ERCP - Lake Okeechobee & Northern Estuaries

Success Indicator:	1) Total Maximum Daily Load target of 140 metric tons phosphorus load for Lake Okeechobee met by 2015
Definition:	The Total Maximum Daily Load (TMDL) of phosphorus to Lake Okeechobee is a long-term (five-year) rolling average of 140 metric tons (mt) per year developed by the Florida Department of Environmental Protection (FDEP) and state-mandated to be met by 2015
Data Source(s):	Annual South Florida Environmental Report (SFER)
Reporting Period:	Water Year (May 1 – April 30)
Reporting Frequency:	Annually by end of Fiscal Year
Aligned Strategy:	Achieve water quality improvements through implementation of the source control programs under the northern Everglades and Estuaries Protection Program and changes in regulatory requirements, as well as through local and regional water quality treatment projects and innovative nutrient control strategies.
Why Success Indicator Is Important:	The South Florida Water Management District is mandated by the 2000 Lake Okeechobee Protection Act and the 2007 Northern Everglades and Estuaries Protection Program legislation to achieve the TMDL for Lake Okeechobee. The Lake Okeechobee Works of the District Regulatory Program is an on-going, performance-based phosphorus source control program utilizing best management practices, and it supports the Lake Okeechobee Protection Plan. Achieving targets at the source in the Lake Okeechobee Watershed is critical to optimizing downstream water quality and the overall success of achieving the lake's TMDL. A watershed-based, phased, comprehensive, and innovative protection program has been designed to reduce Total Phosphorus (TP) loads and implement long-term solutions based on the lake's TMDL.
Examples:	**Water Year** — **Load (mt)*** 2005 — 967 2006 — 819 2007 — 202 2008 — 246 2009 — 647 **Five year Average** — **578** * includes atmospheric deposition of 35 mt
Target(s):	TMDL to Lake Okeechobee of 140 mt per year TP load by 2015
Target definition source:	Lake Okeechobee Protection Plan [Section 373.4595, Florida Statutes (F.S.)], Northern Everglades Technical Plan, Chapter 40E-61, Florida Administrative Code
Subject matter expert(s):	David Unsell, Pam Wade, Pinar Balci, Tom James, Damon Meiers

Success Indicator:	2) Additional water storage constructed within Lake Okeechobee Watershed ranging between 900,000 and 1.3 million acre feet
Definition:	Cumulative volume in acre-feet (ac-ft) of additional water storage within the Lake Okeechobee Watershed as of the end of the Fiscal Year (October 1–September 30), created through multi-agency and program efforts
Data Source(s):	Lake Okeechobee Watershed Construction Project Phase II Technical Plan (LOWCP-P2TP)
Reporting Period:	Fiscal Year (October 1 – September 30)
Reporting Frequency:	Annually, end of fiscal year
Aligned Strategy:	Achieve required water storage through a phased implementation of the storage features identified in the Lake Okeechobee Watershed Construction Phase II Technical Plan, including a combination of above-ground reservoirs, underground storage and alternate water storage projects on public and private lands
Why Success Indicator Is Important:	Additional water storage will provide for a healthier and well-balanced Lake Okeechobee ecosystem by moderating lake levels and reducing damaging discharges to its downstream coastal estuaries, the Caloosahatchee River and St. Lucie River estuaries. The Lake Okeechobee Watershed Construction Project Phase II Technical Plan (P2TP) was submitted to the Florida legislature in February 2008 as required by Northern Everglades and Estuaries Protection Plan (SFWMD et al., 2008). The P2TP identifies construction projects, along with the on-site measures that prevent or reduce pollution at the source, such as agricultural and urban Best Management Practices (BMPs), needed to achieve the TMDL for total phosphorus (TP) established for Lake Okeechobee. In addition, the P2TP 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 rivers' estuaries. The plan currently is being implemented, and an update is scheduled to be completed by early 2011.
Example:	39,203 cumulative ac-ft of water storage capacity were made available through the end of FY2009
Target(s):	Total additional water storage of between 900,000 and 1.3 million ac-ft
Target definition source:	Lake Okeechobee Watershed Construction Project Phase II Technical Plan
Subject matter expert(s):	Temperince Morgan, Pinar Balci, Armando Ramirez

