D.N.R.D.R.M.B.A.P.M.

This article is the second of a two-part series about the agencies which help fund the operation of the IFAS Center for Aquatic Plants' Aquatic Plant Information Retrieval System (APIRS).

APIRS is a technology-transfer system with a database of more than 25,000 books and reports about aquatic plant biology, ecology, control and utilization. APIRS provides information services, computer-generated "retrospective" and "current awareness" bibliographies of the literature, and reprints, to more than 500 aquatic plant researchers and managers, and provides AQUAFITTE to more than 4,000. These services are provided free of charge.

The Florida Department of Natural Resources and the U.S. Army Corps of Engineers Aquatic Plant Control Research Program fund APIRS for users in the U.S. and Canada. (Provision of these services to other countries remains suspended until funding to pay the production and mailing costs for overseas clients is obtained.)

The article which examined the Corps' Aquatic Plant Control Research Program appeared in the last issue of AQUAFITTE.

Where have all the bureaucrats gone?" I asked the secretary. I had visited the Bureau to see what they do. I found all their offices empty. No wonder aquatic weeds are taking over, I thought; those in charge are always on coffee break.

"They're all on Lake Okeechobee," she answered. (They drove 300 miles to take a coffee break?) "They're surveying and mapping the vegetation of the lake." No wonder aquatic weed management in Florida is so successful, I thought; even the paper-pushers are enlisted to do real work; even the paper-pushers know aquatic weed problems first hand.

The Bureau of Aquatic Plant Management of the Division of Resource Management of the Florida Department of Natural Resources is a small office with a big job. It regulates aquatic plant management in Florida.

The Bureau promulgates rules and initiates legislation, issues permits, monitors work, methods and results, disburses millions of tax dollars to water management districts, counties, cities and local taxing districts, conducts in-house research and contracts research work with others, and answers questions and gives advice to thousands of home-owners, companies, associations and agricultural, recreational and environmental interests every year.

The Bureau has three sections: Aquatic Plant Regulation, Research and Technical Services; Survey and Control Permitting; and Contracts and Grants. The Bureau's main office is in Tallahassee, but it maintains six regional biologist field offices throughout Florida.

The Chief

Ms. Shirley Fox is Bureau Chief. Experienced in management and environmental planning, she was appointed to the post only two years ago. "At first, I didn't realize the impact of aquatic plants on Florida's economy and the quality of life of its residents. I [See BUREAU on page 4]

TIDES AND HERBICIDES

Herbicial control of Hydrilla in freshwater tidal areas, and in other flowing waters, may be far more efficient in the near future thanks to experiments now taking place.

Drs. Alison Fox and William Haller hope to determine the optimal tidal time for herbicide application in order to maximize contact with the target plant, thus making herbicidal management of submerged weeds in tidal areas more predictable and efficient and less expensive. Results of these studies will be applicable up and down the United States eastern seaboard where hydrilla is becoming a problem in tidal areas. These studies also will be consequential to the management of hydrilla in other flowing water situations.

Very little is known about herbicidal control in tidal situations. Currently, hydrilla management in tidal areas is often ineffective because the flushing rates of such systems dilute and disperse aquatic herbicides before the necessary contact time for control has been achieved. These experiments will [See TIDES on page 11]
SWIM BILL ENACTED

Florida's Surface Water Improvement and Management Act (SWIM) was signed into law on June 29 by Governor Bob Martinez. The bill affects aquatic plant management in that aquatic weed status is one criteria by which water bodies are being prioritized, and aquatic plant management strategies are included in the bill as means of cleaning up or restoring water bodies.

The law calls for six major Florida water bodies to be studied and cleaned up: Lake Okeechobee, Lake Apopka, the Indian River, the St. Johns River, Biscayne Bay and Tampa Bay. The SWIM programs will be administered by the Florida Department of Environmental Regulation and the five regional water management districts. Initial state appropriations for the first year are about $15 million.

A priority list will be made of water bodies of "regional or statewide significance" based on criteria such as water quality, nutrient loads, aquatic weed status, biological status, fish and wildlife values and threats to water supplies or recreation. Plans and schedules will be devised which will describe the history and uses of the water bodies, jurisdictions, adjacent land uses, sources of water pollution, strategies for restoring and maintaining acceptable water quality, and estimate costs.

At least one hearing for local input is required before plans are completed for each water body. Plans will be reviewed and funding proposals developed annually by the water management districts.

FUNDS ALLOCATED

Initial funding allocations were:
- $4.8 million for the South Florida Water Management District for Lake Okeechobee. An additional $2 million was appropriated for Biscayne Bay, with $500,000 targeted for the Miami River and $1.5 million for stormwater retrofitting.
- $1.5 million for Indian River Lagoon.
- $2 million for the Southwest Florida Water Management District for Tampa Bay and its estuaries.
- $2.2 million and $2.5 million for the St. Johns Water Management District for Lake Apopka and the Lower St. Johns River.

LAKE OKEECHOBEE

The bill contains a separate section for Lake Okeechobee which specifies that the lake restoration program be based on recommendations of the Lake Okeechobee Technical Advisory Council (LOTAC). The council must report its recommendations to the Legislature by March 1, 1988. Programs are to result in reduced phosphorus loadings to the lake by July 1991, allowing no harmful diversions to the Indian River estuary, the Caloosahatchee River or its estuary or the Everglades National Park.

OKEECHOBEE'S BIG ALGA BLOOM OF 1986

It would be ironic if the recent progress made in controlling nutrient loadings to Lake Okeechobee were responsible . . . for a major floating alga bloom last summer, but such a conclusion is at least plausible," according to a report by scientists advising the South Florida Water Management District.

P.F. Brezonik, J. Shapiro and E. Swain of the University of Minnesota postulate that the controversial bloom was due to the low nitrogen/phosphorus ratio in the lake, created primarily "because control of phosphorus inputs has been relatively less effective than control of nitrogen inputs." The low N/P ratio produced a shift in algae dominance to the heterocystous (nitrogen fixing) Anabaena circinalis.

The researchers say Anabaena circinalis can fix its own nitrogen so it is especially able to take advantage of low levels of inorganic nitrogen, thereby dominating other algal species. They contend that many researchers have shown that low N/P ratios cause blue-green algae to predominate.

