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Aquatics

June 1990/Vol. 12, No. 2



EDITORIAL

"There Goes the Neighborhood"

According to a recent article by Dr. Daniel Ward, University of Florida botanist, 27% of Florida's plant species are now exotic. Our natural habitats are threatened by an ever growing number of aggressive exotic weeds or, "biological pollutants."

Florida's aquatic plant managers know, first hand, how "biological pollution" can destroy ecological and recreational functions of infested water-bodies. Yet, exotic plants threaten non-aquatic sites, as well. In South Florida, the Australian pine, melaleuca and Brazilian pepper have invaded hundreds of thousands of acres, many of which are in the Everglades wetlands. The overall result is the destruction or degradation of natural communities.

This is not just a Florida problem. Other states are also losing their natural communities to "biological pollution." For example, exotics such as purple loosestrife, Eurasian water milfoil and hydrilla continue to spread to new states. In Missouri, 23% of all plant species are now exotic. If this isn't a serious environmental problem, what is? Where are the voices from the environmental community?

A number of reasons have been suggested as to why the environmental community has been generally silent about this issue. First, many view natural areas as homes for higher vertebrates and not as natural ecosystems. Given this view, hydrilla's arrival in a lake can be viewed (at least initially) as an enhancement to game fish habitat. Secondly, many fail to notice exotic plant invasions because of the relative slowness of vegetation change (although hydrilla might not fall into this category). Finally, the average person has difficulty identifying exotic plants as threatening, or even abnormal. It is obvious that the FAPMS, along with other exotic plant control groups, must continue to educate the public and the environmental community to be able to recognize invasive exotic weeds and the threat they pose.

The membership of the FAPMS can be proud that our profession has led the fight against "biological pollution" in the waterways of Florida. Because of aquatic plant management, water hyacinths are now at their lowest levels this century. This proves that with aggressive exotic plant management, widespread "biological pollutants" can be successfully reduced and controlled.

Don C. Schmitz

About The Cover



Canoeists enjoy the Wakulla River south of Wakulla Springs State Park, Wakulla County.

Photo by Jess M. VanDyke, DNR Bureau of Aquatic Plant Management, Tallahassee.

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Photo by Wendy Andrew, SWFWMD

Some Characteristics Of Fragrant Waterlily

By
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The fragrant waterlily belongs to the genus *Nymphaea* and is the largest of eight genera in the waterlily family, *Nymphaeaceae*. This genus consists of 35 species bearing showy and fragrant flowers which are either red, blue, yellow or white. This is a primitive group of flowering plants with fossilized pollen grains from species in this genus dating back more than 160 million years.

Fragrant waterlily (*Nymphaea odorata*) is a wide ranging native aquatic plant. It is an emerged perennial that grows rooted in the hydrosol and can rapidly colonize shallow ponds, lakes and slow moving streams. It is found throughout the eastern half of North America extending northward to Manitoba, southward into Florida and westward into Minnesota, Iowa, Kansas, Oklahoma, Texas, Arizona and Washington. Fragrant waterlily was introduced to England (from North America) in 1786 to support a

growing interest in water gardening and plant cultivation. Fragrant waterlily is also found in other European countries and as far south as El Salvador in Central America.

Solitary fragrant waterlily flowers are elevated above the water surface by peduncle (flower stalk) growth which arises from a horizontal rhizome. Flowers consist of four lanceolate sepals, 25 or more white lanceolate petals, 70 or more stamens (male reproductive structures) and 18 to 20 pistils (female structures, collectively called the gynoecium).

The white petals exhibit a gradual reduction in size as they approach the point of staminal attachment near the center of the flower. The outer stamens have broad filaments and elongated anther (pollen) sacs, while the inner stamens have flexible and narrow filaments with distal anther sacs. The female structures are arranged radially around a central core and

form the stigmatic cup.

Fragrant waterlilies can reproduce vegetatively from rhizome branching and by seed production. In the first reported studies (1880s), fragrant waterlily was observed to be especially adapted to cross-fertilization (pollination). More recent investigations have confirmed these early findings.

Fragrant waterlily flowers open in the morning and close by mid-afternoon for three consecutive days. First day flowers are protogynous (in a pollen receptive state), and the stigmatic cup is filled with a surfactant type stigmatic-secretion. First day flowers only partially open forming a narrow vertical passage leading to the fluid filled stigmatic cup. During this time, all style and stamen processes stand vertically, however no pollen is released.

In second and third day flowers, sepals and petals bend outward. The stamens stand vertically but the style process (pistils) bends inward 90° covering the stigmatic tip. Anther dehiscence (pollen release) begins with second and ends with third day flowers. During this time there is no fluid in the stigmatic cup and pollination is difficult if it occurs at all.

Pollinating insects are attracted to fragrant waterlilies by the flower's odor and by visual stimuli. Second and third day pollen-dehiscing flowers usually open about an hour before first day flowers. As insects visit these second and third day flowers, pollen collects on their bodies. Later, when these insects visit pollen receptive first day flowers, they often come in contact with the stigmatic fluid by sliding down the verticle floral passage which leads to the stigmatic cup or by landing or crawling on the flexible inner stamens which will bend and drop the insect into the cup's fluid. The fluid washes pollen from the insect's body and facilitates cross-pollination. After being exposed to the liquid most insects escape, however, some do drown. As the fluid is evaporated or absorbed, pollen settles onto the stigmatic papillae (surface) and pollen tube formation is initiated. This allows the pollen to travel down the pistil to the ovaries where fertilization occurs.

On the fourth day, flowers remain closed and pollinated flowers are drawn below the water by a bending and coiling of the

peduncle. Five to six weeks after pollination, seeds are released underwater through an opening created by the detached stigmatic surface. New seeds often float for several days, but eventually sink after air trapped inside the seed escapes. In addition to water and wind currents, various ducks such as gadwalls and wood ducks eat these seeds and can distribute them within or between water bodies.

Fragrant waterlilies are desirable in many water bodies because they create fish habitat and have an attractive flower. Even though this is a native plant, it still has the potential to become a weed problem when it occurs in shallow and/or small bodies of water. When control is required, glyphosate, 2,4-D and dichlobenil are all effective, and can control up to 100% of the waterlilies treated, however, second applications are sometimes needed the following year to control new growth from seedlings.¹

¹ Before using any registered herbicide, read all label instructions since some herbicides contain water use restrictions.



