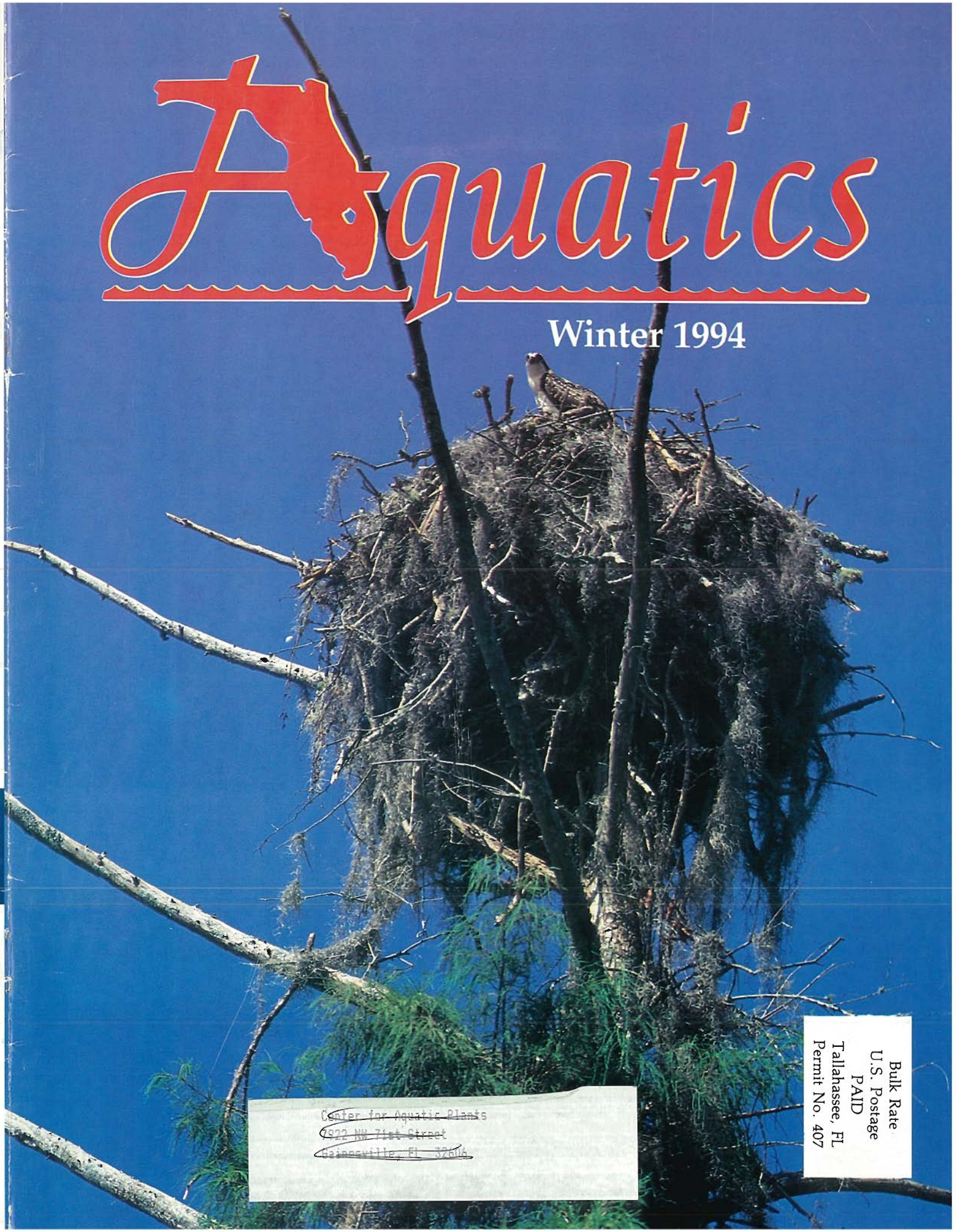
# Aquatics

Winter 1994



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### Letter to the Editor

Was taking stock of things the other day; this year's aquatic plant management program, the preceding years, where we are, where we're trying to go...those sorts of things. Realized that retirement age is approaching at a dead run. Will be eligible for retirement (fireproof) before long. And it won't be too long before I reach the Exalted State of GEEZER-HOOD, that enviable point in a man's life at which time "it" all comes together. Not that the heavens open up and anoint you with great wisdom; its simply that you realize you don't give a big rat's tail about things once thought really important, but weren't. It boiled down to a couple pluses and minuses; (Things I'll Miss and Things I Won't Miss) such as:

**WON'T MISS**

Wondering what was done to offend the gremlin-gods of nozzleheads on those days when NOTHING goes right.

Having a conversation started by: "That's a shiver-lay moter ain't it!" then, without pause, "How fast will it go?"

Helicopter rides.

Dreaming up ways to get the people in charge of contracts out of their air conditioned offices and have them spend a breezeless 98°+ day spraying hyacinths.

Keeping up with a double handful of keys.

August days when the sky and water fuse together in a hazy, brassy cauldron.

Racing a thunderstorm to the boat landing across a white-capping lake (and losing).

Wasp nests, big and black as a sombrero, seat-high above the water.

Writing reports.

*Continued on page 15*

A sharp eyed osprey watches all from his vantage point. Photo by David P. Tarver

Aquatics

Winter 1994/Vol. 16, No. 4

## CONTENTS







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# Winter Treatment with Endothall for Control of East Indian Hygrophila in South Florida Canals

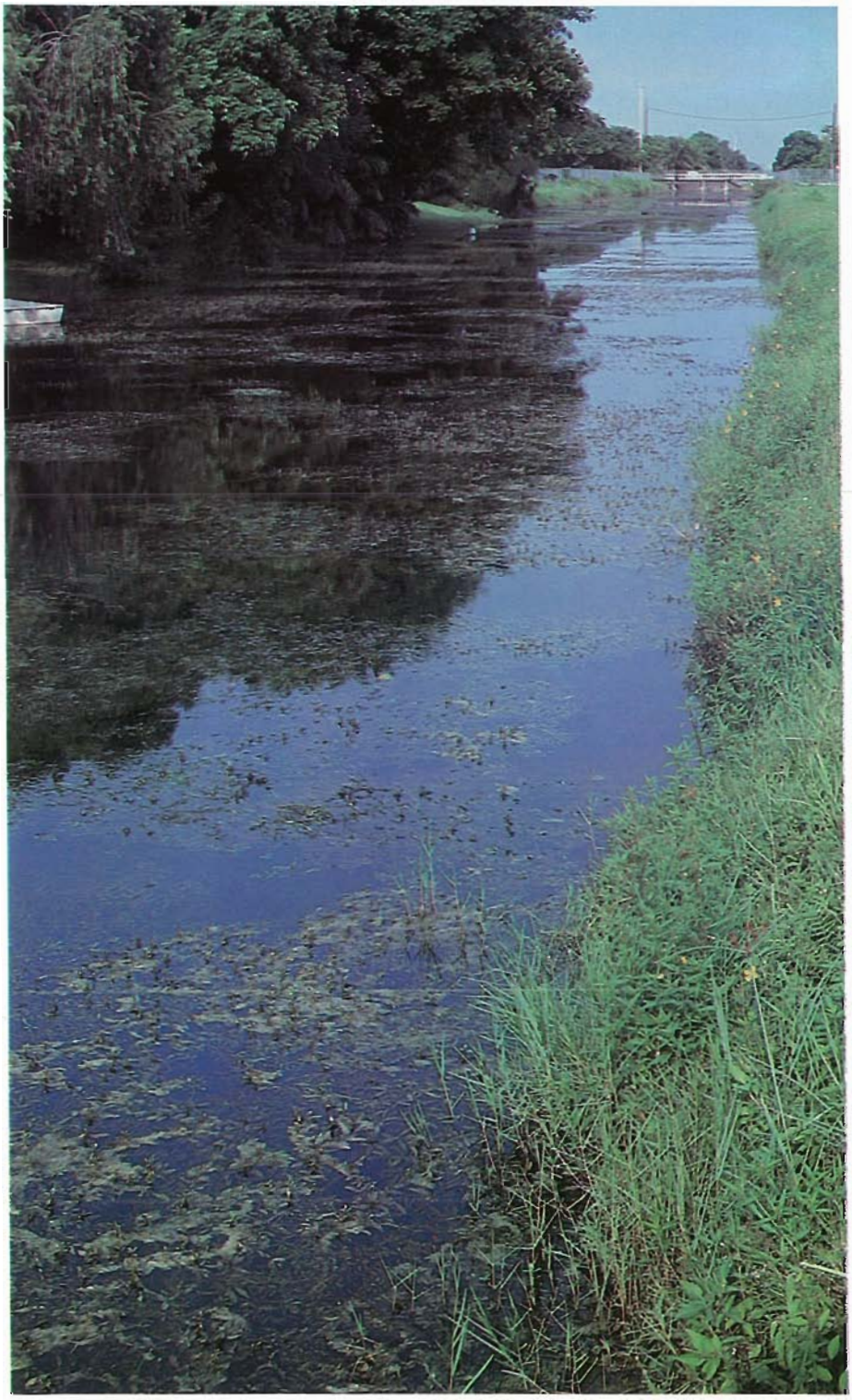

*Figure 1: East Indian Hygrophila is a problem in canals in South Florida.*

by
David L. Sutton
Fort Lauderdale Research and Education Center
University of Florida - IFAS

Leslie E. Bitting
Old Plantation Water Control District

William H. Moore
Elf Atochem

**Introduction**

East Indian Hygrophila (*Hygrophila polysperma* (Roxb.) T. Anderson) (Figure 1) is replacing hydrilla (*Hydrilla verticillata* (L.f.) Royle) as a serious aquatic weed in canals and other bodies of water in South Florida. One reason for the increase in East Indian Hygrophila is this plant is somewhat resistant to herbicides that control hydrilla. Therefore as hydrilla is controlled, East Indian Hygrophila continues to grow in areas formerly occupied by hydrilla. Information is needed on methods to control the growth and spread of East Indian Hygrophila.

