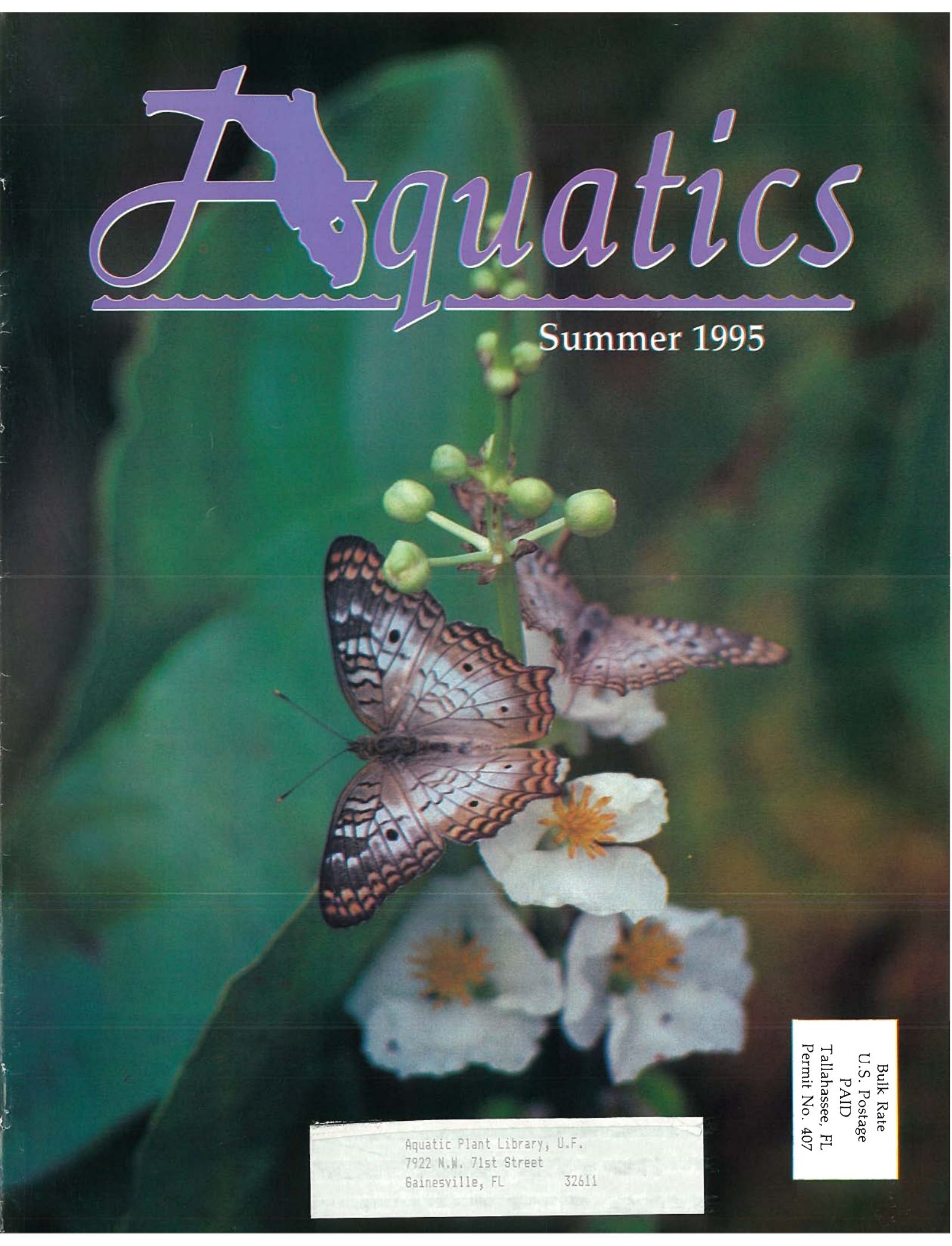

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Letter to the Editor

Now that my term is half over and the 1995 Legislative Session is complete, I would like to update all Florida Aquatic Plant Management Society (FAPMS) members on where we stand to date on acquiring additional funding for hydrilla control. First, I would like to thank the numerous members of FAPMS, various members of homeowners associations and all individuals who contributed endless hours to help gain additional funding for aquatic plant control through the legislative process. However, it is my duty to say that our efforts did not pay off this year in finding a dedicated funding source to control this problem. We did succeed in educating a large number of people about our situation with this nuisance exotic plant. Although, additional funding from the Gas Tax Trust Fund remains the most logical and fairest way to pay for hydrilla management this source will probably not be available. Paving Contractor's lobbyists and the Department of Transportation were responsible for killing any and all legislation with regards to using this funding source. Senator Malcolm E. Beard (Hillsborough County), Transportation Committee Chairman, kept every bill in his committee from being brought up for discussion. Senators Dantzler and Bronson fought hard for acquiring additional funding for aquatic plant control and we appreciate their efforts. On the House of Representatives side, Representative Harris fought for the extra monies; however, the same response was felt from the paving contractors lobbyists and the Transportation Committees. Since the Department of Environmental Protection was not allowed to lobby for these bills we essentially had no representation in Tallahassee and only our letters and phone calls were being heard. This valiant effort did not go unnoticed; however, it did not relate as significantly as if we would have had paid lobbyists on our side during the Session.

Your Society will continue it's efforts to gain a dedicated funding source for hydrilla control. Two town meetings were held this spring, and over 200 people and civic groups heard our call for help. We have now declared "WAR" on this issue, and we plan on holding two hydrilla workshops/field days this summer on Lake Hatchineha. Each field day will start at 10:00 am at Camp Mack (813-696-1108) on the old Kissimmee River between lakes Hatchineha and Kissimmee. The first field day will be on 28

Continued on page 21

White peacock butterflies on common arrowhead. Photo by David Sutton. Butterflies identified by Dr. Robert Pemberton.

Aquatics

Summer 1995/Vol. 17, No. 2

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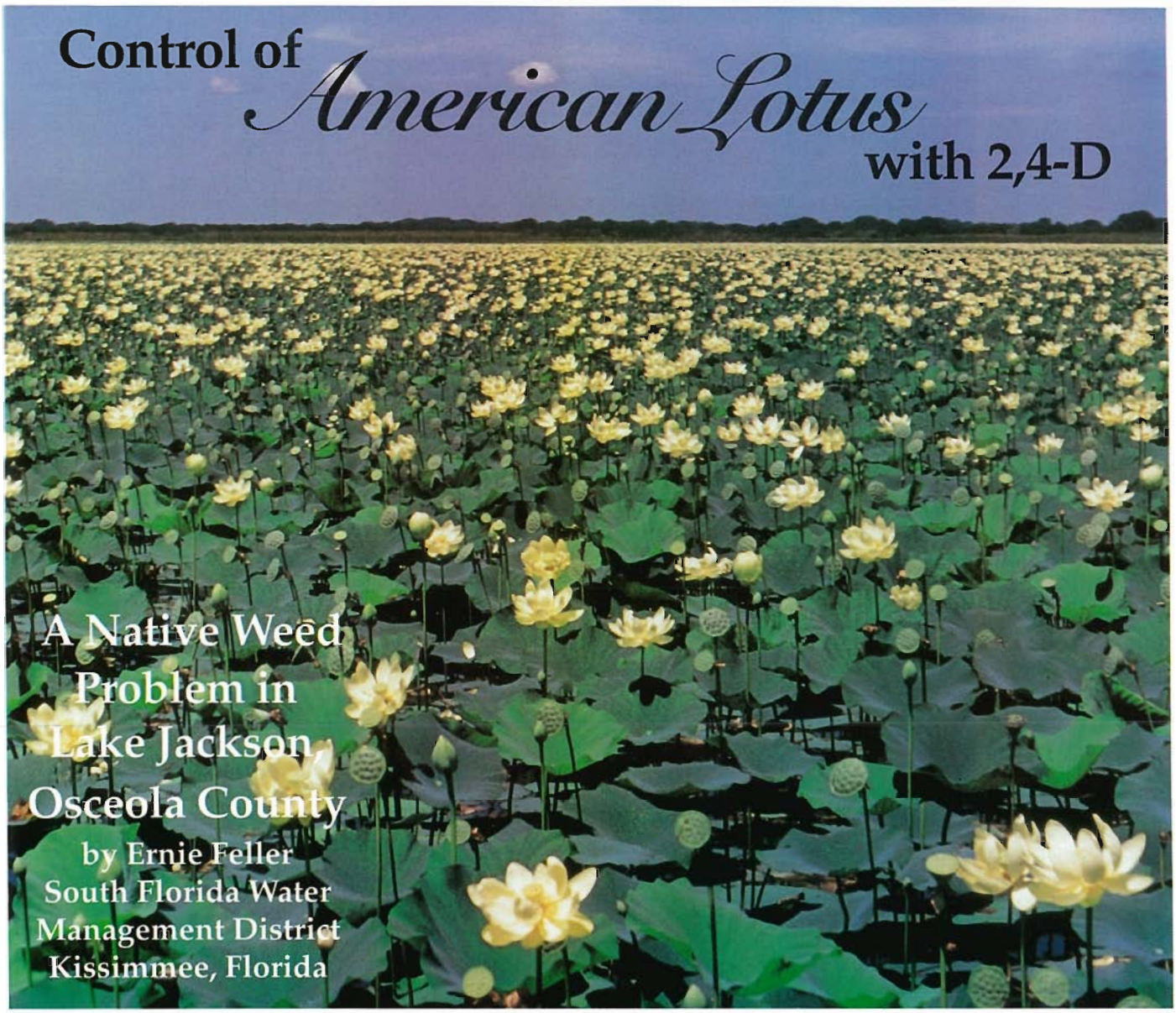
AQUATICS: Published quarterly as the official publication of the Florida Aquatic Plant Management Society Registration No. 1,579,647. This publication is intended to keep all interested parties informed on matters as they relate to aquatic plant management particularly in Florida. To become a member of FAPMS and receive the Society newsletter and Aquatics magazine, send $20.00 plus your mailing address to the Treasurer.

