious summertime navigational impairment is reported from the Mississippi and Ohio Rivers. In Florida relatively heavy growths are usually reported by August in the St. Johns River basin, the old river runs of the Kissimmee River and in the Hillsborough River. Several water managers, including Larry Maddox at the Melbourne field station of SJRWMD, report that in later autumn a decrease in its coverage occurs. This corroborates the annual growth nature reported for the plant. Seemingly, by that time of the year they've just about burnt out and go the way of Fat Sam (That's not Larry burning out every autumn, I mean the plants). Often they die back just as people are getting worried about them, so treatment is usually not necessary. Recurrence of the plant in the same areas year after year must occur by germination of previous years' seeds. DNR's 1984 survey publication reports 100 acres of *Paspalum repens* state-wide in 11 water bodies. The 1983 publication reported roughly the same figure: 154 acres in 7 water bodies.

Ecological Significance and Conclusion

Water paspalum sets a lot of seed. This would be expected of a plant which doesn't count on being here to regrow next spring. The seeds are probably eaten by waterfowl and the shade and structure of the floating plant mass is a haven for micro- and macro-critters. The leaves never show much evidence of having been fed upon so there may not be any bugs dependent upon water paspalum solely for their bread and board. It's another one of those plants that you notice a lot but never makes a major impact except to enhance aquatic Floridian floral fecundity overall.

[1] Godfrey, Robert K. and J. Wooten, *Aquatic and Wetland Plants of the Southeastern U.S.*, Univ. of Georgia Press, p. 120.

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RODEO. EMERGED AQUATIC WEED AND BRUSH CONTROL.

A Preliminary Literature Review on Vegetation and Fisheries with Emphasis on the Largemouth Bass, Bluegill and Hydrilla

By
Joe Hinkle

Suwannee River Regional Biologist
Bureau of Aquatic Plant Management
Florida Department of Natural Resources
Lake City, Florida

Introduction

Approximately 56% of Florida's reported 2.5 million acres of fresh water are accessible to the public via public boat ramps.[67] The majority of these waters have multiple uses, ranging from potable water supply to catch basins for sewage effluent. Although the major value of Florida's water is derived from aesthetics and corresponding increased land values,[71] fresh water sportfishing generates over 525 million dollars annually.[9] Aquatic vegetation has been reported to improve the fishery of a water body;[31,88,89] however, one study on Orange lake indicated that excessive growth of the exotic weed, hydrilla, resulted in a 90% loss of revenue from sportfishing (in excess of one million dollars annually).[24] This report focuses on the relationship between the largemouth bass, the most popular fresh water sportfish in Florida,[48] and hydrilla, the most troublesome exotic weed in Florida waters.[67]

Beneficial Aspects of Aquatic Plants

Aquatic plants function as primary food producers while providing support, shelter, oxygen,[14] and sediment stabilization.[56] The addition of a variety of plants to a lake containing algae results in increased ecosystem stability.[14] The abundance of macroinvertebrates such as aquatic insects, snails, and grass shrimp,[27,35,60,68,94] bottom organisms,[35,68] organisms attached to underwater surfaces,[68] and small fish[5,60,94]increases with greater biomass and types of aquatic plants. Production of invertebrates is positively correlated to surface area of vegetation.[35]

Young-of-the-year largemouth bass are found in aquatic vegetation[5,60,71,72] and their survival is increased by dense vegetation,[27,71] which provides food[5,60] and cover.[1,75] Flooded shoreline vegetation is especially important to bass survival during early life.[1,75] After reaching approximately four inches in total length, largemouth bass primarily utilize fish as food.[23,51,61] Bass survival is improved by an abundant available food source. The switch to a fish diet as early as possible results in fast growth and predator avoidance.[1,61,75]

Spawning of largemouth bass is facilitated by the availability of a hard bottom. In the absence of suitable bottom, vegetation[73] becomes important as a spawning substrate. Rhizomes of the yellow cow lily have been utilized by spawning largemouth bass.[16]

Increases in aquatic plant abundance can increase sportfish populations[31,88,89] and total pounds of fish.[31,68] The amount of harvestable sportfish has been related to specific type of vegetation in some cases,[52,68] but the fish production for the same plant type in different water bodies may be considerably different.[68] Aquatic plants reduce competition between species of sunfish[90] and between size classes of bluegill, possibly preventing stunted populations.[58] Largemouth bass numbers are highest at the edge of emergent vegetation while bluegills are highest over submersed vegetation.[91]

Effects of High Densities of Aquatic Plants

A survey of Florida anglers indicates that over one-half of the anglers consider aquatic vegetation to be a problem.[48] Excessive vegetation decreases angler utilization,[11,24,53] total sportfish harvest,[8,24,53] and fishery related revenue.[24] Heavy vegetation coverage can result in stunted bluegill populations,[72] poor fish growth,[7,11,17,55] increased numbers of fish with a reduction of weight in individual fish,[11,27] increased susceptibility of largemouth bass to being caught by

the angler,[24,53] and fish kills such as the one that occured in Lochloosa Lake in July of 1986.