In a previous article (Sutton, et al 1994), we presented information on an experimental summer application of endothall at label rates to control East Indian Hygrophila in a canal in South Florida. East Indian Hygrophila was controlled in portions of the treatment plots for up to 12 weeks after application of herbicide, but in other areas of the canal, this exotic plant quickly regrew to pretreatment levels

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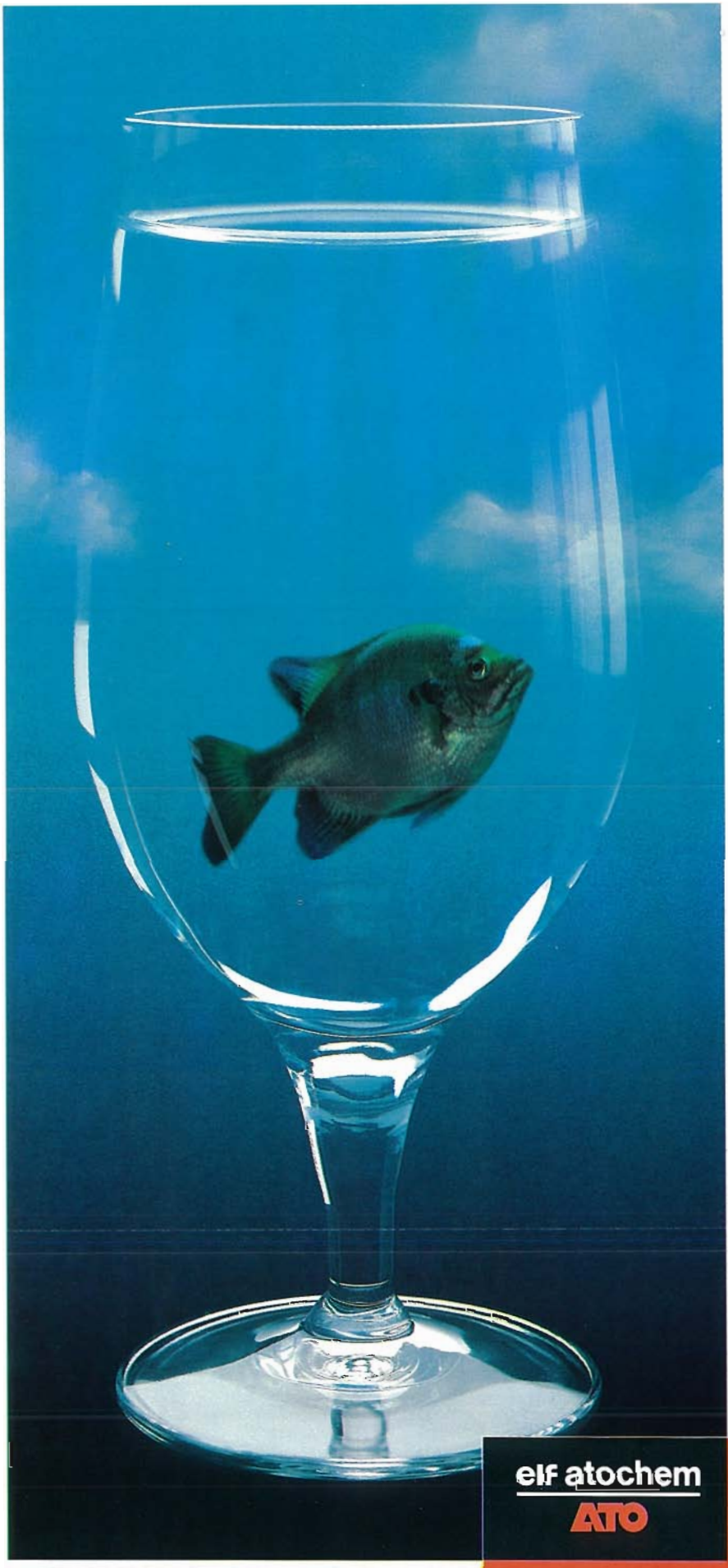

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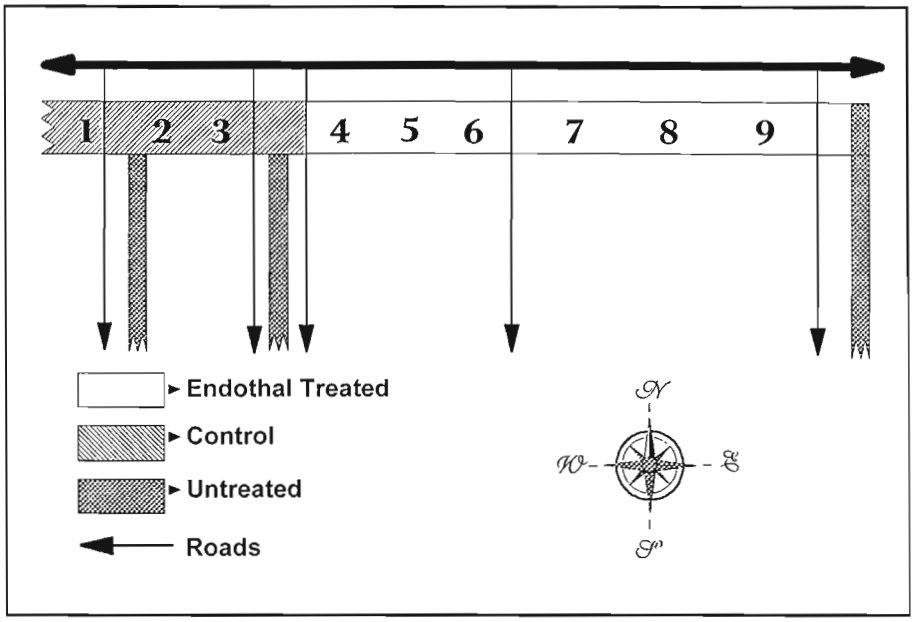


*Figure 2: Schematic of canal in the Old Plantation Water Control District in South Florida used for winter treatment of East Indian Hygrophila with endothall. Numbers indicate sites where measurements for frequency of occurrence and water quality were collected.*

within this time period. The cause for this differences in plant response to application of herbicide was not readily apparent in the study.

Endothall is a contact herbicide. This herbicide does not translocate from the leaves to the root portions of the plant, but does translocate to a limited extent from the roots to the shoot portions of plants. Endothall is rapidly degraded by microbial activity. In view of the high water temperature, 30 C (86 F), when the endothall was applied during the summer treatment of East Indian Hygrophila (Sutton et al, 1994), a winter treatment with endothall was conducted to determine if control of this exotic plant could be achieved during the cooler months of the year when microbial activity would be expected to be low.

### Herbicide treatments

A canal in the central part of the Old Plantation Water Control District (OPWCD) with East Indian Hygrophila was selected for treatment with endothall. The west end of the canal, Sites 1 to 3, served as the control area, and the west end, Sites 4 to 9, was treated with herbicide (Figure 2). The canal averaged 1.6 meters (5.25 feet) in water depth. The treated area contained 1.82 surface hectares (4.5 acres).

Endothall herbicide in two different formulations was applied on January 25, 1994 to achieve 4.5 ppm of Aquathol K and 0.2 ppm of Hydrothol 191. The control area did not receive any herbicide and was located west of the herbicide treated area because the normal water flow in this canal is from west to east (Site 1 to Site 9).

Before application of the herbicides, a plant survey was conducted January 24, 1994 in the control and herbicide areas by stretching a transect line across the canal at each of the 9 sites. Aquatic plants were recorded at 1.0 meter (3.3 feet) intervals along the line. A frequency of occurrence of plants as a percent of those present at each 1.0 meter interval was calculated. The plant survey was repeated 4, 8, and 12 weeks following the herbicide treatment.

Water quality analyses were performed using portable field instruments. Dissolved oxygen in parts per million (ppm) and temperature in degrees Celsius (C) were measured using a YSI Model 57 dissolved oxygen meter, and conductivity values as micromhos per centimeter (umhos/cm) were determined using a YSI Model 33 conductivity meter. All water quality measurements were taken in situ 1 day before (represented as Day 0 in Figure 2) and 1, 3, 7, 14, 28, 57, and 85 days after the herbicide treatment. Measurements were taken at a depth of 0.5 meters (1.6 feet) starting at 1:00 PM at Site 1 and continuing in numerical order to Site 9 with all measurements completed within about a 2-hour period.

### Results and Discussion

Water flow in the treated canal was minimal as no heavy rains occurred immediately before or for several weeks after treatment. Therefore, no endothall herbicide

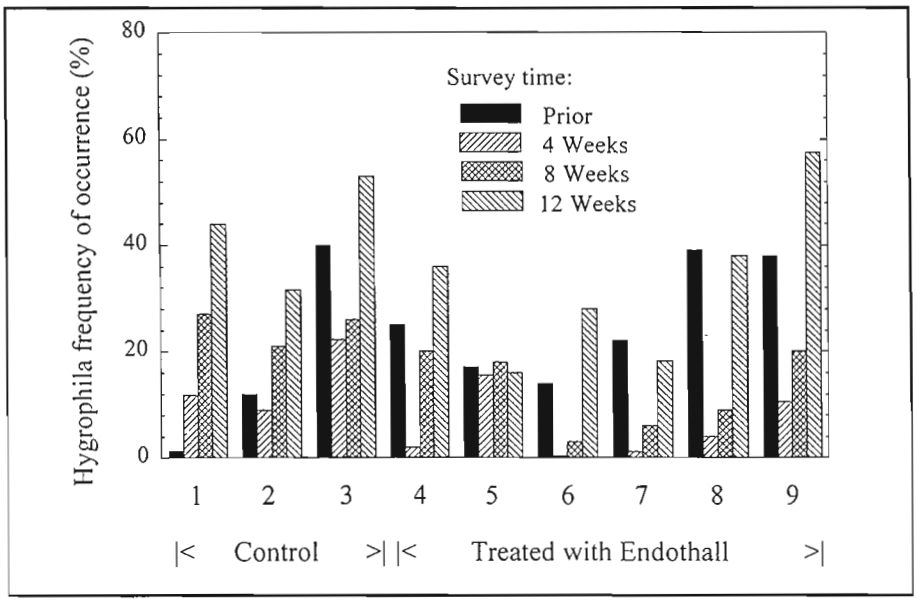


*Figure 3: Frequency of occurrence of East Indian Hygrophila after treatment with endothall.*

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should have entered the control area.