EDITORIAL: Address all correspondence regarding editorial matter to Ken Langeland *Aquatics* Magazine.

Control of *American Lotus* with 2,4-D



A Native Weed Problem in Lake Jackson, Osceola County

by Ernie Feller
South Florida Water Management District
Kissimmee, Florida

Introduction

Native macrophytes sometimes become as troublesome as the highly publicized exotic species, when managing aquatic ecosystems in a tropical climate. When necessity dictates the control of native plants, adequate information regarding their control may not be available. This dilemma transforms a straight-forward plant management exercise into a complex, labor intensive, research effort. But, valuable information can be gathered in the process.

In February of 1994, Lake Jackson, a 413-hectare lake (located in southeastern Osceola County), was targeted for a major renovation. With fisheries in mind, the Kissimmee branch of the Florida Game and Freshwater Fish Commission (G.F.C.) conducted a lake drawdown of what were historically the most productive areas of this public water-body. After lowering the lake levels and exposing the lake bottom along these shorelines, they aimed to enhance fisheries habitat by removing the plant biomass that had accumulated over many years. Bulldozers, front-end loaders, trucks and other heavy machinery were used to scrape and remove this artificial barrier. The de-watering of this system had two dramatic effects. First, was the expected change in physical appearance by reducing the surface area from 413 ha to 303 ha. This was necessary to provide access for the various types of machinery required in the excavation of the detrital layer. The other effect which was somewhat unexpected was dynamic display of the on-going struggle for vegetative dominance in an aquatic environment. Due to the large circular leaves and the fragrant yellow flower of *Nelumbo lutea* (Willd.) Pers., (commonly referred to as American Lotus) it is hard to mistake the impact that this impressive native plant can have. Conditions were good for lotus in Lake Jackson as it covered 182 ha of the 303 ha remaining while this lake was drawn down. (See photo).

In April 1994, G.F.C. representatives to the Kissimmee Interagency Aquatic Plant Management Committee voiced concerns about the total dominance of the American lotus in Lake Jackson. It was agreed

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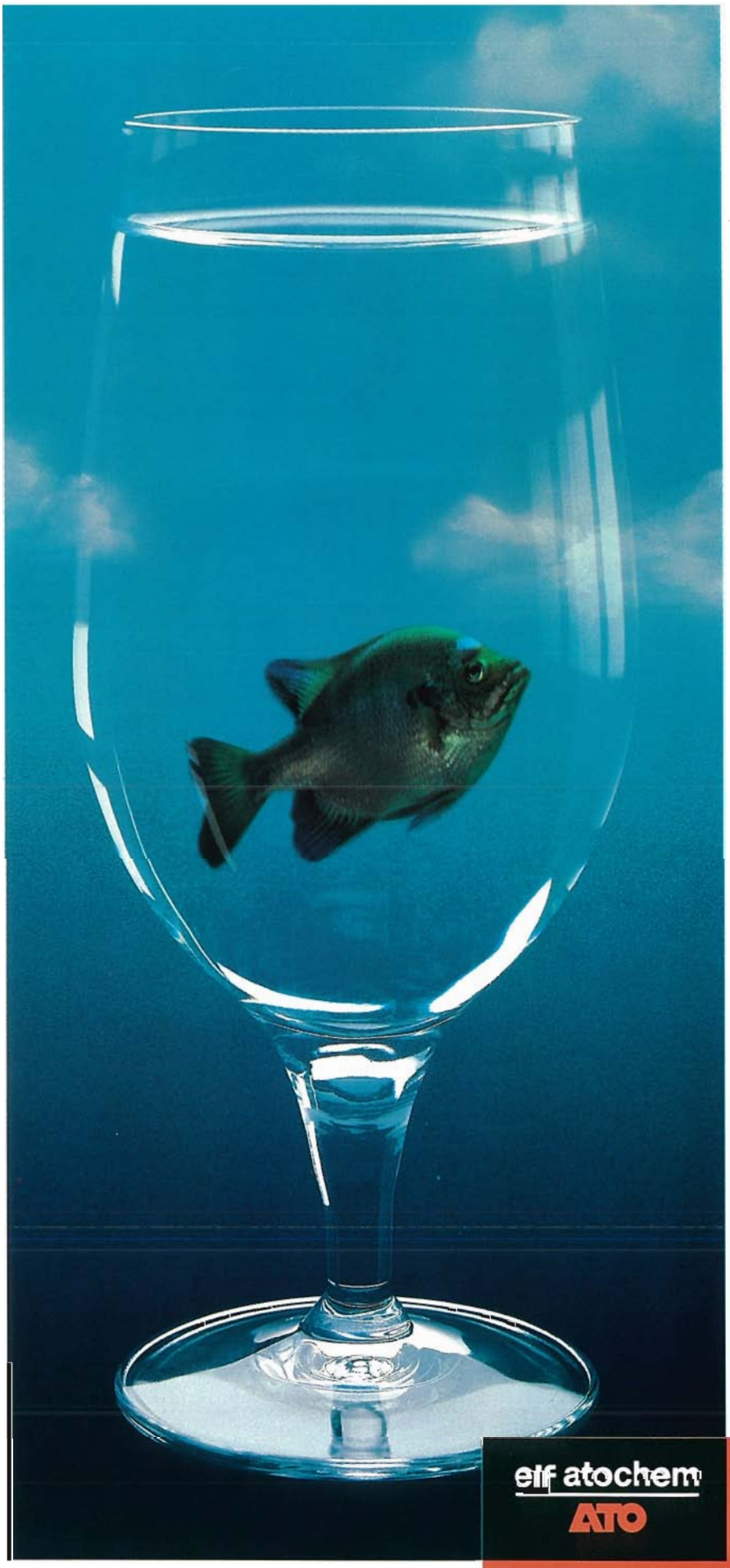

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that some attack should be mounted on the expanding lotus. Up to $40,000 in G.F.C. funds were available for expenses. The next question was, "What herbicide/rate is required to control this plant?"

Because of past experience with other broad-leaf plant control, our first response was the use of a 2,4-D application. 2,4-D is an inexpensive, systemic, broad-leaf herbicide that is approved for aquatic use. After checking with other experts in the field of aquatic plant management, we realized that no one had any recommendations of what it would take to do a large scale 2,4-D application on American lotus. The reason for this was that historically, when dealing with public waters, most vegetation managers spend most of their time working on the control of exotic plants such as; hydrilla, water hyacinths, and water lettuce. It is for this reason that there tends to be a void in the literature available for control of some native species.

In a further attempt to find literature that addressed the control of this plant, I contacted Karen Brown, Coordinator of Educational Media/Communication in the Information office at the University of Florida, Center for Aquatic Plants. Within a very short time she provided us with a thorough listing from the Aquatic Plant Information Retrieval System of all literature that the library had to offer regarding lotus. After narrowing this search down to "control" and the correct species, we had only two articles that gave vague references to control of *N. lutea* using 2,4-D. The first article was an information sheet issued by the Mississippi State University Cooperative Extension Service (Brunson un-dated). They recommended the control of *Nymphaea odorata* (commonly referred to as White Water-lily) and *N. lutea* by using: 2,4-D at four lbs per acre, plus eight ounces of "detergent" or 2,4-D granules at 80 to 120 lbs. per acre. The other publication was the September 1981 edition of "Aquatics" in which John Rodgers gave a thorough description of American lotus, *Nelumbo lutea* (Willd.) Pers. (Rodgers 1981). He referred to this native as; "one of the most aesthetic aquatic plants in the United States," and described its historical background, botanical references, plant description, reproductive capabilities and geographical distribution. His only reference to the control of this native was, "Occasionally, control of lotus with granular 2,4-D or dichlobenil is required in order to provide lake access or when a small pond becomes completely covered." Up to this point, our quest for control information had not revealed much information related to *N. lutea*, but it did offer the foundation for some sound field testing.

