INSTITUTIONAL FRAMEWORK AND CHALLENGES IN MANAGEMENT OF AGRICULTURAL WATER USE IN SOUTH FLORIDA

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ABSTRACT

The institutional framework for management of water use and protection of water and related resources in Florida developed as a result of rapid population growth, industrial advancement and agricultural expansion during the second half of this century. The South Florida Water Management District with an area of 17,930 square miles (44,030 square kilometers) is the largest of five state water management districts established by the Water Resources Act in 1972.

South Florida's tremendous growth results in a continuous need to balance demands among water users. Increasing demands create impact on water resources and the environment. The holistic approach to preservation and restoration of Florida's ecosystems and protection of water supplies led to legal and policy actions for protecting areas such as Lake Okeechobee and the Everglades.

Events affecting water management strategies include the passage of the 1987 Surface Water Improvement and Management Act and the settlement of a federal lawsuit against the State of Florida and the South Florida Water Management District for an alleged pollution of the Everglades. These events provided the impetus for the Marjory Stoneman Douglas Everglades Protection Act.

Solutions to water resources related problems are complex. Florida's agriculture remains in competition for water with the urban sector and the environment. About 1.2 million acres (3 million hectares) of agricultural land are irrigated and the population growth pressures create a potential for impacting the agricultural industry. Farmers are encouraged to adopt the most efficient irrigation methods and apply best management practices. The South Florida Water Management District cooperates with the agricultural community on programs for conserving water and related resources.

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INTRODUCTION

Geography and Hydrology

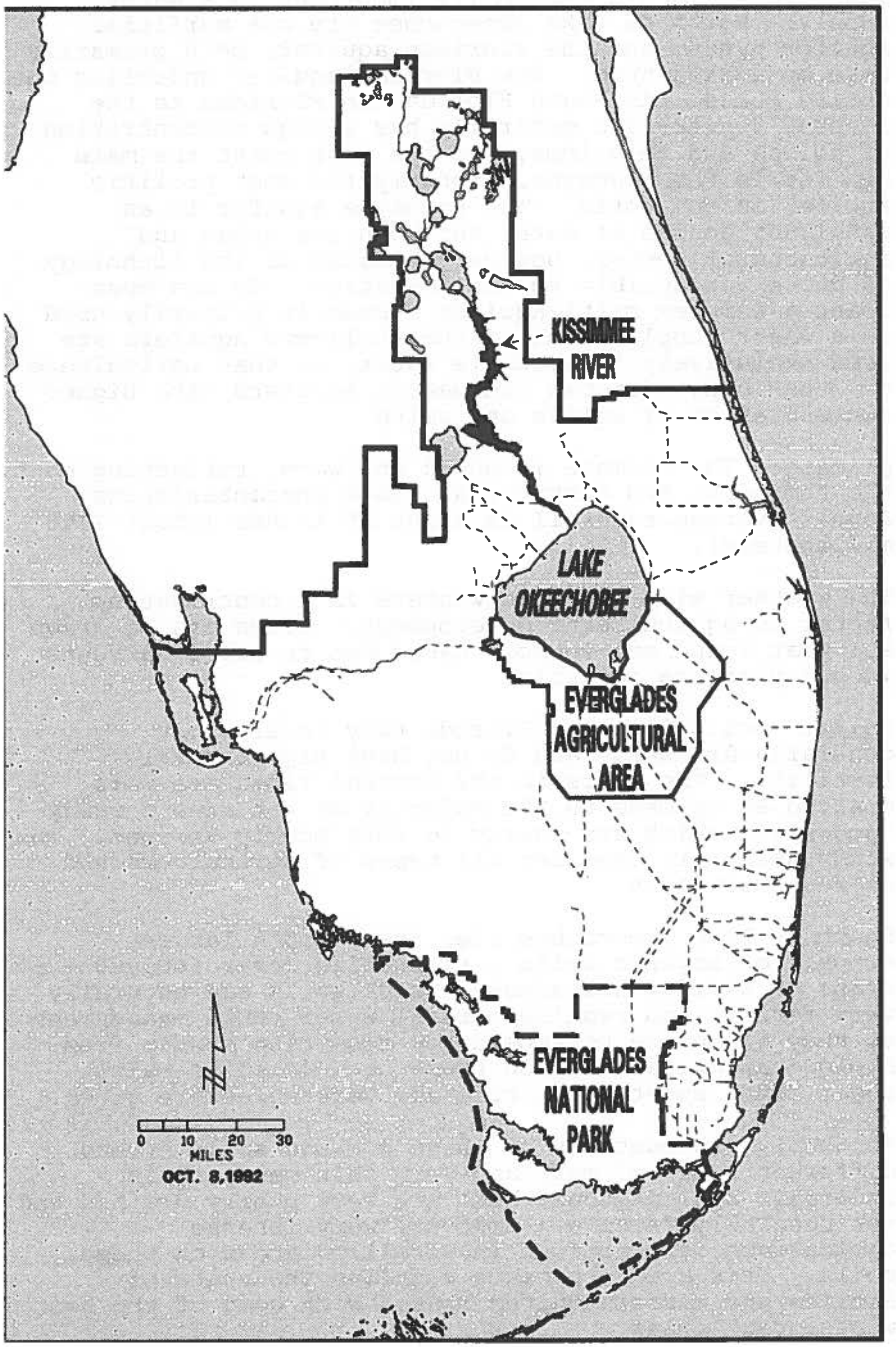
Florida is a peninsula of about 61,083 square miles (150,000 square kilometers), lying between the Atlantic Ocean and Gulf of Mexico. It has the longest tidal coastline of any state in the contiguous United States. Most of Florida is at 45 to 90 feet (15 to 30 meters) above mean sea level (Atlas of Florida, 1992). The north is gently rolling, the south contains more marshes and wetlands. The state is a unique habitat for many plant and wildlife species.