Frequency of occurrence of East Indian Hygrophila in the canal prior to application of herbicides ranged from less than 5% at Site 1 to almost 40% for Sites 3, 8 and 9 (Figure 3). In the control area (Sites 1 to 3), plants increased in frequency of occurrence during the 12-week evaluation period. Site 1 showed the largest increase in plant growth as the frequency of occurrence was less that 5% initially and increased to over 40% at the 12-week measurement.

In the herbicide treated area, a rapid decrease in frequency of occurrence of East Indian Hygrophila occurred within 4 weeks after application of herbicide for all sites except Site 5. In Site 5, the frequency of occurrence of East Indian Hygrophila remained essentially the same for the 12-week period. For Site 4, the frequency of occurrence of East Indian Hygrophila indicated rapid re-growth within 8 weeks and by 12 weeks was 10% higher than pre-treatment levels. For Sites 6, 7, 8, and 9, plant levels remained low 8 weeks after treatment but by 12 weeks the frequency of occurrence of East Indian Hygrophila was at or above pretreatment levels. Although measurements for biomass of East Indian Hygrophila were not determined, field observations, as in the previous summer treatment of East Indian Hygrophila with endothall (Sutton, et al 1994), indicated a significant reduction in overall plant biomass 12 weeks after application of herbicide.

Values for dissolved oxygen were 4 to 6 ppm prior to treatment with herbicides (Figure 4). Dissolved oxygen 1 day after treatment were essentially the same for the control and treated areas. In the treated area, dissolved oxygen was slightly under 4 ppm 3 and 7 days after treatment, but increased to over 6 ppm after 14 days and continued to stay high for the remainder of the evaluation period. The largest difference between the control and endothall treated area occurred 7 days after treatment when the control contained about 7 ppm

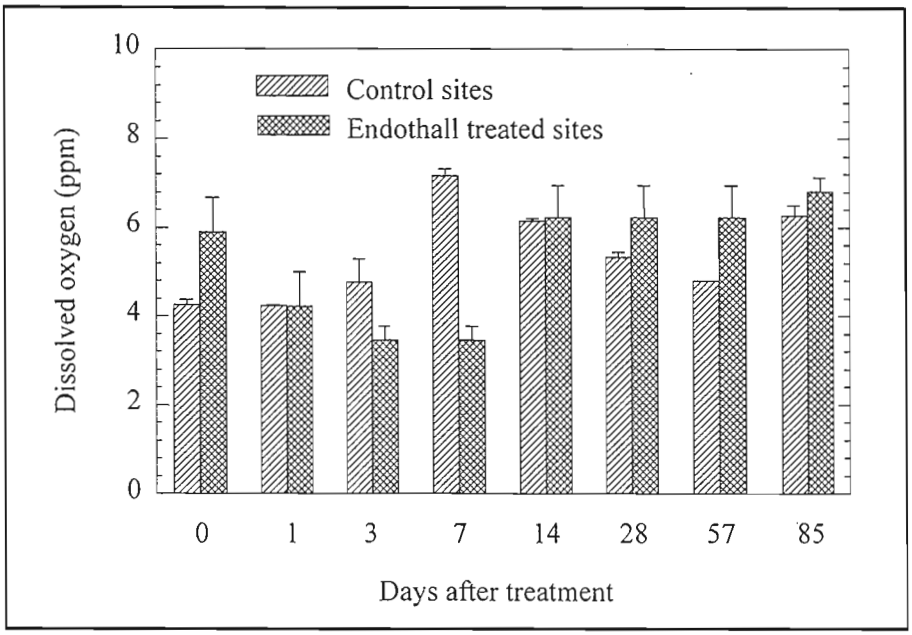


*Figure 4: Dissolved oxygen of canal water after treatment with endothall for control of East Indian Hygrophila.*

dissolved oxygen and the treated area was 4 ppm. The winter treatment of East Indian Hygrophila with endothall resulted in less impact on dissolved oxygen than during our summer treatment.

Water temperature at the time of treatment was 20 C (68 F) and gradually increased to a high of 29 C (84 F) 85 days after treatment. No differences in water temperature were measured between the control and endothall treated areas. Similarly, no differences were noted for conductivity readings between the control and endothall treated areas. Conductivity was 750 umhos/cm prior to treatment and remained around this level for the remainder of the treatment.

Our assumption that a winter application of endothall for control of East Indian Hygrophila would be more effective than a summer treatment did not result in better control of this plant. However, dissolved oxygen appeared to be less affected by the winter treatment than during the summer treatment. In both the summer and winter treatment, endothall resulted in excellent control of East Indian Hygrophila for 4 to 8 weeks followed by rapid regrowth. These studies suggest that endothall will control East Indian Hygrophila but only for a short period of time. It appears that additional applications approximately 8 to 10 weeks after the initial application of endothall will be required to keep East Indian Hygrophila under control. Additional endothall treatments are planned with an initial application at maximum label rates followed by low concentrations at 6 to 8 week intervals to determine if this method of application will provide for long term control of East Indian Hygrophila in South Florida.

### Literature Cited

Sutton, D. L., L. E. Bitting, W. H. Moore, and G. E. Baker. 1994 Summer treatment of hygrophila with endothall in South Florida. Aquatics 16(1):4, 6, and 8.

### Acknowledgments

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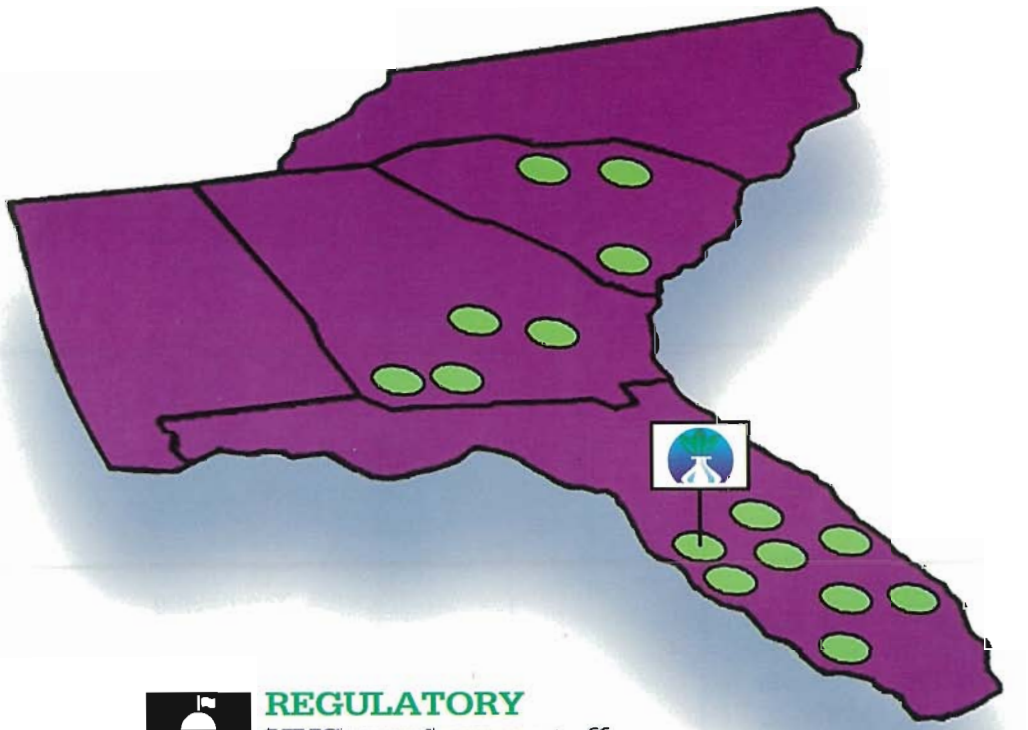

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# Insects to Control Melaleuca I: Status of Research in Australia

by
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**Introduction**

The Australian tree, *Melaleuca quinquenervia* (in Florida, usually called melaleuca or punk tree), has become a serious pest in southern Florida since it was introduced there at the beginning of this century. Initially, it was considered a beneficial plant, and its spread was encouraged. However, it is now growing out of control and appears to be rapidly expanding its range in south Florida (Laroche and Ferriter 1993).

Over 250 *Melaleuca* species are known in Australia (Barlow 1988), with more still being discovered. Most of these are small trees or shrubs, although some are large trees. *Melaleuca quinquenervia* is one of fifteen similar, large *Melaleuca* species grouped together by Barlow (1988). The native range of *M. quinquenervia* is in a thin band along Australia's east coast, from Sydney to the tip of Cape York, the northernmost part of Australia (see Fig. 1), and New Guinea. Unlike in Florida, melaleuca in Australia is mostly confined to coastal swamps and wetlands (except when planted as an ornamental).

The need for biological controls for melaleuca, and the status of this project up to 1988 were summarized in Balciunas and Center (1991). The last report in this publication on our research (Balciunas 1990) covered the period from 1986-1989. At that time, this was still a University of Florida project, housed in temporary facilities on the campus of James Cook University (JCU) in Townsville, with a substation in Brisbane (Fig. 1). However, in 1989, the principal investigator (JKB) became a USDA employee, and these became USDA facilities, collectively known as the Australian Biological Control Laboratory (ABCL). In 1990, the Townsville laboratory moved to our current, specially built and equipped facilities on the JCU campus. The project in Australia operates through cooperative agreements between USDA's Office of International Research Programs and JCU's Australian Centre for Tropical Freshwater Research and the Commonwealth Scientific and Industrial Research Organization. The project has expanded to now employ four full-time and four part-time staff.


*Figure 1. Map of Australia showing locations mentioned in the text.*

Classical biological control, the importation of natural enemies from an exotic pest's native range (in this case Australia) into its new, introduced range (in this case Florida) has successfully controlled many weeds (Julien 1992). To the best of our knowledge, melaleuca is the largest plant species to have been targeted for classical biological control (Balciunas et al. in press). Some people may be sceptical about the ability of small insects to control such a large and fast growing tree species. By using insecticides to protect half of the melaleuca saplings growing outside of our Townsville laboratory in Australia, we demonstrated that insects, even at natural levels, do suppress the growth of melaleuca

saplings (Balciunas and Burrows 1993). Data we obtained from this experiment during 1993 and 1994, also suggests that insect attack may delay the onset of flowering, as well as reduce the number of flowers produced. Buoyed by these positive results, we have recently initiated another, similar experiment, to test the effect of insect herbivores upon the growth of melaleuca seedlings. Since seedlings are rare in the field in Australia, we have little knowledge of the insects which feed upon them.

