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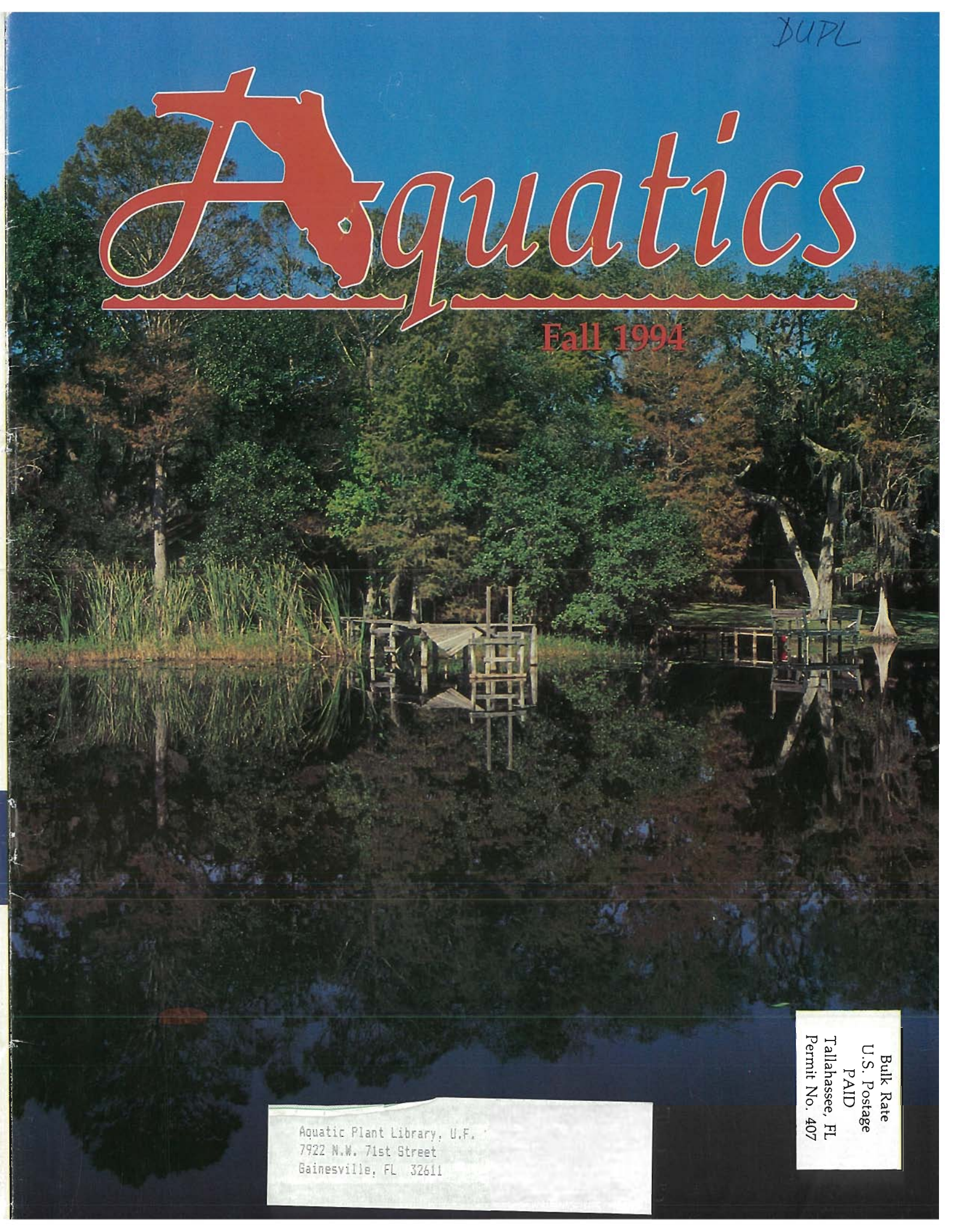

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Letter to the Editor

Dear Dr. Langeland

Alison Fox's article, "Giant Cutgrass - An Unfriendly Native" (*AQUATICS*, Winter 1993), painted *Zizaniopsis miliacea* as a "hostile" plant. Although this interesting grass may become a weed in nutrient enriched or disturbed aquatic habitats, it's leaves are an important food source for insects such as grasshoppers and caterpillars that are in turn eaten by birds and other animals. The larvae of several skipper butterflies feed on the leaves of Giant Cutgrass. In particular, the Wild Rice Skipper (*Panes viator zizaniae*) is a locally distributed butterfly that is closely associated with *Zizaniopsis miliacea* in Florida. Adults of the Wild Rice Skipper flutter slowly through stands of Giant Cutgrass, or may be found visiting nearby Pickerelweed and other flowers for nectar. The larvae of the Wild Rice Skipper usually hide during the daytime in shelters made by folding over a portion of leaf and tying it with silk or in the leaf axils. Giant Cutgrass is a nasty plant for people to work around, but it represents food and cover for other organisms!

Sincerely,

Marc C. Minno, Ph.D.
Department of Zoology
University of Florida
Gainesville, FL

Fall on the Tsala Apopka. Photo by Jim Kelley

Aquatics

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Progress on Eradicating Catclaw Mimosa in Florida

by
David L. Sutton[1], Kenneth A. Langeland[2] and Robert L. Kipker[3]

Introduction

In a previous article (Sutton et al., 1993), we presented information on catclaw mimosa (*Mimosa pigra* L.), an exotic legume with potential to invade and replace native plants in wetland areas of Central and South Florida. Weed problems caused by catclaw mimosa in other countries, such as Thailand and Australia with habitats similar to that of Florida, prompted the Florida Department of Environmental Protection (DEP) to begin a control program in 1985. Since then, the control program has been intensified to attempt eradication of catclaw mimosa. In this article we update progress on the feasibility of eradicating catclaw mimosa in Florida.

Although catclaw mimosa infests less than 1,000 acres in Florida (Table 1), it nonetheless poses a serious threat to wetland ecosystems. The ability of catclaw mimosa to form adventitious roots and corky tissue along stems of flooded plants may allow this exotic plant to colonize wetland areas at the

Table 1. Sites in Florida known to be infested with catclaw mimosa.

Location	Site	Acres
1. Loxahatchee	Cattle Ranch	221
	Pepper Farm	315
	DEP	287
2. Sebring	Little Lake Bonnett	74
	Lake Letta	39
3. St. Lucie River	Bessey Creek	19
	Lagoon	16
4. Hobe Sound	Dickerson	4
5. Hollywood	Eco Grande Golf Course	<1
	Total infested acres	976

[1] Professor, University of Florida - IFAS, Fort Lauderdale, FL
[2] Associate Professor, University of Florida - IFAS, Gainesville, FL
[3] Biological Administrator II, Bureau of Aquatic Plant Management, Florida Department of Environmental Protection, Tallahassee, FL

Figure 1. Catclaw mimosa plants in 1992 at the Eco Grande golf Course in Hollywood, Florida. Note very large, healthy plants covered with flowers and seeds. These plants were growing under inrrigation and fertilization, and competing vegetation held in check.