One of the state's principal watersheds lies within the boundary of the South Florida Water Management District (Figure 1). It is the Kissimmee - Everglades area, covering the central and eastern part of the District. Drainage in the upper portion follows a southerly pattern through a chain of lakes to Lake Kissimmee, and further into the lower part through a partially channelized Kissimmee River into Lake Okeechobee.

Lake Okeechobee, the second largest natural fresh water lake in the conterminous United States covers approximately 730 square miles or 1761 square kilometers (Atlas of Florida, 1992). Its water levels are regulated. The regulation schedule was developed jointly by the U.S. Army Corps of Engineers and the South Florida Water Management District. The Lake plays an essential role in flood control, fishing, sports, recreation, and in water supply. Through an extensive network of canals the water flows to the south and southeast to supply adjacent urban communities as well as approximately 855,731 acres (2,114,511 hectares) of agricultural lands (Soil Subsidence Study, 1987). The largest (603,546 acres) contiguous piece of agricultural land serviced by the Lake lies immediately south of it and is known as the Everglades Agricultural Area (EAA).

At times of drought Lake Okeechobee serves as a back up water supply for South Florida lower east coast communities. The water storage and conveyance function is very important for recharging the potable water wellfields and for mitigation of salt water intrusion impacts. During the critical water supply periods the Lake's water can also be delivered to the Everglades National Park, a natural system of 1,416,450 acres (566,580 hectares) of wetlands and marshes containing a unique wildlife (Hall, 1991).

Ground water: In South Florida there are several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aquifers which are regionally important as a water supply. North of Lake Okeechobee are the surficial aquifer system and the Floridan aquifer, both primarily used by agriculture. The Floridan aquifer underlies the entire state. In South Florida the Floridan is the deepest aquifer and generally has a high concentration of solids and chlorides. On the east coast the main aquifer is the Biscayne, probably the most prolific aquifer in the world. The Biscayne aquifer is an excellent source of water for both the urban and agricultural sector, however, because of its lithology, is quite susceptible to contamination. On the west coast a complex multi-aquifer system is primarily used as a water supply; some of the shallower aquifers are used exclusively for potable water, so that agriculture or other uses must tap the deeper aquifers with higher concentration of solids and salts.

Climate: The climate is humid and warm, reflecting both the temperate and subtropical zones characteristics. Annual average rainfall is about 55 inches (about 1400 millimeters).

The weather with its mild winters is a contributing factor to agricultural development. Crops can be grown all year round and in some cases two to three harvests in one year are feasible.

Soils: Soils in South Florida vary locally but generally are sandy and do not have high natural fertility. The soils in the central ridge are well drained as opposed to the majority of the area's sandy Spodosoils which are poorly to very poorly drained. The sandy soils are used for all types of agriculture and citrus production.

South of Lake Okeechobee lies the world's largest deposit of organic soils - Histosoils (over 600,000 acres or 240,000 hectares). These soils are naturally very fertile and require careful water table management as they are prone to subsidence resulting mostly from biological oxidation. On these organic soils mainly sugar cane, sweet corn, rice and vegetables are grown.