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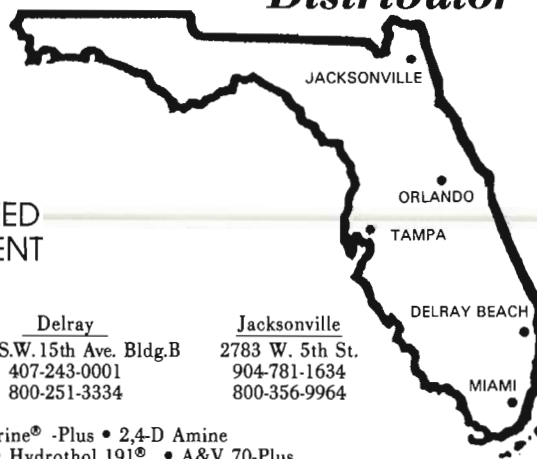
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The Invasion of Exotic Aquatic and Wetland Plants in Florida: History and Efforts to Prevent New Introductions¹

By
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Introduction

By 1950, the number of exotic (non-native) plant introductions into the United States was estimated to be at least 180,000 (Klose, 1950). Some 1,800 exotic plant species have escaped into the wild (Ripley, 1975), and a large portion has become naturalized (Morton, 1976; Austin, 1978). Particularly susceptible to exotic plant invasions because of its semi-tropical climate, Florida has been referred to as "a biological cesspool of introduced life." This paper will focus on the history of exotic aquatic plant introductions into the United States, and the present rules and regulations invoked by Florida and the federal government to prevent new introductions from occurring.

In 1988, 517,438 hectares (1,278,589 acres) of freshwater lakes, rivers, and canal systems were surveyed in Florida to evaluate the distribution and coverage of aquatic plant species (Nall and Schardt, 1989). The survey detected 137 aquatic species covering 140,973 hectares (348,344 acres). Twenty-two species were exotic and covered nearly 37,000 hectares (91,427 acres) or 26 percent of all species observed (Table 1). The submersed African species, hydrilla, comprised 16 percent of all aquatic species or 62 percent of all the exotic aquatic species observed; wetland species were not surveyed. However, it was estimated that nonsurveyed mela-leuca (*Melaleuca quinquenervia*) and Brazilian pepper covered greater than

TABLE 1. Exotic aquatic and wetland plants found in Florida. All aquatic plants and estimated water surface area occupied are from the Florida Department of Natural Resources (FDNR) aquatic plant survey of the state's waters in 1988. All wetland plant survey estimates are compiled from sources other than the FDNR survey.

| AQUATIC PLANT SPECIES | HECTARES INFESTED |
|------------------------------------|-------------------|
| <i>Hydrilla verticillata</i> | 22,635 |
| <i>Panicum repens</i> | 4,654 |
| <i>Salvinia minima</i> | 2,147 |
| <i>Eichhornia crassipes</i> | 1,428 |
| <i>Brachiaria mutica</i> | 1,793 |
| <i>Alternanthera philoxeroides</i> | 1,154 |
| <i>Pistia stratiotes</i> | 1,099 |
| <i>Ludwigia</i> spp.* | 755 |
| <i>Myriophyllum spicatum</i> | 427 |
| <i>Colocasia esculenta</i> | 293 |
| <i>Hygrophila polysperma</i> | 121 |
| <i>Egeria densa</i> | 79 |
| <i>Ceratopteris</i> spp.** | 61 |
| <i>Najas minor</i> | 54 |
| <i>Najas ancistrocarpa</i> | 36 |
| <i>Myriophyllum aquaticum</i> | 27 |
| <i>Pennisetum purpureum</i> | 5 |
| <i>Limnophila sessiliflora</i> | 3 |
| <i>Nasturtium officinale</i> | <1 |
| <i>Ipomoea aquatica</i> | <1 |
| <i>Potamogeton crispus</i> | <1 |
| <i>Hydrocleis nymphoides</i> | <1 |

| WETLAND PLANT SPECIES | HECTARES INFESTED |
|--|-------------------|
| <i>Melaleuca quinquenervia</i> ¹ | >10,000 |
| <i>Schinus terebinthifolius</i> ² | >10,000 |
| <i>Mimosa pigra</i> ³ | >20 |

*Survey estimate comprising *L. octovalis* (native) and *L. peruviana* (exotic).
 **Survey estimate comprising *C. pteroides* (native) and *C. thalictroides* (exotic).
¹Area Infested estimated by Center and Balciunas (1988).
²Area Infested estimated by Dr. Dale H. Habeck, University of Florida.
³Area Infested estimated by Robert Kipker, FDNR.

10,000 hectares (24,710 acres), each (Center and Balciunas, 1988; Habeck, 1989).

These "biological pollutants" have caused extensive ecological, and resource management problems in Florida's waterways. Their introduction and spread have hindered navigation, flood control, and recreational activities such as fishing and water sports, and their expansive growth has displaced native wildlife habitat. Aquatic plant management programs are now necessary to control many of these aggressive exotic aquatic and wetland plants. Since 1980, the cost of aquatic plant management programs to public agencies and private individuals in Florida has been approximately \$90 million.

History of Aquatic and Wetland Plant Introductions

Because water lettuce (*Pistia stratiotes*) was first described by John and William Bartram during their early explorations of Florida in 1765 (Bartram, 1942), it was thought to be native to Florida. However, Cordo et al. (1981) has suggested that water

¹Reprinted from the Proceedings of the National Conference on Enhancing the States' Lake and Wetland Management Programs, 18-19 May 1989, Chicago, IL, R. Kirschner, Editor, 400 W. Madison, Chicago, IL 60606. USEPA, Northeastern Illinois Planning Commission and North American Lake Management Society, Sponsors.