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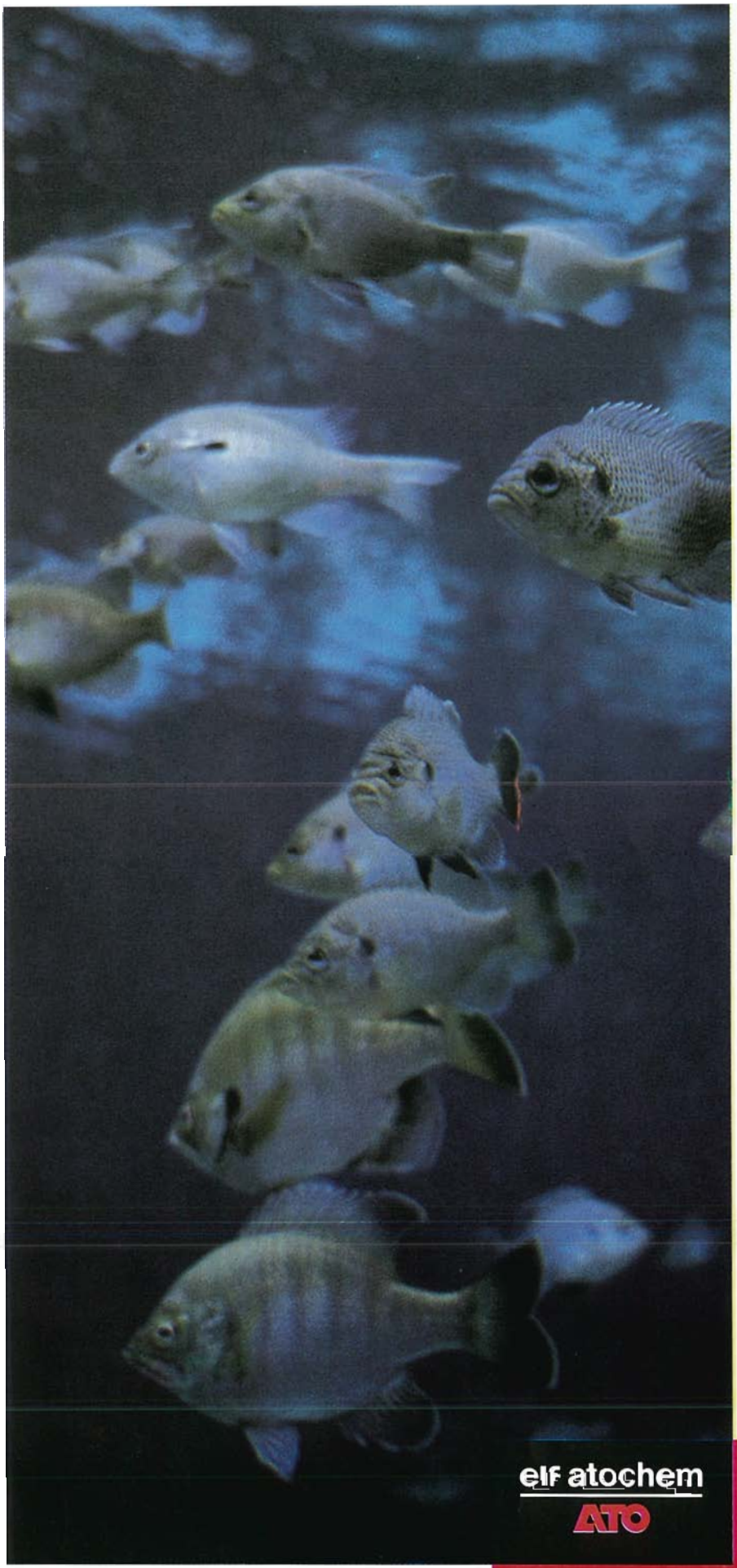

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expense of native aquatic plants as experienced in other countries.

Determination of Florida Species

The latest taxonomic study of the genus *Mimosa* (Barneby 1991) indicates that the catclaw mimosa infesting Florida is properly known as *Mimosa pellita* Humboldt & Bonpland ex Willdenow var. *pellita* rather than *Mimosa pigra* L. var. *pigra* L. The epithet *pigra* has apparently been misapplied for some years in many parts of the world. DEP botanist Kathy Burks has developed a key based upon Barneby's work to distinguish the invasive exotic occurring in Florida from other similar species in the Mimosa genus.

Known Location of Catclaw Mimosa in Florida

In Florida, five locations representing Broward, Palm Beach, Martin, St. Lucie, and Highlands Counties are infested with catclaw mimosa (Table 1). These five locations comprise nine sites for a total of 976 acres infested with catclaw mimosa. Catclaw mimosa was first identified in 1953 from plants collected in Okeechobee and Palm Beach Counties, but no plants are known to be growing in Okeechobee County at this time.

1. Loxahatchee

The Loxahatchee location, located near Jupiter, contains three sites infested with catclaw mimosa: (1) Cattle Ranch, (2) Pepper Farm, and (3) land owned by DEP. This location is the largest area in Florida infested with catclaw mimosa. Catclaw mimosa in this area is found primarily along the Turnpike and Indiantown Road with the Loxahatchee River in contact with the infested area at two locations. Catclaw mimosa may have originated from old nursery operations in the area.

Catclaw mimosa in the Loxahatchee location is difficult to control due to heavy vegetation limiting access to infested areas. This location is swampy and subject to frequent flooding, and limitations for herbicide control are imposed by land use constraints. Areas with easy access are under control but additional surveying is needed to monitor germination. Large seed bearing plants continue to be found inside the Cattle Ranch and access to this area is limited. Only a few catclaw mimosa plants have been found on the Loxahatchee River and surveys along the river show no spread of the infestation. Rodeo®, Garlon® 4, and Garlon® 3A are used at this location.

2. Sebring

Areas infested with catclaw mimosa in Sebring are located along the shoreline of Lake Letta and Little Lake Bonnet. Like the Loxahatchee location, catclaw mimosa may have originated from old nursery operations in the area.

All mature catclaw mimosa plants are under control in four infested areas around Lake Letta. Catclaw mimosa seeds continue to germinate on Lake Letta and are controlled with Rodeo® at 1.5% on three of the four areas. Spike® 40P has been applied to suppress seedling growth in one of these areas. On February 18, 1994, a new area was found. Heavy growth of other vegetation has made it difficult to survey this fifth area, but control measures have been initiated.

Little Lake Bonnet is infested with catclaw mimosa around its entire margin. To promote germination of catclaw mimosa seeds, vegetation removal is the main focus of work at this site. Areas on Little Lake Bonnet that have had competing vegetation removed to expose the soil to the sun has shown massive seed germination. Either Spike® 40P or Rodeo® is used to kill the seedlings. These two herbicides are also used to remove vegetation to promote germination of catclaw mimosa seeds to help bring this site under control.

3. St. Lucie River

The St. Lucie River location, along the C23 canal, includes Bessey Creek, the St. Lucie River, Lagoon area, and Cutter Sound near Stuart, Florida. It is possible that construction of I-95 through the Loxahatchee site may have been the cause of this infestation. Construction eventually crossed the C-23 canal. The St. Lucie River location is under maintenance control, but needs further surveying to determine extent of catclaw mimosa infestation. New catclaw mimosa plants are found occasionally and more surveying needs to be done. The Lagoon site continues to be a source of seed germination. Construction at this site appears to have increased germination of buried catclaw mimosa seeds. Continued development at the lagoon site should help eliminate the problem there as long as no catclaw mimosa seeds leave the site.

