

Executive Summary Lake Okeechobee Protection Plan

UPDATE



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LAKE OKEECHOBEE PROTECTION PLAN - UPDATE 2011

Executive Summary

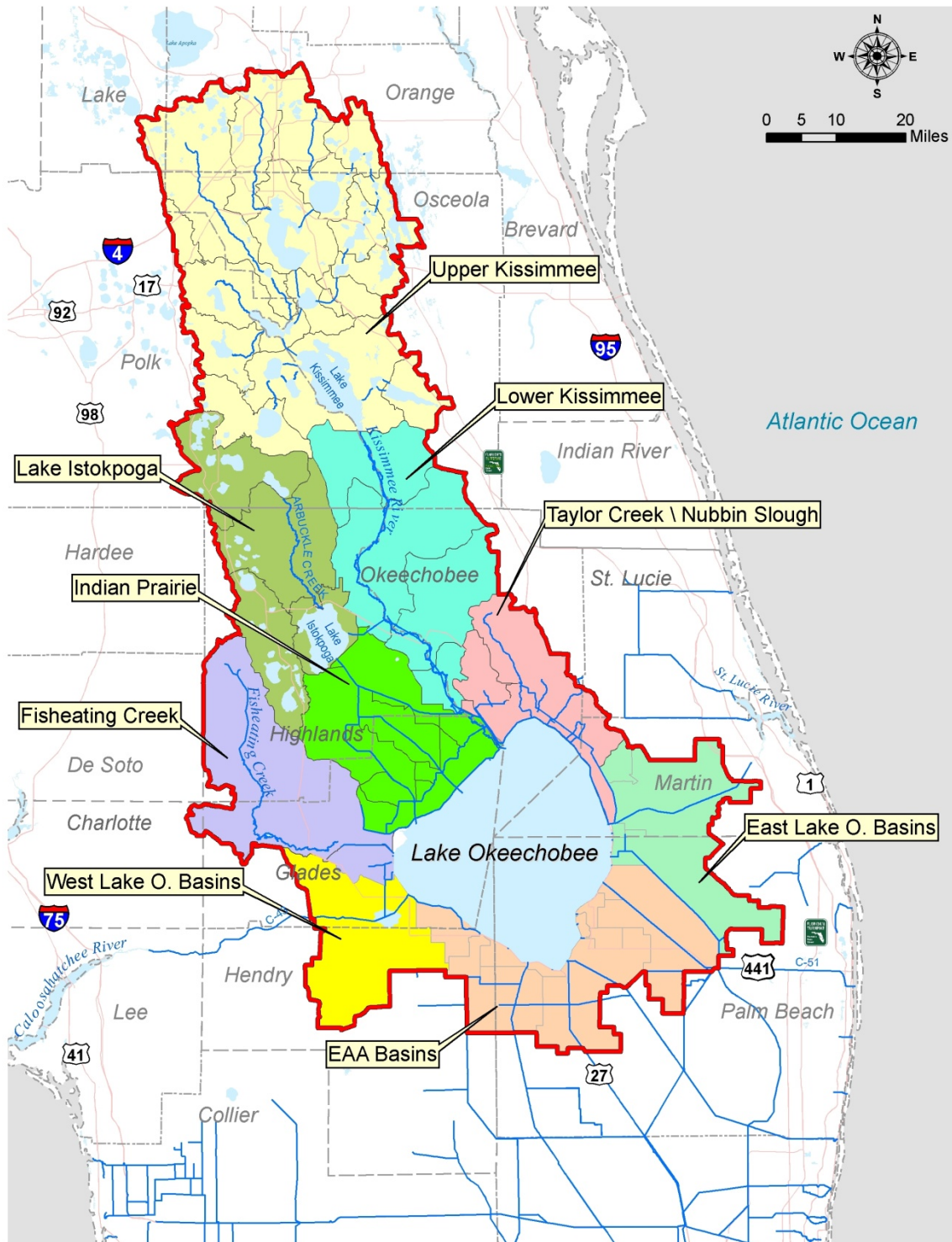
Passed by the Florida Legislature and signed into law in 2007, the landmark Northern Everglades and Estuaries Protection Program promotes a comprehensive, interconnected watershed approach to protecting Lake Okeechobee and the Caloosahatchee and St. Lucie rivers and estuaries. By expanding the 2000 Lake Okeechobee Protection Act, the Florida Legislature recognized the importance and connectivity of the entire South Florida 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 throughout the Northern Everglades by addressing not only water quality improvements but also the quantity, timing and distribution of water to the natural system. State agencies are working in partnership with local governments whose economy and quality of life depend on the health of Lake Okeechobee and the coastal estuaries to implement comprehensive plans to restore and protect these water bodies.