Preliminary work was done using different formulations of 2,4-D. Two 0.20 ha (0.5 ac) plots were laid out and herbicide applied at: 2.24 kg, 4.48 kg / ha (2.0 lbs and 4.0 lbs active ingredient (a.i.) / acre). At the time of the application it was decided that, since 2,4-D is formulated with its own surfactant, there was no need for any additional surfactant. When these first applications were visually inspected, there were no signs of significant control achieved. We re-evaluated the application method and concluded that because of the physical properties of lotus leaf, additional surfactant was needed. In order to test this, a third 0.20 ha plot was measured out and 4.48 kg / ha plus 200 ml (6 oz) of the surfactant Kinetic® were applied. This application was evaluated at the end of 30 days for a comparison to the two prior applications. In this situation, the addition of a surfactant did indeed make a visual difference in the control lotus.

Objectives

Four objectives were proposed to build upon the results of the initial tests: 1) to determine quantitatively what rate of 2,4-D best controls *N. lutea*, 2) to determine if the addition of surfactant makes a difference in the rate of active ingredient required for control, 3) to determine if the type of surfactant makes a difference in the quantity of 2,4-D required.

Method

Twenty-four 0.10 ha square plots were established along the eastern shoreline of Lake Jackson. In order to quantitatively evaluate the efficacy of the different herbicide rates and surfactant applications, three square sampling sites were randomly designated per plot and labeled a,b,and c. Each sample site was 4 m^2 in area and was defined by a square removable PVC frame. Leaf and flower stem counts began on day 0 by establishing two PVC poles on opposite corners of a quadrat. This was done to enable us to return to the exact areas on days 14, 30 and 60 for vegetative sampling (Figure 1). This technique, commonly referred to as pseudo-replication sampling, provided us with 72 sites within the herbicide plots. In addition, to indicate plant growth trends outside the treatment zone, six additional (4 m^2) control sites were randomly located around this vicinity. These control samples were located in various directions approximately 100 meters away from the actual herbicide applications. In order to eliminate some potential variability, the same airboat operator and herbicide applicator were used for the applications and leaf and flower stem counts were taken and documented by the same two people in all of the plots. When these plots were evaluated for live leaves, if any portion of the leaf or stem was any color other than brown it was recorded as live (i.e. green, yellow, red).

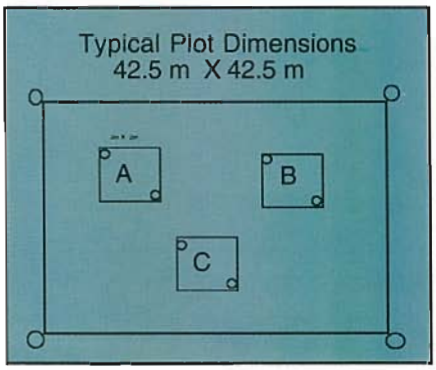
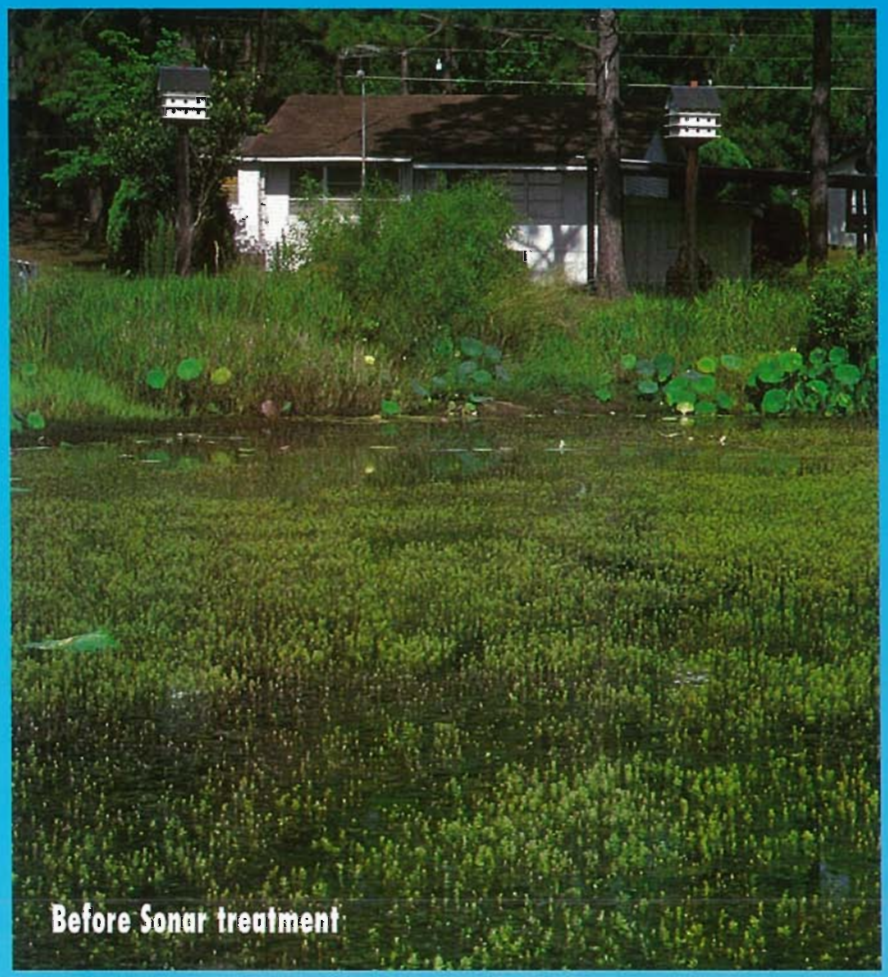
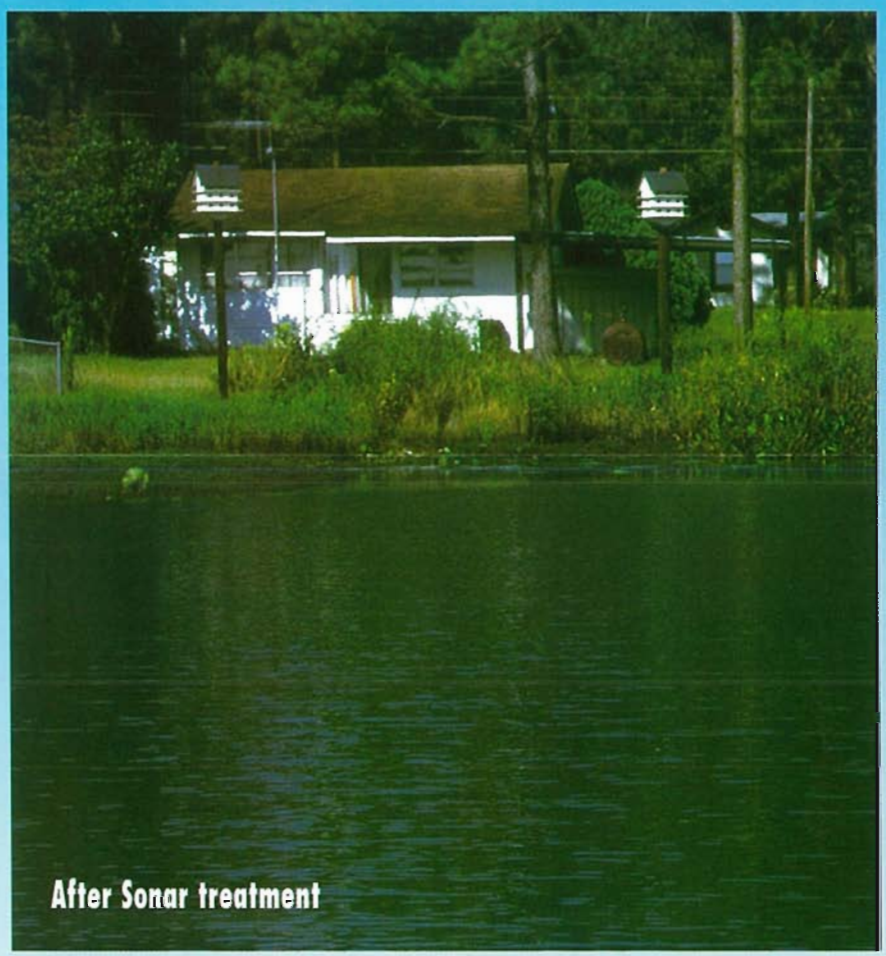


Figure 1

The first applications were conducted on May 5, 1994. An airboat equipped with a Hypro D-30 orifice injection system and vacuum boxes used water drawn directly from the lake. In addition, a peri-





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staltic metering pump unit plumbed to a 15 gallon cone tank with agitation was used to meter the precise spray-mix (surfactant, herbicide and water) per plot. This mixture was applied by hand-gun from the bow of the airboat.

