

# SUMMARY OF BENEFITS OF USSC ACQUISITION



## Authored by:

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**1.0 What purchase will accomplish and what effect purchase will have on CERP/Expedited Projects**

**1.1 Report Summary**

This report provides an explanation of the benefits the purchase of the U.S. Sugar Corporation properties will accomplish as part of the "River of Grass Acquisition Project" for restoring the Everglades ecosystem. The South Florida Water Management District worked with the Federal Government to develop the Comprehensive Everglades Restoration Plan (CERP) to repair damage done to allow agriculture and development of South Florida. A large part of this plan focuses on returning some of the water storage capacity that was lost due to the construction of water management structures.

CERP was developed with the assumption of certain limitations. One of the primary limitations was the limited land available with the Everglades Agricultural Area that could be used for water storage and treatment. At the time, the prospect of purchasing 51,000 acres known as the "Talisman property" was expected to be the limit for surface water reservoirs to the south of Lake Okeechobee.

The opportunity to purchase the U.S. Sugar Corporation properties significantly improves the ability to effectively manage the quantity, quality, timing and distribution of water flows to the Everglades – four key facets of CERP.

**1.2 Prior Assumptions Related to CERP**

The Comprehensive Everglades Restoration Plan was finalized in 1999 as a joint effort by the Federal Government and the State of Florida. The effort resulted in a consensus driven

document that was based in part upon work done by the "Governor's Commission on a Sustainable South Florida" established by then Governor Lawton Chiles. The Commission developed a concept for the restoration of the Everglades with a major goal of returning water storage capacity to the system that was lost due to construction of canals, levees and other water control structures to promote agriculture and other and development activities. In particular, the Commission identified the Everglades Agricultural Area (EAA) as an important location for surface water storage.

The highly productive agricultural lands within the EAA are very valuable to the local economy. As a result, CERP recognized that there were limitations on the availability of land from willing sellers within the agricultural area. Other options for obtaining land in this area is limited because the South Florida Water Management District, who serves as the agent for the State of Florida in its role as the local sponsor to the Federal process, is specifically restricted by State statute from utilizing condemnation as a land acquisition mechanism for Everglades restoration.

In 1999, the District was afforded the unique opportunity to purchase approximately 51,000 acres of agricultural lands from the St. Joe Paper Co. This land, located in the southern portion of the EAA, is known generally as the "Talisman property." The hydrologic analysis performed through the CERP effort assumed that the Talisman purchase was the physical limit for the application of surface water reservoirs south of Lake Okeechobee and that it would provide a significant portion of the water storage needed to facilitate the restoration of water flows to the Everglades.

Furthermore, it was assumed that the water quality treatment requirements for the Everglades would be met. However, no additional treatment acreage was explicitly included in the CERP plan.

### **1.3 What the Purchase will Accomplish: Water Management**

The additional lands made available through the purchase of the U.S. Sugar Corporation properties, over and above those previously acquired for use in CERP, can significantly improve the ability to effectively manage water in South Florida and advance Everglades restoration.

Much of the benefit of the purchase will come from the ability to store more water and hold it longer than currently possible. This water comes from local drainage basin stormwater runoff within the EAA and regulatory releases from Lake Okeechobee. These waters typically contain high levels of nutrients and currently there are few options to limit their release. Additional storage capacity makes it possible to hold the water for treatment and release it over time to supplement the environmental water needs of the Everglades.

The operation of storage reservoirs in the EAA would be coordinated with additional storage reservoirs north of Lake Okeechobee and the management of stages within the Lake. This gives additional options for the management of water throughout much of South Florida.

Building treatment wetlands in the EAA can significantly increase the District's ability to effectively improve water quality. The wetlands will filter nutrients from the waters and prevent them from entering the overloaded Everglades ecosystem.

The additional storage capability that is possible through the "River of Grass Acquisition Project" will facilitate the movement of water into the Everglades. Significantly improving the volume, frequency and duration of environmental water deliveries to the Everglades will benefit both the fauna and flora of the ecosystem.

Lake Okeechobee will also benefit from the purchase of additional lands. Excess water is currently stored in the Lake, which strains its ecosystem. Additional storage capability will facilitate moving water south to the Everglades, thereby reducing the severity, frequency and duration of both excessively high and low stages in the Lake.

Extra water storage areas within the EAA will significantly improve the ability to effectively convey excess water from local drainage basin stormwater runoff. During major rainfall events, this additional capability will facilitate the diversion of local runoff from the existing canal network into reservoir storage and thereby avoid having to "back-pump" the pumping stations along the southern rim of Lake Okeechobee to move this excess water into the Lake. Stopping back-pumping reduces the amount of nutrients that may possibly enter the Lake from agricultural lands.

#### **1.4 What the Purchase will Accomplish: Safety**

The Herbert Hoover Dike (HHD) is a system of earthen embankments along the perimeter of Lake Okeechobee. These embankments have been constructed intermittently since the early 1900s. The Federal Government's involvement began in the 1930s with the construction of dikes for flood protection along the north and south shores. The current system now encircles Lake Okeechobee almost entirely with the exception of the Fisheating Creek area on the western shore.