Southerly and easterly of these organic soils extend different types of marl and very thin sandy soils underlain by limestone; both are very poorly drained and not naturally fertile. However, very intense agriculture is practiced in localized areas on these soils. This area's produce supplies the state of Florida and eastern United States with some of the best winter vegetables.

Along the coastline and in the southern tip of Florida the majority of soils are tidal marshes and swamps, primarily used for recreation and wildlife.

HISTORICAL DEVELOPMENT

South Florida Water Management District

The agency's evolution: The need to respond to South Florida's subtropical extremes - flood and drought - led initially to Congressional creation of the Central and Southern Florida Project in 1948 for flood control and other purposes (Huser, 1989). The following year the Florida Legislature created the Central and Southern Flood Control District (FCD) for purpose of sponsoring the federal project and to provide flood protection for farm lands and urban areas. The FCD was a successor to regionally important drainage and reclamation districts - the Everglades Drainage and the Okeechobee Flood Control District, established in 1913 and, respectively, in 1929.

In 1972 the Florida Water Resources Act established five regional water management agencies (Figure 2). At that time the responsibility of the FCD expanded mainly by regulatory powers. In 1976 the FCD was renamed the South Florida Water Management District (District). Its mission further evolved along with the changing water needs and increased environmental awareness. Today the District is a multi-faceted agency playing a primary role in flood protection, water supply planning, protection of water quality, and environmental enhancement in south central Florida.

The District's boundaries are based on natural hydrogeologic basins rather than political (county) limits to allow for effective planning and management (South Florida Water Management District Facts & Figures, 1991). South Florida's immense growth results in a continuous need to balance demands among water users and safeguarding of a healthy environment. With a population of over five million people concentrated along the coasts and agricultural expansion further to the south, the District has to evaluate and balance water use demands which, if unregulated, may regionally cause adverse impacts on water resources and the environment. These impacts include salt water intrusion, ground and surface water quality deterioration, eutrophication of lakes, and impacts on wildlife.

