

Florida Department of Environmental Protection



Draft Lake Okeechobee Basin Management Action Plan (BMAP) Monitoring Plan

March 19, 2014





Monitoring Plan Objectives

- **Primary Objective**
 - Continue to track trends in TP concentrations and loads by sub-watershed.
- **Secondary Objectives**
 - Continue to identify areas within the watershed with high TP loading to better focus management efforts.
 - Continue to measure effectiveness of individual or collective projects in reaching TMDL target-pollutant loadings.
 - Continue to track trends in TN concentrations and loads by sub-watershed.



Existing Monitoring

- The Department reviewed monitoring information from the following stakeholders:
 - South Florida Water Management District (SFWMD).
 - United States Geological Survey (USGS).
 - Osceola County.
 - Orange County.
 - City of Orlando.
 - City of Kissimmee.
 - Southwest Florida Water Management District (SWFWMD).
- Conversations are ongoing with the stakeholders listed above to determine which stations are most appropriate for inclusion in the BMAP.



SFWMD Monitoring

Project Description	Number of Stations	Frequency	Parameters
Kissimmee River Pools	1	Monthly	NH ₄ , NO _x , TKN, TOC, TPO ₄ , ALKA, TURB, CL, COLOR, NO ₂ , OPO ₄ , CHL-N, COND, DO, TEMP, PH
Kissimmee River Autosamplers/Grabs	3	Weekly-auto sampler composite time (ACT) proportionate/Biweekly and Quarterly Grabs	(W)TPO ₄ / (BW) TPO ₄ , ALK, CHL-N, CL, COLOR, DOC, NO ₂ , OPO ₄ , SIO ₂ , SO ₄ , NH ₄ , NO _x , TOC, TSS, TURB, COND, DO, TEMP, PH/ (Q) CA, MG, K, NA, FE (only at 1 station)
Lake Istokpoga (In-Lake)	1	Bimonthly (6x/year)	TSS, CHL-N, ALKA, TURB, NH ₄ , NO _x , CA, K, MG, NA, CL, COLOR, NO ₂ , OPO ₄ , SIO ₂ , SO ₄ , TKN, TPO ₄ , COND, DO, TEMP, pH
Lake Okeechobee (Littoral)	1	Monthly	ALKA, CHL-N, CL, COLOR, COND, DO, TEMP, pH, NH ₄ , NO ₂ , NO _x , OPO ₄ , TKN, TPO ₄ , TSS, TURB, VSS, CA, K, MG, NA, TDKN, TDPO ₄
Lake Okeechobee (Pelagic)	8	Monthly	ALKA, CHL-N, CL, COLOR, COND, DO, TEMP, pH, NH ₄ , NO ₂ , NO _x , OPO ₄ , TKN, TPO ₄ , TSS, TURB, VSS
Lake Okeechobee Structures/Permit	33	Varies	VARIOUS



SFWMD Monitoring, continued

Project Description	Number of Stations	Frequency	Parameters
Source Control	4	Weekly auto sampler composite flow (ACF) proportionate	TPO4
Source Control (Upper Kissimmee Basin)	2	Biweekly if flowing	TPO4
Tributary Trend Site	12	Biweekly if flowing	TKN, TPO4, NOX
Upper Chain of Lakes	3	Monthly	CHL-N, TSS, ALKA, TURB, CL, COLOR, NO2, OPO4, TKN, TPO4, NH4, NOX, COND, DO, TEMP, PH
Upper Chain of Lakes (In-Lake)	7	Biweekly (6x/year)	CHL-N, TSS, ALKA, TURB, CL, COLOR, NO2, OPO4, TKN, TPO4, NH4, NOX, CYANOBACTERIA (3 stations), COND, DO, TEMP, PH



Osceola County Monitoring

Number of Stations	Sampling Frequency	Parameters
4 (Lake Toho Nutrient Reduction Plan)	Monthly	TP, NOX, TKN, DO, pH, TEMP, COND
15 (Monitoring Network)	Grab/Monthly or As flow permits	TPO4 , TKN, NOX



Osceola County/SFWMD Monitoring

Number of Stations	Sampling Frequency	Parameters
1	Monthly	CHL-N, TSS, ALKA, TURB, CL, COLOR, NO2, OPO4, TKN, TPO4, NH4, NOX, COND, DO, TEMP, PH