The HHD is currently managed under the U.S. Army Corps of Engineers' (USACE) dam safety criteria because of its permanent pool and its potential to cause catastrophic life safety, economic and environmental consequences should a breach occur.

In October 2007, the U.S. Army Corps of Engineers determined that it was likely that structural failure involving piping, a form of internal erosion, from seepage has begun in certain

parts of the HHD. The rate at which piping is occurring depends on lake level, with greater loss when the lake level is highest. Seepage volume and distress indicators in some reaches of the structure indicate that failure is likely when the reservoir operates with water levels above an elevation of about 17 feet NGVD. In this context "failure" means an uncontrolled release of water resulting from a catastrophic breach of some portion of the HHD embankment.

The additional lands made available through the purchase of U.S. Sugar Corporation properties will allow for additional water storage outside of Lake Okeechobee. This additional storage capability will allow water to be moved south to the Everglades, thereby reducing the severity, frequency and duration of excessively high stages in the Lake. This in turn reduces the hydraulic pressure on the Herbert Hoover Dike and subsequently reduces the threat to public health, safety and property.

### **1.5 What the Purchase will Accomplish: Economics**

The acquisition of the U.S. Sugar Corporation assets includes approximately 187,000 acres of agricultural lands currently under cultivation for both citrus and sugar cane. It is anticipated that a portion of the land will not be used to achieve hydrologic restoration of the Everglades. It is possible that the residual lands can remain in agricultural production.

The products of the agricultural land are not restricted to the traditional uses. Renewable energy sources are becoming increasingly important in the public debate over fuel alternatives, environmental issues and the world economy. Biomass is one the more common form of renewable energy in the third world. However, until recently, it has been less common in the Western world. The U.S. ethanol production capacity has been expanding rapidly, particularly since mid-2006, with important implications for the food and fuel sectors of the country's

economy. Sugar cane has been identified as a potential source of cellulose biomass that could be used in the production of ethanol and other biofuel products.

Future technology improvements and economic factors may facilitate the expansion of current sugar production in the region to include the development of biofuels in the EAA, thereby insuring a sustainable agricultural economy for years to come.

#### **1.6 What the Purchase will Accomplish: CERP**

A major goal of CERP is returning water storage capacity to the system that was lost as a result of man-made drainage improvements. Furthermore it was recognized that water quality treatment would be a component of the overall plan as well. Surface water storage reservoirs were always considered a major element of the restoration concept identified by the Governor's Commission for a Sustainable South Florida and documented within CERP. It was recognized early in the planning process that land from willing sellers was limited in availability and this constraint forced CERP to focus on other technologies such as Aquifer Storage and Recovery to make-up the remainder of the storage goals. This purchase will facilitate additional surface water storage south of Lake Okeechobee over and above that contemplated in CERP, potentially improving the plan's ability to meet the goals and objectives.

The purchase also will enhance the time and monetary investments the District and the State of Florida have already made into CERP and other Everglades restoration programs. To date, the monetary investments total approximately \$2,400,000,000.

/s/  
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Biography of Tommy Strowd attached as Exhibit "B"

**2.0 How the restoration and protection will be accomplished by the purchase**

**2.1 Report Summary**

This report provides an early overview of how Everglades restoration and protection can be accomplished through the "River of Grass Acquisition Project" and the purchase of the U.S. Sugar Corporation properties. During the development of the Comprehensive Everglades Restoration Plan (CERP), it was recognized that improving water storage was one of the keys to the health of the Everglades.

Additional storage in reservoirs in the Everglades Agricultural Area (EAA) gives managers the opportunity to restore the Everglades hydroperiod, which is necessary to making water available when and where it is needed for animal and plant life. Controlling the flow of nutrients into the Everglades can also help restore the natural plant communities within the ecosystem.

**2.2 Restoring the Hydroperiod**

The purchase of the U.S. Sugar Corporation will help restore the hydroperiod of the northern and southern Everglades. Land acquired through the purchase will allow for the movement of vast amounts of water from north of Lake Okeechobee and from the Lake itself to the southern Everglades utilizing a highly managed system of reservoirs and treatment facilities.

The reservoirs developed through the "River of Grass Acquisition Project" will capture excess water from local drainage basins and Lake Okeechobee regulatory discharges during wet periods. Water can then be placed in storage until necessary to meet environmental water needs during dry periods. In addition to reservoir construction, improvements to the current canal

conveyance system in the Everglades Agricultural Area (EAA) may be required to facilitate the movement of stored water to treatment areas and subsequent release to the Everglades.

### **2.3 Managing Nutrients**

Excess nutrients entering the Everglades are considered one of the major threats to the "River of Grass Acquisition Project." The natural balance of plant species within Everglades marshes have been disrupted by high levels of phosphorus, which allows certain plants to become dominant.