Reduction of available food[8] to bluegill[24,29,53] and largemouth bass[39,64,65] is associated with dense aquatic plants. This decrease is the result of structural complexity of the vegetation interfering with feeding by largemouth bass[28,36,64,65,92] and bluegills,[29,30,58] resulting in increased numbers of sportfish too small to be used by the angler.[27] This decrease in food capture rate results in lower condition factors for sportfish,[3,8,26] with harvestable largemouth bass adversely affected at lower vegetation densities than other species.[26,27]

As stem density of aquatic plants increase, largemouth bass switch from active searchers for food to ambushers.[65] Bluegill school at low plant densities but disperse among stems of plants at high densities.[65] A 20% plant coverage resulted in adult largemouth bass preferring young-of-the-year largemouth bass as food rather than bluegill.[77]

Extensive mats of submersed vegetation can result in extreme daily fluctuations in dissolved oxygen,[7,12,76,85] pH[12,85] and water temperature.[12,85] In conjunction with the daily oxygen fluctuation, fish kills are known to occur.[69,71,78] Growth of largemouth bass is impaired when subjected to low and high oxygen concentrations during a 24 hour period.[6] High pH created by dense plant growth can delay bass spawning.[18]

Major increases in water clarity were not found until plant levels increased to 60% coverage, with limnological changes occurring at 40% plant coverage.[21] It has been suggested that aquatic plant growth can reduce the trophic status of a lake;[60] however, it has also been pointed out that if plants are taken into consideration in assessing trophic status, the overall status may not change.[20] There are also indications that aquatic plants may be able to transfer nutrients such as phosphorus from anaerobic mud to the water[14] where it can be utilized for the growth of algae or other aquatic plants.

The Role of Exotic Plants

Exotic plants have been a problem in Florida since the early 1900's,[81] long before cultrual eutrophication became prevalent in Florida. In 1984, 31 exotic plant species accounted for 38% of Florida's aquatic plant community.[67] Exotic plants provide many of the same benefits as native species;[5,27,60,68] however, the detrimental effects of excessive growth of these plants on fish, wildlife, and economics is well documented.[8,10,11,19,24,26,27,43,53,54,62,81,82] In 1985, hydrilla was the dominant submersed aquatic plant in Florida's public waters forming dense stands occupying nearly 55,000 acres.[66] Hydrilla has many growth adaptations[4,13,33,38,74,80,84,85,86] that allow it to out compete native plants[38,79,83] and other exotic plants.[4,85] Many native plants have declined as a result of this competition. The dense growth pattern of hydrilla compared to native plants has several negative attributes. These include: decreases in the variety of fish species;[5] considerably lower light levels available for growth of other native plants and algae, resulting in plant stands made up of only hydrilla,[38] stem densities[2] which provide less than optimum feeding by bass and bluegill;[29] largemouth bass avoidance of hydrilla as spawning sites;[16] and the expense involved in management[42,50,57,69,71] (12 million dollars were spent on hydrilla control in Florida between 1981 and 1985, but a net increase in hydrilla of approximately 10,000 acres (24%) occurred during that period.)[66]

Plant Management Objectives

When fishing is the prime user-oriented activity, management should be directed at maintaining a high sustained yield of harvestable sportfish in order to maximize angler utilization of the water body. Intermediate densities and coverage of aquatic plants provide the best growth and condition factors for producing harvestable largemouth bass[25,27,36,65,94] and bluegill.[29,30] Bass feeding success was good at 0 and 50 stems per square meter, but declined to near zero at 250 stems per square meter.[65] Maidencane and knot grass stands average 150 stems per square meter,[68] while hydrilla can produce 200-265 stems per square meter in a six-week period.[2]

Management recommendation for plant coverage within fishery lakes range from 10-40%.[25,27,31,60,94] The most desirable approach would be to encourage the growth of those native plants inoffensive to human activities with exclusion of the troublesome exotic plants.[14] In *moderate* quantities, aquatic vegetation increases stability of ecosystems and is beneficial to fishery interests.[14]

Benefits of Aquatic Plant Management and Control

Primary benefits of aquatic plant management are derived from increased angler utilization[11,24,53] and associated revenue increases[24] to fish camps and local businesses. Fishermen

indicated that weed control increases fishing and boating enjoyment,[10] but also felt that vegetation should not be completely eliminated.[48]

Conflicting studies regarding aquatic vegetation concluded that vegetation removal is detrimental to sportfish;[87] has little or no effect on fisheries;[3,59] and is beneficial to fisheries.[3,7,17,39,53,62,73] Improvements in sportfish condition factors,[3,8] increased fishable shoreline,[10,32] and the elimination of stunted bluegill[63] populations also have been associated with removal of excessive vegetation.