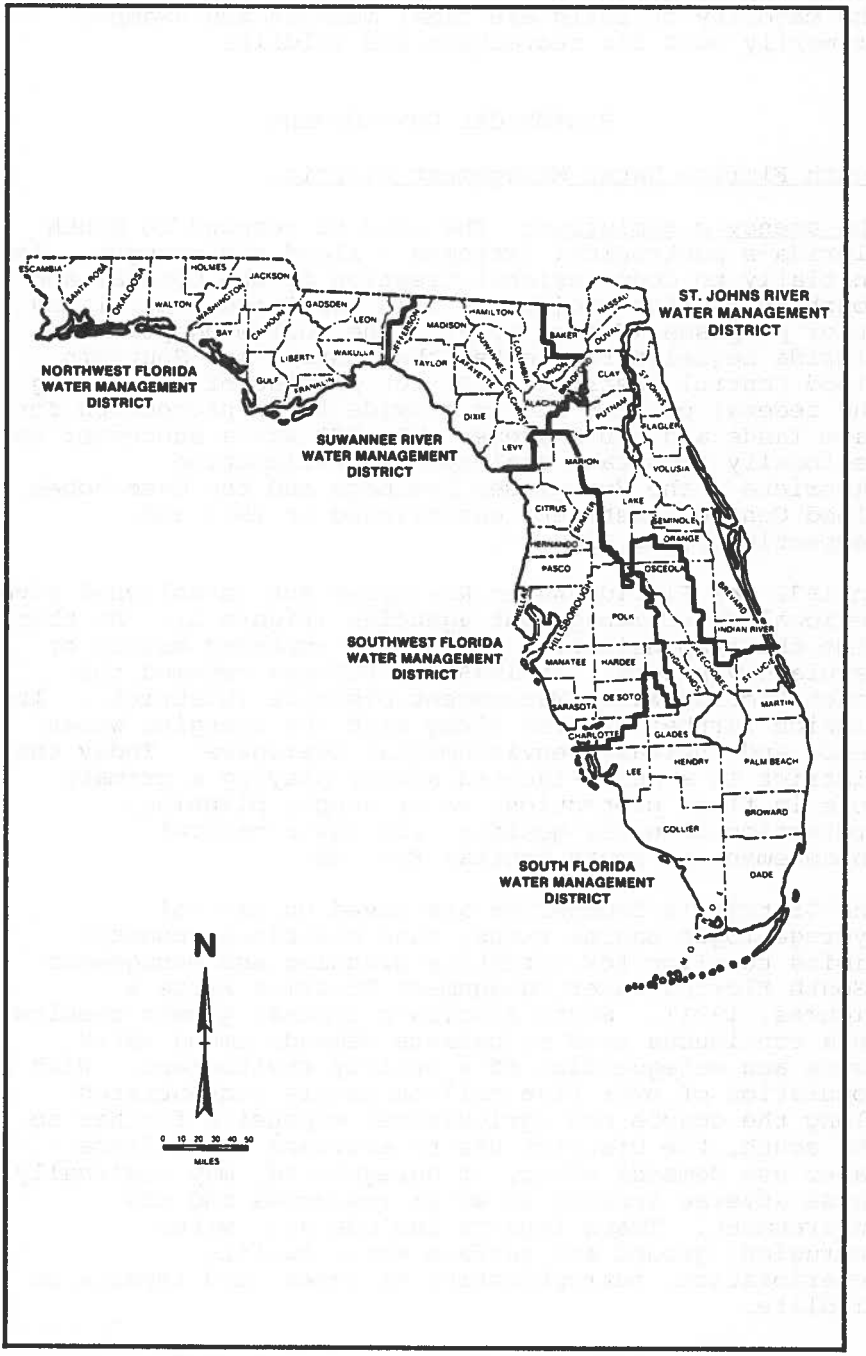

FIGURE 2. Water Management Districts of Florida.

Funding: The agency is faced with an enormous responsibility of preventing damages from floods, soil erosion, excessive drainage and planning for future water supply for public benefit. The budget is funded through a variety of sources, with property taxes as a main source. The District as an independent taxing district is levying its own taxes. The millage has a cap set by the Legislature. Besides the ad valorem taxes and other sources, some monies are derived from fees for consumptive use permits. Every agricultural operation is required to apply for a consumptive/water use permit as well as a well permit. The District charges different fees for these permits, depending on their classification by the water source, type of use and method of withdrawal. There are no charges to the grower for the amount of water used on a farm.

FLORIDA WATER LAW

Florida Water Law Prior to 1972

Prior to the adoption of the Water Resources Act of 1972 Florida was considered a common law riparian state. Riparian owners were entitled to make reasonable water withdrawals for use on their lands. Such system can be viable in a state where water is in plentiful supply or demand is low.

When Florida started to grow it became apparent that the riparian/reasonable water right system would become unmanageable for the policy makers. Additionally, the inherent uncertainty of such system tended to prevent investing in water dependent development and moreover, the system offered no means of protecting the Florida's fragile environment.

The Florida Water Resources Act of 1972

Florida began to address shortcomings of the common law water rights system with the creation of the Florida Water Resources study commission in 1955. The work of the Commission led to adoption of the Water Resources Act of 1957. In 1972 the Legislature adopted the present Florida Water Resources Act which has been codified in Chapter 373, Florida Statutes. This is the primary statute implemented by the District.

The Florida water rights system of today is a blend of the prior appropriation and the doctrine of reasonable use. It provides a certainty to the user by means of holding a permit. It also appears to be more flexible

in assuring a benefit to the public, because by making permits periodically expire, it allows the re-evaluation of each particular use in light of changing conditions.

Water Use Permitting

It is the policy of the District to control all water uses, including uses of water from raw supply to re-use of reclaimed water, within its boundaries. The whole process is driven by Florida Statutes, Chapter 373, which was enacted in 1972. Prior to this date the District's regulatory activity consisted of issuance of permits for the utilization of District rights of way. The District began implementation of Chapter 373 in 1974 by initiating water use and surface water regulatory management programs.

Up until 1975, surface water management reviews consisted of both drainage and water use from surface water sources. Thereafter, review of applications for water use from ground water sources was started. Basin boundaries were created for agricultural water use applications, thus enabling the District to designate one expiration date for all permits within a basin. Throughout the years, substantial changes have been made in the technical basis for water use allocations.

In the early years, emphasis was placed on the reasonable and beneficial needs. During the past few years, water quality impacts, such as salt water intrusion and environmental damage, and impacts on the resource itself, have become increasingly significant in determining the allocable water. The District further established low flows and levels for surface water bodies to be incorporated in the water use allocation process through regulation of intake levels. In 1984 the passage of the Warren S. Henderson Wetlands Protection Act provided authority to protect wetlands and the District designed specific criteria for evaluation of uses and their impact on wetlands.