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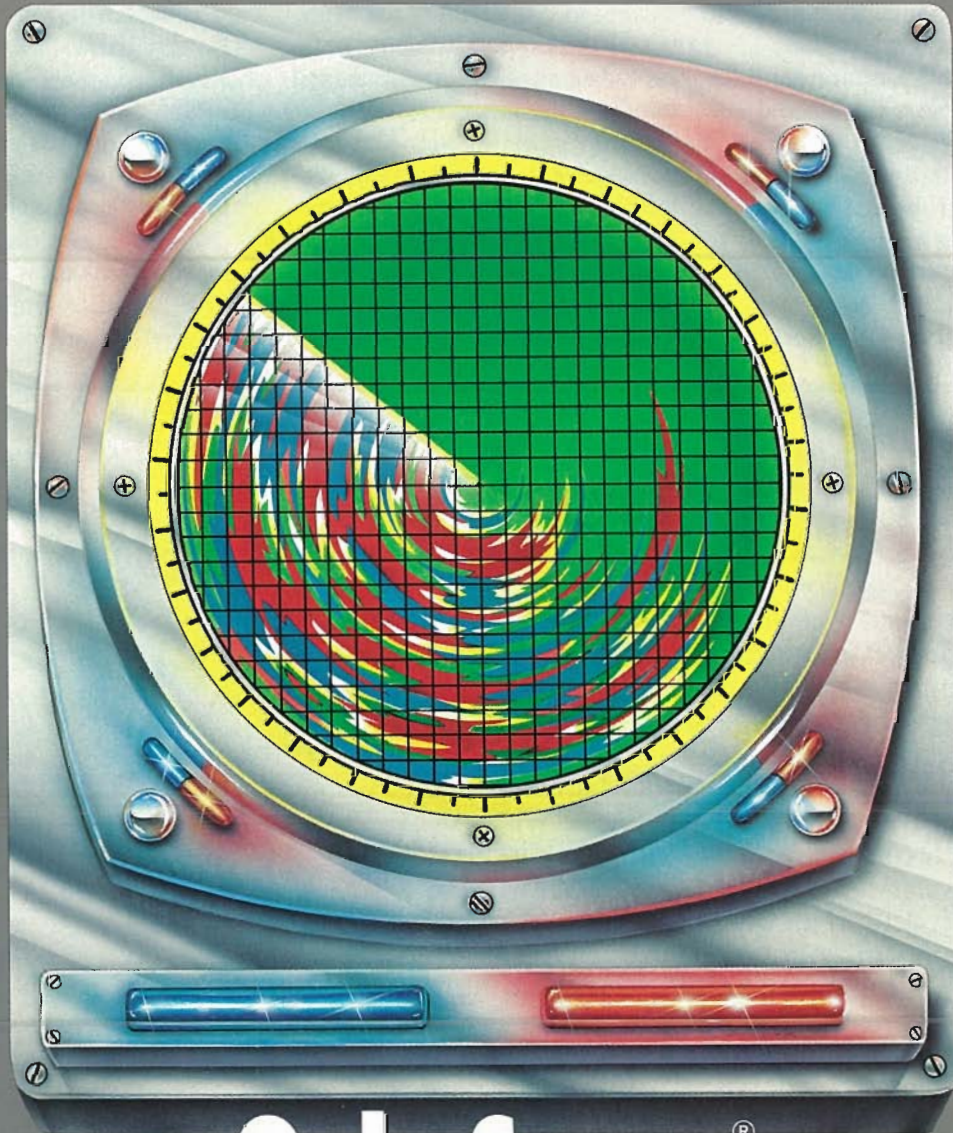
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small bundles of plants sent from St. Louis, Missouri, to Tampa, Florida, that were discarded into a canal in the early 1950s. By 1967, hydrilla was established throughout Florida and was rapidly expanding its range into other southeastern states. Only the female biotype of hydrilla was known to exist in the United States during the 1960s and 1970s. But in 1982, hydrilla plants obtained from a Washington, D.C., aquatic plant nursery produced both male and female flowers, confirming that the monoecious biotype was in this country. The monoecious hydrilla that is now established in the northern states greatly increases the potential for genetic diversification through sexual reproduction, which could lead to even greater expansion of this noxious weed (Steward et al. 1984).

Another exotic wetland plant species that poses a significant threat to south Florida's wetland com-

munities is catclaw mimosa (*Mimosa pigra*). This native of Central and South America now occupies three distinct south Florida locations, one dating back to 1953. This shrub has long, sharp thorns and forms dense stands along waterbodies that can block access to people and wildlife. Because the species has sensitive leaves that fold on touch, its introduction into Florida may have been as an escape from ornamental cultivation.

Other exotic aquatic plants that have escaped from cultivation and are now established in Florida's waterways include: elephant ear (*Colocasia esculenta*), a native of tropical Asia introduced by the U.S. Department of Agriculture in 1910 (Greenwell, 1947); water primrose (*Ludwigia peruviana*), which is commonly found in Central and South America; watercress (*Nasturtium officinale*), a native of Europe that has been introduced and cul-

tivated throughout the United States as an ingredient of salads; and a number of species (*Hydrocleis nymphoides*, *Najas minor*, *Najas ancistrocarpa*, and *Potamogeton crispus*) that are probably related to dumps of home aquaria into Florida waterways.

Regulations to Prevent the Introduction of New Aquatic Weeds

William McLane (1969), who owned and operated an aquatic plant nursery in south Florida from the late 1940s to the early 1970s, first proposed the establishment of rules and regulations regarding the importation of exotic aquatic plants. In 1969, the Florida State Legislature enacted a State Statute (section 403.271) that prohibited the importation, transportation, and cultivation of aquatic plants without a permit from the Department of Pollution Control (now the Florida Department of Environmental



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Regulation). In 1973, the controlling authority was transferred to the Florida Department of Natural Resource's (FDNR) Bureau of Aquatic Plant Research and Control (Goldsby et al. 1976), now the Bureau of Aquatic Plant Management, from which the program has evolved to its present status. In 1984, legislation was introduced that revised section 403.271 by authorizing the permitting and inspection of all persons involved with the aquatic plant business. A violation of Florida's rules can result in a second degree misdemeanor charge.

Chapter 16C-52 of the Florida Administrative Code (F.A.C.) states the specific regulations governing aquatic plant importation, transportation, cultivation, possession, and retail sales. This rule provides for annual permitting of persons who use aquatic plants for business purposes and scientific research. The Florida Department of Natural Resources has established a prohibited aquatic plant list (Table 2)

that consists of a number of species from 18 different genera. The major provisions of FDNR's regulatory program are:

- Exotic aquatic plant species may not be planted in the state's waterways.
- Permittees are required to notify the Bureau of Aquatic Plant Management within seven days after importing plants from abroad, giving a complete botanical listing of species received.
- Permittees who cultivate aquatic plants must have secure and adequate quarantine facilities to avoid accidentally introducing exotic plants to adjacent waterways.
- All permitted culture facilities, wholesalers, and retail outlets are subject to inspection, and all prohibited aquatic plants can be seized without compensation to the owner.
- Violations can result in the suspension or revocation of the

permit or a misdemeanor charge of the second degree.