Competing vegetation has been removed at the Cutter Sound site and has resulted in germination of many catclaw mimosa seeds. Seedlings are periodically sprayed with Rodeo® at 1.5%. The other sites at this location regularly show some germination, but on a much smaller scale. Large areas infested with catclaw mimosa seeds are occasionally browned out with Rodeo® in an attempt to increase seed germination.

4. Hobe Sound

The Dickerson site is located near Hobe Sound. Catclaw mimosa was accidentally introduced to this site through construction activities along the Florida Turnpike adjacent to the Loxahatchee infestation. A few catclaw mimosa plants have been found yearly on this site and have been removed. This site is periodically mowed and was burned once. Plans are to plow the site, allow time for seed germination, remove all seedlings, and then remove the top 12 to 18 inches of infested soil and dispose of it underwater or buried in a landfill. Burying the soil underwater will destroy all remaining catclaw mimosa seeds.

5. Hollywood

Catclaw mimosa plants were possibly planted for use as an ornamental at the Eco Grande Golf Course in Hollywood, Florida. When catclaw mimosa plants were discovered at this site, they were very large, robust plants covered

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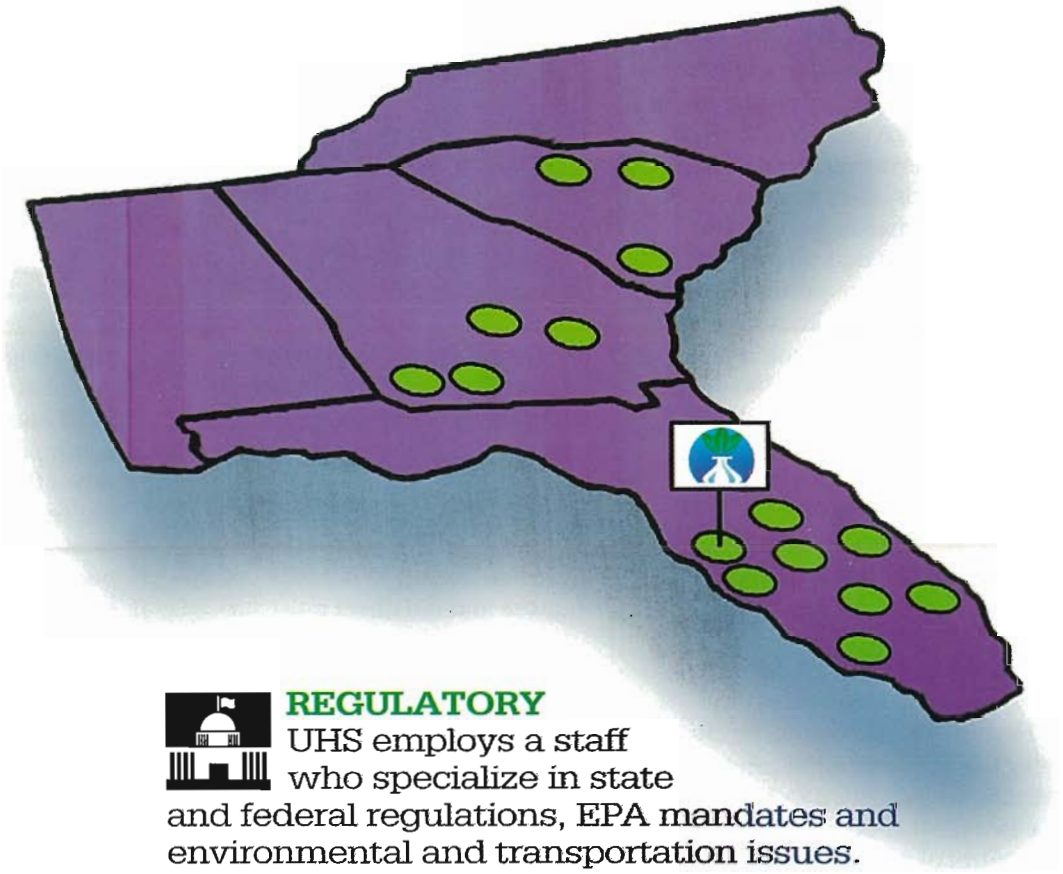

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with flowers and seeds (Figure 1). The plants were under irrigation and fertilization, and competing vegetation held in check. Seed litter was about 1 inch thick. Catclaw mimosa plants at this site were cut by hand and stump treated with Pathfinder® (ready-to-use triclopyr-ester) in July 1992 (Figure 2). Untreated stumps quickly regrew (Figure 3). In July 1993, one plant that had been allowed to grow from seed produced seed after 12 months of growth. Since then, less than 20 seeds have germinated out of the perhaps hundreds of thousands produced by mature plants. The number of years that catclaw mimosa plants have produced seeds at this location is not known. A seed eating weevil was present in large numbers at the time the plants were removed, and may have helped destroy the seed crop. Seedlings have been found on this site as recently as February of 1994. This site is being closely monitored for germination of catclaw mimosa seeds.

Control of Catclaw Mimosa with Herbicides

Herbicides tested or currently being used for control of catclaw mimosa are presented in Table 2. The two most effective herbicides for control of catclaw mimosa are Spike® 40P and Transline® (clopyralid).

Soil applications of Spike are being used to help suppress growth of seedlings; however, this herbicide cannot be used in flooded areas or where desirable plants may be impacted. Most catclaw mimosa seedlings have been found to germinate primarily under the parent plant. Soil treatments with Spike® 40P in the seed fall area appears particularly effective and probably will kill most of the dropped seeds. Land use in several sites prevents use of Spike® 40P because this herbicide is soil active and kills a broad spectrum of plants.

Foliar applications of Transline® have been found to provide excellent control of catclaw mimosa and have little impact on nontarget plants. Transline® is not registered for use in Florida. In many sites, catclaw mimosa grows entwined with other plants making it difficult to spray without impacting nontarget plants. If a 24C permit is obtained, the specific nature of Transline® will allow for use of this herbicide in sites to kill only catclaw mimosa and not affect most surrounding plants.

Figure 2. Stump treatment of catclaw mimosa with Garlon® 4 in July 1992 at the Eco Grande Golf Course.

Foliar applications of Rodeo® at label rates will generally result in complete kill of catclaw mimosa when the herbicide is applied to the entire plant. However, repeat treatments with Rodeo® are usually necessary because of the sprawling growth habit of the catclaw mimosa

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that makes it difficult to obtain complete coverage. Rodeo® is useful for most sites because it is labeled for use in flooded situations.

Foliar applications of Garlon® 3A, and Banval® 720 generally require repeat applications to ensure complete kill of catclaw mimosa plants. Small plants are more easily killed than large plants. Garlon® 4 is effective in cut-stump treatments and as a basal spray.

Foliar applications of Arsenal® and soil applications of Escort® (metsulfuron) do not control catclaw mimosa.

