

# Lake Okeechobee Watershed Construction Project

## Phase II Technical Plan



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# **LAKE OKEECHOBEE WATERSHED CONSTRUCTION PROJECT - PHASE II TECHNICAL PLAN**

*The Northern Everglades and Estuaries Protection Program requires the development of a detailed technical plan for Phase II of the Lake Okeechobee Watershed Construction Project by February 2008. In response, this preferred Plan was developed by the South Florida Water Management District in coordination with the Florida Department of Environmental Protection and the Florida Department of Agriculture and Consumer Services – and with extensive input from stakeholders throughout its development. Subject to ratification by the Florida Legislature, the preferred Plan builds upon and dovetails with on-going restoration activities and successfully consolidates many previous Lake Okeechobee restoration efforts into a broader, Northern Everglades-focused approach.*

## **Executive Summary**

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Passed by the Florida Legislature and signed into law by Governor Charlie Crist in 2007, the landmark “Northern Everglades and Estuaries Protection Program” promotes a comprehensive, interconnected watershed approach to protecting Lake Okeechobee and the Caloosahatchee and St. Lucie rivers and estuaries. By expanding the Lake Okeechobee Protection Act, the Florida Legislature recognized the importance and connectivity of the entire ecosystem – from the Kissimmee Chain of Lakes south to Florida Bay.

The primary goal of the legislation is to restore and protect surface water resources by addressing not only the water quality but also the quantity, timing and distribution of water to the natural system. State agencies are working in partnership with those local governments whose economy and quality of life depend on the health of Lake Okeechobee and the coastal estuaries to develop and implement comprehensive plans to restore and protect these water bodies.

The preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan was developed by the South Florida Water Management District (SFWMD) in coordination with the Florida Department of Environmental Protection (FDEP) and the Florida Department of Agriculture and Consumer Services (FDACS) – and with extensive input from stakeholders throughout its development.

To achieve the restoration goals, the coordinating agencies evaluated various alternatives using best available technology and scientific information, and included significant public involvement and review throughout the process. The resulting preferred Plan identifies construction projects, along with on-site measures that prevent or reduce pollution at its source such as agricultural and urban best management practices (BMPs), needed to achieve water quality targets for the lake. In addition, it includes other projects for increasing water storage north of Lake Okeechobee to achieve healthier lake levels and reduce harmful discharges to the Caloosahatchee and St. Lucie estuaries.

Components of the multi-phase preferred Plan include:

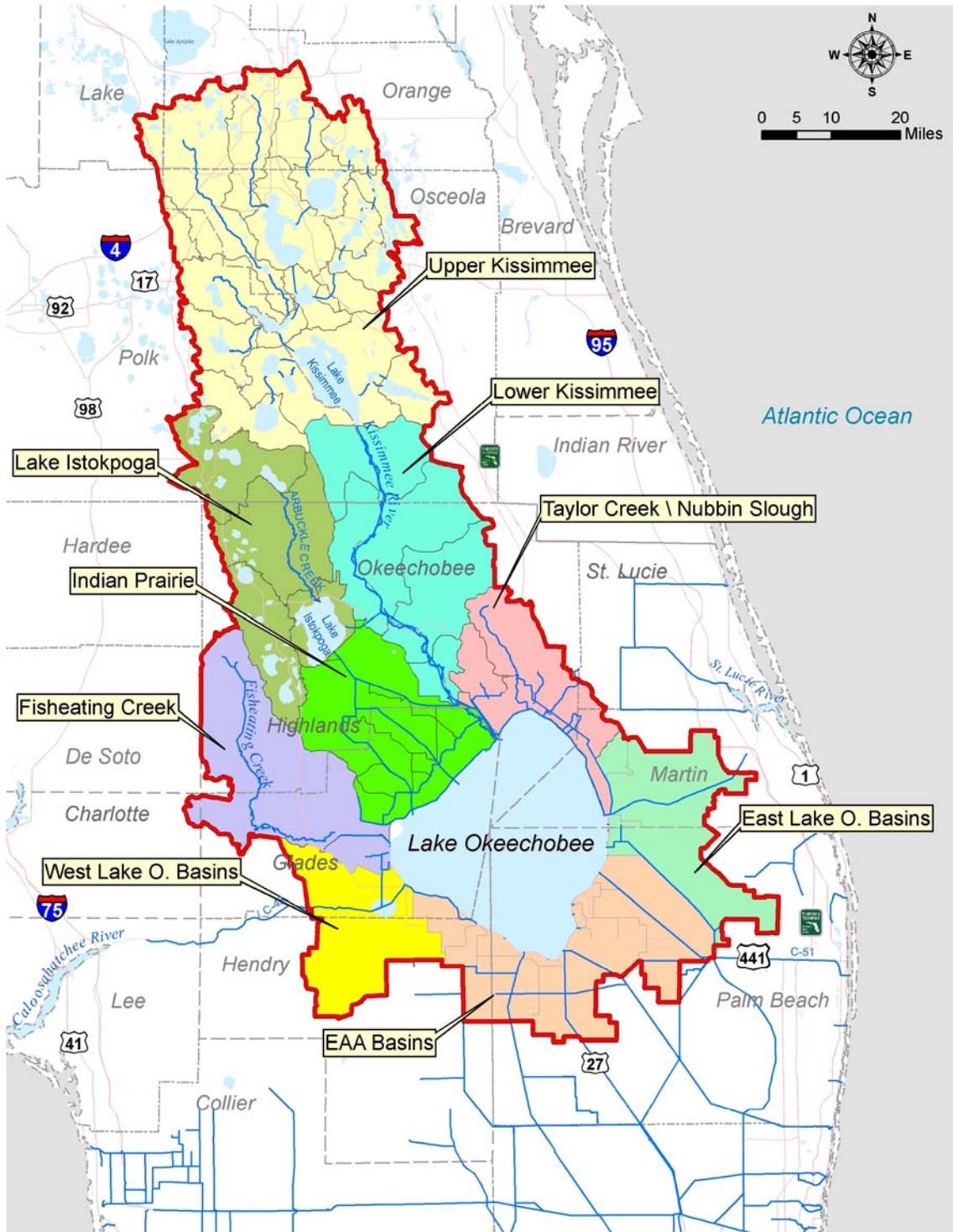
- Implementing agricultural management practices on more than 1.7 million acres of farmland;
- Adopting new regulations that will reduce the impacts of development on water quality and flow;
- Building treatment wetlands to clean water flowing into the lake;
- Using other innovative “green” nutrient control technologies to reduce phosphorus loads from the watershed; and
- Creating between 900,000 and 1.3 million acre-feet of water storage north of the lake through a combination of above-ground reservoirs, underground storage and alternative water storage projects on public and private lands.