Orange County Monitoring

Number of Stations	Sampling Frequency	Parameters
3	Quarterly	TP, NOX, TKN, DO, pH, TEMP, COND



Orlando/Orange County Monitoring

Number of Stations	Sampling Frequency	Parameters
2	Biannually (winter and summer)	Flow, Secchi, pH, DO, Temp, Spec Cond, NOx, NH3, TKN, TN, TP, Chlor-a corrected and uncorrected, Chlor-b, Chlor-c, Phaeophytin, Carotenoids, Turbidity, Chloride, Sulfate, Color, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Thallium, Tin, Vanadium, Zinc



City of Orlando Monitoring

Number of Stations	Sampling Frequency	Parameters
6	Quarterly	Secchi, pH, DO, Temp, Spec Cond, Alk, BOD, NO2, NO3, NH3, TKN, TN, OP, TP, TDS, TSS, TVSS, Chlor-a corrected, Turbidity, Color



City of Kissimmee Monitoring

Number of Stations	Sampling Frequency	Parameters
8	Quarterly	TP, Nitrate/Nitrite, TKN, DO, pH, TEMP, COND

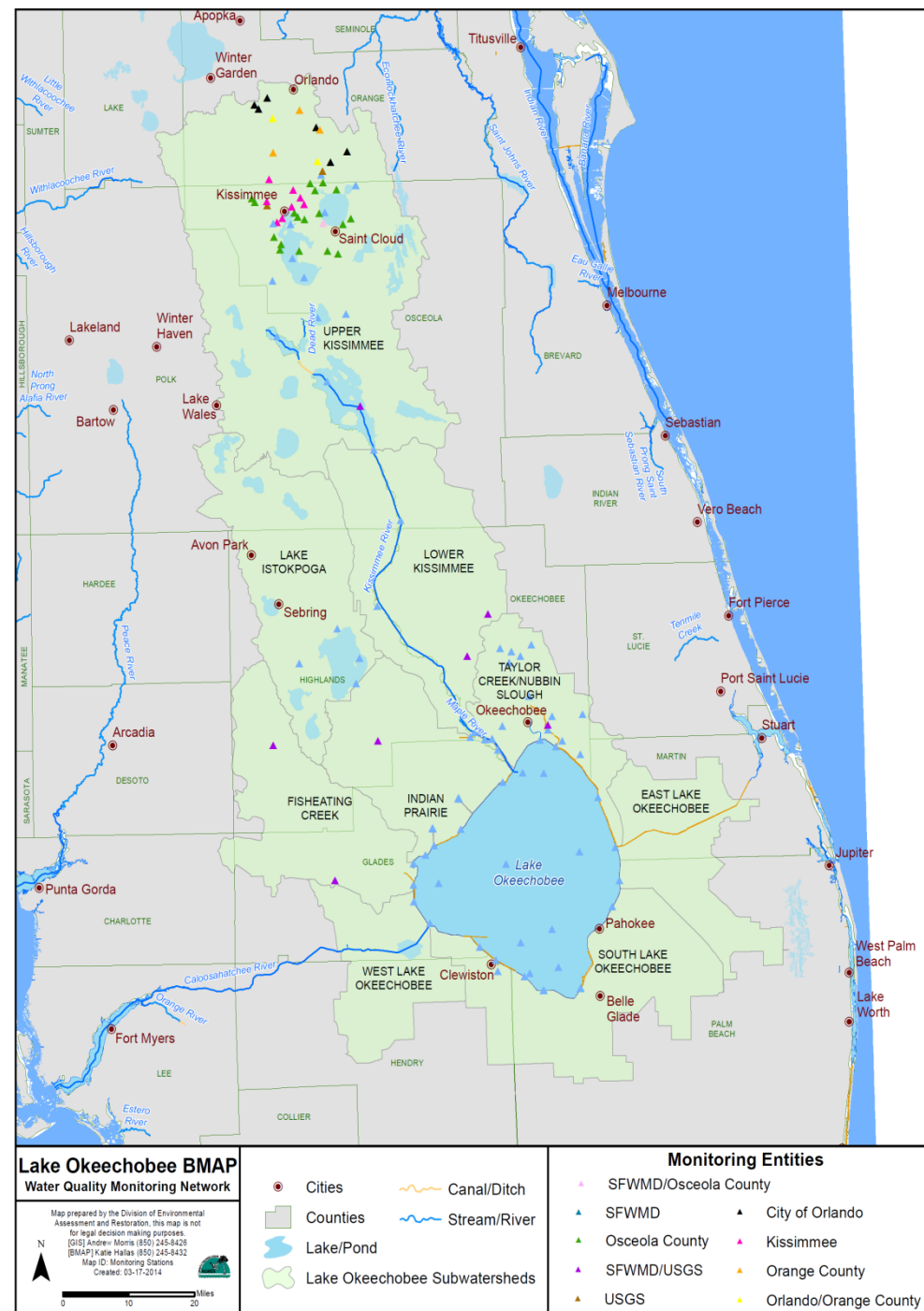


SWFWMD Monitoring

Number of Stations	Sampling Frequency	Parameters
6	?	?