Of the twenty-four applications, four surfactants were used in conjunction with 2,4-D at the following rates: 1.12 kg, 2.24 kg, 3.36 kg, and 4.48 kg a.i. / ha (1.0 lb, 2.0 lbs, 3.0 lbs, 4.0 lbs a.i. / acre). The four different surfactants used were: KINETIC®, BIG SUR® 90, INDUCE® and IVOD® at 118 ml / plot (4 oz). In addition, four plots were applied at: 1.12 kg, 2.24 kg, 3.36 kg, and 4.48 kg a.i. / ha with no surfactant and four plots were applied with granular 2,4-D at: 22.5 kg, 45 kg, 67.5 kg, and 90 kg / plot (50 lbs, 100 lbs, 150 lbs and 200 lbs/acre).

KINETIC® is a non-ionic organic silicon-based surfactant marketed by Helena Chemical Inc. BIG SUR® 90 is a non-ionic isopropanol, alkylarylpoly-oxethylene glycol-based spreader adjuvant marketed by Brewer International Inc. INDUCE® is a non-ionic surfactant marketed by Helena Chemical Inc. IVOD® is an invert oil marketed by Brewer International Inc. In this study IVOD® was used as a d-limonene emulsifiable surfactant instead of inverting the mixture.

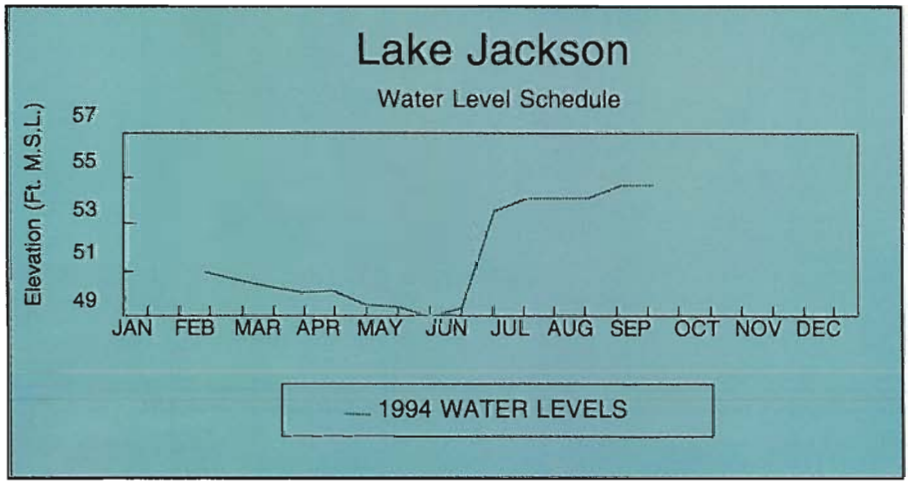

Figure 2

Results and Discussion

Two days after these herbicide/surfactant tests were applied, the summer rains began with four inches of rainfall recorded at the Lake Jackson boat ramp. Rainfall continued and within 30 days the elevation of the lake rose 4.5 feet (Figure 2). This increase in elevation prevented any further data collection from all 78 stations prior to the 60 day evaluation. The following conclusions were derived from 30 days of data.

During the study, the plants outside the application zone were actively growing. Stem and flower counts revealed an average increase of thirty-two percent in all of the control sites. There was a significant difference in control achieved when comparing applications with a surfactant to those without (Table 1). This difference was so evident that the plots could have been evaluated quantitatively or visually. 2,4-D and KINETIC® worked best on American lotus at all rates producing an *average* control rate of over 86 percent. Without surfactant the best control achieved was 38 percent at the *highest* rate of 2,4-D. In addition, the pellet formulation averaged only 50 percent control at its highest rate. Specifically, the best control of *N. lutea* was produced using 2,4-D at: 3.36 kg, or 4.48 kg a.i. / ha (3.0 lbs, 4.0 lbs a.i. / acre) and KINETIC® at 118 ml / plot (4.0 oz).

Although these test were limited to specific rates of 2,4-D and surfactants, results can differ due to uncontrollable variables. In fact, the conclusions of this study could have been quite different if this study had proceeded to the 60 days that were originally designated. According to T. Tsuchiya (1991), the mean leaf life span of Nelumbo sp. is 45 days for emergent leaves. Knowing the relative time it takes for this plant to grow through a cycle offers the possibility that other rates of herbicides/surfactants could have fared better or worse in the long-term, if the sudden rise in water elevation had not terminated data collection prematurely. Some applications that just burned the treated leaves may have had little impact in subsequent regrowth, while other herbicide/surfactant combinations might have prevented regrowth by killing the whole plant eventhough by 30 days some treated leaves were still dying. Shortly before all of the 30 day evaluations were performed, a preliminary conclusion was requested by the G.F.C. to perform their aerial application. With the data at hand, the recommendation of 2,4-D @ 4.48 kg a.i. / ha and KINETIC® @ 200 ml (6.0 oz.) was made. On June 16th & 17th the aerial application of 450 acres was applied for $17,000. This was a highly effective treatment with no lotus regrowth in this area for at least seven months. The rise in water levels may have aided the herbicide in preventing regrowth. To confirm this recommended treatment of 2,4-D at 3.36 kg or 4.48 kg and KINETIC® at 118 ml/ha, it would be useful to

Table 1. Control of American lotus with different rates of 2,4-D, in combination with different surfactants or as granules.

Rates	Kinetic®	Big Sur®	Ivod®	Induce®	None	Granules
1[1]	86[2]	74	41	40	14	23
2	81	79	73	73	15	44
3	90	84	74	76	38	50
4	89	85	53	78	38	45

[1] lb a.i./acre
[2] % reduction in live stems

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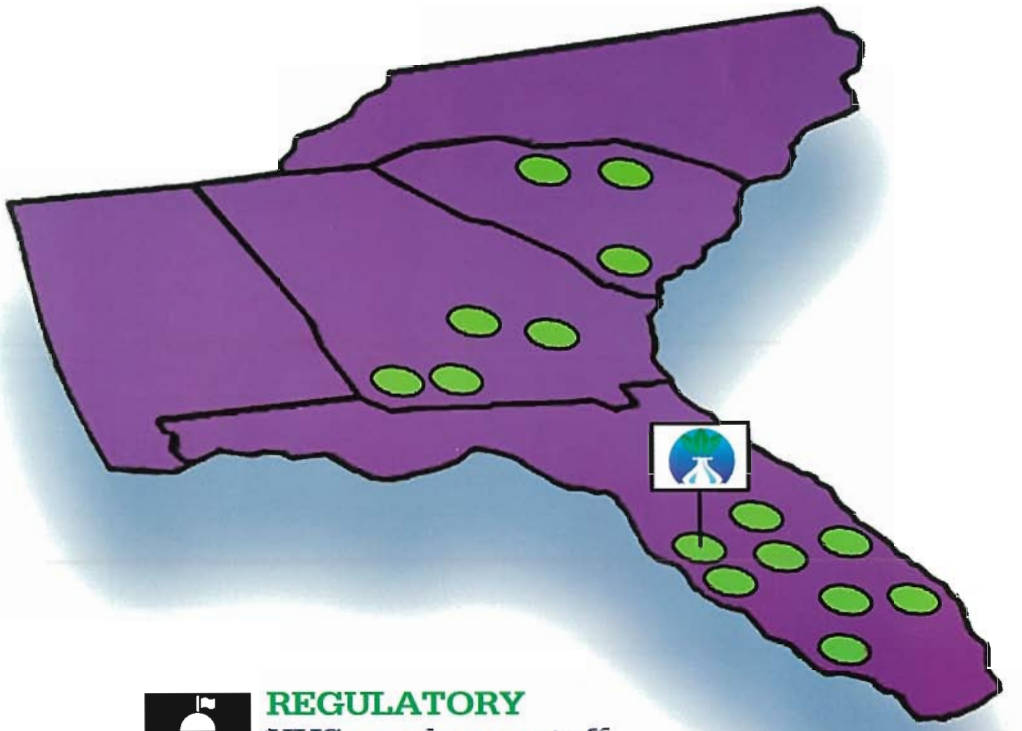

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Lotus Trivia

Did You Know.....

- *Nelumbo lutea* has over 35 common names.
- American Lotus can grow in waters up to 6-8 ft. deep
- The rhizomes and fruit of the plant are edible.
- After initial opening, flowers remain active for 2 days . . . opening early morning, closing at night.
- Seed heads contain between 12–30 developing fruit.
- Seeds have been known to remain viable for over 50 years.
- A single plant can extend reproductive runners up to 20 meters/ summer 7.6 cm / day.
- Range of American Lotus is the eastern half of the U.S., Cuba, Puerto Rico, and northern South America.
- Floating leaves provide excellent shade and shelter for invertebrates and game fish.

Trivia facts taken from "Aquatics" September 1981, The American Lotus by John A. Rodgers

repeat this study under condition with more stable water levels.