Comprised of local and regional projects, the preferred Plan consolidates, builds upon and dovetails with many on-going restoration activities. In addition to augmenting and enhancing efforts under way in the remnant Everglades south of Lake Okeechobee, it builds upon environmental improvements currently being implemented north of the lake as a part of the state-federal Comprehensive Everglades Restoration Plan (CERP). It also consolidates the numerous initiatives currently under way through Florida’s Lake Okeechobee Protection Plan (LOPP) and Lake Okeechobee and Estuary Recovery Plan (LOER).

The proposed implementation schedule calls for a phased approach – designed to provide progressive water quality and quantity improvements to benefit the lake and downstream estuaries. Initial measures outlined by the preferred Plan call for an additional investment of up to \$320 million beyond the State’s 50 percent cost-share for land acquisition and construction projects as part of CERP. While the cost of non-CERP features will be primarily borne by the South Florida Water Management District and the State, CERP investments are eligible for up to a fifty percent cost share with the federal government.

Completion of the Lake Okeechobee Watershed Construction Project Phase II Technical Plan is a critical step in the state’s Northern Everglades initiative to protect and improve Lake Okeechobee and downstream receiving waters. The preferred Plan achieves the legislative requirement by outlining the steps needed to reduce pollution and improve the storage in the watershed north of the lake necessary to clean water flowing into Lake Okeechobee.

*Phase II Technical Plan Boundary and Sub-Watersheds*



## **Background**

Lake Okeechobee is the “liquid heart” of South Florida’s interconnected aquatic ecosystem and holds the distinction of being the largest freshwater body in the southeastern United States. The 730 square-mile lake provides a number of values and benefits to the state’s population, economy and environment, including environmental, public and agricultural water supply; flood protection; a sport and commercial fishery; navigation/recreation; and natural habitat for a variety of endangered and threatened animal and plant species.

Today, the lake’s ecological health is adversely affected by three major influences: (1) excessive nutrient loading; (2) extreme high and low water levels in the lake; and (3) the proliferation of exotic species.