By the end of 1993, our surveys in Australia had collected over 450 herbivorous insect species on melaleuca, with almost 100 additional species on closely related *Melaleuca* species. We continue to conduct research on the more promising of these insect herbivores. Two of these, the melaleuca leaf weevil, *Oxyops vitiosa* and the melaleuca defoliating sawfly, *Lophyrotoma zonalis*, have already been exported to the Gainesville quarantine facility in Florida for final testing of their safety. Several other agents have already shown enough promise to suggest that they too may one day be exported to Florida quarantine for final testing.

### Melaleuca Leaf Weevil - *Oxyops vitiosa*

The melaleuca leaf weevil, *Oxyops vitiosa* (Coleoptera: Curculionidae) was identified as a promising agent during the first year of this project, and is likely to be the first melaleuca insect released in Florida. The adults and larvae of this weevil (both pictured in Purcell and Balciunas in press) feed on the young foliage of melaleuca. The larvae, which can grow up to 2/3 inch long, feed on one side of a leaf through to the cuticle on the opposite side. The resulting distinctive "window" feeding scar may persist for months, and cause a reduction in plant growth. Adult feeding results in short, narrow scars on the leaf. The larval period lasts for 43-53 days, and the larvae are more destructive, with the larger ones consuming at least 10 times more foliage per day than the adults (Balciunas et al. in press).

In our field collections, the melaleuca leaf weevil was only found on melaleuca and one of its very close relatives. In our laboratory tests, larvae only developed to the adult stage upon melaleuca. More details of the field and laboratory host-range of this weevil in Australia can be found in Balciunas et al. (in press). We petitioned for the importation into quarantine of these weevils in March 1992, and the first shipments were hand-carried to quarantine in Gainesville, Florida later that year. We have since sent 18 shipments, containing over 4,700 of these weevils, to quarantine. These have been used in host-range tests by the quarantine research team, led by Dr. Gary Buckingham. After the necessary tests in quarantine are completed satisfactorily, permission for its release in Florida will be requested.

### Melaleuca Defoliating Sawfly - *Lophyrotoma zonalis*

Many species of sawflies (primitive relatives of ants, wasps and bees) cause severe damage to trees. In Australia, one of the most damaging melaleuca insects is the sawfly, *Lophyrotoma zonalis* (Hymenoptera: Pergidae). The adults live for less than one week and do not appear to feed, but the caterpillar larvae, which grow up to 1 1/4 inches long, are voracious leaf-feeders. Young larvae feed side-by-side at the tip of a leaf (pictured in Balciunas 1990), and move backwards while feeding on the leaf surface, leaving a skeletonized leaf. Larger larvae do not show this gregarious behavior, and a single larva consumes many leaves. In Australia, some large *Melaleuca* spp. trees have been completely defoliated for several years in a row by these sawflies. The sawfly populations build up large enough numbers to cause this defoliation, despite heavy mortality of eggs and larvae by parasites. If this sawfly is released in Florida, the absence of these parasites might allow huge numbers of this sawfly to develop.

Permission to export this sawfly

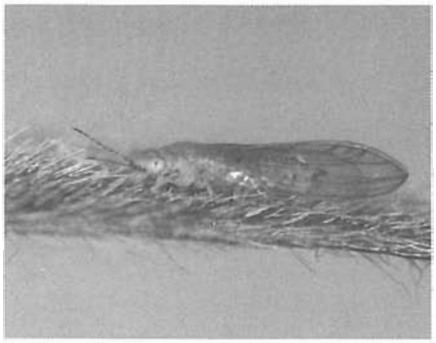

*Figure 2. The adult of the melaleuca psyllid, Boreioglycaspis melaleucae. Both the adults and juveniles of this species attack young growth of melaleuca. We requested permission to export this insect to quarantine early in 1994.*

to Gainesville quarantine was requested in April 1993, and approval was received in February 1994. However, several shipments of this sawfly had already been sent to quarantine under special permit. The melaleuca in Florida was thought to have originally come from a part of Australia where this sawfly does not occur. Therefore, these early shipments were made to test if the sawfly would accept Florida melaleuca for oviposition and larval development. The Florida melaleuca proved acceptable, and quarantine testing has now begun. Thus far, there have been problems in establishing a viable laboratory colony of these sawflies, due to low egg production rates and low numbers of females in the lab colony. Further complementary research is being undertaken at both the Townsville laboratory and in quarantine to find solutions for these problems.

**Melaleuca Psyllid - *Boreioglycaspis melaleucae***

Much of our recent research in Australia has been focused on the melaleuca psyllid, *Boreioglycaspis melaleucae* (Hemiptera: Psylli-dae) (Fig. 2). This insect is not much bigger than a pin head (0.1 inch adult) and resembles a miniature cicada. The immatures crawl about the leaves, while the adults, which have powerful hind legs, jump between branches and plants. Both the adults and juveniles feed on the sap of melaleuca leaves. The immatures cause the most damage, and they secrete a white, waxy "wool", under which they congregate, possibly for protection. The presence of this "wool" helps in locating these tiny insects on a plant. They also secrete honeydew, which encourages the growth of sooty mould on leaves. Development from egg to adult takes 34-42 days, which means there may be up to 10 generations per year.

From published records and our field collections, it appears that the melaleuca psyllid has only been collected from melaleuca and some of its very close relatives. This insect is uncommon in the field and its damage is difficult to detect. However, in the laboratory, where they are free from predators and parasites (as hopefully will be the case if they are released in Florida), populations of these psyllids build up rapidly. In our laboratory, these high psyllid populations result in the leaves on the melaleuca saplings

*Figure 3. Heavy infestations of the melaleuca psyllid in the laboratory have caused the death of many melaleuca saplings. The plant on the left was exposed to these psyllids for one month, while the plant on the right was protected from these psyllids.*

curling and withering. Ultimately, many of these plants die (Fig. 3). In our laboratory tests, melaleuca psyllids laid eggs on two thirds of the 42 plant varieties tested, but the young could only complete their life cycle on melaleuca and one of its close relatives. In March 1994, we requested permission to ship the melaleuca psyllid to the

Gainesville quarantine facility in Florida for final evaluation. It is hard to predict the amount of damage these psyllids will cause to melaleuca if they are released in Florida. Their effectiveness as a biological control agent will largely depend on the level of attack by Florida predators and parasites.

### Melaleuca Leaf-blotching Bug - *Eucerocoris suspectus*

Another insect which has been the focus of recent research is the melaleuca leaf-blotching bug, *Eucerocoris suspectus* (Hemiptera: Miridae). This small (approx. 1/3 inch adult) bug (Fig. 4) feeds on the sap of young leaves and fresh tips of melaleuca. It releases toxic saliva while feeding, which causes the death of the tissue around the

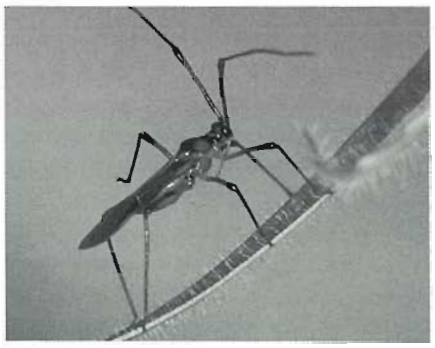

*Figure 4. An adult of the melaleuca leaf-blotching bug, Eucerocoris suspectus. Both the adults and juveniles feed on the sap of young leaves of melaleuca.*

point where feeding occurred. This results in a distinctive, brown blotch on the leaf (Fig. 5). Each bug will produce many such scars during a day. Leaves with more than several scars become distorted and may even drop prematurely. Unlike most other insects studied thus far, the adults, which feed in a similar manner to the juveniles, are more damaging to the plants. While never abundant, these bugs are the most widely distributed of any of our high priority insects, being found at the majority of our sites in northern and southern Queensland and in northern New South Wales.

In our laboratory tests, these bugs have fed upon a number of plant species, but melaleuca and its very close relatives are preferred. Our field evaluations, where a number of tree species within an area are searched for damage caused by these bugs, have been promising. Apart from one instance of minor feeding, damage has been restricted to *Melaleuca* spp. Further testing and field evaluations will continue this year, and if the results continue to be promising, we will request permission to import these bugs into Florida quarantine.

### Summary

During our surveys for potential biological control agents for melaleuca, we have collected over 550 herbivorous insects from this species and its close relatives. While none of these insects have yet been released against melaleuca in Florida, two (the weevil and the sawfly) have shown enough potential to be imported into quarantine for further testing. We are regularly sending shipments of these insects to quarantine to maintain adequate numbers of insects for use in laboratory testing. Two more, (the psyllid and the mirid) are, or will likely be, the subjects of requests for importation to quarantine. The current priorities for the ABCL are to continue the research upon these insects with the aim of getting both accepted into quarantine. In addition, quarantine studies of both the weevil and the sawfly, have resulted in many complementary new

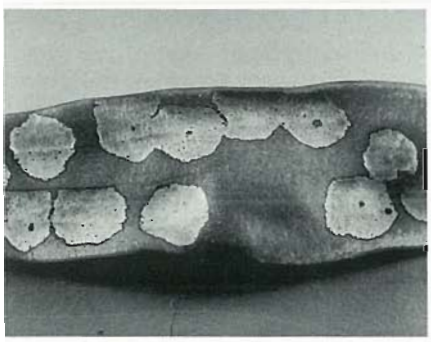

*Figure 5. The toxic saliva of the melaleuca leaf-blotching bug kills portions of leaves, leaving a distinctive, brown blotch scar. Severely damaged leaves become distorted and may drop prematurely.*

studies in Australia. In many cases, these questions can only be adequately answered by additional field observations in Australia.

Despite the potential shown by the four insects mentioned in this paper, more will likely be required to control melaleuca in Florida. Fortunately, there is no shortage of promising potential candidates. In fact, there are so many, that selecting one or more upon which to concentrate our research is not always easy. Our research into evaluating additional suitable candidates from the large number of insects remaining will be reported in the next issue of this magazine.

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# Diversity - Today's Challenge for the Commercial Applicator

by
Steven Weinsier
Aqua Jet Lake Services

Commercial applicators must provide a broad spectrum of services in order to compete in today's marketplace.

