WATER MANAGEMENT REPORT SUPPORTS INCREASED USE OF AQUATIC HERBICIDES

The South Florida Water Management District — the second largest public works project in the United States, second only to TVA — is justifiably proud of its successful aquatic weed control program. Its history is as interesting and important as its contributions to the people of the state of Florida. A 1979 report, prepared by Gordon E. Baker, plant control biologist for the district, discussed the program from its beginning.

According to the report, the concept of controlling or managing aquatic plants in south Florida, as well as the entire nation, had its beginning in the year 1884 in New Orleans, Louisiana. That year the water hyacinth was introduced to this country at a horticultural exhibit. Because of its unusual beauty and prolific growth, samples were given to many visitors. Within 10 years after its introduction the water hyacinth was a serious problem.

Some nameless Floridian found it so attractive that he placed some of the plants in a lawn fountain at his home on the banks of the St. Johns River, close to Palatka, Florida. As the plant multiplied rapidly, the excess was thrown into the nearby river. By 1896, the plant had spread at an alarming rate and was seen throughout most of the St. Johns River Basin. By 1900, hyacinths had taken over the river at Palatka to such an extent that steamboats and other craft were unable to reach docks or pass through navigation openings of bridges. Since then it has spread in Florida from as far north as the Suwannee River to as far south as Florida's famous Everglades.

In 1949, the Central and Southern Florida Flood Control District was born and in 1972 the Water Resources Act changed its name to the South Florida Water Management District (SFWMD) and greatly expanded its responsibilities.

The SFWMD initiated new programs for a State Water Use Plan which have improved its capabilities in water management, conservation and quality control. The work of engineers, biologists, chemists and environmental planners is being directed simultaneously to projects that will protect the quantity and quality of fresh water resources from pressures imposed by population growth and the incumbent changes in land use.

The district presently covers an area of 19,930

Chelated copper invert application (right) on hydrilla.

Gordon Baker, plant control biologist for SFWMD.

District employee (left) spraying paragrass with Velpar, while maintaining bahiagrass. Hydout application (above) to control hydrilla.

square miles from Orlando to the Keys and includes all or parts of 16 counties. Within this area is a complex interconnecting system of canals, levees, lakes, water storage areas, pump stations, and water control structures, designed to provide a sufficient quantity and quality of water for all the diverse interests in South Florida. The district has over 1400 miles of canals, 16 pump stations, more than 125 water control structures, 1345 square miles of water conservation areas, and about 20 lakes; the largest of which is Lake Okeechobee (730 square miles).

The implementation of an aquatic weed control program in district canals was necessary both for flood water removal and to maintain proper water levels. With the warm sunshine and year-round growing season typical of Florida, aquatic weeds left unchecked would soon clog all primary and secondary canals, reservoirs and most waterways, and the entire water management system would cease to be functional.

In the rainy season, canals would back up and overflow. Weeds would clog intake gratings and halt the use of large pumping stations and cause possible damage to expensive equipment. Navigation of boats would be impossible in weed-infested canals. Waterways used by fresh-water fishermen would be blocked off. Recreational boating would be brought to a halt. Farmers would not be able to irrigate their crops, resulting in an economic disaster for the state.

An effective aquatic weed program was essential. The SFWMD's program operates on a year-round basis, following three basic steps:

1) Identification of Plants: The first step in an aquatic weed program is to determine what species or types of aquatics are in the canal facility or waterway. Basically, these include floating, submersed, emersed and ditchbank (including levee grasses and brush).

Diquat application on duckweed and water paspalum. Duckweed is almost completely covering the canal surface.

2) Methods of Treatment: This depends on the growth form of the plant—where it is located, the uses of the water body and the types of equipment available. The district uses four methods of control: mechanical, chemical, biological and physical (i.e., water-level fluctuation).

Mechanical control methods were used by the district primarily against submersed vegetation until about two years ago, when a transition to chemical methods was initiated.

In recent years, advances in chemical technology have allowed the uses of specific chemicals for specific needs in aquatic weed control. Baker said in his report chemical control methods are speedy, cost-effective and longer listing than mechanical methods, realizing, of course, that there are certain environmental considerations inherent in the use of chemical control. For example, the application techniques are designed to place the chemicals on the target species and not on other weeds through equipment designed specifically for aquatic use and by the use of spray additives.

Before submersed weed control operations are begun, the district also determines certain parameters, such as the amount of dissolved oxygen in the water, wind velocity and general weather conditions.

Herbicides presently being used in the district's program are Banvel 720 (dicamba), 2,4-D, dalapon, diquat, chelated copper and endothol. For submersed weed control, two or three treatments are necessary following one mechanical removal during the first year. The second year, one or two treatments are necessary and, finally, one application per year.

Biological control is based on the fact that there are some organisms which feed on plants to the extent that the growth of the vegetation is reduced. The primary objective of biocontrol is not eradication of a species, but reduction of a plant's density to where it is no longer a nuisance. Advantages of this type of control are low program costs, ease of application, no special equipment, minimum training of personnel and relative permanence of treatment, once established. The main disadvantage is that initial results generally are too slow in coming, and usually necessitate the use of other methods of control in addition to biocontrol.

The district has cooperatively participated with the State Game and Fresh Water Fish Commission on lake drawdown projects (physical control) at Lakes Kissimmee and Tohopekaliga. While the primary purpose for these drawdowns was to enhance the fisheries resources, some degree of management of the obnoxious weed community emerged as a secondary result. In addition, the district, under the supervision of the Environmental Sciences Division, has initiated water fluctuation methods for the purpose of re-establishing native Everglades vegetation. A trial scheduled for mid-1979 is presently pending.