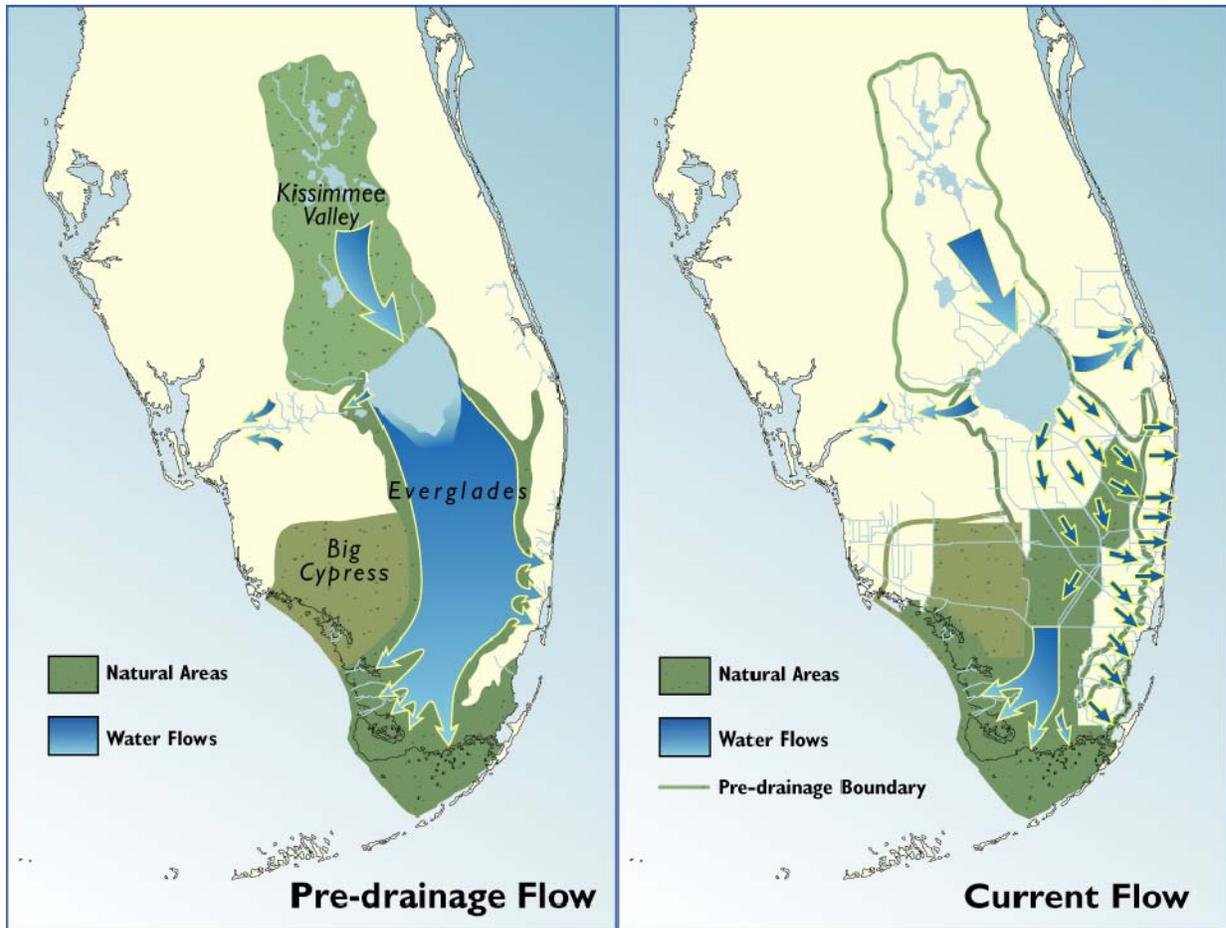
In addition to direct rainfall, the massive lake receives tributary inflows from a number of sources. The Lake Okeechobee watershed encompasses a drainage area of over 3.5 million acres (5,500 square miles), spanning 10 Florida counties, and is dominated by agricultural land uses that account for just over 50 percent of the total area. Based on hydrologic and geographic boundaries, the watershed includes nine sub-watersheds.

Over the last century, a number of factors have led to adverse changes in the hydrology and water quality of Lake Okeechobee – as well as to the Caloosahatchee and St. Lucie rivers and estuaries. These include changes in land use within the upstream Kissimmee River basin; the construction of the regional water management network for flood control (the Central and Southern Florida public works project built by the U. S. Army Corps of Engineers); loss of available surface water storage; and the subsequent flow of nutrient-enriched local runoff into the water bodies.

The impacts have been significant: Channelization of the Kissimmee River removed regional storage upstream of Lake Okeechobee while making way for growth. As nutrient-enriched runoff from agricultural and urban activities within the watershed flowed into the lake, its water quality suffered. In recognition of increasing phosphorus impacts in the lake, in 2001 the State established a stringent restoration target known as a Total Maximum Daily Load (TMDL) for Lake Okeechobee. The TMDL establishes the maximum amount of phosphorus that Lake Okeechobee can assimilate without causing exceedences of water quality standards. The amount of phosphorus entering the lake has significantly exceeded the TMDL over the past three decades.

In addition, construction of the Herbert Hoover Dike greatly reduced the extent of the lake’s natural littoral or shoreline marsh areas, reducing overall lake surface area by a third and, thereby, significantly reducing the lake’s available and historical storage capacity. Construction of the protective levee system along with drainage and development efforts to the south, reduced the natural expanse of the Florida Everglades’ wetland area by 50 percent, constraining flow south from Lake Okeechobee.

Because the volume of water coming from the upstream basin has remained relatively constant (*approximately 3.5 million acre-feet per year, on average, equivalent to about 7.5 feet over the lake surface area*), lake inflows have often exceeded its limited present-day storage capacity. With discharge capacity to the southern part of the Everglades ecosystem reduced because of constructed changes to the natural system, along with legal and environmental operating constraints, the need to discharge water from the lake to the east (*via the St. Lucie River and Estuary*) and west (*via the Caloosahatchee River and Estuary*) has increased. These coastal discharges of excess lake water – driven by the need to maintain safe lake levels in accordance with federal regulations and the U.S. Army Corps of Engineers’ operating schedule for Lake Okeechobee – can cause detrimental ecological fluctuations for the delicate estuarine environments in the St. Lucie and Caloosahatchee Estuaries.



### *Previous Restoration Efforts*

A number of lake and estuary improvement plans and actions have been developed and implemented over the years, primarily aimed at reducing pollution and the flow of excess phosphorus into the lake. Some early protection efforts began in the 1970s and, by the late 1980s, a mandatory program to control phosphorus discharges from dairy operations north of Lake Okeechobee was implemented. That program resulted in the implementation of an initial suite of best management practices on 30 farms and the buy-out of 18 dairies.

Recognizing that construction of the federally-built water management system resulted in unintended consequences on the natural system, Congress authorized the Restudy of the Central and South Florida Project in the early 1990s to assess the measures necessary to restore the south Florida ecosystem. During this time, a number of “Critical Restoration Projects” were determined to provide immediate, substantial, and independent benefits to the Everglades and were specifically authorized by the 1996 Water Resources Development Act. These included projects to benefit the health of Lake Okeechobee.