The District is periodically examining some of the underlying assumptions in determining reasonable and beneficial allocations for agricultural uses. These analyses are based on social/economic impacts and on water shortage/drought management.

LAND AND WATER MANAGEMENT DEVELOPMENT

Factors of Growth

Florida has always welcomed growth. Already in the beginning of this century the pleasant weather attracted developers, tourists and settlers. In the second half of this century a rapid development was marked, especially by the southern half of the state.

The weather in Florida goes through cycles of wet and dry years. Several major hurricanes in the early 1900s caused catastrophic floods and damages to farmland. Almost 3000 lives were lost. For protection of lands against floods, many canals were dug and levees constructed in the beginning of the century.

In 1930 the Corps of Engineers was authorized to control the Lake Okeechobee basin and construct levees around the Lake to reduce damage from overflowing. In the fifties several large drainage canals were dug to equal a total of 1,120 miles (700 kilometers).

During the sixties, in order to be developed, more land was drained, ditches constructed, and levees built. By the year 1982 in south Florida there were total of 1,664 miles (1,040 kilometers) of canals and 1,416 miles (885 kilometers) of levees (Huser, 1989). Agriculture was booming. More field crops and vegetables were grown on the drained lands. Additional lands were brought into citriculture. The cattle industry started to flourish, primarily in the south central plains. The land around and south of Lake Okeechobee containing rich organic soils was cultivated and plantings in sugar cane and vegetables increased. South of Lake Okeechobee several large pumping stations were built to protect this farm land from flooding.

Agriculture in Competition for Water

With the establishment of the National Aeronautics and Space Administration (NASA) complex on Cape Canaveral in the late sixties and with the founding of Walt Disney World in the early seventies, population growth increased in Central Florida. At that time the coastal areas became more densely populated, and agriculture was gradually entering into a competition for water with the urban land uses.

During the seventies and the eighties large cropped areas requiring large pumpages of ground water had to shift more inland and to the south due to increasing

urban pressures. The land farmed allowed, however, a greater degree of recharge after the rain than the mostly impervious urban areas. Due to the higher water demand by coastal development salt water intrusion on both coasts presented an eminent danger unless better management and protection of water resources was instituted.

PLANNING FOR WATER MANAGEMENT IN FLORIDA

Planned Development

Prior to the eighties, development was not planned or controlled. Politics had some impact, but it was becoming obvious that decisions on how to use the available resources must be based on a technical and scientific basis. If the development continued in the same pattern and speed, South Florida would end up being a few islands of native habitat surrounded by urban sprawl and intense agriculture, with tremendous water supply problems.

It was not until the mid eighties that the role of the state water management districts was examined as it relates to the state's planning and growth management scheme. The districts' activities are in general guided by the State Water Use Plan. More consistency was brought into the planning and permitting process by assuring correlation of a proposed land and water use activity with local comprehensive planning in light of the "Florida State Comprehensive Planning Act of 1972" and the "Growth Management Act of 1985".

District's Statutory Framework

The statutory framework in which the state water management districts operate is very complex. While the District as a regional agency is primarily regulating water usage, surface water management, and the use of wetlands in proposed developments, there are other agencies and units of government which exercise water management jurisdiction on federal, state, and local level.

The Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers are the most significant agencies at the federal level in regard to any land development. The most important on the state level are the Florida Department of Environmental Regulation (FDER or DER), the Florida Department of Community Affairs, and the state's Regional Planning Councils. More

recently, local units of government have been important players in this process in the context of comprehensive planning.

In order to describe the role of the water management districts in regard to local plan compliance and in view of determining a course of action for implementation of resource planning and management approach, different pieces of legislature governing land use planning and water resources development would have to be described.

In 1982 the DER adopted a general water policy. The policy is set forth at Chapter 17-40, Florida Administrative Code (F.A.C.). Each water management district is subject to the water policy because it became a part of the DER's 1986 State Water Use Plan. Recent amendments to the state's water policy require each water management district to produce its own agency plan to implement the policies of the State Water Use Plan. All water supply plans should be completed by November 1994, and updated every five years thereafter.

The DER's work, as it relates to agriculture, is mainly focused on ground water quality in dredge and fill operations, hazardous waste disposal, wetlands, and Best Management Practices under FDER Dairy Rule. The DER's responsibility in jurisdiction of wetlands was redefined in 1984 by the State Warren S. Henderson Wetlands Protection Act.