The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USDA/APHIS) has been charged with administering the Federal Noxious Weed Act of 1974 (U.S. Code Serv. 1985). This responsibility includes the identification of actual or potential noxious weeds, prevention of their entry into the United States, and early detection and eradication of incipient infestations. According to Part 360.100 Definitions (Federal Noxious Weed Regulations), section 3 of the Federal Noxious Weed Act of 1974 defines "noxious weed" as

any living stage (including but not limited to seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is of foreign origin, is new to or not widely prevalent in the United States, and can directly or

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TABLE 2. The list of aquatic and wetland plant species that are listed as federal noxious weeds (USDA/APHIS) and FDNR prohibited aquatic plants.

| USDA/APHIS NOXIOUS WEEDS | FDNR PROHIBITED LIST |
|--------------------------------|---|
| <i>Azolla pinnata</i> | <i>Alternanthera philoxeroides</i> |
| <i>Eichhornia azurea</i> | <i>Cabomba aquatica</i> |
| <i>Hydrilla verticillata</i> | <i>Eichhornia spp.</i> |
| <i>Hygrophila polysperma</i> | <i>Hydrilla spp.</i> |
| <i>Ipomoea aquatica</i> | <i>Hygrophila polysperma</i> |
| <i>Lagarosiphon major</i> | <i>Ipomoea aquatica</i> |
| <i>Limnophila sessiliflora</i> | <i>Lagarosiphon spp.</i> |
| <i>Mimosa pigra</i> | <i>Limnophila sessiliflora</i> |
| <i>Monochoria hastata</i> | <i>Mimosa pigra</i> |
| <i>Monochoria vaginalis</i> | <i>Monochoria hastata</i> |
| | <i>Monochoria vaginalis</i> |
| | <i>Nachaniandia alternifolia</i> |
| | <i>Pontederia rotundifolia</i> |
| <i>Sagittaria sagittifolia</i> | |
| <i>Salvinia auriculata</i> | <i>Salvinia spp. (except S. minima)</i> |
| <i>Salvinia biloba</i> | |
| <i>Salvinia herzogii</i> | |
| <i>Salvinia molesta</i> | |
| <i>Sparganium erectum</i> | <i>Sparganium erectum</i> |
| <i>Stratiotes aloides</i> | <i>Stratiotes aloides</i> |
| | <i>Trapa spp.</i> |
| | <i>Vossia cuspidata</i> |
| PROPOSED SPECIES TO BE ADDED | |
| | <i>Crassula helmsii</i> |
| | <i>Ipomoea fistulosa</i> |
| | <i>Melaleuca quinquenervia</i> |
| | <i>Schinus terebinthifolius</i> |

indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation or the fish or wild-life resources of the United States or the public health.

USDA/APHIS has designated 17 aquatic plant species as Federal Noxious Weeds. (FDNR's prohibited aquatic plant list contains a larger number of species because the department believes that a larger number of exotic species could invade and infest south Florida's unique, semitropical waterways.)

Incoming plant shipments from other countries are first inspected at an USDA/APHIS inspection station for agricultural pests and plants that are listed as federal noxious weeds. All federal noxious weed species that are intentionally or accidentally imported are destroyed. The Florida Department of Natural Resources

has an informal agreement with the USDA/APHIS

Miami plant inspection station (where the majority of tropical aquatic plants enter the United States) to monitor shipments for plants listed as FDNR-prohibited aquatic plant species. Under this agreement, the USDA/APHIS notifies FDNR if a species cannot be identified or a FDNR-prohibited plant species has been imported. All FDNR-prohibited aquatic plants are seized or destroyed.

Past FDNR inspections have resulted in the seizure and/or eradication of a number of federal

noxious weed species. Giant salvinia (*Salvinia molesta*) is an aggressive water fern that has caused severe problems wherever it has been introduced (Nelson, 1984). This troublesome weed has been found in two aquatic plant nurseries in Florida that apparently received contaminated plant shipments from Sri Lanka.

A native of southeast Asia, water spinach (*Ipomoea aquatica*) has become Florida's most problematic federal noxious weed species. This plant is cultivated as an edible vegetable by Asian immigrants for personal use and for sale in oriental food markets throughout the United States. This vine-like species can grow in a wide range of habitats and is quite aggressive because of its prolific growth rate. The FDNR has seized and destroyed many water spinach infestations in south and central Florida drainage ditches and ponds, but many aquatic plant

managers believe it is only a matter of time before this species becomes established here.

Another federal noxious weed, the anchored water hyacinth (*Eichhornia azurea*), was seized at a private residence after the species was obtained from a mail-order aquatic plant nursery located in Ohio. The federally listed *Lagarosiphon major*, a plant species very similar to hydrilla, and the floating weed, water hyacinth, can also be easily mail-ordered from aquarium and aquatic garden supply companies.

Although water hyacinths are not listed as a federal noxious weed species, a federal law (Chapter 825, Public Law 874) prohibits the interstate shipment of water hyacinth plants and also alligatorweed and water chestnut (*Trapa natans*). This law is administered by the U.S. Department of Justice, rather than the USDA/APHIS, but it is doubtful that this law has ever been enforced since its enactment in 1956.

According to section 2803(a) of the Federal Noxious Weed Act,

No person shall knowingly move any noxious weed, identified in a regulation promulgated by the Secretary [of the USDA], into or through the United States or interstate, unless such movement is authorized under general or specific permit from the Secretary and is made in accordance with such conditions as the Secretary may prescribe in the permit and such regulations as he may promulgate under this Act to prevent the dissemination into the United States, or interstate, of such noxious weeds.

A number of federal noxious weeds are presently sold as ornamentals and/or vegetables and are freely shipped from state to state. Although section 2803(a) of the Federal Noxious Weed Act grants authority to the USDA to stop the interstate spread of federal noxious weeds, the USDA/APHIS is

interpreting the legislative intent, Senate Report No. 93-1313 (93rd Congress), as overriding the Act itself. In the Senate Report, "the restriction on interstate movement [of noxious weeds] would apply only to movements from areas quarantined under section 5 of the bill." To date, no quarantines have been enacted under the Federal Noxious Weed Act.