Success Indicator:	3) Lake Okeechobee level maintained in the desired range of 12.5 to 15.5 feet (NGVD)
Definition:	Maintain Lake Okeechobee surface elevation between 12.5 and 15.5 feet (ft) National Geodetic Vertical Datum (NGVD), based on the new interim regulation schedule, LORS2008. This stage envelope has been selected based on public health and safety considerations associated with the integrity of the Herbert Hoover Dike, and to best balance and meet the many resource needs served by Lake Okeechobee
Data Source(s):	Lake Okeechobee Watershed Protection Plan
Reporting Period:	Fiscal Year (October 1 – September 30)
Reporting Frequency:	Annually, end of fiscal year
Aligned Strategy:	Strive for optimal lake levels in conjunction with U.S. Army Corps of Engineers during the weekly manager's operational meetings.
Why Success Indicator Is Important:	Lake Okeechobee surface elevations within the prescribed range provide for a healthier, well-balanced Lake Okeechobee ecosystem by moderating lake levels. High lake levels tend to benefit water supply, but may increase the risk to public health and safety, and can harm the ecological health of the lake and may adversely affect estuarine systems receiving lake discharges. Lower lake schedules may reduce water supply potential. The timing and magnitude of water releases is important for preserving flood protection of the region, and also for protecting the natural habitats of the downstream estuaries. The current interim Lake Okeechobee Regulation Schedule (LORS 2008) represents the best operational compromise for public health and safety as it pertains to the Lake Okeechobee Regulation Schedule and the Herbert Hoover Dike. The U.S. Army Corps of Engineers (USACE) expects to operate under LORS until the earlier of: (1) implementation of a new LORS as a component of the system-wide operating plan to accommodate the CERP and the expedited projects; or (2) completion of Herbert Hoover Dike seepage berm construction or equivalent dike repairs for reaches 1, 2, and 3. In balancing the multiple project purposes, the USACE will shift from the interim LORS to a new schedule with the intent to complete any necessary modifications or deviations concurrent with the completion of (1) or (2) above.
Example:	Lake Okeechobee surface elevation ranges for Water Year 2010 were from 10.55 ft to 14.63 ft, with 212 days of the year below the desired range because of drought conditions. For the remainder of the year, 69 days were above the envelope and 84 days were within the envelope.
Target(s):	Lake Okeechobee surface elevation in the desired range of 12.5 to 15.5 ft (NGVD)
Target definition source:	Lake Okeechobee Watershed Protection Plan; Lake Okeechobee Regulation Schedule
Subject matter expert(s):	Luis Cadavid,

Success Indicator:	4) Annual average of 40,000 acres of mixed submerged aquatic vegetation achieved in Lake Okeechobee; at least 20,000 acres should be vascular plants
Definition:	**Submerged aquatic vegetation (SAV):** Plants that grow below the surface of the water. **Acres of submerged/emergent aquatic vegetation:** Number of acres where SAV is found. **Mapping Survey:** Boat crews annually visit the midpoint of a 1 x 1 kilometer (km) grid of the area in Lake Okeechobee where SAV may be found. Three samples from a total of a 1 square meter (m^2) area of sediment are raked, and vegetation is visually inspected and recorded. The average of these three values is applied to the 1 x 1 km grid cell. Using Geographic Information Systems, the values for each 1 x 1 km grid cell are used to create a vegetation map of Lake Okeechobee.
Data Source(s):	Yearly mapping survey provided by District personnel
Reporting Period:	Annually, August – September
Reporting Frequency:	Annually, end of fiscal year
Aligned Strategy:	Assess Lake Okeechobee's ecological condition and program progress on an annual basis
Why Success Indicator Is Important:	SAV provide habitat and spawning grounds for fish. Aquatic vegetation also creates areas of low turbidity, good water quality and habitat for waterfowl. In years with large SAV coverage, algal blooms are less frequent and fish recruitment is higher.
Example:	In the late 1990s, SAV coverage was low and fish recruitment also was low due to very high water levels in Lake Okeechobee. Following the 2000–2001 drought, SAV recovered and fish recruitment was much higher during 2002 and 2003.
Target(s):	A minimum of 20,000 acres of vascular SAV and 40,000 acres of total SAV
Target definition source:	CERP Lake Okeechobee Vegetation Mosaic Performance Measure
Subject matter expert(s):	Therese East, Andy Rodusky, Paul McCormick

