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A HOMEOWNER'S GUIDE TO LAKE MANAGEMENT

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by

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INTRODUCTION

With the increasing demand in Southwest Florida for coastal homesites and a corresponding decrease in their supply, growth has been diverted inland. One of the characteristics of this inland region is the large number of sloughs, which are seasonably wet and dry areas. Development in these areas is often difficult and contractors have found that excavating these areas, rather than filling them is advantageous because the excavated materials can be used as landfill for peripheral homesites. The resulting artificial lakes serve as catch basins for surface run-off. In addition, these lakes increase property values because of their aesthetic qualities and the demand for waterfront property.

Although these man-made lakes increase property values, improper management may result in decreased property values due to accelerated eutrophication and ensuing problems. Eutrophication refers to the addition of nutrients to bodies of water. Eutrophication of lakes is a natural ageing process that can be greatly accelerated by man due to poor initial lake construction, storm sewer flow, and excessive lawn fertilization. Accelerated eutrophication causes changes in plant and animal life -- changes that often interfere with the use of water and detract from natural beauty. A common result is excessive growth of algae and larger aquatic plants. The increased plant growth provides an excellent habitat for such animals as rodents, reptiles, and insects. Therefore artificial lakes must be managed in order to slow down the eutrophication process and to control excessive aquatic plant growth and pests.

Most of the lakes in this area are small enough that the efforts at lake management by adjacent homeowners can affect the overall quality of a lake. Many homeowners are not aware of some of the simple management techniques available to them. Therefore, the purpose of this guide is to educate people by reviewing various lake management techniques that control excessive aquatic plant growth.

PREVENTION OF AQUATIC PLANT GROWTH

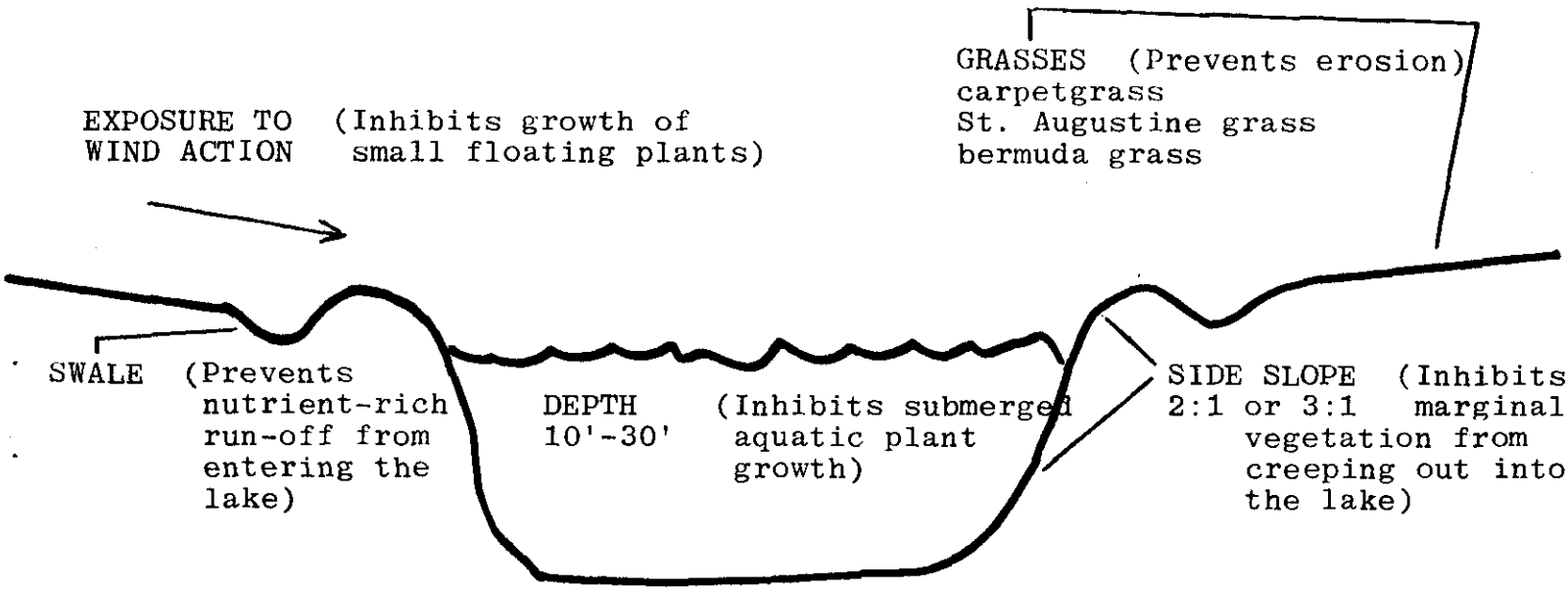
The first step in controlling aquatic plant growth lies in the design and construction of the lake. A few extra hours or dollars expended in the site selection, design, and construction of a lake can save money in the long run.