Management of vegetation levels below 50% coverage has the potential to increase harvestable sportfish,[11,27] increase the growth of black crappie,[55] increase feeding success of largemouth bass[28,36,64,65,94] and bluegill,[28,29,58] and increase total fish catch.[8,24,53]

Hydrilla Management Techniques — Pros and Cons

Mechanical Harvesting

Benefits of harvesting excessive vegetation include: removal of plant material and nutrients from the water body;[93] immediate control results; few water use restrictions during management programs; and a high degree of selectivity for location and types of plants removed. Disadvantages of harvesting include: high expense;[50,57,69,71] amount of time required to perform control operations; short duration of control;[57] loss of food fish and juvenile sportfish through harvesting;[37] and spread of undesirable plants to other sections of the water body through fragmentation.[46]

Herbicide Control

Advantages of herbicide control include: moderate cost;[42,69,71] selectivity for a specific site and type of plant;[22,38,69] will not eliminate all vegetation;[41,71] relative speed of application; longer duration of control than mechanical harvesting;[42,57] increase in native plants;[22,42,71] and use in areas not accessible to harvesting equipment. Disadvantages of herbicide control include: water use restrictions in conjunction with application; release of nutrients back into the water column;[40] unpleasant appearance of decaying vegetation,[22] public apprehension; and in some cases, toxicity to non-target organisms.

Biological Control (Triploid Grass Carp)

Advantages of biological control with triploid grass carp include: low cost;[69,71] few water use restrictions; little increase in algae;[40] no unpleasant decaying vegetation; not labor intensive; and long term control. Disadvantages of grass carp control include: no site selectivity; minimal selection of plant type; possible increase in undesirable exotic plants at the expense of preferred native plants;[49] and near or total elimination of all submersed plants.[71,78,87]

Effects of vegetation removal by grass carp include: an increase in harvestable sportfish,[70] neither improvement nor harm to fish populations,[3] deleterious effects on fish populations[87] and waterfowl habitat.[34]

Conclusion

Recreational sport fishing is one of the most valuable renewable resources in Florida. The value of this resource is dependent upon a sustained production of harvestable sportfish and access to this resource. Water bodies in Florida are dependent on a balance of algae and aquatic plants. However, with the introdution of exotic plants and increased eutrophication, many water bodies have become devoid of plants or overrun with one kind of exotic plant. Neither condition is conducive to a health fishery.

In addition to fish and wildlife habitat, Florida's lakes and rivers are equally important to navigation, pleasure boating, water skiing, diving, swimming and aesthetics. Therefore, ultimate management objectives should be directed at providing a *moderate* combination of submersed, emergent, and floating *native* vegetation which provides substantial cover and food sources for fish and wildlife, including non-game wildlife, while posing as few restrictions as possible to recreational and navigational pursuits.

Recommended aquatic macrophyte densities for wildlife and fishery management range from 10-40%. In waters set aside primarily for fish and waterfowl, native aquatic plants should be managed toward the upper end of this spectrum. However, in multiple use waters, vegetation densities should be maintained at the lower end of the spectrum which provides substantial cover and food for sportfish production while allowing adequate open water for additional water related activities.

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10th Anniversary of the FAPMS

The annual meeting of the FAPMS held in Plant City, October 14-16, marked the 10th anniversary of the Florida Society.

The attendance goes on record as the largest ever, as more than 350 people registered for the meeting, packing the conference hall to its capacity.

Activities included three full days of papers, awards, a 10-year anniversary banquet, a commemorative coffee mug, and of course, plenty of after hours recreation.

The Florida Aquatic Plant Management Society Scholarship and Research Foundation awarded Ms. Pamela Botts of the University of South Florida with this year's scholarship money.

David Tarver relinquishes his post as President to Mike Mahler.

AWARD WINNERS

Photo Contest:

Operations
1st Place — Jeff Nigel
2nd Place — Joe Hinkle
3rd Place — Jim Kelley

Aquatic Scenes
1st Place — Jim Kelley
2nd Place — Gary Buckingham
3rd Place — Jeff Schardt

Membership Drive:
Dean Barber

Applicator of the Year:
Chuck Stevens, Jr.

Exhibitor Award:
Southern Mill Creek Products Co.

Pictured at left: *A field applicator panel, chaired by Jim Wilmoth, addresses applicator concerns and questions. Panel members included: (Left to Right) Bob Woodard, John Fernandes, Ed Terczak, Eddie Knight, Bill Haller, and Mark McKenzie.*

Transplanting Bulrush to Enhance Fisheries and Aquatic Habitat

by
Steve Marshall
Florida Game and Fresh Water Fish Commission
Everglades Region, West Palm Beach

Introduction

Transplanting aquatic vegetation for fisheries habitat, water quality control and aesthetic value has become common in recent years. State agencies concentrate their work around public water to enhance fish and wildlife habitat. In the last few years private companies have ventured into the field as the public demand for aquatic landscaping has expanded. With the vast array of work being done in the field a surprisingly small amount has been documented and reported. While attending the 1985 and 1986 Annual Meetings of the Florida Aquatic Plant Management Society, I benefited by hearing a presentation by the City of Orlando on transplanting aquatic vegetation. I hope that reporting the following information will entice more people to begin documenting and reporting the success and failure of aquatic transplants. The findings can only prove beneficial for both public and private entities.