Success Indicator:	5) Exotic species controlled in Lake Okeechobee's marsh to maintenance levels or less
Definition:	Maintenance level is less than 10,000 acres of coverage by exotic emergent vegetation species of Lake Okeechobee's 100,000 acre marsh
Data Source(s):	Prepared applicator field report and vegetation distribution maps
Reporting Period:	Calendar Year
Reporting Frequency:	Annually, end of Calendar Year
Aligned Strategy:	Utilize prescribed burns, herbicide spraying and low lake stage projects to control exotic species
Why Success Indicator Is Important:	Annual treatment of exotic and invasive species is needed to protect native habitat and allow desirable vegetation to establish in previously impacted areas. The loss of desirable native habitat negatively affects wading birds, fish and other wildlife. Prior to active vegetation management, melaleuca (*Melaleuca quinquenervia*) and torpedograss (*Panicum repens*) each displaced more than 20,000 acres of native vegetation in the marsh. Following years of vegetation management work, melaleuca has been brought under maintenance control and torpedograss now covers less than 12,000 acres. Native SAV, spikerush (*Eleocharis* spp.), and other desirable emergent vegetation also have been displaced by cattail (*Typha* spp.) in Moonshine Bay, South Bay and the northwest region of the marsh. Cattail treatments are necessary to maintain open areas that can be utilized by fish, wading birds, waterfowl and other wildlife.
Example:	Exotic species level at end of FY2009 Total area of Lake Okeechobee marsh = approx. 100,000 acres Exotic species coverage = 11% Invasive species treated in 2009-2010: Torpedograss – 4,500 acres Melaleuca – 30 acres Brazilian pepper – 40 acres Senna pendula – 20 acres Old World climbing fern – 10 acres Cogon grass – 1 acre Australian pine – 5 acres
Target(s):	Less than 10,000 acres of exotic emergent vegetation coverage in Lake Okeechobee's 100,000-acre marsh.
Target definition source:	Lake Okeechobee Vegetation Map
Subject matter expert(s):	Chuck Hanlon, Francois Laroche, Mike Bodle