Planned urban developments are now designed to include a combination of residential, commercial, and "open space areas" which encompass lakes, drainage canals, mitigation areas, and aquascapes. Biological, recreational and aesthetic enhancements such as floating and architectural foundations, transitional zone plantings, and fish stocking additionally add to the complexity of waterway management programs. Agency requirements on water quality standards and environmental considerations, such as endangered species preservation, must receive special attention.

Because of these facts today's commercial applicator must be very flexible. Field technicians need to be knowledgeable in pesticide handling, weed identification, environmental and permit regulations. In addition, they must be able to recognize and adequately document other potential problems and exposures. In order to fulfill the needs of property owners and managers, the private sector applicators need the manpower and equipment to remove trash, pump organic sediments from lake bottoms, clear blocked culverts, plant and maintain wetland preserves and transitional zones, maintain irrigation intake systems, and provide guidance to community associations on controlling the environmental conditions surrounding waterways that affect water quality parameters.

Only a few companies in Florida have the ability to handle the multi-task needs required to satisfy all of the aspects of our industry. This has put stress on small aquatic weed control firms and has given the competitive edge to the larger, more financially able companies. Is this an indication that the small operator is doomed and that all contracts will eventually go the larger operations? Not necessarily.

In order to survive, small companies must utilize every opportunity for education, acquiring marketing and business acumen and coordinating efforts in cooperation with other professionals and agencies.

Local universities and research extension satellites provide an excellent source of information and continuing education. We are very fortunate, in south Florida, to have the University of Florida's IFAS Ft. Lauderdale Education and Research Center nearby. This facility provides valuable classes, information, and research for local industry.

The IFAS Center for Aquatic Plants in Gainesville houses a library full of knowledge that is easily accessible by fax and telephone. The Center is probably the best-known aquatic plant institution in the world.

In addition to maintaining a relationship with these sources of research and education, other opportunities exist for hands-on training. State agencies have auxiliary programs where training can be acquired for the investment of volunteer time. Both the Marine Patrol and the Florida Game and Fresh Water Fish Commission have Reserve Units. I am most familiar with the Game and Fresh Water Fish Commission's Everglades Region programs. These include working with wildlife and fisheries management biologists on projects such as the Urban Fishing Program, Everglades area burns and fish surveys, angler counts and levee surveys, and participation in senior and children's fishing events.

Other organizations that help the aquatic plant manager are the Florida Aquatic Plant Management Society, local lake management organizations, and the Aquatic Plant Management Society headquartered in Washington, D.C. Current research reviews and articles of interest can be found in the F.A.P.M.S. Aquatics Magazine and the Journal of Aquatic Plant Management, a publication of A.P.M.S. Both groups produce a newsletter and sponsor annual educational seminars.

Business and administrative guidance for small companies is provided by the Small Business Administration and S.C.O.R.E. (Service Corps of Retired Executives). At times, financial aid may be obtained through the S.B.A.

All of these resources must be utilized in meeting today's challenge of diversity for the private sector applicator. The ability to survive depends upon versatility. The ability to diversify depends upon training and education. The small commercial applicator of the 90's must take advantage of all avenues available - or find another career!

## *Letter* *Continued from page 3*

The acrid, permeating smell (stench?) of 2,4-D.

Nozzles, pumps, boats, motors, engines, and people that won't work.

Gnats

Eco-twits who get carried away while trying to further their own ideas as to how the world ought to be; and, in their zest, violating biological principles as well as the 4th, 7th and 9th amendments to the U.S. Constitution.

Wondering what our president has on her mind for next year's budget?

Wondering if she knows we're supposed to have a budget?

Wondering if anyone cares?

WILL MISS

The camaraderie of the troops.

APMS meetings.

Being on the water for the arrival of the Autumn's first cold (cool) front. It's still hot, but the humidity is lower, the air clearer; the palpable feeling of summer's broken grip on the throat of the world.

Hollering at and being hollered at by various peers (I still think I'm right).

Seeing the first flock of teal, the first cardinal flower, and the first goldenrod at the start of the fall season.

The cinnamon-silver lances of giant plume-grass glistening before a regiment of somber pines.

The Kelly-green of Spring's first cypress buds, clashing with the soft young-girl pastels of Spring, standing out like a painted lady at a church social.

A post-treatment inspection with targeted weeds controlled in a text book fashion.

Locating bream beds while doing plant surveys.

The first swallow of cold beer after a long hot day on the lake.

The cool breeze that usually comes along with a cloud shadow.

... Truth be known, I probably will miss a lot of things I wouldn't miss right now.

Joe Kight

# FWSS SCHOLARSHIP

The Florida Weed Science Society will award a $600.00 scholarship to a deserving Weed Science student at the 1995 Annual Meeting. Students who are majoring in a field of study with an emphasis on Weed Science are encouraged to apply. Interested students should contact:

Ken Langeland
IFAS CEnter for Aquatic Plants
7922 N.W. 71st Street
Gainesville, FL 32653-3071
904/394-9614

# Where Have All the Princes Gone?

by
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Tampa, FL 33620

The letters to the editor of *The New York Times Magazine* were witty, but curiously insensitive, following a benchmark article by Emily Yoffee (1992). She wrote that frogs first surfaced about 200 million years ago. Since then they survived the dinosaurs (and whatever wiped them out), and they survived glaciers (coming and going). But suddenly frogs are disappearing from apparently pristine areas, from remote areas (Baringa, 1990; Yoffee, 1992). These remarkable survivors are becoming extinct, in some cases just after some species have been discovered in remote areas (Table 1). It took a while for the serious letters to be written; the facetious ones came fast. One asked if there had been a concomitant increase in the number of princes accompanying the disappearance of frogs.

Alas, no. We don't care where the princes are, and we don't know where the frogs have gone. But the salvation of frogs and the control of hydrilla (Hydrilla verticillata Royle) may be related. Let's look at the pieces of the puzzle.

The first World Congress of Herpetology was held in Canterbury, England in 1989. At that time, a number of examples of frog disappearances appeared.

For example, Professor Jay M. Savage (Department of Biology, University of Miami) has studied the evolution and ecology of amphibians in Central America. He and a colleague discovered the golden toad (*Bufo periglenes*) in 1964 in the Monteverde Cloud Forest Preserve (Costa Rica). The males were a bright orange. The toads lived underground and would emerge for an annual breeding season at least up until 1988. That year instead of thousands of adult males at the primary breeding site, only one was observed. From 1990 on, none have been seen.

Yoffe's (1992) article cited several other examples of frog and toad disappearances, most starting in the 1980s, with examples from around the world (Table 1). The disappearance suggests (to some) that these amphibians may be indicator organisms, that they are responding to changes in the environment that higher organisms may not be detecting yet. "Almost one-third of North America's 86 species of frogs and toads appear to be in trouble (Yoffee, 1992)." This is a quotation that gives one pause.

Several possible explanations for the disappearance have been advanced. Over-collecting was suggested but eliminated as an explanation for the disappearance of the gastric brooding frog. So were such explanations as pollution by

**Table 1. What has happened to the frogs and toads (Baringa, 1990; Yoffee, 1992)?**

| Species | Problem |
|---|---|
| *Bufo canorus* | Disappearing from Yosemite habitat |
| *Bufo boreas* (western toad) | Immune system collapsed inexplicably became victims of opportunistic infections in Colorado and elsewhere. |
| *Bufo periglenes* (golden toad) | Discovered in 1964 in Puerto Rico, then disappeared in 1988-89. |
| *Rheobatrachus silus* Gastric breeding frog | Discovered in Australia in 1974, now presumed extinct |

gold miners or loggers, and drought. Obviously, the golden frogs were sought by collectors, but "illicit collection for sale as pets, which was a problem in the 1970s, was curbed before the decline began" (Baringa, 1990). A natural cause, like a once-in-a-century frost, was blamed for the decline of 30 species of frogs at Boracea, Brazil between 1979 and 1982 (Baringa, 1990).

One possibility raised is that the amphibians are sensitive to ultraviolet light and that the depletion of the ozone layer has allowed harmful wavelengths of ultraviolet light to affect some aspect of the amphibian's life. The explanation is flawed because there is no available evidence to prove that the decrease in ozone concentration in the atmosphere has been accompanied by a corresponding increase in ultraviolet (UV) radiation at the Earth's surface. The effect of UV radiation could be subtle.

Specifically, some believe that UV-B, the middle portion of the ultraviolet spectrum, is particularly dangerous. Blaustein (1994) noted that UV-B radiation can cause sunburn in humans, as well as skin cancer and may weaken the immune system.

Blaustein (1994) documented a link between UV-B exposure and egg mortality of Cascade frogs in Oregon. The basis of that link is uncertain. So is the possibility that an explanation based upon UV-B exposure is a universal one for wide spread frog mortalities (Blaustein, 1994). But the link is an interesting one.

With that idea in mind, some scientists have advocated adding tannins to lakes so that these brown colored materials will absorb ultraviolet radiation. The popular press indicates that the idea has met with some misunderstanding. One scientist, in an effort to clarify what tannins were and their low level of toxicity, pointed out that tannins are part of the coloring matter of tea. This led to a predictable headline in a Canadian newspaper that scientists were proposing to add tea to lakes to protect frogs.

Frogs may well be the ideal early-warning bioassay organism. They move during their life cycles from water to land, they change from plant eaters to insect eaters. Their bodies are covered with permeable, delicate skin. Despite their long-term survival, they are delicate creatures.

The thought of using colored matter to absorb ultraviolet radiation and protect frogs is a reasonable one, but it may have fringe benefits in management of unwanted aquatic plants. Colored substances are involved in management of hydrilla. Aquashade® controls hydrilla by reducing the PAR light that the plant receives (Osborne, 1979; Spencer, 1984; Martin and Martin, 1992). Past research has indicated that colored lakes may be less susceptible to proliferation by hydrilla (Dooris and Martin, 1993).

More recently, we have found that treated Kraft black liquor inhibits the growth of hydrilla in the

laboratory (Hassell et al., 1994). Kraft black liquor is material obtained as a by-product from the treatment of wood pulp with an aqueous mixture of sodium hydroxide/sodium sulfide (McKean,1980). The crude material probably contains a complex mixture of lignins and their degradation products. The method of treatment is indicated (Fig 1). The material thus treated (10% black liquor) does not have any BOD. It does contain substantial amounts of organic carbon (28,900 ppm) and is intensely colored. The trace metal content is low. Other workers were unable to detect lead in the sample. We used the 1:10 dilution, then diluted it further (1:50, Hassell et al., 1994), and found that hydrilla growth was seriously inhibited.