The purchase will help address nutrient loading to the Everglades through construction of wetland treatment areas in the EAA. Diverting phosphorous laden runoff and Lake Okeechobee releases to these additional wetland treatment areas gives time for water treatment and filtration prior to entering the southern Everglades.

Converting existing agricultural land to reservoirs and treatment wetlands reduces the amount of nutrients entering the regional watershed. Under current agricultural practices, both sugar cane and citrus apply supplemental nutrients in the form of fertilizer applications. Furthermore, agricultural cultivation and associated drainage practices create conditions that accelerate the oxidation of the muck soils in the region, which releases additional reactive forms of nutrients into the environment. The use of a portion of the purchased lands for water storage reservoirs and wetland treatment areas will significantly reduce the soil oxidation process and eliminate the need for continued fertilization.

Current wetland treatment systems in the EAA are designed to handle the direct inflow of stormwater runoff from agricultural lands in the basin. Recent experience in the operation of the treatment facilities has shown that the high flows and water velocities associated with major

rainfall events has a tendency to disrupt the wetland vegetation communities thus reducing the nutrient-removal capability of the plants.

The purchase and utilization of a portion of U.S. Sugar Corporation lands for the construction and operation of large scale reservoirs and wetland treatment systems will significantly improve the operation and effectiveness of treatment facilities. Additional reservoirs will hold excess levels of runoff and allow them to gradually release the captured storm flow more slowly over a longer period of time. This minimizes high flow damage to sensitive wetland vegetation, thereby improving overall treatment efficiency.

s/s \_\_\_\_\_  
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Curriculum Vitae of Garth W. Redfield, Ph.D. attached as Exhibit "C"

**3.0 Why the purchase will accomplish the restoration and protection**

**3.1 Report Summary**

This report provides an overview of environmental science demonstrating the extraordinary value of the "River of Grass Acquisition Project" for restoring and sustaining the Everglades ecosystem. Man's need for drained land, flood protection and water supplies in South Florida has driven the development of a complex water management system operated by the South Florida Water Management District and the U.S. Army Corps of Engineers. Over the past century, the Everglades marshes have been largely disconnected from their watershed and divided into compartments with levees and canals. This separation forced water from Lake Okeechobee to be discharged east and west to coastal ecosystems causing enormous ecological harm to these important estuaries. The water management system has been very successful in meeting man's needs, but has had unintended consequences for the environment. The Comprehensive Everglades Restoration Plan (CERP) seeks to undo much of this damage by improving the quantity, quality, timing and distribution of water supporting the ecosystem.

The "River of Grass Acquisition Project" is an amazing opportunity to support restoration simultaneously in each of these four aspects of water and to do so to a degree not possible with projects planned to date. The Acquisition Project will allow massive quantities of water to be stored and released southward when the downstream marshes need hydration to sustain aquatic plant and animal communities and preserve Everglades peat soils. Water storage (quantity) will work hand in hand with stormwater treatment (quality) through the existing treatment system and expanded treatment marshes to be incorporated into the Acquisition Project to cleanse water as it

moves south. By adding necessary infrastructure, water stored and treated through the Acquisition Project will be transported to where it is needed (distribution) and when it is needed (timing) to sustain balanced populations of marsh plants and wildlife.

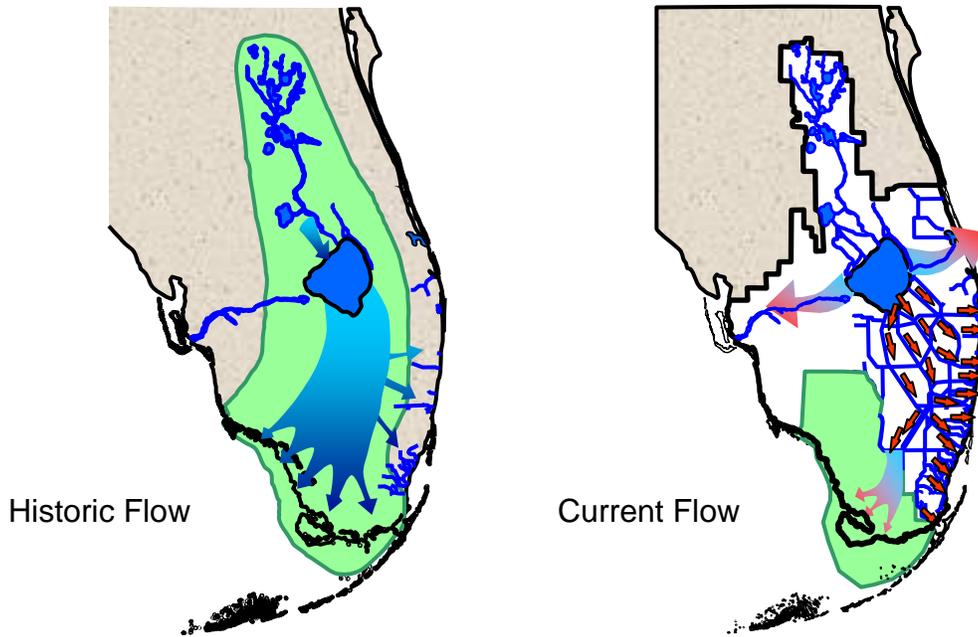
The "River of Grass Acquisition Project" goes far beyond the expectations of any restoration project contemplated to date and holds promise to restore much of the historic connection between the Everglades marshes and Lake Okeechobee. Ecosystem benefits are also expected to extend upstream. The ability to store, treat and move huge amounts of water southward will allow depths in the Lake to be managed much more wisely for the Lake environment. With the Acquisition Project, fewer extreme fluctuations will promote better ecological balance and productivity, and maintain a prudent margin of safety for the Hoover Dike surrounding the Lake. The Acquisition Project's benefits also radiate east and west to the estuaries. The ability to move large volumes into the southern Everglades will reduce harmful pulses of freshwater and associated contaminants now discharged to coastal areas. Better control of freshwater inputs will permit the estuaries to be restored and maintained as productive marine ecosystems with healthy salinity gradients and nutrient levels.