The broader-scope Comprehensive Everglades Restoration Plan (CERP) was proposed in 1999 and was authorized in the Water Resources Development Act of 2000. The joint state-federal partnership of CERP provides a framework and guide to restore, protect and preserve the water resources of central and southern Florida, including the Everglades. The overarching goal of CERP is to capture fresh water that now flows unused to the ocean and the gulf and redirect it to areas that need it most. The majority of the water will be devoted to environmental restoration. The remaining water will enhance urban and agricultural water supplies.

To better manage Lake Okeechobee and the coastal estuaries, CERP included a series of storage and water quality treatment facilities north of the lake, as well as Aquifer Storage and Recovery (ASR) in the vicinity of Lake Okeechobee. In addition, to improve flows to the Caloosahatchee and St. Lucie River watersheds, CERP includes water storage and water quality improvement projects such as the C-43 Reservoir, Indian River Lagoon South projects and the Everglades Agricultural Area Reservoir.

Also in 2000, Florida passed the Lake Okeechobee Protection Act establishing a phased, watershed-based protection program to restore the lake and its tributaries. As required by the Lake Okeechobee Protection Act, the South Florida Water Management District, the Florida Department of Agriculture and Consumer Services and the Florida Department of Environmental Protection developed the Lake Okeechobee Protection Plan, which details a suite of activities necessary for reducing pollutant loads in the watershed and achieving the established TMDL.

That Lake Okeechobee Protection Plan included Phase I of the Lake Okeechobee Watershed Construction Project (*as described in the original Lake Okeechobee Protection Act*), which identified a series of project features designed to obtain phosphorus load reductions through the construction of stormwater treatment facilities and isolated wetland restoration projects.

Through the implementation of the Lake Okeechobee Protection Plan, the State has achieved some notable accomplishments:

- Adopting a Lake Okeechobee TMDL for phosphorus of 140 metric tons to achieve an in-lake target phosphorus concentration of 40 parts per billion;
- Constructing the Taylor Creek and Nubbin Slough Stormwater Treatment Areas (*a Congressionally-approved Critical Restoration Project*) in partnership with the federal government;
- Completing conservation and nutrient-management plans on individual farms covering 550,000 acres to reduce phosphorus loads from agricultural land in the watershed;
- Completing a suite of individual projects to reduce phosphorus from dairy farms, restore isolated wetlands, treat urban stormwater run-off and enhance water storage and habitat on ranchlands;
- Implementing a comprehensive research and water quality monitoring program for the lake and watershed; and
- Treating more than 32,000 acres of exotic and invasive vegetation.

To help further accelerate progress, the \$200 million Lake Okeechobee and Estuary Recovery (LOER) plan was launched in 2005 – a combination of capital projects and numerous interagency initiatives to increase water storage, expand and construct treatment marshes and expedite environmental management initiatives. In addition to expediting construction of a series of Lake Okeechobee Fast-Track projects, other components of the LOER plan include alternative water storage, revisions to permit criteria, changes in fertilizer practices, revisions to the Lake Okeechobee regulation schedule and continued implementation of the Lake Okeechobee Protection Plan components.

To restore the health of the ecosystem upstream of Lake Okeechobee, portions of the channelized Kissimmee River are being backfilled in an effort to reestablish the lost floodplain. The \$578 million Kissimmee River Restoration Project is among the largest ecosystem restoration projects in the world and is well under way. In 2006, the South Florida Water Management District completed acquisition of the 102,061 acres needed for construction of the project. The backfilling of 9.5 miles of flood control canal by the U.S. Army Corps of Engineers has already restored close to 20 miles of historic river channel and 6,500 acres of associated floodplain.

### **Preferred Technical Plan Key Objectives / Findings**

To develop the preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan, the best available land use information, flow data and water quality data were used to identify existing flows and phosphorus loads from each sub-basin within the lake's watershed. An evaluation of current programs and projects was also conducted. Following these analyses, alternatives were identified to reduce harmful flows and phosphorus loads. Potential constraints were also identified to ensure compatibility with all ongoing or planned initiatives and legal mandates.

A set of four restoration alternatives were developed and reviewed, using established performance measures to assess how well each proposed alternative achieved the identified water quality and water quantity/storage objectives.

#### **Water Quality: Meet the Lake Okeechobee Phosphorus TMDL**

In 2001, the Florida Department of Environmental Protection established a TMDL of 140 metric tons per year of total phosphorus for Lake Okeechobee. This has been determined as the amount of total phosphorus that the lake can assimilate without causing significant ecological impacts within the lake. Of that limit, 35 metric tons per year are estimated to naturally reach the lake directly through atmospheric deposition; therefore, no more than 105 metric tons per year of total phosphorus loading should enter the lake from the watershed.

Based on the initial 1991 to 2000 period of record, the average total phosphorus loading to the lake was reported to be 433 metric tons per year from the watershed. Projects and strategies were identified as part of the Lake Okeechobee Protection Plan (*including Phase I of the Lake Okeechobee Construction Project*) to meet the target load. It is important to note that the TMDL is based on a five-year rolling average and the load reduction required to achieve it will vary annually.