Eradication of Catclaw Mimosa

The Florida DEP, University of Florida/IFAS, and USDA/APHIS/PPQP are developing a plan for eradicating catclaw mimosa. Present control efforts are concentrating on killing all mature plants to prevent seed formation and removing competing vegetation in sites to allow for germination of catclaw mimosa seeds.

Seed production has been minimal since the fall of 1993 because of the elimination of most mature plants at all of the sites. However, because of the large number of seeds that have been produced over the years, the eradication program will need to concentrate for a long period of time on surveying sites for seedling development.

A two-person team surveying and spraying infested sites is being evaluated to determine if this team approach will be adequate to effectively eradicate catclaw mimosa. It is estimated that the team will be needed for approximately 10 years to completely deplete the seed bank. The eradication effort being studied consists of evaluating the amount of time the two-person team must spend to: (l) survey all infested sites and any locations that may be potential sites, (2) remove all flowers and seeds from mature plants, and (3) apply herbicides to all existing plants, and where applicable, hand pull seedlings and young plants.

Initial results from the two-person team approach indicates that eradication of catclaw mimosa in Florida is an attainable goal. Successful completion of the eradication program will eliminate the threat of catclaw mimosa problems in the wetlands of Florida.

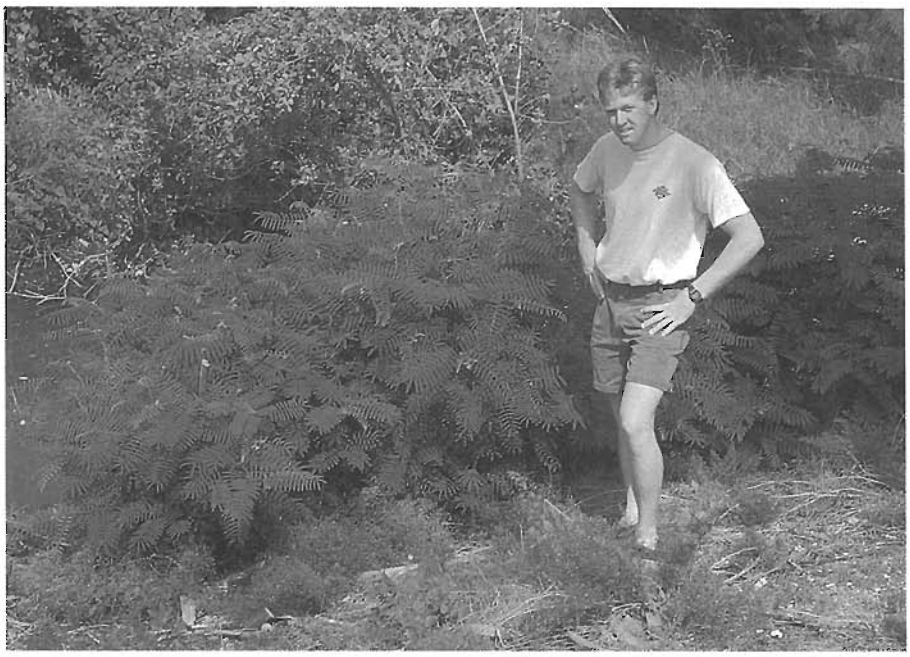

Figure 3. Regrowth of untreated catclaw mimosa stumps at the Eco Grande Golf course. Picture taken two months after stumps were cut.

Acknowledgments

Contribution of the University of Florida's, IFAS, Fort Lauderdale Research and Education Center.

Table 2. Herbicides tested or used for control of catclaw mimosa.

A. Most effective
   1. Foliar - Transline® (0.75%)
   2. Soil - Spike® 40P
   3. Basal and cut stump - Panthfinder® or Garlon® 4 (30 to 50%) + oil

B. Effective with repeated applications
   1. Foliar - Rodeo® (1.5%) + Kinetic®
   2. Foliar - Rodeo® (1.0%) + X-77®
   3. Foliar - Garlon® 3A (2.0 to 3.0% + Kinetic®
   4. Foliar - Banval® 720 + X-77®

C. Not effective
   1. Foliar - Arsenal®
   2. Soil - Escort®

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Barneby, R. C. 1991. Sensitivae Censitae (Mimosa): a description of the genus Mimosa Linnaeus (Mimosaceae) in the New World. Memoirs New York Bot. Garden 65:426-449.

Reporting Catclaw Mimosa Plants

Any person who suspects catclaw mimosa may be growing in Florida needs to contact: DEP Regional Biologist for south Florida, (407/793-5666); University of Florida, IFAS, Center for Aquatic Plants (904/392-9613); Fort Lauderdale REC (305/475-8990); or DEP, Tallahassee (904/488-5631) so the plants can be identified and destroyed if found to be catclaw mimosa.

Synopsis of the 1994 Grass Carp Symposium

Catherine Robbins
U.S. Army Corps of Engineers
North Florida Operations Office

INTRODUCTION

The use of grass carp has been a topic of discussion for many years between scientists, agencies, and members of the public. The first grass carp symposium, held in 1978, focused mainly on the reproduction of grass carp and the production of sterile carp. Since then much has been learned, so a second grass carp symposium was held at the University of Florida in Gainesville, from March 7-9 1994. Representatives from several agencies and private companies from across the country attended. The focus of this meeting was to evaluate environmental impacts and management considerations when using grass carp for aquatic plant control in large lakes and reservoirs. Presentations included, state grass carp policies, grass carp removal techniques, grass carp migration patterns, case histories using grass carp in large water bodies, innovative uses of acoustic fish barriers, and sportfish population response to changing aquatic plant abundance. The following is a brief summary of the symposium.

STATE REPORTS

Louisiana: Diploid grass carp reproduction has been documented since 1975. Since 1989, new hydrilla infestations have been discovered in several key reservoirs which are managed for multiple uses. Grass carp have been considered for one of the reservoirs at 8 fish per vegetated acre. In 1992, the use of grass carp in private waters was allowed. The main concern with the use of grass carp was that the loss of native plants would adversely affect the waterfowl, fur, and aquaculture industries.

North Carolina: Triploid grass carp can be placed, without a permit, in landlocked or fenced lakes up to 10 acres in size or when stocking under 150 fish. Other grass carp introductions are handled by a permit system.

South Carolina: Triploid carp have been allowed since 1985. Permits are issued to distributors and growers who then document the buyers and release locations. A large number of grass carp are being released in major impoundments. Management polices are set by an Aquatic Plant Management Council which is comprised of ten state agencies. Five percent (5%) or 120 fish from each shipment entering the state are checked for ploidy.

Texas: The Texas Parks and Wildlife Department approved the use of triploids, beginning in January 1992. As a result of the unlawful use of diploids, reproducing populations have been established in the Trinity River and the bayous around Galveston Bay. The usual maximum stocking rate is 7 fish per vegetated acre at five year intervals. Any proposed stocking above the maximum rate or at more frequent intervals are reviewed on a case by case basis. Since 1992, 48,000 fish have been permitted.

Washington: The first stocking of triploid carp occurred in 1987. The use of triploids was legalized in December 1990 for use in small lakes without connections to other water bodies. Studies are being conducted for use on larger water bodies. Most grass carp lakes are located in lowland urban areas or in the high desert region of Washington state.