Acknowledgements

The author expresses many thanks to all the individuals that made this study possible. The input, support and hard work from many individuals within the South Florida Water Management District, Florida Freshwater Game and Fish Commission, U.S. Army Corp of Engineers, and the University of Florida, transformed this into an enjoyable learning experience. Go Gators!

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Les Bitting, First President of FAPMS Retires From OPWCD

by
David Sutton

Les Bitting, charter member and first President of the Florida Aquatic Plant Management Society, retired March 30, 1995 from the Old Plantation Water Control District (OPWCD). Les has worked with the OPWCD since 1962.

In a previous article in Aquatics (Sutton 1981) told of Les's dedicated effort in aquatic plant management. This article is an attempt to highlight briefly some of Les's other major accomplishments.

Les's father, Ben Bitting, moved his family from Nebraska to Hialeah, Florida in 1939. In the early 1940's, Les helped his father move cattle from Texas to the Peter's farm in South Dade, and then later in 1942 to the Plantation area where he took care of them (Burghard 1972). For a while, Les lived alone in a log cabin near where the Florida Turnpike runs.

Les is quoted as saying, "I was alone for a year with six saddle horses, a small house, a machinery shelter, the three hundred head of cattle and nothing else but sawgrass" (Burghard 1972). "During World War II, about where 88th Avenue is now, we found evidence of cattle rustling, but it never became serious. The big barn was built in 1944, then the major canal installed. The Old Plantation Drainage District was in existence and the present district was chartered in 1947." Incidentally, Les knew how to run a dragline, and dredged most the canals in the OPWCD that he was later to oversee.

"At the time of the '47 flood Les had been married six weeks. He and his wife tried to reach their new home, a building at time of flood, on East Acre Blvd., Fifty-Second Ave. In a small boat with an outboard motor they cruised the mile westward and floated through their driveway and looked into the kitchen window" (Burghard 1972). Les knew the importance of flood control.

With the drainage of the area, Les turned from cattleman to vegetable grower. He helped the Peters family produce vegetables in the 1950's. In 1958-59 he was the Assistant Chief of the City of Plantation Fire Department. Les has worn many hats over the years, but his interest in aquatic plant management is one of his greatest accomplishments.

Les worked tirelessly for improved methods to manage aquatic weeds. Knowing first hand the destruction that flooding by a major storm can cause, Les was always looking for ways to prevent the buildup of aquatic weeds so major flooding would not occur in the populated areas of South Florida. Les was instrumental in starting the Association of Special Districts.

We will sorely miss his keen wit and enthusiasm for aquatic plant management. Les, best wishes in retirement.

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Burghard, A. 1972. The Story of Frederick C. Peters. Tropical Press, Inc. Fort Lauderdale, FL 258 pp.

Sutton, D.L. 1981. Aquatics 3(4):12-13.

1995 FAPMS ANNUAL MEETING

The Florida Aquatic Plant Management Society will hold it's 1995 Annual Meeting at the St. Petersburg Hilton, which is located at 333 1st Street South, St. Petersburg. The Society has blocked 200 rooms on the evenings of October 16, 17, and 18. The contract rate for the rooms is $59.00 single or double pe night. The room block will be held until 30 days prior to the meeting, or until September 16, 1995. The hotel offers us a large parking lot next to the building for our equipment demonstration. St. Petersburg is a lovely town and the hotel is located on the bay very near to the municipal pier, so there will be shopping and restaurants close by. Meet in St. Pete!

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The Facts About Inerts

by
Lisa M.K. Drake
Manager, Communications
Monsanto's Agricultural Group

Anti-pesticide activists have stated that "inert" ingredients in pesticide formulations must be publicly labeled and disclosed for three reasons: 1) End users have a right to know what every ingredient is in a formulation so they can make personal choices about use of that product, 2) No testing is done on inerts and sometimes they are more dangerous than the active ingredient, and 3) health care professionals don't have necessary information on inerts to reliably treat exposure to pesticides.

Local activists have planted in the media this inaccurate and inflammatory information obtained from environmental groups such as Northwest Coalition for Alternatives to Pesticides. Those tactics are unwarranted in view of the information already available to people — especially about Monsanto products.

Here are the facts:

Inventing the active ingredient in a herbicide is only the beginning of the development of an effective product. Chemists must also develop a commercial formulation that is stable, effective and easy to use. The product must pose no unacceptable risk to users or the environment. A formulated herbicide that clogs application equipment or is difficult to apply will not be popular, no matter how well it works on weeds. And some active ingredients will have little effect if they can't adhere to a plant's surface. Also herbicides will not be acceptable if they deteriorate during storage.

Creating products that meet those standards is the art of the formulator, and it takes years to develop, evaluate and test those formulations in development. That's why companies are protective about their formulas—whether they are shampoos, soft drinks, cleaning agents or herbicides—to discourage disclosure of competitive information. Monsanto's Roundup herbicide is the world's biggest-selling herbicide. It stands to reason we would want to protect our formula from getting in the hands of competitors.

The inert ingredients in a herbicide formulation are subject to regulations enforced by the U.S. Environmental Protection Agency. The agency maintains a list of approved inerts, ranging from water to clay to solvents. Manufacturers who want to use an ingredient not on the list must first have the ingredient approved.

New inerts undergo tests including oral and dermal toxicology, genemutation and birth defect studies. They also are tested for bird and fish toxicity and for environmental fate questions such as soil breakdown, photodegradation and hydrolysis. Every pesticide formulation is fully subject to a number of rigorous, acute toxicological tests. This is important to note because potential exposure to applicators and others comes from the FULL

formulation, not from one ingredient in a formulation. Therefore, the EPA requires that companies test not only the active, but inert ingreditents and the full formulation prior to registration of the compound.

However, and more compelling, it is incumbent on industry to make sure it responsibly and accurately supplies complete information about its products to medical authorities in such a way that a medical protocol can be followed in the event of an exposure or poisoning. Monsanto itself provides a call-collect number (1-314-694-4000) that allows any caller to contact Cardinal Glennon Regional Poison Control Center. That center and its medical personnel are well-versed in knowledge about glyphosate and related formulations such as Rodeo and Roundup herbicides, and also know what inerts are present in each formulation. They are trained to deal quickly and effectively with both public citizens and physicians who call for more information on our products.

Secondly, Monsanto is a member of the American Crop Protection Association (formerly NACA), which is aware of the questions regarding inerts. NACA has taken responsibility to make sure that people who need to know information about pesticide products can readily access a data base that will provide independently designed treatment protocols, including any details relevant to inert ingredients, through a voluntary service called MedTIP, or Medical Treatment Information Program. MedTIP would make treatment related information tailored to the entire product formulation including inert ingredients in all pesticide formulations available to poison control centers in the United States. Again, Monsanto already provides this service through its call-collect number. MedTIP is a voluntary program of ACPA, operated through a Micromedex database.

Lastly, Monsanto has voluntarily provided publicly and to regulatory agencies for the past three years backgrounders on Roundup and Rodeo herbicides with the full list of ingredients—including inerts—within the formulation. We provide the backgrounder to anyone who asks in an effort to be responsive to public concern.

One final note: our philosophy is to always follow up with those who need information about one of our products. We place our physicians in touch with the physicians who are treating possible exposure cases. We take responsibility because we believe the value to our products lies not in just providing great weed control but offering services that aremedically responsible, rational and supportive of our customers.

Call for Papers - FAPMS 1995 Annual Meeting

October 17-19, 1995 are the dates. The St. Petersburg Hilton, St. Petersburg is the place. And NOW is the time to submit your paper for the 19th Annual FAPMS Meeting.

NOTE: Earlier than usual the DEADLINE FOR SUBMISSION IS JULY 10, 1995

Title: _____

_____

_____

Author(s): _____

_____

_____

Organization: _____

_____

Address: _____

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Telephone: _____

Fax: _____

Abstract (75 words or less, to aid the program committee):

_____

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Check as appropriate:
Applicator paper _____
You need: Slide projector _____ ;
Overhead projector _____ ;
video projector _____.

Submit this form to:
Alison Fox – 1995 Program Chair
Center for Aquatic Plants
7922 NW 71st Street,
Gainesville, FL 32606
Tel: (904) 392 1808;
Fax: (904) 392 1840

1995 FAPMS APPLICATOR PAPER COMPETITION

If YOUR job is in aquatic plant management and you work out in the field (whether on a spray crew, a harvester, a mitigation team, or as a general technician), WE would like to hear from you at the 19th Annual FAPMS Meeting. By entering the Applicator Paper Contest you will receive a plaque of appreciation for your efforts, and if you are judged to have made the best presentation you will return home with a $100 prize. Make sure that you indicate your applicator status when returning the Paper Submission Form and include the names of all authors who need to be acknowledged in the program and on your plaque.

If you need some guidance in preparing your presentation, the paper by Alison Fox, "Handy Hints on How (and How Not) to Give a Talk" in the June 1991 issue of *Aquatics* may help. If you need a copy of this article contact the Center for Aquatic Plants at 904/392-9613 (SC 622-9613). Alternatively, think about whose presentations you have enjoyed in the past and, don't be shy, ask them for advice. They will probably be very flattered and will offer all sorts of help!