Method

Two study areas were used for transplanting giant bulrush (*Scirpus* californious). Study area one, Lake Blue Cypress, is a 6,555 acre lake with an undeveloped shoreline surrounded by cypress trees. It is located in Indian River County west of Vero Beach, Florida. The dominant macrophytes include: sawgrass (*Cladium jamaicense*), cattail (*Typha* spp) and knot grass (*Paspalidium geminatum*).

Study area two, Lake Okeeheelee, is a five year old 157 acre lake located entirely within a Palm Beach County Park. The lake is a closed system which is considered oligotrophic in comparison to other Florida lakes. During most of the experiment the littoral zone was void of aquatic vegetation. At present, torpedograss (*Panicum repens*) and spike rush (*Eleocharis cellulosa*) are common around the lake.

In all cases, transportation of aquatic plants within the state of Florida requires a permit from the Department of Natural Resources' Bureau of Aquatic Plant Management. Transplants for both Blue Cypress and Okeeheelee were collected from multiple donor lakes (Table 1). Each plant was removed by excavating the plant and root system with a shovel and placing them in burlap bags to prevent desiccation. The plants were then loaded into a boat and truck bed for transport. *Before placement, rhizomes were thoroughly rinsed to prevent inclusion of any submersed weed propagules.* Each section of rhizome with stems attached was planted 4-6 inches into the lake bottom. The average water depth at planting sites was three feet for Lake Blue Cypress and two feet for Lake Okeeheelee. Soil types at Blue Cypress and Okeeheelee were densely compacted mud and compacted sand, respectively.

Table 1. Donor and receptor sites of transplanted vegetation for 1980-1984.

Transplant Year	Donor Site	# transplanted	Receptor Site
1980	Kissimmee	693	Blue Cypress
1982	Hatchineha	1474	Okeeheelee
1983	Hatchineha Istokpoga	826	Okeeheelee
1984	Istokpoga	1599	Okeeheelee

Results

Of approximately 900 bulrush stems introduced into Lake Blue Cypress, 693 stems remained in place the following day after being subjected to strong winds and wave action. Counts after both one and five month intervals showed the population had grown to 1100 stems. By the ninth month there was a four-fold expansion of the original colony. The next monitoring (4 months later) produced the lowest recorded stem count of the study (624). This low number was the result of abnormally high water inundating many plants. Further monitoring showed the population rebounding to 2126 stems by the end of the study (Fig. 1).

During three years of planting at Lake Okeeheelee different results were attained for different reasons. The 1982 transplants have shown constant expansion to greater than four times their original stem numbers (Fig. 2). For 1983, the end result has been a five-fold increase in stems. However, during the two years of monitoring, fluctuating stem counts have occurred (Fig. 3). Transplants for 1984 showed good expansion until they were cut by a county mowing crew during March 1985. Even after the cutting back they have shown increases in stem numbers (Fig. 4).

Discussion

Bulrush introduction into both lakes proved to be very successful with both substrates being equally conducive to growth and expansion. Cox (1986) and Denson and Langford (1982) experienced problems when transplanted vegetation was subjected to frost damage. The only adverse conditions affecting our transplants were extreme high water (October 1981, Blue Cypress) and a county mowing crew (April 1985, Okeeheelee) (Figures 1 and 4).

Our selection of species to transplant possibly enhanced our success. Reports by Cox (1986) and Denson and Langford (1982) showed, where multiple species were transplanted, bulrush was the most successful. This species of plant provides another benefit to fish manage-

ment. Fisheries biologists on Lake Okeechobee found bulrush to be the most preferred vegetation type of largemouth bass (D.D. Fox, Florida Game and Fresh Water Fish Commission, Okeechobee, personal communication). One limiting factor in the success of establishment and expansion of transplants is possibly the amount of vegetation already established in the zone of planting. Morello (1982) noted that within six months transplants had become established in a newly created lake. Similarly, Cox (1986) found that when species like torpedograss were not completely removed they would re-establish with eventual dominance over the tranplants.

The benefits of favorable native shoreline vegetation are many. In the field of fisheries management such areas are important for production of fish and their food items (Denson and Langford 1982; Morello 1982). To the general public, shoreline vegetation concentrates and provides nesting habitat for waterfowl, shorebirds and songbirds. In addition, plants stabilize the shoreline by reducing wave erosion (Mosher, 1984). This study has shown great promise when transplants are needed for a body of water.

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FIGURE I. Stem Counts for bulrush introduced into Lake Blue Cypress, FL. Sept. 1980.

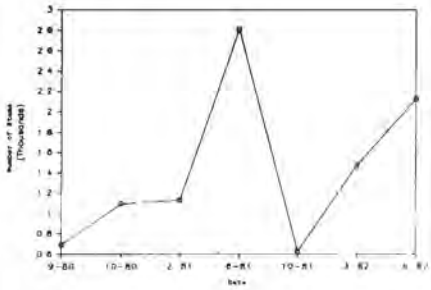


FIGURE II. Stem Counts for bulrush introduced into Lake Okeeheelee, FL. Sept. 1982.