We have not studied the effect of this material on amphibians, but it seems like a reasonable project.

In addition, it would seem to be worthwhile to study some of the intensely colored lakes of the Central and Southern part of Florida. While State agencies might be loath to fund a project to study more lakes after a thorough study of 30 (Hoyer and Canfield , 1990) or 60 (Canfield and Hoyer, 1992), nevertheless it seems worth considering. None of the lakes studied were south of Polk County (Canfield and Hoyer, 1992). The lakes we think should be studied for their hydrilla-inhibiting properties in south-central Florida may also be lakes where frogs thrive. The substances that color these lakes may be similar to treated Kraft black liquor. Makes more sense than treating lakes with tea.

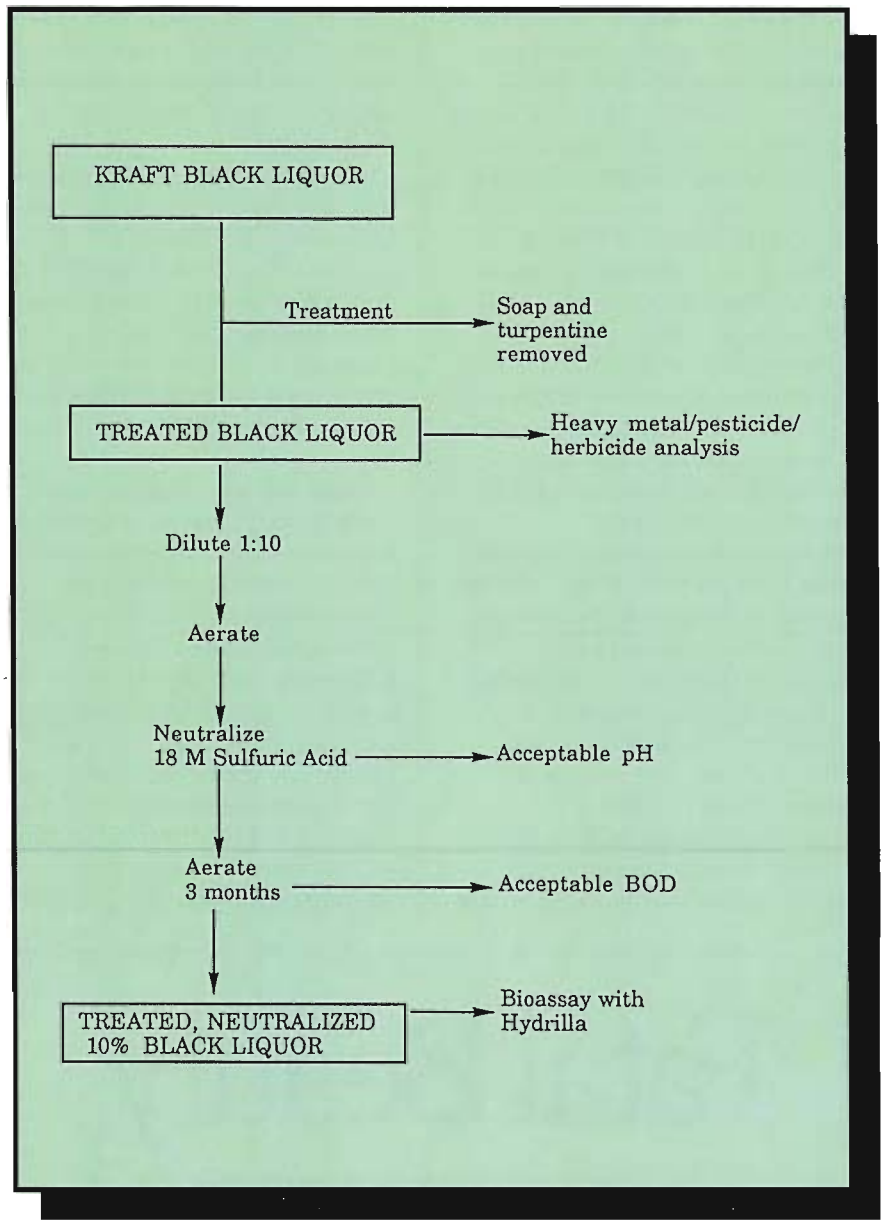


*Figure 1: Treatment of Kraft black liquor prior to dilution for hydrilla bioassay (from Hassell et al., 1994; used with permission).*

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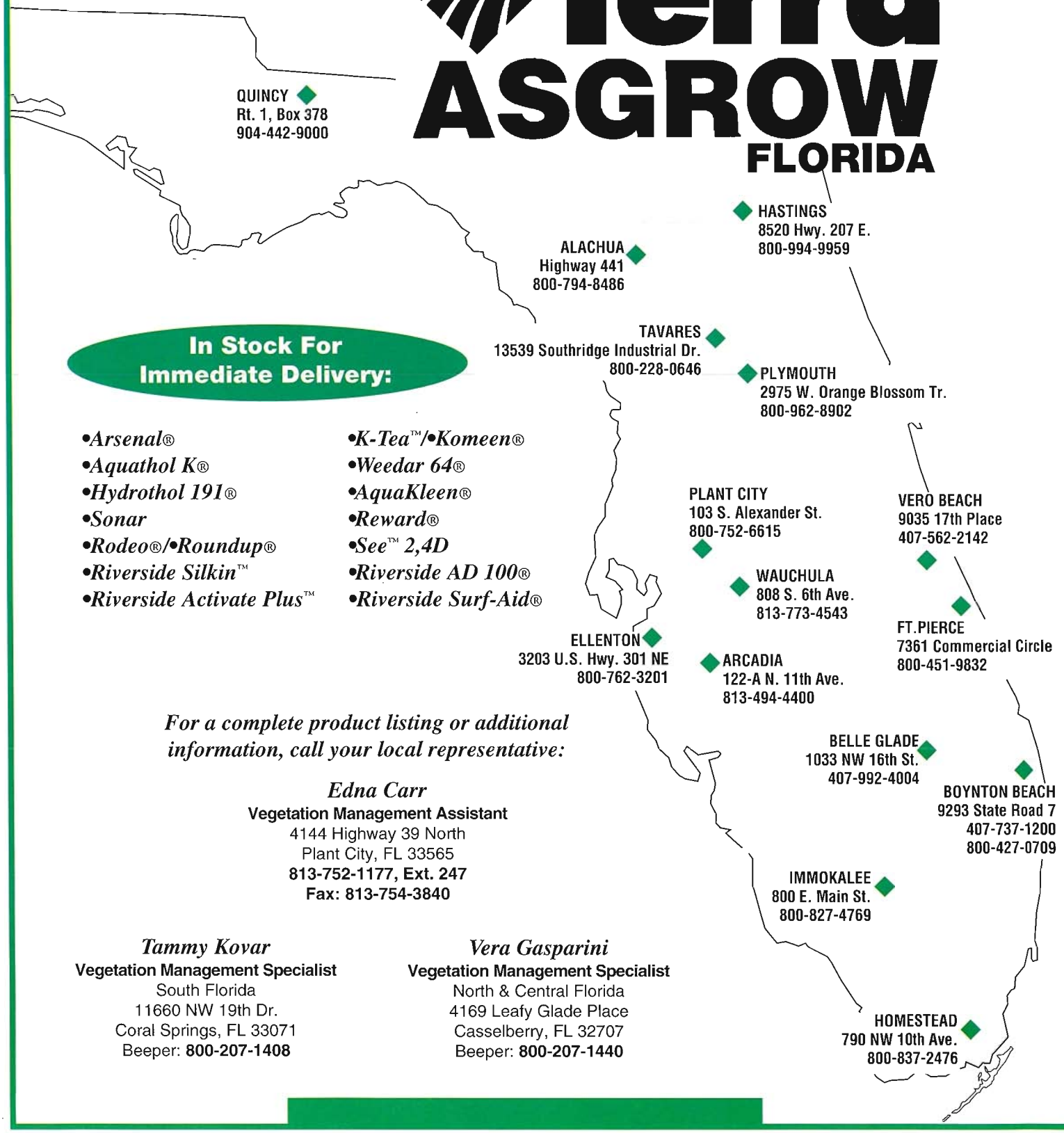


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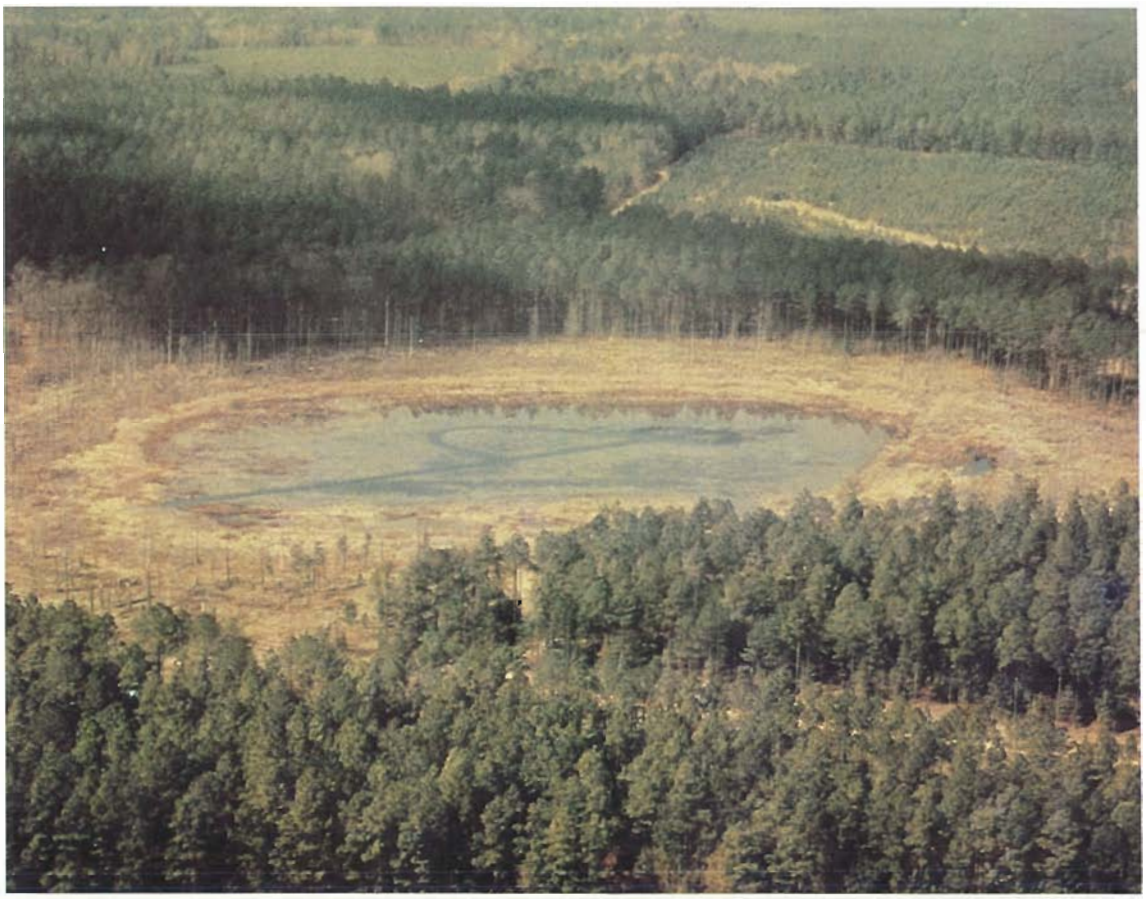
# The New Wetland Delineation Act— A Summary