Records show that since 1973 in Lake Okeechobee, N/P ratios have decreased significantly. Nutrient control methods such as diversion of "back-pumped" water from the surrounding land further reduces the N/P ratio. In 1985-86, for example, "nitrogen loadings decreased much more (almost by half) than phosphorus loadings."

The authors believe that further field studies must be done to verify this postulate before potentially expensive management measures are attempted.

CONTROLLED BACKPUMPING

If further studies support the idea that the N/P ratio is too low, the authors suggest that the District might resume "controlled" backpumping into the lake in order to increase the N/P ratio of nutrient inputs and thus the N/P ratio of the lake water.

They stress that controlled backpumping would be merely an "interim measure to restore a more balanced N/P ratio in the lake while other efforts continue to reduce total loads of N and P to the lake."

ANOTHER RESOURCE FOR MANAGERS

Restoration & Management Notes is a magazine of notes, abstracts and articles about "restoration and wise stewardship of plant and animal communities" in terrestrial and aquatic situations. This magazine would be of interest to those involved in aquatic resource management; the Summer 1987 issue has no less than 12 notes and articles having to do with wetland, lake and river restoration and aquatic plant culturing and transplantation projects. This issue also includes a balanced article on the Kissimme River channelization project and the current work to undo the project and restore the river to its natural condition.

R&MN is edited by William R. Jordan III and is published twice a year by the University of Wisconsin Press. Annual subscription costs are $13 for individuals and $28 for institutions. For subscription information, contact Journals Division, 114 N. Murray Street, Madison, Wisconsin 53715.
AT THE CENTER

MAJOR PUBLIC EDUCATION EFFORT TO BEGIN

The IFAS Center for Aquatic Plants should be the single agency to develop a "concerted, coordinated public education effort" about aquatic plant management in Florida. This agreement in principle has been reached by Ms. Shirley Fox, Chief of the Florida Department of Natural Resources Bureau of Aquatic Plant Management and Dr. Joe Joyce, Director of the Center for Aquatic Plants.

Instead of each of many federal, state and local agencies preparing programs and materials for public education, the Center would be the single agency to do so. Fox points out that "this will save money in the long run."

There is a special need for public education in Florida because of its high proportion of new residents who are unfamiliar with "aquatic weed" history and problems. Many of Florida's new residents are surprised and concerned by the state's naturally eutrophic waterbodies, and usually do not know the differences between Florida's native plants and the exotics which are displacing them.

This high proportion of new residents brings new homeowners, environmentalists, legislators, news reporters, fishermen and agency board members who have never seen a river completely covered with waterhyacinths, and who do not know how quickly infestations would occur if not for "maintenance control."

Frequently, these new residents see managers dealing with small patches of waterhyacinths or hydrilla; they often believe that money is being spent unnecessarily, and that herbicides and machines are being used without need. As Joyce has put it, "Maintenance control is its own worst enemy."

Plans for the new public education effort will be presented to the Legislature by DNR and the Center by summer of 1988.

DIQUAT RE-REGISTRATION. Diquat disappearance field studies have been completed by Center personnel and samples have been delivered to Chevron Chemical Company for analysis. Mr. Francois Laroche takes sediment samples from a study pond. Chevron chemist Glenn Fujie observes sampling procedures.

AQUATIC APPLICATOR TRAINING MANUAL

A new aquatic pesticide applicator training manual is nearing completion. Dr. Ken Langeland is editor.

The manual will be used to help train applicators and supervisors in Florida and will be the primary study-guide for the Florida aquatic pesticide applicator's examination. For more information, contact Langeland at the Center.

HYDRILLA SEDIMENTATION STUDIES

Studies are underway to determine the contribution of hydrilla to sedimentation. The study is being conducted by Dr. Joe Joyce.

In previous studies, Joyce has shown that waterhyacinths contribute substantially to sedimentation, greatly increasing the rate at which waterbody depth is reduced and lakes become marshes.

AQUATIC PLANT SLIDE SHOW AVAILABLE

A slide show designed for public education about aquatic plant management is now available. The show was put together by Mr. Dan Thayer, with the help of the Center for Aquatic Plants and the Florida Aquatic Plant Management Society.

The show is available for the cost of reproduction and mailing. For more information, contact Thayer at the Center.

CENTER FOR AQUATIC PLANTS
INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES
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Dr. Joseph Joyce, Director
BUREAU  [From page 1]  

have found that the problems are bigger, environmentally and economically, than I had ever imagined."

A mere $14 million a year is spent to keep aquatic weeds from choking Florida's public water resources worth billions.

More than 32 million people a year enjoy water-related recreation in Florida, having a major impact on the state's economy. For example, more than $250 million a year is spent on freshwater fishing alone. Much of the state's drinking water and agricultural irrigation water also is drawn directly from the state's lakes and rivers. Weeds very effectively interfere with all water recreation in Florida, shut down water intakes and greatly reduce water flow in water management systems.

Investment Protection

To protect these multi-billion dollar public resources, $14 million in federal, state and local tax dollars are spent for aquatic plant management in public waters each year. (Estimates are that private interests spend approximately the same amount for weed control in private waters.)

Help or Hindrance?

A state task force (the Environmental Efficiency Study Commission) may soon recommend that water resource permitting, which may include some of the Bureau's aquatic plant management permitting responsibilities, be delegated among the five water management districts. Bureau Chief Fox believes this fragmented approach could result in needlessly confusing permitting procedures and create inter-agency fights for funds, resulting in inequitable funding and inadequate control throughout the state. Aquatic plant control could become even more "political" than it is now.

Fox believes that in order to manage these problems effectively, her central Bureau is needed to monitor weed problems statewide and to apply the limited resources and funds fairly. If aquatic plant management permitting responsibilities are shifted, water management districts would have to establish separate permitting offices, bypassing the experience, consistency and procedures already in place at the Bureau. Furthermore, permits currently being considered by the Bureau are sent to several other state and federal agencies for review. Fragmenting the process among five agencies would increase paperwork and paperwork among all the agencies, likely resulting in permitting delays not now experienced.

In 1988, the Bureau will begin a "tank sampling" program in which random samples of applicators' herbicide tanks will be analyzed to verify their contents.