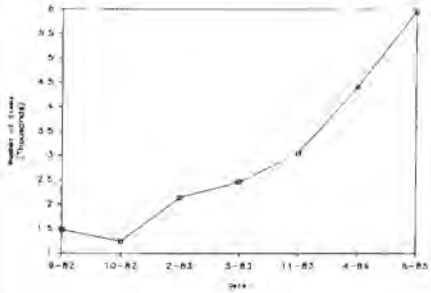


FIGURE III. Stem Counts for bulrush introduced into Lake Okeeheelee, FL. Sept. 1983.

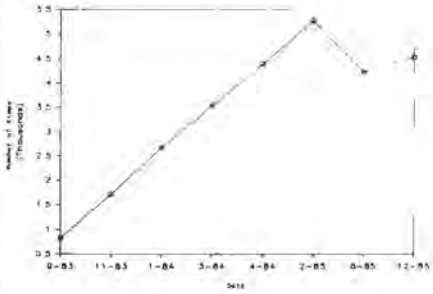
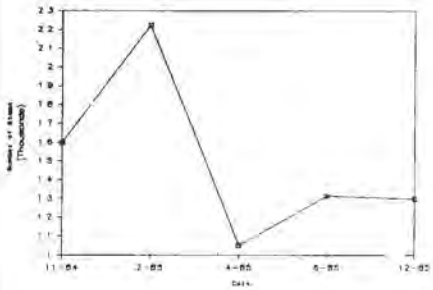


FIGURE IV. Stem Counts for bulrush introduced into Lake Okeeheelee, FL. Nov. 1984.



YOU KNOW ITS GOING TO BE A BAD DAY WHEN:

By
Citrus County Environmental Division

- You read the entire product label after application of the product.
- The camera crew on your boat is with the "Today Show".
- When you fall overboard and the boat is still on the trailer.
- You start up your airboat and the prop is on backwards.
- The new safety inspector says, "My, My, My!!"
- When you sink your airboat in a sewage treatment pond.
- When your hand gun trigger lock won't unlock.
- When Bill Haller say's, "No problem!"
- When you have to treat a sensitive area and the assigned crew calls in sick.

They do not bioaccumulate in the food chain, nor do they bind or leave residues in the hydrosoil. And Pennwalt's aquatic herbicides provide an ample safety margin to fish, shellfish, birds, and other wildlife.

For a complete aquatic weed and algae control program, Pennwalt offers four choices:

Aquathol® K Aquatic Herbicide
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Hydrothol® 191 Aquatic Algicide and Herbicide
Hydrothol® 191 Granular Aquatic Algicide and Herbicide

PESTICIDE SAFETY: A Continuing Concern

by
Dr. William J. Becker
Extension Safety Specialist
University of Florida - IFAS
Gainesville, Florida

Pesticide Safety has been a concern of man for decades — long before any of us in this society developed concerns or became concerned about the concerns of others.

Black Leaf 40, a time-honored natural insecticide still used in horticulture, Paris green, and other copper and arsenic compounds were part and parcel of our pesticide arsenal for decades before you and I were born. People were concerned about the safety of these pesticides long before Rachel Carson, long before EPA or OSHA, long before Right-to-Know Laws, long before Field Sanitation Standards. Way back then, people were concerned about pesticide safety. I know — I, myself, used those products back then — long before Rachel Carson and *Silent Spring*. We were concerned then, just as we are now.

The modern issues regarding pesticide safety began in 1962 with the publication of *Silent Spring* and the dialogue and debates it initiated. Concerns grew in the areas of worker protection, consumer protection and environmental protection. The contamination of the environment, air, water and soil, and the contamination of the food chain, were major concerns.

Dialogue and debate over these and other issues were instrumental in the creation of the Environmental Protection Agency (EPA), while the Occupational Safety and Health Act (OSHA) and the Federal Environmental Pesticide Control Act of 1972 substantially strengthened the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). These and other associated laws, rules and regulations, generated at the federal and state levels, have drastically changed how things are done in the pesticide industry.

Considerable discussion could be held on the concerns of the past, but our time will be better spent considering the issues of today — 1986 — and those we will need to consider in the decade ahead.

Concern #1 — A continuing public concern that pesticides are bad, that they contaminate our environment, poison our water and food supplies. The problem is that these things can and do happen. Contaminated watermelons in California and contaminated ground water discovered in several states are recent examples of

this problem.

Concern #2 — The loss of pesticides for uses for which they are now approved; along with the high cost of pesticide development, testing, approval and marketing.

How do we begin to tackle these concerns? First we must put our house in order. And our house is not in order. With respect to the safe and proper use of pesticides, too many of our competitors are cheating, they are breaking the law because they are not following the directions on the pesticide label.

How many of you have observed the following, or suspected that your competitors have:

- Stored pesticides in violation of the label?
- Applied pesticides in violation of the label?
- Inadequately protected their employees from the hazards of pesticides?
- Transported pesticides in violation of the label?
- Disposed of excess pesticides and empty pesticide containers in violation of the label?

What other violations have you observed or suspected? Every time someone in your profession, in any service or production activity, stores, mixes, loads, applies, transports or disposes of pesticides in violation of the label, we are fueling public concern that pesticides are bad, that we cannot be trusted with them and that, therefore, additional regulations are required to further restrict or ban their use. We are our own worst enemy.