### **3.2 Evolution of Water Management Sets the Stage for the "Acquisition Project"**

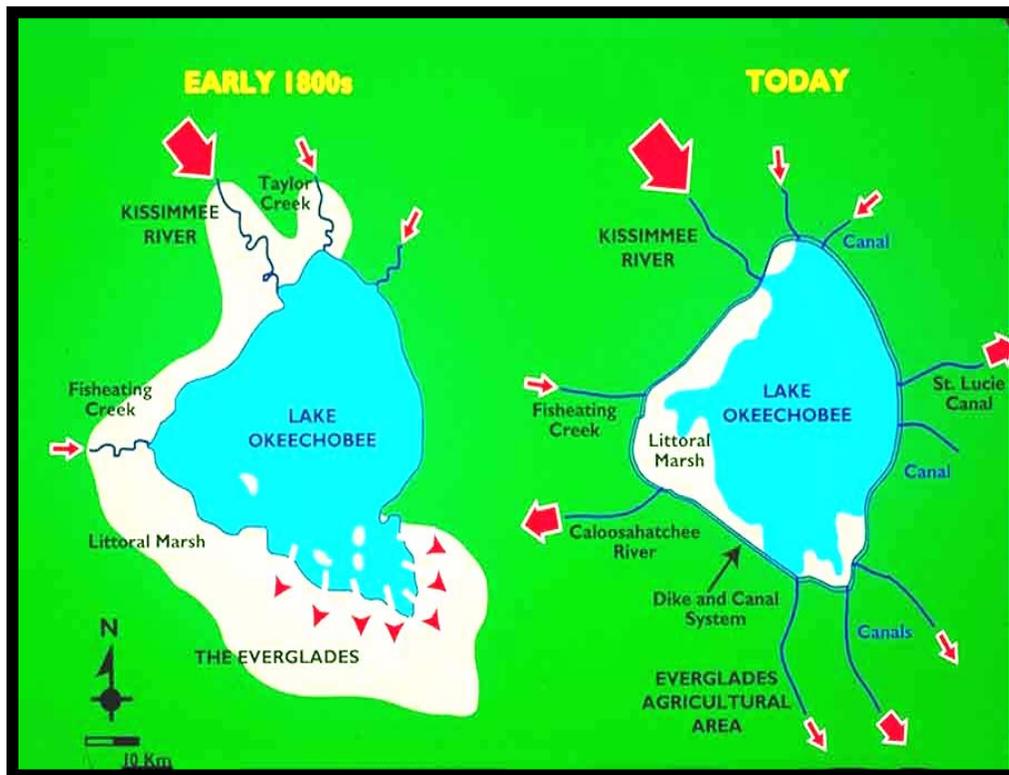
The original "River of Grass Acquisition Project" was an interconnected system through which water gradually made its way from Lake Okeechobee south across what is now the Everglades Agricultural Area into Everglades marshes that extended in a connected series all the way south to Florida Bay and other distributaries along the coast (Figure 1). The natural system covered about nine million acres and provided a diverse array of habitats and landscapes. Although the regional ecosystem was extremely diverse and productive, it was not conducive to settlement by Europeans and there were repeated calls to drain and reclaim the land for use in

agriculture and human settlements (Davis and Ogden, 1994; Chapter 4). With initial efforts at reclamation starting in the 1880s came disappointment and calls for more controls and water management.