Because of the failure of the Federal Noxious Weed Act of 1974 and/or the USDA/APHIS to stop the interstate commerce of federal noxious aquatic weeds, waterways in Florida and in other states are at risk. It makes no economic or biological sense to prevent the importation of federal noxious weeds into the United States and then allow commercial sales of these same plants from state to state. A consistent policy is needed to prevent federal noxious weeds now in this country from becoming naturalized.

Florida has a very active program to prevent new exotic aquatic plant introductions from occurring that uses permits and inspection of aquatic plants at retail, wholesale, and farming establishments. However, Florida cannot regulate plant species shipped here from another state via U.S. mail or commercial freight carriers. It is up to the USDA to properly administer the Federal Noxious Weed Act of 1974, or Florida, as well as other states, will be infested with new exotic aquatic plant populations.

Acknowledgments

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Interstate Sale of Aquatic Federal Noxious Weeds as Ornamentals in the United States

By

Randy G. Westbrooks, Ph.D.
Weed Botanist, USDA APHIS S&T
Whiteville, North Carolina

I. Introduction

As with terrestrial weeds, a number of aquatic weeds have certain characteristics that make them desirable to some people and other traits that make them a serious threat in water systems. Floating water hyacinth [*Eichhornia crassipes* (Mart.) Solms.] is a beautiful plant when properly maintained in a water garden. However, soon after being introduced into the U.S. at an international exposition in New Orleans in 1884, it escaped cultivation and has caused severe problems in a number of water bodies throughout the South. Hydrilla [*Hydrilla verticillata* (L. f.) Royle] was originally imported as an aquarium plant. It is now the scourge of a number of water systems in the U.S.

II. The Johnny Weedseed Syndrome

The intentional spread of undesirable plants without a regard for, or an understanding of, their potential long term effects on the environment is called the "Johnny Weedseed Syndrome." Both hydrilla and floating water hyacinth were intentionally introduced and spread in the U.S. in this manner. The Johnny Weedseed of hydrilla was an aquatic plant dealer in St. Louis who imported the plant from Ceylon (Sri Lanka) about 1950 and subsequently sent it to a dealer in Tampa. The rest of that story is well documented history.

That such plants were introduced in the past is understandable. Plant explorers and horticulturalists are always looking for new species and germplasm to improve our commercially important species. This has

been a boon for agriculture and horticulture in general. However, a small minority of introduced species have escaped cultivation and become serious weeds in the U.S. Species like hydrilla and floating water hyacinth should have never been brought to the U.S. in the first place.

The unchecked natural spread of introduced species has sometimes led to serious problems such as that now being seen with *Melaleuca* in the Florida Everglades. However, an equally serious situation exists with introduced weeds actually being sold as *ornamentals* throughout the United States. Last summer, state officials in South Carolina found floating water hyacinth being sold at a local produce market in Columbia. Clearly we have a big job ahead educating people about weeds; especially about noxious weeds that are also sold as ornamentals.

III. Foreign Germplasm as a Source of New Weeds

One factor that has permitted some weeds to enter and become established in the U.S. has to do with the introduction of germplasm into the U.S. The present system for introducing foreign germplasm was established in 1897 to ensure that introduced plants do not harbor foreign pests such as insects and plant diseases. However, *it does not assess the potential of the plant itself for becoming a weed.* If this criterion had been included in the germplasm introduction philosophy to begin with, many troublesome species we now have would never have been released to the importer.

IV. The Federal Noxious Weed Act of 1974

Another factor that permitted the unabated flow of all types of plants without regard for their weediness was the lack of federal legislation regarding weeds. By the time the Federal Noxious Weed Act (FNWA) was passed in 1974, hydrilla had already become a serious problem in Florida. Hydrilla is truly a national problem and a good example of what can result from the introduction of foreign plants that are both weeds and ornamentals.

The FNWA was passed in 1974 to stop the introduction of foreign weeds into the United States. It also gives authority to eradicate incipient infestations of FNWs in the United States before they become wide spread. Presently, 93 taxa of foreign weeds have been listed as Federal Noxious Weeds. This includes 88 species; plus all species of the parasitic genera *Aeginetia*, *Alectra* and *Striga*; plus all non-native species of *Cuscuta* and *Orobanche*. About 750 additional species have been identified as potential candidates but have not been listed. The last species were added to the list in 1984.

V. Federal Noxious Weeds Already in the United States

Of the 93 taxa now listed, 51 species are known or reported to already occur in the United States. Of these 51 species, USDA APHIS is cooperating with the affected states to eradicate six. APHIS cooperative weed program/ projects now include:

- *Striga asiatica* (L.) Ktze. (Witchweed) in North and South Carolina;
- *Orobancha ramosa* L. (Hemp broomrape) in Karnes County, Texas;
- *Hydrilla verticillata* (L. f.) Royle in the Imperial Irrigation District, Imperial, California;
- *Salsola vermiculata* L. (Wormleaf salsola) in San Luis Obispo County, California;
- *Galega officinalis* L. (Goatsrue) in Cache County, Utah; and
- *Crupina vulgaris* Cassini (Common crupina) in Idaho, Oregon and Washington.

VI. Aquatic Species Listed as Federal Noxious Weeds

At this time, 16 species of aquatic plants have been designated as Federal Noxious Weeds. These include:

| | |
|---|---|
| <i>Azolla pinnata</i> R. Brown | Mosquito fern |
| <i>Eichhornia azurea</i> (Swartz) Kunth | Anchored water hyacinth, Rooted water hyacinth |
| <i>Hydrilla verticillata</i> (Linnaeus f.) Royle | |
| <i>Hygrophila polysperma</i> T. Anderson | Miramar weed |
| <i>Ipomoea aquatica</i> Forsskal | Water spinach, Swamp morningglory |
| <i>Lagarosiphon major</i> (Ridley) Moss | African oxygen weed |
| <i>Limnophila sessiliflora</i> (Vahl) Blume | Ambulia |
| <i>Monochoria hastata</i> (L.) Solms-Laubach | |
| <i>Monochoria vaginalis</i> (Berman f.) C. Presl | |
| <i>Sagittaria sagittifolia</i> L. | Arrowhead |
| <i>Salvinia auriculata</i> Aublet | Giant salvinia |
| <i>Salvinia biloba</i> Raddi | Giant salvinia |
| <i>Salvinia herzogii</i> de la Sota | Giant salvinia |
| <i>Salvinia molesta</i> D.S. Mitchell | Giant salvinia |

| | |
|------------------------------|-----------------|
| <i>Sparganium erectum</i> L. | Exotic bur reed |
| <i>Stratiotes aloides</i> L. | Water-aloe |

VII. Aquatic FNWs Being Sold as Ornamentals

Presently, at least eight of the above are known to occur in the United States, and six of them have been or are being sold in interstate commerce as pond ornamentals, aquarium plants, or as vegetables. These include:

- *Hydrilla verticillata* (L. f.) Royle
- *Eichhornia azurea* (Swartz) Kunth
- *Hygrophila polysperma* T. Anderson
- *Ipomoea aquatica* T. Forsskal
- *Limnophila sessiliflora* (Vahl) Blume
- *Lagarosiphon major* (Ridley) Moss

Hydrilla verticillata has been sold extensively by aquatic plant dealers but is not now listed for sale by any

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major firms. Its continued spread now can be attributed mostly to intentional and accidental spread by private individuals.