In addition, set-back requirements for herbicide treatment near potable water intakes will be established for individual situations, after research is completed.

SURVEY AND CONTROL PERMITTING SECTION

Aquatic plant permitting is delegated to the Bureau by the Florida Department of Environmental Regulation (FSS 403.088; DER permitting). The Bureau issues permits and investigates misuse; DER prosecutes violations.

Mr. Jeff Schardt and the eight regional biologists in his section, process more than 1,000 mechanical, herbicidal and drawdown aquatic plant control permits each year.

Regional biologists receive permit applications and personally document the management needs and methods by identifying plants and problems, and making management recommendations. In 1986, section personnel participated in more than 22,000 consultations.

According to Schardt, approximately 80% of the management permits issued are for herbicidal control, 10-15% for mechanical control, and the remainder are issued for drawdowns.

Only one-third of the state's hydrilla is treated each year. Each year more hydrilla is present throughout Florida.

The most commonly issued permits are for control of the exotic plants waterhyacinths and water lettuce. Hydrilla is the second most frequently controlled. The third most common permits are for controlling aquatic grasses such as torpedo grass, and filamentous algae control permits are the fourth.

Monitoring and Enforcement - Violators Beware!

Each week, randomly chosen field sites are visited by regional biologists to verify that work is being done according to permit and label restrictions. Viola-

[See BUREAU on page 5]
tion of a permit rule is punishable by a maximum fine of $500. Misuse of herbicides is punishable by a maximum fine of $10,000 per site per day. In the past several years, some violators have been caught and several $5,000 fines levied.

**Annual Aquatic Plant Surveys**

Schardt says that one of the most important functions of the permitting section is the annual survey of 500 water bodies throughout the state. One and a half million acres of lakes, rivers and canal systems, having boat ramps or major public access, are surveyed between April and October. "We determine plant coverage and species diversity to assess the success of control programs and to prevent problems before they occur." Of the 160 species identified in the surveys, only 10 account for more than half the aquatic plant coverage of the state. Four of these ten species are exotic.

**Costs**

The Bureau calculated that 60,000 acres of hydrilla were present in the water bodies surveyed in 1986. That year control permits were issued for only 20,000 acres of hydrilla, costing $3 million.

The 1986 survey showed 7,000 acres of waterhyacinth were present. However control permits were issued for 25,000 acres, costing $2 million. Many more acres were controlled than were present at one time because of the rapid regrowth of waterhyacinths during one season.

**Waterhyacinth Success**

Schardt says citizens should be pleased with the state-wide success of waterhyacinth management. In 1983, control permits were issued for 46,000 acres of waterhyacinth (almost twice the acreage of 1986) at a cost of $5 million. He attributes the successful reduction of the waterhyacinth problem to "maintenance control", the consistent and continuous control of the plant to prevent re-infestation. Schardt claims that maintenance control, encouraged statewide through the permitting section, has resulted in less management costs, less use of herbicides and less destruction by waterhyacinths of stands of native plants which are beneficial to fish and birds.

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<th>Regional Biologists</th>
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<td><strong>Northwest Region</strong></td>
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**BUREAU OF AQUATIC PLANT MANAGEMENT**

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**BUREAU SECTION ADMINISTRATORS**

Survey and Control Permitting
Mr. Jeff Schardt

Contracts and Grants
Mr. Greg Jubinsky

Aquatic Plant Regulation, Research and Technical Services
Mr. Larry Nall

**CONTRACTS AND GRANTS SECTION**

Many local and regional government agencies which manage aquatic plants qualify for state and federal cost-sharing. The Contracts and Grants Section of the Bureau is responsible for contracting with these agencies and for allocating the available funds among them. Mr. Greg Jubinsky is the section administrator.

The section manages almost 100 contracts with counties, water management districts and special taxing districts, based on annual work plans submitted to the Bureau by the "cooperators". The work plans must reflect the requirements of the Bureau and the U.S. Army Corps of Engineers.

The contracts and grants section manages two funding programs: the cooperative program between the Army Corps and DNR, and the state program. The cooperative program has two components: the RAG and the APC. Under RAG, aquatic plant management costs in federal navigation project areas are 100% reimbursable. Under APC, if a treated water body has public access and a boat ramp, aquatic plant management costs may be reimbursed on a 50-50% basis.

Under the second (state-funded) program, money is available for plant control which benefits the public such as flood control systems. Money is reimbursed on a 50-50% basis, according to the "priority level" of the plant(s) controlled (Rule 16C-50). Under the state program in 1986, the Contracts and Grants Section received more than $10 million in reimbursement requests, but had only $3 million available.

[See BUREAU on page 6]
Under the state's cost-sharing program, only one-third of the reimbursement money requested was available.

Under all programs in 1986, the section reimbursed a total of $7.9 million to other government agencies for aquatic plant management purposes. Most of the reimbursement money pays for herbicidal management; however, the legislature has directed that at least $1 million a year be reimbursed for non-herbicide control, research or enforcement.

Grass carp are an eligible expense for reimbursement. And, according to Jubinsky, the section would consider reimbursement for collection and dispersal of biocontrol insects. However, no agency has yet applied for insect collection and release reimbursement.

Endangered Species

In the process of permit review, Jubinsky and his section also reconcile aquatic plant management with the needs of endangered species. This means that the section checks EPA endangered species lists and range maps in an effort to ensure that aquatic plant management has minimal impact on endangered species. Two endangered species, the manatee and the Everglades kite, are of particular concern to the Bureau.

In cooperation with the U.S. Fish and Wildlife Service (USFWS) and local cooperators, the Bureau has established specific management practices where the West Indian manatee may be affected. Because USFWS believes that certain copper containing herbicides may accumulate in manatees, the Bureau and USFWS have formally agreed that aquatic plant control should be conducted to minimize any possible impact on the mammals when they overwinter. Certain restrictions on aquatic herbicide use apply in Citrus County where hundreds of the mammals congregate during cold months. As a further precaution, the Bureau and USFWS require that mechanical control crews include a "spotter" whose job it is to watch for manatees while machines are in operation.