The Northern Everglades and Estuaries Protection Program specifically called for the development of the Lake Okeechobee Watershed Construction Project Phase II Technical Plan (completed in 2008), along with separate river watershed protection plans for both the Caloosahatchee and St. Lucie (completed in 2009). Developed by the South Florida Water Management District (SFWMD), the Florida Department of Environmental Protection (FDEP), and the Florida Department of Agriculture and Consumer Services (FDACS), collectively known as the coordinating agencies – with extensive stakeholder input throughout the process – the plans must be updated every three years.

This update of the broader Lake Okeechobee Protection Plan (LOPP) fulfills the legislative requirement for the three-year update. In addition to incorporating the Lake Okeechobee Watershed Construction Project Phase II Technical Plan elements, this document includes additional program components required by the Northern Everglades and Estuaries Protection Program (NEEPP) designed to benefit the lake ecosystem. The 2011 update focuses on the progress of the coordinating agencies in reducing phosphorus loads consistent with the Total Maximum Daily Load established for the lake, as well as increasing watershed storage to achieve healthier lake levels and to reduce harmful discharges to the estuaries. It also defines current and proposed phosphorus reduction and storage projects that will require funding for implementation and identifies the lead agencies for implementing each activity or project, including:

- Best Management Practices
- Regulatory Programs
- Regional Stormwater Treatment Areas
- Stormwater projects
- Phosphorus control and management projects
- Dispersed water management
- Wetland restoration
- Sub-regional treatment projects
- In-lake phosphorus management projects
- Alternative nutrient reduction technologies
- Feasibility studies

Lake Okeechobee Protection Plan Update 2011 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 benefits to the state’s population, economy, and environment, including environmental, public and agricultural water supply; flood protection; fisheries; navigation/recreation; and natural habitat for a variety of endangered and threatened species.

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

In addition to direct rainfall, the massive lake receives inflows from a number of sources. The Lake Okeechobee Watershed encompasses a drainage area of over 3.5 million acres (5,500 square miles), spans 10 Florida counties, and is over 50 percent agricultural land.

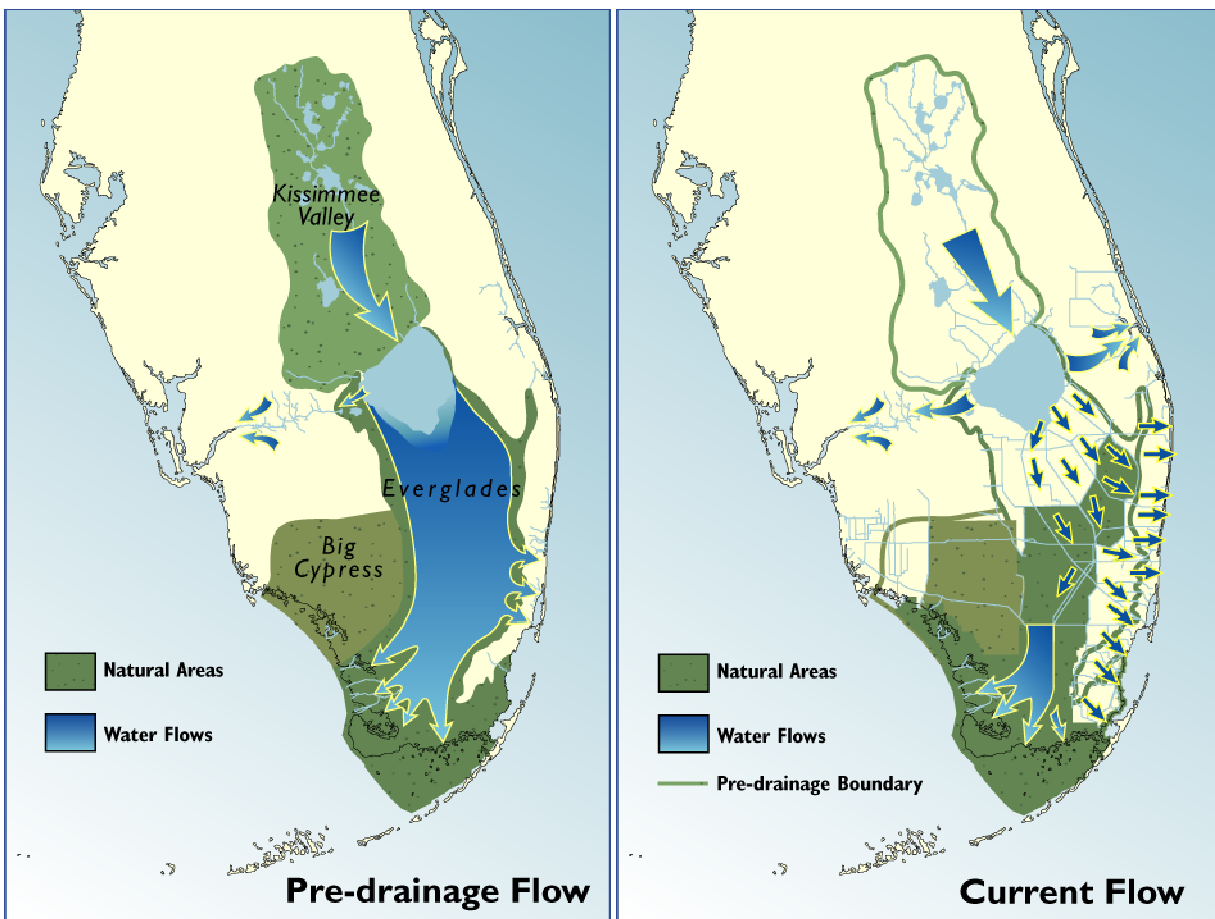
Over the last century, a number of factors have changed the hydrology and water quality of the Kissimmee River and Lake Okeechobee, as well as the Caloosahatchee and St. Lucie rivers and estuaries. These include changes in land use within the upstream Kissimmee River Basin; the construction of the regional water management network for flood control (the Central and Southern Florida public works project built by the U.S. Army Corps of Engineers [USACE]); loss of wetlands as a source of surface water storage; and the subsequent flow of nutrient-enriched runoff into the receiving waters.