For development of the preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan, the period of record for inflow to Lake Okeechobee was updated through 2005 - which included the hurricane-driven extreme rainfall events in 2004 and 2005. This expanded period (1991-2005) raised the annual total phosphorus load to 514 metric tons per year, necessitating additional phosphorus reduction measures to meet the total maximum daily load target.

Significant conclusions from the water quality analyses are:

- Existing water quality in the Lake Okeechobee watershed is significantly influenced by the various land use and land management practices within the individual sub-watersheds and drainage basins.
- In the future, implementation of Lake Okeechobee Protection Plan recommended best management practices (BMPs) and other total phosphorus reduction measures are expected to significantly reduce phosphorus loading. However, measured phosphorus reductions in the lake waters are likely to be substantially delayed because of the residual phosphorus in soils within the watershed (legacy phosphorus) and lake sediments.
- Implementation of BMPs in areas that contribute flows to Lake Istokpoga and Lakes Kissimmee, Cypress and Hatchineha are expected to reduce phosphorus loading to these lakes. While the load reductions to these upstream lakes are not expected to provide an immediate benefit to Lake Okeechobee, implementation of BMPs in these sub-watersheds is necessary to protect water quality in the lakes themselves and to ensure the long-term ability to assimilate phosphorus and protect Lake Okeechobee.
- The Indian Prairie, Taylor Creek/Nubbin Slough and Fisheating Creek sub-watersheds contribute disproportionately high phosphorus loads to Lake Okeechobee relative to their flow contributions. Therefore, these sub-watersheds were targeted for additional water quality measures.

**Water Quantity/Storage: Manage Lake Okeechobee water levels within an ecologically-desirable range and manage flows to meet desirable salinity ranges for the St. Lucie and Caloosahatchee estuaries while meeting other water-related needs of the region, including water supply and flood protection.**

The 2007 legislation also recognized the importance of managing the quantity, timing, and distribution of water from the watershed north of the lake to achieve integrated and comprehensive environmental restoration of Lake Okeechobee and the Caloosahatchee and St. Lucie estuaries. An analysis was conducted to determine the amount of water needed to be stored in the watershed to better manage water levels in Lake Okeechobee and reduce excess damaging freshwater releases to the estuaries. This analysis included an evaluation to ensure that the identified water quantity storage goal would not impact the ability to maintain existing water supply for Lake Okeechobee water users.

Key findings from the water quantity data analysis are:

- There is a breakpoint between 900,000 and 1.3 million acre-ft of storage above which additional increases in storage capacity would provide relatively small improvements in damaging releases to estuaries.
- Because a large portion of the inflows come from large rainfall events, it will be necessary to size, locate and design features with the operational flexibility to capture significant amounts of water during these large events.
- The Upper and Lower Kissimmee and Istokpoga sub-watersheds contribute close to three-quarters of the total average annual inflow to Lake Okeechobee. The Lower Kissimmee and Istokpoga sub-watersheds were targeted for storage projects.
- Although there is a large volume of flow to Lake Okeechobee from the Upper Kissimmee sub-watershed, further evaluation through the Upper Kissimmee Regional Water Supply Feasibility Study will determine if a portion of storage capacity currently identified for the Lower Kissimmee sub-watershed could be located in the Upper Kissimmee sub-watershed.

## Alternatives Evaluation

The coordinating agencies evaluated four restoration alternatives as part of the development of the preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan. Extensive emphasis was also placed on providing opportunities for public comment and review through meetings, web postings and community briefings.

A set of restoration alternatives that addressed project objectives were formulated and evaluated by the coordinating agencies planning team. Below are brief descriptions of the alternatives and a comparison of their load reduction and storage capacities.

Alternative No.	Alternative Characterization	Projected Average Load Reduction* (metric tons per year)  *target reduction is 409 mt/yr	Shortfall in achieving goal (metric tons per year)	Projected Storage Capacity (acre-feet)
1	Current, ongoing, and planned projects	301	108	265,000
2	Maximizes storage capacity	316	93	1,300,000
3	Maximizes phosphorus load reduction	364	45	330,000
4	Integrates the most efficient and effective combination of storage capacity and phosphorus load reduction	360	49	900,000

Each alternative was evaluated for its performance at reducing phosphorus, improving Lake Okeechobee water levels, reducing damaging discharges to estuaries and maintaining water supply. It was clear that Alternative 1 on its own would not meet the water quality and water quantity objectives. Alternative 2 performed best at improving Lake Okeechobee water levels and reducing damaging discharges to the estuaries. Alternative 3 performed best at reducing phosphorus inputs to Lake Okeechobee. Alternative 4 performed the best when balancing the achievement of both water quality and water quantity objectives. It falls short, however, of meeting the TMDL by 49 metric tons per year. It also provides slightly lower water quantity benefits for Lake Okeechobee and the estuaries than Alternative 2, which had a larger storage capacity.

Therefore, a modified version of Alternative 4 became the basis for the preferred Plan. Additional features were added to address the phosphorus reduction shortfall and to provide a storage range from 900,000 to 1.3 million acre feet for optimum water quantity performance. The development and comparisons of the four alternative restoration plans, with input from the public, ultimately identified the best science-based and technologically feasible options for improving lake and estuary health.