Any topic that relates to aquatic plant management and which is interesting to you, will probably be interesting to your fellow FAPMS members. Better methods and equipment for doing what you do; special situations with which you have had to deal (the good and the bad!); the natural history of plants and animals that you see at work; your success stories about how you relate to the public, improve safety, increase efficiency, test new techniques and products; all these topics and many, many more are ideal for our meeting. So submit a title, get out the camera and notebook, and plan to be part of the program in October. It is YOUR annual meeting, so join in the fun!

Insects to Control Melaleuca II: Prospects for Additional Agents From Australia

by
Joseph K. Balciunas, Damien W. Burrows and Matthew F. Purcell
USDA-Australian Biological Control Laboratory,
James Cook University, 4811.
Townsville, Australia

Introduction

In the Winter 1994 issue of Aquatics magazine (Balciunas et al. 1994), we described the status of the searches in Australia for biological control agents for melaleuca (*Melaleuca quinquenervia*), that relentless invader of south Florida. In that article we reviewed the status of four insects: the melaleuca leaf weevil, *Oxyops vitiosa* and the melaleuca defoliating sawfly, *Lophyrotoma zonalis*, which are both currently being studied in Florida quarantine; the melaleuca psyllid, *Boreioglycaspis melaleucae*, for whom importation into quarantine has been requested; and the melaleuca leaf-blotching bug, *Eucerocoris suspectus*, whose request for importation into quarantine should be prepared early in 1995. In this article, we will briefly discuss additional insect species that we have collected and studied which have shown some biocontrol potential and warrant further research.

Need for Additional Agents

Melaleuca is a large tree and there are millions of them in Florida, in a variety different habitats. This makes it likely that an array of insect species will probably need to be released and established before adequate control is achieved. Most biocontrol scientists would not disagree that at least 6-10 insect species will need to be established before adequate control is achieved. That many safe insects

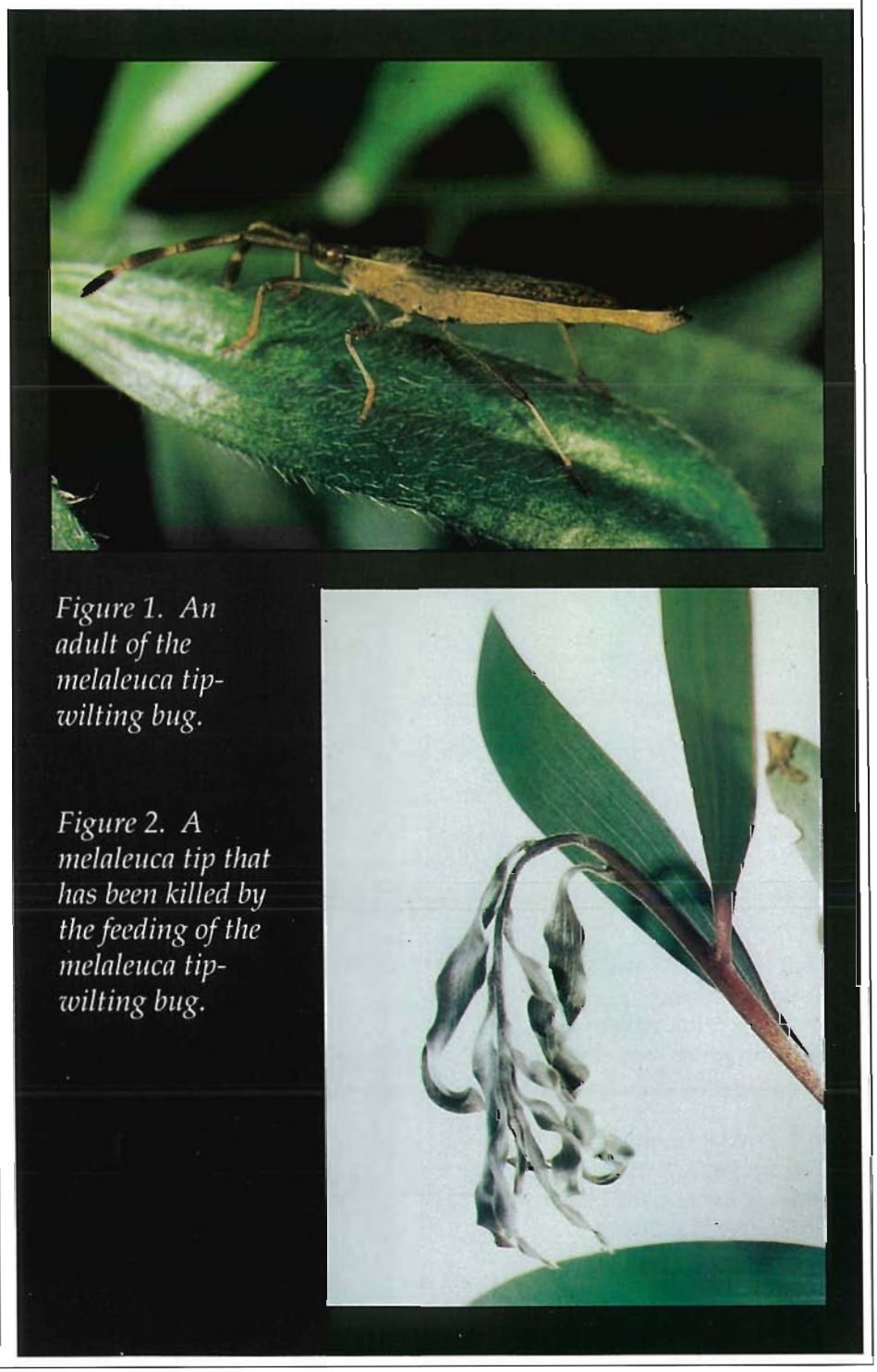

Figure 1. An adult of the melaleuca tip-wilting bug.

Figure 2. A melaleuca tip that has been killed by the feeding of the melaleuca tip-wilting bug.

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should be available in Australia. During this project, we have collected over 450 herbivorous insect species on *M. quinquenervia* in Australia, and an additional 100 insect species on six closely related *Melaleuca* species. We believe that many of these insects may have some biocontrol potential, but have not yet sufficiently studied them for importation into quarantine. Some of these insects will be discussed below.

Some Additional Potential Biological Control Agents

The medium-sized (approx. 1/2 inch adult), melaleuca tip-wilting bug, *Pomponatius typicus* (Hemiptera: Coreidae) (Fig. 1), feeds by sucking sap from a young, fresh, branch tip. Both the adults and the juveniles feed in the same manner. While feeding, they inject toxic saliva which causes the tip to wilt and die (Fig. 2). Tips on the upper portions of saplings are preferred, thus limiting vertical growth of the plant. This insect was one of the two insects to which we attributed the restriction of melaleuca sapling growth which we observed in our herbivore exclusion experiment (Balciunas and Burrows 1993). Unfortunately, this bug also commonly feeds and breeds upon the bottlebrush, *Callistemon viminalis*, an Australian native which is used as an ornamental plant in Florida. The importance of incidental damage to ornamental bottlebrushes in Florida should be resolved before this bug (and other potential insect biocontrol agents which also feed upon bottlebrushes) is sent to quarantine for final evaluation.

Galls are abnormal growths of plant tissue formed by the plant in response to the actions (usually feeding) of organisms such as insects and mites. Galls may be formed on any part of a plant and although their size and shape varies greatly, they usually result in an enlargement of the affected area. Galls can be characterized by their shape or form and what part of the plant they affect. A few gall-formers have been effective biological control agents against other weeds, including Australian *Acacia* trees in South Africa. We have noted a large variety of galls on melaleuca trees in Australia. It was frequently difficult to determine what had caused these galls to form. Many galls are empty, contain only parasites, or insects which use the "old" gall as shelter. In 1992, we were able to employ a full-time entomologist to begin research on these insects. However, lack of sufficient funds resulted in the suspension of this line of research early in 1993. Nevertheless, we have been able to identify at least nine different gall types on melaleuca in Australia, some of which become quite abundant at certain times of the year. However, little is known of the biology of the gall-formers, and their taxonomy is difficult. Opportunistically, we continue to study one of these galls, the fleshy-tip galls (Fig. 3), caused by *Fergusonina* sp. (Diptera: Fergusoninidae) flies in association with nematodes from the genus *Fergusobia*. These galls (about 3/4 inch long) form on young tips and flower buds, thus restricting or preventing branch growth and flower formation. The egg to adult stage takes at least six weeks, and each juvenile occupies a separate chamber within the gall. Up to 25 adult flies have emerged from a single gall. On one tree we examined, 23% of the young tips had these galls forming on them. The most common gall are the pea galls. These galls occur on leaves and are round in shape. Many of these galls may occur on one leaf, causing it to become distorted. These galls are caused by the larvae of a

Figure 3. A fleshy-tip gall caused by the Fergusonina fly. These galls form on both leaf and flower buds, restricting or preventing flowering and branch growth.