Recognizing increasing phosphorus impacts in the lake, the State of Florida in 2001 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 an imbalance of flora and fauna, taking into consideration a “margin of safety.” 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 for flood protection 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 and nutrient assimilative capacity. Construction of the protective levee system and drainage features, as well as development and agriculture across South Florida, have reduced the natural expanse of the Everglades’ wetland area by 50 percent, constraining flow south from Lake Okeechobee.

Because the volume of water coming from the upstream Kissimmee Basin has remained relatively constant (approximately 3.5 million acre-feet per year, on average, equivalent to about 7.5 feet of the lake surface area), lake inflows frequently exceed the lake's altered present-day storage capacity. With discharge capacity to the southern part of the Everglades ecosystem reduced by 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 USACE operating schedule for Lake Okeechobee – can cause detrimental ecological fluctuations for the delicate environments in the St. Lucie and Caloosahatchee estuaries.

Everglades Historic and Existing Flows



Building on Previous Restoration Efforts

A number of lake and estuary improvement plans and actions have been developed and implemented over several decades, primarily aimed at reducing nutrient pollution into the lake.

Some early state-funded protection efforts began in the 1970s and, by the late 1980s, a regulatory program to control phosphorus discharges from dairy operations north of Lake Okeechobee was implemented. That program resulted in an initial suite of Best Management Practices (BMPs) 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. The 1996 Water Resources Development Act authorized a number of “Critical Restoration Projects” to provide immediate, substantial, and independent benefits to the Everglades ecosystem and Lake Okeechobee.

The broader-scope Comprehensive Everglades Restoration Plan (CERP) was authorized in the Water Resources Development Act of 2000. The state-federal partnership of the CERP provides a procedural framework and identifies projects to restore, protect, and preserve the water resources of central and southern Florida, including the Everglades. The overarching goal of CERP is to effectively manage the timing, quality, quantity, and distribution of water to achieve a balanced benefit to the natural system and resident needs. The majority of the water will be devoted to protection and restoration of the natural system. The remaining water will enhance urban and agricultural water supplies.

To better manage Lake Okeechobee and the coastal estuaries, CERP included the Lake Okeechobee Watershed Project. This effort, once fully constructed, will comprise a series of water storage and water quality treatment facilities north of the lake, as well as Aquifer Storage and Recovery near Lake Okeechobee. In addition, to improve flows to the Caloosahatchee and St. Lucie River watersheds, CERP also included other projects such as the C-43 Reservoir, Indian River Lagoon-South projects, and the Everglades Agricultural Area Reservoir.

Florida passed the Lake Okeechobee Protection Act in 2000 with the goal of achieving and maintaining compliance with state water quality standards in Lake Okeechobee and its tributary waters. The act set forth a series of activities and deliverables for the coordinating agencies, including joint development of the Lake Okeechobee Protection Plan.