### **Preferred Technical Plan Features**

An important aspect of the 2007 legislation that sets it apart from previous actions is the requirement to identify both the water quality treatment and water quantity storage needed to improve the health of Lake Okeechobee and the St. Lucie and Caloosahatchee estuaries. The preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan represents the best blueprint that current technology allows for achieving water quality standards while better managing lake levels.

To meet the water quality targets established for the lake, the preferred Plan includes local and regional treatment projects, along with ongoing and expanded implementation of on-site agricultural and urban best management practices. Based on a water budget analysis of the major sub-watersheds flowing into Lake Okeechobee, the preferred Plan also includes other projects and initiatives for increasing water storage north of Lake Okeechobee that will help achieve healthier lake levels and reduce harmful discharges to the Caloosahatchee and St. Lucie Estuaries.

It comprises local and regional project features that include both structural and non-structural components, and builds upon ongoing treatment and restoration projects that are in the planning, design or construction phases. Through interaction between the coordinating agencies and the public, the preferred Plan also promotes involvement of private landowners, local governments and other stakeholders as restoration partners.

Water Quality – The following types of water quality measures are designed to meet the 105 metric ton total phosphorus limit:

- Source control – Best Management Practices (BMPs) and changes in regulatory requirements
- Stormwater Treatment Areas (STAs)
- Deep injection wells
- Innovative nutrient control technologies

Cumulatively, the preferred Plan's construction projects and other measures are predicted to reduce total phosphorus loads to Lake Okeechobee by approximately 409 metric tons per year – the amount needed to meet the total maximum daily load based on the 1991-2005 period of record. In addition, implementation of the preferred Plan provides the capability to reduce in-lake total phosphorus loads by approximately 75 metric tons per year.

Water Storage - The following types of water quantity measures are designed to meet the 900,000 - 1,300,000 acre-feet of needed storage:

- Alternative water storage on public and private lands
- Above-ground reservoirs
- Aquifer Storage and Recovery (ASR) facilities

It is important to note that the water quantity storage goal of 900,000 to 1.3 million acre-feet is not in addition to existing or planned projects. It is an overall goal that may be met through a combination of existing or future projects and through a combination of storage methods such as alternative water storage on public and private lands, large above-ground reservoirs or aquifer storage and recovery facilities. Information from the Lake Okeechobee aquifer storage and recovery pilot projects and other regional pilot projects will help determine the best mix of surface and underground storage needed to achieve the overall goal.

**NOTE:** An overview of features, by project type, is included at the end of this executive summary. For more detailed information and descriptions, please refer to the entire preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan (CD copy included with this summary or available on-line at <https://my.sfwmd.gov/northerneverglades>).

**Phased Implementation**

The preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan calls for an iterative, adaptive and phased implementation process, including an Initial Implementation Stage, Mid-Term Implementation Stage and Long-Term Implementation Stage. The first phase includes existing projects already under way and/or new features that will be initiated between 2008 and 2010.

**Initial Implementation Measures**

		Water Quality	Water Quantity
<b>Features</b>	Agricultural and Urban BMPs and Regulatory Programs	✓	✓
	LOPP Phosphorus Source Control Projects	✓	✓
	Local Government Initiatives	✓	✓
	Florida Ranchlands and Environmental Services Projects	✓	✓
	LOER Alternative Water Storage Projects (Alternative water storage facilities, Paradise Run 10 Well ASR System, Seminole Brighton ASR Pilot, and Taylor Creek ASR Reactivation)	✓	✓
	LOER Stormwater Treatment Areas (Brady Ranch STA, Lemkin Creek Water Quality Treatment Facility)	✓	✓
	CERP ASR Pilots	✓	✓
	CERP Lake Okeechobee Watershed Project (Istokpoga STA, Lakeside Ranch STA, Taylor Creek Reservoir, Paradise Run Wetland Restoration)	✓	✓
<b>Technology and Model Refinement</b>	BMP Research and Refinement	✓	✓
	Chemical Treatment Feasibility Study	✓	✓
	Water Quality Model Development	✓	✓
	ASR Feasibility- Pilot Cycle Testing, ASR Regional Study, ASR Optimization Analysis	✓	✓
	Hydrologic Model Refinement	✓	✓

✓ = Primary benefit      ✓ = Ancillary benefit

Key expectations of the initial implementation stage include:

- Implementing Best Management Practices on 1.3 million acres of agricultural lands;
- Completing Environmental Resource Permit and Works of the District rule revisions;
- Initiating/completing implementation of approximately 100,000 acre-feet of long-term alternative water storage;
- Completing design and initiating construction of more than 2,600 acres of Stormwater Treatment Areas;
- Completing the initial suite of Lake Okeechobee Protection Plan phosphorus source control projects;
- Implementing eight Florida Ranchlands Environmental Services Projects;
- Completing cycle testing of CERP Aquifer Storage and Recovery pilot projects, the interim report, optimization analysis and Floridan Aquifer groundwater model;
- Implementing 65 million gallons per day of Aquifer Storage and Recovery storage;
- Restoring 4,470 acres of wetlands within the Lake Okeechobee watershed; and
- Reducing phosphorus loads to Lake Okeechobee by approximately 150 metric tons.

Information from pilot projects and studies conducted during the initial stage will be used to determine the types of projects to be implemented in future stages.