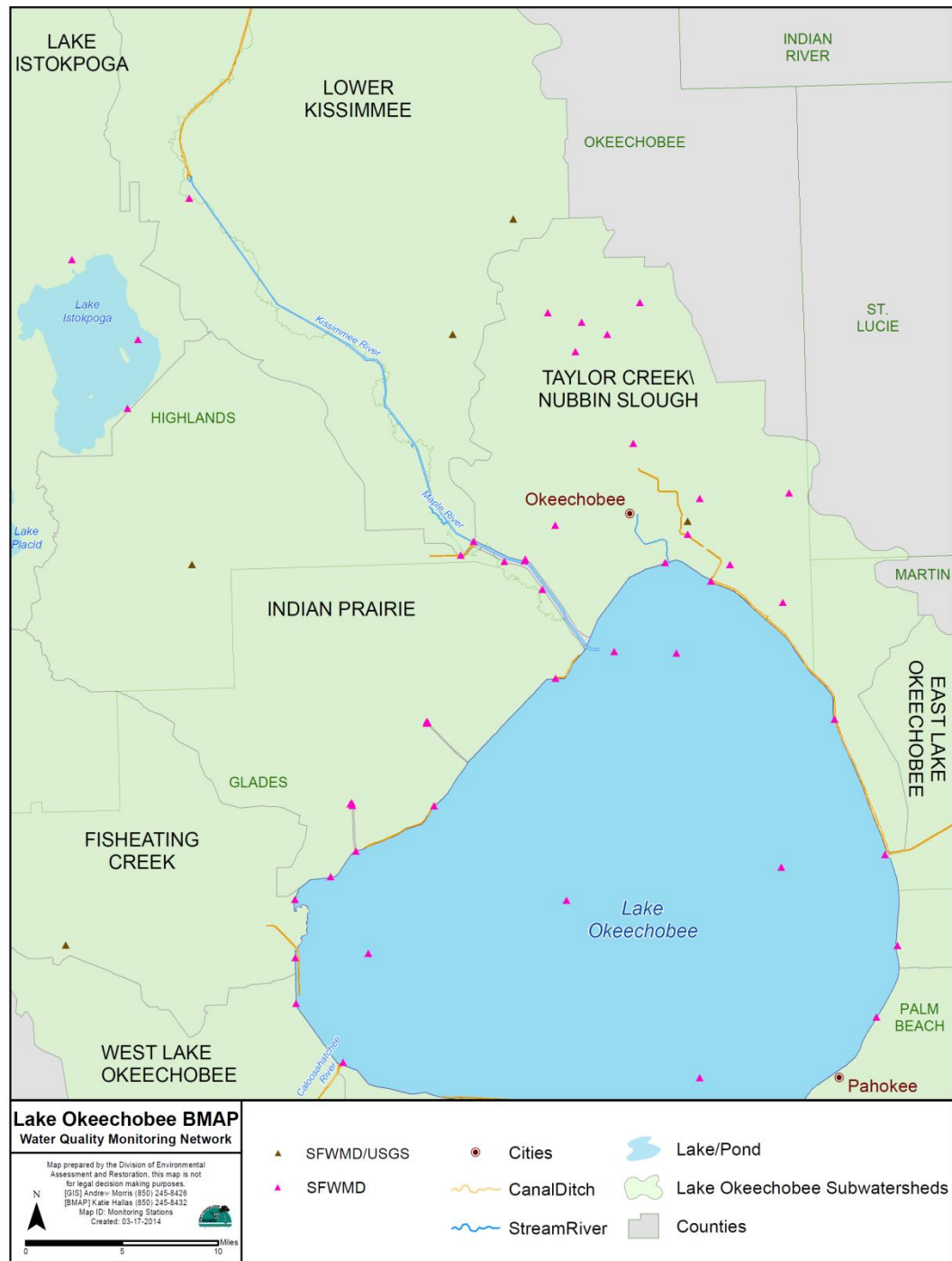


Lake Okeechobee Watershed Monitoring

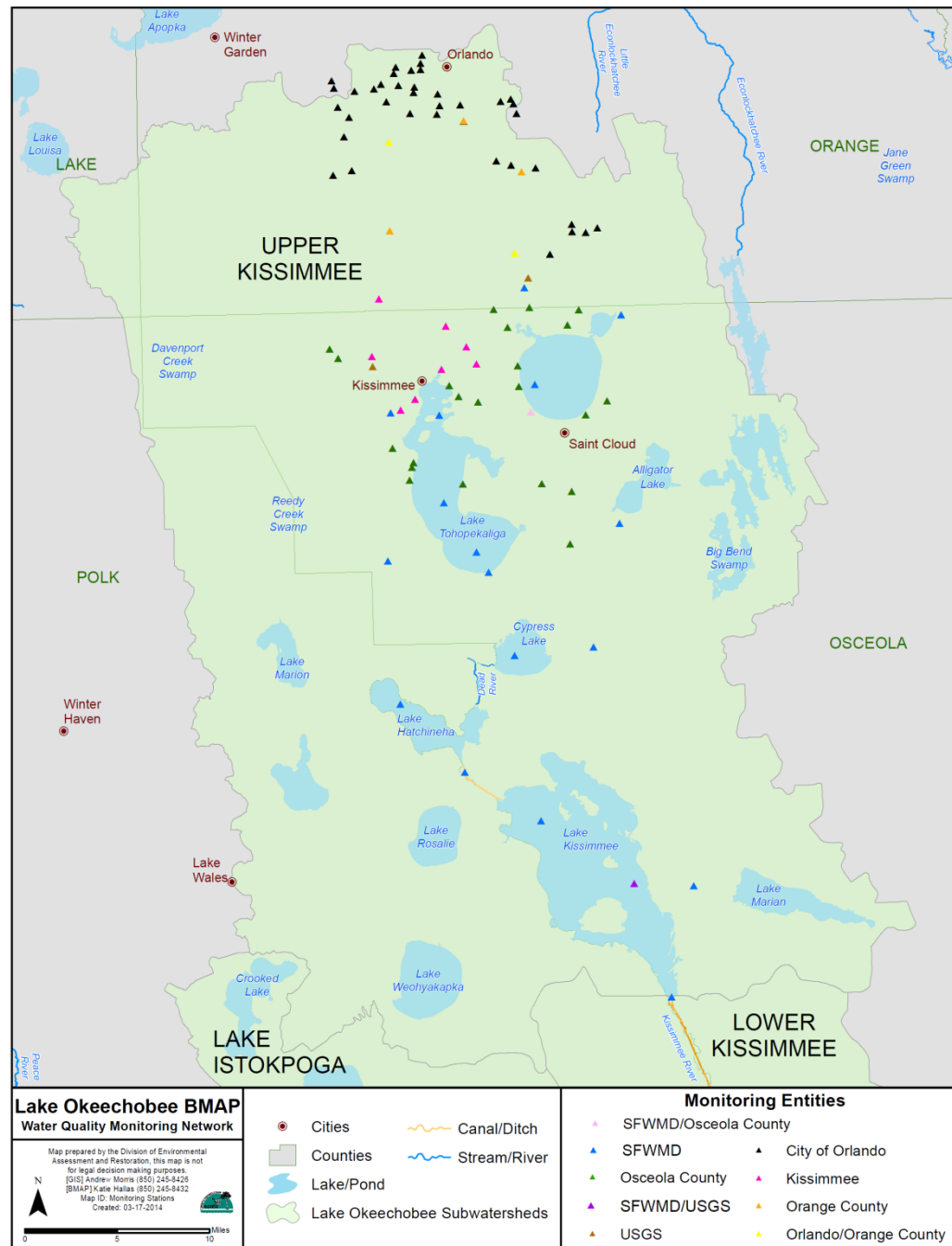




Taylor Creek/Nubbin Slough Sub-watershed Monitoring



Upper Kissimmee Sub-watershed Monitoring



Questions



Florida Department of Environmental Protection



Draft Lake Okeechobee BMAP Contents

March 19, 2014





Executive Summary Contents

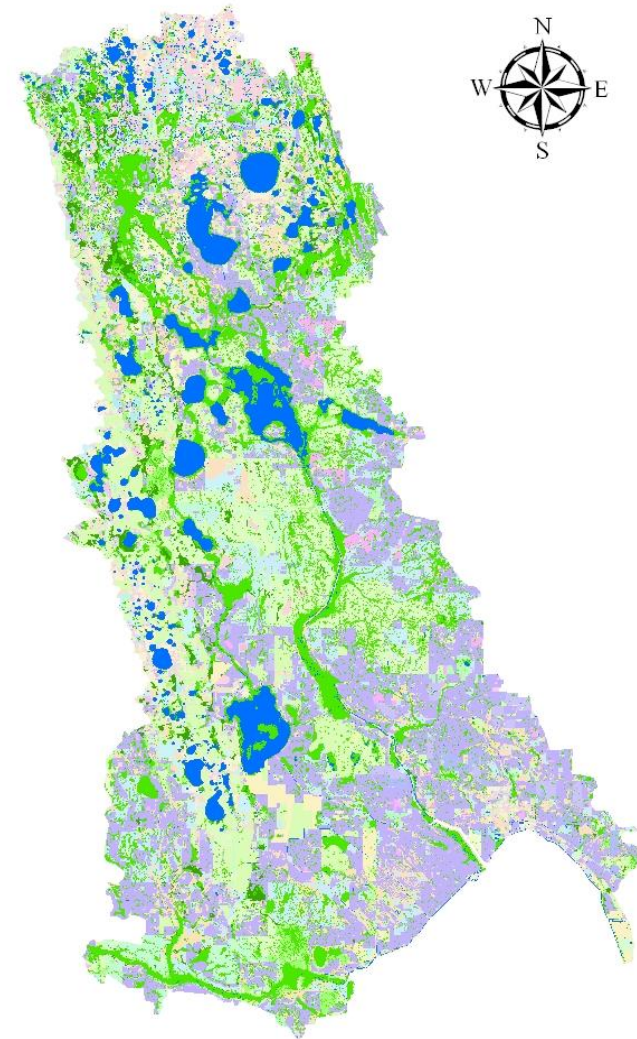
- Summary of water quality problem and pollutant reduction goals, e.g., total maximum daily load (TMDL).
 - Lake Okeechobee TMDL is for total phosphorus (TP).
 - TMDL = 140 metric tons (MT)/year:
 - 35 MT/year direct atmospheric deposition on Lake Okeechobee.
 - 105 MT/year watershed loads.
- Explanation of timeframe associated with BMAP implementation.
 - BMAP will be implemented in three five-year phases.
- Summary of costs (where available) associated with completed, ongoing, planned, and under construction projects provided in BMAP.
- Summary of financial resources available to implement BMAP.
- Overview of Lake Okeechobee stakeholders.

Watershed Context

- Key maps of watershed.
- Relationship to other BMAP waterbodies, e.g., Lake Okeechobee's flows impact St. Lucie Estuary and Caloosahatchee Estuary.
- Brief description of BMAP watershed (acreages) and land uses associated with it.
- Overview of stakeholders: cities, counties, special districts, government agencies, environmental groups, etc.