Site Selection: Lakes should be excavated as far from septic tank fields as possible in order to prevent any nutrient-rich seepage from entering the lake waters.

Since many aquatic weeds thrive in stagnant water, it is important that a lake be exposed to wind action which inhibits the proliferation of small floating plants such as common duckweed (Lemna sp.) and water fern (Azolla sp.).

In the event a lake becomes overgrown with aquatic weeds it is important to have chosen a site which will be easily accessible to equipment and workers.

Design & Construction: The most important aspect in the design of a lake is to limit the number of areas favorable to aquatic plant growth. These areas can be limited by constructing



a lake 10 feet deep or greater in order to limit the amount of light available to submerged rooted aquatics such as Hydrilla and eurasian watermilfoil (Myriophyllum brasiliense). A lake should not be excavated greater than 30 feet deep to prevent possible perturbations to ground-water systems. Deepening the edges of a lake to a depth of 2 or 3 feet prevents marginal vegetation from creeping out into the lake.

Another method for limiting marginal vegetation is to design a lake with a regular shoreline, such as in the shape of an oval or circle. Lakes with irregular shorelines have a greater shoreline length and thus more shoreline vegetation to maintain; whereas regularly-shaped lakes have a minimum amount of shoreline vegetation.

It must be stressed that aquatic plants are not "bad" and that they are an integral part of the aquatic ecosystem, offering

food and shelter for microorganisms, fish, and other wildlife. Rather it is the unchecked proliferation of algae, exotic and weedy species which render a lake aesthetically displeasing and restricts the uses of a lake. When a lake has been dug, filled with water, and is receiving nutrients from surface run-off and other sources, it is similar to a vacant lot which is quickly inhabited by undesirable weeds. Many of these weeds are exotic species which have escaped from tropical countries, mostly from South America. These plants occur in habitats similar to their native environments and proliferate because there are no natural checks to limit their growth here as there were in their native countries. Many times these exotic species, admired for their beauty, are introduced into a lake by adjacent residents who have the plants in fish aquaria. It must be stressed that aquariam plants must not be put into a lake!

It is possible to landscape one's lake with desirable native species which would keep out the weedy opportunistic species. One could plant eelgrass (Vallisneria) to keep out submerged exotics such as Hydrilla. Slender spikerush (Eleocharis) is a very good shore stabilizer and prohibits other marginal and emergent species from growing. The possibility of "stocking" one's lake with desirable vegetation and then managing it should be further investigated.

Another important aspect of lake design is to limit the amount of nutrient-rich surface run-off from adjacent homesites and streets which enters the lake. One method of doing this is to build a swale around the lake. The swale provides an area

whereby the run-off can be absorbed into the ground rather than running directly into the lake.

There are a few turf grasses which quickly stabilize the banks of a lake, thus preventing erosion. Carpetgrass, bermuda grass, and St. Augustine grass are three such examples. In addition, they are tolerant of the fluctuating wet and dry conditions on lake banks and swales. Do not establish grasses such as torpedograss (Panicum repens L.) or paragrass (Panicum purpurascens Raddi.) for these grasses will spread out into the water and will often form dense floating mats.

Land Practices: Careful maintenance of the land surrounding the lake can greatly reduce aquatic weed problems. The practice of lawn fertilization contributes greatly to the nutrient enrichment of a lake. The standard horticultural recommendation for fertilizer for lawns in Sarasota County is one pound combined nitrogen per 1000 square feet, every two months. But Mr. John Zilles, former District Conservationist for the Soil Conservation Service, suggests that homeowners may still maintain a healthy green lawn by using half the recommended amount of nitrogen. This can be done by using fertilizers with slowly soluble nitrogen and by making applications three times a year, rather than six times a year.