There are enough opportunities for pesticide problems and accidents without our help. We will continue to find that the use of certain pesticides will need to be altered and even banned. Research cannot anticipate nor predict all the possible ramifications of a new product. DDT & EDB were once considered "safe" by all our best scientists — experience and time have proved them wrong.

But what are some specifics you, I, and other professionals in our type of business can follow to prevent further restrictions on the use of pesticides?

- Use the right pesticide. Know your pest problem and know if a pesticide is needed. Far too many pesticides are used because a problem "may" develop. We fix far too many water bodies which don't need fixing. When a pesticide is the best or only solution to a problem, consider the pesticides and formulations available. Don't consider just cost and convenience — give equal or greater consideration to safety.
- Store your pesticides safely. Keep them under lock and key. Only 1, 2, or 3 trusted employees should have access to this area. Ideally, the space would be as fire-proof, flood-proof, tornado-proof as possible. Only pesticides would be stored in this area. Only reasonable quantities would be on hand, obsolete or banned pesticides would be in storage, and an inventory would be maintained. A copy of this inventory would be filed with the fire department, who would understand the potential hazard should a fire occur.
- Your personnel are trained, retrained, certified, licensed, and "tatooed and branded" as qualified pestcide mixers, loaders and applicators. And the fact that they are is evident in the quality and care they exhibit in their daily activity. Pesticide safety is an everyday activity. It cannot be relegated to a 4:00-4:30 in the afternoon, end-of-the-day activity, once a year.
- Transportation. How do you transport your pesticides from your business site to the various job sites? On the tailgate of a pick-up truck? Have you ever lost a pesticide container en route? Is your crew equipped to handle an accidental spill? Would they know what to do? Would they have the supplies to handle the spill? And how

about storage at the job site? Are hazardous pesticides left on a pick-up truck, out on the street, unprotected and unguarded, readily available to any inquisitive eight-year old boy?

- Disposal. The disposal of excess pesticide solutions, rinse material, old, obsolete or banned pesticides and the proper disposal of empty pesticide containers are among our most difficult problems. In some areas, legal disposal of these materials is nearly impossible. They cannot be burned, they cannot be buried, they cannot be returned to the manufacturer. It has been the improper disposal of chemicals — including pesticides — which has stirred the concerns of the American citizenry. The hazardous waste sites, the contaminated water supplies, the fear of cancer and other diseases are serious concerns. This association, along with other associations of production and service businesses and industries must join together and lobby for, fight for, insist upon rational and reasonable solutions for the disposal of pesticide materials. Paying a dollar or two per pound for the transportation of pesticide waste materials to a federally approved disposal facility hundreds of miles away is **not** a rational and reasonable solution.

Once we have our house in order — and all the houses in order — and even when all users of pesticides are responsible in their proper and safe use and handling, our task will still not be completed.

Just as we have convinced our population that we cannot run our automobiles without gasoline, our homes without electricity, our daily lives without plastic, we must convince them that we cannot provide them with quality and quantity of food and fiber — and the recreational, agricultural, and biological quality of our water bodies — without pesticides.

I sometimes wish the term "pesticide" had never been coined. Something like quanticides (quantity) and qualicides (quality) would have been much more positive terms. Everyone wants quality products, be they apples, radishes or water resources. And everyone wants these products in sufficient quantity, to keep the price down. How could anyone quarrel with "qualicides" and "quanticides", which would give us quality products in sufficient quantity?

And that's the story every component of the agriculture community must sell. We must sell the hard and true fact that the safe and proper use of chemicals, including pesticides, is the only way that the quantity and quality of food and fiber can be provided in order for us to maintain our American lifestyle and to feed a hungry world.

You and your organization — all agricultural organizations must tell this story every day. But we can only tell that story effectively when we have our own house in order. We must first make certain our industry is, indeed, using pesticides in a safe and proper manner.

Information on Recreational Activities

By
Joe Hinkle
Suwannee River Regional Biologist
Florida Department of Natural Resources

The following information on different types of recreational usage occurring in the State of Florida and nationwide, was compiled from "1980 National Survey of Fishing, Hunting and Wildlife Associated Recreation." Unfortunately, it does not contain information on other aquatic use activities such as tubing, skiing, scuba diving, sailing, etc.