WAM Land Use Type

Animal Race Tracks
Aquaculture
Barren Land
Bay Swamps
Cattle Feeding Operation
Citrus Groves
Commercial and Services
Coniferous Plantations
Cypress
Dairies
Field Crops
Freshwater Marshes
Groves and Orchards
Hardwood Conifer Mixed
Hardwoods
High Density Residential
Horse Farms
Improved Pasture
Inactive Dairy
Industrial
Low Density Residential
Managed Landscape
Medium Density Residential
Mining
Mixed Wetland Hardwoods
Multiple Dwelling Units
Open Water
Ornamental Nurseries
Poultry Feeding Operation
Prisons
Row Crops
Rural Land in Transition
Scrub and Brushland
Sewage Treatment
Sod Farms
Solid Waste Disposal
Sugar Cane
Transportation Corridors
Tree Nurseries
Undeveloped Urban Land
Unimproved Pasture
Wetland Forested Mixed
Woodland Pasture



0 3.75 7.5 15 22.5 30 Miles

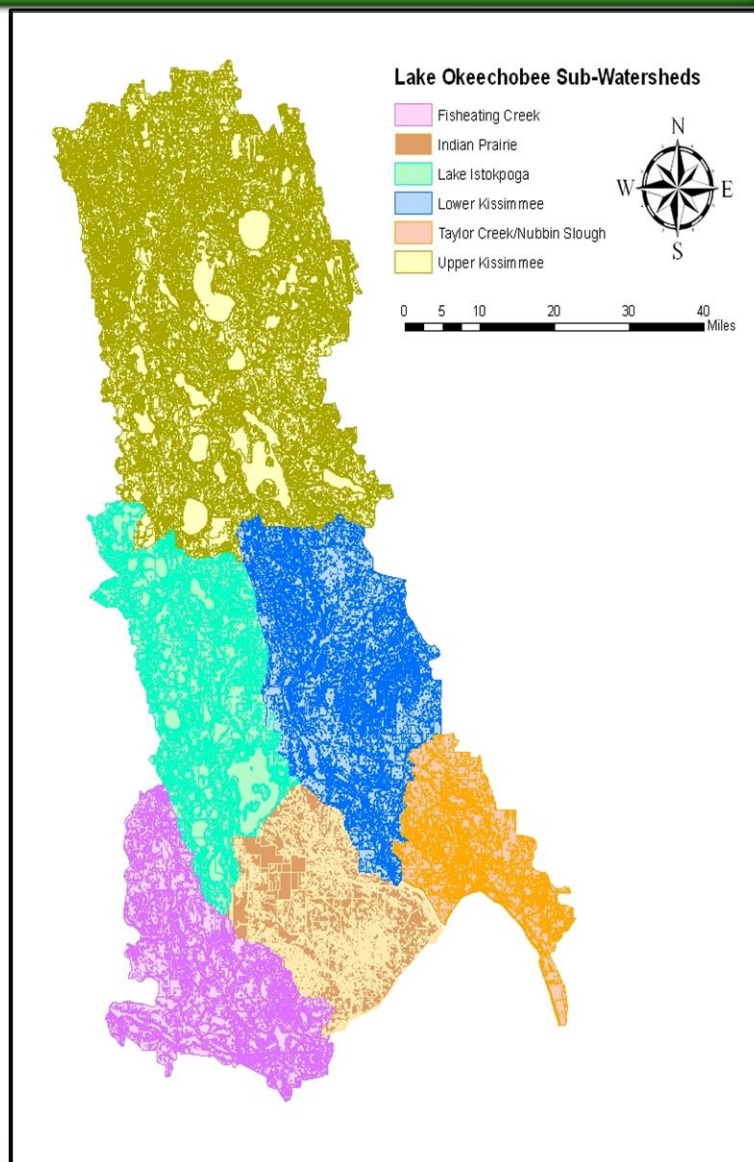


Importance of Restoration of Lake Okeechobee

- Importance of Lake Okeechobee.
 - Serves as water supply and flood control for south Florida.
 - Supports multi-million dollar fisheries and recreational opportunities.
- Scope of water quality problems.
 - High phosphorus (P) loadings from man-induced hydrologic and land use modifications have degraded Lake Okeechobee's water quality.
 - Total starting load for six sub-watersheds north of the lake is 420.2 MT/year based on Watershed Assessment Model (WAM) output.
- Summary of TMDL(s) covered by BMAP.
 - TMDL for Lake Okeechobee was adopted by the Department in 2001.
 - Lake Okeechobee's TMDL is 140 MT/year of TP.
- Explanation of relationship between TMDL and BMAP.
 - BMAPs are a means for implementation of TMDLs.