by
David W. Hall, Debra Segal, Don Deis
KBN Engineering and Applied Sciences, Inc.



The new wetland delineation act became effective July 1, 1994. It will decrease the methodology for dredge and fill permits to two, which will include the U.S. Army Corps of Engineers (USACE) and the state of Florida. The intent of the new legislation, which will be the direct responsibility of the Florida Department of Environmental Protection (FDEP), is to approximate the combined jurisdictional lines now claimed by the FDEP and Water Management Districts (WMD). The methodology will be similar to current rules for the landward extent of wetlands. Under the new legislation, an applicant will be able to submit an aerial map based on limited ground truthing. This new legislation will open the door for technology which includes a global positioning system (GPS), and computer mapping and drawing programs (e.g., Auto Computer Aided Design (AUTOCADD) and Geographical Information System (GIS))

Other methodology that will be affected by the new rules includes:

DETERMINATION — The first step in determining the jurisdictional boundary of a wetland is comparing the wetland types to those listed in the rule, i.e., swamps, sloughs, wet prairies, etc. The actual wetland boundary of the wetland is determined by applying reasonable scientific judgement to evaluate all reliable information. Two methods can be used to evaluate vegetation: the "A" test and the "B" test. The "A" test dictates that the areal extent of obligate plants as listed in the vegetative index (a listing in the rule of the plants to be used for wetland determination) be greater than the areal extent of all upland plants in that stratum. In addition to the requirement for a percentage of obligate plants the "A" test requires that either: hydric soils or riverwash be present; the substrate be composed of non-soil, rock outcrop-soil complexes, disturbed soils which do

not exhibit hydric indicators but evidence indicates that they are hydric, or the substrate is within an artificially created wetland area; or at least one hydrologic indicator, as listed in the rule, be present.

The "B" test has the same substrate and hydrologic requirements, but the percentage of the areal extent of the plant stratum changes. The "B" test states that the areal extent of obligate and/or facultative wet plants (listed in the vegetative index), be equal to or greater than 80% of all the plants in that stratum exclusive of facultative plants.

The landward extent of wetlands does not include pine flatwoods and improved pastures, but does include other areas with undrained hydric soils and areas with hydrologic indicators as listed in this act. Areas with natural or man-induced altered vegetation or soils which can not be identified using the above methodology shall be delineated by using the most reliable available information, i.e. aerial photographs, remaining vegetation, authoritative site specific documents, or topographical consistencies. Permitted or legal nonpermitted activities shall not be regulated by this method.

Selection of and dominance within the appropriate vegetative stratum (canopy, subcanopy, or ground cover) is determined by the composition of the plants. The top stratum (canopy) shall be used to determine dominance, unless the canopy constitutes less than 10% areal extent, or unless a preponderance of evidence indicates that the canopy is not indicative of the hydrologic conditions. If the canopy is not appropriate, the stratum most indicative of on-site hydrologic conditions shall be used.

VEGETATIVE INDEX — an extensive vegetative index lists all species of plants considered obligate, facultative wet, and facultative for purposes of this act. Any species not listed, exclusive of vines, aquatics and subsequent introduced species, is considered upland. The use of all plants in this act is based solely on scientific names. Specific publications intended to resolve any dispute about nomenclature are cited in the act.

HYDRIC SOILS — Hydric soils are used in three different manners to delineate wetlands. First, a site is a wetland when wetland vegetation is present (using the A or B test described earlier) and one of the hydric soil indicators listed on the U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) approved hydric soil indicators for Florida is present. Second, a site is a wetland when one of 13 hydrologic indicators is present and one of the hydric soil indicators listed on the USDA-SCS approved hydric soil indicators for Florida is present. And third, when wetland vegetation is absent and hydrologic indicators are absent, and the soil is undrained,

then one of the following criteria must be met for the site to be classified as a wetland: certain soils classified according to United States Department of Agriculture's Keys to Soil Taxonomy; saline sands as found in salt and tidal flats; and soils designated by the USDA-SCS as frequently flooded or depressional, and which have been field verified using the USDA-SCS hydric soil indicators for Florida (see your local Soil Conservation Service office for information on all referenced soil publications).

HYDROLOGY — Hydrology of a jurisdictional wetland site must be indicative of long-term or periodic inundation or saturation. Inundation must occur for at least 7 consecutive days and saturation must occur for at least 20 consecutive days. Hydrologic records or site specific hydrologic data (13 indicators are listed in the act) must be of such a duration frequency, and accuracy to demonstrate these frequencies. When these records or data are not available an agreed upon site-specific field-verified analytic or numerical model may be used to demonstrate the conditions. Any data deemed inadequate shall be reviewed by the agency and a specific analysis will be provided to the applicant.

SURFACE WATERS — The landward extent of Florida surface waters is to be the more landward extent of wetlands as determined by the methodology in this legislation. The landward extent of tidal waters is determined by the mean high water line elevation, non-tidal waters by the ordinary high water line, and artificial waters by the top of the bank or seasonal high water line. Exemptions are listed for certain works, impoundments, reservoirs, and other watercourses.

SUMMARY — The intent of this legislation is to simplify the permit process while providing the same protection to wetlands. The methodology for determining the landward extent of Florida wetlands has been improved and is easier to interpret. Additions to the descriptions of soils and methodology for determination of hydrology are very helpful. Even though the intent of this act is to parallel current jurisdictional lines there will be some change because agency interpretations of the current rules vary somewhat. The new legislation averages the jurisdictional lines throughout the state and will result in some areas experiencing an increase in jurisdictional area and others a decrease.

Copies of the new rule can be obtained from your local office of the Florida Department of Environmental Protection.

# FAPMS Scholarship and Research Foundation, Inc.

by
Joseph C. Joyce
Foundation Secretary/Treasurer

At the recent FAPMS annual meeting, the attendees were asked how many of them knew or remembered William L. Maier, Jr. (Bill). Less than 40 of the 350 people in the room raised their hands. This was a surprise, but may have been expected, given the length of time since Bill's death, the large increase in new members, and the turnover within our profession. Given this response, it seems like a good time to reflect back on who Bill was, why the FAPMS Scholarship and Research Foundation was formed, how it is organized and managed, and how the money is distributed.

First, Bill Maier: Bill was a charter member in FAPMS, its President in 1981, the first editor of AQUATICS; an employee of the University of Florida at Ft. Lauderdale, the Florida Game and Fresh Water Fish Commission, the Department of Natural Resources, and finally Monsanto Corp.; but above all, a friend to us all. Bill loved life and loved to share it with his friends. Bill enjoyed his job most when he was helping or working with applicators in the field. Bill died on August 19, 1984 at the age of 35. In recognition of his commitment to helping applicators, the Foundation was established and allocates funds from its endowment to assist, encourage, and enable deserving graduate students and FAPMS applicator dependents to pursue a college education.

The FAPMS Scholarship and Research Foundation was incorporated in 1985 as a non-profit, tax exempt, charitable corporation. This has allowed the Foundation to accumulate a tax exempt endowment through the receipt of tax deductible contributions from the FAPMS, corporations and private individuals. The Foundation is a separate corporation from the FAPMS with the members of the Foundation being Past-Presidents of the FAPMS. The officers and Board of Directors of the Foundation are selected annually from the Foundation membership. The current officers are: President-Bill Haller; Vice President-Paul Myers; Secretary/Treasurer-Joe Joyce; and the Board of Directors-Brian Nelson, Dan Thayer and Ken Langeland. The annual meeting of the Foundation is held in October at the site of the FAPMS annual meeting and all FAPMS members are welcome to attend.

The Foundation offers two scholarships. The first is the Graduate Student Scholarship which is awarded in the fall of each year. This $500 scholarship is awarded to a graduate student enrolled at a Florida college or university, majoring in a field of study related to aquatics. The student is selected by the officers and directors of the Foundation, based on the student's grades, financial need, references and an essay on the benefits of aquatic plant management. Members of the Foundation or their dependents are not eligible to apply. The other scholarship, which was initiated in 1992, is the Applicator Dependent Scholarship. The eligibility criteria for this scholarship was developed by a joint committee of FAPMS and Foundation members. It was designed to be awarded to a child of a FAPMS applicator (mainly field personnel) who has been a member for three consecutive years. An applicator is defined as a member of FAPMS, whether a commercial applicator, public applicator, mechanical harvester operator, water sample collector, mower operator, insect collector, fish biologist or university scientist. The student must be enrolled as an undergraduate in the next academic year with no restrictions on the location of the college or area of study. The student is selected by a committee composed of three members of FAPMS appointed by the President of FAPMS and four members of the Foundation appointed by the President of the Foundation. The award is based on financial need and an essay on the most helpful or best course they have taken.