NEW AQUATIC PLANT MANAGEMENT PERMIT RULES

Amendments to Chapter 62C-20, F.A.C. (formerly 16C-20, F.A.C.), Aquatic Plant Management Permit Rules, are important to anyone who conducts aquatic plant management in Florida. The Chapter number changed as a result of the merger of the Departments of Natural Resources and Environmental Regulation into the new Department of Environmental Protection. The Division of Administrative Hearings and the First District Court of Appeals have ruled on challenges to the rule and it is now available in final form. Additional information and copies of the rule can be obtained by contacting Bureau of Aquatic Plants Regional Offices in Tallahassee (904/487-2600), Lake City (904/758-0464), Floral City (904/726-8622), Tampa (813/744-6193), Orlando (407/275-4004), Bartow (813/534-7074), West Palm Beach (407/791-4720), or the Bureau's administrative office (904/488-5631).

cecidomyiid fly, a common gall-forming group of insects. We have had difficulty colonizing this fly, but hope to investigate it further sometime in the future.

In Australia, we have reared over 130 moth species from melaleuca, most of which feed on leaves. Some of these may have biocontrol potential. Among the more promising are: tube-dwelling, leaf-feeding *Epipaschia* sp. B (Pyralidae), leaf-mining *?Acrocercops* sp. (Gracillariidae) and leaf-feeding *Careades plana* (Noctuidae). Like other moth species, it is the juvenile stage, the caterpillar, that feeds upon the plant. *Epipaschia* caterpillars live in small colonies inside a system of tubes (Fig. 4). These tube systems (up to 6 inches long) bind several small branches together, which are then defoliated by the caterpillars. Preliminary laboratory feeding tests of these melaleuca tube moths have not been promising. However, field observations suggest that in nature, they are probably far more host-specific. Thus far, in the field, we have only observed their conspicuous tube systems on *Melaleuca* species. The tiny larvae of the melaleuca leaf blister moth, *?Acrocercops* sp., form "blister" mines within melaleuca leaves. Their feeding activities separate the cuticle (outer protective layer) from the rest of the leaf, thus producing a characteristic "blister" which eventually covers a large portion of the leaf (Fig. 5). These moths are rare in the field, thus difficult to study. Early in 1994, they were common on seedlings placed outside of our shadehouse, and it could be that they prefer this size class, which is uncommon in the field. A 1993 survey of their occurrence on three dozen tree species in our Townsville shadehouse found these "blisters" only on melaleuca and one of its close relatives in the same genus. *Careades plana* caterpillars are large (up to one inch long), voracious

Figure 4. Tube system of the melaleuca tube moth.

leaf-feeders. During seven years of field surveys, we have only collected these caterpillars upon melaleuca, leading us to believe that they may be host-specific to melaleuca. However, only one or two caterpillars are usually collected at a time, thus making it difficult to establish a laboratory colony and study them intensively.

Of the many insects upon which feeding tests were conducted during 1993 and 1994, *Rhyparida* spp. beetles were among the most promising. These chrysomelid beetles are fairly common at certain times of the year, and the adults (<1/4 inch), which feed on leaves, can be maintained in the laboratory. They belong to the chrysomelid sub-family Eumolpinae, the known larvae of which usually occur in the soil, and probably feed upon roots. We have elicited both mating and oviposition in the laboratory, but have failed to rear the larvae, despite offering them a variety of plant parts, including roots. In 1994, moderate numbers of another chrysomelid beetle, *Aporocera iridipennis* were noticed at one of our melaleuca field sites. The adults of this beetle (<1/4 inch) also feed upon leaves, while the larvae have not yet been seen. Larvae of related species feed upon dead leaves. Among the dozen plant species surveyed at the site where they were found, this beetle was found only on melaleuca and one other species. As only adults were found, they may have merely been resting upon this other plant species. A more thorough survey of this site at a later date found only three adults, all of these were on melaleuca.

Some species of stem-boring beetles, belonging to the family Cerambycidae, can be very destructive to melaleuca. The larvae tunnel within tree branches, feeding upon the woody tissue. This usually results in the death of the portion of the branch above the feeding site. The adults (known as long-horn beetles because their antennae are longer than their body) feed externally on the bark. The adults of several species which we have collected from melaleuca have fed upon the bark of a wide variety of other tree species. We suspect that the larvae are probably much more host-specific, but proving this will be very difficult. The larvae are difficult to rear and have long (up to one year) life-cycles. This makes it extremely difficult for us to carry out the tests necessary to determine their safety as potential biocontrol agents.

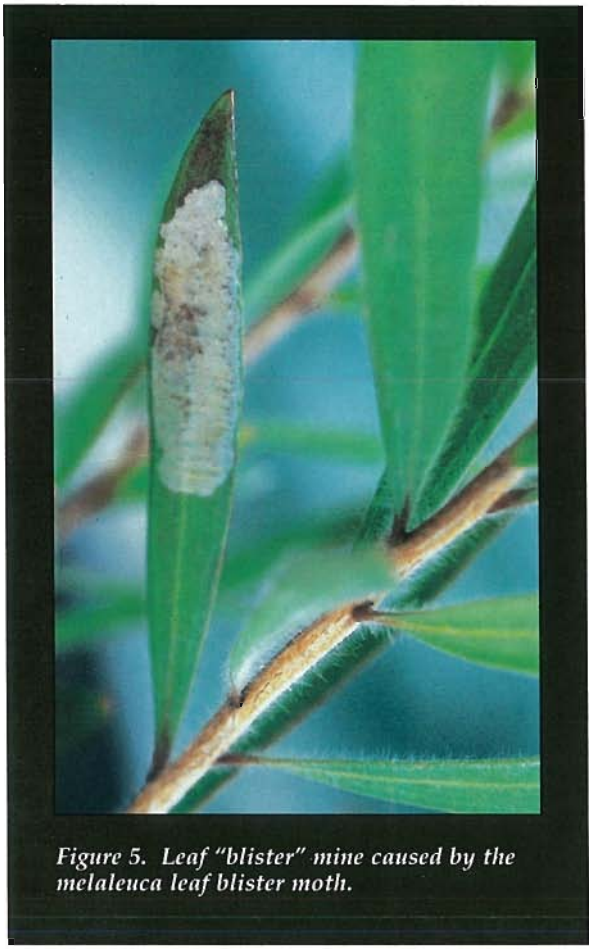

Figure 5. Leaf "blister" mine caused by the melaleuca leaf blister moth.

Apart from the insects already mentioned, numerous other weevils (mostly undescribed species), moths and gall-forming agents also show potential. Unfortunately, many of these are infrequently collected, are difficult to rear, or have taxonomic difficulties associated with them. However, with a large suite of insects to choose from, the prospects for finding more melaleuca-specific insects with potential for providing the desired degree of control remains high.

Future Progress: Direction and Possible Impediments

Our laboratories in Australia will be very busy during 1995, collecting, rearing and shipping approved agents to quarantine in Gainesville. We are also conducting numerous additional tests on these agents in order to enhance and speed up the research in quarantine. Current priorities for our research in Australia are to complete our studies of the melaleuca psyllid and the melaleuca tip-blotching bug, and have these insects imported into Florida quarantine. Further research into the potential agents mentioned in this article should enable us to select several which will undergo more intensive studies, to the point where their shipment to quarantine can be requested.

While much of our time is spent studying insects in the laboratory, field work is an integral part of our research, and this has become a renewed top priority for the ABCL. The extensive field work in previous years documented large numbers of herbivorous insects upon *Melaleuca* species. We now need considerable additional field work to determine the other field hosts (if any) for the more promising of these insects. This requires sampling from a variety of non-*Melaleuca* plant species, then rearing and identifying the insects collected from them. This field data is particularly important, as many insects will feed upon plants in the laboratory, which they ignore in the field. Thus, extensive field data is required to determine if plants which are fed upon in the laboratory are true field hosts. Only a small number of the insect species which we have collected frommelaleuca are known from other plant species. However, this does not necessarily mean that they do not occur on other plants. Very little is known about the herbivorous insect faunas of melaleuca and other plants in our study areas, and for the majority of our insects, our collections are their first known host records.

Bottlebrush trees are receiving

particular attention in both our field and laboratory studies. They are closely related to *Melaleuca* and one, *Callistemon viminalis*, has even been placed in that genus by some authors. Some of the more promising insect biocontrol candidates also feed (at least occasionally) on *Callistemon* bottlebrush trees. This problem will need to be addressed. Compared to the damage associated with the continued expansion of melaleuca, the value of bottlebrush trees in Florida is probably negligible! However, a decision will need to be made whether damage to ornamental plantings of bottlebrush should be tolerated, in order to hasten the control of melaleuca.