Load Estimation Tool Development

- The Department developed a nutrient loading estimation tool to determine loading estimates for the Lake Okeechobee TP TMDL.
- The loading estimation tool is a Geographic Information System (GIS) dataset that covers the six sub-watersheds north of Lake Okeechobee:
 - Upper Kissimmee.
 - Lower Kissimmee.
 - Lake Istokpoga.
 - Indian Prairie.
 - Fisheating Creek.
 - Taylor Creek/Nubbin Slough.





Load Estimation Tool Development, continued

- P loading results simulated by a set of 11 WAM domains were used to create the load estimation tool.
- Both structural and non-structural best management practices (BMPs) were included in the model and treated either explicitly as BMPs (assigning a determined reduction factor) or implicitly as a management practice within the computation of the model.

WAM Land Use Classification Code	WAM Land Use Description	TP Load Adjustment Factor
39	Dairies	1. 18
84	Citrus Groves	1. 27



Load Estimation Tool Development, continued

- The load estimation tool uses the unattenuated land use-specific TP areal loads and total TP attenuation rate.
- The unattenuated TP areal loads represent the TP loads at the source, which includes both the runoff and ground water loads.



Load Estimation Tool Development, continued

Summary of TP Loads to Lake Okeechobee

Sub-Watershed	Watershed TP Loads (kg/year)	Watershed TP Loads (MT/year)	Percent of the Load
Fisheating Creek	79,021	79.0	19%
Indian Prairie	72,669	72.7	17%
Lake Istokpoga	18,296	18.3	4%
Lower Kissimmee	102,991	103.0	25%
Taylor Creek/Nubbin Slough	100,826	100.8	24%
Upper Kissimmee	46,373	46.4	11%
Total TP Loads	420,176	420.2	100%



Load Estimation Tool Development, continued

Summary of TN Loads to Lake Okeechobee

Sub-Watershed	TN Loads (kg/year)	TN Loads (MT/year)	Percent Loads
Fisheating Creek	692,096	692	11%
Indian Prairie	1,120,342	1,120	18%
Lake Istokpoga	1,044,790	1,045	16%
Lower Kissimmee	1,272,032	1,272	20%
Taylor Creek/Nubbin Slough	536,791	537	8%
Upper Kissimmee	1,709,192	1,709	27%
Total	6,375,243	6,375	100%



First Phase TP Reduction Goal

- The total allowable loading each year to the lake from the watershed is 105 MT/year of TP.
- The current loading is 420 MT/year.
- TP will need to be reduced by 315 MT/year to meet TMDL.
- The BMAP will be implemented in a phased approach in which the total load reductions will be met in five-year increments.
- For the first five-year BMAP iteration, a minimum of 40% of the required reductions will be achieved, which is 126 MT/year. We are striving to meet a 50% reduction.
- The stakeholders have already submitted projects to meet a portion of these required reductions.
- The Department will continue to work with the stakeholders to identify additional projects to achieve the remainder of the reductions.



BMAP Projects in Lake Okeechobee Watershed

- Projects will be separated by sub-watershed and will be lumped into the following categories:
 - Completed projects.
 - Ongoing projects.
 - Planned projects.
 - Projects under consideration.
- This information has been provided by the stakeholders.



BMAP Projects in Lake Okeechobee Watershed

Sub-watershed	Project Number	Project Name	Project Type	Start Date	End Date	Expected Load Reduction or Equivalent	Cost
Taylor Creek/Nubbin Slough	TC 1	Lakeside Ranch STA Phase I	STA			9,000 kg/year	



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 - Continue to measure effectiveness of individual or collective projects in reaching TMDL target-pollutant loadings.
 - Continue to track trends in TN concentrations and loads by sub-watershed.



BMAP Monitoring Network

- Final monitoring network will include stations from:
 - SFWMD.
 - USGS.
 - Osceola County.
 - Orange County.
 - City of Orlando.
 - City of Kissimmee.
 - SWFWMD.
- Information will be shown graphically and in tabular format.

Questions