Everglades kites build nests in stands of cattails in the conservation areas in Palm Beach and Broward counties, as well as the southwestern shore of Lake Okeechobee. The Bureau verified reports that kite habitats were being adversely affected by cattail management practices during certain seasons. Consequently, the Bureau is currently working with USFWS to establish criteria for aquatic plant management in critical habitat areas of the Everglades kite.

Jubinsky says, "Anything we can do to increase native plants and plant diversity, we ought to be doing." He believes that revegetation with native species would help restore ecosystems which have been damaged by exotic plants such as hydrilla and may help suppress regrowth of exotics. Unfortunately, Jubinsky says, the law does not allow for reimbursement of revegetation project costs.

[See BUREAU on page 7]

Bureau sampling boat.

Bureau research biologist Mr. Rob Kipker and Mr. Hank Smith collect hydrilla samples.

Long-time DNR biologist Mr. Drew Leslie supervises the Bureau's first integrated management investigation.
BUREAU [From Page 6]

RESEARCH AND TECHNICAL SERVICES

The Bureau also maintains a section which conducts research and monitors aquatic plant importation and retail outlets such as aquatic nurseries and pet stores. This section is headed by Mr. Larry Nall.

Nall and his small cadre of biologists attempt to answer practical questions which are not addressed in the scientific literature, or which are not answered with Florida’s unique environment in mind. Recent such work includes a study of the fate of fluridone in the St. Johns River and a study of fluridone efficacy against a newly introduced exotic plant, Hygrophila.

Research Projects

Nall says there are many research projects he would like to see conducted. However, research funding appropriations for the Bureau have been irregular. Until two years ago, no money was allocated for research; for each of the past two years $225,000 has been allocated. No continuing funding is promised, so research projects are conducted on a year-to-year basis.

The section distributed the 1986 appropriation among five projects; algae control, algae physiology, the use of grass carp in flood control canals, revegetation and limnology.

Possible section projects, depending on funding, include:

- Study the fates of copper sulfate and chelated copper.
- Investigate aquatic habitat restoration using transplanted native plants.
- Set up a bioassay laboratory and check the toxicity of adjuvants, which currently require no registration or toxicity data for their use.
- Set up water quality sampling stations at potable water intakes to ensure herbicide use compliance.
- Study the contribution of hydrilla to sedimentation.

V.R.

SAVE THE NATIVES!

In a study of the effects of aquatic herbicides on native vegetation, MR. DAN THAYER counts stems in sampling frames. Thayer helps coordinate research and education functions between the Bureau and the IFAS Center for Aquatic Plants.

Regional biologist MR. JOE HINKLE has prepared a computerized list to help managers select appropriate herbicides for specific aquatic plants. 310 records are included in the list, which can be searched according to plant species, herbicide trade names, active ingredients, application rates, water body types, waiting periods and precautions. The list is in dBase III format, and runs on IBM or compatibles. Contact Hinkle for information on availability.

Regional biologist MS. JUDY LAMIA recently assumed her duties in the Bureau’s South Florida Region. Lamia earned an M.S. in limnology and fisheries, under the direction of IFAS Professor Dr. Daniel Canfield.

Her work includes surveying, issuing permits and inspecting aquatic plant management activities for Lake Okeechobee and for the 1500 miles of flood control and irrigation canals of southern Florida.

MR. MIKE DUPES is a biologist with the Jacksonville District of the U.S. Army Corps of Engineers. Dupes keeps track of aquatic plant management needs in Florida’s navigable waters for the Corps and makes recommendations to Mr. Pete Milam, Chief of the Natural Resources Management Section of the District.

Among recent activities, Dupes helped draft the agreements between DNR and USFWS which mandate special aquatic plant management programs in the endangered manatee’s winter range; represented the District at recent biological control releases against water lettuce and hydrilla; and administers funding for various Corps-sponsored research.
BOOKS/REPORTS


This proceedings contains 31 professional papers addressing "the possible or probable environmental consequences of applying municipal wastewater to wetlands." The workshop was held at the University of Massachusetts, Amherst, on June 23-25, 1982. The seven sessions were Engineering, Ecology, Ecosystem Dynamics, Community Changes, Environmental Health, Long-term Effects and Management. A final session synthesized and concluded the workshop.

K.C. Ewel concluded that the use of wetlands for wastewater treatment is "clearly an attractive alternative to construction and maintenance of advanced wastewater treatment plants." However, Ewel and J.A. Kadlec emphasized the need for more research to more thoroughly explore possible effects and patterns of response before such systems become widespread.


This is an identification guide to 21 species of floating and submersed plants and 40 genera of emergent plants of the area. It includes dichotomous keys, illustrations and diagnostic plant characteristics.


This is a comprehensive upper-level textbook that deals with the scientific and management aspects of freshwater and coastal wetlands. The book also is a reference for scientists, engineers and planners involved in the management of wetlands. It emphasizes the many types of wetlands of the United States. The book contains sections which generally review principles and components applicable to many wetland types, and sections that detail the structures and functions of dominant wetland types. Separate chapters discuss history, wetland type definitions, hydrology, biogeochemistry, biological adaptations, and ecosystem development. Chapters describe tidal salt marshes, tidal freshwater marshes, mangrove wetlands, freshwater marshes, northern peatlands and bogs, southern deepwater swamps, and riparian wetlands. A final section discusses wetland management and protection, wetland valuation and wetland classification. An extensive bibliography accompanies the text.


This colorful field guide is to aid in the identification of common submerged algae and vascular plants in the Great Lakes. An unusual feature of the guide is its handy use of symbols which identify plants' values to animal populations, including fish, birds and various other animals.

A FIELD GUIDE TO COASTAL WETLAND PLANTS OF THE NORTHEASTERN UNITED STATES by R.W. Tiner, Jr. 1987. The University of Massachusetts Press, Amherst, Massachusetts 01004. 248 pages. $25.00 cloth; $12.95 paper.

This field guide contains seven identification keys to plants which inhabit fresh, brackish and saline coastal wetlands of the United States east coast, especially from Maryland to Maine. Illustrations (by A. Rorer), descriptions, flowering periods, habitats and ranges of more than 150 plants are included. The guide is enhanced by the inclusion of a general overview on coastal wetland ecology.