Virginia: In 1979, the importation of grass carp into Virginia was made illegal. Before 1979, undocumented numbers of diploids were brought into the state on an agency recommendation. In 1984, official triploid stocking began at rates of 16 fish per surface acre. This rate was further revised to 8 fish per vegetated acre to control target vegetation and a rate of 16 fish per vegetated acre for total vegetation control. The largest stocking to date has been 700 fish. Each grass carp shipment is required to carry 10 extra fish which are used for ploidy tests. Less than 2% of people using grass carp apply for a permit. Education of the public about the use of grass carp is a major concern in Virginia.

CASE HISTORIES

Lake Conroe, TX: Eight years after impoundment, 95% of submerged vegetation in Lake Conroe was hydrilla which covered 8,000 acres. In 1981, a total of 167,000 grass carp at 46 fish per vegetated hectare were released. An additional stocking of 100,000 grass carp was made in 1982. This raised the rate to 80 fish per vegetated hectare. Since 1986, no hydrilla has been seen. Red eared sunfish decreased from 140 kg per hectare to 30 kg per hectare after stocking. Increases occurred in the

amount of phytoplankton and threadfin populations. The largemouth bass population decreased but individual specimens increased in weight. White and yellow bass populations increased after the hydrilla was reduced.

Lake Marion, SC: Hydrilla was found in 1982 on Lake Marion, SC and rapidly spread even with bi-annual herbicide treatments. Herbicide treatment costs had escalated, so the decision to use grass carp was made. Grass carp were stocked at 25 fish per vegetated acre and were to be stocked over three years. Hurricane Hugo, however, wiped out the 1989 fish so an additional 100,000 fish were stocked in 1992. Lower Lake Marion now has hydrilla.

Guntersville Reservoir, AL: Guntersville Reservoir covers 68,000 surface acres. Hydrilla was found in the reservoir in 1982, and by 1988, covered 2,900 acres. In 1990, 100,000 triploids were released. Previous stockings by private interests put approximately 20,000 mainly diploid grass carp into the system. Grass carp are not able to reproduce in Lake Guntersville because the required river flows occur before the water temperature rises to adequate levels for egg development. Since addition of the grass carp, the only species to show an increase in population has been the red ear sunfish. The grass carp in Guntersville preferred the native plant species over eurasian watermilfoil.

Lake Conway, FL: Lake Conway is a 700 hectare lake in Orlando. In 1976, the State and the Corps of Engineers agreed to stock the lake with grass carp. Prior to stocking the main plants were Illinois pondweed, nitella, eelgrass, and hydrilla. Female diploid grass carp were stocked in September 1977 at a rate of 17 fish per vegetated acre. A study to monitor the results of the stocking was initiated. Sixty random sample sites were made for biomass figures and 15 permanent SCUBA plots were established to monitor changes in the vegetation types. Hydrilla decreased significantly, eelgrass increased dramatically, and nitella maintained population levels. In 1986, 2.4 triploid grass carp per hectare were stocked. An additional stocking in 1988, added 1.4 triploid grass carp per hectare. Hydrilla abundance has remained low since 1986. Lyngbya is becoming more abundant and is not eaten by the grass carp.

Lake Yale, FL: Lake Yale is a 160 hectare lake, and was treated with Sonar®, in 1984. Between 1987-93, a total of 21,145 triploid grass carp were released in the lake to control hydrilla regrowth. Biomass sampling in 1989, indicated that hydrilla was present in the south end of the lake. In 1989, a study indicated that 90% of grass carp stomach contents was hydrilla, which had been reduced to 30% vegetative cover. Another Sonar® treatment was made in 1992. Eelgrass is coming back slowly. An October 1993 biomass sample contained only 4 hydrilla fragments, and grass carp have been seen feeding on *Panicum hemitomon*. In 1994, grass carp in lake Yale weighed 35 pounds. A removal project is planned to try to decrease the number of grass carp in Lake Yale.

Deerpoint Lake, FL: This lake was stocked with 100,000 grass carp between 1975-77, and in 1978 an additional 10,000 fish were stocked. Pondweed was selected by the grass carp over milfoil. Milfoil populations increased and then crashed. More emersed species were eliminated and by 1982, shoreline erosion had increased. In 1985, milfoil populations had increased with a vengeance. Triploid grass carp, at the rate of 8.5 fish per acre, were stocked. Presently bacopa, nitella and eelgrass are coming back. The grass carp have prevented hydrilla re-establishment.

Johns Lake, FL: Located below Lake Apopka, Johns Lake is

composed of several pools connected by canals. The lake supports 12-14 submersed species and 20 emersed species. The shoreline has been significantly developed. Between 1986-1989, a total of 94.5 hectares of hydrilla was treated with Sonar®. Triploid grass carp were then stocked. By 1993, hydrilla had been reduced to very sparse fragments. Maidencane and rush fuirena populations were reduced by grass carp. Plant populations which increased were fragrant water lily, baby tears, and nitella. Total costs for integrated control for this project was $86,862. Estimates for a non-integrated control approach using Sonar® only were $313,984. The integrated approach, therefore, can theoretically save money and allow for multiple uses for the waterbody. This approach, however, requires frequent monitoring and additional funds may be needed if the grass carp had to be removed.

Lake Istokpoga, FL: In 1988, the 27,000 acre Lake Istokpoga had 20,000 acres of hydrilla. In 1990, a 1.2 million dollar treatment of 2,400 acres of hydrilla was done. In 1991, hydrilla was back in the south end of the lake. Several grass carp were released and tracked for one year to see if the fish would leave the lake through Arbuckle Creek or the Istokpoga canal. None did, so a decision to stock the lake with 125,000 grass carp was made. The goal was to decrease hydrilla to 25% of the lake, or 7000 acres of topped out hydrilla for at least 3 years. Another 1.2 million dollar treatment was done in 1992 before the release of the grass carp. Pondweed and eelgrass are coming back in significant amounts. Currently, hydrilla coverage is at 35% or 9,000 acres but less than 200 acres are topped out. No herbicide treatments are scheduled for 1994. If no herbicide treatments are needed in 1995, then the project will have "broke even" dollar wise.

Orange Lake, and Lochloosa Lake, FL: Orange Lake supports a large marsh community, and is connected by Cross Creek to Lake Lochloosa. Emergent vegetation coverage in 1964 was 34% and increased to 54% coverage in 1991. Because of the marsh community, this lake has a muck layer which ranges from a few inches to 10 feet in thickness. Also, Orange Lake is a eutrophic system and commonly had algae blooms even before hydrilla. In 1975, a 50 acre area of hydrilla was discovered and by the end of the year had increased to cover 276 acres. In 1976, $30,000 from various sources was gathered to fund the harvesting of boat trails because 95% of the lake had topped out hydrilla. With this money 160 acres were harvested and a network of trails and small fishing holes were created in the hydrilla mats. The average cost for harvesting was $1,150 per acre. From 1982 to 1993, a total of 3,572 acres of hydrilla were treated with SONAR® achieving 20,454 acres of control.