Success Indicator:	6) St. Lucie Estuary within desired 30-day moving average salinity range of 8 to 28 practical salinity units 365 days of the year
Definition:	30-day moving average salinity in practical salinity units
Data Source(s):	Salinity measurements taken at two locations in the middle of St. Lucie Estuary
Reporting Period:	Fiscal Year (October 1 – September 30)
Reporting Frequency:	Moving average; measurements taken every 15 minutes; reported weekly
Aligned Strategy:	Publish and implement restoration and protection plans for coastal water bodies and tributary watersheds
Why Success Indicator Is Important:	Salinity levels in surface water reflect the overall health of the St. Lucie Estuary. South Florida Water Management District research has identified a range of salinity concentrations at locations within the St. Lucie Estuary that are required for Valued Ecosystem Components (VECs) (e.g., oysters and seagrasses) to flourish. Large volumes of runoff from the tributary watershed and/or discharges from Lake Okeechobee can result in below-optimal salinity levels in the estuary.
Example:	In 2009, the 30-day moving average salinity was within the desired range of 8 – 28 practical salinity units (psu) for 300 days.
Target(s):	30-day moving average within 8-28 practical salinity units
Target Definition Source:	Note: Practical salinity units (psu) are essentially equivalent to parts per thousand (ppt) Final Indian River Lagoon – South Project Implementation Report and Environmental Impact Statement (March 2004, Exhibit E) http://www.evergladesplan.org/pm/studies/irl_south_pir.aspx “The salinity tolerance range in the literature for spat is 20–23 ppt (optimum) and 15–29 ppt (common natural range).” (p. 24) “In order to maintain a healthy population of oysters in the middle of the St. Lucie Estuary downstream of the Roosevelt Bridge, the average annual salinity in the St. Lucie Estuary should be near 15 ppt; exposures to salinity below 7–8 ppt are considered undesirable. More specific salinity tolerances of oysters related to stress, harm, and death are presented relative to an “Oyster-Health” Model developed for this report.” (p.94)
Subject Matter Expert(s):	Peter Doering

Success Indicator:	7) Total phosphorus and total nitrogen loads to the St. Lucie River Estuary reduced consistent with the St. Lucie River Watershed Protection Plan
Definition:	Total nitrogen (TN) and Total Phosphorus (TP) concentrations of 0.74 mg/L and 81 ug/L are the adopted nutrient Total Maximum Daily Loads (TMDLs) by the Florida Department of Environmental Protection (FDEP) for St. Lucie Estuary. St. Lucie River Watershed Protection Plan aims to reduce the current loads by 56% for TN and 55% for TP to achieve the adopted TMDLs.
Data Source(s):	St. Lucie River Watershed Protection Plan
Reporting Period:	Fiscal Year (October 1 – September 30)
Reporting Frequency:	Status updates annually, end of fiscal year, in the South Florida Environmental Report. Also triennial St. Lucie River Protection Plan updates.
Aligned Strategy:	Achieve water quality improvements through implementation of the source control programs under the Northern Everglades and Estuaries Protection Program and changes in regulatory requirements, as well as through local and regional water quality treatment projects and innovative nutrient control strategies
Why Success Indicator Is Important:	The St. Lucie River Watershed Protection Plan (SLRWPP) was submitted to the Florida legislature in January 2009 as required by Northern Everglades and Estuaries Protection Program (SFWMD et al., 2009). SLRWPP identifies water quality projects, along with the on-site measures that prevent or reduce pollution at the source, such as agricultural and urban Best Management Practices (BMPs) needed to achieve the TMDL for St. Lucie River Estuary. In addition, the SLRWPP includes other projects for increasing water storage to reduce the frequency and duration of undesirable salinity ranges. The plan is currently being implemented and an update is scheduled to be completed by early 2012.
Example:	The current load from the St. Lucie River Watershed to the St. Lucie Estuary is 1,296 metric tons per year of total nitrogen and 276 metric tons per year (mt/y) of total phosphorus. The SLRWPP achieves a total load reduction of 55% for total nitrogen and 56% for total phosphorus.
Target(s):	A reduction in total phosphorus loads to the St. Lucie Estuary by 56% and total nitrogen loads by 55% to meet the adopted TMDLs. In addition, SLRWPP will provide 200,000 acre-feet of storage in the Caloosahatchee River watershed.
Target Definition Source:	St. Lucie River Watershed Protection Plan
Subject Matter Expert(s):	Temperince Morgan, Pinar Balci, Jennifer Leeds