Activity	Nationwide Days of Activity per yr. x 1000	%	Florida Days of Activity per yr. x 1000	%
Residential photography & observing wildlife	5,000,000	75.99	No specific info.	
Non-consumptive wildlife trips to observe, photograph, & feed wildlife	377,400	5.74	No specific info.	
Fresh water fishing	710,600	10.80	33,233	45.42
Salt water fishing	147,000	2.23	27,938	38.18
Small game hunting	151,200	2.30	4,331	5.92
Big game hunting	112,800	1.71	5,716	7.81
Waterfowl hunting	42,900	0.65	1,421	1.94
Other hunting	38,400	0.58	534	0.73
TOTAL	6,580,300	100.00	73,137	100.00

Economic Value of Fresh Water Fishing and Waterfowl Hunting in Florida

	Waterfowl Hunting	Fresh Water Fishing
National expenditure/day of activity	$15.00	$11.00
National expenditure/person/year	$120.00	$214.00
Number of Florida participants per year	181,000	1,352,000
Days of participation/year	1,421,000	33,233,000
Expenditures, total per/yr. based on total participants	$21,315,000	$289,328,000
Expenditures, total per/yr. based on days of participation	$21,720,000	$365,563,000

Letters To The Editor

Dear Editor:

I was disappointed to hear several speakers at the FAPMS meeting belittle the recent article linking 2,4-D with non-Hodgkin's lymphoma (NHL). The article was published in the *Journal of the American Medical Association* and authored by scientists of the National Cancer Institute. This is not a "*National Enquirer*-like" sensationalist newspaper, but a highly prestigious and creditable journal. The study was designed to repeat an earlier Swedish study which found workers exposed to phenoxy herbicides had increased risk of several cancers. That study had several flaws, the Kansas study was designed to address those flaws.

The authors reviewed the backgrounds of several hundred Kansas men diagnosed with three types of cancer over a three year period. The survey found that a significant portion of these cancers were among farmworkers especially those who had extensive exposure to 2,4-D. The study found a sixfold increase in NHL among farmers exposed to herbicides more than 20 days per year. Users who mixed or applied the herbicide had a further increase. Other factors which increased risk were the lack of use of safety equipment and the use of backpack sprayers or handguns.

Critics of this and similar studies are correct that it can never produce a direct link between the toxin and a cancer, but this is the only way to assess effects on humans. Only laboratory studies can establish direct links, and these cannot be performed on humans. Epidemiological studies can only show statistical relationships and, as such, are subject to bad data, invalid assumptions and statistical error.

It is up to specialists at EPA to assess the validity of this study. It is doubtful that this study alone will justify the cancellation of the product, but it should serve as a warning to all who use this compound to use proper safety precautions and minimize contact. To minimize or discount this warning without good cause is to do a tremendous disservice to the applicators. Remember that these people trust us; the scientists and regulators, to be impartial and protect their health and safety.

Sincerely, Larry E. Nall

AQUAVINE

STATE PLAN

The DNR has a draft for a *State Control Plan* that is to be used as a guideline for individuals and agencies in developing aquatic plant management operations. The plan will ensure a state-wide strategy of effective managment methods and is meant to be used as a planning tool for uniform and efficient administration of the Department's programs. The plan will define statutes, rules, program administration philosophies, and long term goals.

DNR TURNOVER

DNR Regional Biologist Stephanie McCarty, Mike Bodle, and Marty Allsup have all moved on to bigger and better (they hope) things. Stephanie now works for Orange County Environmental and will have management responsibility for the Butler chain of lakes in Orlando. Mike Bodle is now the Aquatic Environmental Program Director for the Lake Worth Drainage District in Palm Beach County. Lake Worth Drainage District is responsible for over 500 miles of canals and employs 14 people in their herbicide program. Marty Allsup has gone into private enterprise as an applicator out of Plantation, FL.

SWFWMD

In case you haven't heard, Len Bartos was replaced by Ken Kramer as the Resource Operations Manager for Southwest Florida Water Management District. Ken has been with the District for 14 Years where he served as Land Manager for the District before accepting his current responsibility. SWFWMD is responsible for over 140,000 acres of lakes, rivers, and other surface waters and employs four crews out of Brooksville and one part-time crew out of Bartow.

CAST

The Council for Agricultural Science and Technology (CAST) was established in 1972 to supply the scientific background needed for the government, media and general public to better understand food and agriculture issues. CAST is an educational, not a lobbying, organization. It makes no recommendations, but attempts to place the science of food and agriculture in proper perspective so that all may benefit despite different personal points of view. If you would like to become a member of CAST and receive CAST publications you can join for $20.00 by contacting:

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Phone (515) 292-2125

Call Bill Haller at 904/392-9613 for more information.

AQUATIC PLANTS OK

Professional and lay taxonomist alike will find *Aquatic Plants of Oklahoma* a useful reference. The book provides keys for plant identification and distribution maps for the aquatic plants found in Oklahoma. A variety of photos of the most common plants are included in the book.

The plant I.D. sells for $5.00 per copy and proceeds go to Oral Roberts University Biological Honor Society.