Since 2000, approximately \$315 million of State appropriations and SFWMD contributions have been invested to implement activities described in the act. Achievements to date include:

- ✓ As of December 2010, landowners enrolled approximately 1.3 million acres (76%) of agricultural lands in the FDACS-adopted BMP program and are applying owner-implemented BMPs focused on reducing phosphorus loads to Lake Okeechobee. Almost two-thirds of the agricultural acreage with owner-implemented BMPs (838,780 acres) have also administered cost-share BMPs. FDACS will continue to work cooperatively with the coordinating agencies, stakeholders, and landowners to identify alternative funding sources and other opportunities to accelerate the rate of BMP enrollment and implementation.
- ✓ More than 30 phosphorus reduction projects have been constructed, including isolated wetland restoration projects, Dairy Best Available Technology projects, former dairy remediation projects, and public-private partnership projects. The potential average annual phosphorus load reduction from these projects is estimated at 26 metric tons.
- ✓ Six Hybrid Wetland Treatment Technology (HWTT) projects have been implemented under a joint effort between the SFWMD and FDACS in the St. Lucie and Lake Okeechobee watersheds. Another HWTT site in the Lake Okeechobee Watershed is expected to be built by March 2011. Collectively, these projects will provide approximately 4 metric tons of phosphorus load reduction per year.
- ✓ Construction of two regional Stormwater Treatment Areas (STAs) is complete, and a third is under way. Together these STAs are expected to reduce the average phosphorus load to the lake by approximately 24 metric tons per year when they are all fully operational.
- ✓ Crews removed or sequestered approximately 1.9 million cubic yards of muck from Lake Okeechobee, exposing thousands of acres of natural lake bottom sand and promoting the return of native plant species. In addition, the project removed 142 metric tons of phosphorus from the lake.
- ✓ A total of 129,143 acre-feet of water storage has been achieved in the Northern Everglades and connected watersheds through partnerships that have provided water management alternatives since 2005. A total of 89,814 acre-feet is within the Lake Okeechobee Watershed. Additional water storage sites are being developed as part of the Dispersed Water Management program.
- ✓ Adoption of revisions to the FDEP's Chapter 62-640, Florida Administrative Code (F.A.C.), were completed with the revisions effective on August 29, 2010. The revisions are designed to improve application and management of Class B

biosolids as well as to improve the distribution and marketing of Class AA biosolids. By 2013, no Class B biosolids application will be permitted in the Lake Okeechobee Watershed. To address stakeholders' concerns about Class AA biosolids spreading in the Lake Okeechobee Watershed, various measures were adopted during rulemaking efforts, including the prohibition of having more than one-dry ton of unapplied Class AA biosolids on one's property without proper storage and more stringent reporting requirements.

- ✓ In support of Chapter 40E-61, F.A.C., and 2007 NEEPP amendments, the SFWMD continues to develop technical documents to establish performance measures for the collective source control programs in the Lake Okeechobee Watershed with a completion date anticipated by the end of 2011.
- ✓ Adoption of the FDEP's statewide stormwater rule, which would require additional water detention and water quality improvement of urban runoff, was originally anticipated to be completed by the end of 2011. However, on January 4, 2011, Governor Rick Scott issued Executive Order No. 11-01 suspending all rulemaking; therefore, these efforts are currently on hold.

In 2008, the USACE adopted the 2008 Lake Okeechobee Regulation Schedule (2008 LORS) to help fulfill its responsibility to manage lake levels based on the time of year, weather expectations, and public safety issues. Decisions to retain or release water are based on the 2008 LORS, encompassing the best available science, data, and stakeholder recommendations.

Improved Ecological Conditions

While water quality remains a serious challenge in Lake Okeechobee and its watershed, ecological conditions within the lake have greatly improved since the previous plan update in 2008. This improved status may be attributed to two circumstances. First, water clarity has increased as suspended solids brought into the water column during the hurricanes of 2004 and 2005 have settled into the sediments. Second, and perhaps more importantly, stage conditions (water levels) have been exceptionally beneficial over the past two years due to low rainfall and have resulted in an increase in submerged and emergent vegetation communities.

The lake stages have been almost entirely within the highly desirable 12.5 to 15.5 foot (related to the National Geodetic Vertical Datum) range since mid-2008. Wading birds had great nesting success in 2009, and their foraging was very good in 2010. Fishing, for largemouth bass in particular, has seen a tremendous improvement during the past three years. Benthic invertebrates, the base of the lake's food chain, have been steadily increasing in numbers and species diversity. These data suggest that if we are able to maintain favorable stages, then beneficial aquatic vegetation has the potential to reestablish, which can help buffer the lake until watershed nutrients are adequately controlled.

Ongoing Challenges

Despite the improved ecological conditions, many daunting water quality challenges remain. Among them are the legacy phosphorus throughout the Lake Okeechobee Watershed; nutrient imports; in-lake phosphorus loading; north of the lake Stormwater Treatment Area (STA) operational challenges; delays in the implementation of the Comprehensive Everglades Restoration Plan (CERP) Lake Okeechobee Watershed Project; and funding constraints.