This study determined the time required to dredge a given surface area of hydrilla and the rate of regrowth in dredged areas. It also determined the time required to install bottom-barriers and determined their reduction in plant height and tuber density. The author found that the average time for two divers to dredge an acre of hydrilla to a depth of 2 to 4 inches is 58 hours, at a cost of $17,513. Dredging removed 100 percent of the hydrilla and 91 percent of the tubers. In some instances of dredged high-use areas, hydrilla biomass exceeded control plot biomass within two months after dredging; in less-used isolated areas, only small increases in biomass were measured.

The study found the cost of installing an acre of Dartek to be $11,745; to install an acre of Texel costs $10,875. After one month, tuber density under Dartek and Texel averaged one tuber per square foot, while the control area had five tubers per square foot. The author states that, because of 'ballooning', boat damage and sedimentation, both types of bottom-barriers failed to control hydrilla.

PROCEEDINGS of the European Weed Research Society 7th International Symposium on Aquatic Weeds. For this and previous EWRS Aquatic Weeds Symposia proceedings, contact: Dr. H. Gortz, EWRS Proceedings Symposia, Postbus 14, NL-6700 AA Wageningen, THE NETHERLANDS. Price is 35 Swiss francs.

BOOKS/REPORTS

[From page 8]

Institution Press Books, P.O. Box 4866, Hampden Station, Baltimore, Maryland 21211. (301) 338-6963. 400 pages. $45.00, cloth; $29.95, paper.

This is a "definitive guide" to one thousand species of wildflowers, trees, shrubs, grasses, rushes and sedges. Plants of beaches, dunes, wetlands, and barrier islands from the Gulf States to Massachusetts are included. The book includes keys, scientific and common names, descriptions, and illustrations of flowering, fruiting and vegetative structures. A special feature is the section of six hundred color photographs.


This is the proceedings of a special symposium held by the British Ecological Society in March, 1985. The physiological ecology and problems encountered by both crops and natural flora under soil flood or tidal flood conditions formed the discussion of this international meeting.


This booklet describes the results of research on the use of fish to control algae and macrophytes in several Israeli reservoirs. Much of the data relates to the use of silver carp to manage algae and describes silver carp's growth rate, consumption of phyto- and zooplankton, and its effects on water quality.

FIELD GUIDE FOR LOW-MAINTENANCE VEGETATION ESTABLISHMENT AND MANAGEMENT, by Environmental Laboratory. 1986. U.S. Army Corps, Waterways Experiment Station, P.O. Box 631, Vicksburg, Mississippi 39180-0631. Instruction Report R-86-2, 145 pages.

This handy guide refers to terrestrial situations, however some of its content could be applicable to shoreline vegetation establishment and management. It is written for resource managers who do not have extensive knowledge of soil and plant sciences. Sections of the report help resource personnel select and maintain appropriate vegetation types for certain soil, terrain and site uses. It emphasizes desirable, low-growth, low-maintenance species.

BIOLOGICAL SERVICES PROGRAM

The Biological Services Program "was established to supply scientific information and methodology on key environmental issues that impact fish and wildlife resources and their supporting ecosystems." The program is within the U.S. Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C. 20240.

Projects relevant to aquatic plant research and management have been initiated in several areas of investigation, including water resource analysis, stream alteration, coastal ecosystems, habitat classification, and systems inventory, including the National Wetland Inventory.

"National Teams", such as the National Coastal Ecosystems Team, provide the Program's central scientific and technical expertise and arrange for contracting biological services studies with states, universities, consulting firms and F.W.S. research facilities.

Reports and a publications list are available from: Publications Officer, United States Department of the Interior, Fish and Wildlife Service, National Coastal Ecosystems Team, 1010 Gause Boulevard, Slidell, Louisiana 70458. Single copies are free upon request.

MEETINGS


15th ANNUAL CONFERENCE ON WETLANDS RESTORATION AND CREATION. May 19-20, 1988, Tampa, Florida. For more information, contact Mr. Fred Webb, Hillsborough Community College, Plant City Campus, 1206 North Park Road, Plant City, Florida 33566. (813) 754-1561.

SYMPOSIUM ON HABITAT MANAGEMENT FOR MIGRATING AND WINTERING WATERFOWL IN NORTH AMERICA. January 24-28, 1988, Jackson, Mississippi.

This symposium seeks to assemble information on state-of-the-art management practices in habitats used by migrating and overwintering waterfowl. For more information, contact:Wintering Waterfowl Symposium, Department of Range and Wildlife Management, P.O. Box 4169, Texas Tech University, Lubbock, Texas 79409. (806) 742-2842.

A LITTLE CLOSER

Profile of Dr. William T. Haller, Professor of Agronomy, IFAS Center for Aquatic Plants, University of Florida.

When Hydrilla was first introduced into Florida about 25 years ago, a handful of scientists recognized its destructive potential and predicted its spread into areas where "aquatic weeds" had never been known. Within a few years, thick mats of hydrlila appeared throughout Florida, a state problem. When hydrlila more recently moved north, infesting the Washington Monument reflection pool and the nearby Potomac River, U.S. Congressmen decided it was a national problem. "New studies" of hydrlila were ordered, creating "experts" on hydrlila from here to Timbuctu.

Bill Haller is an expert on hydrlila. In fact, he has studied hydrlila longer than most people have known its name. Over the years, he has authored and co-authored more than 100 papers and reports about waterhyacinths, hydrlila and other aquatic plants. Haller has investigated hydrlila's photosynthesis, germination and reproduction, methods of spread, effects of growth regulators, and effects of salinity on plant growth. He also has conducted studies to control hydrlila by drawdowns and mechanical methods. More recently, Haller has devoted much of his work to herbicidal control of the plant.

In his 1974 doctoral dissertation on the photosynthetic characteristics of hydrlila, Haller reported research results which began to answer the question of how the plant so easily dominates Florida's native submersed plants. During his study, Haller found that hydrlila uses photosynthetic carbon in ways unlike those of plants in the C3 or C4 photosynthetic groups. Haller concluded that hydrlila has photosynthetic characteristics of both groups, a finding which helped lead to world-wide intensive research on the unique growth capabilities of submersed plants.