### Mid-term Implementation Measures

		Water Quality	Water Quantity
<b>Features</b>	Continued Implementation of Previous Measures	✓	✓
	Implementation of Additional Water Quality Measures as optimized by Technology and Model Refinement Studies	✓	✓
	Initiate Implementation of Appropriate Combination of Storage Methods based upon CERP ASR Feasibility Studies	✓	✓
<b>Technology and Model Refinement</b>	BMP Research and Refinement	✓	✓
	STA Integration and Refinement	✓	✓
	ASR Feasibility- Final Results of ASR Regional Study, Data from LOER ASR and Pilot Projects	✓	✓

### Long-term Implementation Measures

		Water Quality	Water Quantity
<b>Features</b>	Continued Implementation of Previous Measures	✓	✓
	Continue Implementation of Storage (ASR/Surface Storage)	✓	✓
<b>Technology and Model Refinement</b>	Process Development and Engineering	✓	✓

✓ = Primary benefit      ✓ = Ancillary benefit

### **Preliminary Cost Estimates**

To provide a source of State funding for the continued restoration of the South Florida ecosystem, the 2007 Florida Legislature expanded the use of the Save Our Everglades Trust Fund to include Northern Everglades restoration and extended the State of Florida's commitment to Everglades restoration through the year 2020.

Cost estimates for the initial implementation stage of the preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan were broken out into two categories: Comprehensive Everglades Restoration Plan (CERP) features and non-CERP features.

- Estimate for Non-CERP features: \$260-\$320 million
- Estimate for CERP features: \$1-\$1.4 billion

The costs for non-CERP features will be primarily borne by the South Florida Water Management District and the State, while CERP costs are eligible for up to a fifty percent cost share with the federal government. It is anticipated that once the Lake Okeechobee Watershed Project – a component of the CERP state-federal partnership effort – is formally authorized by Congress, the federal government will provide its fifty percent cost sharing commitment on a series of reservoirs and stormwater treatment areas in the Lake Okeechobee watershed. It is important to note that a portion of the estimated CERP cost is for projects that the South Florida Water Management District is expediting ahead of authorization to achieve environmental benefits earlier. Completion of these Lake Okeechobee Fast-Track projects, however, is dependent on continued State and SFWMD funding in advance of federal appropriation.

Costs for each subsequent stage of implementation will be developed as information from various pilot projects and studies are gathered. This information will be incorporated into more detailed planning design in the future. Cost estimates for mid-term measures will be provided in the 2010 Lake Okeechobee Protection Plan update submitted to the Florida Legislature.

### **Preferred Technical Plan Refinements and Revisions**

The preferred Plan provides a framework and road map for progressive water quality and quantity improvements to benefit the lake and downstream estuaries.

Throughout implementation, it is fully expected that hydrologic and water quality conditions in the watershed will continue to change as land uses in the watershed are modified, and as restoration projects become operational. Performance will be periodically assessed and revisions made as necessary. In addition, the legislation requires annual reports and plan updates every three years.

***For more details...***

The preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan is designed to reduce phosphorus loadings to the lake and to identify additional storage capacity within the watershed. It builds on and consolidates numerous restoration actions into a more cohesive and comprehensive approach.

For your convenience, a compact disc copy of the entire preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan is attached to the inside back cover of this publication. Please refer to that document for more details on the highlights included in the executive summary. A copy may also be obtained on-line at <https://my.sfwmd.gov/northerneverglades>.

**Preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan  
Overview of LOCAL FEATURES**

<b>Project Type</b>	<b>Project Name</b>	<b>Project Description</b>
Source Control Programs	SFWMD's Environmental Resource Permit Program (ERP)	<p>Existing regulatory program which ensures that alterations in stormwater runoff do not degrade surface water quality, flood protection or the function of existing wetland systems.</p> <p>SFWMD has initiated rule development for an ERP basin rule for the Lake Okeechobee, St. Lucie and Caloosahatchee Watersheds that will be based on a performance standard of post-development discharge volumes not exceeding pre-development discharge volumes. The intent of this rule is to ensure that new development is not increasing the volume of stormwater discharging downstream.</p>
	SFWMD's Works of the District Regulatory Phosphorus Source Control Program	<p>Existing regulatory program which governs Best Management Practice (BMP) implementation on agricultural and non-agricultural lands through issuance of permits.</p> <p>SFWMD is updating the rule criteria to be compatible with current initiatives and amendments to the statute. Proposed updates to the rule could include amendments such as expansion of program to entire Lake Okeechobee watershed, establish load-based performance measures for the combined BMP source control programs implemented in the watershed and timeline for BMP implementation; and establish a monitoring network necessary to ensure compliance.</p>
	FDACS Agricultural BMP Programs	<p>On-going program under which FDACS and Natural Resources Conservation Service (NRCS) cooperate with local landowners to develop farm-specific conservation plans for cow/calf, citrus, row crop and other agricultural operations.</p>
	Supplementary Non-Agricultural BMP Programs	<p>On-going programs under which FDEP regulates measures implemented to control phosphorus loads from non-agricultural sources. Includes implementation of site-specific BMPs, master planning for stormwater and wastewater, implementing stormwater retrofits, designing larger urban stormwater projects and public education.</p> <p>FDEP is also expected to propose a Unified Statewide Stormwater Rule (January 2009) to increase the level of treatment required for nutrients in stormwater from new development.</p> <p>FDACS recently adopted the Urban Turf Fertilizer Rule to limit phosphorus and nitrogen content in fertilizers used for urban turf and lawns.</p>
		<p><i>(Overview of LOCAL FEATURES continues on next page)</i></p>