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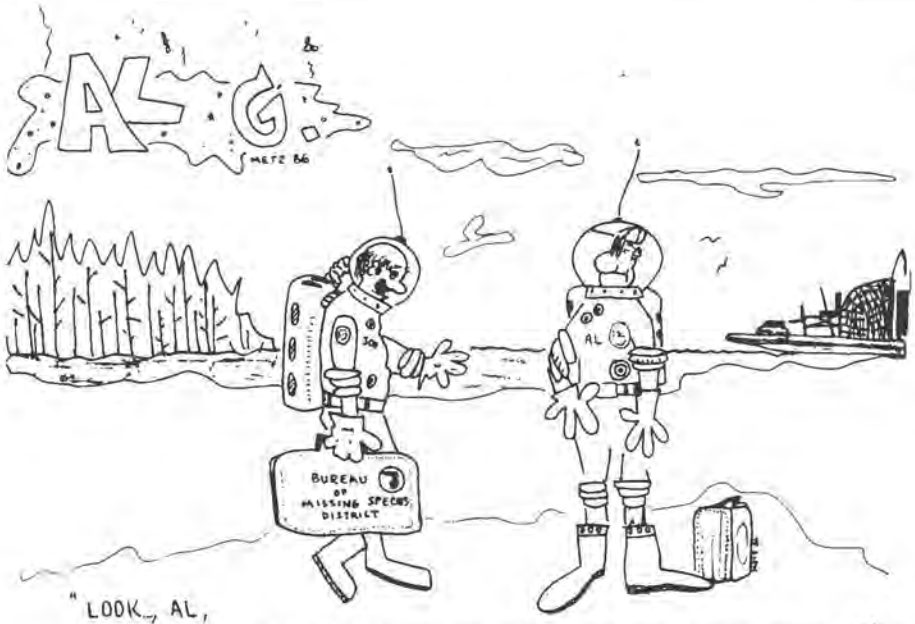

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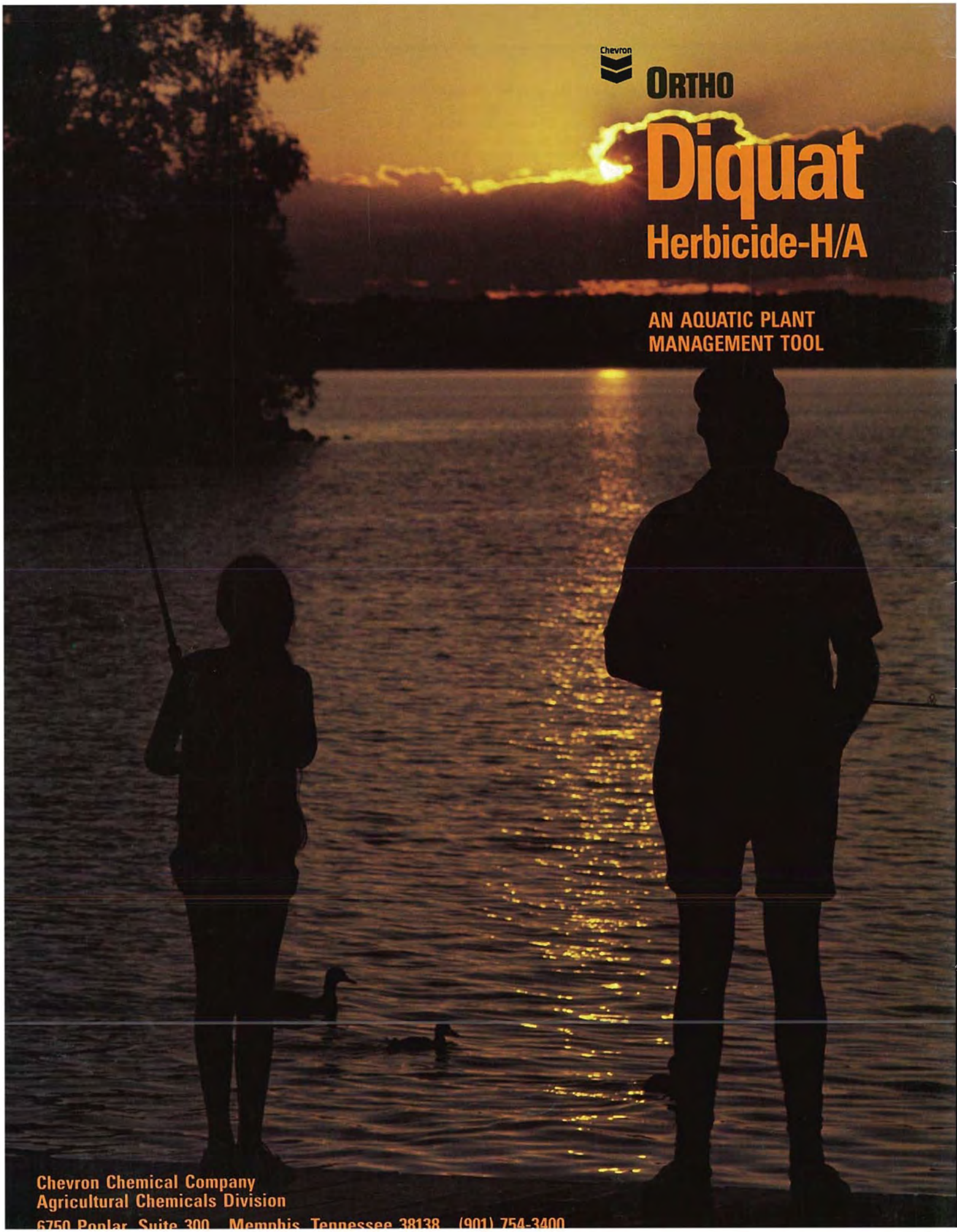

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