Besides being able to grow in extremely low light, hydrlila has other growth weapons at its disposal: tubers and turions, "the most important sources of hydrlila regrowth." Haller and others have studied the seasonal production and germination of these reproductive parts, finding that hydrlila produces tubers and turions during the winter months when vegetative growth is low, and produces few tubers and turions in warmer months, when vegetative growth is high. His research found that mature tuber germination approaches 100% when water temperatures rise above 65° F (and carbon dioxide and oxygen levels in the hydrosoil are adequate). Prolific and efficient tuber and turion production and germination is another reason hydrlila so easily dominates native submersed plants.

Haller believed that mechanical methods of control could not keep up with hydrlila growth, could not remove tubers from the hydrosoil and could even help spread hydrlila by fragmentation regrowth, so he began to concentrate his research on herbicidal control of hydrlila. In recent years, he has studied the efficacy of several herbicide formulations for hydrlila control, including endothall, fenatrol, diquat and fluridone. Much of his work has been concentrated on the use of fluridone formulations, concentrating on "sublethal dose" management of hydrlila.

Besides being an active researcher, Haller has directed and worked with graduate and post-doctoral students from the United States, India, England and The Netherlands. He is a founding member of the the Florida Aquatic Plant Management Society (11 years old this year) and remains an active member. He also is editor of the Journal of Aquatic Plant Management of the National Aquatic Plant Management Society.

Haller received his bachelor's degree from Cornell University and his advanced degrees from the University of Florida. He has lived in Gainesville since 1969 with his wife, Jean. They have three children, Will, Doug and Missy.

CURRENT RESEARCH OF WILLIAM HALLER

- With Dr. Alison Fox; the determination of the best times to apply herbicides to control Hydrlila in flowing waters (see TIDES AND HERBICIDES in this issue)
- With Fox; the investigation of the germination and growth ecology of Zizaniopsis miliacea, a grass which is forming floating islands that are interfering with navigable waterways
- With Dr. Ken Langeland; the investigation of Polygonum control in drawdown situations
- With Dr. Donn Shilling; a residue study of fluridone up to 3 miles from the application site in a large lake
- With Shilling; the determination of "no effect" levels of diquat on non-target aquatic plants and terrestrial crops, and the study of torpedo grass resistance to diquat
- With Shilling; an investigation of the effects of calcium content (water hardness) on glyphosate efficacy for aquatic grass control.
- Investigation of fluridone efficacy for hydrlila tuber control in drawdown situations

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some aquatic plant managers wondered aloud whether they themselves could become an endangered species after they learned of plans of the E.P.A. and the U.S. Fish and Wildlife Service. The two federal agencies are attempting to comply with legislation which disallows the use of certain pesticides in habitats of endangered and threatened plants and animals of the U.S. The new pesticide-use rules currently being promulgated may significantly affect efforts to manage exotic aquatic weeds such as hydrilla and waterhyacinths.

More than 360 delegates to the annual meeting of the Florida Aquatic Plant Management Society heard the E.P.A.'s Mr. Carlton Layne explain that additional pesticide-use restrictions are being imposed throughout the U.S. and apply to all people who use pesticides within ranges of protected plants and animals. The "aquatics cluster" rules are just now being formulated and may go into effect in 1989.

The feelings of the Society may best be represented by one applicator who spoke: "Wouldn't allowing waterhyacinths to cover shorelines and replace native vegetation further degrade the wood stork's habitat and make them even more endangered?"

FAPMS President-elect Eddie Knight promised to bring such questions to the attention of policy-makers, and to make the issue a priority of his administration. He also appointed Dr. Joe Joyce to work with the EPA and FWS in elaborating the new rules.

During the three-day meeting October 20-22, environmental, public health and public education issues also were discussed in talks by officials of several state and regional agencies.

FAPMS President Mike Mahler passed the gavel to Mr. Eddie Knight. Mr. Bill Moore is the new President-elect, Dr. Joe Joyce and Mr. Brian Nelson continue as secretary and treasurer, respectively.

Mr. Larry Maddox. The very active FAPMS arrangements chairman.

The 11th Annual Meeting of the Florida Aquatic Plant Management Society in Daytona Beach. More than 360 attended the three day meeting.
BASS, GRASS CARP AND HYDRILLA

Many fishermen believe good bass fishing lakes require the presence of submerged plants. However, if Florida Lakes Baldwin and Pearl are good examples of bass fishing lakes, then this belief may be wrong. For more than 7 years these lakes have been devoid of submerged plants, yet largemouth bass populations are at the same or higher levels now than when submerged plants were plentiful.

Mr. Douglas Colle and Dr. Jerome Shireman have been observing these lakes as part of a long-term study of the effects of grass carp stocking and the resulting submerged plant loss on native fish population dynamics. Their results are soon to be published. Colle and Shireman are with the Department of Fisheries and Aquaculture, IFAS - University of Florida.

In the late 1970s, Lakes Baldwin and Pearl had 70% and 95% hydriola cover, respectively. Grass carp were released into the lakes at 13 and 17 fish per acre. By the early 1980s, no submerged plants remained in either lake. The grass carp remain and continue to remove submerged vegetation as it re-appears.

Some results:

- Radiotelemetry studies of largemouth bass movement shows that 40% of the adults spend the majority of their time in the middle, deeper parts of the lakes, instead of near the shores.
- As hydriola was consumed by grass carp, there were immediate, significant decreases in non-game fish species such as chubsuckers, blue spotted sunfish, golden shiners and goldentop minnows. These fish populations have not recovered.
- Blue gill and redear fish populations have remained constant or have increased since introduction of grass carp.
- Bass populations were not impacted by grass carp introduction or submerged plant elimination because the bass forage base (bluegills, redear) remained intact.
- The food bases in the lakes shifted from insects and zooplankton which are dependent on vegetation, to insects which do not require vegetation. The latter insects were always present, but are now dominant.
- Water clarity in the lakes changed from six meter Secchi depths to one and a half meter Secchi depths.

In other research, Colle and Shireman are testing lower grass carp release rates in several lakes in order to manage, not eliminate, submerged plants. In other lakes, they are using grass carp to control Spirodea and Eleocharis.

Colle is a biological administrator with degrees in fisheries biology; he has been with IFAS since 1974. Contact Colle at the Department of Fisheries and Aquaculture, IFAS - University of Florida, 7922 N.W. 71st Street, Gainesville, Florida 32606. (904) 392-9613.