Beginning in 1995, the deadline for applications will be March 1st of each year. As with the graduate student scholarship, dependents of members of the Board of FAPMS or the Foundation are not eligible. Table 1 lists the past recipients of the $8,400 of scholarships that have been awarded since 1986. Additional information on the scholarships and application information can be obtained by contacting Dr. Joe Joyce or Bobbi Goodwin, c/o The Center for Aquatic Plants, 7922 NW 71st Street, Gainesville, FL 32653.

The current assets of the Foundation are about $41,000 and are invested in passbook savings and predominantly certificates of deposit. The philosophy of the Board has been to use the interest earned on the endowment to fund the annual scholarships. In this manner, the principal grows each year and thus the amount available for scholarships. This will generate about $4-5,000 per year and will allow the Foundation and FAPMS to have a major impact on the education of graduate students and applicator dependents. This was a vision that was formed out of respect and love for one of our Society's founders and leaders in our profession. Whether you knew Bill Maier, Jr. or not, you should be proud of what you have accomplished in his memory. So when you are asked to support the Foundation, use Bill's response: "No Problem."

**TABLE 1. PAST SCHOLARSHIP RECIPIENTS**

**GRADUATE STUDENTS**

| | | | |
|---|---|---|---|
| 1986 | Pam Botts | USF | $300 |
| 1987 | Chuck Hanlon | UF | $400 |
| 1988 | Mark Mossler | UF | $600 |
| 1989 | Tammera Lee | UF | $450 |
| 1989 | Elsie Gross | USF | $450 |
| 1990 | Greg McDonald | UF | $450 |
| 1990 | Brian Smith | UF | $450 |
| 1991 | Melanie Moon | UF | $400 |
| 1991 | John Chick | UF | $400 |
| 1992 | Marvin Boyer | UF | $500 |
| 1993 | Jeff Sowers | UF | $500 |
| 1994 | Mike Mumma | UF | $500 |

**APPLICATOR DEPENDENTS**

| | | |
|---|---|---|
| 1992 | Cameula Cope | $500 |
| 1992 | Jamie Weinsier | $500 |
| 1993 | Sally Ann McGill | $1,000 |
| 1994 | Sally Ann McGill | $1,000 |

# AQUAVINE

## 1994 FAPMS ANNUAL AWARDS

**Aquatic Plant Manager of the Year**
Lonnie Taylor - SWFWMD

**Best Applicator Paper**
Jerry Renney, Jr.
Applied Aquatics
Eagle Lake, FL

Plaques were presented to Charles Bedard and Johnnie Drew, Matthew Cole, Jan Frye, Andy Price, Arnold Milstein, Jesse Griffen, Earl Massie and Ken Gunter, who were photo-finish runners up.

**Photo-Contest**
Aquatic Scenes:
1st Place - Hans Meier, SFWMD
2nd Place - Boyde Thompson, GFC
3rd Place - Ernie Feller, SFWMD
Operations:
1st Place - Lloyd Mitchum, SFWMD
2nd Place - Ernie Feller, SFWMD
3rd Place - Ernie Feller, SFWMD

**Distinguished Service Award**
Richard Weber
Ron Morgan
SWFWMD, Brooksville, FL

**Plaques for Recognition of Service** awarded to:
Wendy Andrew - President
Wayne Jipsen - Treasurer
Don Dogget - Secretary

**Commercial Exhibit Award**
Aquatic Biomasters
Ron Niznick and Brian Jackson

**Best Resource Demonstration**
Information/expert system on the use of biocontrol for aquatic plant management.
Mike Grodowitz, USACE, WES, Vicksburg, MS.

**APMS Honorary Member**
Dan Gorman, after 38 years of service since 1961, was awarded Honorary Membership at the APMS Annual Meeting in San Antonio last July. Dan was not able to receive his award in San Antonio because of an injury and we had the honor of presenting it to him at the FAPMS banquet.

**Membership Drive**
Nancy Allen
USACE
Crystal River, FL

**Graduate Student Scholarship**
Mike Mumma
Department of Fisheries and Aquatic Sciences
IFAS, University of Florida

**Applicator Dependent Scholarship**
Sally Ann McGill

**Moonsuit Race Participants**
July Ludlow, Brian Nelson, Ken Langeland and Lonnie Taylor.
Lonnie won hands down!
(Editors note: This race was rigged, totally unfair, and the losers will demand a rematch in 1995.)

## IFAS CENTER FOR AQUATIC PLANTS

## AQUATIC PLANT MANAGEMENT RESEARCH REVIEW AND SHORT COURSE: "ISSUES IN AQUATICS"

## MARCH 7-8, 1995

Some of the topics we plan to discuss include:
Chemical sensitivity - what it is & how to accommodate those troubled with it
What about inert ingredients?
Understanding risk asessment.
Registration of new aquatic herbicides.
Who is Carlton Layne?
. . . . and a BBQ at the CAP

## MEETINGS

Southern Weed Science Society, Peabody Hotel, Memphis, TN. January 16-18, 1995. Contact: John Hardin 901/757-0799.

Weed Science Society of America, Sheriton Hotel, Seattle, WA. January 31- February 3, 1995. Contact: Robert Parker 509/786-2226.

Florida Weed Science Society, Tampa area-TBA, March 9-10, 1995 (tentative). Contact: Bill Stall 904/392-2134 ext. 207.

IFAS Research Review and Short Course. March 8-9, 1995. Contact: Bobbi Goodwin 904/392-9613.

## NEW BOOKS

*Handbook of Common Freshwater Fish in Florida Lakes* by M. V. Hoyer, and D. E. Canfield, Fisheries and Aquatic Sciences, IFAS, University of Florida. 1994. 177pp.: Each of 39 most common fish of Florida lakes is presented with a line drawing, a color photo, description, and information on distribution, biology, and biologists' comments. Statistics are presented for lake morphology, water chemistry, aquatic plants, population estimates, size, and weight associated with fish collections. An identification key for the 39 fish species is presented. Order IFAS # SP-160 from IFAS Publications, IFAS Bldg. 664, Gainesville, FL, 32611-0001, 904/392-1764.

*A Guide to Aquatic Plants, Identification and Management* by D. F. Fink, Minnesota Department of Natural Resources, St. Paul. 1994. 52 pp.: This guide contains identification and ecological information for 25 plants common to Minnesota lakes, outlines state laws and permitting of aquatic plant control in the state, and answers the most commonly asked questions about aquatic plant management. Order from Ecological Services Section, Minnesota Department of Natural Resources, 500 Lafayette Road, St. Paul, MN 55155-4025, 612/296-2835.

## MISCELLANY

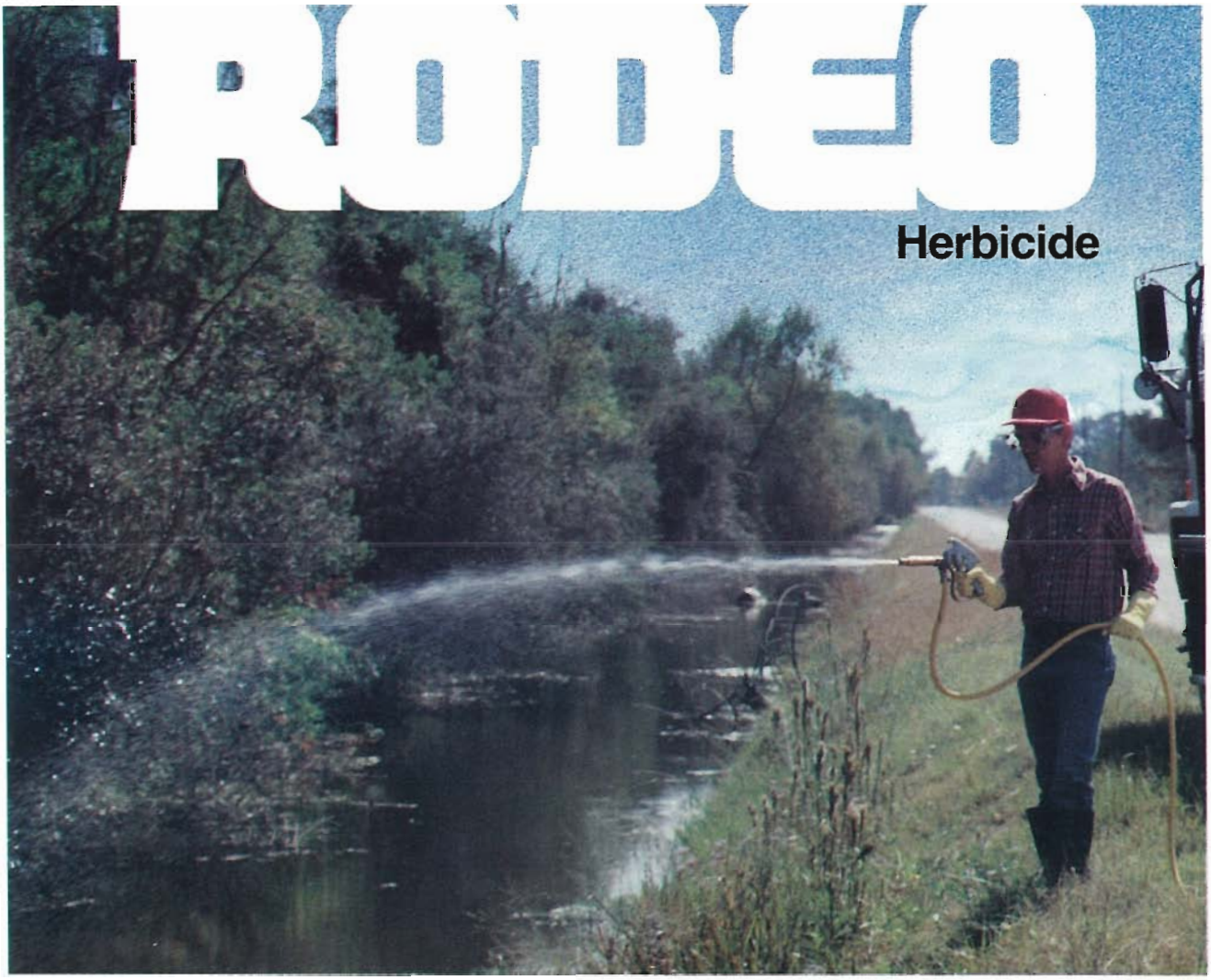
### 2,4-D Toxicology Literature Review

We still have a few 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.

### 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.

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

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