Dredge and fill permitting jurisdiction by the Corps of Engineers was further expanded in the mid eighties, in permitting into isolated wetlands and mitigation for any proposed wetland impact.

CHALLENGES IN MANAGING WATER AND RELATED RESOURCES

Environmental Impacts

Traditionally, water quantity and quality problems related to agricultural water use and irrigation, were treated separately, mainly because of political, economic, social and legal factors. During the eighties it became obvious that drainage and irrigation aspects of water management in agriculture must be evaluated jointly and that existing water management practices in agriculture could not be sustained indefinitely, because they may result in serious impacts on the environment. Water managers needed to focus more on improvements to surface water management systems and water quality problems on a regional basis.

While the environmental awareness was increasing, some adverse impacts related to water quality and degradation of natural environment became obvious. Certain surface water management practices in agriculture were questionable. Specific impacts such as altered hydroperiods and water quality problems were evident in the Everglades National Park. These problems were magnified during the eighties when Florida experienced severe droughts.

Backpumping of drainage water from canals into Lake Okeechobee during the eighties as a strategy for water storage became very controversial because the water was rich in phosphorus and would speed up eutrophication of the lake.

SWIM Plans

As a result of passage of the Surface Water Improvement and Management (SWIM) Act in 1987, the water management districts were required to prepare SWIM plans for priority water bodies as identified by the Act. The South Florida Water Management District designed four regional SWIM plans for improvement of water quality. These plans represent a major breakthrough in management of water and natural resources related to water quality and should be implemented during the nineties.

The Lake Okeechobee and the Everglades SWIM plans are two plans which seem to have an economic impact on different types of agricultural enterprise in specific regions and are discussed here further.

Lake Okeechobee SWIM Plan: Historically, management of the lake has been largely a function of balancing water supply and flood protection needs against environmental requirements. The lake, as a source of inflow water for the Everglades and a home for a number of rare and endangered species, constituted a subject for several studies linked to the water quality. Protection of the lake's extensive littoral zone community became an important environmental resource issue. Excessive nutrient loading and declining water quality in the eighties impacted the fish by stimulating nuisance growth of algae and altering species composition of the lake's phytoplankton.

In 1985 the Lake Okeechobee Technical Advisory Committee was established to evaluate options and prepare recommendations for preserving the lake's life and productivity, and improving its water quality. The work proposed by the Committee created a basis for the SWIM

Plan. The planning area for the Lake Okeechobee SWIM plan was defined as consisting of the major direct tributary basins to the lake.

The 1989 SWIM Plan (an interim plan) focused primarily on implementation of a regulatory and enforcement compliance phosphorus control program within the tributaries. Since that time the District has moved forward with developing rules, permitting procedures and water quality monitoring plans.

In 1987 the FDER enacted the "Dairy Rule" (Chapter 17-6, Florida Administrative Code) which required that all dairy operations within the Lake Okeechobee Basin and its tributaries implement Best Management Practices (BMPs) for the purpose of reducing phosphorus inputs into the lake. Total of 49 dairies came under this Rule. Each farm was required to develop site-specific management plan providing for the collection, storage, and disposal of waste water from high intensity use areas during a 25-year, 24-hour storm event (Surface Water Improvement and Management Plan Update for Lake Okeechobee, 1992). All affected dairies were required to submit construction permit applications along with the BMPs design.

The District provided assistance by hiring two consulting firms to prepare plans for 16 dairies. Best Management Practices included fencing cows away from water courses; collection, containment and treatment of manure and waste water runoff from high intensity areas; crop spray irrigation and land application of waste water, solids and sludge, as well as establishment of buffer zones from natural watercourses. Some critics of the Rule called the BMPs "stringent and experimental" regulation creating financial and psychological hardship.

In 1989 a Dairy Buy-Out program was established, for farmers who were unwilling or unable to comply with the Dairy Rule by implementing BMPs. The state and the District paid up to $602 per cow, based on heard size from June 1986 to June 1987, to facilitate removal of the animals (Surface Water Improvement Management Plan Update for Lake Okeechobee, 1992). The program applied a deed restriction to the property prohibiting future use as a commercial dairy or concentrated animal feeding operation.

So far, from the 49 dairies in the basin 18 have signed contracts to participate in the Buy-Out program. The remaining active dairies are involved in the

implementation of the Dairy Rule BMPs.