Lake Lochloosa has a steeper slope than Orange Lake, and supports a cypress fringe. The

emergent vegetation community covered only 3.5% in 1964, but increased to 6.5% in 1991. Harvesting of trails through hydrilla began in 1980. By 1982, the trails provided the only boat access. The average cost for harvesting was $400 per acre. From 1982 to 1993, a total of 3,606 acres of hydrilla were treated, achieving 20,543 acres of control. For Orange Lake and Lake Lochloosa a total of 4.6 million dollars has been spent on Sonar®, 1.75 million in contact herbicides, and $25,000 in harvesting for a total of 45,000 acres of control. The option of stocking triploid grass carp is now being seriously considered by lake managers.

GRASS CARP TRACKING STUDIES

Grass carp movements were monitored in Lake Harris and Lake Yale, Florida. Lake Harris is an open system, connected to other lakes and has a band of emergent vegetation and hydrilla. Lake Yale, is isolated and supports primarily hydrilla. A total of 22 fish were released in Lake Harris and 14 fish were released in Lake Yale. All fish had transmitters which were surgically implanted. Average amount of grass carp movement was 126 meters per day on Lake Yale. The grass carp did not migrate out of Lake Harris and moved an average of 155 meters per day. The fish tended to have intermittent movement and were primarily located in the shoreline vegetation. Seasonal feeding cycles were also noted.

Tracking studies were done in 1988 on Lake Moultrie, SC. A total of 25 fish were tracked. A second study was done in 1991, again with 25 fish, The fish tended to move around a lot at first, then settled down to hydrilla bed areas. After settling in, the grass carp averaged 0.1 km movement per day within a core area of 10 square km.

REMOVAL TECHNIQUES, ACOUSTIC BARRIERS

Fish Management Bait (FMB) is being developed as a method to remove grass carp. The product contains rotenone in an alfalfa food pellet which is attractive to grass carp. Rotenone affects the cellular energy transport system and causes the fish to exhibit symptoms of oxygen deprivation. Death occurs shortly thereafter. The fish only need to consume 1-2 pellets to receive a lethal dose. FMB pellets were tested on Lake Yale. Rotenone free bait was used for 10-25 days to acclimate the grass carp to the feeder. Then the FMB pellets were used with good results on the same day. It was noted that if the feeder was left in the same position for a second application, the grass carp would learn to reject the FMB pellets. Some non-target fish species were also killed by the use of this product. Another collection method for grass carp has been by bow hunting. The perfection of a reliable removal technique is important in that it will allow lake managers the capability of controlling the effects of grass carp on vegetation removal.

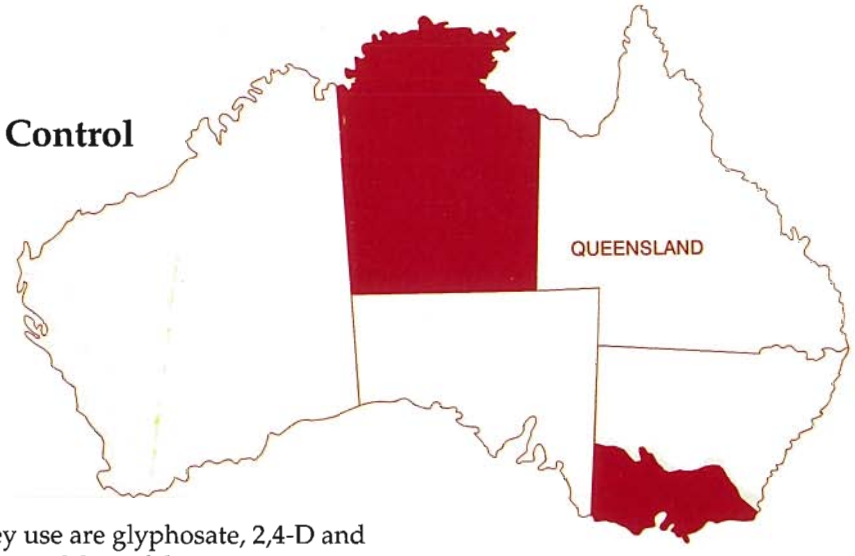
Acoustic fish barriers have been used to deter fish from entering power plant cooling vents and hydropower turbines. This product incorporates the use of various sound frequencies and has been successful in keeping alewives, shad, and herring away from target areas. No tests have yet been made with grass carp.

SUMMARY

The use of grass carp is a grey issue. Grass carp have been compared to a herbicide in that they are persistent, slow acting, mobile, and have variable results. Research on the use of grass carp is continuing and another symposium may be organized in the future. The range of data presented at this symposium generated much discussion. Most of those in attendance supported a cautious approach when considering triploid grass carp until a method is developed that enables the predictable use of these fish as part of an integrated aquatic plant management program.

"Down-under Visits Florida"

Bill Christian
Foreman III
Volusia County Mosquito Control



"G'Day Mate." This is what you would have heard if you had been around East Volusia Mosquito Control this July. Volusia County was one of three counties that Roy Durre, Entomology and Weed Control Officer from Southport, Queensland, Australia visited. According to Mr. Durre, Queensland environment is similar to Florida's. He lives 28 degrees latitude, which is equal to Melbourne, Florida. Some of the items he was interested in were: adulticiding, larvaciding, herbiciding, and air and ground operations against mosquitoes.

Mr. Durre was very interested in our salt marsh operations, which we discovered are very similar to theirs. The mosquito's were different in types and names but almost the same in that they all breed in salt marshes. We use chemical and mechanical operations in our salt marsh mosquito control program. The Rotoditcher is used to create small ditches to breeding sites. These openings provide better movement of natural predators to breeding sites. Several years are required for us to obtain permits for these ditching operations. The down-under crews do it by hand because they are not allowed to have machinery on their wetlands. However, they can do their ditching as needed without permits.

Mr. Durre spent several days with the ditch maintenance crews, and worked with the herbicide crews in right-of-way and aquatics. Here again, their operations are very much the same as ours. Some of the major plants they target are water-hyacinth, salvinia, waterlettuce, Brazilian pepper, alligatorweed and lantana; and some of the herbicides they use are glyphosate, 2,4-D and diquat. Most of their aquatic applications are in canal systems using truck mounted spray equipment. Mr. Durre has three permanent herbicide crews and hires six more part time men to help out through the growing season. Permits are not required for their applications, just an end-of-the-month report to the government. All mechanical cleaning of the canal systems are subcontracted as needed. Discussion was brought up about biological control of aquatic plants. He was shown several sites where triploid grass carp are being used and future stocking sites. Mr. Durre informed us that they don't use grass carp in Australia because they are non-native and the government will not allow them to be used for this reason.

In addition to similarities between our problems and programs, interesting contrasts were noted in our conversations. Mr. Durre said that they have no problem with melaleuca, which is one of our most serious plant pests in south Florida. They're not a problem because they have always been there and are accepted. In fact, *Melaleuca* spp. are listed as desirable landscape plants, along with she-oaks (*Casuarina* spp.), which we call Australian pines. A list of "trees that are potential environmental weeds" published in the Weed Science Society of Queensland Newsletter lists some familiar names, many of which are native or desirable ornamentals in the US, as follows: Camphor laurel (*Cinamomun camphorum*), golden rain tree (*Koelreuteria paniculata*), Indian Hawthorne (*Raphiolepis indica*), jacaranda (*Jacaranda mimosaefolia*), and get ready for this one - slash pine (*Pinus eliotii*).