Legacy Phosphorus: Approximately 176,000 metric tons of phosphorus are currently stored in uplands and isolated wetlands and tributary sediments. Assuming 10 to 25 percent of the reactive phosphorus is available for release, at the current total phosphorus loading rate of roughly 500 metric tons per year, it would take 23 to 57 years to flush the existing legacy phosphorus from the system, assuming phosphorus imports and exports were immediately balanced. Studies indicate that sufficient legacy phosphorus is in the watershed to maintain elevated levels in inflows to Lake Okeechobee for many decades.

Nutrient Imports: While somewhat improved, nutrient imports continue to pose another challenge. Based on 2009 data, approximately 6,088 net metric tons of phosphorus were imported into the watershed and 5,047 metric tons of the phosphorus imports were stored onsite in upland soils. Compared to 2002 data, however, net phosphorus imports have decreased by 25 percent. These decreases are primarily due to changes in phosphorus import from land uses (truck crops and sugarcane) and implementation of Best Management Practices.

In-lake Sediments/Phosphorus Loading: Sediments and internal phosphorus loading are also major concerns within the lake, since they reduce light conditions and, consequently, algal and aquatic plant growth. In addition, excessive phosphorus loads to Lake Okeechobee during previous decades have led to a mass of the nutrient accumulating in the lake's sediments, a primary source of dissolved inorganic phosphorus to the water column.

Operations: Operational issues related to culvert failure and mechanical problems with the Taylor Creek and Nubbin Slough STAs are currently being coordinated with the USACE.

Funding: Funding is the critical determinant in the timely implementation of Lake Okeechobee Watershed projects to achieve the water quality and storage goals. There is a reliance on both state and federal funding to implement the array of projects identified in the LOPP. There have been delays in the implementation of the CERP-Lake Okeechobee Watershed Project primarily due to unresolved cost-sharing issues. The State is still working with the USACE to obtain Congressional authorization to share costs of construction of the water quality improvement features identified in the

tentatively selected plan for the CERP-Lake Okeechobee Watershed Project. The costs of source control, construction projects other than CERP features, research, water quality monitoring projects, and other elements of the Lake Okeechobee Protection Plan (e.g., exotic species management, internal phosphorus management) will continue to be primarily borne by the coordinating agencies and the State.

Given the magnitude and scale of these and other challenges, it is not anticipated that the Lake Okeechobee TMDL can be achieved by 2015. As there is no single solution to address the complicated issues and challenges facing the lake, the 2011 Lake Okeechobee Protection Plan update includes a multitude of projects and activities to be implemented at different spatial and cost scales. The coordinating agencies remain committed to achieving the intent of the legislation and continue to work to overcome the many resource challenges and funding uncertainties. This plan identifies strategic projects, promising technologies, and other proposals that can be implemented in Lake Okeechobee and its watershed to continue to move toward achieving the ultimate TMDL goal.

Meeting Key Objectives – New Data/New Opportunities

1) Water Quality: Meet the Lake Okeechobee Phosphorus TMDL.

In 2001, the FDEP established a Total Maximum Daily Load (TMDL) of 140 metric tons per year of total phosphorus for Lake Okeechobee. This is determined as the amount of total phosphorus 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. 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.

Based on the initial 1991 to 2000 period of record, the average total phosphorus loading to the lake was 433 metric tons per year from the watershed. For development of the Lake Okeechobee Watershed Construction Project Phase II Technical Plan in 2008, 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. That expanded period (1991–2005) of analyses raised the annual total phosphorus load to 514 metric tons per year.

For this 2011 update, the period of record for inflow to Lake Okeechobee is expanded to include the post-Lake Okeechobee Protection Act years of 2001 through 2009. The revised data show the annual total phosphorus load to the lake is 539 metric tons per year, necessitating additional phosphorus reduction measures to meet the TMDL target.

2) 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 Northern Everglades and Estuaries Protection Program legislation 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. As part of the Lake Okeechobee Watershed Construction Project Phase II Technical Plan development, 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 therefore reduce excess damaging freshwater releases to the estuaries. That analysis identified 900,000 to 1.3 million acre-feet of needed storage.

Since then, new opportunities for significant water storage and treatment south of the lake offers other storage options. The acquisition of strategically located lands within the Everglades Agricultural Area provides the ability to send more water from Lake Okeechobee south to assist with Everglades restoration flow targets and reduce damaging discharges to the estuaries. In anticipation of the potential land acquisition within the EAA, the SFWMD hosted the first phase of a series of public planning workshops. The planning process, which assumed significantly more Lake Okeechobee water could be sent south, identified a reduced storage target range of 450,000 to 575,000 acre-feet needed north of the lake. This conceptual-level estimate was based on acquiring the entire *River of Grass* acreage. Completing the second phase of planning will help refine the actual storage target.

Plan Update 2011 – Strategies for Moving Forward

The 2011 update provides an action plan for water quality and quantity improvements to benefit the lake and its watershed, with a specific focus on the projects that the coordinating agencies will be implementing in the next three years (2011–2013). Projects are described as either current (constructed or completed), near term (2011–2013), or future (2014 and beyond).