Success Indicator:	8) Total phosphorus and total nitrogen loads to the Caloosahatchee River Estuary reduced consistent with the Caloosahatchee River Watershed Protection Plan
Definition:	Total nitrogen loading of 4,121 metric tons per year is the adopted Total Maximum Daily Load (TMDL) by the Florida Department of Environmental Protection (FDEP) for the tidal Caloosahatchee River. Caloosahatchee River Watershed Protection Plan aims to reduce the current loads by 38% for TN to achieve the adopted TMDL. The Plan also reduces the loads by 39% for TP.
Data Source(s):	Caloosahatchee River Watershed Protection Plan
Reporting Period:	Fiscal Year (October 1 – September 30)
Reporting Frequency:	Status updates annually, end of fiscal year, in the South Florida Environmental Report. Also triennial Caloosahatchee River Protection Plan updates.
Aligned Strategy:	Achieve water quality improvements through implementation of the source control programs under the Northern Everglades and Estuaries Protection Program and changes in regulatory requirements, as well as through local and regional water quality treatment projects and innovative nutrient control strategies
Why Success Indicator Is Important:	The Caloosahatchee River Watershed Protection Plan (CRWPP) was submitted to the Florida legislature in January 2009 as required by Northern Everglades and Estuaries Protection Plan (SFWMD et al., 2009). CRWPP identifies water quality projects, along with the on-site measures that prevent or reduce pollution at the source, such as agricultural and urban Best Management Practices (BMPs), needed to achieve the TMDL for Caloosahatchee River Estuary. In addition, the CRWPP includes other projects for increasing water storage to reduce the frequency and duration of undesirable salinity ranges. The plan is currently being implemented and an update is scheduled to be completed by early 2012.
Example:	The current load from the Caloosahatchee River Watershed to the Caloosahatchee Estuary is 2,900 metric tons per year (mt/yr) of total nitrogen and 326 mt/yr of total phosphorus. The CRWPP achieves a total load reduction of 38% for total nitrogen and 39% for total phosphorus.
Target(s):	A reduction in total nitrogen loads to the estuary by 38% to meet the adopted TMDL. The Plan also reduces the loads by 39% for TP. In addition, Caloosahatchee River Watershed Protection Plan will provide 400,000 acre-feet of storage in the Caloosahatchee River watershed.
Target Definition Source:	Caloosahatchee River Watershed Protection Plan
Subject Matter Expert(s):	Temperince Morgan, Pinar Balci, Janet Starnes

Success Indicator:	9) Mean monthly flow in the Caloosahatchee River Estuary averaging between 450 and 2,800 cubic feet per second.
Definition:	Mean monthly flow of 300 cubic feet per second (cfs); an MFL exceedance occurs when the 30-day average salinity concentration exceeds 10 ppt at the Ft. Myers salinity station or the daily average salinity exceeds a concentration of 20 ppt at the Ft. Myers salinity station. Permanent monitoring stations have been established to monitor tape grass (*Vallisneria americana*) in the upper estuary.
Data Source(s):	District hydrologic and water quality monitoring database
Reporting Period:	Fiscal Year
Reporting Frequency:	Annually, end of fiscal year
Aligned Strategy:	Develop technical criteria for water reservations and Minimum Flows and Levels
Why Success Indicator Is Important:	The Caloosahatchee River Estuary has suffered from extremely low freshwater inflows, which have threatened the ability of tape grass in the upper estuary to maintain a viable population. SFWMD research has established a relationship between flow rates and salinity concentrations. Prolonged flows less than the minimum level adopted by rule are known to cause significant harm to the estuary. Minimum flows are established to identify where further withdrawals would cause significant harm to the water resources of the Caloosahatchee River Estuary and associated resources, or to the ecology of the area. Minimum levels are established to identify where further withdrawals would cause significant harm to the water resources of the area.
Example:	In 2009, mean monthly flows fell between 450 cfs and 2800 cfs for 7 months.
Target(s):	Mean monthly flow in the Caloosahatchee River Estuary averaging between 450 and 2,800 cubic feet per second
Target Definition Source:	Specific MFLs are established in 40E-8, Florida Administrative Code (F.A.C.), for specified priority water bodies that have been designated pursuant to Section 373.042(2), F.S., and Chapter 40E-8.221, F.A.C.
Subject Matter Expert(s):	Peter Doering