Eichhornia azurea is similar to floating water hyacinth but has a

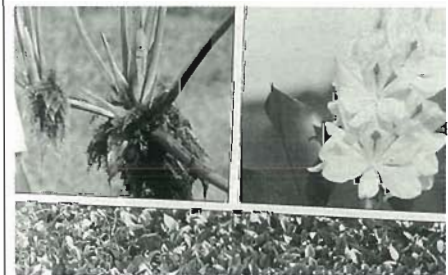


Figure 1. Rooted water-hyacinth (*Eichhornia azurea*) with characteristic slender leaf petioles.

slender leaf petiole. One small population of the plant being grown in a large reflecting pool on a residential estate in Palm Beach, Florida, was eliminated by the Florida Department of Natural Resources (FDNR) in June, 1988. FDNR was alerted of its presence by an aquatic plant dealer in south

Florida. The plants had been purchased from a mail order aquatic plant dealer in Ohio. This plant is still listed for sale by the dealer (see figure 1).

FDNR has also battled and eliminated several small infestations of *Ipomoea aquatica* over the past several years. This plant is cultivated widely as a green vegetable in Asia, and by some Asian-Americans living in the United States. As such, it ranks as one of the most frequently intercepted Federal Noxious Weeds at U.S. ports of entry by the U.S. Department of Agriculture, Animal and Plant Health Inspection Service (USDA APHIS). Its seeds are sold openly in Asian-American food stores in several states and obviously



Figure 2. Seed packet of Chinese water green (*Ipomoea aquatica*) as often imported from Asia and sold in ethnic food stores.

through the U.S. Mail (see figure 2).

Limnophila sessiliflora and *Hygrophila polysperma* (figure 3) are two FNW species causing problems in a number of waterways in south Florida. Both species are listed as prohibited under Florida statutes. However, aquatic plant dealers in Florida are propagating both for sale outside the state.

Lagarosiphon major (Ridley) Moss has been offered for sale by aquatic plant dealers in California and may still be under another name. This plant is similar in morphology to hydrilla but prefers cooler waters. It

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Figure 3. Miramar weed (*Hygrophila polysperma*) in a canal in Ft. Lauderdale, Florida.

may actually be more of a threat to northern states than Florida.

VIII. Discussion

Federal regulation of ornamental noxious weeds is necessary because the states do not regulate the U.S. Mail, interstate carriers, or businesses in other states. At present, the states only find out about FNWs from concerned individuals or after a species has naturalized and become a serious problem. Usually by that time, eradication is too expensive or impractical. The states

must then deal with the problem in *ad finitum*. Prevention (Keeping foreign weeds out of foreign commerce to begin with) and *exclusion* (detection at ports of entry and regulation of interstate movement) are far better than *perpetual control*. The state of Florida alone spent \$90 million during the 1980s to control exotic aquatic weeds.

One reason that ornamental noxious weeds are being sold in interstate commerce has to do with the Federal Noxious Weed Act itself. Section 4 of the FNWA stipulates that FNWs cannot be moved interstate without a permit from APHIS. However, the legislative history of the Act (Senate Report # 93-1313) interprets the restrictions on interstate movement as applying only to movements of FNWs from areas quarantined under Section 5 of the Act. To date, no FNWs have been quarantined under the Act. Thus, APHIS has not restricted the interstate movement or

Continued on page 24

Using Citizen Monitors to Protect a Lake from Eurasian Water Milfoil

By
Frank M. De Steno and L.J. Larson¹

Introduction

Eurasian water milfoil (*Myriophyllum spicatum* L.) has become an issue of real concern in the northern midwest region of the United States. Although other areas of the nation have experienced this nuisance, if not noxious, weed over the past several decades, it is only since about 1987 that it has been reported in Minnesota.

The problems associated with this plant have been well documented (Newroth, 1985). Briefly, this is an exotic species which colonizes an area primarily through the transport of plant fragments. Growth rate under good environmental conditions can be extremely rapid: up to

two inches per day. Due to its rapid growth and the fact that as an exotic species it escapes the herbivory to which other species are subject, Eurasian water milfoil grows into large mats which impede most recreational uses of a lake.

In Minnesota, the problems associated with Eurasian water milfoil are known by many, if not most, of the general public. This, however, is not due to the widespread occurrence of the plant, but rather to its establishment in one of the state's premier recreational areas, Lake Minnetonka, located in suburban Minneapolis-St. Paul. Local newspapers and television news programs feature regular

reports of the problems associated with this milfoil in Lake Minnetonka. The public hears about the immense effort being expended and funds being spent to maintain the lake for boating alone, with no expectation of eradicating the plant. The Minnesota Department of Natural Resources (DNR) has produced and broadcast public service announcements on the problem urging boaters to clean both their boat and trailer of weeds.