The chart below summarizes the issues affecting the health of Lake Okeechobee and its watershed and the strategies identified to address these issues.



Watershed Issues – Strategies and Promising Technologies

Water Quality

Addressing the major water quality issues (e.g., nutrient imports, legacy phosphorus) in the Lake Okeechobee Watershed and achieving the level of phosphorus load reduction required by the Total Maximum Daily Load program requires integrated actions at the source, sub-regional, and regional levels.

Source controls are integral to the success of the Lake Okeechobee Protection Plan and include onsite and sub-regional water quality improvement measures. Onsite measures consist of individual operators implementing best management practices (BMPs) for reducing phosphorus on their property. BMPs are widely considered the most cost-effective water quality improvement measures because they focus on optimizing phosphorus inputs and improving management of irrigation and storm water onsite. This is done through the re-hydration of wetlands and the design and construction of water control structures and facilities that allow landowners to better manage water movement on their property. The coordinating agencies are also committed to identifying opportunities to implement more costly and sophisticated edge-of-farm treatment technologies where feasible.

Sub-regional water quality improvement projects included in the source control programs are intended to further reduce phosphorus once it enters the local drainage system before making its way into the downstream regional system where regional projects are designed for even further reductions. The more effective the source controls are at reducing phosphorus in the local drainage systems, the more effective and less costly the regional treatment systems will be at further reductions. Therefore, the integrated management strategy is based on a foundation of phosphorus source control programs, including onsite BMPs, and sub-regional and regional water quality improvement projects (e.g., stormwater treatment areas, hybrid wetland treatment technology, permeable reactive barriers). These initiatives are evolving and expanding through regulatory and incentive-based programs by the coordinating agencies that operate in concert through an interagency memorandum of understanding to ensure leveraging of resources and responsibilities.

Continued research and the assessment of new technologies are essential to success in achieving nutrient reduction goals in the Lake Okeechobee Watershed. Therefore, the coordinating agencies continue to evaluate more effective and practicable BMPs and innovative nutrient control technologies. Examples include the evaluation of chemical treatment technology in conjunction with the Lakeside Ranch Stormwater Treatment Area Phase I and the SFWMD's New Alternative Technology Assessment initiative that reaches out to the business community for creative ideas to help solve long-standing resource management concerns.

Storage

Increasing stormwater storage in the Lake Okeechobee watershed will require a mix of regional and dispersed water management projects. The coordinating agencies are aggressively pursuing dispersed water management implementation and expansion in the Northern Everglades Watershed by working with other agencies, non-profits, and public, private and tribal landowners. Creating another opportunity for businesses to participate in and help implement solutions, a new Northern Everglades-Payment for Environmental Services dispersed water management solicitation program has recently been released. This program offers eligible cattle ranchers the opportunity to compete for contracts for water and nutrient retention. It is widely acknowledged that the components of the dispersed management program (easements, cost-share, and payment for services) are the most promising options in the near-term to address a portion of the storage needs. The goal is to provide 450,000 acre-feet of storage throughout the Northern Everglades Watershed (Okeechobee, Caloosahatchee, and St. Lucie watersheds). Regional projects (e.g., reservoirs, aquifer storage and recovery projects, deep injection wells) and other State initiatives (*River of Grass*) also continue to be critical to reach the storage goals for the Lake Okeechobee Watershed.

Although regional storage and treatment projects remain part of the solution; implementation has been delayed due to funding constraints, cost-share issues, long planning processes, shifting priorities, and other issues. The CERP – Lake Okeechobee Watershed Project is estimated to provide 273,000 acre-feet of storage and 74 metric tons of phosphorus reduction when fully implemented. The ability to acquire additional land in the Everglades Agricultural Area (*River of Grass*) also provides potential storage opportunities south of the lake, but is dependent on future economic conditions.

In-Lake Issues – Strategies and Promising Technologies

If internal phosphorus loading is not adequately addressed, the lake may not fully respond to external load reductions. Everglades and estuary restoration will be more difficult without improving the quality of water discharged from the lake. To address these concerns, the following ideas could be explored further: sediment dredging; muck removal, scraping and tilling; creation of in-lake islands or littoral zones near outlets; and chemical treatment. Although the ability to investigate these strategies is limited at this time due to funding constraints, the coordinating agencies identified an in-lake phosphorus management study as a beneficial near-term project.