It should also be noted that the ability of closely-clipped lawn grasses to hold fertilizer is very poor. Research has shown that the amount of grass roots are proportional to the tops; and where grass is continually clipped closely it has a very short root system which is unable to utilize heavy applications of fer-

tilizer.

The maintenance of the land surrounding the lake should not stop at the water's edge. The lake should be considered an extension of the yard. Marginal vegetation, which if left unchecked could create a serious problem, is easily controlled with a rake and a little time. The same holds true for floating or submerged vegetation. (When removing noxious aquatic plants, care must be taken so as not to fragment them because many of these plants are capable of regeneration from a small fragment.) If one water hyacinth (Eichhornia crassipes) is spotted in a lake, it should be removed immediately; because if it is not, then it will not be long before the entire lake is covered. Once the entire lake is covered, it is very expensive to restore the lake to its original condition.

MANAGING EXCESSIVE AQUATIC PLANT GROWTH

Although one may be careful in designing and constructing a lake, excessive aquatic plant growth may still become a problem. Different means of controlling aquatic weeds are based upon the different types of aquatic weeds involved. Aquatic plants or weeds are commonly divided into five groups: algae, submerged plants, floating plants, emergent plants, and littoral zone plants. The algae include green and blue-green freshwater algae. Submerged plants are made up of rooted plants which complete their entire life cycle below the surface of the water. Plants which have unanchored roots and float on the surface of the water are termed floating plants. Emergent plants are rooted in the bottom mud, but have leaves and reproductive parts at or above

the water surface. Littoral zone plants refer to plants which will grow out from moist shorelines into water up to two feet in depth.

In order to control these plants, one must first identify them. A publication by the Bureau of Aquatic Plant Research and Control, The Aquatic Weed Identification and Control Manual, is an excellent introduction to aquatic plant identification. It is available for $2.50 from the Florida Department of Natural Resources in Tallahassee.

The following is a review of the chemical, biological, mechanical, and physical management techniques aimed at controlling excessive aquatic plant growth.

Chemical Control: The homeowner has two options available when chemical control is being considered. One option is to purchase the chemicals and treat the lake individually; the other option is to hire a licensed professional applicator.

If a homeowner chooses to treat the lake by himself, the Regional Botanist of the Florida Game and Fresh Water Fish Commission should be consulted to determine whether a state permit is required. (Detailed information regarding notification procedures can be found in Appendix I.) The Regional Botanist can also advise the homeowner as to which chemicals are restricted and which chemicals will do the most efficient job on the existing aquatic plant problem. Chemicals can be obtained from farm and garden stores, chemical products companies, hardware stores, and nurseries. As noted previously, it is important to know what type of weed problem exists before a chemical is purchased to control

it. Copper sulfate ($6.50/5 lbs.) is a common chemical used to control algae. It has a low toxicity to humans and mammals, but a high toxicity to fish. The chemicals or herbicides available to control floating, emergent, and submerged plant species are more expensive, costing from $9.00/gallon and up. If there is any question dealing with the type and/or amount of herbicide that should be used, the Regional Botanist of the Florida Game and Fresh Water Fish Commission should be contacted. (Locations of these Regional Botanists can be found in Appendix II.)

The purchase and application of these herbicides by private individuals is becoming more difficult due to the newly passed Florida Pesticide Act and more stringent Environmental Protection Agency regulations. Therefore the role of the licensed professional applicator is becoming more important. The cost of a professional applicator depends on the type of weed problem (algae, floating plants, submerged plants, etc.), the size of the lake, the bottom contours of the lake, and the herbicide cost. To give the homeowner an idea of the costs, a professional applicator was contacted and the following prices were obtained. Please note that these costs are only approximate and may vary greatly depending on the individual situation. A one acre lake with an algae problem would require about six treatments a year at a cost of $1250/year. A one acre lake with a submerged weed problem, such as Hydrilla, would require two treatments a year at a cost of $2500/year. A one acre lake with a floating weed problem, such as the water hyacinth (Eichhornia crassipes), would require two treatments a year at a cost of $800-$1000/year.

Seldom do herbicides provide a one-shot solution to the

aquatic weed problem. Usually two to four treatments a year are needed and they are expensive as can be seen by the costs above. While herbicides have their drawbacks, many times they provide the only solution to a homeowner with a weed-choked lake.