3) Cost and Economics: Aquatic weed control can be an expensive undertaking. Within the boundaries of the district, weed control maintenance of the primary waterway system is presently costing in excess of three million dollars. This is a considerable in-

crease over what the district spent six years ago (one-half million dollars). The magnitude of cost involved certainly generates a desire to find methods of control that produce results which act in harmony with the environment and, at the same time, reduce costly repetitive and expanded treatments. In this light, Baker concluded, the present technology base indicates superior results for submersed weed control through skilled application of herbicides as contrasted with mechanical control methods.

Baker pointed out some of the major works that have been completed and their contributing value to South Florida:

- Three Conservation Areas — Almost 50 percent of the original Everglades is preserved in a wilderness state in Palm Beach, Broward and Dade counties. These water storage and wildlife areas cover 1,345 square miles. They are surrounded with levees, canals and water control structures. Excess water impounded here is diverted south to Everglades National Park.
- Everglades Agricultural Area — South of Lake Okeechobee, an area of 700,000 acres is

Target Species, Control Methods, Treatment Proposed

Weed Type	Species	Control Method	Chemicals/Equipment	Scheduled Treatments (for year '78-'79)
DITCHBANK	Alligator Weed Torpedograss	Chemical Mechanical	Banvel 720 - Dowpon C Dragline	As Needed
	Brazilian Pepper Cattails Grasses	Chemical Mechanical	Banvel 720 - Dowpon C Mowing	
	Giant Cutgrass Phragmites Spatterdock Willow	Chemical	Banvel 720 - Dowpon C	
	Napiergrass Paragrass Rubber Trees	Chemical Mechanical	Banvel 720 - Dowpon C Chipping/Mowing	
	Water Paspalum	Chemical	Banvel 720 - Dowpon C	
FLOATING	Duckweed Salvinia Water Lettuce	Chemical	Diquat, Diquat Invert 2,4-D	As Needed
	Floating Fern Water Pennywort	Chemical	Diquat	
	Hyacinths	Chemical Mechanical	Diquat, Diquat Invert, 2,4-D Dragline, Towboat	
SUBMERSED	Hydrilla	Chemical	Diquat - Chel. Copper Invert, Hydout	2 Times
	Pondweed	Mechanical	Towboat, Dragline	2 Times
	Coontail Milfoil	Chemical	Diquat - Chel. Copper Invert	1-2 Times
	Cabomba	Chemical Mechanical	Aquathol K - Chel. Copper Towboat, Dragline	2 Times 2-4 Times
EMERSED	Brazilian Pepper Cattails Giant Cutgrass Grasses Napiergrass Paragrass Phragmites	Chemical	Banvel 720 - Dowpon C	As Needed
	Duckweed Hyacinths Water Lettuce	Chemical	Diquat	
	Water Paspalum	Chemical	Banvel 720 - Dowpon C Diquat	
	Torpedograss	Chemical Mechanical	Banvel 720 - Dowpon C Dragline	
	Alligatorweed	Chemical Mechanical	Banvel 720 - Dowpon C Diquat Dragline	
	Spatterdock	Chemical Mechanical	Banvel 720 - Dowpon C Diquat Towboat, Dragline	

leveed and pumped. About 400,000 acres of the total is now in agricultural production. There are 20 levees and seven pumping stations serving this land.

Seasonal rainfall patterns in South Florida annually create periods of flood and drought on land where surface slopes are as low as 0.7 feet per mile. Due to this flatness, a canal large enough to carry flood flows by gravity is impractical. Therefore, pumping stations must be provided to operate during the rainy season to remove excess water from the land and store it in such places as Lake Okeechobee and the three Water Conservation Areas in the Everglades. During the dry season, when water demands are high and supply is low, water is released out of the storage areas to meet the needs of South Florida.

- Lake Okeechobee — A major levee (the Herbert Hoover dike) has been constructed around the perimeter of the Lake, a distance of 100 miles. This levee prevents a recurrence of hurricane-driven wind tides, such as those that drowned 3,000 persons in 1926 and 1928. The levee also will make possible additional storage of water in the Big Lake, a major source of water for South Florida.
- The Caloosahatchee River — A 58-mile waterway project, between Lake Okeechobee and the Gulf of Mexico (at Fort Myers) has been completed. The River improvements serve a basin area of 1,200 square miles and also add discharge capacity for emergency releases from the Lake to tidewater when necessary.
- The Kissimmee River — A 58-mile channel, between Lake Okeechobee and Lake Kissimmee, was finished by mid-1971. The widened and deepened river is equipped with six large dam and spillway structures, operated by the SFWMD. Each structure has a navigation lock 30x90 feet, designed to pass vessels of 5½-foot draft. The river improvements serve a drainage area of 758 square miles and provide an outlet for excess water from the Upper Kissimmee Valley.
- Upper Kissimmee River Basin — To date, 15 canals, equipped with eight water control structures, have been constructed, linking 14 lakes in the Upper Kissimmee in central Florida.

Working within the boundaries of the rising costs of maintenance and restrictions of the Environmental Protection Agency, the SFWMD has managed to meet the objectives set forth in their original establishment with more than a little success.

The success of SFWMD's aquatic weed control program is the culmination of an effective planning and coordination effort. The impact of this effort has affected South Florida by protecting the quality and quantity of fresh water resources and enhancing public recreational facilities. More importantly, the district has protected the health and safety of the people of the state of Florida.

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