Queensland has a professional weed science organization, The Weed Science Society of Queensland (WSQ), which is similar to FAPMS. They publish useful information in newsletters, etc. and have annual meetings similar to ours. Most interesting to me was that their government allows their society to write the "National Weeds Strategy." WSQ annually invites applications for "Weed Society of Queensland Grants." The purpose of these grants is to assist members of their society and weed science students to attend conferences or seminars, or undertake study tours, such as Mr. Durre's visit to Florida. This grant money comes from government support.

I hope, some day, to have the opportunity to go, or send someone else, to Australia to learn more about their operations. As they say down under, G'Day Mate.

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Are We Failing to Communicate?

Joe Kight
Wildlife Biologist
United States Army Corps of Engineers
Chattahoochee, Florida

COMMUNICATION (n.) 1. a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior. 2. a technique for expressing ideas effectively. (From WEBSTER'S II, NEW RIVERSIDE UNIVERSITY DICTIONARY).

"Hydrilla is great for ducks!" (See 1 above). These words were expressed to me several dozen times during the past duck hunting season. What does this really mean? That hydrilla increases the duck population? Does it make the ducks healthy, wealthy and wise? I don't think so. What it really means is that Hydrilla tends to concentrate ducks, which is good for duck **hunters**! About all that it does for the ducks is to draw attention to themselves which often results in getting their tail feathers trimmed with steel shot. (Ignore 2 above).

"Hydrilla is good for fish!" (Forget 2 above). "O.K., hydrilla is good for **bass**!" Again, what does that mean? Does a lake full of hydrilla produce **more** bass? **Bigger** bass? There is a notable lack of evidence to support either case. Does it **concentrate** bass? Sure. Is this good for the bass? I doubt it. It's good for the bass **fisherperson** because it tends to concentrate the fish, making them easier to catch.

"It gives the little bass a place to hide. If more little bass survive, then of course there will naturally be more big bass to catch." Why then, according to Georgia Fisheries data, is there **not** a significant difference in the population levels between Lake Seminole, which is chock-a-block with hydrilla, and Lake W.F. George (Lake Eufaula) which has **NO** hydrilla and very few other weeds? And why was Seminole such a great bass lake **before** hydrilla was introduced? If having more little bass is the key, then why not close the season on bass when they are spawning? (This won't help either, but it makes more sense than providing hiding places).

Each habitat, be it pond, lake, pasture, ocean, or what-have-you, has a certain capacity to support life. It will support only so many organisms; be they bass, cows, cabbages, or kings; even if they do have grass to hide in.

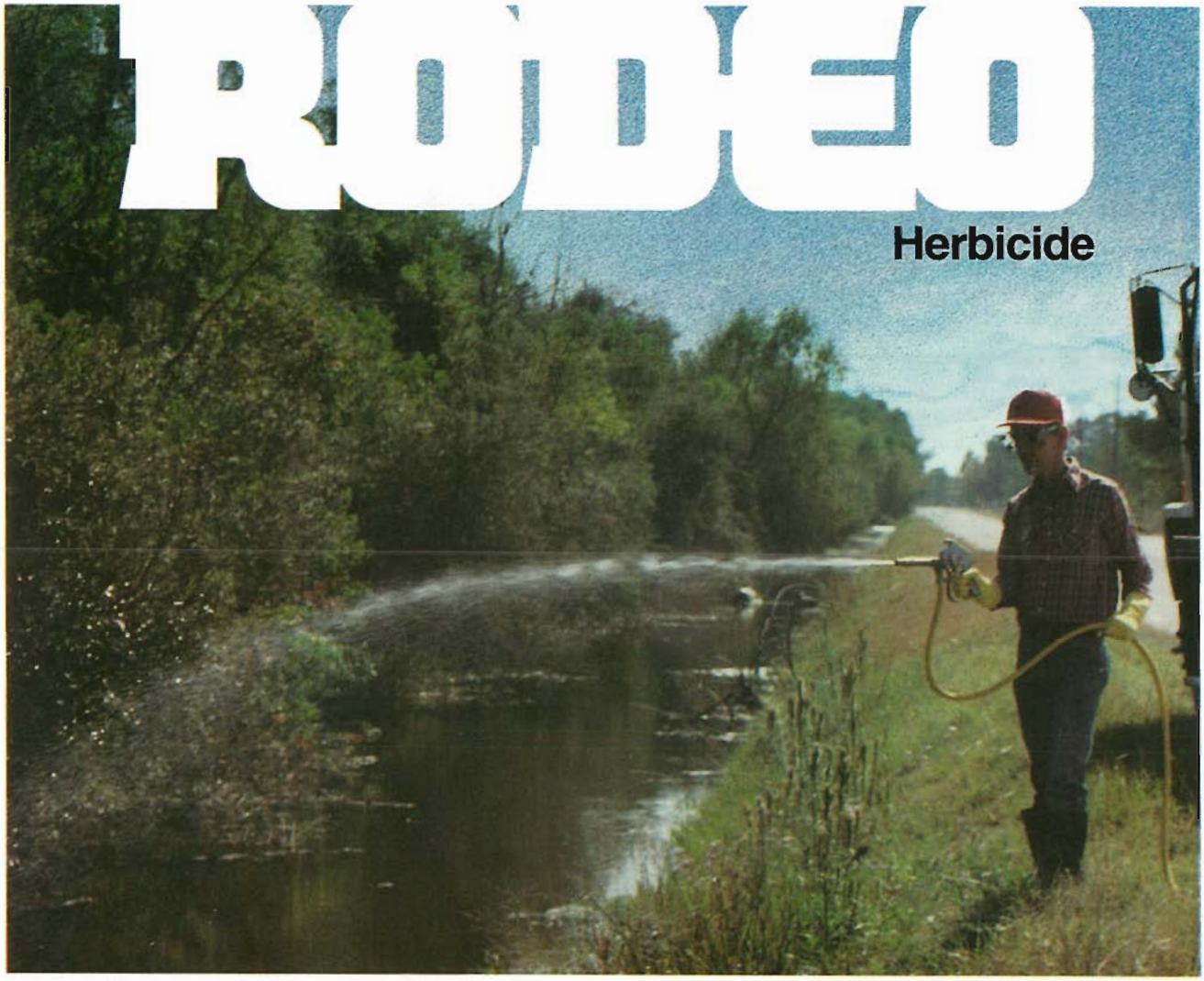
Some of the best fishing (catching) is in farm ponds that are completely devoid of weeds. The little bass do not need to have a place to hide. What is important is that the little bass have an abundance of the proper size food when that particular size food is needed. They transition from the egg to a primary diet of fish in a very short period of time. As the bass gets larger, it needs larger fish to eat. A five pound bass is going to have a hard time getting bigger and fatter if it has to depend on making a living on little-bitty fish. It'll work itself poor chasing "one-finger" brim through thick weeds. And a pond or lake full of weeds will soon produce a stunted bream population. Now when I say "weeds," I'm talking about macrophytes (big plants), not phytoplankton (microscopic plants).