Following massive loss of life and property in the floods of 1926 and 1929, a massive levee was constructed around Lake Okeechobee, effectively disconnecting the lake from downstream areas and leading to huge discharges of fresh water to tide through the Caloosahatchee River to the west and the St. Lucie waterway to the east (Figure 2). The four primary canals created under the Everglades Drainage District between 1907 and 1917 fell into disrepair in the Depression of the 1930s. Killer hurricanes of 1947 and 1948 were followed by extensive flooding and the State of Florida requested and got assistance from the Federal Government to develop an improved system of canals and water management structures. As a result of this State/Federal partnership, what is now the South Florida Water Management District was created. Together, the State and Federal governments systemically compartmentalized the region, further complicating water flow and separating the Everglades marshes into Water Conservation Areas separated from each other and from urban areas by an intricate series of canals, levees and water management structures (Davis and Ogden, 1994; Chapter 4).



**Figure 1.** The development of a water management system decreased the movement of water between Lake Okeechobee and the Everglades downstream and increased flows east and west to the coastal ecosystems.

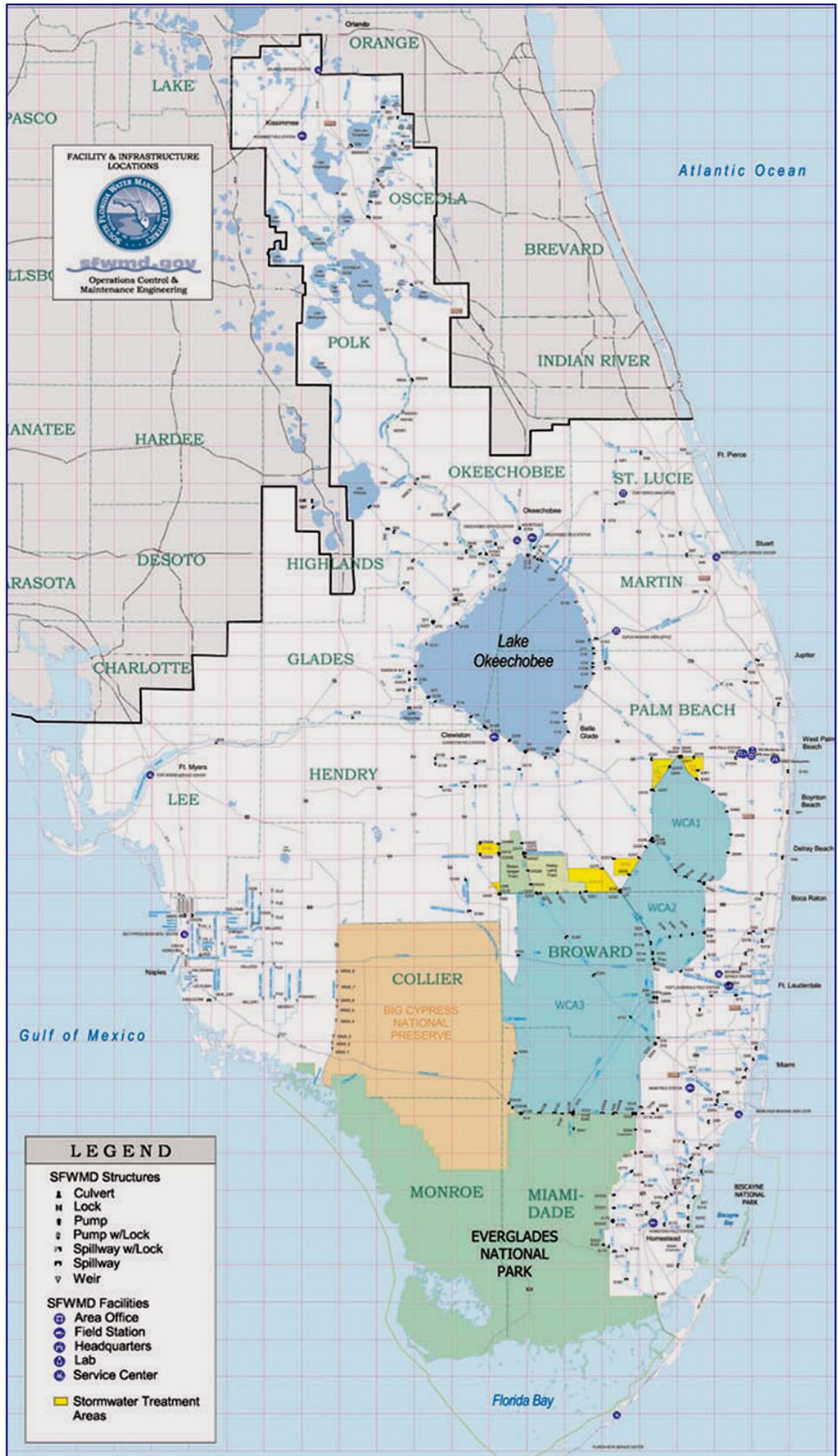


**Figure 2.** The ability of Lake Okeechobee to expand and store large volumes of water was reduced by surrounding the Lake with the Hoover Dike in the 1930s and controlling water levels in the Lake to meet multiple objectives.