Everglades Restoration/ SWIM Plan: The problems with impacts on the sensitive ecosystem of the Everglades National Park culminated in 1988, when the U.S. Attorney in Miami filed a federal lawsuit against the South Florida Water Management District and the Department of Environmental Regulation alleging pollution of the Park and a Federal Wildlife Refuge by agricultural runoff.

The District prepared a first draft of the SWIM plan for the Everglades in 1989. Discussions between various agencies reviewing the plan were endless. The Governor of Florida and the Justice Department Officials held a press conference in July 1991 and announced a proposed settlement to the Everglades lawsuit. After about two weeks of discussions and deliberations, and much involvement of technical and scientific experts, the settlement was accepted by the Governing Board of the District and finally, in February 1992, formally accepted by a judge.

The Everglades SWIM plan was developed pursuant to the 1987 SWIM Act. Additionally, the 1991 Marjory Stoneman Douglas Everglades Protection Act mandates Everglades restoration and gives the District power to establish a stormwater utility in the EAA for financing a massive cleanup and to condemn lands in the EAA for building filtration marshes.

The settlement of the Everglades lawsuit contains several restoration steps which concentrate on regulatory programs such as maintaining and monitoring water quality. Under the requirements of the settlement the District is required to purchase 34,700 acres of land and construct Stormwater Treatment Areas (STAs), which would filter nutrients (mainly phosphorus) from sugar cane and vegetable farms runoff before it reaches the Everglades (Hazen and Sawyer, 1992).

The proposed area of STAs is currently in some type of agricultural production. In 1991 about 26,000 acres of this area were in sugar cane, approximately 5,000 acres in sod and the remainder in vegetables. Converting this lands from agricultural production to STAs will result in job losses, losses in agricultural production, trade and service industries (Hazen and Sawyer, 1992).

The District hired a consultant to prepare a report on the overall economic impact of the construction of STAs in the EAA area. The report concludes that the project will mean an overall economic increase in jobs, earnings

and sales during the three year construction. So far, the plans for construction of STAs have been under heavy criticism and opposition by the agricultural community.

FLORIDA's AGRICULTURE IN THE FUTURE

Competition for Water - Challenge

Urbanization continues to place pressure on agricultural development. Throughout the nineties the population in South Florida is projected to grow and agriculture will remain in competition for land and water. Agriculture will continue to be the largest user of fresh water from both ground and surface water sources. In 1991 there an estimated 2,048,000 irrigated acres (819,000 hectares) in the state of Florida, according to a survey made by the University of Florida's Institute of Food and Agricultural Sciences (1991).

Today's farmers are challenged by compliance with various regulations including the volumes of water they use, irrigation techniques and technology they apply. They also must implement water conservation measures and minimize impacts on the environment by using more sophisticated management practices.

In South Florida, various regional water use regulating policies can definitely create an impact on the economic conditions a small farmer. Changing international trade policies can produce an economic impact on farmers in Florida as well, especially when there seem to be no alternatives for adapting to the increased competition. In the future, South Florida fruit and vegetable growers will most likely be affected (price drop) by the North America Free Trade Agreement (NAFTA), although the net economic effect for the United States may be positive.

Besides natural phenomena, a combined effect of urbanization pressures, limitations of the fresh water resource ("cheap water") and restrictions on local land development may present additional problems for the sustenance of profitable agriculture in Florida in the future.

Natural Phenomena

While regulation is a certain and predictable factor affecting profitability of agriculture enterprise, nature can play havoc. Droughts, freezes and hurricanes can mean locally total devastation, as happened in August 1992 in the case of Hurricane Andrew (Figure 3)