For movement studies, radio antennae are surgically attached inside largemouth bass.

MR. DOUGLAS COLLE

CHESAPEAKE BAY BIBLIOGRAPHY

The Chesapeake Bay Bibliography is a database of 8,000 citations on the science, history, technology and management of the Bay environments. The database may be accessed free of charge by modem or by mail. It is supported by the College of William and Mary and the Virginia Institute of Marine Science, and funded by the Maryland Department of Natural Resources.

A recent keyword search of the database for marsh plants, eelgrass, seagrass, aquatic weeds or submerged plants yielded 270 citations.

Geographic coverage of the CBB encompasses the entire Bay and its tributaries and extends to the offshore waters of the Delmarva Peninsula. Source publications have been monitored since 1971 for relevant materials and earlier bibliographies have been searched. Coastal zone management material has been included since 1975. The database is updated every six months.

Cited materials include primary journals in the marine and environmental sciences, monographs, symposia, dissertations, theses, selected institutional and governmental reports, newspapers and secondary sources. Citations include accession number, author, title, date, journal reference and keywords. The database may be searched by author name, subject, keywords or string searches, and is subject indexed for online searching.

Users can access and search the system from a remote terminal with a PC and modem using the Maryland DNR CHESSEE network. Search results may be printed at the Chesapeake Bay Liaison Office and sent to users free of charge. Users may dial 301/841-5264, log on as "Citizen", and use "CBP" as the password.

For more information, write the Chesapeake Bay Bibliography, VIMS Library, The College of William and Mary, Gloucester Point, Virginia 23062, or call 804/642-7116.
ONE EXOTIC DESTROYS ANOTHER

Tiny imported insects have wiped out two million tons of Salvinia molesta, prompting investigators P.A. Thomas and P.M. Room to announce "... the most outstanding example of biological control of an aquatic weed."

The noxious plant has been virtually eliminated from the floodplain of Papua New Guinea's Sepik River (see Social Consequences of Salvinia Infestations in Papua New Guinea, AQUAPHYTE 6(1):7 1986). According to Thomas and Room, the imported beetles wiped out the pest plant within one year of the widespread distribution of some 900,000 insects (see Successful Control of the Floating Weed Salvinia molesta in Papua New Guinea: A Useful Biological Invasion Neutralizes a Disastrous One. Environmental Conservation 13(3):242-248 1986). Ecologies of the infected water-bodies and the lives of the people who depend on them have been restored to their conditions prior to invasion by the floating fern in the early 1970s.

Village lagoons that were recently completely covered by Salvinia had been abandoned because the severity of infestation prohibited transportation and fishing. The 80,000 people living in the floodplain are totally dependent on water transport for access to markets, schools, medical facilities, and food sources because of seasonal flooding, extensive swamps, and absence of roads. Thomas and Room report that abandoned villages have now been reoccupied.

Control of Salvinia was accomplished by introduction of the beetle, Cylindobagous salvini (originally thought to be C. singularis). The adults feed on Salvinia buds and the larvae tunnel through buds and rhizomes. Successful use of the beetle in controlling Salvinia on Lake Moondarra in Australia suggested its use in Papua New Guinea (see Beetle Destroys Salvinia, AQUAPHYTE 2(1):1 1982).

Cylindobagous salvini was cultured in Binatang Lagoon in 1982 and by May 1983, sufficient numbers were available to transport Salvinia containing all life-stages of the beetle to other lagoons. By November of the same year, these secondary populations had increased enough to allow further redistribution. By May 1985, some 900,000 adult, and unknown numbers of immature, C. salvini were distributed among 160 floodplain sites. The effort was made easier by local people who responded to radio announcements asking them to collect beetle-infested Salvinia from central points.

In most lagoons, a single release of beetles resulted in establishment within 5 to 7 months. Problems did occur where mats of the weed had become very thick and were colonized by other vegetation into sudd. In this case, the mat was sprayed aerially with Paraquat which killed and sank the sudd, leaving a thin cover of Salvinia which induced a rapid increase in the beetle population. Despite the huge biomass of Salvinia which was killed and sunk, no adverse effects on water quality, such as algal blooms, were observed. Approximately one year after the beetles cleared two main lagoons of Salvinia mats, the only Salvinia remaining was present as tiny, primary growth form plants scattered among marginal vegetation. Re-establishment of native aquatic vegetation occurred shortly after the removal of Salvinia.

In the year following widespread redistribution of the beetle, between mid-1984 and mid-1985, the infestation was reduced from nearly 250 km² of Salvinia mat to less than 2 km², a reduction of some 2 million tons of weed.

Thomas and Room believe that Salvinia molesta now will be merely a minor component of the aquatic flora of Papua New Guinea due to biological control by Cylindobagous salvini. K.B.

![Salvinia Infestation](image)

"The most outstanding example of biological control of an aquatic weed."

This graph shows the percent area of water in the Sepik River floodplain covered by Salvinia. Nine hundred thousand beetles (Cylindobagous salvini) were widely distributed in the floodplain in early 1983. By mid-1985, complete Salvinia control was achieved.

TWO MORE AQUATIC

The EXTENSION AQUATIC WEED CONTROL NEWSLETTER is a service of the Florida Cooperative Extension Service, IFAS, University of Florida. Its purpose is to alert readers to new rules and legislation about aquatic plant management as well as new label changes for commonly used aquatic herbicides. The newsletter also announces meetings and plant management courses.

The newsletter is free. To be placed on the mail list, contact Dr. K.A. Langeland, editor, at the Center for Aquatic Plants.