The Central and Southern Florida Project for Flood Control and other Purposes, the official title of this partnership, was constructed from the 1950s to the 1970s. The massive effort produced about 1,800 miles of canals, 160 drainage basins, 200 major water management structures and 27 pump stations (Figure 3). The Project was very successful for man's needs, but had a suite of unintended consequences for the natural environment, many continuing to this day. Natural water levels and landscape patterns of inundation were changed leading to too much or too little water in various areas across the region. Water quality declined as lands were developed or used for agriculture, saltwater intrusion proved to be a problem for water supply wells near the coast, billions of gallons of water had to be wastefully discharged to tide each day and there was a significant loss of Everglades habitat.

Water management today seeks to manage the region to minimize these negative effects and to supply water to meet environmental needs to the extent possible. However, the enormous natural storage capacity of the South Florida ecosystem has been lost, limiting government's ability to do meaningful resource management. Lake Okeechobee suffers from unnatural fluctuations in water levels and the coastal estuaries are damaged greatly when excess water must be released from the Lake. In the absence of major increases in storage capacity, there is simply no means to provide the Everglades with high quality water in the places and at the times that it is needed.

In the 1990s, a lengthy interagency planning effort produced a plan for improving water managers' ability to manage resources in a sustainable manner. Approved by Congress in 2000, the Comprehensive Everglades Restoration Plan (CERP) contains 68 projects that together are



**Figure 3.** The South Florida Water Management District infrastructure includes over 1,800 miles of canals and levees with 200 major control structures in 160 drainage basins.

designed to turn back the clock and allow for better environmental management in the Region. CERP will improve the health of over two million acres of South Florida ecosystem, reduce or eliminate harmful discharges to coastal estuaries, increase water supply capabilities for nature and man alike, improve water quality at a regional level and maintain flood control. The linchpin for this restoration is massive water storage and the original CERP plans called for over 300 large wells to be used to store and retrieve water to drive the natural system. Although well-intended and theoretically feasible, pilot studies of these wells, known as Aquifer Storage and Recovery projects, have demonstrated the potential for very high costs of construction and operation, and water quality problems, as well as the difficulty of moving water to areas where it is needed.

For the first time since CERP planning began nearly two decades ago, we now have an opportunity through the "River of Grass Acquisition Project" to go beyond the limited capabilities of isolated storage in wells and small surface water reservoirs. Instead, the Acquisition Project makes it possible to achieve large capacity surface storage with the capability of moving us much closer to meeting the needs of the natural system and reconnecting areas of the region to a greater extent than would be possible otherwise. We now have the potential to attain more of the restoration goals described by Davis and Ogden (1994; Chapters 29 and 30) and embodied in the suite of CERP projects summarized comprehensively in Chapter 7A of the South Florida Environmental Report (Executive Summary is attached as Exhibit "D").

### **3.3 Comprehensive Restoration Requires Comprehensive Storage**

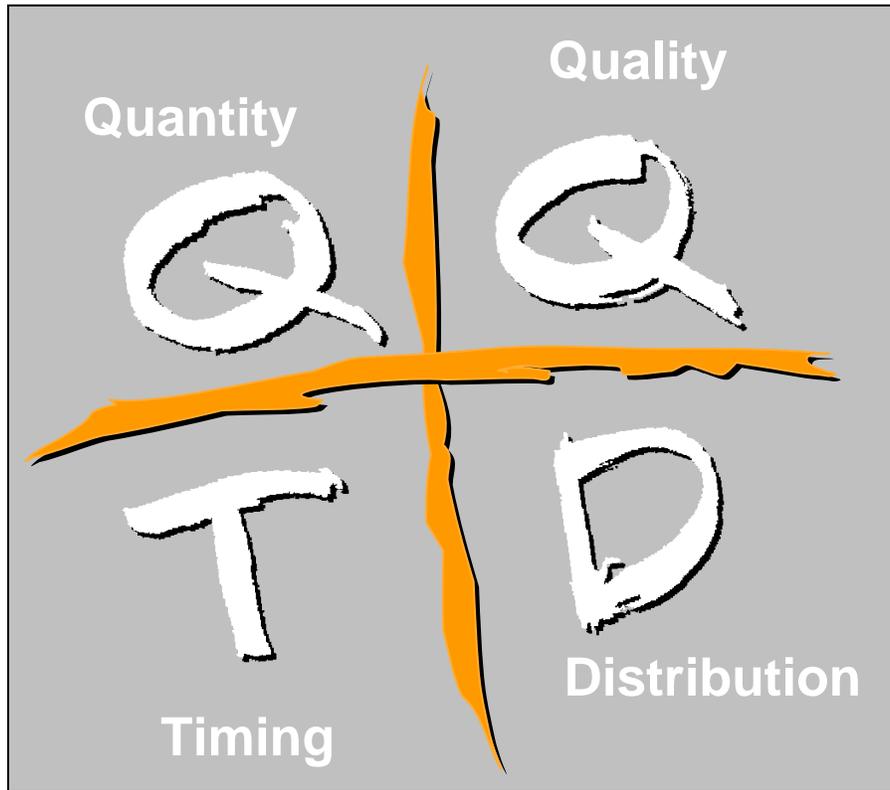
The disruption of natural water storage and movement in South Florida since 1900 dramatically altered the relationship between Lake Okeechobee and the Everglades ecosystem and eliminated much of the storage capacity in the original system. Lake Okeechobee and its 3.5