Invasive exotic species management activities have been, and will continue to be, conducted primarily through the cooperative efforts of state and federal agencies. An interagency memorandum of understanding among the USACE, FDEP, Florida Fish and Wildlife Conservation Commission (FWC), and SFWMD formalized the operational avenue through which the agencies advise and provide exotics treatment. Most of the SFWMD efforts on exotic species management have been focused on exotic vegetation (e.g., torpedograss, South American watergrass, water hyacinth, water

lettuce) in collaboration with the FWC. The spread of exotic animals needs further investigation. Mostly anecdotal evidence suggests that the exotic apple snail is spreading rapidly throughout the ecosystem, but it may occupy a somewhat different, although overlapping habitat with the native snail. Restocking to increase the numbers of native snails, although very costly, would greatly benefit the snail kite.

Estimated Phosphorus Load Reductions

The contribution of each project and activity toward meeting the Lake Okeechobee total phosphorus TMDL was evaluated for this update. BMPs were found to be the most cost-effective approach for initial phosphorus load reductions. Load reductions from other projects were estimated based on the best available data and 2008 evaluations.

The following chart summarizes existing phosphorus loads to the lake and estimates phosphorus reductions anticipated to result from **current** activities (projects that are constructed and/or completed). During the baseline period of 2001 through 2009, the actual total phosphorus load to the lake was 539 metric tons (not including the 35 metric tons from atmospheric deposition), which is 434 metric tons above the targeted load of 105 metric tons.

Current Activities	Estimated TP Load Reduction (mt)	Lead Agency
Owner Implemented and Cost-share Agricultural Best Management Practices	51.8	FDACS
Watershed Phosphorus Control Projects	26.4	SFWMD
Regional Public Works Projects	35.0	SFWMD
Florida Ranchlands Environmental Services Project	6.0	SFWMD
Dispersed Water Management Projects	7.6	SFWMD
Hybrid Wetland Treatment Technology	1.1	FDACS and SFWMD
Total under Current Activities	127.9	

TP: total phosphorus, mt: metric tons

Near-term activities include projects and activities that are either initiated or expected to be completed in the next three years (2011–2013). Total phosphorus load reductions from the near-term activities were estimated based on the best available information and data. Collectively, these activities will provide an additional annual average total phosphorus load reduction of approximately 57 metric tons per year within the next three years.

Activities	Estimated TP Load Reduction (mt)	Lead Agency
Baseline Phosphorus Load (2001–2009)	539.2	
Current Activities	127.9	
TMDL (not including the 35 mt of atmospheric deposition)	105	
Remaining Load	306.3	
Near-Term Activities		
Owner implemented and Cost-share Agricultural Best Management Practices	16.8	FDACS
Dispersed Water Management Projects – Planned	16.5	SFWMD
Northern Everglades Payment for Environmental Service Program Solicitation	TBD	SFWMD
Fisheating Creek Wetland Reserve Special Project	3.5	USDA
Hybrid Wetland Treatment Technology (Grassy Waters site)	2.9	SFWMD
Aquifer Storage and Recovery (Kissimmee Pilot ASR and Taylor Creek ASR Reactivation)	1.3	SFWMD and USACE
C-44 Project	6.7	SFWMD and USACE
Lakeside Ranch Stormwater Treatment Area Phase I	9.0	SFWMD
Subtotal	56.6	
Remaining Load	249.6	

TP: total phosphorus, mt: metric tons

Under the **long-term activities**, several management strategies to provide additional phosphorus reduction capability are being considered. Feasibility studies relating to these strategies will be performed and the most cost-effective projects will be implemented. These future reduction projects are estimated to further reduce the loads to the lake by approximately 186 metric tons. That effectively brings the phosphorus loading to the lake down to approximately 62 metric tons above the target level of 105 metric tons.

Activities		Adjusted TP Load Reduction (mt)	Lead Agency
Baseline Phosphorus Load (2001–2009)		539.2	
Current Activities		127.9	
Near-Term Activities		56.6	
TMDL (not including the 35 mt of atmospheric deposition)		105	
Remaining Load		249.7	
Future Activities	Owner implemented and Cost-share Agricultural Best Management Practices	18.0	FDACS
	Dispersed Water Management Project – Potential Sites	6.1	SFWMD
	Chemical Treatment at the Parcel Level	46.4	FDEP and SFWMD
	Chemical Treatment within Reservoirs	14.3	FDEP and SFWMD
	Lakeside Ranch STA Phase II	10.0	SFWMD
	CERP Lake Okeechobee Watershed Project	54	USACE and SFWMD
	Clewiston Stormwater Treatment Area	2.5	SFWMD
	Brady Ranch Stormwater Treatment Area	2.0	SFWMD
	S-68 Stormwater Treatment Area	8.0	SFWMD
	Istokpoga/Kissimmee Reservoir Assisted Stormwater Treatment Area	8.9	SFWMD
	Kissimmee Reservoir East	6.5	SFWMD
	Aquifer Storage and Recovery	11.2	SFWMD
	Subtotal	187.9	
	Remaining Load	61.8	

TP: total phosphorus, mt: metric tons

Based on this analysis, there are approximately 62 metric tons remaining above the TMDL target. It is apparent that additional watershed phosphorus reduction projects or strategies are needed to address this phosphorus reduction shortfall. Efforts undertaken by coordinating agencies such as the Northern Everglades-Payment for Environmental Service Dispersed Water Management Solicitation Program, innovative nutrient reduction technologies, feasibility planning studies, and BMP research and optimization will be used to identify ways to fill this shortfall and to accelerate achievement of LOPP objectives.