The public perception is "a clear and present danger" for area lakes

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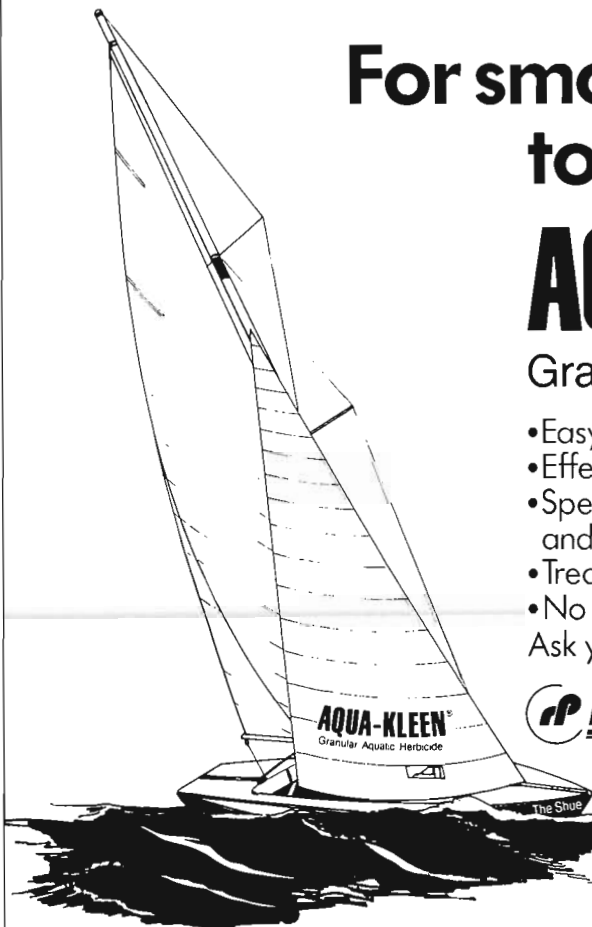
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of lake shoreline about 1.6 km in length semi-monthly from May to September. Due to the characteristic autofragmentation of Eurasian water milfoil, it was felt that if the plant does establish itself in White Bear Lake, pieces will eventually wash up on shore and be seen by a monitor. (Many of the volunteers walk the shoreline as a recreational activity so they do not even think of the monitoring as a chore.) Additionally, some volunteers will monitor their sections by boat.

After monitoring their assigned section, the volunteers fill out and send a report form to the program manager. In the event the target species is encountered, the monitor will mark the site, collect a voucher sample, and contact the program manager who will confirm the identification and determine the location and extent of the infestation. The manager will then contact the aquatic weed control professional and direct the application of the herbicide, the

chosen course of action for White Bear Lake.

Discussion

At the time of writing, the monitoring teams have been established, training has been completed, and the lake has been monitored for one full month. The volunteers have responded well to the challenge and are eager to learn not only about Eurasian water milfoil but also about lake ecology in general. There are no problems associated with section assignments or the reporting process itself. We have not yet had a positive contact with the target species however.

Initially, the training sessions were somewhat disorganized due to the range of background information each individual possessed. During the course of the training process, the program dynamics became more clear and the volunteers were able to focus their energy on learning how to identify some of the common

aquatic macrophytes and observing how Eurasian water milfoil differs from these endemics.

In light of how Eurasian water milfoil is spread, the size of the lake and the number of public access and commercial dock areas ultimately determines the number of monitoring teams. We have concentrated monitoring teams in both public and commercial access areas as they are the most likely spots where initial infestation can occur. (In fact, it was at the commercial dock area where Eurasian water milfoil was first collected in White Bear Lake.) It is important not to have too many monitoring teams because the reporting process becomes too complex and it is difficult to keep track of people and assignments. Most importantly, however, is that in order for a program such as this to be successful, you must have a solid core of volunteers who are dedicated to the cause. Without them, the program cannot work.

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One problem that may present itself as the program continues is maintaining the interest of volunteers if the target species is not encountered. This is, of course, the goal of the project, but can also contribute to a decline in interest on the part of the citizen monitors.

The White Bear Lake program is in place and awaits the next growing season. Volunteers are trained, an eradication plan is in place in the event the target species is observed, and the public is aware of their obligation to help stop the spread of Eurasian water milfoil. Ultimately, the WBLCD and its volunteers will manage their own program thus reducing their reliance on outside consultants as well as their cost. In the Minneapolis-St. Paul area, Lake Minnetonka is a constant reminder of a worst-case scenario. It is more cost-effective to keep Eurasian water milfoil out of a lake than try to deal with it after it is established.

Acknowledgments

This project was a cooperative effort between the White Bear Lake Conservation District, White Bear Lake, Minnesota, and the Rice Creek Watershed District, Arden Hills, Minnesota. The contributions of the individual Board members from each District is gratefully acknowledged.

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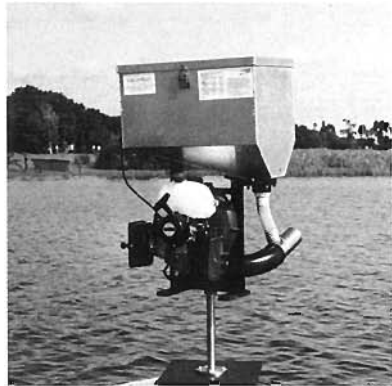
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sale of any Federal Noxious Weeds including the aquatic species listed above. The only exception to this is witchweed in the eastern Carolinas which is quarantined under the Federal Plant Pest Act.

As it is now written and interpreted, the Federal Noxious Weed Act is a handicap in preventing the spread of Federal Noxious Weeds within the United States. The Act must be amended and/or reinterpreted as necessary to provide effective authority against commercial interstate shipments of federally listed weeds. Until that happens, the states will have to rely on their own regulations for protection against the work of modern day "Johnny Weed-seeds." Without effective regulations to deal with the problem, ornamental noxious weeds that can be readily sold will continue to be moved in commerce. Note: In May 1990, Senator Tom Daschle of South Dakota (Chairman of the Subcommittee on Agricultural Research and General Legislation) introduced several proposed amendments intended to strengthen the Federal Noxious Weed Act. Among the changes would be to prohibit the interstate movement or sale of Federal Noxious Weeds in the United States.

Call for Papers – FAPMS 1990 Annual Meeting

October 2-4, 1990 are the dates. Ft. Lauderdale's famous oceanfront Bahia Mar hotel is the place. And now is the time to submit your paper for the 14th Annual FAPMS Meeting.