Biological Control: Since many of the problem aquatic plants were imported from other countries, their native biological controls were left behind. The use of insects, fungus diseases, and other biological controls may help to regulate the exotic plant in its new environment. Once a biological control agent is found it usually provides a cheap and easy way of controlling aquatic weeds, but a great deal of time and expense must be expended to be sure that the biological control agent does only the job for which it was intended. Researchers are currently testing new biological control agents such as the white amur (an imported weed-eating fish), the water buffalo, and certain fungus diseases.

At the present time there are three insects available for the control of the alligator weed (Alternanthera philoxeroides): the alligator flea beetle, a species of thrips, and a moth. Further information regarding the availability of these insects can be obtained from the County Agricultural Agent.

Mechanical & Physical Controls:

1) Harvestors: One of the first efforts at aquatic weed control involved the use of mechanical devices. Mechanical removal involved hand cutting or raking aquatic weeds from shoreline or shallow water areas. (As previously mentioned, this

method is still successful in preventing marginal vegetation from creeping out into the lake.) Today these methods have been replaced by draglines and mechanical harvesters which can service deeper waters and wider areas. Draglines, with the use of specially designed baskets or buckets, are used extensively in areas where a problem of siltation and water weeds co-exist. In areas that cannot be reached by a dragline, a mechanical harvester is used. There are two basic types of harvesters: 1) a floating harvester, which consists of a barge with a conveyor system for lifting the weeds from the water; and 2) a shore-based harvester, which utilizes a conveyor system on the shore and air boats to push the weeds to the conveyor.

Mechanical harvesters and draglines are very expensive to buy and operate. A mechanical harvester costs upwards of $40,000. The operating costs range from $35/acre to $500/acre.

Until recently little research had been done on mechanical harvesters due to cost limitations. But with increasing restrictions being placed on the sale and application of herbicides, more research is being conducted to find a more efficient and economical harvester.

2) Aeration/Nutrient Inactivation: This is a relatively new method of controlling aquatic weeds. This method involves the installation of an aeration system which reduces the carbon dioxide level of the water. Carbon dioxide is an important nutrient for aquatic plants. The carbon dioxide is monitored until the aeration has lowered the level to a point where the precipitation of the nutrients will be successful. When this

level is reached a precipitant, such as alum, is added. This precipitates the nutrients in the water making it difficult for aquatic plants to survive.

Normally the plants die and fall to the bottom where bacteria digest the dead plant matter and release nutrients for new growths of aquatic plants. But the aeration system supplies aerobic bacteria with oxygen to accelerate the decomposition and at the same time raises the oxygen content of the bottom water so that the water will rise, carrying the nutrients to the surface where they will be released into the air. This method has been used in Florida with some successful results. The cost of this system ranges from $800-$1200 for a one acre lake. The system requires little maintenance and operating costs of the aerator run about $6 per month.

3) Drawdowns: By lowering the water level in a lake the aquatic vegetation in marginal areas and in the exposed portions of the lake dry out and die. These plants are then replaced by terrestrial plants which will die when the lake level is reestablished. It is recommended that the lake be drawndown once in February or March and once in August or September. Each time the lake bottom should be exposed to sunlight for a period of two to three months before the lake is allowed to refill. This method has been more successful with submerged and emergent plants than with floating plants, such as the water hyacinth (Eichhornia crassipes). This is due to the fact that the drawdown with kill the plant, but not the seeds. When the lake is refilled, the seeds germinate and the lake is once again covered with hyacinths.

4) Lake Bottom Sealing: Most of the bottom sediments of a lake contain significant amounts of nutrients. The transport of these nutrients can be suppressed by using a plastic or rubber liner. Besides suppressing the nutrient release, the liner often inhibits rooted submerged and emergent plant growth because there is no sediment for the plants to take root in.

One of the most common liners used is a perforated polyethylene. The perforations allow for the vertical transport of gases while suppressing nutrient release. The cost of lining a one acre lake with this material would be approximately $10,000. The liner will last about 15-20 years if not exposed to sunlight. The liners are usually covered with sand to avoid this problem. The polyethylene costs 20¢/square foot, and installation costs about 1¢-5¢/square foot.

5) Lake Deepening: Many lakes are constructed which are very shallow, ranging from three to five feet in depth. Shallow lakes provide a greater area for aquatic plants to grow. To adequately control weeds in this situation, the lake should be drained and deepened.

The cost of deepening a lake range from $2000/acre to $5000/acre depending on who gets the fill dirt. The costs increase if access to the lake is limited.