million acre watershed are rightfully viewed as the 'liquid heart' of the original Everglades; the Lake stored, then gradually released huge quantities of water southward into the Everglades marshes (Aumen, 1995; Havens, et al., 1996; Steinman et al., 2001). With the managed system across the landscape today, the quantity, quality, timing and distribution of surface water has been dramatically changed and the Everglades has been largely cut off from a direct connection to its original watershed. The changes in marsh hydrology are vast and the impacts cut deeply into functions and values of this unique ecosystem (Davis and Ogden, 1994; Chapter 10). CERP aims to improve all aspects of the marsh/watershed linkage, but planning has been faced with large uncertainties without a proven and practical means to these ends – until the "River of Grass Acquisition Project" (Figure 4).

As described by T. Strowd, the Acquisition Project will provide a reservoir capable of holding on the order of one million acre-feet of water and a management infrastructure capable of moving large amounts of water from the Lake and the Everglades Agricultural Area to the storage reservoir and from the reservoir to the Stormwater Treatment Areas (STAs), both those working today or currently planned and new STAs designed and built as part of the Acquisition Project.

A real strength of the Acquisition Project is a strong synergy of water storage and water treatment. Treatment wetlands must have a reliable source of water and the reservoir system being contemplated will allow surges of stormwater to be controlled and hydrological variations to be smoothed within and between dry and wet periods. This large increase in storage capacity and controllability provides the operational flexibility needed for optimal biological treatment of stormwater within each STA. Efficiency is enhanced because it will be possible to transfer water between STAs to balance the input of waters in need of treatment. The great improvement in

storage and control provided by the Acquisition Project will serve as a foundation for restoring and sustaining Everglades marsh habitats and the fish and wildlife that require these resources to thrive.



**Figure 4.** The Comprehensive Everglades Restoration Plan seeks to restore the ecosystem by improvements in water Quantity, Quality, Timing and Distribution – Q,Q,T,D. The "River of Grass Acquisition Project" contributes greatly to all four aspects of getting the water right.

### **3.4 Comprehensive Restoration Requires Water Low in Phosphorus**

Numerous studies have established that phosphorus is both essential for all life and damaging to natural freshwater biological communities when concentrations are pushed above background levels. Dozens of investigations on nutrient effects have been conducted in the Everglades and are compiled and interpreted by Payne et al. (2003). These authors and the references they cited, quantify the pivotal role of nutrients in Everglades ecology and document a cascade of ecological effects when phosphorus is moved into the ecosystem at levels outside the

natural range of variation. In freshwater sloughs far removed from inflows, flora and fauna can be altered when long-term concentrations go above 10 parts per billion (10 ug/L). This concentration has been adopted as a criterion in the State's water quality standard for phosphorus in the Everglades Protection Area and is being tracked each year in the South Florida Environmental Report (SFER), Chapter 3; details on the phosphorus rule can be found in Payne et al. (2006).

For purposes of Everglades restoration, concern for water quality is focused primarily on ensuring that phosphorus inflow concentrations are kept at very low levels so that the criterion can be met in a network of stations across the marsh (SFER, Chapter 3). Aggressive programs have been implemented to control phosphorus at its source (SFER, Chapter 4) and to treat stormwater as it moves south using the Stormwater Treatment Areas (STAs) (SFER, Chapter 5). The STAs are currently being expanded and will include over 60,000 acres of treatment marshes when planned additions are complete. This massive effort to improve water quality, now with a total commitment of over two billion dollars, is being done adaptively under the auspices of the "Long-term Plan for Achieving Water Quality Goals in the Everglades Protection Area." Activities and progress under this plan are described each year in Chapter 8 of the SFER. Improved water quality will move us one step closer to being able to reconnect the Everglades with its watershed.

The "River of Grass Acquisition Project" has the potential to produce a quantum jump in treatment capacity and water quality improvement, moving us far beyond treatment capabilities online or planned to date. Our existing STA system is constrained by available land, reliable sources of water and funding for construction and operation of these treatment wetlands. The

Acquisition Project will provide substantial land area for more treatment capacity and to provide a more reliable source of water for treatment through water storage and interbasin transfers.