There are plenty of grass shrimp, insect larvae, and assorted creepy-crawlies in the weeds that the shad can't eat. And the weeds are so thick the bream can't get to them. If they could, then the bream population wouldn't get stunted.

"Aquatic macrophytes take up nutrients, thereby improving water quality." They take up nutrients all right. That's why weeds are undesirable in ponds that are fertilized. Rather than fertilizer (nutrients) producing plankton, much of which winds up as fish flesh, they produce weeds. Some principle holds in reservoirs too. As for improving water quality, I'll readily admit that I don't know what the phrase "water quality" really means when used in this context. Should there be more or less nutrients available?

I do know that prior to the existence of the vast amount of hydrilla in Lake Seminole, there was a good plankton bloom and there was a very high threadfin shad (forage) population. The water is now much clearer; much less plankton is present. This is reflected in the threadfin shad population. Or lack of it. Has

HOW TO CONTROL BRUSH AND FLOATING VEGETATION IN AND AROUND WATER.



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water quality improved? Ask the shad or the hybrids (striped bass) — if you can find one.

Things biological are dynamic. They are constantly changing; sometimes in a way that we desire, often times not. We really don't care too much about that, because we want to catch a fish and we want to catch it RIGHT **NOW**! But what happens to a given body of water, and the fish in it, that is infested with hydrilla over a long period of time?

A more basic question is, what is the carrying capacity for game fish in that given body of water? How many harvestable sized bass will it support? What is the basis of the food web? What is the main food supply? What size bass is desired? What size and how much forage fish are necessary? What is the management objective? What are you trying to do?

I've been talking mostly about bass but let's keep in mind that the bream fisherperson pays the exact same amount for a fishing license to catch a mess of fish to eat, as the "Bass Pro" who stands to make mega-bucks from a public resource. Sure, the squeaky wheel gets the grease, but let's don't let the other three wheels fall off from neglect just because they don't make a lot of racket.

Seems these and a lot of other pertinent questions should be answered before hard statements are made or actions taken. At least, set the stage by describing the conditions under which the conclusions were drawn and what end results are wanted.

This brings to mind a government official, we'll call him Dr. Willie, who was examining the relationship between the auditory perception (hearing) and the flight abilities of the common housefly, *Musca domestica.*

Dr. Willie caught a fly, placed it on the table and instructed it to fly away. The fly promptly did so. Dr. Willie caught the fly again, humanely removed one wing, placed the fly on the table, and again told it to fly. The fly laid on its back, beat wildly with its one wing, and spun around and around on the table top. Fascinated, Dr. Willie removed the other wing, placed the fly back on the table and again told the fly to fly away. The fly glared at Dr. Willie and stood quite still.

Elated, Dr. Willie ran some computer models, wrote reams of reports, and had his work widely published. He became quite famous and was in constant demand to speak on his work at various meetings and gatherings. Later on, he was elected to the legislature.

The essence of his work, of course, was the obvious "fact" that the loss of a fly's **wings** makes the fly **deaf!**

Could some of us be suffering from the deaf fly syndrome?

Is hydrilla good for ducks? Fish? For water quality?

Don't ask the fly. It's deaf.

AQUAVINE

MEETINGS

FAPMS Annual Meeting

The Florida Aquatic Plant Management Society's 1994 annual meeting will be held October 11-13 at the Ramada Hotel Resort, Florida Center in Orlando. Alison Fox, this year's Program Chair has been busy slave driving her program committee and has a super meeting full of surprises planned. Don't miss it. We extend an invitation to aquatic plant managers everywhere to meet with us in Orlando.

European Weed Research Society 9th International Symposium on Aquatic Weeds

The European Weed Research Society are organizing an International Symposium on Aquatic Weeds, which will be held in Trinity College, Dublin, Ireland during September 12-16, 1994. This is the 9th in a series of symposia aimed at discussing international weed problems, approaches to aquatic weed control and factors affecting the growth, ecology, and performance of aquatic plants. For information contact Dr. Joe Caffrey, Central Fisheries Board, Mobhi Boreen, Mobhi Road, Glasnevin, Dublin 9, IRELAND. Tel: 353-1-379206, FAX: 353-1-360060.

NALMS 14th Annual International Symposium

The 14th Annual International Symposium of the North American Lake Management Society will be held at the Hyatt Orlando Hotel, Orlando, Florida, October 31 - November 5, 1994. The theme of the meeting will be "Managing Water Resources in the 21st Century: Finding Workable Solutions." This year's meeting will focus on a multitude of lake and reservoir management issues. Some of the areas currently slated for discussion include the management of aquatic macrophytes, the role of wetlands in water resource management, forest watershed management, contaminants in aquatic systems, lake restoration case studies, and alternative waste disposal systems.

IN MEMORIUM

Max McGowen died, at the age of 79, shortly after attending the Aquatic Plant Management Society Annual Meeting in San Antonio, Texas. Funeral services were held in Indianapolis on July 22. Max was a member of APMS since 1971. He was a Past President, Honorary Member and always active in the

Society. He worked for Eli Lilly from 1946-85, during which time he was responsible for determining aquatic herbicidal activity of fluridone and was instrumental in it's registration. We owe a great deal to Max and will miss him.

MISCELLANY

2,4-D Toxicology Literature Review

We still have copies available of the 100-page "A Comprehensive, Integrated Review and Evaluation of the Scientific Evidence Relating to the Safety of the Herbicide 2,4-D." To obtain a free copy contact the IFAS Center for Aquatic Plants at 904/392-9613.

Plants of Florida and Southern Coastal Plains Featured in New Book by Noted Botanist

Dr. David W. Hall, recognized authority on wildflowers and grasses, has written "Illustrated Plants of Florida and the Coastal Plain." The 431-page book features pen-and-ink illustrations of more than 1,200 common plants found in Florida and the Southern coastal plain. Published by Maupin House, the book sells for $19.95.

The book describes and illustrates the wildflowers of Florida and the Southeastern coastal plain from Lake Okeechobee in peninsular Florida northward. Most common shrubs and herbaceous plants are included, but grasses, rushes and trees are excluded. Plants are arranged alphabetically by family, with the description alongside for easy identification. Each entry describes the plant and flower, its habitat, range, season, and frequency. Two indexes and a glossary of plant terms are included for reference.

"Illustrated Plants of Florida and the Coastal Plain" is the result of a unique, long-term collaboration between Dr. Hall and amateur plant collectors Leland and Lucy Baltzell. The book represents a part of the couple's 11,800 specimen collection, gathered during more than 22 years of intense field work.

Dr. David Hall is the author of six books and more than 100 articles on the subject of botany and plant collection. In his 19 years as director of plant identification and information services at the University of Florida, Dr. Hall specialized in the identification and biology of weeds and grasses, ornamental uses of native plants, and forensic botany. He is now a senior scientist at KBN Engineering and Applied Sciences in Gainesville, Florida.

The book is available at bookstores or directly from the publisher at 1-800-524-0634.

Copies of "Aquatics" Available

Numerous copies of recent back issues of "Aquatics" are available for distribution through offices, public meetings, etc. We also have limited numbers of other back issues for completing sets. Call the editor for more information if you're interested.

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