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Abstract (75 words or less): _____

Submit this form to: Mr. Wayne Jipsen
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525 Ridge Lawn Road
Clewiston, FL 33440

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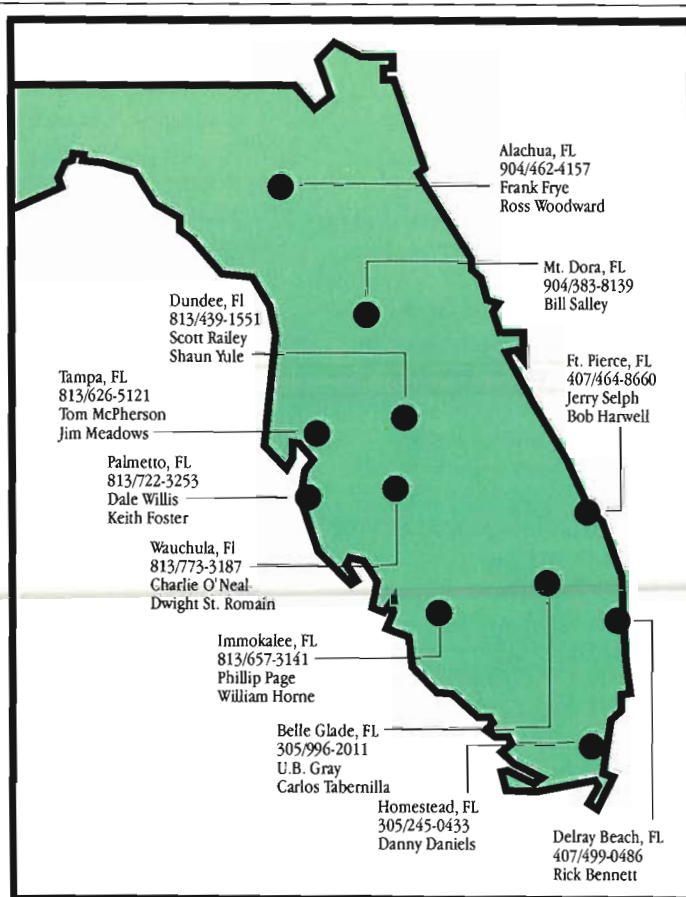
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AQUAVINE



PESTICIDE MISUSE CAN BE HAZARDOUS

An Israeli housewife's fight with a stubborn cockroach put her husband in the hospital with burns, a broken pelvis, and broken ribs, the Jerusalem Post newspaper reported. The wife, frightened by the insect when she found it in their living room, stepped on it, threw it in the toilet, and sprayed a full can of insecticide on it when it refused to die. Her husband came home from work, went to the toilet, and lit a cigarette. When he threw the cigarette butt into the bowl, the insecticide fumes ignited, seriously burning his sensitive parts. When paramedics were called to the home in Tel Aviv, they laughed so hard when they learned what happened that they dropped the stretcher down the stairs breaking the unidentified man's pelvis and ribs. (Ohio Pesticide Newsletter, Feb. 28, 1990)

NEW AQUATIC PLANT MANAGEMENT VIDEO AVAILABLE

A new 24-minute VHS format video entitled, *Florida's Aquatic Plant Story*, has just been released which provides a general public-aimed introduction to Florida aquatic plant management practice and theory. It is available free to public agencies of Florida or \$10 plus \$0.60 sales tax to others (Checks payable to the University of Florida) from:

UF/IFAS Center for Aquatic Plants
Office of Information
7922 N.W. 71st Street
Gainesville, Florida 32601

FEDERAL CONGRESSIONAL SESSION ACTIVITY NOTES

In the current Federal Congressional Session, the introduced Daschle amendments to the Federal Noxious Weed Act (FNWA) of 1974 would increase the

ability to regulate interstate shipment of Federal Noxious Weeds.

At the same time, USDA-supported legislation has been proposed to, in effect, supercede the FNWA with the Plant Protection Act and incorporate the Federal Noxious Weed List into a prohibited pest insects and pathogens list and give USDA authority to readily amend the resultant list. Contact authors Westbrooks and Schmitz (in this issue) for details of these proposals.

FLORIDA LEGISLATIVE SESSION ACTIVITY NOTES

During the recently concluded 1990 Florida Legislative Session, legislation prohibiting the possession, cultivation and sale of melaleuca, Brazilian pepper, *Mimosa pigra* and two species of Australian pine passed both houses. The Governor has not signed this legislation as this issue goes to press. The DNR Aquatic Plant Management Bureau received no increase in spending authority and will have approximately \$4.8 million for aquatic plant management activity for the coming fiscal year. As this issue went to press, the Bureau has received requests from "RAG/APC" co-operators to perform approximately \$8 million of work. The entire \$4.8 million will likely be spent in waters where Removal of Aquatic Growth ("RAG") and Aquatic Plant Control ("APC") programs are authorized with matching federal dollars through the Corps of Engineers. Therefore, it is likely that, once again, no funds will be available for the State program which, in the past, benefitted many of the "298" and Special Districts of the State.

Also, several line item transfers from the Aquatic Plant Trust Fund were authorized. These include \$317,000 transferred to perform hydrilla research to be administered by DNR and \$200,000 transferred for aquatic plant research to be administered by University of Florida Institute of Food and Agricultural Sciences (IFAS).

Legislation which had been introduced to tax horticultural nursery industry production in order to provide funding for exotic plant control in Florida never made its way out of committee review.

1990 FAPMS APPLICATOR OF THE YEAR NOMINATIONS

Now is definitely the time to be considering the nominations for the 1990 FAPMS Applicator of the Year award to be made at the annual FAPMS meeting in October at the Bahia Mar Hotel on the wild Ft. Lauderdale beach. Nominations for this award along with the FAPMS Distinguished Service Award (as described in last month's Aquavine) should be sent, with supporting material, to:

Mr. John Kelso
7311 Sunfish Ct.
Brooksville, FL 34609
(904) 796-7211

Please call John if you have any questions about how to best make the case for your nomination. Supporting descriptions of the nominees' outstanding qualities are strongly considered by the committee in selecting the winner(s). Generally, if more detail is provided the committee will have a greater insight about the nominees and, who knows, ties could be broken on the basis of that last anecdote relating how Applicator X has for years been the golldarnedest hardest worker and taken the heat from the public the best and cared the most about the product labels and ...

ADVISORY COUNCIL MEETING ON COPPER USE

The Florida Aquatic Plant Advisory Council will meet June 21, at the DNR Aquatic Plant Bureau's office in Innovation Park, Tallahassee to consider all aspects of future use of copper-based herbicides (chelates and sulfates) in Florida waters.

EDITOR'S CORRECTION

Please note that a correction is needed in John Boutwell's article *Flowering Rush - A Plant Worth Watching*, in the March 1990 *Aquatics*. The following sentence should read, "It was first observed growing in North America in Quebec along the St. Lawrence River in 1887," not 1987, as published. It is regretted if any confusion was caused by this error.



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