Plan Implementation

The updated Lake Okeechobee Protection Plan will be implemented in multiple phases. The schedule considers not only the time required to construct the various components, but also the lag between construction and actual load reductions. The measures listed in the following table are those that are imminent and have the highest potential to be completed by 2013. The next phase includes those projects/activities that will be initiated or completed beyond 2014. The plan will be revisited and necessary adjustments will be made in the next Lake Okeechobee Protection Plan Update in 2014. This list takes into account the current economic realities. If additional funding sources are identified or economic conditions improve, expedited implementation of BMPs including edge-of-farm systems; the dispersed water management program; and chemical treatment/hybrid treatment systems would be priorities for implementation.

		Initiated	Completed
Source Control	Agricultural and Urban Best Management Practices*	✓	✓
	Revision of the SFWMD's existing regulatory source control program (Chapter 40E-61, F.A.C.) for the Lake Okeechobee Watershed		✓
	Revision of the FDEP's statewide stormwater proposed rule		✓
Construction Project	Dispersed Water Management Projects-Planned	✓	✓
	Northern Everglades Payment for Environmental Service Program Solicitation	✓	
	Fisheating Creek Wetland Reserve Special Project	✓	
	Alternative Nutrient Reduction Technologies (e.g., HWTT, PRB technology, Chemical treatment)	✓	✓
	Lakeside Ranch Stormwater Treatment Area Phase I		✓
	Aquifer Storage & Recovery (Kissimmee Pilot ASR and Taylor Creek ASR Reactivation)		✓
	C-44 Project	✓	
	Rolling Meadows Wetland Restoration Planning and Design		✓
	Fisheating Creek Sub-Watershed Feasibility Study		✓
	Indian Prairie Sub-Watershed Phase I Assessment		✓
	Taylor Creek Site Feasibility Study		✓
	Upper Kissimmee Sub-Watershed Feasibility Study	✓	
Research and Water Quality Monitoring	Pre-Drainage Characterization Modeling		✓
	New Alternative Technology Assessment	✓	
	Legacy Phosphorus Studies		✓
	BMP Research and Extension Coordinating Council Proposals	✓	
	Kissimmee River Phosphorus Study		✓
	Continue Watershed and In-Lake Monitoring	✓	✓
Exotic Species Control	Exotic Vegetation Management	✓	✓
Internal Phosphorus Management	In-lake Dredging	✓	
	In-Lake Phosphorus Management Study		✓

* Completed partial implementation through a phased approach

Plan Cost Estimates

The estimated costs for the current and near-term projects implemented under the Lake Okeechobee Protection Plan Update were calculated in 2010 dollars and adjusted using a 3.5 percent inflation rate from 2011 to 2013. The total cost estimates are reflected below. All project costs were obtained from projected values or actual costs where available. The coordinating agencies will continue to pursue alternative funding sources including federal matching funds, other non-state funding, and public-private partnerships wherever possible to expedite implementation of this plan.

Category of Cost	Cost Estimate
Watershed Source Control	\$16.1 M
Operations and Maintenance of Completed Projects	\$9.6 M
Near-term Construction Project (included the Payment for Environmental Services program funding for Northern Everglades)	\$62.9M
Research and Water Quality Monitoring	\$3.2 M
Exotic Species Control	\$0.8 M
Internal Phosphorus Management	TBD*
Total Cost	\$92.6 M

*Cost estimates for internal phosphorus management program will be determined.

Plan Refinements and Revisions

In summary, the Lake Okeechobee Protection Plan Update 2011 provides a framework 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. The legislation requires plan updates every three years. Accordingly, this plan will be updated in 2014. In addition, the coordinating agencies provide annual progress reports on the Northern Everglades and Estuaries Protection Program (including Lake Okeechobee Protection Plan implementation) as part of the *South Florida Environmental Report*. This consolidated report provides opportunities for refinements every year and can be utilized to include further analyses as well as updates on projects and activities as appropriate.

For More Details...

For your convenience, a compact disc copy of the entire Lake Okeechobee Protection Plan Update is attached to the inside back cover of this publication. Please refer to that document for more details on the highlights included in this executive summary. A copy may also be obtained on-line at <http://www.sfwmd.gov/northerneverglades>.