<b>Project Type</b>	<b>Project Name</b>	<b>Project Description</b>
Land Management Programs	Comprehensive Planning/Land Development Regulations	On-going Florida Department of Community Affairs program under which local government comprehensive plans are reviewed for consistency with the State's growth management policies.
	Farm and Ranchland Protection Program Partnership	On-going, voluntary NRCS program under which matching funds are provided to State, Tribal or local governments and non-governmental organizations to purchase conservation easements. Such easements typically remain agricultural and provide water quality and storage benefits.
	Florida Ranchlands Environmental Services Project	Recently launched pilot program under development. If successful, local landowners can sell environmental services related to water retention, phosphorus load reduction and wetland habitat expansion to state agencies and other willing buyers.
Alternative Water Storage Facilities	--	Stormwater runoff is held on-site on designated private and state lands thereby reducing flow and discharge of nutrients to the regional drainage systems. These facilities generally require minimal engineering, construction, and operation and maintenance and can be sited on either privately-owned agricultural lands in cooperation with the landowners or on public and tribal lands.
Local Initiatives	Taylor Creek Canals Sediment Removal	Removal of sediment and vegetation from canals and tributaries that drain to Taylor Creek from the Treasure Island and Taylor Creek Isles residential areas.
	Okeechobee City Sediment Trap Installation	Installation of two sediment traps within the city of Okeechobee for the removal of phosphorus-laden particulates that might otherwise enter Lake Okeechobee.
	Nubbin Slough East Flow Diversion	Diverting Nubbin Slough flows to restore the east main tributary of the slough.

**Preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan  
Overview of REGIONAL FEATURES**

<b>Project Type</b>	<b>Project Name</b>	<b>Project Description</b>
Surface Storage Facilities	Storage Reservoirs	A reservoir that is operated with changing water level for the purpose of storing and releasing water.
Underground Storage Facilities	Aquifer Storage and Recovery	The injection of fresh water into a confined saline aquifer during times when supply exceeds demands (wet season), and recovering it via the same well during times when there is a supply deficit (dry season).
Underground Surface Disposal	Deep Injection Well	The practice of water and wastewater disposal into the deep Floridan Aquifer “Boulder Zone” through use of a high capacity well.
Nutrient Load Reduction Facilities	Stormwater Treatment Areas	Large, constructed wetlands designed to remove pollutants, particularly nutrients, from stormwater runoff using natural processes.
Reservoir-Assisted Stormwater Treatment Areas (RASTAs)	Reservoir-Assisted Stormwater Treatment Areas (RASTAs)	Feature comprised of a reservoir and a stormwater treatment area. The reservoir functions to store and release water directly to the STA in order to optimize STA performance.

**Preferred Lake Okeechobee Watershed Construction Project Phase II Technical Plan  
Overview of OTHER FEATURES**

<b>Project Type</b>	<b>Project Name</b>	<b>Description</b>
In-Lake Treatment	Muck Sediment Removal	Scraping the lake bed as it is exposed due to falling water levels and transporting the nutrient-laden muck off-site.
	Dredging	Use of innovative dredging techniques to remove phosphorus-laden sediments from the lake bottom.
	Recirculating Stormwater Treatment Areas	Stormwater Treatment Areas located along the Lake Okeechobee shoreline, which are primarily intended to treat nutrient-rich flows from the watershed; however, during dry periods when there is little or no flow from the watershed, lake waters would be diverted to these systems for treatment.
	Disking or Plowing	Disking and plowing are two alternatives to scraping the lake bottom and physically removing the organic sediments. Disking is an action in which the surficial organic sediments are mixed with underlying mineral or sand sediments. Plowing involves slicing more deeply into the soil and attempting to invert a portion of the underlying sands and the organic sediments. The turbidity-producing organic sediment and phosphorus content are typically suppressed by the sandy soil.
Innovative Nutrient Control Technologies	Taylor Creek Algal Turf Scrubber®	Engineered systems in which attached algae are cultured and the algal biomass is routinely harvested to facilitate recovery of pollutants from impaired waters.
	Hybrid Wetland Treatment Technology	Wetland treatment combined with chemical injection technologies.
	Chemical Treatment	Selective application of chemical treatment to achieve phosphorus load reductions. Locations (in association with reservoir/STA, throughout watershed, etc), dosages, and cost-effectiveness of chemical treatment technology will be evaluated through a feasibility study.
Wetland Restoration	Wetland Restoration	An activity that re-establishes the habitats and functions of a former or degraded wetland.
Miscellaneous Projects	Florida Power and Light Martin Cooling Pond	This feature will expand currently available storage capacity at an existing 7,000-acre impoundment located at FP&L's Martin County facility.
	S-133 Water Quality Treatment Facility	Exact nature of this feature (Stormwater Treatment Area, deep well, expansion of the existing Lemkin Creek Urban Stormwater Treatment Area, or a combination of these) would be determined during the implementation stage through a feasibility study.