CONCLUSION

This homeowner's guide has reviewed the various techniques available to prevent and control aquatic weeds. If the water weed problem is discovered in time, a great deal of money and energy

can be saved. It is much easier to rake a few weeds from the margins of a lake than it is to have the entire lake chemically treated. Lastly, remember that in order to have a nice yard, regular and proper maintenance is needed; the same holds true for a lake.

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APPENDIX I: NOTIFICATION PROCEDURES

Where project notification is to be made.

Under categories where notification is required, notification shall be made to the Regional Office of the Florida Game and Fresh Water Fish Commission (See Appendix II), acting as agents for the Department of Natural Resources. Control operation will not proceed until both notification and acceptance have been confirmed.

Responsible Party--Notification may be submitted to the Florida Game and Fresh Water Fish Commission only by the government agency, company, corporation or other person initiating the weed control program and legally responsible for the waters in the control area and not by an individual commercial applicant.

Projects requiring no notification before application.

If each of the following criteria is met by the project, no notification is necessary.

1. The water to be treated must be on private property and only one landowner involved.
2. The chemical or control means to be used must be non-toxic to fish.
3. If chemicals are used, they must be used as the label directs.
4. There must be a minimal hazard of the chemical used in the treatment spreading to the property of other landowners.

If the waters to be treated fit all the requirements of the above category, except that more than one landowner is involved, then unless the responsible party has the written consent of all landowners of waters to be treated, notification of treatment must be made to the Regional Office of the Florida Game and Fresh Water Fish Commission.

Projects requiring notification before application.

If the water to be treated is almost completely surrounded by private landowners, but accessible to the public through a public boat ramp or some other public facility, then notification must be made.

Where any water to be treated is a public water supply source or may flow into a waterway which is a public water supply source, the proposed chemical to be applied shall have Federal label approval for use under these conditions or have approval of the Department of Health and Rehabilitative Services and notification shall be made.

If the aquatic weeds are to be mechanically harvested then no notification is necessary unless public waters are to be harvested, or unless there is an imminent danger of spreading the infestation of aquatic weeds during harvesting.

Type of notification and inclusion in notification.

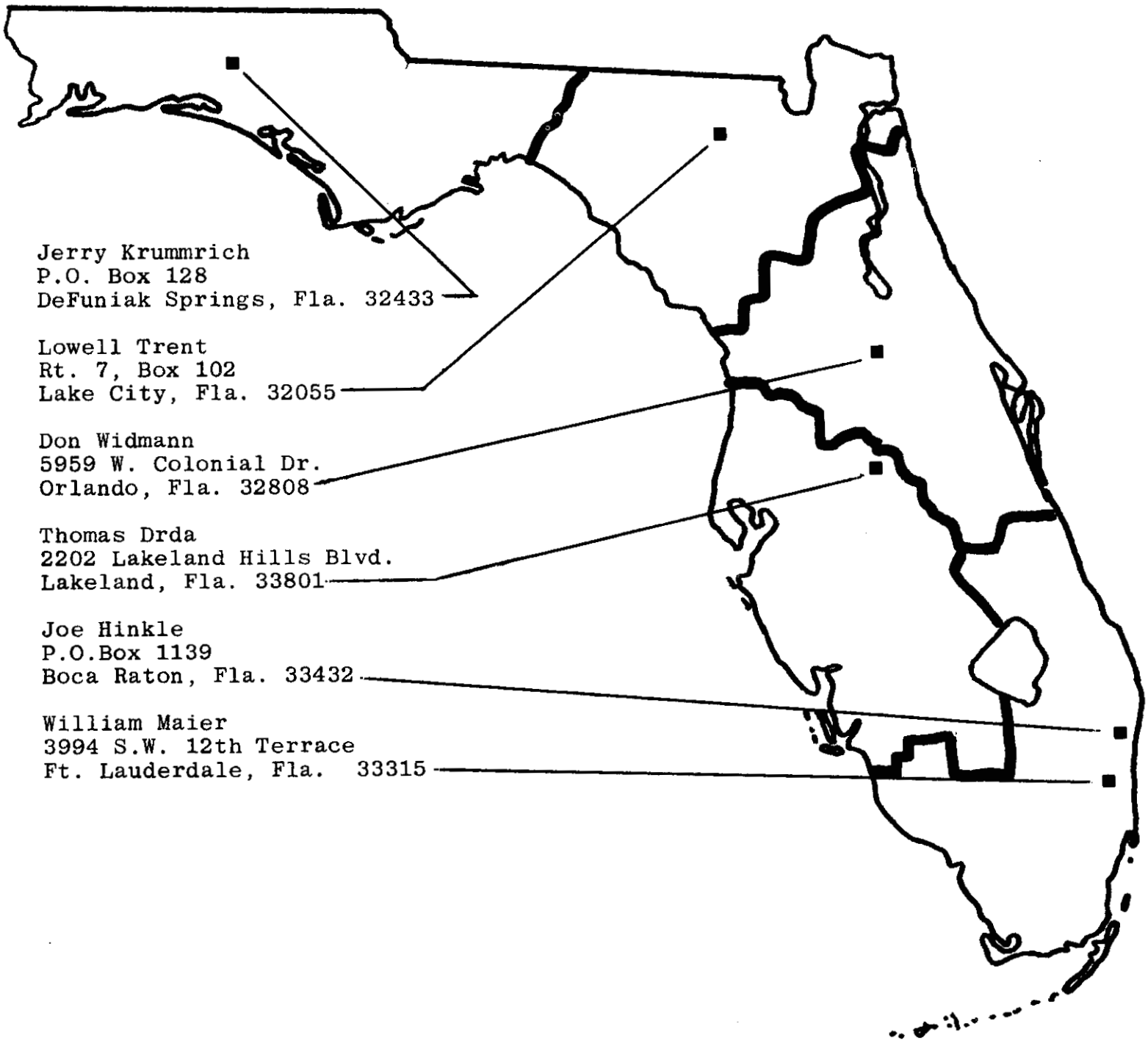
Project notification--Written notification is required for responsible parties who maintain an annual or periodic weed control program. The program or weed control "project" should describe a plan for weed control to cover a period of at least six months. Sufficient period of time must be allowed between notification and the date of application for inspection by the Regional Office Personnel. The notification is to include, but not limited to the following:

1. Name and address of responsible party.
2. Name and address of chemical applicator.
3. Approximate date or dates of application and duration of project.
4. Specific location of applications.
5. Name of chemical (give trade name, active ingredients and percentage) to be used in each instance and resulting concentration in the water upon application.
6. Technique of application.
7. Evidence to support the necessity to use a toxic chemical rather than a non-toxic chemical or mechanical method.
8. Documentary evidence of acceptability of "new" toxic chemicals.
9. Supporting information to include maps showing locations keyed to the notification report.
10. Give name of aquatic weed to be controlled in each area.

Application notification--The application notification should be in written form and will be used to report the specific date and time of an application of the toxic chemical which was described in the previously submitted Project notification. The application notification is to be provided by the person doing the application, whether employee of the Responsible Party or a commercial applicator.

Incidental, test or other single occurence notification--The notification for incidental test or single occurrence application must be in writing, including information required for the "project" notification.

APPENDIX II: LOCATIONS OF REGIONAL BOTANISTS



APPENDIX III:
INFORMATION REGARDING FLORIDA WEED CONTROL

The Florida Aquatic Weed Control Act, which was passed by the 1970 Legislature, has given to the Department of Natural Resources the authority to direct the control, eradication and regulation of noxious aquatic weeds and the research and planning related to said activities as provided by law so as to protect human health, safety and recreation and to the greatest degree practical prevent injury to plant and animal life and property.

The Department of Natural Resources has also been given the responsibility of co-ordinating the activities of all public bodies, authorities, agencies and special districts charged with the control or eradication of aquatic weeds and plants. It may delegate all or part of such functions to the Division of Game and Fresh Water Fish. The Department also has the responsibility to promote, develop and support research activities directed toward the more effective and efficient control of aquatic plants and is authorized to accept donations, grants and services from both public and private sources, and to contract or enter into agreement with public or private agencies or corporations for research and development of aquatic plant control methods or for the performance of aquatic plant control activities. It has the right to construct, acquire, operate and maintain facilities and equipment and enter upon, or authorize the entry upon, private property for the purpose of making surveys and examinations and to engage in aquatic plant control activities, and such entry shall not be deemed a trespass.

The Department of Natural Resources has delegated to the Division of Game and Fresh Water Fish the responsibility for all hyacinth control operations carried out by state crews, aquatic weed control operations in co-operation with the Corps of Engineers and the right to issue permits required by rules and regulations of the Department.