### **3.5 Comprehensive Restoration Requires Water in the Right Place at the Right Time**

Everglades restoration projects seek to get the water right in quantity, quality, timing and distribution with the fundamental expectation that marshes will respond once the water resource is put back to a more natural configuration. As the entire Davis and Ogden (1994) volume describes so eloquently, the Everglades thrived on spatial and temporal variability. The historic ecosystem was shaped simultaneously by many driving forces, most involving the dynamics of water quantity, timing and distribution (see esp. Chapters 2, 12, 17, 18, 29 & 31). The movement of water over large and shallow areas (sheetflow) at wide ranging velocities was a defining characteristic of the original Everglades and was a major force shaping vegetation communities composed primarily of forested tree islands, ridge and slough habitat, sawgrass plains and wet prairies. In turn, the vegetation communities formed habitat needed for maintenance of a complex food web including invertebrates, primarily insects and crustaceans; many freshwater fishes; vertebrates like lizards, snakes, alligators and deer; and a diverse assemblage of wading birds (Chapters 13, 16, 19, 22, 26 & 27). Getting the water right is crucial.

As described in Section 2 and Section 3 of this report, the "River of Grass Acquisition Project" will provide the capacity, operational flexibility, water quality and distribution system that will move Everglades restoration forward through one integrated suite of projects. Water will be stored and cleansed before being routed to where it is needed, when it is needed. Certainly, plans for CERP in the Yellow Book have some of these qualities, but the Acquisition Project goes much farther and with much greater integration. The chances of fulfilling targets for

depths and inundation patterns will be improved greatly with the complementary projects to be built under the "River of Grass Acquisition Project."

The real potential for this huge increment of water for the Everglades arrives just in time. Over the last few years, scientific information has tended to support the view that much more water is needed to restore Everglades marshes (SFER, Chapter 6). CERP was designed primarily around water depth and duration targets for particular areas. Now, flow restoration is also considered important and meaningful restoration of flow requires more water in the right places and at the right times to meet the needs of the Everglades. Additional water will serve the needs of the "ridge and slough" habitat, a major portion of the marshlands, and will help alleviate salinity problems in Florida Bay and improve salinity gradients in other coastal areas.

### **3.6 Ecological Benefits Are Expected Upstream in Lake Okeechobee**

The "River of Grass Acquisition Project" will not only benefit downstream Everglades environments, but will also have tangible benefits upstream in Lake Okeechobee. As summarized by Aumen (1995) and Havens et al. (1996) and discussed at length in Chapter 10 of the South Florida Environmental Report each year, Lake Okeechobee has been damaged extensively by extreme fluctuations in water level. These fluctuations are caused by the Hoover Dike built in the 1930s. The dike cut the lake off from its huge littoral zone, forcing lake water to stay within a smaller area than the original lake (Figure 2). Depth variation is magnified by multi-objective management in which the needs of many water users must be balanced with ecological needs of the Lake itself.

When the Lake falls below about 11 feet NGVD, large shallow areas are drained, killing their aquatic vegetation and promoting sediment decomposition, invasion by terrestrial plants and damage from peat fires. At the other extreme, when water levels are higher than about 16

feet NGVD, the productive shallow areas near shore are covered too deeply and the submerged aquatic plant communities are damaged by strong currents and low underwater light levels. The only effective means to dampen these fluctuations in depth is to increase water storage outside the Lake and the "River of Grass Acquisition Project" provides just this capacity. With the Acquisition Project, water managers will be able to stay within a narrower range of depths to promote healthy vegetation communities around the Lake to the benefit of fish and wildlife that rely on this habitat.

### **3.7 Ecological Benefits are in Coastal Ecosystems to the East and West**

Chapter 12 of the annual South Florida Environmental Report provides updates on the status of South Florida estuaries and activities being undertaken to manage these valuable resources. Overall, the District seeks to ensure that freshwater discharges to South Florida estuaries are managed in a way to preserve, protect and restore estuarine resources. However, the current water management system described in Section 1 and Figure 3 of this report was designed to move large amounts of water off the land, to the Lake and into estuarine environments. Water managers have limited options to avoid excessively large freshwater discharges from the Lake to the Caloosahatchee River and Estuary to the west and the St. Lucie River and Estuary to the east. When water levels rise above target levels in the Lake regulation schedule, discharge to the estuaries is required for public safety and Lake health. Once again, more options for water management require massive water storage.

The "River of Grass Acquisition Project" will provide the means to control Lake Okeechobee water levels without huge discharges to the estuaries except under rare, extreme conditions. The ecological enhancements from reduced water loads to the east and west can not be overstated. The health of both estuaries is currently being impacted greatly by frequent

flushes of fresh water, damaging marine plant and animal communities and stressing entire estuarine food webs and the fish and wildlife that rely upon them. As described in SFER Chapter 12, initial steps are being taken to improve both quantity and quality of freshwater discharges. These actions are steps in the right direction, but they cannot deal with massive amounts of water from the Lake; the "River of Grass Acquisition Project" provides a solution for managing this large volume of water. The ability to move on the order of one million acre-feet annually to the south from the Lake will allow water managers to limit estuarine inputs to volumes that will support healthy estuarine biological communities and to help restore and protect the St. Lucie and Caloosahatchee estuarine resources.

/s/

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