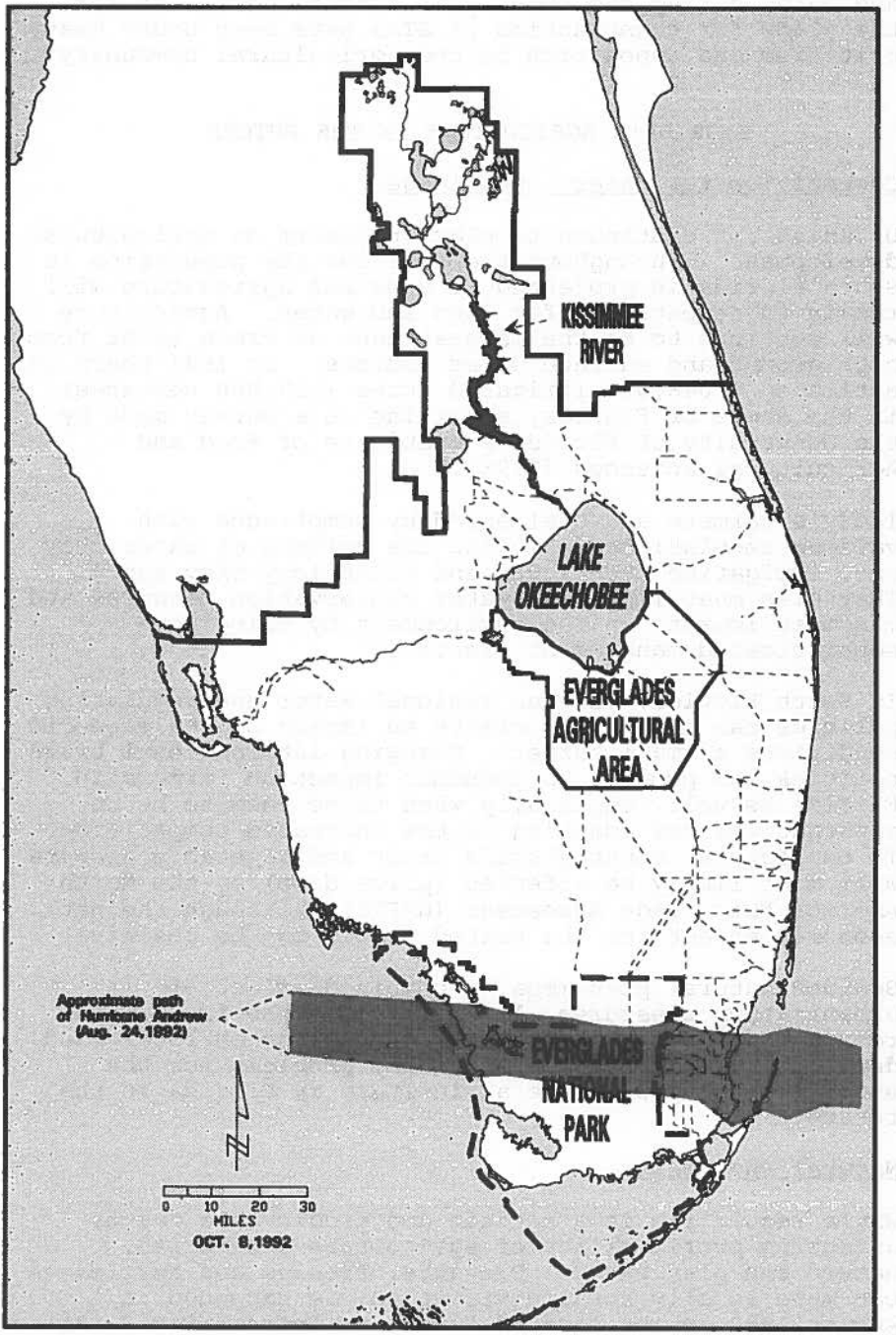

FIGURE 3. The path of Hurricane Andrew, August 1992.

The devastation of the southern Florida fruit, foliage and vegetables was the costliest agricultural disaster in Florida history and second nationally only to the Grain Belt drought of 1988. The 1993 vegetable harvest was partially lost and there is further loss expected from salt water intrusion on 5,200 acres of row crops. Some of the tropical fruit, lime, avocado and mango growers lost their production even beyond the year 1996. The entire estimated agricultural loss in structural damages, destroyed crops, and dead animals totalled approximately $1.04 billion.

Water Conservation

The water conservation programs and efforts fostered by the South Florida Water Management District through the water use permitting process prompt all growers to use the highest available irrigation technology applicable to their crop/soil conditions and apply the best management practices in the use of the systems and water resources. Recycling of tail water and runoff in seepage irrigation systems is encouraged. Utilization of treated waste water is now proven feasible and profitable, especially in irrigation of citrus groves.

When it is evident that growers operate within the guidelines towards water conservation, they will receive a credit from the District towards their allocation during periods of water shortage/drought management. The District is sponsoring jointly with the Soil Conservation District a Mobile Lab program which helps the growers to check their irrigation system efficiency, and provides them with recommendations for improvements in management.

Farmers and growers are continuously increasing their understanding of the complexity of water management issues. The District through different water resources workshops and funding of agricultural research projects is strengthening the relationship with the agricultural community. The majority of growers is anxious to maintain good communication with the District and help to preserve and protect water and natural resources of South Florida. They realize that issues related to water availability and quality are real, and that there is no room for ostrich-like mentality.

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