PLANT NEWSLETTERS

POTOMAC SAV NEWS is a newsletter about submerged aquatic vegetation (SAV) in the metropolitan Washington (D.C.) area. It presents news of interest especially about the recent infestations of hydrilla in the area. It is produced by the Metropolitan Washington Council of Governments, and is supported with funds from the Federal/State Aquatic Plant Control Program. It is free. Contact the Department of Environmental Programs, MWCOG, Suite 200, 1875 Eye Street N.W., Washington, D.C. 20006.
Literature reviews about aquatic plants and their management are being prepared in increasing numbers. In many cases, these reviews are used to convince funding agencies of the value of proposed research or to identify "gaps" in the research. Many users appreciate even more the value of the Aquatic Plant Information Retrieval System (APIRS) when they are preparing literature reviews. APIRS, part of the IFAS Center for Aquatic Plants, provides free of charge retrospective and current awareness bibliographies of the literature to many government and private entities. Recently, we conducted a citation count for areas of research represented in our database of more than 25,000 aquatic plant articles, books and reports. Some of the results, which may indicate research trends of interest to our users and readers, are graphed below. The Y axis indicates numbers of citations in the database; the X axis indicates publication years. APIRS, 2183 McCarty Hall, IFAS - University of Florida, Gainesville, Florida 32611. (Graphs: Stefanie Malir)
APPLIED ELECTROENCEPHALOLOGY -- STUNNING NEW AQUATIC PLANT MANAGEMENT METHOD; PUBLIC RELATIONS DREAM

Aquatic plant management researchers world-wide are discussing recently released data on a new management method, Megaelectrical Point Discharge (MEPD). The method promises not only to eliminate "aquatic weeds" but also to replace public fear and skepticism about aquatic weed management with joy and anticipation.

MEPD is the brainchild of Dr. Ragtop Prabababagous, the noted authority on plant electro-communication and electronecrophytology, the science which studies the death of plants by electricity. Others co-opted into the study are Dr. Hans Beetlemanna, Dr. Beta (Ray) Willsin, Dr. Herbie Sides, and Dr. No Hy Droh. Willsin, of the Mechano-electrohydrobotanical Institute, is the chief designer of the experimental apparatus; Beetlemanna the chief theoretician; Sides the chief ecological consultant, and Hy Droh the chief public relations consultant. A consortium was necessary because no single country could afford the cost of gathering the many quick minds required and developing the ultra-sophisticated technical hardware necessary to test the new method. The Bartram of Zultania graciously donated the test site which is located 140 miles from anywhere.

In simple terms, megaelectrical point discharge employs the use of 12 feet electrodes placed at each end of the aquatic plant infested waterbody. Electrical power is applied and plants are instantly vaporized. No further treatment is required as no biomass of any kind remains.

The method requires the use of several megawatts of power, depending on the size of the treated areas. For the 80 ha. experimental lake, 38 megawatts were necessary to reduce a waterhyacinth infestation (density of 150 m.t./ha) to white phosphatic powder. In the experiment, all power of the country of Zultania was temporarily diverted to the apparatus. Field personnel for the project have been subducted from the ranks of unemployed capital punishment technicians, in plentiful supply in Zultania since electrocution was deemed non-energy-efficient. Morale is high among the newly employed aquatic plant control technicians, known as Wattheads, who feel they are on the cutting edge of a new technology. Wattheads are seen sporting caps which read, "More Power to 'Em!" and bumper stickers stating that "Wattheads are Live Wires!"

OTHER BENEFITS

EVAPORATIVE DRAWDOWNS. Other uses of the MEPD include evaporative drawdowns, achieved by heating waterbodies to high temperatures in order to evaporate excess water. However, controlling the rate of drawdown and restoring the waterbodies to pre-drawdown levels has not as yet been perfected. Specialists agree that more research is needed in the areas of application rate and water reconstitution. Nevertheless, the Zultanian Cadre is anxious to test the method anyway, and has targeted a small urban community's water supply lake as the first test site. Boiled fish will be distributed among residents to offset any complaints of a water shortage.

NON-WATER SPORTS. The evaporative characteristics of the MEPD have also been considered for use in preparing fields for the Zultanian national sport, Basin Ball. Basins for the popular sport have a tendency to fill up with water following heavy rains. After evaporating all water from the basins, the electrodes can be left in place and utilized for illuminating nighttime games and eliminating pesky insects, further engendering public support for this state-of-the-art apparatus.

SHINY OBJECTS. Another beneficial spinoff of the MEPD is the possibility of electroplating anything placed within the waterbody to be treated.
AQUAPHYTE

AQUAPHYTE is the newsletter of the Center for Aquatic Plants and the Information Retrieval System of the University of Florida Institute of Food and Agricultural Sciences (IFAS). Support for the information system is provided by the Florida Department of Natural Resources and by the U.S. Army Corps of Engineers Waterways Experiment Station Aquatic Plant Control Research Program (APCRP).

EDITOR: Victor Ramey
ASSISTANT: Karen Brown

AQUAPHYTE is sent to 3,500 U.S. and Canadian managers, biologists and agencies. Comments, announcements, news items and other information relevant to aquatic plant research are solicited.

We gladly permit free republication of AQUAPHYTE items when accompanied by full acknowledgement.

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PESTICIDE INFORMATION

The University of Florida IFAS Pesticide Information Office has a new coordinator, Dr. O. Norman Nesheim. Dr. Nesheim joined the University of Florida on July 1, after serving as Pesticide Coordinator for nearly 13 years at Oklahoma State University.

Functions of the Pesticide Information Office include the development of examination and training materials for the Certified Pesticide Applicator courses offered through the County Extension Agent offices. The office also writes and distributes informational brochures such as the Pesticide Applicator Training Update which contains new information on the Florida Pesticide Law and Rules, pesticide disposal, handling of spills, endangered species restrictions, safety and warning posters and emergency telephone numbers.

CHEMICALLY SPEAKING is a monthly newsletter published by the Pesticide Information Office. It covers the latest developments in pesticides, including government regulation and new or pending legislation, application restrictions and exemptions, new, recalled or discontinued products, information on violations, and availability of educational materials such as videotapes on safety, proper handling, mixing and storage of pesticides, information updates and safety packets.

CHEMICALLY SPEAKING is available free to all interested parties by calling (904)392-4721 or writing Dr. Nesheim at the Pesticide Information Office, Building 847, University of Florida, Gainesville, Florida 32611.

Other aquatic pesticide publications available from IFAS include:
- Pesticide Applicator Training (PAT) Update
- Applying Pesticides Correctly
- Pesticide Safety Packet
- Aquatic Plant Control Manual
- Aquatic Plant Control Reference Manual
- Aerial Applicator Training Manual

Write IFAS Publications, Building 664, Gainesville, Florida 32611, for prices and order forms.