Scientifically, we do not see impediments to providing insects which will control melaleuca in Florida. We now have the necessary facilities, as well as an experienced and productive research team in place in Australia. However, adequate funds to maintain this research in Australia are becoming increasingly difficult to obtain. Funds for the Australian portion of melaleuca research peaked in 1992. Some of the scarce funds which we currently receive may need to be reallocated to quarantine testing or release of insects. Hopefully, an optimum pace for research in Australia can be funded, in order to ensure the timely success of this project.

Acknowledgments

This study has been funded by the following federal and state agencies in the United States: USDA-ARS - Office of International Research Programs; U.S. Army Corps of Engineers (Jacksonville District); National Park Service; Florida Department of Environmental Protection; South Florida Water Management District; Lee County, Florida and Dade County, Florida. Our thanks to the Exotic Pest Plant Council, and to Dr. Ted Center (USDA-ARS, Ft. Lauderdale Aquatic Weed Lab), for their assistance in obtaining funds from these agencies.

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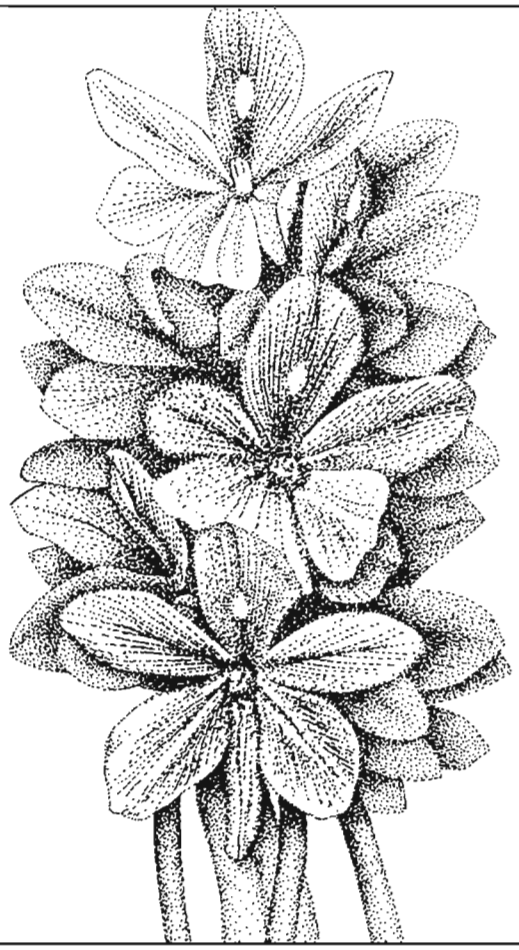
Letter

Continued from page 3

June 1995, we will focus our attention on the education of hydrilla problems to any and all members of various societies (example: Bass Clubs, FLMS, NALMS, EPPC, Audubon, Sierra, homeowners associations, boating industry, Tourist Development Councils, etc.). The second field day will be held on 19 July 1995 for all media people, State and Federal Senators and State and Federal House of Representative Members who would like to come and learn more about our problems.

For more information on these field days or how you can best help with this hydrilla issue, please contact me at 407-846-5300.

Thank you,
Mike Hulon, President



AQUAVINE

Keeping up with Catherine

Catherine Johnson, who used to work at the U.S. Army Corps of Engineers office in Palatka, doesn't work there anymore, and her name is no longer Catherine Robbins. Catherine recently married and has moved her office to Orlando. Her new business address is 5882 South Semoran Boulevard, Orlando, FL 32822 (407/275-4004).

...and keeping up with Harry

Harry Knight, Southeastern Representative for Applied Biochemists, has moved from Orlando (to make room for Catherine?) to Cullman, Alabama where his new address is P.O. Box 1181, Cullman, AL 35056-1181 (205/739-5643).

New Arrivals

Luke Hunter Allen was born February 6, 1995 to Nancy and Mark Allen. He will attend his first FAPMS Board of Directors Meeting on May 3rd. Austin James Henry Wilmoth was born February 18 to Deb and Jimbeau Wilmoth. Austin has been busy helping Dad estimate jobs for Aqua Plant Control, but Mom won't let him in the airboat yet.

Pat O'Quinn Assumes Responsibilities at OPWCD

H.C. "Pat" O'Quinn assumed duties as Superintendent of the Old Plantation Water Control District (OPWCD) in April 1995. Pat has worked for the OPWCD for 13 years. The OPWCD has 36 miles of canals that occupy a little more than 250 acres of water surface in an urban setting.

Meetings

Aquatic Plant Management Society 35 Annual Meeting, Hyatt Regency Bellevue, Seattle, Washington, July 9-12, 1995. Contact Steve deKozlowski, President, 803/737-0800.

South Carolina Aquatic Plant Management Society Annual Meeting, Springmaid Beach Recreation and Conference Center in Myrtle Beach, August 16-18, 1995. Contact Larry McCord 803/761-8000 ext. 5735.

Florida Aquatic Plant Management Society Annual Meeting, St. Petersburg Hilton, October 16-18, 1995. Contact Mike Hulon, President 407/846-5304.

Weed Science Society of America Annual Meeting, Norfolk, Virginia Marriot and Omni Hotels, February 6-9, 1996. Contact Dr. Henry P. Wilson 804/442-6411.

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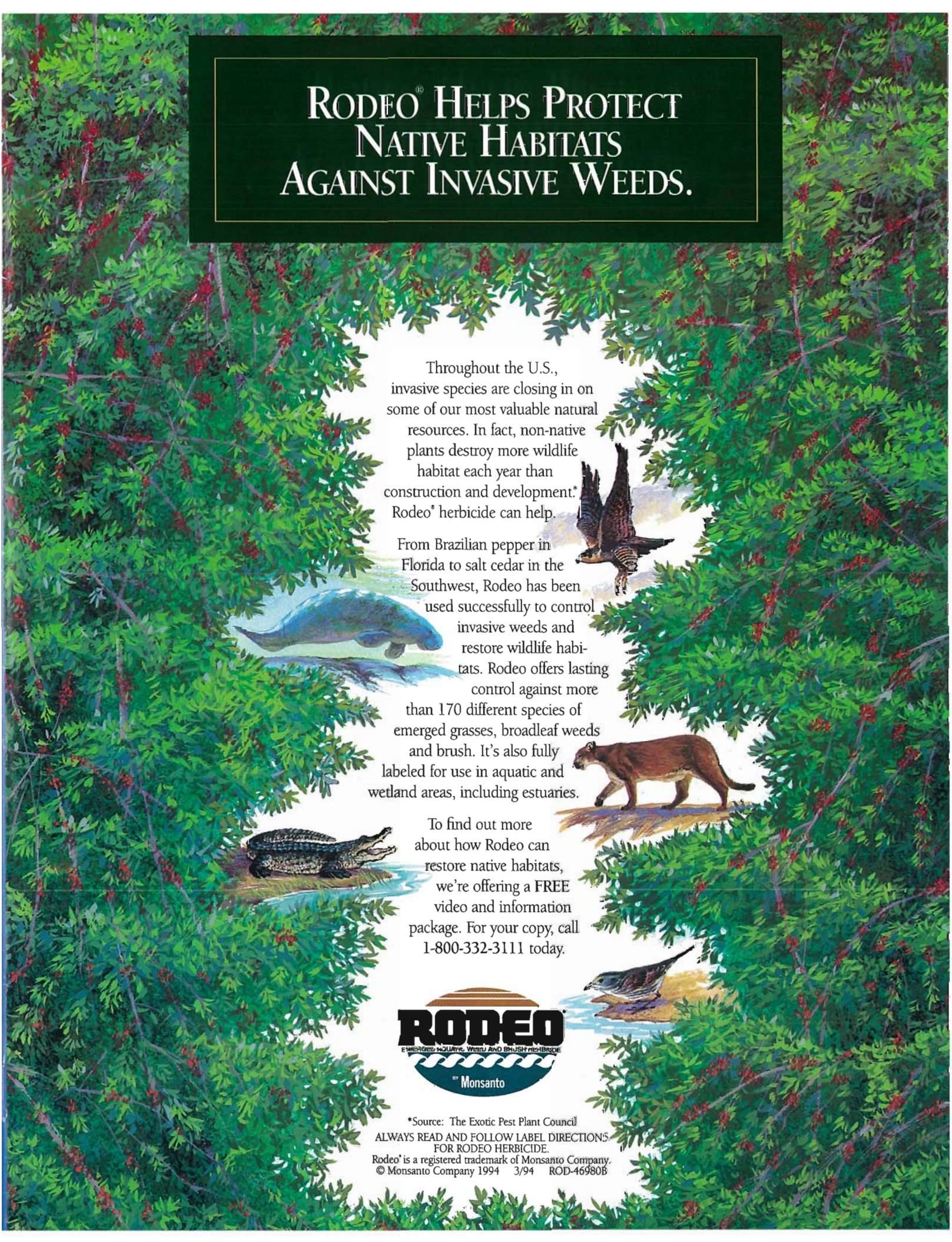

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